

# Moderate Alcohol Use and Depression in Young Adults: Findings From a National Longitudinal Study

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A growing number of population-based studies suggest that moderate alcohol use may have beneficial effects on mental health, including lowering levels of depression and anxiety and raising levels of positive mood, sociability, and subjective health.<sup>1-3</sup> Moderate alcohol use is defined in *Nutrition and Your Health: Dietary Guidelines for Americans* as no more than 1 standard drink per day for healthy nonpregnant women and no more than 2 standard drinks per day for healthy men.<sup>4</sup> Almost all population-based studies to date have found a U- or J-shaped relationship between level of alcohol use and depression and other mental health indicators, with the lowest levels of depression observed at moderate drinking levels.<sup>1-3</sup>

Results of previous studies on moderate drinking and depression that controlled for subjects' previous depression and/or other potential confounders (e.g., previous problem drinking, general health status) have consistently found a lower level of depression among moderate drinkers relative to heavy or problem drinkers.<sup>1-3</sup> However, findings on differences in depression levels between moderate drinkers and abstainers have been inconsistent,<sup>1-3</sup> leaving questions about whether moderate drinking is more beneficial than abstinence. These inconsistent findings may have resulted from not separating lifetime abstainers from ex-drinkers. For example, in a study on moderate alcohol use and depressive mood among adults who participated in the Los Angeles Catchment Area Study, Lipton<sup>5</sup> classified individuals as abstainers if they reported no alcohol use in the prior 6 months. This definition may have led to misleading results, because ex-drinkers who were classified as abstainers may have experienced previous drinking and mental health problems that led to their decision to stop drinking. Therefore, depression levels may be higher among ex-drinkers relative to lifetime abstainers and moderate drinkers. In

**Objectives.** We examined the association between moderate alcohol use and depressive mood among young adults before and after adjustment for demographic, health, and socioeconomic factors that may act as confounders.

**Methods.** We analyzed 2 waves of interview data collected from 13 892 young adults who participated in the National Longitudinal Study of Adolescent Health to compare frequency of depressive symptoms in moderate drinkers with frequency of symptoms in young adults in other alcohol use categories.

**Results.** With adjustment for health and socioeconomic factors, frequency of depressive symptoms were similar among moderate drinkers, lifetime and long-term abstainers, and heavy/heavier moderate drinkers but remained significantly higher among heavy drinkers.

**Conclusions.** Moderate alcohol use may have no effect on depression in young adults relative to abstinence from alcohol use. (*Am J Public Health.* 2005;95:453-457. doi: 10.2105/AJPH.2003.030700)

addition, different levels of moderate and heavy drinking have not adequately been considered in the majority of previous studies, raising questions about whether heavier moderate alcohol use (e.g., having up to 3 drinks per occasion) or infrequent heavy drinking (e.g., having up to 5 consecutive drinks no more than once per month) may be as beneficial as monthly, weekly, or daily moderate drinking.

In addition to inadequate separation of alcohol use levels, previous studies have not adequately considered a number of potential confounders of the apparent association between moderate drinking and lower risk of depression, such as previous depression and problem drinking, general health status, educational attainment, and employment status. Nor have any previous studies addressed this issue with a nationally representative sample. On the basis of a review of 15 studies, Peele and Brodsky<sup>2</sup> concluded that, in lieu of a randomized controlled study, more population-based epidemiological studies are needed with prospective cohort designs and controls for potential confounders, including demographic, health, and socioeconomic factors, to determine whether moderate drinking may have a beneficial effect on mental health. To help address this research question, our study

focused on the relationship between moderate alcohol use and depressive mood in a national sample of young adults who participated in the National Longitudinal Study of Adolescent Health (Add Health).

## METHODS

### Study Sample

This study uses 2 waves of data collected from 13 892 individuals who were interviewed in 1995 and 2002 as part of Add Health.<sup>6</sup> Computer-assisted in-home interviews were conducted in 1995 with 20 745 adolescents who were randomly selected from a larger nationally representative sample of middle and high school students in 33 states. Of the adolescents who participated in the 1995 interviews, 15 197 (73.3%) were reinterviewed in their homes as young adults in 2002. Sample weights for longitudinal analyses were available for 14 322 (94%) of the young adult sample. Of these young adults, 13 892 (97%) provided complete data for all study variables.

