

# Greater than the Sum of its Parts: The Combined Effect of Early Alcohol Use and Violence on Alcohol Abuse and Violence in Adulthood

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**Abstract:** *Background:* Alcohol abuse and violence are key contributors to leading causes of death among youth. Yet, the relationship between violence and alcohol use is complex and the developmental impact of this association merits further investigation. The current study used prospective data from the National Longitudinal Study of Adolescent Health (Add Health) to investigate how violence and alcohol use coexist in adolescence and how this coexistence predicts alcohol abuse and violence in adulthood.

*Methods:* The sample consisted of 9421 adolescents ranging from ages 11-32. The effects of alcohol use and violence on alcohol abuse and violent behavior were modeled by means of survey logistic regression. Racial/ethnic differences were tested using Chi-squared analyses.

*Results:* Independently, alcohol and violence during adolescence were not significantly associated with violent behavior among young adults (Wave IV). Racial/ethnic differences emerged in the relationship between alcohol use and violence, and the overlap between the two in predicting alcohol abuse in adulthood. Among Whites and Blacks, violence and alcohol during adolescence were also associated with alcohol abuse among young adults (Whites: OR=2.59; Blacks: OR=4.23). Alcohol use and violence was not associated with increased alcohol abuse among Hispanics. Results indicate that coexistent alcohol use and violence pose a risk for alcohol abuse in adulthood, beyond the independent effects of alcohol and violence. Combining both alcohol and violence prevention in adolescent populations may prevent the abuse of alcohol and participation in violence in adulthood.

**Keywords:** Adolescence, alcohol, alcohol abuse, prospective, race/ethnicity, violence, young adults.

## INTRODUCTION

Alcohol consumption and violent behavior among adolescents are serious public health problems. Violence has been linked to unintentional injuries and homicide, two of the leading causes of death among young people [1]. Alcohol is often described as the drug of choice among adolescents [2]. Furthermore, alcohol is a key contributor to the leading causes of death among those 10 to 24 years old—motor-vehicle mortality, suicide, and other unintentional injuries [3].

The relationship between violence and alcohol use has been well documented; however, there is debate as to the directionality of the relationship. Four explanations have been proposed to explain the relationship between alcohol and violent behavior: (a) psychopharmacological, meaning that the intoxicating effects of alcohol cause people to be violent to gain resources to support their drug/alcohol use [4]; (b) the relationship is causal, in that violence causes alcohol use because aggressive people self-select into situations that encourage alcohol consumption [5]; (c) the relationship is reciprocal, and the arrow between alcohol use

and violence may point in either or both directions [6]; or (d) the relationship is spurious, as problem behaviors cluster as part of a more general problem behavior syndrome [7].

Adolescence is a critical period developmentally, where participation in at-risk behaviors may result in problem behaviors that persist throughout adulthood [8-10]. Specifically, early onset and alcohol use in general during adolescence has been linked to increased levels of alcohol abuse and aggression in young adults [10, 11]. Early substance use is hypothesized to interfere with cognitive and social learning processes that enable healthy maturation and development into adulthood [12]. Alternatively, adolescent alcohol use increases the risk of later alcohol abuse because environmental conditions (e.g., peer pressure, peer support of alcohol use) encourage continued use [13, 14].

A number of risk factors during adolescence have been associated with alcohol misuse in early adulthood. Early onset of alcohol use, parental alcohol use, tobacco and marijuana use, risk-taking behavior, behavioral problems, theft and property damage in adolescence have been associated with alcohol use disorders in adulthood [15-17]. The relationship between violence in adolescence and alcohol misuse in early adulthood is less clear. Although the evidence is strong that alcohol and violence tend to co-exist in acute and clinical settings of violence [18], and that the relationship between violence and alcohol use is complex but substantial [19], the developmental impact of this association merits further investigation.

