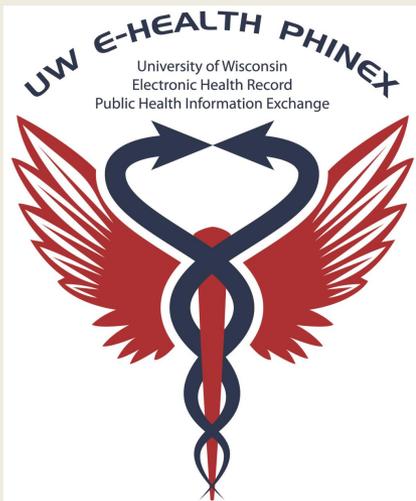


Clinical Big Data and Practice Based Research Networks are the Foundations for a Rapid Learning Health System

Larry Hanrahan PhD MS
Research Director

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DEPARTMENT OF
Family Medicine
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH



Disclosure Statement

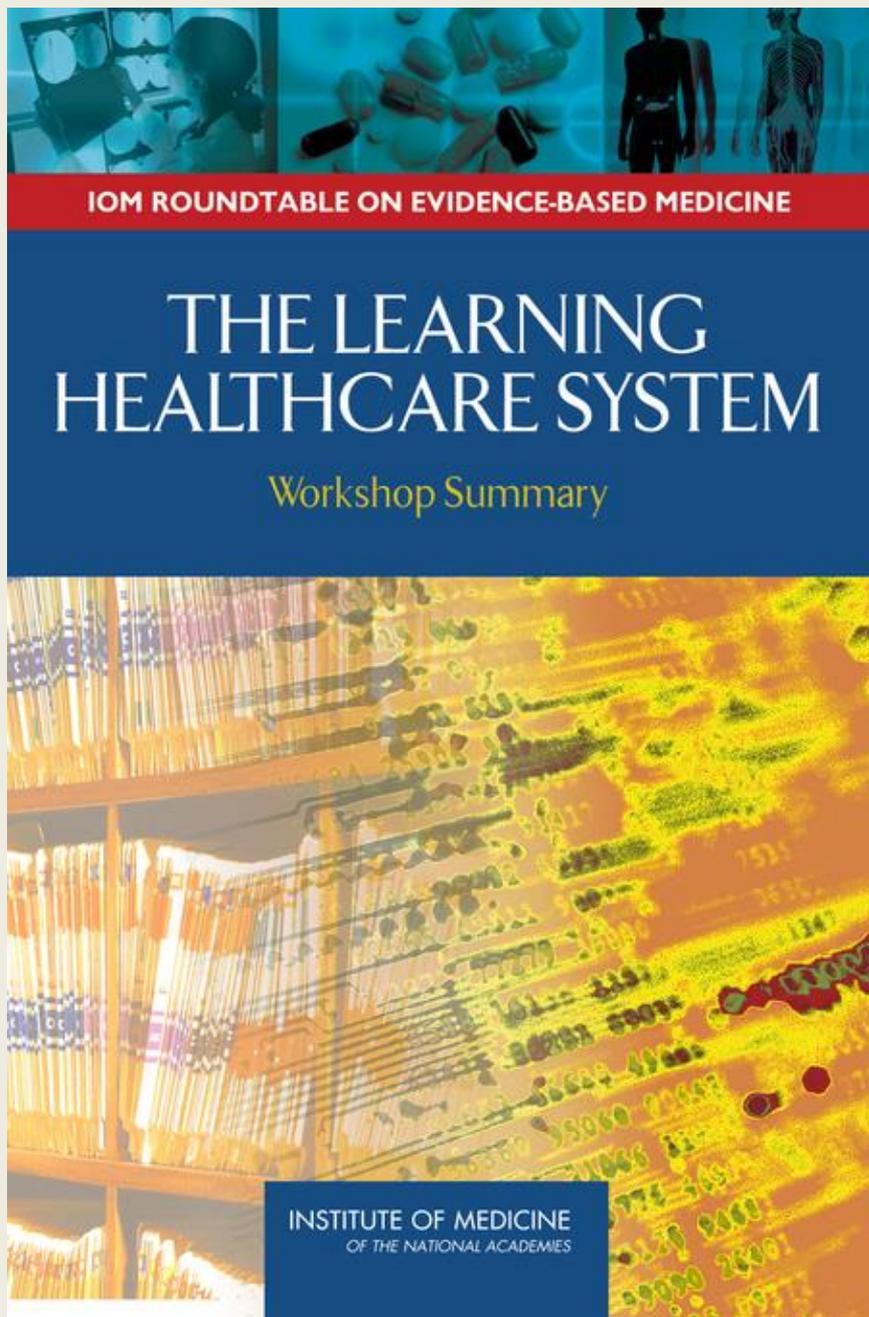
Larry Hanrahan PhD MS

**I have no conflicts of interest to
report**

Objectives

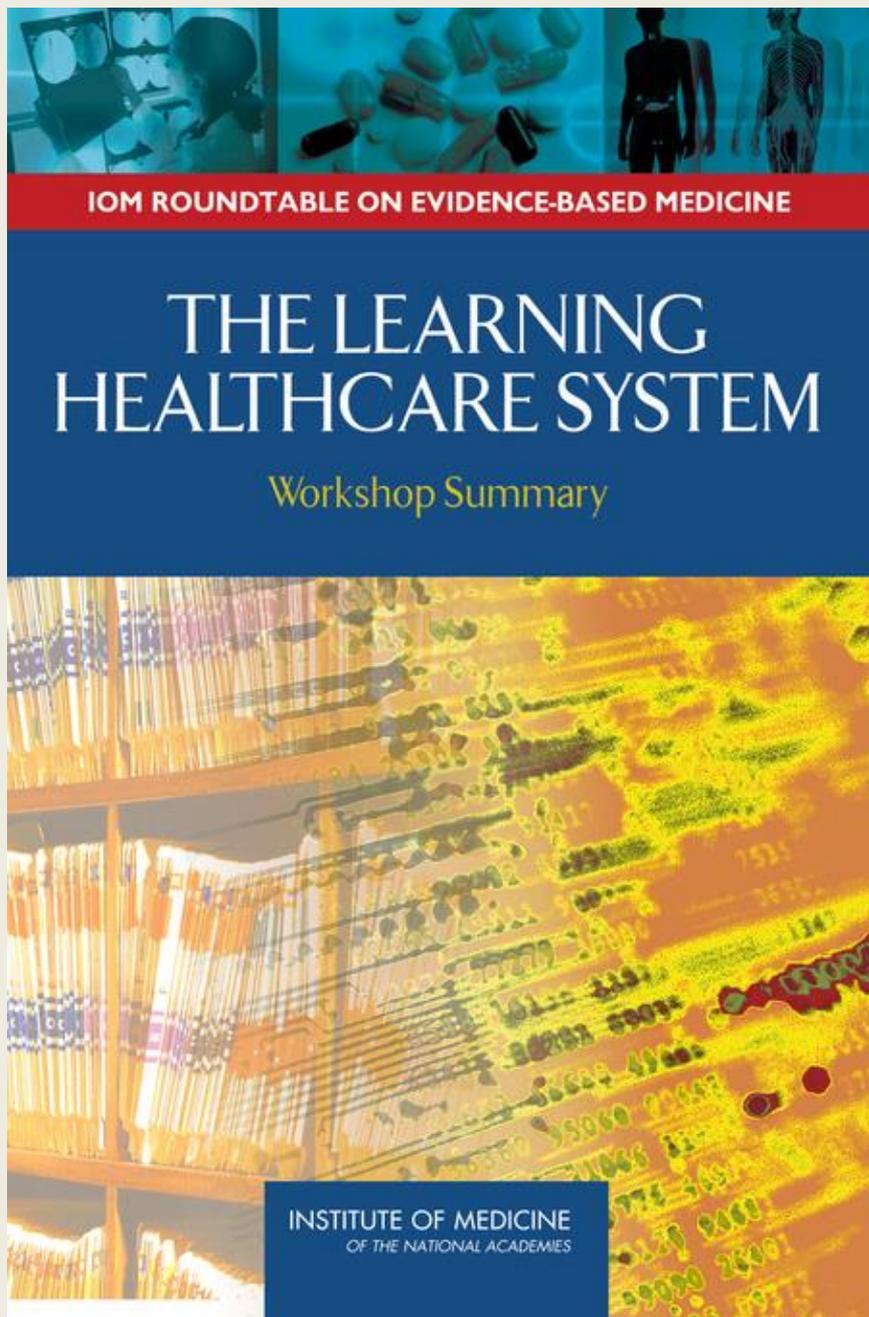
