NAVAL HEALTH RESEARCH CENTER

The Millennium Cohort Study: Respiratory Health Research

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The study protocol was approved by the Naval Health Research Center Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects. Research data were derived from an approved Naval Health Research Center, Institutional Review Board protocol number NHRC.2000.0007.

Study Origin

- 1998: Department of Defense (DoD), Armed Forces Epidemiological Board, Department of Veterans Affairs (VA), and Institute of Medicine recommended a coordinated prospective longitudinal cohort study of service members
  - Newly available DoD surveillance and electronic health care data

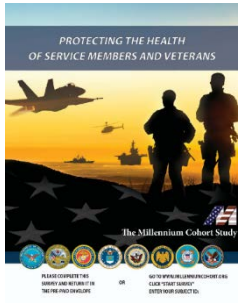
- 1999 National Defense Authorization Act
  - Sect. 743: Establish “a longitudinal study to evaluate data on the health conditions of members of the armed forces upon their return from deployment”
  - NHRC designated as the DoD Center for Deployment Health Research

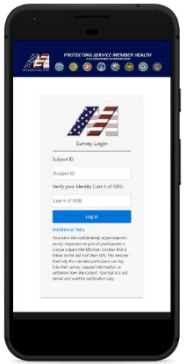
Study Objective and Methodology

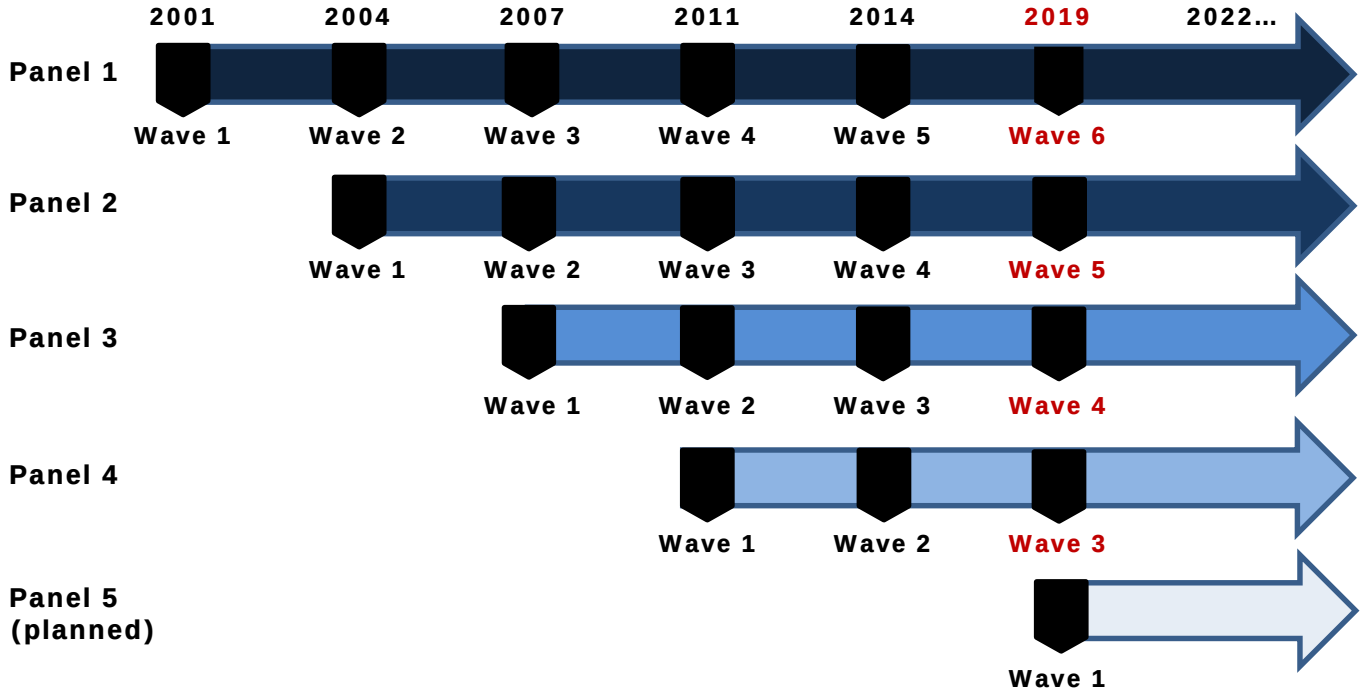
Prospectively determine the impacts of military deployments, experiences, and exposures on the long-term health of Service members and Veterans

