

SDOH Integration into Syndromic Surveillance and Emergency Response Systems

December 2016 ISDS

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Knowledge Management KFLA Public Health , Ontario, Canada

Conflict of Interest Declaration

Presenters: Kieran Moore, Paul Belanger

-No commercial interests

- Employee of KFL&A Public Health
- Not a member of a speakers' bureau
- Web tools are free!

Agenda

- SDOH mapping and introduction to deprivation indexes
- Public Health Information Management System (PHIMS)
 - Why?
 - Demonstration
 - Identifying vulnerable populations
 - Visualizing real-time health outcomes

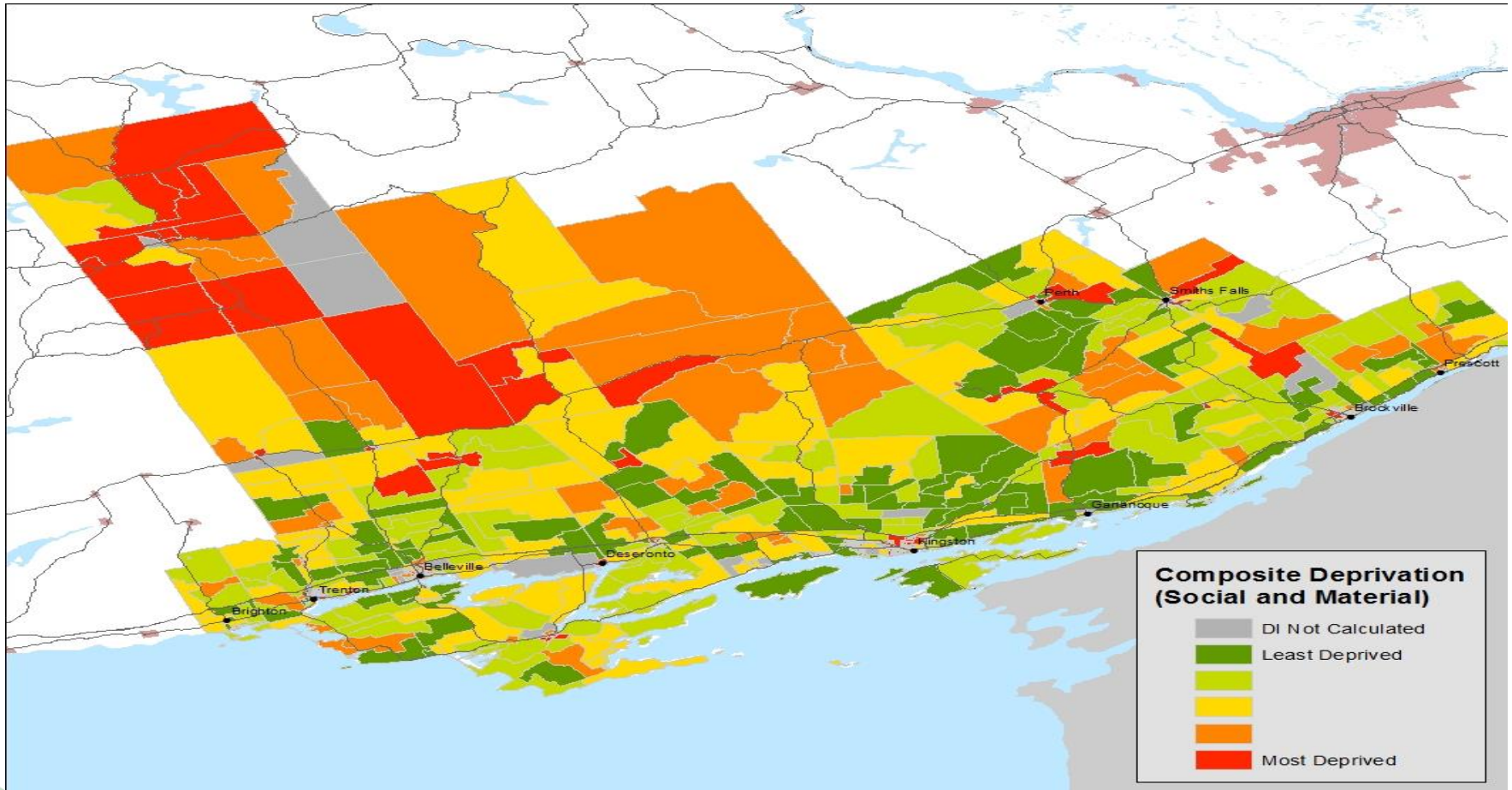
Social Determinants Lens (1)

- It is well established that health outcomes are often correlated with socioeconomic and geodemographic markers.
- Much research of late has focused on unpacking these relationships and the empirical evidence is often compelling.
- The analytical challenge is non-trivial (which variables, interaction effects, robustness, leverage, etc.)

Social Determinants Lens (2)

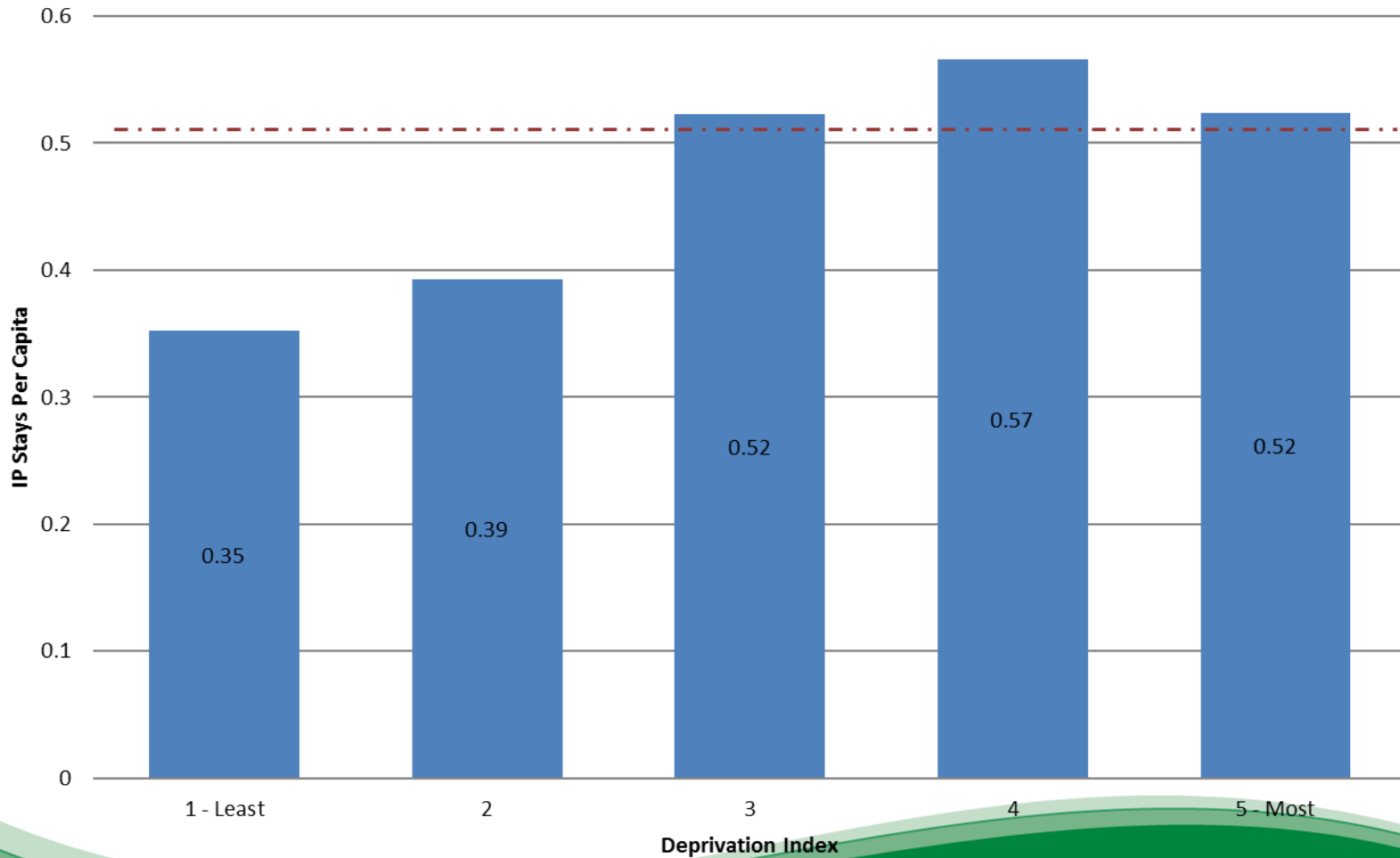
- We use a Deprivation Index created by Robert Pampalon et al. (INSPQ) that combines six (6) census variables using principal components analysis into two indices of deprivation (material and social):
 1. income
 2. employment status
 3. marital status
 4. single-headed family status
 5. education
 6. living alone
- These have been repeatedly shown to discriminate health outcomes
- All DAs in Canada have been scored

Social Determinants Lens (3) (Spatially Targeted PH Interventions)



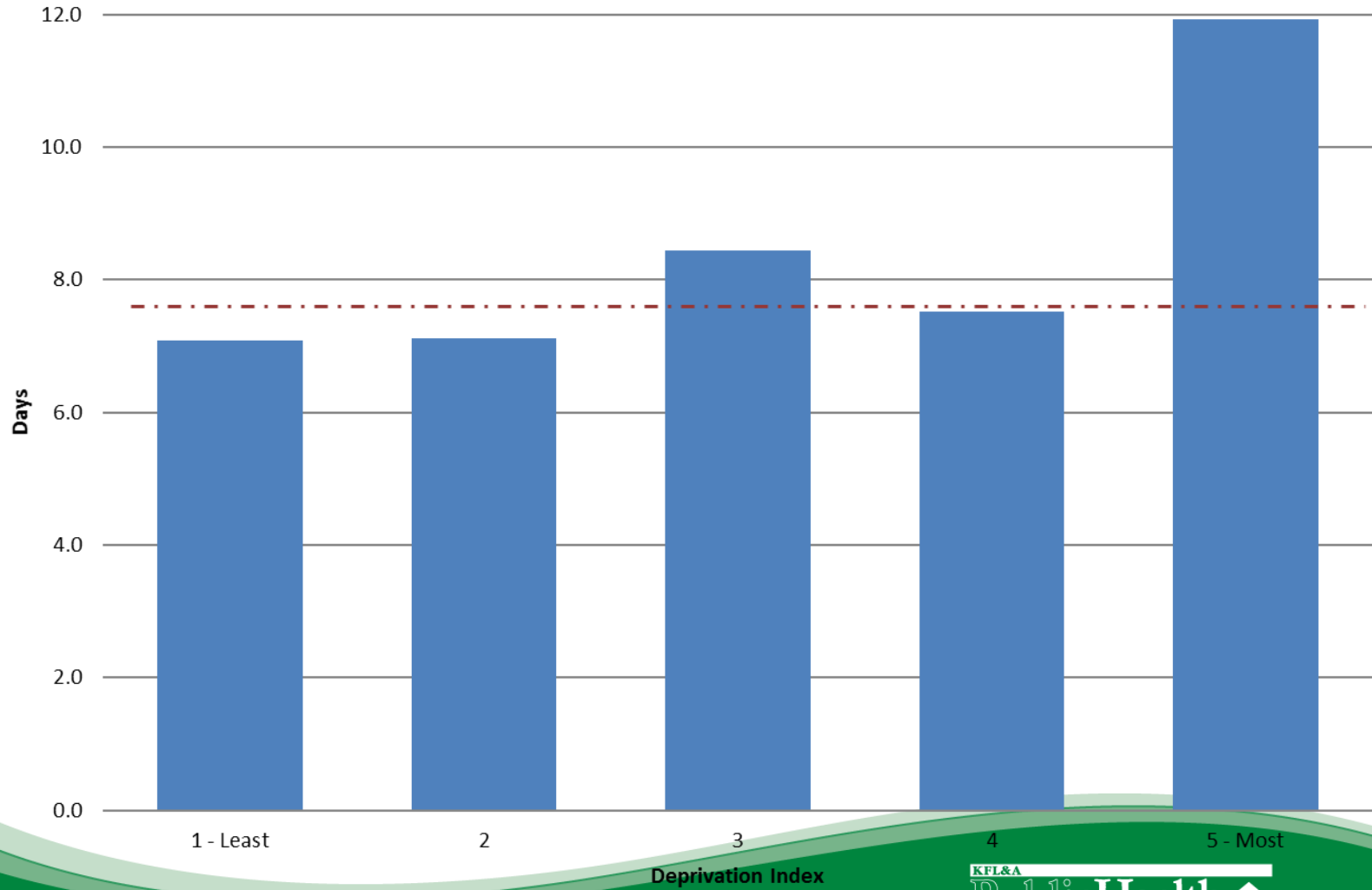
Social Determinants Lens (4)

IP Utilization Rate by DI



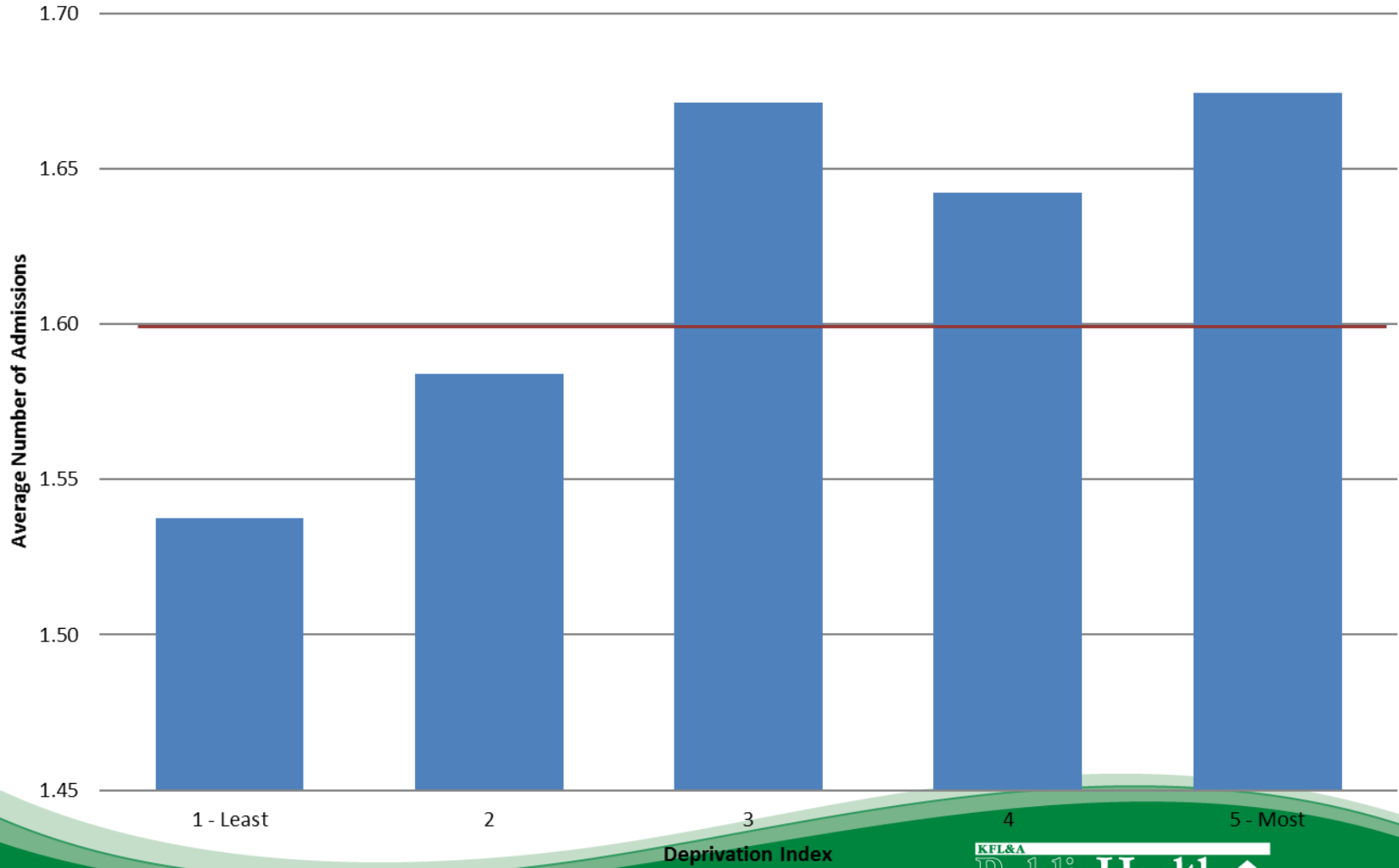
Social Determinants Lens (5)

