The Effect of Combat Exposure on Risky Health Behaviors: New Evidence from the Global War on Terrorism*

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Abstract

Using data drawn from the National Longitudinal Study of Adolescent Health (Add Health) and the 2008 Department of Defense Survey of Health Related Behaviors Among Active Duty Personnel (HRB), we exploit a natural experiment in overseas deployment assignment to identify the causal effect of combat exposure on the probability of subsequent cigarette consumption, binge drinking, and drug use. We find that active duty personnel assigned to combat zones with enemy firefight are more likely to subsequently engage in risky health behaviors than their counterparts deployed to non-combat zones or to combat zones without enemy firefight. These findings are robust to controls for soldiers' propensity to engage in risky behaviors prior to deployment and are generally larger for those serving in the Army. Our results suggest that the adverse psychological consequences of combat can explain one-half to two-thirds of the estimated association between combat exposure and risky health behaviors.

Keywords: combat exposure, substance use, risky behaviors, PTSD

"Abusing alcohol and drugs has been part of military culture historically: troops do it for fun, to ease the stresses of war or to be part of the brotherhood."

-Pauline Jelinek, *Huffington Post*, September 2012

I. Introduction

While much media attention has been paid to the number of soldiers killed and wounded in the Global War on Terrorism (GWOT), policymakers have increasingly turned their attention to the many hidden costs of war imposed on U.S. military personnel. In 2008, the RAND Corporation published an influential report showing that one-quarter of American soldiers returning from combat deployments in Iraq and Afghanistan suffer from "invisible wounds" of war caused by the stresses and psychological trauma of combat exposure (Tanilian and Jaycox 2008). The symptoms are often manifested in the form of Post-Traumatic Stress Disorder (PTSD), depression, traumatic brain injury, and suicide ideation (Cesur, Sabia, and Tekin, 2013).

Could the increased stress and psychological trauma of war trigger an increased propensity to engage in risky health behaviors? A number of researchers have found that combat service in prior wars is associated with poorer subsequent health behaviors. Specifically, exposure to combat in World War II, Korea, and the Vietnam War has been linked to increased cigarette consumption (Bedard and Deschenes 2006; Rohlfs et al., 2010), binge drinking (McFall et al., 1992), and drug use (Price et al., 2004).

Despite this body of work, much less research has been done by health economists on the behavioral health effects of combat exposure in GWOT. One important empirical reason for this is the abolition of the draft lottery, the most common natural experiment exploited in the literature to credibly identify the causal effects of military service. Instead, most studies of the health effects of military service in the military health literature compare the risky behavior outcomes of deployed soldiers to non-deployed personnel, including Reservists and National

Guardsmen (Jacobson et al. 2008; Hoge et al, 2006). However, Reservists and National Guardsmen differ from active-duty deployed soldiers on a myriad of characteristics that are also related to risky behaviors (Hirsch and Mehay, 2003), and active duty soldiers with periods of extended non-deployment may be non-deployable due to health conditions (Department of the Army AR 614-30, 2010).

We contribute to the literature on the health behavioral effects of combat service by exploiting a natural experiment in deployment assignment among active duty personnel. We rely on theoretical and empirical evidence that—conditional on military rank and occupation—deployment assignments of active duty personnel by the US Armed Forces' Human Resources Command is exogenous to servicemembers' propensity to engage in risky health behaviors. Our findings suggest combat exposure is associated with substantially increased risk of subsequent smoking, binge drinking, and drug use. These findings persist even after controlling for pre-deployment risky behaviors. We find that combat-induced psychological stress and adverse mental health—measured by Post-Traumatic Stress Disorder, depression, and suicide ideation—can explain up to one-half to two-thirds of the estimated association between combat exposure and risky health behaviors.

II. Background

A number of recent surveys document substantial rates of risky health behaviors among soldiers serving in the Global War on Terrorism. One in eight veterans of the Iraq and Afghanistan wars received an alcohol-related counselling referral (National Council on Alcoholism and Drug Dependence 2012), over one-quarter suffered from some combination of drug and alcohol dependency, homelessness, and depression (Tanielian and Jaycox 2008), nearly

40 percent of soldiers and Marines reported smoking cigarettes, leading the Institutes of Medicine (2009) to recommended a transition toward a tobacco-free military.

There are a number of theoretical reasons to expect combat exposure to increase subsequent risky health behaviors. First, individuals exposed to combat often experience heightened risk-taking and an adrenaline rush while in combat. Prolonged exposure may induce risk taking (Kilgore et al. 2008) and thrill seeking (Vaughan 2006) as well as increase perceived fearlessness and pain thresholds (Joiner 2005). These emotions may increase risky health behaviors among combat veterans.

The stress of combat may also lead veterans to engage in risky health behaviors as a coping mechanism (Institutes of Medicine 2009).[1] There is compelling evidence that the combat exposure increases the risk for stress-related disorders and poorer mental health. Combat service has been linked to increased risk for Post-Traumatic Stress Disorder (Cesur, Sabia, and Tekin 2013; Bedard et al., 2004; Hoge et al., 2004; 2006), depression (Cesur, Sabia, and Tekin 2013), and suicide ideation (Newman, Hearst, and Hulley, 1986; Grossman and Siddle 2000; Page, Engdahl, and Eberly 1997; Gold et al. 2000). Thus, engaging in risky health behaviors may be a means through which servicemembers cope with or escape from stress-related ailments. These behaviors could also be a "cry for help" or even reflect an attempt at further self-injury (Joiner 2005; Jacobson et al 2008).

A final mechanism through which combat could affect risky behaviors is via income effects. In the short-run, increased combat pay could increase substance use to the extent that

[1] Military policymakers have, in fact, argued for not attempting to curb legal risky health behaviors to the extent that they help servicemembers to cope. For instance, the office of former US Secretary of Defense Robert Gates announced the Secretary's opposition to a military smoking ban on the following grounds:

> "[Secretary Gates] knows that the situation [servicemembers] are confronting is stressful enough as it is. I don't think he is interested in adding to the stress levels by taking away one of the few outlets they may have to relieve stress." (Morrell 2009)

these substances are normal goods. However, in the longer-run, Angrist (1990) finds that military service reduce men's subsequent civilian wages (Angrist, 1990), which could have the opposite effect.

In addition to the above-described causal mechanisms, military service and risky health behaviors could be related via non-causal channels, given that military service is endogenous. Relative to civilians, active duty military personnel are more likely to come from family backgrounds of lower socioeconomic status (Cesur, Sabia, and Tekin 2013), be of particular personality types (Thomsen et al. 2011), and, prior to deployments, be in better physical and mental health due to rigorous screenings (Department of Defense Directives 6130.3 and 6130.4). Each of these characteristics may be related to subsequent risky health behaviors.

To disentangle the causal effect of military service from a spurious correlation, studies of prior US wars (World War II, Korea, and Vietnam) have used the draft lottery to generate exogenous variation in military service (see, for example, Bedard and Deschenes 2006; Rohlfs et al., 2010; Angrist 1990). Using the draft as an instrument, researchers have found that military service is positively related to tobacco use (Bedard and Deschenes 2006), but essentially unrelated to the probability of AIDS-related intravenous drug use (Hearst et al. 1991) and alcohol consumption (Goldberg et al. 1991; Dobkin and Shabani 2009).

Without a military draft to exploit as a natural experiment, a number of recent studies have descriptively explored the relationship between deployment in GWOT and risky health behaviors. Each takes a similar empirical approach, comparing deployed servicemembers to their non-deployed counterparts. Thomsen et al. (2011) finds that deployed marines and sailors are more likely to use illegal drugs than their non-deployed counterparts; Smith et al. (2011) and Hoerster et al. (2012) find some evidence that deployment is associated with higher rates of

smoking[2]; and Jacobson et al. (2008) and Hooper et al. (2008) find that deployment is associated with an increased risk of alcohol abuse.

While informative and intriguing, caution should be taken in interpreting the results from these studies causally. As noted above, non-deployed servicemembers, including Reservists and National Guardsmen, differ from active-duty deployed soldiers on a myriad of characteristics that are also related to risky behaviors (Department of the Army AR 614-30, 2010; Hirsch and Mehay, 2003).

The current study is the first to use a natural experiment in deployment assignment among overseas deployed active duty personnel to identify the causal effect of combat exposure in GWOT on subsequent risky health behaviors. We are also the first to empirically explore a mechanism through which combat exposure in GWOT may affect risky health behaviors.

III. Identification

While studies of prior wars in the economics literature have utilized the draft lottery to generate exogenous exposure to combat, the absence of a draft has challenged scholars in trying to identify the causal effects of combat on health behaviors in the age of an all-volunteer military. However, a few recent studies have identified a potentially new source of plausibly exogenous variation in combat exposure: deployment assignments by US Armed Forces Human Resources Command (Lyle 2006; Engel et al. 2010; Cesur, Sabia, and Tekin 2013). This body of work argues on both theoretical and empirical grounds that, conditional on a small set of military observables available to US Human Resources Command—including rank, military occupation, and cognitive ability—deployment assignment decisions are exogenous to

[2] However, Hooper et al. (2008) found that military service in the UK is essentially unrelated to cigarette consumption.

servicemembers' preferences, personal characteristics, and family background characteristics. Lyle (2006) and Engel et al. (2010) persuasively argue that Army Human Resources Command (AHRC) "regards soldiers of the same rank and occupation as equals" (p. 323). That is, the US Armed Forces views servicemembers of identical military occupation and rank as essentially perfect substitutes in the production of security.[3]

Moreover, individual servicemembers are, in fact, almost never deployed. For example, in the US Army, companies are deployed.[4] An individual soldier has little control over the company to which he or she is assigned and, as matter of policy, is reassigned every 3 or 4 years by AHRC. Servicemembers' stress-tolerance, personality, and underlying propensity to engage in risky behaviors play no role in unit assignments or on the timing and location of unit deployment assignments and, "*as a rule,*[HRC] do[es] not take into consideration the welfare of an individual enlisted soldier...nor do they consider the average characteristics of units and families" when making assignment decisions (Engel et al. 2010; p. 76).

If individual characteristics of servicemembers do not drive deployment assignments among active-duty deployable personnel, what does? Senior commanders base unit deployment assignment on "the exigencies of the operational environment," which are driven by world events, and "the availability and readiness of suitable units" (Engel et al., 2010, p. 76). Lyle (2006) emphasizes, for example:

[3] It is important to emphasize that while servicemembers can affect future assignment via early career occupation choice and service length (which affects rank), *within-occupation assignments of those of identical rank* can be thought of as random. Therefore, occupation selection is not a threat to the internal validity of the experiment, provided there are data on military occupation. While the effect of combat exposure on risky behaviors could be heterogeneous across occupations, data limitations (including the difficulty in identifying exogenous variation in occupation) will not allow an exploration of this question.

[4] Lyle (2006) and Engel et al. (2010) are able to empirically test this theoretical point in their data by instrumenting individual soldier deployment with unit deployment. The results using the instrument are qualitatively and quantitatively similar to treating individual deployment as exogenously determined.

> "The 'needs of the army'…captures the essence of all [military] assignments: world events drive army assignments. [T]he timing of the move and assignment of a soldier to a subordinate army unit are largely independent of a soldier's preferences… [O]nce a soldier is assigned to a division, the division assigns the soldier to one of several brigades, the brigade assigns the soldier to one of several battalions, and the battalion assigns the soldier to one of several companies. The 'needs of the army' also determine the missions that a soldier's company receives." (Lyle, 2006, p. 323)

The availability and readiness of units depends on macro-level unit issues such as the timeliness of equipment being inventoried and cleared for shipment, completion of specified training, and the occupational skill set of unit members (Army Regulation 220-1).

When making unit assignments and deployment decisions, Human Resources Command only has information on a small set of observables available to it, such as the respondent's military rank, occupation, and cognitive test (AFQT) score. Recent studies by Lyle (2006), Engel et al. (2010), and Cesur, Sabia and Tekin (2013) show that, conditional on military rank and occupation, estimated effects of combat deployment are robust to controlling for other individual soldier characteristics, consistent with the hypothesis that deployment assignment is exogenous.

While this natural experiment is useful in identifying the causal effects of combat service on risky health behaviors, it is important to note that the local average treatment effect (LATE) we estimate is theoretically quite different from the LATE obtained using a draft lottery. While the latter represents the effect of randomly drawing a civilian into military service, our experiment identifies the effect of randomly assigning an active duty deployed servicemember of a given occupation and rank to combat. These effects, could in fact, be quite different given that those who choose to serve as active-duty servicemembers in particular occupations are not randomly drawn from the civilian population. While the LATE we identify from our natural

experiment is, in this sense, narrow, we believe it to be an important and relevant policy parameter given current military deployment policy and (at least at present) bipartisan political opposition to reinstituting the draft.

IV. Data, Measures, and Methods

Our analysis uses data drawn from two sources: the National Longitudinal Study of Adolescent Health (Add Health) and the 2008 Department of Defense Survey of Health and Related Behaviors Among Active Duty Personnel. We describe each dataset below, as well as the advantages and disadvantages of each.

Add Health. Collected by the University of North Carolina at Chapel Hill, the Add Health is a nationally representative school-based survey of 7th to 12th graders, interviewed in the 1994-95 school year. The Wave I baseline survey consisted of 20,745 participants and was succeeded by three follow-up surveys: the Wave II survey took place in 1996; the Wave III survey was implemented in 2001 when the respondents were in the age range of 18 to 26; and the last data collection effort took place in 2007-08 for Wave IV when the respondents were ages 24 to 32. There were 15,701 participants responding in at Wave IV, including a sample of 1102 military servicemembers. Surveys were administered privately via the Computer Assisted Self-Interviewing (CASI) system to minimize under-reporting of sensitive health behaviors.

