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Ethnicity and Alcohol Consumption among U.S. Adults with Diabetes

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Abstract

Purpose: The drinking practices of a nationally representative sample of White, Black, Mexican American, and other Hispanic adult diabetics are described and compared.

Methods: Combined years (2005/2006–2011/2012) of the National Health and Nutrition Examination Survey provided home interview data from 2,220 adults with self-reported diabetes of White (n=875), Black (n=720), Mexican American (n=402), and other Hispanic (n=223) ethnicity. Current drinking status, the number of drinks consumed per week, and binge drinking were compared across ethnicity.

Results: The multivariate findings for both diabetic men and women showed no statistically significant ethnic differences in current drinking status and among women, there were no statistically significant ethnic differences in binge drinking. Among male diabetics, Mexican Americans consumed more drinks per week than Whites (b=0.35, 95% CI=0.13–0.58, p=.002) and were at increased risk for binge drinking (OR=2.04, 95% CI 1.30–3.21, p=.002).

Conclusions: Binge drinking is prevalent among Mexican American male diabetics. This pattern of drinking may put them at risk for poor diabetes management and control. It is important that health care providers routinely assess their patients' drinking practices and address the health risks associated with alcohol consumption.

Keywords

diabetes; alcohol consumption; ethnic differences

Introduction

Diabetes is a devastating disease that disproportionately affects many minority groups relative to Whites (1–3). Existing research indicates that alcohol consumption may impact

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diabetes management and control (4-7). Little is known, however, about the drinking practices of those with diabetes and particularly, how this varies in relation to ethnicity. This is important to assess because U.S. general population studies have documented significant differences across ethnicity in both the patterns of alcohol consumption and its adverse effects (8-16). For example, among men, Whites and Hispanics were more likely than Blacks to be current drinkers, but Blacks were more likely than Whites and Hispanics to be daily heavy drinkers (≥ 5 drinks per day). White women were also more likely to be current drinkers compared to Hispanic and Black women. Black and White women were more likely than Hispanic women to be daily heavy drinkers (≥ 4 drinks per day) (10). There is also heterogeneity in drinking among U.S. Hispanics. Mexican Americans and Puerto Ricans were more likely to be current drinkers, had higher weekly consumption levels, and were more likely to be binge drinkers than Cuban Americans or South/Central Americans (13). It is unclear, however, if similar ethnic-specific drinking practices exist among those with diabetes.

This paper describes and compares the drinking practices (current drinking status, number of drinks consumed per week, and binge drinking) of a nationally representative sample of White, Black, Mexican American, and other Hispanic adults with diabetes. Based on ethnic differences in drinking practices in the general population (described above), we hypothesize that White diabetics will be more likely to be current drinkers and will consume a higher number of drinks per week than Black, Mexican American, and other Hispanics. In addition, among men, we expect that Mexican American diabetics will be more likely than White, Black, and other Hispanic diabetics to be binge drinkers. Among women, we expect White diabetics to be more likely than Black, Mexican American, and other Hispanic diabetics to be binge drinkers.

Methods

Sampling and data collection

Respondents are from four combined years (2005/2006-2011/2012) of the National Health and Nutrition Examination Survey (NHANES) (17). This cross-sectional survey is conducted by the National Center for Health Statistics and provides nationally representative estimates of health and disease in the U.S. civilian non-institutionalized population. NHANES includes in-home interviews utilizing a computer assisted personal interview system and health examinations in mobile examination centers. NHANES utilizes a complex multistage probability sampling design with oversampling of subgroups in different years. Approximately 5,000 individuals participate annually. The mean response rate across the U.S. for 2005/06-2011/12 was approximately 75%. These analyses include home interview data from 2220 self-reported diabetic adults (≥ 21 years) who were of White (n=875), Black (n=720), Mexican American (n=402), or other Hispanic (n=223) ethnicity and for whom there were complete data on alcohol consumption. Diabetic status was determined with the following question: "Other than during pregnancy, have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?"

Measures

Alcohol variables. Drinking status was categorized for bivariate analysis as: 1) life-long abstainers, 2) ex-drinkers, and 3) current drinkers (any alcohol in the past 12 months). For multivariate analysis, drinking status was treated as a dichotomy (abstainers versus drinkers).

Number of drinks consumed per week, a continuous measure, was assessed by combining the self-reported frequency and quantity of drinking wine, beer, and liquor in the previous 12 months (standard drink: 5 ounces of wine, 12 ounces of beer, or 1½ ounces of liquor). The raw values are presented in Table 2, and because the distribution of this variable was substantially skewed, it was log transformed for the regression models presented in Table 4.

Binge drinking. The National Institute of Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as consumption of five (men) or four (women) drinks in about a two hour period (18). NHANES did not define binge drinking in this manner until survey year 2011/2012. For consistency across survey years included in these analyses, binge drinking is defined as per survey years 2006 to 2010: as consumption of 5 in a day in the previous year. Respondents were categorized as: 1) lifelong abstainers, ex-drinkers, and current drinkers who did not binge; and 2) current drinkers who binged one or more time. Binge drinking among current drinkers was also assessed: non-binge drinkers versus binge drinkers.

Health Status was controlled for in the analyses because of its possible impact on alcohol consumption (19). These included *insulin dependence* (no, yes) and the presence of *comorbid medical conditions* in addition to diabetes. The comorbidity measure was composed of the presence of 15 medical conditions included in the NHANES questionnaire: asthma, arthritis, heart failure, coronary heart disease, angina, heart attack, stroke, emphysema, chronic bronchitis, liver disease, thyroid condition, gout, vision problems, cancer, and high blood pressure. The presence of each condition was coded as 1 (versus 0 for not present). This additive measure was treated in the analyses, as a categorical variable to represent those with: 1) diabetes only, 2) diabetes and one additional condition, and 3) diabetes and two additional conditions.

