Mapping It Out

using geography to identify and analyze public health disparities

Steve Graves

Geography

Geography

- Geography is a *discipline*
  - Our *subjects* are anything that can be mapped.
- Somewhat unique epistemology
  - We ask “where?” when we want to answer “why?”
  - We “see” problems differently
- Somewhat unique methodological tool box
  - Spatial stats, spatial analysis
  - Geographic information systems, unique analysis
  - Complex, multivariate analysis is available
  - Tests for spatial autocorrelation - overlooked
- Powerful communicative media – the map.

Health and Medical Geography
Topics in Geography 486

- Human Ecology of Disease
- Landscape Epidemiology
- Development and Human Health
- Biometeorology
- Pollution
- Disease Diffusion
- Health Care Delivery Systems
- Health Care Resource Distribution
- Health Service Planning
- Healthy Neighborhoods

John Snow's Cholera Map

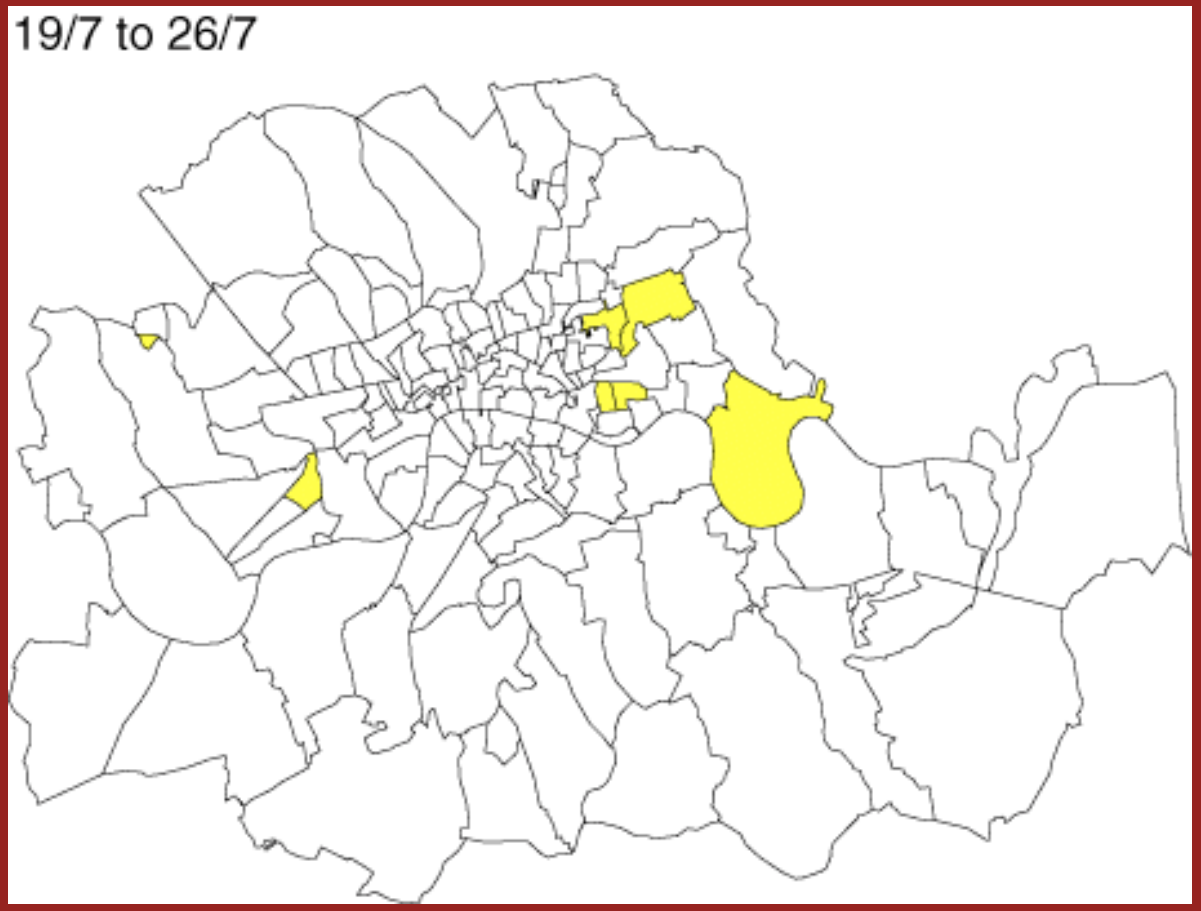
- Medical Geography has a long history.
- http://en.wikipedia.org/wiki/John_Snow_(physician)

