

## ORIGINAL ARTICLE

# Why Is Work Intensity Associated With Heavy Alcohol Use Among Adolescents?

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**Purpose:** To examine and explain the relationship between work intensity (number of hours worked per week) and heavy alcohol use among adolescents.

**Methods:** Analyses were conducted with two waves of in-home interview data provided by a representative sample of adolescents who participated in the National Longitudinal Study of Adolescent Health. Multinomial logistic regression analyses were conducted to determine whether a higher level of work intensity at Wave 1 predicted a higher level of past-year heavy drinking approximately 1 year later at Wave 2, and the degree to which the relationship between work intensity and heavy drinking persisted after adjusting for demographic characteristics, alcohol use before Wave 1, and psychosocial risk and protective factors in family, school, and peer-individual domains.

**Results:** Higher levels of work intensity at Wave 1 (11–20 or more than 20 hours/week) were predictive of heavy drinking at Wave 2. However, these effects were substantially attenuated after adjusting for demographic characteristics and prior alcohol use. Risk and protective factors such as school commitment, friends' drinking, and delinquency also partially explained the effects of work intensity and background variables on heavy drinking, suggesting that these factors may act as confounders and/or mediators.

**Conclusions:** This study suggests that working more than 10 h/week increases the likelihood of heavy alcohol use among adolescents, and that the effect of work intensity is largely, but not completely attributable to demographic characteristics (e.g., age, race/ethnicity, per-

sonal income), prior alcohol use, and family, school, and peer-individual factors. © Society for Adolescent Medicine, 2004

**KEY WORDS:**

Adolescence  
Employment  
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National surveys indicate that the prevalence of heavy drinking (typically defined as five or more consecutive alcoholic beverages at a given time) among adolescents has not declined in the past decade [1,2]. Results of the 2001 Monitoring the Future Study indicated that 13% of 8th graders, 25% of 10th graders, and 30% of 12th graders had engaged in heavy drinking at least once in the previous 2 weeks [1]. A number of studies indicate that working adolescents report the highest rates of alcohol use and heavy drinking [3–13]. Although the relationship between adolescent employment and alcohol use may be well-established, very few studies have been conducted to identify the mechanisms that might underlie this relationship [5,8,12].

McMorris and Uggen sought to explain the relationship between adolescent work intensity and alcohol use using longitudinal data from the Youth Development Study [5]. A series of regression models indicated that the effect of working more than 20 h/week in 10th grade on alcohol use in 12th grade was mediated primarily by work-derived independence from parents, and to a lesser extent by school performance and school misconduct. Gender also acted as a confounder of the work intensity-alcohol

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use relationship. Together, these variables explained 56% of the relationship between work intensity and alcohol use. Interestingly, time spent with work-related friends was not associated with alcohol use, nor was time spent with friends, in general. However, their measures of time spent with friends did not take into account friends' alcohol use. It should also be noted that age was not included as a control variable in their analyses, presumably because all students in their sample were in the same grade level. Despite the narrow age range, it is possible that the observed relationships between work hours, work-derived independence, and alcohol use might have been at least partially spurious owing to the confounding effects of age.

Safron et al analyzed data from a large national sample of 8th, 10th, and 12th graders who participated in the Monitoring the Future study in the 1990s. Their findings provided partial support for theories of time trade-off and precocious development in explaining the relationship between work intensity and alcohol and other substance use [12]. This study was limited by its reliance on cross-sectional data and lack of attention to other possible explanatory variables in the community, family, school, peer, and individual domains.

More recently, Paschall et al analyzed data from the 1998 National Household Survey on Drug Abuse (NHSDA) to determine whether the relationship between adolescent employment and past-month alcohol use and heavy drinking would be attributable to demographic characteristics and other risk and protective factors in the community, family, school, and peer-individual domains [8]. Their findings suggested that the relationship between adolescent employment and alcohol use was primarily owing to demographic differences between working and nonworking adolescents, as working adolescents were older and more likely to be white than nonworking adolescents. Other variables that helped to explain the adolescent employment-alcohol use relationship were perceived levels of alcohol and other drug use among friends, students, and adults, and propensity for risk-taking. This study was limited by the cross-sectional design of the NHSDA and the dichotomous measure for adolescent employment, which did not indicate level of work intensity.

