Military Service and Alcohol Use*

Jay Teachman

Carter Anderson

Lucky Tedrow

Department of Sociology

Western Washington University

Bellingham, WA 98225

Jay.Teachman@wwu.edu

ABSTRACT

It is well known that enlistees and veterans are more likely to use alcohol than civilians.

However, most of this research is potentially biased in that it often does not employ control

variables and is based on cross-sectional data. Much of this research also fails to consider the

relationship between military service and alcohol use among women. Using longitudinal data

taken from the 1997 National Longitudinal Study of Youth, we investigate the relationship

between military service and alcohol use using a fixed-effects approach. We find that military

service appears to encourage young men to consume alcohol. It is also the case that the effect

of military service is not limited to the time that men spend in the military in that male veterans

are also more likely to consume alcohol than are comparable civilians. We find, however, that

women who serve, both enlistees and veterans, are less likely to drink than their civilian

counterparts.

Considerable research has documented the fact that alcohol use is positively associated with military service. A recent report by the Institute of Medicine (2012) indicates that over the past thirty years between 15 to 20 percent of U.S. military personnel drink more than civilians. Other research suggests that patterns of heavy alcohol use continue after service members leave the military. According to the Substance Abuse and Mental Health Services Administration (2001), veterans are more likely than nonveterans to drink and drink heavily. At question, however, is the direction of the relationship between military service and alcohol use. Does military service lead to increased use of alcohol? Or, do men and women predisposed to use alcohol choose to enter the military in greater numbers than other individuals? These questions are important because they are tied to policy efforts aimed at reducing the link between military service and use of alcohol (Institute of Medicine 2012). In this article, we address the issue by applying fixed-effects regression models to longitudinal data taken from the 1997 National Longitudinal Study of Youth (NLSY-97). We find evidence to support the notion that military service leads to increased levels of alcohol use both among individuals currently serving and among veterans, at least for men. The relationship between military service and alcohol is substantially different for women, however.

PRIOR LITERATURE

The prior literature is consistent in finding that military service and alcohol use are positively related, particularly for men. Using measures such as use in the past 30 days, binge drinking (five or more drinks on a single day in the past 30 days), or heavy drinking (five or more drinks on a single day for at least five days in the past 30 days), researchers have found that both currently enlisted service members (Hoerster et al. 2012; Institute of Medicine 2012; Olson

2012) and veterans (Bohnert 2012; Hoerster et al. 2012; Substance Abuse and Mental Health

Services Administration 2001) are more likely to use alcohol. Given the well-known negative

health consequences of alcohol use (Bohnert et al. 2012), these findings are important given

the large number of young men and women who enter the military each year (currently about

200,000 young men and women each year).

Previous research on the topic suffers from several of limitations, though. First, much of

the research fails to compare service members and veterans to civilians, making it difficult to

assess the relative level of alcohol use associated with military service (Bonhert et al. 2012; Bray

et al. 2005, 2010; Mattiko et al. 2011). Some of this research also relies on administrative

records for treatment of alcohol problems, or samples drawn from respondents seeking health-

care assistance, failing to measure the overall use of alcohol in the military (Eggleston, Straits-

Troster, and Kudler 2009; Wallace, Wallace, and Weeks 2008; Shen, Arkes, and Williams 2012).

Second, even if research uses data on civilians to draw conclusions about the relative

magnitude of alcohol use linked to military service, the data used are cross-sectional. We are

not aware of research examining the relationship between military service and alcohol use that

uses longitudinal information on respondents, both civilian and military. Thus, no information

is provided about histories or trajectories of alcohol use. Moreover, the research comparing

civilians to service members and veterans uses a rather limited set of control variables, making

it difficult to assess the extent to which results are free from problems associated with

selectivity. Critical variables such as length of service or exposure to combat are often ignored,

as well as factors that may increase both the likelihood of military service and alcohol use.

Therefore, because the data used are cross-sectional and contain limited information on

covariates, previous research has not been able to address the issue of selectivity. There are no results that provide readers with a handle on the likelihood that higher rates of alcohol use among service members and veterans may be due to positive selection into the military by individuals who are more likely to use alcohol, rather than military service itself.

We address the limitations in prior research in several ways. First, we analyze alcohol use using data on both civilians and respondents who have military experience. Second, the data we use are longitudinal, allowing us to take advantage of information about changes in alcohol use over time. Third, we use an extended set of covariates, as well as a fixed-effects approach, to better address the problem of selectivity. Although our approach still has limitations, which we discuss later, our results provide a cleaner estimate of the degree to which military service itself affects use of alcohol.

THEORETICAL POINTS

The military is seen as an institution where heavy drinking is part of its culture (Ames et al. 2007; Bohnert et al. 2012; Bray et al. 2005). It is also an institution largely comprised of young men and women at those ages where drinking is seen as a rite of passage (Eggleston et al. 2009), and where peer pressure found in social networks is a prime determinant of alcohol use (Donovan 2004; Mundt 2011). In addition to peer influences, alcohol consumption among enlistees is also encouraged by price supports in the military (Olson 2012). Alcohol purchased on base is less expensive that alcohol purchased elsewhere. Because of its supportive culture and price supports, we expect that military service leads to increased alcohol consumption.

