

**Prevention of Alcohol Related Incidents in the US Air Force: Results from a Cluster  
Randomized Trial**

Melissa A. Little, PhD, MPH<sup>1</sup>, Robert C. Klesges, PhD<sup>1</sup>, Indika Mallawaarachchi, MS<sup>1</sup> Timothy  
McMurry, PhD<sup>1</sup> Kinsey Pebley, MA<sup>2</sup>, Meghan McDevitt-Murphy, PhD<sup>2</sup>, James Murphy, PhD<sup>2</sup>, and G.  
Wayne Talcott, PhD<sup>1,3</sup>

<sup>1</sup>University of Virginia, School of Medicine Department of Public Health Sciences, Charlottesville, VA

<sup>2</sup>The University of Memphis, Department of Psychology, Memphis, TN

<sup>3</sup>Wilford Hall Ambulatory Surgical Center, Joint Base San Antonio-Lackland AFB, TX

Corresponding Author:  
Melissa A. Little, PhD, MPH  
mal7uj@virginia.edu  
560 Ray C. Hunt Dr  
Charlottesville, VA, USA, 22903

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## ABSTRACT

**Background:** Alcohol misuse poses significant public health concerns in the U.S. military. A Brief Alcohol Intervention (BAI) have been shown to reduce alcohol related incidents among Airmen undergoing training.

**Purpose:** The current study sought to examine whether a booster BAI administered at the end of an Airmen's training reduced alcohol related incidents out to a one-year follow-up.

**Methods:** Participants were 26,231 US Air Force Technical Trainees recruited between March 2016 and July 2018. Participants were cluster randomized to two conditions: BAI + BAI Booster or BAI + Bystander Intervention. The primary analysis was a comparison of the interventions' efficacies in preventing Article 15s at a one-year follow-up, conducted using a generalized estimating equations logistic regression model controlling for covariates.

**Results:** There was no significant difference by condition in Article 15s at the one-year follow-up ( $p=0.915$ ). Individuals under 21 and who expressed intentions to use alcohol at baseline had a greater likelihood of receiving an Article 15 at follow-up ( $p's<0.001$ ).

**Conclusions:** Findings suggest that a booster may not be necessary to produce maximum effects beyond an initial BAI intervention. It is also possible that alcohol behaviors changed as a result of the intervention but were not measured. Future research should consider alternative outcomes or participant tracking measures to determine whether a different or more intensive BAI booster is effective. The majority of Article 15s were for underage drinking; therefore, developing an intervention focused on this problem behavior could lead to large reductions in training costs in the military.

## INTRODUCTION

Alcohol misuse and the associated health and social problems pose significant public health concerns in the U.S. military. Excessive alcohol use can lead to serious consequences such as violence, injuries, loss of productivity, or military discharge; in 2018, alcohol use disorder was the second most frequent discharge diagnosis among active duty males in the U.S. [1]. These consequences cost the Department of Defense (DoD) an estimated \$1.2 billion annually [2]. In 2013, the DoD reported that 84.5% of active duty personnel reported using alcohol [3]. Furthermore, data from the 2015 DoD Health Related Behaviors Survey (HRBS) showed that 30% of active duty personnel engage in binge drinking and about 35% meet the criteria for alcohol use disorder [4]. Additionally, higher percentages of problematic alcohol use is seen among junior enlisted personnel between the ages of 17 to 24 [4]. Derefinko and colleagues [5] found that among newly enlisted Airmen, 50% reported alcohol use prior to enlisting. Their team also found that Airmen under the age of 21 reported drinking alcohol an average of 18.4 drinks per week, which exceeds NIAAA's recommended weekly drinking guidelines indicating risky drinking behavior [5, 6]. Given that the majority of military recruits are male and between the ages of 18-25, it is imperative that alcohol misuse is addressed in this high risk population [5, 7].

Brief alcohol interventions (BAI) are an efficacious approach to reduce alcohol use and problems among young adults [8, 9]. Most BAI intervention trials have targeted young adult college students who are selected on the basis of high-risk drinking (based on a screening survey or on a campus alcohol policy violation). These BAIs have generally focused on reducing consumption and related problems rather than abstinence (i.e., harm reduction). This is necessary when addressing risky drinking among non-treatment seeking young adults who most often have mild to moderate levels of alcohol risk and problems. BAIs that have been found to be efficacious often include personalized feedback related to alcohol-related risk, drinking norms, and harm reduction strategies, and are typically delivered in the context of an individual motivational interviewing counseling session [10, 11].