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Although the relationship between alcohol use and violent behavior has been well documented for adolescents, there are evident racial and ethnic differences in the participation of violence and consumption of alcohol. Specifically, African-Americans are less likely to consume alcohol compared to other groups, but they are more likely to participate in violence [20, 21]. Hispanics are more likely than Whites to participate in violence, but less likely to use alcohol compared to Whites [22, 23]. Given these racial and ethnic differences in the use of alcohol and violence independently, investigation into the effect of combined alcohol use and violence participation by race/ethnicity is warranted.

The purpose of this study is to understand how violence and alcohol use coexist in adolescence, and how this coexistence predicts alcohol abuse and violence in adulthood. Although violence and alcohol use are related, it is less clear whether violence is related to a diagnosable alcohol use disorder. In this study, we consider the effect of early alcohol use and violence on the DSM IV-TR [24] definition of alcohol abuse, and violent behavior in early adulthood. Specifically, we hypothesize that: 1) alcohol use during adolescence will predict alcohol abuse in adulthood; 2) adolescents who use alcohol and participate in violence are at risk for both alcohol abuse and violence in adulthood; and 3) there are racial/ethnic differences in the participation in violence and alcohol use in adolescents which may put certain groups at higher risk for alcohol abuse and violence in early adulthood.

## METHOD

Data for this IRB-approved secondary analyses were derived from waves I (1994–1995), II (1995–1996), and IV (2008) of the restricted-use sample of the Add Health. The Add Health data comprise a nationally representative sample of 80 high schools and 52 middle schools in the United States, with participants selected using a two-stage cluster sampling design. The individual participants were selected from rosters provided by selected schools. Data were collected from an in-home face-to-face interview with the adolescents and adults, mean ages 15 (Wave I), 16 (Wave II), 21 (Wave III), and 26 (Wave IV). Response rates ranged from 80% (Wave IV) to 88% (Wave II). Details of data collection and survey procedures are described elsewhere [25]. After excluding cases with missing weights at Wave IV [26], 9421 participants remained in the data set. Weights at Wave IV were designed to produce a nationally representative cohort sample of young adults.

## Participants

Table 1 reports demographic and relevant descriptive characteristics of the sample. Briefly, the sample was 50% male, with a mean age of 15.03 ( $se = 0.11$ ) at Wave I. Whites comprises 74% of the sample, 16% were African American, and 12% self-identified as Hispanic. Approximately 20% of the sample reported violence at Wave I, 10% reported violence at Wave II, and 10% reported alcohol abuse at Wave IV.

## Measures

All covariates were measured at Wave I. Dependent variables (violent behavior and alcohol abuse) were collected at Wave IV.

**Table 1. Description of Sample, Add Health (N=9421)**

	n	Proportion
<i>Alcohol and Violence Patterns</i>		
<i>Wave I</i>		
Non-Violent, No Alcohol Use	3784	0.41
Alcohol Only, No Violence	3790	0.06
Violent Only, No Alcohol Use	551	0.06
Alcohol and Violence	1241	0.14
<i>Wave II</i>		
Non-Violent, No Alcohol Use	4634	0.48
Alcohol Only, No Violence	3847	0.41
Violent Only, No Alcohol Use	239	0.03
Alcohol and Violence	652	0.08
<i>Dependent Variables</i>		
Alcohol abuse	838	0.10
Violence	1148	0.12
<i>Demographics</i>		
White	6109	0.74
African-American	2024	0.16
Hispanic	1448	0.12
Male	4279	0.50
Age (Mean, SE)	9416	15.03(0.11)

## Dependent Variables

*Violent behavior.* This dependent variable was created using three items measuring whether three violent behaviors have occurred in the prior 12 months at Wave IV (young adults). Items included (a) “You pulled a knife or gun on someone”; (b) “You shot or stabbed someone”; and (c) “How often did you hurt someone badly enough to need bandages or care from a doctor or nurse?” If the respondent reported an event in one or more of these three categories in the past year, they were categorized as violent.