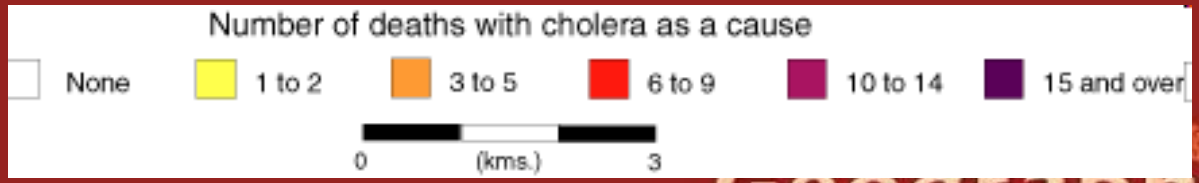
John Snow's Cholera Map

- Mapped outbreak and traced disease to a water pump.
- Bolstered germ theory

Animated File of Cholera Outbreak

- Maps of outbreaks can show the spread of infection through time and space.





Realtime Outbreak Map

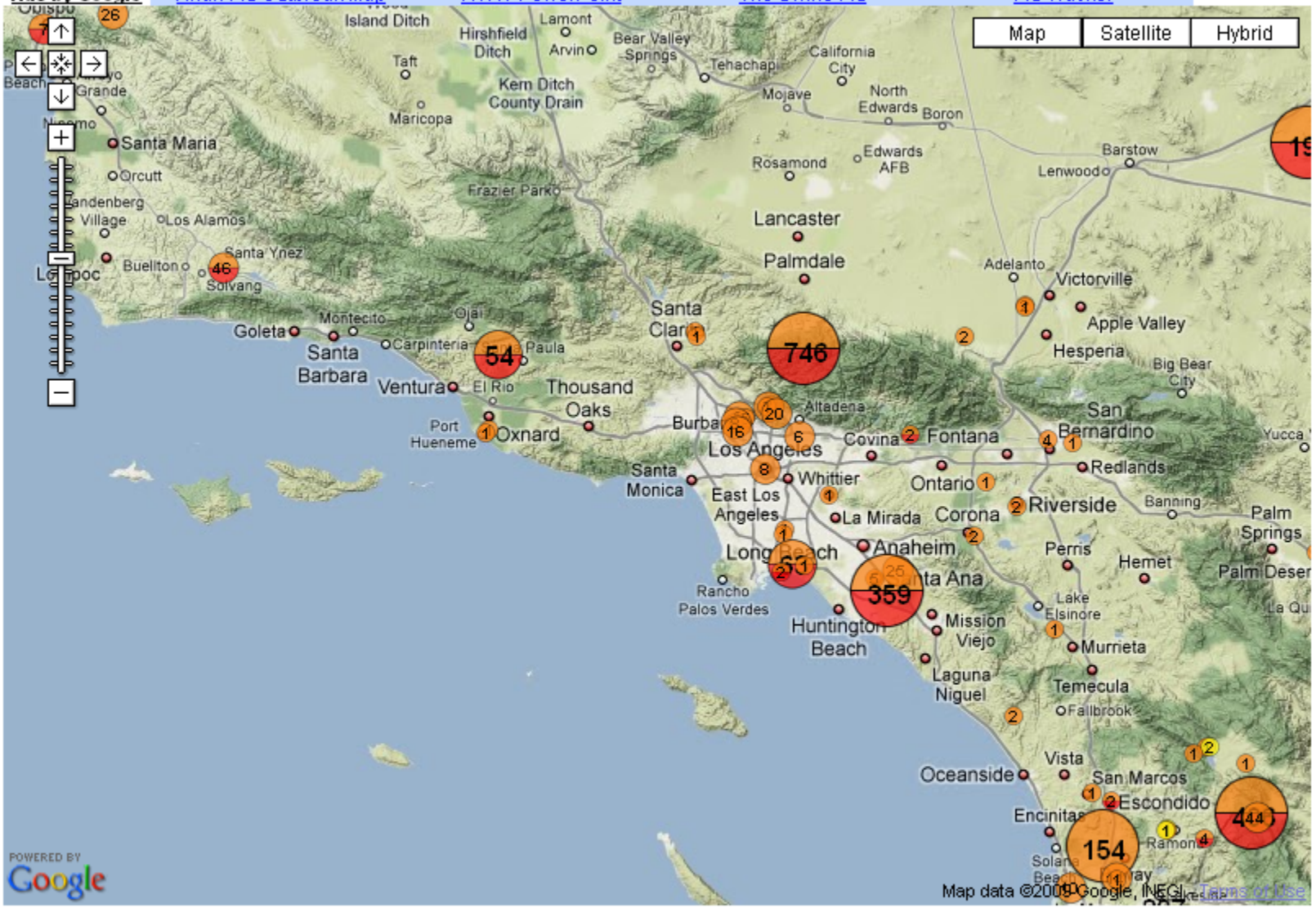
- Modern example, relatively easy to make.
- http://healthmap.org/en

