Suicide in the U.S. army: stressor-strain hypothesis among deployed and nondeployed Army National Guard soldiers

James Griffith

Dr James Griffith is Research Psychologist at National Center for Veterans Studies, University of Utah, Salt Lake City, Utah, USA.

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Abstract

Purpose – *Study samples, having responded to similar survey content, allowed examination of suicide risk factors for deployed soldiers relative to nondeployed or home station soldiers. Specific research questions addressed by this study are: First, what is the prevalence of suicidal behaviors among Army National Guard (ARNG) soldiers – deployed or not, and how do these rates compare with known US national and international rates? Second, what are stressful life events associated with suicidal risk? How do these compare between deployed and nondeployed soldiers? Third, what specifically about combat exposure makes soldiers at risk for suicide? And fourth, is there any evidence of stress-buffering effect between risk factors and suicidal behaviors? The paper aims to discuss these issues.*

Design/methodology/approach – *Three data sources were used. First, the responding sample for the Unit Risk Inventory consisted of 180 company-sized units with a total of 12,567 responding soldiers. Second, the responding sample for the Unit Risk Inventory-Reintegration consisted of 50 company-sized units with a total of 4,567 soldiers. The third data source was all ARNG suicides for calendar years 2007 through 2012. For each calendar year, a random sample of 1,000 ARNG soldiers was drawn to represent nonsuicides. This resulted in a study sample size of 6,523, including the 523 suicides for the years 2007 through 2012 plus 1,000 nonsuicide cases for each calendar year.*

Findings – *Prevalence of suicidal behaviors among soldiers was higher (for thoughts, plans, and attempts, respectively, 4-6, 1.3-2.2, and 0.7-0.08 percent) than among civilian populations (respectively, 2.6, 0.7, and 0.4 percent). Risk was highest among home station than deployed soldiers. Stressful life events associated with suicide risk included personal feelings of loneliness, anger, and frustration, followed by interpersonal behavioral problems, such as aggressive behavior toward a significant other and having committed a crime. Also evident are the beneficial effects (as a main effect and buffering effect) of feelings of cohesiveness, quality leaderships, and job satisfaction on suicidal behaviors.*

Research limitations/implications – *Findings here were consistent with the stressor-strain hypothesis. Stressful life events were associated with suicide risk, especially, personal feelings of loneliness, anger, and frustration, followed by interpersonal behavioral problems, such as aggressive behavior toward a significant other and having committed a crime. Evident, too, were the beneficial effects of feelings of cohesiveness, quality leaderships, and job satisfaction on suicidal behaviors. Soldiers reporting these events were less likely to report suicidal behaviors and social support lessened the cumulative effect of risk factors on suicidal behaviors. Given these findings, it seems that suicide risk in the military is not uniquely different from that observed in civilian populations. The higher prevalence of suicides in the military likely has to do with proportionally more individuals who have historically shown to be at risk for suicide, namely, young males.*

Practical implications – *Strong association of individual-level attributes with suicidal behaviors, such as age, gender, and race, suggest individual-level vulnerability to suicidal behaviors. This expectation is consistent with the stress/suicide vulnerability theory (Bryan, 2014; Nock et al., 2013). Such vulnerabilities may include negative affectivity (one of the Big Five personality dimensions) and early childhood trauma to suicidal behaviors (Griffith, 2012a, 2014).*

Social implications – *Suicide, related constructs, and their underlying processes need to be further examined in future research. Their understanding would be useful in screening individuals most at risk for suicidal behaviors, with referral and treatment, if needed. Practically, such vulnerabilities in relation to what specific experiences could be determined, potentially describing which individuals are suited best to adapt to which environments.*

Originality/value – *There has been much research on the increased suicides in the military, and to date, studies have focussed primarily on traumatic events, such as, deployments and combat exposure associated with suicidal behaviors. Yet, studies have almost exclusively examined the combat-suicide connection without reference to suicide risk factors among nondeployed or home station soldiers. This study fills this gap by examining survey responses to standardized questionnaires administered to ARNG soldiers during calendar year 2010 – one sample of deployed units either to Iraq or to Afghanistan and another sample of nondeployed or home station units.*

Keywords *Suicide, Deployment, Army National Guard, Combat exposure, Health risk, Stressor-strain hypothesis*

Paper type *Research paper*

1. Background

In 2002, the US military first recognized that suicide rates for soldiers were on the rise. Later, more systematic data revealed that since 2004, suicides in the US Army have risen (Army Health Promotion, Risk Reduction, and Suicide Prevention Report, 2010). Early hypotheses centered on what might be called the stressors-strain model – that soldiers who were suicidal experienced trauma, combat exposure. Indeed, initial suicide rates were highest among soldiers who were most likely to have participated in ground combat operations, namely, the Marines and Army (Army Health Promotion, Risk Reduction, and Suicide Prevention Report, 2010). Yet, historically, the US military has had lower suicide rates than the civilian population, stemming back to Second World War (Cassimatis and Rothberg, 1997), and during wartime, suicide rates among soldiers had dropped (Rothberg *et al.*, 1987). It was thought that the unique aspects, both nature and duration of the Iraq and Afghanistan wars, gave rise to new stressors that more adversely affected soldiers. Accordingly, increased suicides in the military were examined as stressors related to individual strain (Nock *et al.*, 2013).

