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The Influence of Being under the Influence

Alcohol Effects on Adolescent Violence

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The authors examine the relationship between intoxication, chronic alcohol use, and violent behavior using data from the National Longitudinal Study of Adolescent Health. The authors introduce a method for disentangling spuriousness from the causal effects of situational variables. Their results suggest that drinkers are much more likely to commit violence *while sober* than nondrinkers, suggesting that a considerable portion of the relationship between prevalence of drinking and violence is spurious. The authors find evidence of a causal effect of intoxication, however, when they examine the relationship between frequency of drinking and violence while sober or drinking. Intoxication has stronger effects on adolescents who are older, White, and who already have violent tendencies.

Keywords: *alcohol; violence; adolescence*

Underaged drinking and a proclivity toward violence among adolescents are both well-known phenomenon (e.g., Elliott, Huizinga, and Menard 1989). The association between drinking and violence among adolescents is also well known (e.g., Newcomb and McGee 1989; White et al. 1999, 2002). The nature of this relationship, however, is not clear. Is it a causal relationship or is it spurious? Is the relationship conditioned by other factors? Lipsey et al. (1997) argue, for example, that "there is no broad, reliable 'main effect' of alcohol on violence. . . . If alcohol has any causal effects on violence, they almost certainly occur for some persons and/or some circumstances" (p. 278).

In this study we introduce a method for disentangling spuriousness from the causal effects of situational variables. We use that method to examine three basic issues that have received limited attention in the literature on alcohol use and violence. First, we attempt to estimate how much of the relationship between frequent alcohol use and violence is due to the causal effects of intoxication (i.e., drinking during the incident), and how much is spurious. Second, we examine whether intoxication has a greater effect on violence among adolescents who already have violent tendencies. Finally, we examine whether the effects of intoxication depend on the adolescent's sex and other social-demographic characteristics.

How Important Is the Causal Effect?

Experimental studies suggest that alcohol intoxication has a causal effect on aggression, although the mechanism is not clear (e.g., Chermack and Taylor 1995; for reviews see Bushman and Cooper 1990; Graham, Schmidt, and Gillis 1996; but see Lipsey et al. 1997). It has been argued that the pharmacological effects of alcohol impair judgment, reduce attention to costs, interfere with self-awareness, and increase psychological and physiological arousal (Critchlow 1986; Dermen and George 1989; Steele and Josephs 1990; Hull 1981). It has also been argued that social beliefs about alcohol contribute to its effect. Alcohol gives the offender an excuse for violence and produces expectations that may result in a self-fulfilling prophecy (Goldman, Brown, and Christiansen 1987). Experimental evidence has documented expectancy effects but suggests that they tend to be weak (Hull and Bond 1986; see Graham, Schmidt, and Gillis 1996, for a review). Based on evidence from a meta-analysis, Bushman (1997) suggests that alcohol affects violence indirectly, as a result of its effect on intellectual functioning, perceptions of risk, and self-awareness.[1]

A number of researchers have argued that the relationship between intoxication and violence outside the laboratory is spurious rather than causal, particularly among adolescents (e.g., Fagan 1990; White 1997). For example, low self-control and other individual difference factors may lead to both alcohol use and violence, thus producing a spurious relationship between drinking and violence (Gottfredson and Hirschi 1990). Drinking is illegal for adolescents so any factor that leads to delinquency could affect both alcohol use and violent behavior. Individual differences in routine activities and differential associations may also produce a spurious alcohol-violence relationship. Adolescents who go out at night, go to parties, and

otherwise live a "fast-lane" lifestyle may have more opportunities to drink and engage in violence than those who live a more sedate lifestyle (Felson 1998). They may be more likely to associate with individuals who are frequent drinkers and who provoke them or influence them to use violence against third parties. It is unknown to what extent these factors explain the relationship between chronic alcohol use and offending or between intoxication and offending.

The causality issue has not received much attention in the literature on adolescent alcohol use and violent offending. Recent research on adults, however, has examined the issue of causality outside the laboratory using within-subject designs. Fals-Stewart (2003), for example, found that men in treatment for alcoholism were much more likely to engage in violence toward their wives on days they had consumed alcohol than on days in which they were sober (see also Leonard 2005). Murphy et al. (2005) found that alcoholic men were more likely to be intoxicated during violent incidents than verbally aggressive incidents. Finally, a study of newlywed couples found some evidence that husbands were more likely to be drinking prior to violent conflicts than verbally aggressive conflicts (Leonard and Quigley 1999; see also, Testa, Quigley, and Leonard 2003).

