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Prevalence and Correlates of Dual Diagnoses in U.S. Latinos

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Abstract

Aim—To examine the population prevalence, patterns of onset, and important demographic covariates for dual (co-occurring) diagnoses of substance and non-substance mental disorders.

Design—A nationally representative sample of U.S. Latino adults was interviewed face-to-face.

Measurements—Estimates were made using data from the National Latino and Asian Services Survey (NLAAS) using the World Health Organization CIDI, DSM-IV criteria, for case ascertainment.

Findings—U.S. born Latinos are much more likely to report a dual diagnoses than are foreign born Latinos in both sexes; 16.88% vs. 5.02% for males ($p < 0.000$), and 7.48% vs. 0.58% for women ($p < .000$). Total dual diagnoses prevalence was 6.79%, with non-substance mental disorder occurring first 70% of the time, with an earlier age of onset for U.S. Latinos. Immigrants were less likely to be positive for dual diagnoses ($OR = 0.234$, $p < 0.0001$), or any substance disorder diagnosis ($OR = 0.261$, $p < .0001$), if they reported lifetime substance use when compared to U.S. born Latinos.

Conclusions—Latino adults residing in the U.S. have one-fourth the risk of dual diagnoses compared to the U.S. population. Most of this difference is accounted for by lower rates of substance and non-substance disorders and a lower propensity for progression from substance use to substance use disorders, combined with a later age of onset for mental disorders among immigrants. Immigrant women rarely reported dual diagnoses. We recommend bio-behavioral models and transnational studies to identify life course factors contributing dual diagnoses among U.S. born Latinos.

Keywords

epidemiology; minority groups; comorbidity; immigration

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1. Introduction

1.1. Scope and burden of dual diagnoses in the U.S

This study presents detailed information about the prevalence, demographic covariates, and patterns of onset for co-occurring substance and non-substance mental disorders in a nationally representative sample of the U.S. Latino population. Co-occurring mental disorders are common in the United States, 79% of all DSM-III-R lifetime disorders reported in the National Comorbidity Survey (NCS) were co-occurring disorders and these were concentrated in 27% of the total population (Kessler et al., 1994). In the NCS, 41% to 65% of those reporting a lifetime substance disorder had at least one other psychiatric disorder, and 50.9% reporting one or more psychiatric disorders also reported at least one substance disorder (Kessler et al., 1996; Kessler, 2004). In this paper, the term *dual diagnoses* denotes co-occurring substance (e.g. alcohol and other drugs) disorders and non-substance mental disorders, such as mood, anxiety, antisocial personality, and bipolar disorders (Burns & Teesson, 2002; Conway et al., 1994; Grant et al., 2004; Modesto-Lowe & Kranzler, 1999; Stohler & Rossler, 2005). The use of dual diagnoses is intended to avoid any confusion with the term “comorbidity” which refers to multiple health conditions of any type.

Dual diagnoses are related to many behavioral problems and poor social functioning, thus aggravating symptoms and frustrating treatment efforts. Dual diagnoses are costly and difficult to manage clinically, and frequently secondary substance disorders go undetected and untreated, imposing severe burdens on families, treatment and criminal justice systems (Clark & Mueser, 2003; Johnson, 2000; Weaver et al., 2003).

1.2 Latinos, Substance Use, and Changing Consumption Patterns

Regional and national studies conducted in Latin American nations and Puerto Rico have consistently found far lower rates of drug use, abuse, and dependence, and in most instances lower rates of lifetime alcohol, mood, and anxiety disorders, than reported for the U.S. population (Canino et al., 1987; Medina-Mora et al., 2005; Vega et al., 1998, Vega et al., 2002). However, adult immigrants who commenced their residence in the U.S. as children or during early adolescence, and second and third generations of Latinos born in the U.S., generally report higher rates of both substance and non-substance disorders than immigrants arriving in the U.S. as adults (Alegria et al., 2006; Alegria et al, 2007; Gfroerer & Tan, 2003; Turner & Gil, 2002).

The prevalence of dual diagnoses was reported for a Mexican origin sample using epidemiologic survey data from Central California (Vega, Sribney, & Achara-Abrahams, 2003). Dual diagnoses rates for lifetime DSM-III-R disorders were significantly more common among men, 8.3%, than among women, 5.5%, and varied by nativity, from 12.3% in U.S. born respondents to 3.5% in immigrants. Similar patterns were reported for the English speaking Latino subsample of the NCS (Ortega et al., 2000). Despite the relatively low prevalence rate compared to the NCS rate, uniformly high rates of dual diagnoses were reported if respondents were positive for a drug disorder.

1.3 Hypotheses

Based on previous findings we expected a progressive normalizing of disorder rates toward U.S. population levels, e.g., higher rates of substance and non-substance disorders among U.S. born Latinos, with a commensurate impact on national rates of dual diagnoses. We anticipated a propensity for non-substance disorders to precede substance disorders, a lower age of onset for dual diagnoses among U.S. born Latinos than foreign born Latinos, and

overall high rates of dual diagnoses conditional on a substance disorder. These patterns were previously reported for non-Latino and Latino populations in several studies (Compton et al., 2000; De Graaf et al., 1993; Merikangas et al., 1998; Vega, Sribney, & Acharya-Abrahams, 2003). We also anticipated major differences in prevalence of dual diagnoses by sex. Lower risk for women is perhaps the most robust finding in the research literature.