*Alcohol abuse.* In accordance with the Diagnostic and Statistical Manual IV-TR [24], participants were asked the following questions to identify whether they qualify as abusive users of alcohol: 1) “How often has your drinking interfered with your responsibilities at school or work?”; 2) “How often have you been under the influence of alcohol when you could have gotten yourself or others hurt, put yourself or others at risk, including unprotected sex?”; 3) “How often have you had legal problems because of your drinking, like being arrested for disturbing the peace or driving under the influence of alcohol, or anything else?”; 4) “How often have you had problems with your family, friends, or people at work or school because of your drinking?”; 5) “Did you continue to drink after you realized drinking was causing you problems with family, friends, or people at work or school?”; 6) “Have you ever found that you had to drink more than you used to in order to get the effect you wanted?”; 7) Has there ever been a period when you spent a

lot of time drinking, planning how you would get alcohol, or recovering from a hangover?"; 8) Have you often had more to drink or kept drinking for a longer period of time than you intended?"; 9) "Have you ever tried to quit or cut down on your drinking?"; 10) "Has there ever been a period of time when you wanted to quit or cut down on your drinking?"; 11) "During the first few hours of not drinking, do you experience withdrawal symptoms such as the shakes, feeling anxious, trouble getting to sleep or staying asleep, nausea, vomiting, or rapid heart beats?"; 12) "Have you continued to drink after you realized drinking was causing you any emotional problems or any health problems?"; and 13) "Have you ever given up or cut down on important activities that would interfere with drinking like getting together with friends or relatives, going to work or school, participating in sports, or anything else?". If the respondent reported at least three of these symptoms in the past 12 months, they were categorized as being alcohol abusing (APA, 2000).

### Predictors

Four independent variables were calculated using the violent behavior measure described above, the lifetime alcohol use variable at Wave I and the following alcohol use variable measured at Wave II: "Since [last interview], have you had beer, wine or liquor—not just a sip or taste of someone else's drink—more than 2 or 3 times?" At each wave, participants who reported neither alcohol use nor violent behavior were categorized as "non-violent, non-alcohol users". Those who reported violence but no alcohol use were categorized as "violent only", and those who reported alcohol use but no violence were categorized as "alcohol use only". Participants who reported both behaviors were categorized as "Violent and Alcohol Users".

### Covariates

*Depression.* This mental health status variable was measured with one item, "How often in the past week have you felt depressed?" Values for this variable were dichotomized so that the reference group indicates no depression, and others reported one or more instance of depression in the past week.

*Academic achievement.* Academic performance was measured using the variable, "On a scale of 1 to 5, where 1 is low and 5 is high, how likely is it that you will go to college?".

*Parental involvement.* Parental influence and involvement was measured using a scale of 20 items (10 for maternal involvement and 10 measuring paternal involvement; Prado et al., 2009). Each individual item was dichotomized, and the scale is the sum of all 20 items (range: 0–20). The 10 items which comprised the scale included whether the respondent reported participating in the following activities with their mother and/or father in the past 4 weeks: (1) going shopping; (2) playing a sport; (3) attending a religious or church-related event; (4) talking about someone they are dating or a party they attended; (5) attending a movie, play, concert, or sporting event; (6) talked about a personal problem they were having; (7) had a serious argument about their behavior; (8) talked about work or grades; (9) worked on a project for school; and (10) talked

about other things they are doing in school. Cronbach's coefficient  $\alpha$  for this scale was .76.

*Safe neighborhood.* Neighborhood safety was measured using one item, "Do you usually feel safe in your neighborhood?". Responses were dichotomized so that values of 1 indicate neighborhood safety and 0 indicates that the respondent does not usually feel safe in their neighborhood.

*Marijuana use.* Marijuana use was measured using the item, "During your life, how many times have you used marijuana?" Responses were categorized into "users" and "nonusers."

