MIND THE GAP: GENDER DIFFERENCES IN ALCOHOL CONSUMPTION AND PROTECTIVE BEHAVIORAL STRATEGIES AT A LARGE PUBLIC UNIVERSITY, 2002 - 2016

by

David B. Salafsky

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As members of the Dissertation Committee, we certify that we have read the dissertation prepared by **David B. Salafsky** titled **MIND THE GAP: GENDER DIFFERENCES IN ALCOHOL CONSUMPTION AND PROTECTIVE BEHAVIORAL STRATEGIES AT A LARGE PUBLIC UNIVERSITY, 2002 – 2016,** and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

Dr. Ken Schachter, **Dissertation chair** Date: **8/3/18**

Dr. Robin Harris, **Dissertation member** Date: **8/3/18**

Dr. Nicole Yuan, **Dissertation member** Date: **8/3/18**

Dr. Paul Hsu, **Dissertation member** Date: **8/3/18**

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director: **Dr. Ken Schachter** Date: **8/3/18**

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SIGNED: David B. Salafsky

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DEDICATION

For my Father, Dr. Bernard P. Salafsky (1935 - 2017),
who instilled a love of learning
and who believed in the power of education.

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LIST OF ABBREVIATIONS

ACHA	American College Health Association
ASTP	Alcohol Skills Training Program
BRFSS	Behavioral Risk Factor Surveillance System
BAC	Blood Alcohol Content/Concentration
BASICS	Brief Alcohol Screening and Intervention for College Students
CHS	The University of Arizona Campus Health Service
HWS	UA Campus Health Service's Health & Wellness Survey
MTF	Monitoring the Future Survey/Study
NCHA	National College Health Assessment
NHTSA	National Highway Traffic Safety Administration
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NSDUH	National Survey on Drug Use and Health
PBS	Protective Behavioral Strategies
SHADE	Student Health Alcohol and Drug Education
UA	The University of Arizona

ABSTRACT

Alcohol use among college students is a persistent and far-reaching public health issue. While some measures of alcohol use within the college population appear to have improved, questions remain as to whether the alcohol use gender gap has been stable or is in a period of change. Protective behavioral strategies (PBS), harm reduction approaches commonly used to address high-risk alcohol use among college students, were also assessed, to determine their relationship with several key alcohol consumption measures for both males and females.

Methods: This research summarizes alcohol-related consumption measures based on annual, cross-sectional survey data collected between 2002 - 2016 at a large, public university. Linear regression models as well as descriptive statistics were used to explain overall trends and gender-specific patterns of use over time. In addition, an analysis based on pooled data between 2013 – 2016 was conducted to determine the association between protective behavioral strategies and key alcohol consumption measures, to inform programming that uses these strategies to reduce high risk alcohol use among students, and determine which strategies may be more likely to benefit either males and females for the following alcohol measures: binge drinking in the past two weeks, average drinks when partying and the number of drinks last time consumed alcohol. Both logistic and linear regression models were used to describe these relationships.

Results: The results of the 15-year trend analysis revealed significant and meaningful declines among all students in past 30-day alcohol use, average number of drink consumed in the past week, average number of nights students “party” each week, and reductions in the frequency of binge drinking. Looking at the gender gap specifically, these results showed a declining

gender gap (i.e. where the difference between male and female use decreased) most notably in average number of drinks consumed in the past week, estimated BAC last time students drank, and past 30 day alcohol use. Based on recent survey results, women showed slightly higher past 30-day alcohol use and reported a higher estimated BAC last time they drank, compared to men.

For the second aim of the study, which was based on pooled data collected between 2013 - 2016, most PBS that were expected to moderate alcohol use showed clear and strong protective effects, with a few exceptions. Top strategies for females that were associated with lower alcohol consumption included stopping alcohol use 1-2 hours before going home, avoiding pre-partying and avoiding hard liquor. For men, these included setting a limit on drinks, avoiding pre-parting, and avoiding hard liquor.

Conclusion: A number of alcohol measures improved during the study period, and for these, male university students showed greater declines, on average, than females – resulting in a shrinking gender gap. Decreases in the frequency of drinking occasions likely influenced overall declines in average drinks per week and the frequency of binge drinking. Male and female students showed considerable overlap with respect to protective behavioral strategies that were negatively associated with alcohol use and identified a few strategies that may have limited effectiveness. These results highlight evolving trends in alcohol use among college students and point to specific strategies which can help address this longstanding public health issue. Policy and program recommendations, informed by these findings, are detailed in its conclusion.

INTRODUCTION

Purpose

This study examines alcohol use among college students. While few groups can boast more research dedicated to them on this topic, alcohol consumption and related behaviors continue to evolve on college campuses - despite a perception that the issue is static and immutable. Given major shifts in higher education that relate to demographics, accessibility, cost, and technology, it is particularly useful to continue to research this significant student health issue, which impacts the safety, wellbeing and success of college students in a rapidly changing landscape.[1, 2] The research presented here seeks to better understand college student alcohol use during a period of considerable social and structural change and offer insights into which strategies show the most promise to reduce alcohol related risk within the college population.

This dissertation has two aims, both of which are addressed through a multi-year analysis of an annual, cross-sectional survey, administered by the University of Arizona Campus Health Service. The first aim compares alcohol use among males and females over a 15-year period on a range of measures, between 2002 and 2016. National research has shown evidence of increasing alcohol use among women relative to men, and that trend has significant implications for how alcohol use is approached from both a policy and a programmatic standpoint. While societal trends play a part in the changing way alcohol is consumed, there are gaps in what is known about these emerging trends at the college level. This research attempts to fill that gap, using data collected at a large, public university, which likely is of interest to other institutions of similar size, scope, and composition.

The second aim focuses on the relationship between alcohol use and protective behavioral strategies (PBS) for the years 2013 - 2016. PBS are an important element in many alcohol prevention programs on college campuses and seek to reduce alcohol related risk as a

part of a harm reduction approach. These strategies figure prominently in education-based strategies that are implemented by college prevention staff, both for primary prevention directed to students at large, as well as intervention programs, such as the Alcohol Skills Training Program (ASTP) and Brief Alcohol Screening and Intervention for College Students (BASICS).[3] This aim quantifies the association between these strategies and several alcohol use measures, and examines how these effects differ by gender, with the goal of identifying strategies associated lower risk drinking, which will inform college health professionals in both population and program-based work on college campuses.

During the study period, the author was an employee of the UA Campus Health Service and was active in both collecting and utilizing data from its annual Health & Wellness Survey (HWS) in that role. Alcohol education figured prominently in this position as well, which underscored the need to use data, whenever possible, to inform the practice of health education to improve its reach, resonance, and impact, among college students, as well as to disseminate findings and trends to campus stakeholders. The research questions described above are born out of that work and explain how alcohol use may be changing on campus, and by whom, but also how colleges and universities can use these results to help construct better program and risk reduction initiatives.

Literature Review

Alcohol use and misuse is a leading cause of morbidity and mortality among college students and has been called the most significant public health issue that this population faces.[4,5] It is associated with increased vehicular injury and death, suicide, homicide, sexual assault, interpersonal violence, high risk sex, and accidental death. Each year in the United States (U.S.),

alcohol has been linked to 1,800 college student fatalities, 97,000 sexual assaults and nearly 600,000 unintentional injuries.[6] Furthermore, 18-29 year olds represent the highest percentage of the U.S. population with alcohol use disorders - the age range for the vast majority of college students.[7]

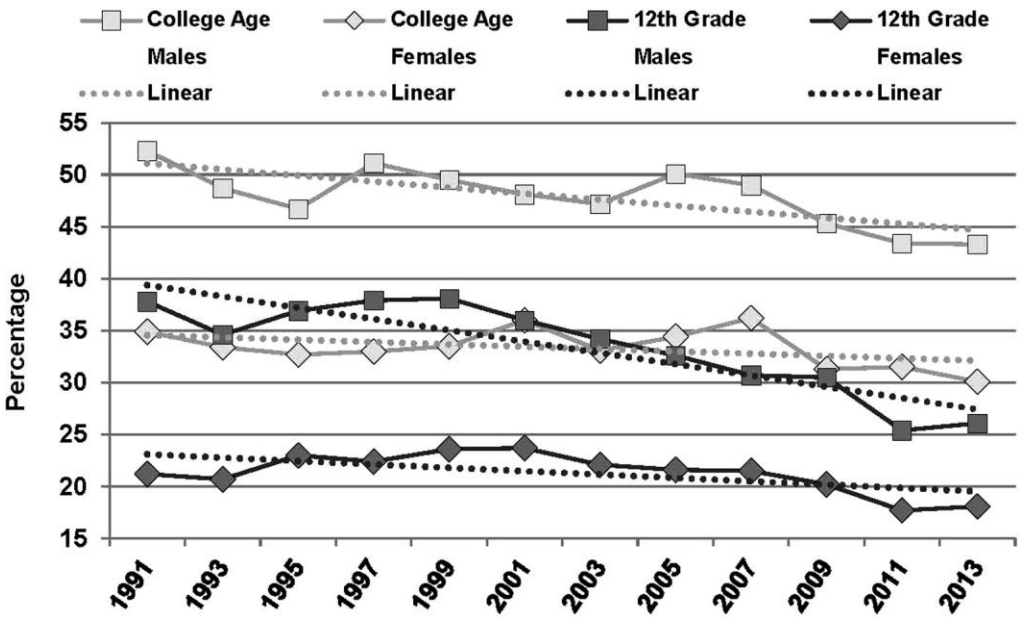
Alcohol use is also an impeding factor in student success, achievement and persistence to graduation.[8] Heavy drinkers, in particular, more commonly miss class, fall behind on their studies and perform poorly on tests and assignments, compared to college students who do not drink heavily.[10-12] In addition, student alcohol use is negatively associated with academic motivation, as well as subjective assessments of academic performance.[13] Beyond alcohol's primary impact on the individual student, this issue also exacts a price at the university level. These so called "secondary effects" of alcohol are detrimental to other students and the university environment as a whole.[14,15] And as the higher education landscape becomes increasingly competitive and costly, student success and persistence to graduation have become more important than ever, underpinning the importance of factors which can support or hinder those goals.[16]

Much of the risk associated with alcohol use in this population stems from heavy episodic drinking, more commonly referred to as "binge" drinking. Over 40% of U.S college students report binge drinking in the past two weeks, often defined as five or more drinks in a single sitting. Alternatively, some research and organizations such as the Substance Abuse Mental Health Association (SAMHSA) and the Centers for Disease Control (CDC), use a slightly lower binge drinking threshold for women, defining it as four of more drinks at a time.[17] Studies show that students who binge drink are more likely experience a host of negative alcohol-related consequences compared to students who do not drink or who consume alcohol at lower levels,

including a greater risk of impaired driving, injuries, poor academic outcomes, unprotected sex, and legal problems.[17]

Among high school seniors in the U.S, binge-drinking rates have been falling over time, largely driven by declines among males. By comparison, binge drinking among females in this age group has remained more or less unchanged during the same timeframe.[18] Similarly, the Monitoring the Future Survey (MTF), derived from a national sample, has shown an overall decrease in the prevalence of binge drinking among college students as well - from 40% in 2002 to 32% in 2016. Again, this 20% overall decrease was strongly influenced by declines among males.[19] Sharper declines of male binge drinking relative to females for both 12th graders and college students and college students are presented in Figure 1 below.

Figure 1: Rates of binge drinking in the past 2 weeks among male and female college students and 12th graders, 1991–2013.



Source: Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2016). Monitoring the Future national survey results on drug use, 1975-2015: Volume II, college students and adults ages 19-55.

Men drink more than women, consistently and nearly universally, across different countries and cultures.[20] This hold true in the United States, where men drink more and are also more likely to experience alcohol use disorders, compared to women.[21] While males continue to drink more than females in the U.S., recent national data have shown that the gender gap with respect to alcohol consumption is narrowing. Annual data collected from the MTF Survey shows that among 12th graders the gap between males and females has fallen from 23 percentage points in 1975 down to only 3 percentage points in 2016 for ever having five or more drinks in a row.[18] In examining frequent binge drinking among adolescents between 1991 - 2015, Jang et al similarly found convergence between males and females among 8th, 10th and 12th graders on this measure during the past two weeks.[22] In addition to rising rates of heavy alcohol use among females, national data also shows that adolescent girls are now more likely to have earlier age of first alcohol use, compared to males.[23, 24]

In the U.S. at large, the county-specific Behavioral Risk Factor Surveillance System (BRFSS) found that between 2005 - 2012 "increases in heavy and binge drinking prevalence in recent years have tended to be larger for women than for men." [25] Similarly, Keyes and Grant showed that gender differences have decreased among younger birth cohorts in the U.S. for a number of alcohol use indicators.[26] Slade et al. employed a systematic review and meta regression model to examine male to female alcohol use trends by birth cohort and confirmed a closing gap over time, which was most pronounced in recent years among young adults.[27] The reasons behind decreases in the alcohol gender gap in the wider population are not entirely known, but may be related to increases in the percentage of women who work outside of the home, declines in the number of women having children, and changing gender roles.[28, 29]

Interestingly, a shrinking gender gap has not been observed with other drugs, making this trend somewhat unique to alcohol use. In fact, the opposite effect has been described with respect to marijuana use in the U.S. A large-scale study by Carliner et al found that while marijuana prevalence increased between 2002 and 2014, men used more relative to women, resulting in a widening gender gap. The largest increases were found among low-income men following the 2007 recession, and the authors cited legalization and economic insecurity during this time period as the primary drivers of these changes.[30] By contrast, tobacco (cigarette) use declined over time in the U.S. during the same period but the percentage difference between male and female smokers has been relatively stable in recent years.[31] These trends suggests that new patterns of alcohol use are running counter to what has been seen with other commonly used drugs.

At the college level, one study that examined trends in alcohol consumption at a single university between 2002 and 2008, found that the gender gap decreased on a number of measures, due to increases in use among females for 30-day alcohol consumption, annual frequency, and average weekly intake.[32] Furthermore, among college students who participated in a log of their alcohol use over the academic year, females exceeded NIAAA weekly guidelines for alcohol consumption more often than men.[33] A recent analysis of the National Survey on Drug Use and Health (NSDUH) between 2002 - 2012 further supported a shrinking gender gap between males and females in national samples of the general population. However, the authors found that the one exception to this trend was among full-time college students, who unlike other groups, did not see gender differences narrow.[34] The reason for this discrepancy between the college and wider U.S. populations is not known, underscoring the need for additional research to examine the alcohol use gender gap among enrolled students in higher education.

At the UA, annual reviews of Health and Wellness Survey data have shown that some measures of alcohol use have improved over time. These include decreases in past 30-day alcohol use, average reported number of drinks per week, and the frequency of binge drinking in the past two weeks among those who drink heavily. Other measures, by contrast, have remained relatively unchanged, such as the average number of drinks and blood alcohol content (BAC) last time students "partied". Alcohol use has been associated with a number of demographic variables at the UA. For example, UA students who are members of a fraternity or sorority report higher consumption levels, consistent with national trends.[35-38]

Table 1 describes how the UA HWS data compares with two national surveys, based on results from 2016. As can be seen below, the UA matches up closely with these national results, and asks several questions shared on both surveys as well as one measure (average drinks per week) listed here that is specific to the HWS. While the differences are relatively minor, the 2016 HWS shows slightly lower percentages for students who consumed alcohol in the past year and past 30 days. However, the HWS showed somewhat higher numbers compared to the national surveys for both binge drinking frequency, average drinks per week, and drinks last time students consumed alcohol.

Table 1: Recent College Alcohol Indicators, UA HWS vs. National Data

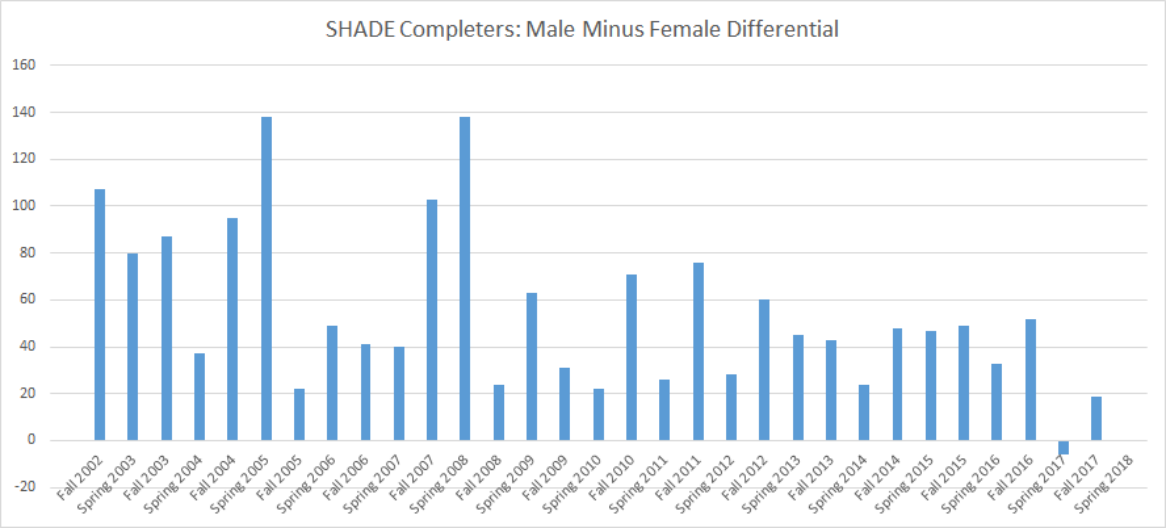
Alcohol Measure	**2016 UA HWS**	**2016 National College Health Assessment**	**2016 Monitoring the Future**
% consumed alcohol in the past year	76.8	-	79.2
% consumed alcohol in the past 30 days	61.6	63.6	67.7

% reported binge drinking (5+ drinks/sitting)	36.6	31.3	32.0
Drinks per week (mean)	3.9	-	-
Drinks last time drank (mean)	4.72	4.36	-

Source: 2016 UA Health & Wellness Survey (n=3,103), 2016 National College Health Assessment (NCHA/ACHA) Spring Survey (n=95,761)[39], 2016 Monitoring the Future Survey (MTF) (n=14,343)[40]

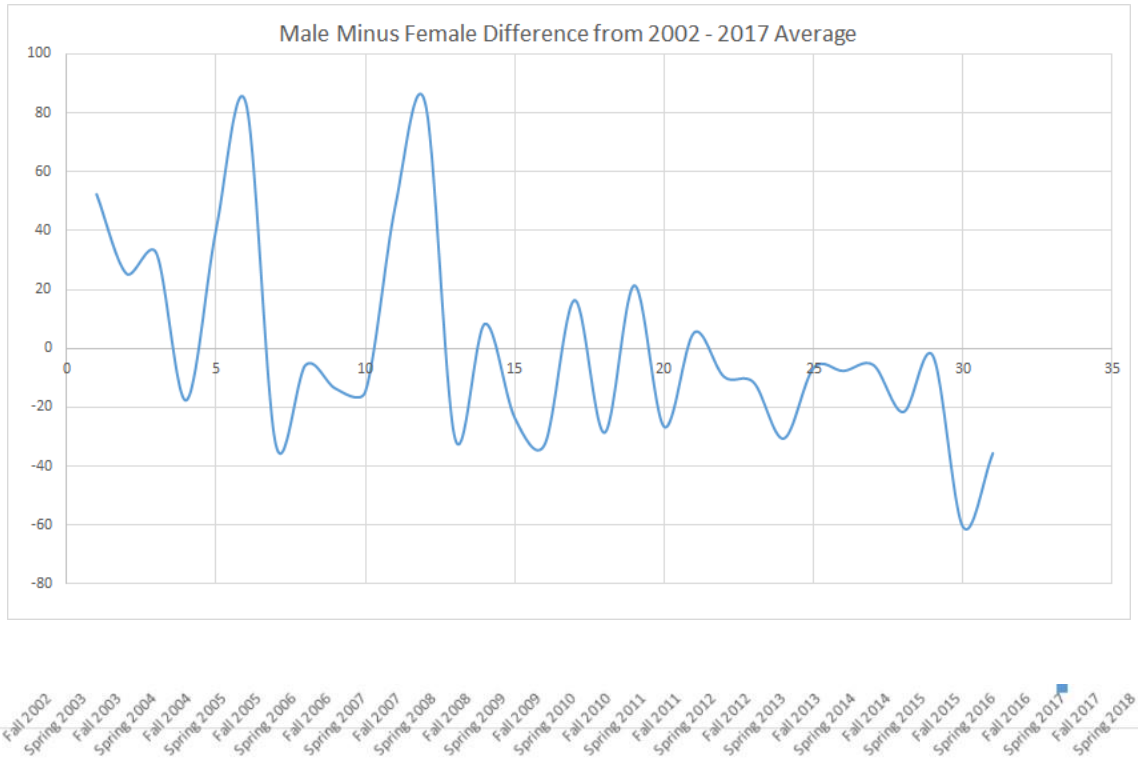
One sign of a possible changing pattern of alcohol use at the UA has been evident through the review of university program data from an alcohol education course for adjudicated students following alcohol policy infractions. For many years, health promotion staff at the University of Arizona Campus Health Service has facilitated a six-hour SHADE (Student Health Alcohol and Drug Education) course which has been a part of the university's diversion process. Underage students found to be drinking or in possession of alcohol were typically referred to the class by the campus police department, housing staff or Dean of Students office. SHADE instructors, including the author, noticed that while female students were underrepresented in classes in the early 2000s, that seemed changed over time, with a higher percentage of females in recent years. Program data comparing participation by gender over time support this. Figures 2 and 3 below illustrate how the program gender gap (i.e. difference between male and female participants by semester) has diminished over time (Fig. 2), and how each single year difference compared to the average difference for the entire period (Fig. 3). All other factors being equal, this campus-specific data suggests that increased alcohol use among women is resulting in more violations and referrals than in the past. Campus policies and enforcement procedures have not changed in any glaring way that would affect how males or females are being referred to the program, which suggests increased alcohol use among females - and perhaps higher risk use that would be more likely to result in an alcohol violation - during this timeframe.

Figure 2: SHADE Program Differences in Male and Female Student Participants



Source: University of Arizona Campus Health Service SHADE Report [41]

Figure 3: SHADE Program Annual Differences in Male and Female Student Participants, Compared to Multi-Year Average Difference



Source: University of Arizona Campus Health Service SHADE Report [41]

Protective Behavioral Strategies (PBS), which are assessed in the second aim of this study, draw on self-efficacy theory and the theory of planned behavior to promote risk reduction techniques that individuals can employ to reduce alcohol consumption and related negative consequences. These strategies often focus on limiting alcohol intake (e.g. setting a maximum number of drinks for the night), reducing the speed at which drinks are consumed (e.g. avoiding shots or drinking games), or promoting behaviors that reduce risk (e.g. use of a designated driver).[42] Research has supported the inverse relationship between PBS and both alcohol use and related negative outcomes, both individually as well as for composite PBS measures.

One well-developed study included 4,154 students across 13 large public universities and found that, as hypothesized, self-reported PBS use was associated with decreased binge drinking and alcohol-related problems based on a summary score from seven items: 'alternate alcoholic and nonalcoholic drinks,' 'determined in advance to limit the number of alcoholic drinks I consumed,' 'purposefully limited the amount of money I spent on alcohol,' 'used a designated driver,' 'eaten before and/or during alcohol consumption,' 'avoided drinking games,' and 'counted drinks.' [43] Haines and Barker found clear associations between PBS and alcohol related risk by examining the spring 2002 National College Health Assessment Survey (NCHA), noting that reported use of multiple PBS had an additive effect in reducing harm and risk, supporting the idea that the strategies operate both individually and synergistically.[44] Recent studies have shown similar relationships between PBS and typical and heaviest drinking days during the past 30 days, number of heavy episodic drinking episodes (i.e. binge drinking), and estimated BAC last time students drank.[45-47]

Despite the body of published research on PBS, knowledge gaps still exist. There is ample evidence describing that college women are more likely to report using PBS than men, but

fewer studies have explored the role of gender and PBS in mediating alcohol-related outcomes.[48-50] Although alcohol is highly accessible for college students at-large, females are more likely to receive free drinks than males, and women who receive free drinks have more than twice the risk of binge drinking compared to women who do not typically drink for free.[51] For this reason, along with the fact that that women are more adversely affected by alcohol's effects compared to men due in part to a slower rate of alcohol metabolism and smaller average body size, PBS are particularly important for them in reducing alcohol-related consequences.[52] Rising levels of alcohol consumption among women further emphasizes this potential for risk that is more pronounced among female drinkers.

