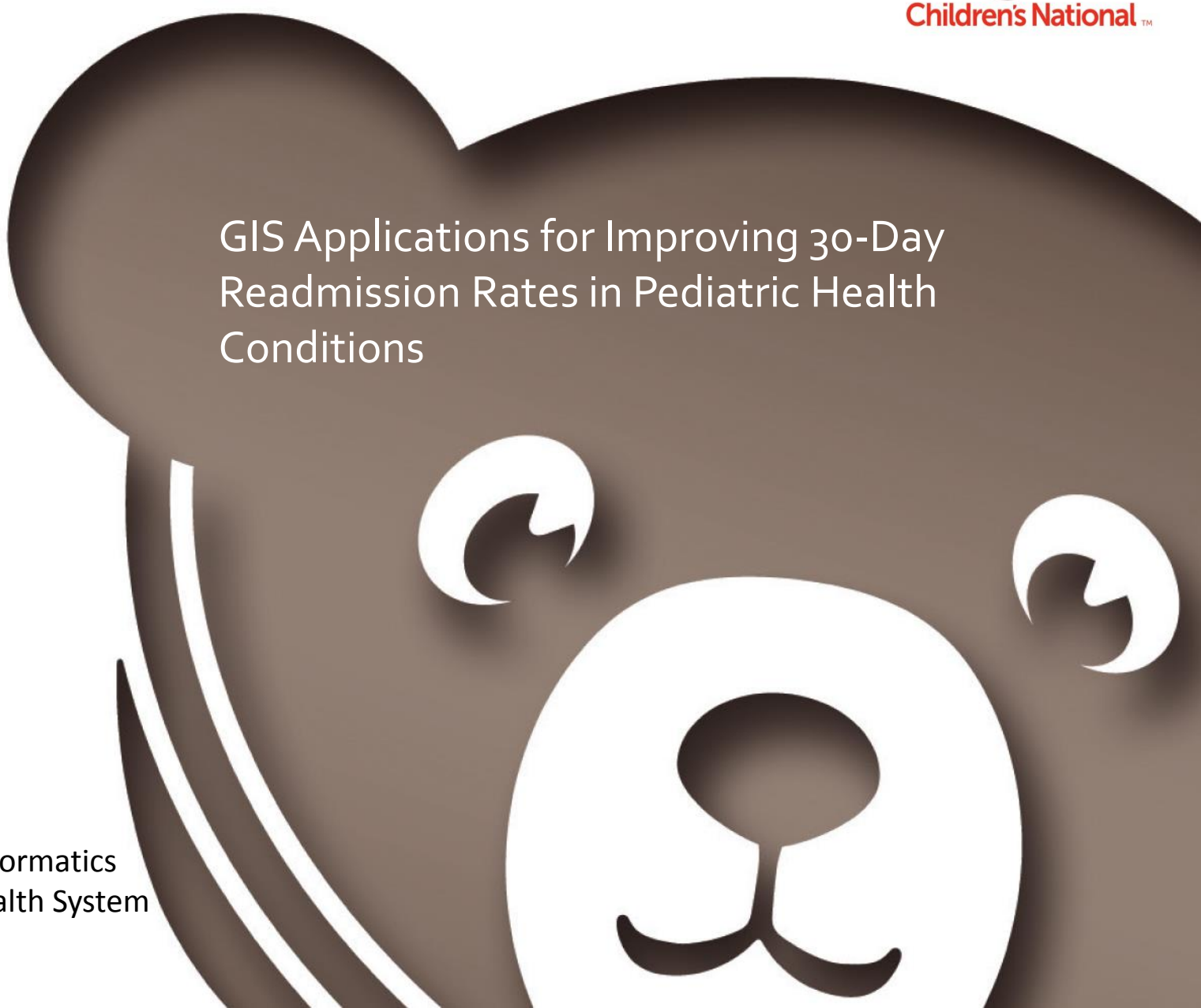
GIS Applications for Improving 30-Day Readmission Rates in Pediatric Health Conditions



Jefferson E. McMillan
Center for Pediatric Informatics
Children's National Health System
ESRI GIS for Health
@HealthMapJeff