2. Methods

2.1 Sample and data collection

The National Latino and Asian American Study (NLAAS) is a nationally representative household survey of Latinos and Asians aged 18 and older residing in the coterminous U.S. The NLAAS is part of the NIMH Collaborative Psychiatric Epidemiology Surveys (CPES) that focus on collecting epidemiological information on the risk factors of mental health and substance disorders and service usage with a special emphasis on minority populations. The analysis presented in this paper is restricted to the 2,554 Latino respondents of the NLAAS. The sample design and survey methods of the NLAAS have been described in detail elsewhere (Alegria et al., 2004; Heeringa et al., 2004). Data collection began in May 2002 and ended in December 2003, with a final sample of 2,554 English and Spanish-speaking Latinos (overall response rate 75.5%) from the four major subethnic groups: 868 Mexicans, 495 Puerto Ricans, 577 Cubans, and 614 Other Latinos. Stratification into the four ethnic subgroups was determined by respondents' self-reported ethnicity using the same question as the Census ethnicity question.

The NLAAS weighted sample is similar to the 2000 Census in gender, age, education, marital status, and geographic distribution but different in nativity and household income, with more U.S. immigrants and lower income respondents in the NLAAS sample, perhaps resulting from more access to the undocumented Latino population (Anderson & Fienberg, 1999; United States General Accounting Office, 1998). All study materials were translated into Spanish using a standard translation and back-translation protocol. The Institutional Review Board Committees of Cambridge Health Alliance, the University of Washington, and the University of Michigan approved all recruitment, consent, and interviewing procedures.

2.2 Measures

Diagnostic measures for lifetime and last 12-month prevalence of mental disorders were assessed using the diagnostic interview of the World Mental Health Survey Initiative version of the World Health Organization Composite International Diagnostic Interview, based on criteria of the Diagnostic and Statistics Manual of Mental Disorders, version 4 (DSM-IV) (WHO World Mental Health Survey Consortium, 2004). The lifetime composite diagnostic categories used in this analysis were: any depressive disorder (dysthymia, major depressive episode); any anxiety disorder (agoraphobia, social phobia, generalized anxiety, post traumatic stress, panic); and any substance-use disorder (drug abuse, drug dependence, alcohol abuse, alcohol dependence) using DSM-IV organic exclusion rules. A cautionary note, criteria for estimating substance abuse or dependence in NLAAS CIDI skipped respondents questions on dependence if criteria for abuse were not met, and this procedure has shown a tendency toward underestimation of dependency disorders in minority groups (Hasin et al., 2004). In this analysis, dual diagnoses are defined as the co-occurrence of a lifetime substance use disorder (alcohol abuse and or dependence and drug abuse and or dependence) and a lifetime diagnosis of a non-substance use disorder (dysthymia, major depressive episode, agoraphobia, social phobia, generalized anxiety disorder, post-traumatic stress disorder, or panic). Ages of onset for these classes of disorder were determined by retrospective recall based on separate probes for age of onset of the disorder/symptoms.

Sociodemographic measures used in this analysis include Latino ethnicity (Puerto Rican, Cuban, Mexican, and Other Latino); gender (male, female); nativity (US-born, immigrant); age (18–34, 35–49, 50–64, 65+); education (11 years, 12 years, 13–16 years, 17 years); household income (<\$15000, \$15000–\$35000, \$35000–\$75000, >\$75000); language of interview (English, Spanish); and lifetime smoker (yes, no).

2.3 Statistical procedures

The sociodemographic characteristics of the NLAAS Latino sample are briefly described below and readers interested in detailed information can consult detailed sources (Alegria et al., 2004). All proportions were weighted by probability sampling weights using the 2000 U.S. Census estimates. Lifetime prevalence rates of different types of dual diagnosis are presented in Table 2 by nativity and gender groups using age- and gender-adjusted weights. Significance tests for Tables 1 were performed using a Rao–Scott statistic for the Pearson χ^2 test for contingency tables adjusting for the survey design. In Table 3 we compare the age of onset by gender within nativity groups and overall using the Wilcoxon rank-sum test, which is a non-parametric alternative to the t-test.

3. Findings

3.1 Sample characteristics and lifetime prevalence of disorders

A weighted total of 41.6% of the sample respondents were Latinos who were born in the U.S. and 58.6% were born in Latin America in the NLAAS. As anticipated Mexican origin respondents had the lowest income and educational attainment, and were the youngest subgroup. Cubans were the oldest and best educated despite a very high proportion of foreign born (about 86%).

Prevalence of substance and nonsubstance disorders—Table 1 presents the lifetime prevalence rates and standard errors for substance use and non-substance DSM-IV disorders that are used in Tables 2 and 3 to represent the dual diagnoses variables. Table 1 compares prevalence rates for Latino sub-groups in the NLAAS sample. The prevalence rates for U.S. born women reporting substance disorders ranged from 4.28% for Other Latinos to 0.45% for Puerto Ricans. Negligible rates were reported by immigrant women in all subgroups, ranging from 0.39% for Mexicans to 0.00% for the remaining three subgroups. U.S. born male prevalence rates ranged from 12.52% among Other Latinos to a low of 3.17% among Cubans with substance disorders. Estimates for males born outside the continental U.S. ranged from 6.71% among Puerto Ricans to a low of 4.71% for Mexicans. Only among Cuban males do we find an example of a higher rate for substance disorders in the foreign born (5.28%) compared to the U.S. born (3.17%). Gender differences were statistically significant ($p < .0000$) for all subgroups; however nativity differences were only significant for Mexican origin ($p < 0.009$) and Other Latino ($p < 0.003$) subgroups.

The lifetime prevalence rates for non-substance disorders only are also presented in Table 1 by gender and nativity within subgroups, and as expected the sex prevalence pattern reverses with women having the higher rates in all estimates of sex within total ethnic subgroup ($p < .043$). Also in these comparisons the nativity differentials in prevalence of non-substance use disorders were not statistically significant.