IP Median Length of Stay by DI



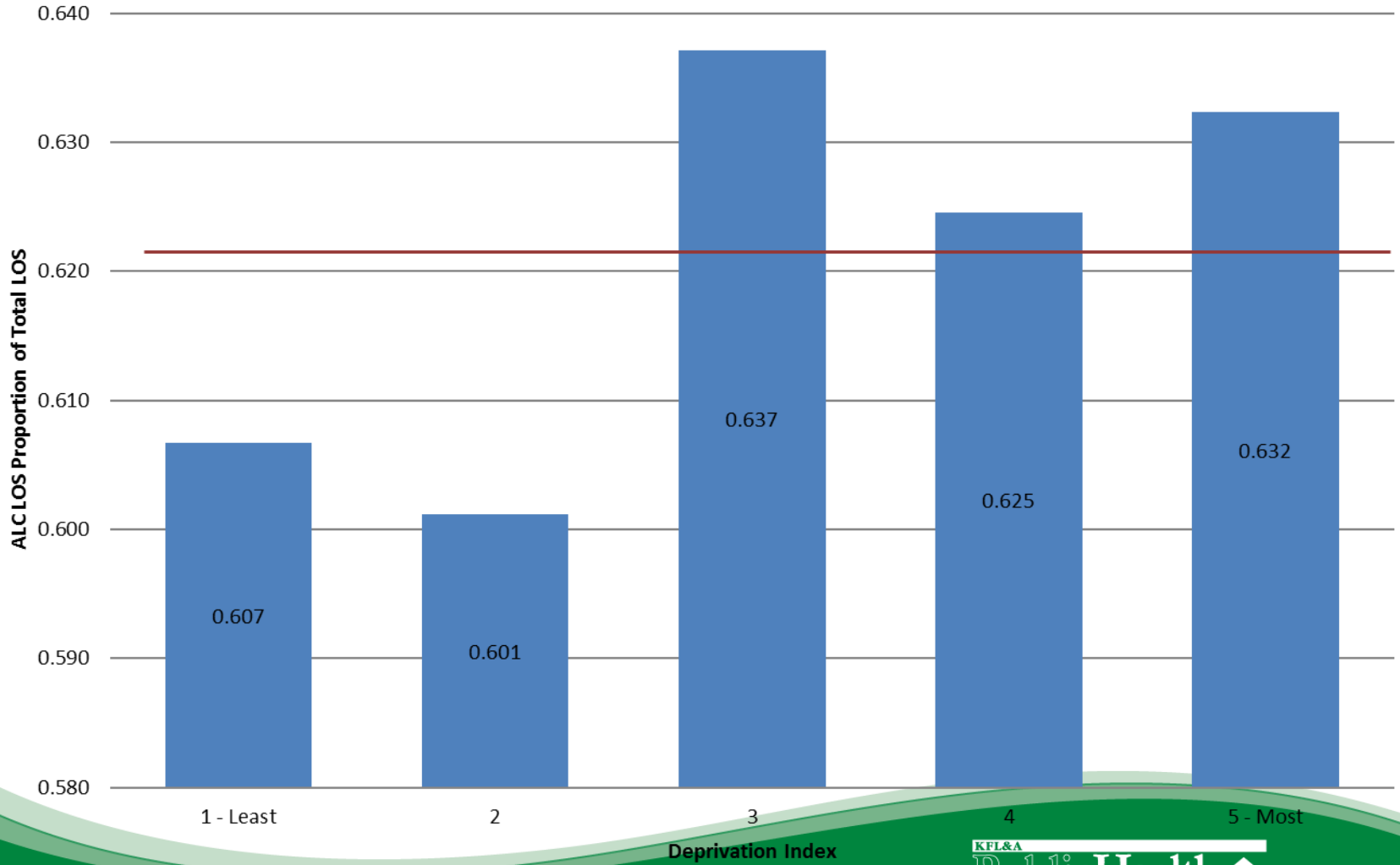
Social Determinants Lens (6)

IP Patient Usage Rate by DI



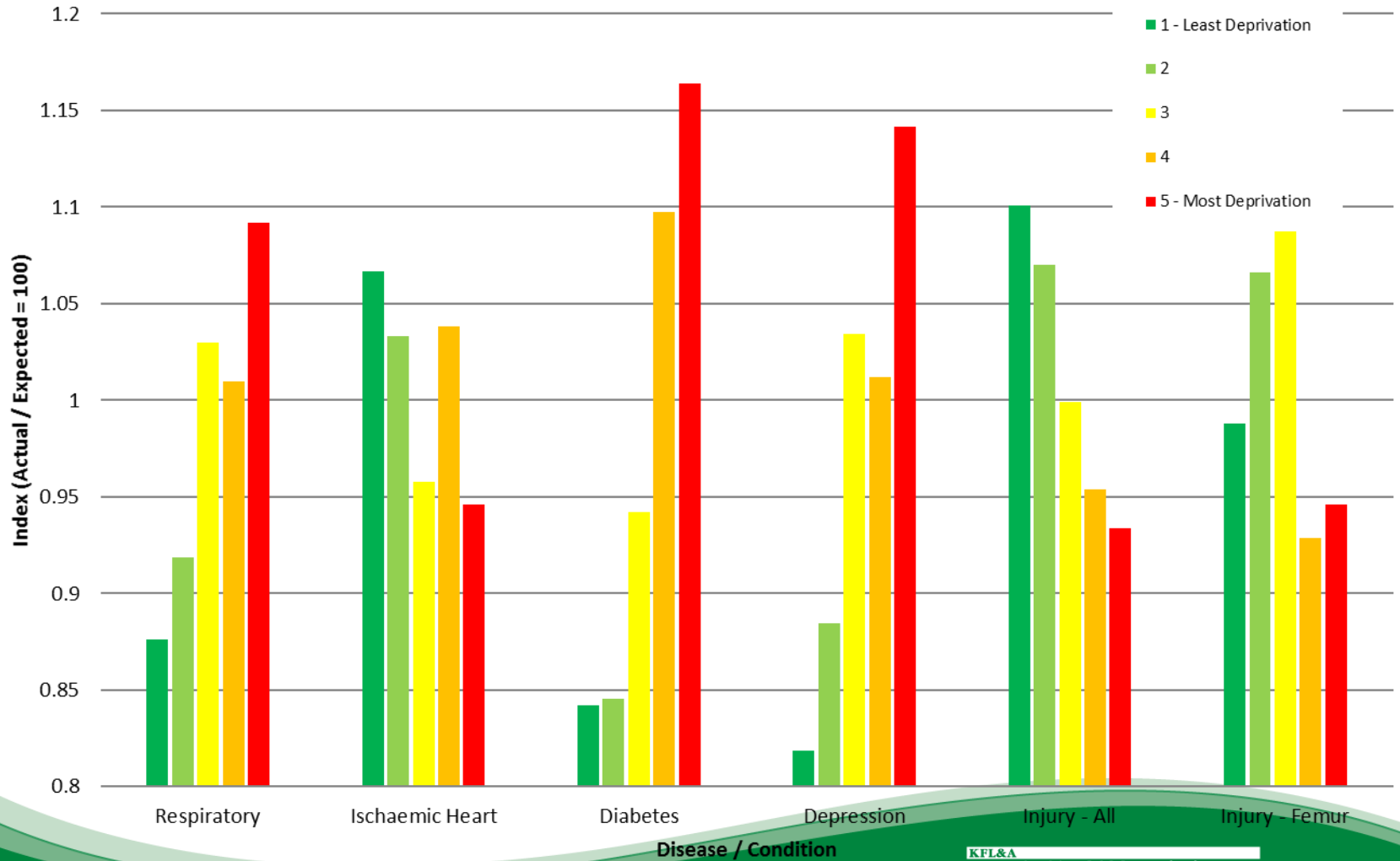
Social Determinants Lens (7)

IP ALC Stay by DI



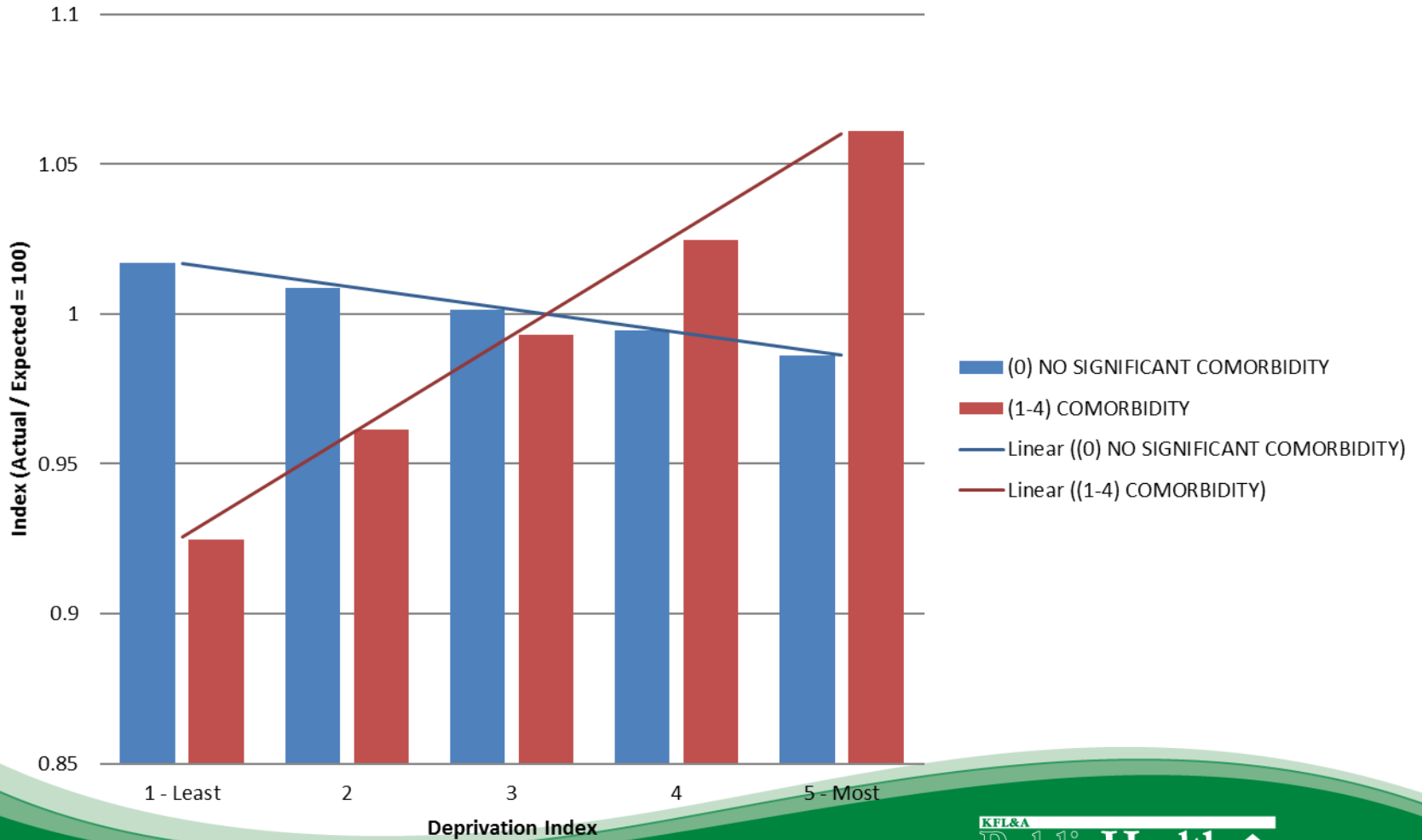
Social Determinants Lens (8)

IP Most Responsible Diagnosis (MRD) by DI



Social Determinants Lens (9)