Our analysis sample in the Add Health is comprised of 565 active duty deployed servicemembers whose military service started after the Wave I interview at the time of Wave IV survey and who provided non-missing information on combat exposure and the outcomes under study.[5] Of these 565 servicemembers, 416 were deployed to a combat zone, and 149 were

[5] The results we describe below are quantitatively and qualitatively similar when those whose military service started prior to the Wave I interviews are included.

deployed overseas to a non-combat zone outside the United States. Among the 416 soldiers who served in combat zone, 185 actually were exposed to combat via enemy firefight while 231 served in combat zone without enemy firefight engagement.[6]

Key Variables. Our key independent variable, *Combat Exposure*, is a dichotomous variable set equal to 1 if the respondent reported deployment assignment to combat zone where he or she "engage[d] the enemy in firefight"; it is coded as 0 if the respondent reported overseas deployment assignment to a non-combat zone or to a combat zone without enemy firefight.

We measure three risky behavior outcomes in the Add Health at the time of the Wave IV survey. First, with regard to smoking, respondents are asked:

"During the past 30 days, on how many days did you smoke cigarettes?"

Respondents who reported positive days of smoking in the past 30 days were coded as 1 and those that reported 0 days of smoking were coded as 0.

Second, to measure binge drinking, we examined servicemembers responses to the following questionnaire items:

"During the past 30 days, on how many days did you drink?"

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[6] Specifically, respondents to the Add Health were asked:

"Was your military service in the US, outside the US, or both?"

"What is the total amount of time you (have) served in a combat zone?"

"During your combat deployment, how many times did you engage the enemy in a firefight?"

To enter our sample, a respondent must report active duty service with deployment outside the United States. Among that sample, if a respondent reported service inside a combat zone *and* engaging the enemy in firefight, *Combat Exposure* was coded as 1. If the respondent reported overseas deployment in a non-combat zone *or* deployment to a combat zone without enemy firefight, *Combat Exposure* was coded as 0.

"Think of all the times you have had a drink during the past 30 days. How many drinks did you usually have each time? A 'drink' is a glass of wine, a can or bottle of beer, a wine cooler, a shot glass of liquor, or a mixed drink"

Respondents who answered that they drank on at least one day in the past 30 days *and* reported usually having 5 or more drinks if male or 4 or more drinks if female were coded as 1. Others were coded as 0. Because of the Add Health survey instrument, our binge drinking measure is not the standard binge drinking measure used in the public health literature (capturing *any* binge drinking in the last 30 days), but rather captures more frequent binge drinking.

Drug use in the last 30 days was measured using responses to the following questionnaire items:

"During the past 30 days, on how many days did you use marijuana?"

"During the past 30 days, on how many days did you use your favorite drug [includes sedatives, tranquilizers, stimulants, pain killers, steroids, cocaine, crystal methamphetamine, ecstasy (MDMA), inhalants, LSD, heroin, PCP, or other illegal drugs]?" [7]

First, a dichotomous indicator for any drug use was generated and set equal to 1 for respondents who reported using marijuana or any other drug in the last 30 days and set equal to 0 for those who reported using neither. Second, we measure non-marijuana drug use ("other drug") use by excluding marijuana from the above list separate indicators.

There are several advantages and disadvantages of the Add Health data. One key advantage is that the Add Health contain data on the full set of observables available to HRC—such as military rank, occupation (measured via four-digit Standard Occupational Classification code), and cognitive ability (measured via the PPVT score)—when making deployment

[7] "Favorite" drug in the Add Health data is defined as the drug that the respondent uses most frequently during their lives. Therefore, measurement error may be introduced if the respondent used a non-marijuana drug in the last 30 days but this drug was not the drug that he or she had designated as the "favorite" most frequently used drug in his or her lifetime.

decisions. Thus, we can empirically test whether, conditional on these characteristics, deployment assignment is unrelated to a wide set of personal and family background characteristics of servicemembers, as we theoretically expect. A second advantage of the Add Health is that these data are longitudinal, which allow us to condition on risky behaviors prior to military service and deployment, measured at Wave I. Third, the Add Health provides information on potential factors that might partly explain the relationship between combat exposure and risky health behaviors, including suicide ideation, a diagnosis of Post-Traumatic Stress Disorder (PTSD), and a psychometrically sound measure of personal stress.

There are important disadvantages of the Add Health, however. First, at Wave IV, respondents are only ages 24 to 32. Thus, results will not be generalizable to older military servicemembers. Second, because the Add Health is a school-based survey comprised largely of civilians, the sample of deployed servicemembers is relatively small. With only 565 respondents who reported overseas deployment, estimated effects will be imprecise. Moreover, detecting significant branch-specific effects will prove especially difficult. For instance, 236 active duty deployed respondents were in the Army, 102 were in the Marines, 142 were in the Navy, and 93 were in the Air Force. To address these drawbacks, we complement our analysis with a second dataset, the Department of Defense Health and Related Behaviors Survey.

DOD HRB Survey. The Department of Defense Health and Related Behaviors Survey was conducted by RTI International of Research Triangle Park, North Carolina and designed to assess with health and well-being of military personnel serving in GWOT. The 2008 HRB Survey consisted of 28,546 active duty military servicemembers—5,927 from the Army, 6,637 from the Navy, 5,117 from the Marine Corps, 7,009 from the Air Force, and 3,856 from the Coast Guard. Each respondent anonymously completed self-administered questionnaires in

approximately 60 minutes. Participants were selected to represent men and women in all pay grades all over the world, but excluded personnel who were (i) absent without official leave (AWOL), (ii) attending a service academy, and (iii) who were incarcerated at the time of data collection. The vast majority of surveys were answered by participants at military installations, while a small number were answered by mail for those who could not attend such sessions. The DOD HRB survey was a pencil-and-paper survey and while self-administered, the lack of a CASI system of data collection, may result in underreporting of behaviors.[8] However, measurement error should not bias our estimates as long as misreporting is not systematically associated with deployment assignment.

Our main sample consists of 14,740 active duty respondents who had deployed overseas and who provided non-missing information on combat exposure and the outcomes under study. Broken down by branch, this sample is comprised of 3,253 soldiers, 4,242 sailors, 3,014 marines, and 4,070 airmen and women. Thus, the key advantage of the DOD HRB survey over the Add Health is its large military sample, which permits us to obtain more precise estimates of the effect of combat exposure for the full military sample as well as for branch-specific samples. In addition, the DOD HRB sample includes veterans ages 18 to 54, which allows estimates that are more generalizable to the active duty population than the younger sub-sample available in the Add Health.

We measure combat exposure in the DOD HRB survey in an analogous way to the Add Health Survey. If the respondent reported being exposed to enemy firefight during deployment, *Combat Exposure* is coded to 1. If the respondent reported overseas deployment without enemy firefight, *Combat Exposure* is coded to 0. Among the sample of overseas deployed

[8] See Bray et al. (2009) for more detailed information on the DOD HRB data collection strategy.

servicemembers, 7,166 (48.6 percent) reported combat exposure.[9] One difference with the Add Health data, however, is that we cannot distinguish whether overseas deployed respondents served in combat or non-combat zones.[10]

As in the Add Health survey, respondents to the DOD HRB survey were asked about their participation in risky health behaviors. The questionnaire items on cigarette consumption and marijuana use in the last 30 days was identical to the Add Health and was coded analogously. For other drug use and binge drinking, the questionnaire items in the HRB survey are different than in the Add Health. With regard to other drug use, respondents were asked about use of cocaine, LSD, PCP, ecstasy (MDMA), other hallucinogens (peyote, mescaline, and psilocybin), methamphetamine, heroin, GHB/GBL, and inhalants in the last 30 days.[11] Binge drinking was defined in the more standard way: "consuming five or more drinks (four or more for women)" on "at least one occasion during the past 30 days."

Despite the advantages of the DOD HRB survey with regard to sample size and a broader age distribution of servicemembers, there are a number of important limitations. First, the data do not contain information on military occupation, which might impact unit deployment

[9] Exposure to combat fire is defined as answering yes to either one of the following experiences in these questions:

> *"Thinking about all of your deployments (combat and noncombat), how many times have you had each of the following experiences?*
>
> > *I, or members of my unit, received incoming fire from small arms, artillery, rockets, or mortars.*
> > *My unit fired on the enemy."*

[10] The DOD HRB survey only asks about combat versus non-combat zone deployment in the previous 12 months; specific combat exposure questions about enemy firefight are asked ever rather than in the previous 12 months. Thus, to code our *Combat Exposure* measure as consistently as possible across datasets, we chose the coding described above.

[11] Respondents were, however, told to exclude "steroids, sexual enhancers, and analgesics" from their report of illicit drug use.

assignment.[12] This creates a potential problem for the credibility of the natural experiment in the DOD HRB data. However, the DOD survey does contain information on educational attainment as well as information regarding an individual's Major Command (MAJCOM). A MAJCOM represents a subdivision for a particular military installation responsible for a specific combat/support mission.[13] While imperfect, controls for MAJCOM and educational attainment should at least help to reduce bias in our estimates.

In summary, the Add Health allows more credible identification, but at the cost of low statistical power, while the DOD HRB survey allows more precise estimates, but lacks a few key observables that might raise doubt about the credibility of identification. However, one of the key advantages of using two data sources for this study is that we can gauge the magnitude of bias in estimates obtained from the DOD HRB sample using the Add Health data. That is, we can use the full set of relevant military observables in the Add Health (including occupation and cognitive ability) to estimate our "ideal" natural experiment and then estimate a "second best" experiment in the Add Health that uses only the subset of observables available in the DOD HRB survey. Differences in the magnitude of these Add Health estimates will give us some sense on the magnitude and direction of any bias from the DOD HRB data.

Methods. We begin with the Add Health data, restrict the sample to active duty deployed servicemembers and estimate a model of the following form:

$$R_i = \beta_0 + \beta_1 Combat\ Exposure_i + \beta_2' \mathbf{M}_i + \varepsilon_i \qquad (1)$$

[12] In addition, the DOD HRB data are not longitudinal in nature, which do not allow controlling for pre-deployment risky health behaviors.

[13] These MAJCOMs include US Army Training and Doctrine Command, US Army Europe, US Army Pacific, 8th Army, US Fleet Forces Command, Commander Pacific Forces, Naval Medical Command, Commander Naval Installations Command, Marine Corps Installations East, Marine Corps Installations West, Air Combat Command, Air Education and Training Command, Air Force Materiel Command, Air Force Space Command, Air Mobility Command, Pacific Air Forces, and US Air Forces Europe.

where R_i is a dichotomous indicator for whether respondent *i* has engaged in a particular risky behavior (smoking, binge drinking, drug use), *Combat Exposure*$_i$ is a dichotomous indicator for whether the respondent has been exposed to combat, and $\mathbf{M}_i$ is a set of relevant military characteristics (rank, occupation, timing of service, branch, cognitive ability). If the theoretical assumptions underlying deployment assignment decisions are correct, the above natural experiment should generate unbiased estimates of β_1.

Next, we add a wide set of personal and family background characteristics to the right hand side of equation (1):

$$R_i = \beta_0 + \beta_1 Combat\ Exposure_i + \beta_2' \mathbf{M}_i + \beta_3' \mathbf{X}_i + \varepsilon_i \quad (2)$$

where $\mathbf{X}_i$ includes age, race, ethnicity, gender, measured height, measured weight, years of schooling attained, religious affiliation, maternal educational attainment, parental marital status when the respondent was an adolescent, parental income when the respondent was an adolescent, and health insurance status. In addition, because the Add Health data are longitudinal, we also include indicators of the respondent's *pre-deployment risky health behaviors* (smoking, binge drinking, and drug use), measured analogously to the outcome variables, when the respondents were in high school. If our identification assumption is credible, our estimates of β_1 from equation (1) should be largely unchanged in equation (2).

Next, we turn to the DOD HRB data, which, as noted above, lacks information on military occupation and cognitive ability. Given the lack of potentially important information on these measures, we first ensure that those who are deployed to combat and see enemy firefight are statistically equivalent on observables to those deployed to non-combat zones or combat

zones without enemy firefight. We estimate a nearest neighbor matching model, where we first use a probit model to estimate the probability of assignment to combat:

$$Combat\ Exposure_i = \delta_0 + \delta_1 \mathbf{Z}_i + \nu_i \quad (3)$$

where $\mathbf{Z}_i$ includes the set of observables available in the DOD HRB survey, including military rank, individual's Major Command (MAJCOM), frequency of deployments, age, race, marital status, gender, and educational attainment. Our nearest neighbor matching procedure imposes common support on observables and requires predicted probabilities of combat exposure within 0.00015.[14] These parameters were chosen to ensure that on the above-mentioned observables, there were no statistical differences across the combat exposed and non-combat exposed samples. After matching, mean differences in the risky behavior outcomes were calculated and standard errors generated via bootstrapping. An alternative to the above approach would be to simply estimate equation (2) using the DOD data and only conditioning on the **Z**s. The findings using this approach were not quantitatively or qualitatively different from those obtained using the above model.

However, because matching can only address selection on observables, we need a further test to explore any problems due to selection on unobservables. To inform the magnitude of the bias in estimates from the DOD HRB survey, we use the Add Health data. A comparison of estimates of β_1 from equation (2) to OLS and PSM estimates *using the Add Health data, but only with DOD HRB controls* will inform the magnitude and direction of any biases from estimates obtained from the DOD HRB model.