1.1 Stressor-strain perspective

In the health psychology literature, negative health outcomes have been explained by life circumstances experienced by the individual, such as excessive or lack of work, work-family imbalance or conflict, and interpersonal problems (Koeske and Koeske, 1993). These circumstances then lead to strain on the individual's physical and emotional health, and over time, result in exhaustion and depletion (Tetrick *et al.*, 2000) and often lead to negative outcomes, including depression and suicide (Nock *et al.*, 2013). Such linkages between stressful events and dysfunctional outcomes lead to the perspective being labeled "stressor-strain." In a similar vein, it was thought initially military personnel who had experienced combat or had deployed multiple times experienced high levels of strain and distress. Studies of deployment experiences, such as the number and length of deployments, as well as engagement in combat, have shown associations with increased PTSD and related symptoms (Mental Health Advisory Team, 2008). This perspective implies examining the personal history surrounding suicide, in particular, events preceding the suicide likely causing distress – such as having been deployed, number and length of deployments, and combat exposure, with possible loss of significant relationship and financial difficulties as associated or independent events – and subsequently, necessitate individual coping and adjustments. Observed relationships between these experiences and suicide would imply mitigation strategies lessening stressful events (e.g. reduce their frequency and intensity), in addition to augmenting individual resources that would facilitate adopting more adaptive coping alternatives. Social support is one such resource, investigated extensively in health psychology, and is believed to intervene in the relationship between stressors and strain, called the "stress-buffering hypothesis" (Cohen and Wills, 1985). This hypothesis states that the negative effects of stressors on health outcomes are less for those individuals having more rather than less social support. Social support refers to those acquaintances having material, informational, and emotional resources, and when drawn on, can reduce the negative impact of stressors on the

individual (Cohen, 1992). Recent military studies have evidenced both main effects (Dickestein *et al.*, 2010; Jones *et al.*, 2012) and moderating or "buffering" effects on the relationship of stressors to health outcomes (Mitchell *et al.*, 2012). Doctrinally, the Army has recognized the significance of positive interpersonal relations among unit members (called cohesiveness) in individual and group performance and individual well-being (US Army Filed Manual 6-22.5, 2009).

1.2 Research gaps and study purpose

There has been much research on the increased suicides in the military, and to date, studies have focussed primarily on traumatic events, such as, deployments and combat exposure associated with suicidal behaviors. Yet, there remain substantial gaps in the research literature. For instance, studies have almost exclusively examined the combat-suicide connection without reference to suicide risk factors among nondeployed or home station soldiers. Hence, it is unknown whether risk factors identified for deployed/combat exposed soldiers are the same or different from those nondeployed or home station soldiers. Any observed consistencies in findings between deployed and home station soldiers suggest commonalities in risk predispositions, and perhaps, suicide and underlying mechanisms of suicide are not unique to the military environment. This becomes exceedingly important when knowing that over 80 percent of all Army National Guard (ARNG) soldier suicides occurred during civilian status and not while on military service (Griffith and Vaitkus, 2013). Too, findings of studies investigating suicide in the military consistently have observed risk factors are not much different from those reported for civilians (Black *et al.*, 2011; Griffith, 2012b; Nock *et al.*, 2013). Of particular relevance is the ARNG, which since Second World War has largely served as a static reserve force to Soviet expansionism. With the introduction of the total force in the 1980s, both the ARNG and Army Reserve more directly complemented available combat arms and combat support units. The US Army Reserve component consists of the ARNG (numbering about 360,000) and the Army Reserve (numbering about 200,000). In the recent Iraq and Afghanistan wars, over 600,000 Army reservists were called to active duty, with average length of deployments anywhere from 12 to 18 months (Defense Science Board Task Force, 2007; Baiocchi, 2013). At times, the reserve forces represented 30-40 percent of the ground forces in Iraq and Afghanistan. Suicide rates for the ARNG increased starting in 2006 and, in 2010, exceeded that of the active component Army (31 per 100,000 vs 25 per 100,000) and the Army Reserve (24 per 100,000) as well as the most recently available civilian age-adjusted rate of 20.3 per 100,000 (Army Health Promotion, Risk Reduction, and Suicide Prevention Report, 2010). Yet, only a slight association between having been deployed and suicide has been observed. Moreover, most ARNG suicides (approximately 86 percent) have occurred during part-time military service, that is, in between weekend drills and while in civilian status (Griffith, 2012a). When examining the association of deployment with suicide, there is a slight association and those greater at risk among deployed are those who have returned already half to one year later (Griffith, 2012d).

