User Gateway

Resolving geographic disparities in human health

Maine Institute for Human Genetics & Health
Institut de Génétique Humaine et de Santé du Maine

PERSISTENT
Partners in Innovation

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Presentation Outline

User Gateway: Novel software to enhance population health and gain insight into health disparities	
Introduction Rationale underlying User Gateway software	*Janet*
User Gateway: principles & use cases	*Chris*
Summary	*Janet*
Discussion with TATRC on commercialization path	*All*

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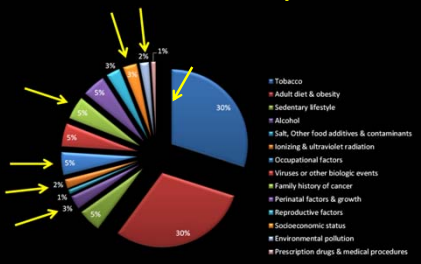
Composite Disease Risks in a Population



- Majority of cancer deaths due to preventable risks – tobacco, obesity/energy balance, alcohol, infectious agents
- Approx 50% of all cancers and cancer deaths can be prevented by modifying personal behaviors. *American Association for Cancer Research Cancer Progress Report, 2011*

- ❑ How to compile data and models for composite risk assessment?
- ❑ Can changing profiles of risk for population subsets explain disparities?

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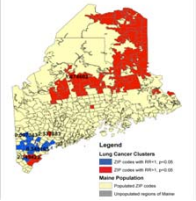
Lifestyle Risks: Population Level

Squamous Cell Lung Cancer



Hosgood, Farah, Schwenn, Black, Hock. 2012.

- Geographic health disparities not understood
- Squamous cell lung cancer linked to smoking

BUT

- Data on tobacco disease at individual level not consistently recorded for a population

To develop effective risk assessment and prevention, need to map known lifestyle risks over patient's life prior to disease diagnosis

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Geographic and Gender Disparities

- Geographic disparities in disease not understood
- Data on timing, duration and "dose" of environmental exposures over geography enhances
  - interpretation of genomic variations and mutations
  - Integration of composite environmental risks

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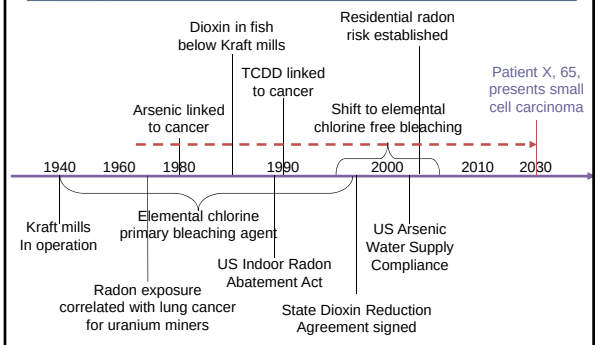
Timing of Environment Exposures over Lifetime



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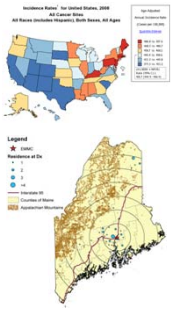
Prototype Software & Data Created in Maine



- Maine is a predominantly rural and non-industrial state with a stable population of 1.4 million and very low in- and out-migration.
- Geographic health and cancer disparities
- Geology defines regions of radon and arsenic exposures
- Strong geospatial expertise at University of Maine
- Publicly available maps with geographic and time-limited land use data standardized for spatial overlays
- MIHGH BioGeoBank generated unusually rich phenotype and lifestyle risks data on a subset of cancer patients linked to geocoding of residences, and occupational and military service histories.
- MIHGH scientists found population-level geographic, histopathology and gender disparities in lung cancer and respiratory diseases in Maine

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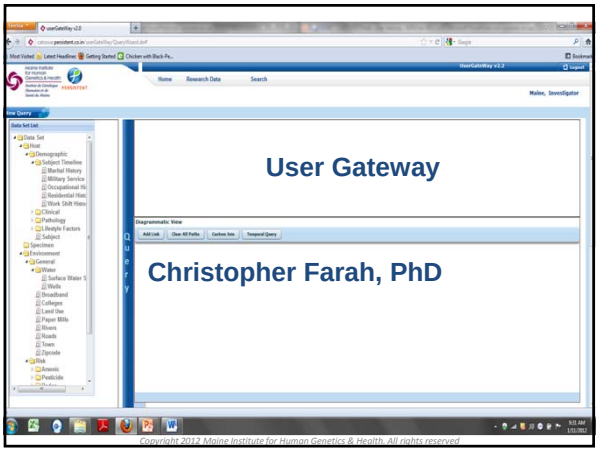

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User Gateway

A standards based visual query platform supports population health management and assessment of health disparities by integrating genomic and composite health risks with EMR data, lifestyle measures, environmental attributes, location attributes, and clinical outcomes bounded by geography and time.

