Implementing an EHR-based Distributed Data Network for Public Health Surveillance of Notifiable Diseases and Chronic Conditions: A How-To Guide with Lessons Learned from Massachusetts

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Council of State and Territorial Epidemiologists

MDPHNET

DEPARTMENT OF POPULATION MEDICINE
HARVARD MEDICAL SCHOOL
Harvard Pilgrim Health Care Institute

Objective

Describe how we implemented a distributed data network of EHRs from multiple clinical sites in Massachusetts to conduct electronic notifiable disease reporting and aggregate-level chronic disease surveillance

- The system and its features
- Overview of implementation
- Current status in MA
- Key elements to success & lessons learned

ESP – EHR Support for Public Health

Software and architecture to extract, analyze, and transmit electronic health information from providers to public health

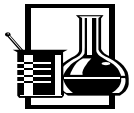
- Surveys codified EHR data for patients with conditions of public health interest
- Generates secure electronic reports for the state health department
- Designed to be compatible with any EHR system – Requires ability to export data
- Open source software, PopMedNet (available via esphealth.org)

JAMIA 2009;16:18-24
MMWR 2008;57:372-375
Am J Pub Health 2012;102:S325–S332

Automated disease detection & reporting for public health

Practice EMR's


diagnoses

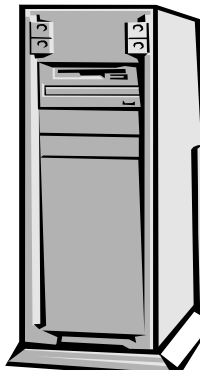

lab results


meds


vital signs


demographics

ESP infrastructure

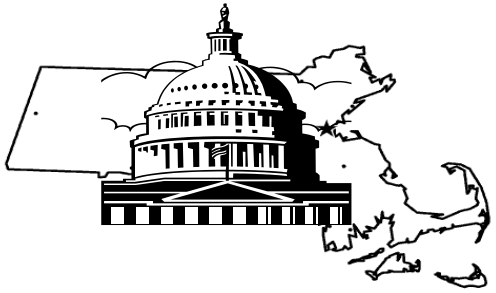


updated nightly

Notifiable disease case reports

Aggregate-level custom queries

Health Department



JAMIA 2009;16:18-24
Am J Public Health 2012;102:S325–S332
Am J Public Health 2014;104:2265-2270

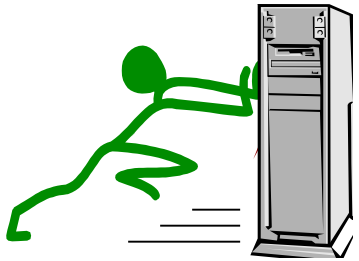
Capabilities and Features

- Individual-level notifiable disease reporting
  - Via encrypted HL7 messages to MAVEN, MDPH's integrated surveillance and case management system
  - HIV, chlamydia, gonorrhea, syphilis, acute HBV, acute HAV, HCV, TB
  - New: Longitudinal case reporting for chronic infections (HIV, HCV, TB)

- Aggregate-level reporting of chronic diseases and conditions of interest
  - Via user interface with drop down menu ("query composer") or SQL code
  - Examples of outcomes and uses:
    - Diabetes, asthma, smoking, opioid Rx's, obesity, hypertension (treated, controlled)
    - Influenza vaccine usage
    - ILInet reporting
    - IUD use after 2016 Presidential election
    - HIV and HCV testing
    - Lyme disease
    - Program evaluation