The final comparisons are for lifetime dual diagnoses rates and these estimates, and generally reflect the subgroup substance and non-substance disorder prevalence patterns reported above. Puerto Ricans have the highest total diagnoses rate of 9.35%, and sex differences within nativity were statistically significant and higher for men than women, including migrants (12.01% and 2.18%) ($p < .004$) and total Puerto Rican men (12.12% and

6.42%) ($p < .011$); as well as Mexican origin immigrant men (4.48% and 0.53%) ($p < .022$), U.S. born (19.47% and 6.27%) ($p < .002$), and total Mexican men (10.91% and 2.99%) ($p < .001$); and Other Latino men who were immigrants (3.83% and 0.10%) ($p < .000$). Nativity differences were statistically significant for all subgroups except Puerto Ricans ($p = .002$). A prevalence of 21.09% for dual diagnosis among U.S. born Cuban women was reported but sex contrasts with U.S. born Cuban men were not statistically significant. Not shown in Table 1, we found immigrants reporting lifetime substance use were significantly less likely to report dual diagnosis (O.R.=0.234, $p < .0001$), and also less likely to report substance use disorders (OR=0.261, $p < .0001$), than U.S. born Latinos reporting lifetime substance use, adjusted for age and sex.

3.2 Prevalence of dual diagnosis by nativity and sex

Table 2 presents prevalence rates and standard errors for dual diagnoses by nativity and sex. Total dual diagnoses rates involving only alcohol abuse or dependence are higher for men than for women (3.83% vs. 1.41%, $p < .002$), and higher for U.S. born than for immigrants (4.60% vs. 1.28%, $p < .001$). *Total dual diagnoses rates involving only drug abuse or dependence are negligible for all sex and nativity comparisons.* Combined dual diagnoses comparisons, involving alcohol abuse and or dependence and drug abuse and or dependence, are all statistically significant for same sex between nativity subgroups, e.g. immigrant women and U.S. born women (0.20% vs. 3.79%, $p < .000$) and immigrant men and U.S. born men (2.29% vs. 10.08%, $p < .000$), as well as for the sex comparisons for the total subsample of men and women (5.52% vs. 1.69%, $p < .000$).

The dominant finding from Table 2 is that U.S. born respondents reporting are much more likely to report dual diagnoses than are foreign born in both sexes, 16.88% vs. 5.02% for males ($p < .000$), and 7.48% vs. 0.58% for females ($p < .000$). Sex comparisons of dual diagnoses rates within nativity subgroups of immigrants (5.02% and 0.58%), U.S. born (16.88% and 7.48%), and for the total sample (9.94% and 3.44%), were higher for men and statistically significant ($p < .000$). Proportional differences for sex by nativity are much greater for females than for males, albeit at far lower overall prevalence levels than reported by males. The total dual diagnoses prevalence rate for the U.S. Latino population was estimated to be 6.79%.

Although not shown in Table 2, the propensity differed between males and females for dual diagnoses conditional on a substance or non-substance disorder diagnoses. We found a consistent trend in which males had a greater likelihood of a substance disorder conditional on reporting a non-substance disorder, and the reverse was true for females who had a greater likelihood of having a non-substance disorder conditional on reporting a substance disorder, adjusted for age and sex within each Latino ethnicity-nativity subgroup. This finding holds for every comparison of sex within nativity, except for U.S. born Cubans. Not all comparisons reached statistical significance due in part to the inadequate sample sizes and the fact that both sexes had high rates of non-substance disorders conditional on having a substance disorder(s). The percentages with a substance disorder conditional on a non-substance disorder were 30.13% (males) and 12.73% (females) ($p < .004$) for Puerto Ricans, 27.14% (males) and 9.10% (females) ($p < .013$) for Other Latinos, and 38.11% (males) and 7.89% (females) ($p < .001$) for Mexicans (data not shown). The percentages for a non-substance disorder conditional on a substance disorder were 58.15 (males) and 96.30 % (females) ($p < .002$) for Puerto Ricans, 42.47% (males) and 92.27% (females) for Cubans ($p < .003$) and 60.77 (males) and 68.19 (females) (n.s.) for Mexicans.

3.3 Age and order of onset for dual diagnoses

Median age and order of onset for the substance and non-substance disorders that comprised the analyses of dual diagnoses are presented in Table 3. The median age of onset for a substance use disorder(s) was 5 years younger for U.S. born males compared to immigrant males (18.0 vs. 23.0 years) and four years younger for U.S. born females compared to immigrant women (19.0 vs. 23.0 years). Onset of non-substance disorders follows a similar pattern among males with a two year difference between U.S. born and immigrants (16 vs. 14 years). The only counter example is the lower median age among immigrant women than among U.S. born women (11 vs. 15 years) which points out the uniqueness of the small proportion of immigrant women who are positive for dual diagnoses. Median age of onset for a non-substance disorder for immigrants occurred 7 years before onset of a substance disorder, at 16 years vs. 23 years; and 4.5 years earlier at 14.0 years for non-substance disorders vs. 18.5 years for substance disorders in the U.S. born. A limitation of this analysis is that the Wilcoxon tests used for these estimates do not adjust for survey design, and the STATA program does not support estimates to accomplish this more complex analysis (Francisco & Fuller, 1991).

Order of onset varied somewhat by nativity and sex. Among immigrants 90.58% of men and 40.15% of women reported onset of a non-substance disorder before a substance disorder, but as noted previously there were very few cases of dual diagnoses among immigrant women. Our findings show that 67.44% of U.S. born men and 70.64% women reported onset of a non-substance use disorder before a substance disorder. For the total sample nearly 70% of respondents reported onset of a non-substance disorder before a substance disorder.