Sociodemographics. These included age (continuous), sex, ethnicity (White, Black, Mexican American, and other Hispanic), level of education (< high school/high school diploma or equivalent, and some college/college degree or higher), income (< \$20,000, \$20,000-\$44,999, \$45,000-\$64,999 and \$65,000), employment status (employed, unemployed/disabled, retired, and homemaker/student/other), and marital status (married/cohabitating, separated/divorced, widowed, and never married).

Data Analyses

To account for the complex sample design of NHANES, data were analyzed using the survey setup command, *svyset*, in Stata 11.2 (20). Analyses were conducted on data weighted to correct for unequal probabilities of selection into the sample and for nonresponse bias. Tables depict unweighted Ns and weighted proportions. Bivariate associations were assessed with chi-square statistics and t-tests. Logistic regression was used

to assess predictors of drinking status and binge drinking, and linear regression for predictors of drinks consumed per week. All multivariate models were developed by fully adjusting for all study independent variable, regardless of their level of significance. Because drinking practices vary by gender (10, 11); gender-specific models were run for the three alcohol outcome variables.

Results

Sample Characteristics

The mean age of all respondents was just under 60 (Table 1). The majority of respondents were White. Most respondents, regardless of gender, had completed at least some college or higher. Overall, a quarter of respondents had annual incomes of < \$20,000, but among women, approximately 30% had incomes at this lowest level. This income disparity was also present at the highest income level: more than 30% of men versus less than 20% of women had annual incomes of \$65,000. A higher proportion of men than women were in the workforce and approximately equal proportions on men and women were retired. While the majority of respondents were married or cohabitating, approximately 20% of women versus only approximately 5% of men were widowed. Approximately one third of respondents were insulin dependent and the mean duration of diabetes was just under 11 years for both genders. Finally, the majority of respondents, regardless of gender, had two or more comorbid conditions accompanying their diabetes.

Bivariate Analyses: Drinking Status among Male and Female Diabetics

Among diabetic men, approximately equal proportions of Whites, Mexican Americans, and other Hispanics, were current drinkers compared to Blacks (Table 2). Among diabetic women, approximately equal proportions of Whites, Blacks, and Mexican Americans were current drinkers compared to other Hispanics.

Bivariate Analyses: Mean Number of Drinks Consumed per Week among Male and Female Diabetics

Among male diabetics, Mexican Americans consumed the highest mean number of drinks per week and other Hispanics consumed the lowest mean number of drinks. Among female diabetics, the number of drinks consumed per week did not vary significantly across ethnicity, although other Hispanic women drank less than women of other ethnicities.

Bivariate Analyses: Binge Drinking among Male and Female Diabetics

Hispanic men, especially Mexican Americans, were significantly more likely than White and Black men to have engaged in binge drinking one or more time in the previous year. Among current drinkers, Mexican American men were also most likely to have binged, followed by other Hispanic and Black men, and then Whites. There were no statistically significant differences in binge drinking among women, although the proportion of binge drinkers was higher among Mexican Americans than women of other ethnicities.

Multivariable Analyses: Drinking Status among Diabetics

The multiple logistic regression analysis for men showed that Mexican Americans were approximately one and a half times more likely to be current drinkers compared to White men. This difference, however, was only marginally significant (Table 3). Current drinking status for men was also associated with level of education, income, and employment. Men with annual incomes of less than \$20,000 per year (versus men with annual incomes of \$65,000 per year) and men with less than a high school education (versus men with some college or higher) were less likely to be current drinkers. Men who were not in the workforce due to unemployment, disability, homemaker or student status were also less likely to be current drinkers compared to employed men. Neither of the illness-related variables was associated with current drinking status among male diabetics.

There were no ethnic differences in current drinking status among women. Current drinking, however, was associated with age: the likelihood of being a current drinker decreased with increasing age. Current drinking status was also significantly associated with level of income, employment, and marital status. Compared to women with annual incomes of \$65,000, women at all lower income levels were less likely to be current drinkers. Women who were unemployed or disabled, retired, and homemakers were also less likely to be current drinkers compared to employed women. Finally, separated and divorced women were approximately one and a half times more likely to be current drinkers compared to married or cohabitating women, although this was only marginally significant. Neither insulin dependence nor the presence of comorbid medical conditions was associated with current drinking status among diabetic women.

Multivariate Multivariable Analyses: Number of Drinks Consumed per Week among Diabetics

The multiple linear regression model for men showed that Mexican Americans consumed more drinks per week than did Whites (Table 4). Men with annual incomes of less than \$20,000 and men with less than a high school education also consumed fewer drinks per week than men earning \$65,000 per year and men with some college or higher, respectively. In addition, men who were out of the workforce due to homemaker, student, or other reason drank fewer drinks per week than employed men, although this was only marginally significant. Separated or divorced men drank more per week than married or cohabitating men. Regarding health status, insulin dependence was associated with a lower weekly consumption of alcohol.

There were no ethnic differences in weekly consumption among women. Employment status was associated with weekly consumption. Unemployed and disabled women consumed fewer drinks per week than employed women. Homemakers, students and women out of the workforce for other reasons also drank less per week than employed women, however, this association was only marginally significant. Neither of the health status variables was associated with weekly alcohol consumption among female diabetics.

