

# Intro to BMI Data Services

May 19, 2016

# Agenda

- Overview of services
- Example collaborations
  - Maternal Infant Data Hub
  - IMPACT Study
- Q&A

## Our mission

*To improve child health by facilitating investigator interactions with high-quality data in order to gain new, actionable knowledge.*

## Key services

- Development of data **collection/transfer** tools
- Complex **extraction** of clinical data for research purposes
- **Integration** of data and **transformation** into standard/common models
- Implementation of **reporting, visualization and discovery** tools
- **Data-in-once** solutions

## Our impact (FY16)

- **\$2.2M** funded research collaborations
- **20+** active multi-center projects
- **100+** investigators in **30+** divisions supported
- **5000+** users at **300+** sites supported
- **120+** research data requests completed
- **300+** research data sets delivered

## Data collection/transfer tools

- Develop custom web/mobile applications
  - Complex workflows
  - Customized/personalized user interfaces
  - Integration w/ clinical and research information systems (e.g., Epic, Cerner)

# Data collection/transfer tools

Home
Contact
Reports
Hello, Elsa Cavanaugh!
Logout

TESTHOSPITAL
Change

Test Hospital Data Collection Form

Entering Data For: August-2015

Children's Hospitals' Solutions for Patient Safety  
Every patient. Every day.

Culture
SSI
Falls
PU
VAP
ADE
OhioEmployeeSafety
OhioEmergencyTransfers
Readmissions

OBAB
CAUTI
VTE
CLABSI
PatientDays
Ohio
CLABSIPreventionStandards
PUPPreventionStandards

CAUTIPreventionStandards
SSIPreventionStandards
VAPPreventionStandards
PIVIE

2015	<div>SSIPreventionStandards</div> <div>Preoperative Bath</div> Our hospital currently implements this standard element. Yes Date implementation began 01/01/2015 Our hospital currently measures this standard element. Yes Date measurement began 02/01/2015 Our hospital measures this standard throughout the entire hospital Yes
2014	
2013	
2012	
2011	
2010	
2009	

No Razor

Our hospital currently implements this standard element. Yes
Date implementation began 01/01/2015
Our hospital currently measures this standard element. Yes
Date measurement began 02/01/2015
Our hospital measures this standard throughout the entire hospital Yes

Appropriate Antibiotic Timing

Our hospital currently implements this standard element. Yes
Date implementation began 01/01/2015

# Data collection/transfer tools

Assessment

Colectomy/Ostomy

Symptoms

Stools

Extraintestinal Manifestations

Exam

Disease Assessment

Nutritional and Growth Status

Psychosocial Risk

Lab

Medications

Prior Medications

Medications

Aminosalicylates

Rectal Therapy

Corticosteroids

Immunomodulators

Immune Suppressant

Antibiotics for IBD

Biologics

Biologics

Biologic Regimen

Other Medication

Caloric intake and nutrition

TPMT

6MP/AZA

Therapy

Patients Taking Biologics

Remicade

Colectomy/Ostomy

Has the Patient had a colectomy? (If Yes, and the patient's diagnosis is UC, the patient should be inactivated) (select one)

☐ Yes
 ☒ No
 ☐ Don't Know

Previous Ileostomy or Colostomy

No

Does the Patient currently have an ileostomy or colostomy? (select one)

☒ Yes
 ☐ No
 ☐ Don't Know

Previous Diagnosis

Ulcerative Colitis

What is the patient's current diagnosis? (select one)

☒ Crohn's Disease
 ☐ Ulcerative Colitis
 ☐ Indeterminate Colitis

← Previous Section

Next Section →

UAT



## Data collection/transfer tools

- Develop/implement data transfer portals
  - Support for flat files and web services/APIs
- Leverage CCHMC research network environment for highly configurable, secure access control

## Data extraction

- Provide honest broker service for research data requests sourced from the CCHMC EHR and other clinical/research information systems
- One-time data sets and recurring reports/refreshes

# Data extraction

- CCHMC central intake form
  - <http://iportal.cchmc.org/sites/is/EpicDataRequest/sitepages/datarequestmenu.aspx>
- [help-dataservices@bmi.cchmc.org](mailto:help-dataservices@bmi.cchmc.org)

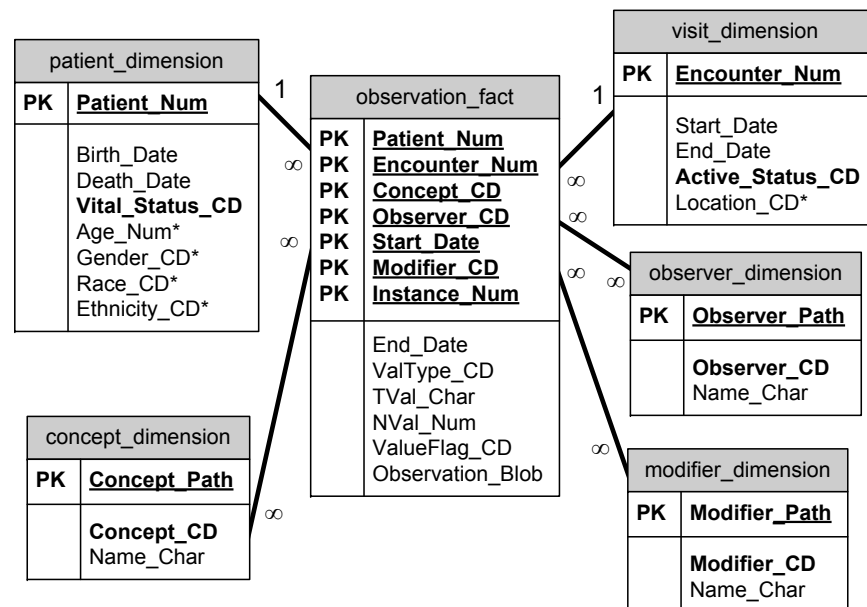
# Data integration/transformation

- Leverage common data models

- i2b2, OMOP, PCORnet

- Produce derived data sets/measures using standardized/reusable and custom methods

- Collaboration with CCHMC Division of Biostatistics & Epidemiology



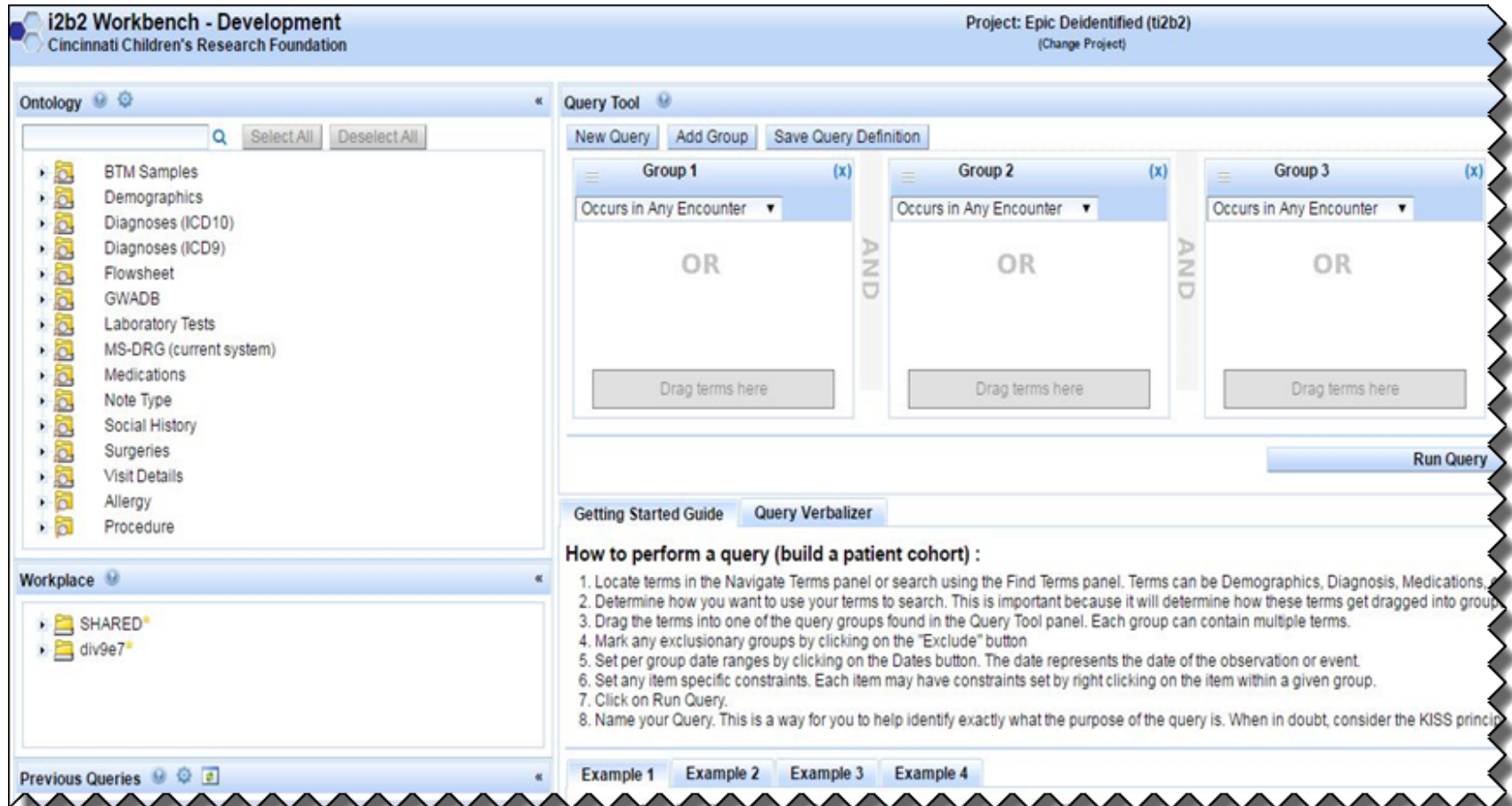
## Reporting/visualization/discovery

- Support CCHMC research data warehouse
- Implement/modify applications, reporting tools and analysis libraries that interact with common data models
- Develop and implement web-based data characterization tools
- Develop distributed, web-based reporting solutions

## CCHMC research data warehouse

- Uses: cohort identification, hypothesis generation
- Limited data set including 1.2M patients, 26M encounters and 230M observations/facts:
  - Diagnoses
  - Vitals
  - Labs/medications
  - Allergies
  - Social history
  - Surgeries
  - Samples (Better Outcomes for Children)

# CCHMC research data warehouse: workbench



**i2b2 Workbench - Development**  
Cincinnati Children's Research Foundation

Project: Epic Deidentified (ti2b2)  
(Change Project)

**Ontology**

Select All Deselect All

- BTM Samples
- Demographics
- Diagnoses (ICD10)
- Diagnoses (ICD9)
- Flowsheet
- GWADB
- Laboratory Tests
- MS-DRG (current system)
- Medications
- Note Type
- Social History
- Surgeries
- Visit Details
- Allergy
- Procedure

**Query Tool**

New Query Add Group Save Query Definition

Group 1 (x) Group 2 (x) Group 3 (x)

Occurs in Any Encounter

OR AND AND OR

Drag terms here

Run Query

Getting Started Guide Query Verbalizer

**How to perform a query (build a patient cohort) :**

1. Locate terms in the Navigate Terms panel or search using the Find Terms panel. Terms can be Demographics, Diagnosis, Medications, etc.
2. Determine how you want to use your terms to search. This is important because it will determine how these terms get dragged into group.
3. Drag the terms into one of the query groups found in the Query Tool panel. Each group can contain multiple terms.
4. Mark any exclusionary groups by clicking on the "Exclude" button
5. Set per group date ranges by clicking on the Dates button. The date represents the date of the observation or event.
6. Set any item specific constraints. Each item may have constraints set by right clicking on the item within a given group.
7. Click on Run Query.
8. Name your Query. This is a way for you to help identify exactly what the purpose of the query is. When in doubt, consider the KISS principle.

