



## Past 6-Year Trends In Current Alcohol Use Among Cyberbullied Adolescents

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### Abstract

Most of the research on alcohol use and being cyberbullied has focused on the correlation between the two. Less is known about the recent epidemiology of adolescent current alcohol use. Objective: To describe the trends in current alcohol use among adolescence that self-report being cyberbullied across sex and racial/ethnic groups. Methods: The data from the present study came from the national Youth Risk Behavior Surveys (YRBS) from 2011 to 2017. We estimated the prevalence of current alcohol use across years by biological sex and race/ethnicity. Further we tested for linear and quadratic trends. Results: We observed statistically significant decreases in alcohol use cyberbullied ( $b = -0.12$ ,  $p < 0.00$ ), and non-cyberbullied individuals ( $b = -0.15$ ,  $p < 0.00$ ). Further, we found significant decreases for cyberbullied males ( $b = -0.10$ ,  $p < 0.01$ ), females ( $b = -0.17$ ,  $p < 0.01$ ) blacks ( $b = -0.39$ ,  $p < 0.00$ ), and Hispanics ( $b = -0.17$ ,  $p < 0.01$ ). Whites and other races were did not have a significant change. We also found significant decreases for cyberbullied white males and females, black males ( $b = -0.46$ ,  $p < 0.03$ ) and females ( $b = -0.37$ ,  $p < 0.02$ ), Hispanic males ( $b = -0.33$ ,  $p < 0.00$ ). White males and females and other males and females did not have significant changes in alcohol use prevalence. Conclusions: Consistent with national trends, alcohol use among adolescents is decreasing. The decrease is occurring within those that are being cyberbullied. Further research with different data are necessary to further validate these results.

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# Past 6-Year Trends in Current Alcohol Use among Cyberbullied Adolescents

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## ABSTRACT

**Background:** Most of the research on alcohol use and being cyberbullied has focused on the correlation between the two. Less is known about the recent epidemiology of adolescent current alcohol use. **Objective:** To describe the trends in current alcohol use among adolescence that self-report being cyberbullied across sex and racial/ethnic groups. **Methods:** The data from the present study came from the national Youth Risk Behavior Surveys (YRBS) from 2011 to 2017. We estimated the prevalence of current alcohol use across years by biological sex and race/ethnicity. Further we tested for linear and quadratic trends. **Results:** We observed statistically significant decreases in alcohol use cyberbullied ( $b = -0.12, p < 0.00$ ), and non-cyberbullied individuals ( $b = -0.15, p < 0.00$ ). Further, we found significant decreases for cyberbullied males ( $b = -0.10, p < 0.01$ ), females ( $b = -0.17, p < 0.01$ ) blacks ( $b = -0.39, p < 0.00$ ), and Hispanics ( $b = -0.17, p < 0.01$ ). Whites and other races were did not have a significant change. We also found significant decreases for cyberbullied white males and females, black males ( $b = -0.46, p < 0.03$ ) and females ( $b = -0.37, p < 0.02$ ), Hispanic males ( $b = -0.33, p < 0.00$ ). White males and females and other males and females did not have significant changes in alcohol use prevalence. **Conclusions:** Consistent with national trends, alcohol use among adolescents is decreasing. The decrease is occurring within those that are being cyberbullied. Further research with different data are necessary to further validate these results.

## KEYWORDS

Cyberbullying; alcohol use; adolescents

## Introduction

Alcohol use is one of the most used substances by adult populations worldwide but is also popular with underage consumers. For some, alcohol use may turn from social and occasional use to high-risk use. Globally, alcohol use is a main contributor to the burden of disease (World Health Organization (WHO), 2018). Researchers have shown that alcohol use has been linked to morbidity and mortality (Patra et al., 2010), cardiovascular issues (e.g., hypertension, stroke, or heart disease) (Patra et al., 2010; Piano & Phillips, 2014; Rehm et al., 2016; Taylor et al., 2009), liver cirrhosis (Rehm & Roerecke, 2015), cancer (Bagnardi et al., 2013; Bagnardi et al., 2015; Choi et al., 2018; Corrao et al., 2004; Praud et al., 2016; Rehm, 2015), pancreatitis (Samokhvalov et al., 2015; Yadav & Lowenfels, 2013), diabetes (Baliunas et al., 2009), and various injuries (Taylor et al., 2010). Issues with alcohol use may also include psychiatric issues (Grant et al., 2004), financial burdens to the user and others (Greenfield et al., 2015; Lewis-Laietmark et al., 2017), participation in crime including violence (Rehm et al., 2009), vehicle crashes (WHO, 2018), or poor social relationships (e.g., family, friends, and coworkers) (Greenfield et al., 2015).

The serious nature of alcohol use *via* physical, psychological, and social harms suggests that the regular and

detailed monitoring of alcohol use trends over time is important for public health. Tracking patterns is essential to understanding behaviors related to alcohol use, as well as alcohol-related morbidity and mortality. In addition, vigilance of tracking patterns of alcohol use and abuse allows researchers to estimate the potential effectiveness of policy changes related to alcohol use.

According to the Youth Behavioral Risk Survey, overall alcohol use for young people under the age of 17 for 2007 to 2017 has decreased from 44.7% to 29.8% (Centers for Disease Control and Prevention, 2017a). Even with alcohol use declining, monitoring of alcohol use patterns over time is important among two subgroups. One subgroup comes in the context of socio-demographics. For instance, researchers have shown males use alcohol more than females (Johnston et al., 2018). In addition, researchers have shown that racial and ethnic groups use alcohol at different rates (Johnston et al., 2018; Krieg & Kuhl, 2016). The continued monitoring of these subgroups is important for the planning and targeting prevention and intervention programs.

In the context of alcohol use, sociodemographic subgroups are not the only categories of individuals who should be investigated to better understand use. Examining groups based on behavioral characteristics and its relationship to

alcohol use is extremely important, especially attempting to understand is bullying and cyberbullying. The act of bullying in the physical world is the repeated, intentional aggressive behavior with the intent to intimidate a victim (Olweus, 1993; Patchin & Hinduja, 2016). Tactics of domination performed by a bully can induce fear, such as participating in physical aggression, theft of personal material, or threatening comments. Articulate harm (physical, emotional or mental) must occur to be considered bullying behavior. Cyberbullying is the “willful and repeated harm inflicted through the use of computers, cell phones, and electronic devices” (Hinduja & Patchin, 2015). Contrary to physical bullying, one direct act of cyberbullying is considered a form of bullying as it can be a continuous method of indirect victimization.