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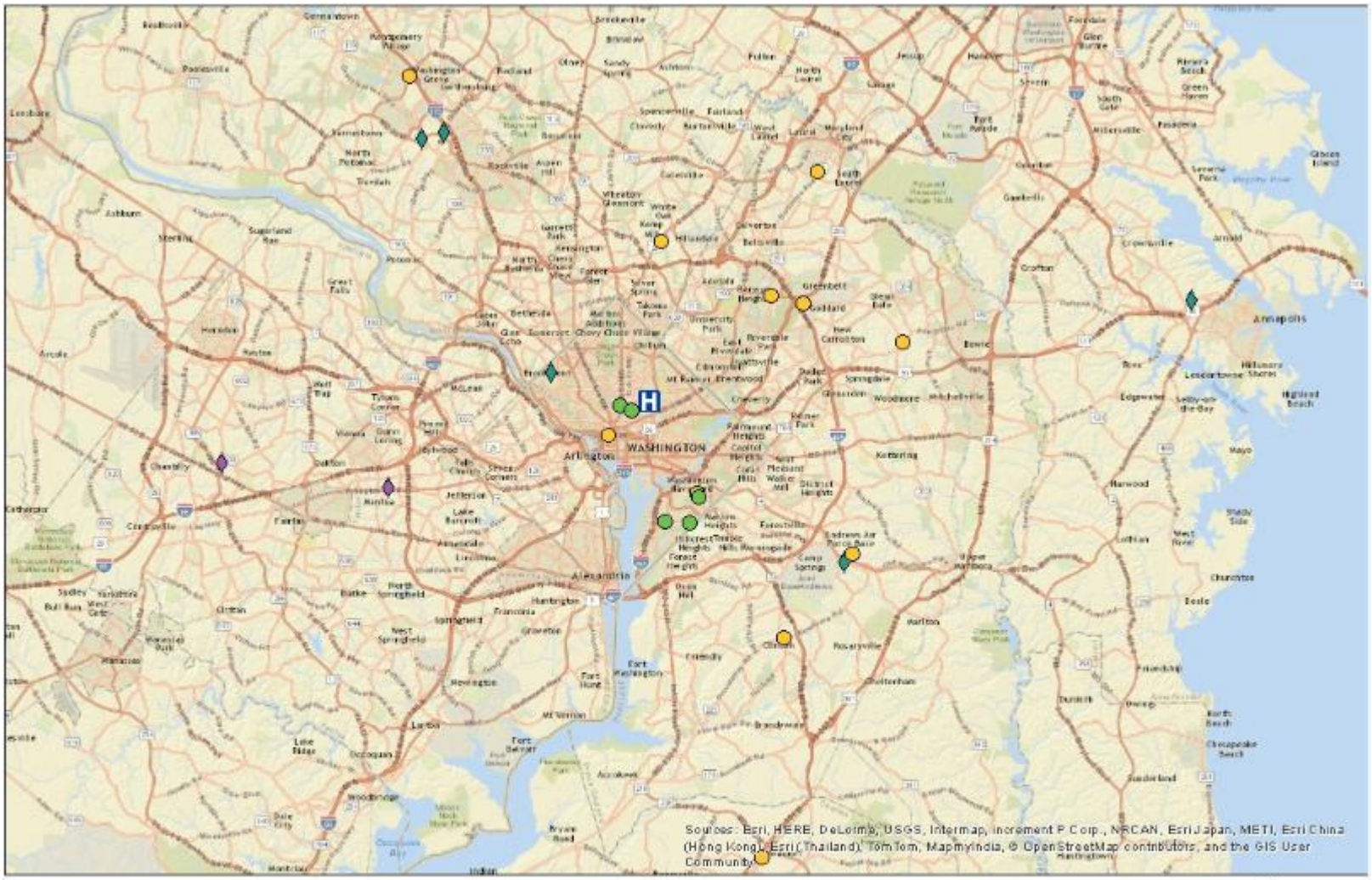
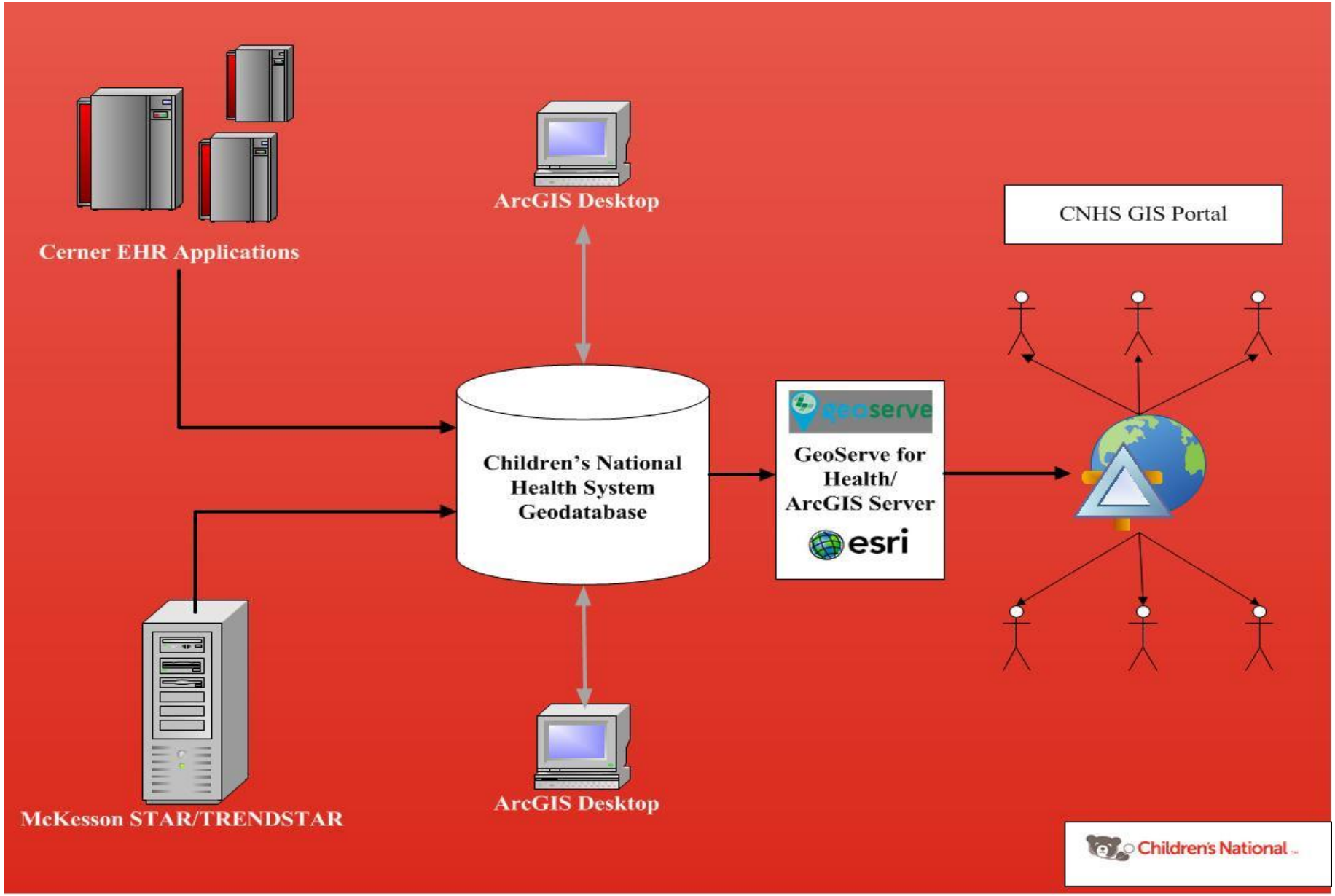
Children's National Health System, Washington, DC



CNHS Enterprise GIS



Methodological Hurdles

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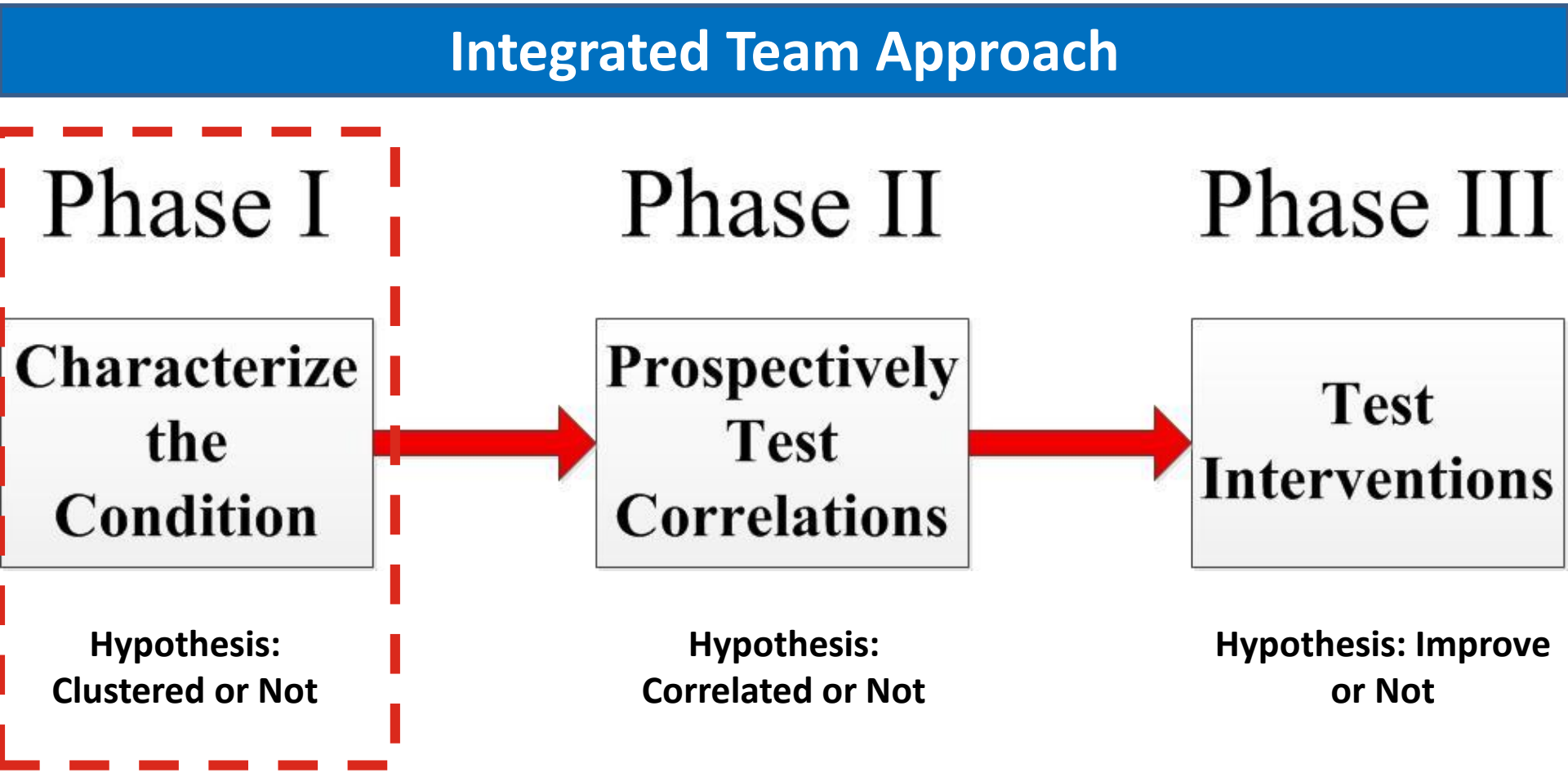
Geospatial Research Process



