Precision Medicine: Understanding How Genomics and Big Data Are Enabling the Right Care for the Right Person at the Right Time

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Director, MAVERIC; PI, MVP, VA Boston Healthcare System





BWH





Disclosures

- Relevant to today's talk: None
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- Foundations and Non-profits: Board member Aspirin Foundation
- Advisory Boards: UKBiobank, TOPMed (chair), Alberta Tomorrow Project (chair)
- Society membership: AMA, ACC, AHA, Royal College of Physicians

- Sports teams: WVU Mountaineers, Patriots, Red Sox, Celtics, Bruins, Revolution
- Hobbies: running, biking, swimming, cooking, wood working, wine making

Transformative "Big Data" Problems in Science









What is Big Data? Information with high volume, high velocity and/or high variety that requires new forms of processing to allow enhanced knowledge generation, decision making and process optimization.



BIG DATA?

According to Gartner (2001),

Big data are high-volume, high-velocity, and/or high-variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization.

Big Data is made of structured and unstructured information

What is

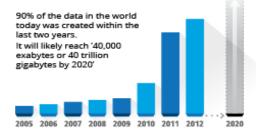
10%
STRUCTURED
Structured information is the data in data-bases and

is about 10% of the story.

90% UNSTRUCTURED

Unstructured information is 90% of Big Data and is 'human information' like emails, videos, tweets, Facebook posts, call-center conversations, closed circuit TV footage, mobile phone calls, website clicks.

Big Data Is Only Getting Bigger



Million Terabytes of new data is created every day Growth in The Big Data Market





Companies are Spending Big on Big Data



Why? The companies that use analytics best are...



performance



Morè likely to make decisions "much faster than competition"



More likely to execute decisions as intended More likely to

More likely to use data very frequently when making decisions











Health care is a late comer to

















NATURAL RESOURCES

INSURANCE

Example: Retail

Capturing Store Insights for Timely Engagement

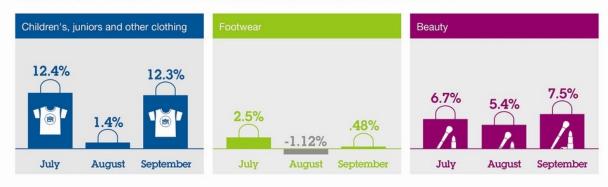




Secure Big Da Infrastructure Analysis, & Act

Retailers get results from early back-to-school push

This summer, retailers began back-to-school promotions earlier than ever. Their efforts drove strong back-to-school spending in July, shows IBM's latest Big Data-based retail forecast.* Children's/juniors/other clothing, footwear and beauty are all projected to grow in July, slow somewhat in August, then post stronger growth in September.



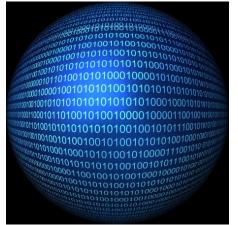
Riding lawn mower owner phenotype

IBM

*Compares year-over-year

Example:
Credit card
companies







Call to collect info about transaction – within 30 seconds

Questions:

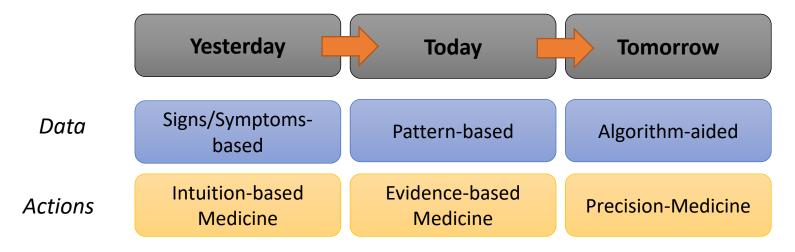
- Do you have your card? yes
- Are you in Ireland buying gas at....? yes
- Would you like to keep your card active? yes

Using data beyond its intended purpose: identification of US special forces

- Fitness tracking app Strava gives away location of secret US army bases
- Data about exercise routes shared online by soldiers can be used to pinpoint overseas facilities



The promise of big health data: To improve health, prevent and treat disease by empowering providers, patients and health systems with better access to and use of health information.

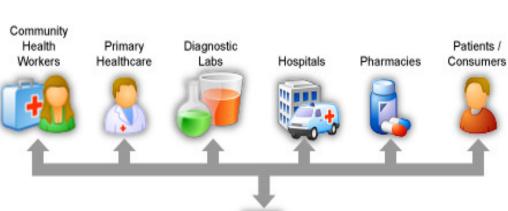






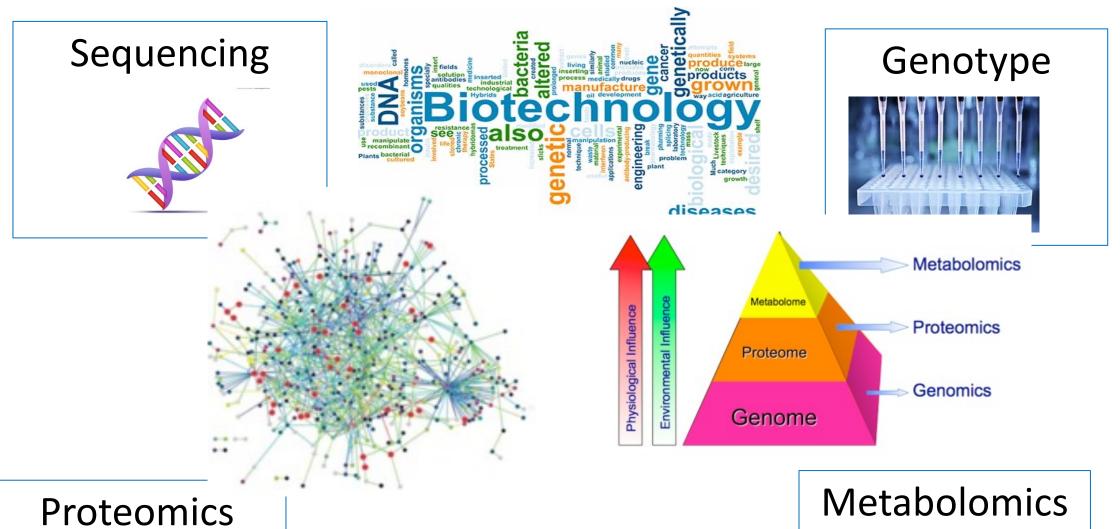






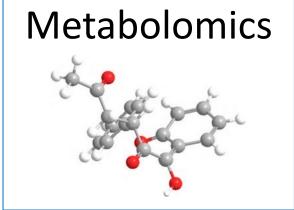








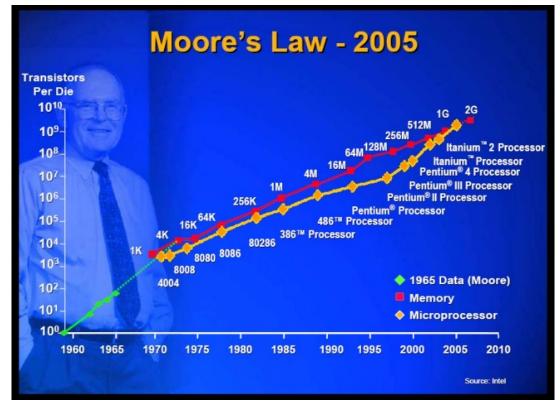
Big Omics





Big Computing







Precision Medicine

- A brief history of data science
- Big data analytics in an integrated health care system:
 - Discovery
 - Observational Epidemiology, Trials
 - Quality Improvement
 - Building mega cohorts for research and clinical care (MVP)
- Challenges in using big data (Data challenges, AI, etc.)
- The future

