



# The Millennium Cohort: a 21-Year Contribution to the Understanding of Military and Veterans' Health

Second Annual Trauma Stress Disorders Conference  
Natcher Auditorium, NIH

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**MOMRP**  
*Science to Soldier*

# Deployment Health Research



## Lessons learned from 1991 Gulf War

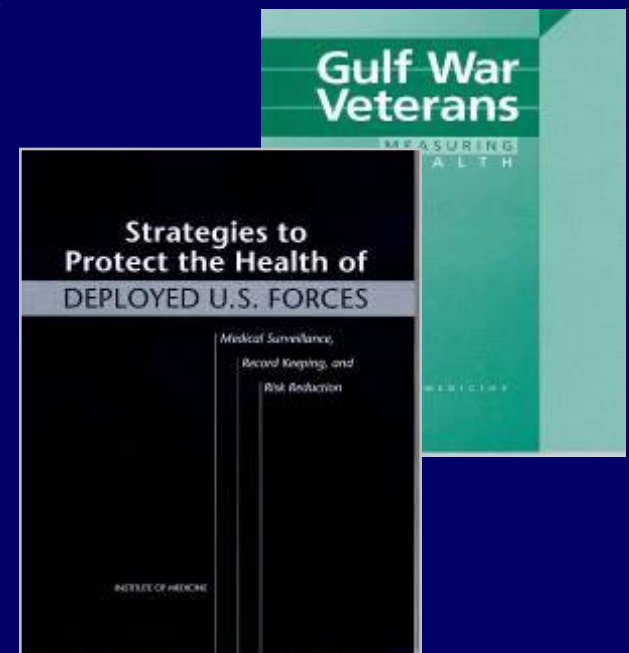


# The Origins of the Millennium Cohort Study



- IOM recommended coordinated prospective cohort study of service members
  - Capitalize on new DoD surveillance and health care data
  - Data sources that were not available at the time of the Gulf War
- For the first time, measure the impact of deployment prospectively

Section 743 of the FY1999 Strom Thurmond Act authorized the Secretary of Defense to establish a... ***longitudinal study*** to evaluate data on the health conditions of members of the Armed Forces upon their return from deployment.



# Background

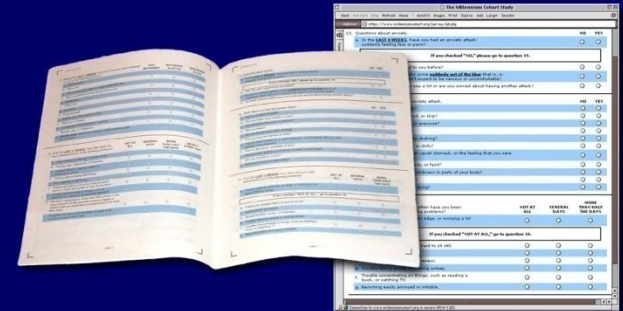


- **The Millennium Cohort Study is a longitudinal study designed to evaluate long-term subjective health and chronic diagnosed health problems, especially in relationship to exposures of military concern and deployments**
- **All services, active duty Reserve/National Guard**
- **Participants are re-surveyed at 3-year intervals including after service through 2022**
- **New accession cohorts were added in FY2004 and FY2007**
- **New accessions planned for FY2010, including a family component**

# Basic Methodology



- Survey refined based on focus group testing, pilot study, and expert review
- Questionnaire leverages standard instruments (PHQ, PCL, SF-36V, others)
- Includes measures of physical health, behavioral health, mental health
- Includes exposure questions, and other metrics (deployment, sleep, etc.)
- Participants respond via traditional paper, or over secure website





## **Current Status**

**2001: Study launched**

**77,047 enrolled in Panel 1 (Wave 1)**

**2004: Panel 1 follow-up and Panel 2 enrollment initiated**

**86,131 enrolled / followed-up**

**2007: Panel 1 and 2 follow-up; Panel 3 enrollment**

**~ 115,000 enrolled / followed-up**

**2010: Panel 1, 2, and 3 follow-up; Panel 4 enrollment**

**Follow-up on > 150,000**

- **> 70% with at least 1 follow-up**
- **~ 50% deployed in support of operations in Iraq and Afghanistan**
- **~ 20% have left military service**
- **> 30 peer-reviewed publications**
- **> 150 scientific presentations with many awards**





