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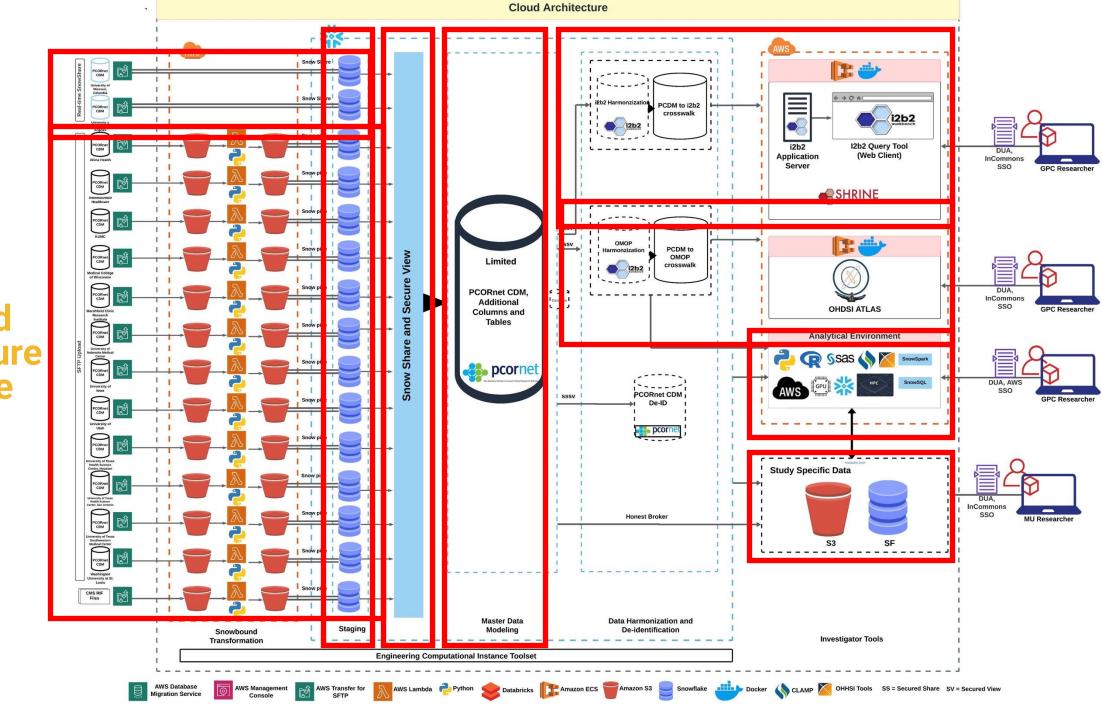
Background

 As part of the PCORnet Enhancement Proposal, we proposed to pilot the deployment of OHDSI Atlas toolset for the Greater Plains Collaborative Clinical Research Network

In this presentation, we will cover the following

- Live demonstration of ATLAS
- Activating OHDSI ATLAS on PCORnet CDM
 - Dynamic harmonization of OMOP CDM for real-time querying of PCORnet CDM
- Integrated Data Analytics using Atlas over federated data network
 - How: Snowflake Snowshare over secure views
- Atlas cloud deployment architecture
 - A low maintenance approach
- Future implementation
 - InCommons federated authentication through institutional single sign-on (SSO)

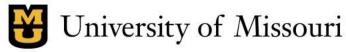
University of Missouri



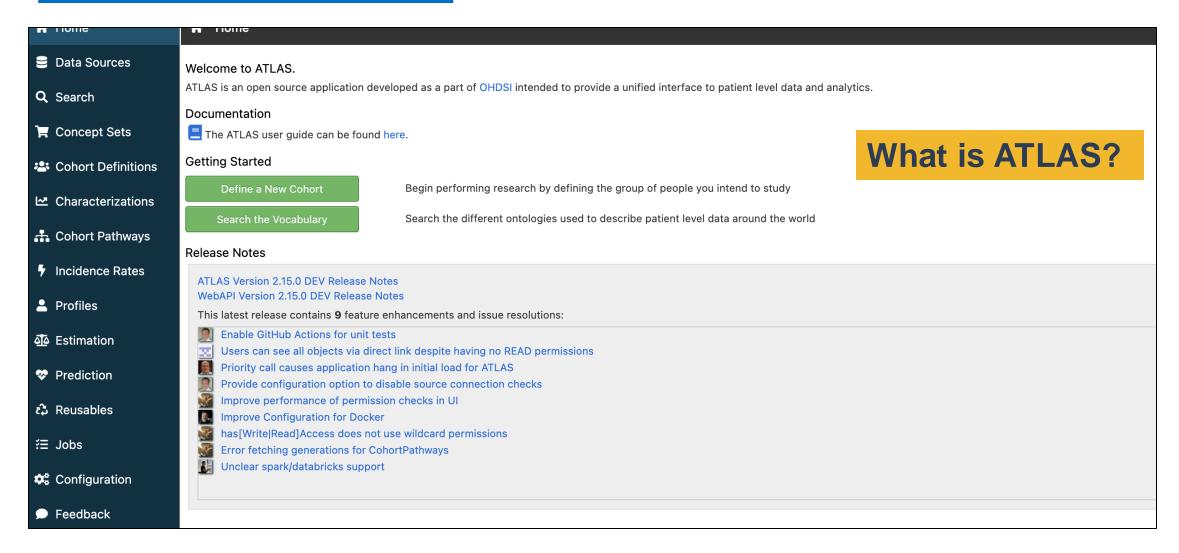
GPC data lake cloud architecture at-a-glace

Let's explore ATLAS through a live demonstration

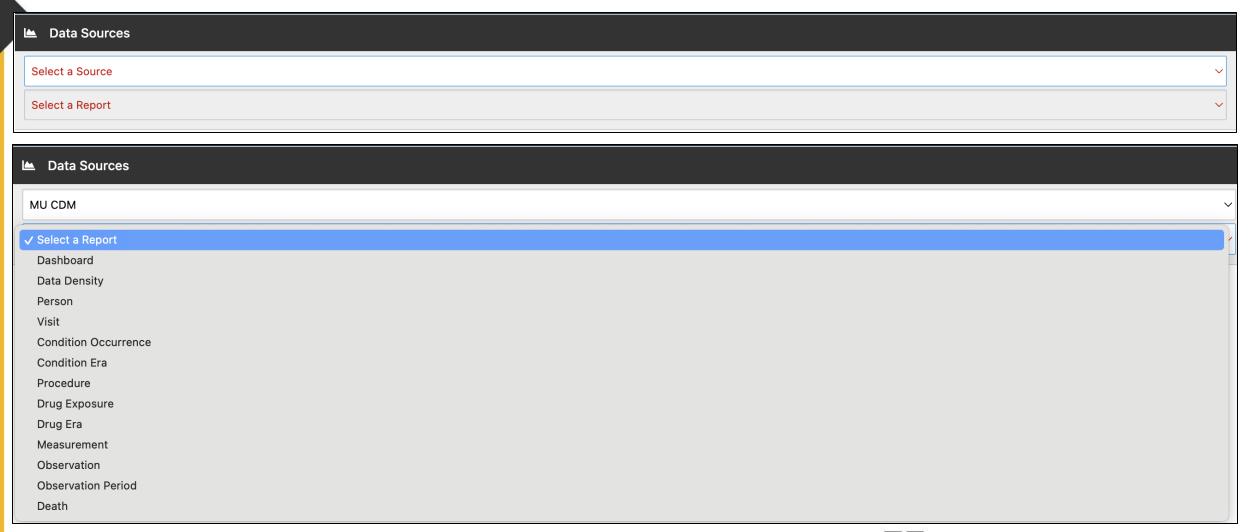
We are running data analysis using ATLAS on PCORnet CDM data through PCORnet CDM to OMOP harmonization