The present study extends prior research on the relationship between adolescent employment and alcohol use by using interview data collected prospectively from a nationally representative sample of adolescents to investigate the possible confounding and/or mediating effects of demographic and other

background characteristics and psychosocial risk and protective factors in several domains. We hypothesized that the effect of work intensity on heavy alcohol use would be explained in part by demographic and other background characteristics, and in part by higher levels of risk factors and lower levels of protective factors among working adolescents. We also expected to find support for both confounding and mediating effects of psychosocial risk and protective factors, as previous research suggests that these factors may be influenced by level of work intensity or they may be related to work intensity in other ways [3–12].

## *Methods*

### **Study Sample and Design**

The National Longitudinal Study of Adolescent Health (Add Health) was designed to study the epidemiology and etiology of adolescent health behaviors, with an emphasis on social contextual and psychosocial risk and protective factors [14]. In 1995 (Wave 1), 20,745 adolescents and their siblings (response rate = 78.9%) aged 11 to 21 years (mean age = 15.0) participated in in-home interviews using audio computer-assisted interviewing (CASI) technology. In 1996 (Wave 2), 14,738 of these youth (response rate = 88.2%) were re-interviewed. The present study analyzes public use data collected from a random sample of 6504 adolescents at Wave 1, focusing on the 4834 adolescents who completed in-home interviews at both waves. Of these adolescents, 4135 (85.5%) provided complete data for all study variables.

### **Data Collection**

Before data collection, informed consent was obtained by Add Health interviewers from parents and the adolescents. Interviewers explained to the adolescents that their responses would remain confidential. All respondents were given the same interview, which took from 1 to 2 hours to complete, depending on the respondent's age and experiences. To protect confidentiality, data were recorded on laptop computers. Depending on the sensitivity of the subject, the interviewer would read the questions and enter the respondent's answers, or the respondent would listen to pre-recorded questions through earphones and enter their answers directly (audio-CASI).

## Measures

*Work intensity.* Adolescents were asked how many hours they worked for pay in a typical non-summer week. Responses to this open-ended question were collapsed into four ordered categories: "none," "1–10 hours," "11–20 hours," and "more than 20 hours."

*Alcohol use.* Heavy alcohol use was based on the question, "Over the past 12 months, on how many days did you drink five or more drinks in a row?" Seven possible responses ranged from "never" to "every day or almost every day." Based on the distribution of responses to this question at both waves, a categorical variable was created with three levels: "none," "once per month or less (infrequent)," and "more than once per month (frequent)."

Adolescents were also asked: "Think about the first time you had a drink of beer, wine, or liquor when you were not with your parents or other adults in your family. How old were you then?" A dichotomous variable was created to represent early onset of alcohol use, defined as age 14 years or younger.

*Family factors.* Family factors included parent-adolescent closeness, mother involvement in adolescent activities, and parent-adolescent conflict. Parent-adolescent closeness was assessed with a four-item scale: "How close do you feel to your mom?"; "How much do you think she cares about you?"; "How close do you feel to your dad?"; and "How much do you think he cares about you?" (Cronbach alpha = .72).

Mother's involvement in adolescent activities was based on a summative index of positive responses to the question, "Which of the following things have you done with your mother in the past 4 weeks?" Activities included "went shopping," "played a sport," "went to a religious service or church-related event," and "talked about a personal problem you were having."

Parent-adolescent conflict was treated as a dichotomy, based on whether adolescents reported having a serious argument with their mother or father about their behavior in the past 4 weeks.

*School factors.* School factors included level of school commitment, overall grade point average (GPA), and college intentions. GPA was estimated based on adolescents' reported grades in math, English, and science.

School commitment was assessed using a nine-item scale. Adolescents were asked how much they agreed or disagreed with statements such as "You feel close to people at your school" and "You feel like you are part of your school," with five possible responses ranging from "strongly agree" to "strongly disagree" (Cronbach alpha = .76).

College intentions were based on the average response to two questions: "On a scale of 1 to 5..., how much do you want to go to college?" and "On a scale of 1 to 5..., how likely is it that you will go to college?" The correlation between these two measures was .70 ( $p < .01$ ).