Both male and female college students tend to underestimate the frequency of PBS use among their peers, even when they themselves use the strategies. Women, however, have been shown to underestimate this to a greater degree than men.[53] One reason for this discrepancy between behavior and perception may be due to students' optimistic views of their own self-control relative to others.[54] Another may be the fact that students simply do not widely discuss these strategies with each other, in a social climate where risk, rather than safety is more likely to be seen as acceptable – or even celebrated. Even as women report more PBS than men, this misperception may be an important barrier that prevents further uptake of these strategies, thereby affecting alcohol use and related consequences.

Research Questions

Aim 1: Alcohol Use Trends by Gender

The first aim in this research is to describe the trends in alcohol consumption behaviors among male and female college students at the University of Arizona between the years 2002 - 2016. These include summaries for the measures listed in the Table 2 below. In addition, the key research question here is: how has the alcohol use gender gap changed - if at all - between undergraduate students at the University of Arizona, between the years 2002 - 2016, based on the results of the annual UA Health & Wellness Survey (HWS)? This analysis will examine the multiple measures below to determine overall trends as well as whether the male to female gender gap is flat, increasing or decreasing during the study time frame.

Table 2: Aim 1 Alcohol Measures, Health & Wellness Surveys 2002 - 2016

Question	Response Format	Data Type	Notes
Alcohol use in the past 30 days	Yes No	Binary	
How often, if ever, had you had five or more drinks in one sitting?	Never Not in the past two weeks Once in the past two weeks Twice in the past two weeks 3 - 5 times, past two weeks 6 or more times, past two weeks	Ordinal Binary (Yes/No)	This is also referred to as "binge drinking" or "heavy episodic drinking".
Average number of drinks you consume in a typical week	Number entry (0-99)	Count	This question will be analyzed two ways. First, with all students - which includes those who

			report zero drinks per week. A secondary analysis will also examine the average based on those students who consume one or more drinks per week (i.e. those who typically drink alcohol).
When you party, how many drinks do you usually have?	Number entry	Count	
How many drinks did you have last time you drank?	Number entry	Count	Estimated Blood Alcohol Concentration (BAC) will also be generated based on these responses, along with Gender and Weight, in survey demographics.
Estimated BAC, last time drank	This measure is calculated based on the previous two measures (drinks and hours, last time drank), as well as the gender and weight measures collected in the survey.	Continuous	This BAC equation is computed based on the National Highway Traffic Safety Association's (NHTSA) estimated BAC equation.[55]
How often do you usually party?	Never Once or twice a year Once or twice a month Once a week Twice a week Three or more times a week	Ordinal	This question was asked prior to 2007, but the response format was different before that time. Therefore, the 2007-2016 data

			are analyzed here for consistency for this question alone. While this is not an alcohol consumption measure *per se*, it does speak to the frequency of alcohol consumption.

Aim 2: Protective Behavioral Strategies and Alcohol Measures

This study's second aim asks the following primary research question: based on recent, pooled HWS data for the years 2013 - 2016, what is the relationship between protective behavioral strategies and the relevant alcohol consumption measures, among UA undergraduates? Second, and in keeping with this paper's theme, these results are analyzed to compare the relationship between PBS and alcohol measures, for both males and females. This will help determine which strategies show the greatest negative effect size relative to alcohol consumption with the intention of informing targeted approaches to reduce alcohol use among both males and females. The full list of the 11 strategies that appear in the HWS are found below in Table 3.

Table 3: Protective Behavioral Strategies (PBS), Health & Wellness Surveys 2013 - 2016

Question: When you drink, how often do you do the following?	**Response Format**
Stop drinking at least 1 to 2 hours before I go home	Never, Rarely, Usually, Always
Alternate with non-alcoholic beverages	Never, Rarely, Usually, Always

Have a designated driver when I know that I will be drinking	Never, Rarely, Usually, Always
Set a limit on the number of drinks I will have	Never, Rarely, Usually, Always
Make my own drinks to limit the amount of alcohol I have	Never, Rarely, Usually, Always
Limit the amount of money that I bring or spend on alcohol	Never, Rarely, Usually, Always
Avoid drinking games	Never, Rarely, Usually, Always
Eat before and during the time I am drinking	Never, Rarely, Usually, Always
Refuse to ride with a driver who has been drinking	Never, Rarely, Usually, Always
Avoid pre-gaming/pre-partying	Never, Rarely, Usually, Always
Avoid shots of hard liquor	Never, Rarely, Usually, Always

Most of the strategies asked on the annual Health and Wellness Survey focus on reducing alcohol consumption when students drink. However, two specifically emphasize risk reduction rather than moderating alcohol use directly. Examples of these strategies include the following: 'Have a designated driver when I know that I will be drinking', and 'refuse to ride with someone who has been drinking'. The remaining 9 strategies can be seen to directly influence the amount, strength or manner of alcohol intake on a given night, and in doing so, the potential to affect alcohol use measures in Table 4 that were assessed in this part of the analysis. All strategies were included in research, at least preliminarily, because it was deemed helpful to look at the associations between alcohol use across all 11 strategies, even if they were not expected (or intended) to reduce alcohol consumption directly. While counterintuitive, some risk reduction strategies may even result in greater alcohol consumption. Arranging for a designated

driver in advance, for example, could in some instances lead to increased alcohol use, since students may be more likely to drink more, aware that this safety measure has been provided for.

Table 4: Alcohol Measures Analyzed with PBS in Aim 2

Measure	Data Type
Have you had five or more drinks in one sitting during the past two weeks?	Yes/No
When you party, how many drinks do you usually have?	Count
How many drinks did you have last time you drank?	Count

Significance

This research represents a number of novel contributions to the field of alcohol research among college students. First, it appears to be the first study of its kind to use multi-year, cross-sectional data to analyze alcohol-related trends at a large southwestern university in nearly 20 years. Bennett and Miller published three years of alcohol use data at a southwestern university in 1999, as part of the Core Institute's Survey on Alcohol and Drugs, but very little has been published on this topic in the region (Arizona or New Mexico) since then.[56] Alcohol use varies rather considerably by state and geography, making research at these levels important in order to accurately track relevant, place-specific trends.[57]

Second, this analysis will help determine whether national alcohol data trends are mirrored at a large, public university to better understand what appears to be a changing pattern of alcohol use in the U.S. Surprisingly, a review of the literature yielded scant recent alcohol trend research from an individual university, public or private. The closest parallel to this work was a 2010 study that examined four years of alcohol trends among undergraduates at a public

university in the northeast U.S between 2002 - 2008.[32] Public college enrollment represents about 62% of all enrollment across 4-year institutions and 41% of total college enrollment, including community colleges and 2-year schools, reflecting the diversity of what a typical college student might look like. While large, nationally representative surveys are essential for overall trends, these percentages also suggest the value of campus-specific perspectives, which may have more relevance for schools that are alike.[58] While not generalizable to college students at large, this study will likely serve as a useful for comparison for other large, public/state universities, with a sizeable percentage of students who are fraternity/sorority members. Additionally, it will likely be of value to other institutions within the southwestern region as well.

The results of this research, it is hoped, will be of interest to both alcohol researchers and practitioners in the field of college health. Since the HWS assesses alcohol use through several measures, this analysis will offer a multidimensional description of college alcohol use as indicated in the measures listed in Table 2 above. As Read et al have discussed, the reliance on binge drinking alone as an alcohol measure does not sufficiently describe alcohol-related risk among college students, despite often being used in that capacity.[59] Given the complexity of student alcohol use as a health issue, having a variety of ways to track alcohol consumption over time is an important strength of this study, and offers nuance in ways not found in research that only examines a single alcohol measure or two.

Changing demographics in higher education also supports this work. Women represent a larger, and growing, percentage of college students on a national level, compared to men. Recent statistics from the U.S. Department of Education show a 56%/44% female to male split among all college students. As a reference point, the numbers have nearly flipped since the

1970s, when there were significantly more males in higher education than females.[58] These demographic shifts underscore the importance of prevention programming that is tailored for the population it intends to reach. As women constitute a larger percentage of all college students, programs will need to be optimized to reflect this. Since women are more vulnerable to alcohol's effects than men, a shrinking gender gap should serve a reminder to effect policies and interventions that better serve women's health in higher education.[60,61]

This study's second aim will also advance the gender-specific association between alcohol use and protective behavioral strategies, thereby contributing to the understanding of how alcohol consumption and related negative consequences might be better mitigated. As more research shows rising female alcohol use, this work will be increasingly important to address a growing and troubling secular trend. Because UA's list of PBS found on the Health & Wellness Survey were developed organically from campus-based focus groups in the late 1990's before national lists were available, they differ slightly in comparison to strategies that are assessed in the literature. Although there is much overlap between the UA and national PBS scales, an analysis that brings together campus-specific strategies and alcohol measures offers particularly valuable results for prevention staff at the University of Arizona.

Sea changes in higher education also supports this work on a macro level. As online enrollment in higher education rises and "big data" options expand to improve retention and assess the many dimensions of student success for both online and on-campus students, targeted interventions will be increasing applied and widespread. Colleges and universities will increasingly rely on technology to identify at-risk students and deliver tailored interventions, more than ever before.[62] Aspects of student health will likely be incorporated into these platforms, bringing together the opportunity to monitor various indicators of wellbeing - which

could take the form of web-based screening tool for alcohol or depression - closely followed by relevant referrals or interventions, as needed. Online platforms and direct text messages will also continue to replace bulletin boards in campus buildings and dormitories as a preferred way to market campaigns and reach students where they spend more of their time. Utilizing these media will be an essential approach to delivering population-level risk reduction messages, among them promoting the protective behavioral strategies that this work assesses. These transitions are already taking place in many outlets which have traditionally been used to market health campaigns to students. For example, the UA student newspaper, the *Arizona Daily Wildcat* reflects these changes. In the past five years, it has moved from a daily, Monday – Friday (5 days per week) print format, then went to a Monday, Wednesday, Friday format (3 days per week), and recently scaled back further to a one day per week option. Notably, the paper retains its longstanding name, based on the fact that it is updated "daily" – but only online.

College-aged individuals represent an important bridge between adolescence and emerging adulthood, and may offer clues on how or when the alcohol gender gap may be shifting in the general U.S. population.[63] Given the prospect of increasing alcohol use among women nationally, the college years also offer an important opportunity to deliver prevention programming at a critical developmental stage, prior to when many individuals join the workforce and long-term behaviors begin to emerge. The translational value of this research will assist with programs and strategies that are most likely to be associated with lower levels of alcohol consumption, and by extension, the risk of blackouts, extreme intoxication, sexual assaults, and other factors associated with heavy alcohol use among both college women and men. Last, these results will offer a new perspective on an age-old topic that holds interest across a broad range of groups, beyond just campus prevention staff. Alcohol researchers,

faculty, university administrators, advisors, parents, and not least of all, students, may find value in these findings. Few topics affect college students and young adults in such a fundamental way, and even the prospect of attenuating a small amount of its associated risk offers large benefits across a population.

METHODS

Data Source

The University of Arizona Campus Health Service has administered the annual, paper and pencil Health & Wellness Survey (HWS) in randomly selected classrooms across its main Tucson campus since 1998. The instrument has approximately 60 questions that include demographics, alcohol and other drug use and related consequences, protective behavioral strategies, nutrition and physical activity, mental health, interpersonal violence, sexual health, and sleep, among others. The anonymous survey has been continuously IRB approved as exempt research since it collects no personally identifiable information. A disclaimer accompanies each survey when administered to students. Originally designed solely as an alcohol and other drug survey to inform grant-related evaluation efforts, the HWS has become more comprehensive over time and serves as an important source of health and wellness related information on students at the UA.

A number of survey questions that appear on the HWS were adapted from existing surveys such as the Monitoring the Future and National College Health Assessment instruments. Others, such as the PBS questions, were created through student input, then piloted and refined as needed since no national surveys contained these questions at the time. The HWS has strong psychometric properties with reliability coefficients for subscales that range from .666 for

alcohol consumption measures to .924 for protective behavioral strategies. These reliability coefficients have been very stable over the past 15 years, according to analyses conducted by Dr. Peggy Glider, coordinator of evaluation and research at the UA Campus Health Service.[64]

Most of alcohol-related survey questions on the HWS were standardized in 2002 and have appeared on each annual survey since, allowing for the consistency necessary for the types of analyses found in this study. Alcohol consumption measures (e.g. 'How many drinks* do you have when you party?') are accompanied by a standard drink definition graphic on each page. These show a glass of beer, a glass of wine, and a shot glass in relative proportion to one another, and read: "1 Drink = 12 oz. beer, 4-5 oz. wine, 1 oz. liquor" as explanation. Following the word "drinks" in these question is an asterisk which leads respondents to the standard drink graphic, to better inform student responses.

Survey Administration and Participation

Each year, the HWS has been consistently administered in UA classes between early February and early March, dependent on when faculty members schedule class time for the survey. During the previous December, each tenth class listed in the spring semester schedule of classes is selected for inclusion in the survey. Course professors/instructors for the randomly selected classes are then contacted and invited to participate in the HWS by allowing for approximately 20 minutes of class time. Since 2007, when the response rate data was readily available, 19.5% of professors and instructors have participated in the survey, of those who were selected and contacted by email (554 of 2844). Table 5 below shows the full response rates from 2007 – 2016, which ranged from 16.1% to 25.6% during the timeframe. Among classes whose faculty lead agreed to participate, 70% students completed the HWS survey over the past five

years; based on the number of surveys returned divided by the official class enrollment (15,101 of 21,590).[64]

Table 5: HWS Course Response Rates, 2007 - 2016

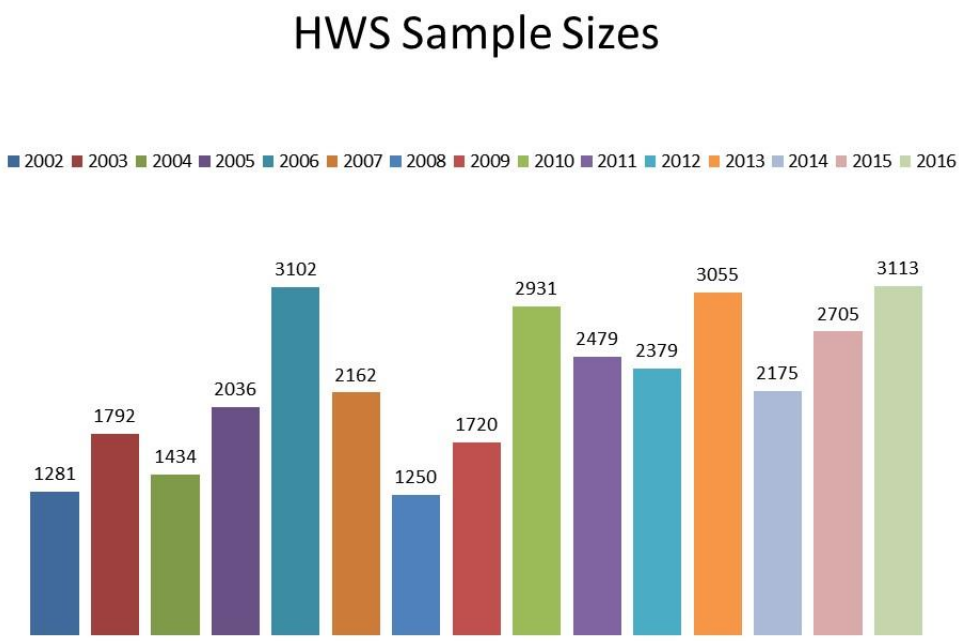
Survey Year	# Classes Selected	# Classes Surveyed	Response Rate %
2007	280	57	20.3
2008	193	37	19.2
2009	174	36	20.7
2010	203	52	25.6
2011	335	73	21.8
2012	314	79	25.2
2013	359	61	17.0
2014	323	53	16.4
2015	345	61	17.7
2016	511	82	16.1
Total	2844	554	19.5%

The overwhelming majority of surveys were directly administered by the Campus Health Service survey team each year, though professors do have the option to administer it themselves with the aid of a standardized written script if they so choose. During survey administration, students were advised not to complete the survey if they had already participated during the current spring semester to prevent duplicates. Surveys are paper and pencil (or pen) in format, and responses are either bubbled in (Scantron© type format), written in, or both. Completed surveys are processed by an optical scanner to transfer the hard copies into a database, then error checked individually by hand for accuracy.

Sample Sizes

Sample sizes for the HWS between 2002 and 2016 are illustrated in Figure 4 below. The samples varied between a low of 1,250 responses (2008) and a high of 3,113 (2016). Variation in the sample size was strongly influenced by the number of students in participating classes, which were selected at random. Between 2002 and 2016, UA increased enrollment steadily from 36,857 to 43,625, a growth of 18%, and added more large format classes/lectures in the process - factors that have played a part in larger sample sizes in recent years.[65] One of the strengths of the HWS data is its robust sample size, which provides ample power for this study and its research questions.

Figure 4: Health & Wellness Survey (HWS) Sample Sizes, 2002 - 2016



Since the emphasis in this work focuses on comparing males and females with respect to alcohol use and PBS, transgender students (added as a response option under "Gender" in the

HWS beginning in 2010) were omitted from the study. Trans-identifying students totaled of 63 cases across the years 2010 and 2016 with an average of 9 students per year, representing between 0.3% and 0.5% of the total sample for those years. Future studies may want to explore alcohol trends of this population, as the pooled numbers of trans-identified students continues to increase across years.

Approach and Statistical Analysis

This study utilizes a wealth of annual, cross-sectional campus survey data to summarize alcohol trends at the UA and answer the research questions outlined above. For Aim 1, summary measures on each of the five alcohol consumption measures of interest (binge drinking frequency, drinks per week, drinks consumed when "partying", number of drinks consumed last timed students drank, and estimated blood alcohol content (BAC) last time students drank), in addition to the 'how often do you party' question, were calculated across years, stratified by gender. HWS data was weighted by gender, class and fraternity/sorority status, and stratified by gender to examine potential variation between males and females over time. These annual averages were then graphed between 2002 - 2016, offering a summary of alcohol trends by gender in advance of more sophisticated tests. Continuous (estimated BAC) and count measures (drinks per week, drinks when partying, drinks last time consumed alcohol) were additionally graphed as dependent variables with linear regression fit lines for male and female sub-groups across years to further illustrate trends gender gap trends for these measures.

Similar to the analysis performed and described in White et al (2015) with the national NSDUH alcohol data, trends in the continuous and count measures were assessed through linear

regression models. Each dependent variable was included in a model with the following independent variables: gender, survey year, and a gender-by-year interaction term. A survey year variable that had a statistically significant coefficient indicated either an increasing trend based on the mean (positive value and slope) or decreasing trend (negative value and slope). Similarly, examining the gender-by-year interaction term and its significance determined an increase or decrease in the slope differential between males and females, that is, the trend in the gender gap over time.[34] Linear regression was chosen as a better fit for this analysis over a Poisson regression since the distributions for these alcohol data contained long tails that were right-skewed (i.e. representing higher alcohol use levels) as well as large numbers of zero values (which were reported by non-drinkers), both of which pose challenges for Poisson models.[66]

Average drinks per week was calculated two ways: first, for all students in the sample, and second, only including drinkers, defined here as students who reported one or more drinks in the past week. Since HWS data has shown decreases in past 30 day use over time, and because the drinks per week measure includes students reporting "zero" drinks, this extra step allowed the analysis to compare all students versus students who had at least one drink per week to determine the trends for each over time. Values for the drinks consumed when partying variable were truncated to a maximum of 30 drinks, and .400 was used as the upper limited for estimated BAC for last time students drank, and average drinks per week was capped at 100 drinks, in line with practices and procedures used in other studies.[67]

For the second Aim, data were pooled between the years 2013 - 2016 and only students who drank alcohol were included in the analysis for each given measure, since this was the population of interest. Students who reported drinking in the past 30 days were included in the binge drinking analysis, which employed a logistic regression model for both males and females

to describe the odds of binge drinking given the role of PBS as predictors, and Greek status (fraternity/sorority members), Caucasian/white students, and students who were under age 21, also included as binary variables (Yes/No) and controlled for in the model.

Linear regression models were run for the other two dependent variables, drinks when partying and drinks consumed last time. As with the logistic regression binge drinking analysis, Greek status, Caucasian/white students and students under age 21 were included in the models. For the drinks last time and average drinks when partying measures, cases were excluded from the analysis if students reported zero drinks for each respective measure. This was done since the research question of interest examined association between PBS and the alcohol consumption of student who drank. All 11 strategies were included in the initial models in Aim 2, though several were dropped from the final models. As mentioned above, these were the harm reduction strategies that were not expected to address alcohol use *per se* but were included initially to examine the directionality and significance of association, as well as help determine face validity before selection of the final model.

Sample weighting

For the cases included in this analysis, extreme outliers were eliminated based on established criteria, which historically has affected less than 1% of total cases. Examples of this include surveys that report “99” drinks when they party or list body weight as “999” pounds. In these instances, the entire case was removed from the final dataset since the validity of all the survey results is left in question. If the results were perceived as even slightly plausible, they were retained and included in the sample. Data were weighted by class, gender, and

sorority/fraternity membership to match campus demographics found in the UA Factbook, which represents the university's published institutional data. Although weighted data differed only slightly from the raw data, this step was done to ensure that the sample is representative of the campus community. IBM SPSS Statistics (currently version 25) is used for all data analyses. A copy of the 2016 HWS and related documents are included in the Appendix for reference.

RESULTS

Demographics

Table 6 shows the sample demographics for the years 2002 through 2016, by gender. Overall, the results show a high degree of consistency for many of these measures. Where there have been changes, such as increases in Hispanic/Latino students in the sample, these have been reflected in the wider student population, based on UA enrollment trends. As can be seen below, the percentage of Hispanic/Latino students in the sample increased from 10.8% to upwards of 25.2% during the study period, with a corresponding decrease in students who identify as Caucasian. As can be seen, females tend to be slightly more likely to be under age 21, compared to males, over time. These results also show that males and females had very similar rates of fraternity/sorority affiliation during the timeframe.