GPC ATLAS Dev Interface



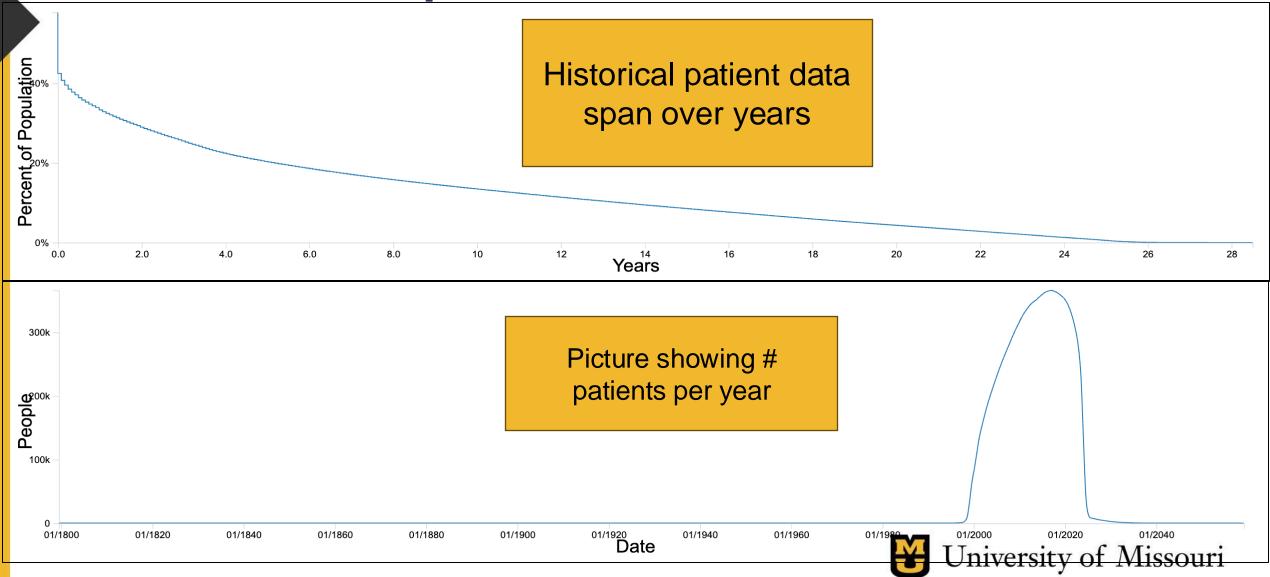
Reports



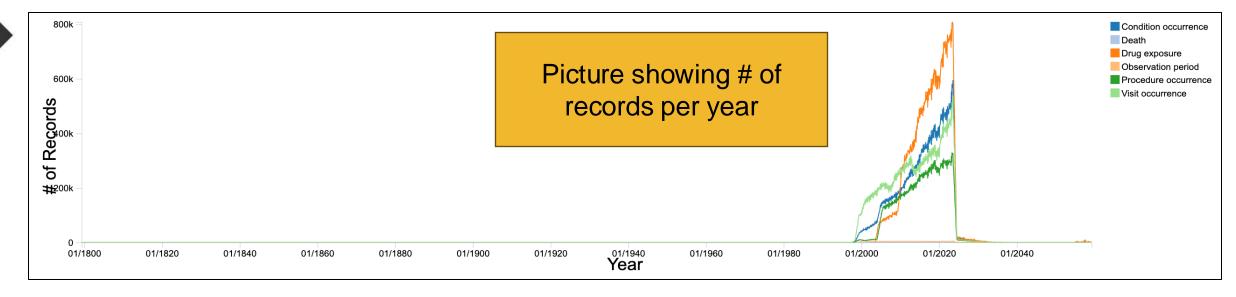
Dashboard Report

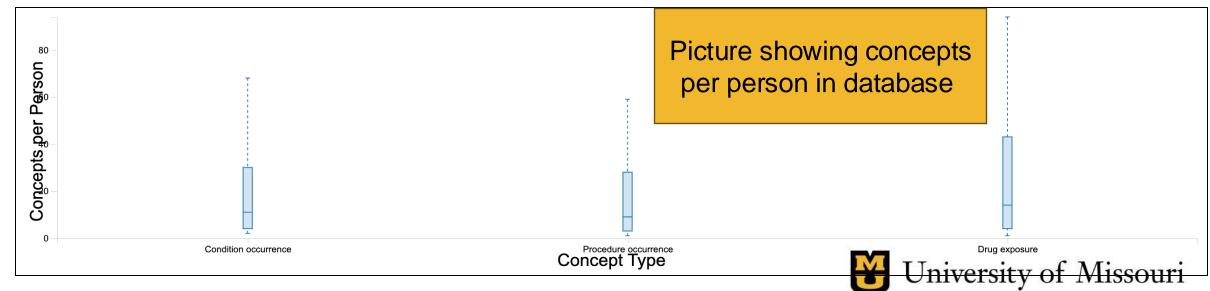
MU CDM Dashboard Report CDM Summary Source name Number of persons 2.2099M Population by Gender FEMALE MALE

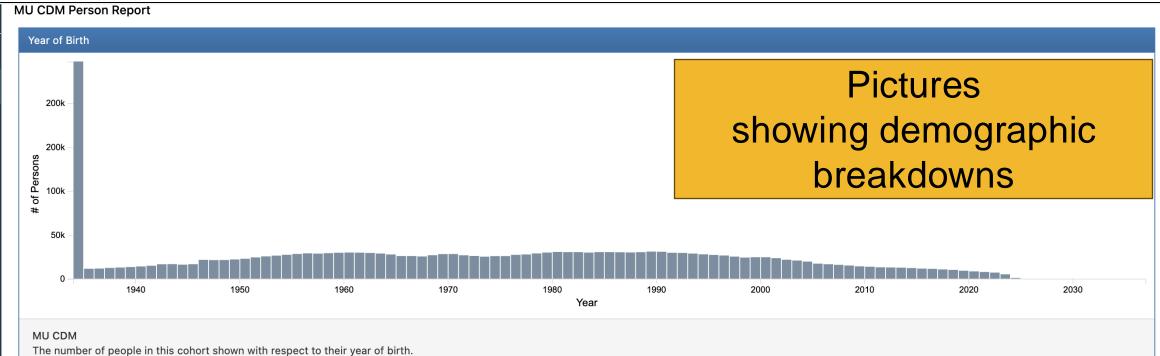
Dashboard Report



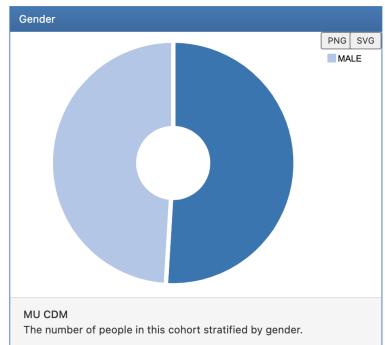
Data Density Report

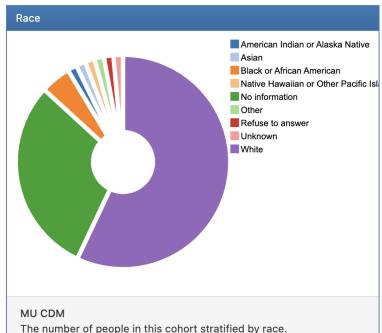


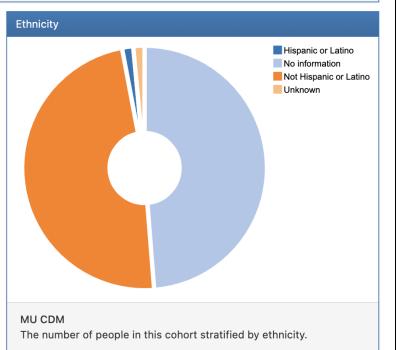




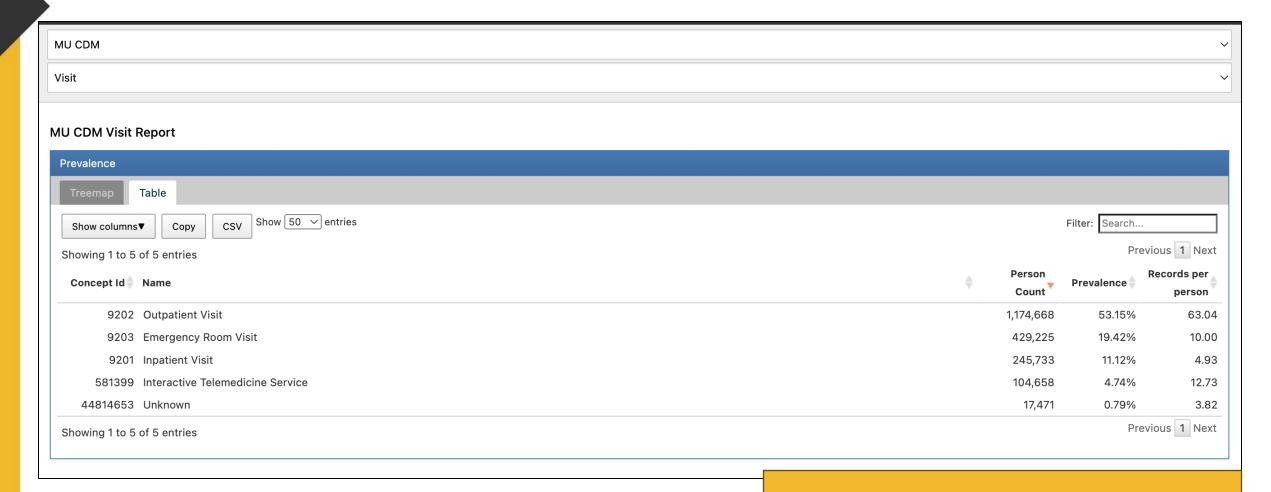
Person Report







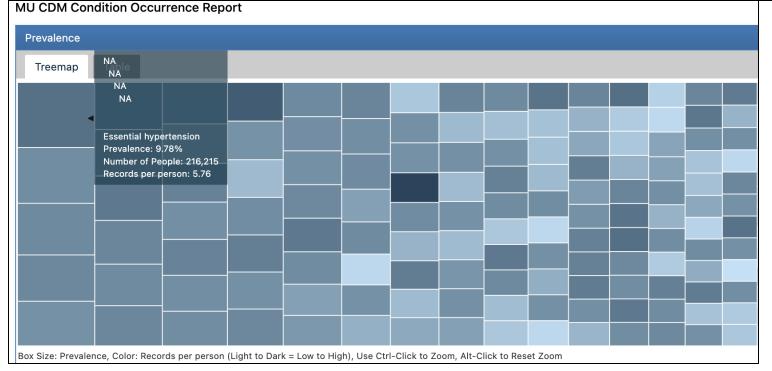
Visit Report



Picture showing visit type breakdown

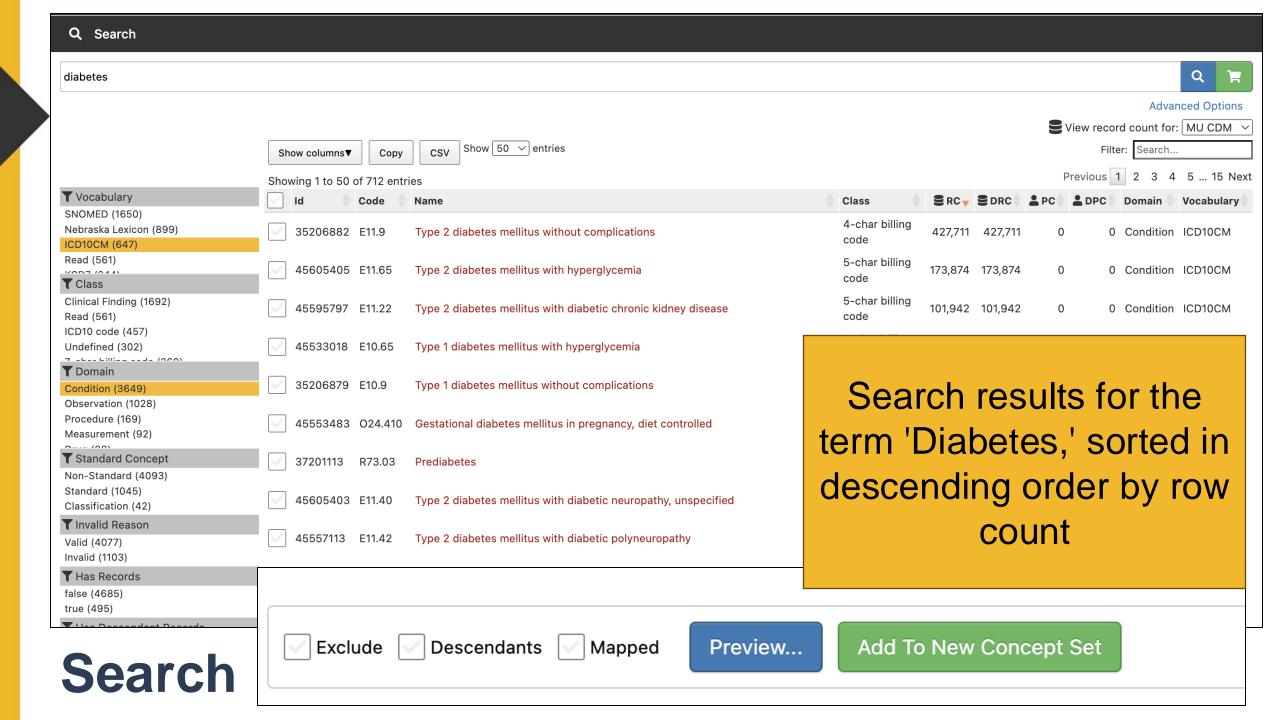
Condition Occurrence

320128 Essential hypertension	216,215	9.78%	5.76
254761 Cough	185,636	8.40%	2.36
200219 Abdominal pain	171,567	7.76%	2.77
77670 Chest pain	153,866	6.96%	3.00
257011 Acute upper respiratory infection	148,335	6.71%	1.95
378253 Headache	136,687	6.19%	2.42
320536 Electrocardiogram abnormal	134,977	6.11%	2.29