H1N1 Real Time Mapping

- Relatively simple to create maps can help those responsible for health care delivery to respond to crises.

- http://flutracker.rhizalabs.com/
  - See next slide

FluTracker map data current as of 13:00 EST 18 November



Source: flutracker.rhizalabs.com

- Suspected (9029)
- Confirmed/Probable (3306484)
- Fatal (8125)
- Suspected & Confirmed/Probable
- Suspected & Fatal
- Confirmed/Probable & Fatal
- Suspected, Confirmed/Probable & Fatal

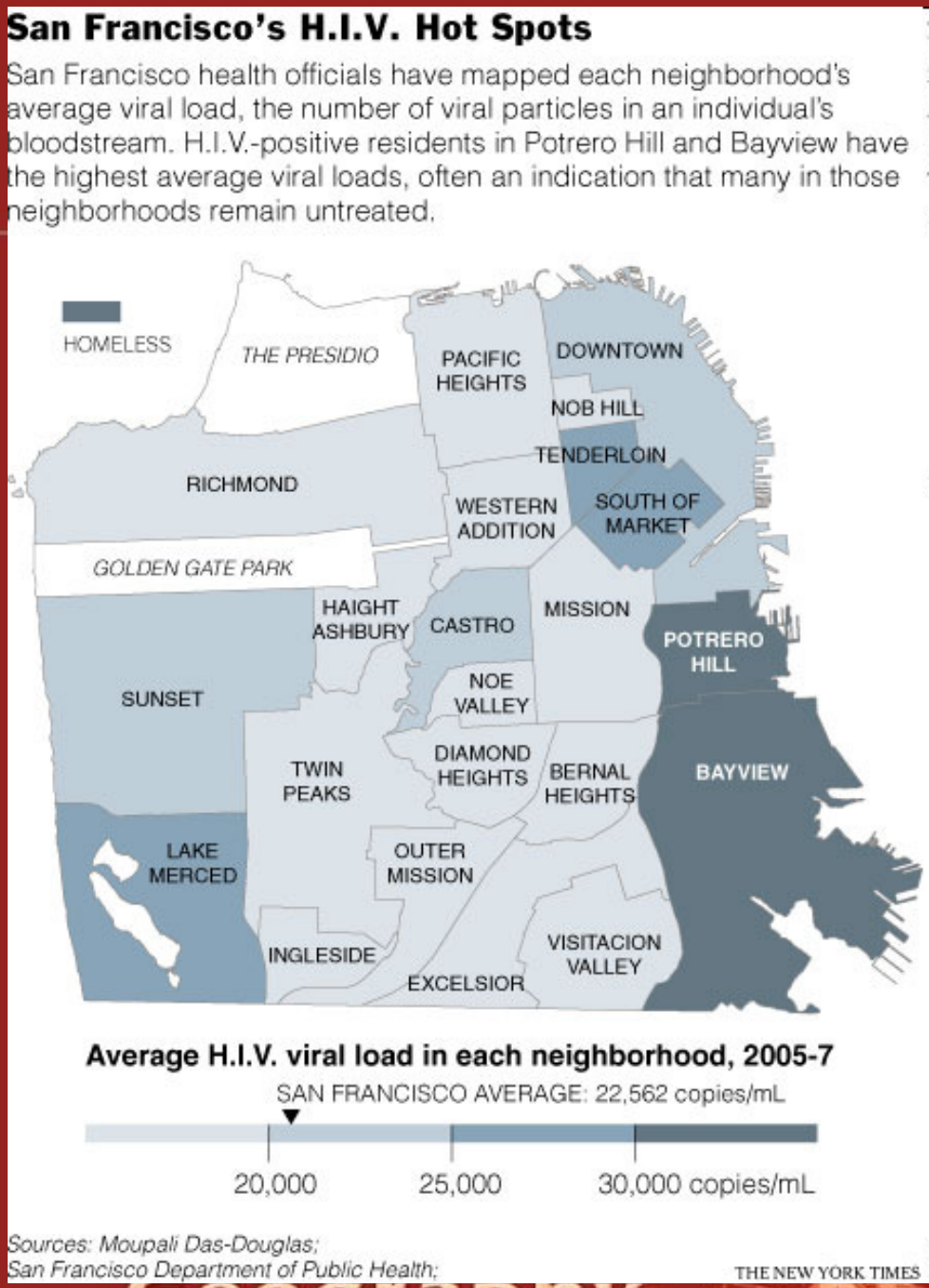
Circle size relative to number of cases. Zoom for more detail.