### Measures

Depressive mood was measured with 9 items from the Center for Epidemiological Studies Depression Scale<sup>7</sup> that were included

in both the 1995 and the 2002 Add Health interviews (Cronbach  $\alpha$  = .78 and .79, respectively). The Center for Epidemiological Studies Depression Scale was developed to assess depressive symptomatology in the general population, but it is not a measure of clinical depression. Respondents were asked how often in the past 7 days they had experienced depressive symptoms such as not being able to shake off the “blues,” being too tired to do things, and feeling depressed. The 4 possible responses to each question were “never or rarely,” “sometimes,” “a lot of the time,” and “most of the time or all of the time.” Response values for Center for Epidemiological Studies Depression Scale items were summed to create a depressive mood score for each respondent.

Alcohol use level was based on responses to a question in the 1995 interview about any lifetime alcohol use (yes/no) and to questions in the 2002 interview about any alcohol use since 1995 (yes/no) or in the past 12 months (yes/no), how often alcohol was consumed in the past 12 months (none, 1–2 days, once a month or less, 2–3 days a month, 1–2 days a week, 3–5 days a week, every day or almost every day), usual number of drinks consumed on each occasion (responses ranged from 1 to 18), any intoxication in the past 12 months (yes/no), and 5 or more consecutive drinks in the past 2 weeks (yes/no). On the basis of these questions and the definition of moderate alcohol use by *Nutrition and Your Health: Dietary Guidelines for Americans*,<sup>4</sup> 7 categories of alcohol use were created: (1) lifetime abstinence, (2) abstinence for at least 1 year (ex-drinkers), (3) moderate drinking (no more than 1–2 drinks per occasion in the past year, and no intoxication or heavy drinking in the past year), (4) heavier moderate drinking (3–4 drinks per occasion at least once a month, but no intoxication or heavy drinking in the past year), (5) infrequent heavy drinking ( $\geq 5$  drinks once a month or less), (6) occasional heavy drinking ( $\geq 5$  drinks 2–3 days a month or 1–2 days a week), and (7) frequent heavy drinking ( $\geq 5$  drinks 3–5 days per week or daily).

In addition to depressive mood in 1995, potential health-related confounders included use of any medication for depression in 2002 (yes/no), subjective general health sta-

tus in 2002 according to a 5-point scale (poor, fair, good, very good, excellent), and frequency of previous alcohol-related problems (e.g., having a hangover) in 1995, according to an 8-item problem drinking scale (Cronbach  $\alpha$  = .83).

Potential socioeconomic confounders included years of formal education, employment status in 2002 (employed/not employed), and receipt of any type of public assistance in 2002 (yes/no). Personal income was not considered, because a large number of respondents indicated that they did not know their annual income level or were not employed. Respondent demographic characteristics included age, gender, race/ethnicity (Hispanic, African American, Asian/Pacific Islander, Native American, White, other), and marital status (married/not married).

### Analysis

All analyses were conducted with SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, NC) to accommodate the unequal weighting of the Add Health sample and to adjust for the clustering effects attributable to the stratified probability sampling design.<sup>8</sup> The weights for analyses with 1995 and 2002 data provided in the Add Health restricted public use dataset were applied to all of the statistical procedures used for this study.

Preliminary analyses indicated that all of the potential demographic, health, and socioeconomic confounders were associated with depressive mood in 2002 in the expected directions. Bivariate analyses (*t* tests) were conducted to examine the unadjusted associations between moderate alcohol use and other study variables. Linear regression analyses were then conducted to determine whether the expected associations between moderate alcohol use and depressive mood would persist after adjustment for demographic, health, and socioeconomic variables. Models were run separately for each set of potential confounders to determine how demographic variables (age, gender, race/ethnicity, marital status), health variables (prior depression and problem drinking, medication for depression, general subjective health), and socioeconomic variables (educational level, employment status, public assis-

tance) would affect the association between moderate alcohol use and lower levels of depressive mood relative to other alcohol use categories. All of the potential confounders were included in a final regression model.

### RESULTS

Results of bivariate analyses in Table 1 indicate that unadjusted mean levels of depressive mood in 2002 were lower among young adults who were moderate drinkers relative to those who were lifetime abstainers, ex-drinkers, or infrequent and frequent heavy drinkers. We found no significant differences in unadjusted mean depressive mood levels in 2002 between moderate drinkers, heavier moderate drinkers, and occasional heavy drinkers.

