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Medical-encounter mental health diagnoses, non-fatal injury and polypharmacy indicators of risk for accident death in the US Army enlisted soldiers, 2004–2009

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ABSTRACT

Accidents are a leading cause of deaths in U.S. active duty personnel. Understanding accident deaths during wartime could facilitate future operational planning and inform risk prevention efforts. This study expands prior research, identifying health risk factors associated with U.S. Army accident deaths during the Afghanistan and Iraq war.

Military records for 2004–2009 enlisted, active duty, Regular Army soldiers were analyzed using logistic regression modeling to identify mental health, injury, and polypharmacy (multiple narcotic and/or psychotropic medications) predictors of accident deaths for current, previously, and never deployed groups.

Deployed soldiers with anxiety diagnoses showed higher risk for accident deaths. Over half had anxiety diagnoses prior to being deployed, suggesting anticipatory anxiety or symptom recurrence may contribute to high risk. For previously deployed soldiers, traumatic brain injury (TBI) indicated higher risk. Two-thirds of these soldiers had first TBI medical-encounter while non-deployed, but mild, combat-related TBIs may have been undetected during deployments. Post-Traumatic Stress Disorder (PTSD) predicted higher risk for never deployed soldiers, as did polypharmacy which may relate to reasons for deployment ineligibility.

Health risk predictors for Army accident deaths are identified and potential practice and policy implications discussed. Further research could test for replicability and expand models to include unobserved factors or modifiable mechanisms related to high risk. PTSD predicted high risk among those never deployed, suggesting importance of identification, treatment, and prevention of non-combat traumatic events. Finally, risk predictors overlapped with those identified for suicides, suggesting effective intervention might reduce both types of deaths.

1. Introduction

One of the leading causes of U.S. young adult deaths are accidents (Center for Disease Control (CDC), National Center for Injury Prevention and Control, 2015). In U.S. active duty service members, where young adults comprise a large proportion of personnel, accidents cause more deaths than suicides and, in most years, combat fatalities (Defense Manpower Data Center (DMDC), Defense Casualty Analysis System (DCAS), 2011). Moreover, demographic risk factors for U.S. active duty Army accident deaths overlap with those identified in general population studies (Lewandowski-Romps et al., 2014). Identifying risk factors for accident deaths in active duty Army soldiers

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serving in Operations Enduring Freedom (OEF) and Iraqi Freedom (OIF), (Defense Manpower Data Center (DMDC), Defense Casualty Analysis System (DCAS), 2016) could facilitate future operational planning, and provide insights for targeting risk prevention efforts with military and civilian populations.

Military administrative data has been used to identify causes of, and soldier risk factors associated with, wartime unit attrition (Gilman et al., 2004). In a recent case-control analysis of administrative records for all U.S. Regular Army soldiers from 2004 to 2009, enlisted soldiers who were male, unmarried, in combat arms military occupation specialties (MOS), of lower rank/length of time in service, were rank demoted or had delayed rank progression were at higher risk for accident death (Lewandowski-Romps et al., 2014). High risk for never and previously deployed soldiers was also associated with a past-year medical encounter for any mental health diagnosis. The absence of this association in currently deployed soldiers could reflect a "healthy warrior effect" (soldiers with mental disorders are less likely to be deployed) (Larson et al., 2008) or absence of a mental health indicator with sufficient sensitivity and specificity to detect an association.

This investigation expands recent study risk models to include medical-encounter mental health diagnosis, non-fatal injury, and prescribed medication indicators associated with accident deaths in prior research.

1.1. Mental health diagnoses

In the general population, higher risk for accident death has been associated with medical-encounter diagnoses (inpatient and outpatient) of schizophrenia, bipolar disease, depression, anxiety, and alcohol/substance abuse disorders (Crump et al., 2013). In Army males on active duty from 1990 to 1998, higher risk was associated with prior hospitalization for alcohol and adjustment disorders (Garvey-Wilson et al., 2003). High rates of Army mental health-related hospitalizations observed during the OEF/OIF timeframe(Armed Forces Health Surveillance Center, 2013) could also reflect risk factors associated with wartime service demands.

Insomnia diagnoses increased for active duty Army soldiers from 2000 to 2009, (Armed Forces Health Surveillance Center, 2010) a time when military operational demands posed challenges for managing healthy sleep routines (Wasensten and Balkin, 2013). Poor sleep patterns (e.g., < 6 h of sleep per night) and sleep disorder sequelae (e.g., fatigue, inattention, slowed reaction time) have been linked to higher risk of accident death in the general population and pre-OEF/OIF serving, active duty Army males (Garvey-Wilson et al., 2003; Laugsand et al., 2014; Luyster et al., 2012). The current study considers whether soldier sleep disorders are also associated with higher risk for accident death during the Afghanistan and Iraq wars.

