

Suicide Risk Among Soldiers

Early Findings From Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS)

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Modeled after the Framingham Heart Study, the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS) is designed to identify salient risk and protective factors regarding suicide,



Related articles pages 493, 504, and 514

adverse mental health outcomes, and functional impairment. This groundbreaking initiative is investigating a wide range of domains, from large administrative data sets to behavioral, neurobiological, and genetic markers. It will certainly have a great impact on the field of psychiatry.

The 3 articles¹⁻³ published in this issue of *JAMA Psychiatry* are only the beginning. Schoenbaum et al¹ report results from the Historical Administrative Data Study (HADS), which used the US Army and Department of Defense administrative data systems to study deaths by suicides or accidents among approximately a million Regular Army troops who served between 2004 and 2009. Notably, members of the more vulnerable National Guard and Army Reserve were not included.¹ Kessler et al² and Nock et al³ report findings from the All Army Study (AAS), a cross-sectional survey of 5428 active duty soldiers who also provided consent for administrative data linkage. The HADS suffers from the limitations of any administrative data set that can offer provocative findings and suggest intriguing hypothesis but cannot explore them in great depth. The AAS data were weighted because the data did not include information on deployed soldiers or those in basic training, and another 23.5% of soldiers could not complete the questionnaire owing to conflicting duty assignments. For the most part, the weighted data compared very well with the target population of all US Army personnel.

Rather than discuss each study separately, I will synthesize the information from all 3 studies.¹⁻³ To me, the most striking findings concern suicides among nondeployed soldiers and the effect of a pre-enlistment psychiatric disorder on suicidal behavior, psychiatric morbidity, and functional impairment. These findings have major implications for screening, assessment, recruitment, and retention of volunteers seeking military enlistment.

Deployment

The increase in suicide rates among soldiers was associated with being currently or previously deployed during the 6 years between 2004 and 2009, whereas the rate for accidents was inconsistent (and actually decreased among currently de-

ployed soldiers).¹ This finding differs from the recent Millennium Cohort Study (MCS),⁴ which found no association between deployment and suicide. The authors argue (and I agree with them) that important differences in design between the HADS and the MCS might account for this discrepancy. Specifically, the MCS was a study of all military services and, therefore, may have been underpowered to detect such a finding in its Army cohort; also, the MCS sample survey response rate was low, whereas the HADS findings are based on population rather than survey data. Deployment also predicts suicidal behavior in the AAS survey.³ The odds ratios for suicidal ideation, plan, and attempt are consistently elevated among soldiers who were ever deployed vs those who were never deployed and are highest for those who had 3 or more deployments. Furthermore, since two-thirds of AAS respondents had a history of deployment, it is noteworthy that the odds ratios for suicide behavior were significantly elevated among soldiers who experienced post-enlistment (and probably deployment-related) onset of major depressive disorder or intermittent explosive disorder.

Nondeployment

Whatever deployment-related factors may be contributing to Army suicides, it is only part of the story because soldiers who were never deployed also exhibited an elevated risk of suicide.¹ Given the limitations in the HADS administrative database, we must look at the survey (AAS) data to try to understand this finding. Kessler et al² report that many soldiers with pre-enlistment psychiatric disorders are being accepted for military service. This is especially true for externalizing disorders such as intermittent explosive disorder and attention-deficit/hyperactivity disorder. Soldiers with posttraumatic stress disorder (PTSD) were also more likely to have onset prior to enlistment. (Because PTSD has an externalizing phenotype,⁵ it appears that externalizing, rather than internalizing, disorders may require closer scrutiny.) Another notable finding is that most (61.5%) soldiers who report severe role impairment have at least 1 *DSM-IV* disorder. Finally, the population-attributable risk proportions of severe role impairment due to 30-day *DSM-IV* disorders are 21.7% for pre-enlistment, 24.3% for post-enlistment, and 43.4% for all 30-day disorders. So this article by Kessler et al² begins to help us understand psychiatric morbidity and the elevated risk of suicide risk among soldiers reported in the article by Schoenbaum et al¹ who were never deployed. Significant numbers of individuals

with preexisting mental disorders are being accepted for military service. Given that these are all volunteers, obvious questions should be answered concerning the reliability of the Army's procedures for identifying suitable applicants, the ease with which applicants can deny having a pre-enlistment psychiatric disorder, and what measures might be the best course of action when it is discovered, after enlistment, that a soldier who entered service has had a psychiatric disorder.