IP Comorbidity Presence by DI



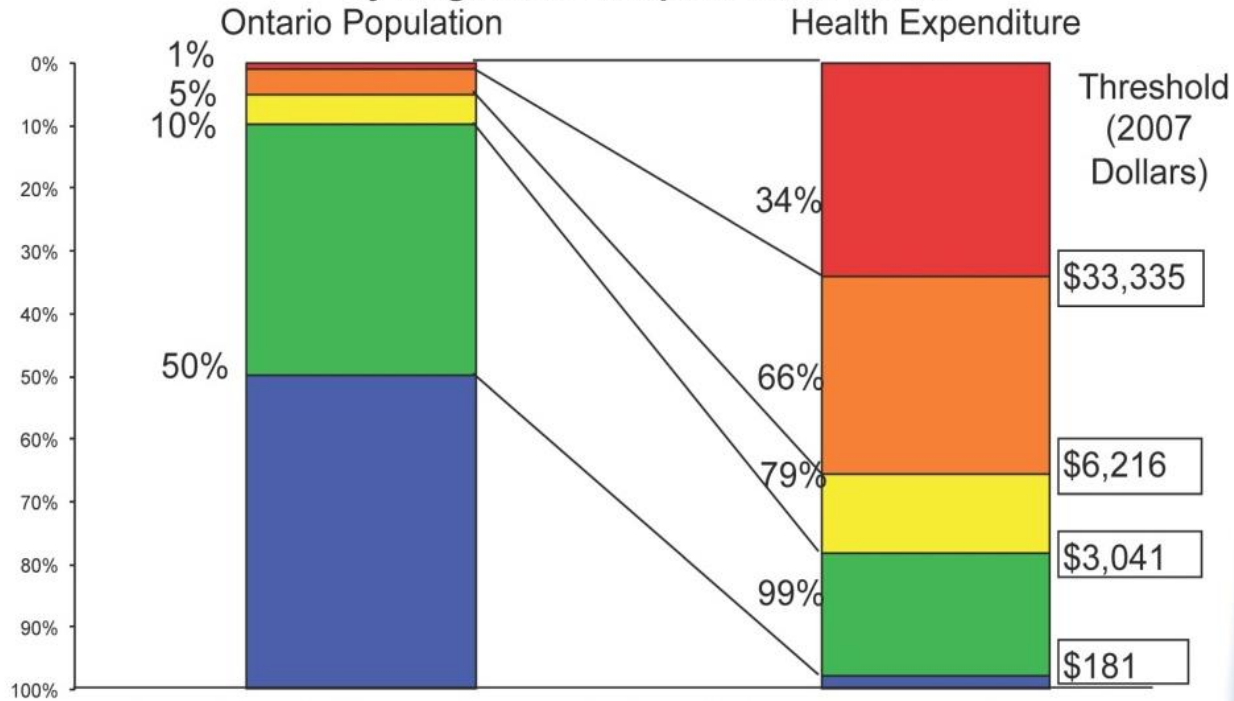
Social Determinants Lens (10)

Our most deprived populations have:

- the most in-patient stays per capita;
 - the longest stays;
 - highest number of multiple stays;
 - highest risk of converting to an ALC stay;
 - very pronounced and long-term costly conditions; and
 - the highest comorbidities.
-
- Implication → resource constraints (\$) mean that our mitigation strategies could be spread so thin as to be ineffectual if we try to spend globally; perhaps we spatially target our investment and focus on our interventions in areas of high material and social deprivation

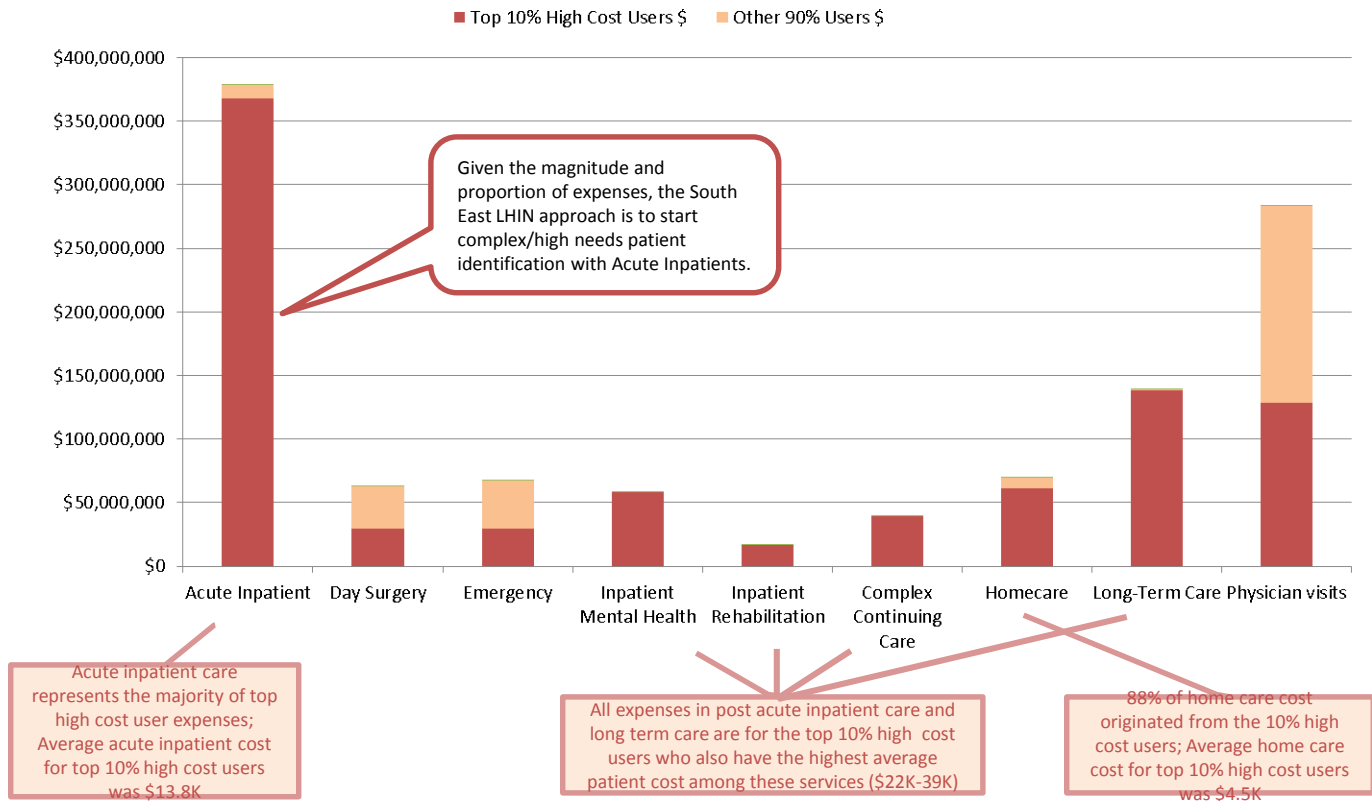
The Concentration of Healthcare Spending in Ontario

Distribution of health expenditure for the Ontario population, by magnitude of expenditure, 2007/08

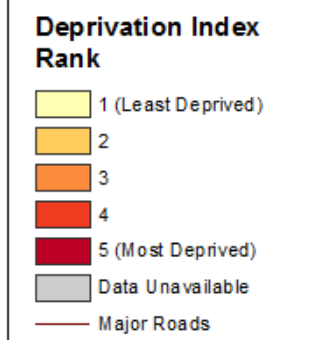
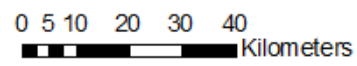
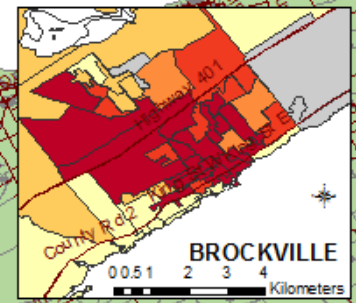
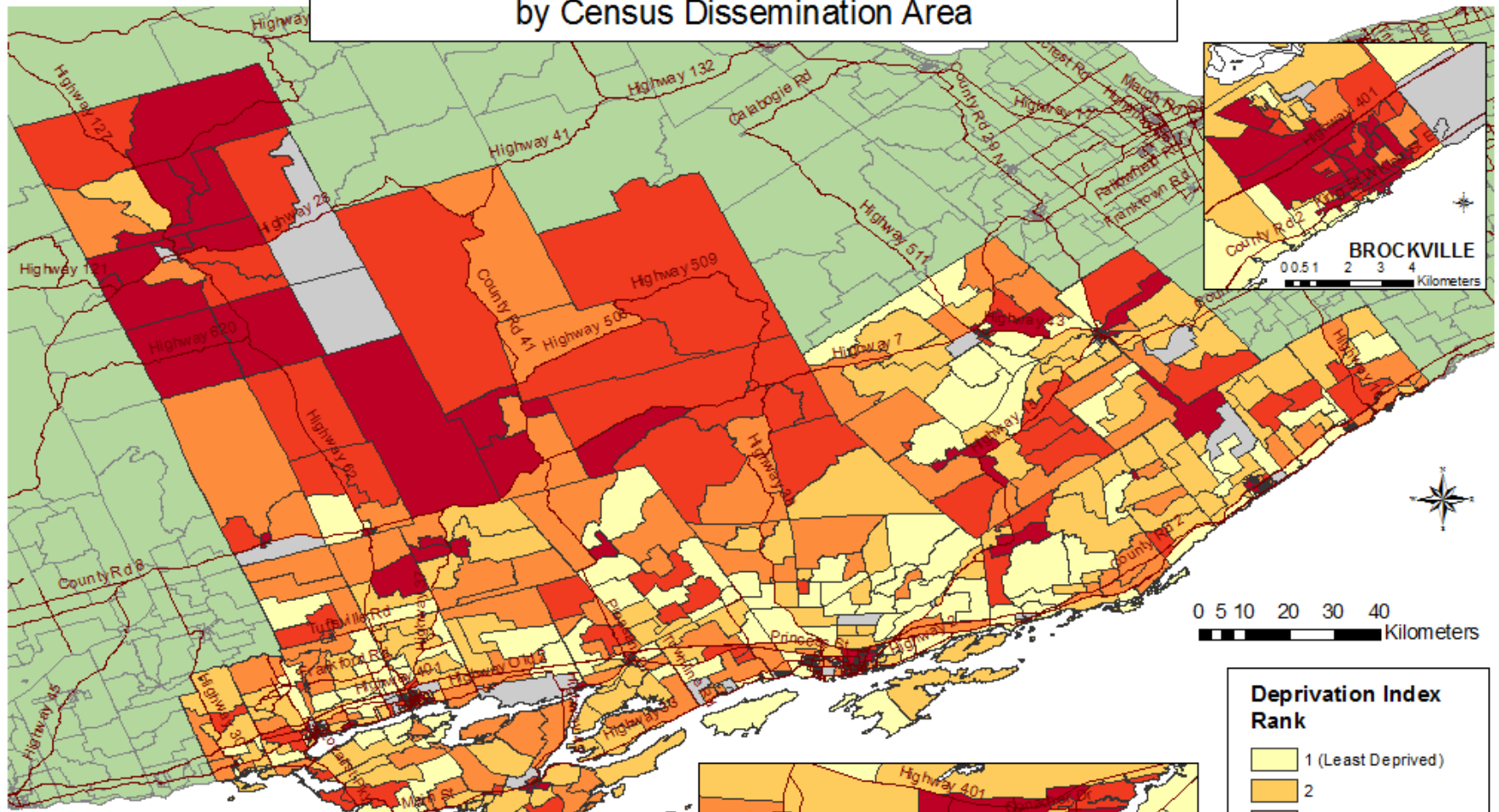


Distribution of Expenses across Health Care Types for Top 10% High Cost Users, South East LHIN, 2010/11

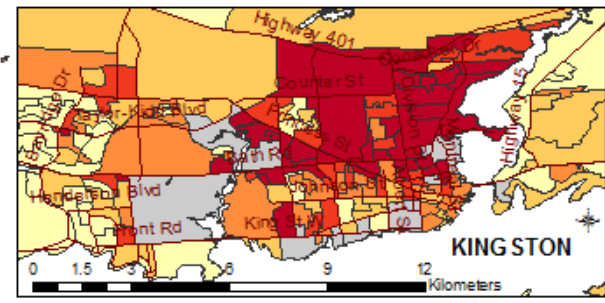
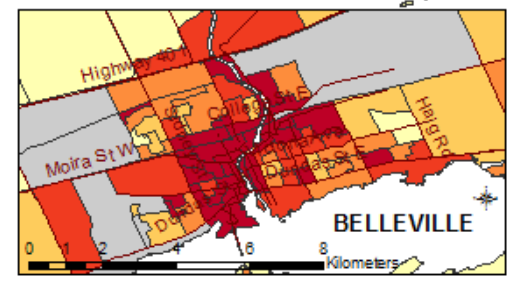
Source: Health Analysis Branch, MOHLTC



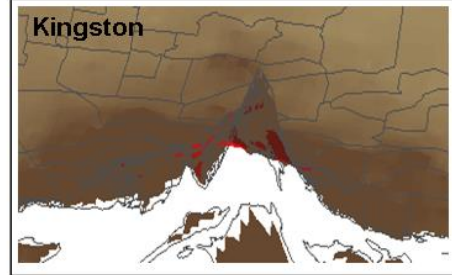
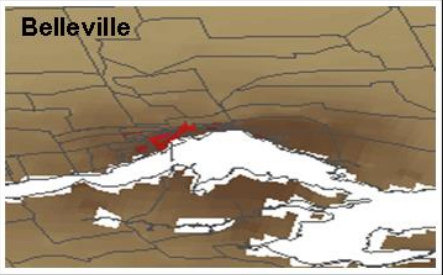
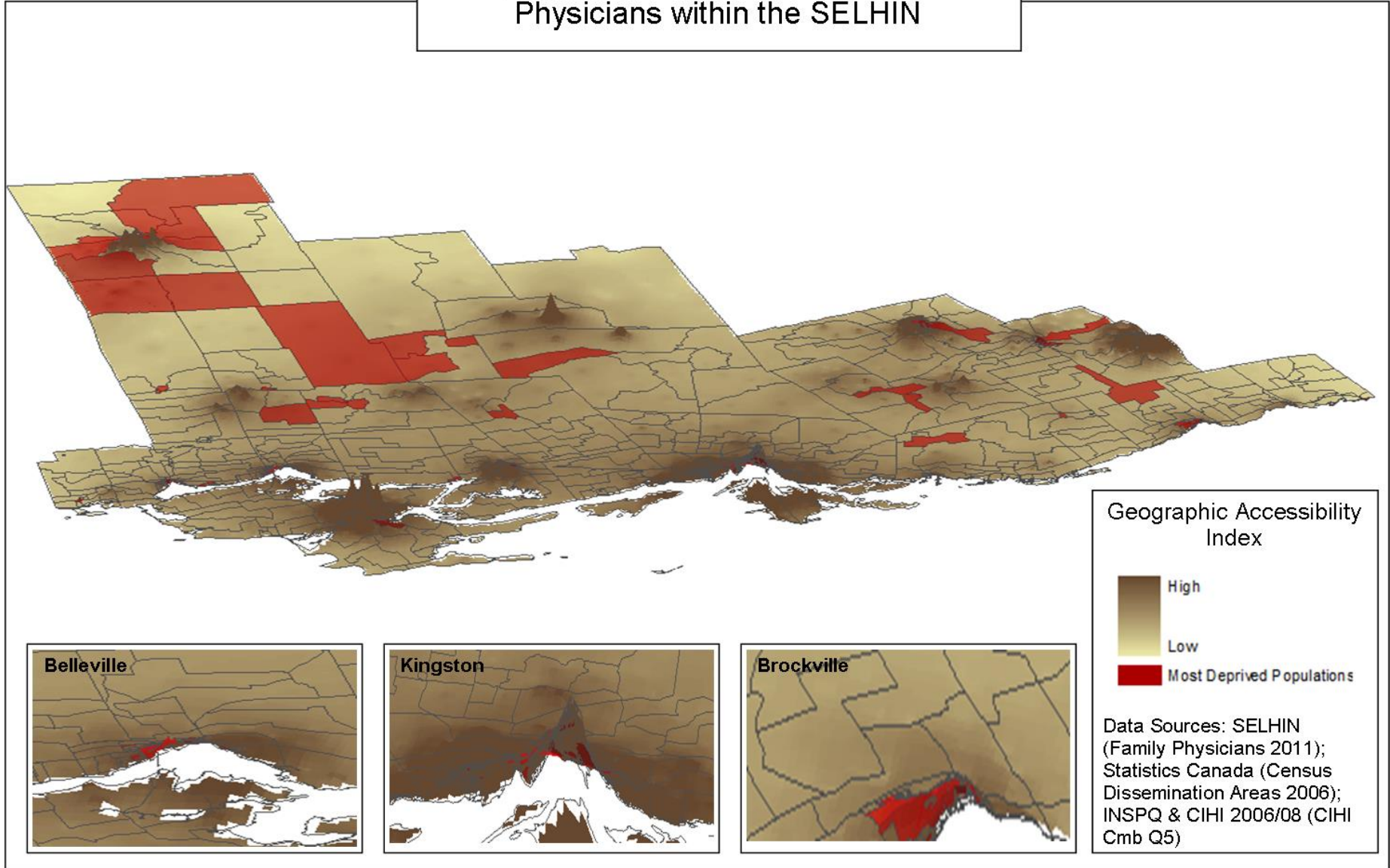
Combined Material & Social Deprivation for the SELHIN by Census Dissemination Area