- **Learning**
- **Intelligence**
- **Big Data**
- **PBRNS**





- Knowledge Generation from Practice
- Outgrowth and Product of Healthcare Delivery
- Continual Improvement
- Practice Based Evidence
- Narrows Research-Practice Divide
- Relevant to Clinical Practice & Environments





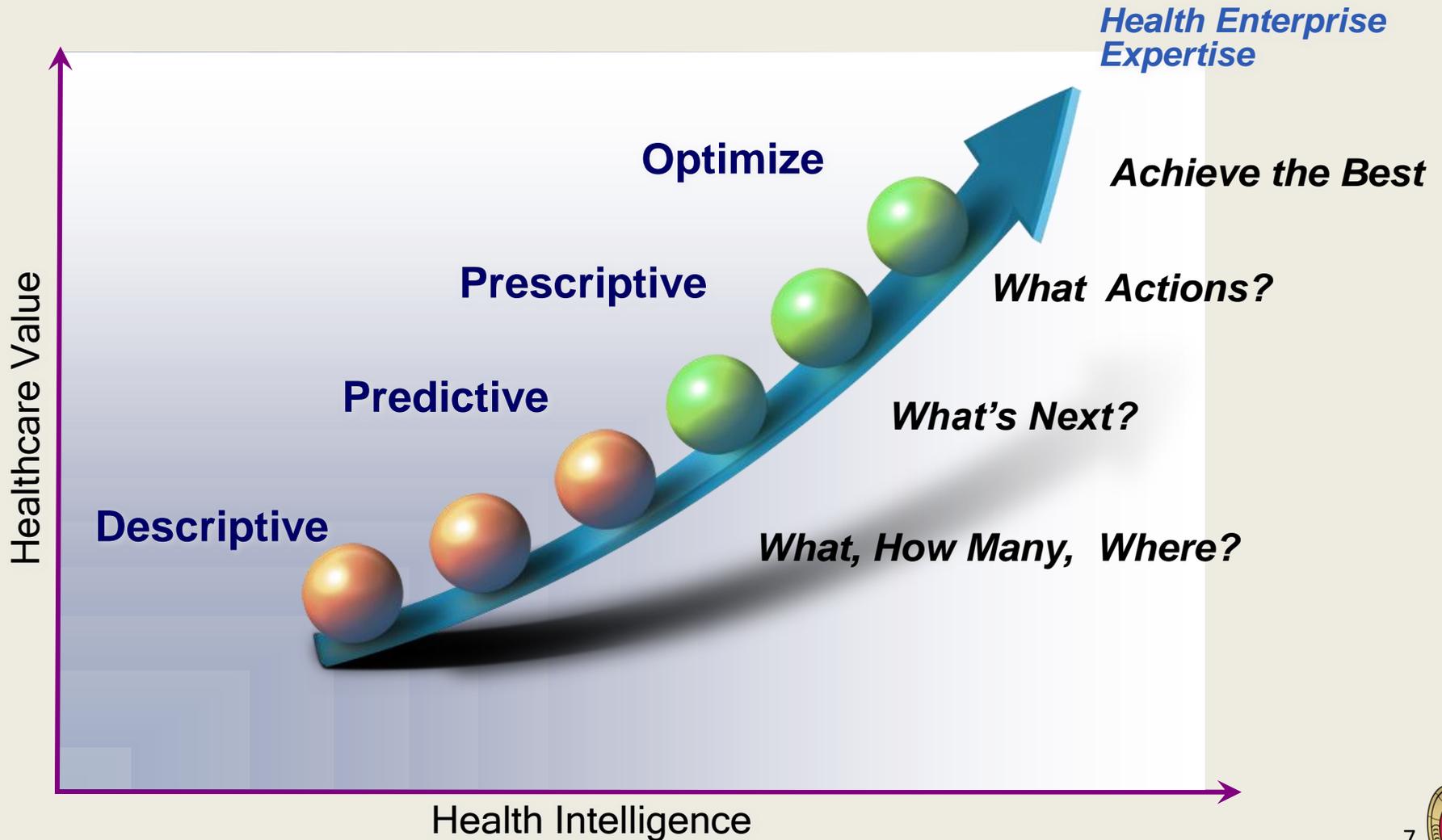
- Better Care, Health, Cost
- Real-Time Access
- Digital Capture Care of Experience
- Engaged, Empowered Patients
- Rapid Data Driven Results
- Now Possible Because of Electronic Health Record Adoption