*Desire to leave home.* This variable was measured using the following item: "How much do you feel that you want to leave home?" Respondents who reported "very much" or "quite a bit" were categorized as "1" and others were categorized as "0."

*Peer marijuana and alcohol use.* Peer alcohol use was measured using one item: "Of your three best friends, how many drink alcohol at least once a month?" Respondents who reported having one or more friends who use alcohol monthly were coded as "1." Similarly, respondents were asked, "Of your three best friends, how many use marijuana at least once a month?" Respondents who reported having one or more friends who use marijuana monthly were coded as "1."

*Demographics.* Respondents were asked to self-report their race as "White," "Black or African American," "American Indian or Native American," "Asian or Pacific Islander," and/or "Other." For this analysis, respondents were grouped as "White," "Black," or "Other" for sample size purposes. Persons who reported multiple races were coded as "other." Ethnicity was recorded using the item, "Are you of Hispanic or Latino background?" Those who responded "yes" to this ethnicity item were coded as Hispanic. Age was recorded using the month and date of birth (calculated from the middle of the month for anonymity purposes). Gender was classified as self-reported "male" or "female."

### Analytical Methods

Analyses were conducted considering the clustered dual-stage sampling design, and observations were weighted due to the unequal probability of selection of each primary sampling unit [26]. The survey logistic regression procedure was used to provide weighted effect estimates and confidence intervals, with calculated robust standard errors (to account for the clustering of individuals within schools). All analyses were conducted using STATA version 11 data analysis software [27].

Four models were created to test the effects of combinations of alcohol use and violent behavior on violence and violence on alcohol abuse. The first model tested the bivariate relationships between alcohol use only, violence only, and alcohol and violence together with violence and alcohol abuse at Wave IV. Second, to test whether the effects of alcohol and violence differed by race/ethnic group, interaction terms were entered into the bivariate model with each of the independent variables. The overall effect for the significance of the interaction terms

was used to determine whether stratification by race/ethnicity was necessary. When these interaction terms were significant, multivariate models by race/ethnic group to understand the differential effect of alcohol and violence on alcohol abuse and violent behavior by subgroup. Finally, a bivariate table ( $\chi^2$  analysis) was constructed to test for differences in the four groups of independent variables by ethnicity and race to understand whether certain racial/ethnic groups are more likely to be members of the highest risk group (alcohol use and violence).

**RESULTS**

**Differences in Alcohol Use, Violence, and Alcohol Use and Violence by Race/Ethnicity**

Table 2 displays the proportions of adolescents who are violent only, use alcohol only, or use alcohol and have participated in violent behavior, stratified by race/ethnicity. This table shows that the greatest proportion of Whites and Hispanics were alcohol users only at each wave, while the majority of Blacks were non-violent and non-alcohol users. Blacks comprised the smallest proportion of the alcohol only category, and the largest proportion of the violent only category. These differences by race/ethnic group are significantly different at each Wave (Wave I:  $\chi^2$  16.73,  $p < 0.001$ ; Wave II:  $\chi^2$  13.45;  $p < 0.001$ ).

**Effect of Alcohol and Violence Overlap on Violent Behavior**

Bivariate effects of the relationship between violence only, alcohol use only, and alcohol and violence combined on later violent behavior are reported in Table 3. The use of alcohol and participation in violent behavior at Waves I (OR = 1.66; 95% CI 1.28-2.15) and II (OR = 1.66; 95% CI 1.23-2.24) increased the risk of violence at Wave IV. The interaction term between race/ethnicity the combinations of alcohol use and violent behavior indicated that there were differences ( $p < 0.05$ ) between the patterns of alcohol use and violence on violence (Wave IV) at each Wave by race/ethnicity. Therefore, the regression analyses are presented by racial/ethnic subgroup separately.