Cyberbullying can occur in many forms, such as posting untrue information (deingratiation), repetitive taunting or insults (harassment), or revealing personal information about an individual without permission (outing) (Gladden et al., 2014; Hinduja & Patchin, 2015; Vessey et al., 2013). These forms of cyber-aggression may be performed once or repetitiously, as well as initiated by one online user or a group. Furthermore, much like bullying in the physical sense, this online crime can be perpetrated by any demographic. However, some studies have indicated females are more likely to commit cyberbullying due to the indirect nature of the crime (Marcum et al., 2014).

Cyberbullying victimization is pervasive and far-reaching. Among teenage Internet users, the Centers for Disease Control and Prevention (2017b) found that national trends of cyberbullying victimization remained relatively stable overall for both sexes and racial and ethnic groups at 14.9% from 2011 to 2017. In 2017 alone, females (19.7%) were cyberbullied more than males (9.9%), and white teenagers (17.3%) were cyberbullied more than blacks (10.9%) and Hispanics (12.3%) (Centers for Disease Control and Prevention, 2017c).

While cyberbullying victimization remained relatively stable over time and cross-sectional data show some sex and racial/ethnic differences, the repercussions that comes from cyberbullying is a major public health concern because it has serious consequences for mental and physical health as well as social life (Niemelä et al., 2011; Vessey et al., 2013). Among adolescents, researchers have shown cyberbullying victimization has been related to a number of public health outcomes that include smoking, alcohol use, depression, anxiety, illicit drug use, and risky sexual behaviors (Brighi et al., 2012; Glew et al., 2005; Hinduja & Patchin, 2013; Kowalski & Limber, 2013; Olweus, 1994; Roland, 2002).

Specifically regarding alcohol, the negative mental and social health consequences stemming from cyberbullying victimization have been found to play a mediating role in the drinking behaviors of youth. The feelings of depression, anxiety, and stress reported by victims can cause youth to turn to alcohol as a means to cope with or remove such negative emotions (Erol & Karpyak, 2015; Kowalski & Limber, 2013). While the social anxiety, loneliness, and mistrust for others resulting from victimization can lead to environments further conducive to delinquency including

drinking through poor peer, school, and parental attachment and monitoring (Brighi et al., 2012, Nixon, 2014).

Given the pervasiveness of cyberbullying and its connection to substance use, research on the epidemiology of alcohol use is scarce among this subgroup. A key objective of this study is to characterize the differences in alcohol use among those that have self-reported being cyberbullied by sex and race/ethnicity, both of which have been shown to be correlates alcohol use (Selkie et al., 2015; Kritsotakis et al., 2017) and being cyberbullied (Lund & Ross, 2017; Marcum et al., 2012, 2014). The hope is the results of this study will provide foundational knowledge lacking in this area to assist in public health planning (Holder et al., 1999). To provide the knowledge in this area, in the current study, we examine trends in alcohol use among cyberbullied individuals stratified on sex and race/ethnicity using national level data [i.e., Youth Risk Behavior Surveys (YRBS)].

## Methods

We used data from the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Survey (YRBS). The purpose of the YRBS is to monitor the incidence and prevalence of priority health risk behaviors of U. S. adolescents (CDC, 1991-2017). The survey was administered using a complex design. A three-stage cluster sampling design was used to produce a nationally representative sample of students in grades 9-12. All school (i.e., public, private, and Catholic) students, in grades 9-12, in the United States and the District of Columbia were included in the sampling frame. The selection of schools occurred systematically, based on probability that was proportional to school enrollment. All classes in a required subject, or all classes meeting during a particular period of the day, depending on the school, made up the sampling frame. The survey had a 71% response rate, and the sample size was 44,632. Finally, the sample was weighted to be nationally representative of high school students in the United States.<sup>1</sup> We chose these samples because the CDC did not begin collecting data on cyberbullying until 2011, and they have continued to collect this data since this period.

## Measures

Five measures were used for this study. The first measure was a self-report, dichotomous measure of whether the individual had at least one drink of alcohol on at least one day in the last 30 days (i.e., current alcohol use) (0=no and 1=yes). The second measure was a self-report, dichotomous measure of whether the individual had perceived if they had been electronically bullied including texting, Instagram, Facebook, or other social media during the past year (i.e., 0=no and 1=yes). Next was each respondent's self-report, dichotomous measurement of their biological sex (0=female and 1=male). The fourth measure for this study was the individual's self-report of the race and ethnicity (1=white, 2=black/African-American, 3=Hispanic, and 4=Other).

Lastly, the fifth measure for this study was the utilization of the calendar year.

## Data analysis plan

The data analysis took place in a series of steps. In the first step, we estimated the prevalence of current alcohol use based on victimization *via* cyberbullying, and then by sex and race/ethnicity. In addition, the 95% confidence intervals were calculated. In the second step, we followed the Center for Disease Control's guidelines for conducting trend studies with their data (CDC, 2017a). We began by conducting logistic regression models to evaluate the significance of linear and quadratic trends in current alcohol use over time.<sup>2</sup> In order to perform the logistic regression analysis, linear and quadratic terms were needed. We calculated orthogonal polynomials of year to create our linear and quadratic terms for these analyses (Johnson et al., 2015). A significant linear term would indicate an increase or decline in the trend, but a significant quadratic term would indicate an acceleration or deceleration of the trend (Schneider et al., 2018). It is possible for both linear and quadratic terms to be significant suggesting linear increases that are accelerating or decelerating or linear decreases that are accelerating or decelerating (Schneider et al., 2018). Because the CDC collected the YRBS data using a complex survey design, we used the CDC's weights and the *svy* package from Stata 15 (StataCorp, 2015) to perform all of the analyses.

## Results

Table 1 presents the results of the prevalence of current alcohol use among cyberbullied and non-cyberbullied individuals. In the cyberbullied group, the prevalence estimates for current alcohol use, among the cyberbullied group was 50.98% (95% CI: 47.78, 54.18) in 2011, compared to 42.72% (95% CI: 39.14, 46.29) in 2017. Over the study period, current alcohol use declined by -16.20%. The observed linear trend was significant ( $b = -0.12$ ,  $p < 0.00$ ), indicating a linear decline over the study period. The prevalence did not change in a quadratic manner ( $b = -0.00$ ,  $p < 0.96$ ). In the non-cyberbullied group, the prevalence for current alcohol use in the non-cyberbullied group was 36.49% (95% CI: 34.64, 38.33) in 2011, compared to 27.59% (95% CI: 25.21, 29.97) in 2017. Over the study period, current alcohol use changed -24.38%. The observed linear trend was significant ( $b = -0.15$ ,  $p < 0.00$ ), indicating a linear decline over the study period. The prevalence did not change in a quadratic manner ( $b = 0.01$ ,  $p < 0.75$ ).

