

I Drink, I Get Drunk, I Fall Down, No Problem: An Analysis of College Student Binge Drinking and Related Decision Making Behaviors

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Abstract—A web-based survey was developed to begin to measure the drinking norms at the Foxfield Races with the hopes of using the results to create a safer environment at future events. Students drink more at the Foxfield Races than a typical Saturday night with almost one-quarter (24.8%) of respondents having 6 or more additional drinks. Students think other students are drinking more than they really are (7.1 actual vs. 8.1 perceived). 46% of students reported experiencing at least one negative consequence as a result of their own drinking. 41% of students reported experiencing at least one negative consequence as a result of others' drinking. Most students make safe transportation plans and follow through with those plans. Only 2.9% knowingly drove back from Foxfield after drinking. Students are not making as good choices with respect to food as only 14.4% brought enough to last for the entire event. Only 26.7% of respondents knew where the first aid tent was located.

I. INTRODUCTION

On college campuses, high-risk drinking and the associated negative consequences have become a national concern. Between 10% and 30% of college students experience direct or second-hand negative effects of alcohol use each year [1]. Each year an estimated 1,400 college students die from alcohol-related unintentional injuries, 2.1 million students drive under the influence of alcohol and 110,000 students are arrested for an alcohol-related violation. Between 1998 and 2001, the proportion of 18 to 24 year-old college students who reported driving under the influence of alcohol increased from 26.5% to 31.4% [2].

Alcohol use is prevalent among, and accepted by, many students at the University of Virginia (UVa) and contributes to many negative outcomes. UVa has been monitoring undergraduate students' drinking behavior since the late 1980's. According to the 2006 Health Behaviors Survey (HBS), 75.3% of students reported drinking in the past month. 9.0% reported driving while under the influence of alcohol, 9.8% reported getting injured or hurt, 12.1% reported hurting academic performance, and 30.0% behaved in ways later regretted in the past year due to alcohol [3].

There are times when students may be more likely to engage in high risk behaviors such as at the Foxfield horse races, held five miles west of UVa. The races are held on the last Saturday in April, when the weather is typically hot and sunny, which increases susceptibility to dehydration and increased blood alcohol concentrations (BAC). Out of approximately 23,000 tailgating patrons, about 8,000 are college students. Dangerous drinking at Foxfield Races has led to injuries and arrests as well as hospital visits [4]-[6].

After some alcohol-related incidents at the 2005 races, including a serious drunk driving crash involving an underage participant, the Albemarle County Police Department developed a coalition of law enforcement agencies and citizen advocacy groups to work with the Foxfield Racing Association to create a safer environment for those in attendance and in the surrounding locality. In addition to law enforcement, there are prevention activities, including a sober driver program, a Safe Ride Home cab program, and emergency medical services at the race area. However it is not clear if (or how well) these interventions are working.

This paper discusses a web-based survey developed and administered after last year's races in order to understand student drinking norms and related behaviors at Foxfield with the hopes of using the analysis to create a safer environment at future events. The focus of the survey was to address the following questions:

- Are student drinking behaviors at the Foxfield Races different from other events? Are there certain sub-populations of students more likely to drink heavily compared with others?
- What are the negative consequences of student drinking at Foxfield, if any?
- Are students well-prepared for the day at Foxfield?
- Are students aware of the existing services (transportation, parking and first aid)?

The answer to these questions may influence UVa's Center for Alcohol and Substance Education (CASE), law enforcement, and other resources allocated to the Foxfield Races and may help in developing new interventions.

II. METHODS

A. Sample

2,000 students were randomly selected by the university's information technology group (250 male and female undergraduates in each of the four class years). These 2,000 students were sent an initial mass e-mail detailing the

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purpose of the project shortly after the running of the races. After 1 week, a follow-up e-mail was sent again to the entire pool of 2,000. 430 students responded (a response rate of 21.5%). Of those, only the ones who had been to Foxfield at least once, reported the number of drinks consumed at Foxfield, and reported the number of hours spent drinking were included in the analysis, leaving a sample of 244 students (Table 1).