Example 1 Example 2 Example 3 Example 4

**Workplace**

SHARED\* div9e7\*

**Previous Queries**

## Distributed research networks

- Uses:
  - Queries of patient populations across participating institutions
  - Identification of cohorts/testing of hypotheses across institutional/geographic boundaries
- Currently supported networks:
  - PEDSnet (8 national pediatric hospitals)
  - ACT (21 national pediatric/adult hospitals)
  - OCTC (12 Ohio pediatric/adult hospitals)





## Data-in-once solutions

- Multi-use, “enhanced” registries: research + quality improvement + care management
- Primarily for learning networks/health systems
- Requires significant investment, collaboration with Anderson Center & Biostats/Epi at CCHMC



IMPROVE**CARE**NOW



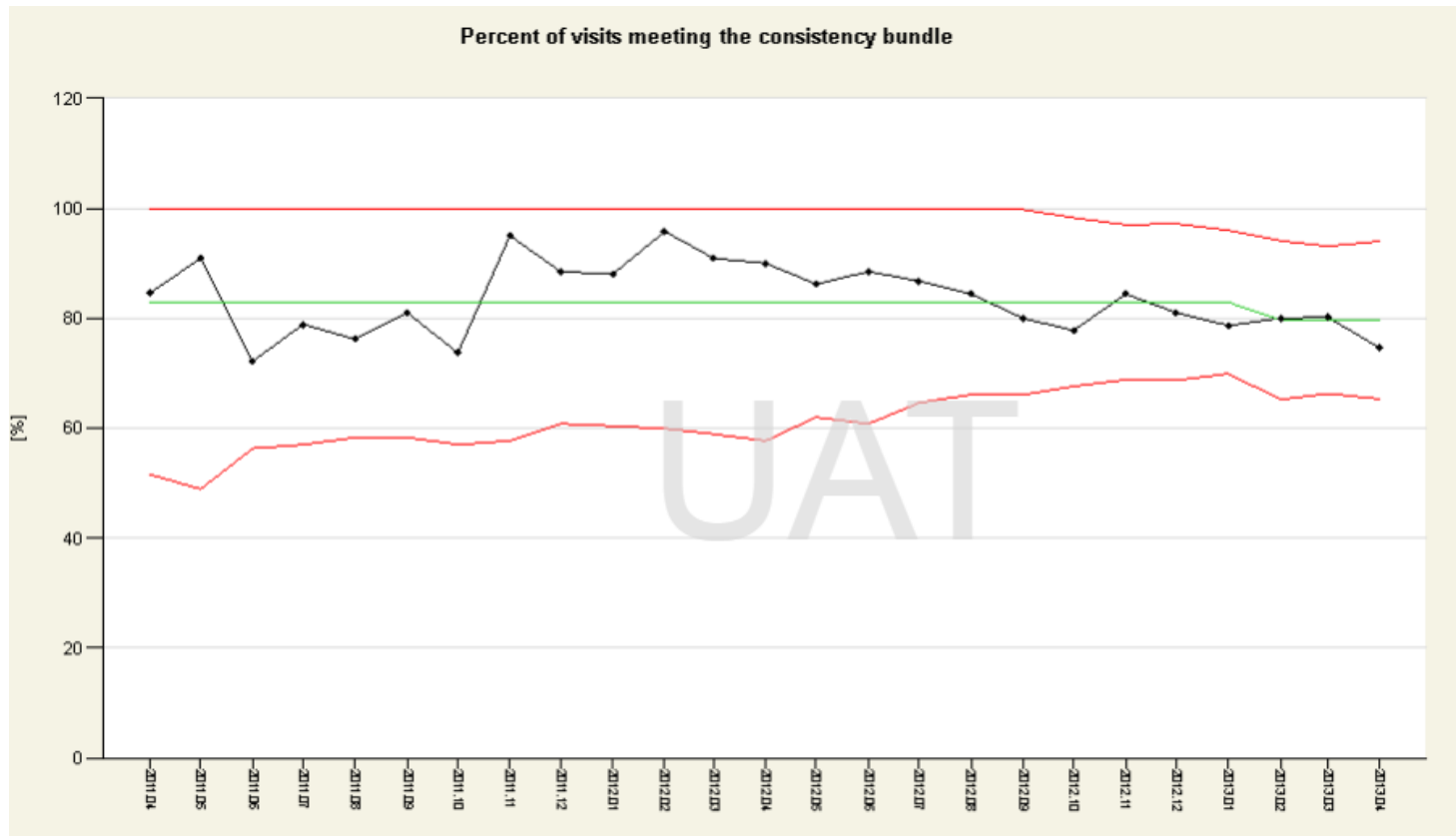
**Children's Hospitals'**  
**Solutions for**  
**Patient Safety**  
Every patient. Every day.



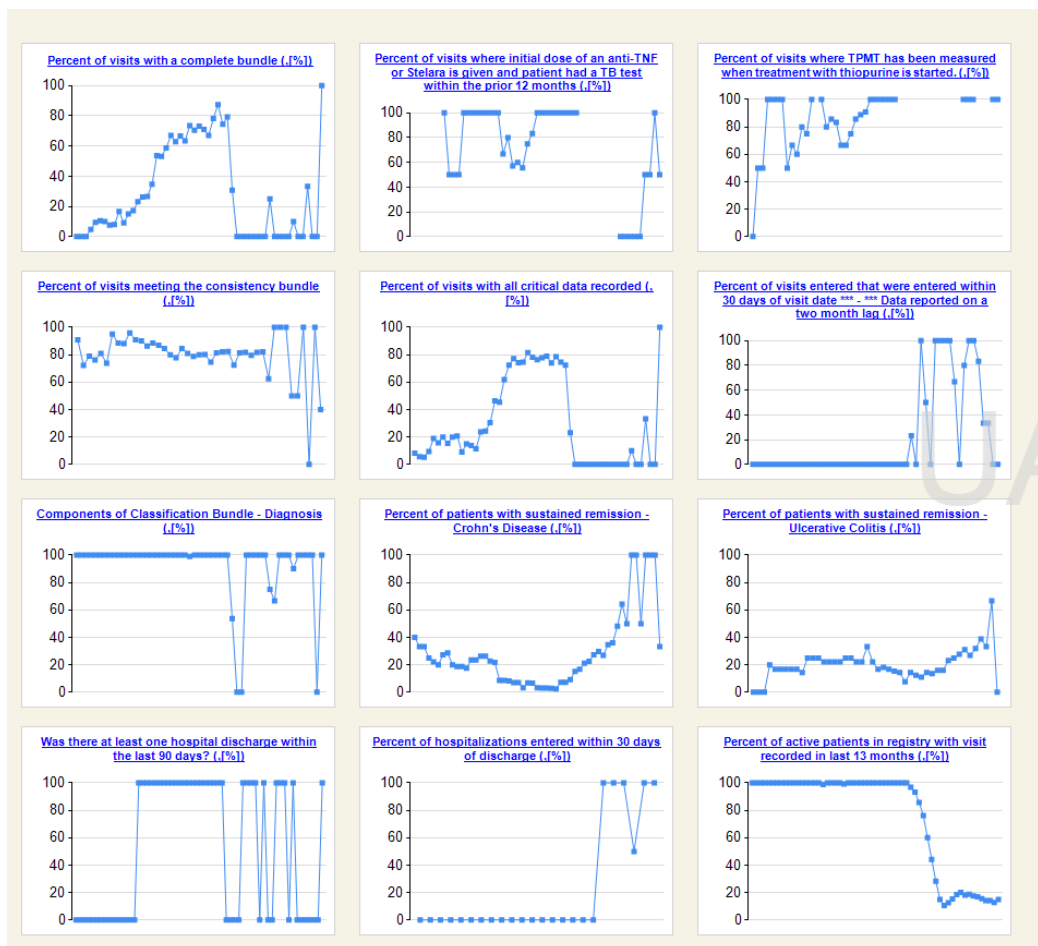
## Data-in-Once: Benefits

- Elimination of redundant data entry
- Integrated inbound and outbound data quality checks
- Identified and de-identified access layers
- Diverse, modular outputs
  - Reports
  - Data sets
  - Query abilities

# Enhanced Registries: ImproveCareNow



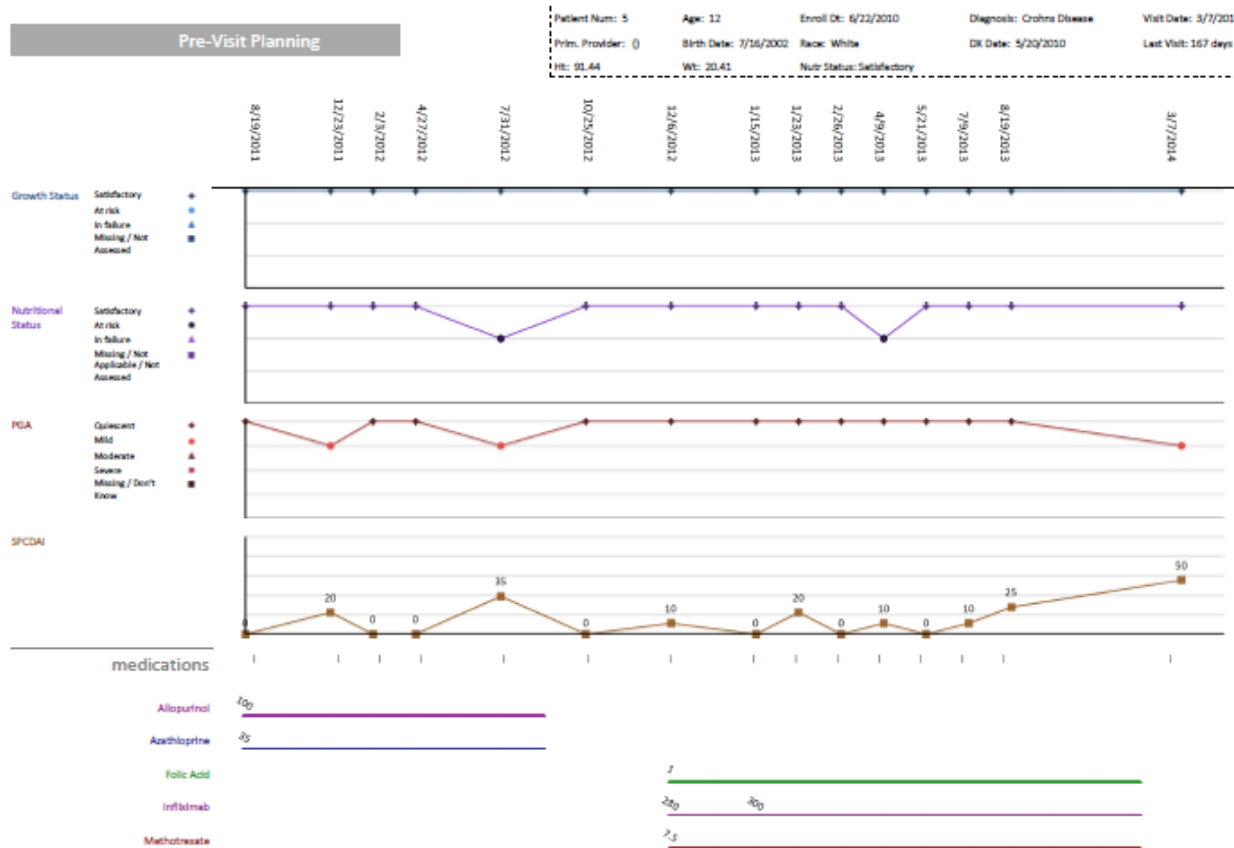
# Enhanced Registries: ImproveCareNow



# Enhanced Registries: ImproveCareNow

IBD PRE-VISIT ASSESSMENT																																																																																																			
Patient Name: Huxtable, Rudy /MRN:6005603			Birth Date: 7/16/2002			Primary Provider:																																																																																													
Patient Num: 5			Current Age: 12.0			Secondary Provider:																																																																																													
Diagnosis: Crohn's Disease - 5/2010			Last Visit: 3/7/2014			Last PPD & Date:																																																																																													
Phenotype: Inflammatory, non-penetrating, non-stricturing			Wt (kg): 20.41			Negative 9/7/2012																																																																																													
Lower: Ileal only			Ht (cm): 91.44			Last CXR:																																																																																													
Upper Proximal: No			BSA: .72			Negative 9/10/2010																																																																																													
Upper Distal: No			Date of last hospitalization:			Last Gold Test & Date:																																																																																													
Perianal Phenotype: No			Not Recorded			Not Done																																																																																													
<b>&gt;&gt; Visits:</b> <table border="1"> <thead> <tr> <th></th> <th>01/15/2013</th> <th>01/23/2013</th> <th>02/26/2013</th> <th>04/09/2013</th> <th>05/21/2013</th> <th>07/09/2013</th> <th>08/19/2013</th> <th>03/07/2014</th> <th>Age of Result</th> </tr> </thead> <tbody> <tr> <td>sPCDAI</td> <td>0</td> <td>20</td> <td>0</td> <td>10</td> <td>0</td> <td>10</td> <td>25</td> <td>50</td> <td></td> </tr> <tr> <td>PGA</td> <td>Quiescent</td> <td>Quiescent</td> <td>Quiescent</td> <td>Quiescent</td> <td>Quiescent</td> <td>Quiescent</td> <td>Quiescent</td> <td>Mild</td> <td></td> </tr> <tr> <td>Nutritional Status</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>At risk</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td></td> </tr> <tr> <td>Growth Status</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td>Satisfactory</td> <td></td> </tr> <tr> <td>Albumin</td> <td>4.5</td> <td></td> <td>4.3</td> <td>4.5</td> <td>4.3</td> <td>4.4</td> <td>4.3</td> <td></td> <td>12 mo ⬇️</td> </tr> <tr> <td>CRP</td> <td>0.00</td> <td></td> <td>0.00</td> <td>0.00</td> <td>0.50</td> <td>0.00</td> <td></td> <td></td> <td>13 mo ⬇️</td> </tr> <tr> <td>ESR</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7.0</td> <td></td> <td>12 mo ⬇️</td> </tr> <tr> <td>Hematocrit</td> <td>36.0</td> <td></td> <td>36.1</td> <td>38.7</td> <td>35.7</td> <td>35.5</td> <td>34.8</td> <td></td> <td>12 mo ⬇️</td> </tr> </tbody> </table>											01/15/2013	01/23/2013	02/26/2013	04/09/2013	05/21/2013	07/09/2013	08/19/2013	03/07/2014	Age of Result	sPCDAI	0	20	0	10	0	10	25	50		PGA	Quiescent	Quiescent	Quiescent	Quiescent	Quiescent	Quiescent	Quiescent	Mild		Nutritional Status	Satisfactory	Satisfactory	Satisfactory	At risk	Satisfactory	Satisfactory	Satisfactory	Satisfactory		Growth Status	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory		Albumin	4.5		4.3	4.5	4.3	4.4	4.3		12 mo ⬇️	CRP	0.00		0.00	0.00	0.50	0.00			13 mo ⬇️	ESR							7.0		12 mo ⬇️	Hematocrit	36.0		36.1	38.7	35.7	35.5	34.8		12 mo ⬇️
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*Result date may differ from visit date                ⬇️ Lab ordering guidelines: 5-ASA:q6mo                6mp/ASA/MTX:q3-4mo                Biologics:q2-3mo																																																																																																			
<b>Care Stratification</b> <table border="1"> <thead> <tr> <th>CS Score</th> <th>CSS Group</th> <th>Current Disease Activity</th> <th>12 Month Disease Activity</th> <th>BMI Z-Score</th> <th>Ht Velocity</th> <th>Hosp Adm within 3 months</th> <th>Currently on Cortico</th> <th>Cortico last 12 months</th> <th>Psychosocial Risk Factors</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										CS Score	CSS Group	Current Disease Activity	12 Month Disease Activity	BMI Z-Score	Ht Velocity	Hosp Adm within 3 months	Currently on Cortico	Cortico last 12 months	Psychosocial Risk Factors																																																																																
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# Enhanced Registries: ImproveCareNow