Table 6: HWS Sample Demographics, by Gender 2002 - 2016:

	Age, mean (SD)		**% Under 21**		**% Caucasian**		**% Hispanic**		**% Greek Member**	
Year	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**

2002	21.1 (4.2)	20.6 (4.2)	54.5	67.0	72.1	72.3	10.2	11.1	22.8	20.0
2003	21.2 (4.8)	21.0 (4.9)	58.8	65.2	72.2	72.9	12.7	14.7	15.0	17.8
2004	21.3 (4.1)	21.2 (4.7)	52.3	58.9	69.3	64.6	12.3	16.0	10.4	10.5
2005	21.5 (4.2)	20.8 (3.7)	49.9	59.3	69.1	69.2	13.1	14.0	10.0	10.0
2006	21.3 (4.0)	20.9 (3.9)	51.1	57.0	69.8	64.9	12.7	17.7	10.0	10.0
2007	21.2 (3.6)	20.9 (3.8)	50.6	58.0	61.5	66.2	16.8	13.9	9.9	9.9
2008	21.1 (3.2)	21.0 (4.2)	52.4	55.9	72.1	69.9	11.2	14.7	11.7	11.7
2009	21.2 (3.2)	20.8 (3.7)	50.8	58.3	68.7	67.1	15.2	18.4	12.0	12.0
2010	21.0 (3.1)	20.7 (3.7)	53.4	59.4	66.4	64.4	12.9	15.4	14.0	14.0
2011	21.4 (4.0)	20.8 (3.6)	51.7	57.4	62.5	62.5	14.6	15.7	14.0	13.1
2012	21.0 (3.5)	20.5 (3.3)	55.2	62.7	61.4	57.4	17.6	20.3	13.9	14.0

2013	20.9 (3.4)	20.3 (2.8)	54.3	60.8	54.5	56.4	20.3	22.2	13.0	13.1
2014	21.1 (3.9)	20.3 (2.8)	53.9	62.7	62.7	59.9	23.8	30.3	14.0	14.0
2015	20.9 (3.4)	20.6 (3.0)	55.6	59.4	60.8	60.9	22.1	26.2	12.0	12.3
2016	20.8 (3.4)	20.4 (2.9)	56.3	61.7	62.3	59.8	22.9	27.3	14.0	14.0

Aim 1: Alcohol Use Trends by Gender

Alcohol consumption measures are reported in Table 7 for individual years from 2002-2016 and by gender. The results for the alcohol frequency measure 'how many nights per week do you usually party' are detailed for the years 2007 - 2016 in Table 8. Results for all measures were stratified by gender to allow for male/female comparisons over time. Consistent declines in average drinks per week, as well as binge drinking frequency and past 30-day use, were observed. For example, average drinks per week declined by 58.9% among males during the study period and 42.9% among females. Similarly, the frequency of binge drinking 6 or more times in the past two weeks declined 62.8% for males and 45.9% for females. The percent of students who drank alcohol in the past 30 days declined 24.1% and 18.7% for males and females, respectively, during the 15-year period. In addition, decreases in drinking frequency as measured by the number of nights per week that student usually party were also evident from these results, for the period between 2007 - 2016. During this time the percent of males who

reported ‘usually partying less than one night per week’ *increased* (i.e. representing fewer average drinking occasions) 32.4% for males and 22.8% for females. Throughout these measures, male students displayed steeper decreases in alcohol use, compared to females. Other measures, such as ‘drinks when parting’ and ‘drinks last time’ were, by comparison, relatively consistent over the study period.

Table 7: Alcohol Consumption Measures 2002 - 2016: Mean values (standard deviations) among university students for the time period 2002 - 2016

	Drinks per Week		**Drinks when ‘partying’**		**Estimated BAC last time drank**	
Year	**M**	**F**	**M**	**F**	**M**	**F**
2002	12.4 (15.1)	4.9 (6.7)	6.5 (7.3)	3.4 (2.6)	.090 (.082)	.085 (.075)
2003	10.0 (13.9)	4.3 (6.2)	5.2 (4.4)	3.1 (2.6)	.077 (.081)	.073 (.071)
2004	9.3 (14.0)	3.4 (5.6)	5.4 (6.5)	3.1 (6.4)	.077 (.084)	.067 (.072)
2005	7.4 (11.1)	3.7 (6.1)	4.7 (4.5)	3.0 (2.7)	.069 (.078)	.068 (.071)
2006	8.0 (11.2)	3.9 (6.0)	4.9 (4.2)	3.1 (2.7)	.071 (.077)	.072 (.074)
2007	7.0 (9.8)	3.7 (5.6)	5.4 (4.6)	3.4 (2.7)	.078 (.086)	.075 (.076)
2008	7.6 (12.7)	2.8 (4.1)	5.7 (6.9)	3.1 (2.6)	.079 (.086)	.072 (.077)
2009	6.0 (8.4)	3.1 (4.7)	5.1 (5.0)	3.2 (2.8)	.069 (.080)	.074 (.083)
2010	6.4 (9.4)	2.9 (4.6)	5.0 (4.2)	3.0 (2.7)	.071 (.077)	.073 (.073)
2011	6.1 (9.6)	2.8 (4.4)	5.2 (5.0)	3.1 (2.7)	.077 (.101)	.072 (.073)
2012	6.1 (9.2)	3.0 (4.8)	5.0 (4.8)	3.1 (3.0)	.078 (.085)	.074 (.072)
2013	5.7 (9.3)	2.8 (4.7)	5.3 (4.9)	3.3 (2.9)	.079 (.082)	.075 (.077)
2014	5.9 (9.1)	2.9 (5.1)	5.3 (5.2)	3.5 (3.0)	.076 (.084)	.076 (.076)
2015	5.0 (8.1)	2.8 (4.7)	4.8 (5.0)	3.3 (2.9)	.067 (.075)	.074 (.075)
2016	5.1 (8.0)	2.8 (4.7)	5.1 (4.6)	3.6 (3.5)	.073 (.084)	.079 (.078)

Table 7 (continued): Mean Drinks Last Time Drank and Binge Drinking Frequencies, by Year and Gender, among university students for the time period 2002 - 2016

	# Drinks Last Time Drank		% Binge Drinking Past two weeks[1]		If Binge, % 1 - 2 times[2]		If Binge, % 3 - 5 times[3]		If Binge, % 6 + times[4]	
Year	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
2002	6.6	3.9	58.4	34.4	44.6	63.0	38.2	29.6	17.2	7.4
2003	5.6	3.5	49.7	28.7	55.8	73.9	30.3	20.4	12.5	5.1
2004	6.0	3.5	46.1	24.7	56.5	73.2	29.6	23.2	13.9	3.6
2005	5.5	3.6	43.7	23.6	63.4	76.5	26.7	17.3	9.8	6.2
2006	5.6	3.8	46.7	28.2	63.4	80.6	27.6	16.6	9.0	2.8
2007	6.3	3.8	55.1	37.0	56.2	67.5	29.0	25.5	14.7	7.0
2008	6.6	3.8	51.6	30.8	60.7	72.3	24.9	20.3	14.4	7.5
2009	5.6	3.8	49.5	34.3	58.6	74.4	31.0	21.6	10.4	4.0
2010	5.7	3.7	47.7	32.5	58.8	77.5	29.9	19.2	11.3	3.3
2011	6.0	3.6	43.0	27.9	63.7	83.2	27.3	13.9	9.0	2.9
2012	5.9	3.7	45.0	28.8	62.3	79.6	28.8	18.2	8.9	2.3
2013	5.8	3.7	45.3	28.1	67.9	77.8	22.2	18.6	9.8	3.6
2014	5.8	3.8	44.6	31.0	66.0	86.2	27.0	12.1	7.0	1.6
2015	5.3	3.8	42.3	29.0	70.0	85.8	21.7	12.1	8.3	2.1

2016	5.6	3.9	43.9	29.7	71.9	82.3	21.7	13.7	6.4	4.0

[1] Percent who have 5 or more drinks in one sitting, during the past two weeks (i.e. binge)
[2] Of those who binged in the past two weeks, percent who binged 1-2 times
[3] Of those who binged in the past two weeks, percent who binged 3-5 times
[4] Of those who binged in the past two weeks, percent who binged 6 or more times

Table 7 (continued): Percent Alcohol Use, Past 30 Days, by Year and Gender, among university students for the time period 2002 - 2016

	% who drank in past 30 days	
Year	**M**	**F**
2002	81.0	75.9
2003	74.9	72.3
2004	74.1	65.7
2005	68.3	67.6
2006	70.8	66.9
2007	72.5	67.2
2008	70.0	61.2
2009	71.6	69.2
2010	65.6	60.1
2011	66.6	65.0
2012	66.0	61.2
2013	66.9	63.7
2014	61.2	63.0
2015	58.7	57.7
2016	61.5	61.7

Table 8: Nights per week that male and female university students report that they 'usually party', for the time period 2007 - 2016*

	% usually party less than once per week		% usually party once per week		% usually party twice per week		% usually party 3 or more times per week	
Year	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
2007	51.5	59.1	17.2	15.2	20.8	18.5	10.5	7.1
2008	54.0	63.7	16.9	16.7	17.2	15.8	11.8	3.7
2009	57.3	60.9	16.1	16.3	18.1	16.9	8.5	5.9
2010	60.1	67.5	15.9	15.1	16.8	14.6	7.2	2.8
2011	64.9	69.6	15.3	15.2	14.1	12.3	5.6	2.9
2012	63.0	68.7	16.1	12.8	15.5	14.9	5.4	3.6
2013	65.5	70.9	17.1	15.3	12.5	11.5	4.9	2.3
2014	64.6	70.7	17.4	16.8	13.7	11.0	4.3	1.5
2015	68.5	74.0	15.3	14.3	12.9	9.1	3.3	2.6
2016	68.2	72.6	16.3	15.3	12.5	10.5	3.0	1.6

*This question was asked somewhat differently prior to 2007, limiting comparisons before that time

For those dependent alcohol measures that were continuous or count-based, an additional analysis was performed, as described in the Approach/Statistical Analysis section and a summary of the results are shown in Table 9. In the regression models, analyses were run for average drinks per week for all students (i.e. all students in the sample, including those who reported zero drinks per week), as well as the average drinks per week among drinkers - those students who reported consuming one drink or more per week. Both gender and age for all four alcohol measures were statistically significant and demonstrated negative trends over time (decreasing mean and slope over time) as well as significant, positive values for the gender-by-year

interaction terms, indicating that the annual trends for both males and females showed the same directionality with respect to decreasing alcohol use over time, but had varying slopes. The beta coefficients for the average drinks per week measures predicted the largest magnitudes, with a decrease of 6.64 drinks per week for females, relative to males, for all students and 7.901 fewer drinks per weeks among drinkers, with similar gender x year interaction terms for both (2.39 and 2.49 respectively).

Table 9: Relationship between continuous alcohol measures and gender and gender interaction terms among university students, for the time period 2002 – 2016, Linear Regression Summary

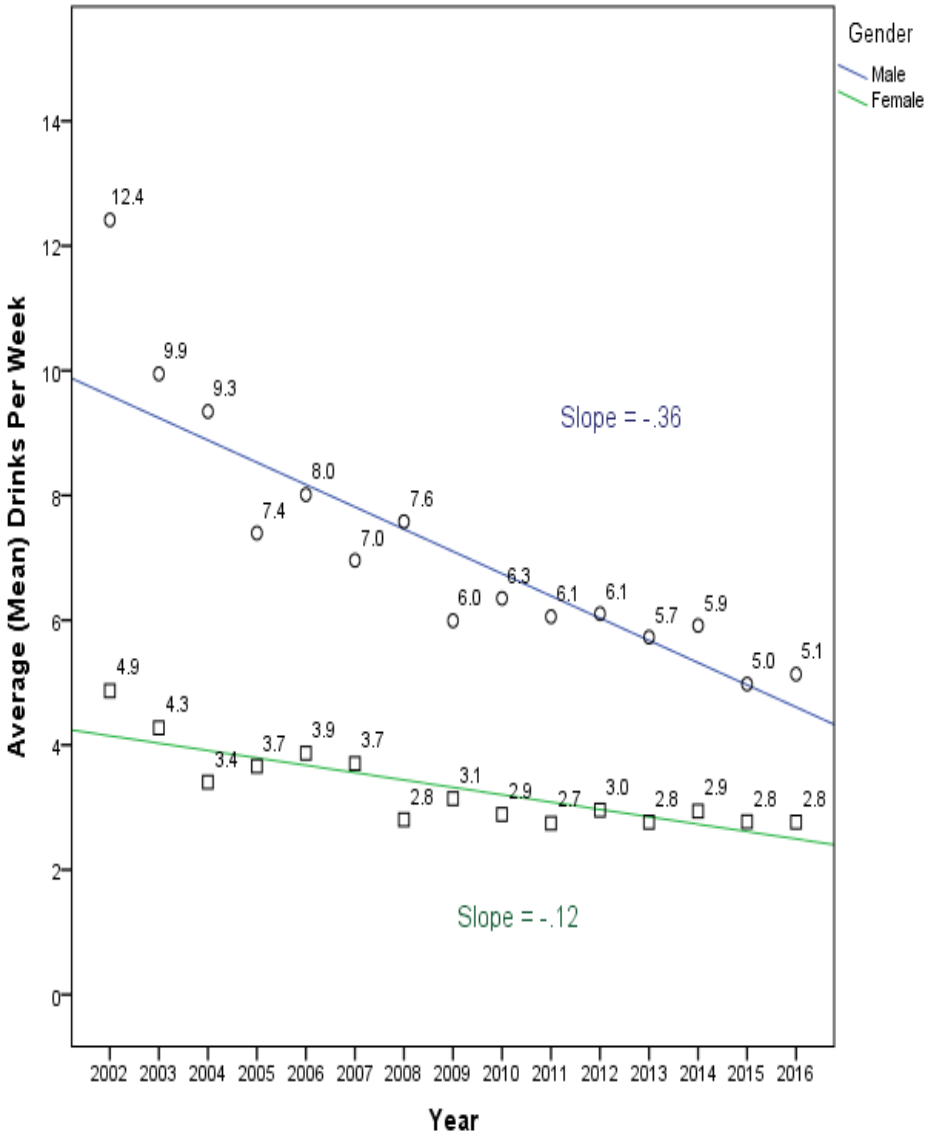
Dependent Alcohol Measure	**Covariate**	**β**	**SE_B**	**Stand. Coeff. Beta**	***p***
Average number of drinks you consume in a typical week	Gender	-6.644	.282	-.400	<.001
	Year	-.595	.034	-.306	<.001
	Gender x Year	.239	.021	.268	<.001
Average number of drinks you consume in a typical week (1 or more drinks/week)	Gender	-7.901	.394	-.423	<.001
	Year	-.640	.047	-.294	<.001
	Gender x Year	.249	.030	.245	<.001
When you party, how many drinks do you usually have?	Gender	-2.500	.132	-.322	<.001
	Year	-.066	.016	-.073	<.001
	Gender x Year	.045	.010	.111	<.001
How many drinks did you have last time you drank?	Gender	-2.534	.145	-.327	<.001
	Year	-.069	.018	-.076	<.001

	Gender x Year	.040	.011	.098	<.001
Estimated BAC, last time drank	Gender	-.007	.003	-.047	.017
	Year	-.001	<.001	-.049	.017
	Gender x Year	.001	<.001	.065	.018

Drinks Per Week:

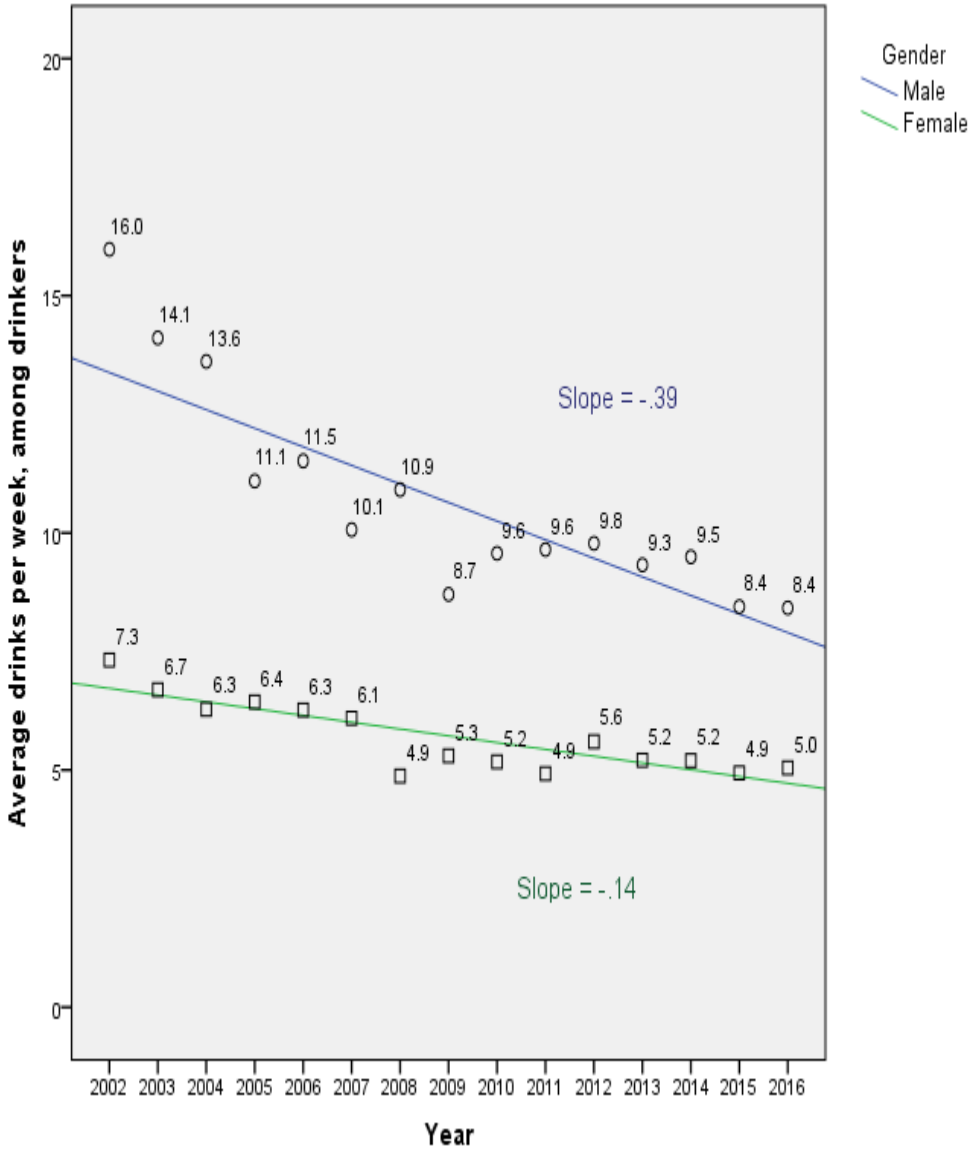
Figure 5 shows the average (mean) number of drinks per week reported by university students between 2002 – 2016. While both males and females reduced their consumption of alcohol over time, men had much steeper declines, which resulted in closing a sizeable amount of the gender gap during this period. This measure includes all students, including non-drinkers, so the fact that 30-day alcohol use is decreasing can be seen to have a corresponding effect here.

Figure 5: Average drinks per week for male and female university students, for the time period 2002 - 2016



By looking at only those students who had at least one drink per week, the numbers are higher with the absence of zeroes, but the decline overall as well as for the gender gap, was no less pronounced or consistent over time. Males declined from 16.0 to 8.4 drinks during the timeframe; 7.3 to 5.0, for females.

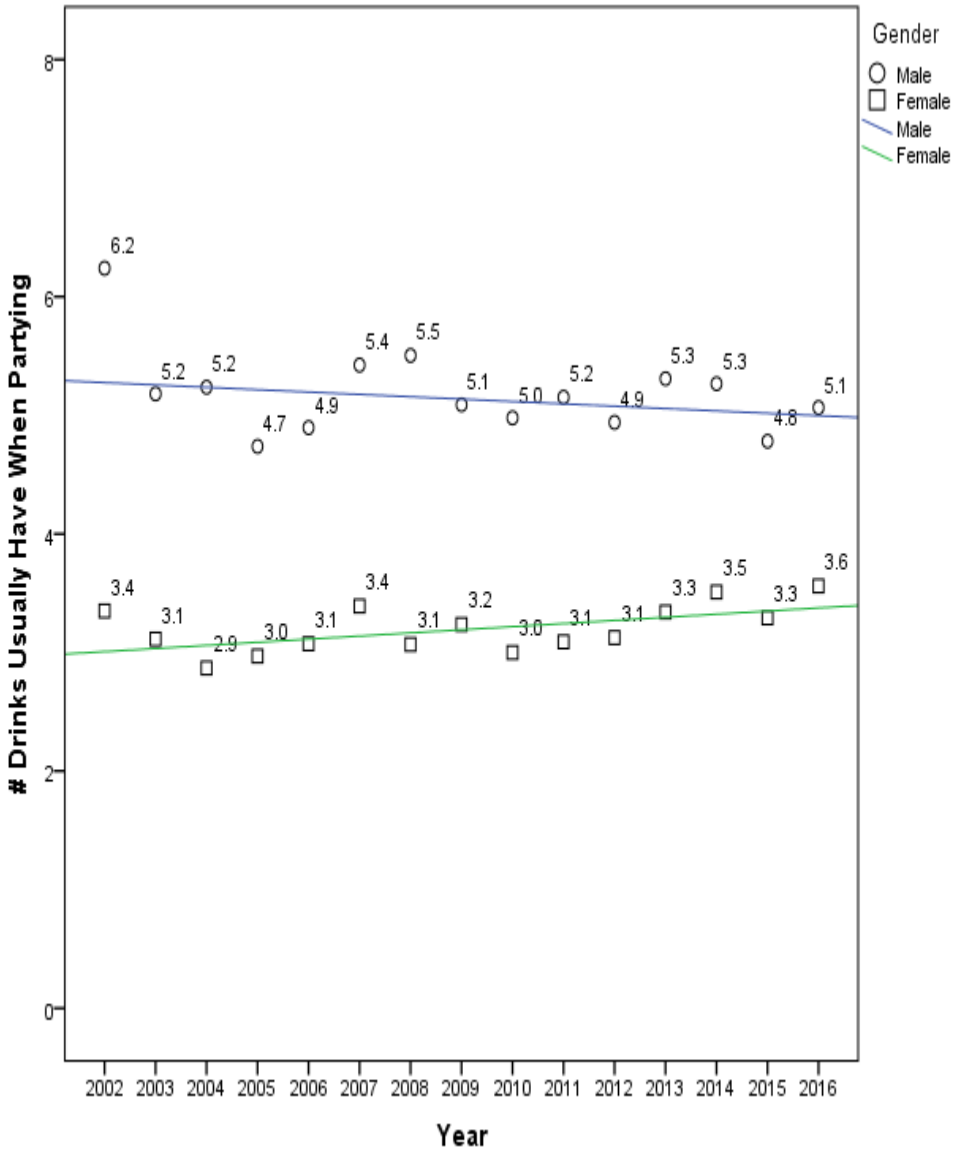
Figure 6: Average drinks per week for male and female university students who reported at least one or more drinks, for the time period 2002 - 2016



Drinks Consumed When Partying:

The overall trends over time by gender were relatively stable for the number of drinks students reported having when they party. Aside from 2002, which appears to be an outlier year, this measure has remained largely unchanged during the study period.

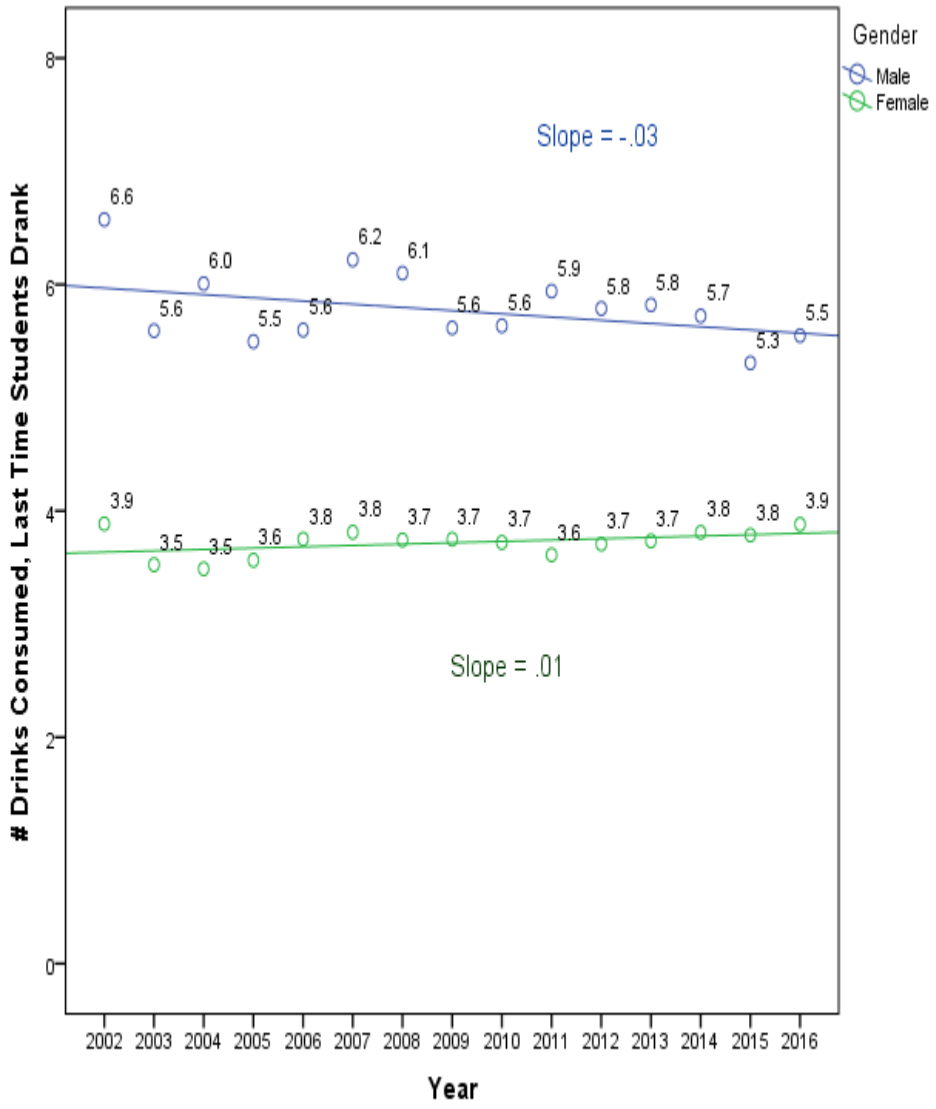
Figure 7: Number of drinks male and female university students 'usually have when they party', of those who reported at least one or more drinks, for the time period 2002 - 2016



Drinks Consumed, Last Time Drank:

This graph bears a strong resemblance to the previous one that looked at drinks when partying – with very little in the way of change over time for either males or females. Interestingly, the values for men are slightly below those found in the drinks when partying measure, yet women report drinking slightly more.