4.0 Discussion

This study has examined patterns of co-occurring alcohol, drug, and non-substance use disorders in a national sample of Latino adults. Similar to the results of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (Smith et al, 2006) our results point toward important differences in patterns and prevalence rates among Latinos compared to other U.S. ethnic groups. Overall lifetime prevalence rates of dual diagnoses are nearly 4 times higher in the U.S. general population than in the Latino population living in the U.S., about 27% vs. 7% for the NCS study (Kessler et al, 1994) and about 21.6% vs. 7% in the most recent NESARC study (Conway, Compton, Stinson & Grant, 2006). Most of the difference between the NLAAS data and the other two US epidemiologic studies is accounted for by the far lower rates of dual diagnoses among immigrants and women (Kessler et al., 1994). Although caution should be exercised in comparing lifetime with 12 month rates of disorder, the NESARC data showed similar results to ours insofar as the Latino groups had significantly lower dual diagnoses rates as compared to non Latino whites of substance use disorders co-occurring with depressive disorders and anxiety disorders (Smith et al, 2006). These results have important implications for research about patterns of behavioral disorders in the context of immigration and age-sex demographic trends in subsequent U.S. born generations, as illustrated by the findings of sequential increases in substance disorder rates in U.S. born Latinos. US born Latino women appear to benefit from retention of protective cultural norms that partially offset the effects of assimilation. However, the nativity differences send a clear signal that protective factors are weakening in both sexes.

Our findings are consistent with other cross cultural studies that show that despite wide variation in base rates of dual diagnoses, patterns of dual diagnoses reported in this study are fundamentally similar across cultures and ethnic groups (Swendsen et al., 1998; Swendsen & Merikangas, 2000; Smith, Stinson, Dawson, Goldstein et al, 2006). Women had lower

substance disorder rates than men, however women were more likely to report a dual diagnoses conditional on having a substance disorder. Men reported lower non-substance disorder prevalence than women yet had higher rates of substance disorders conditional on having a non-substance disorder. Among men the most prevalent form of dual diagnoses involves alcohol disorders, which has important behavioral consequences for the Latino population in terms of increasing arrest and incarceration rates (Vega, 2001).

In order to establish a more comprehensive understanding about dual diagnoses among Latinos, information is needed about lifetime patterns of recurrence and severity of disorders, the relative independence of comorbid non-substance disorders as contrasted with substance-induced non-substance disorders, and the role of sub-syndromal disorders (e.g. depression or anxiety) as these affect the course of personal functioning, social role impairments and recovery (Nunes & Rounsaville, 2006). There are also cross-cultural issues concerning measurement of DSM criteria, and these issues are inherent in the formatting and presumed conceptual universality and semantic equivalence of case-finding research instruments, including wording and sentence construction used in questions to elicit symptom endorsements (Room, 2006).

It is rare for immigrant women with a lifetime mood or anxiety disorders to report a co-occurring drug disorder, occurring in only 1.69% of cases. However, immigrant women reporting a dual diagnosis had a very early onset of non-substance disorders, at a median age of only 11. While dual diagnoses are unusual in immigrant women, they are markers for exceptionally high risk. Elsewhere it was reported that immigrant women, who had entered the U.S. as children, had markedly lower exposure to major and traumatic events and this lowered their risk of drug disorders in their lifetimes (Lloyd & Taylor, 2006; Turner et al., 2006). The small proportion of immigrant women who met criteria for substance use disorders were presumably characterized by greater severity than reported by males with similar disorders (Booth et al., 2004; Swift et al., 2000; Warner et al., 2004). In our study we found only one exceptionally high rate of dual diagnoses that occurred in Cuban women, an unexpected finding which may have resulted from random subsample atypicality.

The findings regarding progression sequences between substance and non-substance disorders confirm the report of Merikangas and others that non-substance disorders usually occur before onset of substance disorders (Compton et al., 2000; De Graaf et al., 1993; Merikangas et al., 1998). In this study about 70% of dual diagnoses cases had (temporally) primary onsets of either (or both) a mood or anxiety disorder(s). Notably, the few foreign born women who had a dual diagnoses were distinctive in reporting greater likelihood of substance disorder onset before non-substance disorders.

Contemporary biobehavioral models explain the emergence of dual diagnoses as a product of shared genetic antecedents interacting with environmental factors that result in phenotypes of addictive and non-addictive disorders (Tsuang et al., 2001). However, there are many unanswered questions about the phenomenology of dual diagnoses and its potential variability as a phenotype among ethnic groups or across societies. At this point we have no biomarkers for either substance or non-substance disorders for objective case identification and we rely on research interview information to identify cases. These methods are adequate for moving ahead with the search for integrated explanations of subgroup characteristics and nativity differences in dual diagnoses based on life course and intergenerational patterns of selection, family aggregation, social adaptation and assimilation, differential exposure to traumatic and persistent life strains, and variations in availability of coping resources (Turner & Lloyd, 2003). The WHO World Mental Health Consortium (2004) surveys reported odds ratios (and confidence intervals) for past 12-month drug disorders of 3.8 (C.I. = 3.2–4.5) in the U.S. and 2.5 (C.I. = 1.8–3.3) in Mexico –

a nation that contributes the majority of Latino immigrants to the U.S. The comparative odds ratio for mood disorders in the U.S. was 9.6 (C.I. = 8.8–10.4) as contrasted with 4.8 (C.I. = 4.0–5.6) in Mexico. Therefore, most U.S. Latino immigrants are coming from societies with lower substance and non-substance disorder rates and they subsequently resettle in a society with higher normative tolerance for substance use and greater risk for lifetime use. This transition is accompanied by variable exposure levels to the cumulative adversity of migration and resettlement.