[14] We also experimented with trimming 5 to 10 percent of observations with predicted probabilities furthest from the highest and lowest predicted probabilities. Our findings were robust to caliper parameters and matching method employed (such as radial matching).

VI. Results

Descriptive Statistics. Table 1 shows descriptive statistics for the key variables by *Combat Exposure*. The first three columns present means using the Add Health data and the final three columns for the DOD HRB survey. Rates of smoking, and drug use were higher in the Add Health than the DOD HRB survey (0.391 vs 0.263 for smoking; 0.118 vs 0.013 for marijuana use; and 0.044 vs 0.039 for other drug use), which is not surprising given that (i) younger servicemembers are more likely to engage in these behaviors than older individuals, (ii) the Add Health data include information on former servicemembers who are no longer active duty (and not subject to, for example, random drug testing), and (iii) differences in survey administration.[15] One notable difference is our measure of binge drinking, but this can be explained by differences in the measures, as the Add Health measures captures typical monthly binge drinking. Across each of these datasets, rates of smoking, binge drinking, and drug use are greater for those who were exposed to combat relative to those who were deployed but not exposed to combat. Table 1 also shows that combat deployment appears most frequent in the Army relative to other branches of service.[16]

Evidence on Exogeneity of Deployment Assignment in Add Health. In Table 2, we present some descriptive evidence of the exogeneity of deployment assignment in the Add Health. Specifically, we estimate:

$$\textit{Combat Exposure}_i = \theta_0 + \theta_1' \mathbf{M}_i + \theta_2' \mathbf{X}_i + \rho_i \qquad (4)$$

[15] In Appendix Table 1, we compare the means of the outcomes for the DOD data for those ages 24 to 32 and for the active duty sample in the Add Health. The means are much more similar with this "apples to apples" comparison. Interestingly, rates of non-marijuana drug use, which includes harder drugs such as cocaine, methamphetamine, and heroin, are comparable to or even greater than rates marijuana use. One explanation for this is that many harder drugs are more quickly eliminated from the body than marijuana, decreasing the likelihood of detection from random drug tests.

[16] Appendix Tables 2 and 3 show the means of the independent variables (as well as alternate combat exposure measures discussed below).

and report estimates of θ_2. Column (1) presents results when comparing those exposed to combat to those deployed to either combat zones without actual combat exposure or to non-combat zones overseas; column (2) compares those exposed to combat to only those deployed to combat zones without exposure; and column (3) compares those exposed to combat to only those deployed to non-combat zones. Across models, the results suggest that conditional on military rank, timing of service, branch, and military occupation, deployment assignment among overseas deployed servicemembers is unrelated to pre-deployment risky health behaviors, as well as a wide set of individual and family background characteristics, consistent with the assumption that deployment assignment is exogenous to risky health behaviors. There is evidence that non-Hispanic males are more likely to be exposed to combat, so we control for gender and ethnicity in all models, but note that if we limit the sample to non-Hispanic males only, all of the results discussed below hold.

Main Results. Table 3 presents estimates of β_1 from equations (1) and (2) using the Add Health data.[17] Panel A presents results for the full sample. The first row shows results using only the military controls. The findings show that combat exposure is associated with a 10.2 percentage-point increase in the probability of smoking (column 1), a (statistically insignificant) 4.0 percentage-point increase in the probability of binge drinking (column 2), and a 6.5 increase in the percentage-point probability of any drug use (column 3). When we separate drug results by marijuana or other drug use, we find that combat exposure is associated with a (statistically insignificant) 3.4 percentage-point increase in the likelihood of marijuana use (column 4), and a 3.9 percentage-point increase in the probability of other drug use (column 5). Relative to the

[17] To economize on space, we only present the estimated coefficients on the variable of interest, *Combat Exposure*. Estimated coefficients on the control variables are available upon request.

means shown in Table 1, these marginal effects are quite large. When the full set of personal and family background characteristics are added to the estimating equation (row 2, Panel A), including pre-deployment risky behaviors, the magnitude of relationship between *Combat Exposure* and risky behaviors remains largely unchanged, consistent with the hypothesis that combat zone deployment is exogenous to personal and family background characteristics, including pre-deployment risky health behaviors.

The final two rows of Panel A separate the control group into those who were assigned to combat zones without enemy firefight and those who were deployed overseas to non-combat zones. While less precisely estimated, the findings continue to show that combat exposure is positively related to the outcomes under study. The magnitude of the estimated relationship appears to be somewhat larger when using the non-combat zone deployed individuals as a control group, but the differences in estimated effects across the two separate control groups are statistically indistinguishable.

The remaining Panels of Table 3 present Add Health estimates by branch of service—Army (Panel B), Marines (Panel C), Navy (Panel D), and Air Force (Panel E). The results, which are quite imprecise given the small sample sizes, on the whole, continue to point to a positive relationship between combat exposure and the probability of engaging in risky behaviors. The estimates are positive in 12 of 16 cases, though largest in the Navy.

Given the limited power of the Add Health, particularly with regard to branch-specific estimates, we next turn to the DOD HRB survey. Table 4A and B present evidence on the success of our matching procedure. After matching, we find that those who were assigned to combat zones are statistically equivalent with regard to military rank, MAJCOM, number of

deployments, educational attainment, gender, age, race, and marital status. Thus, on observables related to occupation, our procedure has ensured common support.

Table 5A presents PSM estimates using the DOD HRB data. Row (1) presents estimates from the full sample and the remaining rows show estimates for the Army (column 2), Marines (row 3), Navy (row 4), and Air Force (row 5). For the full sample, the findings suggest that combat exposure is associated with a 3.6 percentage-point increase in the probability of smoking, a 4.1 percentage-point probability increase in the probability of binge drinking, a 2.8 percentage point increase in the probability of any drug use, a 1.3 percentage increase in the likelihood of marijuana use, and a 2.9 percentage-point increase in the probability of using other drugs. Risky behavioral effects appear to be largest for the Army and Navy, consistent with much of the recent literature that has found larger health effects for these branches (Cesur, Sabia, and Tekin 2013). [18] One reason for smaller effects of combat exposure for those in the Air Force may be less physical proximity to, and perhaps psychological consequences of, combat exposure.

As noted above, one concern with the above DOD HRB data is that the natural experiment may be contaminated. Therefore, we use the Add Health to gauge the magnitude of the bias in our estimates that may arise from missing information on military occupation and cognitive ability. Row (1) of Table 5B replicates the findings from our "clean" natural experiment shown in row (2) of Table 3. In row (2) of Table 5B, we control for only the **Z**s that are common to the Add Health and DOD surveys, the **Z**s. The results from this experiment produce estimates that are statistically equivalent and quantitatively nearly identical to those shown in row (1), suggesting that controls for military rank, number of deployments, educational

[18] Appendix Table 5 presents estimates of the effect of combat exposure in the DOD HRB survey by age: those ages 18 to 23, ages 24 to 32 (to match the Add Health sample), and ages 33 and older. The results suggest the largest impacts of combat exposure on risky behaviors for those in their mid-20s to early 30s.

attainment, and MAJCOM may be sufficient proxies for military occupation and cognitive skills such that the DOD estimates are not plagued by substantial bias. In row (3), we match on the **Z**s[19] rather than control for them linearly, and continue to find a similar pattern of results. And while the binge drinking estimate is somewhat larger, the drug use estimates are smaller.

Taken together, the findings across both datasets suggests that combat exposure increases the likelihood of smoking, and drug use across branches; moreover, there is some evidence that combat exposure increased subsequent binge drinking among soldiers.

Possible Mechanisms. In Table 6, we examine the relationship between *Combat Exposure* and stress-related outcomes through which combat exposure could affect risky behaviors. Table 6 both replicates the recent estimates of Cesur, Sabia, and Tekin (2013) and extends the analysis to a second dataset not used by these authors. Both the Add Health and the DOD HRB surveys provide detailed information on PTSD, anxiety disorders, and suicide ideation, though the measures are not identical across datasets.[20,21]

[19] Appendix Table 4 shows the success of our matching procedure by examining balance on observables.

[20] In the Add Health, we measure suicide ideation dichotomously following Cesur, Sabia, and Tekin (2013) using the individuals' report of whether he or she had "ever seriously thought about committing suicide during the past 12 months"; we measure Post-Traumatic Stress Disorder (PTSD) via respondent's self-report of whether "a doctor, nurse, or other health care provider ever told you have or had PTSD; and we measure stress using the Cohen Stress Scale. We used the Cohen Perceived Scale variable created by the Add Health based on the following four questions.

> *1. In the last 30 days, how often have you felt that you were unable to control the important things in your life?*
> *2. In the last 30 days, how often have you felt confident in your ability to handle your personal problems?*
> *3. In the last 30 days, how often have you felt that things were going your way?*
> *4. In the last 30 days, how often have you felt that difficulties were piling up so high that you could not overcome them?*

Possible responses to the above items and the per-item Cohen scale associated with each response were as follows: "never" (=0); "almost never" (=1); "sometimes" (=2); "fairly often" (=3); "very often" (=4). The scores from questions *(2)* and *(3)* are reversed and the overall Cohen Perceived Stress Scale was created by adding up the responses, ranges between 0 and 16 with higher values corresponding to higher stress levels. The means of each of these variables, by combat exposure, are available in Appendix Table 2.

Panel A of Table 6 presents the results using the Add Health data. For the full sample, we find that combat exposure is associated with a 14.1 percentage-point increase in the probability of receiving a PTSD diagnosis, a 5.3 percentage-point increase in the probability of suicide ideation, and a 0.643-point increase in the Cohen Stress Scale, consistent with the recent findings of Cesur, Sabia, and Tekin (2013). The estimated effects are larger for soldiers than for those serving in other branches, with the exception of the Cohen Stress Scale, where a large effect is detected for the Air Force. In Panel B using the DOD data, there is more robust evidence of adverse psychological consequences across branches, though the effect of combat exposure on suicide ideation is uniformly statistically indistinguishable from zero.

In Table 7A, we explore how stress and mental health may mediate the relationship between combat expose and risky behaviors using the Add Health data. We add controls for PTSD, suicidal ideation, and the Cohen Stress Scale to the vector **X** in equation (2) and explore how the estimate of β_1 changes. We find that the stress-related mediators reduce the magnitude of the estimated effect of combat exposure on smoking by 18.7 percent and the effect of combat exposure on any drug use by 34.3 percent, suggesting that combat-induced stress may be one important mechanism through which combat affects risky health behaviors.

Table 7B repeats the exercise using DOD HRB data. Odd-numbered columns present estimates without the mediating controls as matching variables, while the even-numbered columns add these controls. The results point to a similar pattern, though the magnitude of the

[21] In the DOD HRB survey, a dichotomous measure of suicide ideation was measured identically as in the Add Health. However, for PTSD, the measure is not a self-reported diagnosis, but rather generated via a PTSD Checklist-Civilian Version (PCL-C) test (Weathers, Litz, Husky, and Keane, 1994). Individuals were asked 17 questions that captured symptoms of PTSD in which a score was calculated that indicated whether they require further evaluation. Those who scored above 50 on this scale were coded as screening positive for PTSD. While the DOD HRB survey does not ask the Cohen Stress Scale, participants were screened for serious psychological distress using a 6-item scale, the K-6 scale (Kessler et al., 2002). Those who scored above 13 on this scale were coded as having potential serious stress. The means of each of these variables, by combat exposure, are available in Appendix Table 3.

estimated effect of combat exposure on risky health behaviors falls by approximately 50 percent, and in some cases nearly 67 percent, after controlling for PTSD, suicide ideation, and stress. One explanation for why the mediators may be more important in the DOD as compared to the Add Health data is that the PTSD and stress scales are more detailed in the former dataset (see footnotes 17 and 18).[22]

Alternate Measures of Combat Exposure. Finally, we explore the robustness of our estimates to three alternate measures of combat exposure: whether the respondent had killed (or believed had killed someone), whether the respondent was wounded or injured in combat, and whether the respondent had witnessed the death or injuries of coalition or allies. [23]

The results in Table 8A show findings using these alternate combat measures with the Add Health data. Odd-numbered columns show these findings while even-numbered columns add controls for stress-related mediators. The results show that killing someone or believing a respondent had killed someone is associated with a 12.4 percentage-point increase in the

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[22] Another might be that the mechanisms differ by age. We test this hypothesis by limiting the DOD sample to those ages 24 to 32 to match the Add Health sample (see Appendix Table 5). Results continue to show that the mediators continue to explain a larger share of the estimated effects in the DOD HRB sample as compared to Add Health sample.

[23] Specifically, dichotomous indicators were generated from the following questionnaire items in the Add Health:

> *"During your combat deployment, did you ever kill or think you killed someone?"*
> *"During your combat deployment, were you wounded or injured?"*
> *"During your combat deployment, did you see [a coalition or ally] wounded, killed, or dead?*

In the DOD HRB survey, an analogous set of dichotomous indicators were generated. If a respondent reported positive numbers of the experience listed below, the combat exposure measure was coded as 1; if he/she reported 0 experiences, the variable was coded as 0.

> *"Thinking about all of your deployments (combat and noncombat), how many times have you had each of the following experiences?*
>
> > *I was responsible for the death or serious injury of an enemy.*
> > *I was wounded in combat.*
> > *I witnessed members of my unit or an ally unit being seriously wounded or killed.*

The means of these alternate combat measures are shown in Appendix Tables 2 and 3.

probability of smoking. The addition of controls for psychological stress can explain approximately one-quarter of the estimated relationship between combat and these risky behaviors. Being injured or wounded in combat is associated with a 14.8 percentage-point higher likelihood of using any drugs in the past 30 days. Observing the death or wounding of an ally or coalition member is positively (but not statistically significantly) related to the probability of risky health behaviors.