Some other uses

- Maps can show disparity in health care delivery
- Help patients find quality health care
- Help authorities assess risk
- See the following slides…

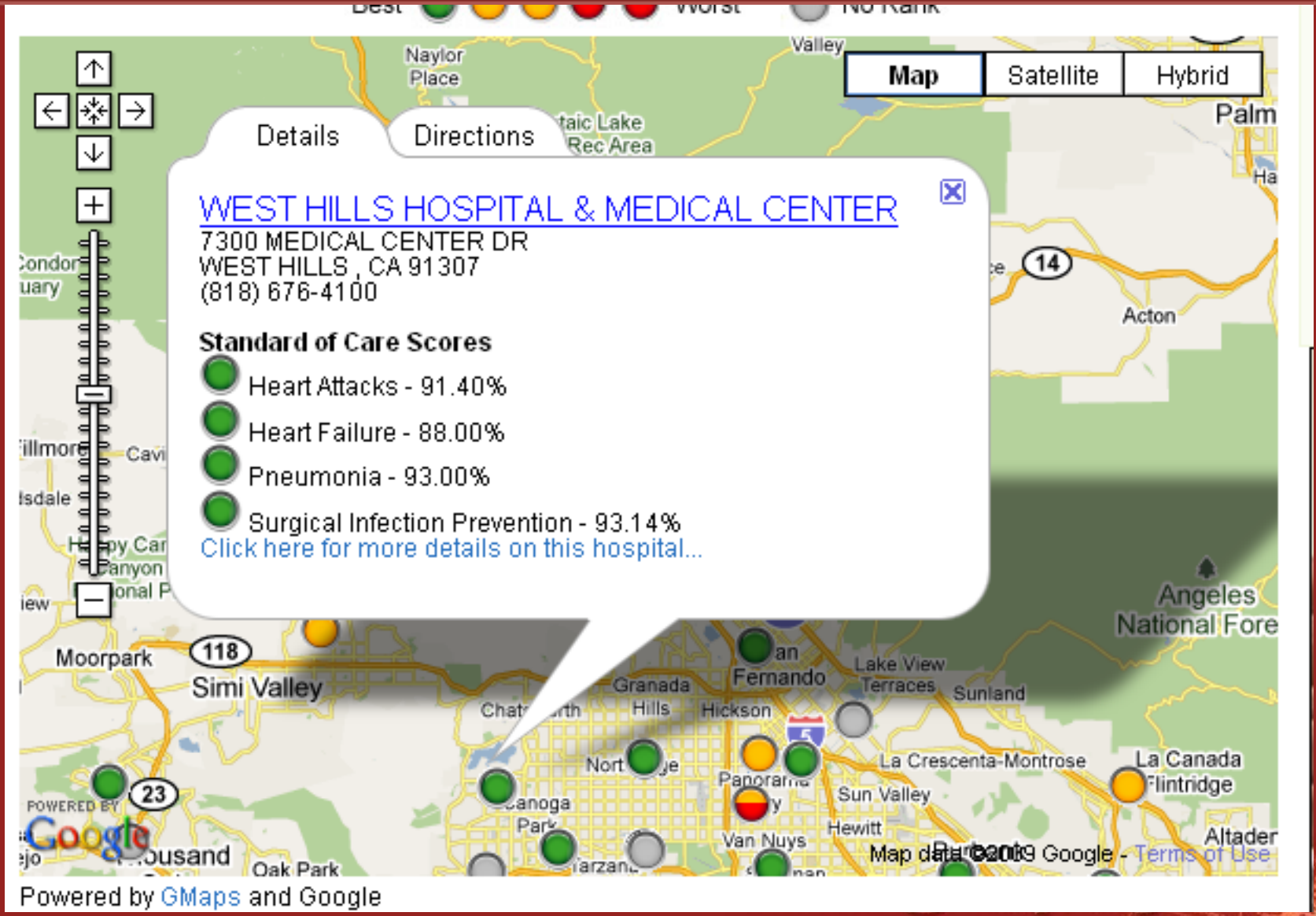
HIV mapping in San Francisco

- Rather than simply mapping cases, this map demonstrates variation in viral load of patients.
- It indicates disparity in treatment, since average viral load is a measure of “how sick” the patients are.