Health Systems Intelligence

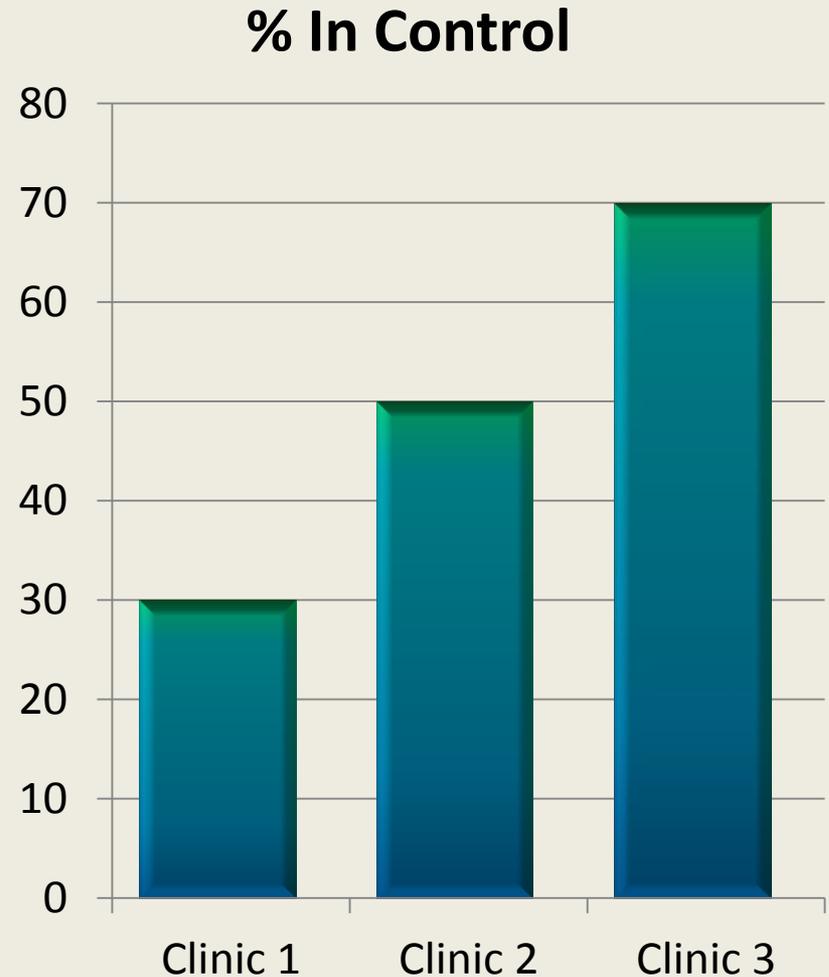
- **Raw Data into Information & Action**
- **Enormous Data Volumes**
- **Easy Interpretation**
- **Opportunities & Strategies**
- **Process and Health Improvement**

Health Intelligence Analytic Phases



1) Descriptive Analytics

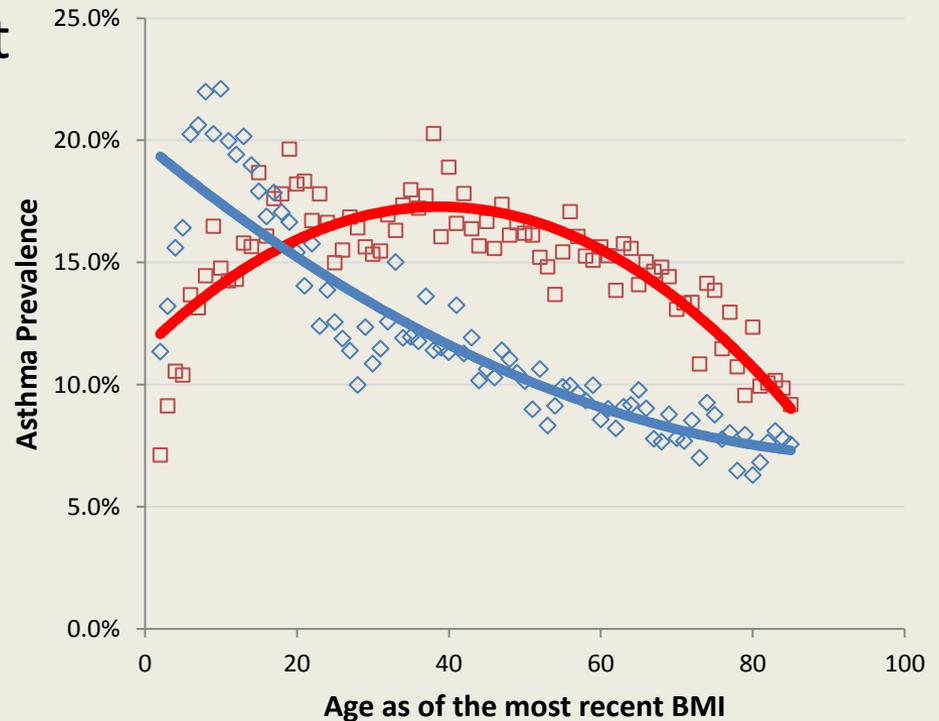
- Hindsight/What Happened
- Simple Summaries
- Tables, Charts, Graphs
- Dashboards
- Queries
- Clinical QI Reporting