There were not substantial differences by race/ethnicity in the effect of alcohol use and violence (Waves I and II) on

violent behavior at Wave IV. Among Whites, the combination of alcohol use and violent behavior marginally ( $p < 0.10$ ) increased the risk of violence at Wave IV (OR = 1.33; 95% CI 0.93-1.90, OR=1.45; 95% CI 0.98-2.15). Among Blacks and Hispanics, neither alcohol use, violence participation, nor the combination of the two was predictive of violence at Wave IV. Although the combined effect of violence and alcohol use (Waves I and II) was significantly predictive of later violence overall (Wave IV) in the bivariate model, the relationship was not significant for any specific racial/ethnic group, after adjusting for relevant demographics, contextual variables, and substance use.

**Effect of Alcohol and Violence Overlap on Alcohol Abuse**

Bivariate effects of the relationship between violence only, alcohol use only, and alcohol and violence combined on alcohol abuse are reported in Table 4. The use of alcohol and participation in violent behavior at Waves I (OR = 2.79; 95% CI 2.11-3.68) and II (OR = 3.50; 95% CI 2.59-4.72) increased the risk of violence at Wave IV. The interaction term between race/ethnicity and the patterns of alcohol consumption and violent behavior indicated that there were differences ( $p < 0.05$ ) in alcohol use and violence on alcohol abuse by race/ethnicity. Therefore, the results for each racial/ethnic subgroup are presented separately.

The effect of alcohol use and violence on alcohol abuse was differential by race and ethnicity. Among Whites, alcohol users who were non-violent were at risk for future alcohol abuse (OR = 1.62; 95% CI 1.23-2.12) compared to non-violent non-alcohol users. Whites who used alcohol and were violent were at the greatest risk for alcohol abuse (OR = 1.95; 95% CI 1.39-2.74). Blacks and Hispanics were not at increased risk for alcohol abuse if they were violent or used alcohol at Wave I; however, increases in risk emerged from substance use behaviors at Wave II. Specifically, Whites who used alcohol only (OR = 2.28; 95% CI 1.78-2.94), were violent only (OR = 1.81; 95% CI 1.00-3.30), or who were both violent and used alcohol (OR = 2.59; 95% CI 1.82-3.69) were at increased risk for alcohol abuse in adulthood. This increase in risk was also present for Blacks who reported alcohol use (OR = 2.61; 95% CI 1.12-6.08) and violence and alcohol use (OR = 4.23; 95% CI 1.83-9.81) at Wave II. Hispanics who used alcohol only were at increased

**Table 2. Proportions of Membership in Each Violence and Alcohol Category by Race/Ethnicity**

	Whites	Blacks	Hispanics	$\chi^2$	$p$
<i>Wave I</i>					
Non-Violent, No Alcohol Use	0.42	0.48	0.4	16.73	<0.001
Alcohol Only, No Violence	0.53	0.37	0.48		
Violent Only, No Alcohol Use	0.004	0.04	0.008		
Alcohol and Violence	0.05	0.11	0.11		
<i>Wave II</i>					
Non-Violent, No Alcohol Use	0.43	0.52	0.4	13.45	<0.001
Alcohol Only, No Violence	0.46	0.29	0.42		
Violent Only, No Alcohol Use	0.02	0.07	0.02		
Alcohol and Violence	0.09	0.11	0.15		

**Table 3. Effects of Alcohol and Violence (Waves I-II) on Violent Behavior (Wave IV) by Race/Ethnicity**

	Bivariate		Adjusted+					
	Full Sample		Whites		Blacks		Hispanics	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Wave I</i>								
Non-Violent, No Alcohol Use	--	--	--	--	--	--	--	--
Alcohol Only, No Violence	1.10	0.93-1.32	1.04	0.80-1.36	0.91	0.59-1.39	0.76	0.39-1.51
Violence Only, No Alcohol	1.17	0.85-1.60	0.95	0.61-1.49	1.64	0.83-1.39	1.33	0.59-2.97
Alcohol and Violence	1.66***	1.28-2.15	1.33	0.93-1.90	1.03	0.53-2.05	1.91	0.87-4.20
<i>Wave II</i>								
Non-Violent, No Alcohol Use	--	--	--	--	--	--	--	--
Alcohol Only, No Violence	1.00	0.83-1.21	0.91	0.69-1.19	1.07	0.68-1.70	0.77	0.41-1.49
Violence Only, No Alcohol	1.76*	1.11-2.81	1.26	0.66-2.37	1.01	0.56-1.82	0.57	0.10-3.27
Alcohol and Violence	1.66**	1.23-2.24	1.45	0.98-2.15	1.10	0.59-2.03	1.11	0.55-2.22