Table 1. Survey demographics

Year in School	Gender	n	
1 st	Male	18	7.4%
1 st	Female	23	9.4%
2 nd	Male	29	11.9%
2 nd	Female	32	13.1%
3 rd	Male	31	12.7%
3 rd	Female	32	13.1%
4 th	Male	31	12.7%
4 th	Female	48	19.7%

B. Survey Instrument

The survey instrument was divided into three sections: demographics, non-Foxfield drinking, and Foxfield-related. The 5 demographic questions included: year at the university, gender, age, weight, and extra-curricular activities. Gender and weight were used to calculate estimated blood alcohol concentration (eBAC), a potentially useful index of alcohol-induced intoxication and impairment. The other demographics support comparisons between groups and organizations.

The non-Foxfield section included questions measuring drinking norms (average number of drinks consumed and hours spent drinking) for each of day of the week, at UVa home football games, and during Halloween. Halloween was chosen as a measure of comparison because it is a social, non-University-sponsored event, similar to Foxfield.

The Foxfield section gathered data about drinking norms at the Foxfield Races. One question asked whether or not the respondent had ever attended Foxfield and if yes, how many times. Two questions asked for the average number of drinks consumed and hours spent drinking by the respondent and two others asked about perception of peer drinking. One question asked about one's method of transportation to and from Foxfield. The options provided were:

- I was a designated sober driver to and from Foxfield;
- I rode the CTS bus;
- I had a sober friend drive me to and from Foxfield;
- I drove to Foxfield but left my car there overnight and found another transportation source back;
- I drove to Foxfield and back because I did not think I drank enough to impact my driving;
- I drove to Foxfield and back even though I had too

much to drink;

- My group chartered a bus;
- Other Please Specify

Another question asked if an individual would drink more if he knew he were being driven to and from Foxfield by a sober driver.

Two questions focused on negative consequences: both for self and others. The options provided for negative consequences of another's drinking were:

- Placed me in a caretaking role (helping someone who is sick, helping someone get home, etc.);
- Damaged my personal property (car, clothing, etc.);
- I was a passenger in a vehicle driven by a drunk driver;
- I experienced physical pushing, shoving or hitting;
- Jeopardized a relationship (caused a verbal argument);
- I experienced an unwanted sexual advance;
- Disrupted my study time;
- Disrupted my sleep;
- Prevented me from enjoying the horse races;
- Other Please Specify:

The options for consequences of one's own drinking were:

- Had a hangover;
- Was nauseous or vomited;
- Was taken to the ER (UVa or other);
- Got into a physical fight;
- Took advantage of someone sexually;
- Experienced unwanted sexual advance or sexual assault;
- Drove a car under the influence;
- Was arrested for DUI/DWI (driving under the influence or while intoxicated)
- Been in trouble with police for something OTHER THAN DUI;
- Urinated in public;
- Blacked out (had memory loss);
- Other Please Specify:

One question asked if the respondent knew where the first aid tent was. Two questions asked the respondent what foods were consumed before attending and while at Foxfield. The options for these two questions were the same:

- Water;
- Juice (without alcohol mixed);
- Soda (without alcohol mixed);
- Fruits;
- Vegetables;
- Bread product;
- Dairy product;
- Meat;
- Other Please Specify:

One question asked the respondents how long it took for their group to run out of food. Another asked the

respondents about their experiences in watching the actual horse races. There was an open-ended comment area at the end.

C. Data Analysis

Estimated blood alcohol content was calculated from gender, weight and number of hours of drinking data and set to 0.0 if the calculated value was negative [7], [8]:

$$eBAC = \left[\frac{\text{consumption}}{2} * \frac{GC}{\text{weight}} \right] - \frac{0.016}{\text{hours}} \quad (1)$$

where

consumption = number of drinks in the drinking session

hours = the number of hours over which drinking occurs

weight = weight in pounds

GC = gender constant (9.0 for females and 7.5 for males)

III. RESULTS

Significant results are report using an alpha level of 0.05 and trends at 0.10.

A. Student Drinking Behaviors

Students self-reported drinking an average of 7.07 drinks at Foxfield but the average number of drinks increased to 8.33 when the non-drinkers were excluded (Table 2). 91 of the respondents who reported drinking were younger than 21 years old. Students thought that on average others drank 8.11 drinks which, using a two-sided paired t test, is statistically higher than the 7.07 ($t_{243} = -3.245$; $p = 0.001$).