2) Predictive Analytics

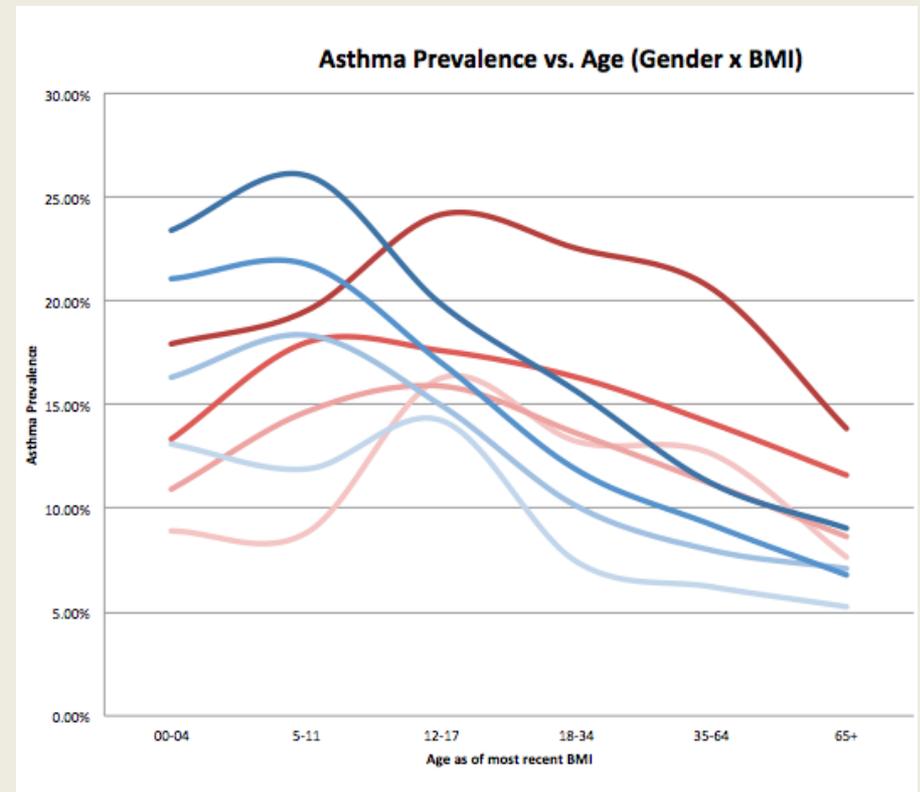
- Insight - Why & What's Next
- Regression Modeling
- Machine Learning
- Data Mining
- Simulation
- Forecasting
- Predict Future / Unknown Events

Asthma = Age + Gender



3) Prescriptive Analytics

- Foresight – Take Action by
- Taking Advantage of Predictions
- Suggest Interventions
- Test & Monitor Outcomes
- Optimization
- Effectiveness

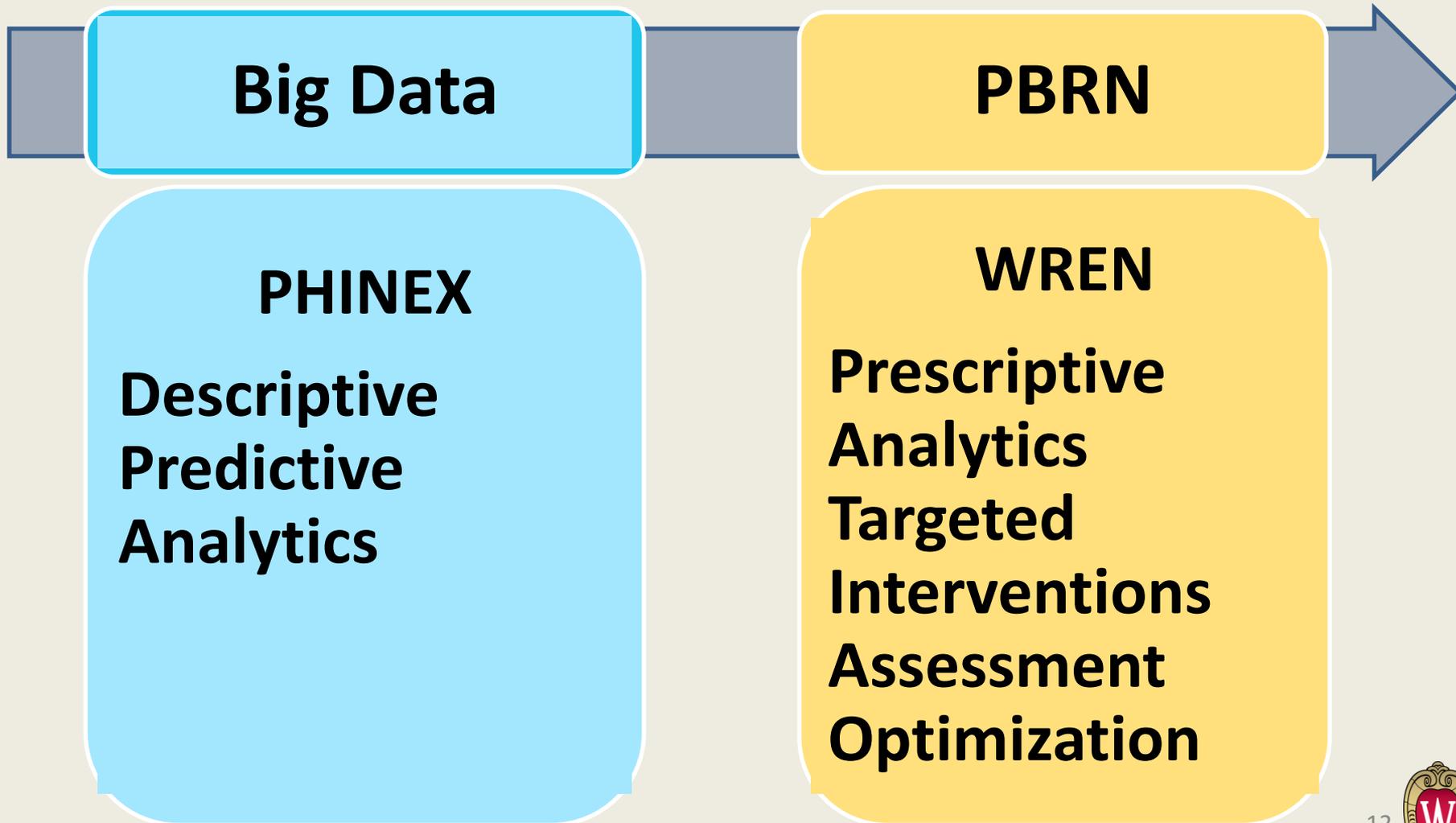


3) Prescriptive Analytics

- Patient Centered Care = Patient Relationship Management
- IT Systems to automate, organize and synthesize
 - Services/Team Care Coordination
 - Navigation/Literacy
 - Patient Centered Compliance
- Optimize Health System Response, Outcomes, Lower Costs
- Unrealized Opportunity in Healthcare