1.2. Non-fatal injuries

Prior hospitalization for non-fatal injury predicted accident death in Army males on active duty in the decade prior to OEF/OIF (Garvey-Wilson et al., 2003). A similar effect is even more likely in combat-exposed soldiers at risk of incurring multiple injuries, including TBIs (Sayer et al., 2014). Severe, combat-related TBIs and blast injury sequelae (e.g., chronic pain, impulsivity) are risk factors for soldier re-injury (The CDC, NIH, DoD, and VA Leadership Panel, 2013). Mild TBIs, (Defense Veterans Brain Injury Center, 2016) which are more common, can result in long- term neurocognitive, emotional and behavioral problems(The CDC, NIH, DoD, and VA Leadership Panel, 2013; Stein et al., 2013) that could heighten risk for accident death.

1.3. Polypharmacy

A growing challenge for medical practice in the general population is balancing clinical benefits against potential harms of prescribing multiple medications for comorbid conditions (Payne, 2016). Polypharmacy, in the form of prescribed combinations of painkillers and psychiatric medications, increased in the U.S. military during operations in Afghanistan and Iraq, as did soldier misuse of these medications (U.S. Headquarters, Department of the Army, 2012). Army deaths due to drug toxicity increased from 2006 to 2010, both accidental and whether accidental undetermined, with the number of deaths caused by one or more prescribed medications exceeding those caused by alcohol or illicit drugs (U.S. Headquarters, Department of the Army, 2012). Findings suggest soldiers prescribed multiple narcotic and/or psychotropic medications may be at higher risk of accident death.

The current study is the first to combine medical-encounter predictors previously associated with accident deaths in multivariate risk models for enlisted, U.S. Army active duty soldiers (excluding Army National Guard and Army Reserve) between 2004 and 2009. Identifying health risk predictors for accident deaths during wartime can help inform allocation of resources aimed to improve soldier retention and readiness, and provide insights into risk prevention for military and civilian populations. Associations between medical indicators and high risk for accident death are believed to be less likely for currently deployed soldiers because of Army health fitness standards required for deployment. Risk factors that may be common causes of accident deaths and suicides are also explored.

2. Methods

2.1. Sample

Army and Department of Defense (DoD) administrative data records for all enlisted, active duty, Regular Army soldiers between January 1, 2004 and December 31, 2009 were integrated from multiple source systems into analysis files for the Army STARRS HADS (Kessler et al., 2013). Enlisted soldiers include rank paygrades E1 through E9 and exclude non-commissioned, commissioned and warrant officers. Sociodemographic and Army service data came from the DoD Defense Manpower Data Center (DMDC) Master Personnel and Transaction Files (MPTF), and the DMDC Contingency Tracking System (CTS) provided OEF and OIF deployment data. The Armed Forces Medical Examiner Tracking System (AFMETS) and Defense Casualty Information Processing System (DCIPS) provided date and manner of death. Records drawn solely from the Transportation Command (TRANSCOM) Regulating and Command and Control Evacuation System (TRAC2ES, medical air evacuation records) comprised only a small proportion of medical-encounter data used in current analyses (e.g., < 1% of injury records). Inpatient and outpatient medical encounter records were largely from the Medical Data Repository (MDR) and Theater Medical Data Store (TMDS, encounters during deployment) source systems. Construction of HADS data files and secondary analyses of data reported here were approved by the IRBs of the University of Michigan and Uniform Services University of the Health Sciences (representing DoD).

2.2. Outcome measures and analysis units

A case-control framework was used to identify associations between accident death and risk predictors for the 2004–2009 observation period. Each "soldier-month" of service had a binary outcome (Y), with a "case"(Y = 1) defined as an accident death, arising from unintentional injury while on active military duty but unrelated to hostile action, of an enlisted soldier within that month (n = 1080; 405 never, 223 currently, and 452 previously deployed). A "control" (Y = 0) was an enlisted soldier-month in which no death occurred (n = 30,939,614; 12,510,450 never, 7,212,887 currently, and 11, 217,357 previously deployed). Without loss of generalization for the case-control analyses, a 1:400 random subsampling of control soldier-month observations was performed, resulting in just under 80,000 observations for the control