The Millennium Cohort Program

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This work was supported by the Military Operational Medicine Research Program, the Defense Health Program, and the Department of Veterans Affairs under work unit no. 60002. The views expressed in this research are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

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.
Millennium Cohort Program

• Millennium Cohort Study
  – Largest population-based prospective health study in US military history
  – Over 200,000 military personnel from all services and components enrolled since 2001

• Millennium Cohort Family Study
  – Only ongoing long-term study of military spouses
  – Only DoD-wide study of family health and well-being
Study Origin

If I had to make one other suggestion in terms of future follow-up studies, a **longitudinal study** to look to see what happens to those individuals over time is critical, because all we have done is...taken a snapshot of the population.

We know what is going on with them 5 years after the Gulf War. We don't know how that is going to **change over a period of time and how that is going to impact on their lives.**

— Testimony from Dr. David Schwartz
House Committee on Government Reform and Oversight (1997)
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

  - Sect. 743: Establish “a longitudinal study to evaluate data on the health conditions of members of the armed forces upon their return from deployment”
Millennium Cohort Study

• Largest and longest running cohort study in military history
  – Initiated July 2001

• Representative sample
  – All Services
  – All Components (Active, Reserve, National Guard)
## Study Objective and Methodology

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

<table>
<thead>
<tr>
<th>Enrollment panels:</th>
<th>Surveys completed every 3-5 years, even after leaving military service, through 2068</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linkage with multiple enterprise military and medical databases</td>
</tr>
</tbody>
</table>
## Enrollment Panels

\(N = 201,620\)

<table>
<thead>
<tr>
<th>Panel (Group)</th>
<th>Enrollment Dates</th>
<th>Years of Service at Enrollment</th>
<th>Oversampled Groups</th>
<th>Roster Size (Date)</th>
<th>Total Contacted</th>
<th>Total Enrolled (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Jun 2004–Feb 2006</td>
<td>1–2</td>
<td>Women Marine Corps</td>
<td>150,000 (Oct 2003)</td>
<td>123,001</td>
<td>31,110 (25%)</td>
</tr>
<tr>
<td>3</td>
<td>Jun 2007–Dec 2008</td>
<td>1–3</td>
<td>Women Marine Corps</td>
<td>200,000 (Oct 2006)</td>
<td>154,270</td>
<td>43,439 (28%)</td>
</tr>
<tr>
<td>4</td>
<td>Apr 2011–Apr 2013</td>
<td>2–5</td>
<td>Women Married</td>
<td>250,000 (Oct 2010)</td>
<td>247,266</td>
<td>50,052 (20%)</td>
</tr>
<tr>
<td>5</td>
<td>Sep 2020–Jun 2021</td>
<td>1–5</td>
<td>Women Married</td>
<td>500,000 (Jun 2020)</td>
<td>~500,000</td>
<td>TBD</td>
</tr>
</tbody>
</table>

*Deployment to Southwest Asia, Bosnia, and/or Kosovo after August 1997.
Cohort Profile (Panels 1-4)

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)

SERVICE BRANCH

<table>
<thead>
<tr>
<th>Branch</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARMY</td>
<td>89,912</td>
</tr>
<tr>
<td>NAVY</td>
<td>32,284</td>
</tr>
<tr>
<td>MARINE CORPS</td>
<td>18,058</td>
</tr>
<tr>
<td>AIR FORCE</td>
<td>57,806</td>
</tr>
<tr>
<td>COAST GUARD</td>
<td>3,559</td>
</tr>
</tbody>
</table>
**Participants by Age, 2019**