Given our interest in the effect cyberbullying has on current alcohol use and current results from this study indicating cyberbullied individuals have higher levels of current alcohol use, from this point forward, we focused on only those that have been cyberbullied. Table 1 presents the results of the prevalence of current alcohol use among cyberbullied individuals stratified by sex. In this context, male current alcohol use prevalence was 51.07% (95% CI: 48.30, 53.83) in 2011, compared to 44.36% (95% CI: 40.22, 48.50)

in 2017. Over the study period, current alcohol use for male adolescents changed -13.13%. The observed linear trend was significant ( $b = -0.10$ ,  $p < 0.01$ ), indicating a linear decrease over the study period, and we found there was not a quadratic change for males ( $b = 0.01$ ,  $p < 0.91$ ). Further, female current alcohol use prevalence was 50.65% (95% CI: 43.51, 57.79) in 2011, compared to 38.95% (95% CI: 34.18, 43.73) in 2017. Over the study period, current alcohol use for females changed -23.10%. The observed linear trend was significant ( $b = -0.17$ ,  $p < 0.01$ ) indicating the linear decrease over the study period. The prevalence did not change in a quadratic manner ( $b = -0.02$ ,  $p < 0.72$ ). These results are consistent with the overall trends that current alcohol use is declining. The sex stratification indicates a larger decrease in current alcohol use for cyberbullied females than for males.

Next, in Table 2, we estimated the trends of current alcohol use by race for cyberbullied individuals. For white adolescents, the current alcohol use prevalence was 50.23% (95% CI: 45.63, 54.82) in 2011, compared to 44.76% (95% CI: 39.38, 50.14) in 2017. While the differences in the percentages show over the study period current alcohol use changed for whites by -10.88%, this change was not statistically significant in a linear nor quadratic form (linear [ $b = -0.09$ ,  $p < 0.11$ ] and quadratic [ $b = 0.02$ ,  $p < 0.77$ ]). For black adolescents, the current alcohol use prevalence was 56.31% (95% CI: 43.17, 69.45) in 2011, compared to 30.51% (95% CI: 20.00, 41.02) in 2017. Over the study period, current alcohol use for blacks changed -45.81%. The observed change was a significant linear decline ( $b = -0.39$ ,  $p < 0.00$ ). The prevalence did not change in a quadratic manner ( $b = 0.10$ ,  $p < 0.41$ ).

For Hispanic adolescents, the current alcohol use prevalence was 55.65% (95% CI: 49.74, 61.56) in 2011, compared to 45.84% (95% CI: 39.50, 52.18) in 2017. Over the study period, current alcohol for Hispanics use changed -17.64%, and this was significant ( $b = -0.17$ ,  $p < 0.01$ ) indicating a linear decline over the study period. The prevalence did not change in a quadratic manner ( $b = -0.09$ ,  $p < 0.21$ ). For other races/ethnicities, the current alcohol use prevalence was 43.57% (95% CI: 36.44, 50.69) in 2011, compared to 34.34% (95% CI: 26.37, 42.32) in 2017. Over the study period, current alcohol use changed -21.17%, but this change was not linear ( $b = -0.09$ ,  $p < 0.27$ ), nor was the change quadratic ( $b = -0.08$ ,  $p < 0.37$ ). These results indicate white and other racial/ethnic group respondents who were cyberbullied are not declining, while blacks/African-Americans and Hispanic individuals that were cyberbullied are declining in their current alcohol use. The results also show blacks and Hispanics in 2011 had the highest prevalence of current alcohol use, suggesting the decline in current alcohol use in these groups is, perhaps, a good indication that cyberbullying is not having as strong an influence on this behavior for these groups.

Next, we examined the trends of current alcohol use of adolescents by combining race/ethnicity and sex. First, we examine white males and females. Figure 1 shows that white male current alcohol use trends (i.e., prevalence) was 46.80% (95% CI: 35.94, 57.67) in 2011, compared to 42.59% (95% CI: 35.58, 49.59) in 2017. Over the study period, white male