Decoupled architecture

EHR



ESP

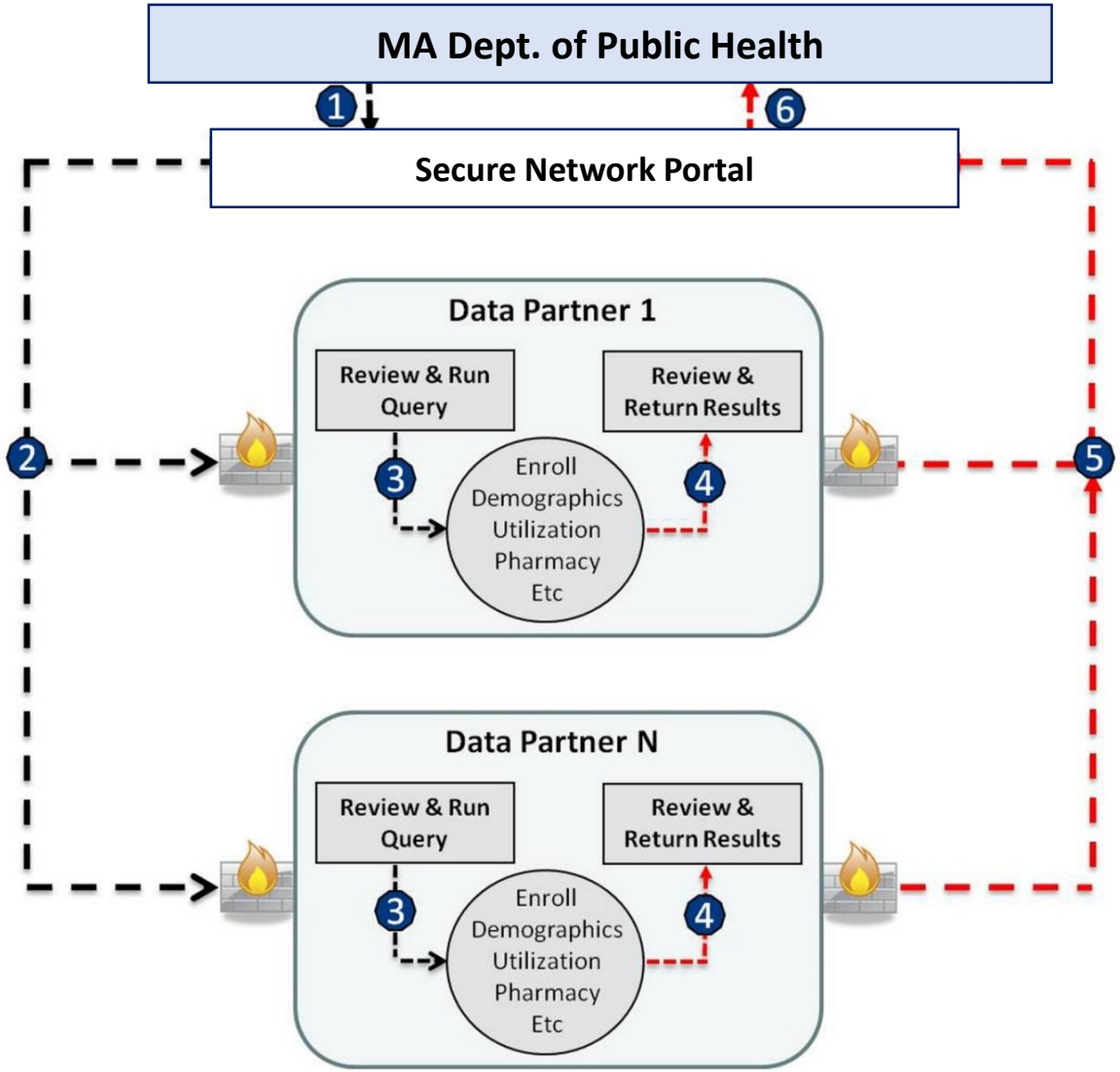
ESP is decoupled from host electronic health record

	Implications
Allows system to be agnostic to the source EMR (local codes translated to common nomenclature)	**Universal**
Offloads computing burden from clinical systems (and keeps ESP invisible to clinicians)	**Unobtrusive**
Can remain within host practice's firewall	**Secure**

ESP*net* is a distributed data network

How aggregate queries work

- Enables timely access to aggregate-level data of public health importance not notifiable on the individual-level
- Confidential personal health data remain with original data holders
- Allows those most knowledgeable about participating systems to ensure data are used and interpreted properly



Organization / The Players

DEPARTMENT OF POPULATION MEDICINE
HARVARD MEDICAL SCHOOL
Harvard Pilgrim Health Care Institute

Commonwealth Informatics

Atrius Health

Massachusetts League of Community Health Centers

CHA Cambridge Health Alliance

FENWAY HEALTH

Planned Parenthood
Planned Parenthood League of Massachusetts

Model for participation varies by clinical site

5 sites in MA: 4 participate in notifiable disease reporting, 3 permit aggregate queries