*Peer-individual factors.* Peer-individual factors included friends' drinking, delinquency, emotional well-being, religiosity, and social support. Friends' drinking was assessed with the question, "Of your three best friends, how many drink alcohol at least once a month?" with four possible responses ranging from 0 to 3.

Delinquency was measured with a 14-item scale that asked adolescents how often in the past 12 months they engaged in behaviors such as deliberately damaging someone else's property, stealing something worth more than \$50, using or threatening to use a weapon to get something from someone, and selling marijuana or other drugs. Four possible responses ranged from "never" to "5 or more times" (Cronbach alpha = .81).

Emotional well-being was based on a 19-item scale in which adolescents were asked, "How often was each of the following things true for you during the past 7 days?" Examples include "You felt depressed," "You felt hopeful about the future," "You felt fearful," and "You didn't feel like eating, or your appetite was poor." Four possible responses ranged from "never or rarely" to "most of the time or all of the time" (Cronbach alpha = .88).

Religiosity was measured with a three-item scale in which adolescents were asked "How often in the past 12 months did you attend religious services?"; "How important is religion to you?"; and "How often do you pray?" (Cronbach alpha = .72).

Social support was assessed with an eight-item scale in which adolescents were asked, "How much do you feel that. . .(a) adults care about you? (b) your teachers care about you? (c) your parents care about you? (d) your friends care about you? (e) people in your family understand you? (f) you want to leave home? (g) you and your family have fun together? (h) your family pays attention to you?" Five possible

responses ranged from “not at all” to “very much” (Cronbach alpha = .78).

*Demographic characteristics.* Adolescents reported their age (years), gender, race/ethnicity, personal income, and mother’s education level. Race/ethnicity was treated as a dichotomy (“white” versus “other”). Mother’s education was coded on a four-point scale, from “didn’t complete high school (1)” to “college graduate (4).” Personal income was based on questions about weekly earnings from nonsummer and summer employment and weekly allowance money from parents. Responses to these questions were summed and the total was divided by 100 to create a personal income measure defined in terms of hundreds of dollars per week.

### Data Analysis

All analyses were conducted with SUDAAN statistical software to accommodate the unequal weighting of the Add Health sample and to adjust for clustering effects that are attributable to the stratified probability sampling design [15]. The weights for analyses with Wave 1 and Wave 2 data provided in the Add Health public use dataset were applied to all of the statistical procedures used for this study.

Unless otherwise stated, the independent variable of interest (work intensity) and all of the potential explanatory variables were based on Wave 1 survey data, and the dependent variable of interest (heavy drinking) was based on Wave 2 data.

We first examined bivariate relationships between heavy drinking, work intensity, and all of the potential explanatory variables. Explanatory variables that were significantly associated with both heavy drinking and work intensity were retained for subsequent multivariate analyses.

We then ran a series of multinomial logistic regression models to examine the relationships between levels of work intensity and past-year frequent and infrequent heavy alcohol use before and after adjusting for demographic and other background characteristics, including prior drinking behaviors, and the risk/protective factor variables grouped by domain (family, school, peer-individual). By controlling for early initiation of alcohol use and past year heavy drinking at Wave 1, the analysis was designed to remove the confounding effects of alcohol use behaviors that may have occurred before, or at the same time as, the respondents’ level of work intensity as reported at Wave 1.

Changes in the strength of association between levels of work intensity and heavy alcohol use (as reflected in the adjusted odds ratios) were used to gauge the extent to which the demographic and other background characteristics and risk or protective factors in each domain accounted for the work intensity-heavy alcohol use relationship. Risk/protective factors associated with past-year heavy alcohol use in the domain-specific models were included in a final regression model to assess the overall explanatory value of all factors combined.

Two supplemental sets of logistic regression analyses were then conducted to further explicate the role of the risk/protective factors in helping to explain the relationship between work status and heavy drinking. First, because the explanatory value of the risk/protective factor measures in the models described above could be masked by the inclusion of Wave 1 measures of alcohol use, the final full model was repeated except that it did not include Wave 1 measures for heavy drinking and early alcohol use. A second supplemental model was tested to assess the additional explanatory value of risk/protective factors measured at Wave 2. Further reductions in the strength of association between work intensity and heavy drinking when Wave 2 risk/protective factors are added to the final full model described above would suggest that those factors mediate this effect (16).