**Table 1.** National race/ethnicity estimates of the trends of current alcohol use.

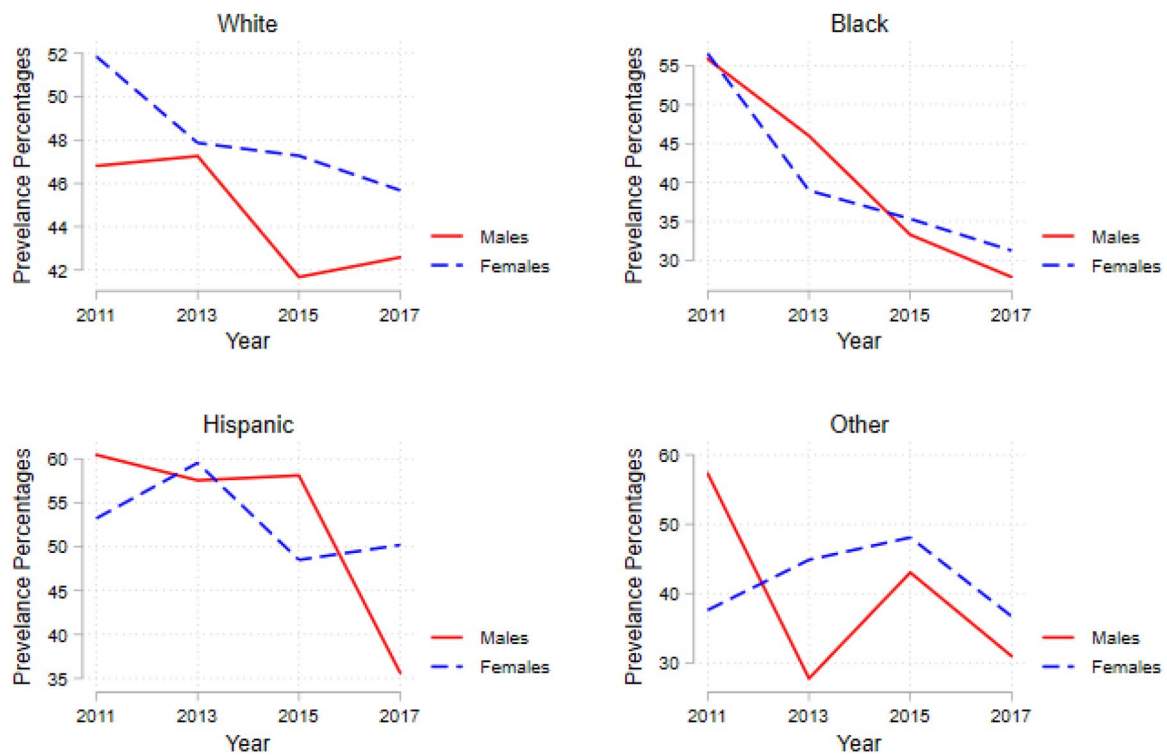
Year	Cyberbullied			Non-cyberbullied			Male			Female		
	Prevalence	LL	UL	Prevalence	LL	UL	Prevalence	LL	UL	Prevalence	LL	UL
All Years	46.93	44.88	48.99	31.74	30.53	32.96	47.62	45.23	50.01	45.39	42.44	48.34
2011	50.98	47.78	54.18	36.49	34.64	38.33	51.07	48.30	53.83	50.65	43.51	57.79
2013	47.93	43.28	52.57	32.67	30.34	35.00	48.33	42.89	53.76	46.90	41.27	52.53
2015	45.87	41.50	50.24	30.37	28.15	32.58	46.55	41.04	52.06	44.55	38.86	50.25
2017	42.72	39.14	46.29	27.59	25.21	29.97	44.36	40.22	48.50	38.95	34.18	43.73
Polynomial	b	p-value		b	p-value		b	p-value		b	p-value	
Linear Trend	-0.12	0.00		-0.15	0.00		-0.10	0.01		-0.17	0.01	
Quadratic Trend	0.00	0.96		0.01	0.75		0.01	0.91		-0.02	0.72	

LL = Lower Limit; UL = Upper Limit.

**Table 2.** National race/ethnicity estimates of the trends of current alcohol use.

Year	White			Black			Hispanic			Other		
	Prevalence	LL	UL	Prevalence	LL	UL	Prevalence	LL	UL	Prevalence	LL	UL
All Years	47.13	44.12	50.13	39.91	34.58	45.24	52.85	49.68	56.02	41.18	36.64	45.71
2011	50.23	45.63	54.82	56.31	43.17	69.45	55.65	49.74	61.56	43.57	36.44	50.69
2013	47.72	41.95	53.48	41.67	32.34	51.00	58.92	51.88	65.95	38.89	27.00	50.77
2015	45.55	38.60	52.49	34.46	24.92	44.00	51.65	45.25	58.05	46.09	37.60	54.58
2017	44.76	39.38	50.14	30.51	20.00	41.02	45.84	39.50	52.18	34.34	26.37	42.32
Polynomial	b	p-value		b	p-value		b	p-value		b	p-value	
Linear Trend	-0.09	0.11		-0.39	0.00		-0.17	0.01		-0.09	0.27	
Quadratic Trend	0.02	0.77		0.10	0.41		-0.09	0.21		-0.08	0.37	





**Figure 1.** Race/ethnicity and sex differences in current alcohol use of cyberbullied individuals.

current alcohol use changed  $-9.01\%$ , but it was not statistically significant change (i.e., linear [ $b=-0.08$ ,  $p<0.40$ ] or quadratic [ $b=0.01$ ,  $p<0.91$ ]). White female current alcohol use prevalence was  $51.86\%$  (95% CI: 48.30, 55.42) in 2011, compared to  $45.68\%$  (95% CI: 39.77, 51.58) in 2017. Over the study period, white female current alcohol use changed  $-11.92\%$  (i.e., linear [ $b=-0.09$ ,  $p<0.10$ ] or quadratic [ $b=0.02$ ,  $p<0.72$ ]). At the beginning of the study period, cyberbullied white females had a higher prevalence of current alcohol use. For both white males and white females, the prevalence of current alcohol use declined in non-statistically significant ways. Finally, at the end of the study period, white females maintained a higher prevalence of current alcohol use.

Figure 1 also shows the trends for black male and female adolescent current alcohol use. Black male current alcohol use trends (i.e., prevalence) was  $55.88\%$  (95% CI: 36.79, 74.98) in 2011, compared to  $27.85\%$  (95% CI: 12.19, 43.50) in 2017. Over the study period, black male current alcohol use changed  $-50.17\%$ , and this decline was a significant linear change ( $b=-0.46$ ,  $p<0.03$ ). The prevalence, however, did not change in a quadratic manner ( $b=0.03$ ,  $p<0.86$ ). Similarly, black female current alcohol use prevalence was  $56.60\%$  (95% CI: 41.59, 71.60) in 2011, compared to  $31.25\%$  (95% CI: 19.39, 43.12) in 2017. Over the study period, black female current alcohol use changed  $-44.79\%$ , and this decrease was a significant linear change ( $b=-0.37$ ,  $p<0.02$ ). The prevalence did not change in a quadratic manner ( $b=0.13$ ,  $p<0.35$ ). Similar to whites, black females began with a higher prevalence of current alcohol use than black

males. Both had significant linear decreases in current alcohol use, and black females continued to have a higher prevalence of current alcohol use at the end of the study period.

Figure 1 shows Hispanic adolescent male current alcohol use prevalence was  $60.45\%$  (95% CI: 49.75, 71.15) in 2011, compared to  $35.62\%$  (95% CI: 25.99, 45.24) in 2017. Over the study period, Hispanic male current alcohol use changed  $-41.08\%$ . The observed linear trend was significant ( $b=-0.33$ ,  $p<0.00$ ), suggesting the linear decrease over the study period, but there was not a quadratic change ( $b=-0.21$ ,  $p<0.08$ ). For Hispanic females, the current alcohol use prevalence was  $53.21\%$  (95% CI: 46.46, 59.97) in 2011, compared to  $50.20\%$  (95% CI: 43.18, 57.21) in 2017. Over the study period, Hispanic female current alcohol use changed  $-5.67\%$ , but the change was not significant (linear [ $b=-0.09$ ,  $p<0.23$ ] or quadratic manner [ $b=-0.04$ ,  $p<0.64$ ]). Hispanics males had a higher prevalence for current alcohol use than females. Further, males had the only significant change in current alcohol use.