It is not feasible, however, to administer BAIs in most military settings given the large numbers of military personnel, and the fact that screening approaches that rely on confidential reporting of drinking are not viable in the military. This is because an individual who reports underage drinking or drinking during a prohibited time such as during basic training could be subject to severe sanctions. Thus, for BAIs to be disseminated in the military it is necessary to develop and evaluate large group-based approaches that do not rely on individual screening for eligibility and must therefore be appropriate for both drinkers and abstainers. Between fiscal years 2010 and 2011, a 1-hour group-based BAI was administered to all enlisted Airmen at the beginning of their Technical Training [12]. The BAI, along with a random alcohol breathalyzer test administered to Airmen under the age of 21, resulted in a significant reduction of alcohol related incidents among Airmen undergoing Technical Training [12]. Additionally, it has been conservatively estimated that every alcohol related incident avoided by the implementation of the BAI saved the Air Force \$9,869 [13].

Although the BAI implemented in the U.S. Air Force has shown promising results, it is not known whether an additional BAI will result in sustained reductions of alcohol related incidents beyond Technical Training (which averages about 4 months). The current study evaluated the impact of an additional BAI “booster” administered at the end of an Airmen’s Technical Training on reducing future alcohol related incidents. The BAI booster intervention extends the effective elements of the original BAI (e.g., discussion of positives and negatives of drinking; discussion of financial and career implications of a drinking violation; review of information about standard drinks, alcohol levels, expectancies and tolerances; provide normative feedback on drinking behavior) with additional elements from behavioral economic theory [14]. Behavioral economic theory suggests that individuals are less likely to engage in risky behaviors if the costs of the action outweighs the benefits (e.g., delay discounting). The intent of the intervention is to bring important long-range goals (e.g., obtaining a college education) into the here and now so that the immediate awareness of this goal might diminish the relative benefit of impulsive drinking. Inclusion of behavioral economic elements, to combat hyperbolic discounting, have shown to improve the effects of BAIs among young college drinkers [15]. We hypothesize that Airmen who receive

the BAI plus booster will have significantly less alcohol related incidents at a one-year follow-up compared to Airmen who receive the BAI plus control booster.

## METHODS

### Study Design

The design was a two-group clustered randomized clinical trial: (1) BAI + Alcohol Booster or (2) BAI + Bystander Intervention (Figure 1). Airmen received all training together in cohorts; each week a new cohort would enter Technical Training and go through training and graduate together. Airmen were randomized to intervention as a cohort based on their last week of Technical Training. The primary outcome was an Article 15 (e.g., an adjudicated alcohol related incident) one year from the end of Technical Training.

### Interventions

*BAI.* The BAI contained components of effective interventions developed for young adult drinkers both in health care and educational settings [16-18] and was specifically tailored to the unique needs and risk factors of Airmen. The 1-hour group intervention was administered using the principles of motivational interviewing (MI) in an interactive Socratic style to generate feedback and discussion [12]. Open-ended questions, reflections, as well as the decisional balance scale were used to increase Airmen's motivation to remain alcohol free. A detailed description of the formative assessment process of the BAI can be found in Klesges et al. 2013 [12].

*Alcohol booster.* The 1-hour booster intervention was delivered using MI to extend the effective elements found in the original BAI intervention [12] with elements from behavioral economic theory [14]. A behavioral economic approach to alcohol use suggests that decisions to drink are more likely when 1) there is a lack of access to or engagement in alternative alcohol-free reinforcing activities, and 2) there is a greater relative focus on immediate, relative to delayed rewards (i.e., steep delayed reward discounting) [19]. The intent of the intervention is to bring important long-term goals (e.g., completing basic military training, advancing in the military, buying a home, obtaining a college education) into the here and now so that the immediate awareness of this goal might diminish the relative benefit of drinking.

Another goal was to have the Airmen identify enjoyable and goal-consistent alcohol-free activities they could engage in during their free time (e.g., sports/exercise, online classes, reading, movies).

Interventions that include BAI plus behavioral economic elements have been associated with significant and enduring reductions in alcohol use and problems college student drinkers [14, 15]. The booster also included reminder of the U.S. Air Forces rules and policies on alcohol use and harm reduction drinking strategies. A detailed description can be found in Derefinko et al. 2017 [20].