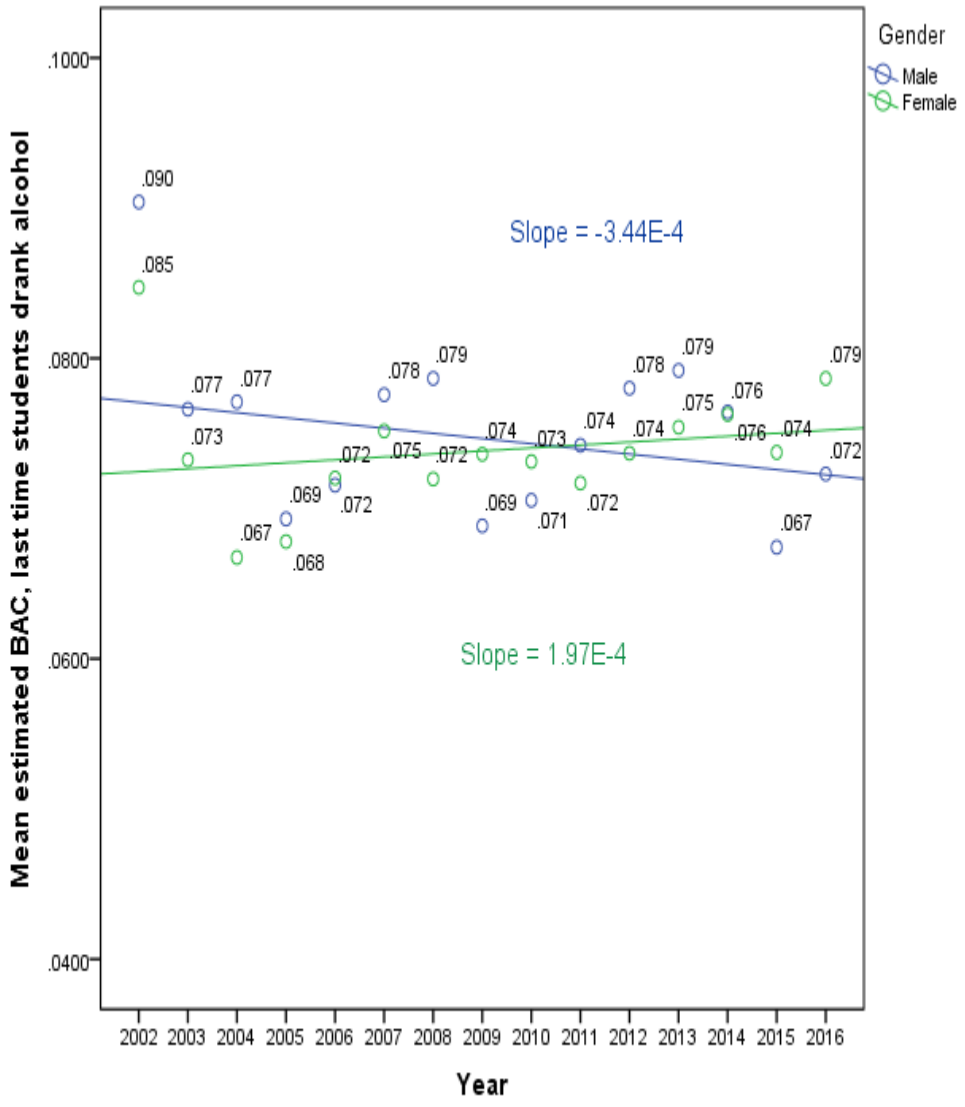
Figure 8: Average number of drinks male and female university students consumed, last time they drank alcohol, for the time period 2002 - 2016



Estimated BAC, Last Time Drank:

An analysis of estimated BAC last time students drank reveals an important change over time. While most of the annual estimated BAC levels are clustered between .070 and .080, with a potential outlier in 2002, the slopes of the regression fit lines for males and females cross at 2010, with females reporting higher BACs than males after that year. Given that women physiologically experience higher BAC levels than men, this should not be completely surprising. However, we can surmise from these data that women may be "keeping up" with men in terms of consumption, leading to elevated BACs that were on average higher than males, for four of the last eight years.

Figure 9: Self-reported average estimated BAC level of male and female university students, last time they drank alcohol, for the time period 2002-2016

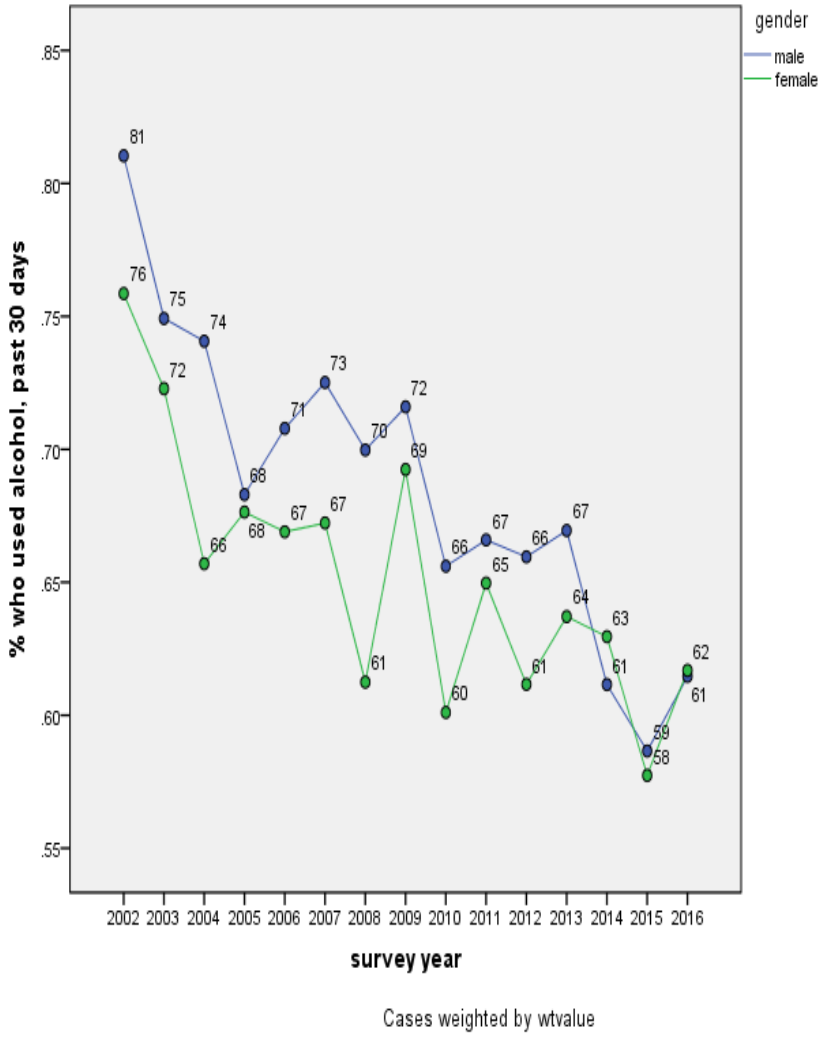


Past 30 Day Alcohol Use:

A rather dramatic decrease in the percentage of students who drank in the past 30 days was seen during the study period. While a gender gap was evident in the earlier years of the survey, this has decreased in recent years. For two of the past three survey years (2014 - 2016),

females were slightly more likely to consume alcohol during the past 30 days than males, the only instance that has been observed since 2002.

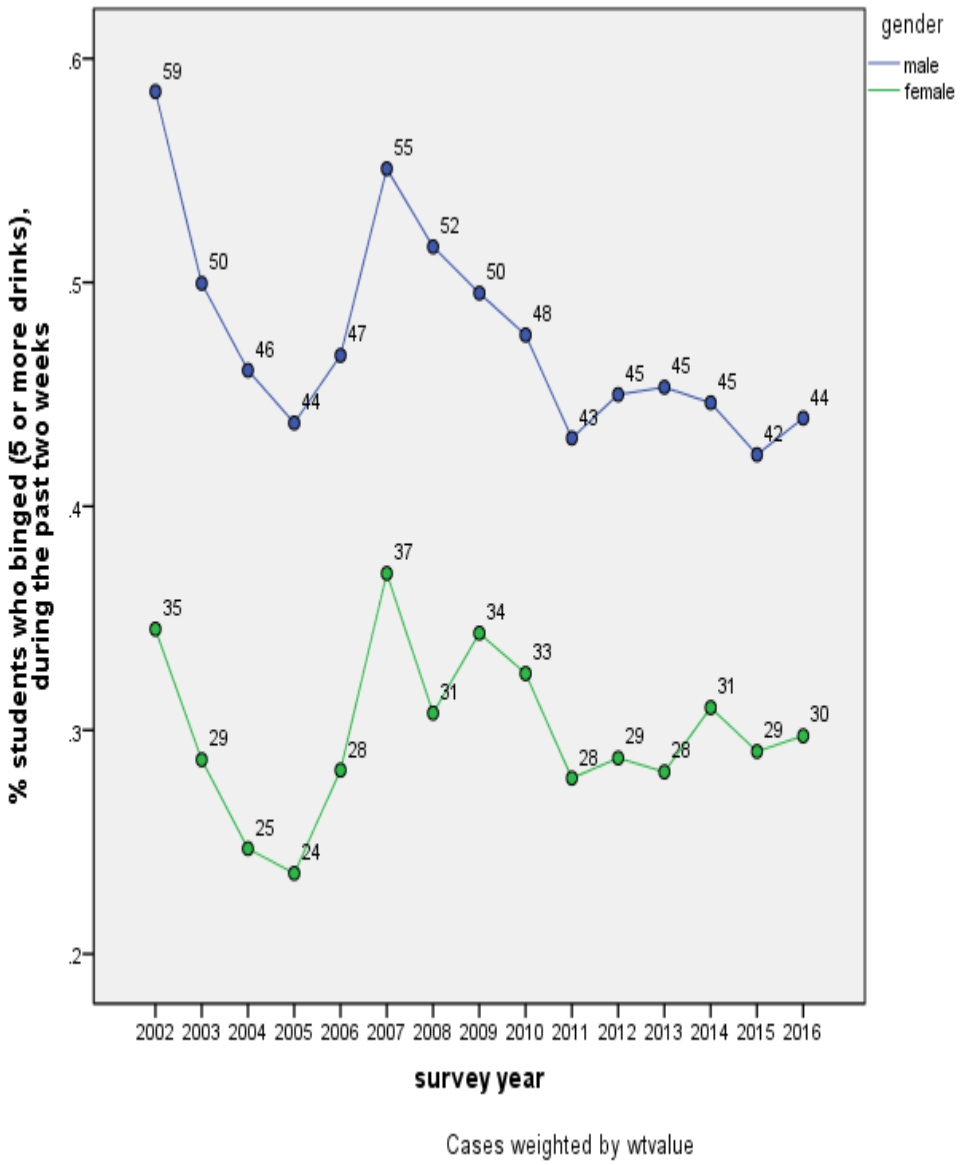
Figure 10: Percent of male and female university students who reported alcohol use in the past 30 days, over the time period 2002 - 2016



Binge Drinking:

Figure 11 shows that the percent of students who report binge drinking (5 or more drinks in one sitting in the past two weeks) has been variable over the years In general the trend line for females is similar to males, although consistently lower for every year

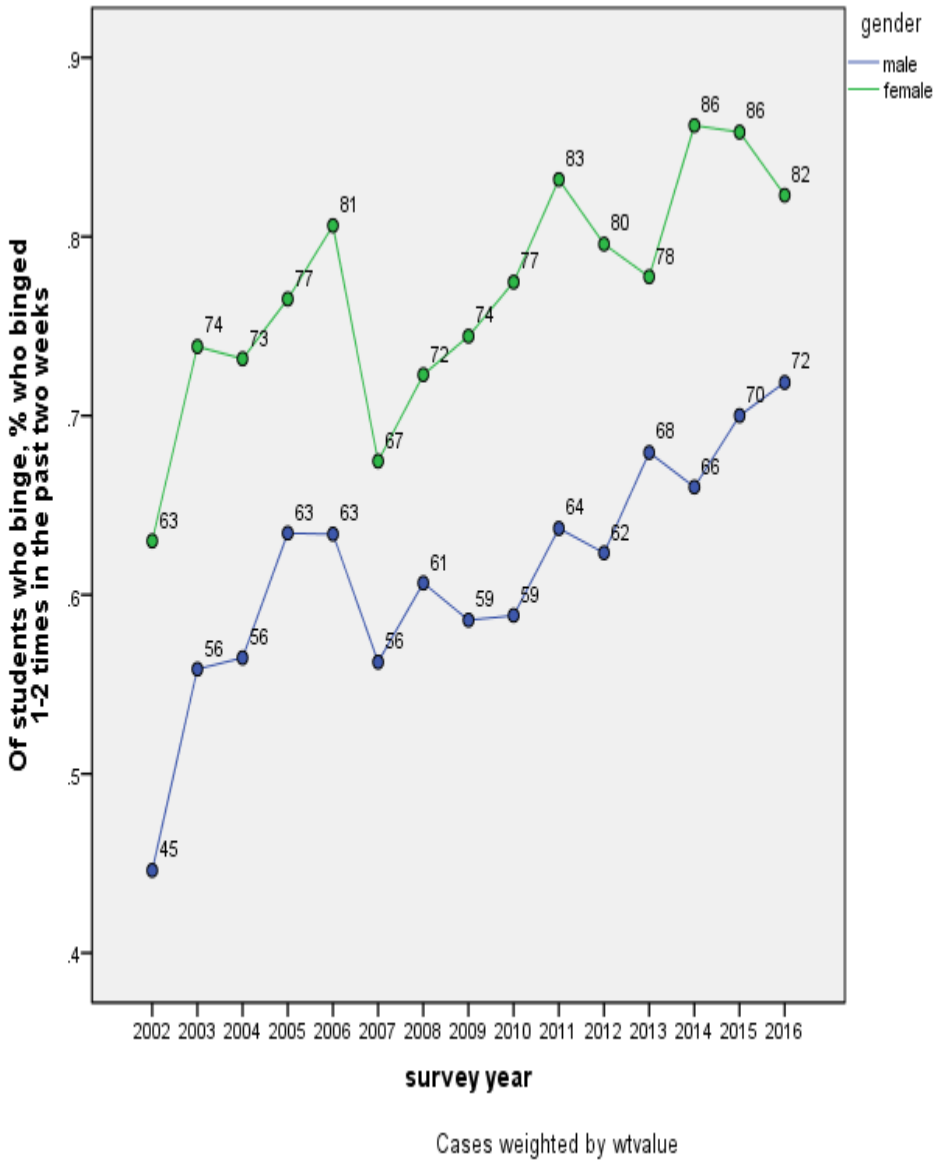
Figure 11: Percent of male and female university students who reported 5 or more drinks in one sitting (binged) during the past two weeks, over the time period 2002 - 2016



Figures 12, 13 and 14 below reveal that the frequency of binge drinking is declining among students who had five or more drinks in one sitting during the past two weeks. In contrast to the more volatile overall binge rate, the frequency of bingeing occasions among students who binge has shown a clear and marked decline during the study period. Students who binge less frequently (the 1-2 times in the past two weeks category) increased 19 percentage

points during the study period for males and 27 percentage points among females. By contrast, the binged 3-5 times in the past two weeks decreased by 16 percentage points by both males and females.

Figure 12: Percent of male and female university students who reported 5 or more drinks in one sitting (binged), 1-2 times during the past two weeks, over the time period 2002 - 2016



As a result of the increases in the 1-2 times per week binge category, prominent declines in the higher frequencies of binge drinking over the past two weeks for both the 3-5 times and 6

or more times per week levels were observed in Figures 13 and 14. The six times or more level has been more than cut in half during the study period for males, and females have also seen declines. In summary, while the overall binge rate has not changed a great deal, the frequency of bingeing has gone down considerably. While the gender gap in these measures has not appreciably changed overall, there does appear to be a modest decline in the gap in the binge drinking/6 or more times category in recent years. This is too early to call a trend, but is certainly worth monitoring in the future.

Figure 13: Percent of male and female university students who reported 5 or more drinks in one sitting (binged), 3-5 times during the past two weeks, over the time period 2002 - 2016

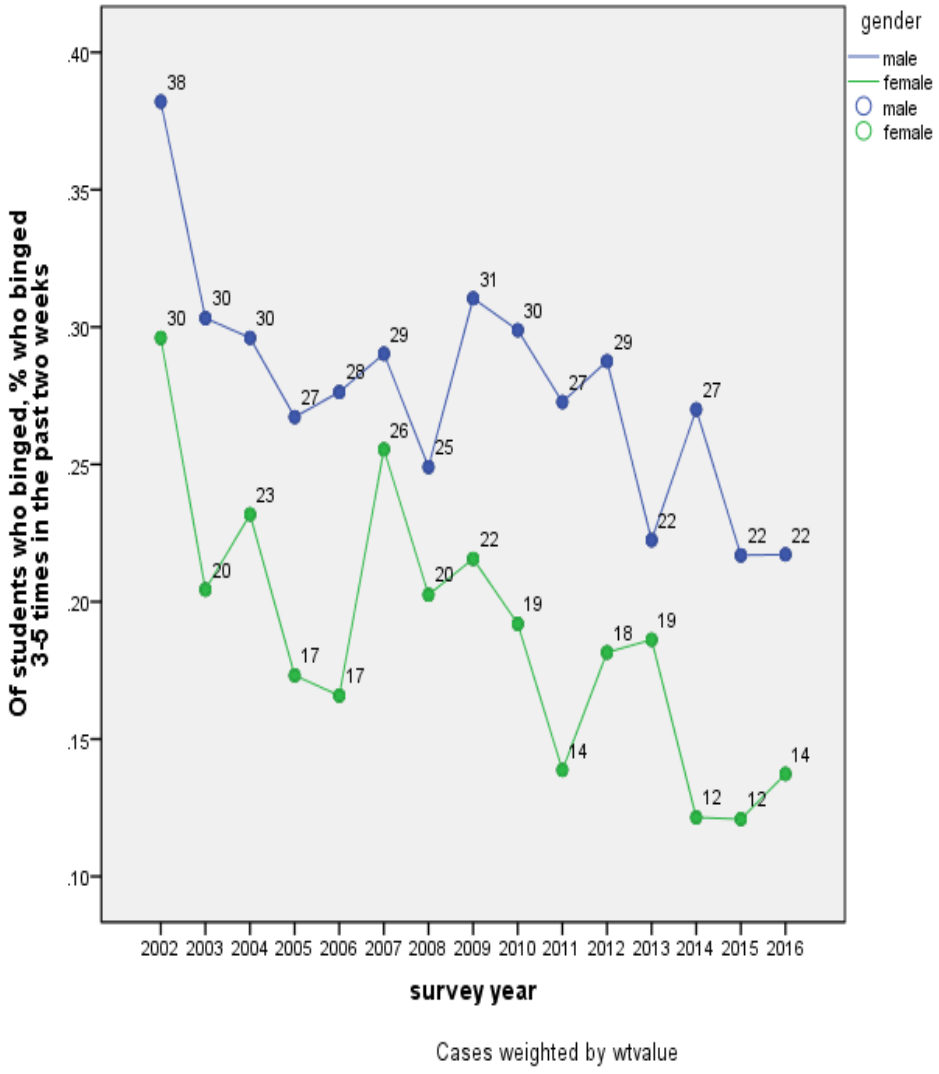
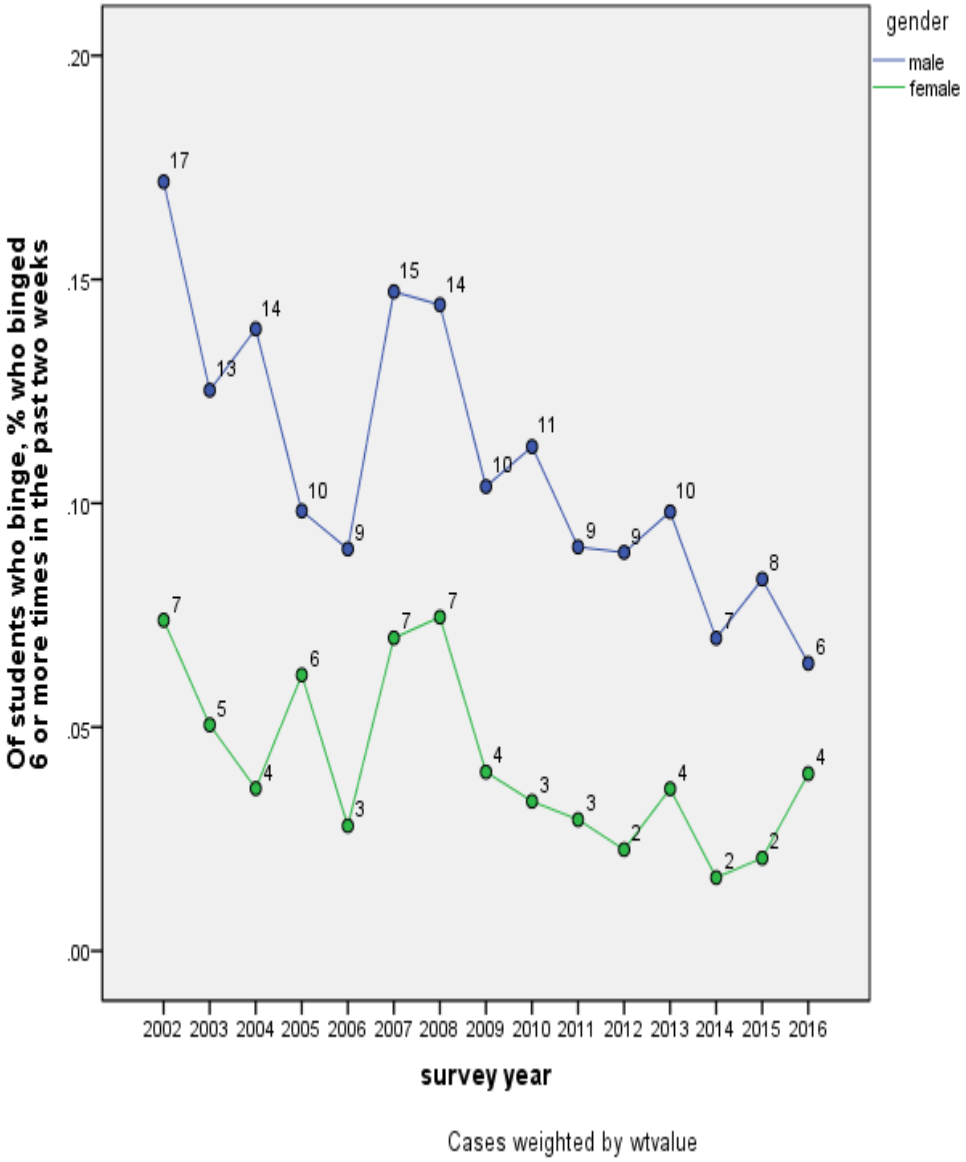


Figure 14: Percent of male and female university students who reported 5 or more drinks in one sitting (binged), 6 or more times during the past two weeks, over the time period 2002 - 2016



Party Nights Per Week:

For nights per week that students report 'partying', there has been a strong downward trend, with increases for both males and females in partying less than one night per week (Figure 15) , and concurrent decreases in at the higher frequency levels - those who reported partying two times per week (Figure 17) as well as three times or more per week (Figure18). This

question likely influences the number of drinks per week that student consume. As drinking days decrease, so too does average weekly consumption.

