

Introduction

1 SHRINE National Pilot is a population-scale investigation across 8 medical centers, nationwide, focusing on discovering co-morbidities related to the primary diagnoses of diabetes and autism.

2 SHRINE National Pilot is an implementation of the SHRINE web-based query tool that allows investigators to determine the aggregate total number of patients at participating hospitals who meet a given set of inclusion and exclusion criteria. Since counts are aggregate, patient privacy is protected.

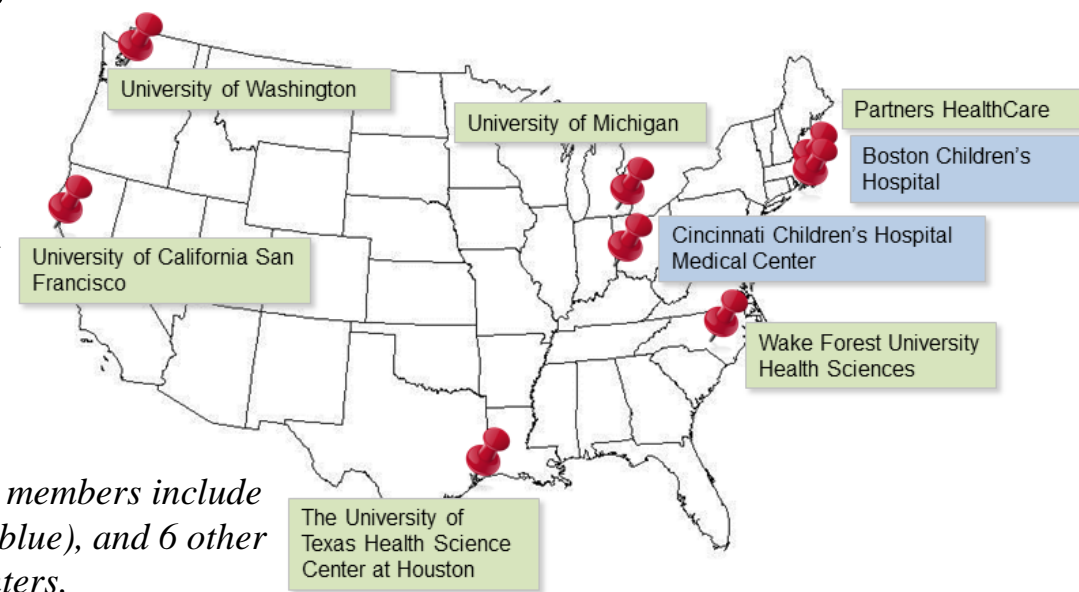


Fig. 1: Current pilot members include 2 pediatric sites (in blue), and 6 other general medical centers.

Objective & Value Proposition

1 Objective: Demonstrate the scalability and utility of the SHRINE technology to provide researchers access to information derived from clinical care at a national level.

2 Value Proposition: SHRINE brings value to investigators interested in:

- Identifying potential clinical trial cohorts for recruitment
- Generating new research hypotheses
- Planning research requiring large sample sizes
- Preparing grant applications.

More specifically, the *SHRINE National Pilot*—the first of its kind—helps researchers **get access to patient sets with regional diversity**. Investigators can define queries to study the demographic and co-morbidity landscape of autism and diabetes, and **examine the variation and consistency of the co-morbidities** found across populations in different states:

"How many patients with diabetes were also diagnosed with liver cancer? How many patients with autism suffer also from schizophrenia? Are the findings similar or different across the country?"

Project

1 Initial patient set includes individuals diagnosed with either Autism Spectrum Disorder or Diabetes Mellitus, at least once between 6/01/09 – 5/31/11. Demographics include age, gender, race, ethnicity.

2 Using federated search architecture, real-time queries can be performed across collaborating institutions, each with their own locally managed patient datasets.