*Bystander Intervention (control condition).* The 1-hour Bystander intervention was a non-alcohol related briefing that served as the control condition. The intervention focused on increasing Airmen's awareness of the qualities of being a good "wingman" (e.g., watching for their peers) and how those are tied to the Air Force Core Values. It aimed to increase individual's perceived responsibility to act in certain situations. The intervention draws on the philosophy that members in a community have a role in shifting social norms to prevent violence [21]. While the intervention did not directly discuss alcohol use, the focus on military values and taking responsibility for one's self and others could contribute to healthier drinking-related choices.

## **Participants**

Participants were 41,966 Airmen undergoing Technical Training at five military bases (Lackland Air Force Base, Keesler Air Force Base, Sheppard Air Force Base, Goodfellow Air Force Base and Fort Sam Houston) in Texas and Mississippi from March 2016 through July 2018. A total 41,966 Airmen were approached to participate in the study. Of those, 26,231 (62.5%) consented to participate. No compensation was given for participation. Eligibility criteria included being at least 18 years of age and understanding the consent process in English. We determined if an Airmen had received an Article 15 in the year following Technical Training by searching the Automated Military Justice Analysis and Management System (AMJAMS). Study procedures were approved by the 59<sup>th</sup> Medical Wing Institutional Review board.

## **Procedure**

At the beginning of Technical Training, all Airmen received the BAI as part of their Technical Training curriculum. At the end of Technical Training, cohorts of Airmen were provided information about the study, allowed to ask questions in either a group or private setting. Airmen who decided to participate were asked to provide written consent and HIPAA authorization before completing a baseline assessment. However, all Airmen received one of the booster interventions regardless of consent status, because the interventions were deemed part of the Technical Training curriculum. However, only Airmen who consented to the study were followed up in the Automated Military Justice Analysis and Management System (AMJAMS) one year later to determine if they had received an Article 15.

### **Training and Fidelity**

All interventionists received an intensive four-day training on all interventions and motivational interviewing techniques needed for successful implementation. Additionally, ongoing training was provided weekly throughout the implementation phase of the study. To evaluate fidelity, 10% of the sessions were randomly selected and assessed by two Ph.D. clinical psychologists who were members of MINT (Motivational Interviewing Network of Trainers). Several aspects of the intervention administration and components were evaluated using a pre-approved checklist. Feedback on noted errors were provided to the interventionists by the psychologists.

### **Measures**

*Baseline Measures.* Airmen were surveyed prior to receiving one of the two booster interventions at the end of Technical Training. Surveys assessed demographic characteristics, including age, sex, education (i.e., high school graduate/G.E.D., some college/vocational school/associate degree, bachelor's degree, post-graduate (master's or doctoral degree), marital status (i.e., married/living as married, widowed, divorced, separated, never married/single), race (i.e., American Indian/Native American, Alaskan Native, Asian, Pacific Islander, Black or African American, White/Caucasian), ethnicity (i.e., Hispanic or Latino, not Hispanic or Latino), and military status (i.e., active duty, guard, reserves). Airmen also completed questions inquiring about intentions to drink using a single categorical

item asking participants how much they planned to drink next time they were able to drink (*I will not drink any alcohol; I will drink 1 to 2 drinks; I will drink 3 to 4 drinks; I will drink 5 or more drinks*).

*Main Outcome.* Given that Airmen could not report actual drinking without risking military sanctions (particularly for those under 21 or who reported high levels of drinking), the primary outcome variable was discipline related to alcohol related incidents, specifically Article 15s. The operational definition of an alcohol-related incident is standardized across the Alcohol and Drug Abuse Prevention and Treatment program of the U.S. Air Force. There are nine categories: (a) driving under the influence/driving while intoxicated; (b) underage drinking; (c) domestic violence or other crimes against people (e.g., sexual assault/spousal abuse/child abuse); (d) drunk and disorderly conduct; (e) duty related incident; (f) injury; (g) public intoxication; (h) crimes against property; and (i) contributing to the delinquency of a minor (e.g., buying alcohol for under aged Airmen). Data on the number of alcohol related incidents were obtained directly from the U.S. Air Force at the one-year follow-up. Drinking intentions were collected as a proxy for actual drinking behavior that would be safe for participants to report without fear of adverse consequences.

### **Statistical Analyses**

*Power Analysis.* The study was designed to detect a mean reduction of 60 alcohol related incidents one year after the end of Technical Training between treatment groups, with 80% power and 5% type I standard error, based on incidence data from the evaluation of the BAI [12]. Using a generalized estimating equation model (accounting for clustering), the detectable odds ratio was 0.57, indicating that the BAI booster could result in a 40% reduction in odds (or incidence rate, from 5 to 3 per 1,000 airmen, since odds ratio and relative risk converge for rare outcomes) of alcohol related incidents.