+ Models are adjusted for academic achievement, depression, parental involvement, desire to leave home, neighborhood safety, marijuana use, peer alcohol and marijuana use, race/ethnicity, gender, and age.

\*p<0.05.

\*\*p<0.01.

\*\*\*p<0.001.

risk for alcohol abuse at Wave IV (OR = 2.53; 95% CI 1.10-5.81). Participation in violence did not increase the risk for alcohol abuse among Hispanics (OR = 1.24; 95% CI 0.43-3.65).

**DISCUSSION**

Although the literature on the relationship between alcohol and violence is extensive, few prospective studies have tested the independent versus simultaneous relationship between alcohol and violence in adolescence on violence and diagnosable alcohol use disorders in adulthood. The current

study also used nationally representative data, whereas most of the extant literature was conducted with geographically specific or less diverse populations. This strengthens the external validity of the findings.

The purpose of this study was to examine the relationship between alcohol, violence, and both violent behavior and alcohol use in adolescence on alcohol abuse and violence in early adulthood. Results indicated that the risk associated with the co-existence of violent behavior and alcohol consumption on violent behavior is greater than the risk associated with violence or alcohol independently; however,

**Table 4. Effects of Alcohol and Violence (Waves I-II) on Alcohol Abuse (Wave IV) by Race/Ethnicity**

	Bivariate		Adjusted+					
	Full sample		Whites		Blacks		Hispanics	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Wave I</i>								
Non-Violent, No Alcohol Use	--	--	--	--	--	--	--	--
Alcohol Only, No Violence	1.94***	1.54-2.42	1.62**	1.23-2.12	0.77	0.59-2.97	2.68	0.96-7.49
Violence Only, No Alcohol Use <sup>a</sup>	1.63*	1.04-2.55	1.58	0.92-2.71	1.33	0.59-2.97	1.42	0.21-9.65
Alcohol and Violence	2.79***	2.11-3.68	1.95***	1.39-2.74	1.91	0.87-4.20	2.08	0.53-8.10
<i>Wave II</i>								
Non-Violent, No Alcohol Use	--	--	--	--	--	--	--	--
Alcohol Use Only, No Violence	2.58***	2.08-3.21	2.28***	1.78-2.94	2.61*	1.12-6.08	2.53*	1.10-5.81
Violence Only, No Alcohol Use	2.04*	1.14-3.65	1.81*	1.00-3.30	0.96	0.24-3.86	2.74	0.24-31.65
Alcohol and Violence	3.50***	2.59-4.72	2.59***	1.82-3.69	4.23**	1.83-9.81	1.24	0.43-3.65

+ Models are adjusted for academic achievement, depression, parental involvement, desire to leave home, neighborhood safety, marijuana use, peer alcohol and marijuana use, race/ethnicity, gender, and age.

<sup>a</sup>The effect of alcohol use only on Blacks' risk of alcohol abuse was not estimated due to collinearity.

\*p<0.05.

\*\*p<0.01.

\*\*\*p<0.001.

the effect is mitigated when considering other potential confounding variables. The participation in both violent behavior and alcohol use during the previous year also increases the risk for alcohol abuse, beyond alcohol use alone. This finding holds for Whites at age 15, and White and Blacks at age 16. This relationship was not observed for Hispanic adolescents. Blacks and Hispanics are more likely than Whites to be members of the highest risk group (using alcohol and engaging in violence).