## Results

### Bivariate Analyses

As expected, adolescents who reported working 11–20 or more than 20 h/week were more likely to report infrequent and frequent past-year heavy drinking than nonworking adolescents at Waves 1 and 2 (Table 1). In contrast, adolescents who were working 1–10 h/week were less likely to report frequent past-year heavy drinking at Wave 1 than nonworking adolescents. Adolescents working 11–20 or more than 20 h/week also were more likely to report early initiation of alcohol use (before age 14 years) than nonworking adolescents.

Table 1 also indicates that level of work intensity was associated with demographic characteristics. Adolescents who were working 11–20 or more than 20 h/week were older and more likely to be white than nonworking adolescents. Adolescents working more than 20 h/week were more likely to be male than nonworking adolescents. Not surprisingly, personal income level increased with level of work

**Table 1.** Study Variables by Level of Work Intensity at Wave 1

Variable <sup>2</sup>	Total (N = 4135)	More Than 20 Hours/Week (n = 344)	11–20 Hours/Week (n = 477)	1–10 Hours/Week (n = 1220)	Not Working (n = 2094)
	Mean (SD) or % <sup>1</sup>	Mean (SD) or % <sup>1</sup>	Mean (SD) or % <sup>1</sup>	Mean (SD) or % <sup>1</sup>	Mean (SD) or % <sup>1</sup>
Heavy drinking in past year, Wave 2					
Frequent	12.8	25.5	24.0	9.3	10.0 <sup>a,b</sup>
Infrequent	16.5	24.0	20.4	16.4	14.2 <sup>a,b</sup>
Demographics					
Age	15.5 (1.57)	16.8 (1.31)	16.5 (1.31)	15.1 (1.44)	15.2 (1.52) <sup>a,b</sup>
Male	49.7	56.4	50.6	49.2	48.7 <sup>a</sup>
White	76.2	76.4	83.7	82.9	70.0 <sup>a,b,c</sup>
Mother's education level	2.60 (1.05)	2.48 (1.00)	2.60 (1.05)	2.70 (1.05)	2.56 (1.05) <sup>c</sup>
Personal income	0.98 (1.31)	3.09 (1.83)	2.03 (1.16)	1.01 (1.13)	0.38 (0.68) <sup>a,b,c</sup>
Heavy drinking in past year, Wave 1					
Frequent	9.9	19.0	17.8	6.0	8.9 <sup>a,b,c</sup>
Infrequent	13.9	21.1	23.4	11.4	11.9 <sup>a,b</sup>
Alcohol use before age 14	19.8	28.4	25.4	16.5	18.8 <sup>a,b</sup>
Family factors					
Parent-child closeness	4.65 (0.55)	4.54 (0.69)	4.57 (0.56)	4.70 (0.48)	4.65 (0.55) <sup>a,b,c</sup>
Mother's involvement	3.66 (1.87)	3.57 (1.96)	3.77 (1.84)	3.83 (1.89)	3.55 (1.84) <sup>b,c</sup>
Parent-youth conflict	39.1	38.3	43.8	38.8	38.3
Easy access to alcohol at home	28.8	26.8	32.6	30.2	27.4
School factors					
School commitment	2.84 (0.63)	2.65 (0.66)	2.78 (0.56)	2.93 (0.60)	2.83 (0.64) <sup>a,c</sup>
College intentions	4.18 (1.13)	3.95 (1.19)	4.21 (1.13)	4.28 (1.02)	4.15 (1.17) <sup>a,c</sup>
G.P.A.	2.84 (0.77)	2.68 (0.77)	2.79 (0.75)	2.94 (0.75)	2.81 (0.78) <sup>a,c</sup>
Peer-individual factors					
Friends' drinking	1.02 (1.15)	1.55 (1.18)	1.45 (1.22)	0.87 (1.08)	0.91 (1.11) <sup>a,b</sup>
Overall social support	4.03 (0.62)	3.93 (0.65)	3.93 (0.60)	4.08 (0.59)	4.04 (0.63) <sup>a,b</sup>
Religiosity	3.12 (0.75)	2.98 (0.79)	3.11 (0.76)	3.12 (0.75)	3.14 (0.74) <sup>a</sup>
Delinquency	0.28 (0.34)	0.33 (0.37)	0.32 (0.33)	0.26 (0.33)	0.27 (0.35) <sup>a,b</sup>
Emotional well-being	0.59 (0.37)	0.73 (0.41)	0.61 (0.36)	0.57 (0.36)	0.58 (0.37) <sup>a</sup>

<sup>1</sup> Descriptive statistics are weighted, but sample (N) and subsample (n) sizes are unweighted.