Multivariable Analyses: Binge Drinking among Diabetics

The multivariate logistic regression model for men showed that compared to Whites, Mexican Americans were twice as likely to have binged at least once in the previous year (Table 5). Age was protective for binge drinking as was lower income (annual income levels of < \$20,000 & \$20,000 - \$44,000 versus \$65,000). In contrast, having a high school degree or equivalent (compared to some college or higher) and a separated or divorced marital status (compared to married or cohabitating) were risk factors for binge drinking. Finally, insulin dependence was protective for binge drinking among men.

Among women, there were no ethnic differences in binge drinking. The only other variable that was associated with binge drinking was age: as age increased, the likelihood of having binged in the previous year decreased.

Discussion

This study assessed ethnic differences in current drinking status, the number of drinks consumed per week, and binge drinking among a nationally representative sample of U.S. adults with diabetes. We hypothesized that current drinkers would be more likely to be White than of other ethnicities. In contrast, in our bivariate analysis, we found comparable rates of current drinking across ethnicity, although Black men were somewhat less likely to be current drinkers compared to other groups. It is interesting to note that rates of current drinking among male and female diabetics are lower than rates of current drinking in the general population (10, 13); a difference that is likely due to the older age and poorer health status of those with diabetes. Also interesting to note is that although rates of current drinking were lower among diabetics than in the general population, similar ethnic differences are apparent. In both this diabetic sample, and the general population, White and Hispanic men have higher rates of current drinking than Black men. Among women in the general population, more are current drinkers than Blacks and Hispanics and we see similar differences among White diabetic women in this sample (10).

We also hypothesized that White diabetics like their counterparts in the general population (21), would consume a higher mean number of drinks per week than diabetics of other ethnicities. In contrast, the bivariate analysis showed that Mexican American men consumed more than Black, White, and other Hispanic men; and in the multivariate analysis, compared to Whites, Mexican Americans had significantly greater weekly consumption. The bivariate analysis for women showed that Blacks and Mexican Americans drank slightly more and other Hispanics drank slightly less than Whites. But these findings, as well as the multivariate findings, were not statistically significant. These findings for women show a different pattern than among women in the general population in which Whites consume more drinks per week than Blacks or Hispanics (21).

Regarding binge drinking, we expected Mexican American men to be more likely than White, Black, and other Hispanic men to engage in this behavior. Our hypothesis was confirmed in the bivariate and multivariate analyses. Mexican American men were at twice the risk for binge drinking compared to Whites. Findings from general population studies have consistently shown that Mexican American men have high rates of binge drinking compared

to other men (8, 13, 22, 23). This has been linked to drinking patterns in Mexico, where drinking is often infrequent but heavy when it occurs (24-26). Among women, we hypothesized that Whites would be more likely than women of other ethnicities to be binge drinkers. In the bivariate analysis we found no statistically significant ethnic differences, although Mexican American women were most likely to binge and other Hispanic women were least likely to binge. It is possible that our sample was too small to detect significant differences among women in bingeing. But these results further demonstrate how women with diabetes drink less than women in the general population. In our study only 5% of white female diabetics drank five or more drinks in a day versus 17% of women in the U.S. general population (27).

Several sociodemographic variables were also associated with the three drinking outcomes. Among men, older age was associated with lower weekly consumption and among both men and women, older age was protective for binge drinking. Older age was also associated with a decreased likelihood of being a current drinker among both men and women. These are consistent finding in the literature on the epidemiology of alcohol consumption (1, 11, 13, 27). Socioeconomic status was also associated with our drinking outcomes, but in different ways. Among men, both lower education and lower income and among women, lower income was associated with a lesser likelihood of being a current drinker. This association between education and drinking status has been documented in the general population where the proportion of current drinkers increases with level of education (1, 11). Regarding weekly consumption and binge drinking, among men, lower income was associated with both lower weekly consumption and decreased risk for binge drinking. Lower education was also associated with a lower weekly consumption. Lower education, however, was associated with an increased risk for binge drinking. This finding regarding binge drinking is in contrast to data from the U.S. general population where the prevalence of binge drinking is lower among those with less education (i.e., 19% of adults without a high school diploma versus 26% with a college degree consumed five or more drinks in a day in the past year) (27). Employment status was also associated with current drinking and weekly consumption. Compared to employed diabetics, those out of the workforce were less likely to be current drinkers. This has been similarly documented in the general population where the proportion of current drinkers was higher for employed than unemployed adults (11). U.S. general population data also show that unemployed individuals are more likely to binge drink than the employed (11); however, this study found no association between employment and binge drinking. Regarding weekly consumption, compared to employed men, those out of the workforce due to homemaking, school, or "other" consumed fewer drinks per week, although this was only marginally statistically significant. Among women, those who were unemployed or disabled had lower weekly consumption than the employed. Unemployment may reduce disposable income and thus reduce alcohol consumption. It is also possible that poor health status may also cause unemployment as well as decreased alcohol consumption. We did, however, control for health status in the analyses. Finally, separated or divorced men were at greater risk for higher weekly consumption and binge drinking. Divorced or separated individuals may have lifestyles that involve more socializing with friends and therefore more opportunities for drinking (28).