Some enable vendor to access their ESP server for data quality and maintenance

Implementation steps

Step 1: Organizational buy-in

Step 2: Designate a physical or virtual server for ESP

Step 3: ESP installation & configuration

Step 4: Create data extract, back load data, implement daily extract & load

Step 5: Data extract validation

Step 6: Map local EHR lab codes to ESP abstract labs

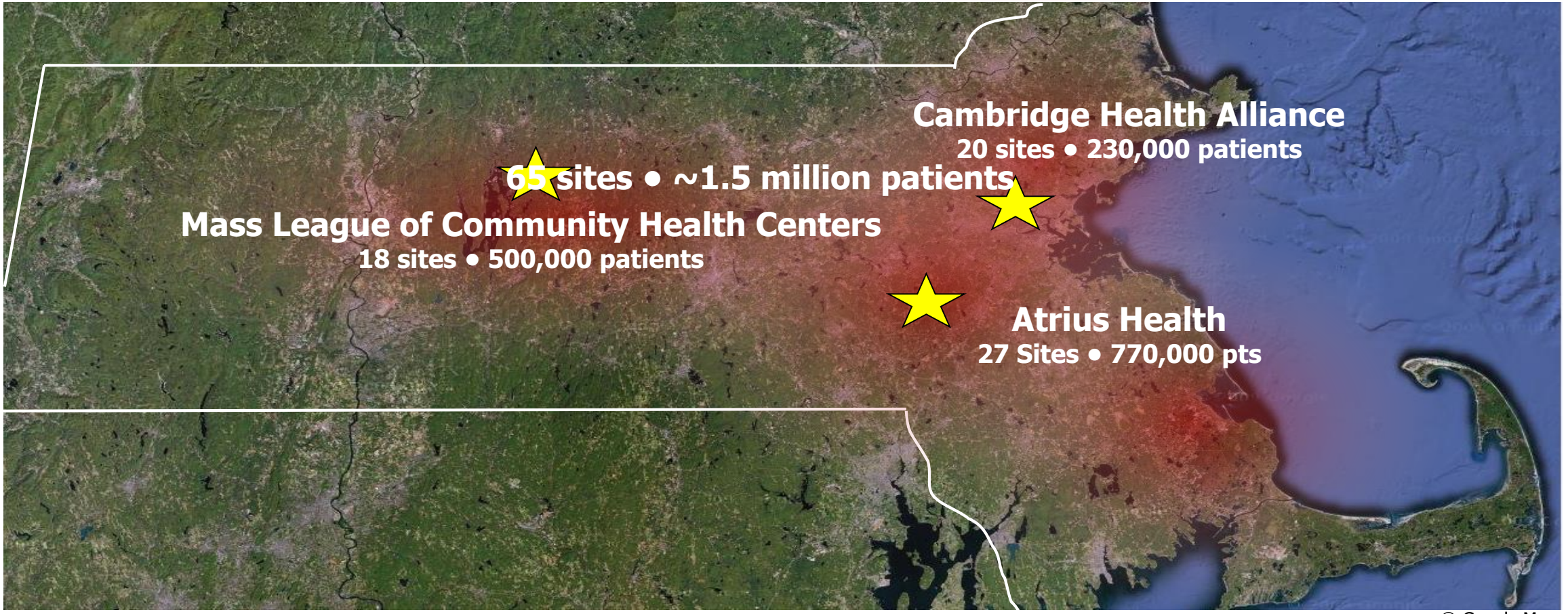
Step 7: Implement case detection algorithms & lab mapping

