



## Original article

## Deployment, combat, and risk of multiple physical symptoms in the US military: a prospective cohort study



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## ABSTRACT

**Purpose:** Multiple physical symptoms (MPS) have historically been observed after deployment to a combat zone and are often disabling in nature. This study examined longitudinal trends in MPS status and its relationship to deployment in U.S. military service members.

**Methods:** Using longitudinal data from panel 1 participants in the Millennium Cohort Study ( $n = 76,924$ ), MPS status was assessed at three time points (2001–2008) using the 15-item Patient Health Questionnaire. Probability of reporting MPS was analyzed using mixed-effects multinomial logit regression, with time and deployment experience as main explanatory variables.

**Results:** After adjustment for demographic, military, and health characteristics, service members who deployed with combat were significantly more likely to report MPS at each time point compared with those not deployed (odds ratio [OR] and 95% confidence interval [CI] for wave 1 = 1.49 [1.47–1.52], wave 2 = 1.73 [1.69–1.78], wave 3 = 2.08 [2.03–2.12]), and those who deployed without combat (OR and CI for wave 1 = 2.66 [2.59–2.74], wave 2 = 1.81 [1.75–1.87]; wave 3 = 1.68 [1.63–1.74]).

**Conclusions:** Longitudinal trends indicate that the probability of reporting MPS has increased consistently over time only for those deployed, regardless of combat experience.

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Physical symptom complaints account for more than half of all outpatient encounters in general medical practice [1,2] and are associated with significantly higher health care utilization and costs [3,4], comorbidity [5,6], health status impairment and disability [7–9], and mortality [10]. As in civilian general practice, physical symptoms are commonly reported by patients seeking care in the U.S. Military Health System. According to 2012

surveillance of all active component service members, “symptoms, signs, and other ill-defined conditions” diagnoses represent a leading category for medical encounters and number of individuals affected [11,12]. Given the high occurrence in the Military Health System and the demonstrated relationship to negative health outcomes, physical symptoms represent an important health priority for the U.S. military to promote force fitness and retention.

Historically, multiple physical symptoms (MPS) have been observed after deployment to a combat zone, typically in constellations of poorly defined somatic complaints [13–16]. After the 1991 Gulf War, a significant proportion of service members reported unexplained postwar symptoms, characterized popularly as Gulf War syndrome and later described more rigorously as chronic multisymptom illness [17–20]. However, for reasons yet to be identified, the association between deployment and MPS has been inconsistent [21–27].

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After nearly 15 years of conflict in Iraq and Afghanistan, careful and systematic efforts to understand MPS and their relationship to deployment over time among military personnel are sparse. The purpose of this study was to examine the relationship of deployment and combat exposure to subsequent MPS in a longitudinal sample of active duty, Reserve, and National Guard personnel from all branches of the U.S. military.

**Methods**

*Study population*

The Millennium Cohort Study, the largest longitudinal military study, was launched in 2001 to assess the long-term health effects of military service [28,29]. The population for the present study included the first panel of participants (panel 1) of the Millennium Cohort Study, a probability-based sample of all U.S. military personnel serving as of October 2000, with oversampling for women, members of the Reserve or National Guard, and those who had previously deployed to Southwest Asia, Bosnia, or Kosovo. Data from the first three waves of Millennium Cohort data collection were used: wave 1 (July 2001–June 2003), wave 2 (June 2004–February 2006), and wave 3 (June 2007–December 2008).

*Primary outcome variable: MPS status*

MPS status was assessed using the 15-item Patient Health Questionnaire (PHQ; see Fig. 1) [30,31]. The first 13 items are rated on a 0 to 2 scale for the past month; the remaining two items, sleeping trouble and fatigue, are rated on a 0 to 3 scale for the past 2 weeks and were adapted to the 0 to 2 response scale using the validated approach of Kroenke et al. [31,32]. Using Millennium Cohort data, the Somatoform Disorders subscale (which composes 13 of the 15 items from the PHQ-15) was found to have satisfactory internal consistency (Cronbach’s  $\alpha = 0.76$ ) [33]. This method yields total scores ranging from 0 to 30 for women and 0 to 28 for men. In

the present study, we derived MPS status (positive or negative) based on a cut point score of  $\geq 10$ , which represents a moderate to high level of somatic symptom severity [31].

*Main explanatory variable: deployment group*

Deployment in support of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) was derived from Department of Defense personnel files obtained from the Defense Manpower Data Center and based on receiving imminent danger pay, hardship duty pay, or combat zone tax exclusion benefits. Participants were classified as having recent deployment if records indicated at least 1 day of deployment in support of OIF/OEF in the 3-year interval before each respective wave survey date. Among those deployed, combat-related experience was based on at least one affirmative response to questions about witnessing death, trauma, injuries, prisoners of war, or refugees in the last 3 years. The main explanatory deployment group variable classified individuals as (1) not deployed, (2) deployed without combat experience, or (3) deployed with combat experience. Deployment group was defined as a time-varying characteristic measured at each wave with an observation window of 3 years before the respective wave.

*Covariates*

Demographic and military-specific data were obtained at baseline from electronic personnel files maintained by the Defense Manpower Data Center and included sex, date of birth, race and/or ethnicity, military rank, service component, and service branch.

Depression was assessed as a time-dependent variable using the nine depression items of the PHQ [30,34] and a question that asked participants if they had ever (baseline) or in the last 3 years (wave 2 and 3) been diagnosed with depression by a health professional. The PHQ items were scored using an algorithm that corresponds to the *Diagnostic and Statistical Manual of Mental Disorders, fourth Edition* [35] depression diagnosis criteria. For each wave,

<b>During the last 4 weeks, how much have you been bothered by any of the following problems?</b>	<b>Not Bothered</b>	<b>Bothered a Little</b>	<b>Bothered a Lot</b>	
Stomach pain	○	○	○	
Back pain	○	○	○	
Pain in your arms, legs, or joints (knees, hips, etc.)	○	○	○	
Pain or problems during sexual intercourse	○	○	○	
Headaches	○	○	○	
Chest pain	○	○	○	
Dizziness	○	○	○	
Fainting spells	○	○	○	
Feeling your heart pound or race	○	○	○	
Shortness of breath	○	○	○	
Constipation, loose bowels, or diarrhea	○	○	○	
Nausea, gas, or indigestion	○	○	○	
<b>Women only:</b> Menstrual cramps or other problems with your periods	○	○	○	
<b>Over the last 2 weeks, how often have you been bothered by any of the following problems?</b>				
	<b>Not at all</b>	<b>Several Days</b>	<b>More than half the days</b>	<b>Nearly every day</b>
Trouble falling or staying asleep or sleeping too much	○	○	○	○
Feeling tired or having little energy	○	○	○	○

Fig. 1. Patient Health Questionnaire items on the Millennium Cohort Study survey.

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