**Health Concerns by Age**

- Quality of Life (Injury Resilience)
- Family/Relationship Stability
- Sleep Quality
- Healthy Aging
- Senescence
- Behavioral/Mental Health (PTSD, Depression, Anxiety, Suicide, Substance Abuse, Disordered Eating)
- Cardiometabolic Disorders (Obesity, Diabetes, Hypertension, Heart Disease, Stroke, Kidney Failure)
- Respiratory Conditions (Exertional Dyspnea, Asthma, COPD (Emphysema/Chronic Bronchitis))
- Reproductive Health and Fertility Issues
- Cancer (Lung, Prostate, Breast, Skin, Colorectal, Brain, Leukemia/Lymphoma)
- Musculoskeletal Conditions (Osteoarthritis, Muscle/Tendon Strain, Carpal Tunnel)
- Autoimmune Disorders (Multiple Sclerosis, Lupus, Crohn’s, Rheumatoid Arthritis)
- Sensory Impairment (Vision, Hearing Loss, Dual)
- Neurodegeneration (Parkinson’s, Alzheimer’s)
Study Participants
# Standardized Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Form 36</td>
<td>Physical, mental, functional health</td>
</tr>
<tr>
<td>Patient Health Questionnaire</td>
<td>Depression, anxiety, panic syndromes, binge eating, alcohol-relation problems</td>
</tr>
<tr>
<td>PTSD Checklist–Civilian Version</td>
<td>Posttraumatic stress disorder</td>
</tr>
<tr>
<td>Posttraumatic Growth Inventory</td>
<td>Posttraumatic growth</td>
</tr>
<tr>
<td>CAGE</td>
<td>Alcohol problems</td>
</tr>
<tr>
<td>Department of Veterans Affairs Gulf War Survey</td>
<td>Specific war-time exposures (i.e., depleted uranium, chemical or biological warfare agents)</td>
</tr>
<tr>
<td>Deployment Risk and Resilience Inventory</td>
<td>Military and unit support</td>
</tr>
<tr>
<td>Insomnia Severity Index</td>
<td>Sleep</td>
</tr>
<tr>
<td>Adverse Childhood Experiences</td>
<td>Childhood trauma</td>
</tr>
</tbody>
</table>
Complementary Data
Contribution to a Healthy and Fit Force

Individual
- Life experiences
- Demographics

Military Service
- Component
- Service branch
- Rank
- Occupation

Exposures
- Occupational
- Environmental
- Deployment

Health-related Behaviors
- Diet and body weight
- Physical activity
- Tobacco/alcohol use
- Sleep
- CAM/supplement use

Social Factors
- Social support
- Military climate
- Family

Resilience & Vulnerability Factors

Health Outcomes
- Physical
- Cardiovascular
- Musculoskeletal
- Autoimmune
- Cancer
- Neurological
- Non-battle injury
- Metabolic
- Respiratory
- Infectious

Service-related Outcomes
- Return to duty
- Employability
- Disability
- Combat-related morbidity
- VA/DoD health care utilization
- Reasons for separation

Prevention strategies
Field/intervention studies
Clinical practices
Training
Policy
Veterans Health: Research Priorities

- Identification of factors that predict successful or unsuccessful transitions from the military
  - Post-service economic well-being
  - Homelessness
  - Health care access and utilization
Veterans Health: Research Priorities

• Post-deployment health concerns
  – Diseases with long latency periods (cancer, dementia)
  – Gulf War illness/Chronic multisymptom illness

• Linkage with VA medical and benefits data

• Coordination with
  – VA Cooperative Studies Program #505
    • Parallel VA research program for conducting research responsive to Veterans and VA concerns
  – VA Office of Patient Care Services, Post-Deployment Health
  – VA Office of Research and Development
VA-MilCo Collaborative Projects

• Risk factors for homelessness among Veterans
• Chronic multisymptom illness and mental health symptoms
• Probable PTSD and care seeking by VHA enrollment status
• Comparison of health measures between survey self-reports and electronic health records among MilCo participants receiving VA care
• Mental health disorders among rural vs urban Veterans
• Mortality among MilCo participants, 2001-2018
Millennium Cohort Family Study

• Objectives
  – Determine the long-term association between military experiences—particularly combat deployment—and the health and well-being of service members and their families
  – Provide strategic evidence-based policy recommendations that inform leadership and guide interventions

• PI: Valerie Stander, PhD
Methodology

• Recruit spouses of service members enrolled in the Millennium Cohort Study
  – Follow-up surveys every ~3 years

• Develop a comprehensive database including self-report and archival data from service members and spouses (i.e., dyads)

<table>
<thead>
<tr>
<th>Panel</th>
<th>Enrollment Dates</th>
<th>Total Contacted</th>
<th>Total Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apr 2011–Apr 2013</td>
<td>28,603</td>
<td>9,872 (35%)</td>
</tr>
<tr>
<td>2</td>
<td>Fall 2020</td>
<td>185,000</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Questions?