It is also possible that military service leads to longer term alcohol use after military service ends. For one, alcohol consumption in the military occurs at those ages (late

adolescence and early adulthood) at which young persons are developing adult identities

(Kroger 1999). Alcohol use, in an environment with considerable peer pressure, may become

part of an individual's established sense of self. It is also the case that drinkers can become

dependent on alcohol, leading to long-term use (Hingson, Heeren, and Winter 2006). Alcohol

use while serving in the military may therefore translate to habits and patterns of use that

extend well beyond time of service. These points lead us to expect that veterans will have

higher levels of alcohol abuse than nonveterans.

It may be the case that duration of exposure to military culture may also affect alcohol

use. Greater exposure to peer pressure and alcohol use during a time in the life course when

many habits are being formed may lead to an increased likelihood of current and subsequent

use. Prior literature has found that longer deployments to combat zones are linked to

increased abuse of alcohol (Jacobson et al. 2008; Spera et al. 2011). Other research has found

that greater exposure to peers who use alcohol increases alcohol use (Mundt 2011).

Accordingly, we expect that longer exposure to military culture will be linked to increased use

of alcohol.

Some research suggests that gender moderates the relationship between peer groups,

alcohol initiation and alcohol dependence. Prior research suggests that women in the military

and women veterans are less likely to use alcohol than their male counterparts (Eisen et al.

2012; Leahavot et al. 2012; Wallace, Sheehan, and Young-Xu 2009). In general, women are less

likely to use alcohol than men, and when they do they are less likely to engage in excessive

drinking (Nolen-Hoeksema 2004). Women are also a much smaller percentage of the military

than are men (although their numbers are climbing), and they are less likely to have been

exposed to an established a culture of drinking. Moreover, women may be less influenced by the "macho" culture of male drinking in the military. Accordingly, we expect that military service will have less impact on alcohol use among women than among men.

The expectations just formulated all assume that military service influences alcohol use. An alternative thesis is that alcohol users, or individuals with a propensity to drink alcohol, are drawn to service in the military. Some evidence suggests that individuals who drink heavily are more likely to enlist or be interested in enlisting in the military than individuals who abstain (Ames, Cunradi, and Moore 2002; Barry et al. 2013). Other research indicates that persons with risk-taking tendencies, or who engage in delinquent behaviors are more likely to enlist in the military (Teachman and Tedrow 2013; Young et al. 2006). Both risk taking and delinquent behavior have been linked to increased use of alcohol (Donovan 2004; Hunter et al. 2000). This line of reasoning suggests that military service by itself does not lead to increased use of alcohol. Rather, individuals who join the military are otherwise more likely to use alcohol. That is, they would be more likely to use alcohol even if they did not enter the military. Accordingly, if this perspective is correct, military service should not be positively linked to alcohol use after accounting for self-selectivity into the military.

DATA AND METHODS

We use data taken from the 1997 National Longitudinal Survey of Youth (NLSY-97). Starting in 1997, the NLSY-97 interviewed 8,984 men and women between the ages of 14-16 who were born between 1980 and 1984. The young men and women in our sample were eligible to be observed up to 14 times over the period 1997 to 2010. Because we estimate a fixed-effects model, a database consisting of person years was created where respondents contribute a

person year for each round of the NLSY-97 in which they were interviewed. Respondents contribute person years until they are lost to follow-up or they reach the last wave of the study (2010). Thus, the final sample includes information on men and women between the ages of 14 and 30. The pooled sample includes 108,602 person years.

Our dependent variable is a time-varying measure of alcohol consumption measured each year in the NLSY-97. Four questions were asked of each respondent: *"During the last 30 days, on how many days did you have one or more drinks of an alcoholic beverage?," "In the past 30 days, on the days that you drank alcohol, about how many drinks did you usually have?," "On how many days did you have five or more drinks on the same occasion during the past 30 days? By occasion we mean at the same time or within hours of each other?," "In the last 30 days, how many days have you had something alcoholic to drink such as beer, wine, or hard liquor right before or during school or work hours?."* For each variable, respondents were assigned a value of 0, 1, 2, or 3 for each question, corresponding to which quartile the respondent scored on each question (0 if the respondent scored in the first quartile, 1 if the respondent scored in the second quartile, 2 if the respondent scored in the third quartile, and 3 if the respondent scored in the fourth quartile). The resulting values were then summed across the four questions. The result is a score for each of the fourteen years that ranges from 0 to 12 with higher scores indicating greater alcohol use.