Explanatory factors can be organized and sequenced using behavioral genetics frameworks that test family aggregation patterns as building blocks for the investigation of gene - environment interactions. At a preliminary stage this research could estimate the effects of “context dependence” represented by transnational immigration and resettlement (Cooper 2003; Institute of Medicine, 2006). This type of research can contribute to identifying trait-related genetic variants in the differentiated populations that comprise the U.S. Latino diaspora (Wang et al., 2008).

The contribution of putative intermediary mechanisms for dual diagnoses, such as ADHD, risk taking and impulsivity, could also be tested (Kendler, Myers, & Prescott, 2007). These intermediary mechanisms may be mediated or moderated by cultural norms (Cherpital & Tam, 2000) or sex linked biology and social constructions of gender (Kreiger, 2002). Gender roles and accepted behaviors are rapidly transforming as a consequence of culture change and social adaptation in the U.S., as indicated by higher proportionate increases in Latino women than in men for dual diagnoses.

5.0 Conclusion

This study presented estimates of dual diagnoses in the Latino population residing in the United States. U.S. Latinos are about 75% *less* likely to experience dual diagnoses than would be expected in the general U.S. population. This finding is primarily attributable to overall lower rates of DSM-IV disorders, and to a later age of onset of these disorders, among foreign born Latinos. The Latino population is in a dynamic state of transition, and U.S. born Latino males, are more likely to experience higher rates of dual diagnoses that approximate those reported in the U.S. general population. Moreover, dual diagnoses rates for U.S. born women, which remain lower than reported for women in the generational U.S. population, are 12 times higher than reported by immigrant women. The dominant profile of immigrant women is a much higher proportion of “clean” non-substance mental disorders with no co-occurring substance disorder. Given the population growth trends of the Latino population residing in the U.S. these findings have implications for future epidemiologic, treatment and prevention research.

References

- Alegria M, Canino G, Stinson FS, Grant BF. 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. *Journal of Clinical Psychiatry*. 2006; 67:56–65. [PubMed: 16426089]
- Alegria M, Mulvaney-Day N, Torres M, Polo A, Cao Z, Canino G. Prevalence of psychiatric disorders across Latino subgroups in the United States. *American Journal of Public Health*. 2007; 97:68–75. [PubMed: 17138910]
- Alegria M, Takeuchi D, Canino G, Duan N, Shrout P, Meng XL, Vega W, Zane N, Vila D, Woo M, Vera M, Guarnaccia P, Aguilar-Gaxiola S, Sue S, Escobar J, Lin KM, Gong F. Considering Context, Place and Culture: the National Latino and Asian American Study. *The International Journal of Methods in Psychiatric Research*. 2004; 13:208–220.

- Anderson, M.; Fienberg, S. Who Counts? The Politics of Census-taking in Contemporary America. New York: Russell Sage Foundation; 1999.
- Booth BM, Curran GM, Han X. Predictors of short-term course of drinking in untreated rural and urban at-risk drinkers: effects of gender, illegal drug use and psychiatric comorbidity. *Journal of Studies on Alcohol*. 2004; 65:63–73. [PubMed: 15000505]
- Burns L, Teesson M. Alcohol use disorders comorbid with anxiety, depression and drug use disorders: Findings from the Australian National Survey of Mental Health and Well Being. *Drug Alcohol Dependency*. 2002; 68:299–307.
- Canino G, Anthony JC, Freeman D, Shrout P, Rubio-Stipec M. Drug abuse and illicit drug use in Puerto Rico. *American Journal of Public Health*. 1993; 83:194–200. [PubMed: 8427322]
- Cherpital CJ, Tam T. Variables associated with DUI offender status among whites and Mexican Americans. *Journal Studies on Alcohol*. 2000; 61:698–703.
- Clark RE, Mueser KT. Progress in research on dual disorders. *British Journal of Psychiatry*. 2003; 183:377–378. [PubMed: 14594909]
- Compton WM, Cottler LB, Phelps DL, Abdallah B, Spitznagel EL. Psychiatric disorders among drug dependent subjects: Are they primary or secondary? *American Journal of Addictions*. 2000; 9:126–134.
- Conway KP, Compton W, Stinson FS, Grant BF. Lifetime comorbidity of DSM-IV mood and anxiety disorders and specific drug use disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*. 2006; 67:247–57. [PubMed: 16566620]
- Cooper R. Gene-environment interactions and the etiology of common complex disease. *Annals of Internal Medicine*. 2003; 139:437–440. [PubMed: 12965972]
- De Graaf R, Bijl R, Spijker J, Beekman AF, Volegergh WM. Temporal sequencing of lifetime mood disorders in relation to comorbid anxiety and substance use disorders: Finding from the Netherlands Mental Health Survey and Incidence Study. *Social Psychiatry Psychiatric Epidemiology*. 1993; 38:1–11.
- Francisco CA, Fuller WA. Quantile estimation with a complex survey design. *Annals of Statistics*. 1991; 19:454–469.
- Gfroerer BA, Tan LL. Substance use among foreign-born youths in the United States: Does the length of residence matter? *American Journal of Public Health*. 2003; 93:1892–1895. [PubMed: 14600061]
- Grant BF, Stinson FS, Dawson DA, Chou BF, Dufour MC, Compton W, Pickering MS, Kaplan D. Prevalence and Co-occurrence of Substance Use Disorders and Independent Mood and Anxiety Disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*. 2004; 61:807–816. [PubMed: 15289279]
- Hasin DS, Goodwin RD, Stinson FS, Grant BF. Epidemiology of major depressive disorder. *Archives of General Psychiatry*. 2004; 62:1097–1106. [PubMed: 16203955]
- Heeringa S, Wagner J, Torres M, Duan N, Adams T, Berglund P. Sample designs and sampling methods for the Collaborative Psychiatric Epidemiology Studies (CPES). *The International Journal of Methods in Psychiatric Research*. 2004; 13:221–240.
- Institute of Medicine. Genes, behavior, and the social environment: Moving beyond the nature/nurture debate. National Academies of Science; 2006.
- Johnson. Cost effectiveness of mental health services for persons with a dual diagnosis. *Journal of Substance Abuse Treatment*. 2000; 18:119–127. [PubMed: 10716095]
- Kendler KS, Myers J, Prescott CA. Specificity of genetic and environmental risk factors for symptoms of cannabis, cocaine, alcohol, caffeine, and nicotine progression. 2007; 64:1313–1320.
- Kessler RC. The epidemiology of dual diagnosis. *Biological Psychiatry*. 2004; 56:730–737. [PubMed: 15556117]
- Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, Wittchen H-U, Kendler K. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. *Archives of General Psychiatry*. 1994; 51:8–19. [PubMed: 8279933]