Rapid Learning Conceptual Model

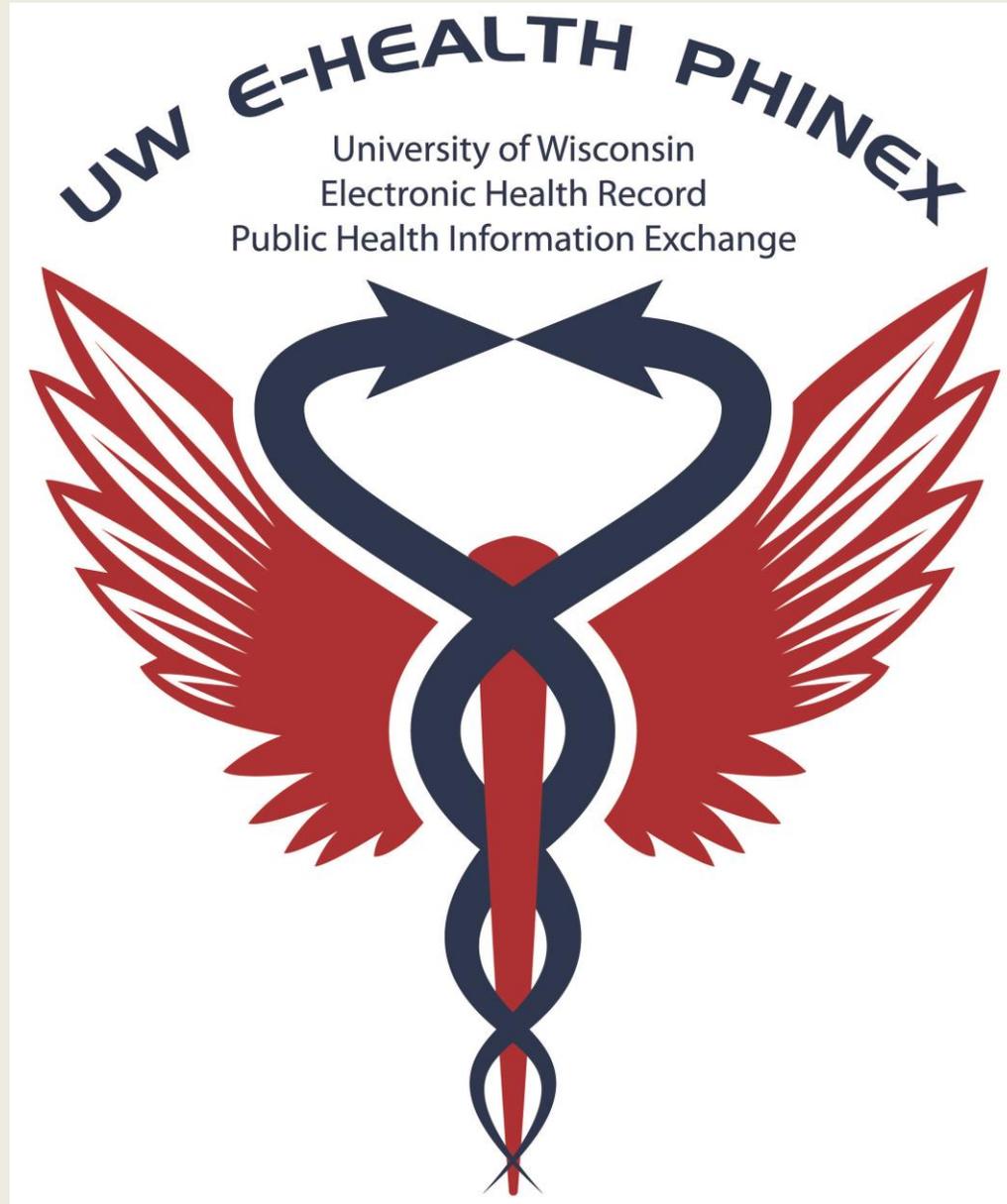


Clinical Big Data

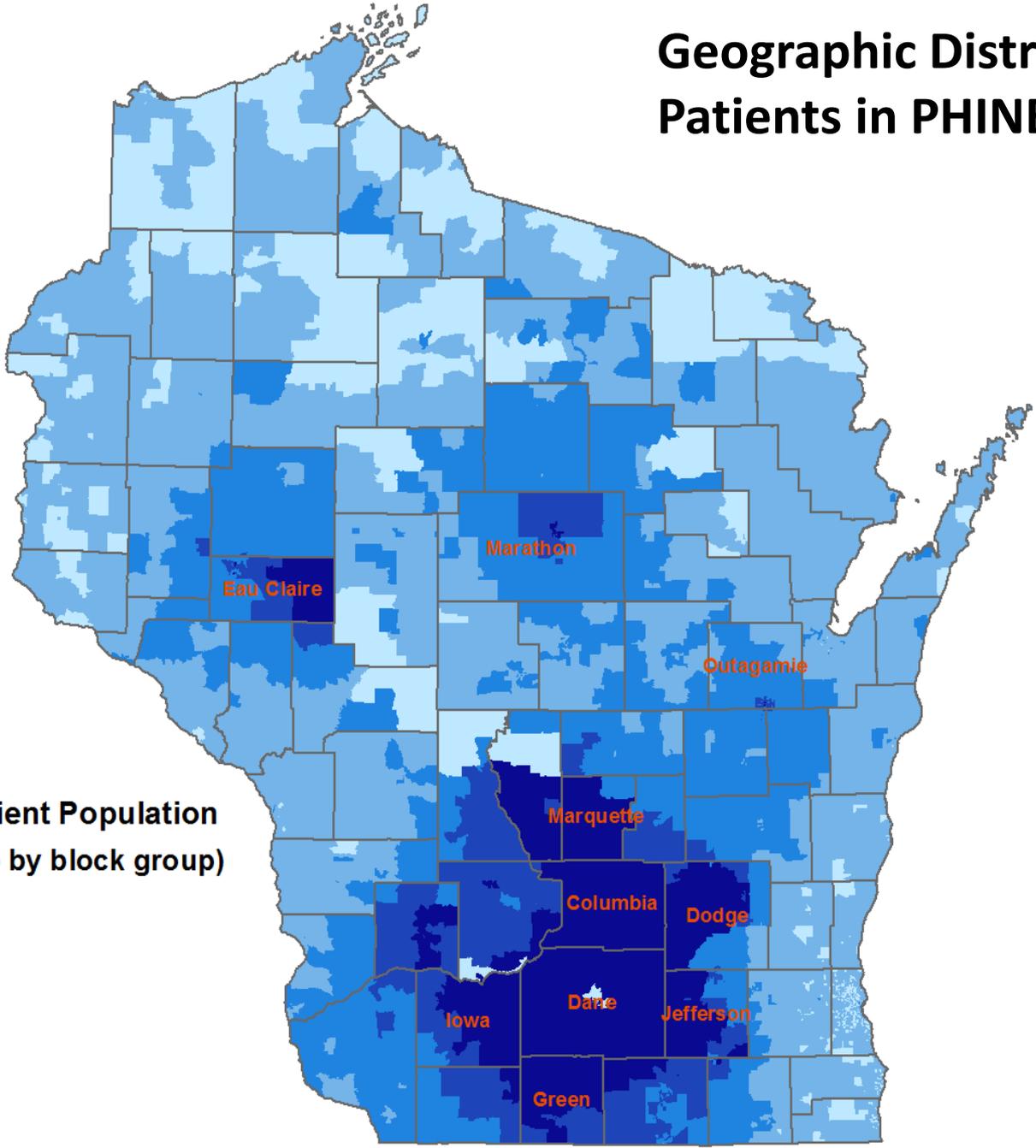
- ✓ UW Primary Care
- ✓ 500,000 Patients
- ✓ 21 Million Encounters
- ✓ 15 Million Prescriptions
- ✓ 3.1 Million Diagnoses