# PTSD and Depression

- **PTSD Checklist-Civilian Version (PCL-C)<sup>2</sup>**
  - 17-item self-report measure (Likert 1 to 5)
  - PTSD if moderate or above level of at least one intrusion symptom, three avoidance symptoms, and two hyperarousal symptoms
  - And a score of 50 or more (range 17 to 85)
  
- **PRIME-MD Patient Health Questionnaire (PHQ)<sup>1</sup>**
  - Psychosocial assessment based on scores of several health concepts
  - Major depressive syndrome (9 items)
  - Panic syndrome (15 items)
  - Other anxiety syndrome (6 items)
  - Eating disorders (4 items; binge and bulimia nervosa)

**Has your doctor or other health professional EVER told you that you have any of the following conditions?**

...

**PTSD**

**Depression**

...

(Spitzer, 1994; Spitzer, 1999; Spitzer, 2000)<sup>1</sup>, (Weathers, 1993; Blanchard, 1996)<sup>2</sup>



## Baseline PTSD Prevalence



- **At baseline, the weighted prevalence of PTSD was 3.6%**
  - **1.2% reported PTSD diagnosis without current symptoms**
  - **2.0% had PTSD symptoms without reported diagnosis**
  - **0.4% reported PTSD diagnosis with symptoms**
  
- **Those with PTSD at baseline were more likely to be:**
  - **Women**
  - **Less educated**
  - **Never married or divorced**
  - **Current smokers**
  - **Problem alcohol drinkers**

# Baseline PTSD Prevalence



	Millennium Cohort N = 74,947	PTSD diagnosis without current symptoms N = 951	No PTSD diagnosis with current PTSD symptoms N = 1,487	PTSD diagnosis with current PTSD symptoms N = 284
<b>Functional health</b>				
MCS, weighted mean (95% CI)	53.0 (52.9, 53.1)	48.5 (47.8, 49.3)	<b>27.4 (26.8, 28.1)</b>	<b>26.0 (24.5, 27.4)</b>
PCS, weighted mean (95% CI)	53.4 (53.2, 53.6)	50.0 (49.3, 50.7)	48.0 (47.3, 48.7)	43.2 (41.6, 44.9)

- **Those with PTSD symptoms (2.4%)**
  - Significantly less favorable PCS and MCS scores
- **Those with reported PTSD diagnosis without symptoms (1.2%)**
  - Lower scores but closer to overall Cohort means



## New-Onset PTSD

**New-onset PTSD symptoms or diagnosis, over the approximate 3 year period between baseline and follow-up, was identified in:**

**7.6% - 8.7% of those who deployed with combat**

**1.4% - 2.1% of those who deployed without combat**

**2.3% - 3.0% of those who did not deploy**

Smith TC, Ryan MAK, Wingard DL, Slymen DJ, Sallis JF, Kritz-Silverstein D, for the Millennium Cohort Study Team. New onset and persistent symptoms of posttraumatic stress disorder self-reported after deployment and combat exposures: prospective population-based US military cohort study. *British Medical Journal*. 2008 Feb;336(7640):366-71.