Evolution of Data in Understanding Disease Relationships

- Descriptive phase
- Pre-analytic phase:

Cases, Early interventions

Analytic phase

Super Ana

Scalable

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Super c

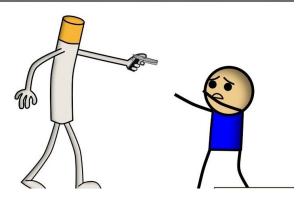
Mega-c



The Black Death

Smoking Kills

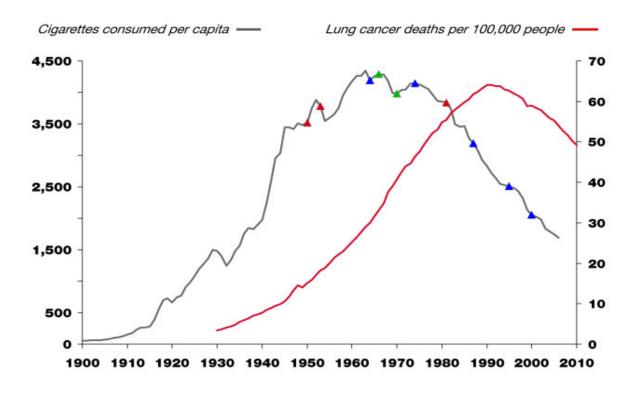
SMOKING KILLS



Which industry first figured out that smoking took years off your life?



Cigarette consumption & lung cancer deaths in the United States





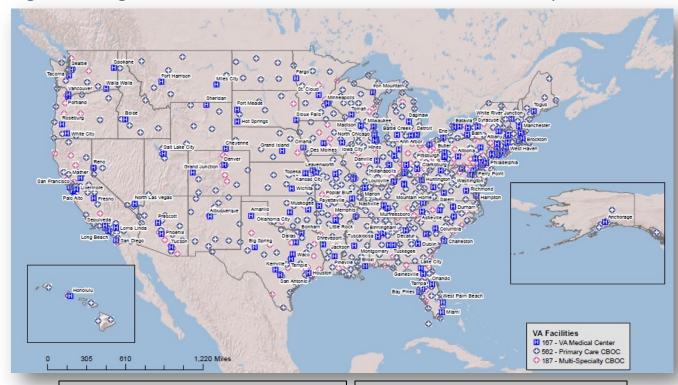
Building a population data center in a large, integrated health system





Veterans Health Administration (VHA)

The Largest Integrated Healthcare Network in the Country



VHA Points of Care (1,748)

- Integrated Healthcare Networks: 21
- Major Medical Centers: 152
- Outpatient Clinics: 990
- Vet Centers: 370Domicillaries: 102
- Community Living Centers: 134

Patient Population

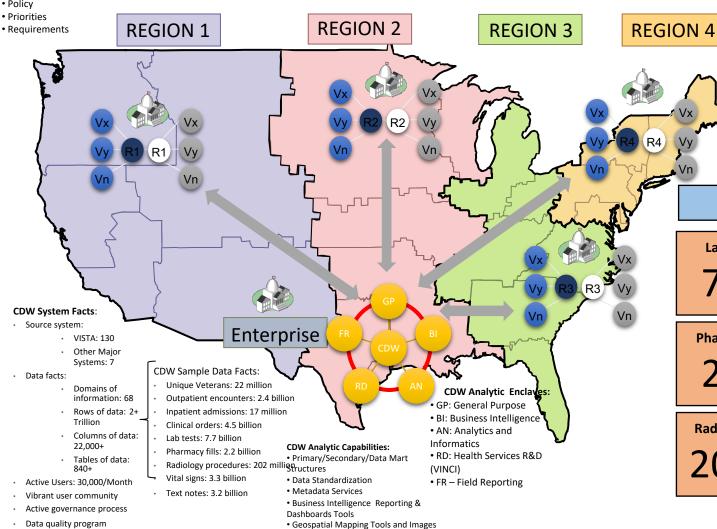
- Enrollees: 8.8M
- Active Patients: 6M
- All Time Patients: 22M
- FY15 Outpatient Visits: 84M
- FY15 Inpatient Admissions: 703K

VA Analytic Ecosystem (2015)

Common Data ♦ Common Infrastructure ♦ Common Tools ♦ Common Security

Governance Board

- Strategy
- Policy



SAS/Grid High Performance Compute

Natural Language Processing Engines

Hadoop Cluster

The EHR data available in the CDW and other data sources is among the best in the world.

Patients: 22 M

Lab Results 7.7B 4.5B **Pharmacy Fills**

Clinical Notes

Vital Signs

3.3B

3.2B 2.2B

Radiology Proc 202M **Clinical Orders Immunizations**

71M

Health Factors

2.2B

Consults

315M

Appointments

1.4B

Encounters

2.4B

Admissions

17M

Oncology

1.3M

Domains: 15/68

Surgeries

14M

MASSACHUSETTS VETERANS EPIDEMIOLOGY RESEARCH AND INFORMATION CENTER (MAVERIC) -

funded in 1997 with the mission

"To enhance health care delivery in the VA system by promoting the conduct of VA based population research relevant to the needs of veterans and to facilitate the transfer of vital epidemiologic information to VHA providers and administrators". MAVERIC AFFILIATIONS

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Web Size www.mornic.org



MAVERIC

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disease in populations"

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- a change boso for NA and son NA dealess and despection to barren them for epidemiologic travelly property and piles modes.
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PROJECTS

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On Going Projects

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Normative Aging Yordy (Eleval) Longitudinal Study

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MAVERIC is a national resource to foster epidemiologic research in the VA with:

- a community of Ad hoc consultants and faculty with expertise in all disciplines of epidemiology
- the necessary infrastructure to support a highly relevant epidemiologic research agenda including a core computing facility and core laboratory for biological specimen processing and storage
- a clearing house for VA and non-VA databases and the expertise to harvest them for epidemiologic research projects and pilot studies
- a training center to educate both young and established VA investigators in epidemiologic research methods
- an information dissemination center for transfer of relevant epidemiological information to VA health care providers and administrators system wide