Data Sources: INSPQ 2006, CIHI 2008, Statistics Canada 2006



Geographic Accessibility of Primary Care Physicians within the SELHIN



Geographic Accessibility Index

High
Low
Most Deprived Populations

Data Sources: SELHIN (Family Physicians 2011); Statistics Canada (Census Dissemination Areas 2006); INSPQ & CIHI 2006/08 (CIHI Cmb Q5)

www.phims.ca

A real time environmental health
surveillance system with population
based integrated determinants of
health layers

PHIMS – EH Rationale

- Initially designed for the senior management team for Situational Awareness/Decision support
- Geospatial portal
- Support reporting obligations, surveillance, situational awareness,
- www.kflaphi.ca

EH REAL TIME Module

- **Air Quality (both AQI and AQHI sensors)**
- **Env. Canada Weather Stations**
- **US National Weather Service**
- **Env. Canada Hydrometric Stations**
- **BlueSky Smoke Forecasting**
- **MNR Forest Fires**
- **MODIS Imagery**

ETF Products | GAM Adv | PHIMS - Login

phims.ca/auth/login

Apps | Bookmarks | PXB | Geo | Dev | PH | Analytics | Queen's U | NETGEAR Router R62 | Collaborative Passwor | Documents - RDataM | CRAN Task Views | ix2-200

Welcome to PHIMS

Situational awareness for public health decision making.

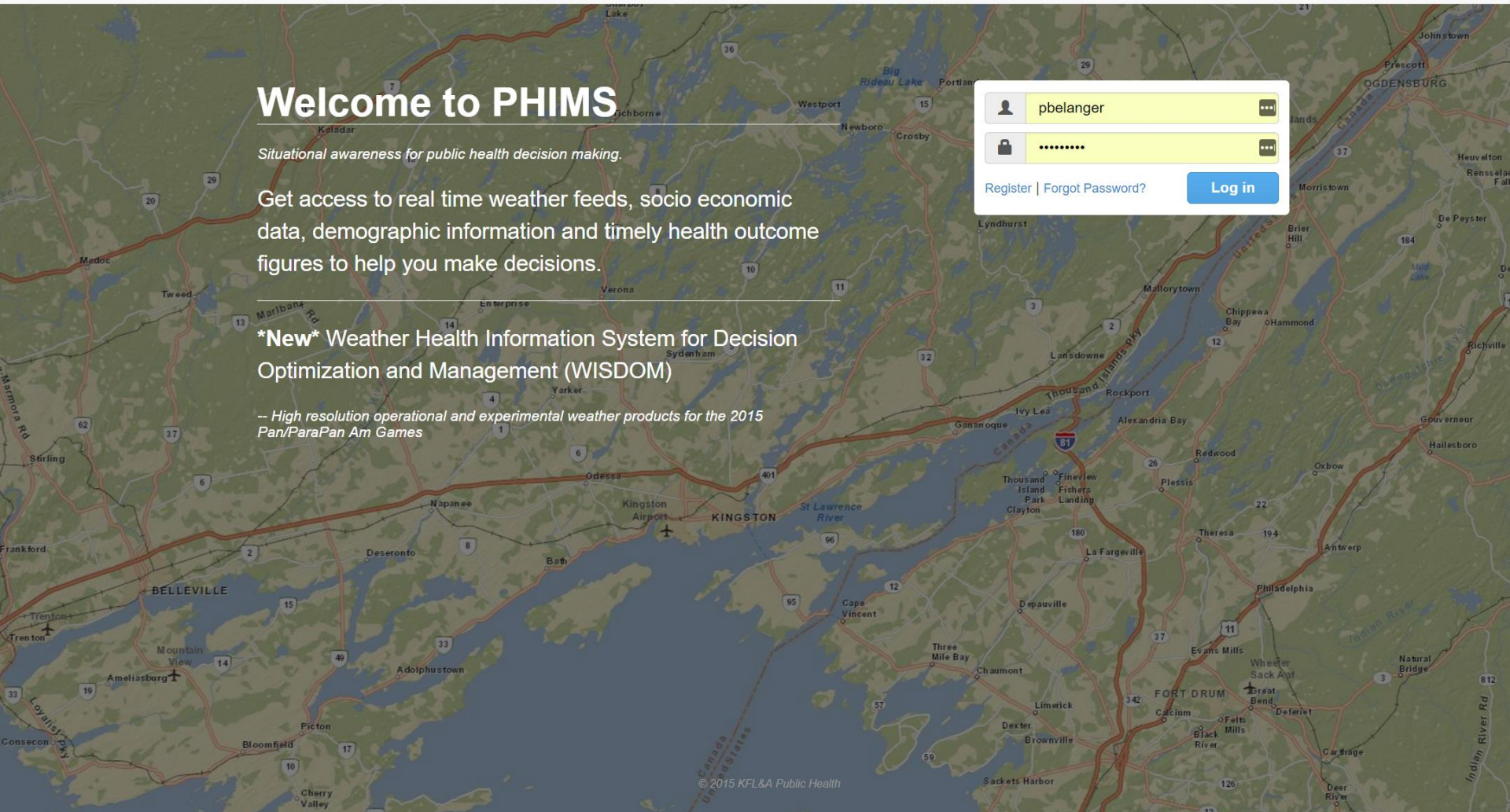
Get access to real time weather feeds, socio economic data, demographic information and timely health outcome figures to help you make decisions.

New Weather Health Information System for Decision Optimization and Management (WISDOM)

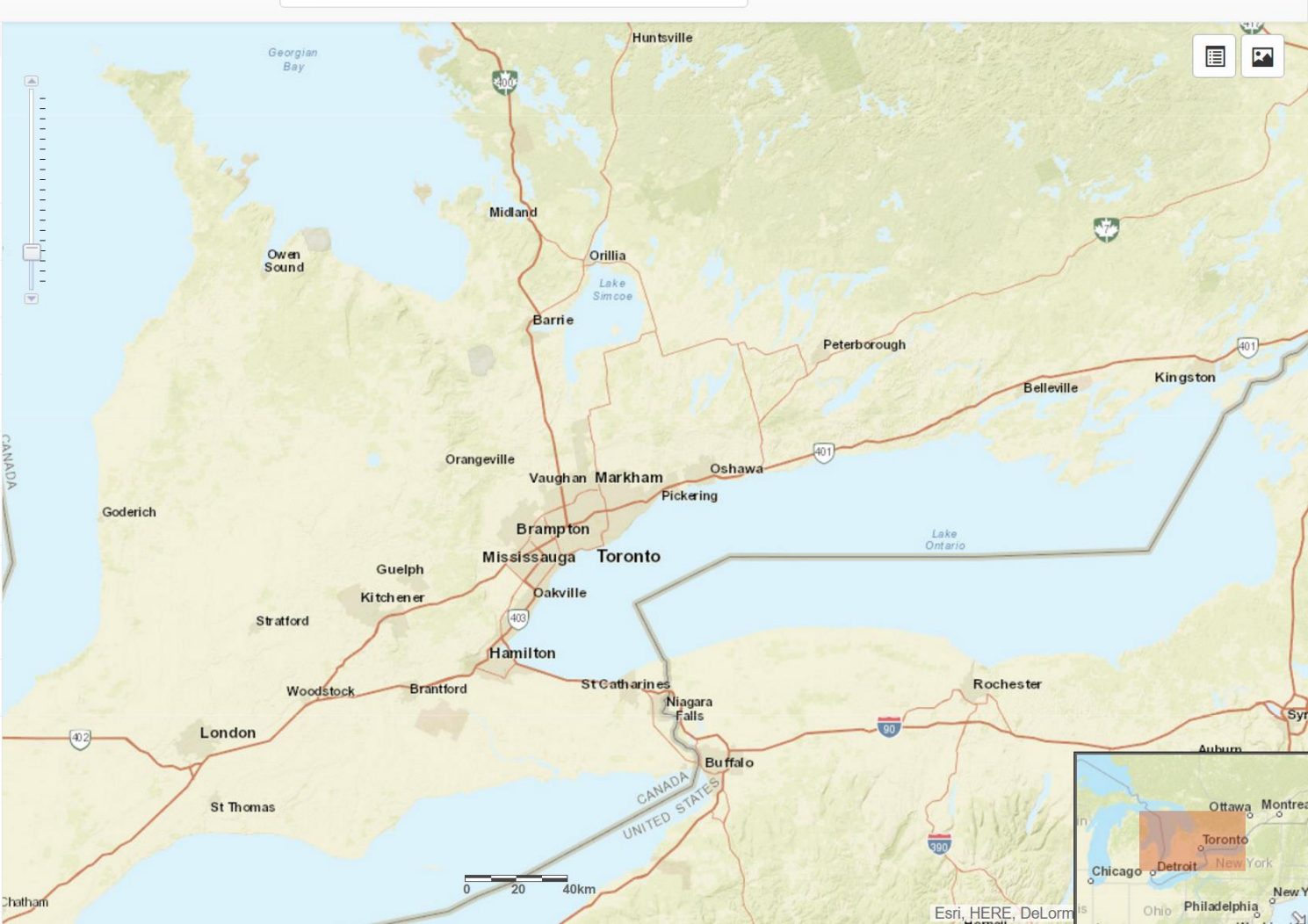
— High resolution operational and experimental weather products for the 2015 Pan/ParaPan Am Games

[Register](#) | [Forgot Password?](#)

[Log in](#)



- Layers
- Tools
- Legend
- Select preset layer theme...
- Search...
- Administrative Boundaries
- Air Quality
- Alerts
- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes
- Storm Events
- Temperature Stress
- Vulnerable Populations



Layers Tools Legend

Select preset layer theme...

Search...

Administrative Boundaries

- Built-up or Urban Areas
- Census Divisions (CD)/Counties
- Census Subdivisions (CSD)
- Forward Sortation Area (FSA)
- Local Integrated Health Networks (LHIN)
- Ontario Public Health Authorities
- Postal Codes (FSALDU)

Air Quality

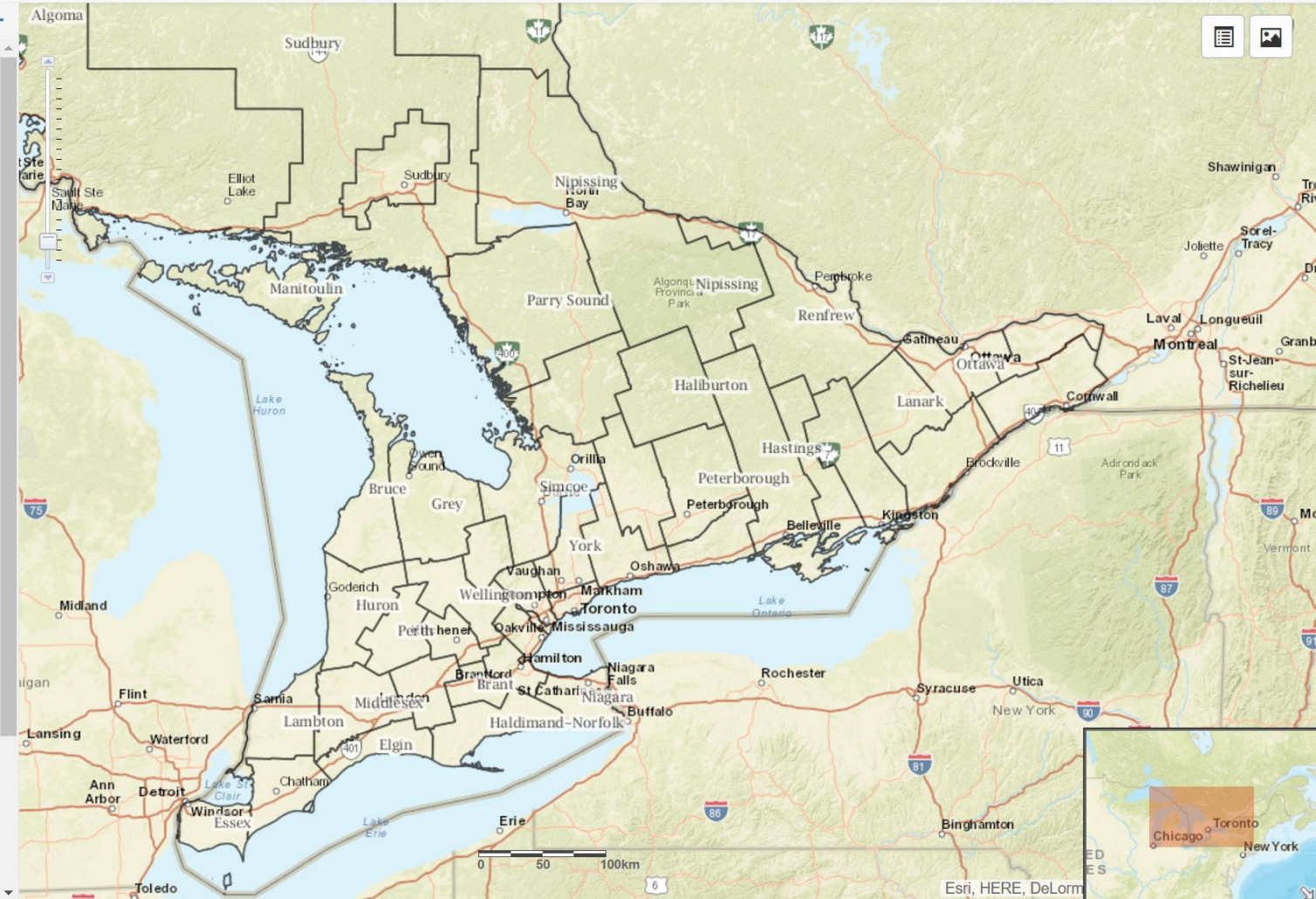
Alerts

Emergency Management

Emergency Management (GTA)

Health Care Facilities

Health Outcomes



Layers Tools Legend

Select preset layer theme...