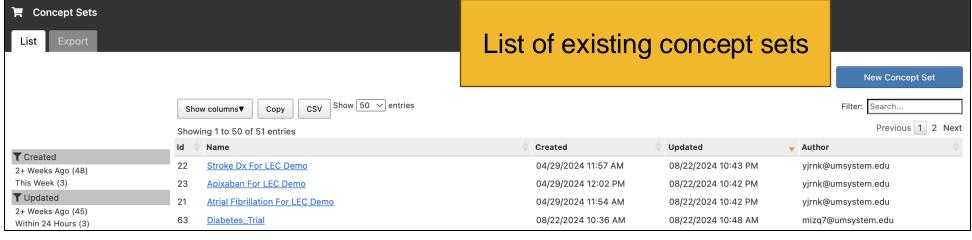


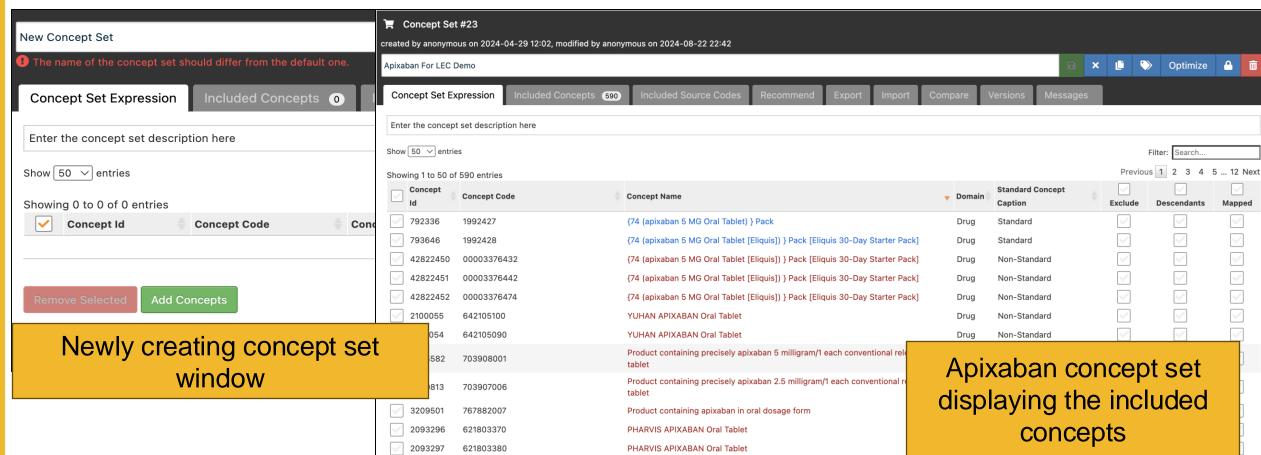
Pictures showing a tabular and tree map view of diagnoses, sorted in descending order by count