A number of studies have attempted to address the causality issue by examining the relationship between chronic drinking and intoxication during violent events. For example, White et al. (2002) found that adolescents who were frequent users of alcohol were more likely than infrequent users to engage in violence while under the influence. Wells and Graham (2003), in bivariate analyses, found that adults who were frequent or heavy drinkers were more likely to be drinking during a violent event than infrequent or light drinkers (but see Scott, Schafer, and Greenfield 1999). Frequent drinkers, however, are more likely to be drinking by chance when they commit their offense. In addition, heavy drinkers tend to be frequent drinkers and this association may explain why heavy drinkers are more likely to be drinking during violent incidents.

Prior research has also examined the relationship between adolescents' chronic alcohol use and violent or criminal behavior using longitudinal data. The evidence is mixed. Newcomb and Mcgee (1989) found that early alcohol use was associated with later criminal behavior, whereas White, Hansell, and Brick (1993) found no evidence that early alcohol use led to increases in aggressive behavior over time. It may be that it is difficult to isolate the causal effects of alcohol with these designs if the effects of alcohol use on violence are more proximate in time.

Intoxication Effects among the Violence-Prone

Some people are described as "mean drunks," others as "happy drunks," depending on how they behave when they are intoxicated. This conventional wisdom is consistent with speculation that alcohol leads to aggression only for persons who are already predisposed to behave in such a manner (Collins 1988; Pernanen 1991). From this perspective, alcohol is a facilitator, rather than an instigator of aggression, and it may not affect those who are not already inclined to use violence. Experimental research supports the argument. It suggests that subjects who are prone to aggression are particularly likely to behave aggressively in the laboratory when intoxicated. For example, Giancola (2002) found that alcohol only increased the tendency to deliver shocks by subjects with high "dispositional aggressivity." In addition, Maletsky (1976) found that intoxicated subjects were more likely to engage in violence if they had a history of violence (see also Bailey and Taylor 1991; Moeller et al. 1998; Giancola 2004; Parrott and Giancola 2004; however, see Pihl, Lau, and Assaad 1997). This "mean drunk" hypothesis has, to our knowledge, never been tested outside the laboratory. To do so, it is important to control for the possibility of a spurious relationship between chronic alcohol use and violence. The question is whether those who have a history of violent behavior are more likely to be intoxicated when they use violence than those who do not, controlling for levels of chronic drinking.

Intoxication Effects and Demographic Characteristics

It is not clear whether one would expect alcohol effects to be stronger for some demographic groups than others. If the effects of alcohol are strictly pharmacological, then the effects of intoxication on violence should not depend on an individual's age, sex, race, ethnicity, or socioeconomic status.[2] On the other hand, if some of its effects are indirect, or due to social beliefs about alcohol, or depend on the social situations that different groups encounter, then the effects of alcohol might depend on social demographic factors. Studies of cultural differences on the alcohol-violence relationship support this perspective (MacAndrew and Edgerton 1969; see Fagan 1990, for a review). They find that alcohol is more strongly linked to violence in some countries than it is in others.

The demographic factor that has received the most attention is sex. Experimental research suggests that alcohol increases the aggressive response to a provocation among male but not female participants (Giancola et al.

2002; Hoaken and Pihl 2000). Research outside the laboratory shows that male offenders are more likely than female offenders to be drinking at the time of their offense (Bureau of Justice Statistics 1998; Karberg and James 2005; Martin and Bryant 2001; Pernanen 1991). In correlational analyses, however, it is important to control for levels of chronic drinking. The fact that men drink more often than women (Substance Abuse and Mental Health Services Administration 2003) may explain why men are more likely to be intoxicated when they commit violence.

Research on convicted jail inmates suggests that White offenders are more likely to be drinking than Black offenders at the time of their offense (Karberg and James 2005). On the other hand, research on violence against intimate partners using victimization data finds no significant race difference (Bureau of Justice Statistics 1998; Caetano, Schafer, and Cunradi 2001). Racial patterns, however, may be affected by the fact that Whites drink more often than Blacks (Substance Abuse and Mental Health Services Administration 2003). We are not aware of any studies outside the laboratory that control for differences in chronic drinking when they look at race or sex differences in drinking at the time of the offense.

Present Study

The current research is based on the National Longitudinal Study of Adolescent Health (Add Health). We first perform individual-level analyses in which we examine whether adolescent drinking is associated with the tendency to engage in violence while sober (vs. no violence). This relationship obviously cannot be due to the situational effects of intoxication; it could reflect the effects of individual difference factors (e.g., self-control) or the effects of routine activities and friendship patterns of adolescents who drink and use violence. We then compare this relationship to the relationship between drinking and violence generally, which we estimate in a second equation. In the second equation, our dependent variable is based on whether adolescents were involved in a fight or not, ignoring whether they were drinking at the time. This equation reveals the total relationship between drinking and violence, due to the causal effect of intoxication and the effects of common causes. Comparing the results from the two equations will give us an estimate of the proportion of the relationship between alcohol use and violence that cannot be attributed to the situational effects of intoxication.