We make use of two primary time-varying independent variables. The first variable is a dichotomous indicator of whether the respondent is currently serving on active duty in the military (409 men and 106 women). The second variable is a dichotomous indicator of whether the respondent is currently a veteran of active-duty military service (261 men and 79 women;

the difference between number of enlistees and number of veterans reflects the number of

men and women who remained in the military as of 2010). We also make use of a time-varying

indicator of cumulative time spent on active duty in the military, measured in weeks. Finally,

because the period covered by the NLSY-97 data includes the wars in Afghanistan and Iraq, we

include a dichotomous indicator of whether the respondent reported having ever served in a

combat zone (*Did you ever serve in a combat or war zone?*). Unfortunately, the question on

service in a combat zone was only asked in 2009 and 2010 and does not indicate when or for

how long combat service occurred. Thus, it is not a time-varying covariate. Moreover, the

question refers to service in a combat zone and does not determine where or whether

respondents actually experienced any combat. Overall, 179 men reported having served in a

combat zone, but only 21 women.

We make use of an extended list of time-varying control variables in order to minimize

the risk of obtaining spurious results. Our fixed-effects models automatically control for the

effects of any time-constant or fixed covariates. The time-varying covariates we control for

include: A dummy variable indicating that the respondent is enrolled in school; the number of

weeks the respondent was employed in the past year; two dummy variables indicating whether

the respondent was either cohabiting or married; the number of years of schooling obtained; a

five-level measure of the respondent's self-evaluated health (1=excellent, 2= very good,

3=good, 4=fair, 5=poor); a continuous measure indicating the ratio of household income to the

poverty level in each year; the number of children the respondent has; and age measured in

months.

In addition to these demographic controls, we also implement a time-varying control measuring the degree of delinquent behavior (risk taking) in which the respondent has engaged. The measure of delinquency consists of a time-varying, cumulative delinquency index that ranges from zero to ten, with higher scores indicating a greater degree of delinquency. The score was constructed by summing the responses to a set of ten questions ascertaining the number of delinquent/criminal acts in which respondents have ever engaged. A change in a respondent's score indicates that in a particular year a respondent engaged in a delinquent behavior that was not listed in earlier intervals. A value of 0 indicates that the respondent has not yet engaged in any of the activities listed. A value of 10 indicates that the respondent has engaged in each of the ten items listed at least once. Weighted scores were assigned to respondents who answered at least eight or more of the ten delinquency questions listed below.[1] Note that the index is based on self-reports and does not necessarily reflect official records of delinquent behavior for an individual. The delinquency index has been used by other researchers to describe patterns of delinquency across the life course of adolescents (Bolken et al. 2010; Hair et al. 2009; Holmes, Jones-Sanpei and Day 2009; Vander Ven et al. 2001) and has considerable construct validity.[2] The delinquency index is highly related to both enlistment in

---

[1] That is, respondents who answered at least eight of the ten questions were given a score that was adjusted to a base of ten. For example, if a respondent answered positively to four of eight questions they were assigned a value of 5 for the scale (4/8 * 10). Respondents who answered fewer than eight items were assigned a missing value for the scale and received an imputed value using the chained equations approach described above.

[2] The questions used to form the Delinquency Index are as follows:

1. *Have you ever run away, that is, left home and stayed away at least overnight without your parent's prior knowledge or permission?*
2. *Have you ever carried a hand gun? When we say hand gun, we mean any firearm other than a rifle or shotgun.*
3. *Have you ever belonged to a gang?*
4. *Have you ever purposely damaged or destroyed property that did not belong to you?*
5. *Have you ever stolen something from a store or something that did not belong to you worth less than 50 dollars?*
6. *Have you ever stolen something from a store, person or house, or something that did not belong to you worth 50 dollars or more including stealing a car?*
7. *Have you ever committed other property crimes such as fencing, receiving, possessing or selling stolen property, or cheated someone by selling them something that was worthless or worth much less than what you said it was?*

the military and alcohol consumption (Hair et al. 2009; Teachman and Tedrow 2013) and can be construed to be a measure of a respondent's level of risk taking.

The NLSY-97, like any other large, longitudinal study is not immune to problems associated with missing data. To deal with this issue we used a chained equation approach to imputing missing data available in STATA (Royston and White 2011). All results reported in this article are based on five imputed data bases using STATA's MI procedure. The dependent variable (the alcohol use index) was used in the imputation procedure; however, all cases with missing data on the alcohol index were dropped from the analysis after missing values were imputed for all other variables.

Statistical Model

We use a fixed-effects estimator to examine the relationship between the covariates and body weight. The fixed-effects model we estimate, following Allison (1994), is of the following general form:

$$ALCINDEX_{it} = u_1 Age_{it} + u_2 Age_{it}^2 + \delta_1 ENLIST_{it} + \delta_2 VET_{it} + \delta_3 DURSERVICE_{it} + \gamma W_{it} + \alpha_i + \varepsilon_{it}$$

where $ALCINDEX_{it}$ represents an individual i's score on the alcohol use index at time t. The 14 possible values of t correspond to the 14 survey rounds covered in our analysis. The value of i for a given t depends upon the number of respondents who contribute an observation at that value of t. Age_{it} indicates the age of the respondent at time t (and is used to account for change in alcohol use associated with aging); $ENLIST_{it}$ represents a time-varying dummy variable

---

8. Have you ever attacked someone with the idea of seriously hurting them or have a situation end up in a serious fight or assault of some kind?