Table 2. Self-reported student drinking at Foxfield, Halloween and a typical Saturday night

Measure	N	Mean	Std. dev.	Max.
Foxfield num. drinks (all)	244	7.07	5.38	26
Perceptions of others' num. drinks	244	8.11	3.11	20
Foxfield num. drinks (drinkers only)	207	8.33	0.34	26
Own num. hours (drinkers only)	207	6.7	0.2	18
eBAC (drinkers only)	207	0.12	0.007	0.45
Halloween num. drinks (all)	201	6.61	0.40	34
Sat. night num. drinks (all)	201	5.89	0.28	20
Foxfield num. drinks (drink at all 3 events)	155	8.83	5.00	26
Halloween num. drinks (drink at all 3 events)	155	8.44	5.00	34
Sat. night num. drinks (drink at all 3 events)	155	6.59	4.05	20

To make comparisons between Foxfield and other events, only the drinkers were considered. For example, there were 24 students who reported drinking on a Saturday night, but having no drinks at Foxfield. They may have been the “sober drivers” at Foxfield. Regardless, of the 207 respondents who self-reported drinking at Foxfield, 4 did not answer the Halloween questions and another 2 did not answer the typical Saturday questions. For the remaining 201 students, 45 reported having no drinks at Halloween and 6 reported having no drinks on a typical Saturday night (one not in the previously mentioned 45). For the 201 who reported drinking at Foxfield but not necessarily on Halloween and a typical Saturday night, a repeated measures ANOVA test of the within-subjects effects of event comparing the number of drinks at Foxfield with Halloween and a typical Saturday night was significant at $p < 0.001$ ($F_{2,400} = 33.125$). Using the Bonferroni adjustment for multiple comparisons, it was confirmed that the number of drinks at Foxfield was greater than for Halloween ($p < 0.001$) and a typical Saturday night ($p < 0.001$) and that Halloween was greater than the typical Saturday night ($p = 0.042$). When only considering the 155 who reported drinking at all 3 events, the Bonferroni post hoc analyses did not show a statistical difference between Foxfield and Halloween, but both were statistically higher than a typical Saturday night.

Of the 201 drinkers, 52 reported having fewer drinks at Foxfield than on a typical Saturday night, while almost three times as many (149) reporting having more drinks at Foxfield. Of the 149, almost half (48.3%, 72 students) reported having 3 or fewer additional drinks, almost one-quarter (24.8%; 37 students) reported having 6 or more drinks than on a typical Saturday night (Figure 1). These 37 students represent 15.2% of the total 244 respondents.

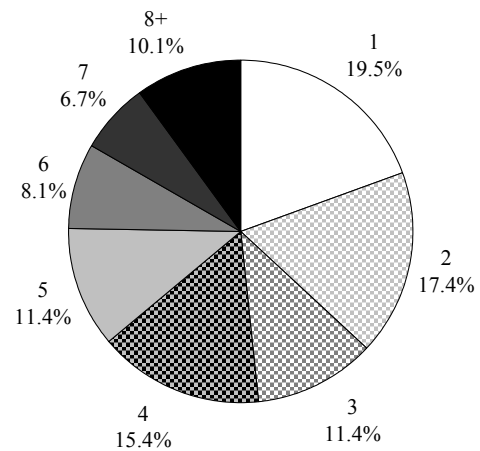


Figure 1. Number and percentage of additional drinks at Foxfield compared with a typical Saturday (N=149)

Not every demographic self-reported drinking at the same level. For example, a χ^2 test of association indicated that there is an association of whether a student drinks and his or her year in school ($\chi^2 = 23.373$, $df = 3$, $p < 0.001$) (Figure 2). The more junior students are less likely to drink at all. For the 207 self-reported drinkers, a single factor ANOVA

analysis by year in school indicated a trend toward significance ($F_{3,203}=2.334$; $p=0.075$) and the post hoc test showed that first years (mean=6.26, std. dev. =4.11) drank less than the 3rd (mean=8.96, std. dev. =3.68) and 4th (mean=8.82, std. dev. =5.80) years but not statistically less than the 2nd years (mean=8.00, std. dev. =4.51). Using the eBAC data, the ANOVA was not significant.