Our findings regarding the high rates of binge drinking among men, and especially among Hispanics, are concerning since diabetics are at increased risk for comorbid medical conditions such as hypertension, congestive heart failure, and coronary heart disease (2). In fact, approximately 70% of the diabetics in this sample had two or more comorbid conditions in addition to their diabetes. That we did not observe an association between binge drinking and comorbidity is of concern, since this suggests that those diabetics in poor health might still be drinking excessively, increasing their risk for complications from disease. Heavy drinking is also associated with depression (29-31), a condition that is common among diabetics (32, 33). Furthermore, diabetics with multiple medical conditions likely take multiple prescription medications, many of which may interact negatively with alcohol (34). It is therefore important to note that among men, insulin use was associated with consumption of fewer drinks per week and a decreased likelihood of binge drinking.

Unfortunately, according to the Centers for Disease Control, only one in six adults discuss their drinking with their health care providers (35). It is therefore important for health care providers to routinely assess their patients' drinking practices and address the health risks associated with alcohol consumption. Such screening and brief counseling has been shown to reduce at risk drinking by 25% in those who drink excessively (35). This is particularly important for providers caring for Mexican American male diabetics given the greater risk in this population for binge drinking.

Limitations

This research is strengthened by its use of a nationally representative sample of U.S. adults with diabetes. Because all analyses were conducted on data weighted to account for design effects and for non-response, these results can be generalized to all White, Black, and Mexican American U.S. adults with diabetes. Unfortunately, our results for other Hispanics may not be generalizable to other U.S. Hispanic groups because NHANES did not collect information about particular Hispanic national origin. This is unfortunate because U.S. Hispanic national groups vary both in their risk for diabetes and in their drinking practices (2, 13). Additionally, NHANES' cross-sectional design prevents the establishment of a temporal order between our outcome and predictor variables. Diabetic status was self-reported and is therefore subject to either under- or over-reporting. Several studies, however, have shown good validity between subjective and objective evaluations of diabetic status (37, 38). Still, this is a sample of prevalent surviving diabetics, who may have different patterns of alcohol consumption than those newly diagnosed with this disease. In addition, because of the link between heavy alcohol consumption and poor glucose control (39), it is possible that the heaviest drinkers may not be represented in this sample due to increased mortality in this group. Alcohol consumption was also self-reported and might be under-reported due to social desirability or recall bias (40-42). Finally, the definition of binge drinking in the current study (i.e., 5 drinks consumed in a day) differed from that of NIAAA (i.e., 5 drinks (men) and 4 drinks (women) within a two hour period) (18). The implication of using a higher cutoff for binge drinking among women is that those who drank four drinks (but not five) would be classified as non-binge drinkers, resulting in an under-estimation of binge drinking in this sample. On the other hand, drinks consumed in a day may be consumed over a longer period of time than just two hours, and therefore may

not result in the raising of one's blood alcohol concentration to 0.08 or above (as per NIAAA's definition; 18). Thus, this definition of binge drinking may over-estimate binge drinking in this sample.

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List of abbreviations

U.S.	Unites States
NHANES	National Health and Nutrition Examination Survey
SE	standard error
OR	odds ratio
CI	confidence interval
B	beta

References

- Schiller JS, Lucas JW, Ward BW, Peregoy JA, National Center for Health Statistics. Summary health statistics for U.S. adults: National Health Interview Survey, 2011. Vital Health Stat. 2012; 10(256) http://www.cdc.gov/nchs/data/series/sr_10/sr10_256.pdf [accessed 01.30.14].
- National Institute of Diabetes and Digestive and Kidney Diseases. National Diabetes Statistics. 2011. <http://diabetes.niddk.nih.gov/dm/pubs/statistics/> [accessed 02.14.13]
- Agency for Healthcare Research and Quality. Diabetes Disparities Among Racial and Ethnic Minorities [AHRQ Publication No. 02-P007]. Rockville, MD: <http://www.ahrq.gov/research/diabdisp.htm>. [accessed 02.14.14]
- Ahmed AT, Karter AJ, Warton EM, Doan JU, Weisner CM. The relationship between alcohol consumption and glycemic control among patients with diabetes: the Kaiser Permanente Northern California Diabetes Registry. J Gen Intern Med. 2008; 23(3):275–82. [PubMed: 18183468]
- Mackenzie T, Brooks B, O'Connor G. Beverage intake, diabetes, and glucose control of adults in America. Ann Epidemiol. 2006; 16(9):688–91. [PubMed: 16458538]
- Ahmed AT, Karter AJ, Liu J. Alcohol consumption is inversely associated with adherence to diabetes self-care behaviours. Diabet Me. 2006; 23(7):795–802.
- Chew LD, Nelson KM, Young BA, Bradley KA. Association between alcohol consumption and diabetes preventive practices. Family Medicine. 2005; 37(8):589–94. [PubMed: 16145630]
- Dawson DA, Grant BF, Chou SP, Pickering RP. Subgroup variation in U.S. drinking patterns: results of the 1992 National Longitudinal Alcohol Epidemiologic Studt. J Subst Abuse. 1995; 7:331–44. [PubMed: 8749792]
- Dawson DA. Beyond Black, White, and Hispanic: race, ethnic origin and drinking patterns in the United States. J Subst Abuse. 1998; 10:321–39. [PubMed: 10897287]
- National Institute on Alcohol Abuse and Alcoholism [NIAAA]. Alcohol use and alcohol use disorders in the United States: Main findings from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Vol. 8. National Institutes of Health; Bethesda, MD: 2006. U.S. Alcohol Epidemiologic Data Reference Manual http://pubs.niaaa.nih.gov/publications/NESARC_DRM/NESARCDRM.pdf [accessed 01.30.14]

