DaVINCI: Cohort Selection in DaVINCI

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Objectives

- Provide a brief overview of DaVINCI and the DaVINCI Cohort
- Describe DoD Eligibility and Enrollment
- Highlight VA-Beneficiary Relationships
- Describe a methodology to build a Longitudinal Continuous Patient Record across DoD and VA – when is it needed?
- Discuss select DaVINCI “subcohorts” and their characteristics

Brief Overview of DaVINCI

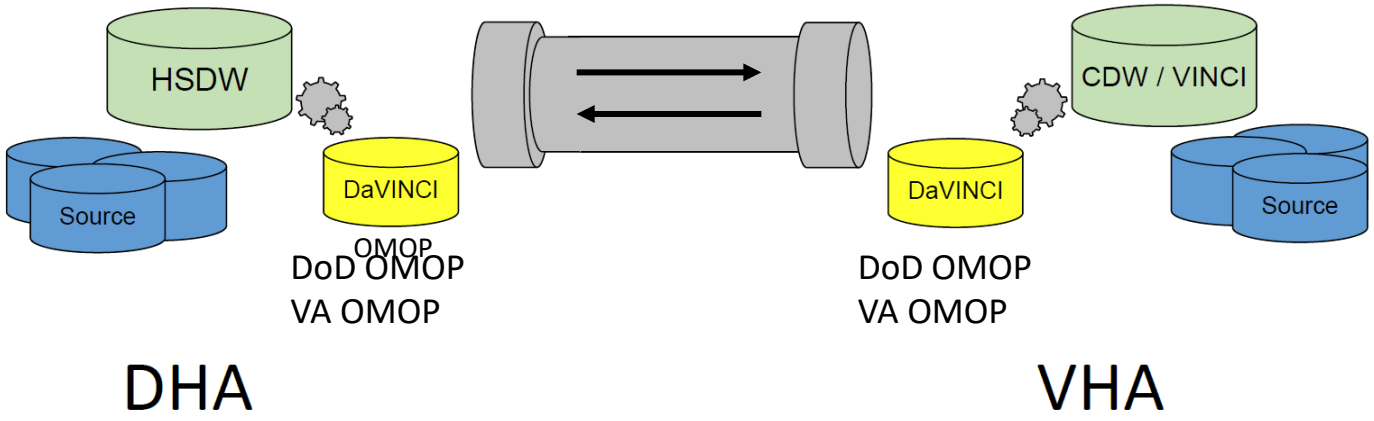
DaVINCI

- DoD and VA electronic health systems are not operationally integrated
  - Problem: there is a significant population whose health history is split between two data systems

- DaVINCI brings together DoD and VA medical records, claims and benefit information from the early 2000s forward
  - Includes ~24 million individuals
  - Enables researches to append DoD records to VA records to extend the visibility of patients' healthcare history

What is DaVINCI?

- Currently, 2 separate DaVINCI databases exist: one lives in a DoD analytic environment (MIP – Redshift), and the other in the VA analytic environment (VINCI – SQL Server)
- The set of tables and fields are the same for the OMOP CDM data tables



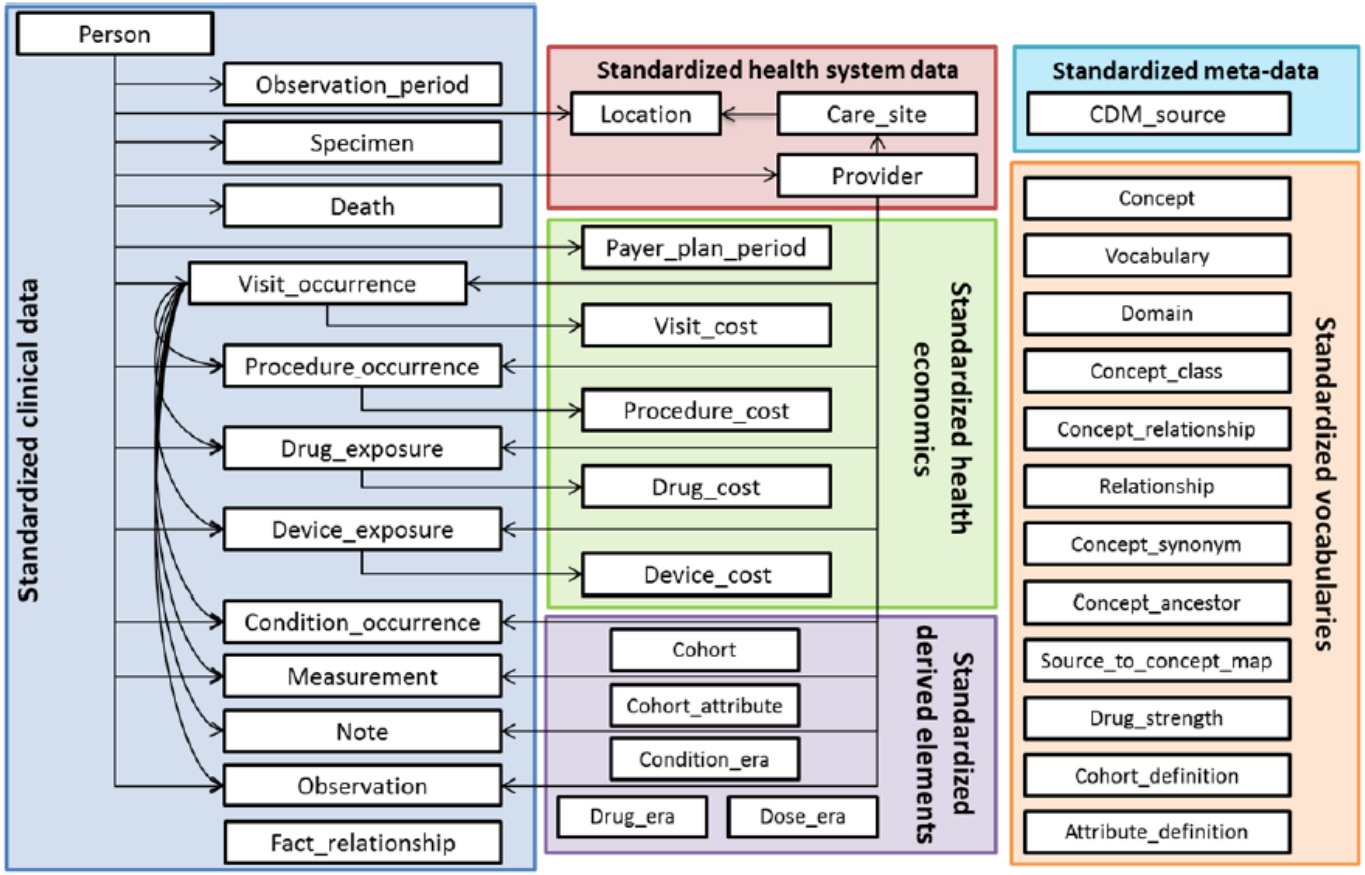
What is the OMOP Common Data Model (CDM)?

