UVA Health
School of Medicine

Leveraging Epic Cosmos for Research

SOM CTU CME Series - Clinical Research education series

Li Mo, Research & Clinical Trial Analytics Team

Andrea Zhou, iTHRIV Informatics Team

Friday, November 6, 2024

Accreditation

The University of Virginia School of Medicine and School of Nursing awards **1.0 contact hour** for nurses who participate in this educational activity and complete the post activity evaluation.

The University of Virginia School of Medicine and School of Nursing awards **1.0 hour of participation** (consistent with the designated number of *AMA PRA Category 1 Credit(s)™* or ANCC contact hours) to a participant who successfully completes this educational activity. The University of Virginia School of Medicine and School of Nursing maintains a record of participation for six (6) years.

UVA Health
School of Medicine

Disclosures

Full Disclosure Policy Affecting CME Activities: As a joint accredited provider, the University of Virginia Office of CME/CE requires attested and signed global disclosure of the existence of all financial interests or relationships with commercial interest from any individual in a position to control the content of a CME activity sponsored by OCME.

Disclosure Summary:

No one in a position to control the content of this educational activity has disclosed a relevant financial interest or relationship with any commercial interest

UVA Health
School of Medicine

Activity Code

Activity Code: 24765

Instructions for claiming credits/contact hours can be found here

Learning Objectives

1. Research real-world data
   - Explore de-identified clinical data in Cosmos.
2. Use Cosmos tools
   - Leverage tools like SlicerDicer and Data Science Virtual Machine (DSVM).
3. Achieve goals
   - Work independently or with iTHRIV and RCTA support.

Who We Are: iTHRIV Informatics

integrated Translational Health Institute of Virginia (iTHRIV)

- The mission of iTHRIV is to catalyze and sustain inclusive clinical and translational research through diverse, collaborative team science, innovative data science, and broad workforce development in order to improve human health and promote health equity.
- The iTHRIV Informatics team supports the design and use of research data tools. We support UVA researchers in the use of iTHRIV and UVA resources as well as providing support to the international research community in the use of NIH resources.

Website: iTHRIV Website

Email: iTHRIVadmin@uvahealth.org

Support System and Service

- UVA Research Orientation and Training in observational patient data tools: Cosmos, EMERSE, OMOP, TriNetX – Cosmos Presentation today!
- **iTHRIV Portal and Commons product owners and trainers**
- **NIH Contract for Core Support for: National COVID Cohort Collaborative and National Clinical Cohort Collaborative**
- **Institutional Contact for NIH All of Us**

iTHRIV co-PIs: Karen Johnston and Don Brown
Director of Informatics: Johanna Loomba
Informatics Team:
Andrea Zhou
Richard Holtzclaw

UVA Health
School of Medicine

Who We Are: RCTA

Research and Clinical Trial Analytics

- A multi-disciplinary team of specialists in human subject research data who support the School of Medicine's research community across the globe. Together we work to provide innovative solutions and find the best tools, systems and processes to reach your research goals.
- We are a remote team that reports up through the University Health System Analytics and Reporting Team (ART) of the Quality and Performance Improvement (QPI) Department.

Website: Homepage - Research and Clinical Trials Analytics

Email: researchdata@uvahealth.org

Support System and Service

- Advarra EDC
- MuSIC
- REDCap
- UVA Health Data (Data Requests, Cosmos, Epic Tools, EMERSE, OMOP, TriNetX) – **Cosmos Presentation today!**
- Caisis
- Cancer Research Data Mart (CRDM)
- CRConnect2/CRC2

Director: Christine Kelly-Fisher
Manager: Deb Green
Cosmos Team:
Li Mo
Fauzia Khan
Supraja Gururaj

UVA Health
School of Medicine

What is Cosmos?

