

# **Million Veteran Program**

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# Genomic ‘Mega-Biobanks’

## Selected biobanks (& corresponding challenges):

- UK Biobank:  $\approx 500\text{K}$  (decentralized health records)
- Vanderbilt University BioVU:  $\approx 200\text{K}$  (“opt-out” model)
- Kaiser Permanente project:  $\approx 200\text{K}$  (patients migrate in/out)
- China Kadoorie Biobank:  $\approx 500\text{K}$  (limited health data)
- Geisinger-Regeneron MyCode:  $> 100\text{K}$  (privacy issues)
- VA Million Veteran Program:  $> 550\text{K}$  (*to be described*)
- many smaller biobanks, representing “country” or “disease”

# Why the VA?

## Advantages of VA environment

- nationwide “pool” of long-term (and altruistic) beneficiaries
- centralized electronic health record
- existing research infrastructure & expertise
- “location” of research in integrated VA healthcare system

## Relevance to Veterans

- Veterans have specific military exposures and health outcomes
- results can inform & improve the VA clinical program

*Note: results can also benefit non-Veterans*

# Million Veteran Program (MVP)

## Overarching goal

- Assemble a large, well-characterized source population of Veterans with DNA samples & linkage to electronic health record (EHR) information, as an infrastructure for multiple future research uses

## Specific objectives

- Enroll  $\geq 1,000,000$  Veterans for scientific research
- Administer general questionnaire; collect blood and extract DNA; link to VA EHR (and create information technology system)
- Create policies and procedures for laboratory and clinical scientists to access & utilize (de-identified) data

# Scope of MVP

## Operational aspects of the Million Veteran Program

- Recruit using opt-in/decline model; invitational letter being sent to >6 million Veteran Health Administration beneficiaries
- Initial enrollees at vanguard sites in 2011 →  $\approx 50$  sites steady-state
- J. Michael Gaziano & John Concato, Principal Investigators
- Example of “team science” and “big data” within existing VA infrastructure; includes administrative, technical, ethical, and scientific challenges

# MVP: Administrative Aspects

Complex organization of project, built within existing network:

- structure provided by internal VA Cooperative Studies Program resources and standard operating procedures
- extensive external monitoring (e.g., VA Central Institutional Review Board, and VA Office of Research Oversight)
- activities are VA-based, but benefit from links with university affiliates and non-profit corporations



# MVP: Technical Aspects

## Genomic analysis:

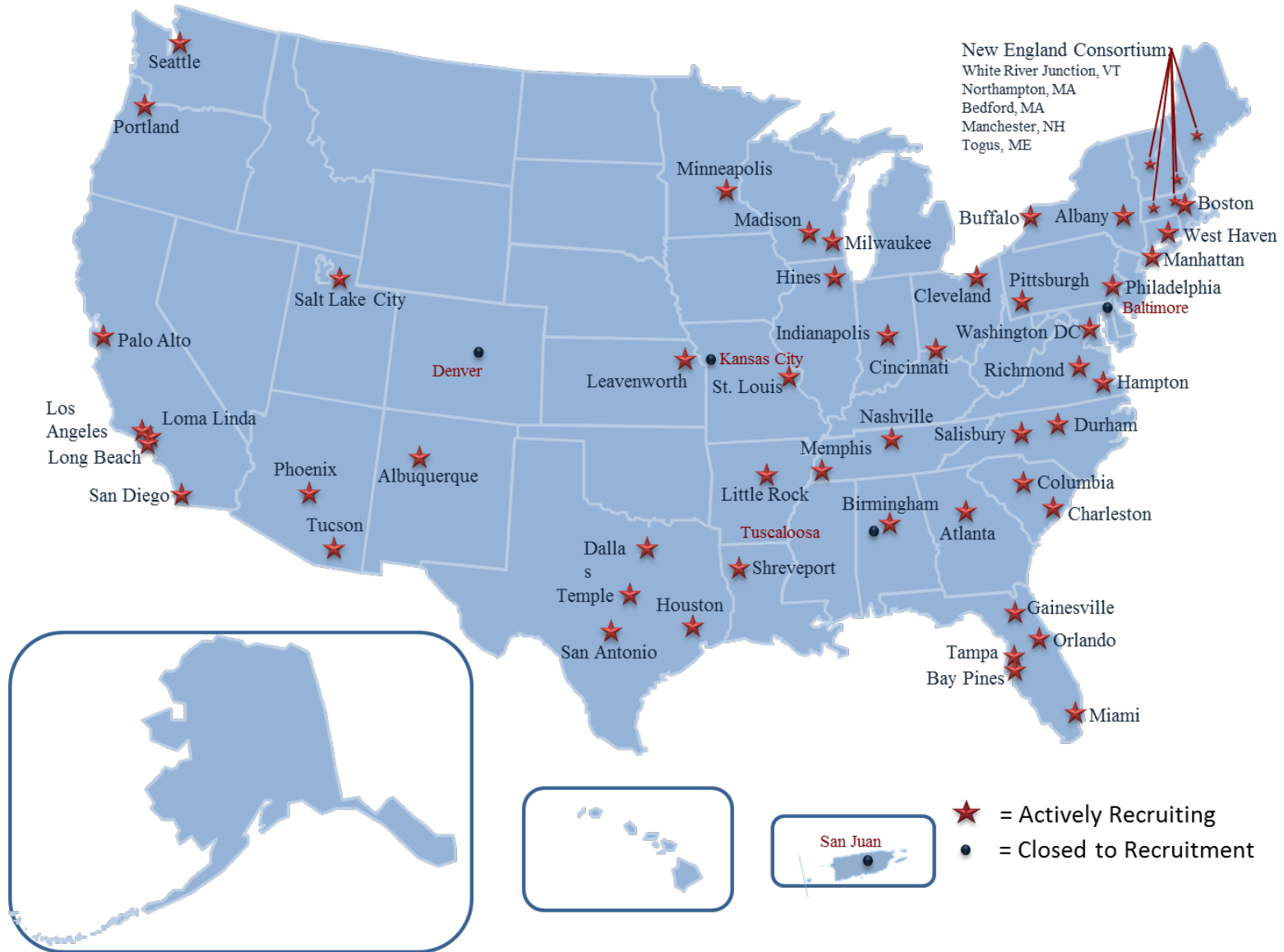
- genotyping and sequencing done by contracted vendors