Step 8: Data validation – notifiable diseases & accompanying data

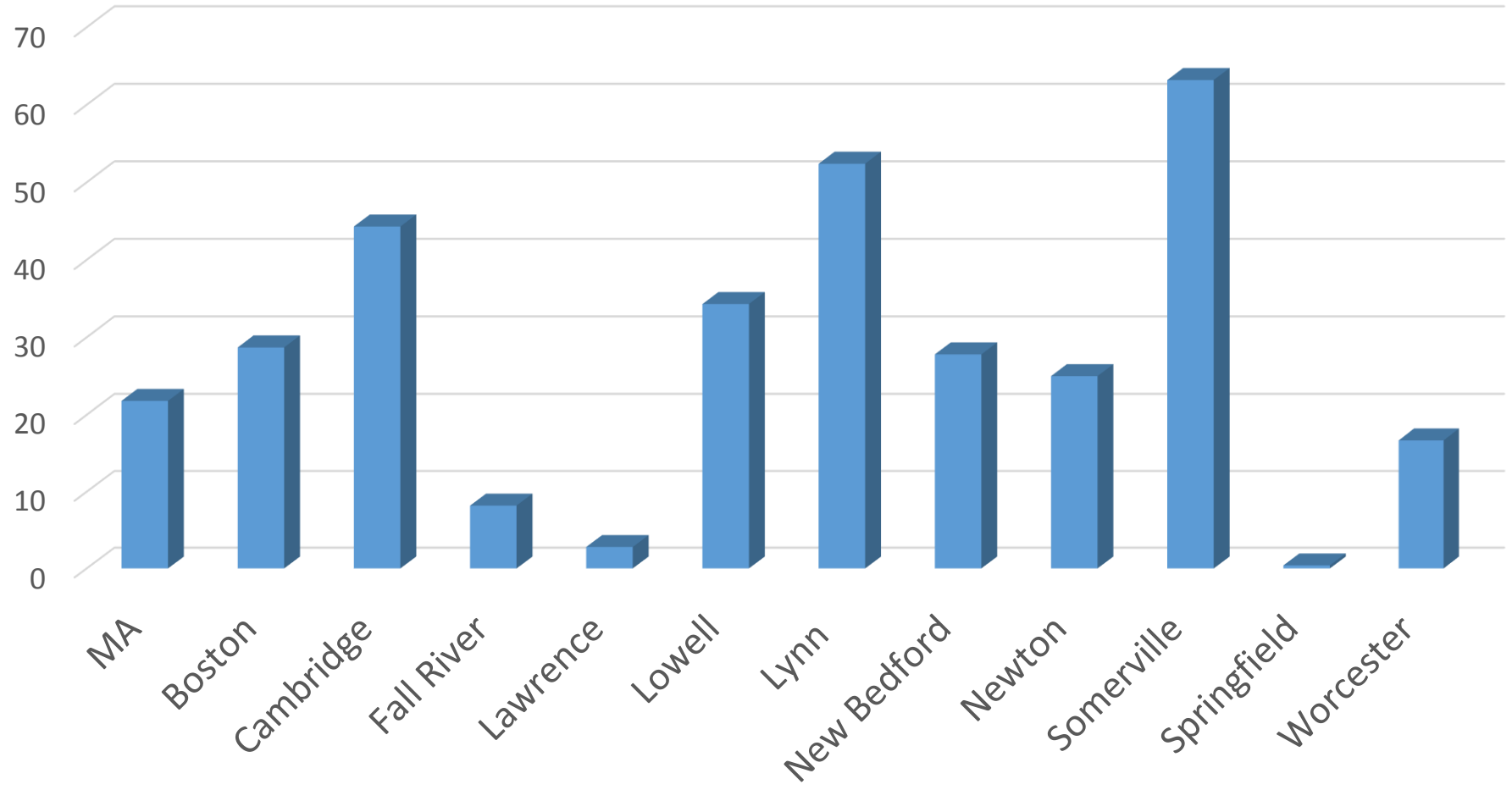
Step 9: Implementation of notifiable disease reporting to DPH