Figure 15: Percent of male and female university students who reported usually partying less than one night per week, over the time period 2007 - 2016

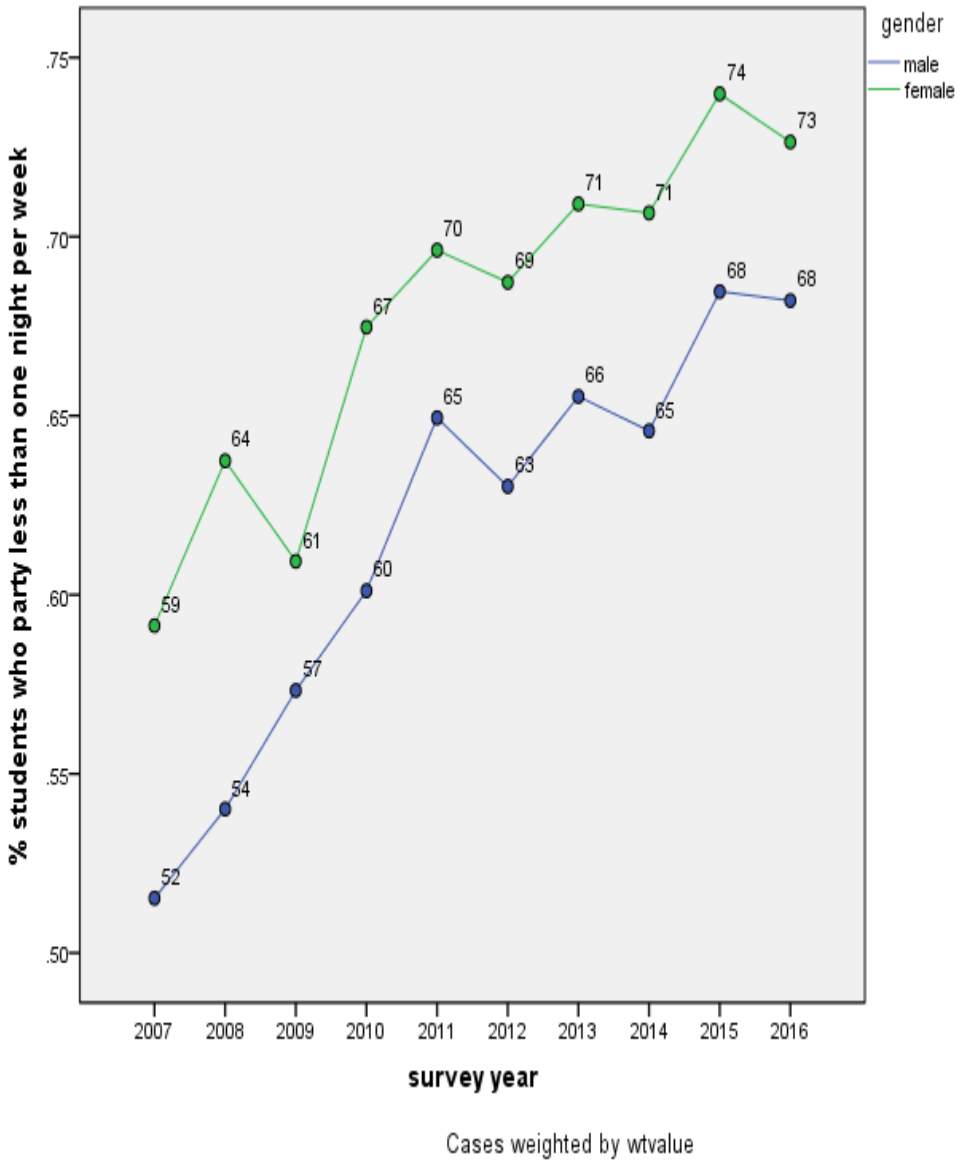


Figure 16: Percent of male and female university students who reported usually partying one night per week, over the time period 2007 - 2016

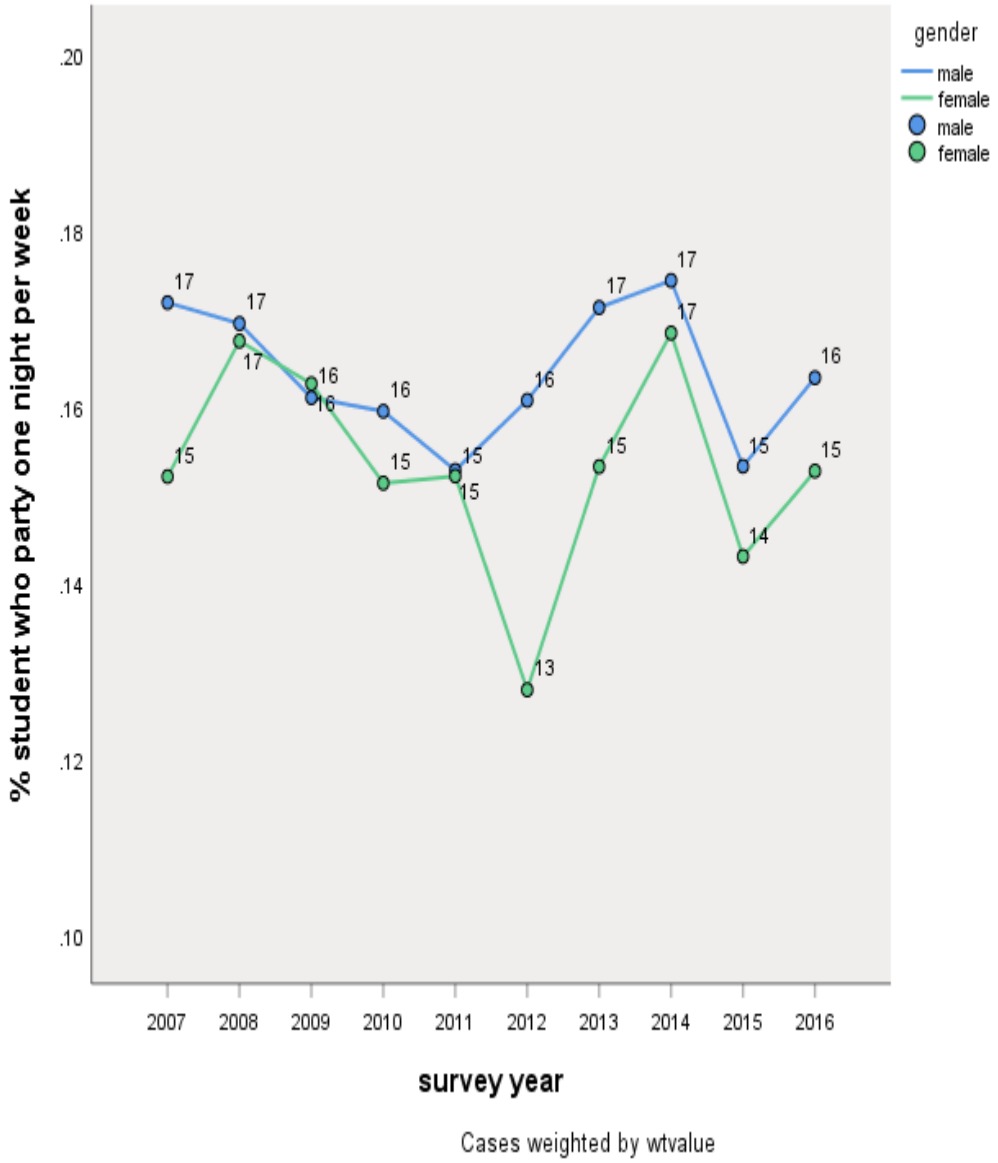


Figure 17: Percent of male and female university students who reported usually partying <u>two nights per week</u>, over the time period 2007 - 2016

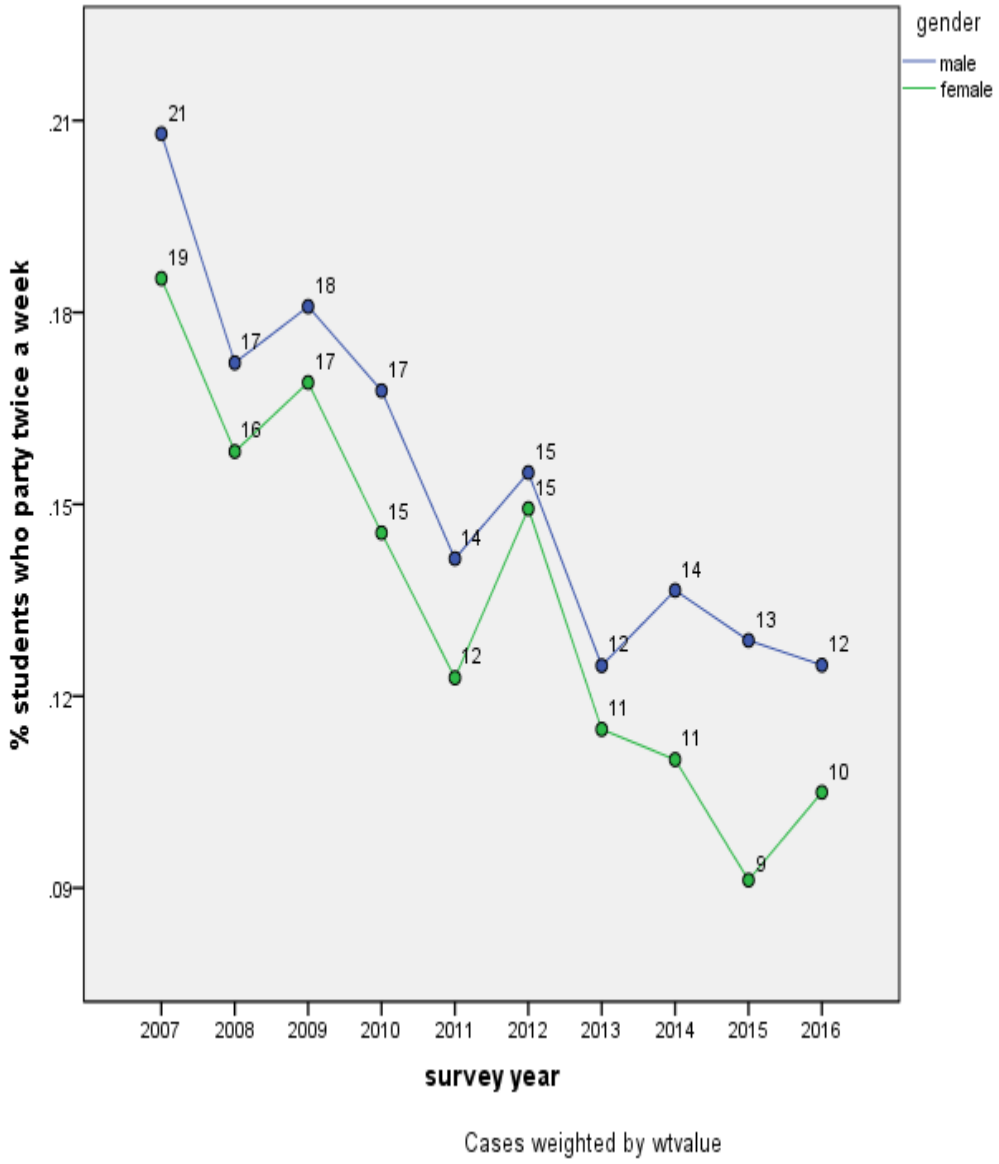


Figure 18: Percent of male and female university students who reported usually partying three or more nights per week, over the time period 2007 - 2016

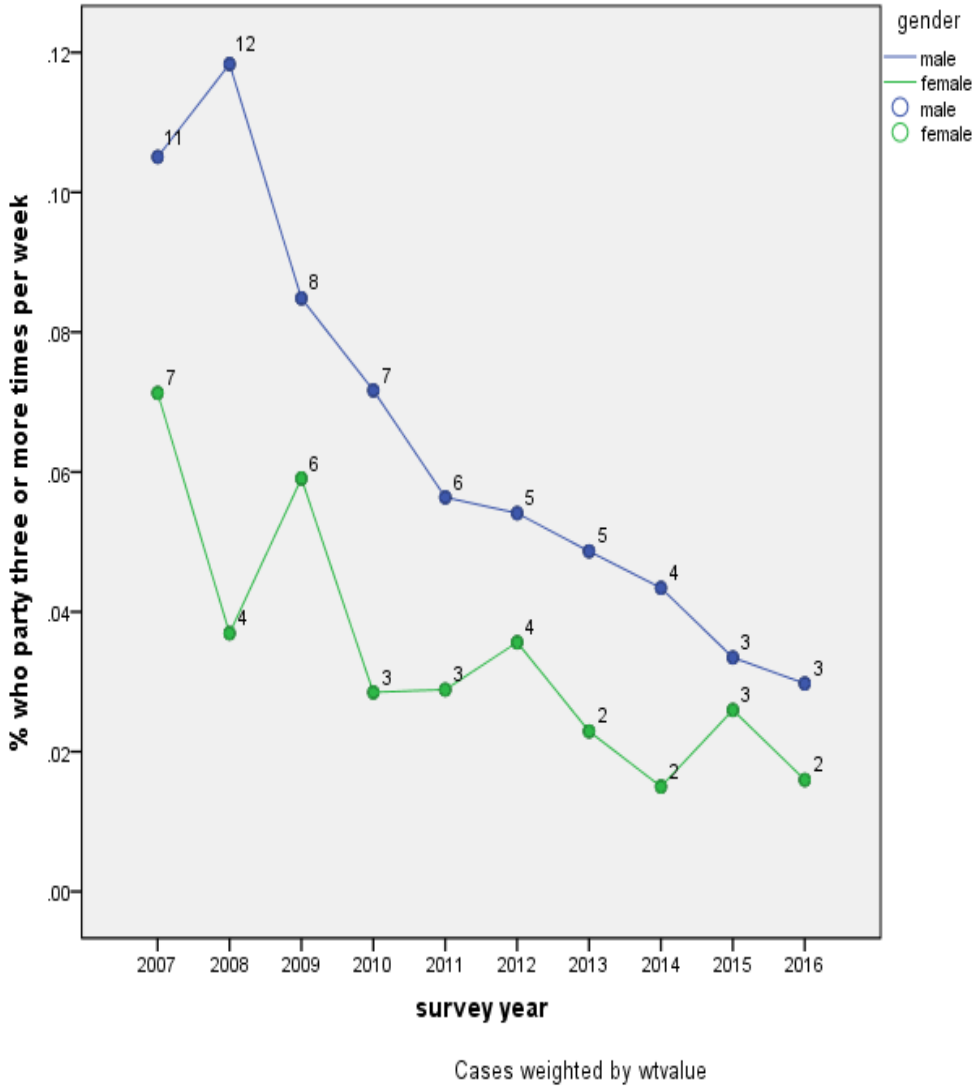


Table 10 below summarizes these results for both overall trends and for the status of the male/female gender gap for each measure over the study period.

Table 10: Summary of Alcohol-Related Variable Trends Among University Students, 2002 – 2016

Measure	Overall Trend	Gender Gap Trend	Notes	Table/Figure
Average number of drinks you consume in a typical week (all)	Declining ↘	Decrease ↘		Figure 5
Average number of drinks you consume in a typical week (drinkers only)	Declining ↘	Decrease ↘		Figure 6
When you party, how many drinks do you usually have?	No change ≅	No change ≅		Figure 7
How many drinks did you have last time you drank?	No change ≅	No change ≅		Figure 8
Estimated BAC, last time drank	No change ≅	Flipped/Females Now Higher↘	Females now have slightly higher BACs compared to males	Figure 9
Alcohol use, past 30 days	Declining ↘	Flipped/Females Now Higher↘	Past 30 day alcohol use is now slightly higher in females compared to males	Figure 10
Have you had five or more drinks in one sitting in the past two weeks?	Slight decline ↘	No change ≅	For the binge drinking measures, these represent a single question broken out by different response categories.	Figure 11
Five or more, 1-2 times in the past two weeks	Declining ↘	No change ≅		Figure 12
Five or more, 3-5 times in the past two weeks	Declining ↘	No change ≅		Figure 13
Five or more, 6+ times in the past two weeks	Declining ↘	Decrease ↘		Figure 14

How often do you usually party?*	Declining↘	No change ≅	*This question was asked prior to 2007, but the response format was different before then. Therefore, the 2007-2016 data is analyzed here for consistency. While this is not an alcohol consumption measure, it does speak to the frequency of alcohol consumption.	Figs. 15- 18

Aim 2: Protective Behavioral Strategies and Alcohol Measures

Frequencies were calculated for all eleven protective behavioral strategies for pooled data between the years 2013 - 2016, stratified by gender. Across the four years, there was an average of 6,052 observations for the 11 measures, which ranged from 6,035 to 6,085. While the question takes the form of a Likert scale (Never, Rarely, Usually, Always) on the survey, Table 11 below shows the percent of students who reported 'usually' or 'always' using each strategy. The strategy with the largest change over time was a decrease in percent of students who usually/always 'avoid shots of hard liquor', which declined from 32.5 to 24.6 percent among males and 39.4 to 32.3 percent for females between 2013 and 2016. The differences in PBS use across gender were significant based on chi-square tests at the p=.001 level for all 11 strategies.

Table 11: Percent of male and female university students who usually or always report doing specific Protective Behavioral Strategies (PBS) when they drink alcohol.

Strategy	2013		2014		2015		2016	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Stop drinking 1-2 hrs. before going home	54.4	66.9	58.9	67.6	59.5	68.7	56.8	69.7
Alternate with non-alcoholic drinks	46.4	59.5	55.5	57.6	53.4	61.6	52.3	61.0
Have a designated driver Stop drinking 1-2 hrs before going home	85.2	91.7	86	92.4	85.3	92.6	88.2	94.0
Set a limit on the # of drinks I will have	39.4	57.9	40.6	56.7	38.5	57.9	38	57.7
Make my own drinks to limit alcohol	58.7	67.4	62.2	67.8	59.0	65.1	61.2	63.7
Limit the amount of money I spend on alcohol	66.3	76.1	64.2	75.8	66.9	76.5	67.9	74.0
Avoid drinking games	26.7	39.3	26.7	41.2	26.1	40.5	23	39.2
Eat before and during drinking	81.3	85.5	84.1	85.7	82.6	86.6	82	86.3
Refuse to ride with a driver who has been drinking	84.4	92.5	86.7	93.3	86.8	94.0	88.4	95.4

Avoid pre-gaming/ pre-partying	32.5	39.4	29.9	36	30.1	37.8	28.6	32.5
Avoid shots of hard liquor	32.5	39.4	27.6	35.6	26.4	36.4	24.6	32.3

Note: All male/female differences are statistically significant based on chi-square tests at p=.001 level.

Pearson's coefficients were calculated to examine how PBS were correlated with one another for the pooled 2013-2016 data. As a whole, the strategies showed a weak, positive correlation with one another, revealing that PBS largely function independent of one another. Exceptions to this included the association between 'avoiding pre-partying/pre-gaming' and 'avoiding shots of hard liquor', with a Pearson's coefficient of 0.680, the strongest association among all the strategies. All coefficients were significant at the p<.01 level. The full results of the PBS Pearson's coefficient analysis are presented in Appendix Table 2.

PBS and Binge Drinking

A multinomial logistic regression analysis was performed to determine the effects of the various protective behavioral strategies on the likelihood that participants reported binge drinking in the past two weeks (Yes/No). Separate models were run for males and females to aid with interpretability and prioritize best strategies based on effect size for each gender. Both analyses included Greek status (fraternity/sorority members), Caucasian/white students, and students who were under age 21 as variables in the model, since they were factors deemed important to control for as independent variables. Results of the final models are presented in Table 12 for both males and females. Only Greek status was statistically significant, exhibiting a greater odds of binge drinking for both males and females, among these demographic predictors. Two strategies, 'have a designated driver when I know that I will be drinking' and 'refuse to ride

with a driver who has been drinking' were included in the initial model but dropped from the final model since they were not expected to address alcohol use as directly as the other strategies and were not significant in the initial model. Both final logistic regression models were statistically significant, for males χ^2 (12) = 265.219, $p < .0005$ and females χ^2(12) = 297.293, $p < .0005$. The models explained 26.1% and 24.8% (Nagelkerke R^2) of the variance in binge drinking, among males and females, respectively. The total sample represented 6,725 total cases - 3,226 males and 3,499 females.

Table 12: Association between Binge Drinking and Use of Specific Protective Behavioral Health Strategies (PBS) and Demographic Characteristics for Male and Female University Students - Multinomial Logistic Regression Summary

Predictor	**Male**		**Female**	
	OR (95% CI)	***p***	**OR (95% CI)**	***P***
Greek Member	1.91 (1.29 - 2.82)	.001	1.64 (1.21 - 2.23)	.001
Caucasian/White	1.08 (.814 - 1.43)	.595	1.11 (.865 - 1.43)	.408
Under 21	.862 (.654 - 1.13)	.288	.970 (.762 - 1.23)	.801
Stop 1-2 hours before going home	.694 (.513 - .938)	.017	.504 (.392 - .647)	<.001
Alternate with non-alcoholic beverages	.703 (.528 - .936)	.016	.671 (.525 - .857)	.001
Set a limit on the # of drinks	.516 (.381 - .698)	<.001	.747 (.581 - .961)	.023
Make my own drinks to limit alcohol	1.38 (1.04 - 1.85)	.028	1.04 (.796 - 1.35)	.795
Limit the amount of money I spend on alcohol	.969 (.716 - 1.31)	.838	1.02 (.770 - 1.35)	.894
Avoid drinking games	.678 (.483 - .952)	.025	.532 (.407 - .697)	<.001
Eat before and during drinking	.970 (.668 - 1.41)	.873	1.11 (.796 - 1.55)	<.001

Avoid pre-gaming/ pre-partying	.411 (.297 - .569)	<.001	.432 (.317 - .590)	<.001
Avoid hard liquor	.501 (.363 - .691)	<.001	.637 (.475 - .854)	.003

Both males and females showed the greatest protective effect from the behavior of 'avoiding pre-gaming/pre-partying': students who binged were .411 and .432 times as likely to report usually or always 'avoiding pre-gaming/pre-partying, for males and females respectively. From there, males benefited most from 'avoiding hard liquor' (odds ratio [OR]=.501, 95% confidence interval [CI] = 363 - .691) and 'setting a limit on the number of drinks they will have' (OR=.516, 95% CI = .381 - .698). For females, 'avoiding pre-partying' was followed by 'stopping alcohol use 1-2 hours before going home' (OR=.504, 95% CI = .392 - .647) and 'avoiding drinking games' (OR=.532, 95% CI = .407 - .697)

Surprisingly, males who made their own drinks showed a higher odds ratio (OR=1.38, 95% CI = 1.04 - 1.85) than those who did not, even though the question specified 'to limit the amount of alcohol I have' (emphasis added here). While this strategy may sound good in theory, the practice of making drinks oneself may still result in more alcohol use, not less. This potential issue deserves further study and perhaps caution before promoting this strategy. It is also quite possible that the word "limit" on the survey question is not prominently enough stated as a qualifier, which could be missed or misinterpreted by the students. There was not a significant association between this PBS measure and binge drinking among females. Another measure, 'eating food before and during drinking' had a significant and slightly elevated odds ratio for females, but not for males. 'Limiting the amount of money spent on alcohol' was not significantly associated with reported binge drinking for either males or females, but this might

be a secondary, risk reduction strategy compared to other strategies that influence alcohol consumption more directly.