This study fills this gap by examining survey responses to standardized questionnaires administered to ARNG soldiers during calendar year 2010 – one sample of deployed units either to Iraq or to Afghanistan and another sample of nondeployed or home station units. These samples, having responded to similar survey content, allowed examination of suicide risk factors for deployed soldiers relative to nondeployed or home station soldiers. Specific research questions addressed by this study are: First, what is the prevalence of suicidal behavior among ARNG soldiers – deployed or not, and how do these rates compare with known US national and international rates? Second, what are stressful life events associated with suicidal risk? How do these compare between deployed and nondeployed soldiers? Third, what specifically about combat exposure makes soldiers at risk for suicide? And fourth, is there any evidence of stress-buffering effect between risk factors and suicidal behaviors?

2. Method

2.1 Data sources

Three sources of data were used. The first two data sets recorded soldiers' responses to the Unit Risk Inventory (URI). This inventory was developed and funded by the US Army (US Army Substance Abuse Program, 2014). It is used as an informal unit assessment of the health and well-being of

soldiers. The URI consisted of about 80 questions. Unit (usually company-sized) leaders administered the survey once a year to assess behavioral health risk behaviors of soldiers. Unit members voluntarily completed the inventory. Specific content of questions pertained to alcohol and drug use, criminal behavior, unit relationships, negative emotions, interpersonal and financial difficulties, suicidal behaviors, interpersonal aggression, and job satisfaction. Questions were similar for soldiers at home station (called the URI) and for soldiers responding after having returned (called the Unit Risk Inventory-Reintegration (URI-R)). Thus, responses provided common variables between the two data sets, except for the deployment-related questions for soldiers in the URI-R sample. To ensure anonymity of survey responses, no personally identifying information was asked or recorded for cases in the data sets, including name, social security number, age, gender, race, rank, and so on. Soldier responses to the inventories were optically scanned into automated data files, which were identified only by unit, usually company-sized units.

Routine data collection during calendar year 2010 provided soldiers' responses to the inventories. The responding sample for the URI consisted of 180 company-sized units with a total of 12,567 responding soldiers. The mean response rate of units was 70.8 percent, with a range from 36 to 100 percent. High completion rates by unit likely meant that responding soldiers adequately represented their units, and the distribution of unit types represented in the study sample were not statistically different from those in the ARNG overall ($\chi^2(3) = 0.81$, ns; combat arms, 48 to 45 percent; combat support, 20 to 23 percent; combat service support, 30 to 29 percent; and other, 2 to 3 percent).

The responding sample for the URI-R consisted of 50 company-sized units with a total of 4,567 soldiers. The mean response rate of units was 90.2 percent, with a range of 55-100 percent. The distribution of deployed unit types represented in the study sample were not statistically different from those units in the ARNG deployed in 2010 ($\chi^2(3) = 1.34$, ns; combat arms, 56 to 52 percent; combat support, 28 to 33 percent; combat service support, 12 to 17 percent; and other, 4 to 3 percent). Most of the soldiers had returned from Operation Iraqi Freedom (84.2 percent) and some (15.8 percent) from Operation Enduring Freedom. Nearly all (90 percent) of the soldiers reported having been deployed for seven to 12 months. Totally 88 percent of the soldiers reported having returned from deployment within three to six months, equally divided between having been back one to three and four to six months. Two-thirds (64.9 percent) of the soldiers had no previous deployments. About one-third (34 percent) of the soldiers in the sample reported having been deployed two or more times.

The third data source was all ARNG suicides for calendar years 2007 through 2012. For each calendar year, a random sample of 1,000 ARNG soldiers was drawn to represent nonsuicides. This resulted in a study sample size of 6,523, including the 523 suicides for the years 2007 through 2012 plus 1,000 nonsuicide cases for each calendar year. Each case was appended with data available in the automated personnel system, including age, gender, race, level and type of high school attainment, mental category (based on the Armed Services Vocational Aptitude Battery), marital status, rank, prior service, years of service, military status (M-day or part-time vs full-time military service), military occupational specialty (MOS; coded into combat arms vs others), in-training, and ever deployed.