Our measures of drinking include prevalence, frequency, and quantity of alcohol typically consumed. In our first set of analyses, we examine

whether drinkers are more likely than nondrinkers to engage in violence while sober or violence generally. In our second set of analyses we include only those respondents who are drinkers and substitute measures of frequency and quantity for the prevalence measure. The results will show whether adolescents who drink more often or in greater quantities are more likely to engage in sober violence and whether these relationships are as strong as the relationships between drinking and violence generally.

In Table 1 we attempt to clarify our interpretation of the individual-level analyses examining various effects of frequent drinking. We focus on frequency of drinking but the same arguments apply to prevalence of drinking (drinkers vs. teetotalers). First, we assume that the effect of frequency of drinking on violence while sober (vs. no violence) is entirely spurious. If frequent drinkers are more likely to fight when sober, it cannot be due to the causal effects of intoxication; the relationship must be due to common causes, such as self-control or activity patterns.

Second, we compare this relationship to the relationship between frequency of drinking and violence generally (vs. no violence). We assume that the relationship between frequency of drinking and violence generally—the focus of most research—is both causal and spurious. The causal argument is that frequent drinkers are more likely to be intoxicated in a particular instance and intoxication leads to violence. The comparison of effects of frequency from the two equations reveals the extent to which the overall relationship between frequent drinking and violence is spurious. If the relationship between frequency and sober violence is as strong as the relationship between frequency and violence generally, it suggests that the latter relationship is entirely spurious. If it is much weaker, a causal effect is also implied. Since the dependent variables are both dichotomous, standardization is unnecessary.

Our approach to causal inference is indirect in that it is based on a comparison of the spurious portion of the relationship with the total relationship. However, our method avoids some of the methodological problems of more typical designs. It does not require us to control for sources of comorbidity. In a cross-sectional design, one never knows whether one has included every possible third variable. For example, it is not necessary to control for location, peer effects, or self-control. The concern for spuriousness is particularly serious in addressing the alcohol and/or delinquency relationship because drinking is a form of delinquency. Longitudinal studies address these concerns to some extent, but they must assume a particular time lag. In addition, they pose a conservative test of effects because they only examine behavioral change over a period of time.

Table 1
Interpretations of the Relationship between Chronic Drinking and Violence while Sober, Violence while Intoxicated, and Violence Generally

Independent Variable	Dependent Variable	Explanation
Frequent drinking	Violence while sober vs. no violence	Spuriousness
Frequent drinking	Violence vs. no violence	Causal effects of frequency on violence Spuriousness
Frequent drinking	Violence while intoxicated vs. no violence	Causal effects of frequency on violence Causal effects of frequency on intoxication (independent of violence) Spuriousness

We do not attempt to interpret the relationship between drinking and violence while intoxicated (vs. no violence). Because intoxication and violence are combined into a single variable, the relationship is difficult to interpret. A frequent drinker is more likely to be intoxicated than an infrequent drinker during any event, not just one involving violence. A teetotaler will not be drinking during any event. These relationships may, therefore, have nothing do with violence. For example, the relationship between being a drinker and taking a walk while sober is certainly lower than the relationship between being a drinker and taking a walk while drinking. It is lower because drinkers may take a walk while drinking but teetotalers never do, not because drinking causes people to take a walk.

On the other hand, we can interpret the relationship between how much adolescents typically drink (when they drink) and whether they commit the offense when drinking. Because we control for how often they drink, it is unlikely that this relationship is spurious. That is, we assume that heavy drinkers are no more likely to be drinking during a particular event than light drinkers, once we control for frequency of drinking. If quantity of drinking is related to the tendency to commit violence while drinking, it will suggest a causal relationship.

We also perform an incident analysis where we only include respondents who drink and who have been involved in a violent incident. Our dependent variable is based on whether offenders were drinking or not during their most recent violent incident. Violence while sober is the comparison category,

rather than no violence. The key independent variables are the frequency of prior violence, the demographic characteristics of the offender, and measures of the frequency and quantity of drinking. By controlling for chronic drinking, we attempt to isolate the situational effects of intoxication. Essentially we are performing longitudinal analyses basing our lagged variable on retrospective frequency data.