Search...

Administrative Boundaries

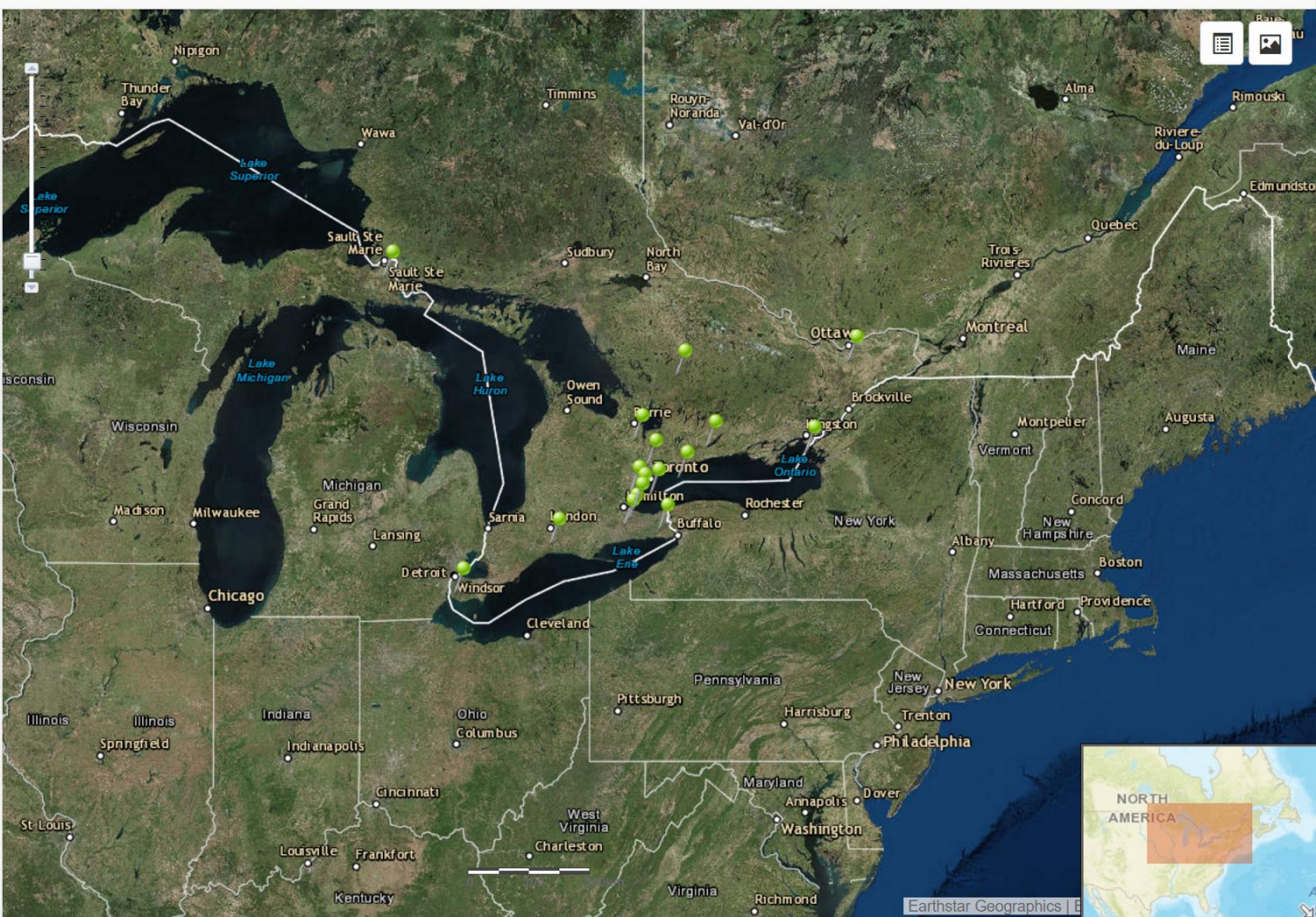
Air Quality 1

- Off AQI Sensors
- On Air Quality Health Index (AQHI) Sensors
- Off Air Quality Health Index (AQHI) Surface
- Off Nitric Oxide Gas
- Off Nitrogen Dioxide Gas
- Off Particulate Concentration Diam_G10 microns
- Off Particulate Concentration Diam_G2.5 microns
- Off Sulphur Dioxide Gas
- Off Surface Ozone




Alerts



Emergency Management

Emergency Management (GTA)

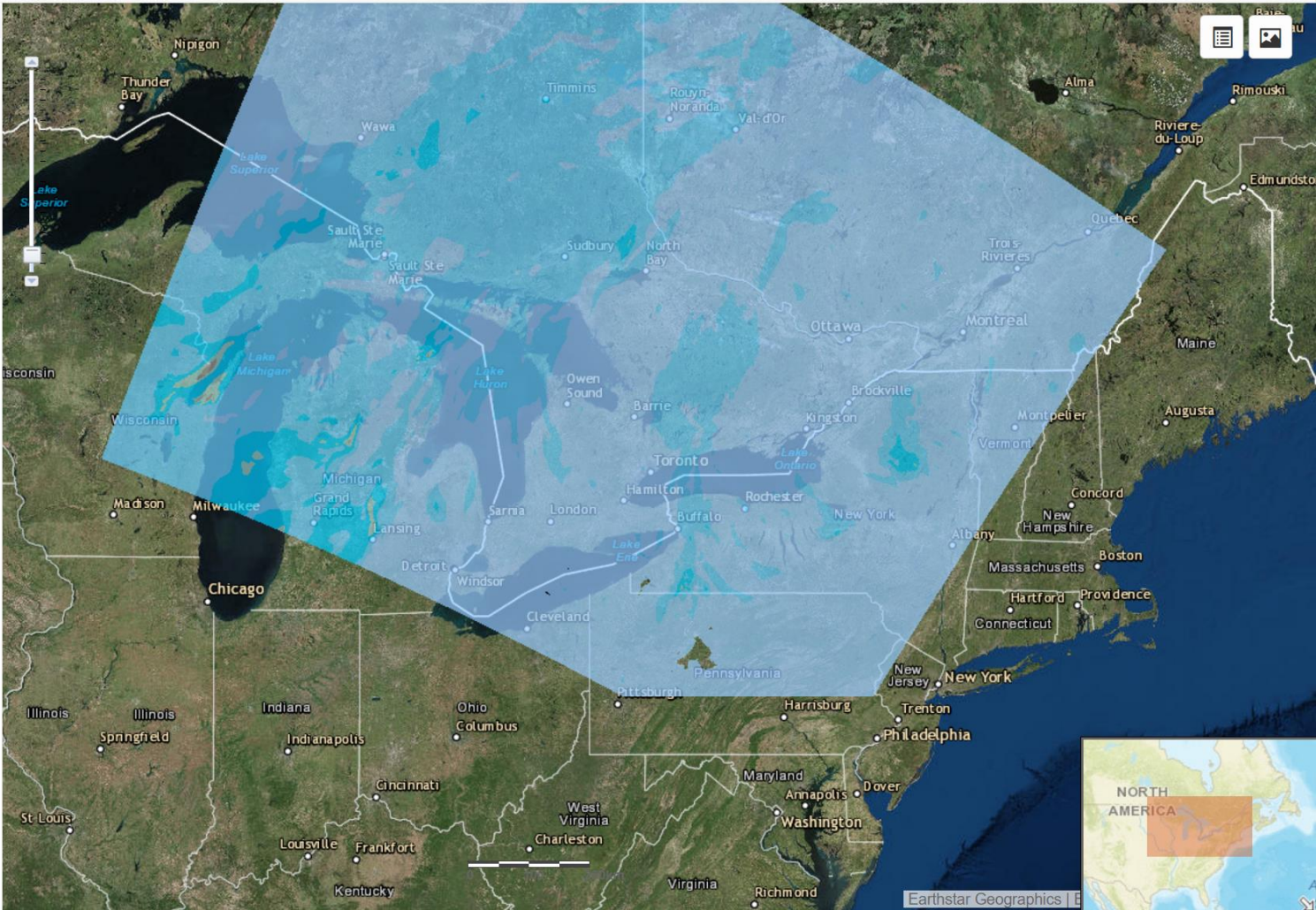
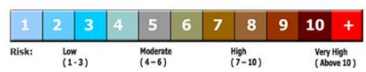


Browser tabs: ETF Products | GAM Adv... PHIMS - Public Health In...
Address bar: phims.ca
Browser icons: Apps, Bookmarks, PXB, Geo, Dev, PH, Analytics, Queen's U, NETGEAR Router R621, Collaborative Passwor, Documents - RDataM, CRAN Task Views, ix2-200

PHIMS  Search Address Alerts Bookmarks Layer Status  

Layers  Legend 

Air Quality Health Index (AQHI) Surface



Windows taskbar: Ask me anything, File Explorer, Chrome, PowerPoint, Network, Volume, Earthstar Geographics, ENG US, 12:34 PM, 2016-12-05

PHIMS

Search Address

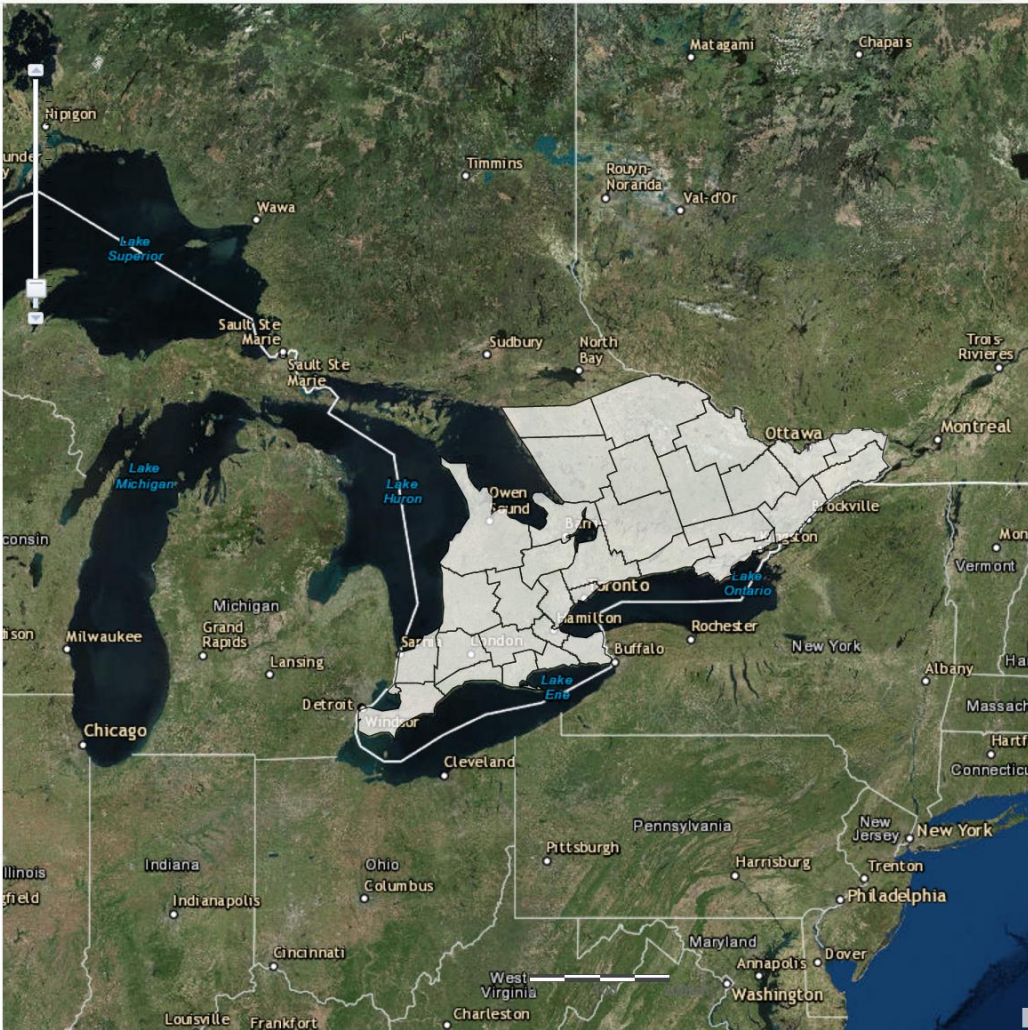
Alerts | Bookmarks | Layer Status

Layers | Tools | Legend

Select preset layer theme...

Search...