MAVERIC's History



Beta Phase Launched



Population Genomics **Center Created**



AoU Created



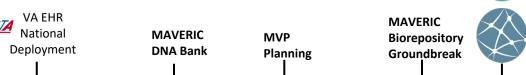
IOM - Envisioning transformed clinical trials enterprise

Widespread Use

CDW for



VA POC DCP Launched



2010 1985 1997 2001 2003 2008



MAVERIC Awarded Clinical Trial Coordinating Center



VA CDW Established



MVP hits 800K





POC presented to **VA CSP**

MVP Launched

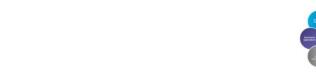
Research in US



Data and Computational Sciences Created



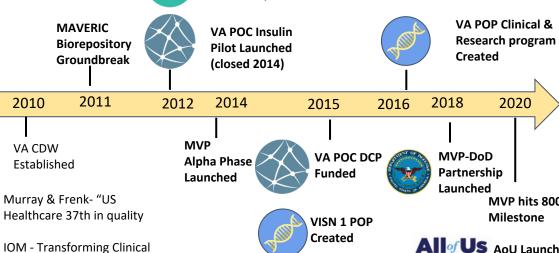
MVP Gamma Phase Launch





Big Data Science VA-DOE Champion Partnership Launched





MAVERIC Components

- Epidemiology research center
- Trial coordinating center
- National biorepository
- National Quality Improvement initiatives
- Million Veteran Program (MVP)
- Phenomics research center and CIPHER
- Computing: Informatics cores / DOE collaboration
- Advanced analytics core
- Training programs

Epidemiology and Prevention

Cardiovascular Benefit of Magnitude of Low-Density Lipoprotein Cholesterol Reduction

A Comparison of Subgroups by Age

Catherine R. Rahilly-Tierney, MD, MPH; Elizabeth V. Lawler, MPH, ScD; Richard E. Scranton, MD, MPH; J. Michael Gaziano, MD, MPH

Table 4. Unadjusted and Multivariate-Adjusted* HRs (95% CI) for Each Category of LDL-C Reduction, by Age Quartile

Category of LDL-C Reduction	<61.1 y	61.1 to 69.3 y	69.3 to 75.3 y	≥75.3 y
Small: 10-40 mg/dL				
Unadjusted	0.87 (0.76-1.00)	0.69 (0.59-0.79)	0.77 (0.66-0.90)	0.72 (0.61-0.85)
Multivariate adjusted	0.73 (0.64-0.84)	0.67 (0.58-0.78)	0.70 (0.60-0.82)	0.64 (0.54-0.76)
Moderate: 40-70 mg/dL				
Unadjusted	0.68 (0.59-0.79)	0.57 (0.48-0.67)	0.65 (0.55-0.77)	0.73 (0.60-0.87)
Multivariate adjusted	0.50 (0.43-0.58)	0.45 (0.37-0.52)	0.45 (0.39-0.56)	0.53 (0.44-0.64)
Large: ≥70 mg/dL				
Usadhadad	0.72 (0.01 0.07)	0.57 (0.47 0.09)	0.52 (0.42 0.66)	0.54 (0.42 0.0.70)
Multivariate adjusted	0.37 (0.31-0.45)	0.29 (0.24-0.37)	0.26 (0.20-0.34)	0.38 (0.30-0.49)

[&]quot;Adjusted for age, gender, current smoking status, body mass index, statin use, nonstatin cholesterol-modifying therapy use, hypertension, cerebrovascular disease, thyroid disease, and renal disease.

Among 326,981 US veterans ≥75 without ASCVD, statin therapy was significantly associated with a lower risk of mortality.

Table 2. Association Between Statin Use, All-Cause Mortality, and Major Cardiovascular Events in 326 981 US Veterans 75 Years and Older Free of Atherosclerotic Cardiovascular Disease at Baseline, After Propensity Score Overlap Weighting

Weighted r		00 person-years	Weighted incidence rate		
Outcome	Statin user (N = 57 178)	Statin nonuser (N = 269 803)	difference/1000 person-years (95% CI) ^a	HR (95% CI)	P value
Primary outcomes					
All-cause mortality (n = 206 902)	78.7	98.2	-19.45 (-20.38 to -18.52)	0.75 (0.74 to 0.76)	<.001
All CV death (n = 53 296)	22.6	25.7	-3.09 (-3.63 to -2.55)	0.80 (0.78 to 0.81)	<.001
Secondary outcomes					
ASCVD composite (n = 123 379) ^b	66.3	70.4	-4.05 (-5.09 to -3.02)	0.92 (0.91 to 0.94)	<.001
Myocardial infarction (n = 24 951)	13.2	12.6	0.56 (0.13 to 0.98)	0.99 (0.97 to 1.03)	.94
Ischemic stroke (n = 35 630)	18.4	18.2	0.25 (-0.26 to 0.76)	0.98 (0.96 to 1.01)	.20
CABG surgery/PCI (n = 74 362)	35.2	39.2	-3.38 (-4.12 to -2.64)	0.89 (0.88 to 0.91)	<.001

Abbreviations: ASCVD, atherosclerotic cardiovascular disease; CABG, coronary artery bypass graft; CV, cardiovascular; HR, hazard ratio; PCI, percutaneous coronary intervention.

b ASCVD composite: time to first MI or ischemic stroke or CABG/PCI. There were fewer composite ASCVD events compared with total individual events, as participants were censored at first event of interest.

^a Weighted incidence rate difference comparing statin users to nonusers after overlap weighting was applied.

Developing a VA CVD Risk Calculator in the VA Health Care System

	C statistic (SD)				
	Men		Women		
Model	White	Black	White	Black	
Overall cohort of 1 672 336 veterans					
ASCVD events, No.	54 550	10 575	1154	326	
No. at risk	1 314 938	260 225	69 055	28 118	
Model 1, 2013 PCE	0.66 (0.004)	0.72 (0.007)	0.78 (0.020)	0.79 (0.036)	
Model 2, 2013 PCE with cohort-derived β	0.67 (0.004)	0.72 (0.007)	0.80 (0.018)	0.80 (0.030)	
Model 3, 2013 PCE with cohort-derived $\boldsymbol{\beta}$ and statin therapy	0.67 (0.004)	0.72 (0.007)	0.80 (0.018)	0.80 (0.029)	
Subset aged 40-79 y with 1 415 057 veterans					
ASCVD events, No.	48 169	9609	847	285	
No. at risk	1 136 161	218 463	44 399	16 034	
Model 1, 2013 PCE	0.63 (0.004)	0.68 (0.008)	0.72 (0.022)	0.72 (0.045)	
Model 2, 2013 PCE with cohort-derived β	0.64 (0.004)	0.68 (0.008)	0.73 (0.023)	0.73 (0.038)	
Model 3, 2013 PCE with cohort-derived $\boldsymbol{\beta}$ and statin therapy	0.64 (0.004)	0.68 (0.008)	0.73 (0.023)	0.73 (0.036)	

Developed at VA specific risk equation for prediction of intermediate and long-term CVD risk using EHR data.