The article by Nock et al³ (with data from the AAS) analyzes the risk of military suicide with regard to pre-enlistment vs post-enlistment psychiatric history. Remarkably, nearly half of the soldiers with a history of lifetime suicide attempts reported that their first attempt occurred prior to enlistment. Because such a history, if known, would exclude an individual from military service, it is clear that this information was not disclosed at the time of recruitment. As has been shown previously in the National Comorbidity Survey-Replication, it is useful to separate suicidal ideation, plan, and attempt as separate outcomes.⁶ Pre-enlistment major depressive disorder and intermittent explosive disorder predict suicidal ideation but do not predict suicide planning or suicide attempts. Only post-enlistment intermittent explosive disorder predicts attempts among ideators. In general, these findings are consistent with civilian (National Comorbidity Survey-Replication) data showing that major depressive disorder predicts ideation but not attempts, whereas impulse control disorders, such as intermittent explosive disorder, predict attempts among ideators.⁶ Posttraumatic stress disorder, which predicts attempts in the National Comorbidity Survey-Replication, did not do so in the AAS; indeed, along with panic disorder, it had an inverse or nonsignificant association with suicidal outcomes among soldiers.

Other Risk Factors

The HADS data showing a higher risk of suicide for men, whites, and junior enlisted rank replicate previous results.⁶ However, new findings show that there is a disproportionate risk of suicide for women, for soldiers with low educational attainment, and for soldiers demoted in the past 2 years. Finally, marriage did not seem to be protective, as in other studies.³ Because unmarried soldiers had lower odds of suicide attempts, this may reflect the unique challenges of Army families during repetitive deployment cycles, as well as increased mental health problems among soldiers' families.⁷ Such information should guide monitoring and targeted prevention programs in the future.

Transition From Ideation to Attempt

In the AAS cohort,³ 80% of first attempts were planned. The proportions of soldiers who have suicidal ideation, who develop a plan, or who make an attempt are 21.0%, 9.0%, and 4.1%, respectively; 38.5% of ideators develop a plan, and 34% of ideators with a plan make an attempt, in contrast to 17% of ideators without a plan. Notably, transitions from ideation to plan and attempt are quite rapid; approximately 60% of transitions from ideation to plans, and from plans to attempts, occur within 1 year. The good news is that most Army suicides

are not spontaneous, impulsive acts, so detection and prevention is a reasonable goal. The caveat is that there may not be very much time to identify and successfully intervene with such suicidal soldiers.

Pre-Enlistment Factors and Accession Waivers

Army regulations exclude enlistment of applicants with a prior history of medical, psychiatric, or substance use problems, as well as those with a criminal record. When such information is waived, in order to permit enlistment, it is called an *accession waiver*. Given the aforementioned AAS data showing the association between pre-enlistment psychiatric disorder and severe role impairment,² it is reasonable to expect that receipt of an accession waiver might have been associated with increased suicide risk. Perhaps the most notorious precedent was during the Vietnam War, when Defense Secretary Robert McNamara lowered enlistment standards to increase recruitment (eg, "McNamara's 100,000"). Although very little rigorous research has been conducted on this group of soldiers, an Army hospital in Vietnam reported that members of this cohort were referred for psychiatric treatment 10 times as frequently as other troops.⁸ The AAS data regarding enlistment of many soldiers who would have been rejected had they been truthful about their prior psychiatric histories² raise many questions about the usefulness of the HADS data showing no association between receipt of accession waivers and suicidal behavior.¹ I believe that this issue deserves closer scrutiny in future Army STARRS analyses.