9. Have you ever sold or helped sell marijuana (pot, grass), hashish (hash) or other hard drugs such as heroin, cocaine or LSD?

10. Have you ever been arrested by the police or taken into custody for an illegal or delinquent offense (do not include arrests for minor traffic violations)?

indicating whether respondent i is enlisted in the military at time t; VET_{it} is a time-varying dummy variable indicating whether respondent i is a veteran at time t; $DURSERVICE_{it}$ is a time-varying indicator of the length of time spent in the military at time t; W_{it} represents a vector of time-varying characteristics of respondents, both nonveterans and veterans, that correspond to control variables; u_1, u_2, δ_1- δ_3, and γ are coefficients or vectors of coefficients, α_i represents unobserved and constant person-specific differences across respondents that affect schooling, and ε_{it} is a residual error term. This model is estimated using XTREG in STATA with a fixed-effects option.

The model does not include any fixed (nonchanging) characteristics because in the fixed-effects procedure, the effects of any constant person-specific characteristics such as race are absorbed within the person-specific factors, α_i. Thus, although covariates such as race do not appear in the model, their effects on the dependent variable are controlled (as noted later, however, interactions between fixed characteristics and time-varying characteristics can be included in the model). Heuristically, one can imagine that the fixed-effects model is estimated by including a set of dummy variables corresponding to each of the respondents.

The value of the fixed-effects procedure is that in controlling for all person-specific factors, it controls for potential fixed sources of spuriousness associated with entry into the military and alcohol use. Transitory sources of spuriousness (those associated with unobserved changes in characteristics linked to military service) are not controlled in fixed-effects models. Yet the model does include a number of important time-varying characteristics of individuals that should help alleviate this issue (i.e., marital status, education, income, school enrollment, children, and health).

RESULTS

Descriptive Statistics

Shown in Table 1 are descriptive statistics for the pooled sample of yearly intervals. The mean

level of the alcohol use index across the fourteen intervals is 3.62. About 2% of the intervals

include a respondent enlisted in the military, and about 1.5% of the intervals include a veteran.

Across intervals that include respondents with military service the mean number of weeks

served is 151.68 (2.92 years). The mean level of the delinquency index across intervals is 2.29.

The mean age of respondents in months is 261.02 (21.75 years). For the other control variables

the means are 11.74 for years of schooling obtained; 2.10 for general health; 3.29 for the

income to poverty level ratio; .42 for number of children; 14 for the percent of intervals

involving a married respondent and 12 for the percent of intervals involving a cohabiting

respondent; 29.94 for the number of weeks worked in the past year; and 44 for the percent of

intervals involving a respondent enrolled in school.

Table 1 About Here

Multivariate Results

Multivariate results are shown in Table 2. Three models are presented. Each model is based on

a fixed-effects regression that automatically controls for all fixed covariates such as race, stable

personality characteristics, parental background, and so on. Model 1 includes the effects of the

measures of military service (enlisted, veteran, and length of service), as well as a simple

control for age. The model also includes an interaction between gender (here, male) and both

enlisted and veteran. Although fixed characteristics cannot be included in a fixed-effects

model, interactions between fixed characteristics and time-varying characteristics can be

included. Thus, the interaction between male and enlisted, in conjunction with the coefficient for enlistment, allows us to determine how the effect of enlistment varies according to gender. Similarly, the interaction between male and veteran, in conjunction with the coefficient for being a veteran, allows us to determine how the effect of being a veteran varies according to gender. Each of the coefficients in the model is statistically significant at conventional levels.

The coefficient for enlistment indicates that women who enlist in the military are less likely to use alcohol than comparable respondents who do not enlist. The difference is .637 units on the alcohol use index. For men who enter the military, however, there is an increase in alcohol use. The increase is (1.187 - .637 =) .550 on the alcohol use index.   For veteran status, a similar pattern emerges. Female veterans score .591 units lower on the alcohol use index, while male veterans score (.914 - .591) .323 units higher on the alcohol index. In addition, duration of military service is linked to increased alcohol use, about .10 units on the alcohol use index for each additional year of service. Finally, the coefficients for age indicate an increase in alcohol use as respondents age, but at a decreasing rate at older ages.

Model 2 adds combat service to Model 1. Recall that combat service as measured in the NLSY-97 is a fixed characteristic and can only be included as part of an interaction with a time-varying variable. Model 2 allows combat service to interact with enlistment and being a veteran. The results indicate that combat service does not affect alcohol use for veterans, but increases alcohol use for enlisted service members by .505 on the alcohol use index. Moreover, the effects of enlistment and veteran status are generally similar to those shown in Model 1, indicating that service in a combat zone does not explain the effects of military service on alcohol use.

