Migration From Mexico to the United States and Conduct Disorder

A Cross-national Study

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Context: Twin studies suggest that conduct disorder (CD) is under substantial genetic influence, which is stronger for aggressive than for nonaggressive symptoms. Studies of migrating populations offer an alternative strategy for separating environmental and genetic influences on psychiatric disorders.

Objectives: To examine variation in the prevalence of CD associated with migration from Mexico to the United States and to determine whether this variation is similar for aggressive and nonaggressive CD symptoms and symptom profiles.

Design: The prevalences of CD, different types of CD symptoms, and CD symptom profiles were compared across 3 generations of people of Mexican origin with increasing levels of exposure to American culture: families of origin of migrants (residing in Mexico), children of Mexican-born immigrants who were raised in the United States, and Mexican-American children of US-born parents.

Setting: General population surveys conducted in Mexico and the United States using the same diagnostic interview.

Participants: Adults aged 18 to 44 years in the household population of Mexico and the household population of people of Mexican descent in the United States.

Main Outcome Measures: Conduct disorder criteria, assessed using the World Mental Health version of the Composite International Diagnostic Interview.

Results: Compared with the risk in families of origin of migrants, risk of CD was lower in the general population of Mexico (odds ratio [OR], 0.54; 95% CI, 0.19-1.51), higher in children of Mexican-born immigrants who were raised in the United States (OR, 4.12; 95% CI, 1.47-11.52), and higher still in Mexican-American children of US-born parents (OR, 7.64; 95% CI, 3.20-18.27). The association with migration was markedly weaker for aggressive than for nonaggressive symptoms.

Conclusions: The prevalence of CD increases dramatically across generations of the Mexican-origin population after migration to the United States. This increase is of larger magnitude for nonaggressive than for aggressive symptoms, consistent with the suggestion that nonaggressive symptoms are more strongly influenced by environmental factors than are aggressive symptoms.

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Conduct disorder (CD) is defined in the DSM-IV by persistent patterns of child or adolescent behavior involving aggression or other violations of age-appropriate norms that cause significant clinical impairment. Children who meet criteria for CD are at high risk for substance use disorders and high school dropout as adolescents and unemployment, incarceration, and early mortality as adults. Conduct disorder is also a strong predictor of a broad range of adult psychiatric disorders, including other impulse control disorders, such as intermittent explosive disorder, substance use disorders, and internalizing disorders (eg, major depression and generalized anxiety disorder). Recent nationally representative studies in the United States have estimated the lifetime prevalence of CD to be 9.5%, based on retrospective self-reports of adults aged 18 to 44 years, and the past-year prevalence to be 2.1%, based on parental reports on children aged 8 to 15 years. A large body of literature on behavioral genetics aims to identify environmental and genetic influences on CD. Comparisons of concordance between monozygotic and dizygotic twins suggest that approximately 50% of population variability in CD symptoms is attributable to inherited liability, with significant components of risk attributable to both shared and unshared environmental factors.
Genetic and environmental influences may differ across CD symptoms. Some studies report stronger heritability and weaker environmental influence for aggressive symptoms (eg, cruelty to others and fighting with a weapon) than for nonaggressive symptoms (eg, stealing without confrontation and truancy). Although there are significant exceptions to this finding, a recent meta-analysis estimated that genetic factors account for 65% of population variation in aggressive symptoms and 48% of population variation in nonaggressive symptoms.

Migration provides an alternative strategy for separating genetic and environmental influences on CD. Populations that migrate alter their environmental conditions without altering their genetic composition. Variability in the risk for a disorder associated with migration from one country to another indicates an environmental influence. Epidemiologic comparisons of immigrant-sending countries in the Caribbean and immigrant-receiving countries in Europe have found higher risk for psychotic disorders in the receiving countries, consistent with a hypothesized environmental influence on these disorders. In the United States, large differences associated with United States vs foreign nativity have been found in risk for mood, anxiety, and substance use disorders for some, but not all, immigrant groups. A study of Puerto Ricans found no significant differences in disruptive behaviors between samples of children in San Juan, Puerto Rico, and the South Bronx, New York.