source data

extracted, transformed, derived data

national terminologies

best practices

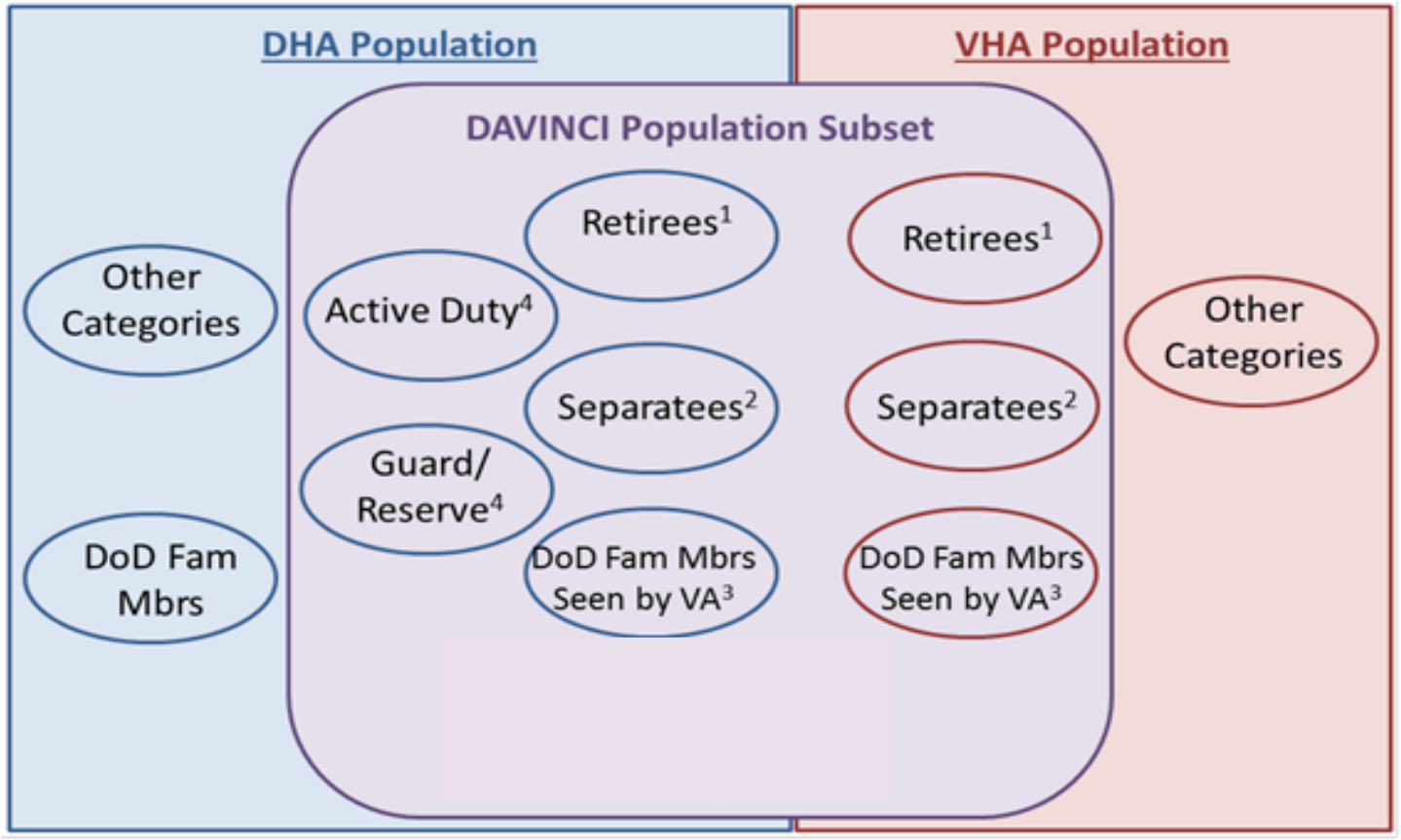


DaVINCI VA & DoD Source Tables

- The strength of OMOP is combining data sources, but the OMOP tables don't lend themselves to easily tracking a person's characteristics over time.
- Fortunately, DaVINCI also covers access to certain DoD and VA Source Tables
  - For example, when looking at patient enrollment, eligibility, and demographic information, researchers can use the OMOP Person, Observation Period, Payer Plan Period Tables, or the DoD and VA Source Tables:
    - DoD:
      - DEERS Person Detail
    - VA
      - SPatient Table (CDW)
      - ADUSH Table (VINCI/CDW)

DaVINCI Cohort

DaVINCI Cohort



Totals by "current" status:

- Active Duty: 1.4M
- Guard / Reserve: 380k
- Retirees: 2.2M
- DoD-only Separatees: 2M
- Veterans: 9.2M
- Deceased: 8.4M

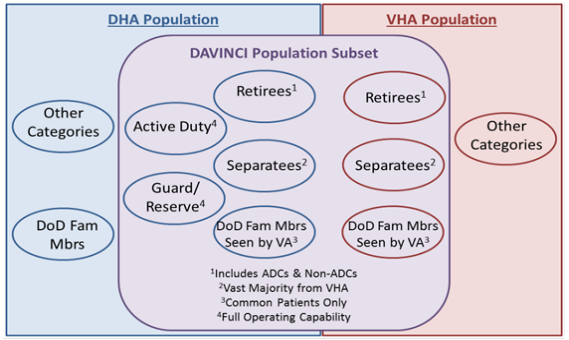
DaVINCI creates a consolidated view of healthcare from accession to interment for Service women and men, Veterans, and other eligible patients receiving care from DoD or VA

Category	OMOP Table Name	VA OMOP	DoD OMOP
Clinical	CONDITION_OCCURRENCE	2,273,566,044	1,869,624,856
Clinical	DEATH	8,005,742	1,188,184
Clinical	DEVICE_EXPOSURE	171,795,075	102,852,998
Clinical	DRUG_EXPOSURE	4,967,974,344	1,231,632,863
Clinical	FACT_RELATIONSHIP	9,272,022	1,831,727,646
Clinical	MEASUREMENT	15,033,573,540	1,993,313,977
Clinical	NOTE	0	43,856,260
Clinical	OBSERVATION	491,173,530	2,217,744,783
Clinical	OBSERVATION_PERIOD	15,209,496	9,307,536
Clinical	PERSON	23,753,749	9,860,907
Clinical	PROCEDURE_OCCURRENCE	2,256,294,443	1,818,098,199
Clinical	SPECIMEN	6,752,554,511	125,527,063
Clinical	VISIT_OCCURRENCE	2,926,319,211	940,892,776
Health System	CARE_SITE	1,221,209	1,422,724
Health System	LOCATION	44,449,311	197,992
Health System	PROVIDER	6,903,537	11,189,042
	Total	**34,982,065,764**	**12,208,437,806**

Select DaVINCI VA & DoD OMOP Tables

Types of Research Studies

Do you need a longitudinal patient record for your study?



- Depending on how your retrospective (observational) studies are structured, you may or may not need to track patients over time:
  - Example Study #1: Inpatient mortality following open heart surgery
    - Identify case with open heart surgery
    - Outcome: Mortality (identified by discharge code)
  - Example Study #2: Onset of post traumatic osteoarthritis (PTOA) after knee surgery (5-10 years)
    - Identify patients who have had a knee surgery
    - Require visibility over patient for 5 -10 years to check for diagnosis of PTOA

- Censoring?
- Representative of entire subgroup?
  (e.g. cont. enrolled Active Duty compared to activated Guard/Reserve?)