Model 3 adds a number of time-varying control variables to Model 2. The addition of the covariates does little to alter the effects of military service on alcohol use. Women enlisted in the military score .484 lower on the alcohol use index, compared to a score of (1.169 - .484) .685 higher for men enlisted in the military. For veterans, women score .651 lower on the alcohol use index, compared to a score that is (.996 - .651) .345 higher for men. Being a veteran with combat service does not alter alcohol use. However, enlistment combined with being a combat veteran increases alcohol use by .510 units. Additional years of service lead to an increase in the alcohol use index by .156.

Table 2 About Here

In order to better understand the results shown in Table 2, predicted values of the alcohol use index are presented in Figure 1. Predicted values are given for someone who is age 25, scores the mean on the delinquency index (2.29), has no children, is at the mean level above the poverty line (3.29), is in excellent health, has 12 years of education, is not married, is not cohabiting, worked 52 weeks the past year, and is not enrolled in school. Using this profile, someone not enlisted in the military and not a veteran would register a score of 4.19 on the alcohol use index. Predicted values for enlisted and veteran men and women are given at two durations of service, 24 months and 48 months.[3]

The predicted values for women enlisted in the military and women who are veterans are consistently lower than for any other group. The highest predicted values are for men who are enlisted, and in particular, for men who are enlisted and have been in a combat zone. Although length of service is a statistically significant predictor of alcohol use, the strength of

---

[3] Predicted values for women serving in a combat zone are not shown given the fact that so few women reported having ever been in a combat zone.

15

the effect, as indicated by the predicted values, is minimal. The difference between enlisted women and enlisted men with combat experience is much more considerable – about 1.7 units on the alcohol use index.

Figure 1 About Here

Extensions

We discuss two extensions of the multivariate results shown in Table 2 (in both cases, results are not shown). First, we sought to determine whether the relationship between veteran status and alcohol use depends on how long a respondent has been a veteran. Our thought was that the effect of being a veteran decays over time with less exposure to military life. When we included a control for duration of time since becoming a veteran, the coefficient was not statistically significant, and the effects of the other variables were unchanged.

Second, we sought to determine whether the military variables would be related not just to overall alcohol use but to what can be construed to be alcohol abuse. To accomplish this task we first determined the relationship between the alcohol use index and one of its component parts – the number of days in the past 30 days that a respondent has had five or more drinks, which is a commonly used indicator of problematic alcohol use. We determined that after a score of four on the alcohol index about 70% of respondents scored in the top quartile of individuals having five or more drinks in a day. Over 90% of these respondents scored in the top two quartiles of individuals having five or more drinks in a day. Accordingly, we replicated the models shown in Table 2 using a dichotomous indicator of whether the respondent scored five or higher on the alcohol use index. The results mirror those shown in Table 2. That is, women who are enlisted or who are veterans are less likely to abuse alcohol.

Men who are enlisted or who are veterans are more likely to abuse alcohol, with the effect being stronger for men currently enlisted. In addition, duration of service was positively related to alcohol abuse, as was being an enlisted person having served in a combat zone.

DISCUSSION

The results are in line with our expectations. Male enlistees and veterans are more likely than their civilian counterparts to use alcohol. The opposite is true for female enlistees and veterans. The longer someone serves the more likely they are to use alcohol, although the effect is small. Enlistees who have served in a combat zone are the most likely to use alcohol, and there is no relationship between being a veteran, having served in a combat zone and alcohol use. The results are similar if either overall alcohol use or problematic drinking is used as the dependent variable. We also do not find that the effects of being a veteran on alcohol use decay over time.

Our results are the first to link military service to use of alcohol using longitudinal data that allow comparisons between civilians and those who have served. The longitudinal data provide multiple observations on each individual, allowing us to employ a fixed-effects estimator that provides a degree of control over selectivity into the military. Our results are free of any selectivity that is tied to time-constant variables, either measured or unmeasured. Of course, it is still possible that time-varying factors may be linked to selectivity into the military, but we employed a large set of important time-varying demographic characteristics that may be linked to military service and alcohol use. We were also able to control for an indicator of risky behavior that prior research has found to be related to military service and alcohol use. The results, therefore, imply that the relationship between military service and

alcohol use is not a function of selectivity. For men at least, there is a close link between military service and increased use of alcohol.

Although our results are in line with expectations, a couple of findings are worthy of additional consideration. First, women who serve in the military are not only less likely to use alcohol than men who serve in the military, but they are less likely to use alcohol than their civilian counterparts. This implies that there is something about military that reduces alcohol consumption for women. It is not immediately evident why this negative relationship should occur. Obviously, women react differently to their experience in the military than do men. We suspect that part of the reason for the negative link between military service and alcohol use for women is the threat of sexual harassment and assault that is common in the military (U.S. Department of Defense 2012). Alcohol use is tightly linked to sexual assaults, both within and outside the military, and women who serve may become particularly aware of this linkage. It may also be the case that in order to justify their place in the military that women abstain from using alcohol, especially to the extent that their participation in particular military occupation specialties is subject to critical review based on their gender.