2.2 Study variables

For analyses using the URI and URI-R survey data, suicidal behaviors served as the criterion or outcome variable in a series of binary logistic regression models. Soldiers responded to three survey items asking whether in the last 12 months, they thought, planned, or attempted suicide. Responses served as "period prevalence" (within the last year) estimates for suicidal behaviors. Soldiers were classified as having suicidal behaviors, having provided an affirmative response to any of the three items. Survey items asking about life events served as predictor variables in binary logistic regression models. Life events were organized as psychological and behavioral including emotional, problems, interpersonal aggression, substance use, and criminal behavior. A second group included contextual circumstances of suicide risk, including problems in interpersonal relations, financial troubles, and job demands and satisfaction. Soldiers responded

"yes" (coded as 1) or "no" (coded as 0) to each life event. Soldiers who responded to the URI-R reported deployment-related experiences, such as number of deployments, length of current deployment, time since having retired from deployment, and combat exposure (experienced combat trauma, received direct gun fire, saw someone killed, killed someone, or had friend killed). Responses to these questions were used as predictor variables in binary logistic regression models for this group of soldiers.

For data gathered on the actual ARNG suicides and nonsuicides, binary logistic regression models were conducted in a similar fashion. Having been a suicide or not (coded as 1 and 0, respectively) served as the criterion or outcome variable, and values on the various personnel data served as predictor variables. Not all personnel data could be used as predictor variables, due to substantial amount of overlap among variables, such as age, rank, prior service, years of service, and marital status, which would cause instability in the regression results. To avoid multicollinearity, several iterative regressions were performed and variables showing consistent relationships to suicidal behaviors without necessarily being correlated with other predictor variables were chosen for regression models displayed here.

3. Results

3.1 Suicide prevalence

The first research question was, what is the prevalence of suicidal behavior among ARNG soldiers – deployed or not, and how do these rates compare with known US national and international rates? Table I displays percentages of individuals who reported recent (last 12 months) suicidal behaviors in the study samples and civilian populations.

Both study samples of ARNG soldiers had higher prevalence of suicidal behaviors than those reported in the international and national populations. ARNG prevalence percentages were two to three times higher than those reported in the civilian populations. Surprisingly, ARNG soldiers at home station or home station (URI) reported the highest prevalence of suicidal behaviors. Relationships remained statistically significant even after consideration of multiple, pairwise comparisons (adjusted $\alpha = 0.05/3$ comparisons or z-values associated with $p < 0.016$).

3.2 General suicide risk factors

The second research question, what are life events associated with suicidal risk? And, how do these compare between deployed and nondeployed soldiers? Table II displays results for two separate logistic regression models in which survey items in several content domains were used to predict self-reported suicidal behaviors (any vs none) in the last 12 months.

Both regression models were statistically significant, and a substantial amount of variance in self-reported suicidal behaviors was explained by the survey items – approximately one-third. Life events associated with suicide risk were remarkably similar between deployed and home station soldiers. Among the strongest events related to personal distress were feelings of being lonely, angry, and frustrated; these soldiers were two to four times more likely to report suicidal

Table I Comparison of suicidal behaviors (self-reported in the last 12 months) between home stations (URI) soldiers, deployed (URI-R) soldiers, and civilian populations

	Soldiers		*Civilian estimates*						
	1. URI	*2. URI-R*	*3. International*	*4. US national*	*Pairwise z-tests*				
Suicidal behavior	*column % (SE)*	*returned % (SE)*	*column %*	*column %*	*1-2*	*1-3*	*1-4*	*2-3*	*2-4*
Thoughts	6.0 (0.2)	4.0 (0.3)	2.1	2.6	–5.93**	18.42**	16.06**	6.28**	4.63**
Plans	2.2 (1.3)	1.3 (0.2)	0.7	0.7	–4.12**	11.47**	11.47**	3.43**	3.43**
Attempts	0.8 (0.1)	0.7 (0.1)	0.4	0.4	–0.66	5.04**	5.04*	2.33*	2.33*
	$n = 12{,}585$	$n = 4{,}196$							

Notes: *$p < 0.05$; **$p < 0.001$, two-tailed

Table II Relationship of life events and military experiences to suicide risk for home station soldiers and deployed soldiers