In the present study, we examined variation across immigrant generations in CD symptoms in a transnational sample of children in Mexico and the United States, the largest sustained international labor migration in the world today. Differences in CD symptoms were examined dimensionally, according to symptom counts, and categorically, according to symptom profiles. This study is unique in migration studies in psychiatry because it included representative samples on both sides of the border, assessments using the same structured interview, and the ability to distinguish subsamples representative of successive generations with increasing exposure to American culture, from families of origin in Mexico to descendants of US-born Mexican-Americans in the United States. We addressed 2 questions. First, to what extent does the prevalence of CD vary across immigrant generations in this population? Second, are differences in prevalence across immigrant generations consistent for aggressive and nonaggressive symptoms? We hypothesized that, because of differences in heritability, there would be less variation in the prevalence of aggressive than nonaggressive symptoms.

Methods

Sample

Data came from surveys conducted in Mexico and the United States using the same face-to-face interview, the World Mental Health version of the Composite International Diagnostic Interview (WMH-CIDI). The Mexico survey, the Mexican National Comorbidity Survey (MNCS), is a stratified, multistage area probability sample of household residents in Mexico aged 18 to 65 years living in communities of at least 2500 people. A total of 5782 respondents were interviewed between September 1, 2001, and May 31, 2002. The response rate was 76.6%. Data on the Mexican-origin population in the United States were obtained from 2 component surveys of the Collaborative Psychiatric Epidemiology Surveys (CPES), the National Comorbidity Survey Replication (NCS-R), and the National Latino and Asian American Study (NLAAS). The NCS-R is a stratified, multistage area probability sample of the English-speaking household population of the continental United States. The NLAAS was based on the same sampling frame as the NCS-R, with supplements to increase representation of the survey's target ethnic groups, including monolingual Spanish speakers. Spanish-language interviews in the NLAAS used the same translation of the diagnostic interview as the MNCS. The NCS-R was conducted from February 1, 2001, through April 30, 2003, and had a 70.9% response rate; the NLAAS was conducted from May 1, 2002, through December 31, 2003, and had a 75.3% response rate for the Latino sample. A total of 1442 respondents in the CPES were of Mexican origin.

To reduce the impact of recall bias, the sample was restricted to respondents younger than 45 years. The resulting sample comprised 1736 MNCS respondents and 927 CPES respondents (268 from the NCS-R and 659 from the NLAAS).

Definitions of Migrant Generation

The MNCS respondents were asked whether they had ever migrated to the United States and whether they had a member of their immediate family (Miembro de la familia nuclear o inmediata) living in the United States. Respondents to the CPES were asked their country of birth, the nativity (United States vs other) of their parents, and, if they were born outside the United States, the age at which they arrived in the United States. Using this information, the sample was divided into 4 groups based on their migration history, the presence of migrants in their immediate family, and the nativity (Mexico vs United States) of their parents. Definitions of the 4 groups and the sample sizes originating from each survey are presented in Table 1.

Group 1, Mexicans in nonmigrant households, is composed of MNCS respondents with no history of migration or a member of their immediate family living in the United States. Group 2, Mexicans from migrant households who were born in Mexico (at least through age 15 years) in Mexico, is composed of MNCS respondents who had a family member living in the United States or had themselves previously lived in the United States and were born in Mexico and migrated to the United States after age 15 years. Immigrants who migrated after age 15 years were included in this group because their early childhood and the majority of their period of risk for CD symptoms occurred in Mexico. Group 3, children of Mexican-born parents who arrived in the United States before age 15 years, is composed of CPES respondents who were born in Mexico and arrived in the United States at age 15 years or earlier or were born in the United States to Mexican-born parents. Group 4 is composed of Mexican-Americans born in the United States with 1 or more US-born parents.