Deployment Length: Stop Loss Orders

Stop loss orders are involuntary extensions of a soldier's tour of duty during a deployment. Not infrequently, a soldier who had expected to return home within a few weeks discovered that his or her tour of duty had been extended for several more months. Given the dose-response relationship between number of deployments and psychiatric morbidity,⁹ the lack of an association between stop loss orders and suicide rates was surprising.¹ Missing from those analyses, as the authors acknowledge, is information on "dwell time," the period of time at home between deployments. Indeed, the ratio of deployment length to dwell time is thought to be a critical issue, and there is evidence that a longer dwell time may reduce the risk of mental health problems.¹⁰ Future studies of the Army STARRS cohort should take this into consideration.

Summing Up

1. A small minority of soldiers are responsible for a disproportionate amount of suicidal behavior. Better identification of and intervention with this cohort are likely to have the best payoff. Special programs need to be developed to address this problem.
2. A significant number of enlisted soldiers have not disclosed their pre-enlistment psychiatric problems and suicidal behavior. Indeed, pre-enlistment mental disorders are associated with one-third of post-enlistment first suicide attempts. Given the likelihood that applicants who do not disclose their prior psychiatric history will continue to

- be accepted into the Army, it is important to consider the best course of action when it is discovered, after enlistment, that a soldier who entered service has had (or still has) a psychiatric disorder.
- Externalizing disorders (probably including the externalizing PTSD phenotype) appear to be a bigger cause for concern than internalizing disorders with regard to suicidal behavior.
 - We need a better understanding of the environmental factors that are associated with suicidal behavior, especially among those at greatest risk. Given the high suicide rate among never-deployed soldiers, there is reason to hope that such factors, once identified, can be modified.
 - Fortifying the mental health and coping capacity of military families is an important goal, given the higher suicide risk among married vs never married soldiers.
 - Future studies need to include National Guard and Army Reservists who may be more vulnerable than Regular Army and who may have unique predictors of suicide risk. These are only the first articles to come from the groundbreaking Army STARRS initiative.¹⁻³ Future articles will hopefully provide finer-grained measurements and more in-depth analyses of the variables already mentioned, as well as new information on psychological, neurocognitive, social, biological, and genetic factors. They will also investigate the impact of intervention. It can be expected that our predictive algorithms will become more specific and sophisticated as such information is acquired. The current articles have already provided a very rich context and raise some important issues that were less apparent previously. Even without further data, we know enough to begin to consider better assessment, monitoring, and intervention strategies.

ARTICLE INFORMATION

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The Striatum and Dopamine A Crossroad of Risk for Schizophrenia

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Neurobiological phenotypes of schizophrenia can be strategically studied in unaffected relatives to parse out susceptibility phenotypes involved in core pathophysiological mechanisms from phenotypes reflecting consequences of the illness or its treatments. A prime example of this strategy is the work by Grimm et al¹ in the current issue of *JAMA Psychiatry*. The authors showed that unaffected relatives, like their affected counterparts, show a robust deficit in activation of the ventral striatum to anticipation of monetary outcome compared with healthy individuals. This finding strongly sug-

gests that deficient anticipatory activation in the striatum represents a functional phenotype of genetic susceptibility to schizophrenia. Supporting further the use of this phenotype for genetic research, Grimm et al went on to show that, within the healthy comparison group, carriers of a risk allele of the *NRG1* candidate gene for schizophrenia have relatively reduced activation of the ventral striatum to anticipation of monetary outcome compared with carriers of a protective allele.

This study presents important methodological highlights: (1) The use of a multisite design with careful coordination of methods across 3 sites, and the assessment of potential site effects is a nice example of how imaging studies should



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