In Table 8B, we repeat this exercise for the DOD HRB sample. For the full sample (Panel A), the results show that the alternative measures of combat exposure are positively related to the likelihood of drug use. However, the effects of killing someone or witnessing death or wounding of allies is most strongly positively related to cigarette consumption and binge drinking than bring wounded or injured. The findings appear most consistent for the Army (Panel B) and to a lesser extent for the Marines (Panel C) and Air Force (Panel E), and the stress-related mediators continue to explain approximately 40 to 50 percent of the estimated effects of combat exposure.

In Table 8C, we condition the sample on those for whom *Combat Exposure* was equal to 1 in the DOD HRB survey and estimate the effect of each violent combat experience on the probability of risky behavior. Thus, here we assume that among those exposed to firefight, killing the enemy, being wounded in combat, and observing the death of an ally are exogenous. The results suggest that exposure to violent combat events among those exposed to enemy firefight are exposed to substantially increased risk of smoking, binge drinking, and drug use.

VII. Conclusions

Using data drawn from two large datasets—the National Longitudinal Study of Adolescent Health and the 2008 Department of Defense Survey of Health and Related Behaviors Among Active Duty Personnel—this study exploits a natural experiment in deployment assignment to identify the effect of combat exposure on risky behaviors. Across each dataset, the results suggest that combat exposure is associated with increased risk for smoking, binge drinking, and drug use. The results are generally largest for those serving in the Army, Navy, and Marines. We also find that combat exposure is associated with an increased risk of PTSD and combat related stress and that these factors, along with suicidal ideation, can explain up to two-thirds of the estimated relationship between combat exposure and risky behaviors.

The findings presented in this study suggest that there may be substantial health behavioral costs to US servicemembers exposed to combat in the Global War on Terrorism and that future estimates of the costs of war should consider these costs. Moreover, because binge drinking and drug use often produce important externalities, such as domestic violence (Markowitz and Grossman, 1998, 2000; Angelucci 2008; Markowitz 2000; Klosterman and Fals-Stewart, 2006; Exum 2002; Stuart et al. 2008; El-Bassel et al. 2005; Kyriacou et al. 1999), traffic fatalities (Young and Bielinska-Kwapisz, 2006; Cook and Durrance 2013; Carpenter and Dobkin, 2009), and crime (Cook and Durrance, 2013; Carpenter 2005, 2007; Mocan and Tekin, 2005), these costs likely extend beyond the private costs to servicemembers to their families and communities.

References

Angelucci, Manuela (2008). "Love on the Rocks: Domestic Violence and Alcohol Abuse in Rural Mexico." The B. E. Journal of Economic Analysis & Policy 8(1): Article 43.

Angrist, Joshua D. 1990. "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," *The American Economic Review* 80(3): 313-336

Angrist, Joshua D., Stacey H. Chen, and Brigham R. Frandsen. "Did Vietnam Veterans get Sicker in the 1990s? The Complicated Effects of Military Service on Self-Reported Health." Forthcoming in the *Journal of Public Economics*.

Bedard, Kelley and Olivier Deschenes. 2004. "The Long-Term Impact of Military Service on Health: Evidence from World War II and the Korean War," *American Economic Review* 96(1): 176-194.

Bray, Robert, Michael Pemberton, Laurel L. Hourani, Michael Witt, Kristine L. Rae Olmsted, Janice M. Brown, BeLinda Weimer, Marian E. Lane, Mary Ellen Marsden, Scott Scheffler, Russ Vandermaas-Peeler, Kimberly R. Aspinwall, Erin Anderson, Kathryn Spagnola, Kelly Close, Jennifer L. Gratton, Sara Calvin, Michael Bradshaw. 2009. "2008 Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel: A Component of the Defense Lifestyle Assessment Program," *RTI International*.

Carpenter, C. 2005. Heavy Alcohol Use and the Commission of Nuisance Crime: Evidence from Underage Drunk Driving Laws. *American Economic Review Papers and Proceedings*, 95(2): 267-272.

Carpenter, C. 2007. Heavy Alcohol Use and Crime: Evidence from Underage Drunk Driving Laws. *Journal of Law and Economics*, 50(3): 539-557.

Carpenter, Christopher, and Carlos Dobkin. 2009. "The Effect of Alcohol Consumption on Mortality: Regression Discontinuity Evidence from the Minimum Drinking Age." *American Economic Journal: Applied Economics*, 1(1): 164-82.

Cesur, Resul, Joseph J. Sabia, and Erdal Tekin. 2013. "The Psychological Costs of War: Military Combat and Mental Health," *Journal of Health Economics* 32(1): 51-65.
Cook, P. J., and C. P. Durrance. 2013. The Virtuous Tax: Lifesaving and Crime-Prevention Effects of the 1991 Federal Alcohol-Tax Increase. *Journal of Health Economics*, Volume 32(1): 261-267.

Department of the Air Force. 2012. Air Force Instruction 10-403. Available at: http://www.e-publishing.af.mil/shared/media/epubs/afi10-403.pdf

Dobkin, Carlos and Raza Shabani. 2009. "The Health Effects of Military Service," *Economic Inquiry* 47(1): 69-80.

Eisenberg, D, and Rowe, B. 2009. "The Effects of Smoking in Young Adulthood on Smoking and Health Later in Life: Evidence based on the Vietnam Era Draft Lottery," *Forum for Health Economics and Policy* 12(2): Article 4

El-Bassel, Nabila, Louisa Gilbert, Elwin Wu, Hyun Go, and Jennifer Hill. (2005) Relationship Between Drug Abuse and Intimate Partner Violence: A Longitudinal Study Among Women Receiving Methadone. *American Journal of Public Health*: March, Vol. 95, No. 3, pp. 465-470.

Engel, Rozlyn C., Luke B. Gallagher, and David S. Lyle. 2010. "Military Deployments and Children's Academic Achievement: Evidence from Department of Defense Education Activity Schools," *Economics of Education Review* 29(1): 73-82.

Exum, M. Lyn. (2002). "The Application and Robustness of the Rational Choice Perspective in the Study of Intoxicated and Angry Intentions to Aggress," Criminology, 40.4, 933–966.

P.B. Gold, B.E. Engdahl, R.E. Eberly, R.J. Blake, W.F. Page, B.C. Frueh. 2000. "Trauma exposure, resilience, social support, and PTSD construct validity among former prisoners of war," *Soc Psychiatry Psychiatr Epidemiol* 35: 36-42.

Grossman, Dave and Bruce Siddle. 1999. "Psychological Effects of Combat," in *Encyclopedia of Violence, Peace and Conflict* , Vol. 3, ed. Lester Kurtz and Jennifer Turpin, 139-49. San Diego, CA: Academic Press.

Harrison, Lana and Joseph Gfroerer. 1992. "The Intersection of Drug Use and Criminal Behavior: Results from the National Household Survey on Drug Abuse," *Crime and Delinquency* 38(4): 422-443.

Hearst, N., T.B. Newman, and S.B. Hulley. 1986. "Delayed Effects of the Military Draft on Mortality: A Randomized Natural Experiment," *New England Journal of Medicine* 314: 620-24.

Hoerster, Katherine, Karen Lahavot, Tracy Simpson, Miles McFall, Gayle Reiber, Karin Nelson. 2012. "Health and Health Behavior Differences: US Military, Veteran, and Civilian Men," *American Journal of Preventative Medicine* 43(5): 283-489.

Hoge, C., J.L. Auchterlonie et al. 2006. "Mental Health Problems, Use of Mental Health Services, and Attrition from Military Service After Returning from Deployment to Iraq or Afghanistan," *Journal of the American Medical Association* 295(9): 1023-1032.

Hoge, C., C.A. Castro et al. 2004. "Combat Duty in Iraq and Afghanistan: Mental Health Problems and Barriers to Care," *New England Journal of Medicine* 317(26): 1630-1634.

Hooper R. et al. 2008. "Cigarette and Alcohol Use in the UK Armed Forces and their Association with Combat Exposure: A Prospective Study," *Addictive Behaviors* 33(8): 1067-71.

Institutes of Medicine. 2009. Combatting Tobacco Use in Military and Veteran Populations. National Academy of Sciences. Available at: http://www.nap.edu/catalog/12632.html.

Jacobson, Isabel G., Margaret A.K. Ryan, Tomoko I. Hooper, Tyler C. Smith, Paul 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.

Joiner, TE. 2005. "Why people die by suicide." *Harvard University Press*

Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., Normand, S.L., Walters, E.E., & Zaslavsky, A.M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32*, 959-976.

Khan, Shaila, Robert Murray, and Gordon Barnes. 2002. "A structural equation model of the effect of poverty and unemployment on alcohol abuse." *Addictive Behaviors* 27(3): 405-423.

Killgore WDS, Cotting DI, Thomas JL, Cox AL, McGurk D, Vo AH, et al. 2008 "Post-combat invincibility: violent combat experiences are associated with increased risk taking propensity following deployment." *Journal of Psychiatric Research* (42):1112-1121.

Klosterman, Keith C., and William Fals-Stewart. (2006). "Intimate Partner Violence and Alcohol Use: Exploring the Role of Drinking in Partner Violence and its Implications for Intervention," Aggression and Violent Behavior, 11.6 , 587–597.

Kyriacou DN, Anglin D, Taliaferro E, Stone S, Tubb T, Linden JA, Muelleman R, Barton E, Kraus JF. (1999). Risk factors for injury to women from domestic violence. New England Journal of Medicine ;341:1892– 8.

Lyle, David S. 2006. "Using Military Deployments and Job Assignments to Estimate the Effect of Parental Absences and Household Relocations on Children's Academic Achievement," *Journal of Labor Economics* 24(2): 319-350.

MacManus, D., K. Dean, M. Al Bakir, A. C. Iversen, L. Hull, T. Fahy, S. Wessely, and N. T. Fear. 2012. "Violent behaviour in UK military personnel returning home after deployment," *Psychological Medicine* 42: 1663–1673.

Markowitz, S., Grossman, M. (1998) Alcohol regulation and domestic violence towards children." *Contemporary Economic Policy*; 16, 309–320.".

Markowitz, S, and M. Grossman, "The Effects of Beer Taxes on Physical Child Abuse," Journal of Health Economics 19, no. 2 (2000): 271-282.

"Management of deployments of members and measurement and data collection of unit operating and personnel tempo," Title 10 *U.S. Code*, Chapter 50, Section 991. 2006 ed.

McFall, M. E., P. W. Mackay, and D. M. Donovan. 1992. ''Combat-Related Posttraumatic Stress Disorder and Severity of Substance Abuse in Vietnam Veterans,'' *Journal of Studies on Alcohol* 53: 357–63.

McKinney, W. P., D. D. Mclntire, T. J. Carmody, and A. Joseph. 1997. "Comparing the Smoking Behavior of Veterans and Non-Veterans," *Public Health Report* 112: 212–17.

Mocan, Naci H, Erdal Tekin. 2005. "Drugs and Juvenile Crime: Evidence from a Panel of Siblings and Twins," in Substance Use: Individual Behavior, Social Interactions, Markets, and Politics, Bjorn Lindgren and Michael Grossman (eds.), Amsterdam: Elsevier, 2005; pp. 91-120

Morrell, D. 2009. "Military Encounters Resistance to Ban on Smoking." Available at: http://www.boston.com/news/world/middleeast/articles/2009/08/30/study_proposing_smoking_ban_in_military_draws_protests/?camp=pm

National Council on Alcoholism and Drug Dependence. 2012. "Veterans and Alcohol," Available at: http://www.ncadd.org/index.php/learn-about-alcohol/seniors-vets-and-women/198-veterans-and-alcohol

Page WF, Engdahl BE, Eberly RE. 1991. "Prevalence and correlates of depressive symptoms among former prisoners of war," *J Nerv Ment Dis* 179:670-677.

Price, R. K., N. K. Risk, A. H. Haden, C. E. Lewis, and E. L. Spitznagel. 2004. "Post-Traumatic Stress Disorder, Drug Dependence, and Suicidality among Male Vietnam Veterans with a History of Heavy Drug Use," *Drug and Alcohol Dependence* 76S: 31–43.

Rohlfs, Christopher. 2010. "Does Combat Exposure Make You a More Violent or Criminal Person? Evidence from the Vietnam Draft." *Journal of Human Resources* 45(2): 271-300.

Smith, Tyler C, Isabel G. Jacobson, Tomoko I. Hooper, Cynthia A. LeardMan, Edward J. Boyko, Besa Smith, Gary D. Gackstetter, Timothy S. Well,s. Paul J. Amoroso, Gregory C. Gray, James R. Riddle, Margaret A.K. Ryan, and the Milennium Cohort Study Team. 2011. "Health Impact of US Military Service in a Large population-Based Military Cohort: Findings of the Millennium Cohort Study, 2001-2008," *BMC Public Health* 11: 69-78.

Stuart, Gregory L.; Temple, Jeff R.; Follansbee, Katherine W.; Bucossi, Meggan M.; Hellmuth, Julianne C.; Moore, Todd M. (2008). "The role of drug use in a conceptual model of intimate partner violence in men and women arrested for domestic violence." *Psychology of Addictive Behaviors*, Vol 22(1), Mar, 12-24.

Tanielian T. and L.H. Jaycox. 2008. "Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery," Rand Corporation.

Thomsen CJ, Stander VA, McWhorter SK, Rabenhorst MM, Milner JS. 2011. "Effects of combat deployment on risky and self-destructive behavior among active duty military personnel." *Journal of Psychiatric Research (*45) 1321-1331.