Descriptive statistics were calculated based on demographics, alcohol use intentions and Article 15s. Next, we conducted a generalized estimating equation to determine whether the booster intervention reduced Article 15s at the 1 follow-up. The model controlled for demographics and alcohol use intentions

and accounted for clustering by week and military base. All analyses were performed in SAS and p-values were set at 0.05 significance level.

## RESULTS

Demographic characteristics are displayed in Table 1. Participants had a mean age of 20.98 (SD = 3.20) and the sample racial/ethnic composition was 64% White, 17% African American, 7% multiracial, and 12% other races. Hispanic/Latino individuals made up 20% of the sample, and 77% were male. Most participants reported being active duty (89%), followed by members of the guard (8%), and then the reserves (3%). Most Airmen also reported being single/never married (84%) and 45% had at least some college or vocational training, and all Airmen had at least a high school diploma or GED. More than half (55%) of Airmen reported some intentions to drink the next time they were able to drink.

### *Results of the One-Year Follow-up*

There were 192 Article 15s at the one-year follow-up. The majority of Article 15s were violations for underage drinking, accounting for 64% of Article 15s at the one-year follow-up (see Table 2).

Results of the main effects generalized estimating equation predicting Article 15s at the one-year follow-up are presented in Table 3. There were no statistically significant differences in the treatment compared to the control in terms of Article 15s at the one-year follow-up (OR = 0.98, 95% CI 0.70-1.39;  $p = 0.915$ ). Results indicate that individuals over 21 years of age were less likely to receive Article 15 than individuals under 21 years of age (OR = 0.37, 95% CI 0.25-0.55;  $p < 0.0001$ ). Additionally, Airmen who expressed intentions to use alcohol at baseline had a greater likelihood of receiving an Article 15 at follow-up (OR = 1.75 CI 1.25-2.46;  $p = 0.001$ ).

## DISCUSSION

The current study describes the results of a large randomized clinical trial to reduce heavy drinking among Airmen during their first term of service. While the group based BAI has previously shown to reduce alcohol related incidents during Technical Training,[12] the addition of a booster at the end of training did not produce additional reductions in alcohol related incidents between the treatment

and control groups at the 1 follow-up. However, individuals were less likely to receive Article 15s if they were over the age of 21.

There are several takeaways given these null findings related to the addition of a BAI booster. First, a booster session may not be necessary for BAIs to be effective. It is possible that the BAI was effective enough on its own to produce a ceiling effect. A previous study found that the BAI along with a random alcohol breathalyzer test resulted in a significant reduction of alcohol related incidents among Airmen undergoing Technical Training (OR= 0.56, 95% Confidence Interval (CI) 0.38-0.81) [12]. This means that institutions such as the military may be able to save resources by providing the initial BAI, which has previously been found to be effective at reducing alcohol-related incidents, even after initial dissemination to multiple locations [12, 22]. The current study advances the field by providing evidence that, perhaps, a single brief intervention is sufficient to have a significant impact on alcohol use among young adult military members, and increasing the “dose” with a booster session does not significantly improve results.

The only demographic factors that predicted receiving an Article 15 at the one-year follow-up were age and expressing intentions to use alcohol at baseline. Given that the majority of Article 15s received by Airmen in the study were for underage drinking, it is not surprising that age was significantly related to receiving an Article 15. However, underage drinking can still have serious consequences, resulting in discharge from the Air Force regardless of job performance. Given the relative paucity of serious Article 15s (64% were for underage drinking compared to 10% for driving under the influence), future interventions with this high-risk population should focus on reducing underage drinking.

Another takeaway is that the use of Article 15s may not be the best proxy for alcohol use behaviors. Complete confidentiality cannot be promised for military personnel, because information regarding potential Uniform Code of Military Justice (UCMJ) violations (e.g., underage drinking) or concerns regarding fitness for duty may be reported to appropriate medical, law enforcement, or command authorities and can result in serious sanctions (e.g., discharge). Since half of our sample were underage, measuring alcohol use behaviors, such as underage drinking could have placed our participants at risk for a UCMJ violation. Therefore, we

chose to use a proxy for alcohol use behaviors, Article 15s. Although there are thousands of alcohol-related Article 15s in the Air Force annually, we did not realize there would be so few among Airmen in their first year of service. Because there were so few Article 15s across the one-year follow-up, we had unexpectedly limited power to detect differences between treatments. Letters of Counseling and Letters of Reprimand, while more common in the Air Force, are not adjudicated by a formal legal review, and therefore more sensitive to personal biases of commanders that would be responsible for issuing such punishments. As a result, these outcomes were also dismissed as non-viable options.