## Future directions

- Research data warehouse:
  - Workbench upgrades
  - Flowsheets, de-identified notes
- Learning health systems:
  - Modularly programmed, reusable measures
- Structured data capture pilot
  - Study forms embedded in the EHR

## Example collaborations

- Maternal Infant Data Hub
  - Study Team: Eric Hall, PhD; Jim Greenberg, MD
  - BMI Team: Janet Zahner, Jay Gholap, Parth Divekar, Diana Epperson
- IMPACT Study (Illness Management & Parental Adjustment to Cancer Treatment)
  - Study Team: Ahna Pai, PhD; Caroline Morrison
  - BMI Team: Billy Shuman, Jeremy Nix



## Contact us

- Ron Bryson, Manager  
[ron.bryson@cchmc.org](mailto:ron.bryson@cchmc.org)  
513-636-0271
- [help-dataservices@bmi.cchmc.org](mailto:help-dataservices@bmi.cchmc.org)

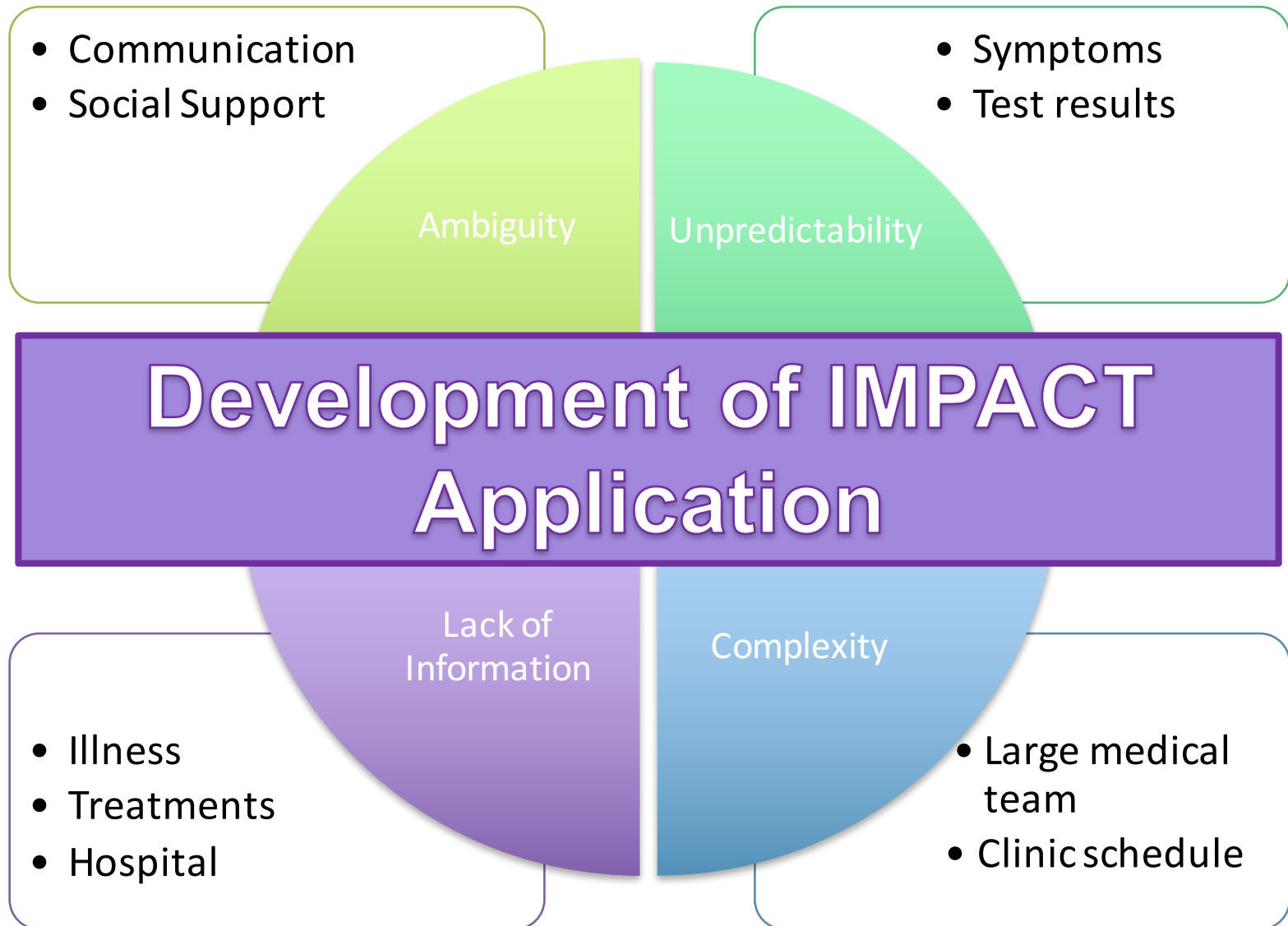


# IMPACT Study

Pai Lab and BMI Collaboration  
May 19, 2016

- 15,780 Children are diagnosed with cancer every year in the United States (ACS, 2014)
- Uncertainty inherent to the cancer experience
  - Dramatically increases uncertainty experienced by patients and their caregivers
  - Parental Uncertainty is robustly related to psychological distress of BOTH parents and the child with cancer.
- Multi-site randomized control trial of IMPACT
  - Minimize and manage the uncertainty faced by families with a child diagnosed with cancer
  - Parents of children newly diagnosed with cancer

# Sources of Uncertainty



- Accessibility
  - Variety of device manufacturers- Apple, Android
  - Smartphone, Tablet, Computer
  - Login to secure health information
  - Easy to navigate
- Information about the Treatment Process
  - Content designed based on family interviews
  - Integrate content from trusted sources
- Personalized information integration
  - Laboratory results
  - Healthcare provider contact information
  - Calendar of medical appointments
- Interactive Uncertainty Management navigation

## Needs

- Variety of device manufacturers- Apple, Android
- Smartphone, Tablet, Computer
- Login to secure health information
- Easy to Navigate

## Solutions

- Mobile centric website
- MyChart authentication

## Needs

- Content designed based on family interviews & existing literature
- Integrate content from trusted sources

## Solutions

- Live Well Collaborative for design
- Information pulled directly from National Cancer Institute

## Needs

- Laboratory results
- Healthcare provider contact information
- Calendar of appointments

## Solutions

- Centerlink pull for provider contact information
- EPIC data pull for laboratory results and calendar appointments



## Need

- Interactive Uncertainty Management navigation

## Solution

- Interactive navigation
- Editing capabilities
- Stored history


# Responsive Design



- Latest Web Technologies
  - HTML5, CSS3, JavaScript Frameworks
- Full-text searching
  - Rebuilt nightly
- Not a traditional mobile application





- Epic web services (MyChart)
- National Cancer Institute (cancer.gov)
- National Library of Medicine
  - MedlinePlus (medications)
- Organization handouts (CCHMC)

 IMPACT


USERNAME


PASSWORD


Login


 IMPACT 


TUESDAY, FEBRUARY 16






 Calendar Events



 Results

 Medications

 Notes

 Education Bookmarks


JOURNEY


Results
Medications
Care Team
Notes

25OH VITAMIN D
2015-09-01 9:10 ...

URINALYSIS
2015-09-01 9:08 ...

Status: Final result

U APPEARANCE  
Value: Cloudy






U COLOR  
Value: Yellow


U GLUCOSE  
Value: Neg mg/dL

U BILI  
Value: Low

U KETONES  
Value: Neg  
Comment: Negative <5, Trace 5-10, Small 10-20, Moderate 40-50, Large 80-100.

U SPEC GRAV  
Value: 1.0002


JOURNEY


Results
Medications
Care Team
Notes

EB VIRUS IGG
2015-09-01 9:57 ...






CMV IGG ANTIBODY
2015-09-01 9:56 ...

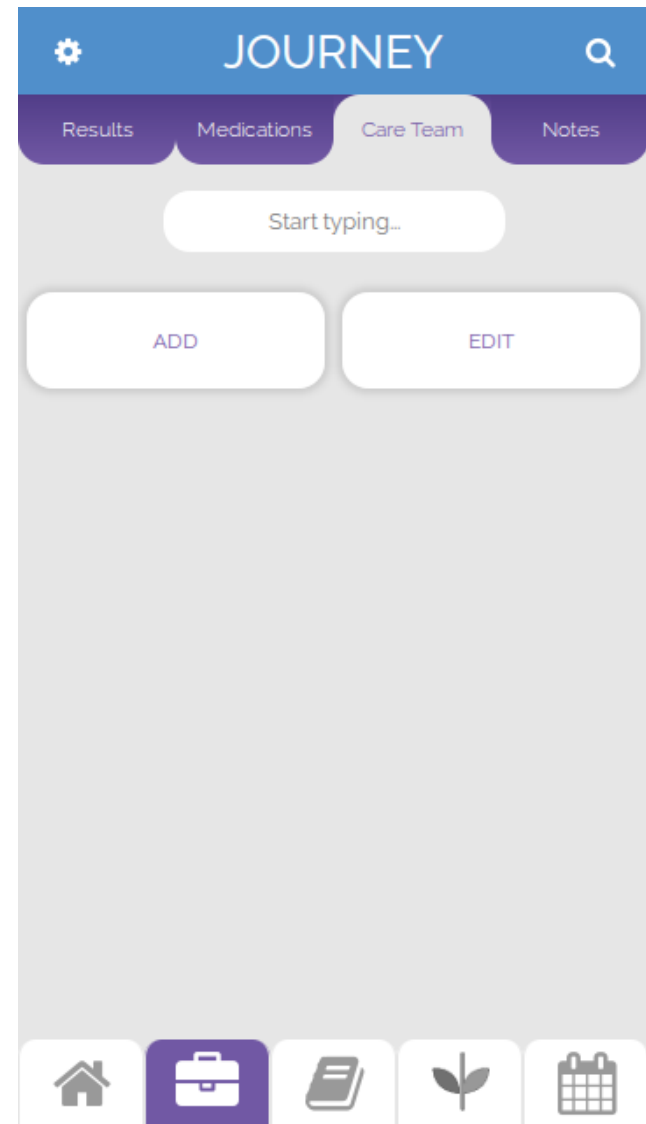
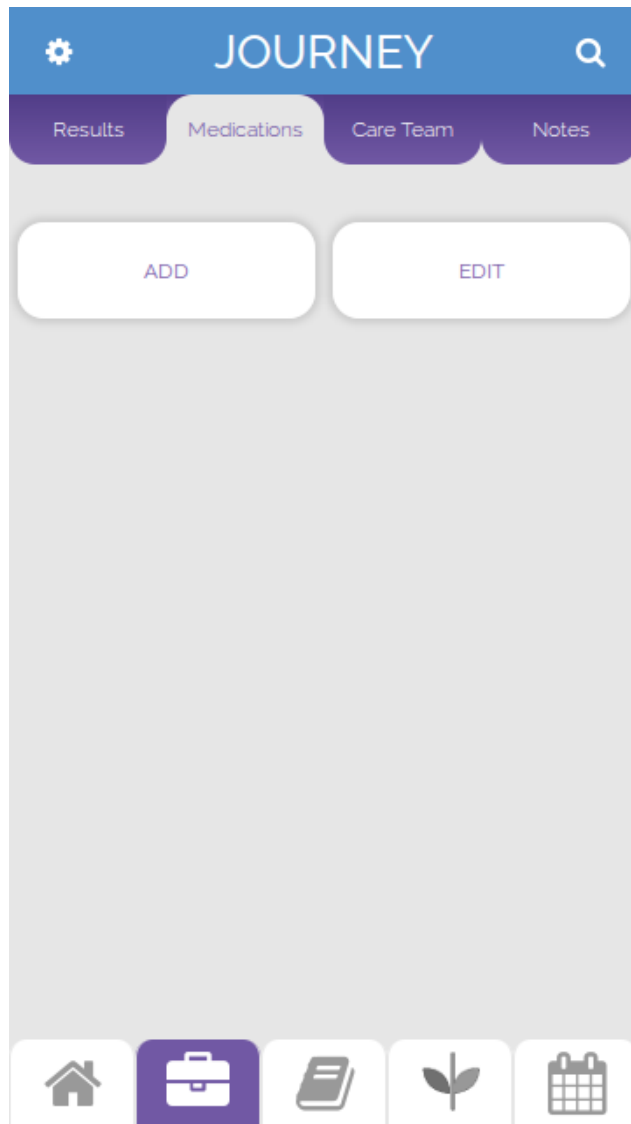
Status: Final result