Life event URI/URI-R (item no. also indicated)	*Nondeployed/home station soldiers*		*Deployed soldiers (URI-R)*	
	Regression coefficient (SE)	*Odds ratio*	*Regression coefficient (SE)*	*Odds ratio*
Psychological/behavioral				
Emotional problems				
25/50 feel angry and frustrated	0.77 (0.10)***	2.16	0.74 (0.24)**	2.11
26/51 feel lonely	1.43 (0.10)***	4.19	1.46 (0.21)***	4.32
Aggressive behavior				
20/49 physically threatened unit members	0.18 (0.14)	1.20	0.23 (0.29)	1.26
44/62 verbally threatened sig other	0.43 (0.15)**	1.53	0.91 (0.28)***	2.49
45/63 physically mishandled sig other	0.01 (0.17)	1.01	0.35 (0.35)	1.42
46/64 insulted/sworn at child	0.19 (0.13)	1.21	0.18 (0.24)	1.20
48/65 pushed/hit child	0.44 (0.19)*	1.55	–1.19 (0.51)*	0.30
49/66 hit child with object	0.41 (0.19)*	1.51	0.42 (0.44)	1.52
Substance abuse				
12/43 driven under influence	0.31 (0.11)**	1.37	0.53 (0.20)**	1.69
14/44 trouble with police in conjunction with alcohol use	0.62 (0.21)**	1.86	0.43 (0.46)	1.54
15/45 illegal while drinking	0.18 (0.16)	1.20	0.13 (0.33)	1.14
16/46 use illegal drugs	0.77 (0.16)***	2.15	0.55 (0.35)****	1.74
Criminal behavior				
37/60 vandalized property	0.04 (0.20)	1.04	0.58 (0.34)****	1.79
38/61 committed crime	0.51 (0.24)*	1.67	0.74 (0.39)*	2.11
Contextual				
Interpersonal problems				
17/47 work well with unit members	–0.37 (0.15)*	0.69	0.18 (0.26)	1.20
19/48 trust unit leaders	–0.20 (0.10)*	0.82	–0.20 (0.20)	0.82
27/52 people available for support	–0.23 (0.12)	0.80	–0.57 (0.21)**	0.57
28/53 significant relationship ended	0.32 (0.09)***	1.37	0.29 (0.19)****	1.33
Financial difficulties				
29/56 many difficult life changes	0.48 (0.10)***	1.62	0.00 (0.28)	1.00
31/54 financial troubles	0.45 (0.09)***	1.57	0.47 (0.26)*	1.60
32/55 used Army emergency for basic living expenses	0.16 (0.13)	1.18	0.38 (0.35)	1.46
Job satisfaction				
51/67 demanding job; no time relax	0.17 (0.09)*	1.18	0.22 (0.20)	1.24
52/68 satisfied with Army	–0.31 (0.09)***	0.74	–0.54 (0.21)*	0.59
Constant	4.11 (0.22)***	0.02	–3.95 (0.35)***	0.01
Nagelkerke R^2	0.328		0.336	
χ^2 (23)	1,569.86***		438.91***	
Column *n*	10,909		4,091	

Notes: The criterion variable, suicide risk, included soldiers who provided an affirmative response to any of the three suicide items – thoughts, plans, and attempts. ****$p < 0.15$; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

behaviors. Aggressive behavior toward a significant other and having committed a crime were next most associated with suicidal behaviors, with soldiers reporting these events 1.5 to two times more likely to report suicidal behaviors. Driving under the influence of alcohol and financial difficulties were also associated with suicidal behaviors; soldiers reporting these events were about 1.5 more times likely to have suicidal behaviors. Of particular note is the use of illicit drugs placed nondeployed soldiers at higher risk than deployed soldiers (respectively, odds ratios = 2.15 and 1.74). Also evident was the beneficial effect of feelings of cohesiveness, quality leadership, and job satisfaction on suicidal behaviors. Soldiers reporting these events were less likely (1/2 to 3/4) to have reported suicidal behaviors, in particular, among garrison soldiers.

Due to guarantees of soldier anonymity, soldier background information was not available in the URI data sets. Demographic variables have shown strong association with suicidal behaviors both in civilian and military studies (Nock *et al.*, 2013). Lacking soldier background, a database containing personnel information for known ARNG suicides and nonsuicides was derived. ARNG suicides from 2007 through 2012 were combined with random samples of 1,000 nonsuicides from

each calendar year (described earlier). Variables were derived from information for suicides and nonsuicides contained in the automated personnel system, which were then used as predictor variables in a binary logistic regression model to predict suicide or not. Table III displays results.

The overall model was statistically significant, accounting for 20.2 percent of the variance in having committed suicide or not. Soldier background characteristics (sex, age, race, etc.) contributed the most to the total explained variable in suicide (83 percent), with military experience variables accounting for only 10 percent of the total explained variance. Soldiers most at risk for suicide were those 17-24 years of age (three times more likely), in addition to being male, white and single (each, two times more likely). Surprisingly, those soldiers previously deployed were 1/2 as likely to have committed suicide as those deployed. Except for 2011, suicides were highest in the reference year of 2012. The last group of variables examined the combined effects of the primary risk factors, namely, young age, male, and white (examined as all possible two-way and three-way interactions, e.g. young age X male X white) as well as interaction effects that might test associations between combat exposure and suicide (i.e. combat MOS or combat MOS X having been deployed). Among these interactions examined, several were statistically significant. Being young in age and male showed risk of suicide (odds ratio = 2.58) and soldiers having combat MOSs and having been deployed showed a risk (odds ratio = 1.48). Noteworthy is that interaction terms, while significant, contributed little additional explained variance to the overall model.