UVA Health
School of Medicine

Cosmos Community Data Set

277 Million
Patients

13.8 Billion
Encounters

6.6 Billion
Face-to-Face Visits

36.3K
Clinics

1,591
Hospitals

302K
Beds

378K
Physicians

& Lebanon

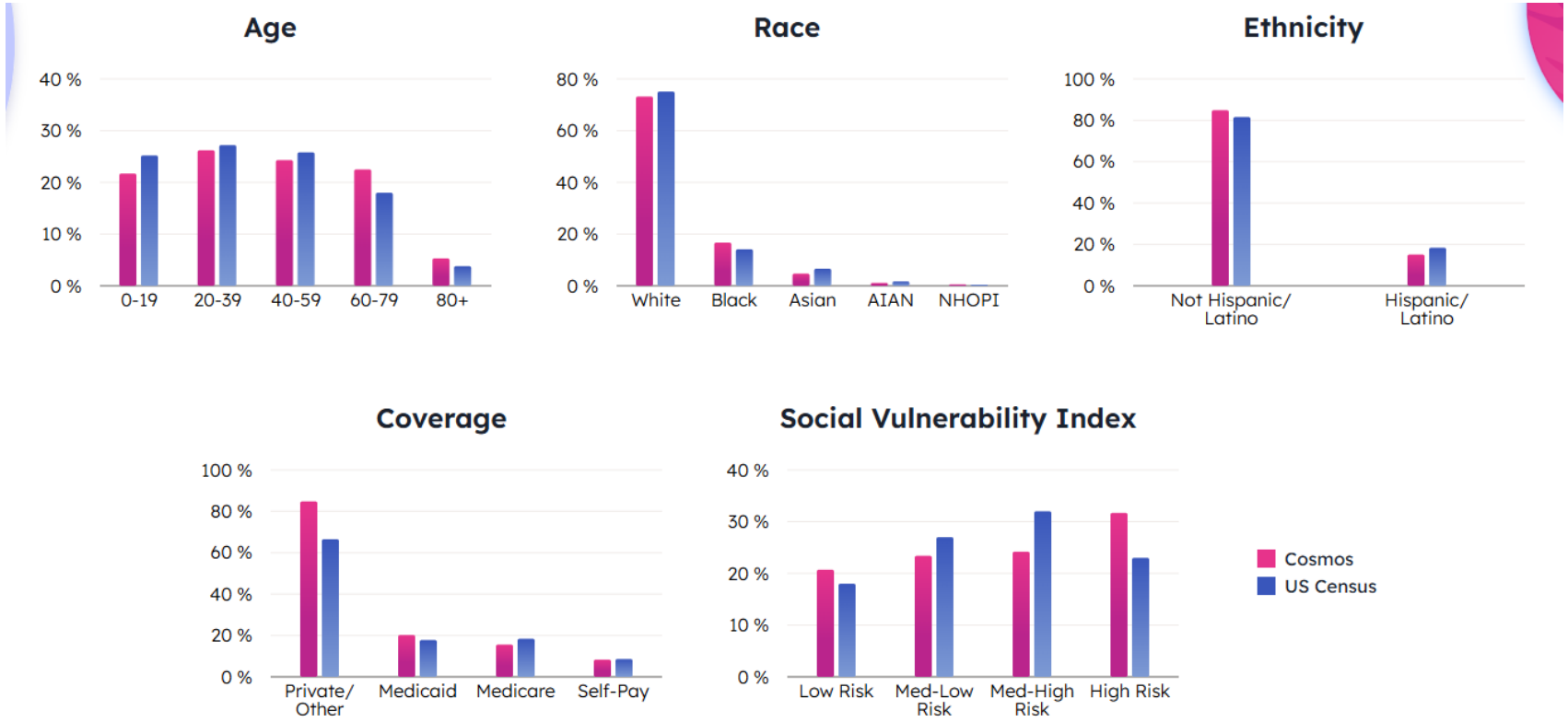
Including

- Academic Medical Centers
- Peds-only Hospitals
- Critical Access Hospitals
- FQHC Visits

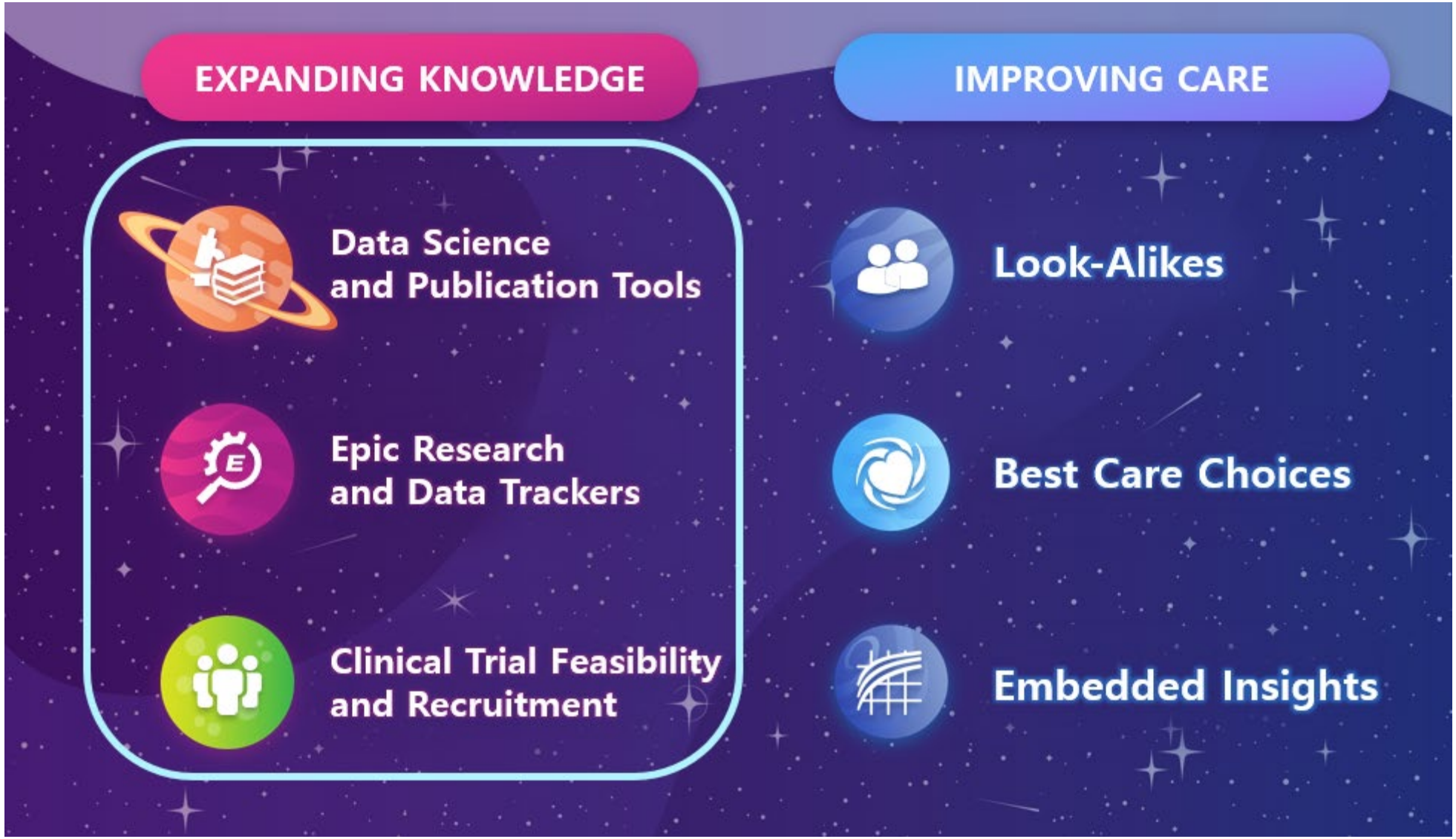
UVA Health
School of Medicine

Cosmos Data Set

Representative of US Census for Age, Race, Ethnicity, and Coverage



UVA Health
School of Medicine



UVA Health
School of Medicine

Research with Real-World Data

1. Longitudinal, deduplicated records
2. Privacy protections
   - Limited data set in SlicerDicer
   - De-identified data in data science tools
3. Structured EHR data from the real world
4. Built in analytical tools
5. Self-service training

Accomplish Your Goals with Cosmos

Cosmos can be a

.....**research question** refinement tool

.....**method** for answering your question

..... source for added **context**

for many of your use cases!