<sup>2</sup> All variables are based on Wave 1 interview data except heavy drinking at Wave 2.

<sup>a</sup> Significant difference ( $p < .05$ ) between nonworking youth and those working >20 hours per week.

<sup>b</sup> Significant difference ( $p < .05$ ) between nonworking youth and those working 11–20 hours per week.

<sup>c</sup> Significant difference ( $p < .05$ ) between nonworking youth and those working 1–10 hours per week.

intensity. Additionally, adolescents who were working 1–10 h/week reported a higher level of education for their mothers than nonworking adolescents.

Family factors associated with work intensity included parent-child closeness and mother's involvement in adolescent activities. Adolescents working more than 10 h/week reported lower levels of closeness to their parents than nonworking adolescents, but adolescents working 1–10 h/week reported a higher level of closeness to their parents than nonworking adolescents. Contrary to expectations, adolescents working 1–10 or 11–20 h/week reported higher levels of mother involvement than nonworking adolescents.

School factors associated with work intensity included school commitment, college intentions, and

grade point average (GPA). Adolescents working more than 10 h/week reported lower levels of school commitment and lower GPAs than nonworking adolescents. Adolescents working more than 20 h/week were less likely to have college intentions than nonworking adolescents. In contrast, adolescents working 1–10 h/week reported a higher level of school commitment, a higher GPA, and a higher level of college intentions than nonworking adolescents.

Peer-individual factors associated with work intensity included friends' drinking, delinquency, religiosity, emotional well-being, and social support. In general, these relationships were in the expected directions. For example, adolescents working more than 10 h/week reported higher levels of friends'

drinking and delinquent behavior and lower levels of social support than nonworking adolescents. Adolescents working more than 20 h/week also reported a lower level of religiosity than nonworking adolescents. Contrary to expectations, adolescents working more than 20 h/week reported a higher level of emotional well-being than nonworking adolescents.

### Multivariate Analyses

Results of multinomial logistic regression analyses (unadjusted odds ratios in Table 2, Model 1) indicate that adolescents who were working 11–20 or more than 20 h/week had odds for frequent heavy drinking that were over three times as high, and odds for infrequent heavy drinking that were at least twice as high, relative to the odds experienced by nonworking adolescents. Adolescents who were working 1–10 h/week were similar to nonworking adolescents in their past-year heavy drinking behavior.

The effects of working 11–20 or more than 20 h/week on frequent and infrequent past-year heavy drinking were attenuated after adjusting for prior alcohol use measured at Wave 1 (Table 2, Model 2). However, these effects remained at least moderate in size and statistically significant. For example, the odds for frequent heavy drinking among adolescents working more than 20 h/week relative to nonworking adolescents were reduced from 3.81 (2.71, 5.36) to 2.96 (1.94, 4.50) after adjusting for Wave 1 measures of prior alcohol use. Wave 1 alcohol use measures were strongly associated with past-year heavy drinking at Wave 2 in the expected directions.

The effects of work intensity on heavy drinking were further attenuated by demographic characteristics (Table 2, Model 3), and only the effect of working 11–20 h/week on frequent heavy drinking remained statistically significant at the .05 level. The odds for frequent heavy drinking among adolescents working more than 20 h/week relative to nonworking adolescents was further reduced from 2.96 (1.94, 4.50) to 1.59 (0.96, 2.62). With the exception of mother's education, demographic characteristics and measures of prior alcohol use were associated with past-year heavy drinking at Wave 2 in the expected directions.