- Administrative Boundaries
- Air Quality
- Alerts 1
- On Southern Ontario Alerts**
- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes
- Storm Events
- Temperature Stress
- Vulnerable Populations



Warnings: 0 | Watches: 0 | Special: 0

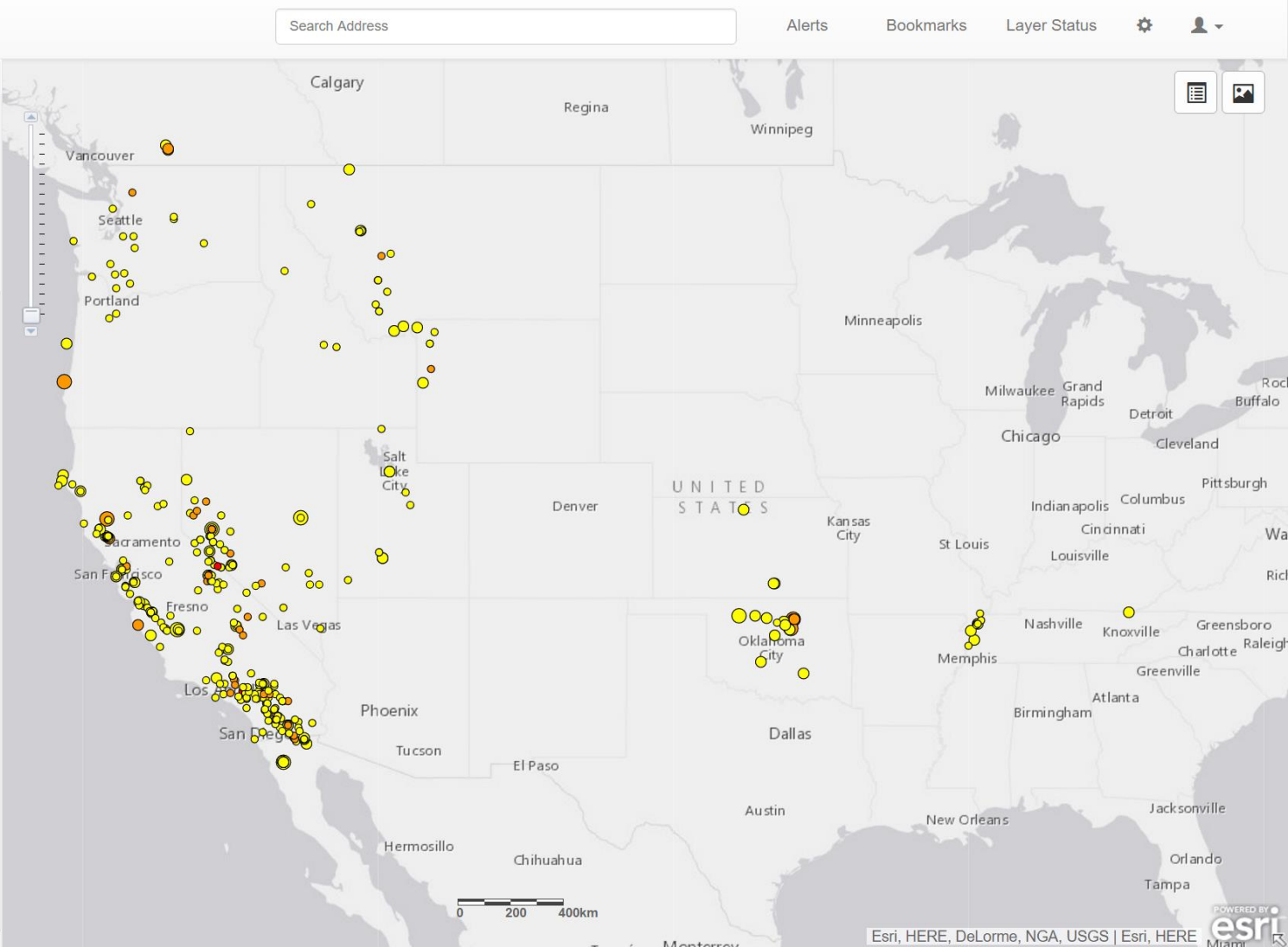
0 Alerts in Southern Ontario

Earthstar Geographics | Esri, HERE, DeLorme

PHIMS

Layers Tools Legend

- Emergency Management 1
 Earthquakes (USGS)
 Hydrometric Stations
- Emergency Management (GTA)
 Ambulance Station
 Defibrillator Locations
 Fire Hall
 Police Facilities
- Health Care Facilities
 Hospitals
 Hospitals (British Columbia)
- Health Outcomes
- Storm Events
- Temperature Stress
- Vulnerable Populations



Layers Tools Legend

- Alerts
- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes
- Storm Events
- Temperature Stress **1**
- Vulnerable Populations

Off Air Temperature (C) **i**

Off Cloud Cover **i**

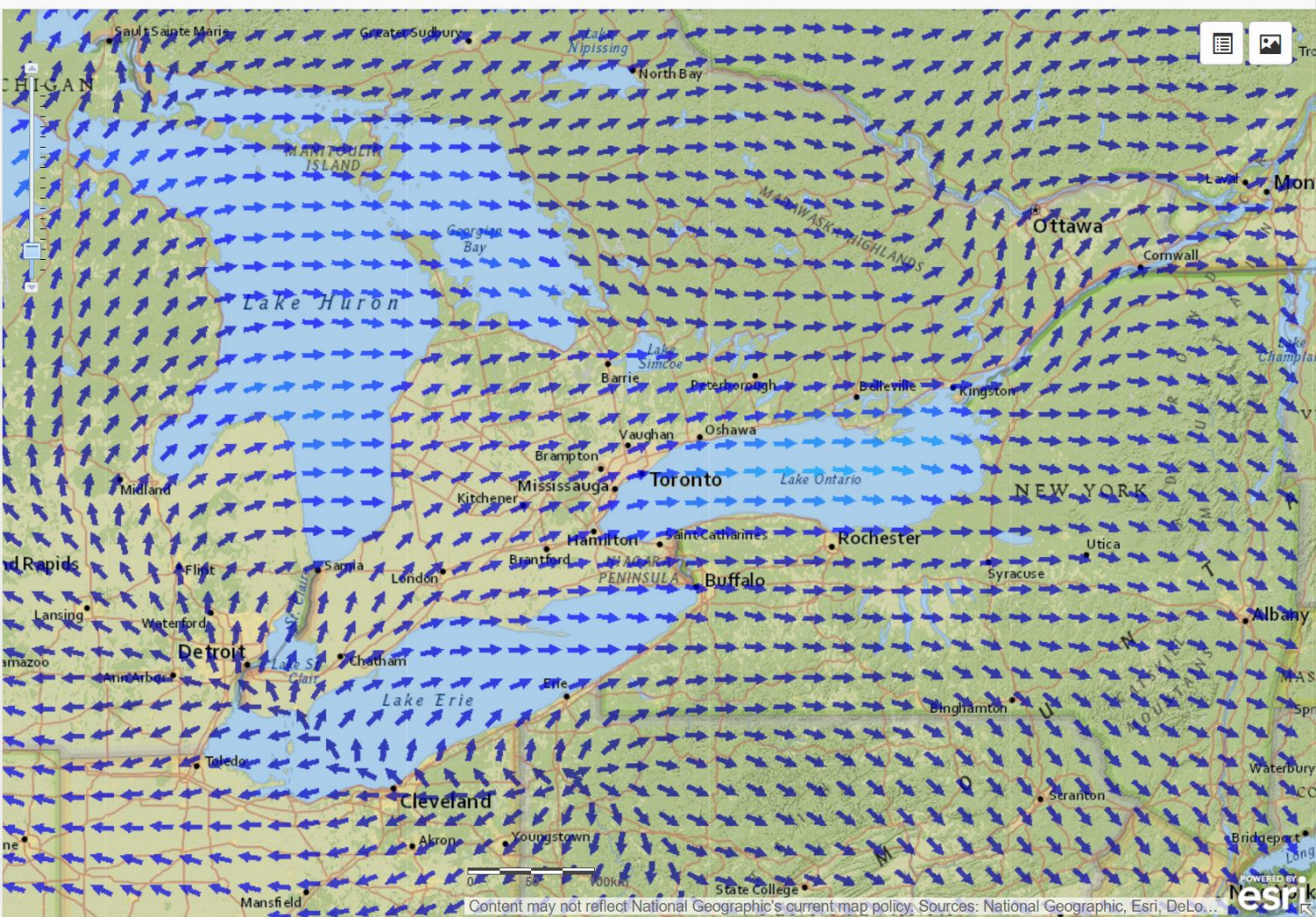
Off Dew Point (C) **i**

Off Local Sensors **i**

Off Relative Humidity **i**

Off Specific Humidity (KG/KG) **i**

On Winds **i**



Layers Tools Legend

Emergency Management (GTA)

Health Care Facilities

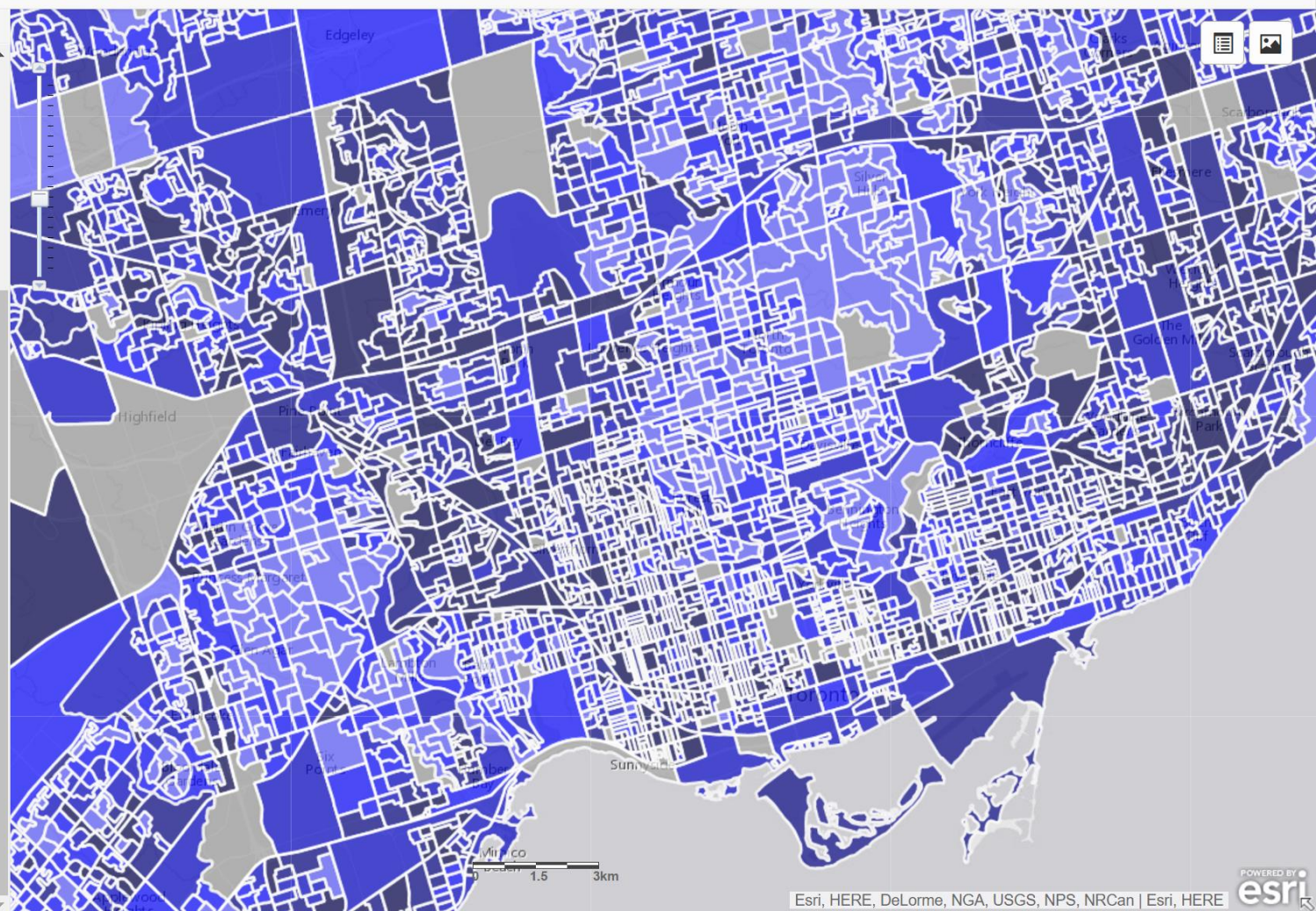
Health Outcomes

Storm Events

Temperature Stress

Vulnerable Populations **1**

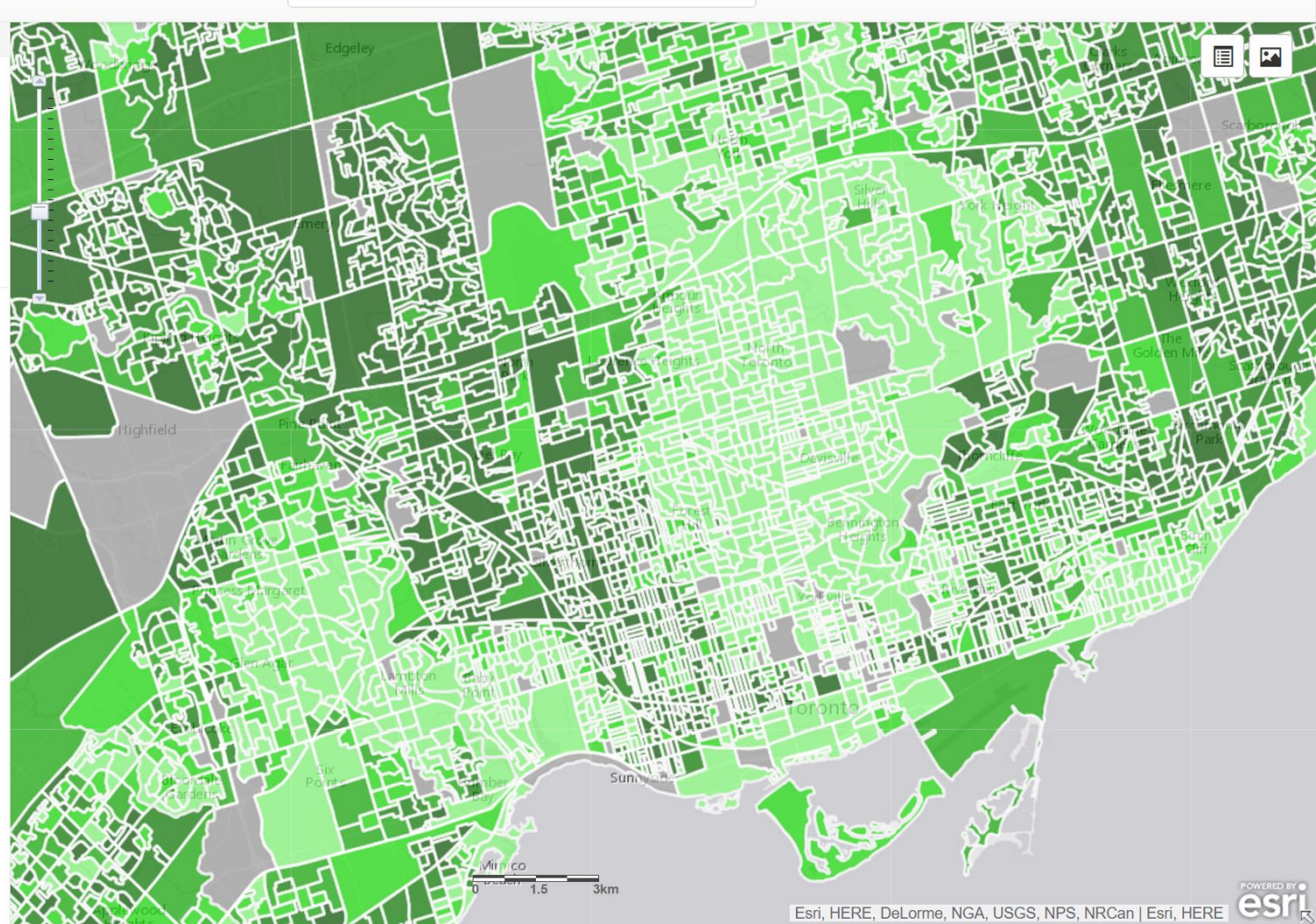
- Combined Deprivation (BC)
- Combined Deprivation (Deprivation Index)
- Dependency (Ontario Marginalization Index)
- Ethnic Concentration (Ontario Marginalization Index)
- Material Deprivation (Deprivation Index)
- Percent of the Population Age 4 and Under
- Percent of the Population Age 65+
- Residential Instability (Ontario Marginalization Index)
- Social Deprivation (Deprivation Index)