Figure 1 shows “other” males, the current alcohol use prevalence was  $57.32\%$  (95% CI: 44.86, 69.79) in 2011, compared to  $30.96\%$  (95% CI: 16.74, 45.17) in 2017. Over the study period, current alcohol use changed  $-46.00\%$ . The prevalence did not change in a linear manner ( $b=-0.29$ ,  $p<0.06$ ). The prevalence did not change in a quadratic manner ( $b=0.13$ ,  $p<0.39$ ). For “other” females, the current alcohol use prevalence was  $37.60\%$  (95% CI: 29.86, 45.34) in 2011, compared to  $36.71\%$  (95% CI: 26.56, 46.85) in 2017. Over the study period, current alcohol use changed  $-2.38\%$ , and the change was not significant (linear manner [ $b=0.02$ ,  $p<0.80$ ] or quadratic [ $b=-0.19$ ,  $p<0.10$ ]).

## Discussion

Data analysis revealed several important findings related to future health and success of adolescents. Results indicated that current alcohol use is steadily decreasing despite the respondent's cyberbullied status. Furthermore, this was a consistent finding despite the method of separating the groups for analysis (i.e., sex, race). These findings are consistent with those from the 2018 National Survey on Drug Use and Health, indicating alcohol use in adolescents between the ages of 12 and 17 years old has decreased since 2002 (SAMHSA, 2019). However, the results from the 2018 National Survey on Drug Use and Health indicate the need for a huge level of concern regarding the epidemic of underage drinking, with approximately 2.2 million adolescents between the ages of 12 and 17 years old consuming alcohol in the past month and 1.2 million participated in binge drinking (SAMHSA, 2019). Underage drinking also has severe repercussions for an adolescent's physical, emotional and mental health (Hanes, 2012). For example, as the human brain continues to develop until age 25, underage drinking can cause memory loss and stunt neurological development. Youth who consume alcohol are also more likely to participate in risky sexual behavior, increasing rates of sexually transmitted diseases and unplanned pregnancy.

These problems with underage alcohol consumption note concern that cyberbullying victims appear to be using alcohol more frequently, potentially as a method of coping. As mentioned previously, cyberbullying victims can experience a range of mental health repercussions as a result of victimization, including anxiety, depression and suicidal ideation (Brighi et al., 2012; Glew et al., 2005; Hinduja & Patchin, 2013, 2015; Kowalski & Limber, 2013; Olweus, 1994; Roland, 2002). These negative emotions have also been linked to alcohol consumption (Erol & Karpyak, 2015), and this could explain the higher rate of drinking by cyberbullying victims and potential future harm as a result.

Additional results from this study found male adolescent alcohol use is slightly higher than female adolescents, but the female respondent rate of drinking decreased at a higher rate. Historically, females were more likely to abstain from alcohol use and less likely to exhibit problem drinking and alcohol-related disorders. However, recent research has indicated that adult male and female drinking patterns are becoming more similar (Fox, 2015; Slade et al., 2020), attributed to societal perceptions of female alcohol consumption changing over the years (Wilsnack, 2012). Furthermore, females are more likely to drink heavily when experiencing negative emotions, such as sadness, depression and anxiety (all potential results of cyberbullying). Excessive alcohol use leads to physical and mental health problems for both sexes (Erol & Karpyak, 2015), as well as problems specific to females, such as problems with reproductive health (Gill, 2000), breast cancer (Brooks & Zakhari, 2013), and pregnancy complications (Zelner & Koren, 2013). The larger decrease in alcohol use found among females may also be explained by a tendency to utilize more healthy coping strategies to deal with cyber victimization compared to males. Females are more likely

to ask a trusted adult for help, see greater social support from family and friends, experience positive bystander intervention, and apply problem solving skills following victimization which can reduce some of the negative mental health consequences (Bradbury et al., 2018; Nixon, 2014; Ronis & Slaunwhite, 2019).

The results also indicated that black adolescent alcohol use decreased the most compared to all other races, with the same findings even when separating race categories by sex. In addition, this drastic decrease in alcohol consumption resulted in white adolescents having a higher drinking rate compared to black adolescents. These findings are consistent with studies performed using Wave 1 and 2 of the National Longitudinal Study of Adolescent to Adult Health (Krieg & Kuhl, 2016) and Monitoring the Future data (Johnston et al., 2013). The difference in adolescent drinking rates by race could possibly be explained by neighborhood/structural disadvantage and differences in socioeconomic status (Krieg & Kuhl, 2016), as white youth are more likely to have ability and financial access to alcohol compared to black youth.

As stated previously, the fact that alcohol consumption of youth is decreasing is a positive finding, but the indication that specific demographics of youth are using alcohol at high rates (especially to potentially cope with cyberbullying) is of great concern. Adolescents and young adults are active members of a subculture where these behaviors are viewed as acceptable, or at the very least, expected. Law enforcement can be utilized as a tool to help combat cyberbullying, while also educating on the dangers of underage drinking. A recent study by Patchin and Hinduja (2016) found that informal sanctions by law enforcement officers rather than formal sanctions that cause embarrassment, judgment, and distrust are more effective in combatting issues of cyberbullying in adolescent populations. Esbensen et al. (2012, as cited in Marcum & Higgins, 2019) asserted success can be found in multi-week instructional programming targeted at this age group, utilizing law enforcement to provide detailed information on the following: 1) methods of cyberbullying and cyberstalking; 2) detrimental effects of the behaviors; 3) resources to report these behaviors; and 4) education on forming positive relationships online and resisting inappropriate behaviors. Law enforcement are actively providing a new option for prosocial online behavior, as well as creating positive bonds with young people, without resorting to formal criminal justice procedures.

In addition, the importance of the role in elementary and secondary education is imperative in a child's prosocial development. Studies have found schools that provide clear rules with thorough explanations of appropriate and inappropriate conduct, as well as sanctions affiliated with breaking the rules, help with the reduction of deviant behaviors (Catalano et al., 1999; Youniss et al., 1997). Teachers and school staff who work together to protect students from bullying behaviors, educate on prosocial methods of coping, and resources available to students can assist in developing a subculture where cyberbullying is not tolerated. Furthermore, this can decrease the negative repercussions victims experience when cyberbullied.