Comparisons between these 4 groups, adjusted for age and sex, were specified to test study hypotheses regarding associations of migration with CD and CD symptoms. Group 2, which represents the families of origin of Mexican migrants in the United States, was specified as the reference group. Differences between group 2 and group 1 indicate household-level migrant selection, ie, differences between individuals in migrant vs nonmigrant households in Mexico. Differences between groups 2, 3, and 4 indicate potential influences of migration.
ASSESSMENT

The CD module of the WMH-CIDI assesses 15 CD symptoms and additional information required to establish a DSM-IV diagnosis, ie, impairment, clustering of symptoms within a 12-month period, and age at symptom onset. A clinical validity study in an adolescent sample found excellent sensitivity (96.8%) and specificity (98.7) for the diagnosis of CD compared with a structured clinical interview. Studies of the NCS-R (adult) sample have shown strong associations of the WMH-CIDI diagnosis of CD with established demographic correlates, including male sex, low educational attainment, urban residence, and divorce. Moreover, NCS-R respondents who met DSM-IV CD criteria are more likely than other respondents to have a broad range of other psychiatric disorders, including anxiety, mood, substance use, and impulse control disorders. Diagnoses of CD in the present study refer to a history of CD in childhood.

Information from the CD assessment was used to identify respondents who met DSM-IV criteria for CD and respondents who met the symptom count criteria (≥3 symptoms) regardless of whether they met the additional DSM-IV criteria.

STATISTICAL ANALYSIS

The sample design variables for the combined MNCS/CRES used 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 developed to account for the overlapping coverage of Mexican-Americans by the NCS-R and NLAAS. 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 poststratification adjustments to enhance the representativeness of weighted inferences with respect to contemporaneous national census estimates of target population sizes. An additional rescaling factor was applied to the sampling weights in the cross-national data set so that the weighted sample sizes would reflect the relative sizes of the Mexican-origin target populations in Mexico and the United States, enhancing the suitability of the weights for use in design-based analyses involving the full population as well as population subgroups.

Associations between migrant generation and CD outcomes, with statistical adjustment for age and sex, were estimated using the appropriate logistic regression model using the SUDAAN software package to correct standard errors for survey design effects. Binary outcomes, eg, presence of DSM-IV CD, were examined using binary logistic regression models, symptom counts were examined using ordered logistic regression models, and polytomous outcomes, eg, CD profiles, were examined using multinomial logistic regression models. Latent class analysis was conducted with the Mplus software package.

RESULTS

Table 1 shows the age and sex distribution of the sample. Members of group 3 were slightly younger than those of the other groups.

The prevalence of CD symptoms in the entire sample ranged from 0.1% (forced sex) to 12.8% (truancy). Table 2 shows the age and sex distribution of the sample. Three or more symptoms were present in 11.5% of the sample, and 2.0% met DSM-IV criteria for CD. There was a strong pattern of higher symptom prevalence in groups 3 and 4 relative to groups 1 and 2, with differences in prevalence reaching statistical significance for 12 of the 15 symptoms. Symptom prevalence was at least twice as common among group 4 compared with group 2 for all but 1 symptom and was frequently much larger in group 4. For instance, respondents in group 4 were more than 13 times as likely to endorse damaging property and more than 9 times as likely to endorse stealing without confrontation as respondents in group 2. The 3 symptoms for which this difference in prevalence was less than 2-fold were all aggressive symptoms (cruelty to animals, stealing with confrontation, and forced sex). Forced sex was endorsed very rarely in this sample (n=3).

The prevalence of 3 or more symptoms and DSM-IV CD similarly increased across these groups. Respondents in group 4 were more than 5 times as likely to have 3 or more symptoms and more than 7 times as likely to have DSM-IV CD as were respondents in group 2.

The pattern of increasing risk for CD was confirmed in logistic regression models for having 3 or more CD symptoms and for each individual symptom. The prevalence of CD symptoms in the entire sample ranged from 0.1% (forced sex) to 12.8% (truancy). Table 2 shows the age and sex distribution of the sample.
symptoms or meeting DSM-IV CD criteria, with statistical adjustment for age and sex (Table 4). In these models, group 2 was specified as the reference group because this group represented the families of origin of US migrants and thus was the appropriate point of comparison for subsequent generations. Members of group 2 were more likely to have both outcomes compared with Mexicans from nonmigrant families (group 1), although this difference did not reach statistical significance for DSM-IV CD. Compared with group 2, risk for both outcomes was higher in group 3 (odds ratio [OR], 3.28 and 4.12) and higher still in group 4 (OR, 9.66 and 7.64).