Multiple-panel cohort study of all Services and Components (n=201,620)	
Enrollment Panels: 2001, 2004, 2007, 2011	Follow-up every 3-5 years through 2068
Participants complete paper or online surveys	Mental and physical health outcomes, health behaviors, military exposures and other experiences (combat, deployment, sexual trauma)
Linkage with multiple enterprise military and medical databases	

Multiple-Panel Design







Enrollment Panels (N = 201,620)

Panel (Group)	Enrollment Dates	Years of Service at Enrollment	Oversampled Groups	Roster Size (Date)	Total Contacted	Total Enrolled (%)
1	Jul 2001–Jun 2003	Unrestricted	Females Reserves/Guard Prior deployers*	256,400 (Oct 2000)	214,388	77,019 (36%)
2	Jun 2004–Feb 2006	1–2	Females Marine Corps	150,000 (Oct 2003)	123,001	31,110 (25%)
3	Jun 2007–Dec 2008	1–3	Females Marine Corps	200,000 (Oct 2006)	154,270	43,439 (28%)
4	Apr 2011–Apr 2013	2–5	Females Married	250,000 (Oct 2010)	247,266	50,052 (20%)

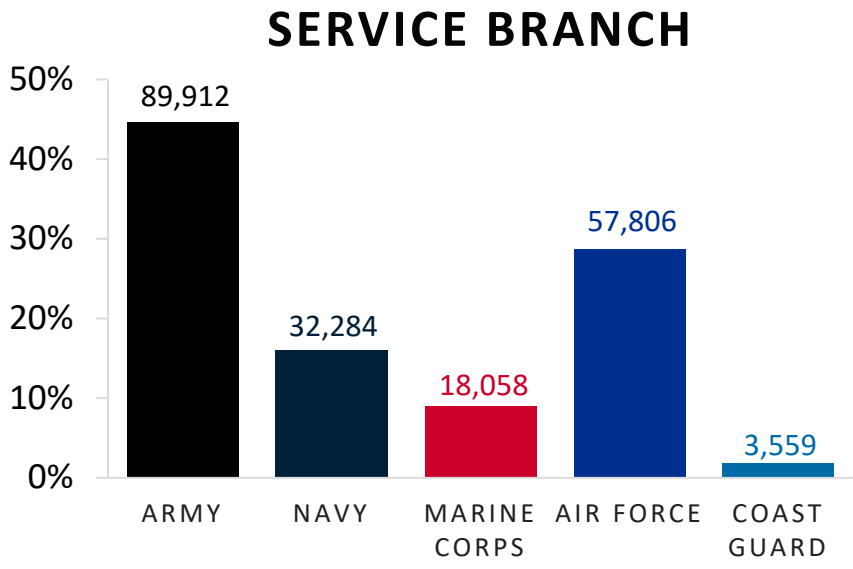
*Deployment to Southwest Asia, Bosnia, and/or Kosovo after August 1997.