One potential solution to this issue is to find alternative measures to represent alcohol use, such as the alcohol purchase task which has been shown as a reliable and strongly associated correlate of actual alcohol purchase behaviors [23-25]. Another option could be to use self-generated identification codes to track participants behavior over time without collecting identifiable information and maintaining anonymity [26]. Measuring changes from baseline to one-year follow-up of alcohol use directly would be a purer test of the effects of a booster intervention on alcohol use behavior. It may be the case that behaviors such as binge drinking, which are more common [4] than Article 15s in this population, were changed because of the booster. Future research may benefit from replicating these results using other outcome measures and other methods for data collection that encourage honest, direct reporting of alcohol use behaviors without compromising the confidentiality of the participant.

### **Limitations**

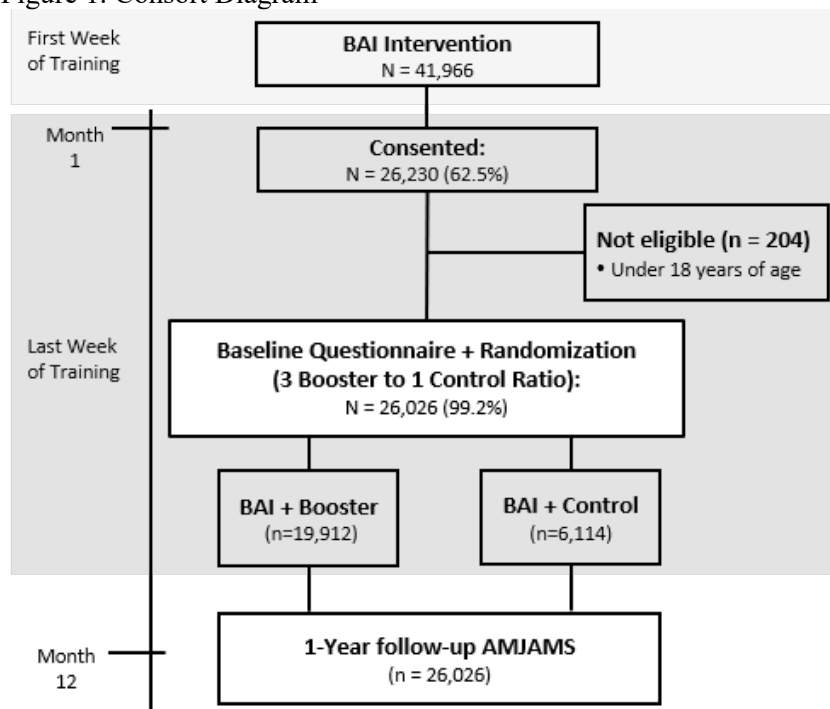
Limitations of the current study include using a single outcome measure to represent alcohol use, which was a considerably rarer occurrence than originally anticipated. This outcome measure was chosen to preserve the confidentiality of participants given that military research participants do not have the same confidentiality rights as civilians. Future studies incorporating direct measures of alcohol consumption or consequences while preserving participant anonymity may be helpful in confidently determining if boosters to BAIs are indeed helpful. Additionally, we were unable to control for other variables that may have influenced Article 15s, such as base specific drinking prevention efforts or policies at the bases where Airmen were stationed following Technical Training. Since we did not

conduct an assessment at the one-year follow-up with Airmen, we were unable to measure any of these potential confounders.

## Conclusions

The current study did not find evidence for the utility of a booster session after an initial BAI, which may suggest that a booster session is not necessary to yield maximum effects. However, it is also possible that other behaviors are impacted (e.g., binge drinking), or that other alcohol-related consequences that are less visible are endured, but not assessed in the current study due to restrictions collecting sensitive information in research with military personnel. Future research may benefit from replicating the current findings using alternative outcomes or participant tracking measures to determine whether a different or more intensive BAI booster is effective with this high-risk population. Additionally, given that the majority of Article 15s were for underage drinking, developing an intervention to exclusively address underage drinking among military personnel could lead to huge reductions in training and personnel costs in the Air Force [13].