The finding that alcohol and violence together are predictive of violent behavior, independent of violence and alcohol use alone, adds to the literature on the relationship between alcohol and violence. A great deal of research on the directionality of the arrow between alcohol and violence suggests that alcohol use precedes violent behavior [28-31], however, no prospective, nationally representative studies to our knowledge have tested the effect of exposure to both risk factors for violence and alcohol abuse in adulthood. Our findings support the hypothesis that the relationship between alcohol and violence is reciprocal [6], or that these two behaviors tend to cluster as part of a general problem behavior syndrome [7], as alcohol and violence appear to coexist in a small proportion of adolescents. Membership in this group appears to increase risk for both problem behaviors in adulthood (violence and alcohol abuse).

The differences in risk for alcohol abuse by race/ethnicity may reflect differences in the level of alcohol use. Clear racial and ethnic differences in the participation of violence and consumption of alcohol have been identified, as African-Americans are less likely to consume alcohol compared to other groups, but they are more likely to participate in violence [20, 21]. Hispanics are more likely than Whites to participate in violence, but less likely to use alcohol compared to Whites [22, 23]. Whites and African-Americans may have the greatest frequency of problematic alcohol use, and by extension, their participation in violence may be attributable to high-risk alcohol use. Therefore, it is possible that the overlap between norms of event-specific use of alcohol use and participation in violent behavior may be driving the observed effect between alcohol use, violence, and alcohol abuse among Whites and Blacks only. The mechanism by which this subgroup-specific overlap is operating is a direction for future research.

The findings from this study have significant implications for the prevention of alcohol abuse and violence. Adolescents are initiating both alcohol use and violent behavior prior to age 11, and prevention programming within the schools should begin early (e.g., elementary school) and target multiple risk behaviors, particularly among minority youth. Many prevention activities are implemented after adolescents have initiated alcohol use and have already engaged in violent behavior. This may hamper the success of alcohol and violence prevention and/or cessation interventions, as adolescents and their peer group have already engaged in violent behavior. Therefore, support from the school and community is essential in the design and implementation of effective alcohol and violence prevention programming.

These findings should be interpreted in light of several limitations. First, this survey was conducted using self-reported violent behavior and alcohol consumption patterns,

which is relatively sensitive and may be underreported. To maximize validity in the survey design, sensitive questions (e.g., drug use, violence, other illegal behavior) were recorded by the participant (rather than the interviewer). In the event that these behaviors were underreported, increased validity in reporting would only strengthen the effects found in this study. Second, our set of covariates was not exhaustive and it is possible that some excluded predictors could explain a portion of the association between alcohol, violence, alcohol abuse and violence in adulthood. To address this, we included a number of other variables that may confound this association (such as parental involvement, neighborhood safety, participants' desire to leave home).

Despite these weaknesses, this study has a number of strengths. The sample is nationally representative of adolescents and young adults ages 11 to 32. Additionally, adolescents were followed prospectively, allowing this study to evaluate intra-participant change over time. These prospective, nationally representative study designs are rare in the literature evaluating the relationship between alcohol use and violent behaviors [32, 33]. Finally, the outcome variables included violent behavior and DSM IV-TR measures of alcohol abuse, which translate directly into prevention and treatment programming.

In conclusion, results from this study indicate that the co-existence of alcohol consumption and violent behavior in adolescence is a risk factor for alcohol abuse and violence in adulthood, beyond the risk associated with each risk factor independently. Black and Hispanic adolescents are over-represented among those who participate in both alcohol use and violent behavior. These findings indicate that prevention programming should target multiple risk behaviors (e.g., alcohol use and violent behavior) early, as these behaviors often begin prior to age 11. Combining both alcohol and violence prevention in adolescent populations may prevent the abuse of alcohol and participation in violence in adulthood.

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**CONFLICT OF INTEREST:**

None declared.

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