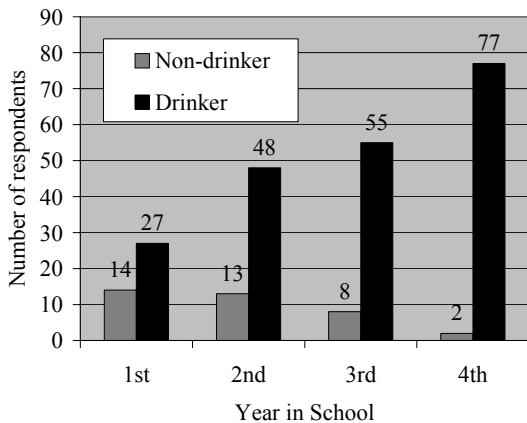


Figure 2. Drinkers at Foxfield by Year in School

Gender differences were significant for the number of drinks but not for eBAC. Of the 207 drinkers, 85 males self-reported having a mean of 10.78 drinks (std. dev. = 5.64) and the 122 females reported a mean of 6.63 drinks (std. dev. = 3.29). A two-sided t-test (assuming unequal variances) was significant ($t_{123,59}=6.091$; $p<0.001$).

While on average, the 106 Greek students (IFC) self-reported drinking more at Foxfield (mean=7.44, std. dev. =6.21) than others (mean=6.77, std. dev. =4.60), this difference was not significant. When comparing students who self-reported having at least one drink, the mean difference increased (IFC Greeks: mean=9.03, std. dev. =5.7; others: mean=7.81, std. dev. =4.03), with a trend toward statistical significance ($t_{150,836}=-1.732$; $p=0.085$ for the two-tailed test). Using the eBAC data, the test was not significant.

B. Negative consequences of student drinking

45.9% of students reported experiencing at least one negative consequence as a result of their own drinking. Hangovers were by far the most common negative consequence (97 reports). Blacking out (35 respondents) and vomiting (31 respondents) were the next most common ones. 24 students reported urinating in public. While no students self-reported being charged with a DUI or DWI, 3.2% (8 out of 244) of students drove home after drinking. One of these students reported driving after having twelve drinks. Four of these students indicated that they were serving as the “sober driver” (one of whom reported having six drinks). Four students reported getting involved with the police (not driving related) and three had to be treated at the emergency room. Three were involved in fights. One student reported taking advantage of someone sexually and three reported being taken advantage of sexually. One person mentioned cheating on the person she was currently dating.

One student mentioned losing a cell phone. One student reported being late to work.

41% of students reported experiencing at least one negative consequence as a result of others’ drinking. The most common negative consequence was being placed in the caretaker role (56 respondents). Experiencing physical abuse was the next most common (27 reports). One student mentioned having a bone broken. 24 students mentioned that other peoples’ drinking jeopardized their relationships. Students commented that they were embarrassed by their friends’ behaviors. 18 respondents reported having study interrupted and 18 also mentioned interrupted sleep. 14 students reported that others prevented them from enjoying the horse races. 13 reported having their property damaged. 8 reported experiencing an unwanted sexual advance due to another’s drinking. With respect to the behavior of others, students also mentioned having drinks spilled on them and being disturbed by witnessing people being arrested or behaving poorly.

C. Planning/Preparation

Most students made safe transportation plans and followed through with those plans. Only 7 (2.9%) knowingly drove back from Foxfield after drinking (Figure 3). Four of the 7 were supposed to be the sober drivers while twenty seven students reported being the completely sober drivers. The rest of the students used alternative means (taxis, sober friends, buses).

Only 11 students self-reported not eating anything before leaving for the races and only 1 of these students reported not drinking alcohol at Foxfield. Another 34 students only had liquids (water, juice, soda or coffee). The other 199 students had some solid food (bread, meat, dairy products, fruit, vegetables). Students mentioned having more filling foods such as breakfast bars, pancakes, eggs as well as snacks such as chips.