3.3 Combat and deployment suicide risk factors

The third research question was, what specifically about combat exposure makes soldiers at risk for suicide? The URI-R study sample was used to provide findings. Two binary logistic regression models were performed. The first contained all deployment characteristics and combat exposure

Table III Prediction of suicide completion (vs random sample) by soldier background and military experience

Predictor variable	*Regression coefficient*	*SE*	*Odds ratio*	*R^2 added*	*% of total R^2 explained*
Soldier background					
Male	0.70****	0.47	2.02		
17-24 years	1.21**	0.47	3.35		
25-29 years	0.15	0.14	1.17		
White	0.86****	0.49	2.37		
Single	0.86***	0.12	2.37	0.167	82.7
Military experience					
Prev. deployed	–0.81***	0.13	0.45		
Combat MOS	–0.10	0.15	0.90	0.021	10.4
Year effect, cf. 2012					
2007	–0.79***	0.18	0.46		
2008	–0.72***	0.18	0.49		
2009	–0.47**	0.18	0.62		
2010	–0.24****	0.15	0.79		
2011	–0.2	0.16	0.98	0.012	5.9
Combined effects					
Male X 17-24 years	0.95****	0.54	2.58		
Male X white	0.10	0.52	1.10	0.001	0.5
Male X 17-24 years X white	–0.35	0.30	0.70		
Combat MOS X prev. deployed	0.39*	0.21	1.48	0.001	0.5
Constant	–3.79	0.46	0.02		
Nagelkerke R^2				0.202	100.0
χ^2 (16) = 582.37***					

Notes: $n = 6{,}523$; included suicides for each CY 2007-2012, plus 1,000 nonsuicide cases for each calendar year. ****$p < 0.15$; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

items, and the second only those which were statistically significant in the first model. Also, due to its nonspecificity, having experienced trauma in combat was excluded from the second model. Results for both models are displayed in Table IV.

Both models were statistically significant. The full model explained 8.6 percent of the variance in suicidal behaviors, and the subsequent parsimonious model explained 2.8 percent of the variance in suicide behaviors. Soldiers who reported having killed someone were highest at risk for suicide behaviors (two times more likely), followed by having received direct combat fire (about 1.5 times more likely). The number of deployments and time since having returned from the most recent deployment were associated with greater risk for suicidal behaviors (respectively, odds ratio = 1.35 and 1.23).

3.4 Stress-buffering effect

The fourth and final research question was to examine evidence for the stress-buffering effect of social support on the relationship of previously identified risk factors or stressful life events and suicidal behaviors. Following the described method by Cohen and Wills (1985), three logistic regression models were performed. Two regression models examined the main effects of social support (combined responses to work well with others, trust unit leaders with personal problem, and others available for support) on suicidal behaviors in the URI and URI-R data sets. Cumulative risk factors (affirmed life events) were the sum of the survey items showing statistically significant risk association with suicidal behaviors, interaction terms were derived by multiplying values of social support and cumulative risk factors. The third regression model examined the main effects and buffering effects of social support on the relationship of having seen someone killed in combat and suicidal behaviors. Results are displayed in Table V.

In all three regression models, the stressor variable (cumulative risk or having killed someone in combat) was significantly and positively related to suicidal behaviors. Also, social support was significantly and negatively related to suicidal behaviors in all models, providing evidence for the positive main effects of social support. There was also evidence for the buffering effect in all models, though the last model did not approach a traditional level of statistical significance. To illustrate the interaction, correlations of cumulative risk and suicidal behaviors were derived for the levels of social support (from none to three affirmative responses to the support items). The positive correlations decreased in magnitude from no support to responding "yes" to each social support item – for the URI sample, from 0.63 to 0.30 (difference between correlations, $z = 3.89$, $p < 0.001$); and for URI-R sample, from 0.57 to 0.35 ($z = 3.20$, $p < 0.001$). A similar trend was observed for the relationship between having killed someone and suicidal behaviors, from 0.34 to 0.04 ($z = 3.46$, $p < 0.001$).