We hypothesize that adolescents who have a history of prior violence are more likely to be intoxicated during their most recent violent incident. This hypothesis is based on the idea that intoxication has a stronger effect on people who already have violent tendencies. The control for chronic drinking addresses the possibility that violent adolescents also tend to drink more often. Our analyses will also reveal whether the causal effect of intoxication depends on the offender's sex, race, ethnicity, socioeconomic background, family structure, and urban residence. Following the experimental literature, we hypothesize that boys are more likely than girls to become violent when drinking. Our control for chronic drinking helps us rule out the possibility that boys are more likely than girls to be drinking during a violent incident because they tend to drink more often and in greater quantity. We make no hypotheses about the effects of the other demographic characteristics.

In sum, we test three hypotheses:

1. The relationship between drinking (prevalence and frequency) and engaging in violence while sober is weaker than the relationship between drinking and violence.
2. The relationship between quantity of drinking and engaging in violence while sober is weaker than (1) the relationship between quantity of drinking and violence and (2) the relationship between quantity of drinking and violence while drinking.
3. Adolescents who have a history of prior violence are more likely to be intoxicated during their most recent violent incident.
4. Boys are more likely than girls to be intoxicated during their most recent violent incident.

Methods

Add Health is a school-based study of a nationally representative sample of adolescents in seventh through twelfth grade. In addition to demographic and health variables, the adolescents were interviewed about violent behaviors and drug and alcohol use. We use the first wave of data

from the in-home survey, collected in 1995. The in-home survey was conducted at the adolescent's home and took approximately one to two hours to complete (Bearman, Jones, and Udry 1997). We omit the middle school students (grades 7 and 8) because they have less access to alcohol and because they drink at much lower levels.[3]

Add Health researchers selected 80 middle school–high school pairs for inclusion in the study. These schools were representative of the United States with respect to region of the country, urbanity, school type (e.g. public versus private), ethnicity, and size (Bearman, Jones, and Udry 1997). Participants were chosen for the in-home survey based on a stratified sampling procedure. Within schools, students were stratified based on sex and year in school. Each high school contributed approximately 200 respondents to the study. The total *n* for the individual analysis is 13,612, after the exclusion of middle school students and those with missing data.[4] For the incident analyses, we limit the sample to the 2,408 respondents who reported that they had engaged in violent behavior in the past year.

Add Health is a complex survey sample that includes regional stratification, a clustered sample design using schools as primary sampling units (PSUs), and oversampling of special populations. We use Stata to estimate models that take into account design effects based on the Add Health sampling plan (see Chantala and Tabor 1999).[5]

Dependent Variables

Our dependent variables are based on two questions. Respondents were asked, "In the past 12 months, have you gotten into a physical fight?" Those who said yes were then immediately asked the following question: "The most recent time you got into a fight, had you been drinking?" We assume that adolescents who report that they were involved in a physical fight attempted or actually used violence themselves. It is possible, however, that in some instances, they did not initiate the violence and might be considered adversaries or victims as well as offenders. The survey (like most self-report surveys) does not have much information on the context of the violent incident.

One limitation of our study is that it is based on self-reports. It may be, for example, that respondents cannot recall whether they had been drinking at the time of their most recent fight in the preceding year. Six of the respondents answered "don't know" in response to the question about physical fighting in the past year and 16 respondents refused to answer this question. No respondents answered "don't know" in response to the

question about whether they had been drinking during their most recent fight and only 1 respondent refused to answer. These individuals were excluded from our analyses. It is possible that some respondents think they know but are mistaken, and that their under- or over-reporting affects the results. We think these errors in self-report are likely to produce random measurement error and that it is unlikely that they can account for our findings. It is possible that offenders are more likely than nonoffenders to provide inaccurate information (Hindelang, Hirschi, and Weis 1981), although it is not clear whether they would be more likely to under- or over-report drinking. Finally, violent incidents are emotional events, and experimental evidence suggests that emotional events tend to be remembered (Bohannon 1998; Brown and Kulik 1977; Christianson and Loftus 1990; Goodman and Quas 1997).

In the individual analysis, we predict whether respondents were involved in a physical fight while drinking or while sober, or whether they were not involved in a physical fight (the reference category). We estimate this equation using multinomial logistic regression. In a second individual analysis, we examine whether the respondent was involved in a fight, ignoring whether they were drinking. In the incident analysis, the dependent variable is whether the respondent was drinking during their most recent physical fight. We estimate this equation using logistic regression.

