Millennium Cohort Study Overview

Principal Investigator

Naval Health Research Center, San Diego, CA

Defense Health Board Briefing
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Origin of the Millennium Cohort Study

- By 1998 the DoD, Armed Forces Epidemiological Board, and Institute of Medicine recommended a coordinated prospective longitudinal cohort study of Service members
  - Newly available DoD surveillance and electronic health care data
  - 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”
- NHRC designated as the DoD Center for Deployment Health Research
Study Oversight and Management

- Naval Health Research Center
  - Operational oversight
  - Scientific oversight
  - Institutional review board (IRB)
  - Public affairs correspondence

- Military Operational Medicine Research Program
  - Core program funding
  - Programmatic oversight and tracks program objectives

- Defense Health Program
  - Core program funding

- Strategic Board
  - Composed of external group of DoD, VA, and academic stakeholders
  - Strategic guidance on long-term research agenda and dissemination and translation

- Task Area M Committee
  - Composed of internal and external investigators
  - Research proposal review
  - Scientific oversight
  - Research task prioritization
Study Methodology

- Multiple-panel cohort study
  - Initiated July 2001 (pre-9/11)
  - Includes Active Duty, Reserve, National Guard

- Participants respond via secure website or traditional paper survey every ~3 years (planned through 2068)

- Questionnaires includes standard survey instruments
  - Includes questions on military (combat, deployment) and other experiences (head trauma, sexual trauma, alcohol, and tobacco use)
## Embedded Standardized Survey Instruments

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Complementary Data Sources

- Demographic Data
- Immunization Data
- Deployment Data
- Environmental Exposure Data
- Pharmacologic Data
- Recruit Assessment Program
- Medical History
- Survey Data
- DoD Serum Repository
- Family Data
- DoD Birth and Infant Health Registry
- Military Inpatient And Outpatient Care
- Civilian Inpatient and Outpatient Care
- Dept. of Veterans Affairs Data
- Mortality Data
- DoD Health Research Center
- Millennium Cohort Study
Enrollment and Follow-up (N = 201,620)

### Study Timeline

<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>
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<tbody>
<tr>
<td>1</td>
<td>Jul 2001–Jun 2003</td>
<td>Unrestricted</td>
<td>Females, Reserves/Guard, Prior deployers*</td>
<td>256,400 (Oct 2000)</td>
<td>214,388</td>
<td>77,019 (36%)</td>
</tr>
<tr>
<td>2</td>
<td>Jun 2004–Feb 2006</td>
<td>1–2</td>
<td>Females, 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>Females, 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>Females, Married</td>
<td>250,000 (Oct 2010)</td>
<td>247,266</td>
<td>50,052 (20%)</td>
</tr>
</tbody>
</table>

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

- Research projects include subject matter experts:
  - Military organizations (35+ projects)
  - Veterans organizations (20+)
  - Academic institutions (30+)
Research Program Areas

Survey Operations (10+)

Mental Health (20+)

Behavioral Health (17+)

Chronic Disease (15+)

Veterans Health (15+)

Environmental Health (4)

Injury and Resilience (8)

Family Health (3)

(Publications to date)
Publications and Projects

- Total peer-reviewed publications = 86 (5 currently in press)
- Active projects = 25
Citations in Peer-Reviewed Literature

Total = 2,188
New Areas of Focus

- Precision Medicine Initiative
  - Collaboration with VA Million Veteran Program (MVP) to enroll Millennium Cohort participants into MVP

- Airborne hazards (DoD/VA working group)

- Traumatic brain injury
  - Questions included in 2014 survey

- Cancer case ascertainment: cancer registry linkages
Acknowledgements

The Millennium Cohort Study Team includes:

Richard Armenta PhD; Lauren Bauer MPH; Deb Bookwalter PhD; Ania Bukowinski MPH; CPT Adam Cooper PhD; James Davies; Alex Esquivel; CDR Dennis Faix MD MPH; Lt Col Susan Farrish MD MPH; Toni Rose Geronimo; Gia Gumbs MPH; Isabel Jacobson MPH; Claire Kolaja MPH; Joyce Kong PhD; Cynthia LeardMann MPH; William Lee; Hector Lemus PhD; Kyna Long MS; Gordon Lynch; Denise Lovec-Jenkins; Rayna Matsuno PhD; Danielle Mitchell; Kristin Motylinksi; Anna Nagel MPH; Chiping Nieh PhD; Chris O’Malley MPH; Serguey Parkhomovsky; Anet Petrosyan; Chris Phillips MD MPH; Ben Porter PhD; Teresa Powell MA; Rudy Rull PhD; Kari Sausedo MA; Beverly Sheppard; Steven Speigle; Daniel Trone PhD; Jennifer Walstrom

Co-Investigators

Dr. Paul Amoroso; Dr. Edward Boyko; Dr. Gary Gackstetter; Dr. Greg Gray; Dr. Tomoko Hooper; Dr. Margaret Ryan; Dr. Tyler Smith; Dr. Timothy Wells

We are indebted to the Millennium Cohort Study members for their continued participation!