These results and recommendations have to be consumed within the confines of the limitations of the study. First, the study does not make use of longitudinal data. Longitudinal data will be able to show the effect that cyberbullying has on the individual over time. This could mask the individual change in alcohol use. Individuals may be changing in different ways that these data do not reveal. Our study survives because our intent is to provide a trend analysis in the CDC's (2017a) tradition. Second, cyberbullying is captured in a rather narrow manner. A broader definition of cyberbullying may provide more information in regard to alcohol use because it captures a broader content of domain. Further, it is possible that specific forms of cyberbullying may provide different trends in alcohol use. The analysis, however, was bound by the operational definition provided in the CDC data. Third, our measure of alcohol use does not capture binge drinking. Fourth, the school surveys did not include responses from youth who were absent on the days of survey administration. This is important as absentee youth are more likely to engage in alcohol use compared to students who regularly attend school (Gakh et al., 2020).

Despite the limitations, our study addresses adolescent alcohol among cyberbullied individuals and treats it as a public health problem. While additional research in this area is necessary to continue to monitor alcohol use among cyberbullied individuals. In addition, the additional research may consider using longitudinal data, a broader definition of cyberbullying, and more severe forms of alcohol use (i.e., binge drinking). The current study shows that alcohol use is declining, but for cyberbullied individuals. It is important to note for all individuals, alcohol use began higher than the overall trend; thus, it has a longer way to decline before it is not seen as a public health problem. This work serves as foundational research for addressing alcohol use among cyberbullied individuals. In our view, we are following Holder et al. (1999) four-stage approach to public health research. Holder et al. (1999) argued that a comprehensive descriptive understanding of a problem is essential before the development of interventions and other public health efforts. The results of this study are a step toward adequately defining the scope of alcohol use among cyberbullied individuals.

## Notes

1. To handle missing data, the models took advantage of the multi-stage cluster design (CDC, 2017a). This includes weights that handle non-response to the items (i.e., missing data). This is consistent with Schneider et al. (2018) use of these data conducting a trend analysis of cocaine use.
2. The authors understand that statistical significance is more likely given the sample size. As one reviewer pointed out, discussing the effect sizes might be more fruitful. Our use of logistic regression is only designed to determine the shape of the trend, and not a substantive interpretation of the relationship between the variables. We, thus, chose not to interpret the effect sizes to stay consistent with the CDC's (2017a) guidelines for performing trend studies with their data.

## References

- Bagnardi, V., Rota, M., Botteri, E., Tramacere, I., Islami, F., Fedirko, V., Scotti, L., Jenab, M., Turati, F., Pasquali, E., Pelucchi, C., Bellocco, R., Negri, E., Corrao, G., Rehm, J., Boffetta, P., & La Vecchia, C. (2013). Light alcohol drinking and cancer: A meta-analysis. *Annals of Oncology*, 24(2), 301–308. <https://doi.org/10.1093/annonc/mds337>
- Bagnardi, V., Rota, M., Botteri, E., Tramacere, I., Islami, F., Fedirko, V., Scotti, L., Jenab, M., Turati, F., Pasquali, E., Pelucchi, C., Galeone, C., Bellocco, R., Negri, E., Corrao, G., Boffetta, P., & La Vecchia, C. (2015). Alcohol consumption and site-specific cancer risk: A comprehensive dose-response meta-analysis. *British Journal of Cancer*, 112(3), 580–593. <https://doi.org/10.1038/bjc.2014.579>
- Baliunas, D. O., Taylor, B. J., Irving, H., Roerecke, M., Patra, J., Mohapatra, S., & Rehm, J. (2009). Alcohol as a risk factor for type 2 diabetes: a systematic review and meta-analysis. *Diabetes Care*, 32(11), 2123–2132.
- Bradbury, S. L., Dubow, E. F., & Domoff, S. E. (2018). How do adolescents learn cyber-victimization coping skills? An examination of parent and peer coping socialization. *Journal of Youth and Adolescence*, 47(9), 1866–1879. <https://doi.org/10.1007/s10964-018-0812-y>
- Brighi, A., Melotti, G., Guarini, A., Genta, M. L., Ortega, R., Mora-Mercha, J., Smith, P. K., & Thompson, F. (2012). Self-esteem and loneliness in relation to cyberbullying in three European countries. In Q. Li, D. Cross, & P. K. Smith (Eds.), *Cyberbullying in the global playground: Research from international perspectives* (pp. 32–56). Wiley Blackwell.
- Brooks, P., & Zakhari, S. (2013). Moderate alcohol consumption and breast cancer in women: From epidemiology to mechanisms and intervention. *Alcoholism: Clinical and Experimental Research*, 37(1), 23–30. <https://doi.org/10.1111/j.1530-0277.2012.01888.x>
- Catalano, R. F., Oxford, M. L., Harachi, T. W., Abbott, R. D., & Haggerty, K. P. (1999). A test of the social development model to predict problem behavior during the elementary school period. *Criminal Behaviour and Mental Health*, 9(1), 39–56. <https://doi.org/10.1002/cbm.290>
- Centers for Disease Control and Prevention. (2017a). *Conducting trend analyses of the YRBS data*. Conducting Trend Analyses of YRBS Data (cdc.gov). Published June 2018. Accessed, June, 8, 2020.
- Centers for Disease Control and Prevention. (2017b). *Combining YRBS data across years and across sites*. Youth Risk Behavior Survey: Combining YRBS Data across Years and Sites (cdc.gov). Published June 2018. Accessed, June, 8, 2020.
- Centers for Disease Control and Prevention. (2017c). *Youth risk behavior survey data summary and trendreport 2007*. Retrieved June, 8, 2020, from <https://www.cdc.gov/healthyyouth/data/yrbs/pdf/trendsreport.pdf>
- Choi, Y., J., Myung, S. K., & Lee, J. H. (2018). Light alcohol drinking and risk of cancer: A meta-analysis of cohort studies. *Cancer Research and Treatment*, 50(2), 474–487. <https://doi.org/10.4143/crt.2017.094>
- Corrao, G., Bagnardi, V., Zambon, A., & La Vecchia, C. (2004). A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine*, 38(5), 613–619. <https://doi.org/10.1016/j.ypmed.2003.11.027>
- Erol, A., & Karpyak, V. M. (2015). Sex and gender-related differences in alcohol use and its consequences: Contemporary knowledge and future research considerations. *Drug and Alcohol Dependence*, 156, 1–13.
- Esbensen, F., Peterson, D., Taylor, T., & Osgood, D. (2012). Results from a multisite evaluation of the G.R.E.A.T. program. *Justice Quarterly*, 29(1), 125–151. <https://doi.org/10.1080/07418825.2011.585995>
- Fox, M. (2015). Male, female drinking habits becoming more similar. *NBC News*. <https://www.cnbc.com/2015/11/23/male-female-drinking-habits-becoming-more-similar-study.html>
- Gakh, M., Coughenour, C., Assoumou, B. O., & Vanderstelt, M. (2020). The relationship between school absenteeism and substance use:



- An integrative literature review. *Substance Use & Misuse*, 55(3), 491–502. <https://doi.org/10.1080/10826084.2019.1686021>
- Gill, J. (2000). The effects of moderate alcohol consumption on female hormone levels and reproductive function. *Alcohol and Alcoholism*, 35(5), 417–423. <https://doi.org/10.1093/alcac/35.5.417>
- Gladden, R. M., Vivolo-Kantor, A. M., Hamburger, M. E., & Lumpkin, C. D. (2014). *Bullying surveillance among youths: Uniform definitions for public health and recommended data elements. Version 1.0*. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention and U.S. Department of Education.
- Glew, G. M., Fan, M.-Y., Katon, W., Rivara, F. P., & Kernic, M. A. (2005). Bullying, psychosocial adjustment, and academic performance in elementary school. *Archives of Pediatrics & Adolescent Medicine*, 159(11), 1026–1031. <https://doi.org/10.1001/archpedi.159.11.1026>
- Grant, B. E., Stinson, F. S., Dawson, D. A., Chou, P., Dufour, M. C., Compton, W., Pickering, R. P., & Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 61(8), 807–816. <https://doi.org/10.1001/archpsyc.61.8.807>
- Greenfield, T. K., Karriker-Jaffe, K. J., Kaplan, L. M., Kerr, W. C., & Wilsnack, S. C. (2015). Trends in alcohol's harms to others (AHTO) and co-occurrence of family-related AHTO: The four US National Alcohol Surveys, 2000–2015. *Substance Abuse*, 9(suppl 2), 23–31.
- Hanes, M. (2012). Effects and consequences of underage drinking. *Juvenile Justice Bulletin*. <https://ojdp.ojp.gov/sites/g/files/xyckuh176/files/pubs/237145.pdf>
- Hinduja, S., & Patchin, J. (2013). Social influences on cyberbullying behaviors among middle and high school students. *Journal of Youth and Adolescence*, 42(5), 711–722. <http://dx.doi.org/wncn.wncn.org/10.1007/s10964-012-9902-4><https://doi.org/10.1007/s10964-012-9902-4>
- Hinduja, S., & Patchin, J. (2015). *Bullying beyond the schoolyard: Preventing and responding to cyberbullying* (2nd ed.). Sage.
- Holder, H., Flay, B., Howard, J., Boyd, G., Voas, R., & Grossman, M. (1999). Phases of alcohol problem prevention research. *Alcoholism: Clinical and Experimental Research*, 23(1), 183–194. <https://doi.org/10.1111/j.1530-0277.1999.tb04043.x>
- Johnson, R. M., Fairman, B., Gilreath, T., Xuan, Z., Rothman, E. F., Parnham, T., & Furr-Holden, C. D. M. (2015). Past 15-year trends in adolescent marijuana use: Differences by race/ethnicity and sex. *Drug and Alcohol Dependence*, 155, 8–15. <https://doi.org/10.1016/j.drugalcdep.2015.08.025>
- Johnston, L. D., Miech, R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E. (2018). *Monitoring the Future national survey results on drug use, 1975–2017: Overview, key findings on adolescent drug use*. Institute for Social Research, The University of Michigan. <http://www.monitoringthefuture.org/pubs/monographs/mtf-overview2017.pdf>
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2013). Monitoring the Future national results on adolescent drug use: Overview of key findings, 2012.
- Kowalski, R. M., & Limber, S. P. (2013). Psychological, physical, and academic correlates of cyberbullying and traditional bullying. *The Journal of Adolescent Health*, 53(1 Suppl), S13–S20. <https://doi.org/10.1016/j.jadohealth.2012.09.018>
- Krieg, A., & Kuhl, D. (2016). Race, adolescent binge drinking, and the context of neighborhood exposure. *Deviant Behavior*, 37(6), 615–633. <https://doi.org/10.1080/01639625.2015.1060804>
- Kritsotakis, G., Papanikolaou, M., Androulakis, E., & Philalithis, A. (2017). Associations of bullying and cyberbullying with substance use and sexual risk taking in young adults. *Journal of Nursing Scholarship*, 4, 360–370.
- Lewis-Laietmark, C., Wettlaufer, A., Shield, K. D., Giesbrecht, N., April, N., Asbridge, M., Dell, C., Rehm, J., & Stockwell, T. (2017). The effects of alcohol-related harms to others on self-perceived mental well-being in a Canadian sample. *International Journal of Public Health*, 62(6), 669–678. <https://doi.org/10.1007/s00038-016-0924-7>
- Lund, E., & Ross, S. (2017). Bullying perpetration, victimization, and demographic differences in college students: A review of the literature. *Trauma, Violence & Abuse*, 18(3), 348–360. (<https://doi.org/10.1177/1524838015620818>)
- Marcum, C. D., & Higgins, G. E. (2019). Examining the effectiveness of academic scholarship on the fight against cyberbullying and cyberstalking. *American Journal of Criminal Justice*, 44(4), 645–655. <https://doi.org/10.1007/s12103-019-09482-8>
- Marcum, C. D., Higgins, G. E., Freiburger, T. L., & Ricketts, M. L. (2012). Battle of the sexes: An examination of male and female cyberbullying. *International Journal of CyberCriminology*, 6(1), 904–911.
- Marcum, C. D., Higgins, G. E., Freiburger, T. L., & Ricketts, M. L. (2014). Exploration of the cyberbullying victim/offender overlap by sex. *American Journal of Criminal Justice*, 39(3), 538–548. <https://doi.org/10.1007/s12103-013-9217-3>
- Niemelä, S., Brunstein-Klomek, A., Sillanmäki, L., Helenius, H., Piha, J., Kumpulainen, K., Moilanen, I., Tamminen, T., Almqvist, F., & Sourander, A. (2011). Childhood bullying behaviors at age eight and substance use at age 18 among males. A nationwide prospective study. *Addictive Behaviors*, 36(3), 256–260. <https://doi.org/10.1016/j.addbeh.2010.10.012>
- Nixon, C. L. (2014). Current perspectives: The impact of cyberbullying on adolescent health. *Adolescent Health, Medicine and Therapeutics*, 5, 143–158. <https://doi.org/10.2147/AHMT.S36456>
- Olweus, D. (1993). *Bullying at school: What we know and what we can do*. Oxford, UK and Cambridge MA, USA: Blackwell Publishers.
- Olweus, D. (Ed.) (1994). *Bullying at school: Long-term outcomes for victims and an effective school-based intervention program*. Plenum Press.
- Patchin, J. W., & Hinduja, S. (2016). *Bullying today: Bullet points and best practices*. Sage (Corwin Press).
- Patra, J., Taylor, B., Irving, H., Roerecke, M., Baliunas, D., Mohapatra, S., & Rehm, J. (2010). Alcohol consumption and the risk of morbidity and mortality for different stroke types—A systematic review and meta-analysis. *BMC Public Health*, 10, 258. <https://doi.org/10.1186/1471-2458-10-258>
- Piano, M. R., & Phillips, S. A. (2014). Alcoholic cardiomyopathy: Pathophysiologic insights. *Cardiovascular Toxicology*, 14(4), 291–308. <https://doi.org/10.1007/s12012-014-9252-4>
- Praud, D., Rota, M., Rehm, J., Shield, K., Zatoński, W., Hashibe, M., La Vecchia, C., & Boffetta, P. (2016). Cancer incidence and mortality attributable to alcohol consumption. *International Journal of Cancer*, 138(6), 1380–1387. <https://doi.org/10.1002/ijc.29890>
- Rehm, J. (2015). *Light or moderate drinking is linked to alcohol related cancers, including breast cancer*. *BMJ*, 351: h4400.
- Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*, 373(9682), 2223–2233. [https://doi.org/10.1016/S0140-6736\(09\)60746-7](https://doi.org/10.1016/S0140-6736(09)60746-7)
- Rehm, J., & Roerecke, M. (2015). Patterns of drinking and liver cirrhosis—What do we know and where do we go? *Journal of Hepatology*, 62(5), 1000–1001. <https://doi.org/10.1016/j.jhep.2015.01.027>
- Rehm, J., Shield, K. D., Roerecke, M., & Gmel, G. (2016). Modelling the impact of alcohol consumption on cardiovascular disease mortality for comparative risk assessments: An overview. *BMC Public Health*, 16, 363. <https://doi.org/10.1186/s12889-016-3026-9>
- Roland, E. (2002). Bullying, depressive symptoms and suicidal thoughts. *Educational Research*, 44(1), 55–67. <https://doi.org/10.1080/00131880110107351>
- Ronis, S., & Slaunwhite, A. (2019). Gender and geographic predictors of cyberbullying victimization, perpetration, and coping modalities among youth. *Canadian Journal of School Psychology*, 34(1), 3–21. <https://doi.org/10.1177/0829573517734029>
- Samokhvalov, A. V., Rehm, J., & Roerecke, M. (2015). Alcohol consumption as a risk factor for acute and chronic pancreatitis: A systematic review and a series of meta-analyses. *EBioMedicine*, 2(12), 1996–2002. <https://doi.org/10.1016/j.ebiom.2015.11.023>
- Schneider, K. E., Krawczyk, N., Xuan, Z., & Johnson, R. M. (2018). Past 15-year trends in lifetime cocaine use among US high school