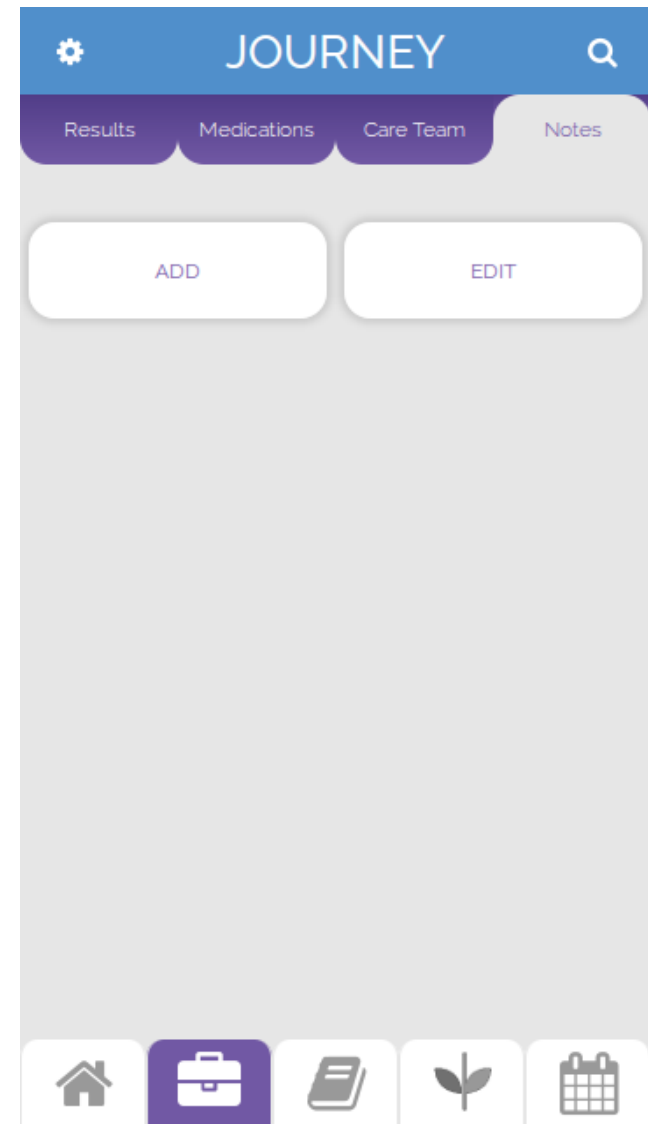
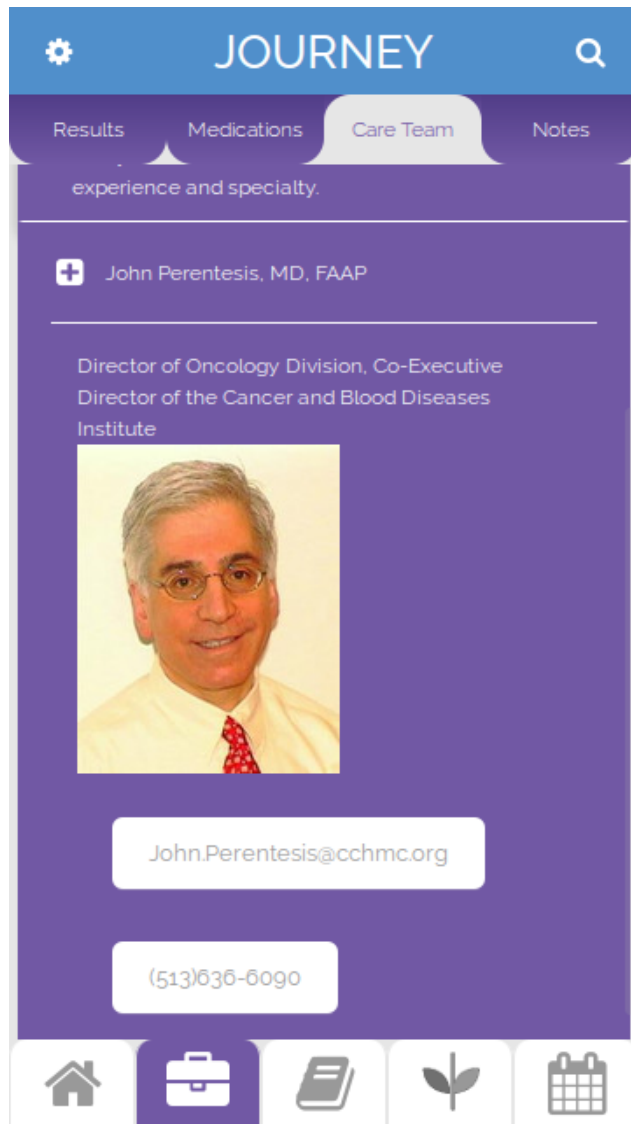
CMV IGG AB  
Value: Positive  
Comment: This test detects IgG antibody against cytomegalovirus. CMV serology may not be useful for the evaluation of active or reactivated infection in immunocompromised patients. Molecular diagnostic tests are preferred in these cases.

RENAL PROFILE  
(NA,K,CL,CO2,BUN,CREAT,CA,GLU)
2015-09-01 9:53 ...



CBC (WITH PLATELETS)
2015-09-01 9:33 ...









Results

Medications

Care Team

Notes

CANCEL


SAVE


TITLE


TITLE


CONTENT


CONTENT

















Lifestyle



Terms



Procedures


Treatment


Start typing...


 Health and Wellness 


 Nutrition 


 School and Learning 

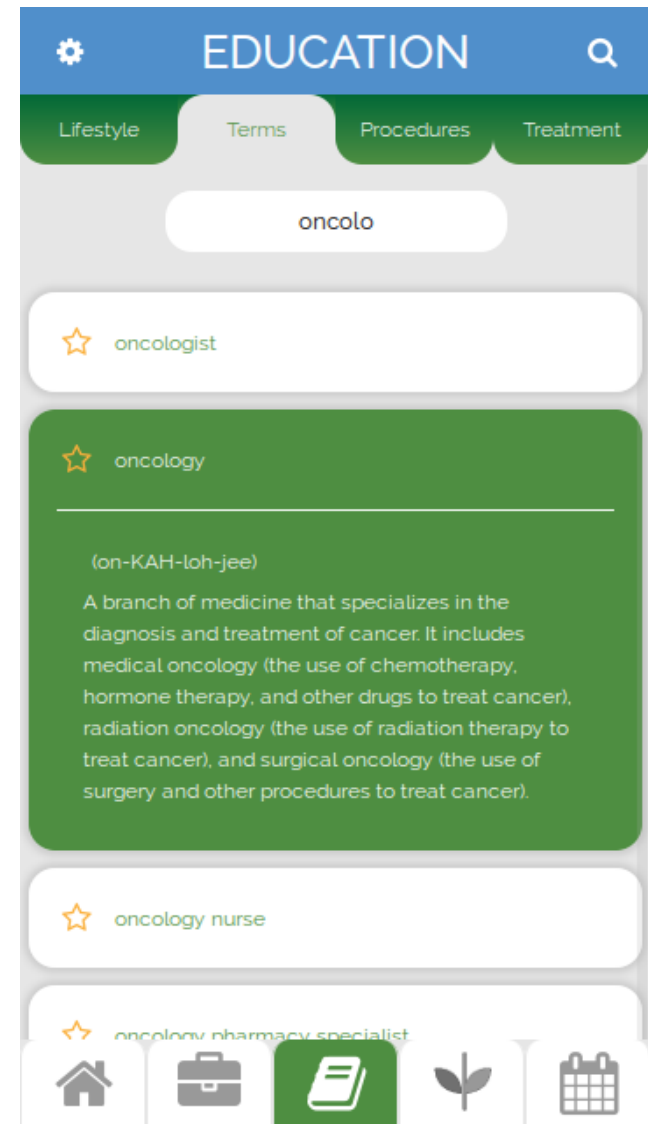


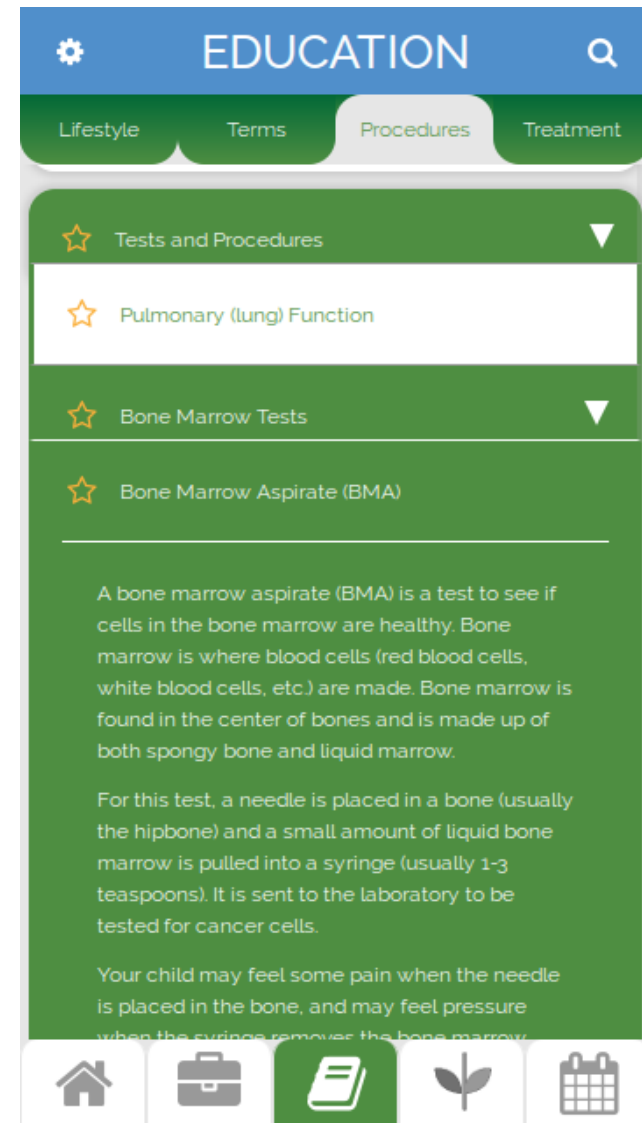
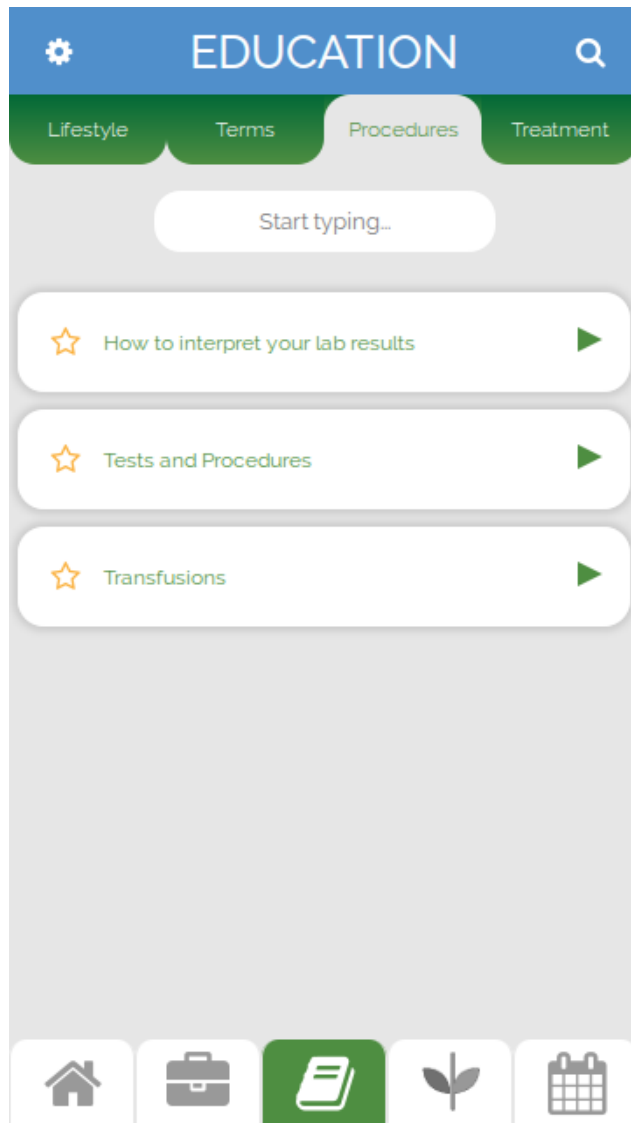