Results in Table 1 also indicate differences, with respect to demographic, health, and socioeconomic variables, between young adults who were moderate drinkers and those in 1 or more of the other drinking categories that might account for the apparent association between moderate drinking and lower levels of depressive mood. For example, young adult moderate drinkers were older, were more likely to be female and married, had a higher level of educational attainment, and were less likely to report prior drinking problems in 1995 compared with young adults in most of the other alcohol use categories. Somewhat contrary to expectations, moderate drinkers were similar to those in most other alcohol use categories in previous level of depressive mood in 1995, whether they were taking medication for depression in 2002, and subjective general health status in 2002. However, lifetime abstainers were less likely than moderate drinkers to report previous drinking problems in 1995 and to be on medication for depression in 2002. Moderate drinkers were more likely to be White but less likely to belong to certain racial/ethnic minority groups (Hispanic, Black, Native American) than were abstainers; moderate drinkers also were less likely to be White and more likely to be Black than were heavy drinkers. Moderate drinkers were less likely than ex-drinkers, but more likely than occasional heavy drinkers, to report receiving some type of public assistance in 2002. Moderate drinkers were

**TABLE 1—Results of Bivariate Analyses Comparing Drinkers in Each Alcohol Use Category With Moderate Drinkers, by Demographic and Other Variables**

	Alcohol Use Categories							
	Total (N = 13 892)	Abstainers		Moderate Drinkers		Heavy Drinkers		
		Lifetime (n = 2014)	Ex-Drinkers (n = 1746)	Moderate (n = 1675)	Heavier Moderate (n = 813)	Infrequent (n = 2109)	Occasional (n = 4315)	Frequent (n = 1220)
Depressive mood, mean score <sup>a</sup> (SD)								
2002	4.5 (4.0)	4.5 (4.0)*	4.9 (4.6)**	4.0 (3.8)	4.5 (3.9)	4.7 (4.2)**	4.3 (3.8)	4.9 (4.3)**
1995	5.9 (4.2)	5.6 (4.0)	7.1 (4.4)**	5.8 (4.3)	6.1 (4.3)	6.0 (4.3)	5.5 (4.1)	5.7 (4.2)
Age, mean, y (SD)	21.8 (1.9)	21.5 (2.0)**	22.0 (1.9)	22.1 (1.8)	22.1 (1.9)	21.6 (1.9)**	21.8 (1.8)**	21.9 (1.7)*
Gender, %								
Male	50.6	47.7**	47.3**	33.7	45.9**	42.9**	56.3**	72.8**
Female	49.4	52.3**	52.7**	66.3	54.1**	57.1**	43.7**	27.2**
Race/ethnicity, %								
Hispanic	11.6	13.7	14.2*	10.7	15.7*	12.8	10.1	7.5*
Black	15.1	29.1**	25.0*	20.0	15.1*	11.9**	7.2**	8.9**
Native American	0.7	0.6	1.2*	0.2	1.2	0.5	0.5*	1.0
Asian/Pacific Islander	3.5	5.6	3.6	4.5	2.3*	4.0	2.6*	1.7*
White	65.8	48.5**	53.4**	61.1	63.6	66.2*	76.0**	77.5**
Other	3.3	2.5	2.6	3.4	2.0	4.6	3.6	3.3
Marital status in 2002, %								
Married	16.6	18.4**	25.6	25.2	23.2	17.6**	10.9**	6.8**
Not married	83.4	81.6	74.4	74.8	76.8	82.4	89.1	93.2
Use of depression medication in 2002, %								
Yes	5.3	2.8**	3.7	5.2	5.5	6.4	6.3	5.7
No	94.7	97.2	96.3	94.8	94.5	93.6	93.7	94.3
General health status in 2002, mean score <sup>a</sup> (SD)	4.0 (0.9)	4.1 (0.9)	4.0 (0.9)	4.0 (0.9)	4.0 (0.9)	4.0 (0.9)	4.0 (0.8)	3.9 (0.9)*
Problem drinking in 1995, mean score <sup>a</sup> (SD)	1.5 (3.4)	0.0 (0.0)**	2.1 (3.9)**	0.8 (2.1)	1.5 (3.3)**	1.4 (3.1)**	1.9 (3.6)**	2.8 (4.5)**
Receipt of public assistance in 2002, %								
Yes	10.9	12.1	17.4**	11.0	10.8	12.7	8.0**	8.3
No	89.1	87.9	82.6	89.0	89.2	87.3	92.0	91.7
Employment status in 2002, %								
Employed	75.2	65.6**	71.6**	77.7	78.1	77.3	78.1	76.8
Not employed	24.8	34.4	28.4	22.3	21.9	22.7	21.9	23.2
Formal education, mean, y (SD)	13.1 (2.0)	12.6 (1.8)**	12.4 (1.9)**	13.6 (2.1)	12.7 (1.8)**	13.0 (1.9)**	13.5 (2.0)	13.4 (2.1)