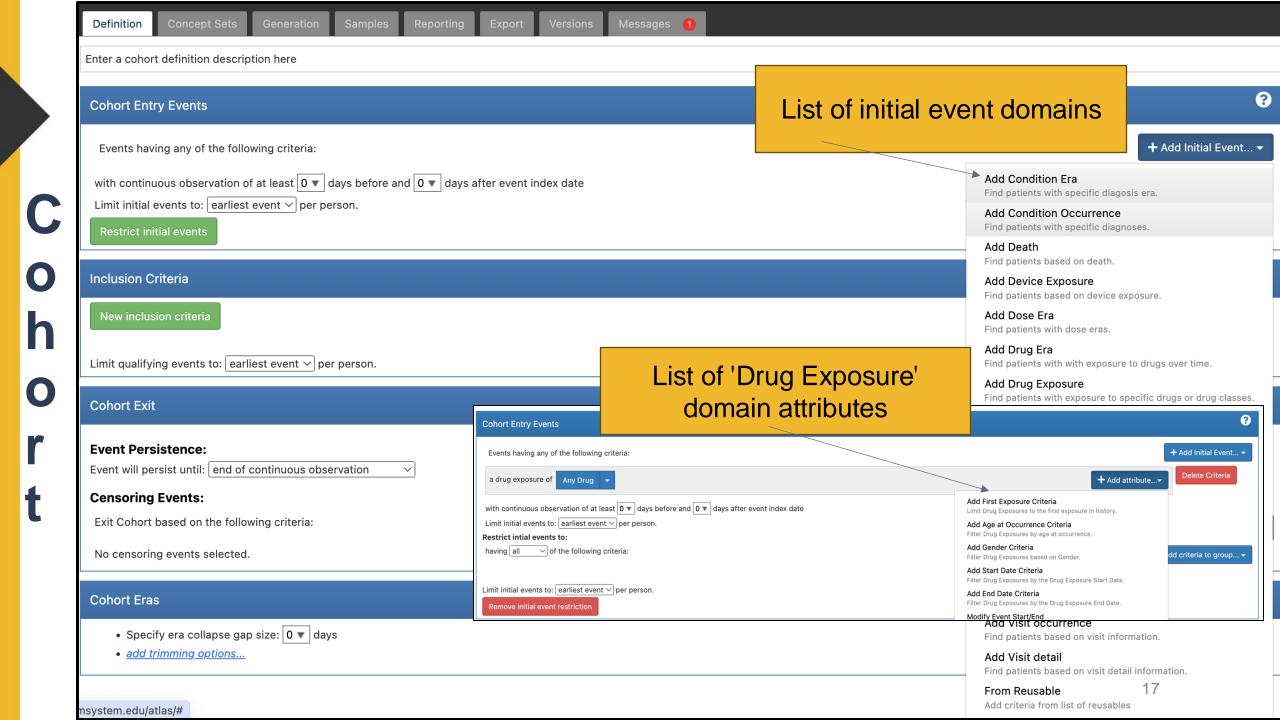


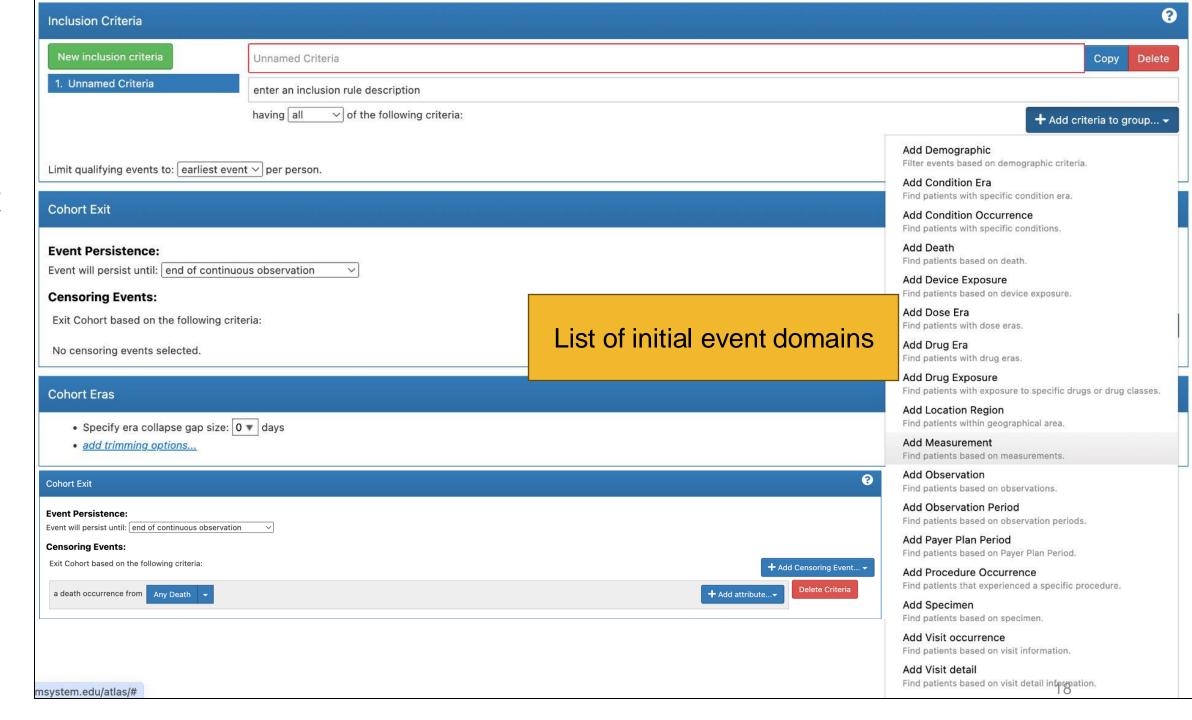


Concept Sets

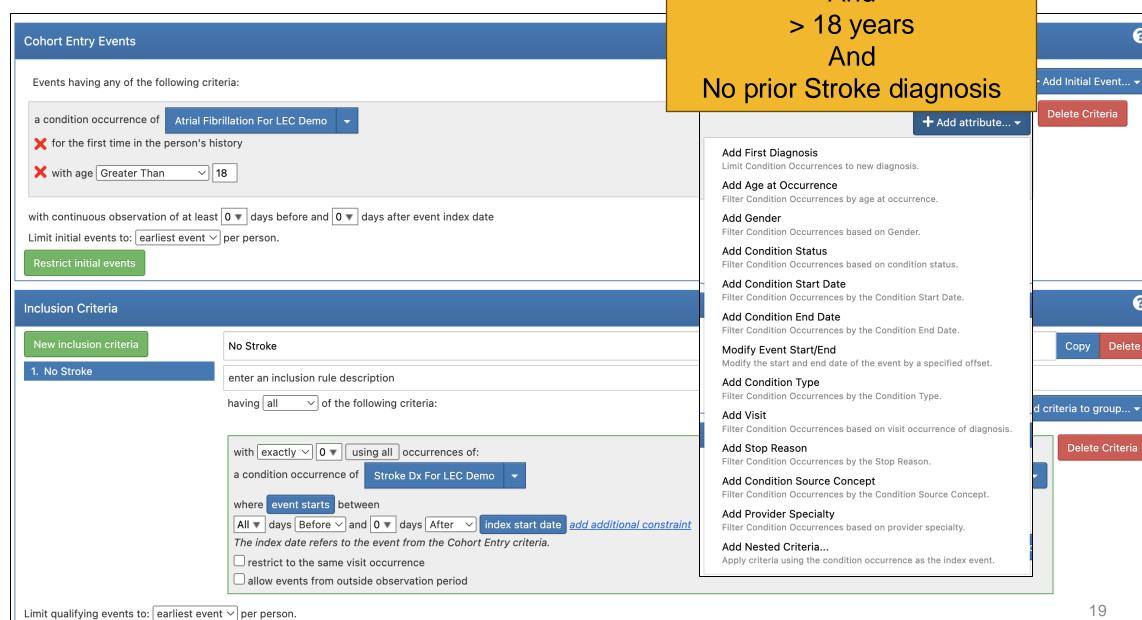








Atrial Fibrillation Cohort

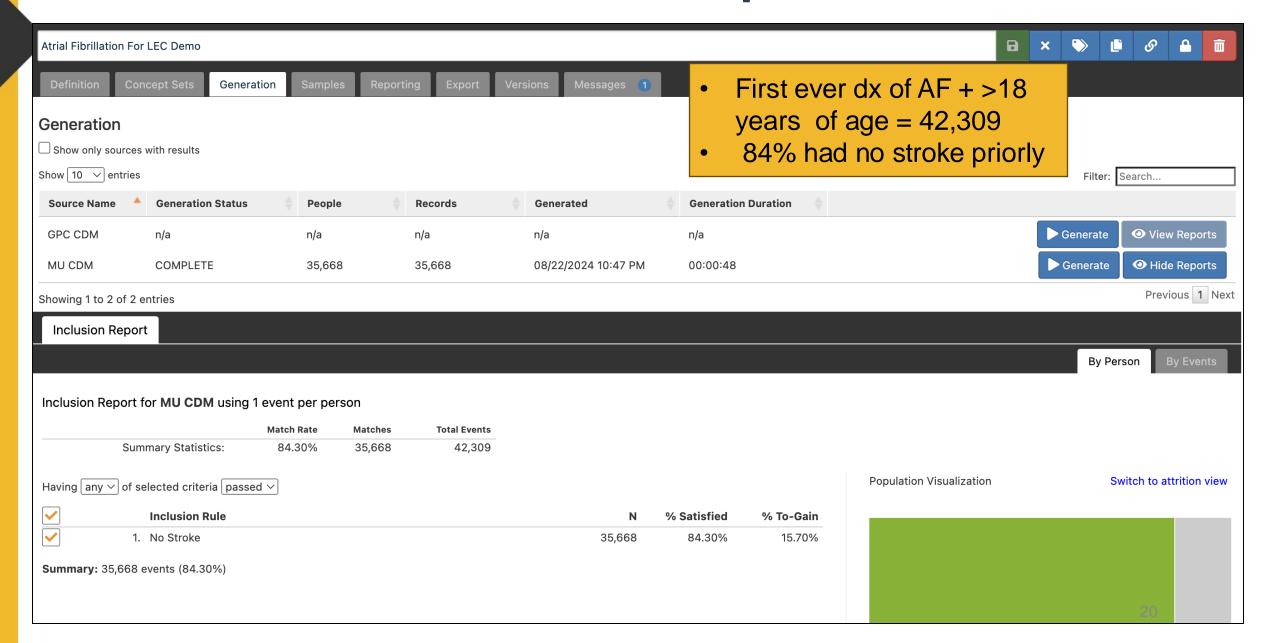


First ever diagnosis of AF

And

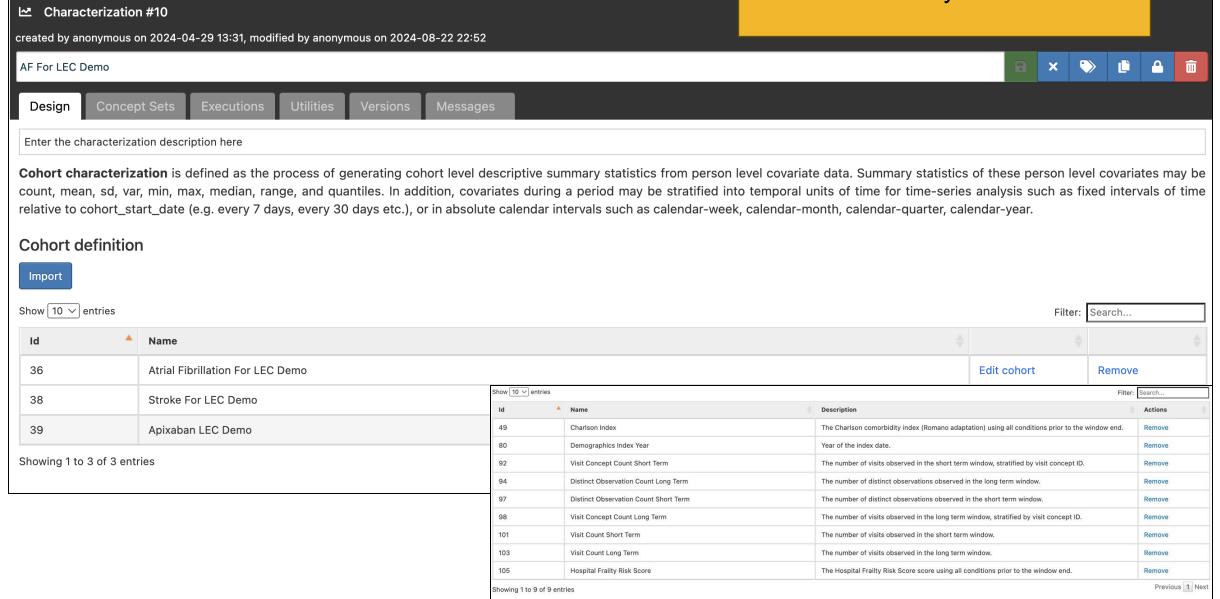
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Atrial Fibrillation Cohort Report

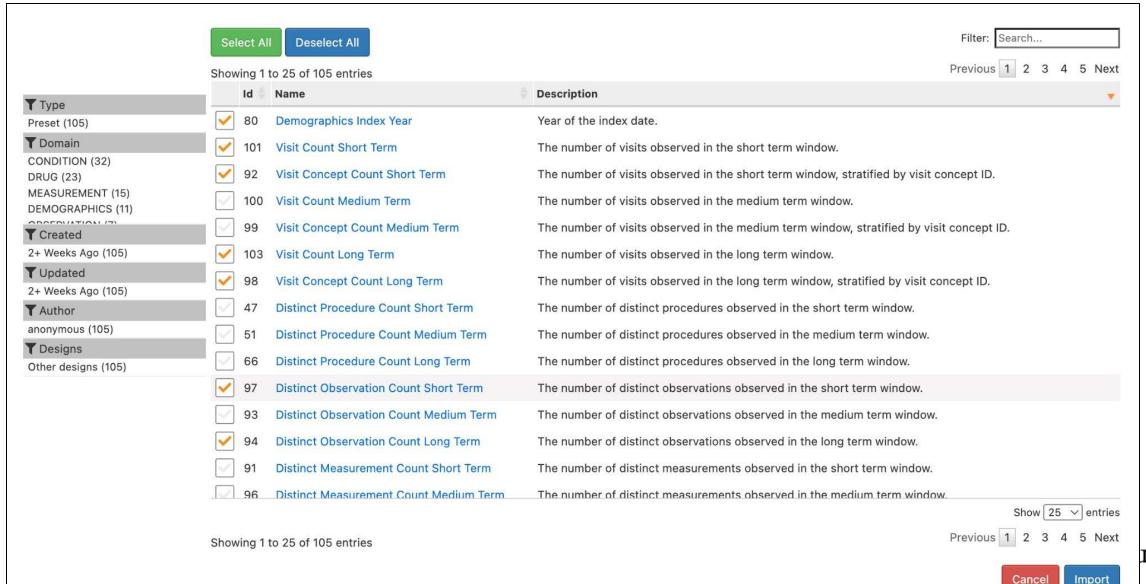


Cohort Characterization

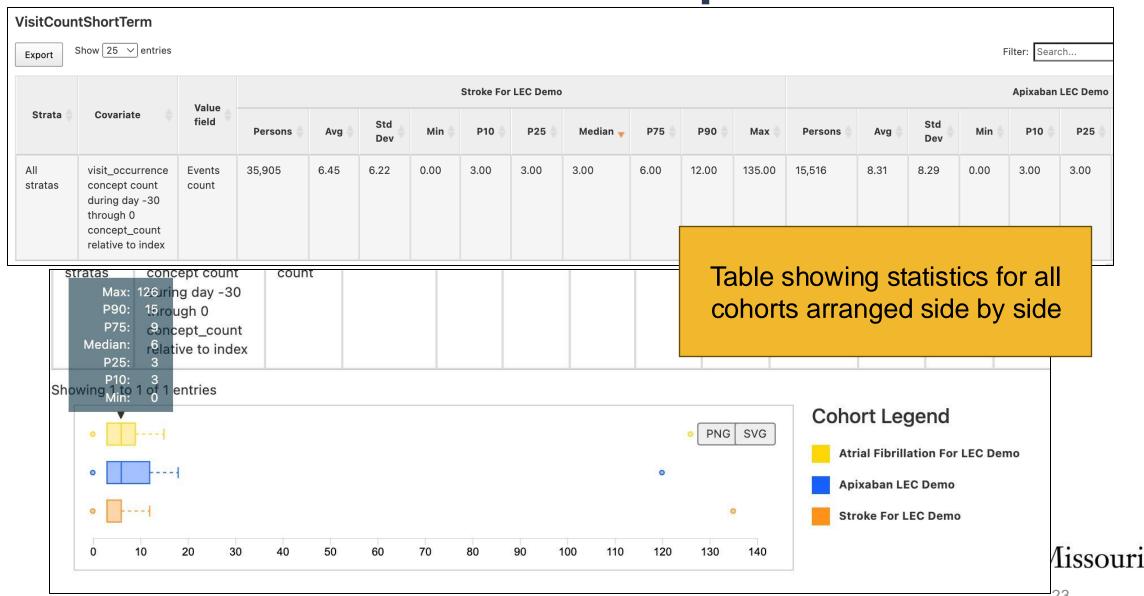
Cohort sets with selected feature analyses