20 students self-reported not eating anything during the races and only 1 of these students reported not drinking at Foxfield. Another 20 students only had liquids (water, juice, soda or coffee). The other 204 students had some solid food (bread, meat, dairy products, fruit, vegetables; Figure 5). For the “other” food items, students mentioned having more filling foods such as pizza, barbeque, chicken, and sandwiches as well as snacks such as candy, cookies, and chips.

The gates at Foxfield were open from 10:30AM until 5:30 PM (7 hours). In general, the students’ food did not last for that long (Figure 6). Of the 195 students who provided a response, only 14.4% brought food that lasted for the entire event.

D. Knowledge of Services

Students were asked whether or not they knew where the first-aid tent was at Foxfield. There were 243 valid responses with only 65 “yes” responses (26.7%).

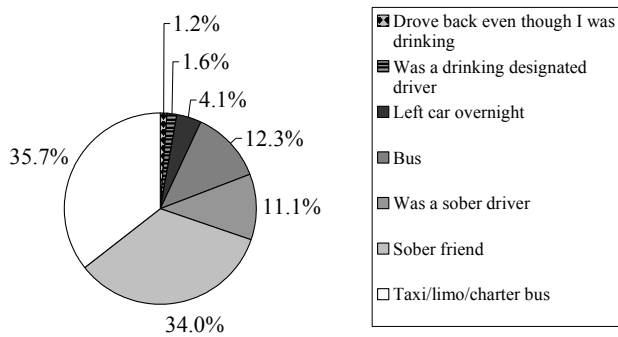


Figure 3. Transportation Choices Back from Foxfield

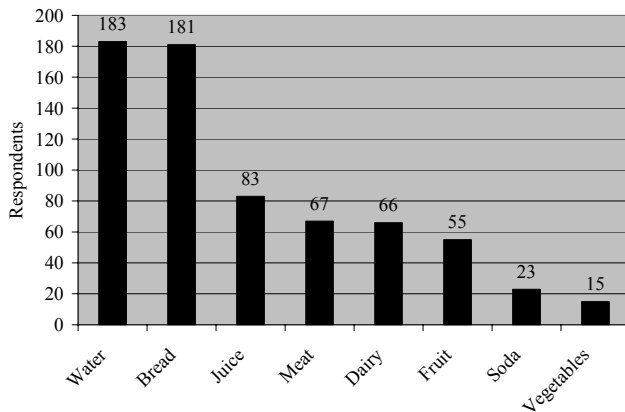


Figure 4. Food Choices before Foxfield

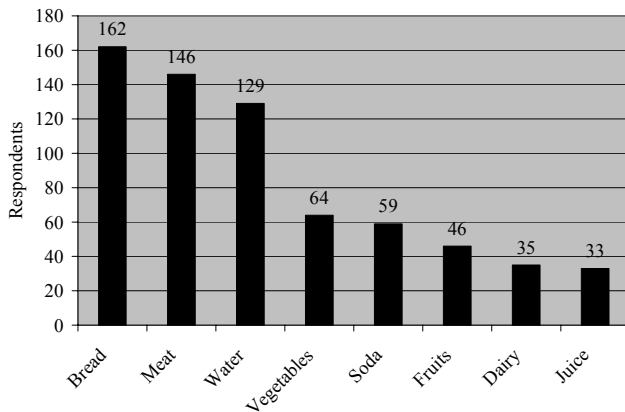


Figure 5. Food Choices during Foxfield

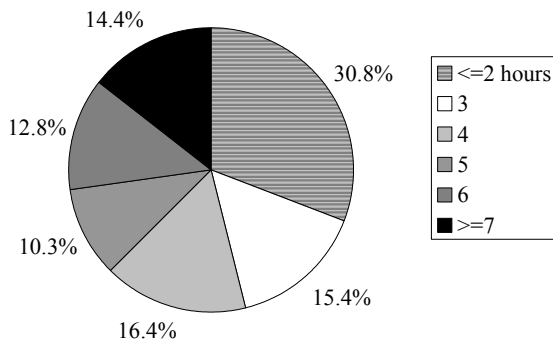


Figure 6. Hours before Student Ran Out of Food (N=195)

IV. DISCUSSION

Without data to quantify the drinking norms at Foxfield, it is difficult for organizations such as the Center for Alcohol and Substance Education and the Foxfield Races Association to understand where to focus limited resources available to support safer events, with respect to alcohol consumption and general health and safety. This effort provided an analysis in support of this goal.