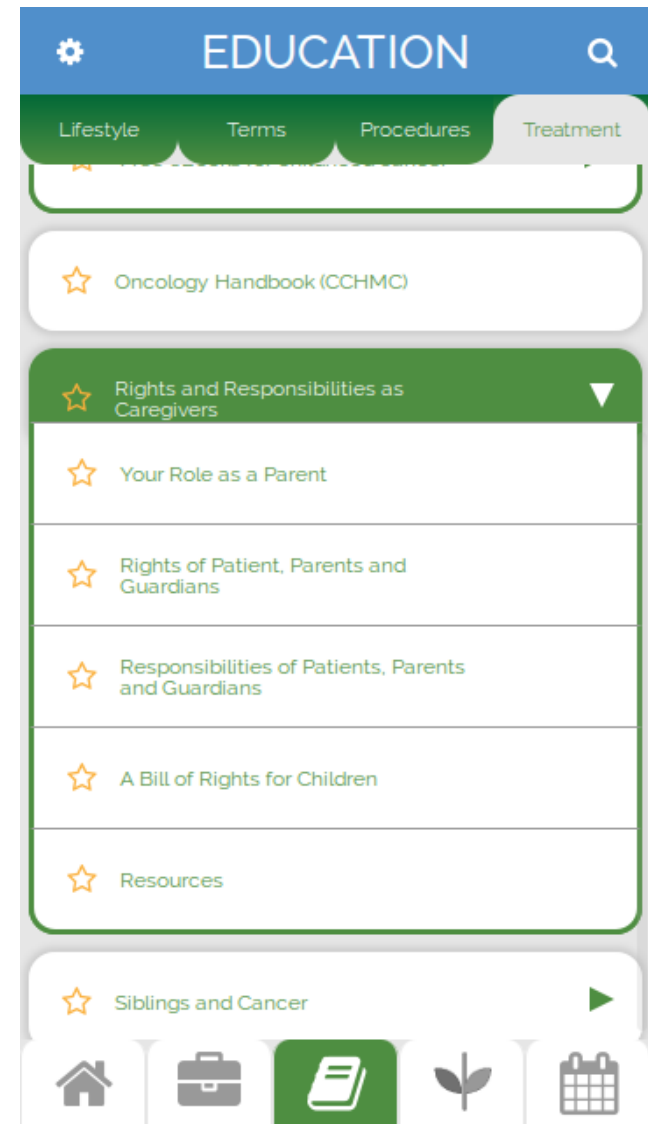
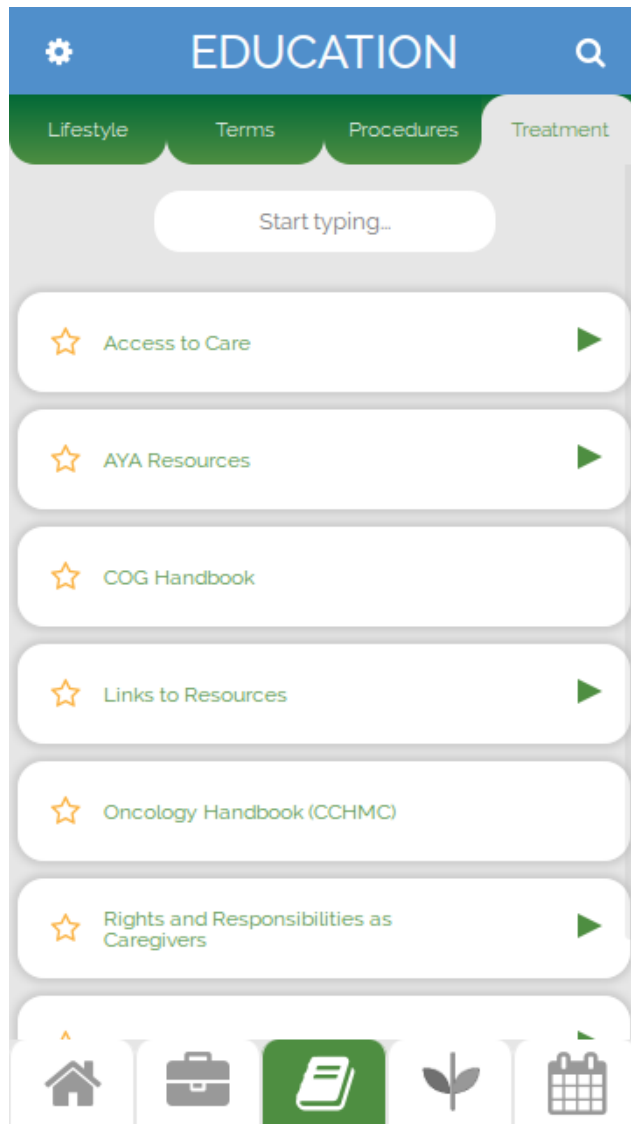














 STUDY 

Uncertainty






Journal



Resources

ADD

EDIT

MY SOURCES OF UNCERTAINTY:  
Click add to create a new source of uncertainty.



 STUDY 

Uncertainty

Journal


Resources

CANCEL


SAVE

SOURCE OF UNCERTAINTY


Other

☐ 


 Symptoms are unpredictable

☐ 


 Meaning of symptoms

☐ 


 Treatments are complex

☐ 


 Side effects

☐ 






 Prognosis



☒ 

 Labs

☐ 

 Friendships



 STUDY 

Uncertainty

Journal

Resources


ADD


EDIT


MY SOURCES OF UNCERTAINTY:  
Click on the source to start managing your uncertainty.


Labs


Uncertainty Management













 STUDY 

Uncertainty

Journal


Resources


CANCEL


SAVE


What are you currently doing to manage this uncertainty?


NEXT















STUDY

UncertaintyJournalResources






CANCELSAVE

Is your strategy working?

☐  YES

☐  NO

PREVIOUS



STUDY

UncertaintyJournalResources

CANCELSAVE

Do you want to try something different?



☐  YES

☐  NO

☐  NOT RIGHT NOW

PREVIOUS



STUDY

UncertaintyJournalResources

CANCEL

SAVE

Think of other possible strategies to manage this uncertainty.

Running

Cleaning






Meditation



Reading

Add Another Action

PREVIOUS

NEXT



STUDY

UncertaintyJournalResources

CANCEL

SAVE

Rank your actions:

↑

↓

Running

↑

↓

Cleaning

↑

↓

Meditation






↑

↓



Reading

PREVIOUS

NEXT





 STUDY 

Uncertainty

Journal


Resources


CANCEL


SAVE


I have uncertainty about **Labs** and I will manage it by **Meditation**.  
What steps do you need to complete in order to accomplish this strategy?


PREVIOUS













 STUDY 

Uncertainty

Journal

Resources

ADD

EDIT


MY SOURCES OF UNCERTAINTY:  
Click on the source to start managing your uncertainty.


Labs


---


I have uncertainty about **Labs** and I will manage it by **Meditation**.


Steps to accomplish this strategy:  
Learn how to meditate.




















STUDY

UncertaintyJournalResources

ADDEDIT

Click add to start a new entry.








STUDY

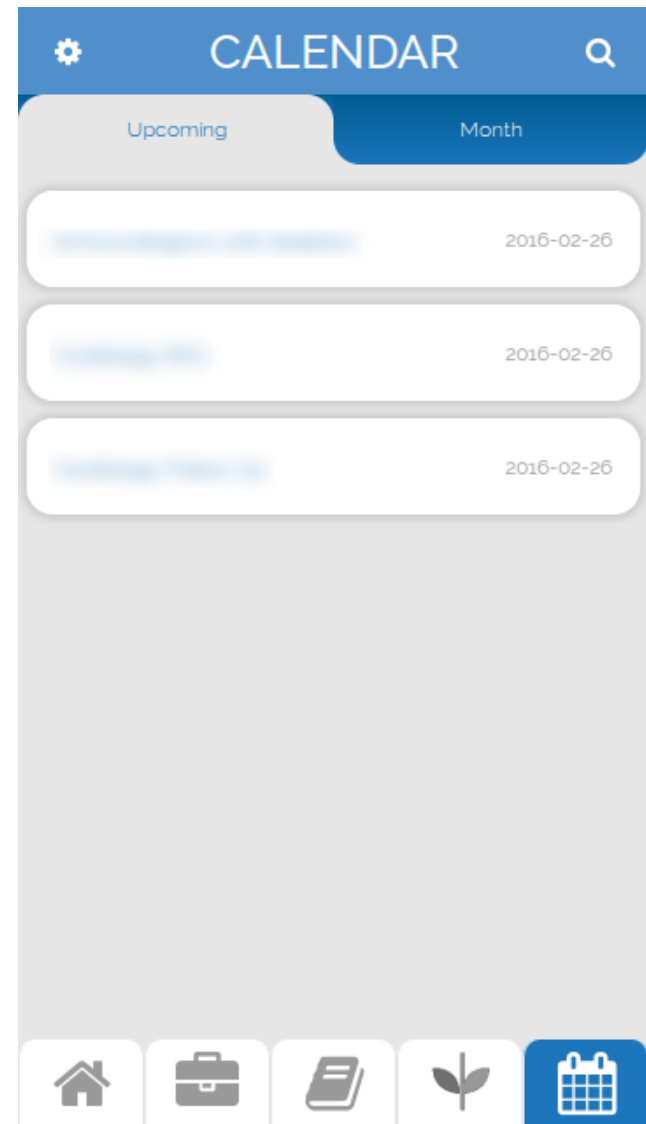
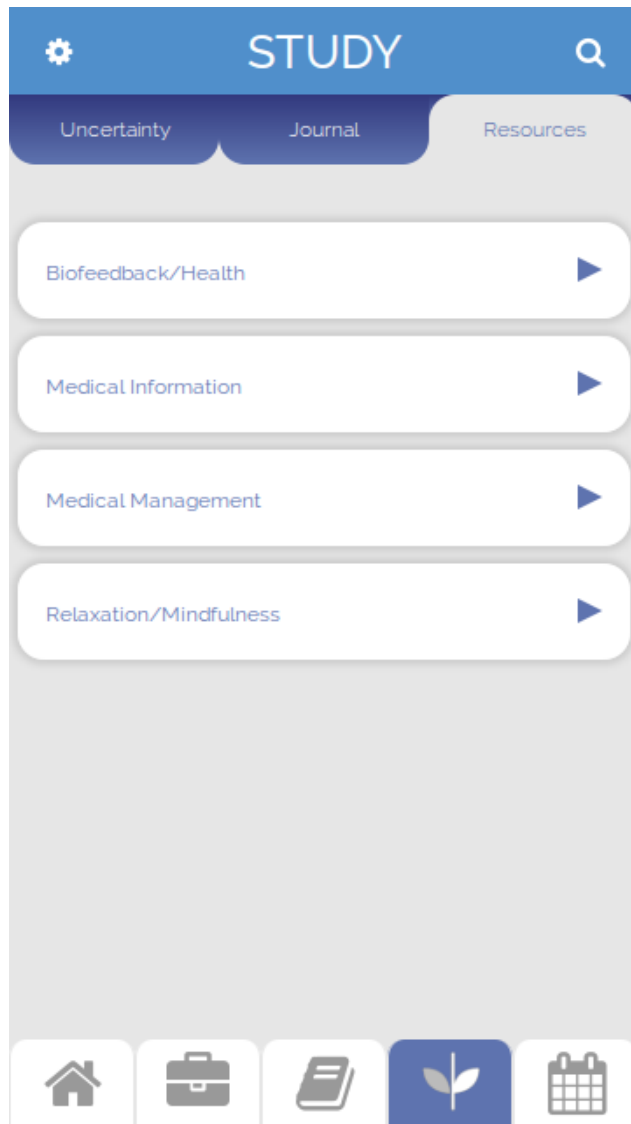
UncertaintyJournalResources

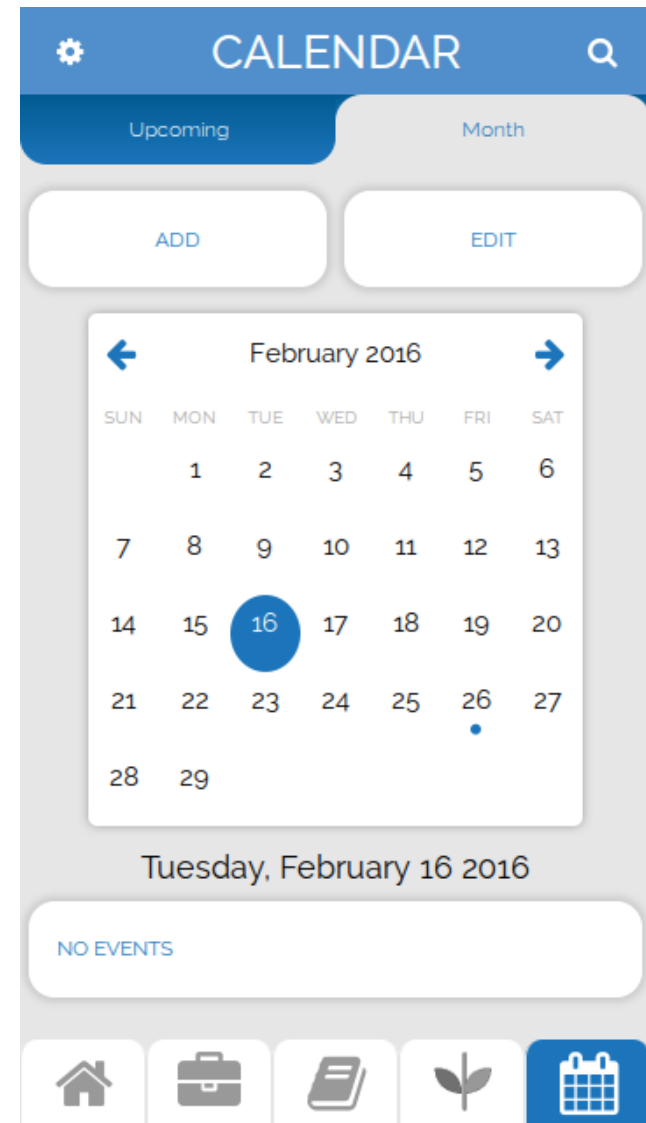
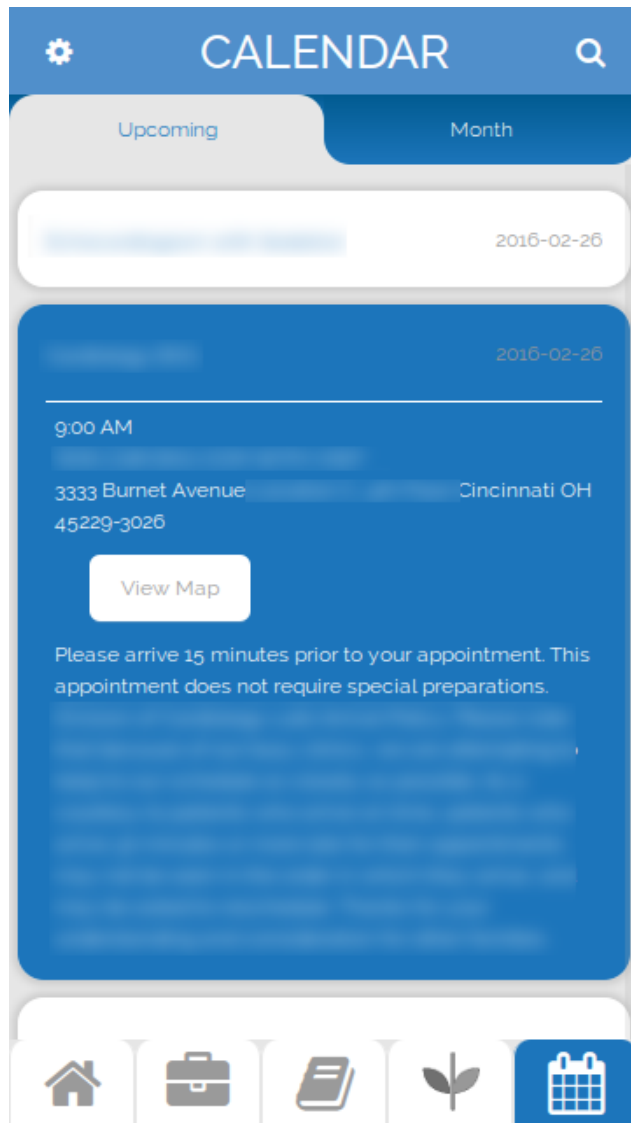
CANCELSAVE