All other statistically significant variables had effect sizes that were in the expected direction. By and large, PBS measures showed a substantial impact for decreasing the odds of binge drinking among both males and females. Males and females shared the top strategy (avoiding pre-partying) which had the greatest protective association, but from there the strategies differed in their order of impact by gender.

PBS and 'Drinks Usually Have When Partying'

A multiple regression analysis was used to assess the relationship between PBS measures and the number of drinks students report usually having when they party. Again, since the effect of interest was among students who drink, only students who reported one or more drinks were included in the analysis. For the years 2013 - 2016, this represented a sub-sample of 8,241 students consisting of 3,870 males and 4,371 females. The 'have a designated driver when I know that I will be drinking' and 'refuse to ride with a driver who has been drinking' strategies were included in the initial model but dropped from the final model since they were not statistically significant. In checking the assumptions for linear regression, the Durbin-Watson statistic was 1.974 for the model for males and 2.007 for the female model. There was homoscedasticity, assessed by examining plots of studentized residuals versus unstandardized predicted values. No large correlations (i.e. 0.70 or more) were observed between independent variables and Tolerance values were all greater than 0.1 (the lowest was 0.651), which indicated that multicollinearity was not an issue. A review of the P-plots indicated that the residuals were normally distributed. Altogether, these analyses supported that the data met the requirements for

linear regression and did not violate the assumptions of normality. The multiple regression model significantly predicted the number of drinks students usually have when they party for both males $F(12,1284) = 28.227$, $p<.0005$, R^2 20.9%, adjusted R^2 20.1% and females $F(12,1977) = 46.117$, $p<.0005$, R^2 21.9%, adjusted R^2 21.4%. Table 13 shows the final models for both males and females. Strategies that were not statistically significant for both men and women included 'eating before and during drinking' and' limiting the amount of money spent on drinking'. 'Avoiding drinking games' was significant for females but not for males. 'Making my own drinks to limit alcohol' was significant for males but not females. The strategies with the largest effect sizes for males included 'setting a limit on drinks', 'avoiding pre-gaming', and 'avoiding hard liquor'. For women, the largest observed effects were 'stopping drinking 1-2 hours before going home', 'avoiding hard liquor', and 'avoiding drinking games'.

Table 13: Association between **'**Drinks Usually Have When Partying' and Use of Specific Protective Behavioral Health Strategies (PBS) and Demographic Characteristics for Male and Female University Students - Multiple Regression Summary

Variable	**Male**			**Female**		
	β	**SE_β**	***p***	**β**	**SE_β**	***p***
Intercept	8.766	.460	<.001	6.388	.244	<.001
Greek Member	.397	.251	.113	.138	.123	.263
Caucasian/White	.151	.214	.480	.036	.108	.741
Under 21	-.022	.204	.913	-.029	.104	.778
Stop 1-2 hours before going home	-.935	.227	<.001	-.791	.120	<.001
Alternate with non-alcoholic beverages	-.617	.216	.004	-.414	.114	<.001
Set a limit on the # of drinks	-1.368	.237	<.001	-.661	.116	<.001

Make my own drinks to limit alcohol	-.493	.217	.023	-.107	.116	.354
Limit the amount of money I spend on alcohol	.283	.223	.205	.076	.127	.551
Avoid drinking games	-.415	.272	.127	-.670	.120	<.001
Eat before and during drinking	.124	.268	.643	-.112	.152	.461
Avoid pre-gaming/ pre-partying	-1.167	.272	<.001	-.445	.130	.001
Avoid hard liquor	-1.150	.260	<.001	-.704	.128	<.001

PBS Measures and 'Drinks Last Time Had Alcohol'

Multiple regression modeling was also used to describe the relationship between use PBS measures and the number of drinks students reported consuming the last time they drank alcohol. Students were included in the analysis if they had reported one or more drinks for this measure. For the years 2013 - 2016, this represented a sub-sample of 8,595 students consisting of 4,012 males and 4,583 females. The 'have a designated driver when I know that I will be drinking' and 'refuse to ride with a driver who has been drinking' strategies again were included in the initial model but dropped from the final model since they were not statistically significant. In checking the assumptions for linear regression, the Durbin-Watson statistic was 1.999 for the model for males and 1.995 for the female model. There was homoscedasticity, assessed by examining plots of studentized residuals versus unstandardized predicted values. No large correlations were observed between independent variables and Tolerance values were all greater than 0.1 (the lowest was 0.6535), which suggested that multicollinearity was not a concern. A review of the P-plots indicated that the residuals were normally distributed. Altogether, these analyses

supported that the data met the requirements for linear regression and did not violate the assumptions of normality. The multiple regression model significantly predicted the number of drinks students had last time they drank for both males $F(12,1337) = 26.782$, $p<.0005$, R^2 19.4%, adjusted R^2 18.7% and females $F(12,2070) = 42.021$, $p<.0005$, R^2 19.6%, adjusted R^2 19.1%. Table 14 presents of the final models for both males and females

Table 14: Association between 'Drinks Last Time Had Alcohol' and Use of Specific Protective Behavioral Health Strategies (PBS) and Demographic Characteristics for Male and Female University Students - Multiple Regression Summary

Variable	Male			Female		
	β	**SE_β**	***P***	**β**	**SE_β**	***p***
Intercept	9.375	.490	<.001	6.426	.274	<.001
Greek Member	1.155	.273	<.001	.389	.140	.005
Caucasian/ White	-.473	.230	.040	-.154	.121	.204
Under 21	-1.140	.219	<.001	-.426	.117	<.001
Stop 1-2 hours before going home	-1.453	.246	<.001	-.729	.135	<.001
Alternate with non-alcoholic beverages	-.803	.234	.001	-.449	.128	<.001
Set a limit on the # of drinks	-.981	.256	<.001	-.591	.131	<.001
Make my own drinks to limit alcohol	-.129	.232	.578	-.192	.130	.140

Limit the amount of money I spend on alcohol	.321	.241	.184	.064	.142	.653
Avoid drinking games	-.068	.288	.814	-.488	.135	<.001
Eat before and during drinking	.172	.292	.556	-.133	.173	<.001
Avoid pre-gaming/ pre-partying	-.671	.289	.020	-.605	.147	<.001
Avoid hard liquor	-1.344	.275	<.001	-.810	.143	<.001

Based on these results, males and females shared the same significant strategies that were negatively associated with alcohol use, with the exception of avoiding drinking games (significant for men but not women). The largest effect sizes for females based on the coefficients were avoiding hard liquor (-.810), stop drinking 1-2 hours before going home (-.729) and avoiding pr-gaming (-.605). For males, the top strategies were stop drinking 1-2 hours before going home (-1.453), avoiding hard liquor (1.344) and set a limit on drinks (-.981). Non-significant strategies for both men and women included making one's own drinks, limiting the amount of money spent on alcohol, and eating before and during drinking.

DISCUSSION

This study examined 15-year trends in alcohol consumption among male and female college students at a large, public university. It represents a unique contribution given that these trends were collected at a single university for a relatively long study period, covering a period

of considerable change. While several national studies have shown evidence of a declining alcohol use gender gap in recent years, those findings were not always seen among college students.[18,19,34] The results presented here showed a diminishing gender gap in some alcohol use measures, but not others – suggesting that patterns of alcohol use are changing by gender in this population, but not always in predictable or monolithic ways. In addition, the research presented here examined the relationship between protective behavioral strategies and several alcohol consumption measures. The findings support a clear negative association between most PBS and alcohol use measures, with a few exceptions. This research is helpful in identifying which strategies may be most impactful, as well as others which may have limited effectiveness. Furthermore, while the results did show a couple of instances where the strategies differed by gender, for the most part males and females shared many of the strategies that appeared to be most helpful in moderating alcohol consumption.

Aim 1: Alcohol Use Trends by Gender

Among university students completing the annual Health & Wellness Survey, a number of drinking-related behaviors show significant decreases between 2002 and 2016. These behaviors include reductions in the percent who reported alcohol use in the past 30-days,which declined from 82% to 61% among males during the study period and 76% to 62% among females. Average (mean) drinks per week also reduced 58.9% among males and 42.9% among females among all students, as well as for 47.5% for males and 31.5% for females for those who reported one or more drinks in the past week. Although the overall binge rate did not decline, this analysis shows a marked decrease in the frequency of heavy drinking, among those students who binge. This led to steep reductions in the percent of the heaviest drinking students - those who binged more than once or twice (i.e. 3 or more times) in the past two weeks. For example,

among students who binged, the percent who binged three to five times in the past two weeks fell from 38% to 22% among males and from 30% to 14% among females. Similarly, students who binged six or more times in the past two weeks dropped from 17% to 6% among males and 7% to 4% among females.

Although past 30 day alcohol use by gender has historically closely tracked for females and males, in two of the last three years women actually reported a slightly higher percentage of alcohol use than males (62% versus 61%) the only time that has occurred since 2002. A shrinking gender gap was conspicuously evident in the average drinks per week measure - both genders showed declines but the rate of decrease for males was greater. This held true for all students and those who reported at least one drink, on average, per week.

For two measures, number of drinks that students report having when they party and the number of drinks they had last time they drank, held relatively stable over time. Graphing data from these measures revealed a high degree of continuity, both in the overall trend as well as the parallel lines of the gender gap. The overall binge rate showed more variation in the early 2000s but plateaued since 2011. For the binge drinking frequency measures, there was a fair amount of variability in the gender gap, but the 6 or more times (i.e. the heaviest drinking bingers) did show signs of a diminishing gap in recent years even as the overall trend went down markedly over time.

For most of the study period, average estimated BAC last time students drank has been between .070 and .077, with a few exceptions. Of note in the most recent years of the study, the gender gap for estimated BAC flipped: with women now reporting slightly higher BACs than men for the last time they drank alcohol. The linear regression fit line shows a decreasing trend

and an increasing trend for females that crossed around 2011. Since the 'drinks last time' variable (from which, the estimated BAC measure was in part calculated on) did not show an increase for women, other factors are likely related to this increase. Although it was not included as part of this analysis, the number of hours spent drinking (another variable used in the estimated BAC equation) could very well have decreased, leading to more compression of drinking time and elevating BAC in the process, other factors remaining equal.

The analysis of the 'how often do you usually party?' measure was particularly revealing, and appeared to support concurrent reductions in the average drinks per week since the frequency of drinking among students declined over the study period. While the gender gap changes were negligible over time, the overall decrease in the number of days students reported usually partying was dramatic. For females/males who reported partying three or more times per week, this decreased from 7% and 11% in 2002 to 2 and 3% in 2016, respectively. Similarly, those who reported they party twice a week went down from 19% (females) and 21% (males) in 2002 to 10% and 12% in 2016. The results showed steady and consistent declines in the measures across the study period. In contrast, the percent of students who reported partying one night per week, was stable between 2007 and 2016.

Most significant of all, large increases for both men and women were seen among those who report partying *less than* one night per week, which increased from 52% and 59% among females and males in 2002 to 68% and 73% in 2016. Given these results, many students were reporting fewer drinking nights than in the past - a key finding from this study. Additionally, the declines in 'party nights' support reductions in binge drinking frequency among those students who binge drink, since these episodes and the opportunities for heavy drinking seem to be getting more infrequent. In this way, the trends in drinking frequency suggests a dramatic

decline for a range of students at different levels of alcohol use and appears to be a key driver for a number of the reductions in alcohol consumption during this time frame.

Aim 2: Protective Behavioral Strategies and Alcohol Measures

Consistent with national data, women in the HWS sample report significantly higher PBS usage compared to men. An in-depth analysis of the reported use of eleven PBS measures and three key alcohol use behaviors revealed that, as a whole, the strategies have the anticipated association on mitigating alcohol consumption, with a few exceptions. One strategy, 'eating before and during drinking', remained in all the analysis models, but was statistically significant only for one behavior (binge drinking among females - which showed an elevated odds ratio of 1.11). This finding suggests that eating food is perhaps more of a risk reduction strategy to lower BAC, since food slows the rate of alcohol absorption, rather than a strategy that moderates consumption and alcohol intake.[67] This association is still unclear, since as was seen in the binge drinking analysis, it may actually be associated with an increase of alcohol consumption. One scenario to explain this could be that some students may offset a slightly lower BAC due to food intake by drinking more alcohol.

The 'make my own drinks to limit the amount of alcohol I have' measure was not statistically significant in four of the six analyses. In the two instances where it was significant, one was a negative association with 'drinks when partying 'among males, and the other was a positive odds ratio of 1.38 (i.e. 38% greater odds) among males for the likelihood of binge drinking during the past two weeks. These results imply that this strategy, in particular, may be less useful and even counterproductive. Focus groups and student feedback may be needed to better understand this relationship and whether these findings are due to how the question was

stated, understood, or some other factor. 'Limit the amount of money I bring or spend on alcohol' was also less than effective, and failed to show a statistically significant association across all alcohol use behaviors for either males or females. Given that alcohol is widely available and often "free" for students – especially for females - this strategy may have limited relevance.[51] For the current analyses for the 2013 - 2016 sample, 58% of students were under age 21 and, therefore, would have less access to purchase alcohol. In addition, even if we assume that some of the money spent on alcohol could be peer to peer (e.g. from an underage consumer to an of-age buyer) this strategy may be becoming obsolete as fewer students and young adults carry cash, instead opting for mobile payment services such as PayPal, Venmo, Apple Pay, Google Wallet, and Zelle to pay others.[68]

For the remaining six strategies, a clear case can be made that they have a negative association with alcohol use across the three alcohol consumption behaviors that were investigated. Top strategies for women based on negative effect size were 'stopping 1-2 hours before going home', 'avoiding pre-partying' and 'avoiding hard liquor' (all #1 strategies). For men, the best strategies were 'setting a limit on drinks', 'avoiding pre-parting', and 'avoiding hard liquor'. In other words, men and women shared two of the three top strategies across the alcohol measures. And for men, 'stopping 1-2 hours before going home' was not far behind. Males, notably, showed non-significant associations between 'avoiding drinking games' for two of the alcohol behaviors. This is somewhat surprising given that drinking games by definition create external criteria that govern alcohol decision making and may promote alcohol consumption in a short period of time - completely counter to the goals of PBS.[69] Presumably, avoiding these games could limit the potential for heavy alcohol intake, so more work is needed to understand this strategy, and perhaps how it is interpreted or implemented by students. By

contrast, ‘avoiding drinking games’ was the third best strategy for two of the three alcohol behaviors for females.

In summary, it is apparent there is considerable overlap in the potential utility of these strategies to reduce alcohol use behaviors across gender. Table 15 lists the various PBS measures for three alcohol behaviors. These results indicate that there is especially strong evidence here for avoiding drinking games and pre-partying, and stopping drinking 1-2 hours before going home to limit alcohol consumption.

Table 15: Ranking of Top Protective Behavior Strategies for Three Alcohol Consumption Measures by Gender*

PBS Measure	Alcohol Use Measure – Ranking 1 = Best Strategy					
	Five or more drinks in a sitting, past two weeks		Drinks Usually Have When Partying		Drinks Last Time	
	Male	Female	Male	Female	Male	Female
Stop 1-2 hours before going home	5	2	4	1	1	2
Alternate with non-alcoholic beverages	6	5	5	6	4	6
Set a limit on the # of drinks	3	6	1	4	3	4
Avoid drinking games	4	3	n.s.	3	n.s.	5
Avoid pre-gaming/ pre-partying	1	1	2	5	5	3

Avoid hard liquor	2	4	3	2	2	1

*PBS with mixed results/directionality, and/or lack of significant results were omitted. These included: 'make my own drinks to limit the amount of alcohol that I have', 'limit the amount of money that I bring or spend and alcohol', and 'eat before and after drinking.'

Limitations

This study has a number of limitations that are important to consider. All project data come from students enrolled at a single university, which limits its generalizability. At the same time, the UA is a large, public university, with many student alcohol use indicators near the national average – factors which may make this research of value to other similar schools and peer institutions across the country. Data used in this study are derived from surveys consisting of self-report responses, another potential limitation. While surveys that rely on self-report data are by far the most common method to measure student alcohol use, they are inherently imperfect. Research has shown that students tend to underreport their alcohol use, largely because they may not measure drinks or are unsure what constitutes a standard drink of alcohol.[70] Also, social desirability and recall bias may influence self-report data, since some students can feel uncomfortable reporting high levels of alcohol use or have difficulty remembering their exact alcohol intake.[71] By assessing a range of alcohol measures, this analysis has attempted to reduce the potential for recall bias, where possible. For example, the 'drinks last time' variable may be less prone to recall bias based on what would likely be a recent occasion for most students. However, alcohol-related memory loss or the fact that students didn't count or track their intake could still make recall bias a factor.

The measure used in this study to examine binge drinking (5 or more drinks in one sitting in the past two weeks) has also been defined differently across organizations and surveys, which also may impact how these results are compared and interpreted with other data

sources. This particular question has always been asked the same way for both males and females (5 drinks for either), on the UA Campus Health Service's Health & Wellness Survey in large part to ensure internal consistency in this measure across survey years. However, the CDC, Behavioral Risk Factor Surveillance System (BRFSS), National Institute on Alcohol Abuse and Alcoholism (NIAAA), the Substance Abuse Mental Health Services Administration (SAMHSA), and the Harvard School of Public Health College Alcohol Study all employ a differential binge definition: four drinks for females and five drinks for males, due to physiological variation across gender and its potential impact on alcohol metabolism and BAC.[72-75] While these are good reasons to support a so-called 4/5 definition of binge drinking that acknowledges these differences, the fact remains that the binge question on the HWS that these analyses were drawn from asks the question for five drinks across the board, for all respondents. Due to this, the prevalence of binge drinking presented in the results here would likely be lower for females, compared to other surveys and research which employs a slightly broader gender-specific term.[76]

Since this research was based on a series of cross-sectional surveys, the potential associations between the alcohol use behaviors and the PBS measures lack the temporal relationship needed to demonstrate causation. Although these analyses do show that a number of protective behavioral strategies are associated with lower alcohol consumption across multiple behaviors, the nature of the study design warrants some caution in interpreting the results. Another potential limitation was the fact that PBS were assessed based on general usage ('When you drink, how often do you do the following?') rather than being tied to a specific drinking occasion and number of drinks. The analyses conducted in the second aim were stratified by gender in separate models that did not include gender interaction terms. This decision was made to improve the interpretability of the results given that the research question was designed to

inform college-based prevention staff. As a consequence, the results have avoided direct comparisons of odds or coefficients across gender, instead describing each and ranking the main effects accordingly. Despite these limitations, this research stands within the context of other work conducted on PBS, and expands the knowledge base on their utility.

Policy and Program Recommendations

In addition to the research value of this study, there are policy and program implications to be gleaned from these results, both for higher education personnel and staff working in the field of alcohol abuse prevention. The complexity of alcohol use as a social phenomenon necessitates a broad spectrum of approaches to address this issue, as evidenced by the range of suggested strategies put forth below. These study-informed recommendations cover both Aims of this research and offers multi-level approaches that translate the results into practice-based initiatives to reduce alcohol use and related risk among the student population, both at the UA and at colleges and universities at large. Table 16 summarizes these recommendations, which are discussed in detail below.

Table 16: Summary of Policy and Program Recommendations.

Recommendation Level	Strategy
Policy	Uphold and enforce the Minimum Legal Drinking Age Act
Policy	Implement and monitor hard alcohol bans and stricter enforcement for hard alcohol on campus
Policy	Develop a mandatory for-credit course to promote PBS, alcohol risk reduction strategies and student health in general

Policy	Use policy compliance with U.S. Department of Education requirements to drive collaboration and improve coordination across units that have a role in student alcohol use
Program	Promote PBS that appear to have greatest impact and reassess questionable strategies
Program	Tailor and deliver gender-specific alcohol prevention programming
Program	Enhance alcohol-free social opportunities for students.

Policy Recommendations

Policy Recommendation: Uphold and enforce the Minimum Legal Drinking Age Act

From a policy standpoint, it is important not only to identify new strategies to address alcohol use, but also essential to uphold and support existing ones that protect public health in this area. First among them is the National Minimum Legal Drinking Age Act (MLDA). While the U.S. has experimented with various ages over the years, age 21 has been the law of the land in all 50 states since 1988. The prospect of lowering the legal drinking age is a common refrain from time to time. One frequent justification for this involves the fact servicemen and women can and enlist at age 18 in the U.S. military and put their lives at risk while being unable to legally drink until 21, a fact that has been front and center since the U.S. has been at war since 2001.

One high-profile effort to lower the legal drinking age that occurred in 2008 and coincides with the study period was The Amethyst Initiative. This group, led and endorsed by a number of college and university presidents, put forth the idea that a lowered drinking age would reduce high risk alcohol use among young adults.[77] Critics pointed out that the initiative was

misguided - stating that a lowered drinking age would only serve to undo a highly effective public policy that research has shown to reduce both underage alcohol consumption and related risk, as well as the odds of dependence and addiction into adulthood due to delaying the onset of use .[78,79] While alcohol use has been and remains one of the most important public health issues for the college population, it is difficult to identify any policy that has had as well documented a role in mitigating alcohol related risk as the MLDA. For this reason, it is important not to overlook the impact of the MLDA as a cornerstone of effective alcohol policy in the face of periodic attempts to challenge its utility, particularly for the college student population.

Policy Recommendation: Implement and monitor hard alcohol bans and stricter enforcement for hard alcohol on campus

The results presented here also speak to the opportunity to do more on this issue from a policy standpoint. Addressing what appears to be an anecdotal shift away from lower alcohol by volume drinks such as beer, in favor of liquor/hard alcohol would necessarily be a key area of emphasis from a program perspective. From a policy standpoint, a number of schools including Stanford, Dartmouth, and Notre Dame, among others, have announced bans on hard alcohol in recent years in an attempt to address this.[80] Many others, including the University of Arizona, do not have outright bans but do largely restrict hard alcohol on campus, which includes tailgating during football season and university-approved fraternity parties. Although these restrictions may be helpful, enforcement can prove to be difficult. Hard alcohol is portable, easy to conceal, and therefore a challenge to curb. No published studies could be found on the effectiveness of hard alcohol bans as a campus wide strategy, at present, but examining the impact of these policies going forward will be very valuable, given the risks associated with hard alcohol use.

Nevertheless, hard alcohol bans should be an important pilot strategy to address high-risk alcohol use on campus, particularly so because liquor presents additional risks to female college students. This is in part due to the rapid nature that hard alcohol is consumed and its elevated alcohol by volume (typically 35% alcohol and above) relative to other drinks, which in turn can quickly lead to dangerously high BAC levels. As has been presented here, decreasing percentages of women who report that they 'avoid hard alcohol' and 'avoid pre-partying' (often associated with hard alcohol use) on the Health & Wellness Survey as prevention strategies implies that students are consuming higher alcohol content drinks in shorter periods of time, which underscores the importance of finding ways to deter hard alcohol consumption wherever possible.

Additional approaches, such as stiffer penalties for underage students who are in possession of hard liquor versus other, lower alcohol content beverages could also be incorporated into campus policies in conjunction with hard alcohol bans. In this way, a differential approach to alcohol enforcement may be promising since it could influence student use and consumption practices. Longstanding policies that banned common alcohol sources such as beer kegs in the 1990's at the UA were implemented with good intention, but may have inadvertently led to increased hard alcohol consumption among students. Kilmer et al noted this as far back as 1999 in a paper that described the unintended consequences of risk management approaches such as bans on beer kegs within the Greek system, which appeared to result in more hard alcohol use and higher levels of risk among students looking to get around these well-meaning policies.[81] As a result, new strategies will need to be put in place to help counter hard alcohol use, 'pre-gaming', and their consequences. Although there is good reason to support stricter policies with respect to hard alcohol on campus, strong evaluation plans will need to

accompany these policy changes to monitor their impact to ensure they are functioning as intended.