Ordered multinomial regression models were specified to examine differences in the number of symptoms across the migration groups, with statistical adjustment for age and sex (Table 4). When all symptoms were considered together, there was a strong relationship between migrant group and CD symptoms, with risk increasing across generations. Note that the confidence intervals for the ORs associated with groups 3 and 4 (relative to group 2) do not overlap.

To examine associations of migrant generation with different types of symptoms, separate ordered logistic regression models were specified for counts of aggressive and nonaggressive symptoms. Migration is significantly associated with both types of symptoms, but the association is weaker for aggressive than for nonaggressive symptoms. The ORs relating risk for aggressive symptoms in groups 3 and 4 to those in group 2 were 1.51 and 3.07 for aggressive symptoms and 3.45 and 10.50 for nonaggressive symptoms.

## Table 2. Age and Sex Distribution of the Sample and Comparison Groupsa

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>( \chi^2 )</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1051</td>
<td>286</td>
<td>493</td>
<td>128</td>
<td>144</td>
<td>8.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female</td>
<td>1612</td>
<td>544</td>
<td>689</td>
<td>170</td>
<td>201</td>
<td>11.49</td>
<td>&lt;.001</td>
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<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>18-24</td>
<td>837</td>
<td>270</td>
<td>342</td>
<td>121</td>
<td>104</td>
<td>8.00</td>
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</tr>
<tr>
<td>25-34</td>
<td>1002</td>
<td>299</td>
<td>460</td>
<td>117</td>
<td>126</td>
<td>8.04</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>35-44</td>
<td>824</td>
<td>261</td>
<td>388</td>
<td>60</td>
<td>115</td>
<td>8.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total</td>
<td>2663</td>
<td>830</td>
<td>1190</td>
<td>298</td>
<td>345</td>
<td>18.63</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a Percentages are weighted. Statistical tests were adjusted for sample design. Group 1 consisted of Mexicans in nonmigrant households; group 2, Mexicans from migrant households who spent their childhood through age 15 years in Mexico; group 3, children of Mexican-born parents who were raised in the United States before age 15 years; and group 4, children of 1 or more US-born parents.