11. Substance Abuse and Mental Health Services Administration. Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2013. NSDUH Series H-46, HHS Publication No. (SMA) 13-4795
12. Chartier K, Caetano R. Ethnicity and health disparities in alcohol research. *Alcohol Research & Health*. 2010; 33(1, 2):152–60. [PubMed: 21209793]
13. Ramisetty-Mikler S, Caetano R, Rodriguez LA. The Hispanic Americans Baseline Alcohol Survey (HABLAS): Alcohol consumption and sociodemographic predictors across Hispanic national groups. *Journal of Substance Use*. 2010; 15:402–16. [PubMed: 23847447]
14. Vaeth PAC, Caetano R, Ramisetty-Mikler S, Rodriguez LA. Hispanic Americans Baseline Alcohol Survey (HABLAS): Alcohol-related problems across Hispanic National Groups. *J Stud Alcohol Drugs*. 2009; 70:991–99. [PubMed: 19895778]
15. Dawson DA, Grant BF, Stinson FS, Chou PS, Huang B, Ruan WJ. Recovery from DSM-IV alcohol dependence: United States, 2001–2002. *Addiction*. 2005; 100(3):281–92. [PubMed: 15733237]
16. Caetano R, Ramisetty-Mikler S, Rodriguez LA. The Hispanic Americans Baseline Alcohol Survey (HABLAS): Rates and predictors of Alcohol Abuse and Dependence across Hispanic National Groups. *J Stud Alcohol Drugs*. 2008; 69:441–48. [PubMed: 18432387]
17. National Health and Nutrition Examination Survey (NHANES). About the National Health and Nutrition Examination Survey. http://www.cdc.gov/nchs/nhanes/about_nhanes.htm [accessed 02.05.2014]
18. National Institute on Alcohol Abuse and Alcoholism. NIAAA council approved definition of binge drinking; NIAAA Newsletter. 2004. p. 3 http://pubs.niaaa.nih.gov/publications/Newsletter/winter2004/Newsletter_Number3.pdf [accessed 06.25.14]
19. Mackenzie T, Brooks B, O'Connor G. Beverage intake, diabetes, and glucose control of adults in America. *Ann Epidemiol*. 2006; 16(9):688–691. [PubMed: 16458538]
20. 2011
21. Caetano R, Baruah J, Ramisetty-Mikler S, Ebama MS. Sociodemographic predictors of pattern and volume of alcohol consumption across Hispanics, Blacks, and Whites: 10-year trend (1992–2002). *Alcoholism Clinical and Experimental Research*. 2010; 34(10):1782–92. c.
22. Caetano R, Vaeth PAC, Ramisetty-Mikler S, Rodriguez LA. The Hispanic Americans Baseline Alcohol Survey: alcoholic beverage preference across Hispanic national groups. *Alcohol Clin Exp Res*. 2009; 33:150–59. [PubMed: 18976346]
23. Randolph WM, Stroup-Benham C, Black SA, Karkides KS. Alcohol Use among Cuban-Americans, Mexican-Americans, and Puerto Ricans. *Alcohol Health & Research World*. 1998; 22(4):265–69. [PubMed: 15706753]
24. Taylor, B.; Rehm, J.; Trinidad Caldera Aburto, J.; Bejarano, J.; Cayetano, C.; Kerr-Correa, F., et al. Alcohol, Gender, Culture and Harms in the Americas: PAHO Multicentric Study Final Report. Pan American Health Organization; Washington, D.C: 2007.
25. Caetano R, Medina Mora ME. Acculturation and drinking among people of Mexican descent in Mexico and the United States. *Journal of Studies on Alcohol*. 1988; 49:462–71. [PubMed: 3216651]
26. Medina-Mora, MA.; Villatoro, J.; Caraveo, J.; Colmenares, E. Surveys of Drinking Patterns and Problems in Seven Developing Countries. World Health Organization, Department of Mental Health and Substance Dependence; 2000. Patterns of alcohol consumption and related problems in Mexico: Results from two general population surveys; p. 13–31. WHO Monograph on Alcohol Epidemiology in Developing Countries
27. Schoenborn CA, Adams PF, Peregoy JA, National Center for Health Statistics. Health behaviors of adults: United States, 2008–2010. *Vital Health Stat*. 2013; 10(257) Table 3.3.
28. Prescott CA, Kendler KS. Associations between marital status and alcohol consumption in a longitudinal study of female twins. *Journal of Studies on Alcohol*. 2001; 62(5):589–604. [PubMed: 11702798]