Vaughan, D. 2006. “Risky business.” *Today’s Officer* 21-24.

Weathers, F.W., Litz, B.T., Huska, J.A., & Keane, T.M. (1994). *The PTSD checklist-civilian version* (PCL-C). Boston, MA: National Center for PTSD.

Wells, Timothy S., Cynthia A. Leard Mann, Sarah O. Fortuna, Besa Smith, Tyler C. Smith, Margaret Ryan, Edward Boyko, and Dan Blazer. 2010. “A Prospective Study of Depression Following Combat Deployment in Support of the Wars in Iraq and Afghanistan,” *American Journal of Public Health* 100(1): 90-99.

Williams, Timothy. 2012. “Suicides Outpacing Deaths for Troops,” *New York Times.*

Young, D. J. and A. Bielinska-Kwapisz. 2006. Alcohol Prices, Consumption and Traffic Fatalities. *Southern Economic Journal*, 72: 690–70.

Table 1. Means of Risky Behaviors and Branch of Service, by Combat Exposure

Variable	Add Health Survey			DOD HRB Survey		
	All	Combat Exposure = 1	Combat Exposure = 0	All	Combat Exposure = 1	Combat Exposure = 0
Smoking	0.391	0.478	0.348	0.263	0.282	0.246
	(0.488)	(0.501)	(0.477)	(0.440)	(0.450)	(0.431)
Binge Drinking	0.202	0.243	0.182	0.445	0.476	0.415
	(0.402)	(0.430)	(0.387)	(0.497)	(0.500)	(0.493)
Any Drug Use	0.142	0.184	0.121	0.043	0.059	0.029
	(0.349)	(0.388)	(0.327)	(0.204)	(0.235)	(0.168)
Marijuana Use	0.118	0.142	0.106	0.013	0.020	0.007
	(0.323)	(0.350)	(0.308)	(0.113)	(0.138)	(0.082)
Other Drug Use	0.044	0.070	0.032	0.039	0.054	0.025
	(0.206)	(0.256)	(0.175)	(0.194)	(0.226)	(0.156)
Army	0.418	0.541	0.358	0.223	0.356	0.097
	(0.494)	(0.500)	(0.480)	(0.416)	(0.479)	(0.297)
Marines	0.181	0.254	0.145	0.206	0.284	0.134
	(0.385)	(0.437)	(0.352)	(0.405)	(0.451)	(0.340)
Navy	0.251	0.119	0.316	0.292	0.122	0.452
	(0.434)	(0.325)	(0.465)	(0.455)	(0.327)	(0.498)
Air Force	0.165	0.114	0.190	0.279	0.239	0.317
	(0.371)	(0.318)	(0.392)	(0.448)	(0.426)	(0.465)
Observations	565	185	380	14740	7166	7574

Notes: The means from the first three columns are generated using drawn from Wave IV of the National Longitudinal Study of Adolescent Health; the means from the final three columns are generated using data drawn from the 2008 Department of Defense Health and Related Behaviors Survey. Note that some servicemembers in the Add Health report multiple branches of service so the proportions may sum to greater than 1.

Table 2. Evidence on Exogeneity of Deployment Assignment in Add Health Data

VARIABLES	(1) *Combat Exposure* = 1 vs. *Combat Exposure* = 0	(2) *Combat Exposure* = 1 vs. Combat Zone without Exposure	(3) *Combat Exposure* = 1 vs. Non-Combat Zone
Pre-Deployment Smoking	0.008	0.064	-0.050
	(0.062)	(0.073)	(0.076)
Pre-Deployment Binge Drinking	0.040	0.057	-0.005
	(0.051)	(0.066)	(0.067)
Pre-Deployment Drug Use	0.031	0.056	0.020
	(0.049)	(0.065)	(0.070)
F-test on joint significance of Prior Behaviors	*0.629*	*1.437*	*0.154*
P-value	*0.597*	*0.236*	*0.927*
Log Height	0.235	0.075	0.632
	(0.645)	(0.793)	(0.863)
Log Weight	-0.181	-0.057	-0.294
	(0.137)	(0.179)	(0.191)
Religion: Protestant	0.054	0.078	0.053
	(0.053)	(0.071)	(0.069)
Religion: Catholic	0.025	0.044	-0.009
	(0.061)	(0.074)	(0.082)
Religion: Other Christian	-0.022	0.007	-0.047
	(0.066)	(0.084)	(0.085)
Religion: Other	-0.096	-0.009	-0.192
	(0.094)	(0.141)	(0.136)
F-test on joint significance of Religion	1.409	0.572	1.235
P-value	0.235	0.684	0.300
Male	0.244***	0.292***	0.365***
	(0.067)	(0.096)	(0.107)
Age in Years	-0.276	-0.479	0.066
	(0.373)	(0.460)	(0.517)
Age in Years Squared	0.005	0.008	-0.001
	(0.007)	(0.008)	(0.009)
Race: Black	-0.054	-0.053	-0.037
	(0.054)	(0.066)	(0.076)
Race: Other	-0.078	-0.082	0.008
	(0.072)	(0.086)	(0.124)
Race: Hispanic	-0.128**	-0.135*	-0.070
	(0.059)	(0.080)	(0.085)
F-test on joint significance of Race	*1.646*	*1.053*	*0.284*
P-value	*0.182*	*0.372*	*0.837*
Education: Some College or Vocational Training	-0.012	-0.044	0.037
	(0.048)	(0.062)	(0.072)
Education: College Degree	-0.023	-0.079	0.015
	(0.073)	(0.088)	(0.109)
F-test on joint significance of Education	*0.0537*	*0.444*	*0.165*
P-value	*0.948*	*0.643*	*0.848*

No Health Insurance	0.002	0.056	-0.004
	(0.060)	(0.084)	(0.088)
Wave 1 Picture Vocabulary Test Score	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
Log Parental Income	0.038	0.042	0.082
	(0.032)	(0.050)	(0.051)
Parent is Married	-0.030	0.064	-0.198
	(0.109)	(0.141)	(0.127)
Parent is Divorced, Separated or Widowed	0.058	0.170	-0.086
	(0.113)	(0.142)	(0.129)
F-test on joint significance of Parental Marital Status	*1.463*	*1.892*	*1.858*
P-value	*0.236*	*0.156*	*0.161*
Mother's Education: Some College	-0.005	-0.003	0.014
	(0.052)	(0.068)	(0.062)
Mother's Education: College Degree or More	0.047	0.093	-0.003
	(0.053)	(0.058)	(0.068)
F-test on joint significance of Mother's Education	0.489	1.595	0.0328
P-value	0.614	0.208	0.968
Observations	565	416	334
R-squared	0.251	0.311	0.359
F-test all	3.521	3.232	3.431
F-test all P-value	0.000	0.000	0.000

Robust standard errors corrected for clustering on the school are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Notes: All models include controls for military-specific variables, including rank, branch of service, timing of service, and occupation. Regressions are estimated using data drawn from Waves I and IV of the National Longitudinal Study of Adolescent Health.

Table 3. Estimates of the Relationship between Combat Exposure and Risky Behaviors in Add Health

VARIABLES	(1) Smoking	(2) Binge Drinking	(3) Any Drug	(4) Marijuana	(5) Other Drug
			Panel A: Full Sample		
Combat Exposure	0.102**	0.040	0.065*	0.034	0.039**
(Military Controls)	(0.042)	(0.045)	(0.037)	(0.036)	(0.019)
	[563]	[554]	[565]	[560]	[565]
Combat Exposure	0.110**	0.024	0.068*	0.040	0.035
(All Controls)	(0.043)	(0.043)	(0.039)	(0.038)	(0.021)
	[563]	[554]	[565]	[560]	[565]
Combat Exposure	0.088*	0.031	0.059	0.031	0.029
(Control: Combat Zone deployed	(0.051)	(0.053)	(0.036)	(0.035)	(0.026)
without Combat Exposure)	[414]	[406]	[416]	[412]	[416]
Combat Exposure	0.148***	0.028	0.068	0.037	0.041**
(Control: Non-Combat Zone deployed)	(0.056)	(0.053)	(0.049)	(0.050)	(0.020)
	[333]	[329]	[334]	[331]	[334]
			Panel B: Army		
Combat Exposure	0.116	0.033	0.010	-0.024	0.059*
	(0.071)	(0.072)	(0.057)	(0.053)	(0.031)
	[235]	[231]	[236]	[233]	[236]
			Panel C: Marines		
Combat Exposure	0.094	-0.026	-0.017	-0.028	0.157
	(0.128)	(0.099)	(0.093)	(0.093)	(0.096)
	[102]	[101]	[102]	[101]	[102]
			Panel D: Navy		
Combat Exposure	0.275**	-0.085	0.169*	0.134*	-0.005
	(0.129)	(0.104)	(0.091)	(0.077)	(0.053)
	[141]	[140]	[142]	[141]	[142]
			Panel E: Air Force		
Combat Exposure	-0.321	0.377*	0.030	0.086	-0.114
	(0.266)	(0.220)	(0.128)	(0.111)	(0.079)
	[93]	[90]	[93]	[93]	[93]

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Notes: All models use the full set of controls shown in Appendix Table 2 along with pre-deployment risky behaviors. In all models, military rank, timing of military service, branch of service, occupation indicators, and an indicator for having a check-up in the past year are controlled for. Models also include missing dummy categories for each of the control variables.

Table 4A. Evidence on Matching on Observables in DOD HRB Survey

	ALL			Army			Marines			Navy			Air Force		
	Combat	Non Combat	P-value	Combat	Non Combat	P-value	Combat	Non Combat	P-value	Combat	Non Combat	P-value	Combat	Non Combat	P-value
Rank E4-E6	0.54	0.54	0.84	0.52	0.51	0.84	0.49	0.54	0.30	0.58	0.60	0.57	0.52	0.57	0.11
Rank E7-E9	0.16	0.16	0.93	0.16	0.17	0.65	0.10	0.10	0.84	0.16	0.15	0.72	0.18	0.16	0.22
Rank W1-W5	0.03	0.04	0.00	0.07	0.05	0.46	0.06	0.06	0.67	0.01	0.01	0.65	0.00	0.00	.
Rank O1-O3	0.11	0.11	0.35	0.13	0.15	0.36	0.15	0.13	0.43	0.09	0.08	0.79	0.12	0.09	0.10
Rank O4-O10	0.10	0.09	0.24	0.06	0.09	0.32	0.10	0.09	0.60	0.09	0.10	0.73	0.12	0.12	0.51
Number of Deployments in lifetime	1.62	1.61	0.39	1.25	1.18	0.79	1.27	1.30	0.37	1.82	1.86	0.70	1.61	1.60	0.82
High School Education	0.20	0.21	0.22	0.16	0.16	0.85	0.37	0.42	0.40	0.23	0.26	0.43	0.12	0.14	0.48
Some College	0.49	0.50	0.82	0.48	0.45	0.72	0.36	0.33	0.83	0.50	0.46	0.26	0.54	0.59	0.23
College Degree or above	0.29	0.27	0.11	0.35	0.35	0.83	0.27	0.25	0.54	0.25	0.25	0.76	0.33	0.27	0.08
Male	0.77	0.78	0.36	0.73	0.71	0.76	0.83	0.84	0.94	0.82	0.86	0.24	0.80	0.81	0.76
Age	31.65	31.37	0.16	31.65	31.13	0.54	28.68	28.69	0.79	32.05	32.09	0.90	32.24	32.06	0.59
Age Squared	1062	1046	0.21	1059	1027	0.52	877	878	0.80	1084	1087	0.90	1093	1085	0.67
Race (Black)	0.18	0.17	0.96	0.25	0.26	0.88	0.08	0.09	0.54	0.17	0.16	0.75	0.13	0.12	0.67
Race (Other)	0.71	0.74	0.05	0.56	0.65	0.03	0.91	0.91	0.95	0.75	0.83	0.01	0.68	0.68	0.88
Married	0.54	0.54	0.84	0.52	0.51	0.84	0.49	0.54	0.30	0.58	0.60	0.57	0.52	0.57	0.11
Divorced	0.16	0.16	0.93	0.16	0.17	0.65	0.10	0.10	0.84	0.16	0.15	0.72	0.18	0.16	0.22
Currently in Contiguous US (CONUS)	0.71	0.74	0.05	0.56	0.65	0.03	0.91	0.91	0.95	0.75	0.83	0.01	0.68	0.68	0.88

Notes: Nearest neighbor matching is employed using data drawn from the 2008 Department of Defense Health and Related Behaviors Survey

Table 4B. Evidence on Matching on Major Command in DOD HRB Survey

	All			Branches		
	Combat	**Non-Combat**	**P-value**	**Combat**	**Non-Combat**	**P-value**
					Army	
US Army Training and Doctrine Command*	0.02	0.03	0.00	0.11	0.12	0.300
US Army Europe*	0.03	0.03	0.02	0.17	0.13	0.24
US Army Pacific*	0.03	0.03	0.09	0.15	0.13	0.58
8th Army*	0.03	0.03	0.32	0.11	0.09	0.22
					Navy	
US Fleet Forces Command*	0.1	0.07	0	0.24	0.19	0.13
Commander Pacific Forces*	0.04	0.04	0.08	0.14	0.14	0.91
Naval Medical Command*	0.03	0.02	0.01	0.14	0.15	0.65
Commander Naval Installations Command*	0.04	0.03	0.09			
					Marines	
Marine Corps Installations East*	0.12	0.15	0	0.33	0.31	0.85
Marine Corps Installations West*	0.07	0.08	0			
					Air Force	
Air Combat Command*	0.08	0.07	0.02			
Air Education and Training Command*	0.04	0.03	0.04	0.09	0.1	0.37
Air Force Materiel Command*	0.04	0.03	0.74	0.1	0.11	0.47
Air Force Space Command*	0.04	0.03	0.3	0.08	0.1	0.12
Air Mobility Command*	0.07	0.06	0.07	0.21	0.19	0.29
Pacific Air Forces*	0.06	0.04	0.03	0.15	0.16	0.49
US Air Forces Europe*	0.04	0.04	0.54	0.11	0.1	0.41

Notes: Nearest neighbor matching is employed using data drawn from the 2008 Department of Defense Health and Related Behaviors Survey
*- The following represent various major commands for the Army, Navy, Marines, and Air Force respectively.