Additional analyses not presented in Table 2 indicated that personal income explained a substantial portion of the remaining relationship between working more than 20 h/week and frequent past-year heavy drinking after adjusting for other demographic characteristics and measures of prior alcohol

use [reduction in adjusted OR from 2.15 (1.38, 3.36) to 1.59 (0.96, 2.62)]. Personal income explained a somewhat smaller portion of the relationship between working 11–20 h/week and frequent past-year heavy drinking [reduction in adjusted OR from 1.83 (1.28, 2.62) to 1.52 (1.02, 2.26)]. These analyses thus provided support for a mediating effect of personal income.

The addition of family factors to the regression model did not further attenuate relationships between level of work intensity at Wave 1 and frequent or infrequent past-year heavy alcohol use at Wave 2 (Table 2, Model 4). Family factors were generally unrelated to past-year heavy drinking at Wave 2 when controlling for other variables already in the model. Only parent–adolescent closeness was inversely associated with infrequent past-year heavy drinking at Wave 2.

Similarly, the addition of school factors to the regression model did little to further explain the effect of work intensity level on frequent or infrequent past-year heavy drinking (Table 2, Model 5). School commitment and GPA were, however, inversely associated with frequent past-year heavy drinking at Wave 2, whereas college intentions were not predictive of either frequent or infrequent past-year heavy drinking.

The addition of peer-individual factors to the regression model also did little to further explain the effects of work intensity level on past-year heavy drinking (Table 2, Model 5). Only the effect of working 11–20 h/week on frequent past-year heavy drinking was further attenuated [from adjusted OR = 1.52 (1.02, 2.26) to 1.47 (0.97, 2.22)]. In general, the peer-individual factors were associated with both frequent and infrequent past-year heavy drinking at Wave 2 in the expected directions.

The full regression model (not included in Table 2) that included all of the family, school, and peer-individual risk/protective factors was not different from Model 5 in terms of further explaining the effects of work intensity level on frequent and infrequent past-year heavy drinking at Wave 2.

It is plausible that the apparent inability of the risk/protective factor measures to contribute to the explanation of the work intensity-heavy drinking relationship could be owing to the fact that their explanatory effect is absorbed by the inclusion of the Wave 1 alcohol use measures in the model. To determine whether their explanatory power increases when Wave 1 alcohol use measures are not considered, Model 3 and the final (full) model described above were each run without including the

**Table 2.** Results of Multivariate Analyses to Explain the Relationship Between Work Intensity (Wave 1) and Heavy Drinking (Wave 2)