This enables automated estimation of CVD risk in real time using EHR data for use in clinical practice.

Abbreviations: ASCVD, atherosclerotic cardiovascular disease; PCE, Pooled Cohort Equation.

Quality Improvement in VA

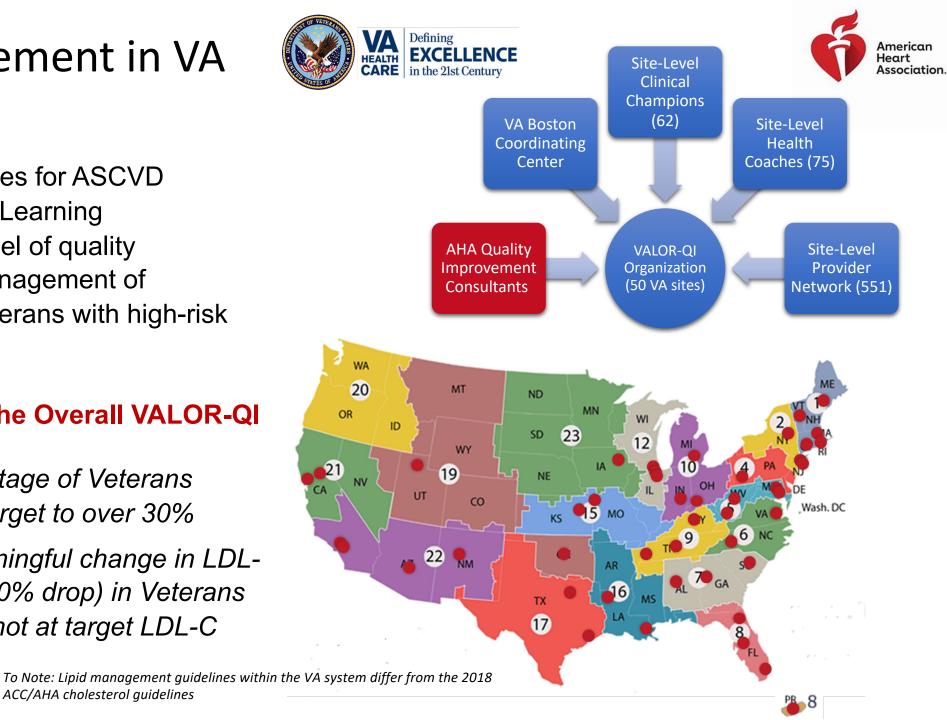
VALOR-QI Vision

improve clinical processes for ASCVD management through a Learning Healthcare System model of quality improvement for the management of dyslipidemia among Veterans with high-risk ASCVD.

Clinical Objectives for the Overall VALOR-QI **Program:**

- ✓ To increase the percentage of Veterans achieving the LDL-C target to over 30%
- ✓ To demonstrate a meaningful change in LDL-C from baseline (i.e., 10% drop) in Veterans with ASCVD currently not at target LDL-C

ACC/AHA cholesterol guidelines

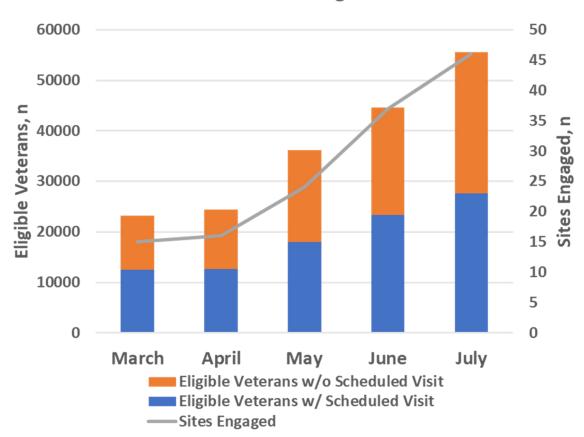


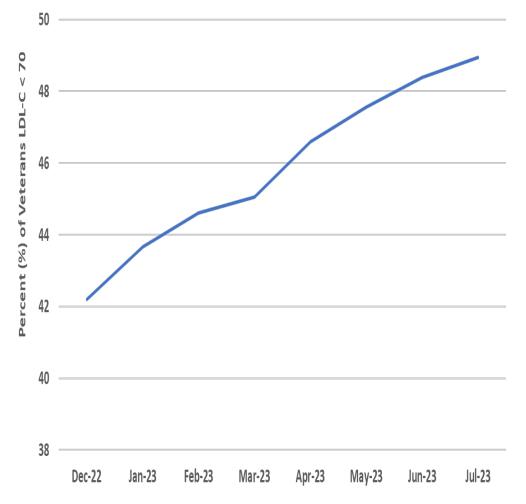


Percent of Veterans Achieving LDL-C <70mg/dl













Research Article

The Burden of Frailty Among U.S. Veterans and Its Association With Mortality, 2002–2012

Ariela R. Orkaby, MD, MPH, 1,2,3 Lisa Nussbaum, MA, MBA,2 Yuk-Lam Ho, MPH,2 David Gagnon, MD, PhD,24 Lien Quach, PhD,25 Rachel Ward, MPH, PhD,2 Rachel Quaden, MA,² Enzo Yaksic, BS,² Kelly Harrington, PhD,^{2,6} Julie M. Paik, MD, MPH, MSc,^{1,7} Dae H. Kim, MD, MPH, ScD, 89 Peter W. Wilson, MD, 2.10,11,12 J. Michael Gaziano, MD, MPH,^{2,3} Luc Djousse MD, ScD,^{2,3} Kelly Cho, PhD,^{2,3} and Jane A. Driver, MD, MPH^{2,1,2,3}

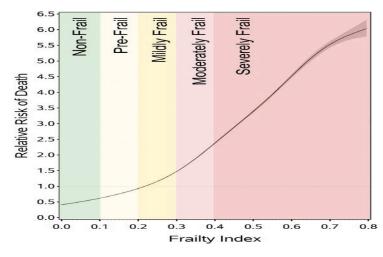


Table 4. Twelve Years' Median Survival Time According to FI Level for U.S. Veterans of age at least 65 Years