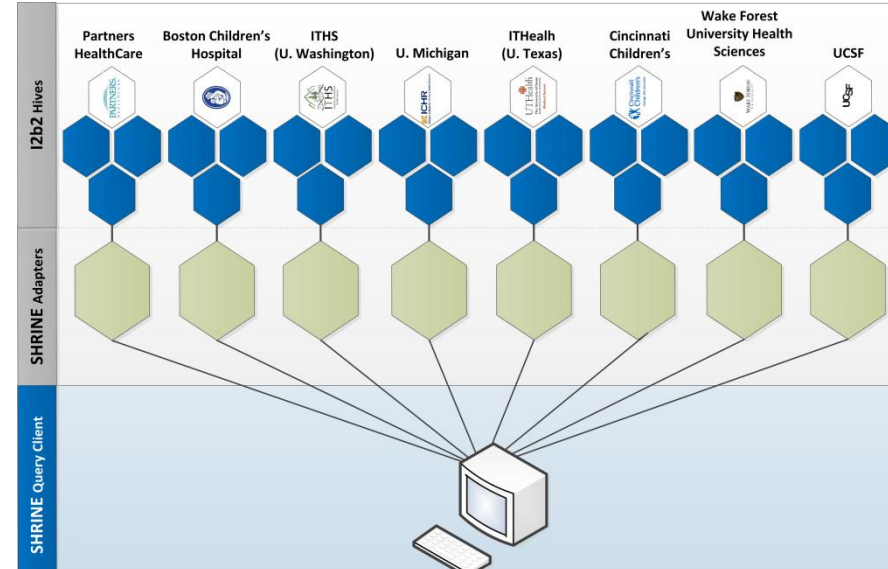


Fig. 2: SHRINE National Pilot architecture

Results

1 General: The total number of patients with a diagnosis of diabetes is 186,937 while the number of patients with autism is 14,330.

2 Autism: Across 7 sites there was a remarkable consistency of prevalence rates for epilepsy. The mean prevalence rate of epilepsy in autism across the sites is 17.5% (range 8.9-23.2%), which is well within the rates of 5-38% reported in the literature [1]. In contrast, the prevalence of schizophrenia was more variable in patients with autism, in part because some of the sites were mostly pediatric and therefore did not include cases of ASD developing schizophrenia in late adolescence and early adulthood. The reported prevalences at non-pediatric sites ranged from 2.1% to 8.1%, greater than the population prevalence of approximately 0.5% and within the reported prevalence of schizophrenia in autism of 7%.

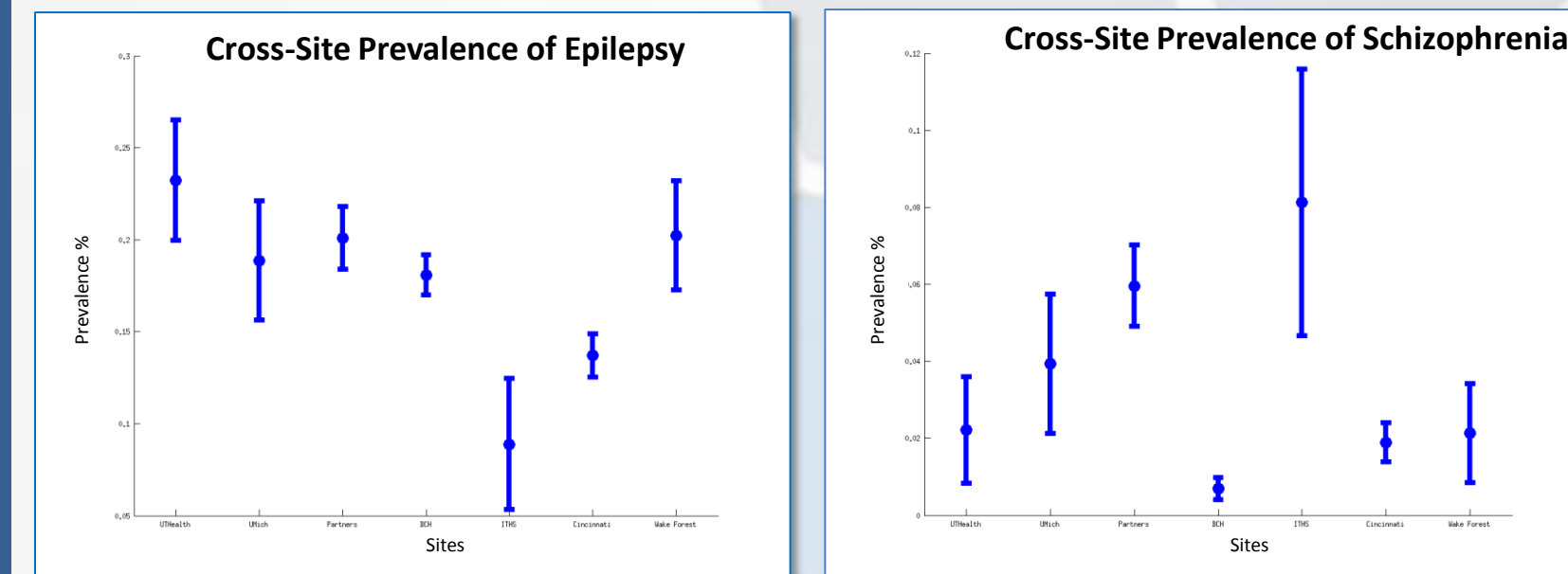


Fig. 3a and 3b: Cross-sites prevalence of epilepsy and schizophrenia

3 Diabetes: Given that academic medical centers (AMC's) are tertiary care facilities, we found a high prevalence of co-morbid cancers, highest at Partners Healthcare because of a generally older median population (65-74 y/o) as opposed to the medians (55-64 y/o) at the other AMC's.