Policy Recommendation: Develop a mandatory for-credit course to promote PBS, alcohol risk reduction strategies and student health in general

Even the best protective behavioral strategies are only useful if they are effectively shared, learned, and implemented. Large universities such as the UA can present challenges to get these messages out *en masse* to effectively scale and reach all or even most of the student population. Some students may see these strategies/messages on a poster in their dormitory, others may have heard about them from a health educator as a guest presenter in their class or sorority, but reaching a wide swath of the student population is difficult. One idea to address this would be to propose a one-credit course required of all incoming students, focusing on student health as a foundational aspect of success in college and beyond. This course could not only include alcohol education and address PBS/harm reduction strategies, but also bring together a host of other disparate requirements for first-year students, including sexual assault prevention and Title IX trainings. With growing mental health needs among students, the class could also serve as a vehicle to deliver information on topics ranging from sleep and stress management, anxiety and depression, coping and life skills, all while highlighting campus resources that support these aspects of student health and wellbeing.

In this way, a campus policy-level decision to mandate a credit-bearing course could provide a tremendous backing to alcohol prevention programming efforts, among them promoting the protective behavioral strategies discussed here. An administrative decision to support this would effectively create the structure to deliver a sort of universal alcohol education

to all students early in their college experience, which would be an important statement in acknowledging the fact that alcohol is one of the most significant public health issues affecting college students.[4,5] Building support for such a course would be a considerable undertaking, due to the burden of making these units a requirement as part of enrollment at the UA, as well as the logistics of implementing across such a large population. Developing this as an online course, at least in part, could help facilitate its implementation on such a large scale.

Another approach could be to develop the course first as a standard (optional) course and then follow those students over their college experience to determine any potential impact on their health, wellbeing, persistence in school and graduation rates. If the results are favorable, they could help convince campus administrators the value of requiring all students to enroll in such a course as part of a wider effort to improve university retention rates. The importance of aligning student health to university retention goals and implementing an evaluation plan to monitor that connection could very well serve as a key selling point to transition the course from an optional class to one that all undergraduates are required to enroll in and successfully complete. If a mandated course does show effectiveness at reducing alcohol-related risk and improving student persistence in school, it is not hard to imagine that many colleges and universities would push to adopt similar strategies as a best practice – a development which could have far-reaching benefits for college students on a national level.

Policy Recommendation: Use policy compliance with U.S. Department of Education requirements to drive collaboration and improve coordination across units that have a role in student alcohol use

Until such a course can be designed and implemented, more work can be done to effectively promote the strongest PBS across departments and units at the university level.

Campus health, housing, Dean of Students, campus police, Greek Life, risk management and other campus departments have a clear stake in addressing alcohol as a health and safety issue. Those familiar with student conduct will no doubt be unsurprised by the clear association between many these behaviors (e.g. pre-gaming and hard alcohol use) and a host of negative student health consequences that they regularly see when addressing legal issues, code of conduct violations and student behavior.

More can be done to ensure these risk reduction strategies are reinforced across all areas of the college environment. Campus-based alcohol and other drug committees and coalitions form an ideal place to bring these units together and create buy-in for common messaging practices. For campuses that lack a committee of this kind, the U.S. Department of Education's Safe and Drug Free Schools and Campuses Biennial Review process, in compliance with EDGAR, part 86, can be a call to action for prevention staff to bring stakeholders to the table in support of alcohol risk reduction strategies that form the basis for a campus-wide approach.[82] This approach has been very helpful at the UA for many years.

Policy level compliance can play an important part as both a starting point and a way to sustain work in this area. Data sharing can serve as another way to galvanize these cross-campus efforts, to monitor student health trends and review programs and approaches that address alcohol use. Results, such as the ones detailed in this study, can help facilitate the kind of collaboration needed to develop campus-wide support. These findings will be used in such a way at the UA, to advance key strategies which are described here, and increase coordination across the university with regard to how these messages are shared with students.

Program Recommendations

Program Recommendation: Promote PBS that appear to have greatest impact and reassess questionable strategies

From these results, a roadmap emerges on the top protective behavioral strategies that are associated with lower alcohol consumption levels for both males and females. These include: 'stopping drinking 1-2 hours before going home', 'setting a limit on the number of drinks', 'avoid pre-partying', 'avoid hard liquor', and 'alternating with non-alcoholic drinks'. The policy recommendations above cite a few ways to better promote these PBS – through both increased campus collaboration to ensure delivery of these messages in public health campaigns as well as through the vehicle of a mandated course, required for all students. In addition to these broader strategies, even at the department level more can be done to ensure these PBS are highlighted through programs going forward. Surprisingly, although PBS have been well studied in regard to their association with alcohol consumption and related consequences, no research could be found evaluating how they might be more effectively promoted.

Despite the fact that avoiding hard alcohol and pre-partying have among the lowest usage rates compared to other strategies, this analysis revealed that they are among the best PBS to reduce alcohol consumption. As a result, promoting these strategies in an appealing way to students that emphasizes the benefits of adopting them is a key program recommendation based on this work. Unfortunately, fewer than ⅓ of students overall usually or always use these strategies when then drink, though women are more likely to report using them than men. On the positive side, these results suggest that improvements in these numbers have great potential

to mitigate alcohol consumption and related harm among the student population, should they be effectively promoted and adopted.

Since these two strategies showed some of the greatest impact, but were also among the least likely to be used, new approaches should be considered to promote them. For example, highlighting a strategy such as 'choosing lower alcohol content drinks such as beer' could very well have a similar effect to 'avoiding hard liquor' but might be a message that students are more likely to adopt. In this way, a positive behavior (choosing beer) would also be more instructive - and perhaps better received - than a negative one (avoiding liquor), as a risk reduction approach. Finding other creative ways to reinforce the avoiding hard alcohol and pre-partying strategies will require student feedback in the form of interviews, focus groups, and ongoing evaluation, but could offer promising results.

While most of the protective behavioral strategies showed excellent results in mitigating the association with alcohol use, a few strategies, despite how seemingly well-intentioned and straightforward, may be problematic. While different strategies often complement each other, they also function individually, and should also be evaluated as such to see which work, and which may not. This is one of the strengths of this study since, to date, much of the literature on PBS has focused on composite scores across multiple strategies. While valuable in describing the synergy across strategies, this approach is less able to identify strategies that are ineffective - or conversely, ones that are particularly good. From a program standpoint, knowing which strategies do not appear to reduce alcohol consumption is as important as identifying the ones that do. The data presented here indicate that a few of the strategies ('make my own drinks' and 'limit the amount of money I spend on alcohol'), may need to be reassessed. In addition, avoiding drinking games was not significant for males across two of the three alcohol measures,

which also deserves more examination. As drinking patterns change, protective behavioral strategies that are at the core of many program and population-based education efforts will need updating to ensure that they are both relevant and effective. Part of that will be to utilize the results of this and other studies to promote strategies that appear to be universally effective across the college student population. While these results were specific to college students at the UA, there is the potential that at least some of these strategies could be used and/or adapted for broader use in both the non-college and general adult population as well.

Program Recommendation: Tailor and deliver gender-specific alcohol prevention programming

The prospect of a shrinking gender gap on a number of alcohol use measures supports the idea of enhancing tailored, gender-specific programming, and its reach – beyond the more generally effective strategies identified in the preceding program recommendation. Examples of gender specific initiatives could include developing or expanding alcohol-related campaigns that target women in all-female dorms or sorority houses to ensure that existing prevention programs are reaching females at high risk for alcohol use. Program evaluation would be particularly important in this regard, to monitor female participation rates for high-risk groups. While this analysis found that males and females generally benefitted from similar PBS, there were a few exceptions. For example, avoiding drinking games was associated with lower alcohol use for females, but not males - making it the kind of strategy that could be readily incorporated into existing programs selectively for female students, whether they be delivered online, in print, or in person. While not covered here, it's quite possible that gender should be an important consideration in how these strategies are marketed, in both the way those messages are designed and how they are conveyed.

Online programs also offer considerable opportunities to tailor and deliver programs that are specific to gender, and therefore is likely an ideal platform to implement these at scale. Widely used programs such as San Diego State University's 'e-Check Up to Go', for example, could be further improved by incorporating content that draws upon selective strategies once a gender option is selected in the demographic section of the program.[83] Similarly, other online programs that are in use at the UA and at other colleges and universities could do the same, such as the UA's Project 21 website that is delivered to students in advance of their 21st birthday, in support of lower risk ways to celebrate safely. Beyond these, there may be opportunities to use online academic platforms such as D2L (Desire to Learn) to offer periodic alcohol education tips, that could be tailored to either males or females since this level of customization is readily available and could enhance the relevance and impact of these health promotion messages.

Program Recommendation: Enhance alcohol-free social opportunities for students.

Based on overall declines in 30-day usage over time, more students report being non-drinkers. Campus prevention staff should continue to promote this fact through social norms approaches to dispel misperceptions that all students drink, let alone drink heavily. A growing number and presence of non-drinkers on campus can help redefine a culture that too often promotes alcohol as an expectation of the college experience. Much of that expectation translates into the social lives of students, and prevention staff as well as other campus stakeholders should acknowledge that alcohol use often takes place within a context and need for social connection.

Universities may then opt to facilitate these connections more deliberately, especially early on in the college experience, to ensure that those needs are met in ways that promote student health and wellbeing, rather than hinder it. This is particularly important since even as some measures of alcohol consumption improve at the UA and across the nation, another prominent student health issue, mental health, continues to worsen.[84] Alcohol-free late night events, such as the UA's "Cats After Dark" program, have been recently implemented with the intent of promoting student engagement and wellbeing and have the combined benefit of supporting non-drinkers, students in recovery, and providing social opportunities for all students – drinkers and non-drinkers alike. As a result, alcohol-free programming should be supported and enhanced as part of a comprehensive, campus-wide approach to alcohol abuse prevention that fosters social connection and promotes students' mental health.

Future Research

Aim 1: Alcohol Use Trends by Gender

These 15-year trends mirror reductions in several alcohol use measures at the national level, and show evidence of a declining gender gap in a few measures. Analogous to national trends, many of the reductions at UA have been driven by declines in use among males.[18,19,34] On one hand, males drank at higher levels and had more "room to improve." On the other, this suggests that new approaches must be used to reduce alcohol use among women where usage has been flat, or in some cases, increasing. These efforts should examine and incorporate motivations for use among both men and women, and explore the reasons that might explain why female alcohol use has not seen the same reductions seen among males.

While the research presented here contributes to describing these trends, more work is needed to understand the "why" behind these results. Societal forces, as has been mentioned, may be reshaping gender roles, and with it alcohol use. Alcohol may also be used as a way to cope with stress, and the HWS has consistently shown that UA females report higher levels of stress, compared to their male counterparts.[85] These factors may in turn warrant additional study of effective coping skills and stress management, both for a general population, as well as strategies which can be tailored specifically for female college students. The benefits of this research will likely yield a better understanding what may represent changing motivations for alcohol use for this population.

Even as some measures of alcohol use have improved over time, the fact that women in the study now have higher estimated BACs last time they drank compared to men based on the HWS data should be cause for concern. While more research is needed in this area, these data suggest that the manner of college student alcohol use is in a period of transition, leading to higher BAC levels which may be due to harder alcohol consumed over shorter periods of time. While this research looked at a number of alcohol measures, more can be done to further explore the factors behind elevated estimated BACs among college females. The consequences of this type of use pose a serious threat to the health of college students in general and college women in particular, even while other measures appear to be improving.

Future research might explore why drinking frequency (measured by 'nights per week that students party') is on the decline, as has been noted here. This study period, 2002 - 2016 spans a great deal of technological change for college students, who are often early adopters of technology. The role of technology to influence student life, including alcohol use, is hard to ignore. As more time is dedicated to "screen time" and phone-based activities, research has

shown that students today spend less time socializing face-to-face with their peers than in the past, which this analysis appears to support.[86] Today, the word "binge" is as likely to be used to describe viewing multiple TV episodes in succession ("binge watching"), often alone, as it is to account for consuming five or more drinks at a party.[87] Language reflects culture, so perhaps this change of parlance is significant. It seems plausible that reductions in drinking frequency are at least in part attributable to the diminishment in social, in-person time that college students spend with their peers, though more research is needed to substantiate this connection.

On the policy side, as has been referenced, research on the effectiveness of alcohol bans and stricter hard alcohol enforcement on campus will be needed to measure the impact of these policies going forward. For a handful of campuses who have adopted them, these policy changes are still in their infancy. Tracking and disseminating campus alcohol use trends pre and post implementation will provide important clues to their impact. Examining student alcohol consumption measures, alcohol-related infractions, and medical transports are a few of the measures that would be important to monitor, and differences between males and females in these metrics would also be of interest, given the research presented here. On the program side, a fuller understanding of how individual alcohol prevention programs have influenced wider trends is another important area of work, and would do much to complement existing program evaluations currently being conducted.

A key part of public health is communicating population-based health and emerging trends. Results from this study can help. On a campus level, more research and evaluation is needed to monitor these trends, as well as a willingness to disseminate results, whatever the results may be, positive or negative. To supplement findings from national surveys, college health researchers could establish "sentinel" sites, comprised of college and universities with

different profiles and from varying regions, to lead to better surveillance and communication on this issue. Greater uniformity in how alcohol related survey questions are asked would also be an important part of this model. The higher education landscape is broad and diverse, and perhaps a decentralized yet coordinated approach to data collection on this topic would offer greater comparability across schools, and allow higher education stakeholders and public health staff to be more responsive to emerging trends as well as testing strategies with the greatest utility in addressing these issues. Many colleges and universities compare and benchmark themselves to a short list of "peer institutions" – which could make a convenient place to begin this work.

Additionally, the UA was recently designated as a Hispanic Serving Institution (HSI), a distinction that might serve as another reason to monitor alcohol consumption in this capacity as Hispanic/Latino student enrollment increases nationally.[88,89] In addition to gender, this research would be benefit from future studies that explore long-term trends in alcohol use by race and ethnicity, as another important area of alcohol research. Based on its HSI distinction, a part of which is derived from having at least 25% of full-time students who identify as Hispanic/Latino, the UA would be well positioned monitor alcohol use (as well as other health indicators) of this segment of the student population going forward, which would be of value for other institutions and policymakers.[90]

Aim 2: Protective Behavioral Strategies and Alcohol Measures

The associations presented here between alcohol use behaviors and the different PBS results should serve as a starting point for further analysis. While many of the strategies show the potential for considerable impact on several alcohol behaviors, more work is needed to

confirm these findings. Additionally, a few strategies may need to be set aside until their impact on alcohol related outcomes are better understood. The majority of the published studies on PBS come from cross-sectional data, similar to this study. And while the current findings are bolstered by a large sample size and consistent methodology, more longitudinal studies and meta-analyses are needed to help provide more definitive results, as suggested by Pearson (2013) in a critical review of the published findings to date.[91]

The marketing and promotion of PBS appears to be another topic ripe for study, of which there appears to be very little. While the body of literature on PBS grows, nothing could be found on how to effectively market these strategies – let alone to different subgroups of the student population (i.e. males/females, Greek members, by race/ethnicity). Presumably, questions on how best to present and encourage the uptake of PBS among students are answered independently on each college campus based on informal research, but a more systematic approach would be well received and welcomed by practitioners in the field as to the better understand which approaches can promote PBS as widely as possible and ensure they are resonating with students.

Conclusion

The reductions described in this study should reinforce the commitment of campus-based alcohol harm reduction programs. Colleges and universities, including UA, might consider ways to further increase the exposure of prevention programming, particularly to address rising alcohol use among college women. While a gender gap persists on most alcohol use behaviors, the trend data, presented here, show that the gaps are closing for some behaviors. Of note, none of the alcohol behavior/measures showed an increasing gender gap. The fact that only decreases

or relative stability in the male/female gender gap were observed across the study is important because it suggests the ways in which men and women use alcohol may be changing. And for two of the alcohol behaviors examined, past 30-day alcohol use and estimated BAC last time students drank, the gender gap has flipped entirely – with females showing higher values in these measures. While these differences were modest, it remains to be seen whether a new gender gap is now emerging.

This analysis shows that on average, students are less likely to drink during the past 30 days, are partying less, and are drinking fewer average drinks per week, over the study period. The overall binge-drinking rate has been a stubborn alcohol behavior metric to move, but it is promising that the frequency of heavy episodic drinking is declining, among students who had five or more drinks in one sitting during the past two weeks. As students report fewer drinking occasions over time, these reductions not only appeared to influence declines in binge drinking, but also alcohol use more generally, as measured by average drinks per week. Fewer drinking occasions among students is certainly good news, but these results need to be seen in a larger context. If, in fact, drinking occasions among college students are decreasing due to overall reductions in face-to-face interactions, the news is mixed, and may signal a need to address the mental health implications of more student isolation and less social connectedness – even as some alcohol measures appear to have improved.[86]

Additional research will be needed to determine the drivers behind these factors, both at the college level and in the general population, but it would be hard to ignore the impact of health promotion efforts at the UA during this timeframe. These include population-based health education campaigns (see Appendix for examples), an evidence-based online alcohol intervention (the 'e-Check Up To Go' program) for incoming freshmen implemented beginning

in 2005, resources for UA parents to address and speak with their student about alcohol use, harm and risk reductions programs such as SHADE and BASICS for adjudicated students and The Buzz, a prevention program that primarily reached Greek and on-campus students.[71c] While determining the impact of these efforts on the overall alcohol numbers can be challenging, many of these efforts have program data and research that support their effectiveness, and underscores the import of sustained prevention and intervention efforts on campus, both in supporting the students of today and the leaders of tomorrow.[92-94]

Public health and campus prevention practitioners should seek to build on the declines detailed here, identifying key areas where more work is needed (e.g. addressing hard alcohol use, pre-gaming), and finding ways to reach both men and women in ways that maximize program impact. In addition to these, the program and policy-based recommendations outlined above provide a framework to address the issue of college student alcohol use comprehensively. For individuals working in the area of alcohol prevention on college campuses, as well as researchers monitoring alcohol trends in this population, both would be well-advised to continue to monitor and address the gender gap to ensure that improvements seen among males do not mask what could represent a growing cause for concern among female drinkers.

APPENDICES

Appendix Table 1: HWS Sample Demographics, 2002 - 2016 (percentages unless otherwise noted)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	All
Female	60.7	56.5	53.1	53.0	53.1	53.0	53.0	52.7	52.4	54.0	52.4	52.3	52.3	52.1	52.0	53.2
Age, mean (SD)	20.8 (4.2)	21.0 (4.9)	21.3 (4.4)	21.1 (4.0)	21.1 (3.9)	21.0 (3.7)	21.1 (3.7)	21.0 (3.5)	20.9 (3.4)	21.1 (3.8)	20.7 (3.4)	20.6 (3.1)	20.7 (3.4)	20.7 (3.2)	20.6 (3.2)	20.9 (3.7)
Freshmen	31.8	34.4	25.1	25.1	24.8	24.7	24.7	26.3	26.1	25.9	31.0	29.8	31.0	28.3	31.0	28.0
Sophomore	24.1	22.7	21.8	21.7	21.6	22.0	22.0	21.1	21.9	22.2	20.8	21.2	20.9	21.4	21.0	21.7
Junior	20.7	19.2	23.0	23.0	23.2	22.5	22.5	22.1	21.9	22.2	22.4	22.4	22.4	23.5	22.0	22.3
Senior	23.4	23.7	30.2	30.2	30.4	30.8	30.8	30.5	30.1	29.7	25.8	26.6	25.8	26.8	26.0	28.0
Fraternity/ Sorority member	21.1	16.6	10.4	10.0	10.0	9.9	11.5	12.0	14.0	13.5	14.0	13.1	14.0	12.2	14.0	12.9
Under 21	37.2	37.2	44.1	45.1	45.8	45.5	46.0	45.2	43.5	45.2	40.8	42.3	41.4	42.5	40.9	42.9
African American	2.6	2.5	2.5	2.0	3.0	3.1	3.2	3.3	2.8	3.0	3.2	3.4	5.7	4.9	5.5	2.9
Asian/Pacific Islander	6.8	5.3	7.3	8.8	6.7	9.8	5.3	6.4	10.3	9.7	10.6	11.6	10.9	15.7	13.2	8.7
Caucasian	72.3	72.6	66.8	69.1	67.2	64.0	70.9	67.8	65.4	62.5	59.3	55.5	61.2	60.9	61.0	65.0
Hispanic/ Latino	10.8	13.8	14.3	13.6	15.3	15.3	13.0	16.8	14.2	15.2	19.0	21.3	27.2	24.2	25.2	15.7
Native American	1.2	1.3	3.4	1.7	1.4	2.5	1.6	1.3	1.7	1.8	1.3	1.6	2.1	2.2	2.0	1.1
Other	3.8	2.3	3.3	2.1	3.5	2.3	3.4	1.5	2.6	3.0	2.1	2.3	3.6	1.8	3.2	2.7

Appendix Table 2: Pearson's Correlational Coefficients Across PBS Measures

	Stop drinking 1-2 hrs before going home	Alternate with non-alcoholic drinks	Have a desig-nated driver	Set a limit on the # of drinks I will have	Make my own drinks to limit alcohol	Limit the amount of money I spend on alcohol	Avoid drinking games	Eat before and during drinking	Refuse to ride with a driver who has been drinking	Avoid pre-gaming/ Pre-partying	Avoid shots of hard liquor
Stop drinking 1-2 hrs before going home	1	.339	.137	.321	.178	.185	.258	.165	.185	.308	.282
Alternate with non-alc. drinks	.339	1	.138	.288	.180	.164	.230	.198	.177	.297	.254
Have a designated driver	.137	.138	1	.128	.187	.183	.052	.161	.374	.029	.052
Set a limit on the # of drinks I will have	.321	.288	.128	1	.255	.238	.353	.174	.170	.336	.337

Make my own drinks to limit alcohol	.178	.180	.187	.255	1	.292	.105	.156	.201	.090	.095
Limit the amount of money I spend on alcohol	.185	.164	.183	.238	.292	1	.128	.151	.200	.113	.117
Avoid drinking games	.258	.230	.052	.353	.105	.128	1	.121	.096	.473	.437
Eat before and during drinking	.165	.198	.161	.174	.156	.151	.121	1	.224	.149	.150
Refuse to ride with a driver who has been drinking	.185	.177	.374	.170	.201	.200	.096	.224	1	.145	.119

Avoid pre-gaming/ pre-partying	.308	.297	.029*	.336	.090	.113	.473	.149	.145	1	.680
Avoid shots of hard liquor	.282	.254	.052	.337	.095	.117	.437	.150	.119	.680	1

All correlations are significant at the p<.01 level, with the exception of *, which is significant at p<.05

Appendix Figure 1: "Students & Alcohol: 7 Ways Parents Can Help" Health Education Graphic

STUDENTS & ALCOHOL: 7 Ways Parents Can Help

By: David Salafsky, MPH, Director, Health Promotion & Preventive Services, UA Campus Health Service

While the UA is nationally recognized for evidenced-based alcohol prevention programs that support student health, we simply cannot be successful without your help.

That's because students say their parents, along with their peers, are the two groups they go to most for advice, support, and modeling.

Here are seven things you can do to help:

1. **Set clear and realistic goals on academic performance.** Being upfront about expectations helps students put their education first.

2. **Check in on Thursdays, Fridays or Saturdays.** It's no surprise that these are the days students drink most. Research suggests that parent phone calls, emails or text messages can reduce alcohol consumption by their student on the day of contact.

3. **Encourage volunteerism.** Students who connect with their community while they are here will have a fuller, more enriching college experience. Research suggests they will also drink less.

4. **Correct misperceptions.** Students tend to overestimate how much their peers drink. In reality, most drink moderately, if they drink at all (see "Just the Facts" to the right).