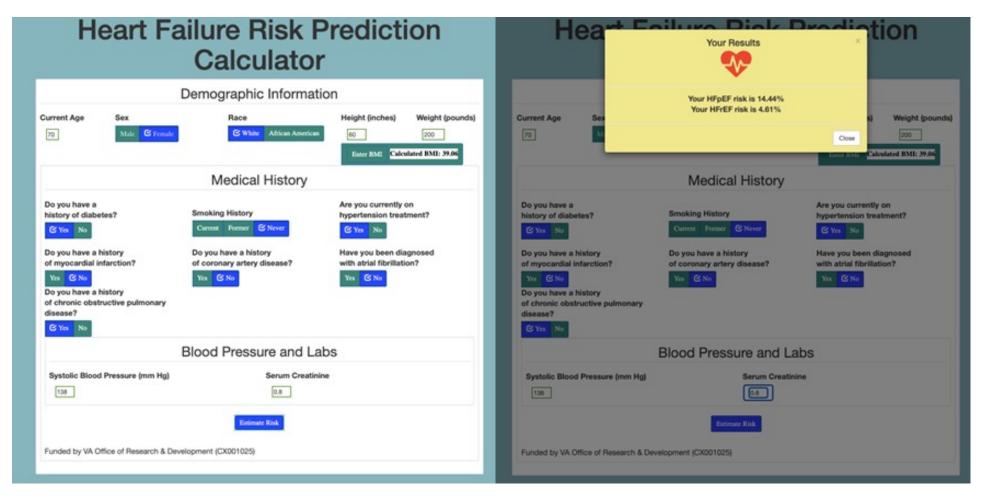
2002	Median Survival Time (years)						
	Men			Women			
	Aget	Aget	Aget	Age	Aget	Aget	
Frailty Score	6.5-74	75–84	≥85	65-74	75–84	≥85	
H ≤ 0.1	13.0	10.4	6.4	19.2	11.6	7.4	
>0.1 to <0.2	12.4	8.7	5.7	15.1	10.5	6.5	
>0.2 to <0.3	9.5	7.0	4.8	12.0	8.8	5.6	
>0.3 to <0.4	_ 6.8	5.4	3.8	8.5	7.0	4.5	
H > 0.4	4.6	3.8	2.8	6.0	5.1	3.7	
All FI	12.9	8.0	4.9	15.6	9.5	5.7	

Note: FI = Frailty Index.

[†]Prom Kaplan-Meter estimates.

^{&#}x27;From gamma model because median had not been achieved by the end of the study.

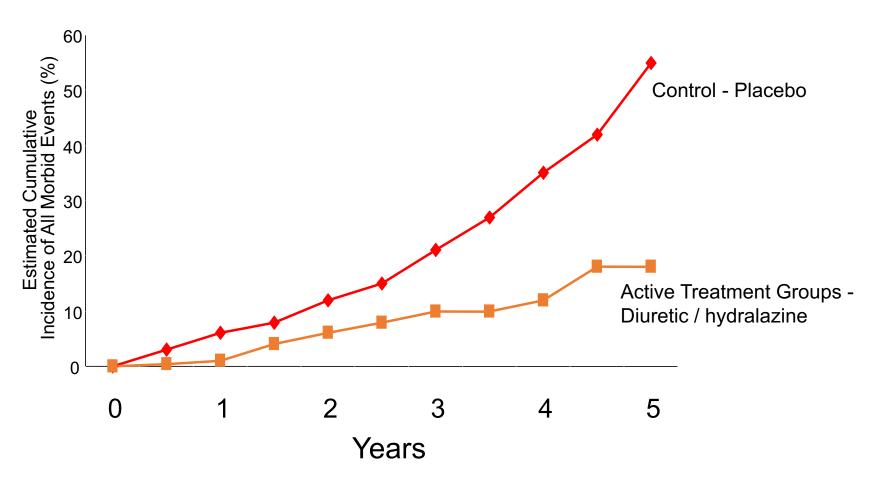
Developing a HF Risk Prediction Calculator (HF, HFrEF, HFpEF)



Liam Gaziano, et al., ESC Heart Fail. 2021 Dec;8(6):4893-4903.

First Hypertension Treatment Trial: Reduced Mortality and Morbidity in the VA Cooperative Study (CSP) - 1970

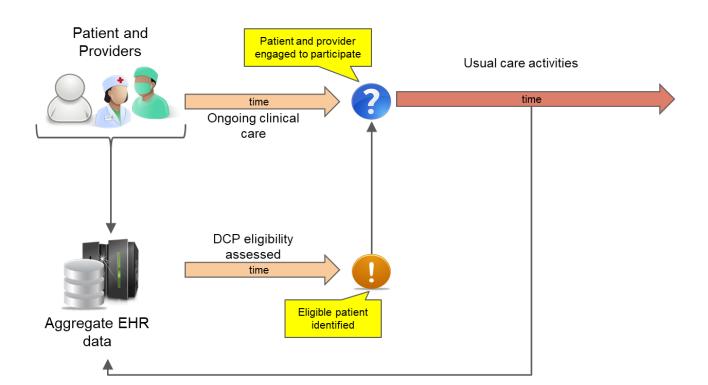




Veterans Administration Cooperative Study Group on antihypertensive agents *JAMA* 1970;213(7):1143-1152.

Boston CSP Trial Center: Traditional and pragmatic trials.

VA Diuretic Comparison Trial



RESEARCH SUMMARY

Chlorthalidone vs. Hydrochlorothiazide for Hypertension-Cardiovascular Events

Ishani A et al. DOI: 10.1056/NEJMoa2212270

CLINICAL PROBLEM

Thiazide diuretics are first-line treatments for hypertension. Guidelines have preferentially recommended chlorthalidone, although Medicare data suggest that prescriptions for hydrochlorothiazide far exceed those for chlorthalidone. Whether chlorthalidone is superior to hydrochlorothiazide for preventing major adverse cardiovascular events is unclear.





CLINICAL TRIAL

Design: A multicenter, pragmatic, open-label, randomized trial assessed the efficacy and safety of chlorthalidone as compared with hydrochlorothiazide in U.S. veterans with hypertension.

Intervention: 13,523 adults ≥65 years of age (97% men) with a most recent systolic blood pressure of ≥120 mm Hg and an active prescription for hydrochlorothiazide (25 or 50 mg per day) were assigned to continue that treatment or switch to chlorthalidone (12.5 or 25 mg per day). The primary outcome was a composite of nonfatal cardiovascular events (myocardial infarction, stroke, heart failure hospitalization, or urgent coronary revascularization for unstable angina) or non-cancer-related death.



Nonfatal Adverse Cardiovascular Events

and Non-Cancer-Related Death

RESULTS

Efficacy: During a median follow-up of 2.4 years, the incidence of primary-outcome events did not differ significantly between the chlorthalidone and hydrochlorothiazide groups.

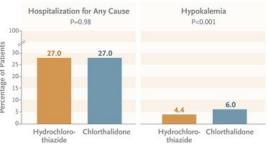
Safety: The incidence of hospitalization for any cause did not differ between the groups. Hypokalemia was more common in the chlorthalidone group than in the hydrochlorothiazide group.