A second finding worth commenting upon is the fact that having served in a combat zone increases alcohol use for currently enlisted service members but not for veterans. As was the case for reduced alcohol use among women service members, it is not immediately clear why this difference would occur. One possibility may be tied to the fact that currently enlisted respondents have served longer than have veterans (results not shown). Accordingly, it is possible that currently enlisted respondents have experienced more than one tour of duty in a combat zone and may suffer from stress-induced alcohol use associated with the prospect of

another deployment to a combat zone.   It is also possible that re-enlistment in the military (which is more likely to have occurred for currently enlisted service members) represents an unmeasured and time-varying source of selectivity positively linking military service to alcohol use.

Despites its strengths, our analysis also suffers from a number of weaknesses. One weakness is that despite the longitudinal nature of the data, the number of respondents who have served in the military is relatively small, especially for women. The small number of respondents in our sample who served in the military means that we are not able to make use of more detailed information about military service such as branch of service, rank, and military occupation. At best, we have provided estimates of the effects of military service that likely hide variation in use that occurs according to characteristics of service. Another weakness of the NLSY-97 data is that the measure of combat service does not provide any information about actual exposure to combat or its timing. As such, we suspect that the effect of combat on alcohol use may be underestimated in our models. The results of our analysis are also limited to a particular piece of historical time, roughly the first decade of the new millennium. We are not able to draw any conclusions about the relationship between military service and alcohol use during any other period. Finally, the NLSY-97 data only follow respondents until they are about age 30. This limitation is particularly important for considering the effects of veteran status on alcohol use. We did not find evidence that the effect of being a veteran declined with time, but this could change as veterans in the NLSY-97 continue to age.

CONCLUSION

Despite its limitations our study is the first to use longitudinal data and a fixed-effects approach to provide evidence that military service affects alcohol use and in a different direction for men and women. The culture of alcohol use in a highly age-stratified environment appears to encourage men to consume more alcohol. It is also the case that the effect of military service is not limited to the time that men spend in the military. Male veterans are also more likely to consume alcohol than are comparable civilians. Although we expected women experiencing military service to drink less than their male counterparts, we found that women who serve are less likely to drink than their civilian counterparts.

The results that we present are important for policy makers to consider. Prior research has indicated that military service, both current service and being a veteran, is positively linked to alcohol consumption. What has been missing, however, is evidence that military service may play a causal role in alcohol use. Cross-sectional results are subject to the possibility that selection leads to the positive relationship between military service and alcohol use. Our models, while not perfect, provide evidence that military service leads to more alcohol consumption among service members that would have been the case if they had not served. This finding should provide for increased emphasis on efforts to reduce the culture of alcohol consumption in the military. The results should also spur more investigation into the unique role that gender plays in the linkage between military service and alcohol use.

References

Allison, Paul. 1994. "Using Panel Data to Estimate the Effects of Events." *Sociological Methods and Research* 23:174-199.

Ames, Genevieve M., Carol B. Cunradi, and Roland S. Moore. 2002. "Alcohol, Tobacco, and Drug Use among Young Adults Prior to Entering the Military." *Prevention Science* 3(2):135 144.

Barry, Adam E., Michael L. Stellefson, Bruce Hanik, Bethany L. Tennant, Shawn D. Whiteman, Julia Varnes, and Shelley M. Wadsworth. 2013. "Examining the Association Between Binge Drinking and Propensity to Join the Military." *Military Medicine* 178(1):37-42.

Bohnert, Amy S., Mark A. Illgen, Robert M. Bossarte, Peter C. Britto, Stephen T. Chermack, and Frederic C. Blow. 2012. "Veteran Status and Alcohol Use in Men in the United States." *Military Medicine* 177(2):198-203.

Bolken, Cory, Yoshie Sano, Jennifer De Costa, Alan Acock, and Randal Day. 2010. "Early Adolescents' Perceptions of Mothers' and Fathers' Parenting Styles and Problem Behavior." *Marriage and Family Review* 46:563-579.

Bray, Robert M., Michael R. Pemberton, Marian E. Lane, Laurel L. Hourani, Mark J. Mattiko, and Lorraine A. Babeu. 2010. "Substance Use and Mental Health Trends among U.S. Military Active Duty Personnel: Key Findings from the 2008 DoD Health Behavior Survey." *Military Medicine* 175(6):390-399.

Bray, Robert M., Kyung Hee Bae, E. Belle Federman, and Sara C. Wheeless. 2005. "Regional Differences in Alcohol Use among U.S. Military Personnel." *Journal of Studies on Alcohol* 66(2):229-238.

Donovan, John E. 2004. "Adolescent alcohol initiation: A Review of psychosocial risk factors."

Journal of Adolescent Health 35(6):529.e7-18.