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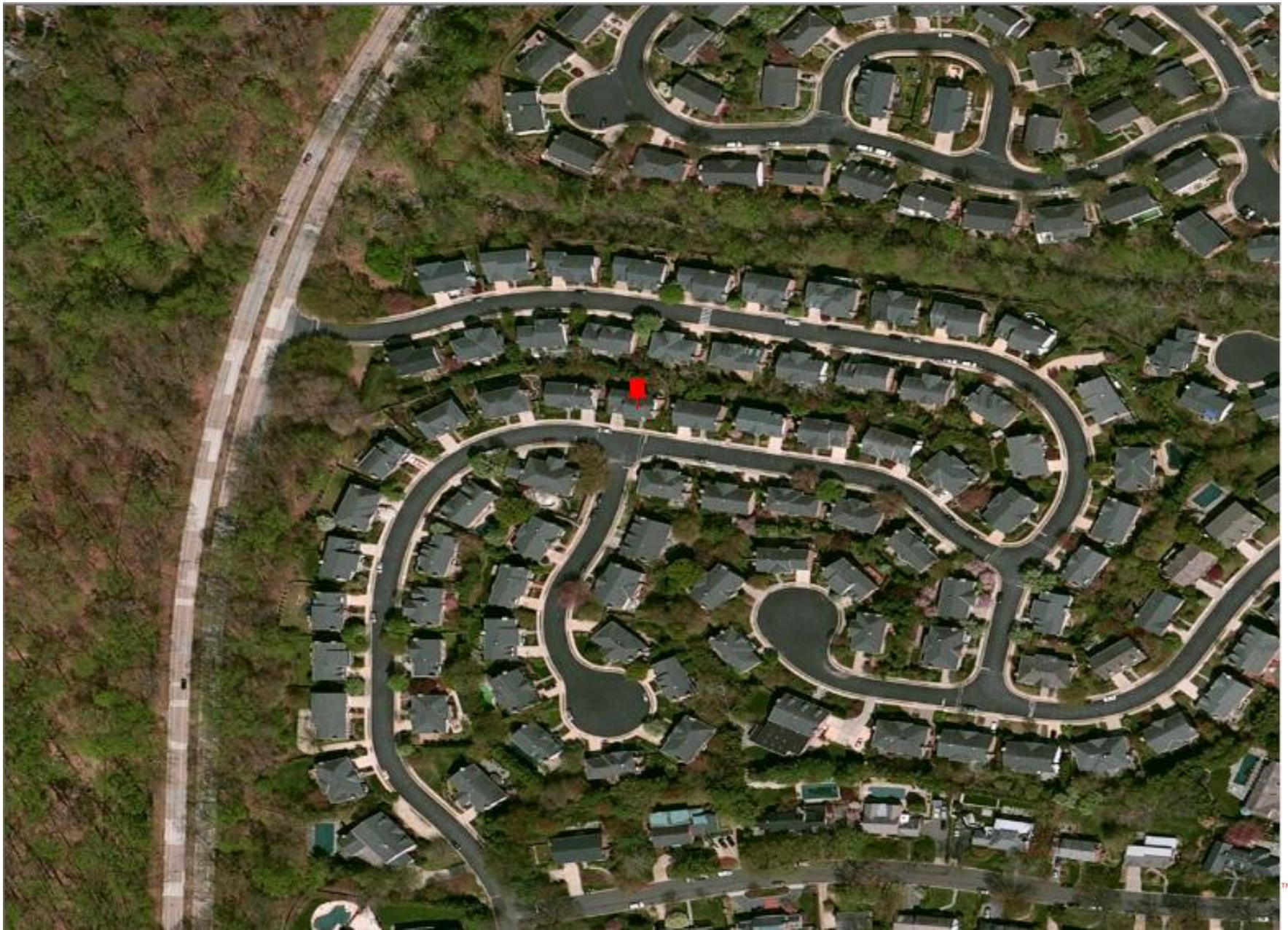
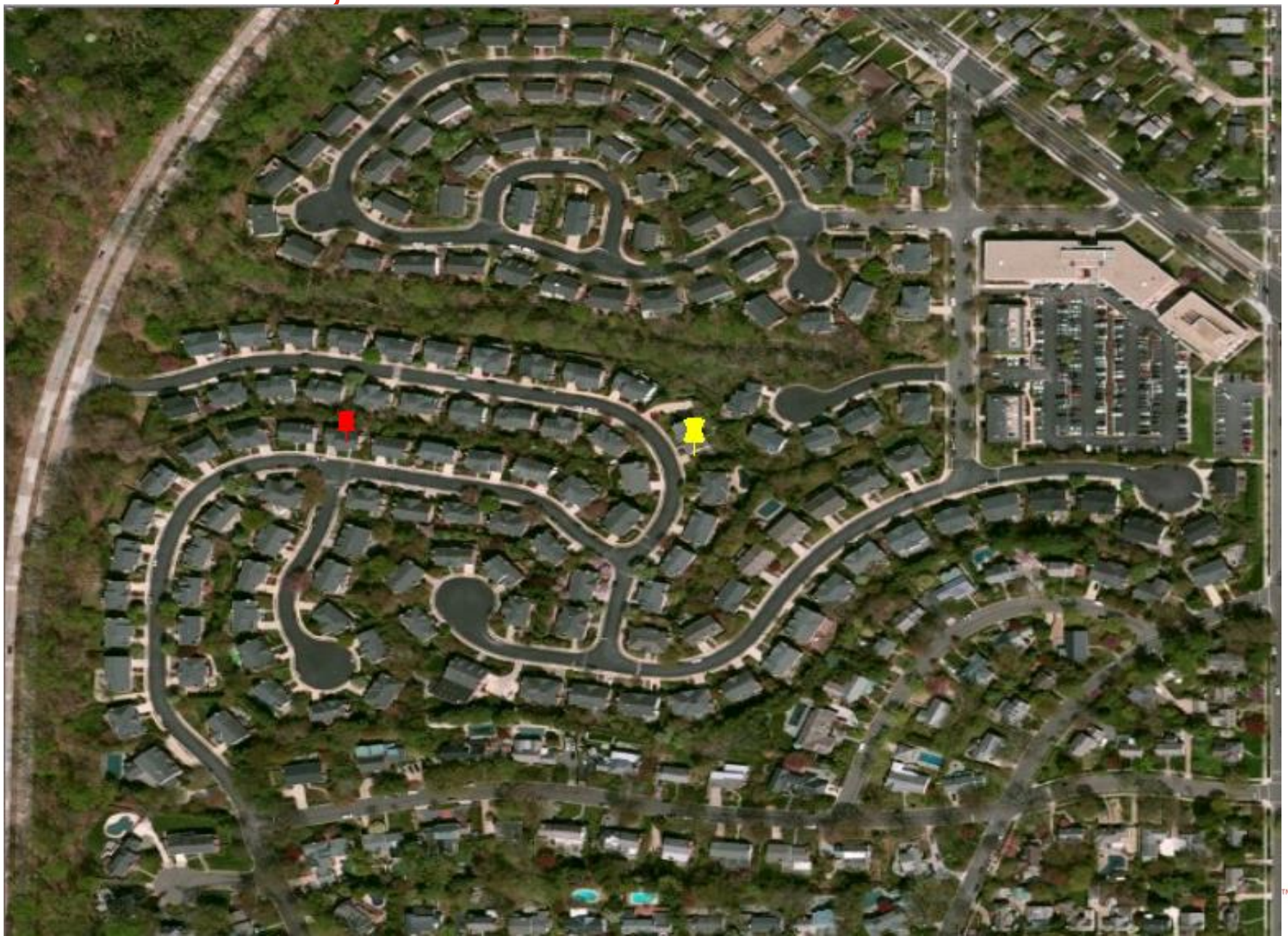
Rooftop Geocoding