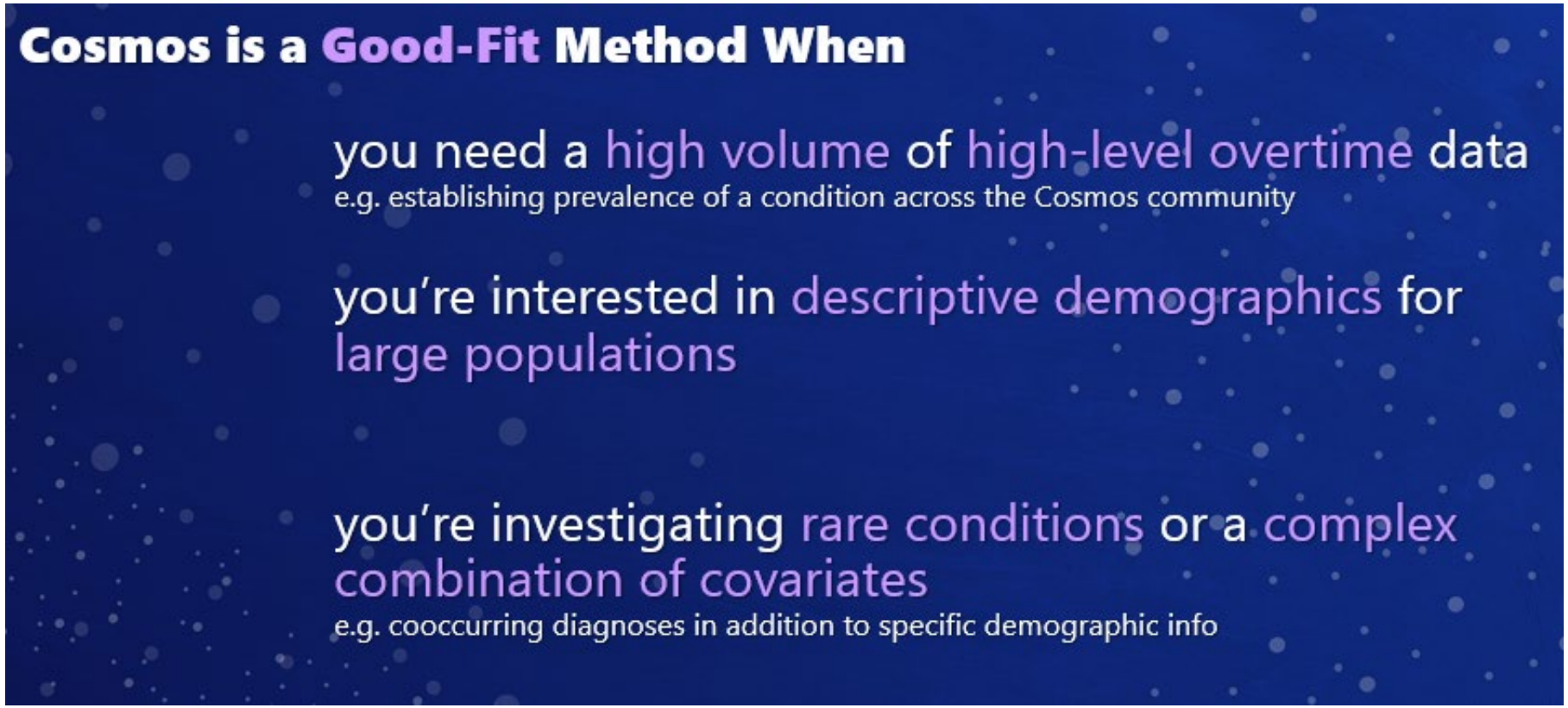
Predictive Modeling

Population Health

Study Feasibility

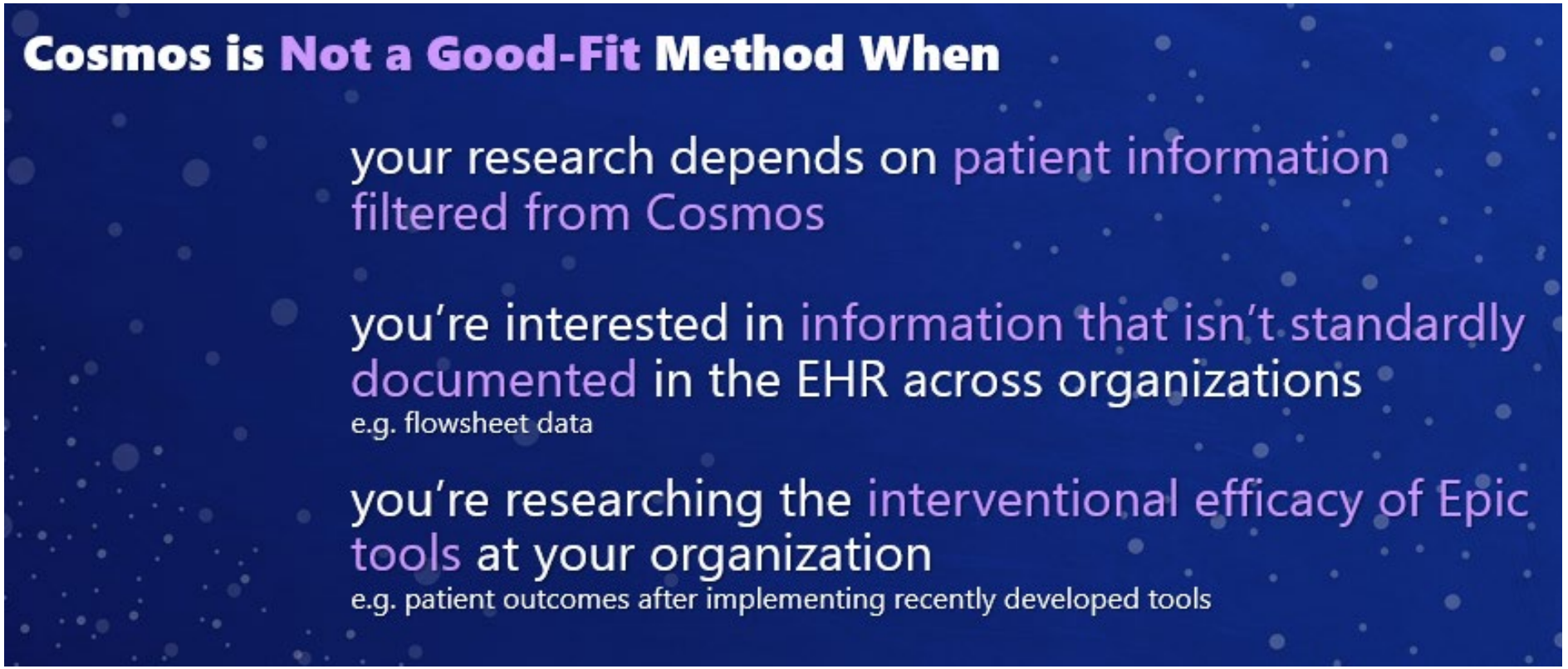
UVA Health
School of Medicine

Asking Questions with Cosmos



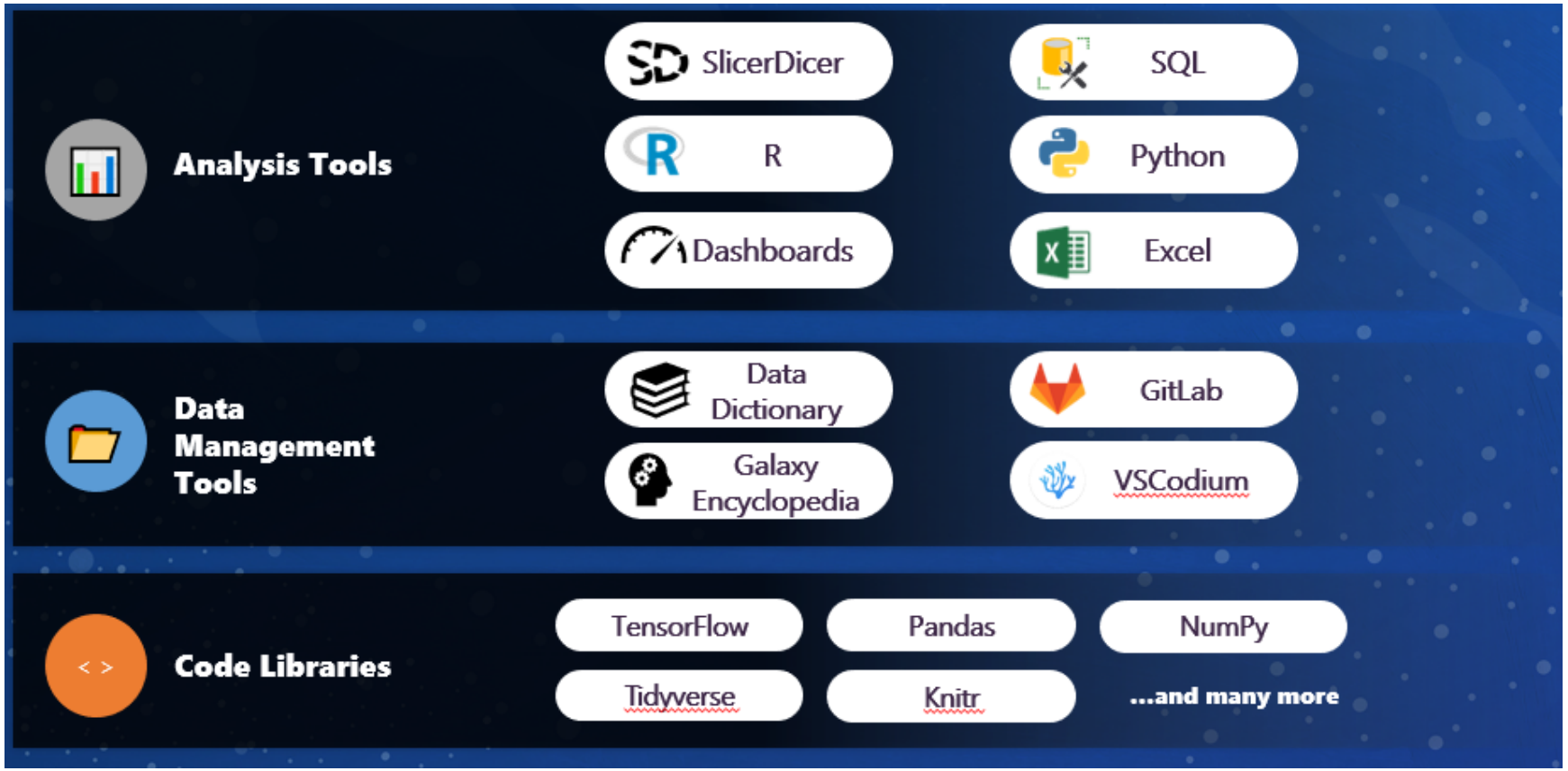
UVA Health
School of Medicine

Asking Questions with Cosmos



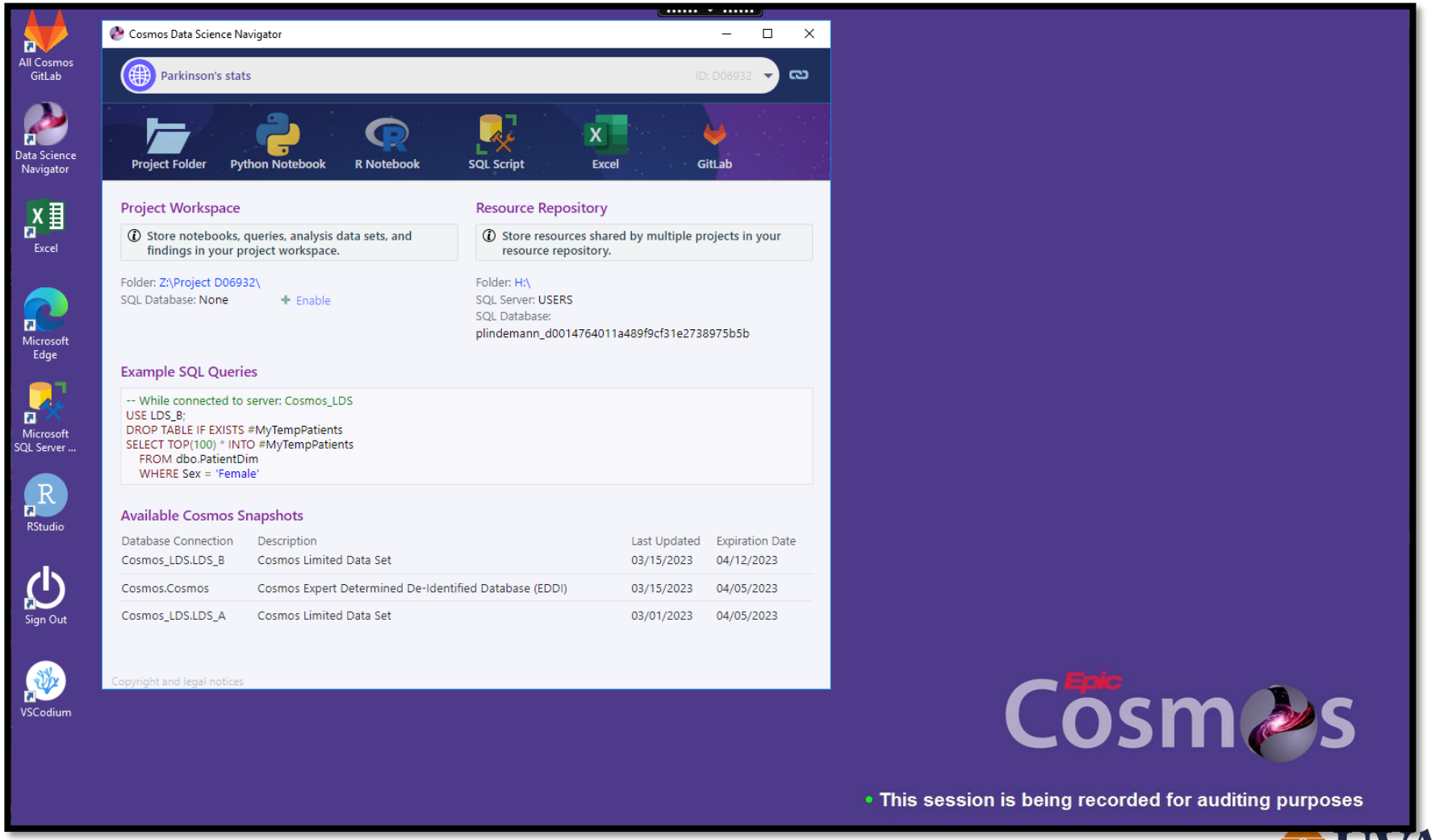
UVA Health
School of Medicine

Cosmos Tools



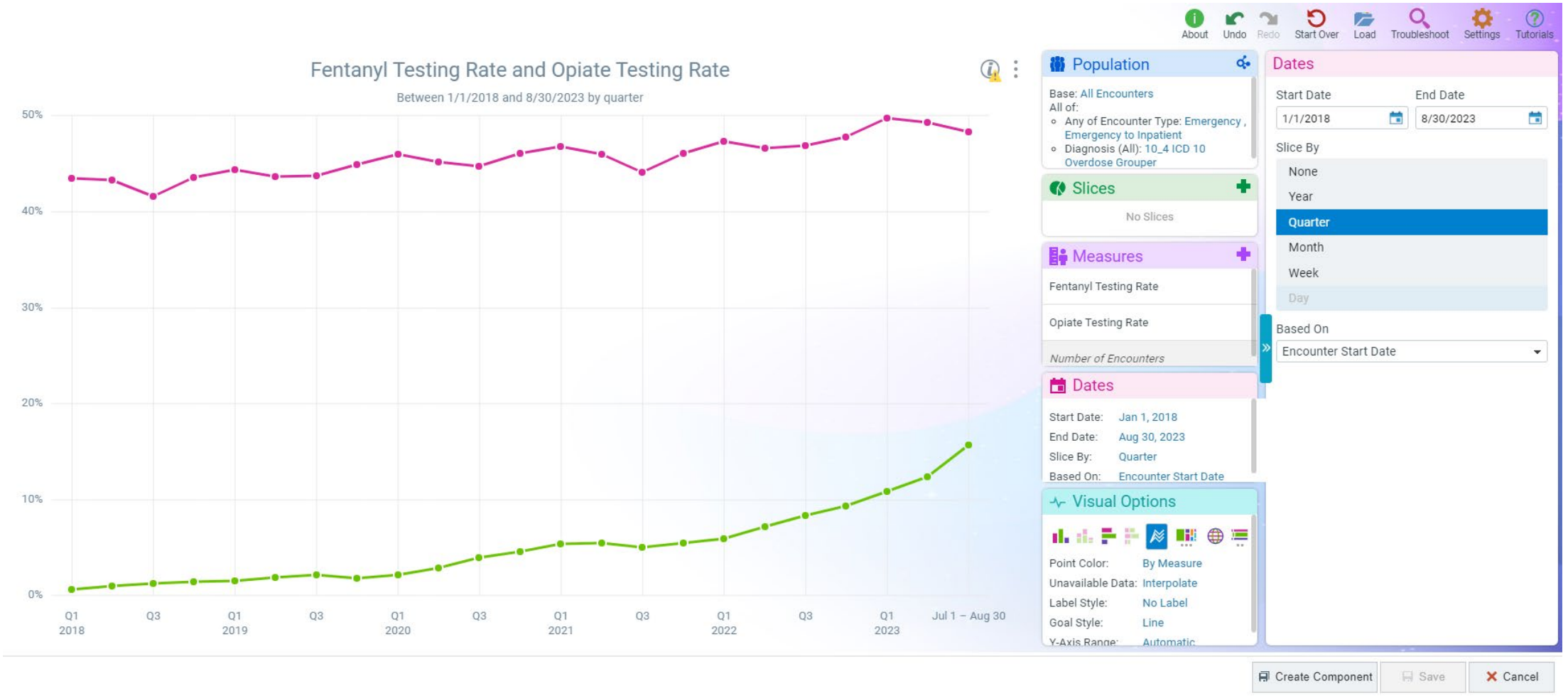
UVA Health
School of Medicine

Cosmos Data Science Tools



UVA Health
School of Medicine

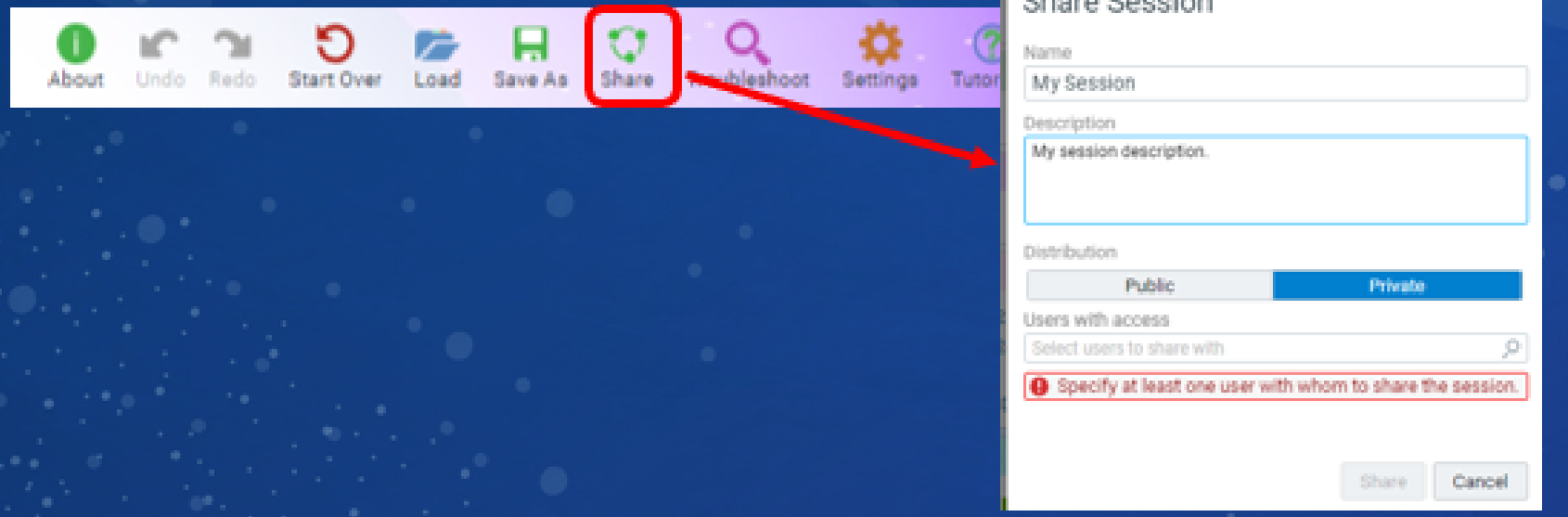
Cosmos SlicerDicer and the Limited Data Set



UVA Health
School of Medicine

Example Use Case