Independent Variables

In our analyses of prevalence of drinking, we use a single dichotomous variable based on whether they had consumed alcohol at all during the past year. In our analyses of frequency and quantity of drinking, we use a series of dummy variables because preliminary analyses revealed nonlinear effects. Frequency was based on responses to the question "During the past 12 months, on how many days did you drink alcohol?" Response categories included the following: every day or almost every day, three to five days each week, once or twice a week, a couple times a month, three to twelve times in the past year, once or twice in the past year, or never. In addition, we measured the average number of drinks per occasion that the adolescent reported, based on the following item: "Think of all the times you have had a drink during the past twelve months. How many drinks did you usually have each time?" Responses to this question were dummy coded representing one or two drinks (the reference category), three or four drinks, five or six drinks, or seven or more drinks.

We also include a series of demographic characteristics to test whether the effect of intoxication varies across demographic groups (see Table 2).

Table 2
Data Description

	Number	Percentage
Outcome		
Violent while sober	2,107	15.5
Violent while drinking	301	2.2
Not violent	11,204	82.3
Frequency of drinking		
Never	6,251	45.9
Once or twice a year	2,525	18.5
3 to 12 times a year	1,952	14.3
Couple times a month	1,281	9.4
Once or twice a week	1,041	7.6
3 to 5 times a week	383	2.8
Daily	150	1.1
Quantity consumed		
0 drinks	6,280	46.1
1 drink	1,411	10.4
2 drinks	1,180	8.7
3 drinks	977	7.2
4 drinks	734	5.4
5 drinks	751	5.5
6 drinks	482	3.5
7 or more drinks	1,668	12.3
Frequency of violence[a]		
1 or 2	1,265	52.5
3 or 4	369	15.3
5 or more	335	13.9
Demographics		
Male	6,718	49.4
Female	6,894	50.6
White	6,956	51.1
Black	2,714	19.9
Hispanic	3,752	27.6
Other	190	1.4
Both parents	8,778	64.5
Other family types	4,834	35.5
Rural	2,279	16.7
Suburban	7,442	54.7
Urban	3,891	28.6
Mean age	16.9	

a. Only relevant for the incident-level analyses.

Demographic variables include sex, race (Black, Hispanic, and other versus White), suburban or rural residence (versus urban), age, and whether they were living with both their biological parents. In addition, we include a family socioeconomic status index based on parents' reports of their years of schooling and the adolescent's reports of their parents' occupation. Occupational prestige was based on the U.S. Census occupational group codes. After standardization, we computed the mean of these two items for one or both parents, depending on what was available.

The independent variables are the same in the incident-level analyses as they are for the individual analyses except that we include a measure of frequency of past violence. This variable enables us to determine whether adolescents with a history of violent behavior are more likely to be drinking during their most recent physical fight. Frequency is based on dummy variables representing the number of violent incidents the respondent reported during the past year. The dummy variables represent three or four fights in the past year and five or more fights in the past year. These are compared against the excluded reference category of one or two violent incidents in the past year.

Results

Descriptive statistics for the data are presented in Table 2. They show that 17.7 percent (15.5 + 2.2 percent) of the adolescents report a violent incident in the past year. Offenders are drinking in 12.5 percent of these incidents (301/(2107 + 301)).[6] A slight majority of adolescents report drinking at least once in the past year (54.1 percent).

Individual Analyses

The first set of individual-level analyses is based on the total sample (see Table 3). In the first two panels we present results from the multinomial logistic regression where no violence is the omitted category. In the third panel we present the equation involving violence (drinking and sober combined versus no violence) based on logistic regression. We are mainly interested in the relationship between prevalence of drinking and sober violence (panel 1) and comparing that coefficient with the coefficient for violence generally (panel 3).[7]

The results from the first panel show a strong relationship between the prevalence of drinking and engaging in violence while sober. The odds of a

Table 3
Individual-Level Equations Predicting Violence

	Violent While Sober			Violent While Drinking			Violent		
	b	*SE*	Odds Ratio	*b*	*SE*	Odds Ratio	*b*	*SE*	Odds Ratio
Demographics									
Male	1.02*	.06	2.77	1.35*	.17	3.86	1.06*	.05	2.90
Black	.11	.13	1.11	–.95*	.31	.39	.00	.13	1.00
Hispanic	.14	.12	1.15	–.33	.27	.72	.08	.12	1.08
Other	–.11	.14	.89	.15	.29	1.17	–.08	.13	.92
Age	–.22*	.03	.80	.12	.08	1.13	–.18*	.03	.84
SES	–.21*	.06	.81	–.24*	.10	.79	–.21*	.06	.81
Suburban	–.13	.12	.88	.26	.19	1.30	–.08	.11	.92
Rural	–.20	.14	.82	–.17	.23	.84	–.20	.12	.82
Both parents	–.35*	.09	.71	–.38*	.17	.68	–.35*	.09	.70
Drinker	2.36*	.12	10.63	3.99*	.49	53.94	2.47*	.12	11.83

Note: The first two columns of data are based on a multinomial logistic regression while the third column is based on logistic regression. For both analyses, no violence is the reference category (n = 13,261).
*$p < .05$.

drinker committing violence while sober is 10.63 times the odds of a nondrinker doing so. This coefficient is almost as strong as the coefficient for total violence (panel 3). The results support the hypothesis that the relationship between prevalence of alcohol use and violence is spurious and not due to the causal effect of intoxication.