29. Merrick EL, Horgan CM, Hodgkin D, Garnick DW, Houghton SF, Panas L, et al. Unhealthy drinking patterns in older adults: prevalence and associated characteristics. *J Am Geriatr Soc*. 2008; 56:214–23. [PubMed: 18086124]
30. Manninen L, Poikolainen K, Vartiainen E, Laatikainen T. Heavy drinking occasions and depression. *Alcohol & Alcoholism*. 2006; 41(3):293–99. [PubMed: 16490791]
31. Paschal MJ, Freisthler B, Lipton RI. Moderate alcohol use and depression in young adults: findings from a national longitudinal study. *American Journal of Public Health*. 2005; 95(3):453–57. [PubMed: 15727976]
30. Esteban y Peña MM, Hernandez Barrera V, Fernández Cordero X, Gil de Miguel A, Rodríguez Pérez M, Lopez-de Andres A, et al. Self-perception of health status, mental health and quality of life among adults with diabetes residing in a metropolitan area. *Diabetes & Metabolism*. 2010; 36(4):305–11. [PubMed: 20483647]
32. Li C, Ford ES, Zhao G, Strine TW, Dhingra S, Barker L, et al. Association between diagnosed diabetes and serious psychological distress among U.S. adults: The Behavioral Risk Factor Surveillance System, 2007. *International Journal of Public Health*. 2009; 54(Suppl 1):43–51. [PubMed: 19396581]
33. Strine TW, Mokdad AH, Balluz LS, Gonzalez O, Crider R, Berry JT, et al. Depression and anxiety in the United States: Findings from the 2006 Behavioral Risk Factor Surveillance System. *Psychiatric Services*. 2008; 59(12):1383–90. [PubMed: 19033164]
34. Pringle KE, Ahern FM, Heller DA, Gold CH, Brown TV. Potential for alcohol and prescription drug interactions in older people. *J Am Geriatr Soc*. 2005; 53:1930–36. [PubMed: 16274374]
35. Centers for Disease Control. Alcohol screening and counseling: an effective but underused health service. *CDC Vital signs*. Jan. 2014 <http://www.cdc.gov/vitalsigns/alcohol-screening-counseling/index.html> [accessed 03.05.2014]
36. Bowlin SJ, Morrill BD, Nafziger AN, Lewis C, Pearson TA. Reliability and changes in validity of self-reported cardiovascular disease risk factors using dual response: The Behavioral Risk Factor Survey. *J Clin Epidemiol*. 1996; 49(5):511–17. [PubMed: 8636724]
37. Margolis KL, Lihong Q, Brzyski R, Bonds DE, Howard BV, Kempainen S, et al. Validity of diabetes self-reports in the Women's Health Initiative: Comparison with medication inventories and fasting glucose measurements. *Clin Trials*. 2008; 5(3):240–47. [PubMed: 18559413]
38. Martin LM, Leff M, Calonge N, Garrett C, Nelson DE. Validation of self-reported chronic conditions and health services in a managed care population. *Am J Prev Med*. 2000; 18(3):215–18. [PubMed: 10722987]
39. Ahmed AT, Karter AJ, Warton EM, Doan JU, Weisner CW. The relationship between alcohol consumption and glycemic control among patients with diabetes: the Kaiser Permanente Northern California Diabetes Registry. *J Gen Intern Med*. 2008; 23:275–282. [PubMed: 18183468]
40. Dawson DA. Methodological issues in measuring alcohol use. *Alcohol Research & Health*. 27(1): 18–29. [PubMed: 15301397]
41. Del Boca FK, Darkes J. The validity of self-reports of alcohol consumption” state of the science and challenges for research. *Addiction*. 2003; 98(Suppl. 2):1–12. [PubMed: 14984237]
42. Stockwell T, Donath S, Cooper-Stanbury M, Chikritzhs T, Catalano P, Mateo C. Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction*. 2004; 99:1024–33. [PubMed: 15265099]

Table 1

Sample Description: All Diabetic Respondents and Stratified by Sex among 21+ year olds with Self-Reported Diabetes. NHANES 2005-2012.*

	All Diabetics		Male Diabetics		Female Diabetics	
	N=2220		N=1113		N=1107	
Mean age (range: 21-85 years)	59.7 years ($\pm$.43)		59.3 years ($\pm$.58)		60.1 years ($\pm$.57)	
	%	N	%	N	%	N
Ethnicity						
White	66.6	875	69.5	477	63.8	398
Black	18.9	720	16.4	340	21.4	380
Mexican American	8.7	402	8.7	190	8.7	212
Other Hispanic	5.8	223	5.4	106	6.1	117
Level of Education						
< High school	28.3	889	26.4	436	30.1	453
High school diploma or equivalent	25.8	510	23.8	234	27.8	276
Some college or higher	45.8	817	49.8	442	42.1	375
Annual Income						
< \$20,000	25.0	691	19.2	296	30.5	395
\$20,000-\$44,999	35.0	733	34.0	382	35.9	351
\$45,000 - 64,000	14.5	264	15.3	138	13.7	126
\$65,000	25.5	355	31.5	221	19.8	134
Employment Status						
Employed full/part time	40.2	682	44.9	387	36.3	295
Unemployed/disabled	21.5	559	20.9	267	22.9	295
Retired	31.6	800	31.8	429	32.0	371
Female homemaker/student/other	6.7	179	2.3	30	8.7	116
Marital Status						
Married/cohabitating	61.1	1247	71.7	759	50.9	488
Separated/divorced	17.6	408	14.5	172	20.6	236
Widowed	12.7	369	5.1	89	20.1	280
Never married	8.5	192	8.7	91	8.4	101
Insulin Dependent	30.0	638	33.1	345	27.0	293
Comorbid Health Conditions						
Diabetes only	10.5	236	13.3	143	7.9	93
Diabetes plus one condition	19.3	419	23.8	242	15.1	177
Diabetes plus 2 conditions	70.1	1565	62.9	728	77.1	837

* Note: Table reports unweighted sample sizes and weighted proportions; Ns range from 2,220 to 2,045 (full sample) 1,113 to 1,037 (men). and 1,107 to 1,006 (women) due to missing data for some variables.