Eggleston, A. Meade, Kristy Straits-Tröster, and Harold Kudler. 2009. "Substance Use

Treatment Needs among Recent Veterans." *North Carolina Medical Journal* 70(1):54-58

Eisen, Susan V., Mark R. Schultz, Dawne Vogt, Mark E. Glickman, A. Rani Elwy, Mari-Lynn

Drainoni, Princess E. Osei-Bonsu, and James Martin. 2012. "Mental and Physical Health

Status and Alcohol and Drug Use Following Return from Deployment to Iraq or

Afghanistan." *American Journal of Public Health* 102(S1):S66-S73.

Hair, Elizabeth, Jane Park, Thomson Ling, and Kristin Moore. 2009. "Risky Behavior in Late

Adolescence: Co-occurrence, Predictors, and Consequences." *Journal of Adolescent*

Health 45:253-261.

Hingson, Ralph W., Timothy Heeren, and Michael R. Winter. 2006. "Age at Drinking Onset and

Alcohol Dependence." *Archives of Pediatrics and Adolescent Medicine* 160(7): 739-746.

Hoerster, Katherine D., Keren Lehavot, Tracy Simpson, Miles McFall, Gayle Reiber, and Karin M.

Nelson. 2012. "Health and Health Behavior Differences. U.S. Military, Veteran, and

Civilian Men." *American Journal of Preventative Medicine* 43(5):483-489.

Holmes, Erin, Hinckley Jones-Sanpei, and Randal Day. 2009. "Adolescent Outcome Measures in

the NLSY97 Family Process Data Set: Variation by Race and Socioeconomic Conditions."

Marriage and Family Review 45:374-391.

Hunter, Christopher L., Gerald W. Talcott, Robert C. Klesges, Harry Lando, and Keith C. Haddock.

2000. "Demographic, lifestyle, and psychosocial predictors of frequency of intoxication

and other indicators as estimates of alcohol-related problems in Air Force basic military

    recruits." *Military Medicine* 165(7):539-546.

Institute of Medicine. 2012. *Substance Use Disorders in the U.S. Armed Forces*. Washington

    D.C.: Institute of Medicine, The National Academies Press.

Jacobson, Isabel G., Margaret A. Ryan, Tomoko I. Hooper, Tyler C. Smith, Pail J. Amoroso,

    Edward j. Boyko, Gary D. Gackstetter, Timothy S. Wells, and Nicole S. Bell. 2008.

    "Alcohol Use and Alcohol-Related Problems Before and After Military Combat

    Deployment." *Journal of the American Medical Association* 300(6):663-675.

Kroger, Jane. 1999. *Identity Development: Adolescence through Adulthood*. Thousand Oaks,

    CA: Sage.

Lehavot, Keren., Katherine D. Hoerster, Karin M. Nelson, Matthew Jakupcak, and Tracy L.

    Simpson. 2012. "Health Indicators for Military, Veteran, and Civilian Women." *American*

    Journal of Preventative Medicine 42(5):473-480.

Mattiko, Mark J., Kristine L. Rae Olmsted, Janice M. Brown, and Robert M. Bray. 2011. "Alcohol

    use and negative consequences among active duty military personnel." *Addictive*

    Behaviors 36(6):608-614.

Mundt, Marion P. 2011. "The Impact of Peer Social Networks on Adolescent Alcohol Use

    Initiation." *Academic Pediatrics* 11(5):414-421.

Nolen-Hoeksema, Susan. 2004. "Gender differences in risk factors and consequences for alcohol

    use and problems." *Clinical Psychology Review* 24(8):981-1010.

Olson, Wyatt. 2012. " Military Brass Dealing with and Entrenched Culture of Alcohol in Asia."

    Stars and Stripes, December 10, 2012.

Royston, Patrick and Ian R. White. 2011. "Multiple Imputation by Chained Equations (MICE): Implementation in Stata." *Journal of Statistical Software* 45(4):1-20.

Shen, Yu-Chu, Jeremy Arkes, and Thomas V. Williams. 2012. "Effects of Iraq/Afghanistan Deployments on Major Depression and Substance Use Disorder: Analysis of Active Duty Personnel in the US Military." *American Journal of Public Health* 102(S1): S80-87.

Spera, Christopher, Randall K. Thomas, Frances Barlas, Ronald Szoc, and Milton H. Cambridge. 2011. "Relationship of Military Deployment Recency, Frequency, Duration, and Combat Exposure to Alcohol Use in the Air Force." *Journal of Studies on Alcohol and Drugs* 72(1):5-14.

Substance Abuse and Mental Health Services Administration. 2001. Alcohol Use Among Veterans. The NHSDA Report. http://www.samhsa.gov/data/2k2/NSvets/NSvets.htm, retrieved August 1, 2013.

Teachman, Jay, and Lucky Tedrow. 2013. Delinquent Behavior, the Transition to Adulthood, and the Likelihood of Military Enlistment. Unpublished paper.