Wave 1 Predictor Variable	Heavy Drinking (Wave 2) <sup>1</sup>											
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Frequent OR (95% CI)	Infrequent OR (95% CI)	Frequent OR (95% CI)	Infrequent OR (95% CI)	Frequent OR (95% CI)	Infrequent OR (95% CI)	Frequent OR (95% CI)	Infrequent OR (95% CI)	Frequent OR (95% CI)	Infrequent OR (95% CI)	Frequent OR (95% CI)	Infrequent OR (95% CI)
<b>Work intensity</b>												
> 20 h/week	3.81 (2.71–5.36)	2.53 (1.82–3.52)	2.96 (1.94–4.50)	2.13 (1.48–3.06)	1.59 (0.96–2.62)	1.38 (0.88–2.17)	1.57 (0.95–2.58)	1.36 (0.86–2.13)	1.54 (0.93–2.54)	1.36 (0.86–2.13)	1.57 (0.94–2.62)	1.42 (0.90–2.23)
11–20 h/week	3.26 (2.37–4.50)	1.96 (1.48–2.50)	2.40 (1.70–3.38)	1.55 (1.14–2.11)	1.52 (1.02–2.26)	1.08 (0.76–1.53)	1.51 (1.01–2.25)	1.07 (0.76–1.52)	1.51 (1.02–2.25)	1.08 (0.76–1.54)	1.47 (0.97–2.22)	1.09 (0.77–1.55)
1–10 h/week	0.95 (0.72–1.25)	1.18 (0.94–1.48)	1.17 (0.86–1.61)	1.31 (1.03–1.67)	0.98 (0.70–1.37)	1.16 (0.90–1.49)	0.99 (0.71–1.38)	1.17 (0.91–1.50)	1.02 (0.73–1.42)	1.19 (0.92–1.53)	0.97 (0.68–1.37)	1.19 (0.92–1.53)
<b>Demographics</b>												
Age					1.17 (1.06–1.29)	1.15 (1.07–1.25)	1.17 (1.06–1.29)	1.15 (1.06–1.24)	1.17 (1.06–1.29)	1.15 (1.06–1.24)	1.10 (0.99–1.23)	1.11 (1.02–1.20)
Male					1.58 (1.21–2.04)	0.87 (0.71–1.07)	1.63 (1.25–2.14)	0.91 (0.73–1.12)	1.52 (1.17–1.99)	0.83 (0.68–1.03)	1.47 (1.12–1.94)	0.80 (0.64–1.00)
White					2.03 (1.48–2.84)	2.21 (1.71–2.85)	2.03 (1.47–2.79)	2.20 (1.70–2.85)	2.15 (1.55–2.98)	2.29 (1.76–2.98)	2.00 (1.43–2.78)	2.07 (1.59–2.70)
Mother's education level					0.99 (0.87–1.12)	1.06 (0.96–1.17)	0.98 (0.87–1.11)	1.05 (0.95–1.17)	1.01 (0.88–1.15)	1.09 (0.98–1.21)	0.99 (0.87–1.13)	1.08 (0.98–1.20)
Personal income					1.14 (1.01–1.28)	1.08 (0.97–1.19)	1.14 (1.01–1.28)	1.08 (0.98–1.19)	1.15 (1.02–1.29)	1.08 (0.98–1.19)	1.11 (0.99–1.26)	1.05 (0.95–1.16)
<b>Alcohol use variables</b>												
Alcohol use before age 14			2.30 (1.68–3.14)	2.40 (1.87–3.09)	2.55 (1.86–3.52)	2.55 (1.98–3.30)	2.50 (1.81–3.45)	2.49 (1.92–3.22)	2.39 (1.71–3.32)	2.44 (1.88–3.16)	1.64 (1.17–2.30)	1.85 (1.40–2.44)
<b>Past-year heavy drinking</b>												
Frequent			19.89 (14.10–28.07)	4.35 (3.00–6.30)	15.89 (11.19–22.55)	3.86 (2.64–5.65)	15.75 (11.09–22.37)	3.82 (2.61–5.58)	14.16 (9.84–20.38)	3.62 (2.47–5.30)	7.44 (5.04–10.98)	2.37 (1.57–3.57)
Infrequent			6.86 (4.91–9.58)	6.02 (4.65–7.79)	5.91 (4.21–8.29)	5.24 (4.03–6.82)	5.87 (4.18–8.25)	5.20 (3.99–6.77)	5.46 (3.86–7.73)	5.01 (3.85–6.51)	3.72 (2.57–5.38)	3.91 (2.97–5.15)
<b>Family factors</b>												
Parent-youth closeness								0.85 (0.65–1.11)	0.82 (0.68–1.00)			
Mother's involvement								1.01 (0.94–1.09)	1.02 (0.96–1.08)			
<b>School factors</b>												
GPA									0.78 (0.64–0.95)	0.86 (0.74–1.00)		
College intentions									1.12 (0.99–1.27)	1.02 (0.92–1.12)		
School commitment									0.70 (0.54–0.92)	0.84 (0.70–1.01)		
<b>Individual and peer factors</b>												
Friends' drinking											1.72 (1.51–1.97)	1.35 (1.22–1.50)
Emotional well-being											0.99 (0.65–1.51)	0.83 (0.61–1.14)
Religiosity											0.98 (0.82–1.17)	0.82 (0.72–0.94)
Delinquency											2.21 (1.50–3.24)	1.80 (1.24–2.59)
Overall social support											0.85 (0.67–1.07)	0.81 (0.66–0.98)

<sup>1</sup> Odds ratios in Model 1 represent the unadjusted effects of each work intensity level on frequent and infrequent heavy drinking. Odds ratios for work intensity levels in Models 2 through 6 are adjusted for different sets of potential explanatory-variables, for which odds ratios also are provided. Reductions in the magnitude and/or statistical significance of the unadjusted odds ratios for work intensity levels (Model 1) when adjusting for each set of potential explanatory variables (Models 2–6) indicate that the effects of work intensity on heavy drinking are at least partially attributable to those explanatory variables.