## VA Genomic Info System for Integrated Sciences (Genesis):

- coordinates central recruitment and scheduling
- receives & stores genetic data; links to pertinent health data
- creates & maintains secure information technology platform

[Note: data remain on VA servers, behind VA firewall]

# MVP Enrollment Sites





# MVP Update

## Status as of 12 Apr 2017

invitations mailed	3,815,059
baseline surveys returned	616,607
<b>consent forms (&amp; blood)</b>	<b>555,758</b>
genomic data:	
- genotyping available for analyses	358,286
- exome sequencing samples (FY15)	24,260
- whole-genome sequencing samples (FY15)	1,886

# MVP Scientific Aspects

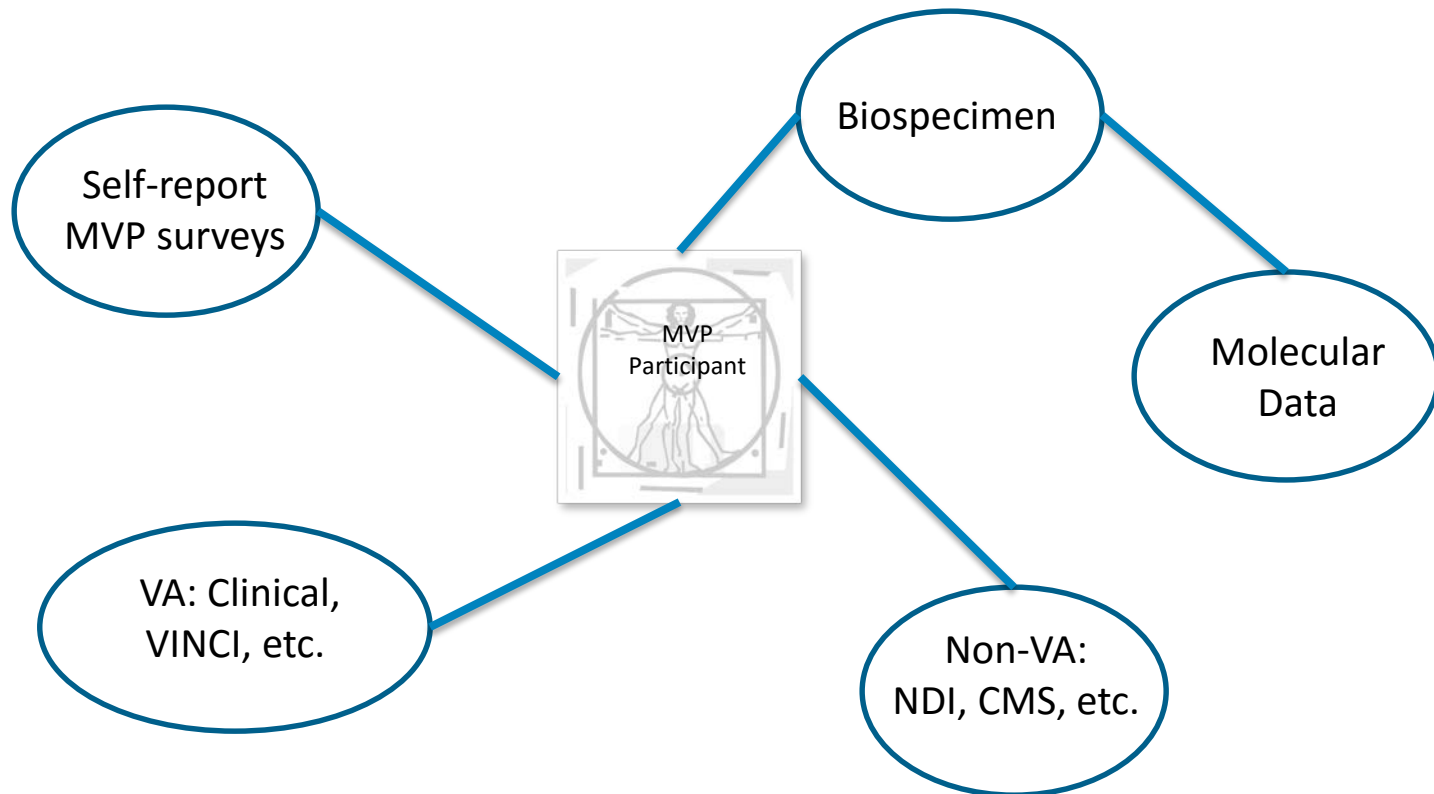
## Genotyping ( $\approx$ 723K chip):