Layers Tools Legend

Material Deprivation (Deprivation Index)

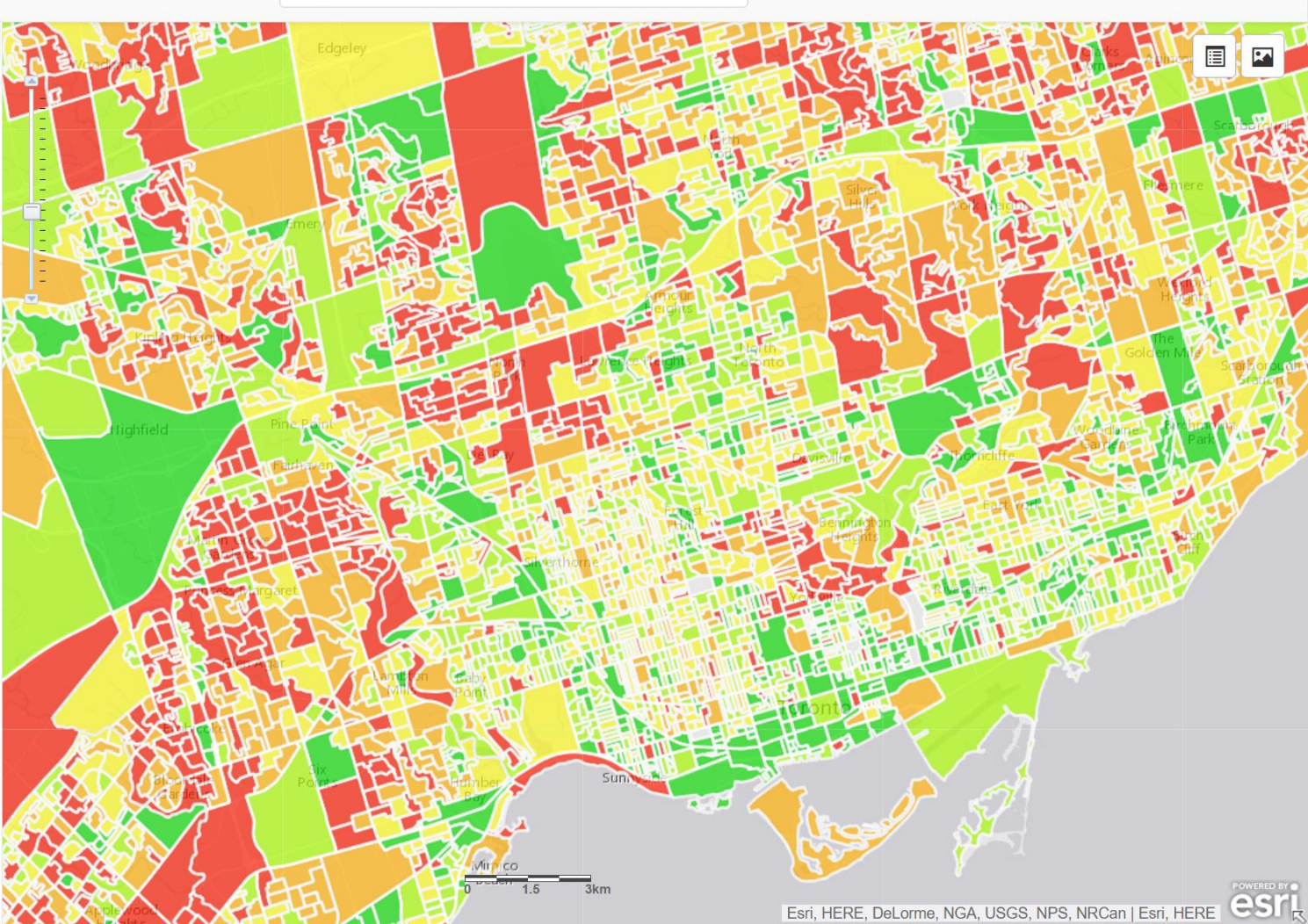
- Q5 (Most Deprived)
- Q4
- Q3
- Q2
- Q1 (Least Deprived)
- NO DATA



Layers Tools Legend

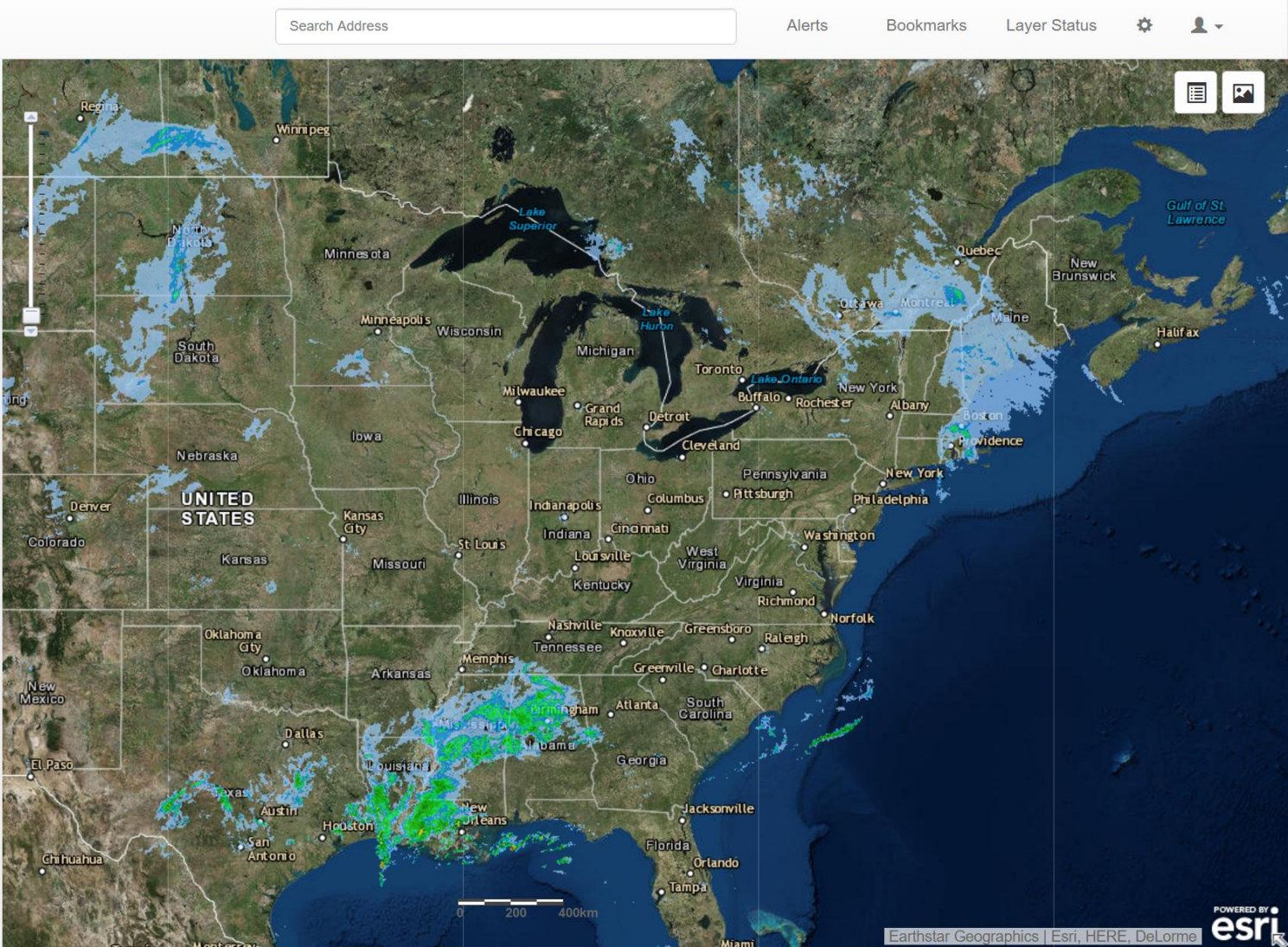
Percent of the Population Age 65+

- 0 - 8.38 (Least Vulnerable)
- 8.39 - 11.90
- 11.91 - 15.48
- 15.49 - 20.83
- 20.84 - 100.00 (Most Vulnerable)



Windows taskbar with open applications: ETF Products | GAM Adv..., PHIMS - Public Health In..., Paul, and browser tabs for phims.ca.

PHIMS interface sidebar with navigation options: Layers, Tools, Legend. A list of layer themes is shown, including Administrative Boundaries, Air Quality, Alerts, Emergency Management, Emergency Management (GTA), Health Care Facilities, Health Outcomes, Storm Events (1), Accumulation of total precipitations (m) from 24 hours final precipitation analysis (Off), RADAR (On), Soil Volumetric Water Contents (Off), Temperature Stress, and Vulnerable Populations.



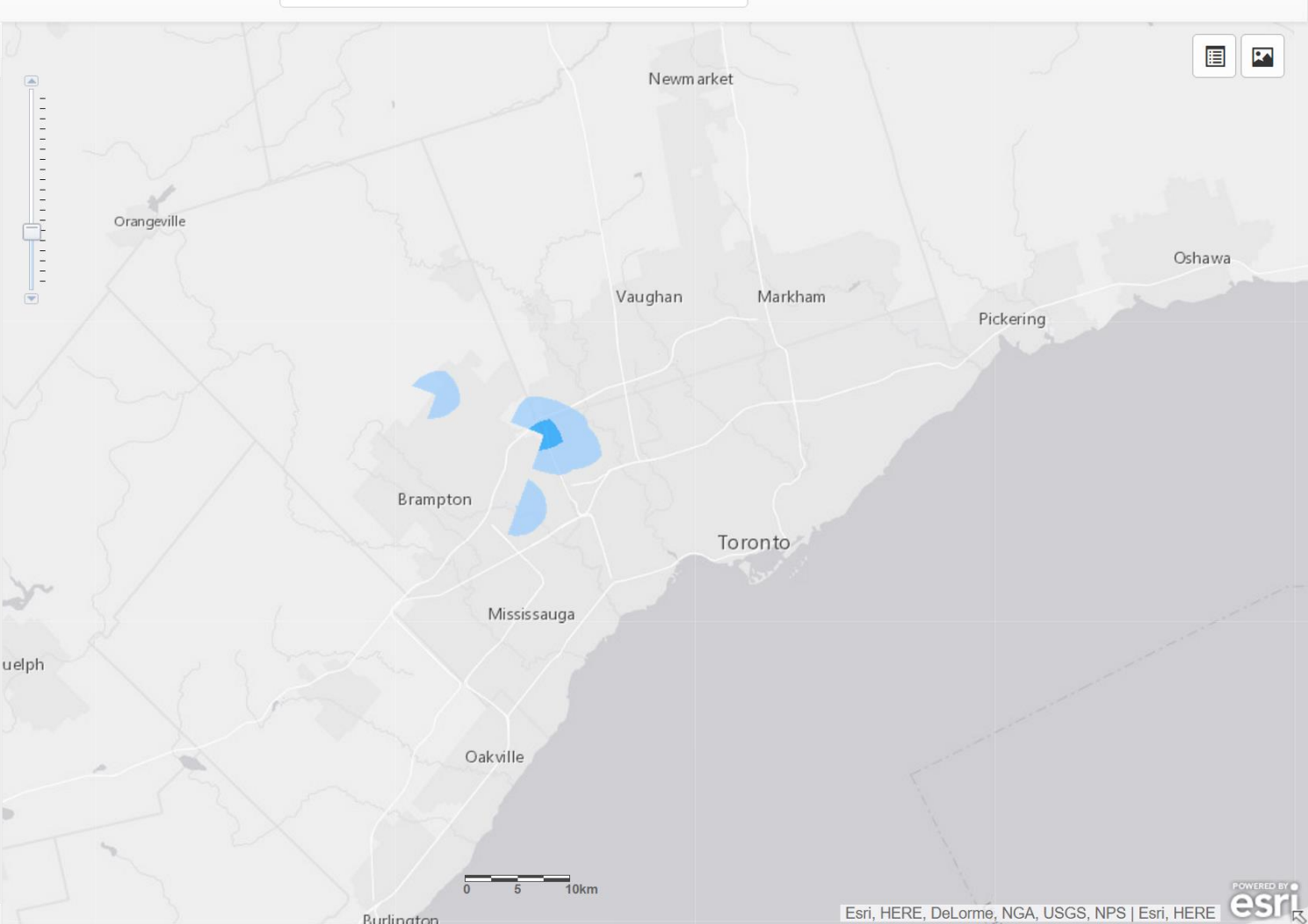
Windows taskbar at the bottom showing system tray icons, language (ENG US), and time (12:40 PM 2016-12-05). The background features a green banner with the text 'Working together for better health'.

Layers Tools Legend

Select preset layer theme...

Search...