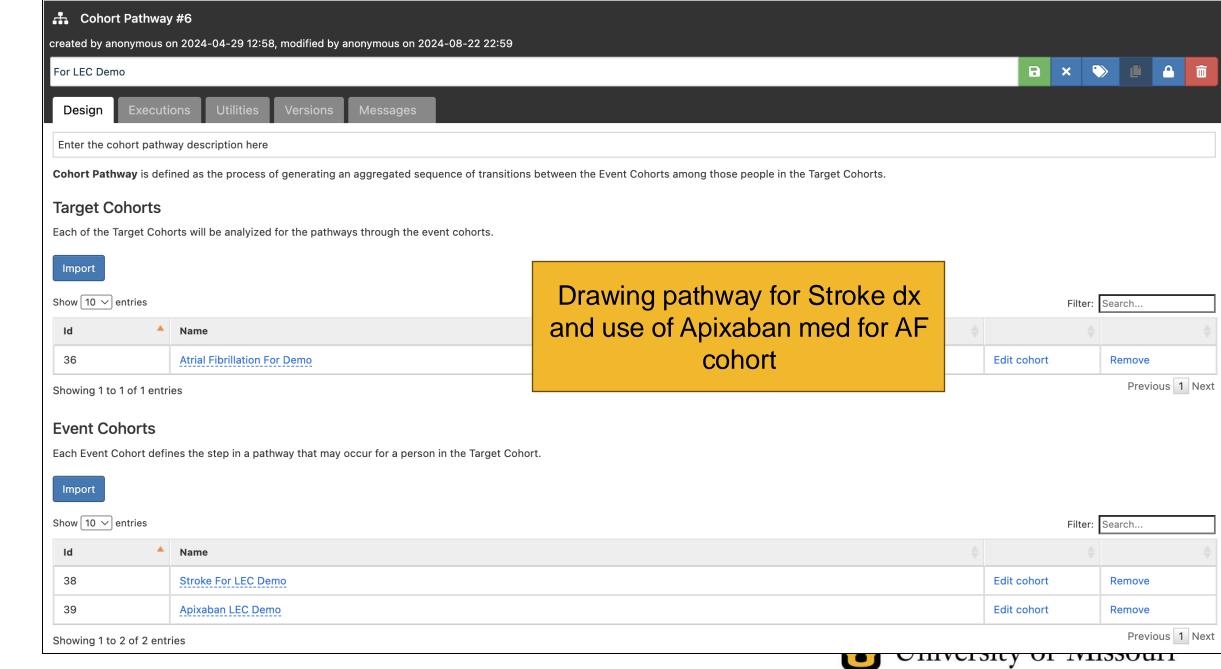


Characterization Feature analyses



Cohort Characterization Report

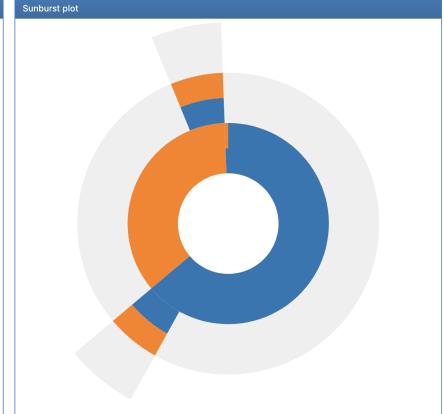




Pathways Report

Showing 1 to 5 of 5 entries



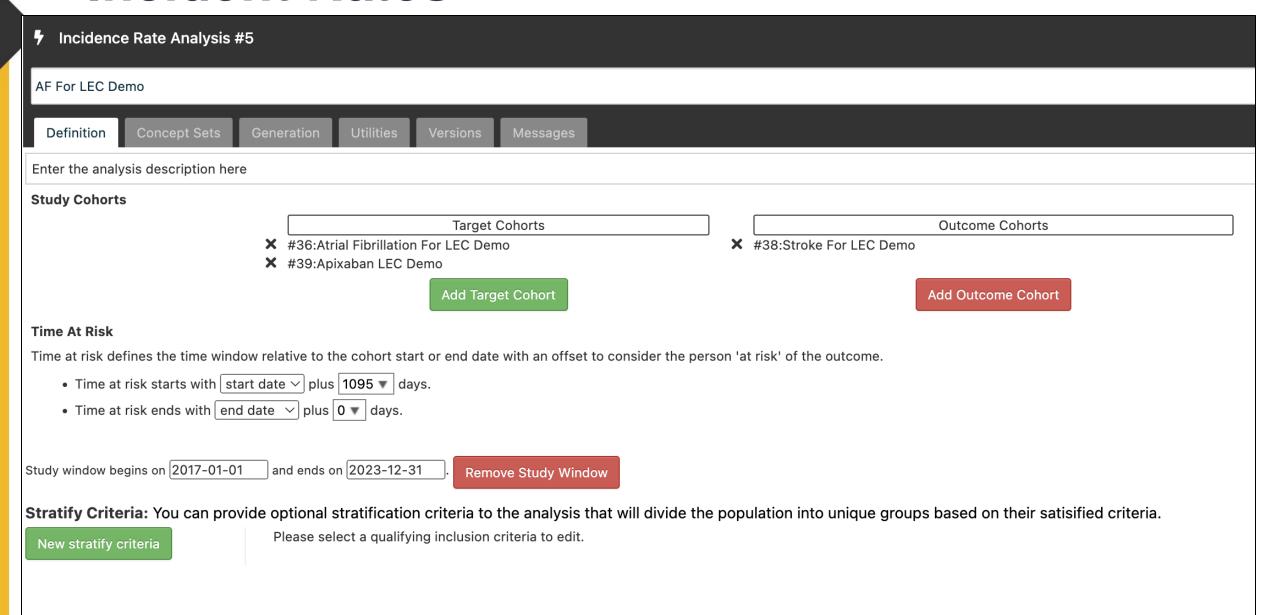


Path details		
Name	Remain	Diff
Apixaban LEC	5,009	2,837
Demo	(63.8%)	(36.2%)
Stroke For LEC	2,792	5,054
Demo	(35.6%)	(64.4%)

Step 1	Step 2	Step 3	Step 4	Step 5	Count	% with Pathway	% of Cohort
Apixaban LEC Demo					4556	58.07%	12.77%
Stroke For LEC Demo					2350	29.95%	6.59%
Apixaban LEC Demo	Apixaban LEC Demo + Stroke For LEC Demo				453	5.77%	1.27%
Stroke For LEC Demo	Apixaban LEC Demo + Stroke For LEC Demo				442	5.63%	1.24%
Apixaban LEC Demo + Stroke For LEC Demo					45	0.57%	0.13%

Previous 1 Next

Incident Rates

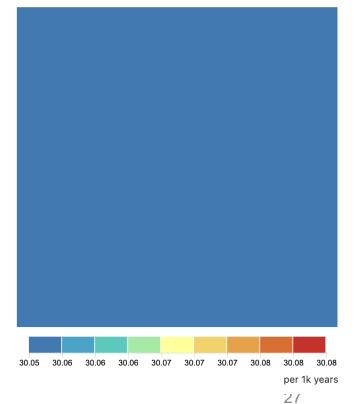




Incident Rates Report

MU CDM

		Persons	Cases		Proportion [+ -] per 1k persons	Risk (years)	Rate [+ -] per 1k years		
	Summary Statistics:	3,970	149		37.53	4,958	30.05		
Stratify Rule				N	Cases	Proportion [+		Risk ears)	Rate [+ per 1k year



Close

Profiles



- Timeline representation of patient profile.
- A tree map visualization.

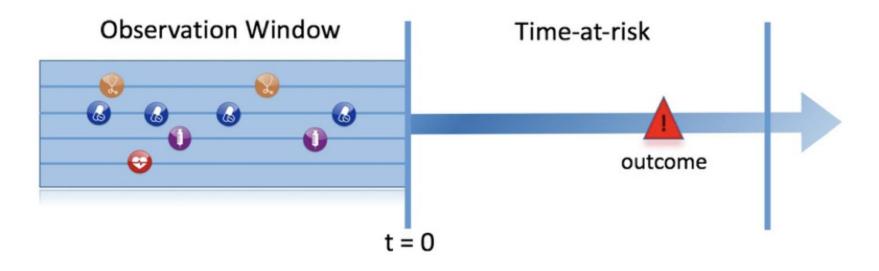
Population-Level Estimation

- Refers to the estimation of average causal effects of exposures (e.g., medical interventions such as drug exposures or procedures) on specific health outcomes of interest.
- In what follows, OHDSI consider two different estimation tasks:
 - **Direct effect estimation**: estimating the effect of an exposure on the risk of an outcome, as compared to no exposure.
 - Comparative effect estimation: estimating the effect of an exposure (the target exposure) on the risk of an outcome, as compared to another exposure (the comparator exposure).
- OHDSI Documentation <u>Link</u>

Population-Level Prediction

- Machine Learning prediction models have been developed to support this decision-making process.
- Models predict a diagnostic or prognostic outcome based on a combination of patient characteristics, e.g. demographic information, disease history, and treatment history.

Figure 13.1 illustrates the prediction problem we address. Among a population at risk, we aim to predict which patients at a defined moment in time (t = 0) will experience some outcome during a time-at-risk. Prediction is done using only information about the patients in an observation window prior to that moment in time.



Potential Challenges For New Users

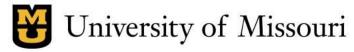
- Understanding the tool to its full potential.
- Getting right ontology for concept sets.
- Running Estimation and Prediction packages.