Figure 1. Consort Diagram



Notes. BAI =Brief Alcohol Intervention; BAI + Booster = Brief Alcohol Intervention plus alcohol booster; BAI + Control = Brief Alcohol Intervention plus bystander intervention

Table 1. Demographic Characteristics

		N (%)
<b>Race</b>		
	White	16567 (64%)
	African American	4288 (17%)
	Multiracial	1778 (7%)
	Other	3116 (12%)
<b>Age</b>		
	<21	15351 (59%)
	≥21	10675 (41%)
<b>Ethnicity</b>		
	Hispanic	4865 (20%)
	Non-Hispanic	19647 (80%)
<b>Sex</b>		
	Male	19933 (77%)
	Female	5948 (23%)
<b>Marital Status</b>		
	Single/Never married	22100 (85%)
	Married/Living as married	3801 (15%)
<b>Education Level</b>		
	High school diploma/GED	13979 (55%)
	Some college or vocational school	9723 (38%)
	Bachelor's degree	1658 (7%)
	Post-graduate education	109 (<1%)
<b>Military Status</b>		
	Active duty	23080 (89%)
	Guard	1947 (8%)
	Reserves	882 (3%)
<b>Alcohol use intentions</b>		
	No intentions	11789 (45%)
	Some intentions	14206 (55%)
		M (SD)
<b>Age</b>		20.98 (3.19)

*Note.* M = mean; SD = standard deviation. Other race included American Indian/Native American, Alaskan Native, Asian, and Pacific Islander.

Table 2. Number of Article 15s by Category at the One Year Follow-up

<b>1 Year Follow-ups</b>	
	N (%)
Dorm violation	16 (8%)
Drunk driving	20 (10%)
Open container	0
Policy violation	20 (10%)
Possession underage	1 (1%)
Provide to minor	11 (6%)
Underage drinking	123 (64%)
<b>Total</b>	<b>191</b>

Table 3. Results of the Generalized Estimating Equation predicting Article 15s at the One-year Follow-up

<b>Effect</b>	<b>OR</b>	<b>95% CI</b>	<b>P-value</b>	
<b>Treatment</b>				
Booster vs Wingman (control)	1.019	0.721	1.439	0.916
<b>Age</b>				
≥21 vs <21	0.367	0.247	0.545	<.0001
<b>Race</b>				
African America vs White	1.066	0.691	1.646	0.771
Multiple vs White	1.080	0.608	1.920	0.792
Other vs White	1.107	0.708	1.729	0.656
<b>Marital status</b>				
Living as Single vs Married/Living together	1.585	0.922	2.725	0.095
<b>Gender</b>				
Male vs Female	1.390	0.907	2.129	0.130
<b>Education</b>				
College or higher vs HS/GED	1.167	0.827	1.646	0.380
<b>Alcohol use intentions</b>				
Some vs no use	1.749	1.245	2.457	0.001

Note. Data were clustered by week of enrollment and military base; OR: Odds ratio; CI: Confidence interval

## SUPPLEMENTAL TABLES

Table S3a. Results of the Generalized Estimating Equation predicting Article 15s at the One-year Follow-up for subjects who had intentions to drink

Effect	OR	95% CI	P-value	
<b>Treatment</b>				
Booster vs Wingman (control)	0.914	0.567	1.473	0.712
<b>Age</b>				
≥21 vs <21	0.344	0.222	0.533	<.0001
<b>Race</b>				
African America vs White	1.192	0.655	2.170	0.564
Multiple vs White	0.782	0.330	1.851	0.575
Other vs White	0.939	0.497	1.773	0.845
<b>Marital status</b>				
Living as Single vs Married/Living together	1.362	0.724	2.564	0.337
<b>Gender</b>				
Male vs Female	1.839	1.045	3.236	0.035
<b>Education</b>				
College or higher vs HS/GED	1.110	0.711	1.731	0.646

Table S3b. Results of the Generalized Estimating Equation predicting Article 15s at the One-year Follow-up for subjects who did not have intentions to drink

Effect	OR	95% CI	P-value	
<b>Treatment</b>				
Booster vs Wingman (control)	1.252	0.748	2.095	0.392
<b>Age</b>				
≥21 vs <21	0.519	0.232	1.157	0.109
<b>Race</b>				
African America vs White	0.925	0.497	1.722	0.805
Multiple vs White	1.595	0.697	3.652	0.269
Other vs White	1.338	0.674	2.655	0.404
<b>Marital status</b>				
Living as Single vs Married/Living together	2.397	0.768	7.484	0.132
<b>Gender</b>				
Male vs Female	1.018	0.572	1.811	0.951
<b>Education</b>				
College or higher vs HS/GED	1.247	0.727	2.139	0.422

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