Table 2

Drinking Status, Binge Drinking, and the Mean Number of Drinks Consumed per Week, Stratified by Sex and Ethnicity among 21+ year old Men and Women with Self-Reported Diabetes. NHANES 2005-2012.*

Men	White	Black	Mexican American	Other Hispanic	P Value
	% (N=477)	% (N=340)	%(N=190)	%(N=106)	
Drinking Status					.28
Lifelong Abstainers	6.7 (39)	9.3 (27)	2.7 (6)	6.6 (5)	
Ex-drinkers	30.0 (176)	35.5 (136)	32.4 (72)	28.9 (40)	
Current Drinkers	63.6 (262)	55.1 (177)	64.9 (112)	64.5 (61)	
Mean Number of Drinks per Week ($\pm$ SE)	3.0 (.30)	3.1 (.46)	4.9 (.82)	2.6 (.66)	.83 ^a
					.04 ^b
					.64 ^c
					.07 ^d
					.57 ^e
					.03 ^f
Binge Drinking					.01
All Abstainers/Non-binge Drinkers	79.2 (395)	78.3 (283)	63.1 (131)	69.5 (78)	
Binge Drinker	20.8 (82)	21.7 (57)	36.9 (59)	30.5 (28)	
Current Drinkers					<.01
Current Non-binge Drinkers	67.3 (180)	60.6 (120)	43.3 (53)	52.8 (33)	
Current Binge Drinkers	32.8 (82)	39.4 (57)	56.8 (59)	47.2 (28)	
Women	White	Black	Mexican American	Other Hispanic	P Value
	(N=398)	(N=380)	(N=212)	(N=177)	
Drinking Status					.04
Lifelong Abstainers	22.1 (102)	25.2 (97)	37.6 (84)	36.5 (44)	
Ex-drinkers	33.9 (142)	33.2 (139)	25.6 (59)	27.0 (37)	
Current Drinkers	44.0 (154)	41.6 (144)	36.8 (69)	36.4 (36)	
Mean Number of Drinks per Week ($\pm$ SE)	0.52 ($\pm$.11)	0.83 ($\pm$.17)	0.79 ($\pm$.29)	.45 ($\pm$.23)	.12 ^a
					.39 ^b
					.78 ^c
					.90 ^d
					.20 ^e
					.11 ^f
Binge Drinking (Abstainers and Drinkers)	94.9 (381)	94.9 (362)	91.1 (201)	95.4 (111)	.52
All Abstainers/Non-binge Drinkers	5.1 (17)	5.1 (18)	8.9 (11)	4.6 (6)	
Binge Drinker s					
Binge Drinking (Current Drinkers Only)	88.5 (137)	87.6 (126)	75.9 (58)	87.3 (30)	.30
Current Non-binge Drinkers	11.5 (17)	12.4 (18)	24.1 (11)	127 (6)	
Current Binge Drinkers					

* Note: Table reports unweighted sample sizes and weighted proportions

^a Black compared to Whites;

^b Mexican Americans compared to Whites;

^c Other Hispanics compared to Whites;

^d Mexican Americans compared to Blacks;

^e Other Hispanics compared to Blacks;

^f Other Hispanics compared to Mexican Americans

Table 3

Odds Ratios and 95% Confidence Intervals from Multiple Logistic Regression Models Predicting Current Drinking Status versus Abstinence* among Men and Women with Diabetes. NHANES 2005-2012.

	Men (N=1035) OR (95% CI)	P Value	Women (N=1001) OR (95% CI)	P Value
Ethnicity (Ref: White)				
Black	0.82 (0.54, 1.24)	.34	0.88 (0.55, 1.43)	.61
Mexican American	1.58 (0.97, 2.58)	.07	0.76 (0.42, 1.40)	.38
Other Hispanic	1.36 (0.71, 2.60)	.35	0.75 (0.35, 1.57)	.43
Age (Continuous)	0.97 (0.95, 0.99)	.02	0.97 (0.95, 0.99)	<.01
Income (Ref: \$65,000)				
< \$20,000	0.53 (0.28, 1.00)	.05	0.42 (0.23, 0.75)	.004
\$20,000 - \$44,999	0.76 (0.44, 1.33)	.34	0.37 (0.21, 0.65)	.001
\$45,000 - \$64,999	0.61 (0.31, 1.18)	.14	0.38 (0.19, 0.76)	.01
Education (Ref: Some college or higher)				
< High school	0.30 (0.20, 0.47)	< .001	0.68 (0.42, 1.09)	.11
High school or equivalent	0.24 (0.52, 1.28)	.37	0.67 (0.41, 1.10)	.11
Employment status (Ref: Employed)				
Unemployed/disabled	0.49 (0.29, 0.82)	.01	0.31 (0.17, 0.57)	< .001
Retired	0.66 (0.38, 1.13)	.13	0.44 (0.23, 0.83)	.01
Homemaker/in school/other	0.25 (0.06, 0.98)	.05	0.41 (0.20, 0.82)	.01
Marital Status (Ref: Married)				
Separated/Divorced	1.42 (0.81, 2.47)	.21	1.55 (0.94, 2.56)	.08
Widowed	1.50 (0.91, 2.46)	.10	1.06 (0.58, 1.94)	.85
Never married	1.79 (0.90, 3.54)	.09	1.61 (0.87, 2.98)	.12
Insulin Dependence (Ref: Not dependent)				
Dependent	0.80 (0.51, 1.26)	.33	0.84 (0.51, 1.36)	.47
Comorbid Health Conditions (Ref: None)				
1 condition	1.04 (0.45, 2.38)	.94	1.08 (0.47, 2.47)	.85
2 or more conditions	1.02 (0.46, 2.25)	.96	1.21 (0.65, 2.23)	.54

Notes: Data are weighted; OR = Odds ratio; CI = Confidence interval; Ref = Reference group

* Abstinence refers to lifelong abstinence and abstinence among former drinkers.