- Kessler RC, Nelson CB, McGonagle KA, Edlund MJ, Frank RG, Leaf PJ. The epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization. *American Journal of Orthopsychiatry*. 1996; 66:17–31. [PubMed: 8720638]
- Kandel DB. Stages of adolescent involvement in drug use. *Science*. 1975; 190:912–914. [PubMed: 1188374]
- Kandel DB, Faust R. Sequence in stages and patterns of adolescent drug use. *Archives of General Psychiatry*. 1975; 32:923–932. [PubMed: 1156108]
- Kandel DB, Yamaguichi K. From beer to crack: developmental patterns of drug involvement. *American Journal of Public Health*. 1993; 83:851–855. [PubMed: 8498623]
- Krieger N. Genders, sexes, and health: What are the connections-and why does it matter? *International Journal of Epidemiology*. 2002; 32:652–657. [PubMed: 12913047]
- Lloyd DA, Taylor J. Lifetime cumulative adversity, mental health and risk of becoming a smoker. *Health: An Interdisciplinary Journal of the Social Study of Health, Illness, and Medicine*. 2006; 10:1363–4593.
- Medina-Mora ME, Borges G, Lara C, Benjet C, Jeronimo B, Fleiz C, Villatoro J, Rojas E, Zambrano J. Prevalence, service use, and demographic correlates of 12-month DSM-IV psychiatric disorders in Mexico: results from the Mexican National Comorbidity Survey. *Psychological Medicine*. 2005; 35:1–11.
- Merikangas KR, Mehta RL, Molnar BE, Walters EE, Swendsen JD, Aguilar-Gaxiola S, Bijl R, Borges G, Caraveo-Anduaga JJ, De Wit DJ, Kolody B, Vega WA, Wittchen HU, Kessler RC. Comorbidity of substance use disorders: Results of the International Consortium in Psychiatric Epidemiology. *Addictive Behavior*. 1998; 23:893–907.
- Modesto-Lowe V, Kranzler HR. Diagnosis and treatment of alcohol-dependent patients with comorbid psychiatric disorders. *Alcohol Research and Health*. 1999; 23:144–149. [PubMed: 10890809]
- Nunes EV, Rounsaville BJ. Comorbidity of substance use with depression and other mental disorders: from Diagnostic and Statistical Manual of Mental Disorders, fourth Edition (DSM-IV) to DSM-V. *Addiction*. 2006; 101(Suppl 1):89–96. [PubMed: 16930164]
- Ortega AN, Rosenheck R, Alegria M, Desai RA. Acculturation and the Lifetime Risk of Psychiatric and Substance Use Disorders Among Hispanics. *Journal of Nervous and Mental Disease*. 2000; 188:28–35.
- Room R. Taking account of cultural and societal influences on substance use diagnoses and criteria. *Addiction*. 2006; 101(Suppl 1):31–39. [PubMed: 16930159]
- Smith SM, Stinson FS, Dawson DA, Goldstein R, Huang B, Grant B. Race/ethnic differences in the prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine*. 2006; 36:987–998. [PubMed: 16650344]
- Stohler, R.; Rossler, W. *Dual Diagnosis: The Evolving Conceptual Framework*. Switzerland: S. Karger AG; 2005.
- Swendsen JD, Merikangas KR. The comorbidity of depression and substance use disorders. *Clinical Psychology Review*. 2000; 20:173–89. [PubMed: 10721496]
- Swendsen JD, Merikangas KR, Canino GJ, Kessler RC, Rubio-Stipec M, Angst J. The comorbidity of alcoholism with anxiety and depressive disorders in four geographic communities. *Comprehensive Psychiatry*. 1998; 39:176–84. [PubMed: 9675501]
- Swift W, Hall W, Copeland J. One year follow-up of cannabis dependence among long-term users in Sydney, Australia. *Drug Alcohol Dependence*. 2000; 59:309–318.
- Tsuang MT, Bar JI, Harley RM, Lyons MJ. Genetic and environmental influences on transitions in drug use. *Behavioral Genetics*. 2001; 29:473–479.
- Turner RJ, Gil AG. Psychiatric and substance use disorders in South Florida: Racial/ethnic and gender contrasts in a young adult cohort. *Archives of General Psychiatry*. 2002; 59:43–50. [PubMed: 11779281]
- Turner RJ, Lloyd DA. Lifetime cumulative adversities and drug dependence: racial/ethnic contrasts. *Addiction*. 2003; 98:305–316. [PubMed: 12603230]
- Turner RJ, Lloyd DA, Taylor J. Stress burden, drug dependence, and the nativity paradox among U.S. Hispanics. *Drug & Alcohol Dependence*. 2006