DoD:
Eligibility and Enrollment

What does it mean to be eligible in the DoD's Military Health System?

- TRICARE eligibility is granted via law ("entitlement")
  - Direct Care – care at MTFS
  - TRICARE for Life (TFL) – Medicare wraparound coverage
  - Up until 2018, could also include Standard (fee for service insurance to supplement direct care)
  - Nearly all beneficiaries have direct care.
  - Person called an "eligible"
- Sponsors are automatically put in DEERS by Service for these entitlements
  - The Service keeps information about Active Duty, Guard and Reserve as current as possible.
  - Sponsors must *register* family members, though
  - Family member updates are initiated by the families or sponsors themselves
- DEERS is the official source for information about eligibility for the MHS.

What does it mean to be enrolled in the DoD's Military Health System?

- Enrollment means different things to different people.
  - In the early days of TRICARE, enrollment almost always meant to a managed care program, as those were the only types of programs MHS beneficiaries needed to enroll in.
  - Later, programs were added that required enrollment that were not HMOs.
- Managed Care Programs:
  - TRICARE Prime:
    - One of the largest HMOs in the US.
    - Can be enrolled with a PCM in an MTF or in the private sector through the Managed Care Support Contracts or with a "line" PCM, such as a doctor who is embedded with an operational unit.
    - In order to enroll, must not have aged into Medicare, and must live where Prime is offered

What does it mean to be enrolled in the DoD's Military Health System?

- Managed Care Programs:
  - Designated Provider:
    - Very small percentage of the MHS Enrollees (most are enrolled in Prime)
    - Same benefit as Prime but managed by "Designated Providers"
    - Beneficiaries can enroll to one of the Designated Providers in 6 areas of the US.
    - Must live near a Designated Provider and be eligible for Prime, unless….
    - There are some grandfathered aged Medicare eligible enrollees, but enrollment is no longer open to this category of patients.
    - Enrollees must give up access to MTFs and use of TRICARE during the period of enrollment to a Designated Provider.
    - Designated Provider healthcare data are stored separately from other files.

What does it mean to be enrolled in DoD's Military Health System?

- Fee for Service (TRICARE Select):
  - Prior to Jan 2018, TRICARE Standard was automatically assigned to beneficiaries who were direct care eligible, and not aged into Medicare or in Prime or Designated Provider.
  - Beginning Jan 2018, Standard is replaced by Select. Those who were previously Standard-eligible may enroll in Select.
  - Both are fee for service insurance with similar benefits (some differences in cost-sharing)
  - No enrollment was required for Standard.
  - Select requires annual enrollment and requires new accessions (after 1/1/2018) and their families to pay premiums upon retirement.

What does it mean to be enrolled in DoD's Military Health System?

- TRICARE Fee Programs
  - Beneficiaries in TRICARE Fee programs do not have any eligibility at all unless it is purchased. All other programs have direct care eligibility.
  - **TRICARE Reserve Select and TRICARE Retiree Reserve Select**: Guard or Reserve members not on active duty can purchase TRICARE Standard or Select, depending on whether before or after Jan 2018.
  - TRICARE Young Adult: Previously eligible family members under the age of 26 can purchased Prime or Standard/Select, depending on the date.

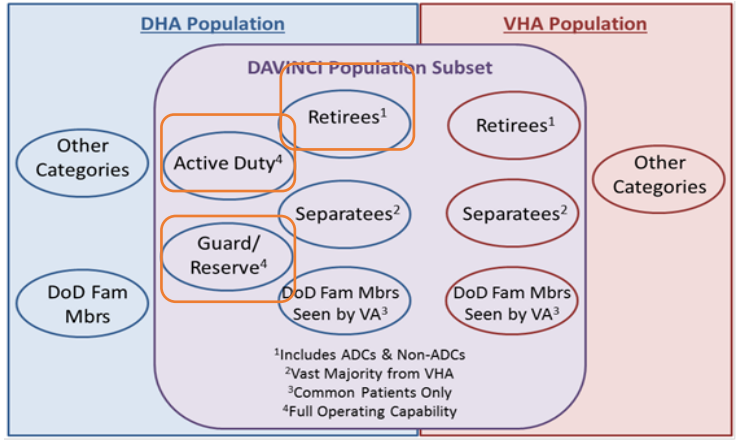
DoD Terminology and Variables (for determining (or tracking) Eligibility and Enrollment)

Beneficiary Category

- Beneficiary category is an **extremely important** variable in the MHS, especially with varying benefits based upon it.
- Beneficiary category common and Beneficiary category.
- Bencat Common is what is most commonly used.
  - 1: Active Duty Family Members,
  - 2: Retirees,
  - 3: All Others,
  - 4: Active Duty
    - Activated Guard and Reserve are included in category 4 (and their families in 1)

FY 2018, FM 7 MHS Eligible Population

Ben Cat Common	BCC Desc	Beneficiary Count
1	Active Duty Family	1,967,236
2	Retired	2,199,776
3	Retired Family/Oth	3,756,272
4	Active Duty	1,524,558



Beneficiary Category and Bencat Common

FY 2019, FM 5 MHS Eligible Population

Beneficiary Category		Bencat Common 1 Active Duty Family	2 Retired	3 Retired Family/ Others	4 Active Duty
ACT	Active Duty				1,379,655
DA	Active Duty Family	1,659,278			
DGR	Family of Activated Guard/Reserve	290,088			
DR	Family of Retired			2,634,552	
DS	Survivor			605,890	
GRD	Activated Guard/Reserve				186,956
IDG	Family of Inactive Guard Reserve			296,884	
IGR	Inactive Guard Reserve			187,078	
OTH	Other			36,035	
RET	Retiree		2,213,070		
Z	Unknown			155	
Sum:		**1,949,366**	**2,213,070**	**3,760,594**	**1,566,611**

Beneficiary Category

- Guard and Reserve and their families can be identified using Beneficiary Category, but not bencat common.
- Guard and Reserve are usually not eligible for healthcare at MTFs or using TRICARE except:
  - Care for line of duty related conditions
  - When called up to active service for 30 days or more, eligibility is granted for the duration of the call-up
  - During early alert (pre-callup) and transitional assistance management program (6 months post callup)
  - When enrolled in TRICARE Reserve Select
  - When the beneficiary is covered under another's benefit (i.e. married to an active duty service member)

Health Plans

- Beneficiaries opt for additional coverage beyond the default.