<sup>a</sup>Refer to Measures section for description of scales used to measure depressive mood, general health status, and problem drinking.  
\*P < .05; \*\*P < .01.

more likely than abstainers to be employed but were similar to heavier drinkers with respect to employment status. Results in Table 1 should be viewed as general trends rather than exact findings, because they apply to only some alcohol use categories (i.e., moderate drinkers vs other groups).

Results of linear regression analyses in Table 2 indicate significantly lower levels of depressive mood in 2002 among young adults who were moderate drinkers com-

pared with young adults in all of the other 6 drinking categories after adjustment for age, gender, race/ethnicity, and marital status (model 1). Thus, control for demographic variables revealed differences in frequency of depressive symptoms among moderate drinkers, heavier moderate drinkers, and occasional heavy drinkers that were not apparent in unadjusted bivariate analyses (Table 1). The difference in depressive mood between moderate drinkers and heavier moderate drinkers

was no longer statistically significant after the inclusion of health variables in the regression model (model 2). The magnitude of differences in depressive mood between moderate drinkers and those in other drinking categories ( $\beta$  coefficients) also was reduced after adjustment for health variables. Socioeconomic variables accounted for differences in depressive mood among moderate drinkers, heavier moderate drinkers, and lifetime abstainers (model 3) and reduced the magni-

TABLE 2—Results of Linear Regression Analyses With Potential Confounding Variables

	Model, $\beta$ (SE)			
	Model 1	Model 2	Model 3	Model 4
Intercept	5.14 (.65)***	8.46 (.63)***	7.78 (.62)	9.54 (.60)***
Alcohol use (reference group: moderate drinkers)				
Lifetime abstainers	.39 (.19)*	.40 (.17)*	.11 (.18)	.25 (.17)
Ex-drinkers	.88 (.20)***	.51 (.19)*	.50 (.19)**	.33 (.19)
Heavier moderate drinkers	.56 (.26)*	.35 (.25)	.33 (.26)	.25 (.24)
Infrequent heavy drinkers	.72 (.18)***	.46 (.17)**	.55 (.17)**	.39 (.16)*
Occasional heavy drinkers	.58 (.16)***	.45 (.15)**	.55 (.15)***	.45 (.15)**
Frequent heavy drinkers	1.32 (.21)***	.97 (.20)***	1.27 (.19)***	.98 (.19)***
Age, y	-.05 (.03)	-.11 (.03)***	.02 (.03)	-.07 (.03)*
Male gender	-.96 (.09)***	-.33 (.08)***	-1.01 (.09)***	-.38 (.08)***
Race/ethnicity (reference group: White)				
Hispanic	1.14 (.18)***	.88 (.16)***	.95 (.18)***	.80 (.16)***
Black	.98 (.15)***	.80 (.14)***	.73 (.14)***	.67 (.14)***
Native American	1.18 (.58)*	.38 (.60)	.98 (.53)	.33 (.57)
Asian/Pacific Islander	.77 (.28)**	.53 (.23)*	1.02 (.28)***	.67 (.24)**
Other	.97 (.24)*	.81 (.22)***	.85 (.23)***	.76 (.22)***
Currently married, 2002	-.11 (.14)	-.18 (.13)	-.31 (.14)*	-.28 (.13)*
Depressive mood, 1995		.25 (.01)***		.24 (.01)***
Problem drinking, 1995		-.02 (.02)		-.03 (.02)
General health status, 2002		-.91 (.06)***		-.84 (.06)***
Use of depression medication, 2002		2.16 (.24)***		2.12 (.24)***
Receipt of public assistance, 2002			.91 (.15)***	.52 (.14)***
Currently employed, 2002			-.47 (.11)***	-.29 (.10)**
Years of formal education, 2002			-.28 (.03)***	-.15 (.02)***
$R^2$	.032	.177	.060	.185

\* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$ .

tude of differences in depressive mood between moderate drinkers and young adults in other drinking categories. Adjustment for demographic, health, and socioeconomic variables further reduced the difference in depressive mood between moderate drinkers and ex-drinkers to statistical nonsignificance ( $P = .07$ ) but did not further attenuate differences in depressive mood between moderate drinkers and young adults in the 3 heavy drinking categories (model 4).