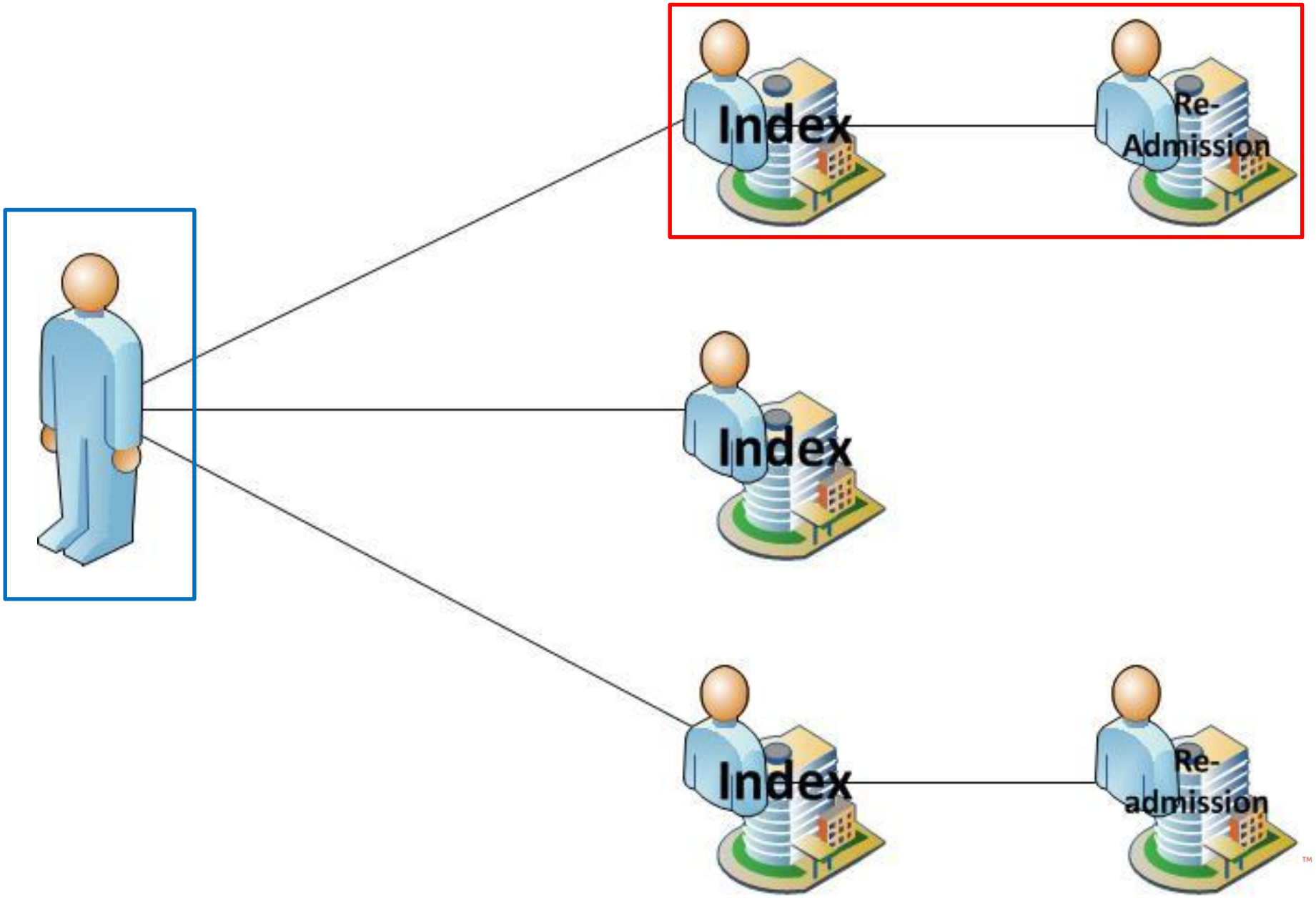


CNHS Rounding Method



CNHS Rounding Method

Person vs. Visit Level Readmissions



Specific Condition Exploration

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Sickle Cell Disease Crisis

- Sickle Cell Disease
  - Hemoglobinopothy
    - Chartered by intense pain crises
  - Distinct clinical indicators (pain score, narcotics use, etc.)
  - Suggested environmental geographic indicators
- Evaluation Sample
  - Inpatient admissions to Children's National with SCD Pain Crisis between January 1, 2010 and December 31, 2012
    - SCD Pain crisis determined using both ICD-9 and SNOMED
  - 373 total validated patients over three years