Wave 1 alcohol use measures. Results of these analyses were similar to those conducted with Wave 1 alcohol use measures as the addition of risk/protective factor variables to the regression model only modestly attenuated the effect of working 11–20 h/week on frequent heavy drinking after adjusting for demographic characteristics.

An additional full regression model was run to assess the possible mediating effects of risk/protective factor variables. Wave 2 risk/protective factor measures were included in the regression model with Wave 1 measures of work intensity, demographic characteristics, prior alcohol use, and corresponding risk/protective factors. The effects of working 11–20 or more than 20 h/week on frequent past-year heavy drinking at Wave 2 were not attenuated by Wave 2 risk/protective factors, but the effects of working 11–20 or more than 20 h/week on infrequent past-year heavy drinking were further attenuated. Similar results were obtained when Wave 1 alcohol use variables were excluded from the regression models.

### *Discussion*

This study is the first to investigate why work intensity is associated with heavy alcohol use among adolescents with longitudinal data from a nationally representative sample. Consistent with previous research [3–12], a higher level of work intensity was predictive of a higher level of past-year heavy drinking among adolescents in the Add Health sample. The effects of working 11–20 or more than 20 h/week on frequent and infrequent heavy drinking were largely, but not completely, explained by demographic and other background characteristics, including age, race/ethnicity, personal income, and prior heavy drinking; and to some extent by psychosocial risk/protective factors in the peer-individual domain (religiosity, friends' drinking, delinquency) measured at both Wave 1 and Wave 2. Thus, we found limited support for both the confounding and mediating effects of these risk/protective factors. Even when adjusting for these risk/protective factor variables and demographic and background characteristics, the effects of working more than 10 h/week on frequent heavy drinking remained marginally significant in the regression models.

Our findings may be somewhat misleading because many of the risk/protective factors were associated with preexisting demographic characteristics and prior alcohol use. Results in Table 2 are indica-

tive of these relationships as the effects of demographic and prior alcohol use variables on subsequent heavy drinking were partially attenuated when adjusting for risk/protective factors in the family, school, and peer-individual domains. These results suggest that risk/protective factors such as parent-adolescent closeness, school commitment, and friends' drinking are potentially important explanatory variables that should be considered in future studies.

Our findings are consistent with the study by Paschall et al [8], which pointed to the importance of preexisting demographic characteristics, particularly age, as confounders of the relationship between adolescent employment and alcohol use. This explanation also would be consistent with the studies by McMorris and Uggen [5] and Safron et al [12], as we would expect older adolescents to be more inclined than younger adolescents to seek greater independence from their parents by working. Heavy alcohol use also may be viewed by older adolescents as a sign of maturity and greater independence from parents.

Personal income also appears to play an important mediating role, as it explained a substantial proportion of the effect of working more than 10 h/week on frequent past-year heavy drinking after taking demographic characteristics and prior alcohol use into account. However, the strong association between personal income and work intensity indicates that these constructs are at least partially redundant. It may be that older adolescents who have already begun to use alcohol decide to work, or increase the number of hours they work, to have more income to support their desire for greater independence.

Also important is the lack of an association between working 1–10 h/week and heavy alcohol use. Adolescents who reported working 1–10 h/week reported a slightly lower level of frequent heavy drinking and higher levels of protective factors such as closeness to parents, mother involvement, school commitment, and GPA. Thus, whereas working more than 10 h/week appears to increase adolescents' risk for alcohol misuse, working up to 10 h/week does not appear to pose such a risk and may be associated with higher levels of protection in school and family domains.

Additional research is needed to improve our understanding of why work intensity is associated with alcohol misuse among adolescents, and whether measures taken to limit work intensity are also likely to reduce adolescents' risk for alcohol use and misuse. Future studies might examine whether

adolescent work settings provide them with greater access to alcohol and increase their exposure to peers and adults who drink. This study suggests that work intensity is not associated with greater access to alcohol at home, thus pointing to the importance of greater access to alcohol outside of the home that may be facilitated by employment and personal income. The study by Paschall et al found that adolescents who work perceive higher levels of alcohol and other drug use among peers and adults in their community than adolescents who do not work. Work settings may increase adolescents' exposure to peer and adult models of alcohol use and informal access to alcohol [8].

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