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Valerie Stander, PhD
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www.familycohort.org
CSP #505: Millennium Cohort Study

Edward J. Boyko, MD, MPH
VA Puget Sound Health Care System
Seattle WA
• I have been involved starting with planning in 1999

• The study was designed with the plan to follow-up participants using VA health care data after separation from the military
  – VA can provide objectively measured health outcomes and other information in addition to survey self-report

• VA Research leadership support
  – VA Cooperative Studies Program for research staff in Seattle
  – VA Research & Development and Post-Deployment Health Service provide support for Veteran focused research conducted at Naval Health Research Center
How Do We Follow-Up Millennium Cohort Participants Using VA Records and Data?

By sharing data

DOD/VA PARTNERSHIP
Data Sharing Agreement

Approval was received from both DoD and VA in late 2018.

Identifiers sent securely from NHRC to VA Puget Sound for matching.

Bilateral Millennium Cohort participant data sharing between these two agencies.

Millennium Cohort participant identifiers matched to VA care facility encounters nationally.
Capturing VA Utilization

- Of the 141,133 Millennium Cohort Study participants who have separated from military service, approximately 95% (134,687) have a VHA record.
# Millennium Cohort Study - VA Top 10 Outpatient Diagnoses

## ICD-9 (before Oct 1 2015)

<table>
<thead>
<tr>
<th>Dx Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>30981</td>
<td>Prolonged PTSD</td>
</tr>
<tr>
<td>V6549</td>
<td>Other specified counseling</td>
</tr>
<tr>
<td>V6540</td>
<td>Other unspecified counseling</td>
</tr>
<tr>
<td>311</td>
<td>Depressive disorder, not elsewhere classified</td>
</tr>
<tr>
<td>7242</td>
<td>Lumbago</td>
</tr>
<tr>
<td>V571</td>
<td>Care involving other physical therapy</td>
</tr>
<tr>
<td>V703</td>
<td>Other general medical examination for administrative purposes</td>
</tr>
<tr>
<td>4019</td>
<td>Essential Hypertension</td>
</tr>
<tr>
<td>30000</td>
<td>Anxiety state, unspecified</td>
</tr>
<tr>
<td>V6810</td>
<td>Disability examination</td>
</tr>
</tbody>
</table>

## ICD-10 (October 1 2015 or later)

<table>
<thead>
<tr>
<th>Dx Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4312</td>
<td>PTSD, chronic</td>
</tr>
<tr>
<td>Z7189</td>
<td>Other specified counseling</td>
</tr>
<tr>
<td>F4310</td>
<td>PTSD, unspecified</td>
</tr>
<tr>
<td>Z719</td>
<td>Counseling, unspecified</td>
</tr>
<tr>
<td>M545</td>
<td>Low back pain</td>
</tr>
<tr>
<td>Z0289</td>
<td>Encounter for other administrative examinations</td>
</tr>
<tr>
<td>F331</td>
<td>Major depressive disorder, recurrent, moderate</td>
</tr>
<tr>
<td>I10</td>
<td>Essential (primary) hypertension</td>
</tr>
<tr>
<td>G4733</td>
<td>Obstructive sleep apnea (adult) (pediatric)</td>
</tr>
<tr>
<td>F419</td>
<td>Anxiety disorder, unspecified</td>
</tr>
</tbody>
</table>
Millennium Cohort Study - VA Outpatient Encounters

MILCO Cohort Outpatient Utilizations
Count of Encounter with Diagnoses

Number of Principle Diagnosis

Fiscal Year

OE
OEWI
Millennium Cohort Study - VA Inpatient Discharges
Capturing Veteran Benefits Administration Disability Data

Unique Person Count by Combined % Service Connection
Source: VetsNet, run June 10th, 2020

![Bar Chart showing unique person count by combined % service connection]
The merging of Millennium Cohort Study participants with VA data was only recently initiated.