5. **Communicate the risks.** Scare tactics don't work, but discussing the obvious risks openly and evenly can help discourage their participation in drinking games, hazing, 21st birthday dangers, and other high risk behaviors.

6. **Show your student how to intervene if they need to.** Explain how to prevent alcohol poisoning before it happens, and how to step up when someone needs help.

7. **State the obvious.** Underage drinking and impaired driving are against the law. Avoid messages that obscure these facts.

For more ways you as a parent can help, please visit the UA Campus Health Service website at www.health.arizona.edu.

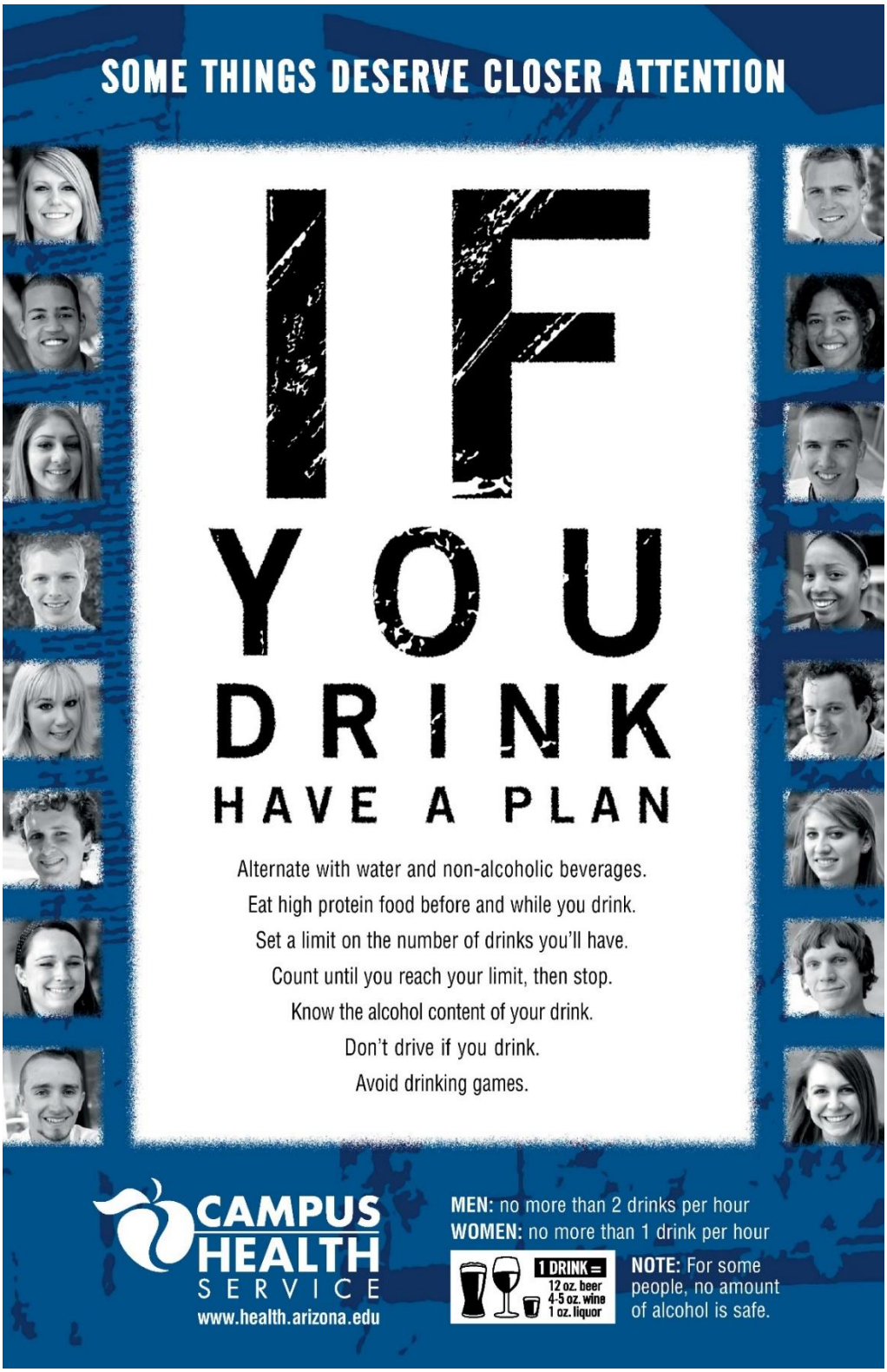
Adapted from: *The College Parent Advisor*, published by College Parents of America.

JUST THE FACTS: UA Freshmen & Alcohol

- **51%** did not drink alcohol in the past 30 days.
- **91%** arrange to have a designated driver if they plan to drink.
- **90%** did not get in trouble with the school authorities or police during the past year.
- **67%** party less than weekly.

Source: 2015 Health and Wellness Survey (n=2,705), administered to a random sample of undergraduate classes at The University of Arizona

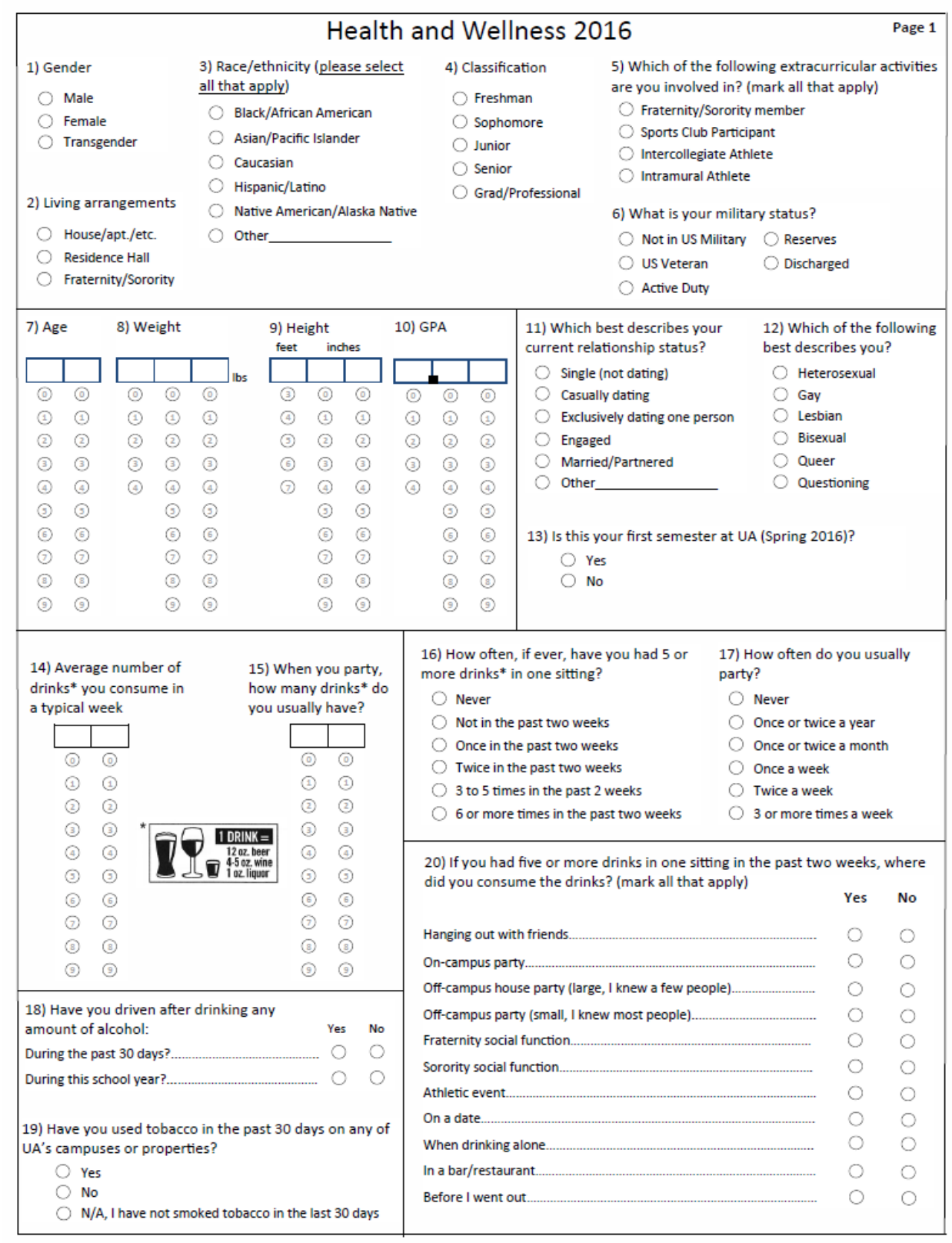
Appendix Figure 2: "Some Things Deserve Closer Attention" (PBS) Health Education Graphic



Appendix Figure 3: "Stop at the Buzz" Health Education Graphic

Appendix Figure 4: "Safer Drinking Tips" Health Education Graphic

Appendix Figure 5: UA Health and Wellness Survey (2016) and Disclaimer Form



Health and Wellness 2016

Page 1

1) Gender
- ○ Male
- ○ Female
- ○ Transgender

2) Living arrangements
- ○ House/apt./etc.
- ○ Residence Hall
- ○ Fraternity/Sorority

3) Race/ethnicity (please select all that apply)
- ○ Black/African American
- ○ Asian/Pacific Islander
- ○ Caucasian
- ○ Hispanic/Latino
- ○ Native American/Alaska Native
- ○ Other_____

4) Classification
- ○ Freshman
- ○ Sophomore
- ○ Junior
- ○ Senior
- ○ Grad/Professional

5) Which of the following extracurricular activities are you involved in? (mark all that apply)
- ○ Fraternity/Sorority member
- ○ Sports Club Participant
- ○ Intercollegiate Athlete
- ○ Intramural Athlete

6) What is your military status?
- ○ Not in US Military
- ○ Reserves
- ○ US Veteran
- ○ Discharged
- ○ Active Duty

7) Age

8) Weight (lbs)

9) Height (feet, inches)

10) GPA

11) Which best describes your current relationship status?
- ○ Single (not dating)
- ○ Casually dating
- ○ Exclusively dating one person
- ○ Engaged
- ○ Married/Partnered
- ○ Other_____

12) Which of the following best describes you?
- ○ Heterosexual
- ○ Gay
- ○ Lesbian
- ○ Bisexual
- ○ Queer
- ○ Questioning

13) Is this your first semester at UA (Spring 2016)?
- ○ Yes
- ○ No

14) Average number of drinks* you consume in a typical week

15) When you party, how many drinks* do you usually have?

* 1 DRINK = 12 oz. beer, 4-5 oz. wine, 1 oz. liquor

16) How often, if ever, have you had 5 or more drinks* in one sitting?
- ○ Never
- ○ Not in the past two weeks
- ○ Once in the past two weeks
- ○ Twice in the past two weeks
- ○ 3 to 5 times in the past 2 weeks
- ○ 6 or more times in the past two weeks

17) How often do you usually party?
- ○ Never
- ○ Once or twice a year
- ○ Once or twice a month
- ○ Once a week
- ○ Twice a week
- ○ 3 or more times a week

18) Have you driven after drinking any amount of alcohol:

	Yes	No
During the past 30 days?	○	○
During this school year?	○	○

19) Have you used tobacco in the past 30 days on any of UA's campuses or properties?
- ○ Yes
- ○ No
- ○ N/A, I have not smoked tobacco in the last 30 days

20) If you had five or more drinks in one sitting in the past two weeks, where did you consume the drinks? (mark all that apply)

	Yes	No
Hanging out with friends	○	○
On-campus party	○	○
Off-campus house party (large, I knew a few people)	○	○
Off-campus party (small, I knew most people)	○	○
Fraternity social function	○	○
Sorority social function	○	○
Athletic event	○	○
On a date	○	○
When drinking alone	○	○
In a bar/restaurant	○	○
Before I went out	○	○

21) How often have you used the following substances?

*DO NOT include drugs prescribed to you by your physician

	Used in past 30 days	Used in past year	Not Used
Tobacco (smoke, chew, hookah)	○	○	○
E-cigarettes	○	○	○
Alcohol (beer, wine, liquor)	○	○	○
Marijuana (pot, hash)	○	○	○
Cocaine	○	○	○
Heroin	○	○	○
Pain pills (oxy, vicodin, Percocet, etc.)	○	○	○
Sedatives (valium, Xanax, sleeping pills)	○	○	○
Ritalin/Adderall/Concerta	○	○	○
Ecstacy/Molly/MDMA	○	○	○
Other Illegal Drugs	○	○	○

23) During this school year, did you see the following Campus Health materials in the Daily Wildcat or emailed to you?

	Yes	No
Sex Talk Columns	○	○
Red Cup Q&A Columns	○	○
NutriNews Columns	○	○
Ads about cold and flu prevention	○	○
Ads about general health and wellness	○	○
Ads related to services at Campus Health.	○	○
Living Wild e-magazine	○	○

24) During this school year, did you see the following Campus Health media in or around campus buildings?

	Yes	No
"Sweet Spot" alcohol poster	○	○
"Be an Ace" sun safety poster	○	○
"Antibiotics: Think you Need Them?"	○	○
Other Campus Health posters	○	○
"Free Condom Friday" posters/ads	○	○
Social Media (Facebook/Twitter)	○	○

26) On how many of the past 7 days did you get enough sleep so that you felt rested when you woke up in the morning?

○ 0 days ○ 2 days ○ 4 days ○ 6 days
○ 1 day ○ 3 days ○ 5 days ○ 7 days

27) Within the current school year, has poor sleep or sleep difficulties caused you to: (mark all that apply)

- ○ Receive an incomplete grade or drop a course
- ○ Receive a lower grade in a course
- ○ Receive a lower grade on an exam/important project
- ○ Consider dropping out of school
- ○ Not applicable/No sleep problems

28) Within the past school year, how would you rate the overall stress you have experienced?

- ○ No stress
- ○ Less than average stress
- ○ Average stress
- ○ More than average stress
- ○ Tremendous stress

Recall the last time you drank alcohol... Page 2

○ Not applicable, I don't drink alcohol

22a) How recent was the last time you drank?

- ○ Within the past 30 days
- ○ Within this school year
- ○ More than one year ago

22b) How many drinks* did you have? [ ][ ]

22c) Over how many hours did you drink? [ ][ ]

* 

25) When you drink, how often do you do the following?

○ Not applicable, I don't drink alcohol

	Never	Rarely	Usually	Always
Stop drinking at least 1 to 2 hours before I go home	○	○	○	○
Alternate with non-alcoholic beverages	○	○	○	○
Have a designated driver when I know that I will be drinking	○	○	○	○
Set a limit on the number of drinks I will have	○	○	○	○
Make my own drinks to limit the amount of alcohol that I have	○	○	○	○
Limit the amount of money that I bring or spend on alcohol	○	○	○	○
Avoid drinking games	○	○	○	○
Eat before and during the time I am drinking	○	○	○	○
Refuse to ride with a driver who has been drinking	○	○	○	○
Avoid pre-gaming/pre-partying	○	○	○	○
Avoid shots of hard liquor	○	○	○	○

29) Have you ever been diagnosed with any of the following? (mark all that apply)

- ○ Depression
- ○ Anxiety
- ○ Neither

30) How difficult has anxiety or depression made it for you to do your work, study, go to class, or get along with other people?

- ○ Not difficult at all
- ○ Somewhat difficult
- ○ Very difficult
- ○ Not applicable

31) Have you experienced the following in the last year?

	No	Yes, in past year	Yes, in past 30 days
Felt things were hopeless	○	○	○
Felt overwhelmed by all you had to do	○	○	○
Felt exhausted (not from physical activity)	○	○	○
Felt very lonely	○	○	○
Felt very sad	○	○	○
Felt so depressed that it was difficult to function	○	○	○
Felt overwhelming anxiety	○	○	○
Felt overwhelming anger	○	○	○
Intentionally cut, burned, bruised, or otherwise injured yourself	○	○	○

32) Which types of sexual intercourse have you ever had?

	Yes	No	Age of 1st experience
Oral	○	○	
Vaginal	○	○	
Anal	○	○	

33) How many different people have you had vaginal or anal intercourse with this school year?

- ○ Zero
- ○ One
- ○ Two
- ○ Three to five
- ○ Six or more

34) How often have you and your partner(s) used a condom?

- ○ Not Applicable
- ○ Never
- ○ Rarely
- ○ Usually
- ○ Always

35) Have you been tested for any Sexually Transmitted Infections (STIs) in the last year?

- ○ Yes
- ○ No
- ○ Don't know

36) If you have experienced any of the following DUE TO DRINKING ALCOHOL, please indicate the most recent time frame: (mark only one per item)

○ Not Applicable, I do not drink alcohol

	Within the past 30 days	Within this school year	Not in past school year
Had a hangover	○	○	○
Been sick	○	○	○
Missed a class	○	○	○
Damaged property	○	○	○
Been hurt or injured	○	○	○
Had memory loss	○	○	○
Experienced threats of physical violence	○	○	○
Performed poorly on a test or important project	○	○	○
Used marijuana or other drugs while drinking	○	○	○
Been in trouble with school authorities	○	○	○
Been left in a potentially dangerous situation	○	○	○
Gotten into a fight or argument	○	○	○
Been in trouble with the police	○	○	○
Did something you later regretted	○	○	○
Drove while under the influence of alcohol	○	○	○
Passed out	○	○	○
Received an MIP alcohol citation	○	○	○
Received a lower grade in a class	○	○	○

37) Have any of the following services helped you remain a student at the UA?

	Yes	No	Not Applicable
Dept. Campus Recreation (Rec Center, classes, intramurals, Outdoor Adventures, Etc.)	○	○	○
Campus Health Service			
Medical Services	○	○	○
Counseling and Psych Services (CAPS)	○	○	○
Health Promotion and Preventive Services (HPPS*)	○	○	○

*HPPS includes SexTalk Column, Red Cup Q&A, Step Up! Violence Prevention Program, The Buzz, Campus Health TV videos, SHADE, e-checkup to go, nutrition counseling, health presentations, QPR Suicide Prevention training, Facebook Page, Living Well e-newsletter, events, brochures, posters, etc.

38) Have you ever used the Campus Health Service? ○ Yes ○ No

39) Were you aware that you do NOT need medical insurance to be seen at Campus Health? ○ Yes ○ No

40) Do you have medical insurance that requires you to go somewhere other than Campus Health for your medical care? ○ Yes ○ No

41) Have you purchased health insurance on the Health Insurance Marketplace? ○ Yes ○ No

42) What is your primary form of health insurance?

- ○ My college/university sponsored plan
- ○ My parents' plan
- ○ Another plan
- ○ I don't have health insurance
- ○ I am not sure if I have health insurance

43) Have you received the following vaccinations/shots?

	Yes	No	Don't know
Hepatitis B	○	○	○
Human Papillomavirus/HPV	○	○	○
Meningococcal disease (meningitis)	○	○	○
Varicella (chicken pox)	○	○	○

44) Have you had a flu shot in the last year? (since August 2015) ○ Yes ○ No

45) Are you aware of the UA's policies around tobacco use on campus? ○ Yes ○ No

46) Have these policies caused you to decrease/stop using tobacco? ○ Yes ○ No ○ N/A

47) Have you experienced/been the victim of any of the following within the past 3 months?

	Yes	No
Bullying	○	○
Emotional/Verbal abuse	○	○
Hate Crimes/Discrimination (race/ethnicity, gender, sexual orientation, religion, etc.)	○	○
Hazing	○	○
Physical assault/abuse	○	○
Stalking	○	○

Did you complete page 2?

Has any of the following happened to you since August 2015?

48.1) Someone fondled, kissed, or rubbed up against the private areas of my body (lips, breast/chest, crotch, or butt) or removed some of my clothes without my consent by:

	Yes	No
A. Taking advantage of me when I was too drunk or out of it to stop what was happening	○	○
B. Telling lies, threatening to end the relationship, threatening to spread rumors about me, criticizing me or getting angry at me, or continually verbally pressuring me after I said I didn't want to	○	○
C. Threatening to physically harm me or someone close to me or using physical force (holding me down with their body, pinning my arms, or having a weapon)	○	○

48.2) Someone had oral, anal, or vaginal sex with me without my consent by:

	Yes	No
A. Taking advantage of me when I was too drunk or out of it to stop what was happening	○	○
B. Telling lies, threatening to end the relationship, threatening to spread rumors about me, criticizing me or getting angry at me, or continually verbally pressuring me after I said I didn't want to	○	○
C. Threatening to physically harm me or someone close to me or using physical force (holding me down with their body, pinning my arms, or having a weapon)	○	○

	Yes	No
49. Since August 2015, have you been sexually assaulted or raped?	○	○

50) Have you ever been in treatment for alcohol or other drug problems? ○ Yes ○ No

51) Are you currently in treatment for alcohol or other drug problems? ○ Yes ○ No

52) Are you currently in recovery for alcohol or other drug problems? ○ Yes ○ No

53) Are you interested in recovery programming for alcohol and other drugs at the UA? ○ Yes ○ No

54) How many times during the past school year have you seriously considered attempting suicide?

○ 0 times
○ 1-4 times
○ 5-8 times
○ 9 or more times

55) How many times during the past school year have you attempted suicide?

○ 0 times
○ 1 time
○ 2 times
○ 3 or more times

56) If in the future you were having a personal problem that was really bothering you, would you consider seeking help from a mental health professional?

○ Yes
○ No

57) Are you familiar with the National Suicide Prevention Lifeline? (800) 273-TALK ○ Yes ○ No

58) Have you used the National Suicide Prevention Lifeline? ○ Yes ○ No

59) Are you aware of suicide prevention resources? ○ Yes ○ No

60) How often do you eat fruits and/or vegetables at meals and snacks?

	Always	Often	Sometimes	Never
Breakfast	○	○	○	○
Lunch	○	○	○	○
Dinner	○	○	○	○
Snacks	○	○	○	○

61) Within the past 12 months, have you done any of the following to lose weight?

	Yes	No
Dieted	○	○
Vomited or used laxatives	○	○
Taken diet pills	○	○
Exercised more	○	○
Smoked cigarettes	○	○
Misused prescription drugs	○	○

Did you complete page 3?

Thank you for completing this survey!

62) On how many of the last 7 days did you do the following?
(Please mark the correct column for each row)

	0	1	2	3	4	5	6	7
Moderate-intensity cardio/aerobic exercise (caused noticeable increase in heart rate) for at least 30 min?	○	○	○	○	○	○	○	○
Vigorous-intensity cardio/aerobic exercise (caused large increases in breathing/heart rate) for at least 20 min?	○	○	○	○	○	○	○	○
9-10 strength training exercises (e.g. resistance weight machines) for 8-12 repetitions each?	○	○	○	○	○	○	○	○

STUDENT DISCLAIMER FORM

Campus Health Service Health and Wellness Survey

You are invited to voluntarily complete this survey. The Campus Health Service Health and Wellness Survey is administered annually to collect information about University of Arizona students' health-related behaviors including substance use, mental health, sexual activity, nutrition, etc. There are no guaranteed benefits associated with completing this survey; but the information will be used to develop programming and to determine changes in these variables over time. The aggregate data may also be included in publications, presentations and reports. This survey takes approximately 15 minutes to complete. You will not be compensated for your participation. Please read each item carefully.

This survey is anonymous, so please answer honestly.

There is a possibility that information revealed during this survey may be sensitive in nature and could possibly cause emotional distress to a participant. In the event that a scenario such as this one arises, the following Campus Health resources are available to assist the participant:

Counseling & Psych Services (CAPS)…….....621-3334
Health Promotion & Preventive Services (HPPS).....621-6483

You can obtain further information from Dr. Peggy Glider at (520) 621-5973. If you have questions concerning your rights as a research subject, you may call the Human Subjects Protection Program office at (520) 626-6721 or online at: http://rgw.arizona.edu/compliance/human-subjects-protection-program.

NOTE:

If you are under the age of 18, DO NOT complete this survey.
This survey is voluntary; you are free to leave any items or the entire survey blank. By returning a completed survey, you are granting permission to the Campus Health Service to use the information for program development and evaluation.

Thank you for your participation.

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