Table 5A. Propensity Score Matching Estimates of Relationship between Combat Exposure and Risky Behaviors, DOD HRB Survey

Sample	(1) Smoking	(2) Binge Drinking	(3) Any Drug	(4) Marijuana	(5) Other Drug
All	0.036***	0.041***	0.028***	0.013***	0.029***
	(0.014)	(0.014)	(0.007)	(0.003)	(0.007)
	[4,876]	[4,876]	[4,876]	[4,876]	[4,876]
Army	0.103**	0.095*	0.008	-0.008	0.017
	(0.044)	(0.049)	(0.034)	(0.018)	(0.032)
	[467]	[467]	[467]	[467]	[467]
Marines	0.018	0.029	0.033	0.011	0.029
	(0.041)	(0.048)	(0.020)	(0.014)	(0.028)
	[552]	[552]	[552]	[552]	[552]
Navy	-0.011	0.046	0.034**	0.025**	0.039***
	(0.040)	(0.039)	(0.016)	(0.001)	(0.015)
	[859]	[859]	[859]	[859]	[859]
Air Force	0.058**	0.026	0.014	0.001	0.016
	(0.029)	(0.035)	(0.013)	(0.012)	(0.012)
	[1,204]	[1,204]	[1,204]	[1,204]	[1, 204]

Bootstrapped standard errors are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in App. Table 3.

Table 5B: Using Add Health Data to Test Degree of Bias in DOD HRB Survey Estimates

	(1) Smoking	(2) Binge Drinking	(3) Any Drug	(4) Marijuana	(5) Other Drug
Ideal Experiment	0.110**	0.024	0.068*	0.040	0.035
(Row 2, Table 3)	(0.043)	(0.043)	(0.039)	(0.038)	(0.021)
	[563]	[554]	[565]	[560]	[565]
OLS Estimates Using only DOD HRB	0.135***	0.032	0.073*	0.046	0.037*
Survey Controls (Zs)	(0.040)	(0.043)	(0.039)	(0.038)	(0.019)
	[563]	[554]	[565]	[560]	[565]
Matching Estimates Using only DOD HRB Survey Controls (Zs)	0.139**	0.066	0.058	0.036	0.029
	(0.065)	(0.045)	(0.047)	(0.044)	(0.025)
	[266]	[266]	[266]	[266]	[266]

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Tables 1.

Table 6. Estimates of Relationship between Combat Exposure and Combat Stress

	(1) All	(2) Army	(3) Marines	(4) Navy	(5) Air Force
Outcome	***Panel A: Add Health (OLS Full Panel Controls)***				
PTSD	0.141***	0.166**	0.130	0.022	0.121
	(0.030)	(0.067)	(0.135)	(0.061)	(0.105)
	[564]	[235]	[102]	[142]	[93]
Suicide Ideation	0.053*	0.110**	-0.025	0.035	-0.038
	(0.028)	(0.045)	(0.079)	(0.123)	(0.088)
	[565]	[236]	[102]	[142]	[93]
Psychological Stress	0.643**	0.619	-0.369	-0.407	2.226**
	(0.263)	(0.478)	(0.954)	(0.730)	(1.111)
	[564]	[235]	[102]	[142]	[93]
Outcome	***Panel B: DOD HRB (PSM)***				
PTSD	0.066***	0.103***	0.105**	0.074***	0.041**
	(0.009)	(0.037)	(0.029)	(0.026)	(0.016)
	[4,876]	[467]	[552]	[859]	[1,204]
Suicide Ideation	0.09	0.025	0.018	0.007	0.003
	(0.006)	(0.024)	(0.019)	(0.018)	(0.011)
	[4,876]	[467]	[552]	[859]	[1,204]
Psychological Stress	0.059***	0.78*	0.036	0.056**	0.049**
	(0.011)	(0.045)	(0.035)	(0.027)	(0.020)
	[4,876]	[467]	[552]	[859]	[1,204]

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Tables 2 and 3.

Table 7A. Exploration of Whether Psychological Stress Mediates the Relationship Between Combat Exposure and Risky Behaviors in Add Health

VARIABLES	(1) Smoking	(2) Smoking	(3) Binging	(4) Binging	(5) Any Drugs	(6) Any Drugs	(7) Marijuana	(8) Marijuana	(9) Other Drug	(10) Other Drug
Combat	0.107**	0.087*	0.026	0.025	0.067*	0.044	0.038	0.022	0.036*	0.024
	(0.042)	(0.044)	(0.044)	(0.043)	(0.039)	(0.038)	(0.038)	(0.037)	(0.021)	(0.021)
PTSD		0.102		0.007		0.110*		0.080		0.050
		(0.065)		(0.078)		(0.062)		(0.057)		(0.048)
Suicide Ideation		0.087		0.064		0.056		0.062		0.006
		(0.077)		(0.093)		(0.068)		(0.065)		(0.048)
Stress		0.003		-0.004		0.008		0.004		0.008**
		(0.008)		(0.007)		(0.005)		(0.005)		(0.003)
Observations	561	561	553	553	563	563	559	559	563	563
R-squared	0.235	0.242	0.206	0.207	0.198	0.218	0.206	0.218	0.143	0.163

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Tables 2 and 3.

Table 7B. Exploration of Whether Psychological Stress Mediates the Relationship Between Combat Exposure and Risky Behaviors Using PSM in DOD HRB Survey

	(1) Smoking	(2) Smoking	(3) Binge	(4) Binge	(5) Any Drug	(6) Any Drug	(7) Marijuana	(8) Marijuana	(9) Other Drug	(10) Other Drug
					Panel A: All					
Combat	0.036***	0.020	0.041***	0.019	0.028***	0.014**	0.013***	0.008*	0.029***	0.014**
	(0.014)	(0.014)	(0.014)	(0.017)	(0.007)	(0.007)	(0.003)	(0.004)	(0.007)	(0.007)
	[4,876]	[4,779]	[4,876]	[4,779]	[4,876]	[4,779]	[4,876]	[4,779]	[4,876]	[4,779]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel B: Army					
Combat	0.103**	0.070	0.095*	0.083	0.008	0.004	-0.008	0.013	0.017	0.000
	(0.044)	(0.050)	(0.049)	(0.059)	(0.034)	(0.027)	(0.018)	(0.018)	(0.032)	(0.026)
	[467]	[460]	[467]	[460]	[467]	[460]	[467]	[460]	[467]	[460]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel C: Marines					
Combat	0.018	0.085	0.029	0.008	0.033	0.008	0.011	0.008	0.029	0.000
	(0.041)	(0.058)	(0.048)	(0.051)	(0.020)	(0.017)	(0.014)	(0.017)	(0.028)	(0.018)
	[552]	[517]	[552]	[517]	[552]	[517]	[552]	[517]	[552]	[517]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel D: Navy					
Combat	-0.011	0.000	0.046	-0.024	0.034**	0.019	0.025**	(0.019)*	0.039***	0.022
	(0.040)	(0.038)	(0.039)	(0.041)	(0.016)	(0.019)	(0.001)	(0.011)	(0.015)	(0.018)
	[859]	[833]	[859]	833]	[859]	833]	[859]	833]	[859]	833]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel E: Air Force					
Combat	0.058**	0.016	0.026	0.000	0.014	0.001	0.001	-0.003	0.016	-0.003
	(0.029)	(0.035)	(0.035)	(0.035)	(0.013)	(0.009)	(0.012)	(0.006)	(0.012)	(0.008)
	[1,204]	[1,216]	[1,204]	[1,216]	[1,204]	[1,216]	[1,204]	[1,216]	[1, 204]	[1,216]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Bootstrapped standard errors are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 3.

Table 8A. Estimated Effect of Violent Combat Events Among Those Assigned to Combat with Firefight, Add Health Data

VARIABLES	(1) Smoking	(2) Smoking	(3) Binging	(4) Binging	(5) Any Drug	(6) Any Drug	(7) Marijuana	(8) Marijuana	(9) Other Drug	(10) Other Drug
	Panel A: Killed Someone									
Killed	0.124***	0.102**	0.061	0.061	0.005	-0.027	0.011	-0.010	0.011	-0.006
	(0.046)	(0.049)	(0.049)	(0.051)	(0.037)	(0.037)	(0.035)	(0.035)	(0.023)	(0.022)
PTSD		0.091		0.004		0.130*		0.093		0.054
		(0.064)		(0.078)		(0.064)		(0.058)		(0.047)
Suicide Ideation		0.088		0.060		0.065		0.067		0.009
		(0.078)		(0.093)		(0.066)		(0.063)		(0.048)
Stress		0.004		-0.004		0.009		0.004		0.009**
		(0.008)		(0.007)		(0.005)		(0.005)		(0.003)
Observations	554	554	546	546	556	556	552	552	556	556
	Panel B: Wounded or Injured									
Wounded	0.040	-0.012	-0.066	-0.082	0.148**	0.108	0.096	0.065	0.062	0.043
	(0.080)	(0.083)	(0.066)	(0.068)	(0.073)	(0.070)	(0.058)	(0.058)	(0.044)	(0.041)
PTSD		0.128**		0.032		0.097*		0.071		0.046
		(0.063)		(0.081)		(0.058)		(0.054)		(0.045)
Suicide Ideation		0.090		0.069		0.053		0.059		0.005
		(0.078)		(0.092)		(0.068)		(0.065)		(0.048)
Stress		0.003		-0.004		0.009*		0.004		0.008**
		(0.008)		(0.007)		(0.005)		(0.005)		(0.003)
	561	561	553	553	563	563	559	559	563	563
	Panel C: Witnessed Death of Ally									
Witnessed Death of Ally	0.036	0.011	0.027	0.023	0.047	0.024	0.036	0.019	0.008	-0.004
	(0.043)	(0.048)	(0.042)	(0.043)	(0.038)	(0.040)	(0.035)	(0.036)	(0.019)	(0.022)
PTSD		0.121*		0.007		0.115*		0.080		0.056
		(0.068)		(0.081)		(0.065)		(0.058)		(0.050)
Suicide Ideation		0.083		0.061		0.055		0.060		0.007
		(0.079)		(0.093)		(0.069)		(0.065)		(0.049)
Stress		0.004		-0.003		0.009*		0.004		0.009**
		(0.008)		(0.007)		(0.005)		(0.005)		(0.003)
	559	559	551	551	561	561	557	557	561	561
	0.229	0.238	0.206	0.207	0.195	0.216	0.205	0.218	0.139	0.162

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 2.

Table 8B. PSM Estimates of Effect of Violent Combat Events Among Those Assigned to Combat with Firefight, DOD HRB Data

	(1) Smoking	(2) Smoking	(3) Binge	(4) Binge	(5) Any Drug	(6) Any Drug	(7) Marijuana	(8) Marijuana	(9) Other Drug	(10) Other Drug
					Panel A: All					
Killed Someone	0.048**	0.025	0.091***	0.049**	0.057***	0.038***	0.037***	0.027***	0.057***	0.038***
	(0.025)	(0.023)	(0.027)	(0.024)	(0.011)	(0.010)	(0.007)	(0.006)	(0.010)	(0.009)
	[2,370]	[2,160]	[2,370]	[2,160]	[2,370]	[2,160]	[2,370]	[2,160]	[2,370]	[2,160]
Wounded or Injured	0.038	0.027	-0.003	-0.031	0.111***	0.058***	0.086***	0.046***	0.108***	0.061***
	(0.034)	(0.040)	(0.045)	(0.043)	(0.024)	(0.020)	(0.016)	(0.014)	(0.024)	(0.019)
	[792]	[652]	[792]	[652]	[792]	[652]	[792]	[652]	[792]	[652]
Witnessed Death of Ally	0.039**	0.034*	0.070***	0.058***	0.045***	0.026***	0.027***	0.021***	0.042***	0.025***
	(0.017)	(0.018)	(0.017)	(0.016)	(0.008)	(0.009)	(0.005)	(0.005)	(0.007)	(0.009)
	[3,534]	[3,401]	[3,534]	[3,401]	[3,534]	[3,401]	[3,534]	[3,401]	[3,534]	[3,401]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel B: Army					
Killed Someone	0.033	-0.010	0.092*	0.052	0.045*	0.010	0.014	-0.006	0.038*	0.020
	(0.042)	(0.046)	(0.049)	(0.054)	(0.024)	(0.029)	(0.015)	(0.013)	(0.022)	(0.029)
	[665]	[574]	[665]	[574]	[665]	[574]	[665]	[574]	[665]	[574]
Wounded or Injured	0.027	0.032	-0.032	-0.039	0.114***	0.051*	0.054**	0.006	0.108***	0.051*
	(0.068)	(0.075)	(0.063)	(0.068)	(0.038)	(0.029)	(0.025)	(0.019)	(0.037)	(0.027)
	[369]	[312]	[369]	[312]	[369]	[312]	[369]	[312]	[369]	[312]
Witnessed Death of Ally	0.056	0.056	0.133**	0.092*	0.023	0.005	0.025*	0.015	0.020	0.005
	(0.039)	(0.044)	(0.053)	(0.050)	(0.020)	(0.019)	(0.014)	(0.012)	(0.020)	(0.017)
	[890]	[781]	[890]	[781]	[890]	[781]	[890]	[781]	[890]	[781]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel C: Marines					
Killed Someone	0.053	0.095**	0.074	0.082*	0.071***	0.045**	0.046**	0.041***	0.064***	0.045**
	(0.038)	(0.045)	(0.049)	(0.047)	(0.027)	(0.020)	(0.018)	(0.015)	(0.025)	(0.020)
	[556]	[488]	[556]	[488]	[556]	[488]	[556]	[488]	[556]	[488]
Wounded or Injured	0.061	0.015	-0.010	-0.149	0.121**	-0.029	0.141***	0.000	0.111***	0.014
	(0.070)	(0.095)	(0.079)	(0.096)	(0.049)	(0.042)	(0.038)	(0.029)	(0.049)	(0.042)
	[200]	[133]	[200]	[133]	[200]	[133]	[200]	[133]	[200]	[133]
Witnessed Death of Ally	0.022	-0.010	0.062	0.034	0.058***	0.034*	0.027***	0.034***	0.052***	0.027
	(0.041)	(0.049)	(0.047)	(0.045)	(0.019)	(0.018)	(0.010)	(0.010)	(0.019)	(0.018)
	[651]	[590]	[651]	[590]	[651]	[590]	[651]	[590]	[651]	[590]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel D: Navy					
Killed Someone	0.083	-0.051	0.092	0.051	0.092**	0.093***	0.100***	0.068***	0.083**	0.085**
	(0.069)	(0.074)	(0.068)	(0.085)	(0.038)	(0.035)	0.027	(0.026)	(0.038)	(0.035)
	[241]	[235]	[241]	[235]	[241]	[235]	[241]	[235]	[241]	[235]