TITLE

CONTENT

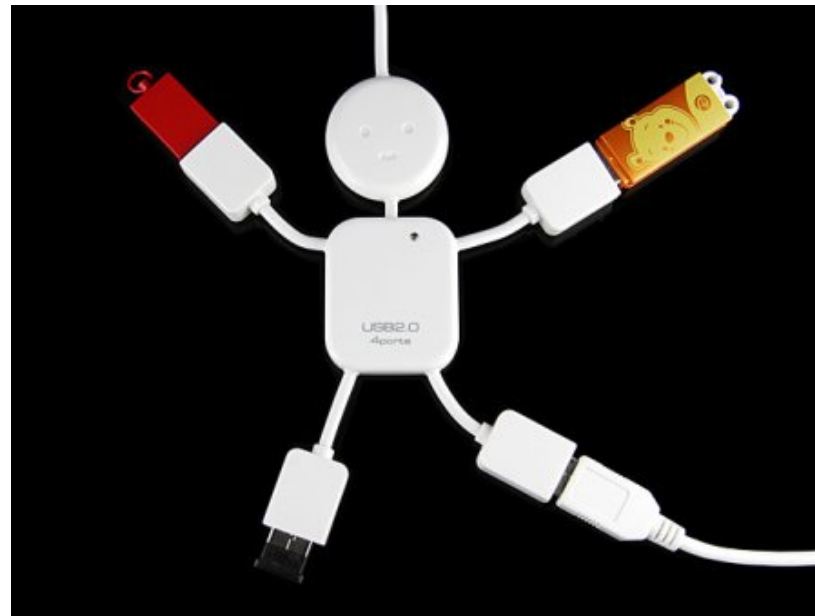






# Questions?

# Lifespan Data Integration Module: Maternal and Infant Data Hub



- Measures of community maternal and infant health are instrumental for
  - Planning
  - Allocation of key resources
  - Testing of relevant hypotheses
  - Effective operation of healthcare and community-based programs
- Focus on reduction of infant mortality

- The number of deaths in children under 1 year of age per 1000 live births in the same timeframe

$$\frac{\# \text{ infant deaths}}{\# \text{ live births}} * 1,000$$

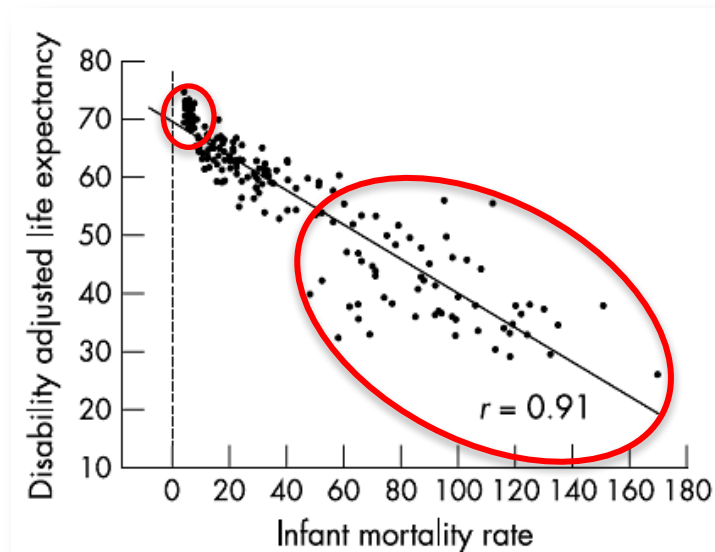
- Hamilton County IMR (2011-15)

$$\frac{508}{54,805} * 1,000 = 9.3$$



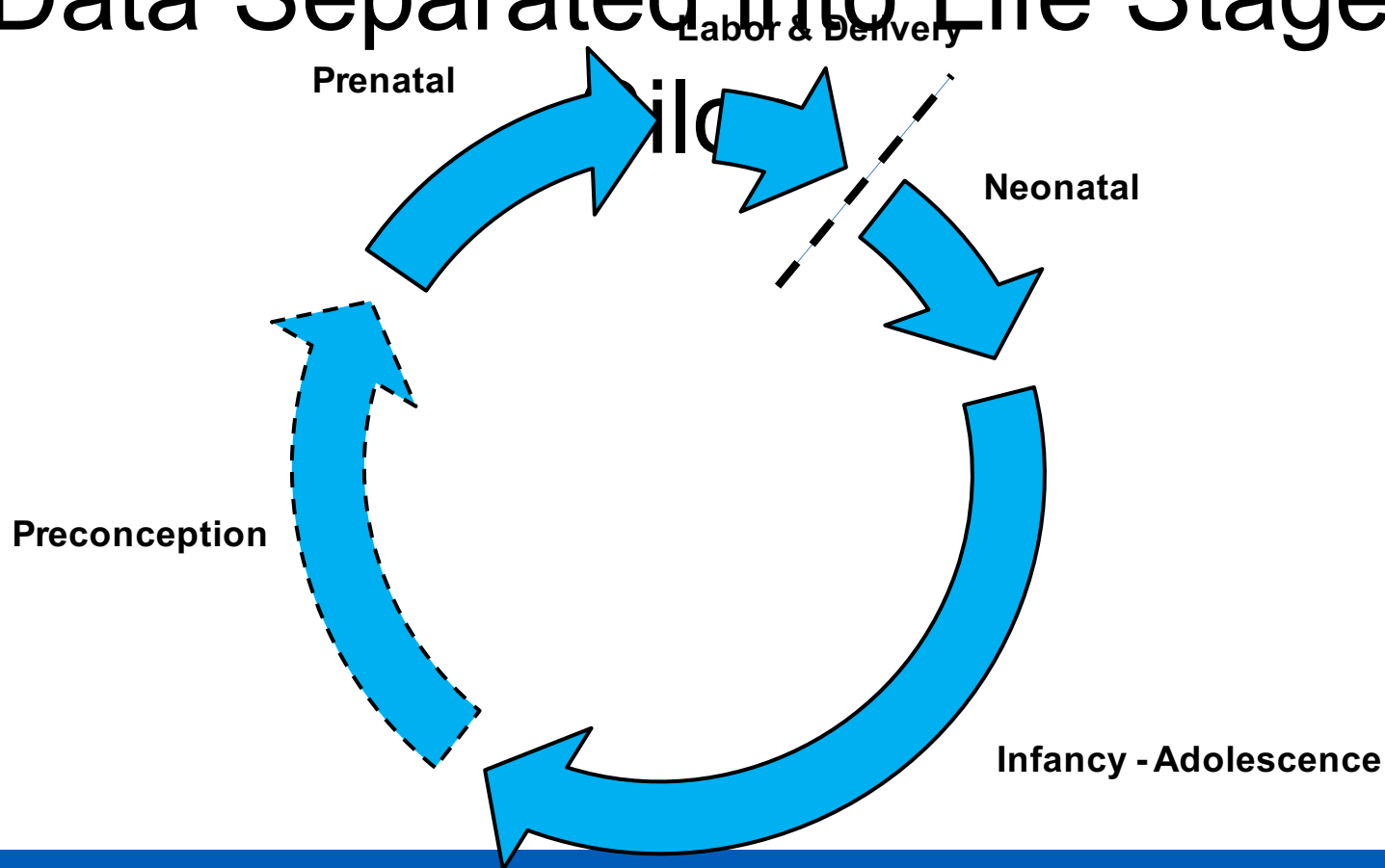
# Why Focus on Infant Mortality Rate

- A highly sensitive proxy measure of population health
- Early warning signal

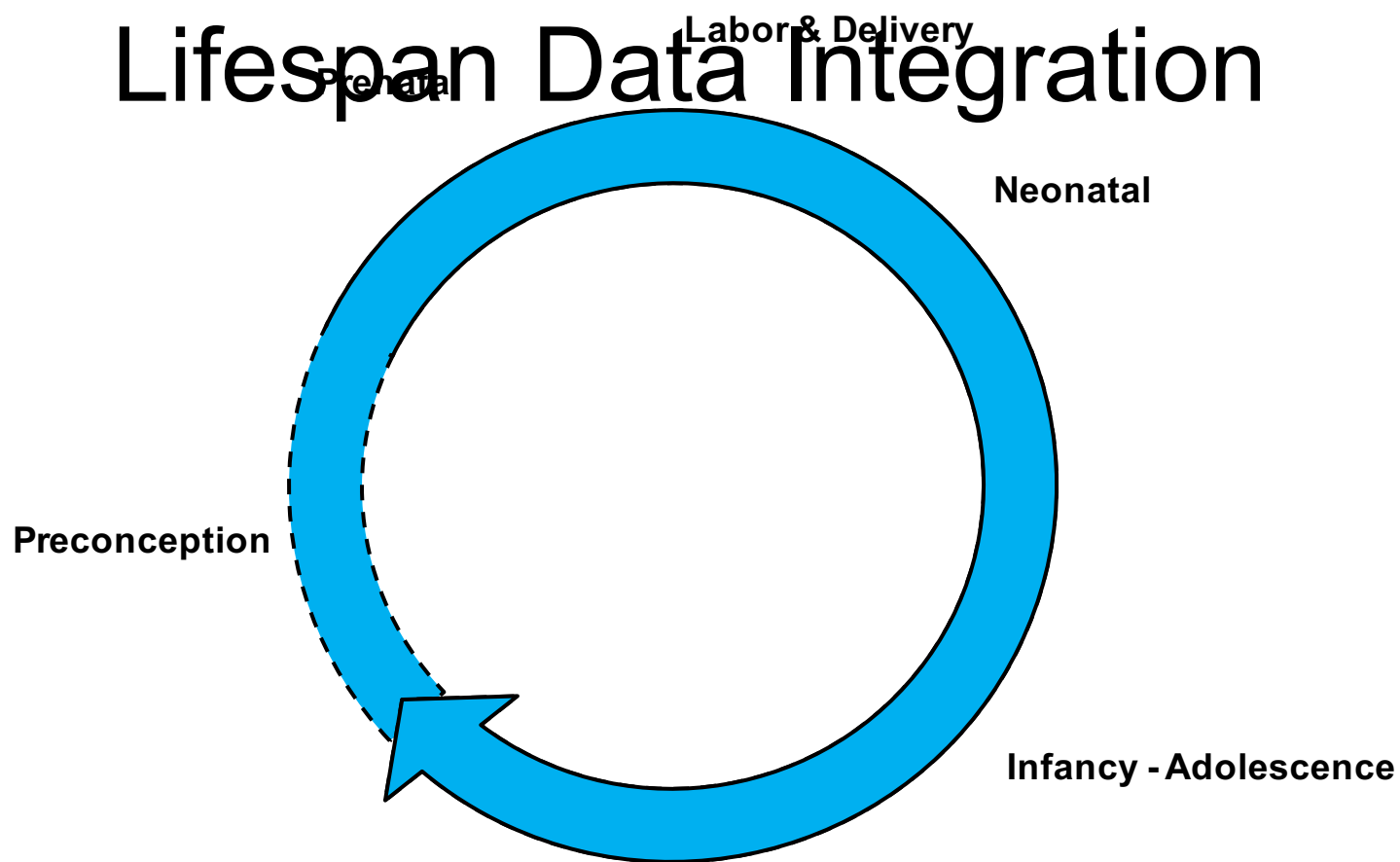


- Preterm birth  $\approx$  60%
- Congenital Anomalies  $\approx$  15%
- Sudden Unexpected Infant Death (SUID/SIDS) or Sleep Related Deaths  $\approx$  14%