## Persistent PTSD

**Persistent PTSD symptoms or diagnosis, over the approximate 3 years between baseline and follow-up, was identified in:**

**43.5% - 47.9% of those who deployed with combat**

**22.4% - 26.2% of those who deployed without combat**

**45.9% - 47.6% of those who did not deploy**



Photo source: <http://www.defenselink.mil/multimedia>

# Prior Assault and New-Onset PTSD



- **New-onset PTSD symptoms or diagnosis among combat deployers was identified in:**

## **Women**

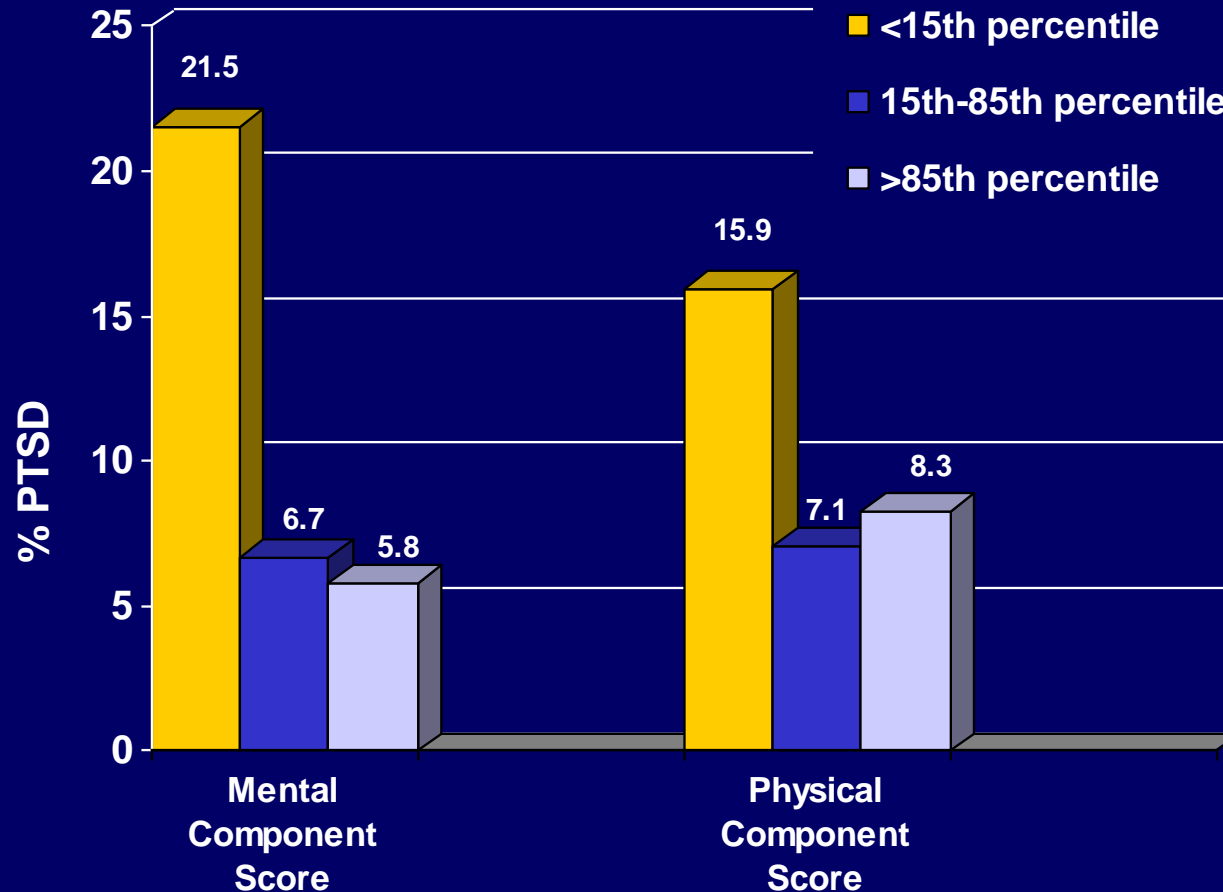
- \* **21.7% of women who reported prior assault**
- \* **10.1% of women who did not report prior assault**

## **Men**

- \* **12.4% of men who reported prior assault**
- \* **5.9% of men who did not report prior assault**

- **In contrast to hypotheses that survival from trauma represents or confers resilience, these findings suggest vulnerability to combat stress and PTSD among survivors of prior assault**

# Functional Health and PTSD Symptoms



LeardMann CA, Smith TC, Smith B, Wells TS, Ryan MAK, for the Millennium Cohort Study Team. Baseline self-reported functional health predicts vulnerability to posttraumatic stress disorder following combat deployment: prospective US military cohort study. *British Medical Journal*. 2009; 338:b1273.