Table IV Prediction of post-deployment suicide risk by deployment characteristics and combat exposure (URI-R study sample)

	% reporting							
	Suicide risk	*No suicide risk*		*Simple r*	*Full model*		*Parsimonious model*	
Predictor variables	*n = 186*	*n = 4,102*	*z-test b/n row (%)*	*n = 4,289*	*Unstd B*	*Odds ratio*	*Unstd B*	*Odds ratio*
No. of deployments	6.24 or more	0.74 or more	3.17**	0.04**	0.25*	1.29	0.30**	1.35
Deployment length	13.9 ⩾ 1 year	8.1 ⩾ year	2.31*	0.02	0.03	1.03		
Time since return	16.7 > 6 mos	11.5 > 6 mos	1.90	0.02	0.20*	1.22	0.21*	1.24
Experienced trauma	50.0	18.6	8.45***	0.16**	1.55***	4.70		
Engaged in direct combat	30.8	19.3	3.33***	0.06**	–0.08	0.93	0.37*	1.44
Killed someone	12.0	4.2	3.22***	0.08**	0.55*	1.73	0.79**	2.20
Saw someone killed	54.4	47.9	1.72	0.03	–0.18	0.83	0.04	1.04
Had friend killed	18.1	14.7	1.17	0.02	–0.27	0.77		
Constant					–3.81***	0.22	–3.58***	0.03
Nagelkerke R^2					0.086		0.028	
χ^2 (df)					106.62 (8)***		35.14 (5)***	

Notes: The criterion variable, suicide risk, included soldiers who provided an affirmative response to any of the three suicide items – thoughts, plans, and attempts. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table V Main and buffering effects of social support on the relationship of stressors (cumulative and killed someone in combat) to suicidal behaviors

	URI/suicide risk		*URI-R/suicide risk*			
Criterion variable Predictor variable	*Unstb B (SE)*	*Odds ratio*	*Unstb B (SE)*	*Odds ratio*	*Unstb B (SE)*	*Odds ratio*
Cumulative risk	0.63 (0.08)***	1.88	0.65 (0.10)***	1.91	–	–
Killed someone	–	–	–	–	1.21 (0.45)**	3.35
Social support (main effect)	–2.18 (0.30)***	0.11	–2.07 (0.44)***	0.13	–2.17 (0.24)***	0.12
Interaction (buffering effect)	0.25 (0.10)*	1.28	0.41 (0.15)**	1.50	–0.48 (0.70)	0.62
Constant	–2.18 (0.27)		–3.17 (0.33)		–1.58 (0.17)	0.21
Nagelkerke R^2	0.29		0.30		0.09	
χ^2 (3)	1,482.12		425.82		111.75	
n	11,538		4,331		4,104	

Notes: The criterion variable, suicide risk, included soldiers who provided an affirmative response to any of the three suicide items – thoughts, plans, and attempts. Cumulative risk is sum of agreed responses to the URI survey items – 25, 26, 44, 48, 12, 16, 38, and 31; and corresponding URI-R survey items – 50, 51, 62, 65, 43, 46, 61, and 54. Social support was the combined positive responses to the survey items – work well with others, trust unit leaders with personal problem, and others available for support. The first two columns Unstd B-Odds ratio represent two separate logistic regression analyses, one for the URI sample and one for the URI-R, with the same predictor variables. The third column represents a separate logistic regression analysis for only the URI-R sample, which had survey items specific to combat exposure. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

4. Discussion

4.1 Suicide prevalence

The period prevalence of suicidal behaviors (in the last year) among soldiers in the present study samples was higher than those found in national and international populations. This finding may not be all that concerning. Military samples, due to their missions, are over-represented of the young in age and males, groups known to be at risk for suicide in the general population (Kessler *et al.*, 2005). Also, for some time now, the military has relied more on applicant self-reports and medical records and less on standardized measures to screen prospective recruits for behavioral health problems. It may be that in recent years, more soldiers have been recruited who have behavioral health conditions and who are more at risk for suicide than in past years. For example, Warner *et al.* (2007) reported higher rates of depression among soldiers in basic training compared to those observed in the civilian population, suggesting recruits may be entering military service with elevated risk for negative health outcomes. More recently, the recent STARRS study reported one-third of post-enlistment suicide attempts were associated with pre-enlistment mental disorders (Nock *et al.*, 2014). Also, among all soldiers who have visited Army medical treatment facilities, there has been an increase of mental health disorders, in particular, for adjustment disorders, from about 45 percent in 2005 to 80 percent in 2008 (Bachynski *et al.*, 2012). Surprisingly, the prevalence of suicidal behaviors in the present study was highest among the home station (URI) soldiers than the deployed soldiers (URI-R). This may have to do with selection. That is, to reduce any anticipated adjustment problems during deployment, soldiers may have been screened, informally or formally, for problem behaviors prior to deployment (Warner *et al.*, 2011). It may also be that some soldiers in the home station sample had been previously deployed (though this cannot be determined by the data source), and previous research has shown deployment-related behavioral health issues are more likely to emerge six months to a year or more later (Griffith, 2010).