Observational Health Data Sciences and Informatics (OHDSI) Resources For Researchers

- Website: https://ohdsi.org/
- ATLAS Tutorials: https://ohdsi.org/resources/tutorials/
- Youtube: https://www.youtube.com/@OHDSI
- The Book of OHDSI: https://ohdsi.github.io/TheBookOfOhdsi/
- GitHub: https://github.com/OHDSI

Activating OHDSI ATLAS on PCORnet Common Data Model

OMOP CDM is harmonized for real-time querying of PCORnet CDM and integrated data analytics is facilitated using Atlas over federated data network



PCORnet CDM V6.1

PCORnet Common Data Model v6.1 Tables and Constraints

DEMOGRAPHIC

PATID

ENROLLMENT

PATID

ENR_START_DATE ENR BASIS

ENCOUNTER

PATID ENCOUN

ENCOUNTERID ADMIT_DATE ENC TYPE

DIAGNOSIS

PATID

DIAGNOSISID

DX

DX_TYPE
DX SOURCE

PROCEDURES

PATID

PROCEDURESID

PX

PX_TYPE

VITAL

PATID VITALID MEASURE_DATE VITAL SOURCE

DISPENSING

PATID DISPENSINGID DISPENSE_DATE NDC

LAB_RESULT_CM

PATID

LAB_RESULT_CM_ID

RESULT_DATE

CONDITION

PATID
CONDITIONID
CONDITION
CONDITION_TYPE
CONDITION_SOURCE

PRO CM

PATID PRO_CM_ID PRO_DATE

PRESCRIBING

PATID PRESCRIBING_ID

PCORNET TRIAL

PATID TRIALID PARTICIPANTID

DEATH

PATID DEATH_SOURCE

DEATH_CAUSE

PATID
DEATH_CAUSE
DEATH_CAUSE_CODE
DEATH_CAUSE_TYPE
DEATH_CAUSE_SOURCE

MED ADMIN

PATID MEDADMINID MEDADMIN_START_DATE

PROVIDER

PROVIDERID

OBS CLIN

PATID
OBSCLINID
OBSCLIN_START_DATE

OBS_GEN

PATID
OBSGENID
OBSGEN_START_DATE

HASH_TOKEN

PATID
TOKEN_ENCRYPTION_KEY

LDS ADDRESS HISTORY

PATID
ADDRESSID
ADDRESS_USE
ADDRESS_TYPE
ADDRESS_PREFERRED

IMMUNIZATION

PATID
IMMUNIZATIONID
VX_CODE
VX_CODE_TYPE
VX_STATUS

HARVEST

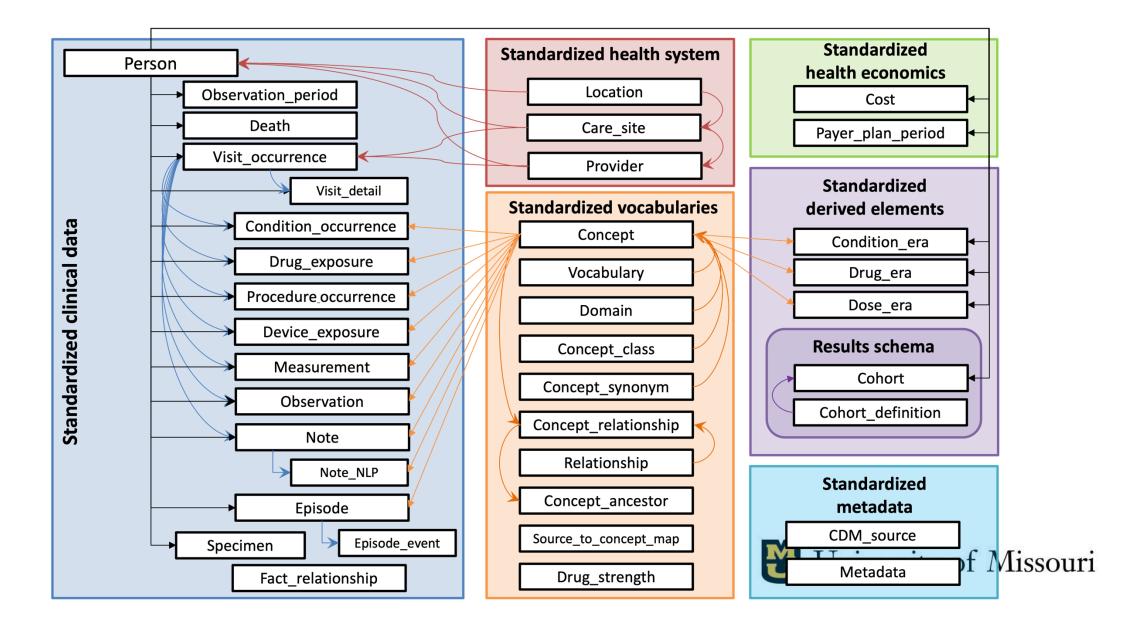
NETWORKID DATAMARTID

LAB_HISTORY

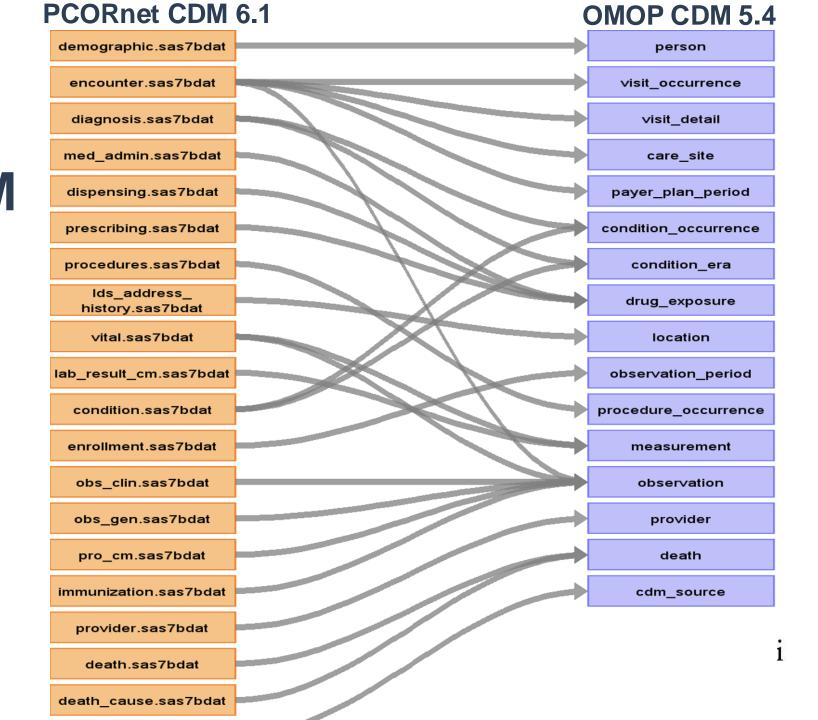
LABHISTORYID LAB_LOINC

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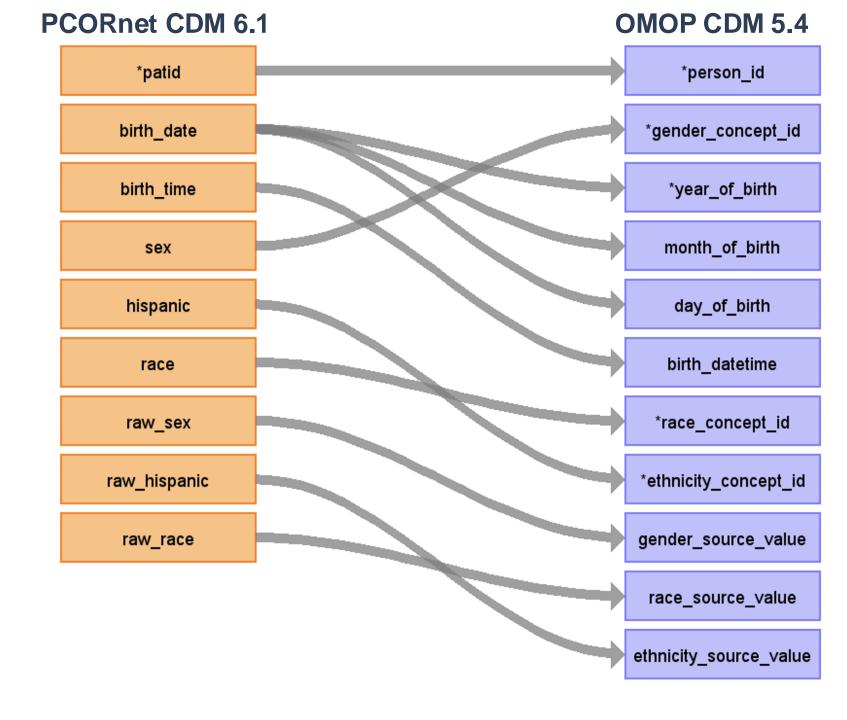
OMOP CDM V5.4



Mapping from PCORnet CDM tables to OMOP CDM tables using RabbitInAHat



Demographic Table to Person Table Mapping



Harmonizing OMOP CDM to PCORnet CDM

Currently it is a private GitHub: https://github.c/ GitHub Source. We will github.com/Missouri-BMI/OMOP_ON_P_CDM make it open source. Missouri-BMI TasTiger_Millenniu... NextGen BMI Engi... Misso Missouri-BMI / OMOP_ON_P_CDM △ 11 Pull requests (Actions Projects Wiki (1) Security Settings OMOP ON P CDM Private Unwatch 3 ူး main ₽ 7 Branches
♥ 0 Tags <> Code ▼ Q Go to file Add file wasanthi014 reorganize (18 Commits aed36a6 · now Resources reorganize now pcornet to omop cdm Merge branch 'main' into pcornet-to-omop-cdm 3 minutes ago DS Store reorganize now .gitignore Initial commit 2 years ago ☐ LICENSE Initial commit 2 years ago README.md Initial commit 2 years ago