The table also reveals well-known demographic differences in the prevalence of violence. Boys and younger adolescents are more likely than their counterparts to have a violent incident. Adolescents who live with both parents and whose parents have high SES are less likely to engage in violence. Note that we may underestimate demographic effects because our dependent variable is a dichotomy, not a frequency measure.

We next restrict analyses to drinkers and substitute measures of frequency and quantity of alcohol typically consumed for the measure of whether the adolescent drinks at all (see Table 4). We do not present the effects of the control variables because they are similar to those we present in Table 3. The results show that adolescents who drink with any frequency are more likely to engage in violence while sober than those who drink only once or twice in the past year (the reference category). Those who drink every day are particularly likely to engage in sober violence. When we compare these coefficients to the coefficients for violence generally, we notice that they are clearly weaker. For example, the coefficient for daily drinkers and sober violence is 60 percent (.60/1.00) as high as the corresponding

Table 4
Individual-Level Equations Predicting Violence (Drinkers Only)

	Violent While Sober			Violent While Drinking			Violent		
	b	*SE*	Odds Ratio	*b*	*SE*	Odds Ratio	*b*	*SE*	Odds Ratio
Frequency of drinking									
3 to 12 per year	.26*	.11	1.29	1.04*	.40	2.83	.26*	.10	1.30
2 per month	.37*	.13	1.45	2.37*	.35	10.73	.50*	.12	1.65
1 to 2 per week	.35*	.12	1.42	2.83*	.37	16.98	.60*	.13	.18
3 to 5 per week	.32	.17	1.37	3.18*	.41	23.93	.69*	.18	.20
Daily	.60*	.30	1.83	3.64*	.44	37.96	1.00*	.26	2.73
Quantity of drinking									
3 to 4 Drinks	–.03	.11	.97	.42	.31	1.52	–.01	.11	.99
5 to 6 Drinks	–.01	.14	.99	.61*	.30	1.85	.03	.13	1.03
7 Drinks	.33*	.11	1.39	1.26*	.26	3.51	.45*	.10	1.56

Note: The first two columns of data are based on a multinomial logistic regression while the third column is based on logistic regression. For both analyses, no violence is the reference category (n = 7,164).
*$p < .05$.

coefficient for all violence. The coefficient for those who drink three to five times a week and sober violence is 46 percent (.32/69) as high as the corresponding coefficient for all violence. These coefficients imply a substantial causal effect of intoxication but a fair amount of spuriousness as well.

The results do not show much of a relationship between the quantity an adolescent typically drinks and violence while sober. Only adolescents who consume seven or more drinks in a sitting are more likely to engage in sober violence than adolescents who typically consume only one or two drinks at a time. The relationship is 73 percent (.33/.45) as large as the corresponding coefficient for all violence. This difference implies that heavy drinking has a causal effect on violence. Recall that we are also interested in comparing the coefficients for violence while sober (panel 1) to the coefficients for violence while drinking (panel 2). The table reveals large differences, suggesting an intoxication effect. We discuss this pattern in more detail below where we present the effects of quantity on whether the adolescent was sober or drinking in our incident analyses.

Incident Analyses

The incident-level analyses only involve respondents who drink and who have engaged in violence (see Table 5). In analyses not presented, we included the nondrinking respondents and the results were similar. The

Table 5
Incident-Level Analysis Predicting Violent while Drinking versus Violent while Sober ($n = 2,086$)

	b	*SE*	Odds Ratio
Demographics			
Male	.07	.20	1.08
Black	–.86*	.37	.42
Hispanic	–.38	.27	.68
Other	.25	.36	1.28
Age	.25*	.08	1.28
SES	.03	.11	1.03
Suburban	.29	.22	1.33
Rural	–.17	.30	.85
Both parents	.12	.19	1.13
Frequency of violence			
3 to 4 times per year	.56*	.25	1.76
5 or more times per year	.79*	.23	2.21
Frequency of drinking			
3 to 12 per year	.75	.39	2.11
1 to 2 per week	2.45*	.36	11.56
3 to 5 per week	2.69*	.40	14.72
Daily	2.70*	.47	14.89
Quantity of drinking			
3 to 4 drinks	.33	.34	1.39
5 to 6 drinks	.65*	.31	1.92
7 drinks	.95*	.29	2.58

Note: Results from logistic regression.
*$p < .05$.

results show that adolescents who have been involved in three or four or five or more fights are more likely to be drinking during their latest fight than those who have been involved in only one or two fights (the reference category). For example, the odds of an adolescent being intoxicated during their latest fight is 2.21 times higher if they have been involved in more than five fights during the year than if they have been involved in only one or two fights. The evidence supports the hypothesis that alcohol has a stronger effect on those who are more violence-prone.