4.2 Stressor-strain hypothesis

Findings here were consistent with the stressor-strain hypothesis. Stressful life events were associated with suicide risk, especially, personal feelings of loneliness, anger, and frustration, followed by interpersonal behavioral problems, such as aggressive behavior toward a significant other and having committed a crime. Findings were very similar in the two study survey samples, though for the deployed group, there was an added risk factor of having seen someone killed in combat. Evident, too, were the beneficial effects of feelings of cohesiveness, quality leaderships, and job satisfaction on suicidal behaviors. Soldiers reporting these events were less likely to report suicidal behaviors and social support lessened the cumulative effect of risk factors on

suicidal behaviors. Findings related to the increased risk for suicidal behaviors among soldiers who reported loss of a significant relationship further substantiate benefits of social support. These findings are in keeping with past military studies that have shown the importance of social support to soldier well-being – both as main effect (Dickestein *et al.*, 2010; Jones *et al.*, 2012) and a moderating effect (Mitchell *et al.*, 2012). Suicide risk factors identified in civilian populations also include personal distress and troubled interpersonal relationships, in addition to males, young in age. Additionally, the positive effects of social support, both as main effects and buffering effects are evident in civilian populations (Taylor, 2011). Given these findings, it seems that suicide risk in the military is not uniquely different from that observed in civilian populations. The higher prevalence of suicides in the military likely has to do with proportionally more individuals who have historically shown to be at risk for suicide, namely, young males.

4.3 Implications for practice

At present, lacking systematic assessments prior to entering military service, proportionally more soldiers with behavioral health conditions may now be serving (Bachynski *et al.*, 2012; Nock *et al.*, 2014; Warner *et al.*, 2007). Finally, it is likely that there are stressors unique to military service (e.g. having killed someone) that place individuals greater at risk for suicide, though this likely applies to a small group without completely understanding the underlying processes involved. Strong association of individual-level attributes with suicidal behaviors, such as age, gender, and race, suggest individual-level vulnerability to suicidal behaviors. This expectation is consistent with the stress/suicide vulnerability theory (Bryan, 2014; Nock *et al.*, 2013). Such vulnerabilities may include negative affectivity (one of the Big Five personality dimensions) and early childhood trauma to suicidal behaviors (Griffith, 2012c, 2014). Practically, such vulnerabilities in relation to what specific experiences could be determined, potentially describing which individuals are suited best to adapt to which environments. Future effort might include more deliberate screening soldiers and prospective recruits for suicidal behaviors. Questions to be asked and assessed consistently include recent thoughts of killing oneself, plans made, and attempts, perhaps given as a part of records review and the annual periodic health examination. Screening might also include the soldier's recent experiences of interpersonal difficulties and loss, and substance abuse, as these have been found to be co-occurring conditions of suicidal behaviors (Army Health Promotion, Risk Reduction, and Suicide Prevention Report, 2010). Such screening has been successfully done by Warner *et al.* (2011) who used the Predeployment Mental Health Screening Questionnaire, prior to deployment, to assess soldiers' at-risk for behavioral health problems.

Future effort might also deliberate actions to increase social support or adaptive coping strategies. Coping strategies for soldiers might include expanded programs, such as the Army's Master Resilience Training (Reivich *et al.*, 2011) which elaborates the cognitive behavioral methods of Beck (1967) and has been more recently loosely linked to PTSD, suicide, and related mental health conditions as possible preventive measures. To develop social support among unit members, the Army in the past has relied on personnel policies, such as common training and deployment (Griffith, 1989; Vaitkus and Griffith, 1990). More prominent now are the resilience programs intervening at the individual psychological level (e.g. behavioral cognitive training summarized above), though some resilience programs aim to build social resilience or group and community level support to the individual (Cacioppo *et al.*, 2011). The latter programs in combination with methods to enhance unit cohesion (Armfield, 1994) deserve further policy and program attention for strengthening unit members' support to the soldier. Constructs of individual vulnerability, such as these and others, and their underlying processes need to be further examined in future research. Their understanding would be useful in intervening for individuals most at risk for suicidal behaviors, through screening and identification, followed by appropriate referral and treatment.

4.4 Study limitations

Several limitations of the present study should be mentioned. One obvious limitation has to do with the data set not designed explicitly for the purposes of the present study. In addition, the quality of the data relied on the extent to which the respondent could recall and accurately report experiences, health risk behaviors, and physical and mental health. Last, the survey's guarantee of anonymity prevented collection of key information, such as age, gender, and race – often

associated with individual physical and mental well-being, and their consideration in analyses and in determining the representativeness of the sample. It should be noted that completion rates for soldiers in the participating units were high, and therefore, likely represented the units to which soldiers were assigned, and units in the study sample did show a similar distribution of unit types (i.e. combat arms, combat support, combat service support, and other) as that observed in the ARNG. Future research studies might seek improvements in each of these areas.

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Corresponding author

Dr James Griffith can be contacted at: jhgriffith@comcast.net