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Age at Baseline by Panel


Participants (1,000)

Age at baseline

Baseline Demographic Characteristics

Race/Ethnicity

- White, non-Hispanic
- Black, non-Hispanic
- Asian/Pacific Islander
- Hispanic
- Other

Female (%)

≥ Bachelor's degree (%)
Service Branch by Panel

Service Branch (%)

Navy/Coast Guard  Marine Corps  Army  Air Force
Military Service Characteristics by Panel

Deployment History (%)

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<th>Separated</th>
<th>Deceased^a</th>
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<tr>
<td>1</td>
<td>70.9%</td>
<td>1.6%</td>
</tr>
<tr>
<td>2</td>
<td>62.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>3</td>
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^a As of March 2015.
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Survey Modes

- Paper
  - Simple, mark sense survey created using Teleform software

- Web: www.millenniumcohort.org
  - Advanced security and backup features.
  - Provides substantial cost savings over postal survey
  - Cost-effective incentives offered for online completion
  - Toll-free phone number and email available for questions.
One thing that we might want to think about when it comes to converting to the PCL which mirrors the DSM-5 or adding items to approximate it. Unfortunately, the PCL-5 has only been developed and validated using the specific form (as reference to a particular trauma). Some of the items are different because of this. However, I highlighted the new items.
FY14-16 Survey Response

Panels 1-4 of the 2014-16 Survey Cycle

Days After Launch

Response %

P1
P2
P3
P4
Execution of Fiscal Year (FY) Plans

- FY plans created in advance and submitted to MOMRP

- Ideas are derived from DoD, VA, HA, sponsor, service member concerns, and literature findings
  - Internal team determines project feasibility based on available data

- Task Area M Committee reviews and offers advice on proposals responsive to the FY plan

- Goal is rapid response to queries, including those deemed urgent
Task Area M: FY16 Plan

- **Relationship of deployment with mental and physical health**
  - Health impacts of environmental exposures (e.g., airborne particulates)
  - Risk factors for cancer incidence and mortality
  - Impacts of deployment on cardiopulmonary and metabolic diseases
  - Burden of multimorbidity among Service members over time and across the life-course
  - Persistent physical health symptoms related to military exposures
  - Gender differences of impacts of military service on health

- **Health-related burden of military service**
  - Impact of deployment experiences on mental and physical health outcomes
  - Health- and military-related economic costs associated with mental and physical health outcomes

- **Impact of behaviors and resilience factors**
  - Impacts of Performance Triad (sleep, diet, exercise) on health outcomes
  - Relationships between Service-related experiences and alcohol/tobacco use over time
  - Modifiable behaviors and resilience factors associated with healthcare utilization

- **Long-term health, disability, and mortality**
  - Long-term functional health of Service Members and Veterans
  - Examine risk factors for all-cause and cause-specific mortality
  - Long-term functional and physical health of Service Members and Veterans
  - Persistent physical health symptoms in relation to military experiences and occupations

- **FAMILY STUDY: Family well-being and resilience**
  - Examine overview of Family Study methodology and target enrollment population
  - Assess the role that family support and resiliency has on Service Member and Veteran health
  - Determine the effect of the family’s mental health on the Service Member and Veteran health
  - Examine methodological approaches to ensure Cohort retention

- **Prospective assessments and validity**
  - Conduct prospective survey methods
  - Evaluate methodological approaches to ensure representative Cohort sample
  - Assess validity of assessment measures and instruments
  - Examine methodological approaches to ensure Cohort retention
Key Findings: Mental and Behavioral Health

- **Sexual Trauma Outcomes Among Women (J Trauma Stress, 2015)**
  - Women who reported recent sexual trauma, harassment or assault, had significantly lower mental health, lower physical health, and more likely to report difficulties in daily work or activities due to emotional health and physical health compared to those who reported no sexual trauma.

- **Risk factors associated with suicide (JAMA, 2013)**
  - Suicide risk was independently associated with depression, manic-depressive disorder, alcohol-related problems, and male gender. None of the deployment or military-related factors were associated with an increased risk for suicide.

- **New-onset depression and deployment (Am J Pub Health, 2010)**
  - Combat-deployed personnel were more than twice as likely to screen positive for new-onset depression compared with non-deployed, while deployment without combat was associated with a decreased risk for new-onset depression.
Key Findings: PTSD

- **Longitudinal Assessment of Gender Differences in PTSD (J Psych Research, 2015)**
  - No significant gender differences were observed when examining the likelihood for developing PTSD among women and men who reported combat experience or among those who did not.
  - Additionally, PTSD severity scores were not significantly different by gender, regardless of combat experience.

- **Preinjury psychiatric status, injury, PTSD (Arch Gen Psychiatry, 2011)**
  - After controlling for injury, baseline psychiatric disorders were significantly associated with new-onset PTSD.

- **PTSD and physical activity (Public Health Rep, 2011)**
  - Those who reported at least 20 minutes of vigorous physical activity twice weekly had decreased odds for new-onset and persistent PTSD.

- **New-onset and persistent PTSD (BMJ, 2008)**
  - Combat deployers were three times as likely to screen positive for PTSD compared with non-deployed.
  - Deployment was not associated with PTSD persistence.
Key Findings: Physical Health

- Pre-deployment sleep and post-deployment mental health (Sleep, 2013)
  - Combat-related trauma and pre-deployment insomnia symptoms were significantly associated with developing posttraumatic stress disorder, depression, and anxiety following deployment

- Combat deployment and sexual harassment and assault (Women’s Health Issues, 2013)
  - Significant risk factors for sexual trauma included prior deployment with combat experience, serving as a Marine, younger age, recent marital separation or divorce, positive screen for a prior mental health condition, moderate/severe life stress, and prior sexual trauma experiences

- Diabetes, deployment and mental health (Diabetes Care, 2010)
  - Those who screened positive for baseline PTSD, but not other mental disorders, had a 2-fold increase in type 2 diabetes risk