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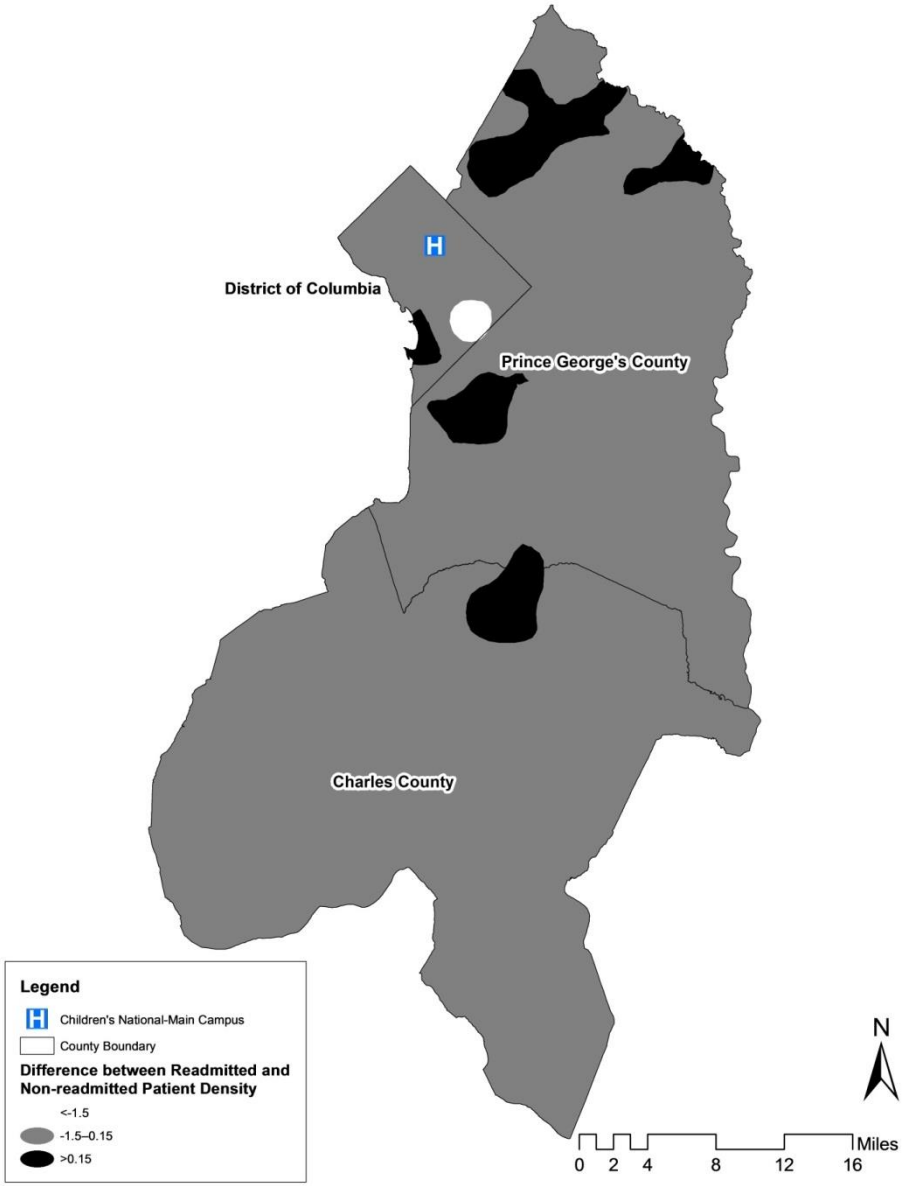
Variability between Readmitted and Non-Readmitted



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SCD Crisis Readmissions Have a Geographic Aspect

30-Day Readmission Model (Concordance Rate: 76.6)

Model Variables	Coefficient Estimates	Adjusted Odds Ratio (95% CI)
Length of Stay (Per day)	-0.1526	0.858 (0.772–0.954)
Age (Per year)	0.0577	1.059 (1.013–1.108)
Hospital Utilizations in Previous 12 Months (Per utilization)	0.2470	1.280 (1.154–1.421)
Admission Pain Score >=7	0.7310	2.077 (1.234–3.497)
Discharge Pain Score >=4	0.4581	1.581 (0.907–2.756)
Residence within 5 miles from CNMC Main Campus	-0.7759	0.46 (0.256–0.827)

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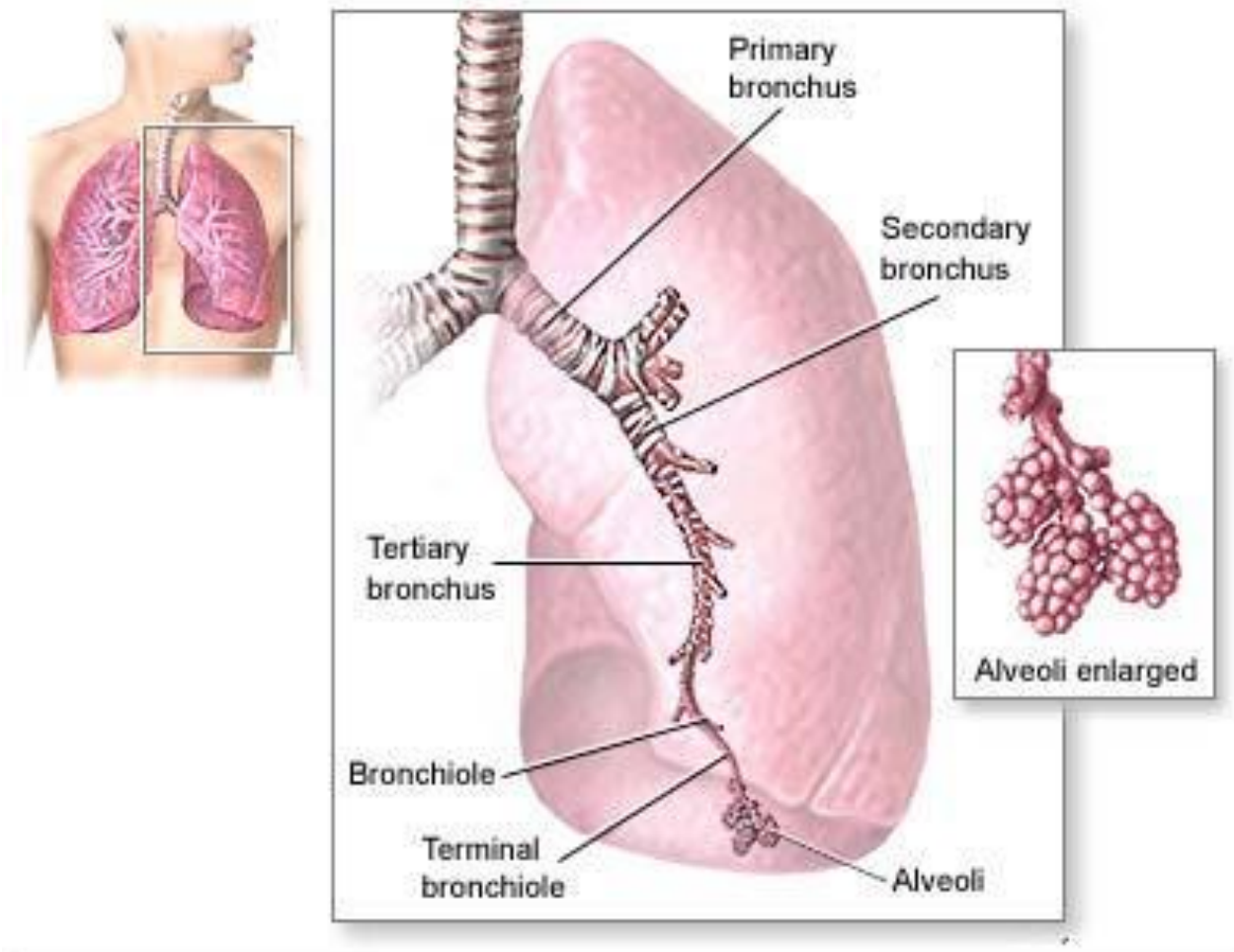
Acute Bronchiolitis