Step 10: Ongoing support & maintenance

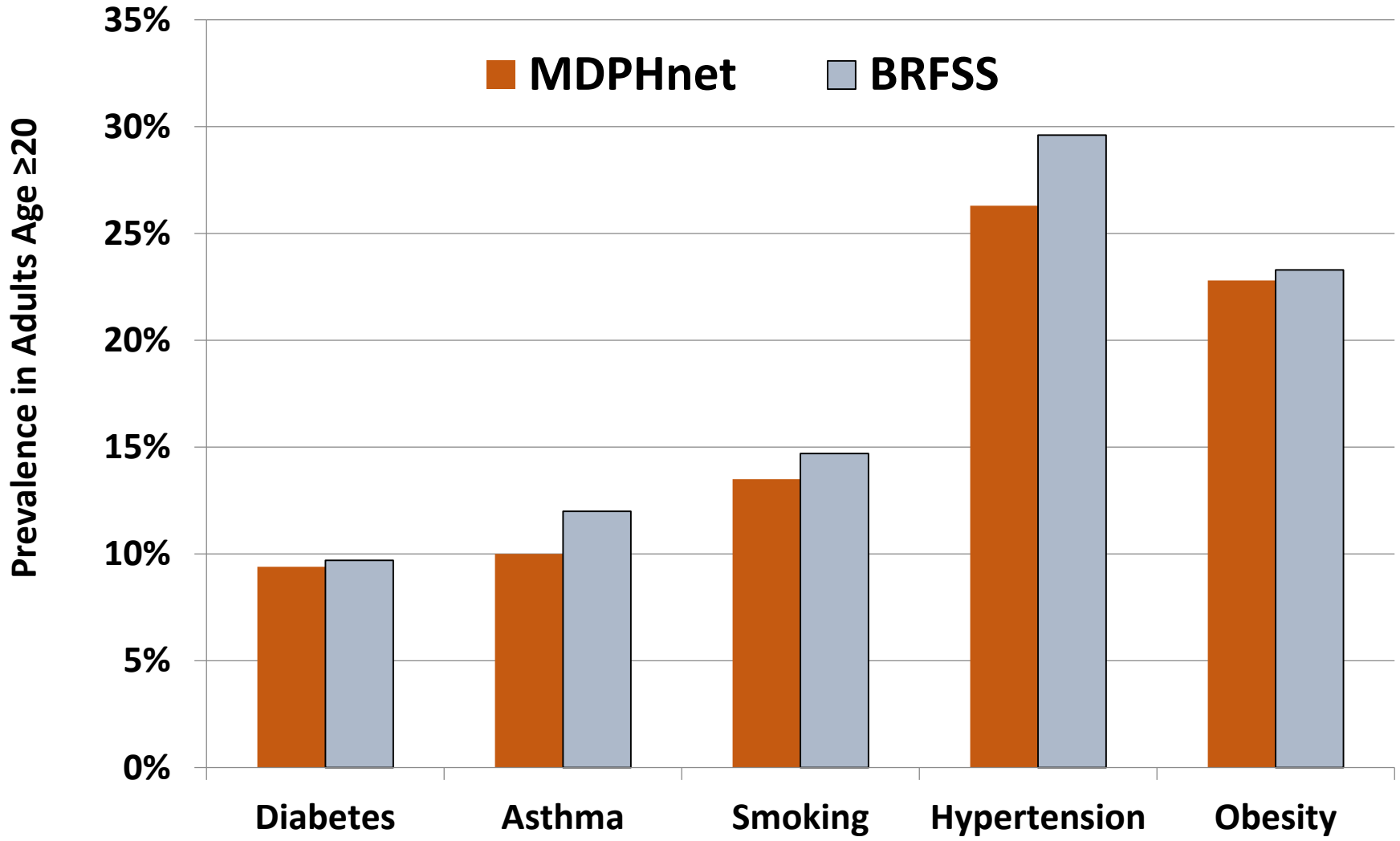
Current status of ESPnet in Massachusetts



Percentage of Adults in Massachusetts Census Population Included in ESPnet, by Community



ESPnet vs BRFSS Estimates, Massachusetts 2014



Lessons Learned / Reality Check

- Establishing and nurturing collaborative relationships between all participating entities has been the cornerstone of this work