# Data Separated into Life Stage

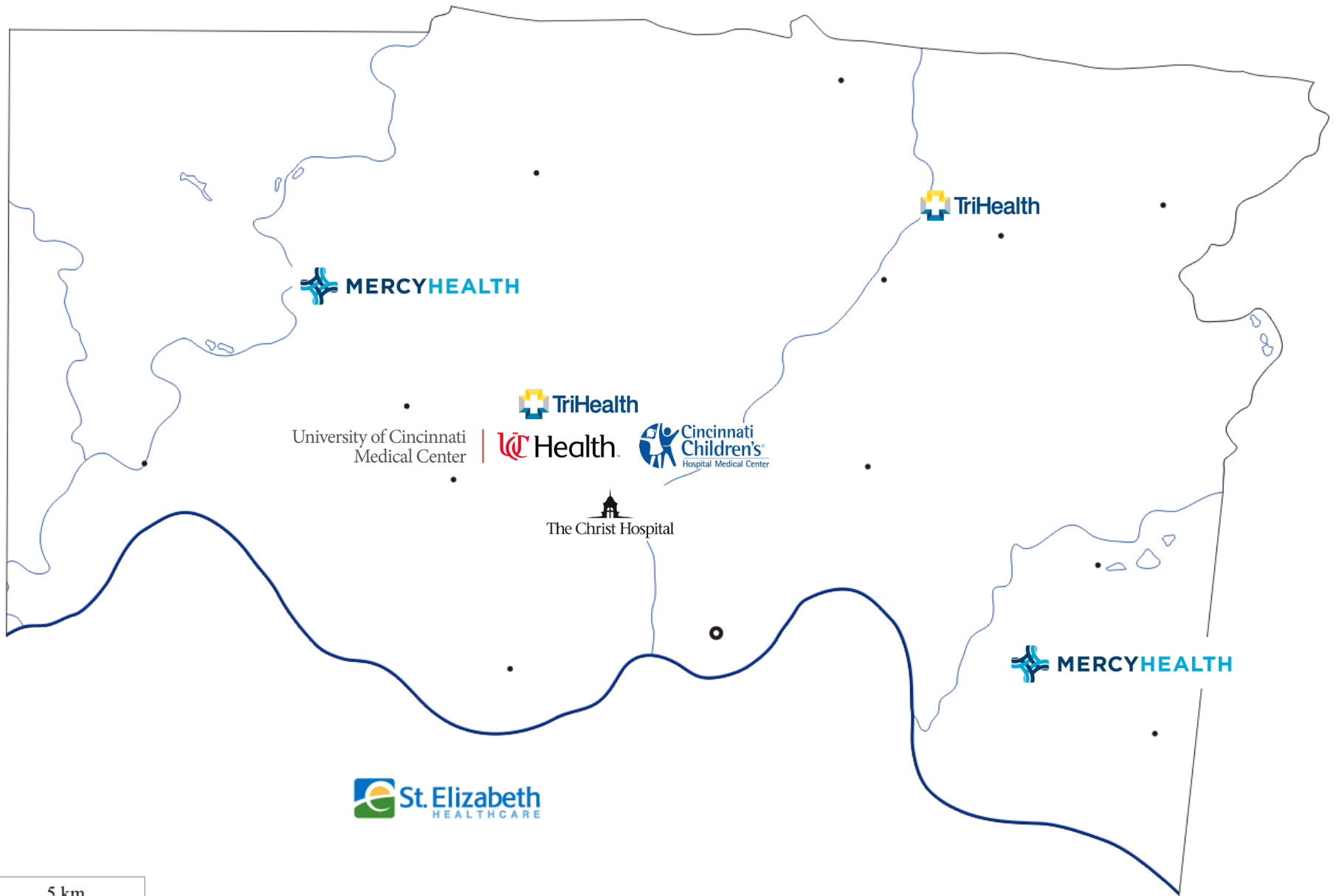


# Lifespan Data Integration



- Data reside in silos without interoperability
- Questions of data ownership
- Regulatory barriers
- Appropriate privacy concerns
- Lack of sustainability of funding
- Two classes of individuals – mother and baby

- Manages nurseries throughout Greater Cincinnati
  - Approximately 90% of all newborns
  - Nearly all Medicaid insured or high-risk babies
  - 100% of Neonatal Intensive Care @5 NICUs
- Program Structure
  - Centralized billing
  - Standardization of care



University of Cincinnati  
Medical Center

UC Health

Cincinnati  
Children's  
Hospital Medical Center

The Christ Hospital

St. Elizabeth  
HEALTHCARE

5 km

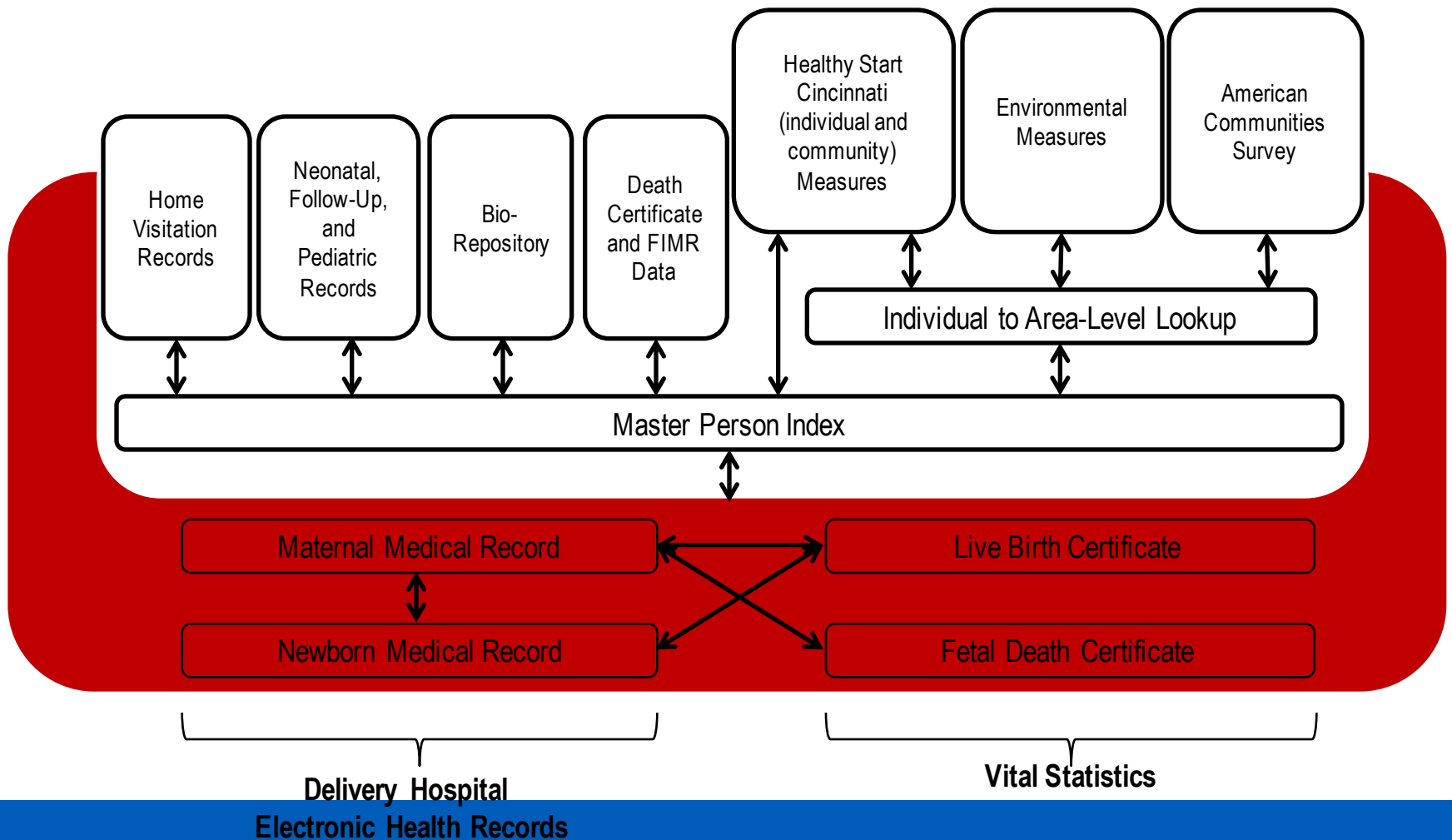
3 mi

- CCHMC neonatal billing provides a near population-based definition of regional births
- Usable as a hub for additional record linkage
  - Regional EHRs
  - Home visitation records
  - Vital statistics
  - Regional demographic and environmental measures
- Pilot Support from the CCTST and CCHMC Academic and Research Committee



- Support seamless integration of maternal, neonatal, and pediatric records to establish a population-based, clinically focused, regional research data repository, or data hub.

# Maternal and Infant Data Hub



- University of Cincinnati Medical Center EHR
  - Maternal Prenatal and Labor and Delivery and Infant
    - Medications, Procedures, Diagnoses
- CCHMC EHR
  - NICU and Pediatric
    - Medications, Procedures, Diagnoses, Growth and Developmental Measures
- Every Child Succeeds
  - Home visiting
    - Maternal mental health and substance use

- Aggregates and links data containing identifiers
  - Ongoing IRB approval
  - Honest broker model
- De-identified data sets may be requested without additional IRB approval
- Identified data sets may be obtained with study specific IRB approval

- Envisioned as a core resource for
  - Maternal and child health providers, policy-makers epidemiologists, community agencies, researchers
- Supporting
  - Cohort identification
  - Hypothesis generation
  - Hypothesis-driven research
  - Monitoring of time-related changes in neonatal and maternity care and outcomes
  - Benchmarking of neonatal & developmental outcomes

# MIDH

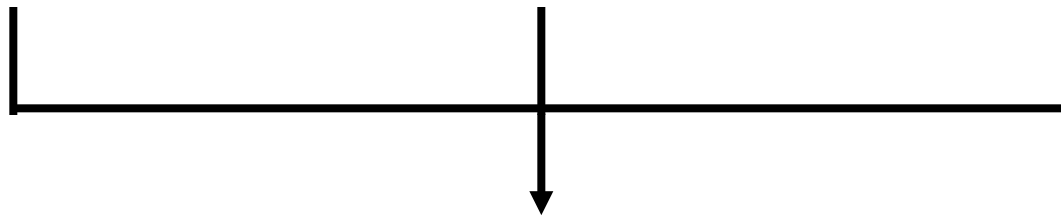
Maternal infant data hub  
Common data model presentation  
5/19/2016



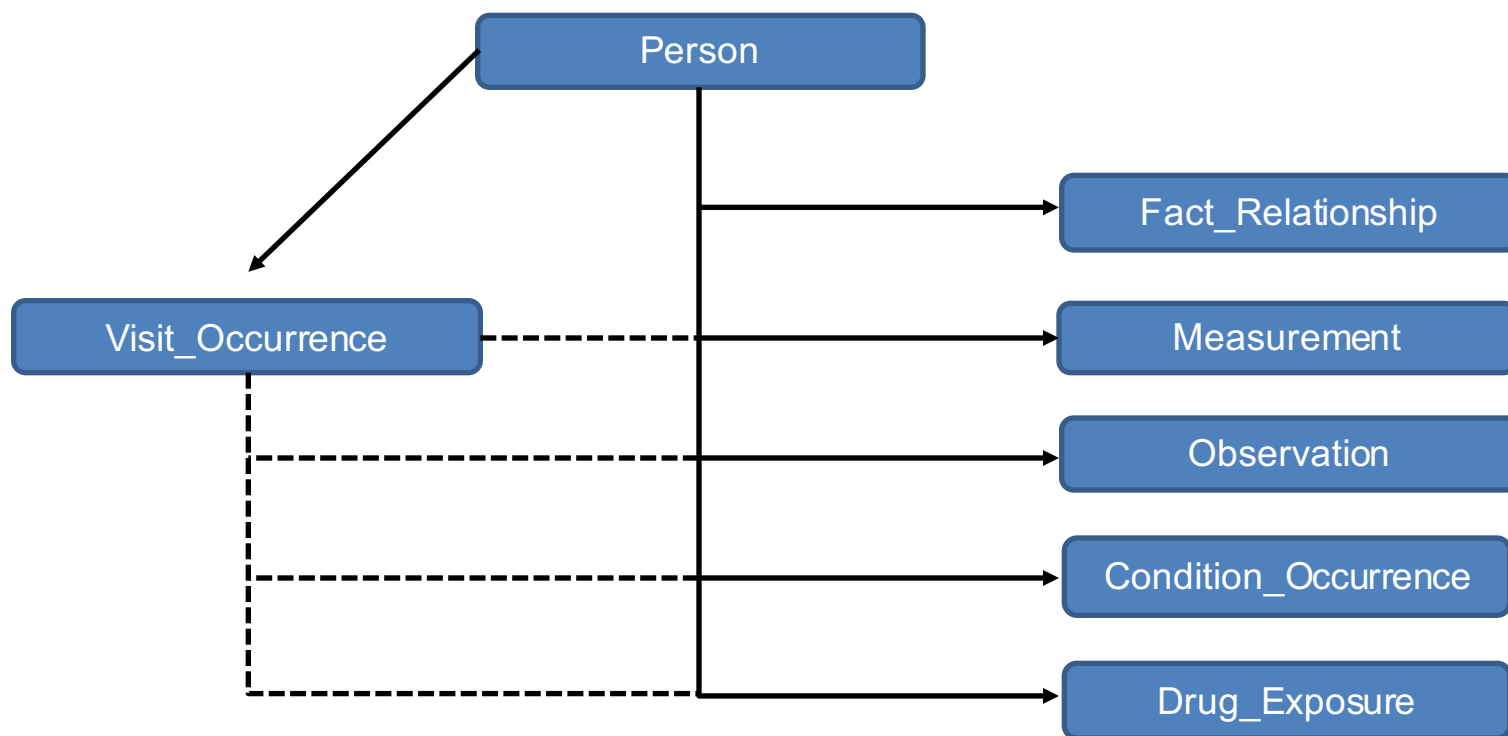
ECS	UC	CCHMC
<p>Baby:</p> <ul style="list-style-type: none"><li>Beth I. 6/10/2015 (no ID)</li></ul> <p>Mother:</p> <ul style="list-style-type: none"><li>Michelle G. (no DOB) (screening ID 01234567)</li></ul>	<p>Baby:</p> <ul style="list-style-type: none"><li>Beth I. 6/10/2015 (MRN 11223344)</li></ul> <p>Mother:</p> <ul style="list-style-type: none"><li>Michelle G. 9/20/1990 (MRN 98765432)</li></ul>	<p>Baby:</p> <ul style="list-style-type: none"><li>Beth I. 6/10/2015 (MRN 31415926)</li><li>Beth I. 6/10/2015 (MRN 0112358)</li></ul> <p>Mother:</p>



ECS	UC	CCHMC
<ul style="list-style-type: none"><li>• Primary mother's data</li><li>• Baby's name, gender, and DOB are available</li><li>• Home Visits</li><li>• Surveys/Questionnaires</li></ul>	<ul style="list-style-type: none"><li>• Data about baby and mother</li><li>• Medications</li><li>• Labs</li><li>• Diagnoses</li><li>• Demographics</li></ul>	<ul style="list-style-type: none"><li>• Only baby's data</li><li>• All clinical data available in Epic</li></ul>