## Table 3. Symptom and Disorder Prevalence by Migration Groupa

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>( \chi^2 )</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bullying others</td>
<td>125</td>
<td>20</td>
<td>44</td>
<td>24</td>
<td>37</td>
<td>8.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Getting into fights</td>
<td>293</td>
<td>56</td>
<td>123</td>
<td>40</td>
<td>74</td>
<td>11.49</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Fighting with a weapon</td>
<td>76</td>
<td>15</td>
<td>33</td>
<td>13</td>
<td>15</td>
<td>2.76</td>
<td>.04</td>
</tr>
<tr>
<td>Cruelty to people</td>
<td>76</td>
<td>9</td>
<td>16</td>
<td>17</td>
<td>34</td>
<td>8.04</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cruelty to animals</td>
<td>100</td>
<td>22</td>
<td>55</td>
<td>9</td>
<td>14</td>
<td>4.72</td>
<td>.003</td>
</tr>
<tr>
<td>Stealing with confrontation</td>
<td>37</td>
<td>11</td>
<td>18</td>
<td>3</td>
<td>5</td>
<td>0.17</td>
<td>.91</td>
</tr>
<tr>
<td>Forced sex</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.87</td>
<td>.46</td>
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<tr>
<td>Property destruction</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire setting</td>
<td>19</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>2.49</td>
<td>.06</td>
</tr>
<tr>
<td>Damage to property</td>
<td>96</td>
<td>8</td>
<td>22</td>
<td>16</td>
<td>50</td>
<td>18.63</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Theft/deceit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaking and entering</td>
<td>53</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>42</td>
<td>8.16</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Frequent lying</td>
<td>325</td>
<td>49</td>
<td>92</td>
<td>67</td>
<td>117</td>
<td>24.08</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Stealing without confront</td>
<td>243</td>
<td>30</td>
<td>58</td>
<td>46</td>
<td>109</td>
<td>24.92</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Rule breaking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staying out late</td>
<td>409</td>
<td>60</td>
<td>106</td>
<td>82</td>
<td>161</td>
<td>23.66</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Running away from home</td>
<td>224</td>
<td>36</td>
<td>78</td>
<td>44</td>
<td>66</td>
<td>17.70</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Truancy</td>
<td>415</td>
<td>66</td>
<td>121</td>
<td>81</td>
<td>147</td>
<td>29.19</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of conduct symptoms ≥3</td>
<td>383</td>
<td>45</td>
<td>113</td>
<td>75</td>
<td>150</td>
<td>33.09</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>DSM-IV/CD disorder</td>
<td>66</td>
<td>14</td>
<td>17</td>
<td>5</td>
<td>30</td>
<td>6.32</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a Percentages are weighted. Statistical tests were adjusted for sample design. Group 1 consisted of Mexicans in nonmigrant households; group 2, Mexicans from migrant households who spent their childhood through age 15 years in Mexico; group 3, children of Mexican-born parents who were raised in the United States before age 15 years; and group 4, children of 1 or more US-born parents.
Respondents were then classified into 4 mutually exclusive CD profiles based on the presence of aggressive vs nonaggressive symptoms: (1) no-CD, no CD symptoms; (2) aggressive, 1 or more aggressive symptoms and no nonaggressive symptoms; (3) nonaggressive, 1 or more nonaggressive symptoms and no aggressive symptoms; and (4) combined, 1 or more of both aggressive and nonaggressive symptoms. On the basis of this categorical scheme, the contrast between aggressive and other CD classes is even more pronounced (bottom 3 rows of Table 4). There were strong associations between migrant group and both the nonaggressive and combined CD profiles, with increasing risk in groups 3 and 4 relative to group 2. However, there was no significant difference in risk for the aggressive profile in group 3 or 4 relative to group 2. Note that here too, group 2 is at higher risk for all 3 CD classes relative to group 1, significantly so for the aggressive and combined classes.

**ADDITIONAL ANALYSIS: EMPIRICALLY DERIVED CLASSES**

To identify subtypes of CD on the basis of empirically derived symptom configurations, we estimated latent class models. The best-fitting model according to model fit indices included 4 latent classes. Model fit statistics for latent class models with 2 through 5 classes are presented in the eTable (http://www.archgenpsychiatry.com). The entropy of the 4-class model was 0.898, above the threshold of 0.8 recommended for modeling associations between latent class assignments and auxiliary covariates. The prevalence of each CD symptom in each of the 4 classes identified by latent class analysis. The first class (no CD) was characterized by low prevalence of all 15 symptoms. The second class (rule breaking/deceit) was characterized by high prevalence of rule breaking and thef/deceit symptoms and low prevalence of most aggressive symptoms. The third class (aggressive) was characterized by high prevalence of aggressive and low prevalence of all other symptoms. The fourth class (severe) was characterized by high prevalence on all symptoms. Respondents in the severe class were more severe in having a higher prevalence of symptoms characteristic of the rule-breaking/deceit and aggressive classes, as well as having a high prevalence of destructive symptoms (fire setting, damage to property) and breaking and entering, which are uncommon in the other classes.

No respondents in the no-CD class had 3 or more symptoms. In the 2 intermediate classes, rule-breaking/deceit and aggression, the prevalence of 3 or more symptoms was high at 53.3% and 40.8% respectively; the prevalence of DSM-IV CD was 7.9% and 5.5% respectively. All respondents in the severe class endorsed 3 or more symptoms, and 40.4% met criteria for DSM-IV CD.