- United States General Accounting Office. GAO/GGD-98-103. 1998. Decennial Census: Overview of Historical Census Issues.
- Vega WA. A profile of crime, violence, and drug use among Mexican immigrants. *Perspectives on Crime and Justice*. 2001; 4:51–68.
- Vega WA, Aguilar-Gaxiola S, Andrade L, Bijl R, Borges G, Caraveo-Aduaga JJ. Prevalence and age of onset for drug use in seven international sites: Results from the International Consortium of Psychiatric Epidemiology. *Drug and Alcohol Dependency*. 2002; 68:285–297.
- Vega WA, 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. *Archives of General Psychiatry*. 1998; 55:771–778. [PubMed: 9736002]
- Vega WA, Sribney WM, Achara-Abrahams I. Co-occurring alcohol, drug, and other psychiatric disorders among Mexican origin people in the United States. *American Journal of Public Health*. 2003; 93:1057–1064.
- Warner L, Alegría M, Canino G. Remission from drug dependence symptoms and drug use cessation among women drug users in Puerto Rico. *Archives of General Psychiatry*. 2004; 61:1034–1041. [PubMed: 15466677]
- Weaver T, Madden P, Charles G, Stimson A, Renton P, Tyrer P, Barnes T, Bench C, Middleton H, Wright N, Paterson S. Comorbidity of substance misuse and mental illness in community mental health and substance misuse services. *British Journal of Psychiatry*. 2003; 183:304–313. [PubMed: 14519608]
- WHO World Mental Health Survey Consortium. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization mental health surveys. *JAMA*. 2004; 291:2581–2590. [PubMed: 15173149]
- Wang S, Ray N, Rojas W, Parra MV, Bedoya G, Galloa C, Poletti G, Mazzotti G, Hill K, Hurtado AM, Camrena B, Nicolini H, Klitz W, Barrantes R, Molina JA, Freimer NB, Bortolini MC, Salzano FM, Petzl-Erler ML, Tsuneto LT, Dipierri JE, Alfaro EL, Bailliet G, Bianchi NO, Llop E, Rothhammer F, Excoffier L, Ruiz-Linares A. Geographic patterns of genome admixture in Latin American Mestizos. 2008; 4:1–9. www.plosgenetics.org.

Table 1

Lifetime prevalence of substance abuse/dependence only, non-substance use disorders only dual diagnoses by Latino subgroup, nativity, and sex.

	Male	SE	Female	SE	Total	SE	P value	Test between Immigrant vs. US Born
Substance abuse/dependence only¹								
Puerto Rican								
Migrants	6.71%	0.032	0.00%	0.000	3.46%	0.017	0.042+	
US Born	10.12%	0.039	0.45%	0.005	5.43%	0.020	0.000+	
Total Puerto Rican	8.58%	0.024	0.25%	0.002	4.54%	0.013	0.000+	0.474
Cuban								
Immigrants	5.28%	0.011	0.00%	0.000	2.72%	0.005	0.001+	
US Born	3.17%	0.031	1.66%	0.018	2.45%	0.020	0.631	
Total Cuban	5.00%	0.011	0.21%	0.002	2.68%	0.006	0.000+	0.898
Mexican-origin								
Immigrants	4.71%	0.007	0.39%	0.004	2.61%	0.005	0.007+	
US Born	10.15%	0.023	2.74%	0.011	6.56%	0.016	0.001+	
Total Mexican	7.05%	0.012	1.40%	0.005	4.31%	0.008	0.000+	0.009*
Other Latino								
Immigrants	4.95%	0.016	0.00%	0.000	2.55%	0.008	0.005+	
US Born	12.52%	0.035	4.28%	0.022	8.52%	0.024	0.019+	
Total Other Latino	7.84%	0.016	1.64%	0.008	4.83%	0.011	0.000+	0.003*
Non-substance use disorder only²								
Puerto Rican								
Migrants	31.98%	0.090	46.05%	0.078	38.80%	0.060	0.276	
US Born	24.91%	0.050	42.45%	0.046	33.42%	0.045	0.001+	
Total Puerto Rican	28.10%	0.044	44.07%	0.046	35.84%	0.031	0.028+	0.527
Cuban								
Immigrants	24.86%	0.030	36.05%	0.039	30.29%	0.018	0.071	
US Born	33.17%	0.084	43.79%	0.101	38.23%	0.064	0.424	
Total Cuban	25.95%	0.025	37.04%	0.035	31.31%	0.016	0.043+	0.250
Mexican-origin								

	Male	SE	Female	SE	Total	SE	P value	Test between Immigrant vs. US Born
Immigrants	18.10%	0.028	32.39%	0.025	25.03%	0.025	0.000+	
US Born	17.23%	0.029	38.34%	0.040	27.47%	0.029	0.000+	
Total Mexican	17.73%	0.019	34.94%	0.026	26.08%	0.021	0.000+	0.466
Other Latino								
Immigrants	18.72%	0.035	32.44%	0.032	25.38%	0.024	0.008+	
US Born	21.76%	0.060	31.70%	0.046	26.58%	0.029	0.297	
Total Other Latino	19.88%	0.035	32.16%	0.027	25.84%	0.021	0.021+	0.715
Dual diagnoses³								
Puerto Rican								
Migrants	12.01%	0.039	2.18%	0.011	7.24%	0.022	0.004+	
US Born	12.21%	0.034	9.89%	0.028	11.08%	0.023	0.582	
Total Puerto Rican	12.12%	0.025	6.42%	0.016	9.35%	0.018	0.011+	0.156
Cuban								
Immigrants	2.78%	0.014	0.90%	0.005	1.87%	0.008	0.107	
US Born	9.73%	0.046	21.09%	0.141	15.15%	0.069	0.425	
Total Cuban	3.69%	0.014	3.48%	0.023	3.59%	0.013	0.939	0.001*
Mexican-origin								
Immigrants	4.48%	0.014	0.53%	0.006	2.56%	0.009	0.022+	
US Born	19.47%	0.029	6.27%	0.018	13.07%	0.016	0.002+	
Total Mexican	10.91%	0.013	2.99%	0.012	7.07%	0.010	0.001+	0.000*
Other Latino								
Immigrants	3.83%	0.020	0.10%	0.001	2.03%	0.010	0.000+	
US Born	13.17%	0.033	8.24%	0.025	10.78%	0.021	0.251	
Total Other Latino	7.41%	0.020	3.22%	0.010	5.38%	0.011	0.052	0.002*