Type of Benefit	Description	How to Get it
Direct Care	Nearly all beneficiaries have direct care	Default
Fee for Service	Standard <1/2018, Select 1/2018+)	Pre 2018 was default, 2018+ requires enrollment
HMOs	Prime, Designated Provider	Enrollment
Medicare Wraparound	TRICARE for Life	Default, but must enroll with Medicare and have part B
Fee Plans	TYA, TRS, TRR	Enrollment. This group does not have any default coverage
Preferred Access for Primary Care	Plus. Not a health plan	Enrollment

Enrollment HCDP

FY2019 FM5, Enrolled HCDP Frequency

HCDP - Enrolled	HCDP Description	Beneficiary Count
303	TRICARE Select - AD Family Members	358,785
304	TRICARE Select - TAMP Sponsors and Family Members	69,873
305	TRICARE Select - Retired Sponsors and Family Members	1,245,892
306	TRICARE Select - Reserve Select Sponsors and Family Membe	388,638
307	TRICARE Select - Retired Reserve Select Sponsors and Family	553
308	TRICARE Select - Young Adults	24,097
310	TRICARE Prime - AD Sponsors	1,267,706
311	TRICARE Prime - AD Family Members	1,497,857
312	TRICARE Prime Remote - AD Sponsors	90,666
313	TRICARE Prime Remote - AD Family Members	91,295
314	TRICARE Prime - TAMP Sponsors and Family Members	8,112
315	TRICARE Prime - Retired Sponsors and Family Members	1,659,168
330	TRICARE Prime - Young Adult Active Duty/TAMP	1,250
331	TRICARE Prime - Young Adult Retired	10,492
332	TRICARE Prime Remote - Young Adult Active Duty	31
345	TRICARE Plus, Direct Care Only (Presentation level only)	5,241
346	TRICARE Plus, Direct Care Only	185,542
347	TRICARE Plus with ADFM Selec	846
348	TRICARE Plus with Ret/RetFM Select	25,412
		2,558,185

- HCDP, Enrolled is available in all years of data.
- Valid values changed at the beginning of CY2018.
- All members were disenrolled from legacy HCDPs and re-enrolled into the new ones.

Enrollment HCDP

- Legacy Enrollment HCDP categories were collapsed into groups that represent the same benefit.

Example of HCDP Code Collapsing

Legacy HCDP	Description	New HCDP	Description
110	Prime/Designated Provider, Ind Cvg for Survivors of AD Sponsors	315	Prime/Designated Provider Retired Sponsors and Family Members
111	Prime/Designated Provider, Fam Cvg for Survivors of AD Sponsors		
116	Prime/Designated Provider, Ind Cvg for Retired and Medal of Honor Spons/Fam		
117	Prime/Designated Provider, Fam Cvg for Retired and Medal of Honor Spons/Fam		
136	Prime/Designated Provider, Ind Cvg for Survivors of Grd/Res Deceased Sponsors		
137	Prime/Designated Provider, Fam Cvg for Survivors of Grd/Res Deceased Sponsors		
160	Prime/Designated Provider, Ind Cvg for Medically Retired Sponsors and Fam		
161	Prime/Designated Provider, Fam Cvg for Medically Retired Sponsors and Fam		

Reminder: Designated Provider/ USFHP Enrolled MHS Beneficiaries cannot be treated at MTFs or in Purchased Care. Their data is captured by the USFHP Sites of Enrollment (e.g., Johns Hopkins) and sent to the MDR -> DaVINCI. Comprises of a very small portion of the MHS population.

Enrollment Group and Eligibility Group

Enrollment Group	Enrollment Group Desc	Beneficiary Count
D	Direct Care Only	446,772
L	TRICARE Plus	216,115
P	Prime	4,516,133
S	Select	2,111,987
U	Designated Prov	154,044
Z	None	2,084,392

Eligibility Group	Elg Group Desc	Beneficiary Count
D	Direct Care Only	451,931
E	TRICARE Eligible	6,270,426
L	TRICARE for Life	2,364,310
R	TRICARE Retiree Res Select	9,979
S	TRICARE Reserve Select	388,550
Y	TRICARE Young Adult	35,261
Z	None	8,986

- CY2018 and later
- Derived from healthcare delivery program codes
- Easy to use categories that characterize eligibility and enrollment.
- The reason the “D” values differ is that some of the Direct Care Only eligible are in TRICARE Plus

Alternate Care Value Group

- ACV Group is a legacy data element that was used to characterize enrollment.
- Was discontinued in 2019.
- Reliant: Mostly unenrolled Active Duty Service Members

ACV Group	Beneficiary Count	Percentage:
Desig Prov	151,126	1.60%
Other	4,404,303	46.64%
Plus	217,324	2.30%
Prime	4,332,353	45.88%
Reliant	337,467	3.57%
	Percentage:	**100.00%**
Sum:	**9,442,573**	

- There are significant differences in the benefits associated with enrollment programs.
- For example, TRICARE Prime has access guarantees while many of the other programs do not.
- Be sure when you use the word “enrollment” that you are communicating well which categories you mean.

Enrollment PCM Type

Enrollment PCM Type	Enrollment PCM Type Desc	Beneficiary Count
C	Civilian Prime (Non-Remote)	1,047,632
M	MTF	3,308,370
N	No PCM/Unknown	34,943
O	Operational Forces PCM	143,178
R	TRICARE Prime Remote	150,241
U	Designated Provider	154,013
Z	Not Enrolled	4,651,264

- Enrollment PCM Type indicates the affiliation of an enrollee's Primary Care Manager

Enrollment Location (MTFs/DMIS IDs)

- Defense Medical Information System (DMIS) IDs are used to identify enrollment entities
- Enrollment Site will contain an MTF DMISID if the beneficiary is enrolled to an MTF.
- There are also DMIS IDs to represent enrollment to a managed care provider in the private sector, or to Designated Provider.

Enrollment Site Parent	Enrollment Site Parent Name	Beneficiary Count
6923	MNG CARE-R 23 1JAN2018 (EAST)	851,709
6924	MNG CARE-R 24 1JAN2018 (WEST)	353,657
0124	NMC PORTSMOUTH	159,955
0089	AMC WOMACK-BRAGG	117,219
0029	NMC SAN DIEGO	115,821
0125	AMC MADIGAN-LEWIS	108,550
0110	AMC DARNALL-HOOD	99,887
0123	FT BELVOIR COMMUNITY HOSP-FBCH	95,779
0039	NH JACKSONVILLE	82,599
0109	AMC BAMC-FSH	79,281

Benefit Information

- Other government sponsored health coverage
  - Veterans Administration (available in VA OMOP)
  - Medicare
  - Medicaid
  - FEHBP
- Of these, only Medicare information is available
  - Steady data exchange w/ CMS since 2001 (on the MDR for MHS Beneficiaries)
  - Necessary for TFL
  - TRICARE receives eligibility, Part D enrollment and claims if TRICARE had any payment (i.e if the beneficiary had a co-pay with Medicare).