The prevalence of the no-CD class decreased sharply across the migrant groups from 86.7% in group 2 to 38.6% in group 4 (bottom rows of Table 5). The increase was not evenly distributed across the 3 remaining classes. The prevalence of the rule-breaking/deceit and of severe classes increased dramatically across groups, and the prevalence of the aggressive class increased slightly, from 2.4% in group 2 to 3.3% in group 4.

This pattern of association between migrant group and latent class membership was sustained with adjustment for age and sex (Table 6). The strength of this association was modest for the aggressive class: compared with group 2 (families of origin of migrants), risk for being in the aggressive class was not significantly elevated in group 3 but was elevated in group 4 (OR, 3.35; 95% CI, 1.28-9.88). Associations between migration and the other 2 classes were much stronger. Compared with group 2, the ORs associated with being in the rule-breaking/deceit or severe classes were 3.55 and 6.08, respectively, in group 3 and 10.73 and 29.43, respectively, in group 4. Differences between group 3 and group 4 were statistically significant.

### Table 4. Regression of CD, Symptom Counts, and Symptom Profiles on Migrant Groupa

<table>
<thead>
<tr>
<th>CD Outcome</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 CD symptoms</td>
<td>0.47 (0.30-0.71)</td>
<td>1 [Reference]</td>
<td>3.28 (2.15-4.99)</td>
<td>9.66 (6.60-14.15)</td>
</tr>
<tr>
<td>DSM-IV/CD conduct disorder</td>
<td>0.54 (0.19-1.51)</td>
<td>1 [Reference]</td>
<td>4.12 (1.47-11.52)</td>
<td>7.64 (3.20-18.27)</td>
</tr>
</tbody>
</table>

#### Symptom counts

<table>
<thead>
<tr>
<th>Count</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CD symptom count</td>
<td>0.58 (0.44-0.75)</td>
</tr>
<tr>
<td>No. of aggressive symptoms</td>
<td>0.47 (0.33-0.66)</td>
</tr>
<tr>
<td>No. of nonaggressive symptoms</td>
<td>0.63 (0.48-0.84)</td>
</tr>
</tbody>
</table>

#### Symptom profiles

<table>
<thead>
<tr>
<th>Profile</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive profile</td>
<td>0.50 (0.32-0.78)</td>
</tr>
<tr>
<td>Nonaggressive profile</td>
<td>0.78 (0.54-1.06)</td>
</tr>
<tr>
<td>Combined profile</td>
<td>0.39 (0.25-0.63)</td>
</tr>
</tbody>
</table>

### Abbreviations: CD, conduct disorder; OR, odds ratio.

a All models include statistical adjustment for age and sex. Risk for having 3 or more CD symptoms and DSM-IV CD was analyzed using binary logistic regression models. Symptom counts were examined using ordered logistic regression models, with 0, 1, 2, and 3 or more symptoms as the ordered outcomes; 0 symptoms is the reference group. Symptom profiles were defined a priori as follows: (1) no-CD, 0 CD symptoms; (2) aggressive, 1 or more aggressive symptoms and no nonaggressive symptoms; (3) nonaggressive, 1 or more nonaggressive symptoms and no aggressive symptoms; and (4) combined, 1 or more of both aggressive and nonaggressive symptoms. Associations between migrant group and profile were estimated in a multinomial regression, with no-CD as the reference group. Group 1 consisted of Mexicans in nonmigrant households; group 2, Mexicans from migrant households who spent their childhood through age 15 years in Mexico; group 3, children of Mexican-born parents who were raised in the United States before age 15 years; and group 4, children of 1 or more US-born parents.
This study has several unique strengths. Data were collected in both the sending and host countries using the same survey instrument, and information was available to identify subsamples representing families of migrants in Mexico and successive generations of Mexican-Americans in the United States. The ability to account for migrant selection bias by identifying families of migrants in Mexico (group 2) turned out to be particularly important because respondents from these families were more likely to report having had CD symptoms than were respondents in families without migrants (group 1). Had we not made this distinction and simply compared Mexican-Americans in the United States with the general Mexican population, the increase in risk for CD associated with migration to the United States would have appeared larger. Selection effects were minimized, although not eliminated, by including individuals who migrated at age 16 years or older and return migrants in...
the Mexico group. In addition, differences between children of migrants raised in the United States (group 3) and those of US-born parents (group 4) suggest that risk continues to increase within the US population, independent of possible migrant selection effects.