Linked Community Factors (~6,000 Variables)

- ✓ Economic Hardship
- ✓ FFV Consumption
- ✓ Retail Food Environment



Geographic Distribution of Patients in PHINEX Database

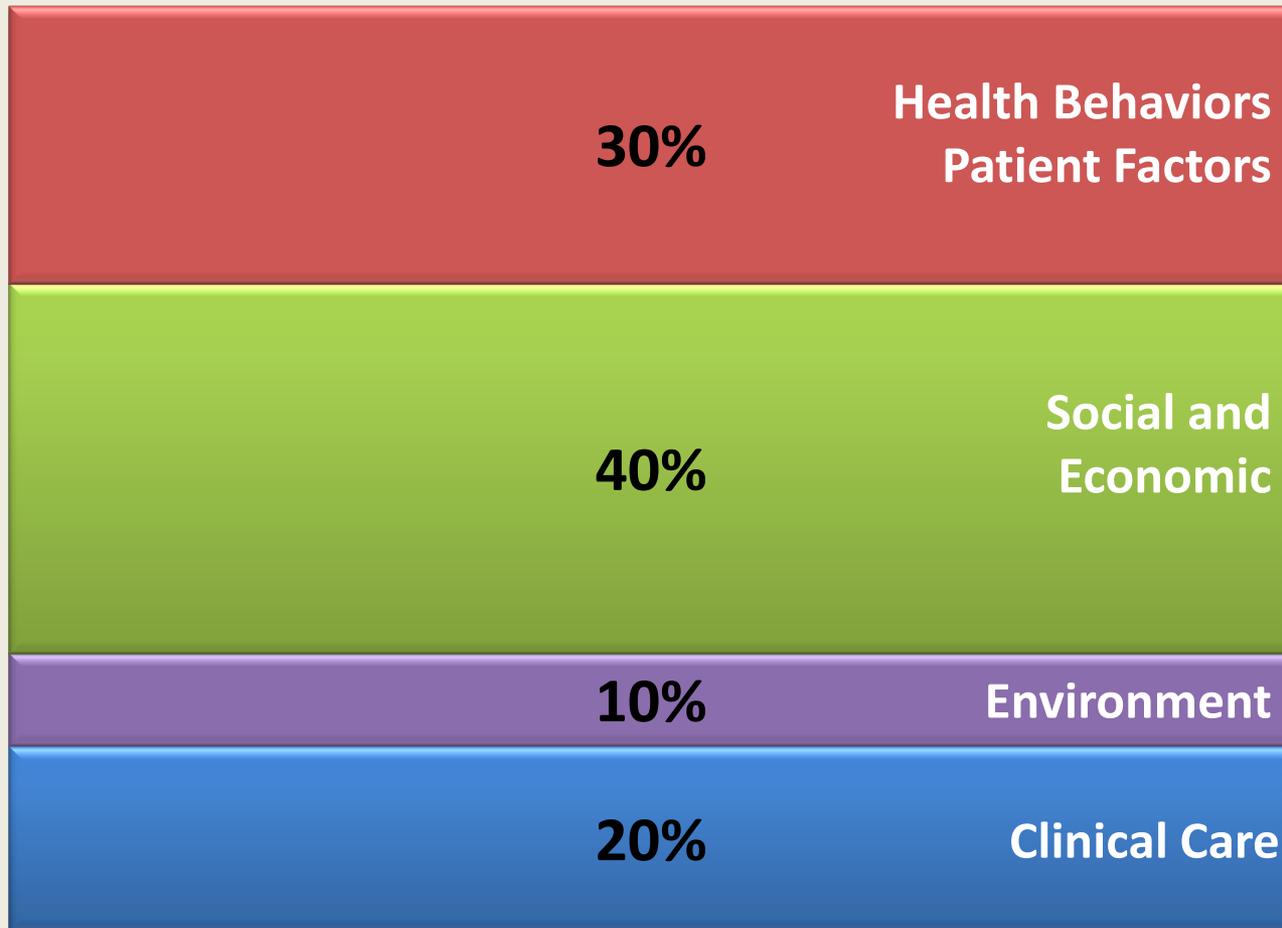


PHINEX Patient Population
(per 1,000 pop by block group)

