The MDPHnet Distributed Querying Approach for Public Health

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Approach to Distributed Querying
Distributed Querying Guiding Principles

• Data partners maintain control and analyze their data
• Standardize the data using a common data model
• Data partners’ ongoing involvement is needed to interpret findings
• Little or no exchange of person-level data is needed
• Secondary use can’t interfere with primary use
• Few data elements are needed to answer most questions
• Distribute code to partners for local execution
• Provide results, not data, to requestor
PopMedNet Architecture Overview

Network Portal
- Presentation Layer
  - Public
  - Admin
- Web Services
  - Access Control
    - Security Manager
    - Roles Manager
    - Rights Manager
  - Network
    - Content Manager
    - Security Manager
    - Search Manager
- Business Objects
  - Organization
  - Project
  - User
  - DataMart
  - Workflow Manager
  - Document Manager
  - IRB Manager
  - Model Manager
  - Audit Manager
  - Archive Manager
  - Search Manager
- Models
  - Request Manager
  - Schema
  - Results Manager
  - Meta Data
- Data Source
  - Data Access
  - Portal Database

Data Partner
- DataMart Application
  - Presentation Layer
    - DataMart Administrator
  - Business Objects
    - Web Services
      - Request Manager
      - Results Manager
      - Security Manager
      - Connection Manager
  - Data Manager
    - Data Source Manager
    - Data Source Database
  - Data Partner Host
    - Data Source
      - Common Data Model
      - EMR Database
  - Archive Data Vault
    - Repository
    - Database

Internet

Researchers

Network Administrators
### PopMedNet Architecture – Deployment Overview

**PopMedNet Portal**
- **DMZ**
- **Non DMZ (Internal Components)**

**FISMA Compliant Data Center**
- User and DataMart Provisioning and Administration
- DataMart Management (Metadata, Authorization)
- User Account Management (Groups/Roles/User Accounts)
- Workflow
- Job Scheduling
- Request/Response Mgr
- User Interface

**Data Partner Organization**
- Data Mart Client
- Data Source (Common Data Model)
- Optional Site to Site VPN
- DataWarehouse/Repositories

**Network Security (IDS/IPS, VPN/RSA)**
- Web Servers/Reverse Proxies/Load Balancers

**Internet**
- HTTPS, TLS

**System Administrator (Two Factor AuthN)**

**Data Administrators & Reviewers (Two Factor AuthN)**

**Investigator**

**DMZ**

**Observer**

**Enhanced Investigator**

**Optional**

**REST**

**ETL**

**Audit**

**HTTPS, Mutual TLS**

**PopMedNet Portal**

- **PMN Software** – Supports multiple deployment models
  - Agnostic to data center infrastructure and complements existing network infrastructure
  - VM based deployments enabling ease of disaster recovery and planning
  - Seamless overlay of VPN Connections (Remote Access, Site to Site, Two Factor User Authentication)
  - Supports consolidation of remote sites into the data center for central management (Data Partner Components can be hosted in a central data center similar to the PMN Portal)
  - Secure End to End connection (Encrypted Transport using X.509 certificates)
  - Supports industry standard RBAC configuration for users
  - Supports Data Source provisioning based on RBAC and additional data source specific metadata
  - Data Partners execute queries using PULL model instead of PUSH model
PopMedNet Design Features

- Any data model from any source
- Flexible and secure distributed querying options
  - Execution of custom analytic code
  - Menu-driven queries
- Role-based access control
- Data partner autonomy
- Query execution options from fully automated to manual
- Auditing
- Software-enabled governance
Security Features

• FISMA compliant tier III data center
• 3rd-party secure audit completed
  – **Enhanced system procedures**
    • Securely store credentials as Salted Hashes
    • No maximum password length, require expiration, enforce history
    • Use cryptographically secure random values for session IDs (.Net Type 4 GUID)
    • Cookies marked as ‘SECURE’, ‘SESSION’ & ‘HTTPONLY’ and the cookie domain
  – **Transmission**
    • Require/force Secure Socket layer (SSL) for all communications
    • Enable strongest cipher suites and Transport Layer Security (TLS) versions
  – **Web Service and Portal Authorization**
    • Ensure all submissions are performed via POST method
    • Do not publish WSDL
    • Limit the number and size of file submissions
• Passed multiple independent security audits and penetration tests