Medicare Eligibility for DoD Beneficiaries

Medicare Eligibility		<65	65+
A	Medicare A Only	19,507	75,979
B	Medicare B Only	168	2,834
C	Medicare A and B	168,359	2,209,722
N	No Medicare	6,986,176	26,896

- Under 65 Medicare eligibles are disabled, ESRD or have Lou Gehrig's disease and can be in Prime
- Over 65 w/ no eligibility did not pay enough Social Security to get Medicare
- Prime/Select eligibility exists until a beneficiary ages into Medicare

Medicare Eligibility for DoD Beneficiaries

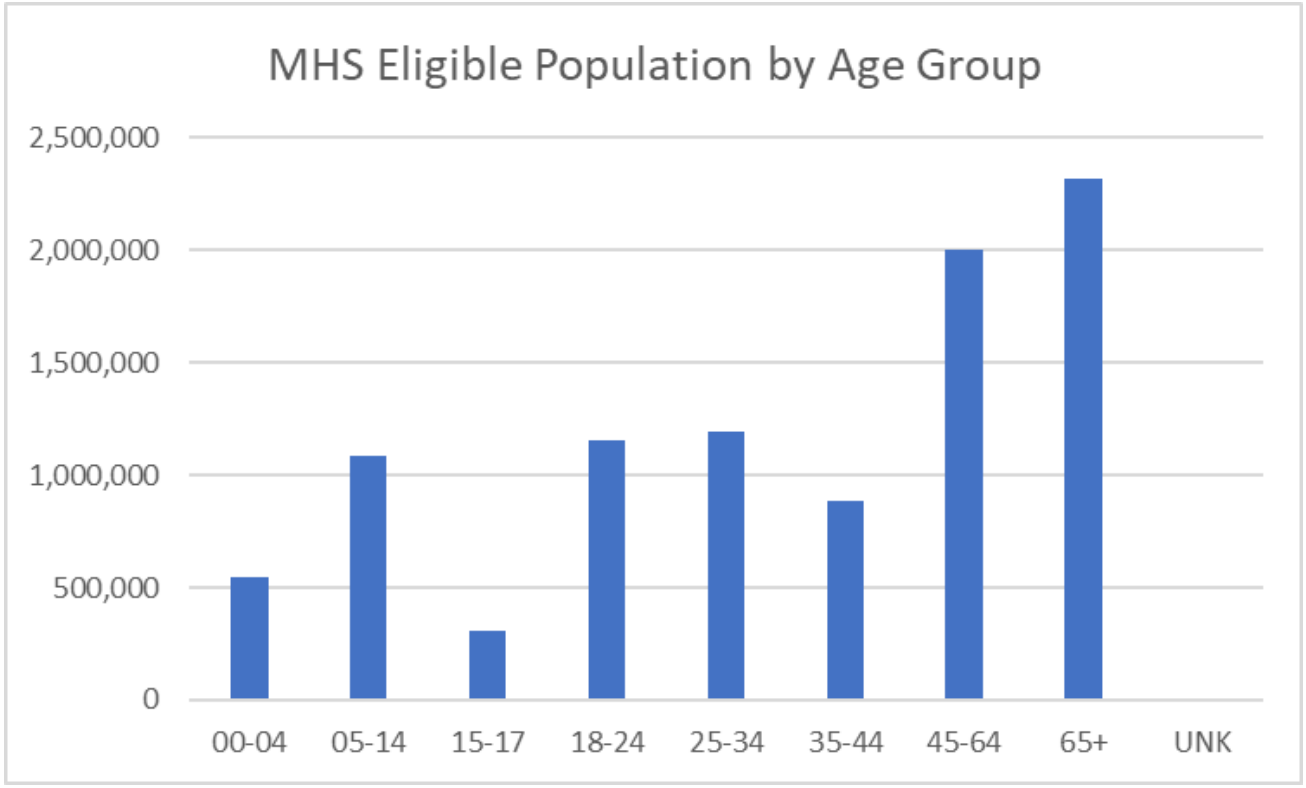
Enrollment Group		Medicare A and B	Medicare A Only	Medicare B Only	No Medicare
D	Direct Care Only	6,368	77,904	503	381,956
L	TRICARE Plus	185,567	3	122	26,108
P	Prime	63,781	1,654	799	4,406,330
S	Select	1,831	667	1,499	2,083,841
U	Designated Prov	42,433	5,535	37	106,008
Z	None	2,078,101	9,723	42	8,829

- Most TRICARE Plus are Medicare Eligible
- The TRICARE Prime and Select Medicare Eligibles are either disabled or 65+ with no social security
- The Designated Provider Medicare eligibles are grandfathered, DP programs no longer accept Medicare eligibles.

Basic Demographics – Age
DOD Beneficiaries

FY 2019, FM 5 MHS Eligible Population

Age Group Code	Age Group Desc	Beneficiary Count	Percentage:
A	00-04	549,432	5.79%
B	05-14	1,082,796	11.41%
C	15-17	309,164	3.26%
D	18-24	1,153,549	12.16%
E	25-34	1,192,138	12.56%
F	35-44	887,341	9.35%
G	45-64	1,999,579	21.07%
H	65+	2,315,431	24.40%
Z	UNK	211	0.00%
		Percentage:	**100.00%**
Sum:		**9,489,641**	



Race/Ethnicity	Description	Not	Sponsor
A	American Indian/Alaskan Native	5,820	41,692
B	Asian or Pacific Islander	43,618	184,330
C	Black, not Hispanic	90,984	567,761
D	White, Not Hispanic	266,516	2,318,230
E	Hispanic	21,618	343,505
X	Other	13,628	63,335
Z	Unknown	1,306,135	471,813
	Null	3,728,262	64,585
	Total	5,476,581	4,055,251
% Unknown		92%	15%

Race	Description	Not	Sponsor
C	White	285,586	2,594,654
M	Asian or Pacific Islander	38,766	181,953
N	Black	93,511	588,827
R	American Indian/Alaskan Native	5,483	33,648
X	Other	21,680	112,717
Z	Unknown	1,312,438	483,696
	Null	3,719,117	59,756
	Total	5,476,581	4,055,251
	% Unknown	92%	16%

Basic Demographics & Caveats: Race/Ethnicity

- Race & Race/Ethnicity:
  - Unreliable, and poorly populated except for sponsors
  - Race and race/ethnicity can conflict for a person

Capturing DoD Eligibility and Enrollment Data
Defense Enrollment and Eligibility Reporting System (DEERS)

DaVINCI DoD Source Data: DEERS Data Files

- DEERS Person Detail (Point in Time Extract):
  - Monthly file
  - Contains person identifying information, geography, enrollment, eligibility, demographics, service data, sponsor information, etc.
  - There are two different sources of DEERS data for DaVINCI
  - **Direct MDR Extract: FY00 FM12 to FY08 FM01**
    - These data were provided from the MDR directly via an extract:
    - **Each month of data was updated 6 times to accommodating late arriving information**
    - These files include multiple records per person per month; primary record flag indicates best relationship and can vary by month
    - Monthly files can also include some records for certain beneficiaries who are not eligible in a month (eligibility flag indicates monthly eligibility);

DaVINCI DoD Source Data: DEERS Data Files

- DEERS Person Detail (Point in Time Extract):
  - **Extracted from MDR and "processed" on the MIP: FY08 FM02+**
    - 1 record per person who is eligible (records for non eligibles in a month are not provided; only primary records)
    - Updates are not applied to this data, which is a data quality problem.
      - For example, DEERS will not know of all people who died within a month (and are subsequently not eligible) until a death certificate is provided.
      - That late arriving information does not get passed to DaVINCI.
      - DHA is hoping to address this issue to improve quality of data and this will be passed along to DaVINCI.
      - Primarily a problem with mortality, newborns, new spouses and changes in health plans in the 1st quarter of each year.