- 0
- 1-10
- 11-50
- 51-100
- > 100



Health Outcome Drivers



Predictive Analytics

Asthma; Control =

Behaviors +

SES +

Environment +

Clinical Care



Descriptive & Predictive Analytic Approach

Mapping

- Risk Factors**
- Prevalence & Control**

Multiple Logistic Regression Prediction

- Disease Risk**
- Control**

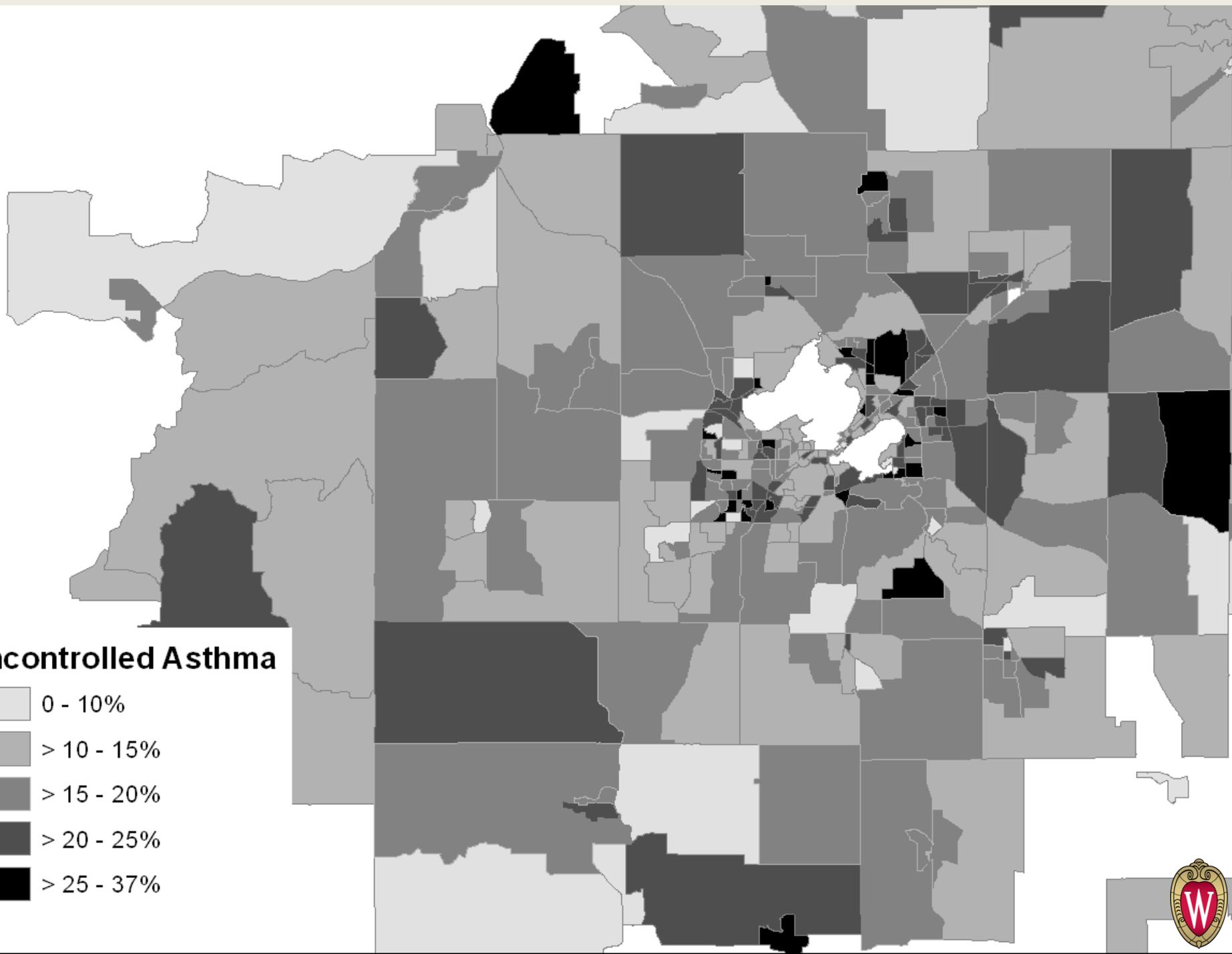


PHINEX Analytics

Asthma Risk and Control

Outcomes =	Health Behaviors Patient Factors +	Clinical Care Factors +	Physical Environment, Social, and Economic Factors
<p>Asthma Risk 40,011 / 258,837 15.5%</p> <p>Uncontrolled 6,554 / 40,011 16.4%</p>	<p>Age Gender Race BMI Smoking Insurance Payor Census Block Group</p>	<p>Clinic</p>	<p><u>Census Block Group:</u> Economic Hardship Index Urban/Suburban/ Rural</p>
Electronic Health Record Data			Community Level Data