Common Data Model



- Baby -> mother
- Mother -> baby
- Grandmother -> mom -> baby
- siblings

MIDH ID	ID NUM	PERSON TYPE	FIRST NAME	LAST NAME	BIRTH DATE	GENDER
29739	1234567	ECS - mom	Michelle	G		F
29739	98765432	UC - mom	Michelle	G	9/20/1990	F
40097	31415926	CCHMC - baby	Beth	I	6/10/2015	F
40097	112358	CCHMC - baby	Beth	I	6/10/2015	F
40097		ECS - baby	Beth	I	6/10/2015	F
40097	11223344	UC - baby	Beth	I	6/10/2015	F

Person\_ID: 29739

- 23 Home Visits (5/11/2015 – 11/12/2015)
- No recorded diagnoses
- 260 distinct lab results
- 1 recorded ECS family assessment

Person\_ID: 40097

- 1 recorded diagnosis (774.6 - Unspecified fetal and neonatal jaundice)
- 3 distinct lab results

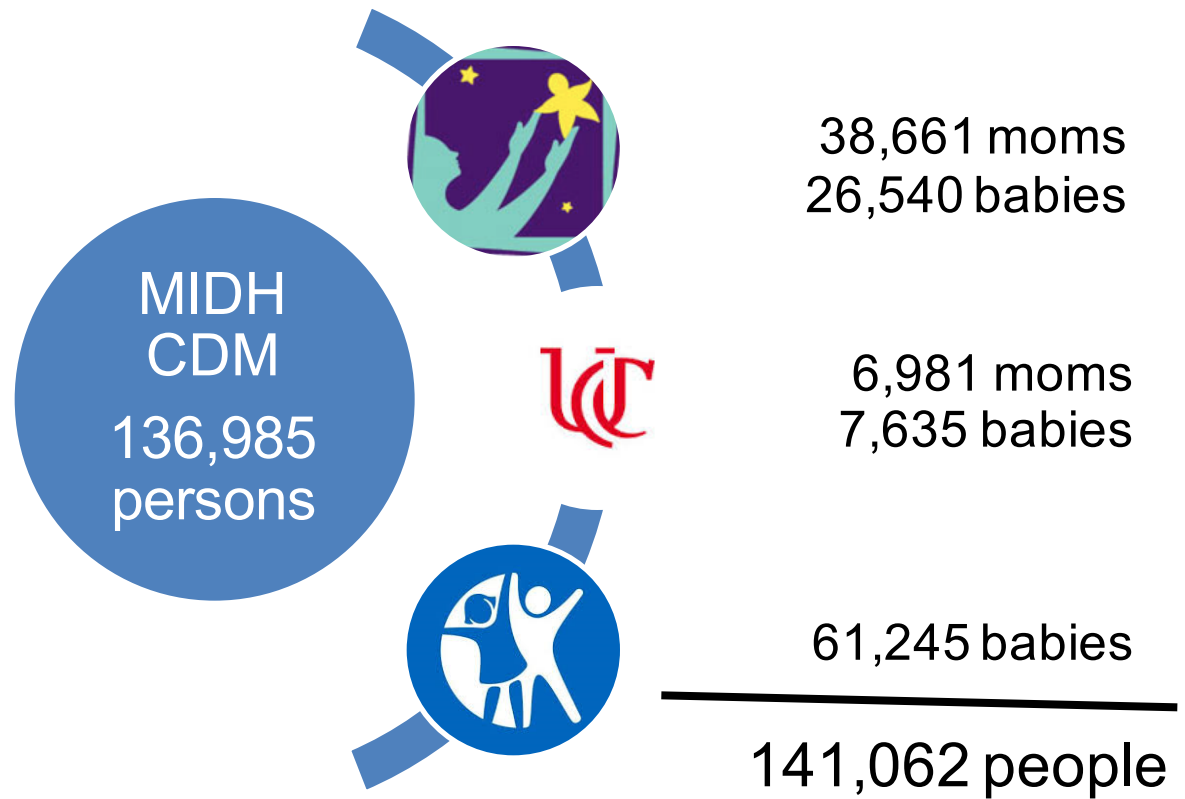
## Matching and Consolidation Techniques

- Compare first name, last name, birth date, and gender
- Remove non-alpha characters (spaces, hyphens, apostrophes, etc.) from first and last names before comparing
- Birth Dates must match
- Genders must match or be blank (Gender is often not recorded in ECS)



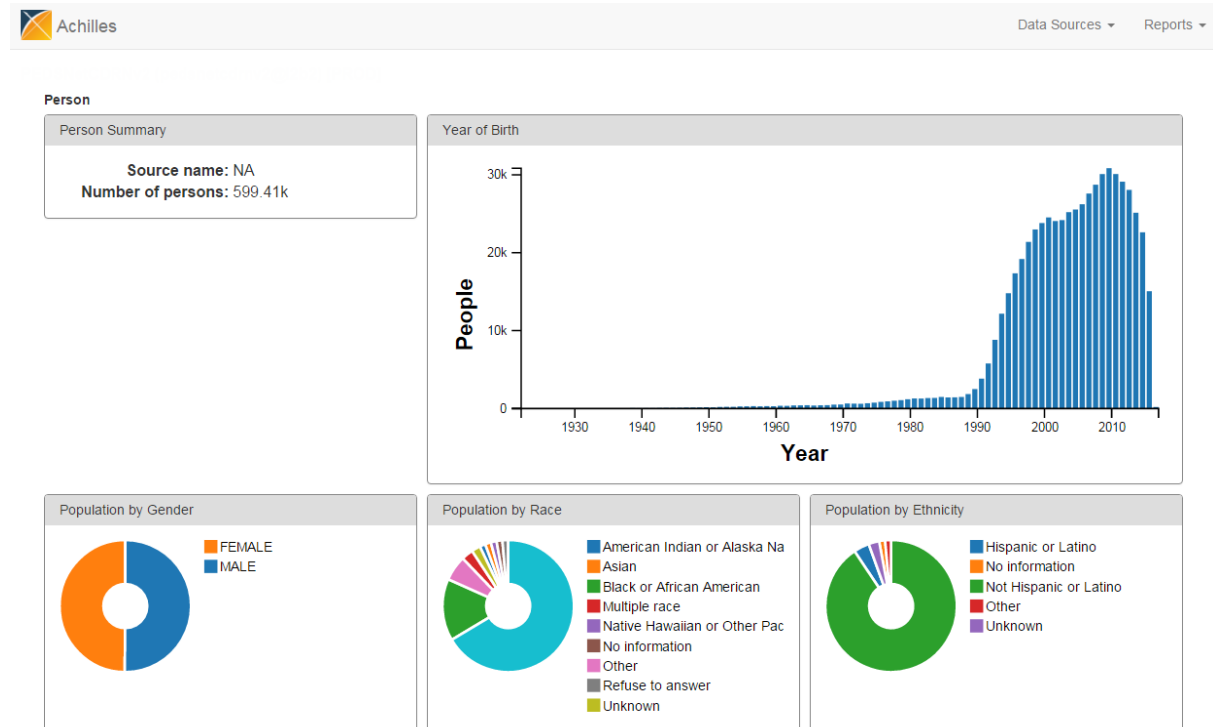
## Edit Distance

- A technique used for “fuzzy matching” when comparing first and last names
- Allows us to identify matches even when first and/or last names are not a perfect match in various source systems
- Also known as "Levenshtein Distance "(named after the Russian scientist Vladimir Levenshtein, who devised the algorithm in 1965), is a measure of Similarity between two strings, s1 and s2. The distance is the number of insertions, deletions or substitutions required to transform s1 to s2.
- Ex: Edit Distance between "shackeford" and "shacke/ford" = 2



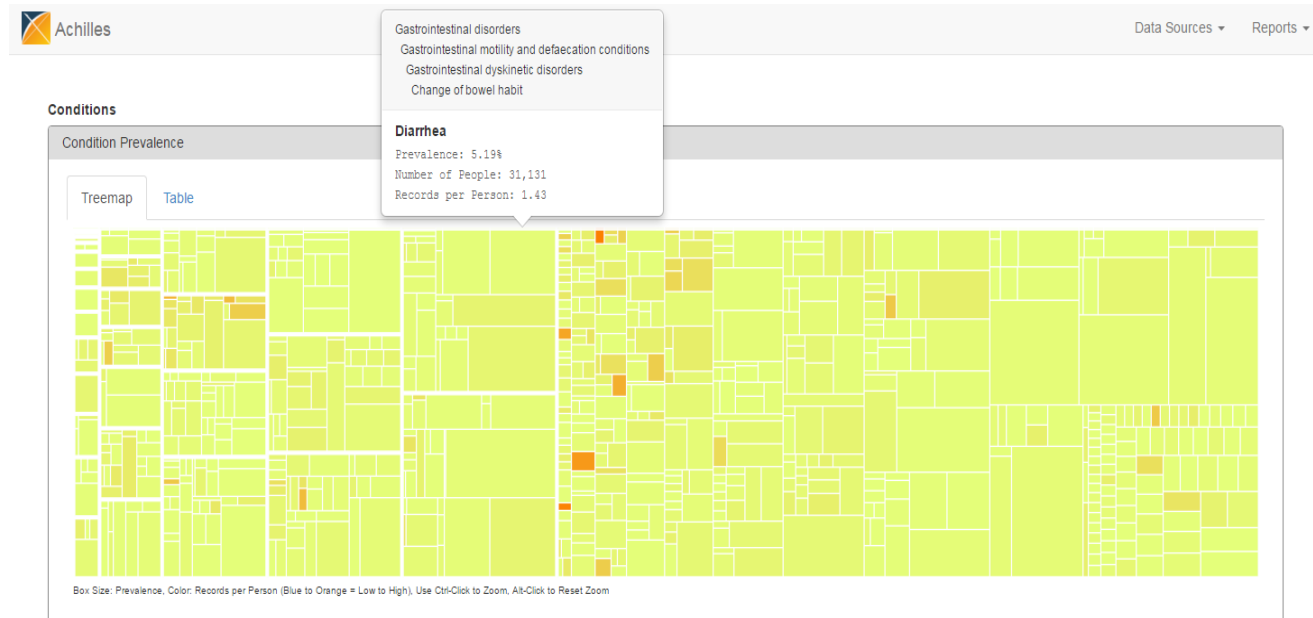
- CONCEPTS table includes standard vocabularies (ICD-9, CPT, SNOMED, LOINC, etc)
- CONCEPTS table can also hold custom vocabularies (ex: ECS assessment types)

- Designed to work with this CDM
- Presents high level counts and groupings



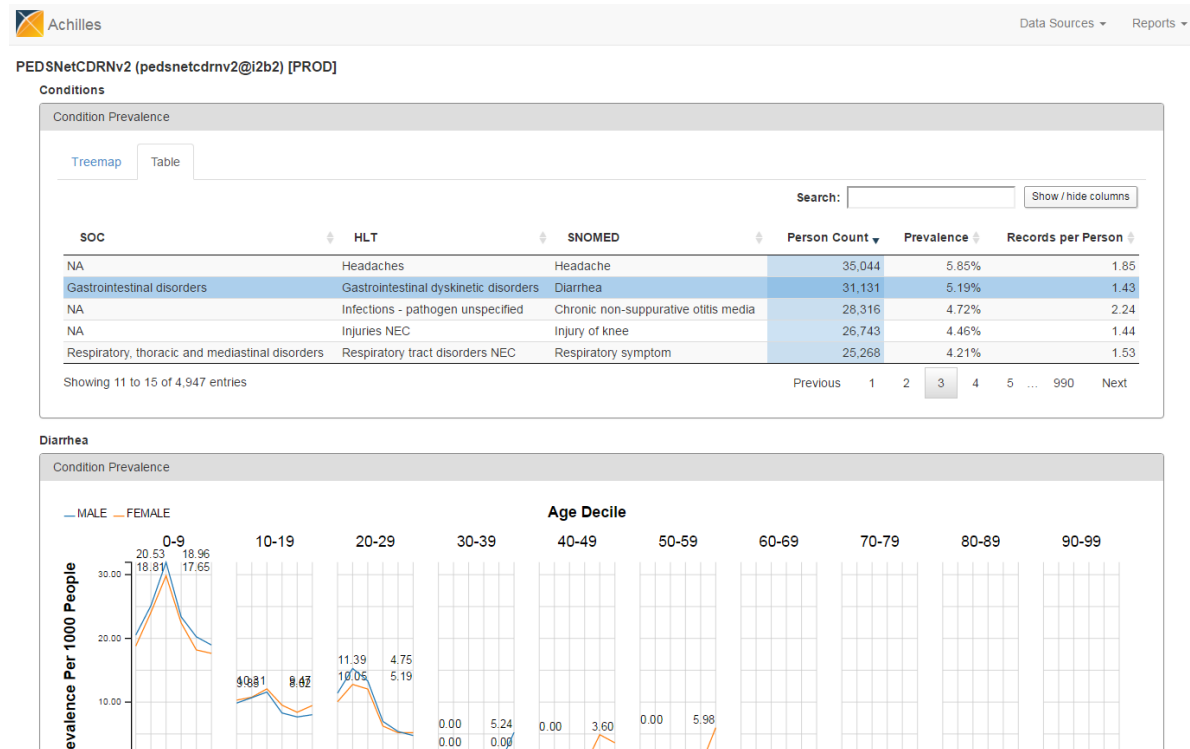
\* not MIDH data

- Density charts for prevalence



\* not MIDH data

- Person and Record counts per condition, drug, lab



\* not MIDH data