Table 4

Linear Regression Predicting Log-Transformed Standard Number of Drinks Consumed per Week among Men and Women with Diabetes. NHANES 2005-2012.*

	Men (N=1035) b (95% CI)	P Value	Women (N=1001) b (95% CI)	P Value
Ethnicity (Ref: White)				
Black	-0.011 (-0.19, 0.17)	.90	0.05 (-0.04, 0.14)	.25
Mexican American	0.35 (0.13, 0.58)	.002	0.02 (-0.11, 0.16)	.72
Other Hispanic	-0.02 (-0.30, 0.26)	.89	-0.03 (-0.19, 0.12)	.68
Age (Continuous)	-0.011 (-0.02, -0.003)	.01	-0.003 (-0.01, 0.001)	.13
Income (Ref: \$65,000)				
< \$20,000	-0.31 (-0.51, -0.10)	.004	-0.09 (-0.25, 0.07)	.27
\$20,000 - \$44,999	-0.10 (-0.31, 0.11)	.34	-0.14 (-0.30, 0.02)	.08
\$45,000 - 64,999	-.18 (-.48 - 0.11)	.21	-.03 (-.26 - 0.20)	.77
Education (Ref: Some college or higher)				
< High school	-0.20 (-0.38, -0.015)	.03	0.02 (-0.09, 0.13)	.75
High school or equivalent	0.04 (-0.18, 0.27)	.69	-0.08 (-0.17, 0.01)	.08
Employment status (Ref: Employed)				
Unemployed/disabled	-0.09 (-0.37, 0.19)	.52	-0.20 (-0.31, -.09)	.001
Retired	-0.03 (-0.32, 0.25)	.81	-0.08 (-0.21, 0.05)	.23
Homemaker/in school/other	-0.38 (-0.79, 0.04)	.08	-0.12 (-0.26, 0.02)	.08
Marital Status (Ref: Married)				
Separated/Divorced	0.39 (0.14, 0.64)	.003	0.02 (-0.09, 0.13)	.72
Widowed	0.12 (-0.11, 0.34)	.30	-0.06 (-0.15, 0.04)	.24
Never married	0.30 (-0.05, 0.65)	.09	0.11 (-0.07, 0.28)	.22
Insulin Dependence (Ref: Not dependent)				
Dependent	-0.22 (-0.41, -0.03)	.03	-0.04 (-0.13, 0.04)	.32
Comorbid Health Conditions (Ref: None)				
1 condition	-0.014 (-0.39, 0.36)	.94	0.12 (-0.06, 0.30)	.17
2 or more conditions	-0.04 (-0.41, 0.32)	.80	0.03 (-0.10 - 0.17)	.64

Notes: Data are weighted; CI = Confidence interval; Ref = Reference group

Table 5

Odds Ratios and 95% Confidence Intervals from Multiple Logistic Regression Models Predicting Binge Drinking among Men and Women with Diabetes. NHANES 2005-2012.

	Men (N=1035) OR (95% CI)	P Value	Women (N=1001) OR (95% CI)	P Value
Ethnicity (Ref: White)				
Black	0.86 (0.52, 1.40)	.53	1.06 (0.41, 2.70)	.90
Mexican American	2.04 (1.30, 3.21)	.002	0.93 (0.24, 3.57)	.92
Other Hispanic	1.34 (0.52, 3.43)	.47	0.55 (0.16, 1.87)	.33
Age (Continuous)	0.94 (0.93, 0.96)	<.001	0.92 (0.88, 0.95)	<.001
Income (Ref: \$65,000)				
< \$20,000	0.52 (0.28, 0.97)	.04	0.93 (0.28, 3.03)	.90
\$20,000 - \$44,999	0.52 (0.32, 0.86)	.01	0.51 (0.13, 1.93)	.31
\$45,000 - 64,999	0.67 (0.31, 1.47)	.32	1.82 (0.57, 5.82)	.30
Education (Ref: Some college or higher)				
< High school	1.16 (0.70, 1.91)	.56	2.72 (0.79, 9.35)	.11
High school or equivalent	2.60 (1.38, 4.89)	.004	1.48 (0.44, 5.01)	.52
Employment status (Ref: Employed)				
Unemployed	0.89 (0.47, 1.69)	.71	0.50 (0.18, 1.39)	.18
Retired	0.84 (0.39, 1.82)	.65	1.12 (0.23, 5.35)	.89
Homemaker/in school/other	0.44 (0.13, 1.44)	.17	0.41 (0.14, 1.19)	.10
Marital Status (Ref: Married)				
Separated/Divorced	2.45 (1.44, 4.17)	.001	0.91 (0.34, 2.46)	.85
Widowed	1.53 (0.66, 3.55)	.32	0.61 (0.11, 3.23)	.56
Never married	1.25 (0.60, 2.62)	.55	1.13 (0.41, 3.11)	.80
Insulin Dependence (Ref: Not dependent)				
Dependent	0.52 (0.29, 0.92)	.02	0.43 (0.14, 1.30)	.13
Comorbid Health Conditions (Ref: None)				
1 condition	0.76 (0.36, 1.59)	.46	1.50 (0.50, 4.47)	.46
2 or more conditions	0.96 (0.41, 2.25)	.92	1.14 (0.26, 4.96)	.86

Notes: Data are weighted; OR = Odds ratio; CI = Confidence interval; Ref = Reference group