DaVINCI DoD Source Data: DEERS Data Files

- Analysts can use the DEERS Person Detail file to create a Longitudinal Eligibility/Enrollment File:
  - Can be built from the monthly DEERS Person Detail
  - Instead of one record per person per year per month, can build a file that contains one record per person per year, with monthly attributes of the person as columns.
    - Note: While not sent to DaVINCI, this type of Longitudinal Eligibility File (LELG) is available on the MDR.

DEERS PERSON DETAIL

FY	Month	Name	Enr Site
2017	Oct	John	0110
2017	Nov	John	0110
2017	Dec	John	0110

LONGITUDINAL ELIGIBILITY

FY	Name	Enr Site Oct	Enr Site Nov	Enr Site Dec
2017	John	0110	0110	0110

VA Beneficiary Relationships: Brief Overview

VA Eligibility and Patient Status

- Unlike the DoD, VA does not have enrollment style healthcare plans.
- General eligibility requirements include service in the Active military, Naval, or Air Services or Active-Duty Service as a member of the Reserves or National Guard
- Veterans are assigned to priority groups 1-8 (with 1 considered the highest priority) based on military service history, disability severity rating, income, Medicaid eligibility, and other benefits the Veteran may be receiving

Priority Group	ADUSH: Patient Records (2018)	Percentage (%)
1	2,595,558	27%
2	749,087	8%
3	1,288,370	14%
4	118,483	1%
5	1,542,621	16%
6	485,847	5%
7 (all)	292,241	3%
8 (all)	2,370,674	25%
Total	**9,442,881**	

VA Eligibility and Patient Status

- Operationally, the VA also assesses the number of *active patients.*
- Active Patients defined as patients with at least one:
  - *Outpatient/Inpatient Encounter or*
  - *An active medication prescription*

captured in the electronic health record annually.

- In DaVINCI, these record are found in the Visit Occurrence, Measurement, and Drug Exposure Tables.

Building a Longitudinal Continuous Patient Record

DoD vs VA: Compare and Contrast Methods

- While the DoD has specific plans that patients enroll into, there is no directly comparable status in the VA to the DoD's "enrolled" concept
  - Can be difficult to track enrolled/active patients over time
- We used priority groups to derive a subset of Veterans who rely on the VA health system (similar to DoD enrollees).
  - Based on our analysis, Priority Group 1-5 VA beneficiaries were more likely to use the VA system for their care.
  - Caveat:
    - In DaVINCI, DoD sends both MTF and TRICARE claims while VA primarily sends EHR data.

DaVINCI subcohorts

Methodology for Identifying subcohorts in DaVINCI

Individuals from the DoD and VA are uniquely assigned to a subcohort following a hierarchy (for each calendar year):

1. **Old Deceased:**
   - Deaths occurring in previous years
2. **(New) Deceased**:
   - Deaths occurring in the “current” or “given” year
3. **Active Duty/Guard Reserve (“Service Members”):**
   - Those in the Military Health System (MHS) who have a DEERS Beneficiary Category of Active Duty, Guard or Reserve in a given year
4. **Military Retiree:**
   - Those who have a DEERS Beneficiary Category of Retired in a given year
5. **DoD Family Member:**
   - Those who have DEERS Beneficiary Category of a ‘Dependent of a Service Member’ in a given year
6. **Veteran VA User:**
   - Those who are recognized in the VA system and are flagged as veteran, who also do not have future DEERS Beneficiary Category of Active Duty/Guard/Reserve (“Service Members”)
7. **Non-Veteran VA User:**
   - Those known to the VA system but are not flagged as Veteran users
8. **Separatee:**
   - Individuals who have past instances of Active Duty, Guard, Reserve, or Retired status but have not appeared in the VA data
9. **Future Active Duty/Guard Reserve (“Service Members”):**
   - Individuals who have been identified in the DoD/VA cohort population but do not fit into any other hierarchy group but have a future Service Member Beneficiary Category
10. **Fall Through:**
    - A data integrity group that catches those that fail to be assigned to other parts of the hierarchy

DaVINCI subcohorts by CY 2000-2020

Calendar Year	Active Duty/Guard	Separatee	Military Retiree	Veteran	Deceased	Total
2000	1,644,229		1,922,976	12,142,080	245,165	15,954,450
2001	1,946,780	54,414	1,913,556	11,935,574	265,830	16,116,154
2002	2,042,599	200,671	1,918,704	11,673,864	288,646	16,124,484
2003	2,171,037	347,482	1,915,410	11,484,557	303,177	16,221,663
2004	2,213,953	477,184	1,925,132	11,304,670	310,643	16,231,582
2005	2,161,280	593,239	1,942,614	11,142,642	325,719	16,165,494
2006	2,111,618	715,418	1,968,120	10,979,653	329,165	16,103,974
2007	2,101,221	804,915	1,996,020	10,807,654	331,393	16,041,203
2008	2,152,395	919,663	2,017,924	10,740,253	341,770	16,172,005
2009	2,217,138	969,777	2,036,838	10,560,743	339,490	16,123,986
2010	2,227,852	1,040,694	2,049,380	10,386,261	348,746	16,052,933
2011	2,197,352	1,122,068	2,063,082	10,220,981	357,170	15,960,653
2012	2,158,266	1,203,126	2,078,615	10,054,754	362,617	15,857,378
2013	2,109,140	1,290,438	2,087,020	9,902,033	367,586	15,756,217
2014	2,049,050	1,378,761	2,107,951	9,724,384	363,947	15,624,093
2015	1,996,647	1,470,815	2,131,720	9,528,100	372,363	15,499,645
2016	1,998,271	1,536,849	2,150,710	9,316,438	369,101	15,371,369
2017	2,009,692	1,602,804	2,163,617	9,099,332	374,530	15,249,975
2018	2,039,020	1,659,038	2,176,931	8,863,911	371,054	15,109,954
2019	2,077,039	1,716,489	2,180,262	8,638,012	368,335	14,980,137
2020	2,120,216	1,758,860	2,181,272	8,374,770	414,486	14,849,604

The 5 subcohorts we focused on made up a total of 73% of the total (non-deceased) DoD and VA population captured within DaVINCI

- The largest subcohort that was not included were Non-Veterans utilizing their VA ("Non-Veteran VA User")
  - 17% of total DaVINCI Cohort
  - ~4.2 million
- Some subgroups (e.g., Active Duty/Guard) remain stable but change year
  - Active Duty/Guard: Total numbers set by DoD need and turnover depends on contract length
- The Veteran subgroup accumulates people over time until they lose their VA benefit or die