Cohort Profile (N = 201,620)

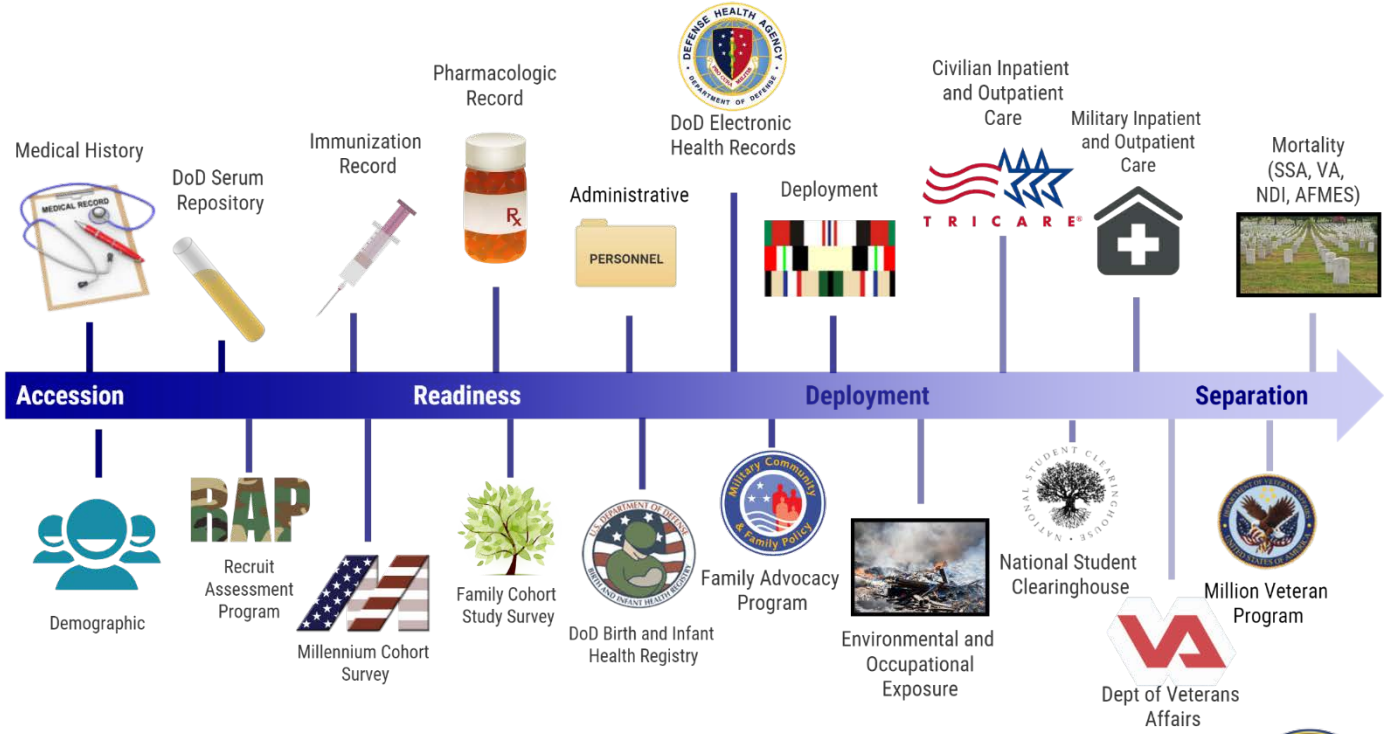
Baseline Characteristics	%
Female	31
Non-Hispanic White	70
Enlisted	83
Active component	67

Current Status	%
Ever deployed	65
Separated	71
Deceased	1.2

Mean Age (SD)		
Panel	Enrollment	2019
1	35 (9)	52 (9)
2-4	25 (5)	36 (5)