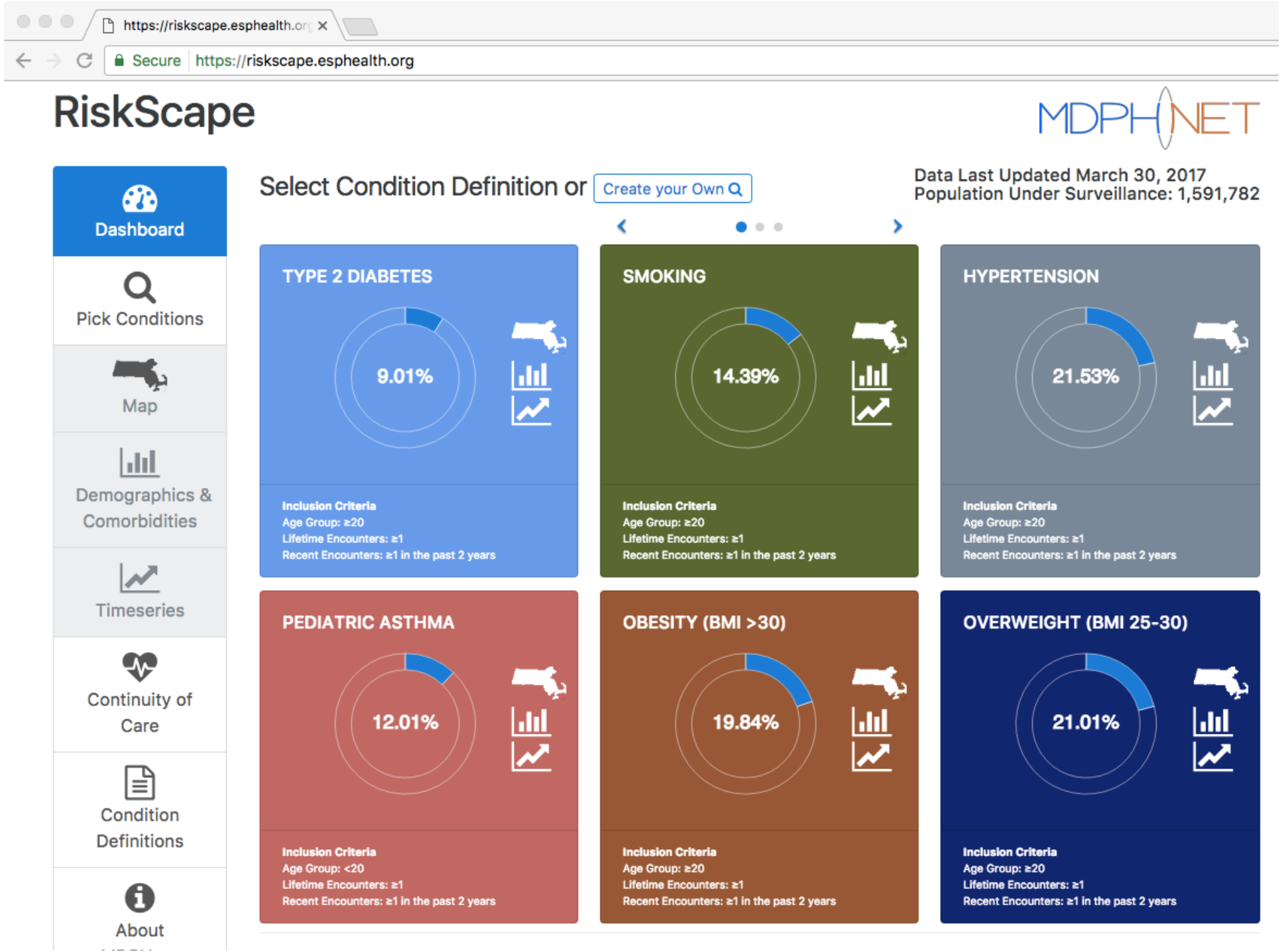
- DPH has invested in the system from the start
  - Bureau of Infectious Disease and Laboratory Sciences committed to ESP as a data source beyond the initial case reporting

- Champions within clinical sites make it easier in terms of initial buy-in and ongoing maintenance

- Different approaches to set up yield more or less efficiency
  - e.g. whether informatics vendor has VPN access

Challenges

- Coverage is concentrated towards the eastern part of the state
- Validation of data, data completeness, and algorithm performance
- Importance of maintenance – e.g. ensure lab tests/results are mapped
- Sustainability / funding: staffing costs, hardware and software
- Have not *quantified* the benefit for the sites


https://riskscape.esphealth.org
Secure https://riskscape.esphealth.org
RiskScape
MDPHNET
Dashboard
Pick Conditions
Map
Demographics & Comorbidities
Timeseries
Continuity of Care
Condition Definitions
About
Select Condition Definition or Create your Own
Data Last Updated March 30, 2017
Population Under Surveillance: 1,591,782
TYPE 2 DIABETES
9.01%
Inclusion Criteria
Age Group: ≥20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years
SMOKING
14.39%
Inclusion Criteria
Age Group: ≥20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years
HYPERTENSION
21.53%
Inclusion Criteria
Age Group: ≥20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years
PEDIATRIC ASTHMA
12.01%
Inclusion Criteria
Age Group: <20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years
OBESITY (BMI >30)
19.84%
Inclusion Criteria
Age Group: ≥20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years
OVERWEIGHT (BMI 25-30)
21.01%
Inclusion Criteria
Age Group: ≥20
Lifetime Encounters: ≥1
Recent Encounters: ≥1 in the past 2 years