United States Department of Defense. 2012. Annual Report on Sexual Assault. http://www.sapr.mil/public/docs/reports/FY12_DoD_SAPRO_Annual_Report_on_Sexual_Assault-VOLUME_ONE.pdf, retrieved August 16, 2013.

Vander Ven, Thomas, Francis Cullen, Mark Carrozza, and John Wright. 2001. "Home Alone: The Impact of Maternal Employment on Delinquency." *Social Problems* 48:236-257.

Wallace, Amy E., Edward P. Sheehan, and Yinong Young-Xu. 2009. "Women, Alcohol, and the Military: Cultural Changes and Reductions in Later Alcohol Problems among Female Veterans." *Journal of Women's Health* 18(9):1347-1353.

Wallace, Amy E., Atticus Wallace, and William B. Weeks. 2008. "The U.S. military as a natural

experiment: Changes in drinking age, military environment, and later alcohol treatment

episodes among veterans." *Military Medicine* 173(7):619-625.

Young, Sylvia Y.N., Christian J. Hansen, Roger L. Gibson, and Margaret A.K. Ryan. 2006. "Risky

Alcohol Use, Age at Onset of Drinking, and Adverse Childhood Experiences in Young

Men Entering the US Marine Corps." *Archives of Pediatrics and Adolescent Medicine*

160(12): 1207-1214.

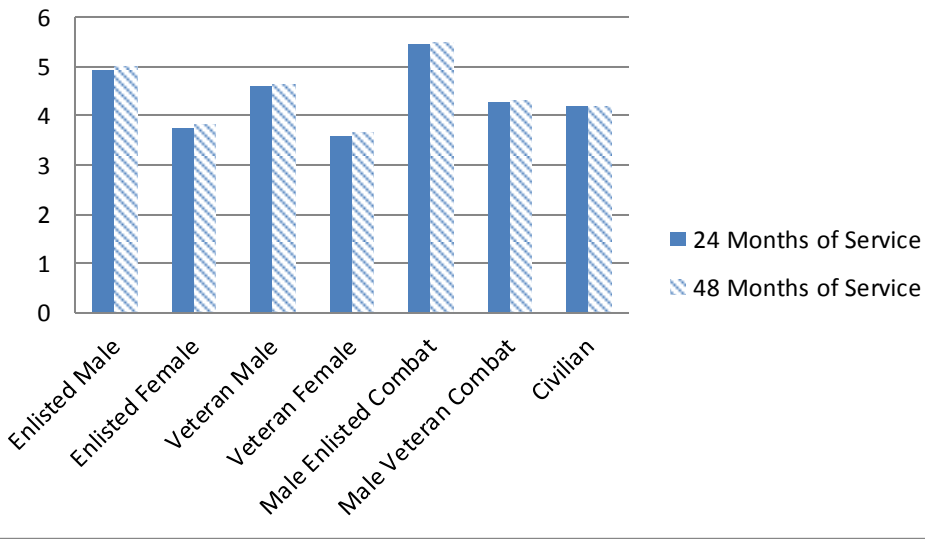**Figure 1 Predicted Score for Alcohol Use Index**

Legend:
- 24 Months of Service
- 48 Months of Service

Categories: Enlisted Male, Enlisted Female, Veteran Male, Veteran Female, Male Enlisted Combat, Male Veteran Combat, Civilian

Table 1: Descriptive Statistics for Variables Used in the Analysis of Alcohol Use: NLSY-97

Variable	Mean or Percent	Standard Deviation
Alcohol Use	3.62	3.88
Enlisted	2.17	
Veteran	1.54	
Age	261.07	51.21
Age Squared/1000	70.78	269.73
Length of Service	151.68	117.15
Delinquency Index	2.29	2.42
Number of Children	0.42	0.84
Poverty Ratio	3.29	3.49
General Health	2.10	0.95
Education in Years	11.74	2.76
Married	13.72	
Cohabiting	11.97	
Weeks Worked in the Past Year	29.94	21.52
Enrolled in School	43.94	

Table 2: Fixed Effects Results for the Analysis of Alcohol Use: NLSY-97

Variable	Fixed Effects Estimates		
	Model 1	**Model 2**	**Model 3**
Enlisted	-0.637**	-0.750**	-0.484**
Veteran	-0.591**	-0.621**	-0.651**
Male*Enlisted	1.187**	1.099**	1.169**
Male*Vet	0.914**	0.916**	0.996**
Age in Months	0.124**	0.124**	0.058**
Age Squared*1000	-0.212**	-0.212**	-0.100**
Length of Service in Weeks	0.002**	0.002**	0.003**
Enlistment*Combat		0.505**	0.510**
Veteran*Combat		0.086	-0.061
Delinquency Index			0.242**
Number of Children			-0.179**
Poverty Ratio			0.007**
General Health			**0.163****
Education in Years			0.241**
Married			-0.744**
Cohabiting			-0.440**
Weeks Worked in the Past Year			0.010**
Enrolled in School			0.124**

**P<.05

Dependent Variable: Alcohol Use