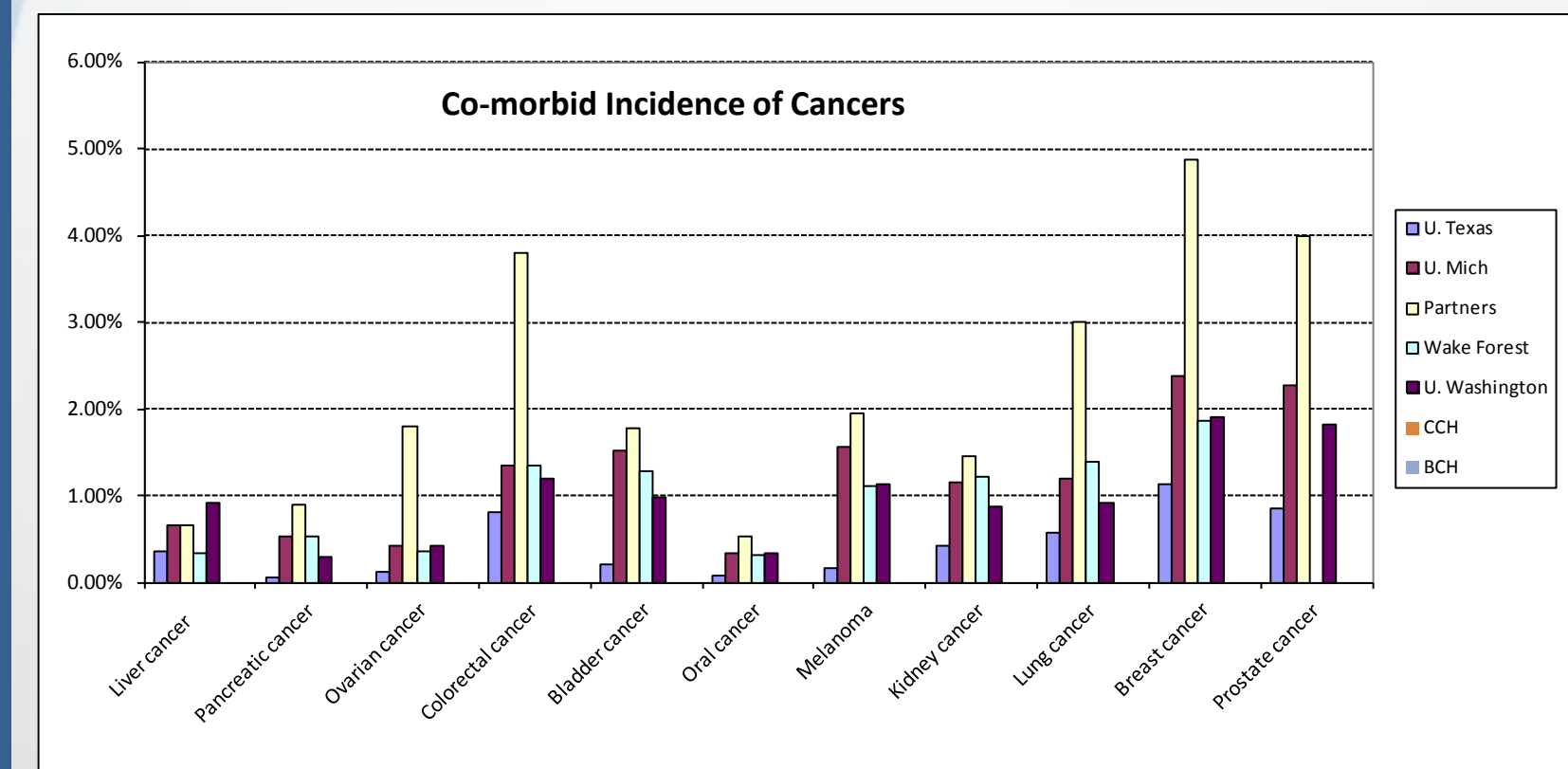
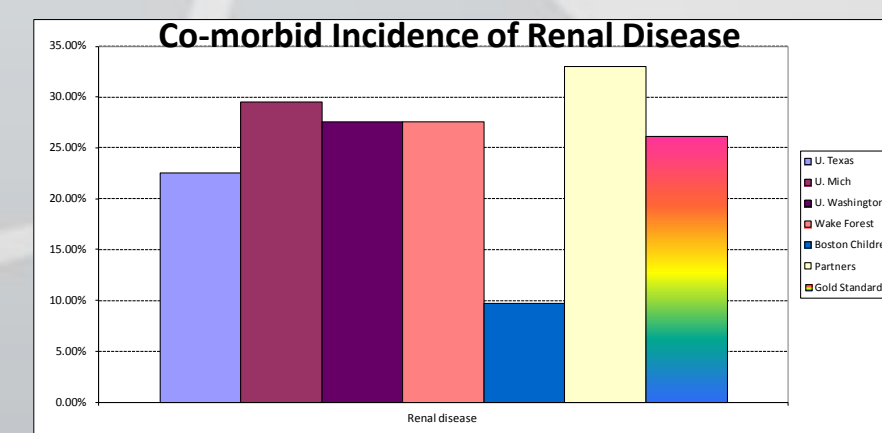


