GIS for Targeted Clinical Preventive Services


ESRI Health GIS Conference
September 8, 2011
Presentation Overview

- **Project background**
  - Environmental Medicine and Educational Services Branch
  - Geospatial Research, Analysis, and Services Program
  - Michigan Pilot

- **Data acquisition and analysis**
  - Environmental contaminants of concern
  - Physician data

- **Preliminary results**

- **Next steps**
PROJECT BACKGROUND
Project Background

- Geospatial Research, Analysis and Services Program
  - Largest geospatial unit
  - Diverse expertise

- Environmental Medicine and Educational Services Branch
  - Diverse expertise
  - Case studies in environmental medicine
    http://www.atsdr.cdc.gov/csem/csem.html
Clinical Preventive Services

- "Preventive Care Guidelines are standards of care developed to encourage the appropriate provision of preventive services to patients, according to their age, gender, and risk-status.”*

- **Infants**
  - Physical exams, immunization, developmental and behavioral assessments, lead

- **Young Adults**
  - Scoliosis, STIs, TB

- **Adults**
  - ECG, mammogram, PSA/DRE, lipid panel

- **Limited awareness for environmental risk factors**

* [http://www.bcbsnc.com/content/providers/guidelines.htm](http://www.bcbsnc.com/content/providers/guidelines.htm)
Michigan Pilot Project

- Multiple partners in Michigan
- BCBS trainings
  - Asbestos
  - Arsenic
  - Radon
  - Exposure history
- 561 physicians completed training
- Costs effectiveness
- 1 cancer case identified
Expansion of Pilot Project

- Investigate other potential environmental hazards in Michigan
- Focus on environmental hazards with known cancer endpoints and preexisting case studies in environmental medicine
- Consider pediatric populations and other vulnerable populations
DATA ACQUISITION
Data Acquisition

- Contaminants of concern
  - Benzene
  - Beryllium
  - Cadmium
  - Chromium
  - Vinyl chloride
Data Acquisition

- **Data sources**
  - EPA’s National Priority List Sites
  - EPA’s Toxic Release Inventory
  - ATSDR Site Work
PRELIMINARY RESULTS
National Priority List Sites in Michigan by Contaminant of Concern

- Benzene: 33 sites, 1,504,978 people within 5 miles
- Beryllium: 12 sites, 919,486 people within 5 miles
- Cadmium: 30 sites, 1,432,478 people within 5 miles
- Chromium: 36 sites, 1,480,851 people within 5 miles
- Vinyl Chloride: 33 sites, 1,523,613 people within 5 miles
- All Sites: 50 sites, 1,716,034 people within 5 miles

Legend

- NPL site
Toxic Release Inventory

- Emissions for all chemicals of concern
- Limited by self-reporting
- Assumptions about exposures
Locations of TRI Facilities and NPL Sites Reporting Benzene Emissions

**TRI Facilities**
- 33 sites
- 2,793,221 people within 5 miles
- 79585.5 pounds (air)

**NPL Sites**
- 33 sites
- 1,504,978 people within 5 miles
Locations of TRI Facilities and NPL Sites Reporting Beryllium*

Emissions

TRI Facilities

- 2 sites
- 377,614 people within 5 miles
- 32 pounds (air)
- 37 pounds (surface)

NPL Sites

- 12 sites
- 919,486 people within 5 miles

*TRI reports beryllium compounds
Locations of NPL and TRI Facilities Reporting Cadmium Emissions

TRI Facilities

Legend

1 site 2,662,22 people within 5 miles
1 pound (max onsite)

NPL Sites

Legend

30 sites 1,432,478 people within 5 miles

Legend

- TRI facility
- NPL site
Locations of TRI Facilities and NPL Sites Reporting Chromium Emissions

TRI Facilities

Legend

- TRI facility

78 sites 4,247,505 people within 5 miles

NPL Sites

Legend

- NPL site

36 sites 1,480,851 people within 5 miles
Locations of TRI Facilities and NPL Sites Reporting Vinyl Chloride Emissions

**TRI Facilities**
- 1 site
- 48,257 people within 5 miles

**NPL Sites**
- 33 sites
- 1,523,613 people within 5 miles
Locations of TRI Facilities and NPL Sites Reporting Emissions of All Contaminants of Concern

TRI Facilities

Legend

- TRI facility

115 sites 5,252,878 people within 5 miles

NPL Sites

Legend

- NPL site

50 sites 1,716,034 people within 5 miles
Additional Data

- **ATSDR Site Work**
  - Completed exposure pathways
  - 6 sites since 2008
  - 1 vinyl chloride
  - Site boundaries and exposure data

- **Physician continuing education**
Ratio of Physicians Completing Case Studies in Environmental Medicine Training to Population Residing within 5 miles of NPL Sites

Legend
- NPL site
- 0
- 0.01-0.13
- 0.14-0.74
- 0.75-1.28
- 1.29-333.33

Legend
- Physician Locations
NEXT STEPS
Next Steps

- **Population focused analyses**
  - 2010 US Census data

- **Additional data sources**
  - Meteorological
  - Groundwater

- **Explore physician distribution**
  - Blue Cross Blue Shield
  - National Provider Index
  - Identify gaps

- **National expansion**
  - Arsenic
  - Radon
  - Pesticides
  - Particulate Matter
## Surface Data, Hourly Global: Summaries (DS3565)

### ISD Summary
POR 01/01/2005 - 12/31/2009
Wind Summary for 99798899999/BIG BAY
2005/01/01 00:00 to 2009/12/31 23:59
data counts = 19072

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### DETROIT CITY
5-year summary 2005 - 2009

### BIG BAY
5-year summary 2005 - 2009
EPA’s Radon Zones

http://www.epa.gov/radon/zonemap.html
Pesticide Data

1,3-D - other pesticide
2002 estimated annual agricultural use

Average annual use of active ingredient
(pounds per square mile of agricultural land in county)
- no estimated use
- 0.001 to 0.046
- 0.047 to 0.466
- 0.467 to 5.748
- 5.751 to 34.062
- >= 34.063

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USGS: http://water.usgs.gov
Particulate Matter

**Figure 4: Comparison of 4th Highest 8-Hour Ozone Values Averaged Over Three Years 2005-2007, 2006-2008 and 2007-2009**

Source: MI Department of Environmental Quality

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**PM$_{2.5}$ (Fine Particle) FRM Monitors in 2010**

Source: MI Department of Environmental Quality

**Trace Carbon Monoxide (CO) Monitors in 2010**

Source: MI Department of Environmental Quality
Particulate Matter

http://www.renci.org/focus-areas/visualization/visualization-projects/visualize-particulate-matter
Thank you!

For more information please contact:
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Web:  http://www.atsdr.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Agency for Toxic Substances and Disease Registry.