You have colleagues at another Cosmos contributing organization. They're working on an interesting project, and you want to see how they built their session. They share their session with you, and you provide feedback, ultimately leading to academic collaboration.



UVA Health
School of Medicine

SlicerDicer as a Starting Point

1. **Dynamic Queries**
   - SlicerDicer visualizes data by querying the Limited Data Set.
2. **Feasibility Check**
   - Use SlicerDicer to assess study feasibility before deeper analysis.
3. **SQL Query Viewer**
   - Access and build on SlicerDicer's SQL code for further investigation.

Limitations of SlicerDicer

1. **Aggregated Data only**
   - No line-level data to avoid re-identification risks.
2. **Low Count Restrictions**
   - Groups <11 records show as “10 or fewer.”
3. **Limited Analysis**
   - Designed for usability; use Data Science tools for complex analysis.

Example Use Case

You have a previous publication using a "**gold standard**" dataset. You want to compare your previous results to a new set of results using a similar query in Cosmos.

You recreate your cohort using SlicerDicer and see some interesting differences that launch a new, continued project.

Cosmos Dashboards

Epic Research

UVA Health
School of Medicine

Research Powered by Epic Cosmos

COVID 19 Vaccines & Myocarditis

COVID-19 Vaccination and Pediatric Myocarditis: Using Big Data to Monitor Vaccine Adverse Events

Jane Hinkle
CWRU
School of Medicine
Class of 2023

Age	COVID-19 Positive: Incidence per 1,000,000	COVID-19 Positive: Relative Risk of Myocarditis (95% CI)	COVID-19 Vaccinated: Incidence per 1,000,000	COVID-19 Vaccinated: Relative Risk of Myocarditis (95% CI)	Risk Ratio
12-25	**425**	**12.4 (10.5, 14.5)**	**129**	**3.8 (3.2, 4.4)**	**3.3 (2.7, 4.0)**
26-45	214	8.5 (7.2, 10.0)	70	2.8 (2.4, 3.2)	**3.0 (2.5, 3.7)**
46-64	187	11.3 (9.3, 13.6)	53	3.2 (2.7, 3.7)	**3.5 (2.9, 4.3)**
65+	167	14.8 (11.5, 19.1)	31	2.8 (2.2, 3.4)	**5.4 (4.2, 6.9)**
Total	232	10.4 (9.5, 11.4)	57	2.6 (2.4, 2.4)	**4.1 (3.7, 4.5)**

Myocarditis appears to be ~3-5 times MORE likely from COVID-19 itself than from the COVID-19 vaccine.

This analysis was completed in ~1 week using COSMOS!