The results suggest that there is a large difference in risk for CD between Mexicans in Mexico and people of Mexican descent in the United States. Only 2% of people in families of migrants (group 2) met DSM-IV criteria for CD; 11.5% of US-born Mexican-Americans with at least 1 US-born parent (group 4) met these criteria. The prevalence of CD in group 4 was close to that in the non-Mexican-American, US-born sample of the CPES of 10.6%. Adjusting for age and sex, the odds of CD were 7.64 times as high in group 4 as they were in group 2. This is a dramatic increase in risk for one of the most serious childhood psychiatric disorders. The fact that this increase in risk occurred across generations within a migrating population strongly suggests the influence of early childhood environmental conditions in the United States. The findings highlight the importance of identifying environmental factors that are potentially modifiable and may offer opportunities to reduce the prevalence of CD in the United States.

The increase in risk for CD in the United States is particularly concerning because of the strong relationship of CD in childhood with a wide range of adverse life events in adolescence and adulthood, as well as most forms of adult psychopathologic disorders. In fact, CD may be an indicator of influences that affect not only childhood psychiatric disorders but also contribute to differences in risk for later mood, anxiety, and substance use disorders between immigrants and US-born individuals that have been observed in studies of Mexican-Americans and some other immigrant groups in the United States.

Convergent evidence from analysis of symptom counts and symptom profiles suggests that differences associated with migration are weaker for aggressive symptoms than for nonaggressive symptoms. In the analysis of symptom counts, aggressive and nonaggressive symptoms were significantly higher in groups 3 and 4 relative to group 2, but the association was much stronger for nonaggressive symptoms than for aggressive symptoms. A limitation of the analysis of symptom counts is that no distinction is made between “pure” and “mixed” symptom profiles. When classes of CD were defined on the basis of the a priori distinction between aggressive and nonaggressive symptoms, there was a strong association of migration with the nonaggressive and combined types of CD profile and no association of migration with the aggression-only profile. Similarly, analysis of the empirically derived latent classes found much stronger associations with migration for the rule-breaking/deceit and severe latent classes than for the aggressive latent class.

These findings are consistent with hypothesized differences in the extent of genetic influence on different types of CD symptoms. If, as twin studies suggest, aggressive symptoms are more strongly influenced by genetic factors compared with nonaggressive symptoms, we would expect to find the pattern of results observed in this study, that is, a much smaller intergenerational change in aggressive than in nonaggressive symptoms. These data do not allow us to quantify the heritability of either type of symptom, and the results should not be interpreted as evidence that aggressivity is predominantly genetic. Rather, this study provides confirmation of the findings from twin studies regarding the relative contribution of environmental and genetic factors to different types of symptoms using different methods. In contrast with twin studies, inferences based on this study do not depend on the equal environments assumption. In addition, the range of variation in environment is greater in this study than in twin studies, which are generally limited to a single country or region.

The difference in association with migration between aggressive and nonaggressive symptoms was larger in the analysis of CD profiles than in the analysis of symptom counts. One potential explanation for this pattern is that aggressive behaviors that occur along with other CD symptoms are more likely to be situational, that is, contextually normative or premeditated, and therefore more influenced by environmental factors than aggressive behaviors that occur in isolation from other CD symptoms. For instance, adolescents who are more likely to break rules may, through that rule breaking, get into situations or relationships in which aggressive behaviors are more common, such as drug trafficking or gang activity. There is some empirical support for a distinction between aggressive and nonaggressive CD (with the former uniquely associated with emotional dysregulation) that may help explain these differences.