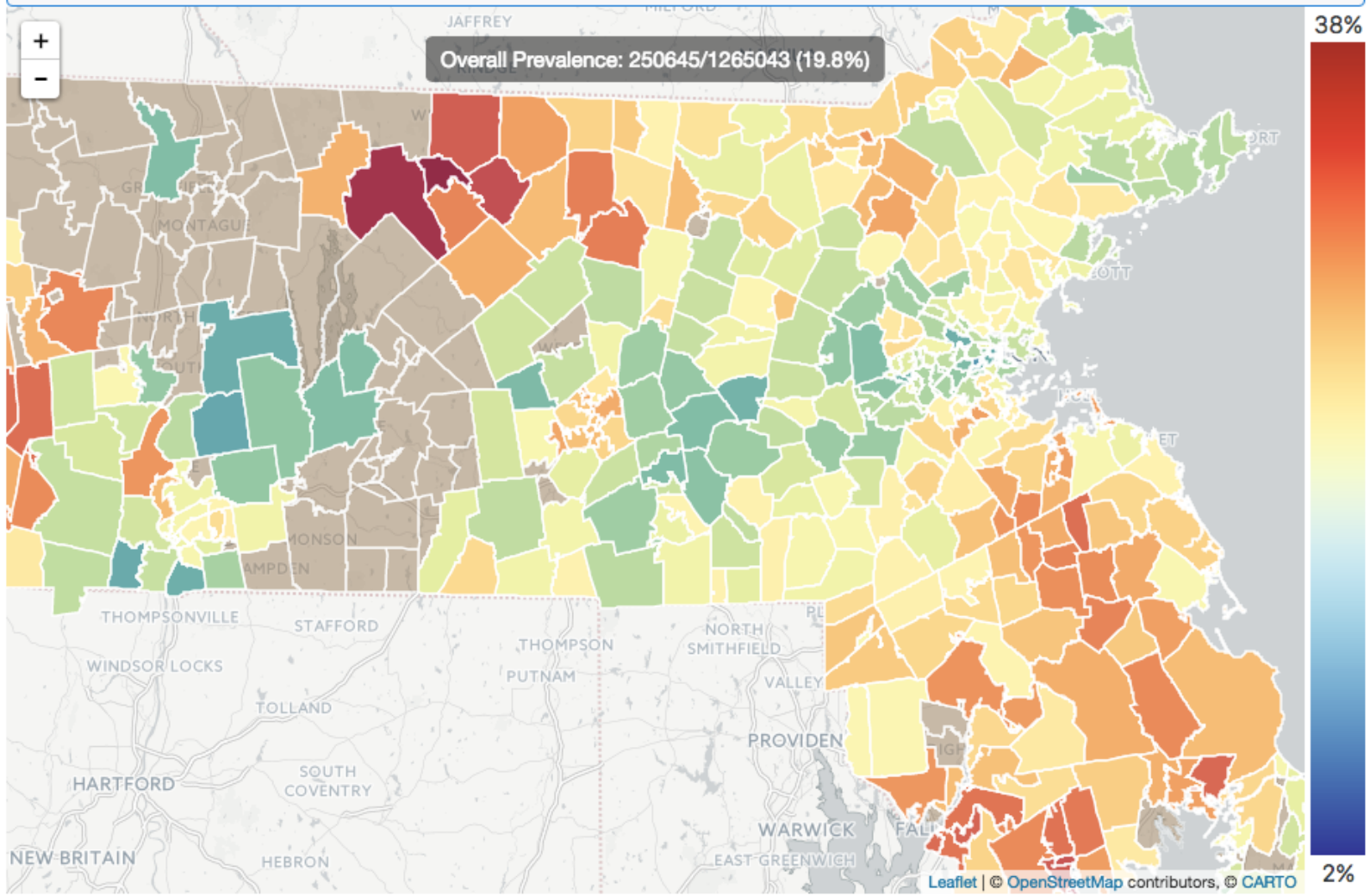
- Dashboard
- Pick Conditions
- Map
- Demographics & Comorbidities
- Timeseries
- Continuity of Care
- Condition Definitions
- About MDPHnet

Outcome(s) of Interest
BMI: Obese (BMI >30.0)