## DISCUSSION

Moderate alcohol use is recognized by many as a means of reducing stress and anxiety and of elevating positive mood.<sup>2</sup> This popular belief is buttressed by epidemiological studies that have consistently found lower

levels of depression among moderate drinkers relative to abstainers and heavy drinkers, even after control for previous levels of depression and other potential confounders.<sup>1-3</sup> Yet most previous studies have not adequately characterized different levels of alcohol use after control for potentially important demographic, health, and socioeconomic factors that may differentiate moderate drinkers from other subgroups. Moreover, no previous studies have used data collected prospectively from a nationally representative sample. Our study thus represents a relatively rigorous assessment of whether moderate alcohol use actually has a beneficial effect on mental health.

Findings from this study suggest that moderate alcohol use (no more than 1–2 drinks per day) does not reduce the likelihood of depressive mood in young adults compared with

lifetime or long-term abstinence from alcohol use or heavier-moderate drinking. Control for health and socioeconomic factors attenuated, but did not completely eliminate, differences in depressive mood levels between young adults who were moderate drinkers and those in all of the other alcohol use categories. Only higher levels of depressive mood among young adults in the 3 heavy drinking categories remained significantly different from the levels of depressive mood among young adults who were moderate drinkers. This finding is not surprising, because numerous studies have found higher levels of depression among individuals who drink heavily or meet diagnostic criteria for alcohol abuse or alcoholism (or both).<sup>1-3</sup>

Although our study represents an advancement over previous studies on moderate alcohol use and depression, several limitations are noteworthy. First, this study was based in part on the assumption that level of alcohol use can have an effect on depressive symptomatology within 1 year, which may not be true. Second, the Center for Epidemiological Studies Depression Scale is based on depressive symptoms in the past week and therefore may not accurately characterize respondents who did not have depressive symptoms in the past week but did have such symptoms within some previous period (e.g., past month). Third, sample attrition through loss to follow-up, nonresponse, or both may have biased our results in unknown ways. Findings therefore may not generalize beyond young adults included in the study sample, although weighted descriptive analyses indicate that the study sample was demographically similar to the general young adult population. Fourth, findings of this study may not generalize to older adults, although findings of previous studies on the relationship between moderate alcohol use and depression have been very similar for adult and young adult samples.<sup>2</sup> Finally, other important differences may exist between moderate drinkers and individuals in other alcohol use categories (e.g., personality and lifestyle factors) that were not examined in this study but that may further account for observed differences in depression. Although differences in depressive mood levels between young adults who were moderate drinkers and those in other alcohol use cate-

gories were attenuated by health and socioeconomic factors, mean depressive mood levels remained lower for moderate drinkers compared with all other groups, pointing to the need for additional research on other factors that may further explain the association between moderate alcohol use and lower levels of depression.

Because of the limitations noted, this study does not provide a definitive answer to the question of whether moderate alcohol use lowers the risk of depression. Additional epidemiological studies with representative samples and longitudinal designs and randomized controlled studies are needed to evaluate the possible mental health benefits of moderate alcohol use as defined by the US Department of Agriculture.<sup>4</sup> ■

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This article was accepted November 19, 2003.

#### Contributors

M.J. Paschall, B. Freisthler, and R.I. Lipton contributed to the study design, data interpretation, and article preparation. M.J. Paschall and B. Freisthler performed the data analysis.

#### Acknowledgments

This study was supported by the National Institute on Alcohol Abuse and Alcoholism (grant RO1 AA13998) and is based on data from Add Health, a program designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris and funded by the National Institute of Child Health and Human Development (grant PO1-HD31921), with cooperative funding from 17 other agencies.

Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original study design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W Franklin St, Chapel Hill, NC 27516-2524 (Web site: <http://www.cpc.unc.edu/addhealth/contract.html>).

#### Human Participant Protection

Use of Add Health restricted public use data was approved through a contractual agreement with the Add Health Project and by the authors' institutional review board. In addition to data security requirements specified in the contractual agreement, Add Health data are protected by a Certificate of Confidentiality from the US Department of Health and Human Services.

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