Evidence of environmental influences on risk for CD does not rule out the possibility that there are inherited liabilities that are triggered or suppressed by environmental conditions. Twin studies of substance use, smoking, and externalizing behaviors have found that, in settings in which the prevalence of these outcomes is higher, their heritability is greater. For instance, there might be an inherited liability to CD common to Mexico and the United States that is more frequently expressed in the United States because of environmental influences. This pattern would suggest that CD among Mexican-Americans in the United States would be concentrated among offspring of migrants with liability—expressed or not—to CD. Alternatively, there could be distinct inherited liabilities to CD in the 2 environments. This pattern would suggest that CD would be heritable within both populations but not heritable between migrants and their offspring. Family studies with follow-up of migrants on both sides of the border are needed to examine these alternative models.

Although the dramatic increase in CD symptoms across generations within this migrant population implicates environmental influences, specification of the particular environmental factors remains elusive. The environmental changes experienced by migrating populations are comprehensive, involving virtually all aspects of social institutions, identity, family relationships, language, and diet. Generations of researchers have focused on the distinctive social circumstances of immigrants. In the 1920s, Faris and Dunham observed a configuration of social conditions among immigrant groups living in ur-
ban areas of Chicago that they suggested led to increasing risk for juvenile delinquency as well as substance use and mental disorder. The authors believed that immigrant parents were marginalized from mainstream culture, while their children were caught between their culture of origin, to which they often felt little connection, and their host culture, which was likely to reject them. Similar explanations in terms of differential acculturation and discrimination have been proposed in recent studies for observations of increased risk for mental disorders in children of immigrants relative to their parents.

Observation of the increase in risk for psychiatric disorders among descendants of migrants in terms of experiences distinctive to migrant communities would suggest that risk is particularly high in these communities relative to more established populations that do not share these circumstances. However, epidemiologic evidence does not support this prediction. Differences among ethnic groups in the United States are much smaller than are differences between immigrants and US-born individuals, and members of ethnic minorities tend to have lower rather than higher risk for most psychiatric disorders. An alternative explanation for the observed changes across immigrant generations is that immigrants in the United States share the same cultural and social conditions that account for high risk for psychiatric disorders in the United States relative to immigrants’ countries of origin. This explanation implies that differences observed across migrant generations are due to influences on the US population as a whole that contribute to large cross-national differences in disorder prevalence.

The association between migration and CD symptoms in this sample should not be generalized across migrant groups. Bird and colleagues did not find differences in disruptive behaviors between samples of Puerto Rican children on the island and in the South Bronx. However, in that study, parental acculturation was related to disruptive behavior in both samples. Other studies have found that the association between US nativity and psychopathologic characteristics differ between the Mexican and Puerto Rican populations.

Results of the present study should be interpreted in light of its reliance on retrospective reporting of CD symptoms and other DSM-IV criteria by adults, a method known to result in underestimates of prevalence due to failures of recall. To minimize the impact of recall errors, the sample was limited to respondents younger than 45 years, but this restriction is unlikely to fully correct for recall errors. Recall errors bias estimates of the prevalence of CD downward but would also affect estimates of the relative risk of CD if recall accuracy is associated with migration. Results of tests for statistical interactions between age and migrant group were not significant in any of the models.

A second potential limitation arises from the reliance on contemporaneous samples of generational groups rather than the samples drawn from actual multigenerational families. This is a common method in migration studies, but the assumption that these groups represent biologically connected successive generations may not be accurate. However, the validity of this assumption is supported by the consistency in the finding that Mexican-born immigrants to the United States have lower risk for psychiatric disorders compared with the US-born Mexican-American population from the early 1980s through the early 2000s.

International migration across societies presents a valuable opportunity for biobehavioral research to advance understanding of the interplay between environments and gene expression in the etiology of CD and other complex psychiatric disorders. Although migration studies lack the mathematical formalism that underlies the quantitative estimation of trait heritability in twin studies, they provide valuable insight into the role of environmental factors in the etiology of disease. In this study, comparisons across representative samples of successive generations within a migrating population suggest that the environmental influence on CD is large but restricted to certain subtypes of the disorder. Future studies may be able to identify the specific genetic and environmental factors involved in this complex epidemiologic shift in psychiatric morbidity, particularly if they include samples of migrant families with members in both the sending and receiving communities.
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