MetroHealth

School of Medicine Case Western Reserve University

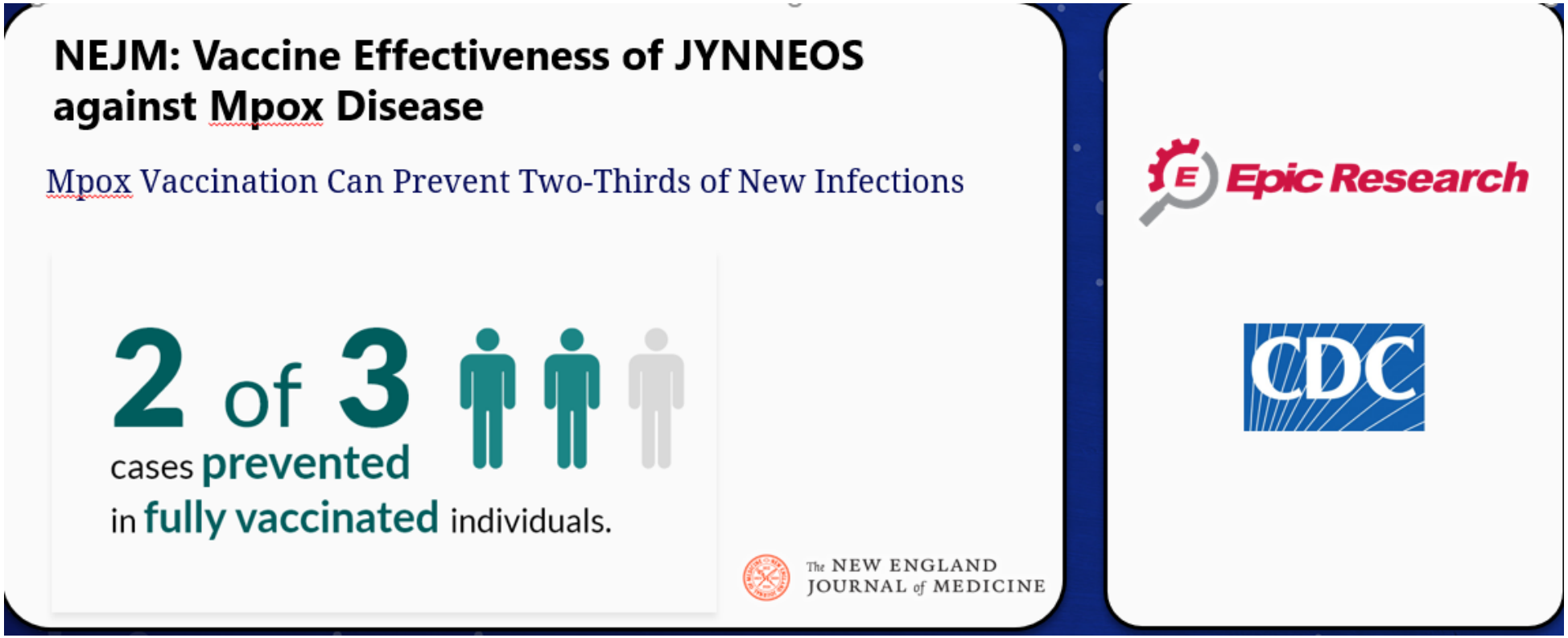
Research Question:
How are pediatric myocarditis and COVID-19 infection and vaccination statuses statistically interrelated?

Why Cosmos was a good method:
Cosmos has a wide array of immunization and diagnosis information that can be tracked overtime.

UVA Health School of Medicine

Data Science Tools in Use

Academic publications using Cosmos have been published in medical/medical data science peer-reviewed journals.



UVA Health
School of Medicine

Why Cosmos for Research

1. **Longitudinal Records:** Integrates inpatient and outpatient data.
2. **Representative Sample:** Diverse and inclusive patient data.
3. **Fast Access:** Quick answers without lengthy data requests.
    - Eliminates time-consuming data request.
    - Provides immediate data access for faster discoveries.

iTHRIV Cosmos Support

1. **Free Consults**
   a. **Needs Assessment:** Discuss your project with Real World Data experts and determine which tools, Cosmos or otherwise, best suit your needs
   b. **Product Access and Onboarding:** Guidance with getting started in Cosmos
   c. **Query Training**: Assistance with using SlicerDicer for study feasibility or other purposes
2. **Research Collaboration:** iTHRIV Informatics team members can participate in funded research efforts that leverage Data Science Virtual Machine environment and pull in RCTA as needed

RCTA Cosmos Support (Fee-Based)

Our Expertise:

1. Deep Knowledge of COSMOS, SliderDicer, EPIC tools and Caboodle data models.
2. EPIC-Certified team for advanced workflows.
3. We serve as data architects in the COSMOS workflow.

Comprehensive Services:

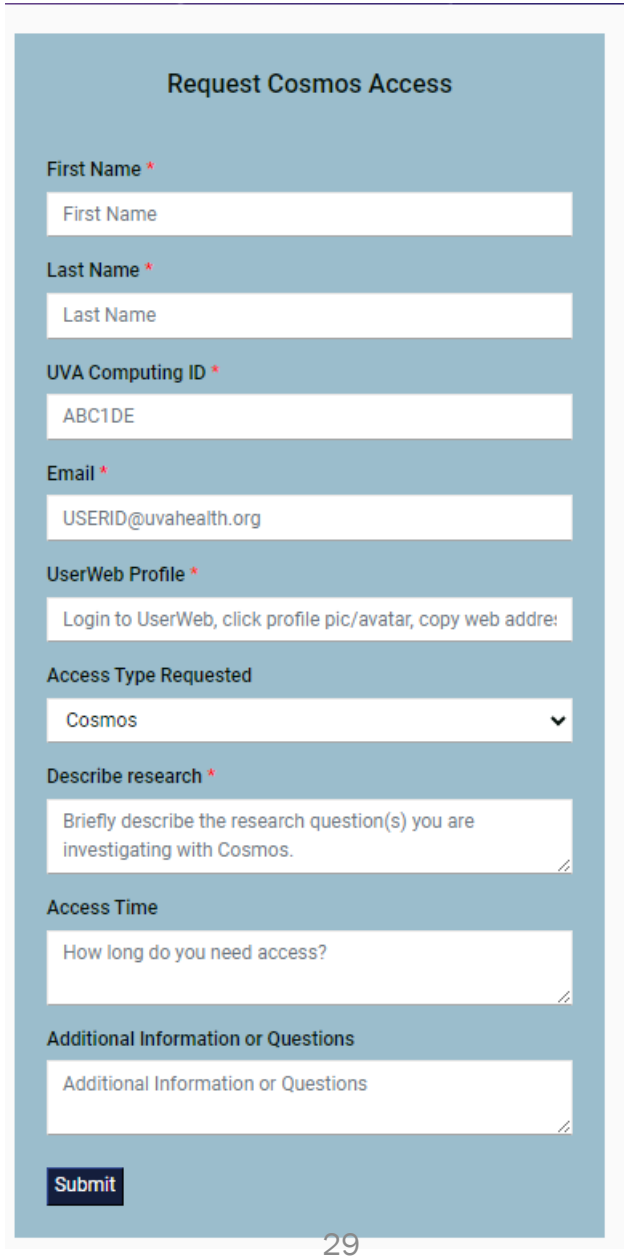
1. SlicerDicer Assistance: Help with complex queries and visualizations.
2. DSVM Configuration: set up user-specific virtual machines for data science needs
3. SQL Queries: Transfer de-identified Cosmos data in virtual machines.
4. Feasibility Queries: Generate aggregate data for study feasibility.