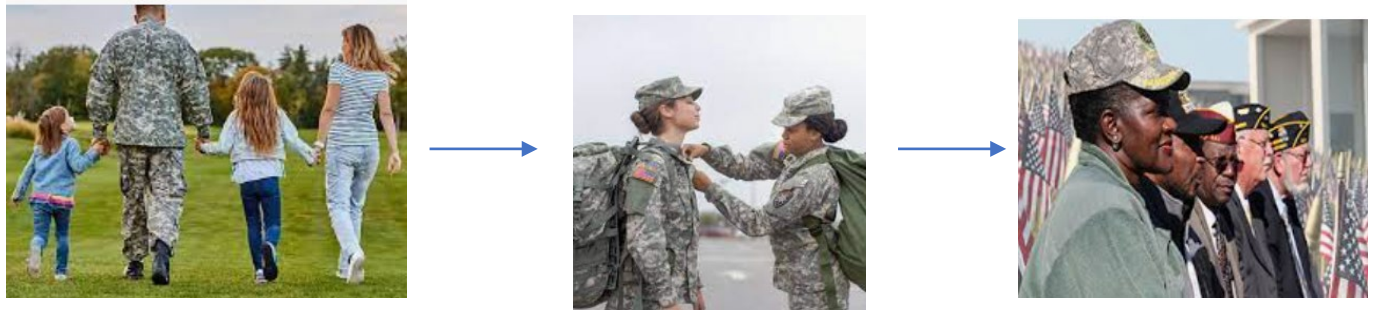
Relationship and Utilization by Subcohort

Data Source	Active Duty, Guard, Reserve	Separatee	Military Retiree	Veteran	Deceased
DaVINCI: CY 2020 Population	**2,120,216**	**1,758,860**	**2,181,272**	**8,374,770**	**414,486**
DoD (OMOP)					
Num Continuously Enrolled (12 months)	**1,211,324 (57%)**	**29,568 (2%)**	**2,070,495 (95%)**	**22,290 (<1%)**	**8,934 (2%)**
Num Enrolled (at least 1 month)	1,884,634 (89%)	34,839 (2%)	2,163,578 (99%)	24,413 (<1%)	9,128 (2%)
Num Utilizing Care - Any Visit/Stay	1,693,076 (80%)	156,192 (9%)	1,625,874 (75%)	134,922 (2%)	30,410 (7%)
Num Utilizing Care - Outpatient Visit	1,683,780 (79%)	152,824 (9%)	1,604,161 (74%)	126,378 (2%)	29,817 (7%)
Num Utilizing Care - Emergency Visit	374,246 (18%)	26,261 (1%)	388,092 (18%)	25,675 (<1%)	16,758 (4%)
Num Utilizing Care - Inpatient Visit	65,049 (3%)	8,439 (<1%)	193,299 (9%)	7,688 (<1%)	15,339 (4%)
Num Utilizing Care - Ancillary only use	44,724 (2%)	9,153 (<1%)	15,484 (<1%)	19,997 (<1%)	410 (<1%)
Num Utilizing Care - Pharmacy only use	41,507 (2%)	2,609 (<1%)	244,809 (11%)	470,790 (6%)	10,691 (3%)
VA (OMOP)					
Num Priority Group 1-5	**111,539 (5%)**	**2,885 (<1%)**	**1,295,845 (59%)**	**4,611,197 (55%)**	**226,482 (55%)**
Num Utilizing Care - Any Visit/Stay	60,557 (3%)	38 (<1%)	895,992 (41%)	5,071,558 (61%)	217,083 (52%)
Num Utilizing Care - Outpatient Visit	54,128 (3%)	33 (<1%)	864,575 (40%)	4,885,599 (58%)	199,280 (48%)
Num Utilizing Care – Emergency Visit	6,281 (<1%)	5 (<1%)	96,577 (4%)	809,360 (10%)	44,061 (11%)
Num Utilizing Care - Inpatient Visit	633 (<1%)	2 (<1%)	23,971 (1%)	229,091 (3%)	35,439 (9%)
Num Utilizing Care - Ancillary only use	2,260 (<1%)	5 (<1%)	193 (<1%)	1,171 (<1%)	158 (<1%)
Num Utilizing Care - Pharmacy only use	290 (<1%)	2 (<1%)	2,324 (<1%)	12,791 (<1%)	3,107 (<1%)

- Only about 57% of persons in the Active Duty, Guard, or Reserve sub cohort were continuously enrolled to the DoD in CY 2020
- The majority (80%) of Active Duty, Guard, and Reserve utilize the DoD system, but about 3% were seen in the VA
- About 75% of Military Retirees were seen by the DoD and 41% were seen by the VA

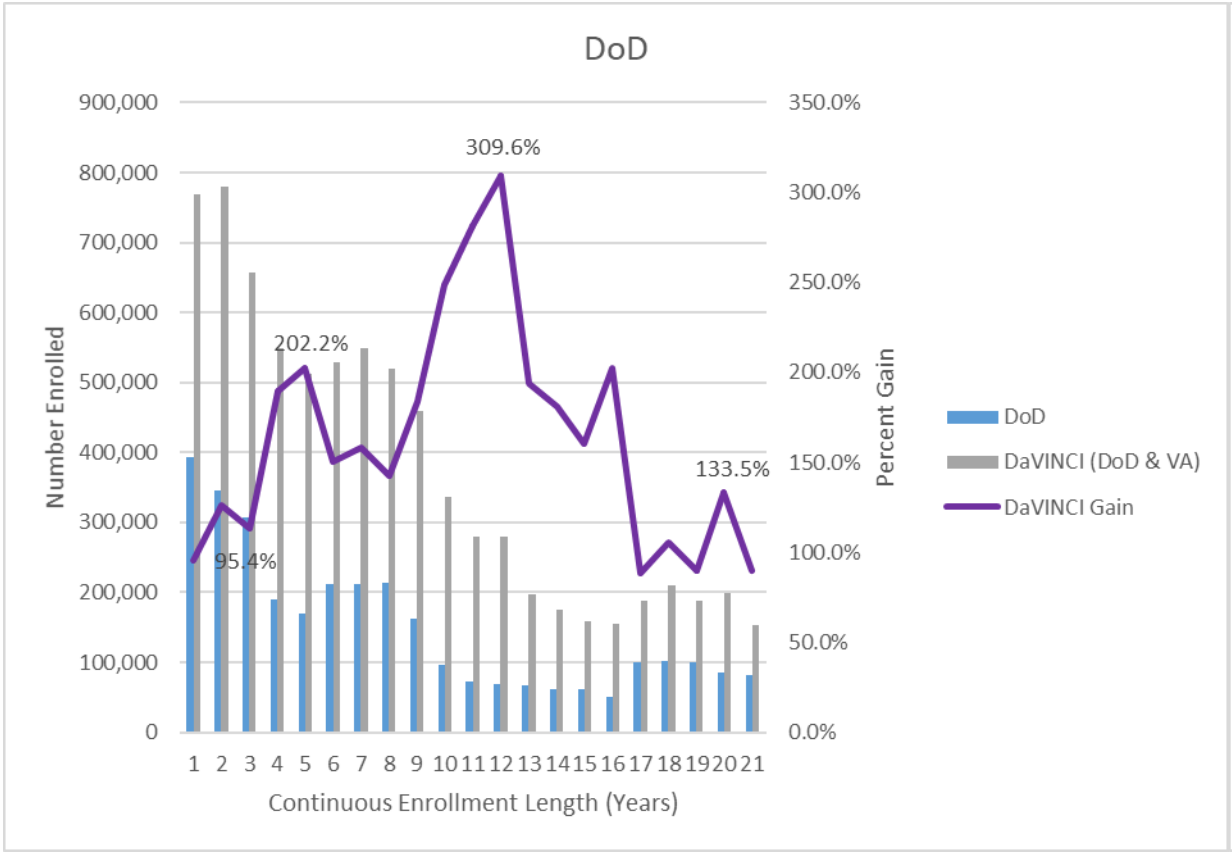
CY 2020 Subcohorts: Continuous Years of Enrollment