LIMITATIONS AND REMAINING QUESTIONS

- More patients assigned to receive chlorthalidone switched back to hydrochlorothiazide, as compared with patients assigned to continue treatment with hydrochlorothiazide switching over to chlorthalidone — possibly owing to the open-label nature of the trial.
- Only 5% of participants were receiving a daily 50-mg dose
 of hydrochlorothiazide at baseline; thus, the trial primarily
 compared hydrochlorothiazide at a daily dose of 25 mg
 with chlorthalidone at a daily dose of 12.5 mg, and the results should not be extrapolated to other dosages.

Links: Full Article | NEJM Quick Take | Editorial

Safety Events



CONCLUSIONS

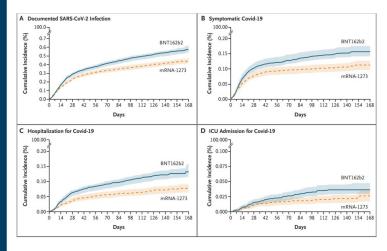
In a large pragmatic trial among U.S. veterans with hypertension, patients who received chorthalidone did not have a lower occurrence of nonfatal cardiovascular events or non-cancer-related death than those who received hydrochlorothiazide.

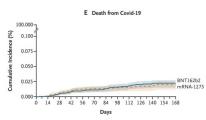
Advanced Analytics Using EHR Data

Causal inference modeling / Target Emulation Trial: Head-to-head comparison of COVID Vaccines

COVID

Cumulative incidence curves for the study outcomes in each vaccine group during the period marked by alpha-variant predominance.







RESEARCH SUMMARY

Comparative Effectiveness of BNT162b2 and mRNA-1273 Vaccines in U.S. Veterans

Dickerman BA et al. DOI: 10.1056/NEJMoa2115463

CLINICAL PROBLEM

Both mRNA-based Covid-19 vaccines — BNT162b2 (Pfizer-BioNTech) and mRNA-1273 (Moderna) — are highly effective, but data on their comparative effectiveness in distinct populations are lacking.

STUDY DESIGN

Electronic health records from the Veterans Affairs (VA) health system were used to compare the effectiveness of the two mRNA vaccines among U.S. veterans without previously documented SARS-CoV-2 infection. A total of 219,842 veterans who received their first dose of BNT162b2 between January and mid-May 2021 — during a period marked by B.1.1.7 (alpha)—variant predominance — were matched by risk factors to 219,842 who received mRNA-1273. Outcomes included documented SARS-CoV-2 infection, symptomatic Covid-19, hospital admission for Covid-19, intensive care unit (ICU) admission for Covid-19, and death from Covid-19. A separate analysis involved veterans vaccinated between July and mid-September 2021, during a period marked by B.1.617.2 (delta)—variant predominance.

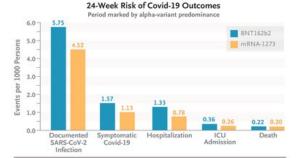
RESULT

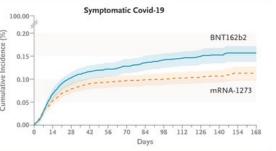
During 24 weeks of follow-up in the alpha-predominant period, risks of all outcomes were low with both vaccines but were somewhat higher with BNT162b2 than with mRNA-1273 for SARS-CoV-2 infection, symptomatic Covid-19, hospital admission, and ICU admission. During the delta-predominant period, the risk of SARS-CoV-2 infection over 12 weeks of follow-up was also slightly higher with BNT162b2 than with mRNA-1273.

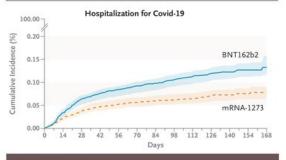
LIMITATIONS AND REMAINING QUESTIONS

- The vaccine groups had similar demographic characteristics and medical histories, but potential confounding inherent to observational studies cannot be ruled out.
- Outcomes could have been misclassified if veterans sought care outside the VA health system.
- The study population primarily included men older than 50 years, limiting the generalizability of the findings.

Links: Full Article | NEJM Quick Take | Editorial







CONCLUSIONS

Risks of symptomatic Covid-19 and hospitalization for Covid-19, among other outcomes, were low among U.S. veterans after receipt of either mRNA-based vaccine, although risks were somewhat higher with BNT162b2 than with mRNA-1273.

Building MVP



MILLION VETERAN PROGRAM

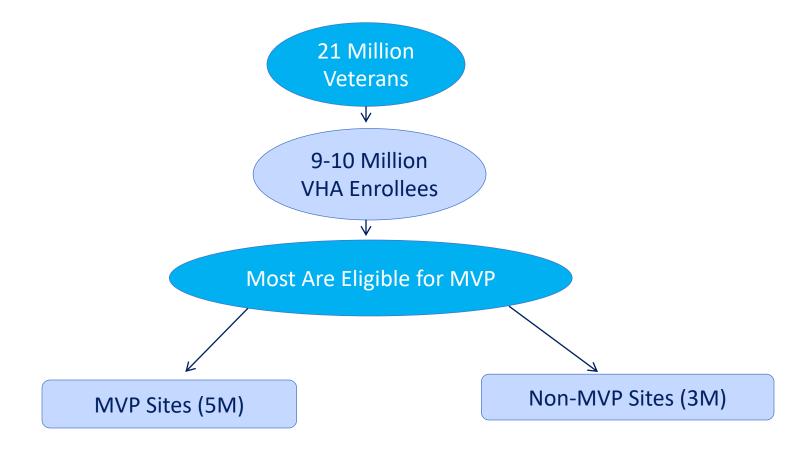
MVP's Journey

2009 Planning meeting 2011 First veteran enrolled 2014 MVP reaches 250,000 2016 MVP reaches 500,000 2018 First results published 2019 MVP reaches 750,000 2023 MVP reaches 1 million 20?? MVP hits 2 million