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Acute Bronchiolitis Readmissions

- Evaluation Sample
  - Inpatient admissions to Children's National with SCD Pain Crisis between January 1, 2009 and December 31, 2013
    - Determined using both ICD-9 and SNOMED
  - 5,016 total validated patients
    - 720 Same Diagnosis Readmissions (365 days)

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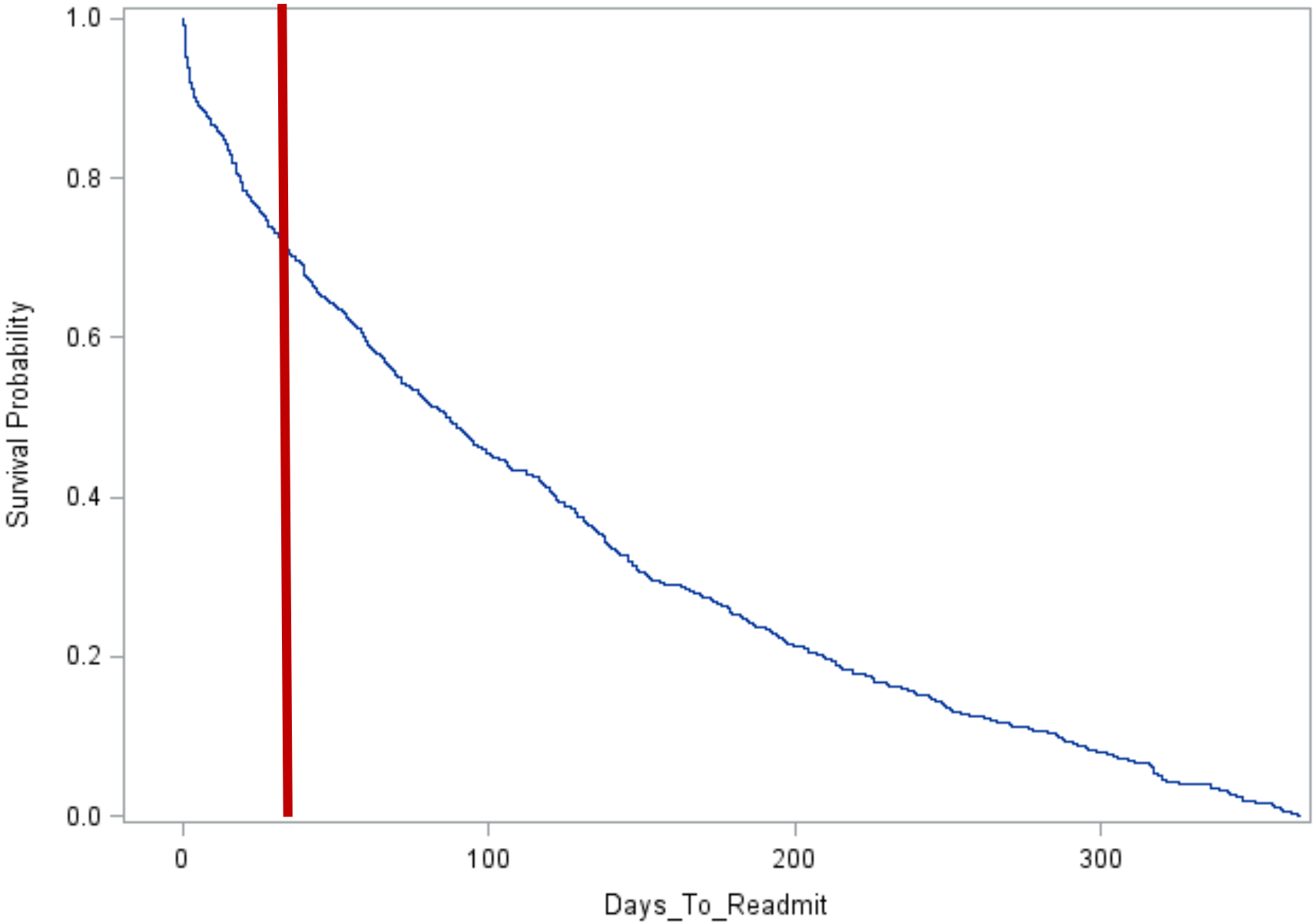
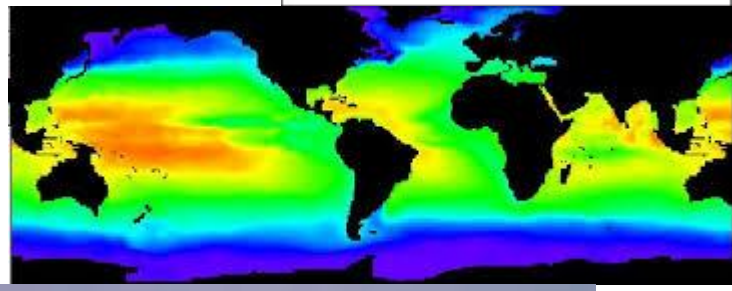
Acute Bronchiolitis Readmissions



Possible Readmission Indicators

- Access to appropriate care
    - Health System
    - Transportation Infrastructure
- Climatologic Indicators
    - Temperature fluctuation
    - Cloud cover
- Environmental Quality Indicators
    - Smog
    - Pollutant presence
    - Proximity to pollution creators