- Provides secure, customized, private portals, and file transfer capabilities that allow users to query data held by disparate partners
- Allows participating partners to maintain physical and operational control over their data
- Supports both menu-driven analyses and distribution of complex analytic programs
- Accommodates any network size, from single datasets held by two organizations to multi-year projects encompassing dozens of organizations and multiple projects
- Accommodates any data model
- PopMedNet allows users to send questions to the data

www.popmednet.org
Existing Networks
PopMedNet Networks

- SPAN: Scalable PArtnering Network for CER (AHRQ)
- PEAL: Population-Based Effectiveness in Asthma and Lung Diseases Network (AHRQ)
- Mini-Sentinel (FDA)
- HMO Research Network (HMORN)
- MDPHNet (ONC): MA Department of Public Health
- Several ONC QueryHealth Pilots
Implementing *MDPHNet*
MDPHnet Overview

- Funded by ONC and coordinated by MA eHealth Collaborative (MeHI)
- Distributed public health surveillance query capability for Massachusetts DPH
  - Menu-driven query capability
- Based on the ESP data model (esphealth.org) that is used for other public health surveillance systems
- 2 large medical group practices represents ~1million patients and hundreds of clinics
  - Mass League of Community Health Centers
  - Atrius Health
- Go-live planned for November 2012
• MDPHnet Governance Rules Document developed and approved by all stakeholders

• Governance document describes:
  – Overview of network activities and types of participants
  – Scope and use cases
  – Current organizational structure
  – Guiding principles
  – Network implementation policies (e.g., Network roles, query types, expectations for member organizations, DataMart settings, security policies)
  – Network usage
MDPHnet Phased Implementation

✓ Phase I
  - Menu driven ad-hoc querying
  - Request scheduler functionality

✓ Phase II
  - Diabetes and ILI report query types
  - Enhancements to menu-driven querying
  - Granular access control
  - Project Management functionality
MDPHnet Screenshots
Portal Login
PopMedNet Architecture – Deployment Overview
### PMN Dashboard

- **What's New**
  - **Notifications**
    - Date  Event  Message
    - No Notifications

- **Requests**
  - **Name**  **Id**  **Date**  **User**  **Status**  **Type**
  - ICD-9 Diagnosis - 98  206  08/22/2012 10:26 AM  MSullivan  Draft  ICD-9 Diagnosis
  - ICD-9 Diagnosis - Mike test  202  08/21/2012 03:56 PM  MSullivan  4/6 completed  ICD-9 Diagnosis
  - Incl. ICD-9 Diagnoses (3 digit codes) - 11  201  08/21/2012 03:54 PM  MSullivan  Draft  Incl. ICD-9 Diagnoses (3 digit codes)
  - Incl. ICD-9 Diagnoses (3 digit codes) - 8  165  08/16/2012 07:04 PM  MSullivan  Draft  Incl. ICD-9 Diagnoses (3 digit codes)
  - Incl. ICD-9 Diagnoses (3 digit codes) - TE  128  08/15/2012 07:16 AM  MSullivan  1/2 completed  Incl. ICD-9 Diagnoses (3 digit codes)
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  - ICD-9 Diagnosis - 43  67  08/08/2012 11:16 AM  MSullivan  Draft  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1  8  08/02/2012 09:38 AM  MSullivan  Scheduled  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy 8)  47  08/02/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy 7)  40  08/01/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy 6)  35  07/31/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy 5)  26  07/30/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy 4)  22  07/29/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
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  - ICD-9 Diagnosis - 1 (Copy 2)  16  07/27/2012 08:00 AM  MSullivan  Completed  ICD-9 Diagnosis
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  - ICD-9 Diagnosis - 4  11  07/26/2012 06:33 PM  MSullivan  Approval  ICD-9 Diagnosis
  - ICD-9 Diagnosis - 1 (Copy)  9  07/26/2012 04:37 PM  MSullivan  Approval  ICD-9 Diagnosis
Select A Request Model
Select A Request Type

Multiple request types available:

- Menu-driven Query
- Several query types
- File Distribution
Set Request Parameters Via Forms
Set Request Parameters Via Wizards

Search by specific code (including decimal, for 4 and 5 digit codes), range of codes (e.g., 250-251, 250.1-255.1, or 296.00-296.99) or keyword to identify codes for the query; wildcards (*) can be used. Select up to 10 codes.