We observe no support for the hypothesis that intoxication affects boys more than it affects girls. Girls are just as likely to be drinking when they commit violence as boys, controlling for sex differences in chronic drinking. On the other hand, we observe a strong positive effect of age, suggesting that alcohol has a stronger effect on older adolescents than younger

adolescents. The odds of an adolescent drinking during a violent incident is 3.84 times as high for a 14 year old as for a 17 year old, controlling for the fact that the older adolescents drink more (3 * 1.28). We also find that Blacks are much less likely than Whites to be drinking during a violent incident, controlling for race differences in chronic drinking. The odds of a Black adolescent drinking during a violent incident is .42 times as high as for a White adolescent.

Finally, Table 5 shows significant effects of the quantity of drinking. The analyses mirror the earlier analyses of quantity effects, but they permit a statistical comparison of the tendency to commit violence while sober or drinking. They show that the more alcohol adolescents consume at a time, the more likely they are to have been drinking during the most recent violent incident (controlling for frequency of drinking). Adolescents who typically consume five or more drinks are more likely to be drinking during a violent event than adolescents who drink only one or two drinks at a time. For example, the odds that an offense is committed while drinking is 2.58 times more likely for adolescents who drink seven or more drinks compared with light drinkers. This dosage effect supports the hypothesis that alcohol intoxication has a causal effect.[8]

Discussion

In this research we attempt to determine to what extent the relationship between alcohol and adolescent violence involves a causal effect. Causal inference is always tentative with correlational data, but we claim that by examining the relationship between chronic drinking and violence while drinking or sober we can make reasonable inferences about causality. We first considered the relationship between the prevalence of drinking and the prevalence of violence. It is well known that adolescents who drink are more likely to engage in violence than adolescents who do not drink. Our evidence suggests that this relationship is mostly spurious. Drinkers are much more likely to engage in violence while sober and this tendency is almost as strong as the overall relationship between being a drinker and engaging in violence. Presumably some individual difference factors affect both types of delinquency, producing a spurious relationship. These individual difference factors should be more likely to produce a spurious relationship between drinking and violence among adolescents than among adults, because drinking is legal for adults. It could also be that certain routine activities and friendship patterns are criminogenic and create opportunities

for adolescents to drink and to use violence, even when sober. For example, they may find themselves in locations where they need to defend themselves.

It is also well known that frequent drinkers are more likely to engage in violence than infrequent drinkers. Our evidence suggests that this relationship is partly spurious and partly causal, the result of the situational effects of intoxication. Frequency of drinking is related to sober violence, but the relationship is not as large as the relationship between frequency and overall violence. Our evidence suggests that almost half of the relationship between frequency of drinking and violence can be attributed to the causal effects of intoxication. Our evidence is therefore consistent with experimental evidence showing causal effects of intoxication. It is also consistent with correlational studies of adult couples that use within-subject designs (e.g., Fals-Stewart 2003).

The evidence on the effects of quantity of alcohol consumed also suggests a causal effect of intoxication. First, we do not observe much of a relationship between how much adolescents usually drink at a time and whether they engage in violence when they are sober. Only the heaviest drinkers (seven or more drinks at a time) engage in more sober violence, and that effect is not very large. Second, we find that the heaviest drinkers are more likely to be drinking when they engage in violence. Because we control for frequency of drinking, it is unlikely that this dosage relationship is spurious. Our conclusion is that the evidence on both frequency and quantity of drinking suggests a causal effect of intoxication.

Individual Differences

We also find that adolescents with a history of violence are more likely to be drinking in their most recent incident, controlling for their levels of chronic drinking. This evidence suggests that alcohol has a stronger effect on more violent-prone adolescents. It is consistent with experimental research showing that aggressive subjects are more likely to respond with aggression when intoxicated (e.g., Giancola 2002; Maletsky 1976). It supports those scholars who have theorized that alcohol leads to aggression primarily for persons who are already predisposed to behave in such a manner (Collins 1988; Pernanen 1991). In other words, alcohol may facilitate violent behavior among those who are already inclined to behave that way. It is also possible that violent adolescents sometimes use alcohol as an excuse for their behavior.