Request Access

- Epic Cosmos - Health Information Technology

Resources

- Need UserWeb access?
- Approved multi-factor authentication programs!
- Overview of Cosmos
- Take a virtual tour of Cosmos
- Latest Cosmos Statistics
- Looking for an Executive Review?
- Register for Cosmos Slice of the Month
- Sign up for Cosmos Quarterly Newsletter!
- Cosmos Data Science Users Meeting for real world use cases by experts in the data science platform.
- Cosmos Data Science Userweb Forum for the latest announcements and information from and by the community.



UVA Health
School of Medicine

Feasibility: Beginning a Research Project

Contact Epic

- When starting a research project with Cosmos, reach out to Epic early for guidance. Connect with your Cosmos TS or document any uncertainties in your disclosures during project setup.

Determine Feasibility

Epic provides the following resources to aid feasibility analysis:

- Cosmos Data Domain Encyclopedia
- Data Dictionary
- Cosmos Data Science Whitepapers
- **Cosmos SlicerDicer**

Conducting Feasibility Analysis

1. Use **SlicerDicer** to see if a study population is in Cosmos
2. Use the **Data Dictionary** to see if there are relevant columns for the data you will need to reference about that population.
3. Use the documents available to evaluate bias and other considerations.

Determine Feasibility in Cosmos

Study	Notes from SlicerDicer	Feasible in Cosmos?
You need at least 500 patients in your cohort for a study on patients diagnosed with Zika virus disease. between 1/1/2022 and 1/1/2024 Are there enough of them?	*There are over 900 patients diagnosed with Zika virus disease in this date range*	*Yes*
You would like to study patients who have had an intestinal transplant in the last 10 years. You need at least 50 for your study. Are there enough of them?	*There are 10 or fewer patients with a Transplanted Organ of Intestines or Small Intestine since 1/1/2014*	*No*
Babesiosis is a disease that can be transferred via blood transfusion. Can you report on patients with babesiosis in Cosmos? Can you report on whether these patients donated blood?	*There are over 11,000 patients with babesiosis in Cosmos since 2020. You can find blood transfusions in Billed Procedures but not blood donations.*	*Babesiosis diagnoses: yes. Blood donations: no.*

Construction: Building a Data Mart

1. Start after project creation and database provisioning.
2. Data scientists define the data mart based on research questions.
3. Data architects explore Cosmos data using SQL in EDDI (De-identified data set).
4. Relevant data is copied from EDDI to the project database.

From Validation to Publication

1. **Validation:** Ensuring High Data Quality
2. **Analysis:** Moving from Information to Insights
3. **Publication:** Sharing Your Findings
   - Review findings against the Cosmos Publication Checklist.
   - Ensure compliance before file transfer and sharing.

Receive Free iTHRIV Consult

1. **Email Request:** Send a brief description of your request to iTHRIVadmin@uvahealth.org
2. **Submit a Consult Request:** Fill out a consult request form for Informatics Tools help at portal.ithriv.org after logging in using your UVA institutional login
3. **Office Hours:** Wednesdays at 12pm at https://virginia.zoom.us/my/ithriv.informatics

Submit a Cosmos Service Request

1. **Submit Form:** Fill out the RCTA Research Data Request form for consultation and cost estimate.
2. **Cost Estimate:** $100/hour provided after consultation.
3. **Approval:** Work prioritized after signed cost estimate.
4. **Service Delivery:** Team gathers requirements, extracts data, and builds the data mart, etc.
5. **Billing:** Study team is invoiced for services provided.

Resources

- Cosmos Portal & Analytics Resource Kit
- Data Dictionary
- Data Domain Encyclopedia
- Slice of the Month meeting
- Best practice guides

Cosmos E-Learning Lessons

- Tour of Cosmos [COS100] : Navigate Cosmos, create dashboards, and explore data.
- Querying Cosmos Data [COS200] : Use SlicerDicer models, dashboards, and population linking.
- Advanced Cosmos Queries [COS300] : Explore advanced criteria like sequential and linked measures.
- SlicerDicer Filters and Time [COS310] : Learn tips for working with dates and over-time visualizations.
- Navigate the Cosmos GitLab [COS320] : Use and share code in Cosmos GitLab for data analysis.

DSVM* Support Features

- Cosmos Data Science Whitepapers
- Epic SQL I & II Training Companions
- Cosmos Data Science Users meeting (recordings on Galaxy)

Reference

1. COS305 Introduction to Cosmos Data Science
2. EPIC Cosmos Learning Program Support Materials
   - Cosmos for Informaticists PowerPoint
   - Cosmos for Data Scientists PowerPoint
   - Cosmos for Students PowerPoint

Activity Code

Activity Code: 24765

Instructions for claiming credits/contact hours can be found here

Questions?


UVA Health
School of Medicine