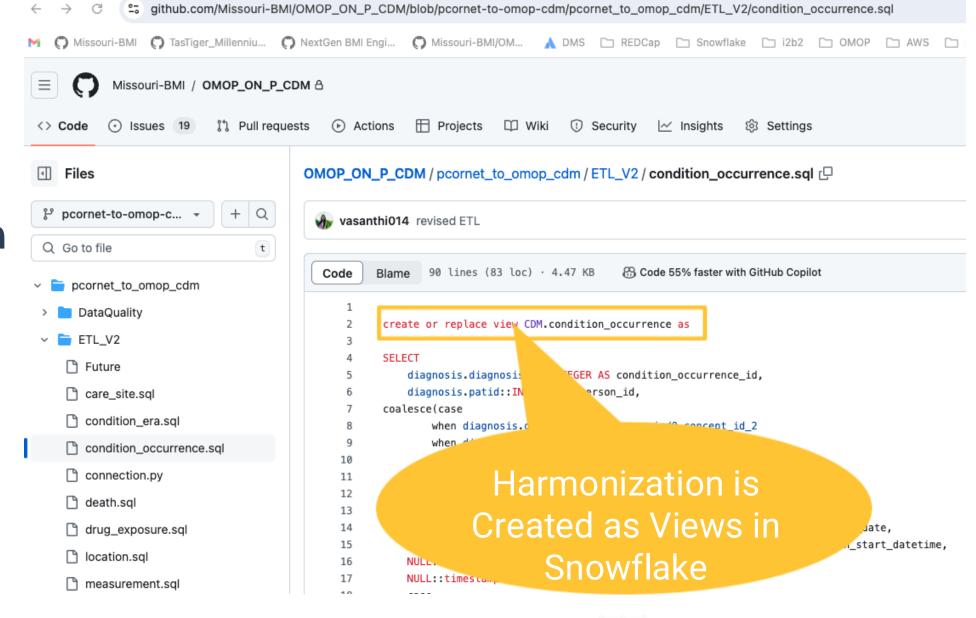
♠ Apache-2.0 license

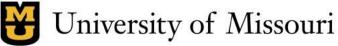
□ README

ersity of Missouri

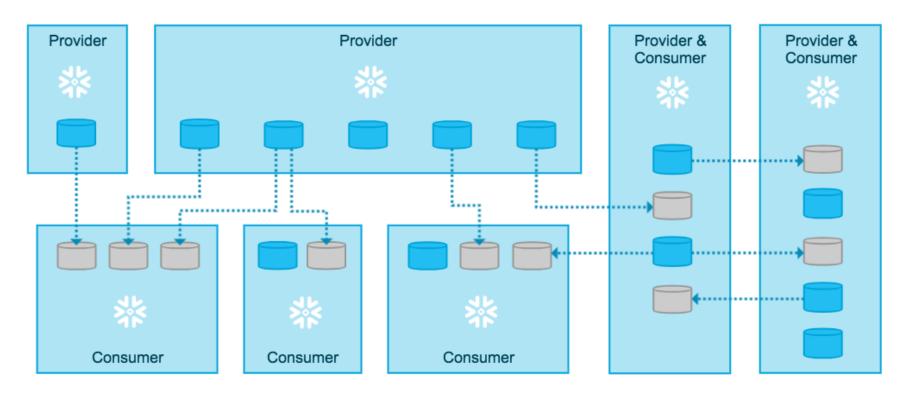
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Harmonization is dynamic and executes during real-time data analysis

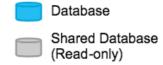


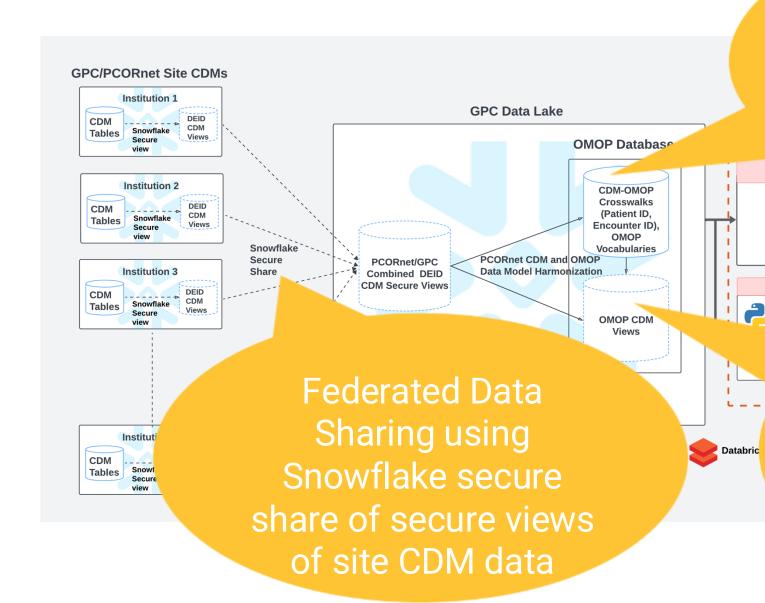


SnowFlake secure views and secure data sharing for protecting information access



Credit: https://www.snowflake.com/





Harmonization process uses crosswalk/mapping tables between PCORnet CDM and OMOP database schemas

DUA.

InCommons

SSO

OHDSI ATLAS

Analytical Environment

Harmonization is
Created as Views in
Snowflake – facilitates
dynamic
harmonization process

MU Researcher

Query Result Comparison between PCORnet and OMOP CDMs

	PCORNET CDM					OMOP CDM				
Cohort	Patient Count	Age Distribution		Sex Distribution		Patient Count	Age Distribution		Sex Distribution	
Diabetes	123,846	AGE 0-18 18-34 35-44 45-54 55-64 >=65 Other	# Patients 1620 8472 9806 13177 20825 69945 1	SEX F M NULL	# Patients 64550 59283 13	123,846	AGE 0-18 18-34 35-44 45-54 55-64 >=65 Other	# Patients 1620 8472 9806 13177 20825 69945	GENDER 8532 8507 NULL	# Patients 64550 59283 13
ALS	471	AGE. 0-18 18-34 35-44 45-54 55-64 >=65	# Patients 5 12 18 36 79 321	SEX F M	# Patients 206 265	471	AGE 0-18 18-34 35-44 45-54 55-64 >=65	# Patients 5 12 18 36 79 321	GENDER 8532 8507	# Patients 206 265
HBA1C	133,089	AGE 0-18 18-34 35-44 45-54 55-64 >=65 Other	COUNT 5356 17743 16427 18601 23664 51296	SEX. F M NULL	COUNT 73992 59091 6	133,089	AGE 0-18 18-34 35-44 45-54 55-64 >=65 Other	COUNT 5356 17743 16427 18601 23664 51296	GENDER 8532 8507 NULL	COUNT 73992 59091 6

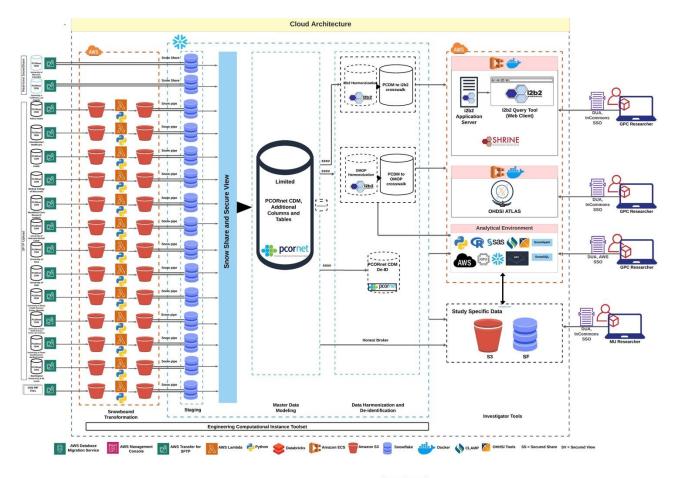
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ATLAS cloud deployment architecture

A low maintenance approach

We use AWS and SnowFlake for the research data lake operations in the cloud

Cloud-enablement enhanced overall capabilities by creating a highly stable, reliable, secured (NIST 800.53) and low maintenance infrastructure



The deployment of Atlas is in the cloud

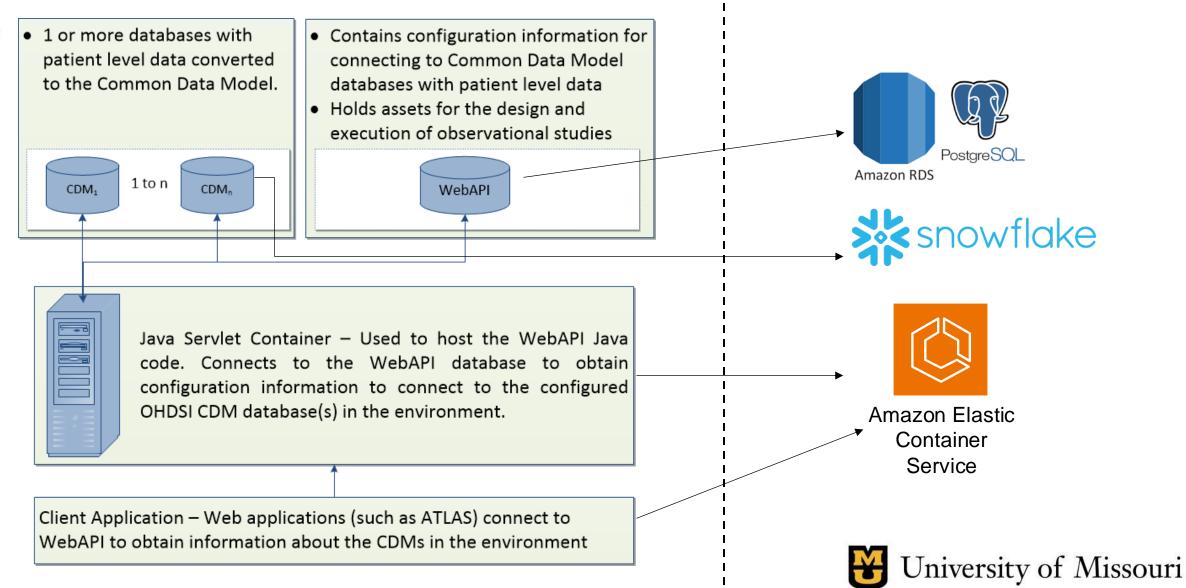
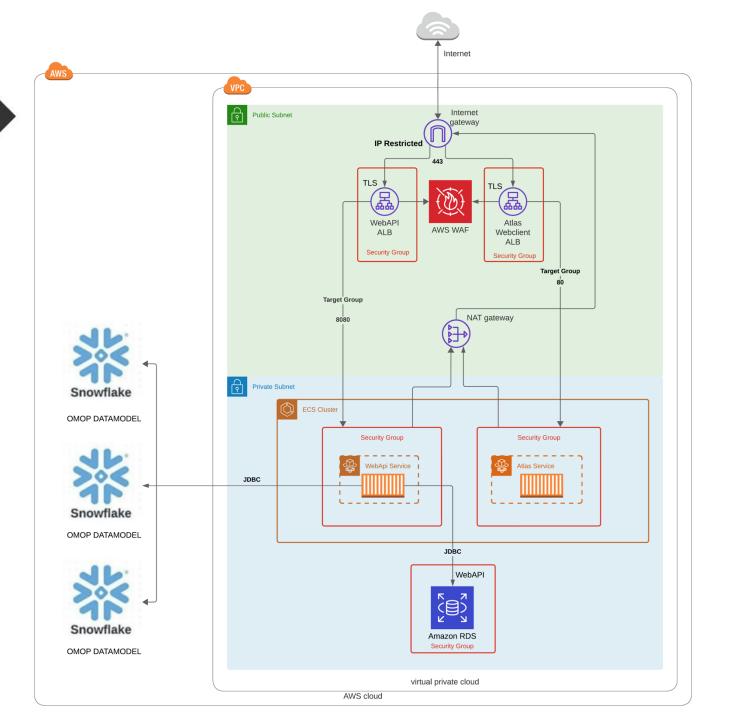
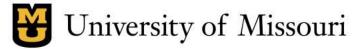