Inclusion Criteria
Age Group: ≥20 / Lifetime Encounters: ≥1 / Recent Encounters: ≥1 in the past 2 years

Hide Map Underlay

Highlight Zip | Highlight

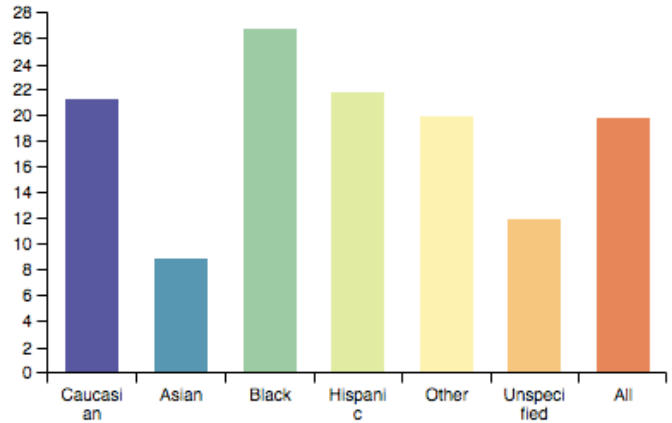


Obesity in Adults

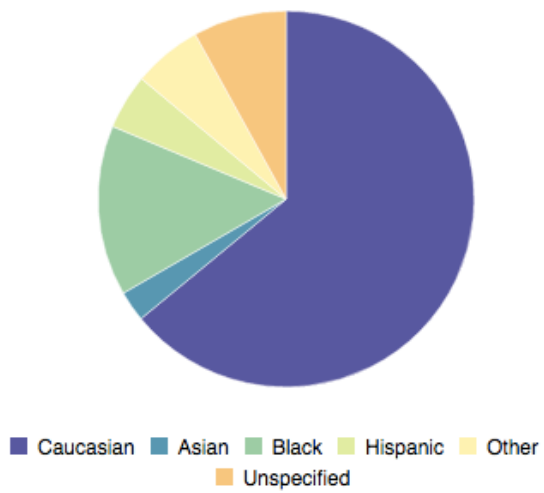
- Map
- Demographics & Comorbidities
- Timeseries
- Continuity of Care
- Condition Definitions
- About MDPHnet
- Logout

Massachusetts

Prevalence of the Selected Outcome by Race

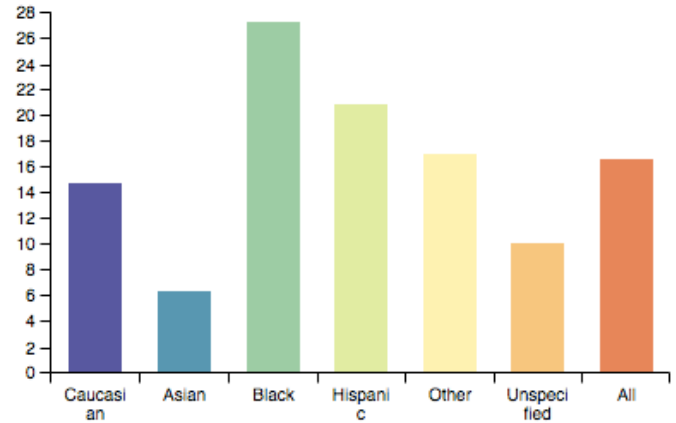


Race of Patients with the Selected Outcome

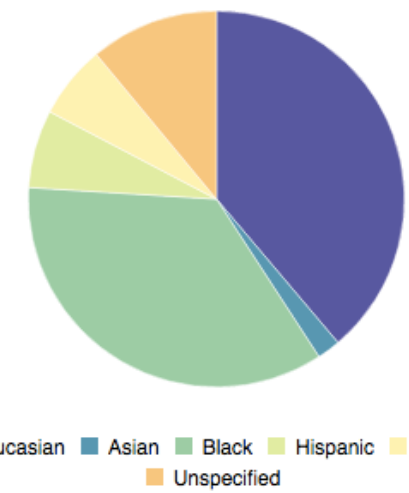


Boston

Prevalence of the Selected Outcome by Race



Race of Patients with the Selected Outcome



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Participating sites

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- **CHA**
- **Atrius Health**
- **Fenway Health**
- **PPLM**

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Questions?

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