# Positive and Negative Health Factors Associated with PTSD Symptoms



- **Vigorous physical activity was associated with decreased odds of new-onset and persistent PTSD symptoms**
- **Light/moderate exercise at follow-up was also associated with decreased odds of new-onset PTSD symptoms**
- **Those with new-onset PTSD symptoms experienced a 3-4 lb weight gain over those with no PTSD symptoms**
- **New-onset and persistent PTSD symptoms in nondeployed was associated with weight gain over those with resolved or no PTSD symptoms**
- **Herbal therapy and megavitamin use significantly more prevalent among participants with PTSD symptoms**

# PTSD or Any Mental Health Diagnosis Among Those with PTSD Symptoms



PTSD Symptoms*	Dx code from time of symptom at		
	1 year (%)	3 years (%)	5 years (%)
2001-2003 N = 1876			
PTSD dx (ICD-9-CM code 309.81)	2.3	4.8	6.7
Any mental health dx (codes 290-319x)	26.4	41.7	49.4

\*PTSD sensitive criteria among Panel 1 baseline participants

- A relatively small percentage received a PTSD-specific diagnosis through their care in the military health system within 5 years
- Nearly half received any mental health diagnosis within 5 years
- Among those with PTSD symptoms and subsequent PTSD diagnosis code
  - ~ 2/3 had persistent PTSD symptoms at 3-year follow-up
  - ~ 1/3 had resolved PTSD symptoms at 3-year follow-up



## Alcohol Problems



- **Factors most strongly predictive of alcohol problems included younger age, smoking, and prior alcohol problems**
- **Reserve/Guard with reported combat exposures at increased odds of heavy weekly drinking, binge drinking, and alcohol-related problems**
- **Results consistent between men and women**
- **Results consistent across service branches**

# Smoking



- **Deployment associated with an increase in smoking**
  - **Increase predominantly due to smoking reuptake rather than smoking initiation**
  - **Among past smokers, deployment with combat, deploying multiple times, and deployment >9 months increased risk of smoking reuptake**
  - **Among baseline smokers, deployment not associated with increased amount of smoking**





## New-Onset Depression

- **New-onset depression symptoms:**
  - **5.7% of men and 15.7% of women who deployed with combat**
  - **2.3% of men and 5.1% of women who deployed without combat**
  - **3.9% of men and 7.7% of women who did not deploy**
  - **Deployed men and women who reported combat exposures had a significantly increased risk for depression compared with nondeployed service members**
  - **In contrast, deployed men and women who did not report combat exposures were at significantly lower risk for depression than nondeployed men and women**

# Limitations of Presented Studies



- **Millennium Cohort is a random sample of the military population that may not be representative of all military personnel or those who deploy**
- **Those who were ill may have declined or participated in follow-up at different levels biasing new-onset estimates**
- **Self-reported exposure assessment is limited and not specific to deployment**
- **Use of a mental health screen as a surrogate for clinician diagnosis is imperfect**

# Strengths of Presented Studies



- **71% follow-up**
- **Prospective investigations of specific characteristics and select populations possible from a large population-based sample of all services and components**
- **Preliminary findings investigating follow-up non-response did not find significant differences in measures of effect for PTSD after adjusting for non-response**
- **Self-reported mental health symptoms may be a better representation of symptom prevalence than diagnoses in medical databases**

## Conclusions



- **Combat exposures, rather than deployment itself, significantly affect onset of mental health symptoms, problem alcohol drinking, and cigarette smoking post-deployment**
- **Significant amount of newly reported smoking and problem drinking associated with newly reported mental health symptoms post-combat deployment**
- **Specific populations including those with poor mental and/or physical health, and prior stressful life events could be targeted for PTSD prevention programs**

# Acknowledgments



## Millennium Cohort Study Team, San Diego

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# MILLENNIUM COHORT STUDY



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