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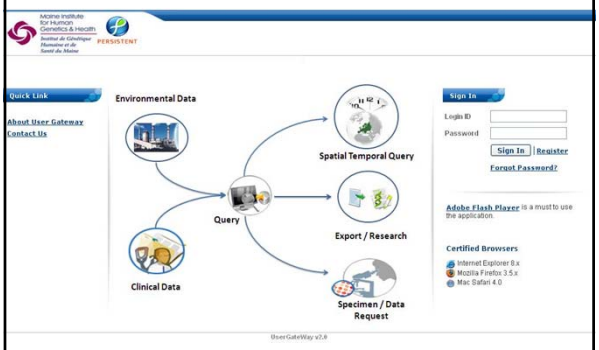
User Gateway



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User Gateway: Data Integration

- Patient Self-Report Attribute
- Lifestyle Risk Attribute
- Environment Risk Attribute
- Location Attribute
- Clinical Data
- Genomic Data
- Standards Based
- Time Bound

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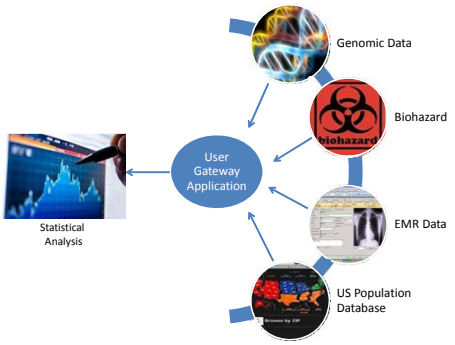
Distributed Integration



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Tools and Technologies

Software	Version	Type
Windows	XP SP3 / 7	Server and client
Ant	1.7	Build tool
JBoss	4.2.2 GA	Application server
JDK	1.5	Java
PostgreSQL	8.4	Database
PostGIS	1.5	PostgreSQL Database GIS Extension
Pentaho DI (Kettle)	4.0.1	ETL Tool
CSM	4.2	Common Security Module
GeoServer	2.0.2	GIS Server
OpenLayers	2.10	Java Script Map API
mdlogix CRMS	2012.1	Source Clinical Database

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Capabilities

- Sophisticated Authentication and Authorization support
- Adheres to caBIG compliance standards
- SNOMED Based Ontology Support
- Custom Ontology Configuration capability
- Web based platform
- Highly configurable
- Allows easy data export to SAS tools
- Allows Map Toggling
- Poly line support to track migration paths

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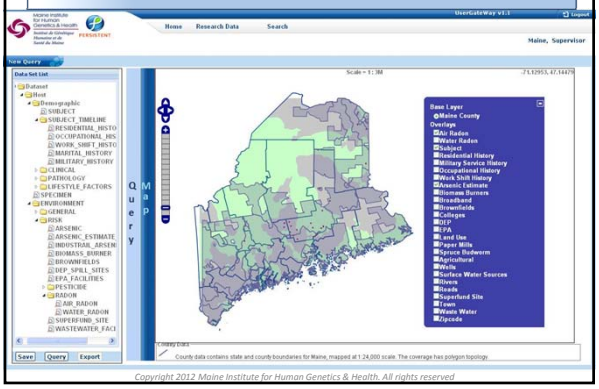
Browsing the GIS Layers



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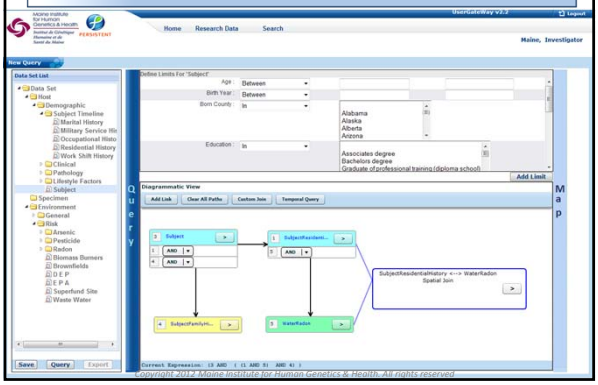
Constructing the Query



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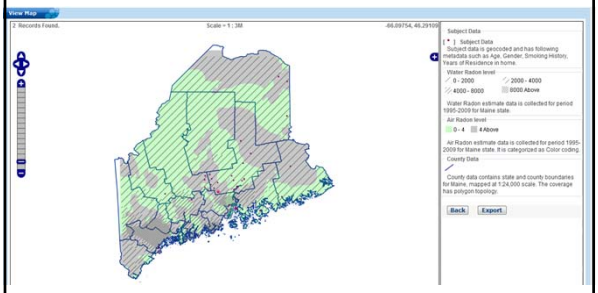
Map of the Query Return



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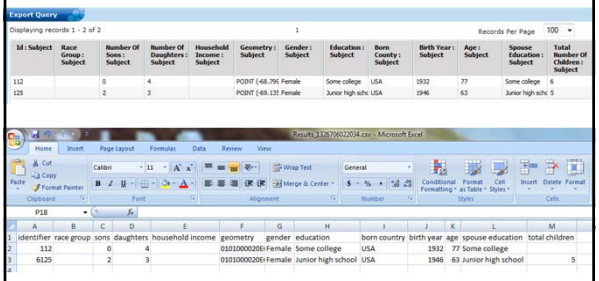
Data Export of the Query Return



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Software Demonstration

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