Over time, more VA data will be matched to Millennium Cohort Study participants including information on:

- Service-connected conditions
- Pharmacy prescription fills
- Laboratory results
- Other diagnostic and illness severity information
Impact of DoD/VA Data Sharing

• Improve ability to validate survey information obtained from Millennium Cohort Study protocol using objective VA data

• Expand the types of health outcomes we can identify in relation to military service beyond what is available in the Millennium Cohort survey that is conducted every 3-5 years

• Enhance the ability of Millennium Cohort Study to assess long-term health effects of military service
• VHA inpatient and outpatient data have been transmitted to DoD colleagues at Naval Health Research Center
• Veteran focused research on this merged data must be conducted at NHRC by analysts working there
  – Several Veteran focused research projects are underway
  – Two grant applications have been submitted by VA investigators to study melanoma and Parkinson’s Disease risk factors
• Approval has been granted for transfer of Millennium Cohort data to VA CSP #505
• Plans are underway to make these data available for analysis within the VA firewall
  – Data will reside on VINCI
  – Data resource guide and dictionary are being developed
  – Information and instructions for access are now available on the INVESTD-R website and will be updated as needed
Future Plans as a Resource for VA Investigators

- Stay tuned to the HSR&D cyberseminar series for future updates on Millennium Cohort Research
- Plans include presentations on:
  - Women’s Health research in Dec 2020
  - Millennium Cohort Family Study and DoD Birth and Infant Health Registry in early 2021
  - Practical guidance on proposing and accessing Millennium Cohort data inside the VA firewall for approved research after data are successfully transferred to VA in hopefully early 2021
THANK YOU!
Millennium Cohort Study (CSP #505): A VA / DoD Collaboration

Aaron I. Schneiderman, PhD MPH RN
Post Deployment Health Services
Washington, DC
The views and opinions expressed in this presentation are those of the author. The contents do not represent the views of the U.S. Department of Veterans Affairs or the United States Government.
Visual Pause
Why Does it Matter?

• MilCo Study and Family Study represent tremendous resources for researchers
  – Data collections include significant detail and depth across domains of health, risk factors and other covariates
  – Large sample sizes
  – Longitudinal & cross-sectional analytical opportunities
  – Family Study provides the ability to understand effects of military service and veteran experience in the context of the family unit through dyadic analysis
Why Does it Matter?

CSP 505 is a VA DoD Interagency Partnership

- Partnership across agencies represents
  - “Whole of Government” approach
  - Maximizes the significant investment
  - Serves policy needs and increases generalizable knowledge
  - Brings strength of research to understanding the Veteran Journey
How Did We Get Here?

- A new initiative, but a collaboration with a long history
- Very few principals remain from the very start
  - Dr. Boyko’s patience paid off
  - Collaboration continued but not on the intended scale

What happened?
- Changes in the Data Security Landscape
- ORD and PDHS renewed the partnership with MilCo
- Funding for CSP 505
- Development of an Interagency Agreement (IAA)
- Development of the Data Use Agreement (DUA)
Policy Implications

- MilCo has supported DoD force health and readiness providing background and support to congressional testimony, legislation, clinical practice guidelines and DoD policy
  - Sexual Assault
  - Suicide
  - Chronic Multisymptom Illness /Physical Symptoms
  - Substance Abuse
  - Sleep and Resilience/Readiness
  - Mental Health/Traumatic Brain Injury
  - Women’s Health in the Military
  - Environmental Health/Pulmonary Health
  - Health Promotion/Disease Prevention
• Current collaborations
  – Risk factors for homelessness
  – Chronic multisymptom illness / Mental health symptoms
  – Health care access
  – Urban vs rural differences in mental health
  – Million Veteran Program co-enrollment

• There is opportunity for growth!
  – Veteran survey module (methodological considerations)
  – Cancer ascertainment (Virtual Pooled Registry)
  – New panel 5 enrollment (multigenerational cohort a possibility)
Where Are We?

- Introducing this collaboration
  - Additional webinars planned
- Currently merged data analysis conducted at Naval Health Research Center
- Goal: is merged data available to VA researchers
- Now: Developing knowledge tools to support investigator engagement
- Planning infrastructure to enable collaboration
- Dialogue with ORD to support specific funding mechanisms -- existing funding solicitations may be applicable