- Administrative Boundaries
- Air Quality
- Alerts
- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes
- Storm Events 1
- Accumulation of total precipitations (m) from 24 hours final precipitation analysis BETA
- RADAR**
- Soil Volumetric Water Contents
- Temperature Stress
- Vulnerable Populations



1. Select a shape or boundary

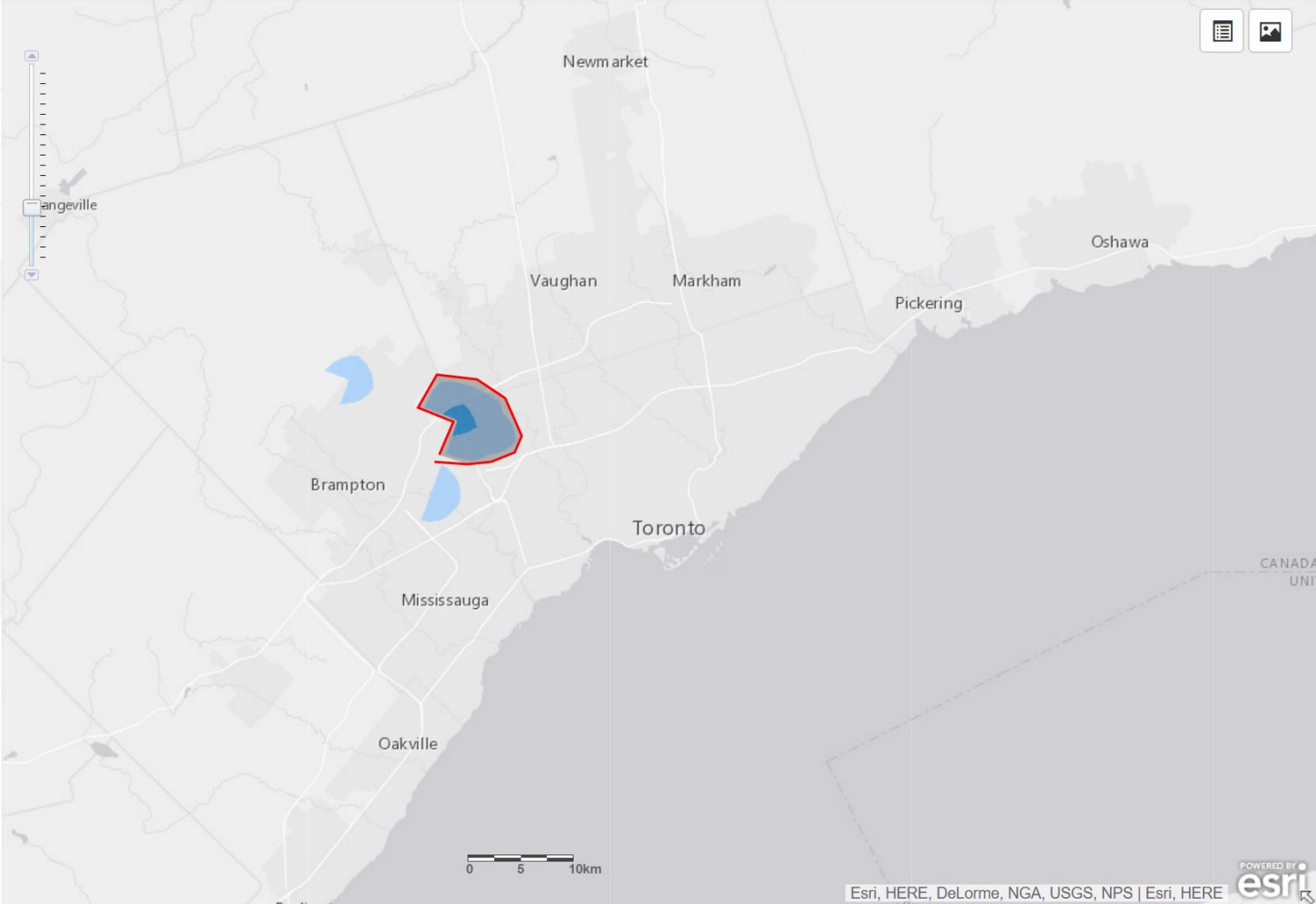
Extent Circle Polygon

Public Health Units

2. Click Instructions

- Click on the map to create a starting point
- Continue clicking to add a vertex
- Double click to finish

Clear Map



PHIMS

Search Address

Alerts Bookmarks Layer Status [gear] [user]

Layers [Tools] [Legend]

Directions [v]

Service Area [v]

Draw [v]

Social Determinants of Health [v]

1. Select a shape or boundary

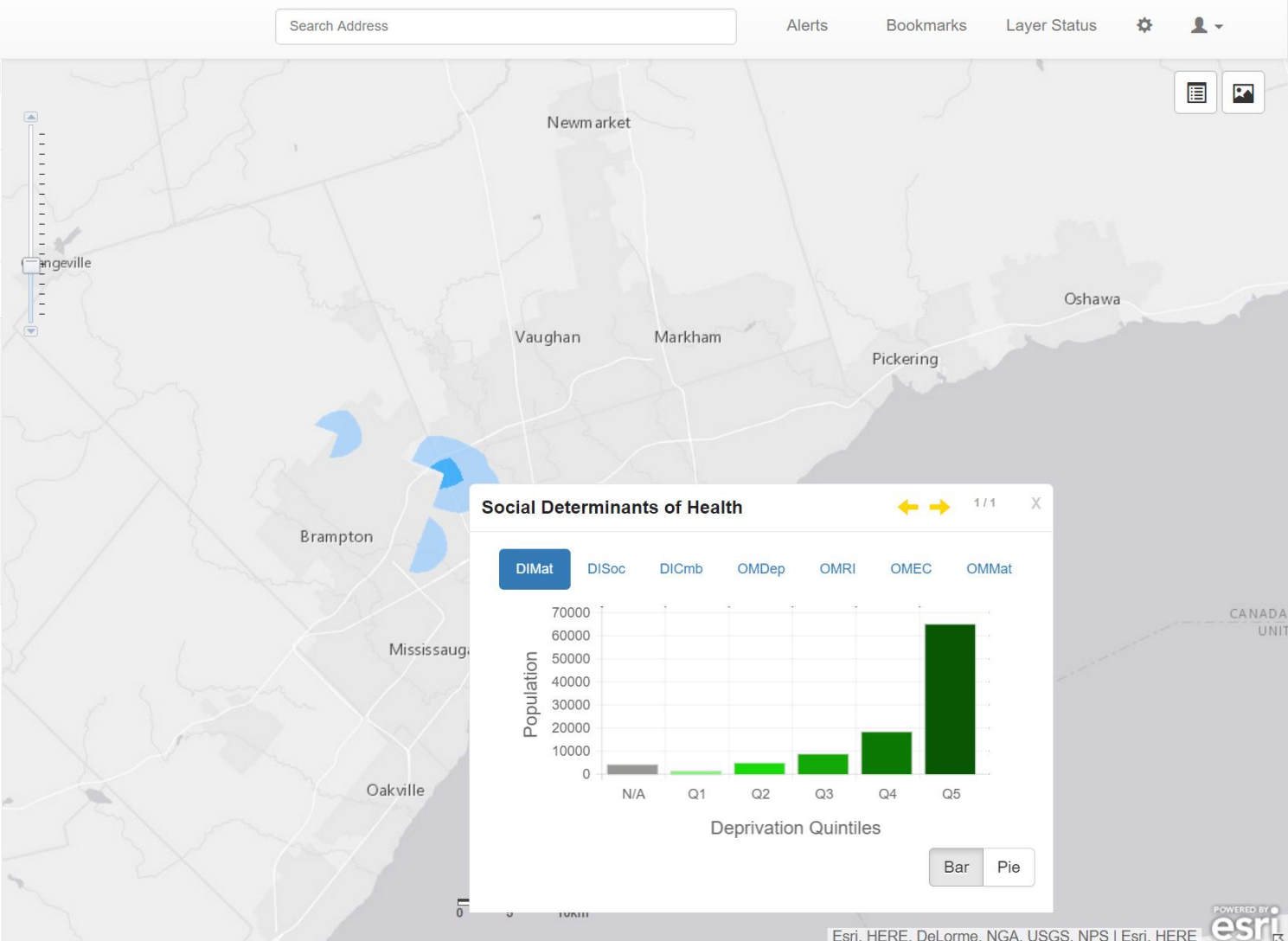
Extent Circle Polygon

Public Health Units [v]

2. Click Instructions



Choose a Shape

Clear Map





PHIMS


Layers Tools Legend


- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes **1**
- On** Acute Care Enhanced Surveillance (ACES)  


Layer Options

Opacity: 0%  100%

Show/Hide Layer: 

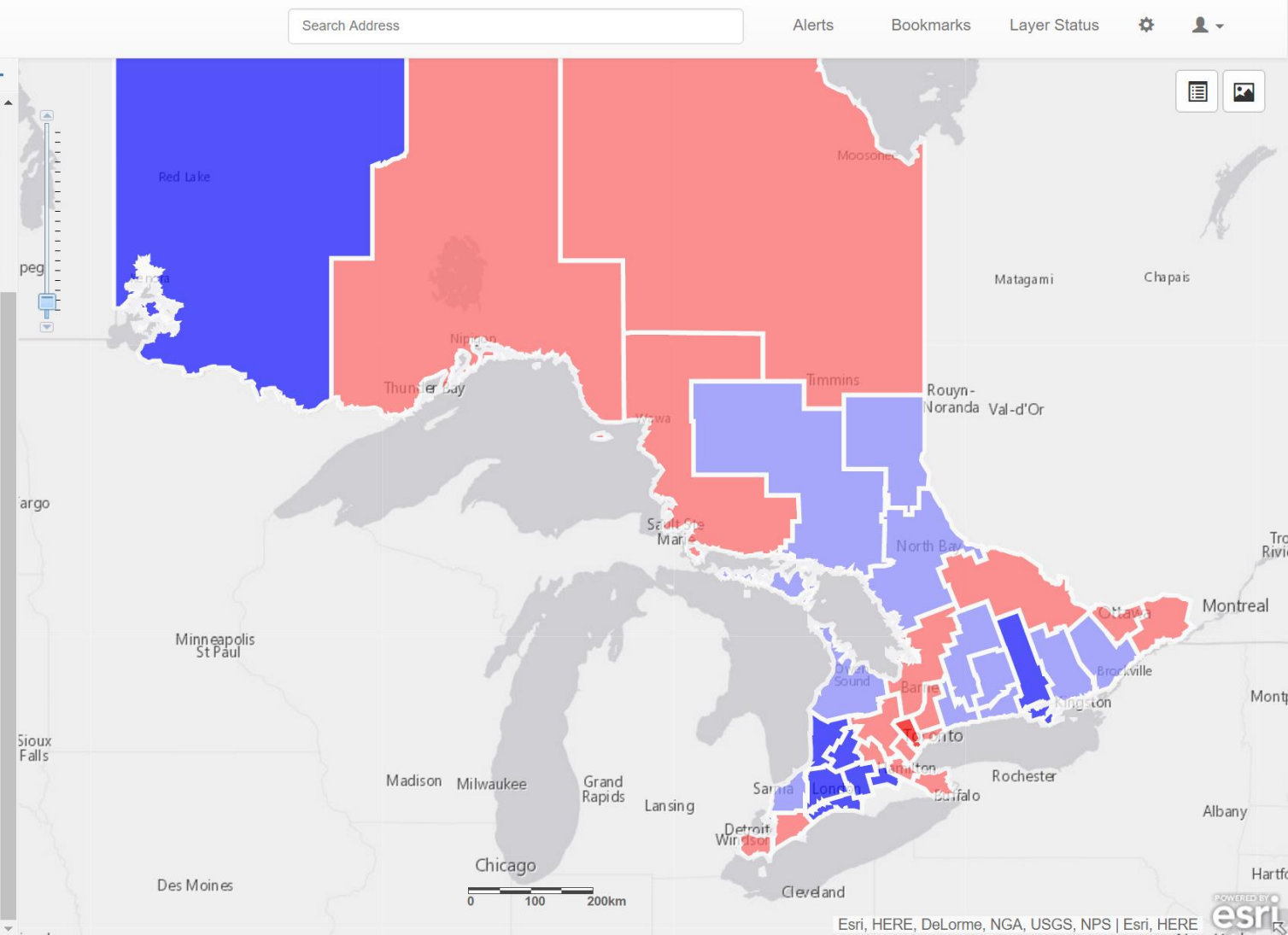
Syndromes: Influenza-like Illnes: 

Level of Geography: PHU 





Time Period: 1 Day 

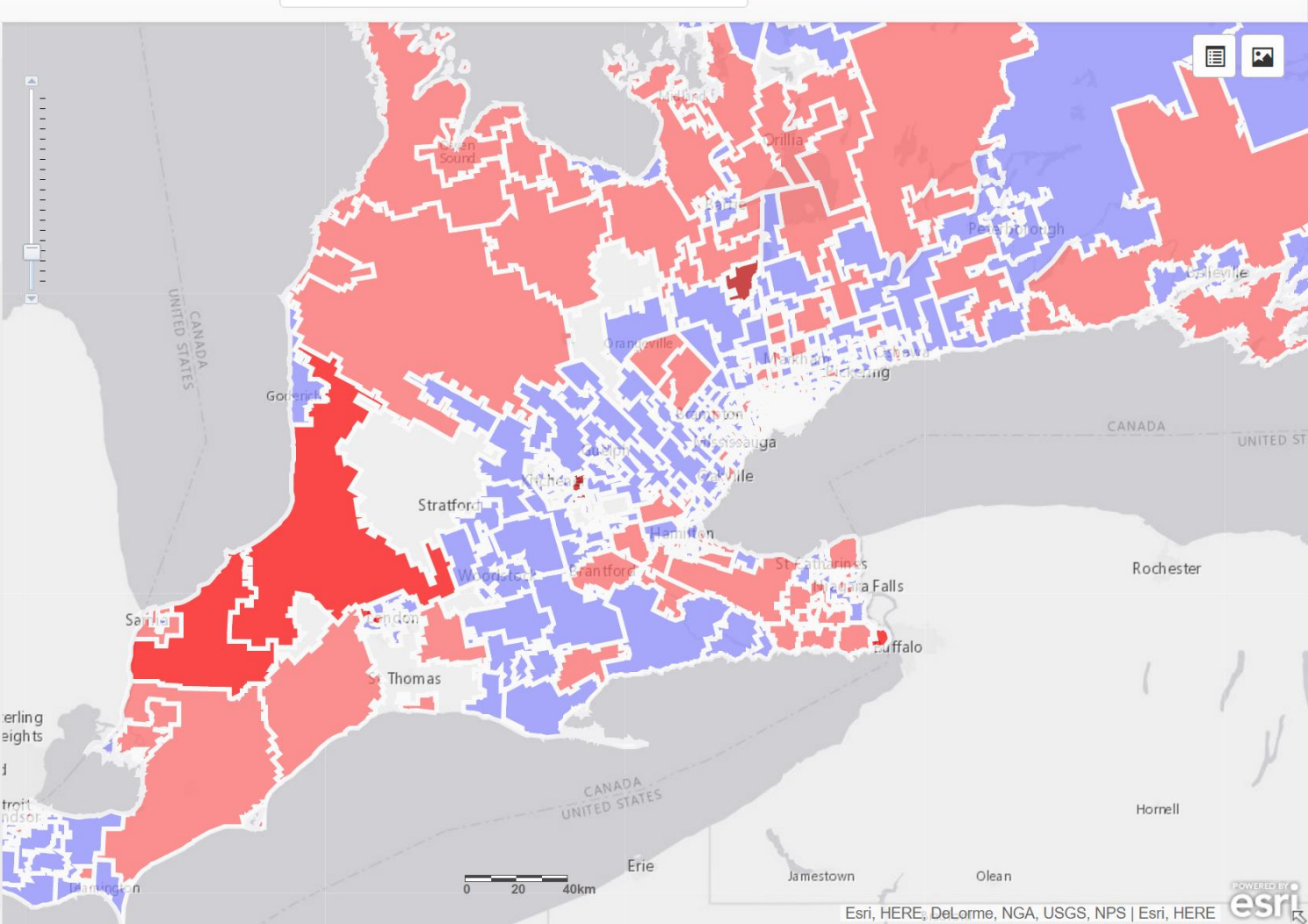
Update

- Storm Events
- Temperature Stress
- Vulnerable Populations



Layers Tools Legend

- Emergency Management
- Emergency Management (GTA)
- Health Care Facilities
- Health Outcomes **1**
- On** Acute Care Enhanced Surveillance (ACES)  
- Layer Options
 - Opacity: 0%  100%
 - Show/Hide Layer: 
 - Syndromes: Respiratory
 - Level of Geography: FSA
 - Time Period: 1 Day
 - Update**
- Storm Events
- Temperature Stress
- Vulnerable Populations



Q & A

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