Our evidence suggests that some of the effects of intoxication reflect social factors rather than the pharmacological effects of alcohol. Strictly

pharmacological effects should have similar effects on different demographic groups. We find, however, that the effect of intoxication varies by age and race. Its effect is much greater for older adolescents than younger adolescents, in spite of the fact that older adolescents can hold more alcohol. The effect of intoxication is also much greater for White adolescents than Black adolescents. The results suggest the possibility that a drinking and violence subculture exists among older White adolescents. Some White high school students may participate in recreational activities that involve getting drunk and fist fighting. Perhaps the alcohol provides both the courage and the excuse for this behavior. It is also possible that alcohol-based impairment of cognitive functioning (Bushman 1997) affects members of some groups more than others, although it is hard to imagine why this would be the case. Finally, we do not find evidence that alcohol has a greater effect on boys than girls. These results are inconsistent with the experimental literature showing stronger alcohol effects on male than female undergraduates (Giancola et al. 2002; Hoaken and Pihl 2000). It is not clear why our results are different. It may be due to differences in samples, differences in the dependent measures (the experiments rely on shock delivery), or the fact that the experimental studies focus on retaliatory aggression. The sex pattern is also inconsistent with correlational studies (e.g., Pernanen 1991) but those studies do not control for sex differences in chronic drinking. When we examine the relationship between sex and drinking during violent events without controls for age and chronic drinking, we do observe a statistically significant relationship.

The Method

Our method can be used to disentangle the causal effects of situational variables generally when one observes variation across individuals and situations and when one suspects that the relationship may be spurious. We can imagine a variety of applications: (1) Compare the relationship between frequency of drug use and violence while not under the influence to the relationship between frequency of drug use and total violence to test the psychopharmacological effect of a particular drug. (2) Compare the relationship between frequency of alcohol use and automobile accidents while sober to the total relationship between frequency of drinking and the likelihood of an accident. (3) Compare the relationship between frequency of going out at night and daytime offenses with the total relationship between frequency of nighttime activity and the likelihood of committing a crime. One could also look at other routine activities (e.g., unstructured

socializing and going to bars) in the same way. (4) Compare the relationship between chronic depression and crime when not depressed with the total relationship between chronic depression and the likelihood of committing a crime. (5) Compare the relationship between frequency of victimization and violent crime unprovoked with the total relationship between victimization and the likelihood of committing a violent crime. This analysis would reveal whether victimization has a situational effect on offending. (6) Compare the relationship between frequency of weapon carrying and unarmed assault with the total relationship between weapon carrying and the likelihood of committing an assault. This analysis would reveal whether having a gun leads offenders to use them in assaults.

In sum, this research has both methodological and substantive implications. On the methodological side, it suggests a technique for isolating the causal effects of situational variables and provides an application of this method. Substantively, the research increases our understanding of the nature of the relationship between alcohol and violence among adolescents. Our results suggest that among adolescents, intoxication has a causal effect, but that a considerable proportion of the relationship between alcohol use and violence is spurious. Among adolescents who are older and White, there may be a subculture of violence and drinking. Finally, intoxication primarily affects adolescents who already have violent tendencies. These are the "mean drunks."

Notes

1. Developing brains may be particularly susceptible to alcohol and drug use during adolescence. For example, Medina and colleagues (2007) find that alcohol users and abusers have smaller left hippocampal volumes and greater left-right asymmetry, compared with nonusers.

2. The effect of the *amount* of alcohol consumed, however, may depend on sex and age because these factors are related to body weight.

3. Analyses including the middle school students produced results substantially similar to those presented.

4. We also omit respondents who did not have a grand sample weight (as suggested by Chantala and Tabor 1999). These respondents (7.8% of the sample) were part of a special sample of genetically related individuals.

5. For the incident-level analyses, 68 individuals were missing data on at least one of the independent variables. For the individual-level analyses, 351 individuals were missing data on at least one of the independent variables. These individuals were not included in the analyses. For both sets of analyses, fewer than 5% of individuals had missing data.

6. In this sample, we find more frequent drinking by boys, Whites (vs. Blacks and Hispanics), and adolescents who are older, living in suburban areas, and from single-parent families.

7. The fact that the relationship between drinking and violence while drinking is so strong (panel 2) is not informative, for reasons discussed earlier. Teetotalers cannot be drinking when they commit violence, by definition.

8. In other analyses we included controls for pubertal development, friend's violence, and prior victimization. The coefficients for quantity and frequency of drinking were similar in these equations.

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