Note:

¹ Substance abuse/dependence only refers to substance abuse/dependence without any other non-substance disorder

² Non-substance use disorder only refers to non-substance use disorder without any substance abuse/dependence

³ Dual diagnoses refers to having a substance abuse/dependence disorder and a non-substance use disorder

⁺ Denotes statistically significant ($p < .05$) sex within nativity differences by subgroup

* Denotes statistically significant ($p < .05$) nativity differences within subgroup

Table 2

Lifetime prevalence of dual diagnoses: alcohol abuse/dependence, drug abuse/dependence, and non-substance use disorders by nativity and sex.

	Male		Female		Total	SE	P value
	Mean	SE	Mean	SE			
Dual diagnoses							
Alcohol abuse/dependence ONLY with non-substance disorder ¹							
Immigrants	2.48%	0.01	0.00%	0.00	1.28%	0.00	0.042
US Born	5.74%	0.01	3.39%	0.01	4.60%	0.01	0.000
Total Latino	3.83%	0.01	1.41%	0.00	2.65%	0.00	0.002
Male Immigrant vs. Male US Born							0.104
Female Immigrant vs. Female US-Born							0.003
Immigrant vs. US-Born (sexes combined)							0.001
Drug abuse/dependence ONLY with non-substance disorder ²							
Immigrants	0.25%	0.20	0.37%	0.00	0.31%	0.00	0.106
US Born	1.06%	0.01	0.31%	0.00	0.70%	0.00	0.853
Total Latino	0.59%	0.00	0.35%	0.00	0.47%	0.00	0.252
Male Immigrant vs. Male US Born							0.080
Female Immigrant vs. Female US-Born							0.734
Immigrant vs. US-Born (sexes combined)							0.147
Alcohol abuse and or dependence and drug abuse and or dependence with non-substance disorder ³							
Immigrants	2.29%	0.01	0.20%	0.00	1.28%	0.00	0.000
US Born	10.08%	0.01	3.79%	0.01	7.03%	0.01	0.000
Total Latino	5.52%	0.01	1.69%	0.00	3.66%	0.00	0.000
Male Immigrant vs. Male US Born							0.000
Female Immigrant vs. Female US-Born							0.000
Immigrant vs. US-Born (sexes combined)							0.000
Total dual diagnoses ^b							
Immigrants	5.02%	0.01	0.58%	0.00	2.87%	0.01	0.000
US Born	16.88%	0.02	7.48%	0.01	12.32%	0.01	0.000
Total Latino	9.94%	0.01	3.44%	0.01	6.79%	0.01	0.000
Male Immigrant vs. Male US Born							0.000

	Male		Female		
	Mean	SE	Mean	SE	P value
Female Immigrant vs. Female US-Born					0.000
Immigrant vs. US-Born (sexes combined)					0.000

Note:

¹The definition of alcohol abuse/dependence ONLY categories exclude R's comorbid with drug abuse/dependence.

²The definition of drug abuse/dependence ONLY categories exclude R's comorbid with alcohol abuse/dependence.

^aThe definition includes an alcohol AND a drug disorder (abuse or dependence) and a non-substance disorder.

^bThe definition of total dual diagnoses includes any substance use disorder and any non-substance disorder (at least one of each type).

Table 3

Age of onset of substance-use disorder and non-substance-use disorder for persons with dual diagnoses. ¹

Median Age of Onset	Male	SE	Female	SE	Total	SE	P value
Median age of onset of substance-use disorder for persons with dual diagnoses							
Immigrants	23.0	—	23.0	—	23.0	—	0.675
US Born	18.0	—	19.0	—	18.5	—	0.038
Total Latino	18.5	—	20.0	—	19.0	—	0.061
Median age of onset of non-substance-use disorder for persons with dual diagnoses							
Immigrants	16.0	—	11.0	—	16.0	—	0.550
US Born	14.0	—	15.0	—	14.0	—	0.664
Total Latino	14.0	—	15.0	—	14.0	—	0.403
Order of onset for persons with dual diagnoses (age- and sex- adjusted weights by immigration status)							
% with substance-use disorder onset > non-substance-use disorder onset							
Immigrants	90.58%	0.062	40.15%	0.204	82.97%	0.090	0.008
US Born	67.44%	0.062	70.64%	0.096	68.28%	0.058	0.750
Total Latino	72.95%	0.055	66.50%	0.109	71.42%	0.057	0.545
% with substance-use disorder onset < =non-substance-use disorder onset							
Immigrants	9.42%	0.062	59.85%	0.204	17.03%	0.090	0.008
US Born	32.56%	0.062	29.36%	0.096	31.72%	0.058	0.750
Total Latino	27.05%	0.055	33.50%	0.109	28.58%	0.057	0.545

¹ Wilcoxon tests used for these estimates do not adjust for survey design