Complementary Data

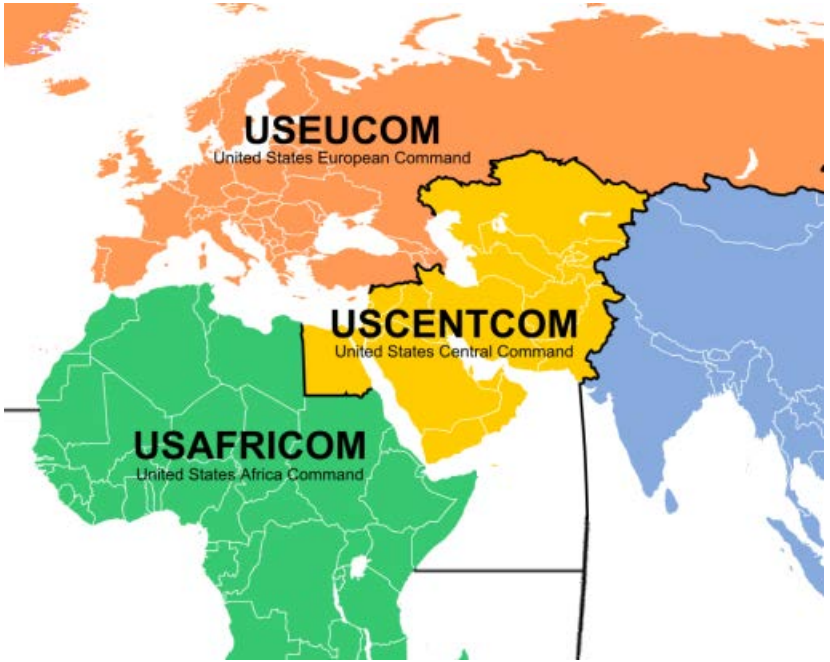


Respiratory Outcomes

- Self-reported physician-diagnosed
  - Asthma
  - Chronic bronchitis
  - Emphysema
- Baseline: “Has your doctor or other health care professional ever told you that you have [condition]?”
- Follow-up: “In the last 3 years, has your doctor or other health care professional told you that you have [condition]?”
- Also assessed persistent or recurring cough or shortness of breath

Deployment Status

- Contingency Tracking System
  - Country of deployment
  - In- and out-of-theater dates
  - Maintained by Defense Manpower Data Center (DMDC)
- CLASSIFIED: Within-country deployment locations



Post-Deployment Respiratory Outcomes (2001-2006)

Adjusted Odds Ratios (AORs) of Self-Reported New-Onset Respiratory Outcomes, Deployers vs. Non-Deployers

	Respiratory symptoms* AOR (95% CI)	Chronic bronchitis or emphysema AOR (95% CI)	Asthma AOR (95% CI)
Service branch (n)			
Army (18,045)	1.73 (1.57–1.91)	1.25 (0.94–1.67)	1.06 (0.77–1.44)
Air Force (12,029)	1.09 (0.95–1.26)	0.93 (0.59–1.47)	1.04 (0.68–1.60)
Navy/Coast Guard (7,240)	1.06 (0.86–1.32)	0.79 (0.42–1.46)	0.90 (0.49–1.65)
Marine Corps (1,679)	1.49 (1.06–2.08)	0.94 (0.24–3.75)	0.56 (0.15–1.98)

Smith et al. *Am J Epidemiol*. 2009.
CI, confidence interval.

Combat Exposure

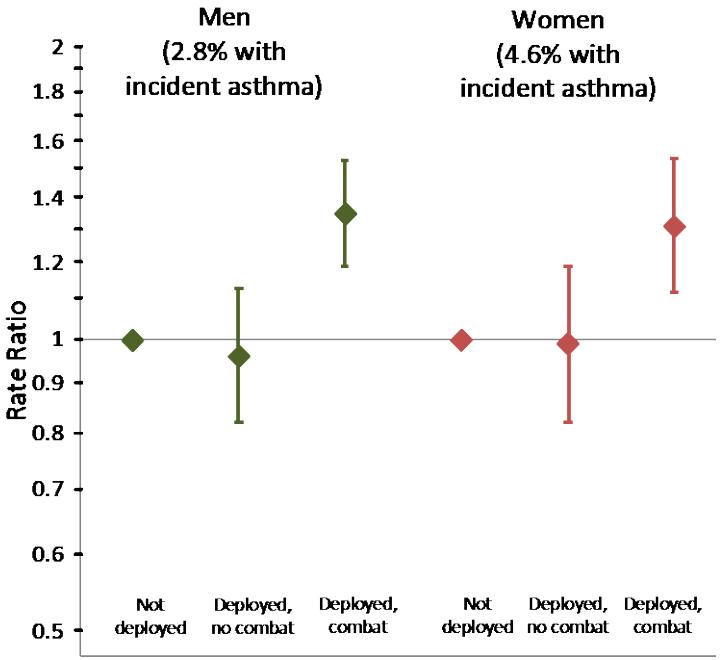
- Participants were asked if they had been personally exposed to (in the last 3 years):
  - Witnessing a person's death due to war, disaster, or tragic event
  - Witnessing physical abuse (torture, beating, or rape)
  - Dead and/or decomposing bodies
  - Maimed soldiers or civilians
  - Prisoners of war or refugees