- customized Affymetrix Axiom<sup>®</sup> Biobank array
- analysis by BioStorage Technologies, Inc. & Akesogen<sup>®</sup>
- content recognizes UK Biobank; includes African-American booster, psychiatric genomic consortium module, etc.

## Exome and whole-genome sequencing:

- w/ Claritas Genomics Inc. & Personalis<sup>®</sup>

# MVP Data Universe



# MVP - Dept. of Energy Agreement

## MVP Computational Health Analytics for Medical Precision to Improve Outcomes Now (MVP-CHAMPION):

- “VA and the Department of Energy will collaborate to apply the most powerful computational assets at the Department of Energy’s National Labs to nearly half a million veterans’ records from one of the world’s largest research cohorts – the Million Veteran Program”


# MVP - Dept. of Defense Agreement

Memorandum of Agreement  
Between  
The Department of Veterans Affairs (VA) and the Department of Defense (DoD)  
For  
Precision Medicine Collaboration

Purposes include:

- facilitate Millennium Cohort Study participants' enrollment in MVP
- “enable DoD and VA investigators to discover and utilize clinical, epidemiological, and genomic methods for research to improve active duty and Veteran health care”

# Ongoing Scientific Projects

Type of Project	Topic	VA & University Affiliations
Alpha test: separate enrollment	Schizophrenia and Bipolar Disorder (CSP 572)	Miami, Bronx, West Haven, & Boston VAs; University of Miami; Mt. Sinai School of Medicine; Yale; Harvard; Stanford
Alpha test: 'prototype'	PTSD in Veterans (CSP 575B)	San Diego, West Haven, and Boston VAs; UC San Diego; Yale
Alpha test: re-contact	Gulf War Illness (CSP 2006) 	East Orange, Durham, West Haven, and Boston VAs; Rutgers, Duke, Yale
Beta test	Cardiovascular Disease	Atlanta & Boston VAs; Emory; Harvard; Boston University
Beta test	Chronic Kidney Disease	Nashville & Memphis VAs; Vanderbilt; University of Tennessee Health Science Center
Beta test	Cardio-metabolic Disease	Palo Alto, Philadelphia, Albany, Boston, and Phoenix VAs; University of Pennsylvania; Stanford; Albany Medical College; University of Massachusetts; Harvard; Arizona State University
Beta test	Multi-substance Abuse Disorders	West Haven & Philadelphia VAs; Yale; University of Pennsylvania
Beta test	Age-related Macular degeneration	Cleveland & Buffalo VAs; Case Western Reserve



# Why are Veterans Supporting MVP?



*(photo with permission)*

**“Knowing that I would be helping other GIs is the reason I am part of the Million Veteran Program.”**

Mons S. Sjaastad

U.S. Army

Korean War Era

VA Connecticut Healthcare System