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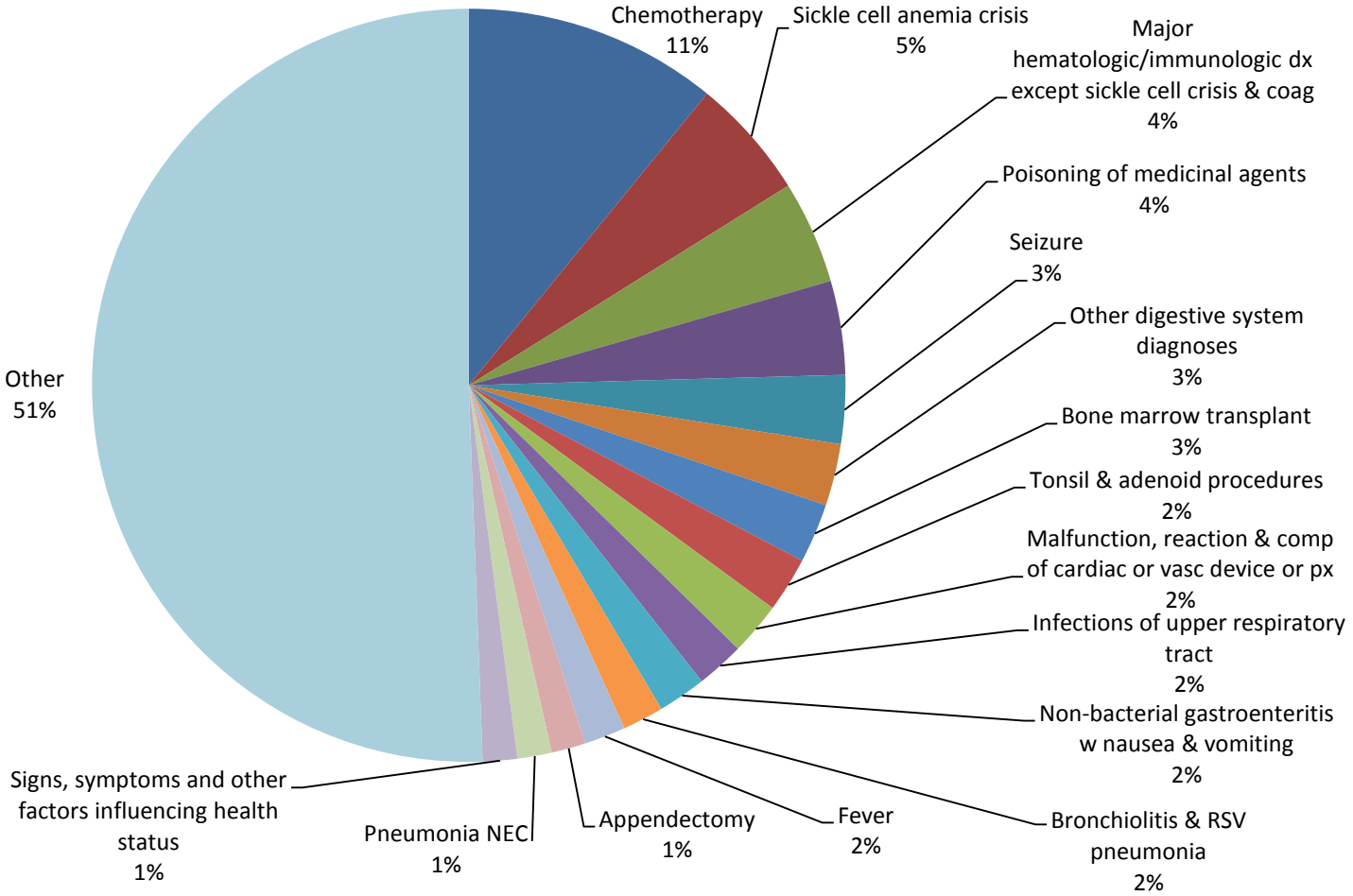
Broad Scope Readmissions