Fig. 4a and 4b: Co-morbid incidences of Cancers (above) and Renal Disease (below)

At Partners Healthcare we compared the general incidence to a Gold Standard (colored bar), 97% specificity cohort and found the incidence to be expectantly less but comparable to the overall determination.



Challenges & Lessons Learned

1 This section identifies some of the key challenges that were faced during the implementation of the project. By sharing lessons learned, the *SHRINE National Pilot* team hopes that others interested in setting up a similar network will have access to best practices.

Challenges	Description	Solutions/ Lessons Learned
Variation in Semantics	Queries were initially described via text and allowed for local interpretation of the query criteria within the web client. Different teams interpreted the same query differently, using for instance the "parents ICD 9 code" vs. the "children ICD9 codes."	All queries were subsequently specified with precise search codes using the central SHRINE ontology.
Lack of Standard National Authentication Process	Joining the network required a manual configuration change at all the other nodes on the network due to the fully-meshed, peer-to-peer configuration.	Reconfigure network to a hub-and-spoke configuration to reduce the number of configuration changes needed as nodes join the network.
Understanding the Nature of each Healthcare Center	The specifics of each site, including type (pediatric, diabetic etc.) and size are critical to analyzing the data.	Upon entry into the network, capture and share broad demographics of the population at the new node.

Conclusion & Next Steps

1 Conclusion:

- A successful nationwide implementation of the *SHRINE* software which provides researchers with **access to large numbers of patients with regional diversity**
- A **technical and regulatory achievement**: 8 medical centers connected by a network of peer-nodes and a coast-to-coast IRB
- A framework for **CTSA collaboration in patient studies**
- A network that is **scalable**

2 Next steps will include:

- Publish results, develop a proposal to expand the network
- Include data on lab tests and medications
- Include data encoded with NLP

- **Reference:** [1] Levisohn PM. (2007). The autism-epilepsy connection. *Epilepsia*, (48) Suppl 9:33-5.
- **Acknowledgement:** This work was conducted with support from Harvard Catalyst | The Harvard Clinical and Translational Science Center (NIH Award #UL1 RR 025758 and financial contributions from Harvard University and its affiliated academic health care centers). The content is solely the responsibility of the authors and does not necessarily represent the official views of Harvard Catalyst, Harvard University and its affiliated academic health care centers, the National Center for Research Resources, or the National Institutes of Health.
- **Autism expert team:** Mohammad Ghaziuddin, Martha Herbert, Kurt Klinepeter, Patricia Manning-Courtney, Sarah Mohiuddin, Lauren Weiss | **Diabetes Expert team:** Alain Bertoni, Ryan Bradley, Nancy Crimmins, Amy Shah, Bill Herman, Meng Tan, Allison Goldfine | **Technical Team:** Susan Guerrero, Johnny Phan, Steve Gendler, Kevin Smith, James Law, Joe Bath, Kathleen Hayden, Hai Ge, Parth Divekar, Brian Ostasiewski, Michael Horvath, Justin Prosser, Prakash Lakshminarayanan, Nandan Patibandla, Nich Wattanasin, Andy McMurphy, Clint Gilbert, Phillip Trevvett, Bill Simons and Katia Zilber