Wounded or Injured	0.044	0.000	0.111	0.000	0.156***	0.044	0.156***	0.044	0.133***	0.022
	(0.103)	(0.102)	(0.105)	(0.136)	(0.053)	(0.059)	(0.052)	(0.051)	(0.051)	(0.052)
	[90]	[90]	[90]	[90]	[90]	[90]	[90]	[90]	[90]	[90]
Witnessed	0.056	0.000	0.060	0.019	0.065**	0.028	0.060***	0.038**	0.065**	0.028
Death of Ally	(0.047)	(0.049)	(0.062)	(0.054)	(0.029)	(0.027)	(0.018)	(0.016)	(0.029)	(0.026)
	[431]	[415]	[431]	[415]	[431]	[415]	[431]	[415]	[431]	[415]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
	Panel E: Air Force									
Killed Someone	0.118**	0.030	0.058	-0.053	0.013	-0.015	0.026	0.007	0.006	-0.015
	(0.053)	(0.058)	(0.066)	(0.075)	(0.028)	(0.023)	(0.017)	(0.017)	(0.025)	(0.020)
	[306]	[272]	[306]	[272]	[306]	[272]	[306]	[272]	[306]	[272]
Wounded or Injured	0.143	-0.042	0.000	0.042	0.071	0.083	0.071	0.083*	0.071	0.083
	(0.168)	(0.151)	(0.154)	(0.157)	(0.066)	(0.063)	(0.059)	(0.045)	(0.065)	(0.063)
	[56]	[48]	[56]	[48]	[56]	[48]	[56]	[48]	[56]	[48]
Witnessed	0.004	-0.011	0.014	-0.087*	0.018	-0.015	0.014	0.013	0.014	-0.026**
Death of Ally	(0.039)	(0.054)	(0.054)	(0.049)	(0.017)	(0.014)	(0.010)	(0.009)	(0.015)	(0.011)
	[567]	[531]	[567]	[531]	[567]	[531]	[567]	[531]	[567]	[531]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Bootstrapped standard errors are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 3.

Table 8C. PSM Estimates of Effect of Violent Combat Events Among Those Assigned to Combat with Firefight, DOD HRB Data

	(1) Smoking	(2) Smoking	(3) Binge	(4) Binge	(5) Any Drug	(6) Any Drug	(7) Marijuana	(8) Marijuana	(9) Other Drug	(10) Other Drug
					Panel A: All					
Killed Someone	0.023	0.012	0.041*	0.025	0.056***	0.026**	0.038***	0.021***	0.054***	0.026**
	(0.025)	(0.026)	(0.022)	(0.029)	(0.012)	(0.013)	(0.009)	(0.07)	(0.012)	(0.012)
	[1907]	[1,806]	[1907]	[1,806]	[1907]	[1,806]	[1907]	[1,806]	[1907]	[1,806]
Wounded or Injured	0.073*	-.006	-0.027	-0.069	0.097***	0.059**	0.067***	0.038**	0.092***	0.059**
	(0.041)	(0.044)	(0.035)	(0.045)	(0.027)	(0.029)	(0.016)	(0.017)	(0.027)	(0.030)
	[743]	[633]	[743]	[633]	[743]	[633]	[743]	[633]	[743]	[633]
Witnessed Death of Ally	0.037**	0.015	0.084***	0.62***	0.045***	0.029***	0.026***	0.020***	0.041***	0.026**
	(0.017)	(0.019)	(0.021)	(0.024)	(0.011)	(0.010)	0.007	(0.005)	(0.009)	(.010)
	[2,612]	[2,455]	[2,612]	[2,455]	[2,612]	[2,455]	[2,612]	[2,455]	[2,612]	[2,455]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel B: Army					
Killed Someone	-0.007	0.022	0.025	0.092*	0.051*	-0.031	0.010	-0.022	0.054*	-0.026
	(0.048)	(0.061)	(0.055)	(0.050)	(0.028)	(0.028)	(0.014)	(0.014)	(0.028)	(0.027)
	[557]	[462]	[557]	[462]	[557]	[462]	[557]	[462]	[557]	[462]
Wounded or Injured	-0.006	-0.056	0.031	-0.133	0.099**	0.014	0.031	-0.014	0.099***	0.027
	(0.066)	(0.086)	(0.069)	(0.083)	(0.041)	(0.050)	(0.027)	(0.023)	(0.037)	(0.047)
	[324]	[288]	[324]	[288]	[324]	[288]	[324]	[288]	[324]	[288]
Witnessed Death of Ally	0.049	0.067	0.120**	0.155***	-0.002	0.003	0.008	0.019	-0.002	0.000
	(0.038)	(0.048)	(0.054)	(0.055)	(0.020)	(0.028)	(0.014)	(0.013)	(0.0195)	(0.027)
	[718]	[623]	[718]	[623]	[718]	[623]	[718]	[623]	[718]	[623]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel C: Marines					
Killed Someone	0.041	0.046	0.094**	0.093	0.078***	0.046*	0.045**	0.026	0.074***	0.046*
	(0.044)	(0.045)	(0.046)	(0.062)	(0.024)	(0.027)	(0.020)	(0.020)	(0.022)	0.026
	[492]	[388]	[492]	[388]	[492]	[388]	[492]	[388]	[492]	[388]
Wounded or Injured	0.028	0.033	-0.042	-0.016	0.097*	0.049	0.111**	0.049	0.097*	0.049
	(0.089)	(0.082)	(0.083)	0.114	(0.059)	(0.042)	(0.046)	(0.030)	(0.057)	(0.043)
	[145]	[121]	[145]	[121]	[145]	[121]	[145]	[121]	[145]	[121]
Witnessed Death of Ally	-0.004	-0.017	0.082	0.041	0.046**	0.025	0.029*	0.017	0.039*	0.021
	(0.065)	(0.051)	(0.060)	(0.052)	(0.023)	(0.019)	(0.16)	(0.013)	(0.022)	(0.018)
	[560]	[478]	[560]	[478]	[560]	[478]	[560]	[478]	[560]	[478]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
					Panel D: Navy					
Killed Someone	0.000	0.000	0.026	-0.047	0.105	0.047	0.079	0.047	0.079	0.024
	(0.133)	(0.174)	(0.154)	(0.180)	(0.077)	(0.076)	(0.071)	(0.055)	(0.078)	(0.077)
	[76]	[84]	[76]	[84]	[76]	[84]	[76]	[84]	[76]	[84]
Wounded or Injured	-0.111	-0.059	0.000	-0.117	0.167	0.000	0.111	0.000	0.167	0.000

	(0.202)	0.360	(0.234)	0.323	(0.144)	0.153	(0.130)	0.056	(0.149)	0.153
	[36]	[33]	[36]	[33]	[36]	[33]	[36]	[33]	[36]	[33]
Witnessed	-0.107	0.019	0.125	-0.019	0.107	-0.019	(0.071)	0.000	0.107	0.000
Death of Ally	(0.147)	(0.145	(0.117)	(0.131)	(0.085)	(0.061)	(0.047)	(0.035)	(0.085)	0.059
	[112]	[104]	[112]	[104]	[112]	[104]	[112]	[104]	[112]	[104]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
	Panel E: Air Force									
Killed Someone	0.093	-0.011	0.061	0.089	0.020	0.011	0.020	0.011	(0.020)	0.011
	(0.086)	(0.090)	(0.089)	(0.097)	(0.036)	(0.030)	(0.024)	(0.019)	(0.036)	(0.031)
	[194]	[181]	[194]	[181]	[194]	[181]	[194]	[181]	[194]	[181]
Wounded or Injured	0.130	0.136	0.087	0.000	0.000	0.091	0.043	0.091	0.043	0.091
	(0.196)	(0.203)	(0.185)	(0.184)	(0.101)	(0.069)	(0.079)	(0.062)	(0.101)	(0.068)
	[46]	[44]	[46]	[44]	[46]	[44]	[46]	[44]	[46]	[44]
Witnessed	0.006	0.060	-0.030	-0.060	0.018	0.013	0.012	0.013	0.006	-0.006
Death of Ally	(0.055)	(0.068)	(0.077)	(0.075)	(0.028)	(0.022)	(0.015)	(0.012)	(0.015)	(0.020)
	[329]	[299]	[329]	[299]	[329]	[299]	[329]	[299]	[329]	[299]
Stress Controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Bootstrapped standard errors are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 3.

Appendix Table 1. Means of Outcomes For Active Duty Samples Ages 24 to 32

Variable	Add Health Survey			DOD HRB Survey		
	All	Combat Exposure = 1	Combat Exposure = 0	All	Combat Exposure = 1	Combat Exposure = 0
Smoking	0.338	0.400	0.303	0.297	0.329	0.267
	(0.474)	(0.493)	(0.461)	(0.457)	(0.470)	(0.443)
Binge Drinking	0.166	0.180	0.158	0.497	0.531	0.465
	(0.373)	(0.386)	(0.366)	(0.500)	(0.499)	(0.499)
Any Drug Use	0.058	0.124	0.021	0.043	0.059	0.027
	(0.234)	(0.331)	(0.144)	(0.202)	(0.236)	(0.163)
Marijuana Use	0.032	0.076	0.007	0.012	0.018	0.006
	(0.176)	(0.267)	(0.084)	(0.107)	(0.132)	(0.075)
Other Drug Use	0.031	0.062	0.014	0.039	0.055	0.024
	(0.174)	(0.242)	(0.118)	(0.194)	(0.228)	(0.153)
Army	0.429	0.556	0.357	0.237	0.390	0.094
	(0.496)	(0.500)	(0.481)	(0.425)	(0.488)	(0.292)
Marines	0.130	0.185	0.098	0.167	0.226	0.111
	(0.337)	(0.391)	(0.298)	(0.373)	(0.418)	(0.314)
Navy	0.241	0.148	0.294	0.303	0.123	0.472
	(0.429)	(0.358)	(0.457)	(0.460)	(0.328)	(0.499)
Air Force	0.232	0.148	0.280	0.293	0.262	0.323
	(0.423)	(0.358)	(0.450)	(0.455)	(0.440)	(0.468)
Observations	224	81	143	5777	2791	2986

Standard deviations in parentheses

Appendix Table 2. Means of Alternate Combat Measures and Control Variables in Add Health Data

Variable	All	Combat Exposure = 1	Combat Exposure = 0
PTSD	0.122	0.250	0.061
	(0.328)	(0.434)	(0.239)
Stress	4.32	4.58	4.19
	(3.01)	(3.05)	(2.99)
Suicide Ideation	0.069	0.103	0.053
	(0.254)	(0.304)	(0.224)
Killed or Believed Killed Another	0.358	0.742	0.037
	(0.480)	(0.439)	(0.189)
Wounded or Injured	0.115	0.184	0.037
	(0.320)	(0.388)	(0.189)
Saw Coalition or Ally Killed, Dead, or Wounded	0.505	0.721	0.203
	(0.501)	(0.450)	(0.403)
Height in Inches	69.462	70.184	69.111
	(3.772)	(3.578)	(3.819)
Missing Data: Height in Inches	0.000	0.000	0.000
	0.000	0.000	0.000
Weight in Pounds	188.4	189.7	187.7
	(38.1)	(34.7)	(39.7)
Missing Data: Weight in Pounds	0.005	0.005	0.005
	(0.073)	(0.074)	(0.073)
Religion: Protestant	0.317	0.368	0.292
	(0.466)	(0.484)	(0.455)
Religion: Catholic	0.223	0.227	0.221
	(0.417)	(0.420)	(0.416)
Religion: Other Christian	0.193	0.162	0.208
	(0.395)	(0.370)	(0.406)
Religion: Other	0.073	0.049	0.084
	(0.260)	(0.216)	(0.278)
Missing Data: Religion	0.005	0.000	0.008
	(0.073)	0.000	(0.089)
Male	0.853	0.957	0.803
	(0.354)	(0.204)	(0.399)
Age in Years	28.662	28.530	28.726
	(1.711)	(1.773)	(1.678)
Age in Years Squared	824.428	817.070	828.011
	(97.304)	(100.495)	(95.641)
Race: Black	0.251	0.205	0.274
	(0.434)	(0.405)	(0.446)
Race: Other	0.081	0.065	0.090
	(0.274)	(0.247)	(0.286)
Race: Hispanic	0.159	0.119	0.179
	(0.366)	(0.325)	(0.384)
Missing Data: Race	0.002	0.005	0.000
	(0.042)	(0.074)	0.000
Missing Data: Race - Hispanic	0.002	0.000	0.003
	(0.042)	0.000	(0.051)
Personal Earnings	42915.700	43836.150	42457.980
	(43931.500)	(24247.050)	(50991.630)
Missing Data: Personal Earnings	0.025	0.011	0.032