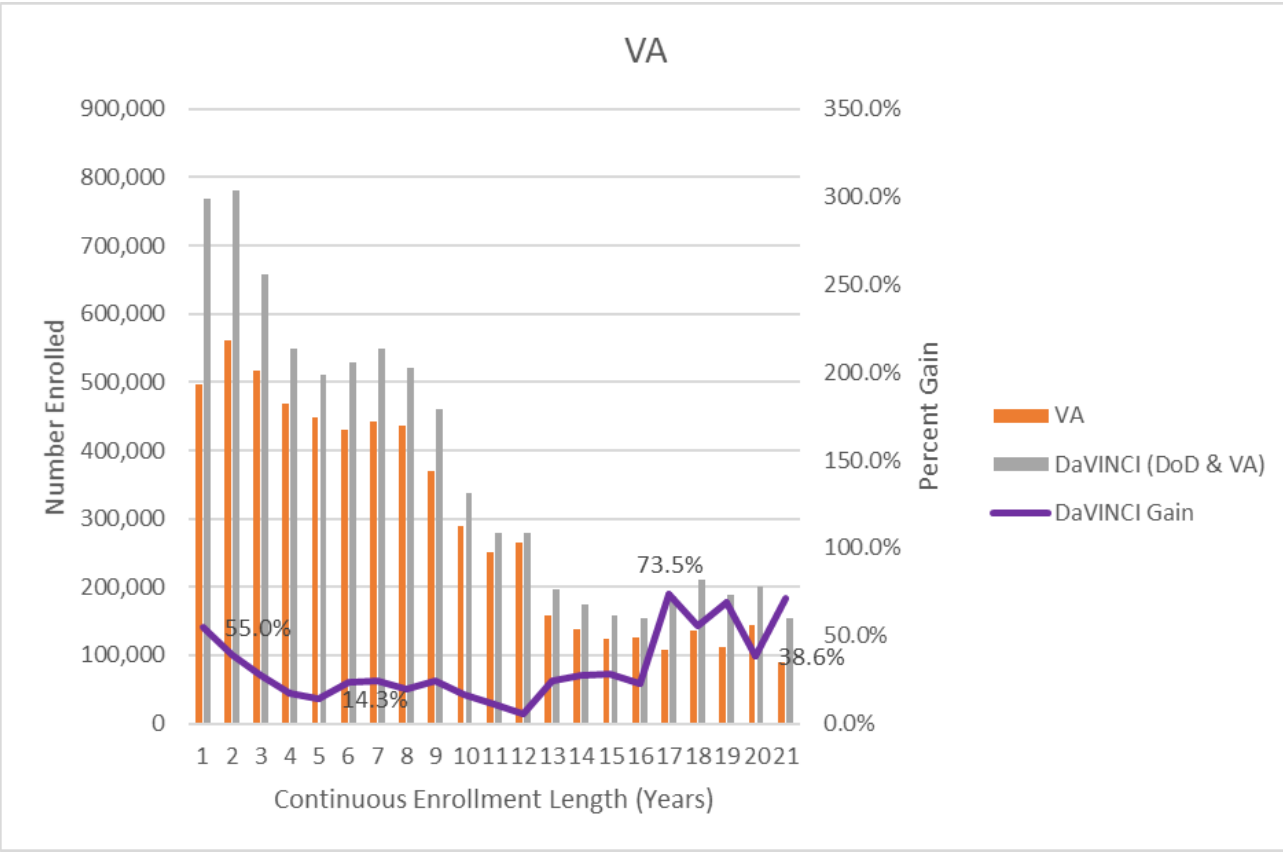
Subcohort	N	Min	Max	Mean (s.d.)	Median (IQR)
All Subcohorts	**8,556,810**	**1**	**21**	**9 (6.88)**	**8 (4-16)**
Active Duty/Guard	1,507,532	1	21	5 (5.02)	3 (2-7)
Separatee	41,153	1	21	10 (8.01)	6 (2-18)
Military Retiree	2,156,154	1	21	15 (6.15)	19 (10-21)
Veteran	4,621,305	1	21	8 (5.79)	7 (3-11)
Deceased	230,666	1	21	9 (6.58)	8 (4-15)



- For beneficiaries who were in the 5 subcohorts in CY2020, we tracked their continuous "enrollment" back 21 years to examine the distribution and average length of continuous enrollment.
- The Retiree cohort has the longest average length of continuous enrollment with a mean of 15 years
- The Active Duty/Guard cohort had the shortest average length of continuous enrollment with a mean of 5 years

CY 2020 Subcohorts: Impact of Combining VA & DoD Data





- The value added (n count) from building a cohort in DaVINCI is greater for those who would normally only utilize DoD data
  - For Example: For the population continuously enrolled for 1 year in 2020, DaVINCI increases the total by over 95% compared to DoD data alone (55% compared to VA data alone)

Censoring & Generalizability of DaVINCI (DoD/VA) subcohorts

- Our DoD and VA methodology tries to capture the beneficiaries who rely most on DoD and VA healthcare systems and over whom we then have the most visibility in our data:
  - DoD: Prime Enrolled
    - Active Duty/AD Family (Prime Enrolled) beneficiaries have low rates of OHI (~4%) so they rely on the DoD for the majority of their care
    - Note: 65+ Retirees enrolled in Medicare cannot generally be also enrolled in TRICARE Prime
  - VA: Priority Group 1-5 (limited private sector data)
- These patients are likely (systematically/inherently different) from those who are not ‘continuously’ enrolled or choose to only partially rely on DoD/VA health systems

Generalizability to the Civilian Population

DoD and VA Beneficiaries are inherently different from the average civilian population.

- Prevalence of Conditions/Injuries:
  - Anterior Cruciate Ligament Reconstruction (ACLR) is 10 times more common in Active Duty Service Members as compared to civilian cohorts*
- High Demand Athletes are a better civilian comparison subcohort for Musculoskeletal injuries
- Demographic Differences
- The DaVINCI cohort is predominately male; therefore, it does not provide a gender 'balanced' population pool to draw from.

Source: Owens BD, Mountcastle SB, Dunn WR, et al: Incidence of anterior cruciate ligament injury among active duty U.S. military servicemen and servicewomen. *Mil Med*. 2007*;172*(1):90.

Summary

- Building longitudinal “enrollment” patient records across DoD and VA can be difficult as DoD and VA differ in how they track and capture relationships with their beneficiaries
- While OMOP makes pulling healthcare information very easy, it is not as useful in tracking patient characteristics over time BUT DaVINCI MOA covers DoD and VA source tables, which can be used to build your research cohort.
- Our DoD and VA methodology tries to capture the beneficiaries who rely most on DoD and VA healthcare systems and over whom we then have the most visibility in our data
    - These patients are likely (systematically/inherently different) from those who are not ‘continuously’ enrolled or choose to only partially rely on DoD/VA health systems

Questions?