- students. *Drug and Alcohol Dependence*, 183, 69–72. <https://doi.org/10.1016/j.drugalcdep.2017.10.028>
- Selkie, E., Kota, R., Chan, Y., & Moreno, M. (2015). Cyberbullying, depression, and problem alcohol use in female college students: A multi-site study. *Cyberpsychology, Behavior and Social Networking*, 18(2), 79–86. <https://doi.org/10.1089/cyber.2014.0371>
- Slade, T., Chapman, C., Teesson, M. (2020). *Women's alcohol consumption catching up to men: Why this matters*. <https://ndarc.med.unsw.edu.au/blog/womens-alcohol-consumption-catching-men-why-matters>
- StataCorp (2015). *Stata Data Analysis Statistical Software: Release 14*. StataCorp LP, College Station, TX. <http://www.stata.com/>.
- Substance Abuse and Mental Health Services Administration. (2019). *Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health*. <https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHNationalFindingsReport2018/NSDUHNationalFindingsReport2018.pdf>
- Taylor, B., Irving, H. M., Baliunas, D., Roerecke, M., Patra, J., Mohapatra, S., & Rehm, J. (2009). Alcohol and hypertension: Gender differences in dose-response relationships determined through systematic review and meta-analysis. *Addiction*, 104(12), 1981–1990. <https://doi.org/10.1111/j.1360-0443.2009.02694.x>
- Taylor, B., Irving, H. M., Kanteres, F., Room, R., Borges, G., Cherpitel, C., ... & Rehm, J. (2010). The more you drink, the harder you fall: a systematic review and meta-analysis of how acute alcohol consumption and injury or collision risk increase together. *Drug and Alcohol Dependence*, 110(1-2), 108–116.
- Vessey, J. A., DiFazio, R. L., & Strout, T. D. (2013). Youth bullying: A review of the science and call to action. *Nursing Outlook*, 61(5), 337–345. <https://doi.org/10.1016/j.outlook.2013.04.011>
- Wilsnack, S. (2012). The GENACIS project: A review of findings and some implications for global needs in women-focused substance abuse prevention and intervention. *Substance Abuse and Rehabilitation*, 3(Suppl 1), 5–15. <https://doi.org/10.2147/SAR.S21343>
- World Health Organization (WHO). (2018). *Global status report on alcohol and health 2018* [Licence: CC BY-NC-SA 3.0 IGO]. World Health Organization.
- Yadav, D., & Lowenfels, A. B. (2013). The epidemiology of pancreatitis and pancreatic cancer. *Gastroenterology*, 144(6), 1252–1261. <https://doi.org/10.1053/j.gastro.2013.01.068>
- Youniss, J., Yates, M., & Su, Y. (1997). Social integration community service and marijuana use in high school seniors. *Journal of Adolescent Research*, 12(2), 245–262. <https://doi.org/10.1177/0743554897122006>
- Zelner, I., & Koren, G. (2013). Alcohol consumption among women. *Journal of Population Therapeutics and Clinical Pharmaceuticals*, 20(2), e201–e206.