	(0.156)	(0.104)	(0.175)
Education: Some College or Vocational Training	0.671	0.670	0.671
	(0.470)	(0.471)	(0.471)
Education: College Degree	0.174	0.157	0.182
	(0.379)	(0.365)	(0.386)
Missing Data: Education	0.000	0.000	0.000
	0.000	0.000	0.000
No Health Insurance (%)	0.119	0.119	0.118
	(0.324)	(0.325)	(0.324)
Missing Data: Health Insurance Status	0.014	0.016	0.013
	(0.118)	(0.127)	(0.114)
Wave 1 Picture Vocabulary Test Score	96.113	97.930	95.229
	(29.404)	(27.513)	(30.278)
Missing Data: Wave 1 Picture Vocabulary Test Score	0.071	0.054	0.079
	(0.257)	(0.227)	(0.270)
Log of Parental Income Wave 1	2.651	2.800	2.578
	(1.683)	(1.643)	(1.699)
Missing Data: Parental Income Wave 1	0.258	0.232	0.271
	(0.438)	(0.424)	(0.445)
Parent is Married in Wave 1	0.620	0.622	0.618
	(0.486)	(0.486)	(0.486)
Parent is Divorced, Separated or Widowed in Wave 1	0.205	0.216	0.200
	(0.404)	(0.413)	(0.401)
Missing Data: Parents' Marital Status	0.136	0.124	0.142
	(0.343)	(0.331)	(0.350)
Biological Mother's Education: High School Degree	0.342	0.308	0.358
	(0.475)	(0.463)	(0.480)
Biological Mother's Education: Some College	0.221	0.232	0.216
	(0.415)	(0.424)	(0.412)
Biological Mother's Education: College Degree or More	0.266	0.303	0.247
	(0.442)	(0.461)	(0.432)
Biological Mother's Education: Not Known	0.030	0.022	0.034
	(0.171)	(0.146)	(0.182)
Biological Mother's Education: Missing	0.012	0.005	0.016
	(0.111)	(0.074)	(0.125)
Currently in the Military	0.397	0.438	0.376
	(0.490)	(0.498)	(0.485)
Months Served in the Military	69.628	72.481	68.240
	(33.724)	(34.060)	(33.516)
Rank: Specialist/Corporal	0.338	0.303	0.355
	(0.474)	(0.461)	(0.479)
Rank: Sergeant	0.368	0.400	0.353
	(0.483)	(0.491)	(0.478)
Rank: Staff Sergeant	0.149	0.178	0.134
	(0.356)	(0.384)	(0.341)
Rank: First Class Sergeant or Higher	0.087	0.103	0.079
	(0.282)	(0.304)	(0.270)
Army	0.418	0.541	0.358
	(0.494)	(0.500)	(0.480)
Marines	0.181	0.254	0.145
	(0.385)	(0.437)	(0.352)
Navy	0.251	0.119	0.316
	(0.434)	(0.325)	(0.465)
Air Force	0.165	0.114	0.190
	(0.371)	(0.318)	(0.392)
Service Exclusively in After-September 11	0.234	0.287	0.208

	(0.424)	(0.453)	(0.406)
Observations	565	185	380

Notes: The means are generated using drawn from Waves I and IV of the National Longitudinal Study of Adolescent Health.

Appendix Table 3. Means of Alternate Combat Measures and Control Variables in DOD HRB Survey

Variable	All	Combat Exposure = 1	Combat Exposure = 0
PTSD	0.098	0.132	0.065
	(0.297)	(0.339)	(0.247)
Stress	0.135	0.152	0.120
	(0.342)	(0.359)	(0.325)
Suicide Ideation	0.042	0.045	0.038
	(0.200)	(0.207)	(0.192)
Killed Someone	0.129	0.260	0.008
	(0.335)	(0.439)	(0.087)
Wounded or Injured	0.045	0.090	0.002
	(0.207)	(0.287)	(0.043)
Witnessed Death of Ally	0.201	0.398	0.017
	(0.401)	(0.490)	(0.129)
CONUS	0.693	0.755	0.635
	(0.461)	(0.430)	(0.481)
Rank E4-E6	0.531	0.513	0.548
	(0.499)	(0.500)	(0.498)
Rank E7-E9	0.160	0.164	0.157
	(0.367)	(0.371)	(0.363)
Rank W1-W5	0.033	0.049	0.018
	(0.179)	(0.215)	(0.133)
Rank O1-O3	0.103	0.103	0.102
	(0.303)	(0.304)	(0.303)
Rank O4-O10	0.096	0.108	0.083
	(0.294)	(0.311)	(0.277)
Number of Deployments	1.576	1.885	1.284
	(1.175)	(1.050)	(1.212)
High School Education	0.215	0.211	0.219
	(0.411)	(0.408)	(0.414)
Some College	0.486	0.480	0.492
	(0.500)	(0.500)	(0.500)
College Degree and Above	0.276	0.282	0.270
	(0.447)	(0.450)	(0.444)
Male	0.783	0.830	0.739
	(0.412)	(0.376)	(0.439)
Age	31.372	31.586	31.169
	(7.678)	(7.580)	(7.764)
Age Squared	1043.114	1055.109	1031.766
	(509.601)	(504.462)	(514.191)
Black	0.176	0.160	0.190
	(0.380)	(0.367)	(0.392)
Asian	0.052	0.036	0.067
	(0.222)	(0.187)	(0.250)
Race Other	0.118	0.106	0.130
	(0.323)	(0.308)	(0.337)
Married	0.633	0.656	0.611

	(0.482)	(0.475)	(0.488)
Divorced	0.109	0.115	0.102
	(0.311)	(0.319)	(0.303)
Observations	14740	7166	7574

Notes: The means are generated using drawn from the 2008 Department of Defense Health and Related Behaviors Survey.

Appendix Table 4. Evidence on Matching on DOD HRB Observables in Add Health Survey

	All			Army			Marines			Navy			Air Force		
	Combat	No Combat	p-value	Combat	No Combat	p-value	Combat	No Combat	p-value	Combat	No Combat	p-value	Combat	No Combat	p-value
Months in the military	0.41	0.48	0.35	0.43	0.47	0.72	0.22	0.18	0.94	0.47	0.50	0.91	0.67	0.80	0.61
Specialist/Corporal	68.04	72.37	0.33	64.88	75.27	0.15	66.87	57.59	0.38	89.11	95.13	0.70	74.83	90.20	0.32
Sergeant	0.33	0.35	0.94	0.47	0.50	0.84	0.39	0.29	0.41	0.26	0.13	0.45	0.25	0.00	0.24
Staff Sergeant	0.40	0.36	0.93	0.27	0.24	0.79	0.35	0.47	0.37	0.47	0.50	0.91	0.25	0.80	0.04
1st Class Sergeant or >	0.16	0.18	0.97	0.16	0.12	0.55	0.17	0.18	0.94	0.26	0.38	0.58	0.17	0.20	0.88
Army	0.09	0.11	0.58	0.10	0.15	0.49	0.04	0.00	.				0.25	0.00	0.24
Marine Corps	0.50	0.56	0.12										0.17	0.00	0.36
Navy	0.23	0.32	0.14												
Air Force	0.15	0.08	0.04	0.02	0.00	0.37									
Service after 9/11	0.15	0.08	0.06	0.02	0.09	0.22									
Currently Active Duty	0.26	0.29	0.26	0.25	0.29	0.59	0.04	0.12	0.17				0.42	0.60	0.52
Male	0.96	0.96	0.79	0.92	0.97	0.26				0.89	1.00	0.36			
Age in Years	28.64	28.73	0.81	28.43	28.35	0.43	28.61	28.82	0.90	29.37	29.63	0.63	28.67	28.20	0.66
Age in Years Squared	822.55	828.26	0.78	811.41	807.12	0.45	821.13	833.88	0.88	864.21	878.38	0.65	825.17	798.20	0.65
Black	0.20	0.22	0.85	0.29	0.32	0.73	0.13	0.12	0.95	0.37	0.38	0.98	0.33	0.40	0.81
Other Race	0.07	0.04	0.44	0.06	0.00	0.20	0.04	0.06	0.97	0.11	0.00	0.36			
Hispanic	0.15	0.16	0.86	0.12	0.12	0.75	0.17	0.24	0.93	0.16	0.13	0.83	0.17	0.00	0.36
Some College	0.66	0.67	0.99	0.75	0.71	0.59	0.57	0.71	0.64	0.63	0.50	0.54	0.67	1.00	0.16
College	0.16	0.20	0.55	0.14	0.15	0.96	0.17	0.06	0.97	0.16	0.25	0.59	0.33	0.00	0.16
Married	0.58	0.63	0.61	0.59	0.65	0.65	0.70	0.71	0.91	0.63	0.50	0.54	0.67	1.00	0.16
Divorced	0.13	0.13	0.75	0.14	0.12	0.55	0.00	0.06	0.34	0.11	0.00	0.36	0.08	0.00	0.54

Notes: Nearest neighbor matching is employed using data drawn from the Add Health.

Appendix Table 5. Propensity Score Matching Estimates of Relationship between Combat Exposure and Risky Behaviors for HRB Survey by Age

	(1) All	(2) Army	(3) Marines	(4) Navy	(5) Air Force
Outcome			***Panel A: Age 18-23***		
Smoking	0.050	0.333*	-0.011	0.000	-0.079
	(0.053)	(0.175)	(0.088)	(0.185)	(0.126)
	[519]	[53]	[188]	[54]	[76]
Binge Drinking	0.04	0.222	0.011	0.185	0.132
	(0.054)	(0.137)	(0.073)	(0.175)	(0.142)
	[519]	[53]	[188]	[54]	[76]
Any Drug Use	0.050***	0.037	0.106***	-0.037	-0.079
	(0.032)	(0.120)	(0.040)	(0.089)	(0.054)
	[519]	[53]	[188]	[54]	[76]
Marijuana Use	0.015	-0.037	0.032**	0.037	-0.053
	(0.020)	(0.075)	(0.025)	(0.071)	(0.046)
	[519]	[53]	[188]	[54]	[76]
Other Drug Use	0.050	0.037	0.096**	0.000	-0.053
	(0.031)	(0.113)	(0.037)	0.092	(0.051)
	[519]	[53]	[188]	[54]	[76]
Outcome			***Panel B: Age 24-32***		
Smoking	0.046*	0.050	0.089	-0.024	0.095
	(0.025)	(0.099)	(0.088)	(0.077)	(0.064)
	[1,489]	[163]	[252]	[161]	[400]
Binge Drinking	0.061*	0.050	0.013	-0.016	0.065
	(0.032)	(0.105)	(0.096)	(0.095)	(0.065)
	[1,489]	[163]	[252]	[161]	[400]
Any Drug Use	0.037**	0.038	0.000	0.031	0.015
	(0.013)	(0.061)	(0.029)	(0.038)	(0.023)
	[1,489]	[163]	[252]	[161]	[400]
Marijuana Use	0.016***	-0.013	0.000	0.024	0.000
	(0.006)	(0.027)	(0.009)	(0.023)	(0.011)
	[1,489]	[163]	[252]	[161]	[400]
Other Drug Use	0.035***	0.025	0.000	0.024	0.019
	(0.013)	(0.056)	(0.029)	(0.036)	(0.022)
	[1,489]	[163]	[252]	[161]	[400]

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 3.

	(1) All	(2) Army	(3) Marines	(4) Navy	(5) Air Force
Outcome			***Panel C: Age 33+***		
Smoking	0.025	0.041	-0.013	0.0188	0.080*
	(0.025)	(0.098)	(0.099)	(0.071)	(0.042)
	[1,700]	[144]	[152]	[321]	[403]
Binge Drinking	0.055*	0.278***	0.039	0.013	0.025
	(0.031)	(0.102)	(0.085)	(0.071)	(0.066)
	[1,700]	[144]	[152]	[321]	[403]
Any Drug Use	0.009	0.014	0.000	0.013	0.035*
	(0.011)	(0.054)	(0.025)	(0.029)	(0.021)
	[1,700]	[144]	[152]	[321]	[403]
Marijuana Use	0.003	0.000	0.000	0.006	0.000
	(0.003)	(0.013)	(0.000)	(0.013)	(0.003)
	[1,700]	[144]	[152]	[321]	[403]
Other Drug Use	0.008	0.014	0.000	0.013	0.035
	(0.011)	(0.054)	0.025	(0.027)	(0.021)
	[1,700]	[144]	[152]	[321]	[403]

Robust standard errors corrected for clustering on the school are in parentheses. Number of observations is in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All models use the full set of controls shown in Appendix Table 3.