- Note: Surveys included 13-item combat measure on 2007 survey

Combat Deployment and Incident Asthma Risk

- N = 75,770
- Incident cases ascertained through 2013

- Among deployers, no association between asthma risk and multiple deployments and deployment duration



Rivera AC, et al. Am J Epidemiol. 2018. PMID: 29893775

Burn Pit Proximity and Respiratory Health

- 2010: Office of the Assistant Secretary of Defense for Health Affairs requested MilCo Study to examine whether exposure to burn pit smoke was associated with long-term respiratory outcomes
- DMDC identified personnel deployed within 3 and 5 miles of 3 documented burn pits in Iraq between 2003–2008
  - Joint Base Balad, Camp Taji, Camp Speicher
  - MilCo Panels 1–2, Army or Air Force:
    - Approx. 22,300 deployed
    - Approx. 3,500 deployed within 3 miles of burn pit site
- Final report: No associations with incident asthma, chronic bronchitis or emphysema, or respiratory symptoms

Smith et al. *J Occup Environ Med*. 2012.

Burn Pit Proximity and Respiratory Health

- Government Accountability Office reports
  - 2016 (GAO-16-781): DoD has yet to comprehensively assess the health effects of burn pit exposures
  - 2018 (GAO-18-596T): Improved monitoring of burn pit emissions and examination of health effects related to burn pit exposure
- 2017: ASD(HA) requested updated analysis with extended follow-up
  - Additional follow-up surveys conducted: 2011–2012, 2014–2016
  - Exposure period: July 2003–April 2009
  - Briefed to ASD(HA) and presented at Military Health System Research Symposium abstract submitted, manuscript in preparation

Current Projects

- Deployment, comorbidities, and long-term respiratory health (USU-led, manuscript in preparation)
- Deployment and risk of chronic obstructive pulmonary disease (analyses underway)
- Exertional dyspnea among active duty personnel (analyses underway)
- Molecular indicators of burn pit exposure (protocol pending)

Burn Pit Biomarkers Study

- Defense Health Program-funded study
  - Co-PI: Dr. Aarti Gautam, Integrative Systems Biology Program, WRAIR
- Longitudinal analysis of serum collected pre- and post-deployment in relation to burn pit proximity

miRNA expression (epigenetic changes)
Metabolites of incomplete combustion byproducts • Polycyclic aromatic hydrocarbons (PAHs) • Polychlorinated dibenzo**dioxins**/furans (PCDD/Fs)

- Examine associations between burn pit proximity, exposure biomarkers, tobacco use (self-reported, serum cotinine), and adverse respiratory outcomes

Considerations and Future Directions

- Analyses relied on self-reported outcomes
  - Military medical records only cover active duty and activated reservist service time
  - VA medical records will be linked to survey data
- Anticipated release of DoD/VA Individual Longitudinal Exposure Record (ILER)
  - Pending declassification of OIF/OEF deployment locations/dates
- Focus on specific occupations
- Focus on smoking as a potential effect modifier of deployment-related environmental exposures
- 2019 survey will include items on frequency and severity of asthma symptoms

Questions?

www.millenniumcohort.org

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