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Impact on Clinical Practice

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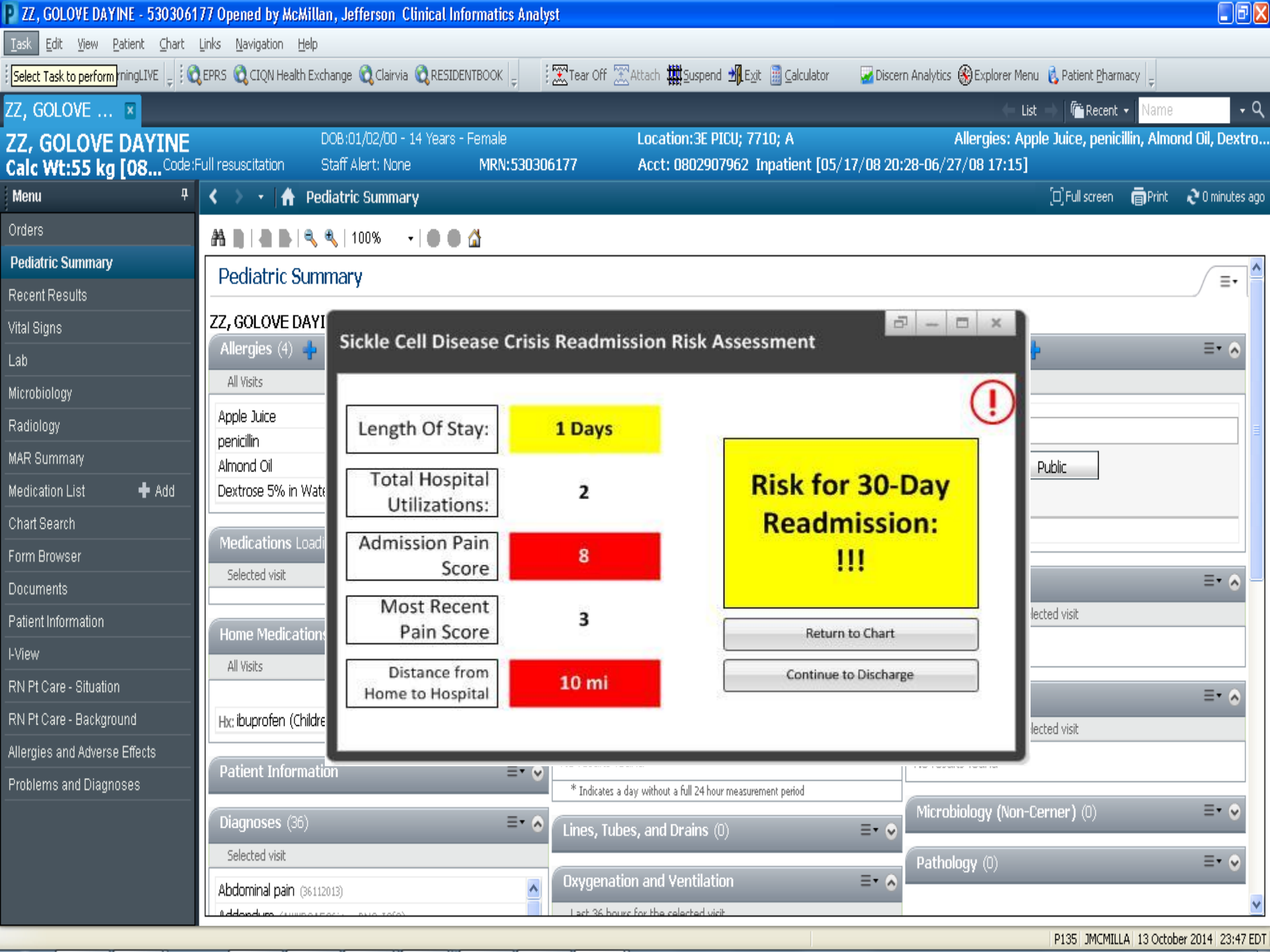
ZZ, GOLOVE DAYINE - 530306177 Opened by McMillan, Jefferson Clinical Informatics Analyst
Task Edit View Patient Chart Links Navigation Help
Select Task to perform
EPRS CIQN Health Exchange Clairvia RESIDENTBOOK
Tear Off Attach Suspend Exit Calculator
Discern Analytics Explorer Menu Patient Pharmacy
ZZ, GOLOVE ...
List Recent Name
ZZ, GOLOVE DAYINE
Calc Wt:55 kg [08...
Code:Full resuscitation
DOB:01/02/00 - 14 Years - Female
Staff Alert: None
MRN:530306177
Location:3E PICU; 7710; A
Acct: 0802907962 Inpatient [05/17/08 20:28-06/27/08 17:15]
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Orders
Pediatric Summary
Recent Results
Vital Signs
Lab
Microbiology
Radiology
MAR Summary
Medication List
Add
Chart Search
Form Browser
Documents
Patient Information
I-View
RN Pt Care - Situation
RN Pt Care - Background
Allergies and Adverse Effects
Problems and Diagnoses
Pediatric Summary
Full screen
Print
0 minutes ago
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Pediatric Summary
ZZ, GOLOVE DAYI
Sickle Cell Disease Crisis Readmission Risk Assessment
Length Of Stay:
1 Days
Total Hospital Utilizations:
2
Admission Pain Score
8
Most Recent Pain Score
3
Distance from Home to Hospital
10 mi
Risk for 30-Day Readmission: !!!
Return to Chart
Continue to Discharge
Allergies (4)
All Visits
Apple Juice
penicillin
Almond Oil
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Selected visit
Home Medications
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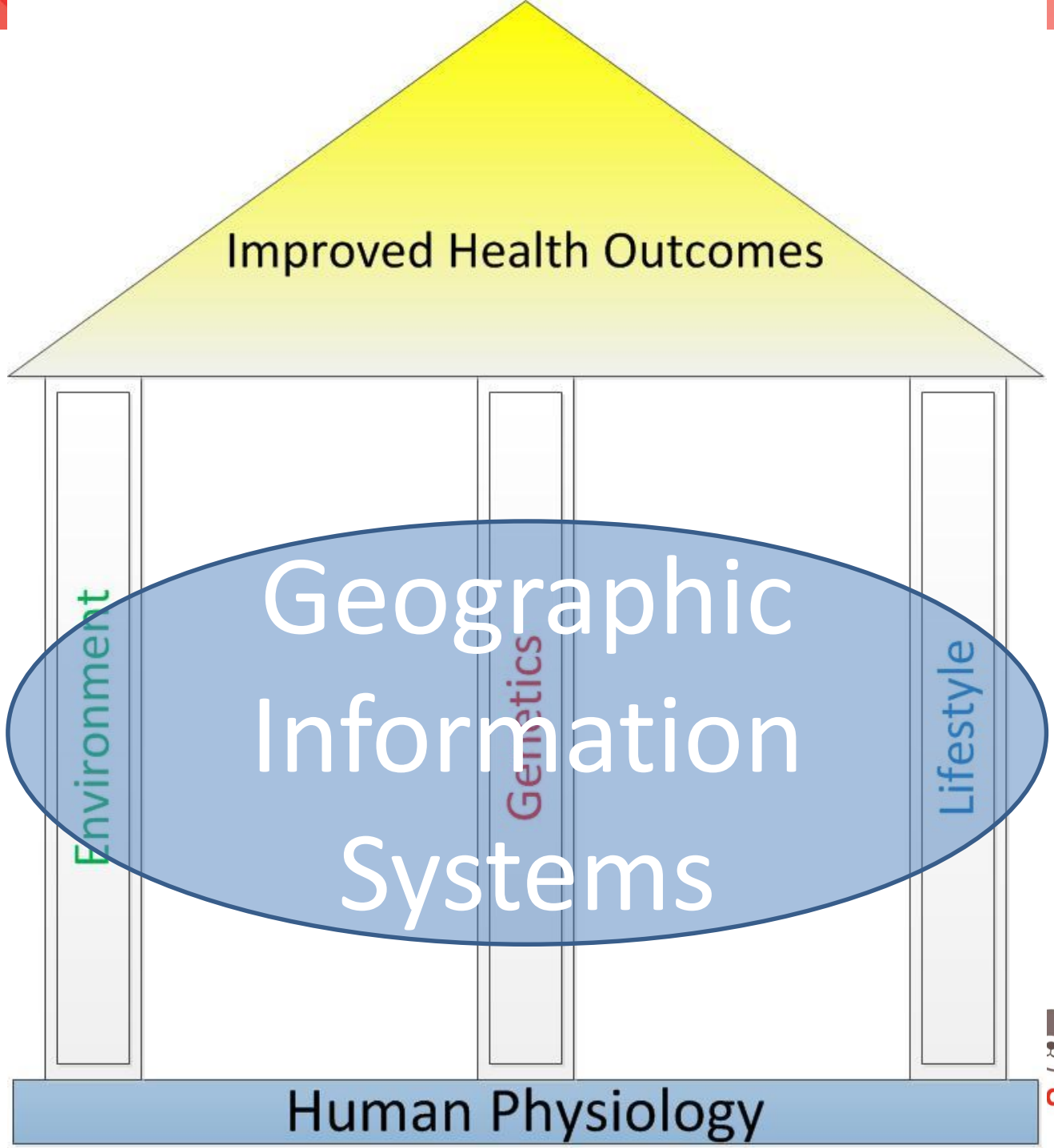
lected visit
Patient Information
* Indicates a day without a full 24 hour measurement period
Diagnoses (36)
Selected visit
Abdominal pain (36112013)
Lines, Tubes, and Drains (0)
Oxygenation and Ventilation
Microbiology (Non-Cerner) (0)
Pathology (0)
P135 JMCMILLA 13 October 2014 23:47 EDT

Future of Readmission Evaluation

- Prospective model testing
- User Interface Design and Testing
- Outcomes Measurement
    - Reduced readmission rate
    - Improved patient satisfaction
- Model refinement and testing



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Questions?

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