VA Population

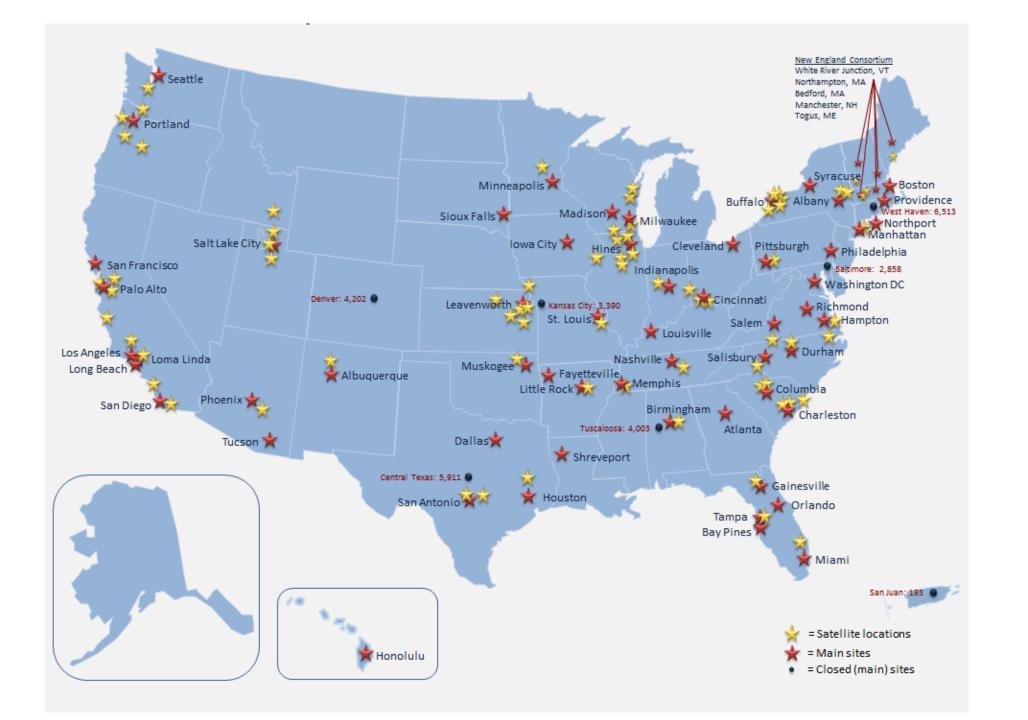




Million Veteran Program (MVP)

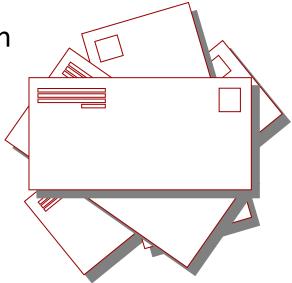
- Goal: Enroll up to one million users of the VHA into an observational mega-cohort
 - Collect health and lifestyle information
 - Blood collection for storage in biorepository
 - Access to electronic medical record
 - Ability to recontact participants





MVP Recruitment and Enrollment

- Invitational Mailing
 - Invitation letter, Baseline Survey, MVP Brochure
- Appointment Mailing
 - Appointment letter, Informed consent language
- Study visit procedures
 - Informed consent/HIPAA, Blood collection
- Thank-you Mailing
 - Thank-you letter, Lifestyle Survey



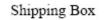
Building the VA National Biorepository











Primary Container (Blood tubes)







VA Central Biorepository:

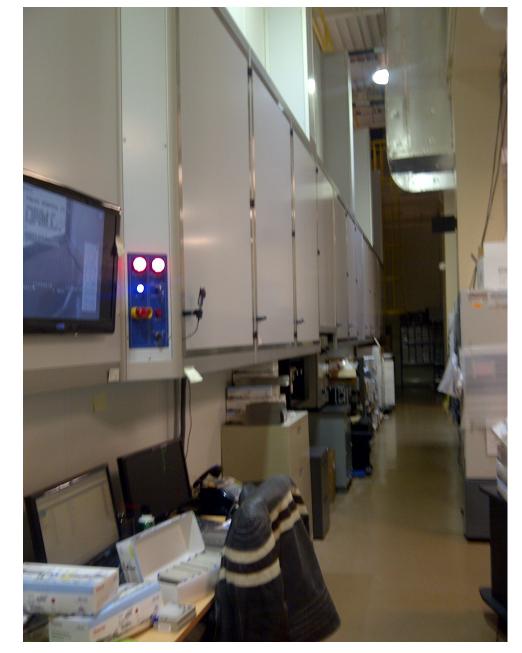
Processing



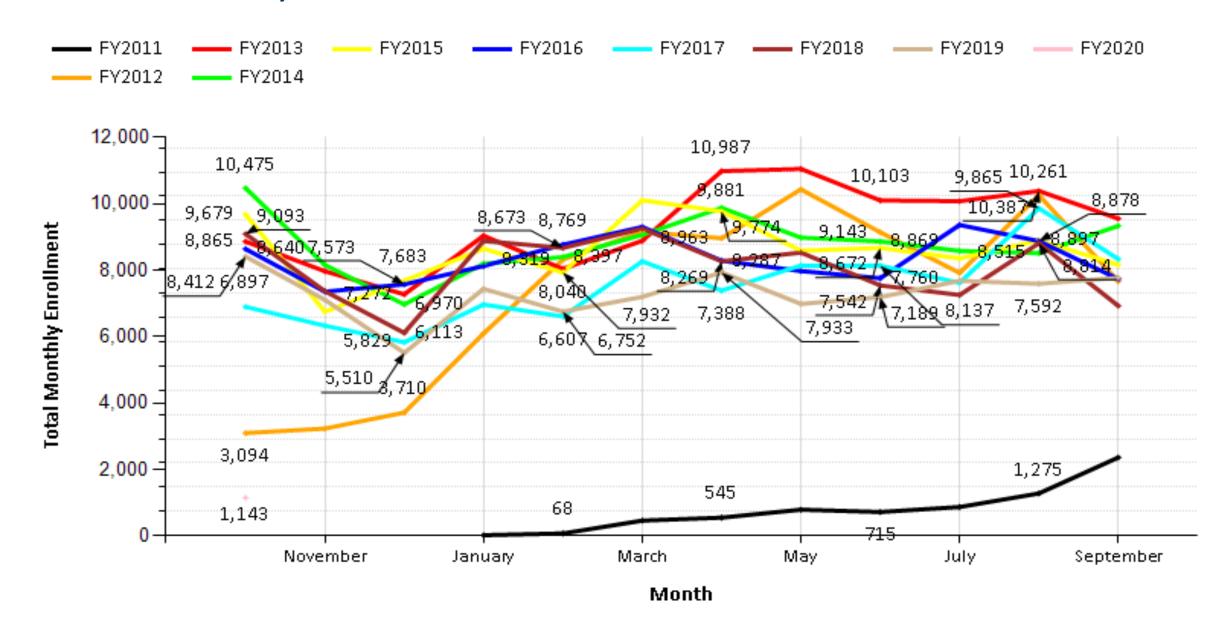


VA Central Biorepository: Storage

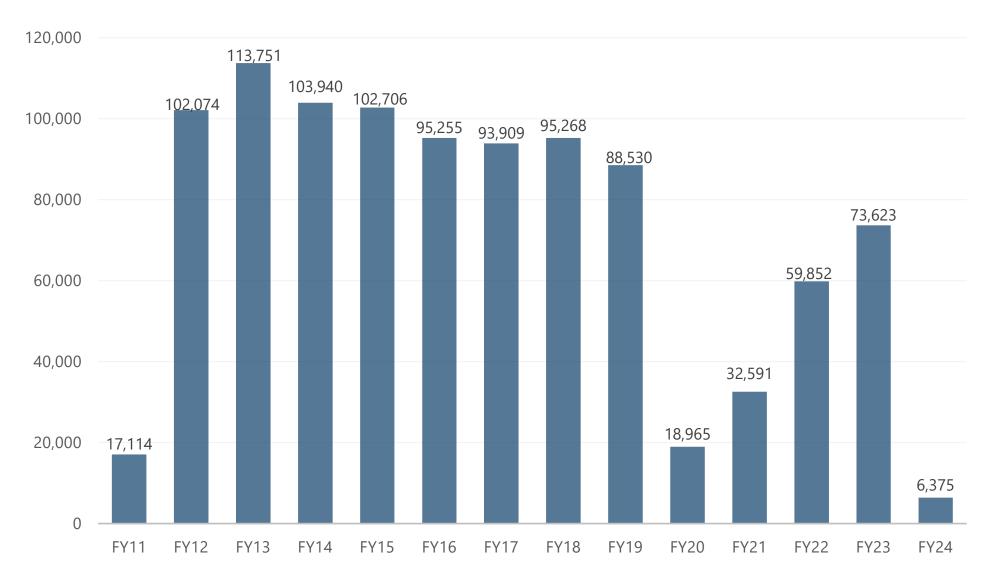




MVP Monthly Enrollment Across Years



MVP Enrollment by FY

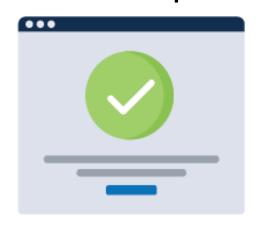




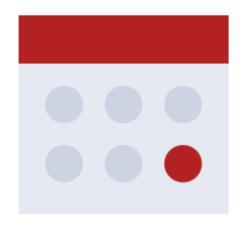
MVP Online For Expanded Enrollment



SIGN IN
using the same
credentials as other VA
partners (such as My
HealtheVet or eBenefits).



COMPLETE the consent process and allow access to health records.



SCHEDULE an MVP visit to provide a blood sample.



FILL OUT surveys about health and lifestyle.

mvp.va.gov

Launched 09/19 6,500 Enrolled Online

Biospecimen Expansion:

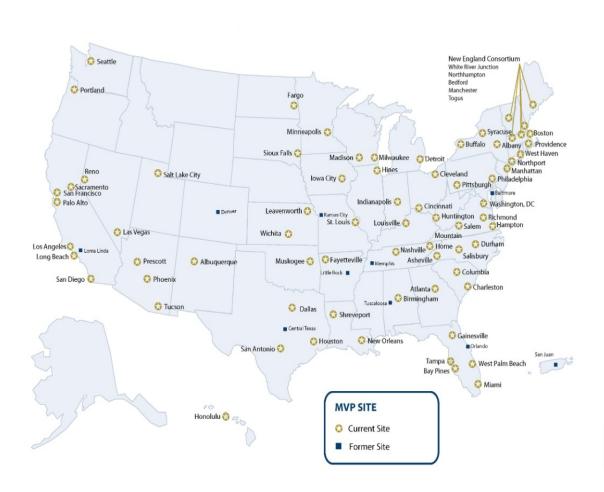
What are we doing in terms of biospecimens expansion?



MVP Site Stats

Current

- 147 total
 - 68 main sites
 - 79 satellite sites
- 279 MVP site staff
 - 106 LSIs
 - 173 research staf



Ever

- 228 total
 - 85 main sites
 - 143 satellite sites
- 932 MVP site staff
 - 181 LSIs
 - 751 research staff





Hitting a Million: Nov 8, 2023 at 3:42 pm





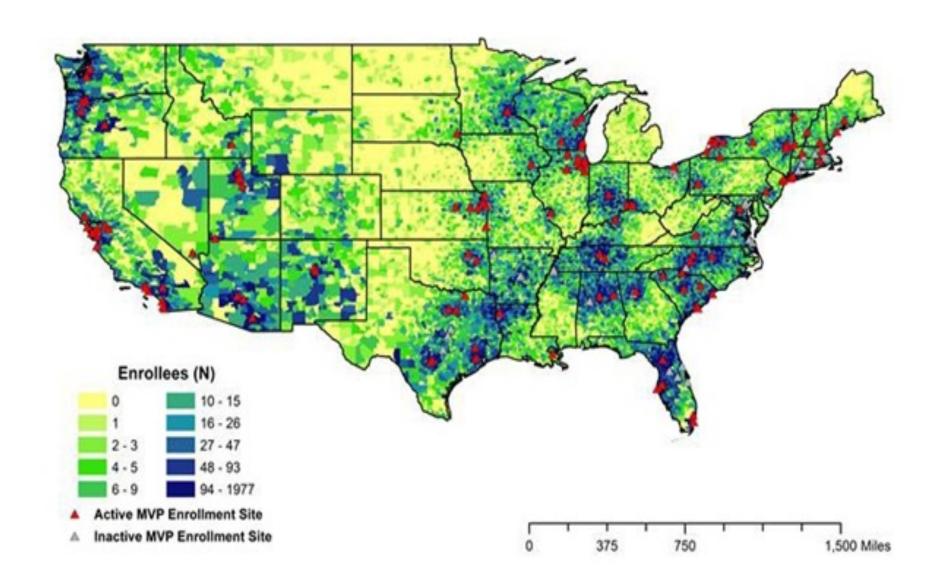


MVP: Current Status





MVP Enrollment Map



Who's in MVP?

Key health and demographic stats

Below are selected statistics from a recent review of the demographic, military, and health characteristics of Veterans enrolled in VA's landmark <u>Million Veteran Program</u>, which has become one of the world's largest databases of health and genomic information. The researchers concluded that the demographic make-up of the MVP cohort—which has nearly 700,00 Veterans enrolled to date—is similar to that of VA patients on the whole.

90.4% of the MVP cohort is male



The average age is 61.9



73.9% of the cohort is White, 19% Black, and 6.5% Hispanic







The most common self-reported disease among Men is hypertension (64.6%)



The most common self-reported disease among women is depression (47.5%)



38.2% of the MVP cohort is obese, and 42.3% is overweight



PTSD was reported by 18.3% of men, and 26% of women



Tinnitus was reported by 34.2% of men, and 20% of women







Diversifying the Cohort Beyond a Million

Stacey Whitbourne, Director, MVP Cohort Management



MVP 100K Re-Contact

- Invitation
 - Implement re-contact for additional research process
 - Sample: more than 5 years since enrollment
 - Mailings/emails with invitation to participate
 - Follow-up phone calls
 Exception
 - Engage existing MVP sites/staff for re-contact visit
 - Additional consent
 - Blood collection
 - Update and new self-report data / New data: cognition, military exposure, etc.
- Blood Specimen
 - Standard EDTA tube/biorepository processing and PAXgene
 - Processing of other types of specimens as needed
- Timeline
 - Begin pilot efforts in late 2023
 - 33K per year

Priorities:

Time in MVP
Baseline data
Diversity
Exceptional Age