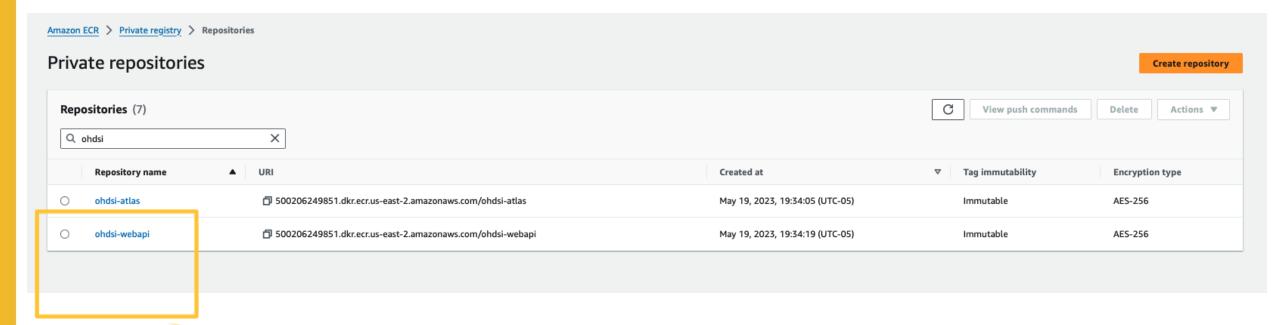
Fig: Ecosystem of OHDSI Atlas tool.



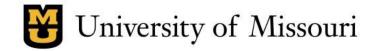
AWS Cloud and Snowflake in action for the Atlas deployment



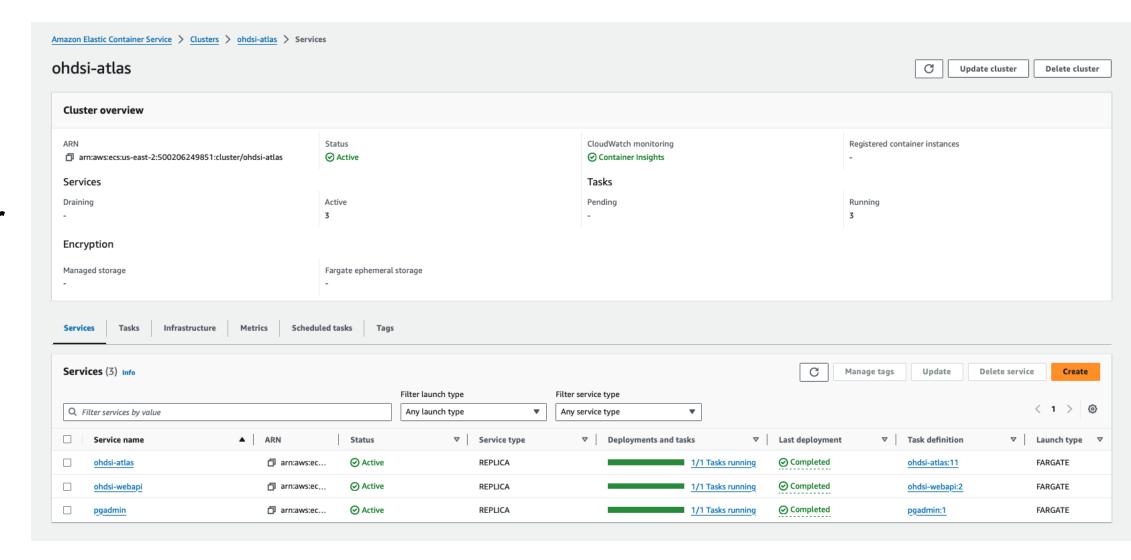
Docker Containers are loaded in the AWS Elastic Container Registry



Atlas docker containers

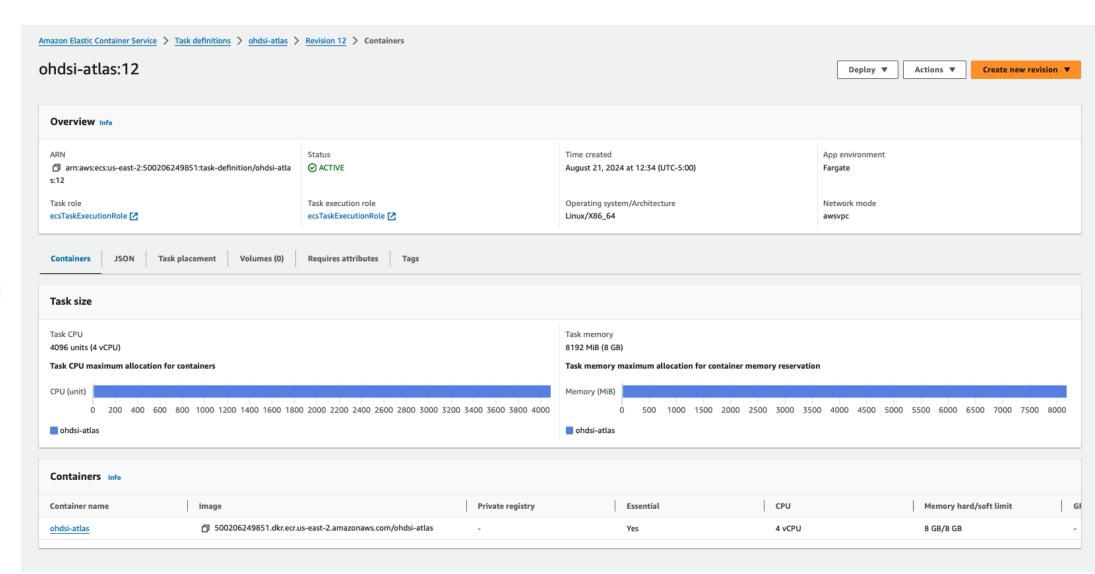


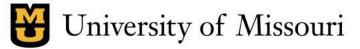
AWS ECS Cluster for OHDSI Tools



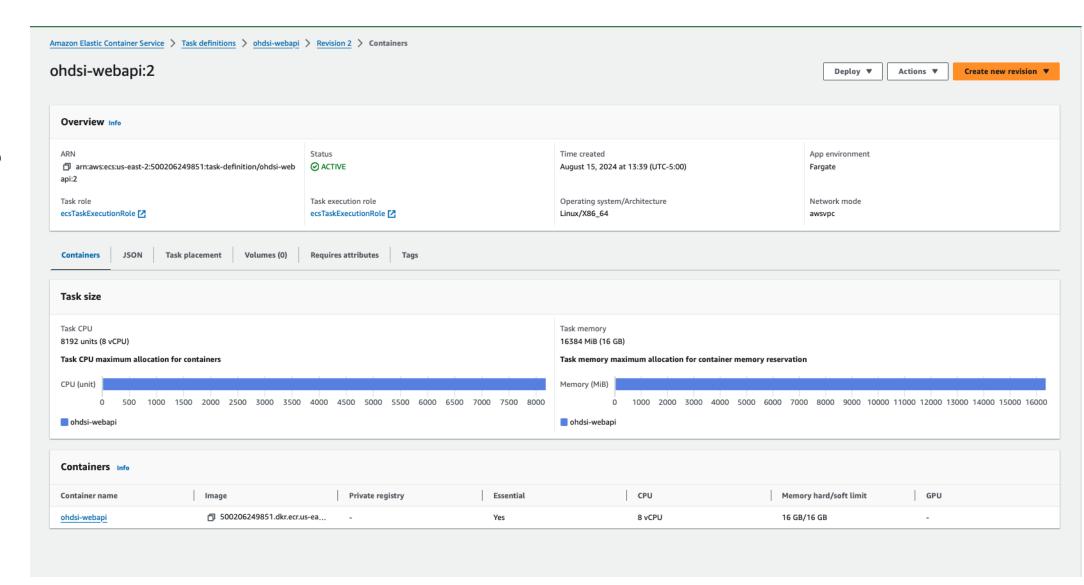


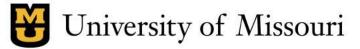
AWS ECS Task Definition for Atlas



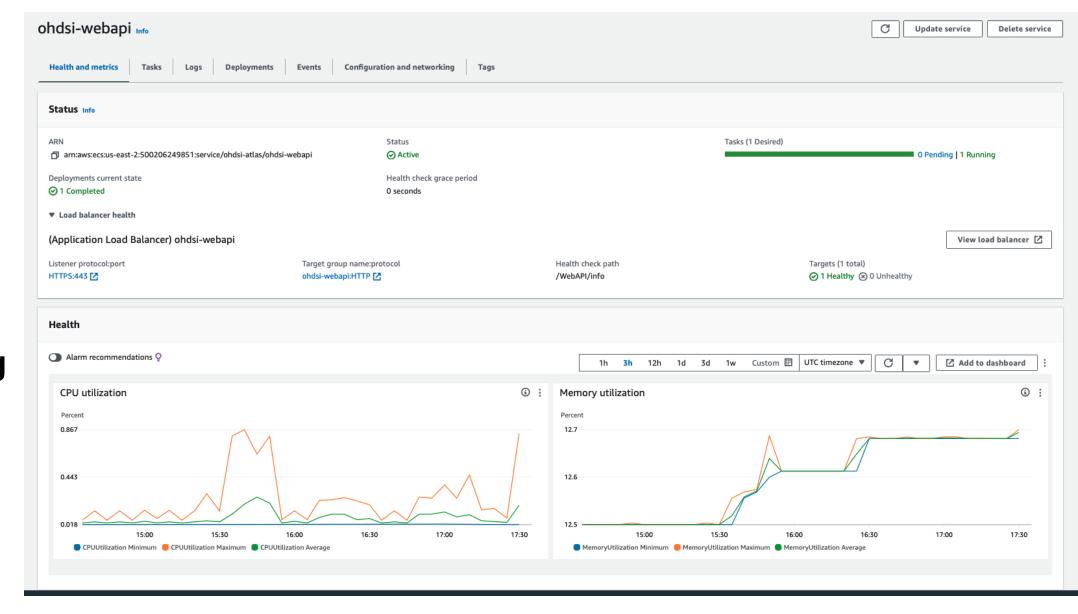


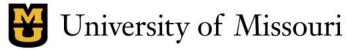
AWS ECS Task Definition for WebAPI





AWS ECS Service Monitoring





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Shaun Ferguson DevOps



Aaron Bruce, DevOps University of Missouri

Questions?

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