The code set used for the specifications for HCPCS, ICD-9 Diagnosis (3, 4 and 5 digit) and ICD-9 Procedure (3 and 4 digit) query types are provided by Ingenix, Inc.

Search Results

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<tr>
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<th>Name</th>
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<td>250</td>
<td>DIABETES MELLITUS</td>
</tr>
<tr>
<td>250.0</td>
<td>DIABETES MELLITUS WITHOUT COMPLICATION</td>
</tr>
<tr>
<td>250.00</td>
<td>DM - DIABETES MELLITUS</td>
</tr>
<tr>
<td>250.01</td>
<td>DM - TYPE 1 DIABETES MELLITUS</td>
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<tr>
<td>250.02</td>
<td>DM - TYPE 2 UNCNTRLD</td>
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<td>250.03</td>
<td>DM - TYPE 1 UNCNTRLD</td>
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<tr>
<td>250.1</td>
<td>DIABETES WITH KETOACIDOSIS.</td>
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Selected Codes

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Set Request Scheduling
Select Data Providers to Query

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<th>Organization</th>
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<tr>
<td>LPP - Atlanta Manual DM</td>
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<td>LPP - Boston Manual DM</td>
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<tr>
<td>LPP - India Auto DM</td>
<td>LPP - India</td>
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</tbody>
</table>

Submit | Save | Copy
### DataMart Administrator Processes Request

#### Administrative Workflow In Box

![DataMart Client Image](image)

<table>
<thead>
<tr>
<th>DataMart Name</th>
<th>Priority</th>
<th>Due Date</th>
<th>Request Id</th>
<th>Created By</th>
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*Page size: 25*
DataMart Administrator Processes Request

Administrator Can Review Query Input...
DataMart Administrator Processes Request...

...and output, and sends results back to the requestor.
Results Upload to Portal
Requester Views the Results

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<th>Code</th>
<th>Description</th>
<th>5 Year Age Group</th>
<th>Sex</th>
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<th>Race</th>
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<td>Center N-Z</td>
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Or Downloads
Thank You

• For more information:
  – PopMedNet: popmednet.org
  – ESP: esphealth.org
  – Query Health: queryhealth.org
Engagement with National Initiatives
PopMedNet and National Standards

- PMN is a key component of the ONC’s QueryHealth Initiative

- ONC national standard for distributed querying
  - QueryHealth Initiative uses PMN as the distributed querying platform for policy and governance

PMN Implements HHS ONC Query Health
<table>
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<th>RI Queries</th>
<th>RI Policy Layer</th>
<th>Data Sources</th>
<th>Kickoff</th>
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<td>i2b2</td>
<td>PMN</td>
<td>RHIOs EHR Vendor</td>
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<td>FDA Mini-Sentinel</td>
<td>Use of clinical data sources for FDA questions</td>
<td>PMN</td>
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<td>CDC</td>
<td>National / regional: Disease syndromes - Situation awareness</td>
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<td>Mass. Dept. of Public Health</td>
<td>Diabetes</td>
<td>PMN</td>
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Query Health Pilot: MDPHnet

✓ Implement the Query Health Query Envelope standard
  - Standardize Privacy and Security
  - Query agnostic, content agnostic, facilitates privacy guidance from HIT Policy Committee

✓ Map ESP to the Query Health Clinical Element Data Dictionary
  - Query against the CEDD in addition to ESP

✓ Use Health Quality Measures Format (HQMF) to issue a query
  - Standardize Structure
  - Query format for distributed population queries to work across diverse platforms