Focusing on drinking at Foxfield is justified as many students drink significant quantities of alcohol. Drinking students tend to drink more alcohol than they typically do. Almost one quarter of the drinkers are drinking substantially more (six drinks or more) than they normally do. It is possible that it is not just that students are drinking more than usual that is putting them at risk. These extra drinks put the students at higher risk for negative consequences such as blackouts and the need for medical attention.

Students think other students are drinking more than they really are (7.1 actual vs. 8.1 perceived). It is possible that social norms marketing campaign may work to educate students about the drinking norms. The social norms approach involves correcting misperceptions about the prevalence and acceptability of high-risk alcohol use. A number of studies have documented how college students consistently overestimate the amount of alcohol that their peers consume [9-12] and misperception of peer norms is associated with higher rates of alcohol use [10, 13-14]. One way to reach students with messages about the prevalence of healthy behaviors is through social marketing - an approach that applies traditional marketing techniques to support healthy behaviors [15].

It is not just the fraternity students who engage in these behaviors. Prior research by CASE has shown that in general, students that are associated with Greek organizations tend to drink more than non-Greek students. The data have caused CASE to focus intervention activities on the Greek community. However, the present analysis has shown that there is no statistical difference in drinking patterns at Foxfield for Greek and non-Greek students, meaning that CASE may have to try other strategies for the Foxfield event. Resources to educate students on high-risk drinking at Foxfield should not just be focused on the Greek community but on the entire student body.

With respect to potential interventions, the data show that focusing exclusively on drunk driving is not the only strategy for UVa students. The majority of the students are in general making safe choices for transportation. One intervention is to ensure that the "sober driver" really is sober, but even here only small numbers of drivers are drinking at all. However no students should be behind the wheel when safe transportation is freely available. Future work should investigate how to get the number of drinking drivers down to zero.

Interventions may need to focus on the impact high-risk drinking on oneself and others. Almost half of the respondents admitted to negative consequences, corroborating the results of the HBS. These data uphold the

assumption that high-risk drinking poses a health threat and creates an unsafe environment for drinkers and non-drinkers alike. The numbers of students blacking out and vomiting are quite high. Future work should investigate how to increase student awareness of the symptoms of alcohol poisoning and how students can intervene when their friends are drinking too much. Additionally, less than 30% of the respondents knew where the first-aid tent was, indicating that better communication regarding available resources at Foxfield may be necessary.

Information concerning how to prepare for a day of alcohol consumption may be beneficial. Many students are running out of food much earlier than they are running out of alcohol. Conversations with students after the data were collected uncovered the practice of some student groups of letting the males bring the alcohol and the females bring the food. Sometimes the female students underestimate how much their male colleagues can eat. Simple interventions may involve publicizing both this issue and data on how much people of different sizes need to eat on a hot day in the sun when alcohol is available.

While drinking at Foxfield is the major concern of this endeavor, there is a larger problem that it is attacking. Although alcohol is a staple facet to the culture of college life, it is the *choices* that students make that are the root of the problem. Although many students are making lower risk choices by finding safe ways home, they may be inadvertently putting themselves at risk for other negative consequences.

When making comparisons, the results for the estimated blood alcohol content data did not turn out to be significant when the data for the number of drinks were. The eBAC may have turned out to be less reliable as it required the students to self-report multiple items: weight, the number of drinks, and the number of hours. Future work should investigate better measures and data collection methods to determine the eBAC values.

A new survey should be designed to investigate some of the findings herein and to help inform future educational materials. It should focus on what students know about transportation options and their attitudes toward designated drivers who drinks; this would help to ensure that no students drink and drive. The new survey should also investigate student knowledge about the first aid tent as so few students are aware of it. The new survey should also investigate student knowledge about and use of other services such as 911. With respect to preparation, the new survey should consider what types of food students are eating with a focus on healthier foods. It should also continue to investigate the amount of food students bring.

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