Uncontrolled Asthma

- 0 - 10%
- > 10 - 15%
- > 15 - 20%
- > 20 - 25%
- > 25 - 37%



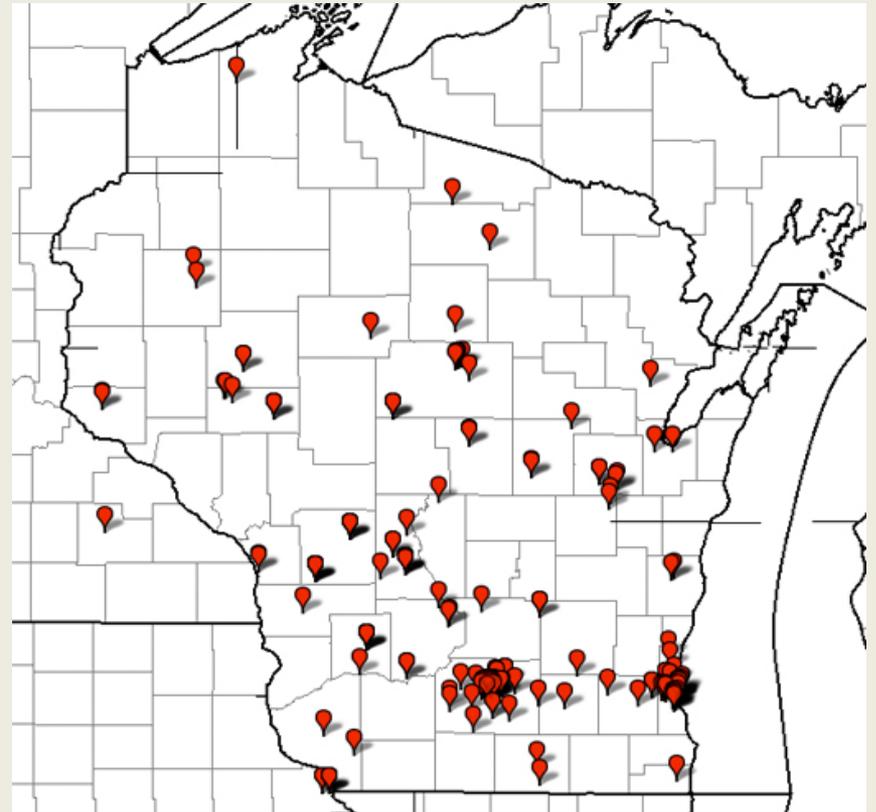
Logistic Regression Predictive Models

**Asthma = Age,
Gender, Race,
BMI, Smoking,
Payor, Urban,
EHI**



Wisconsin Research & Education Network

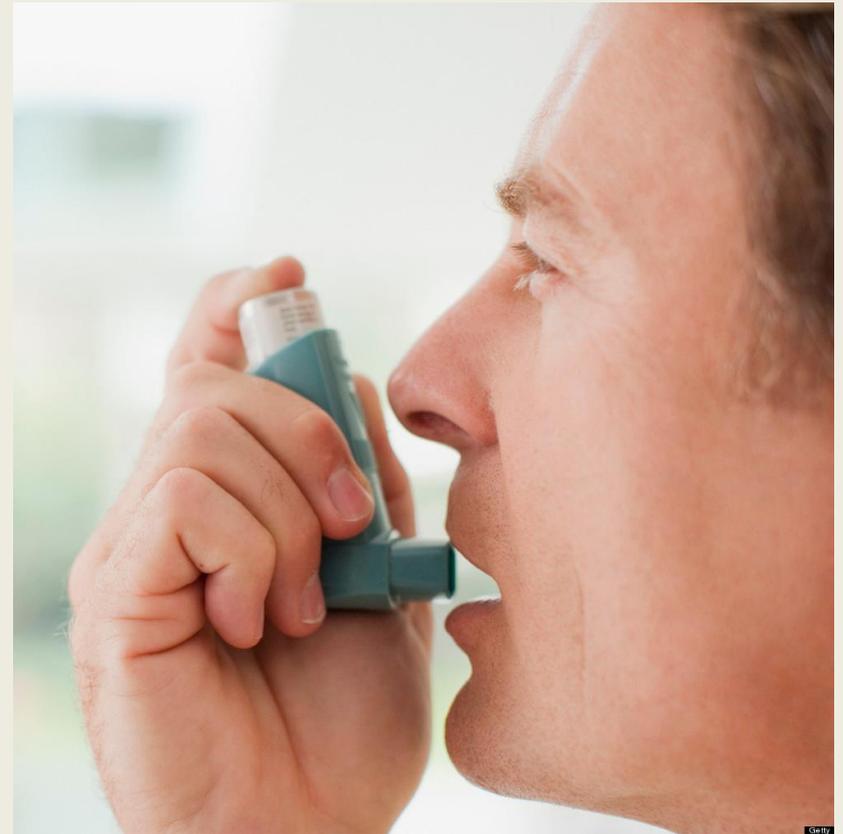
- 300 Members
- 200 Practicing Clinicians
- 80 Clinic Sites
- 37 Healthcare Orgs



Pactical Asthma Control Evaluation (PACE)

Sorkness, Guilbert, Hahn, Hanrahan

- Systems Approach to Improve Outcomes
- Evaluate Efficacy - Targeting Interventions, Tracking Results
- Risk Factors for Poor Outcomes



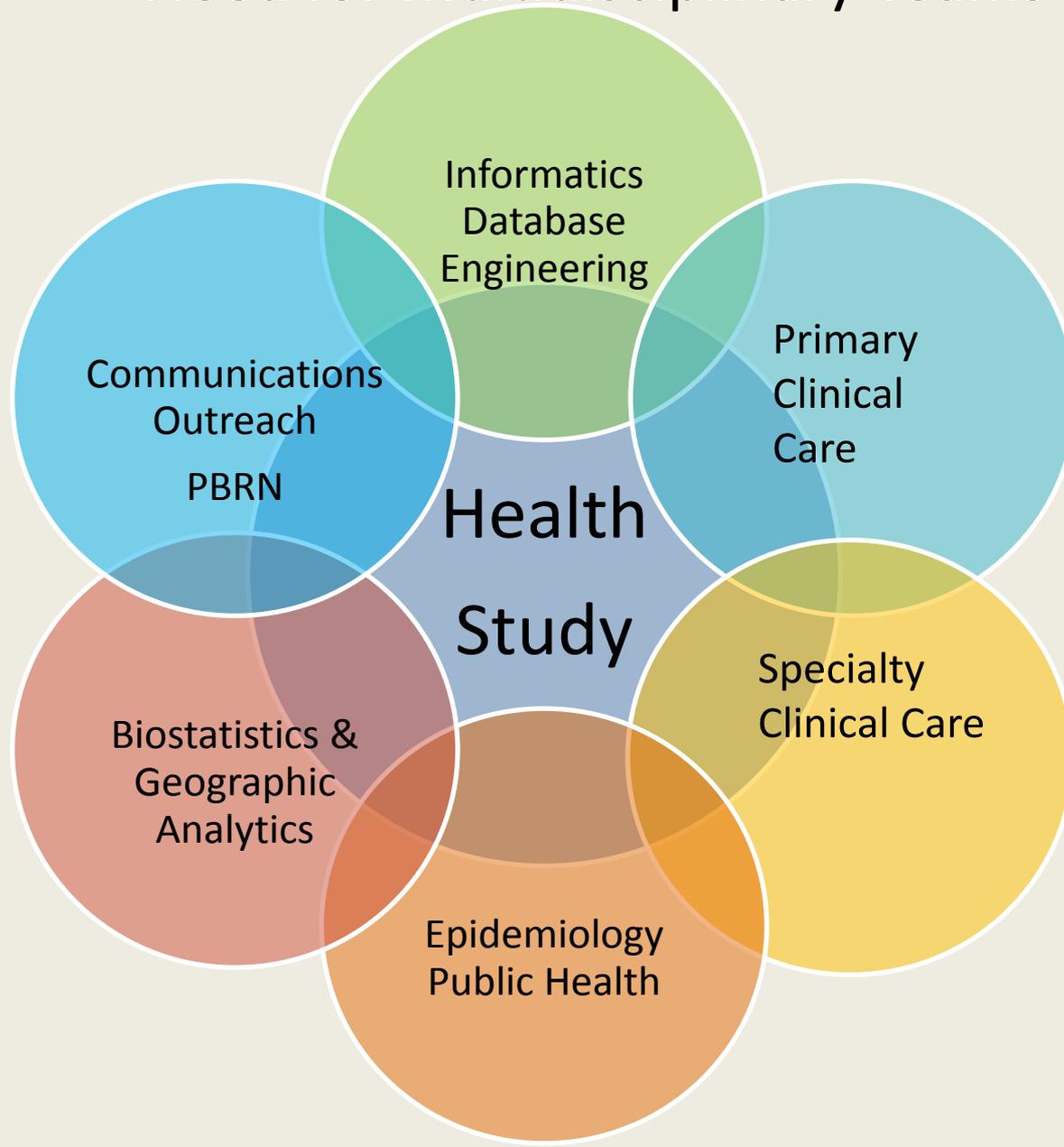
PACE

- Pilot – for Cluster Randomized Trial
- Usual Care vs
- Systematic Assessment & Management
- Intervention
 - ACT
 - Step-Care Guideline Treatment
 - Reassessment
- Efficacy



Practical Advice to PBRNs – Using Big Data

Need for Multidisciplinary Teams



Contact Information

Larry Hanrahan PhD MS

Research Director

Department of Family Medicine

University of Wisconsin School of
Medicine and Public Health

Larry.Hanrahan@fammed.wisc.edu



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Family Medicine

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