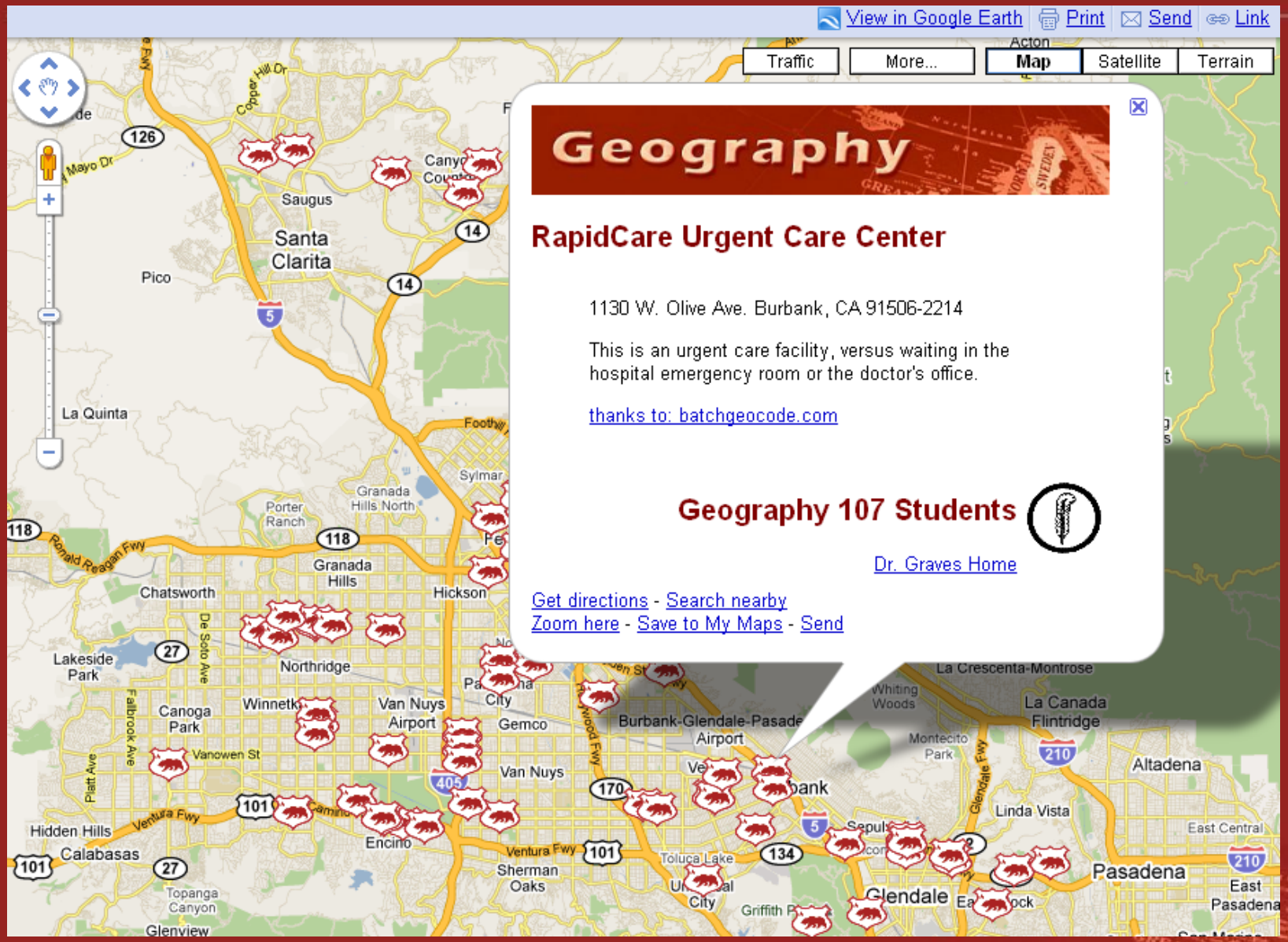
Online Hospital Ranking Map

http://www.netdoc.com/hospital-rankings/

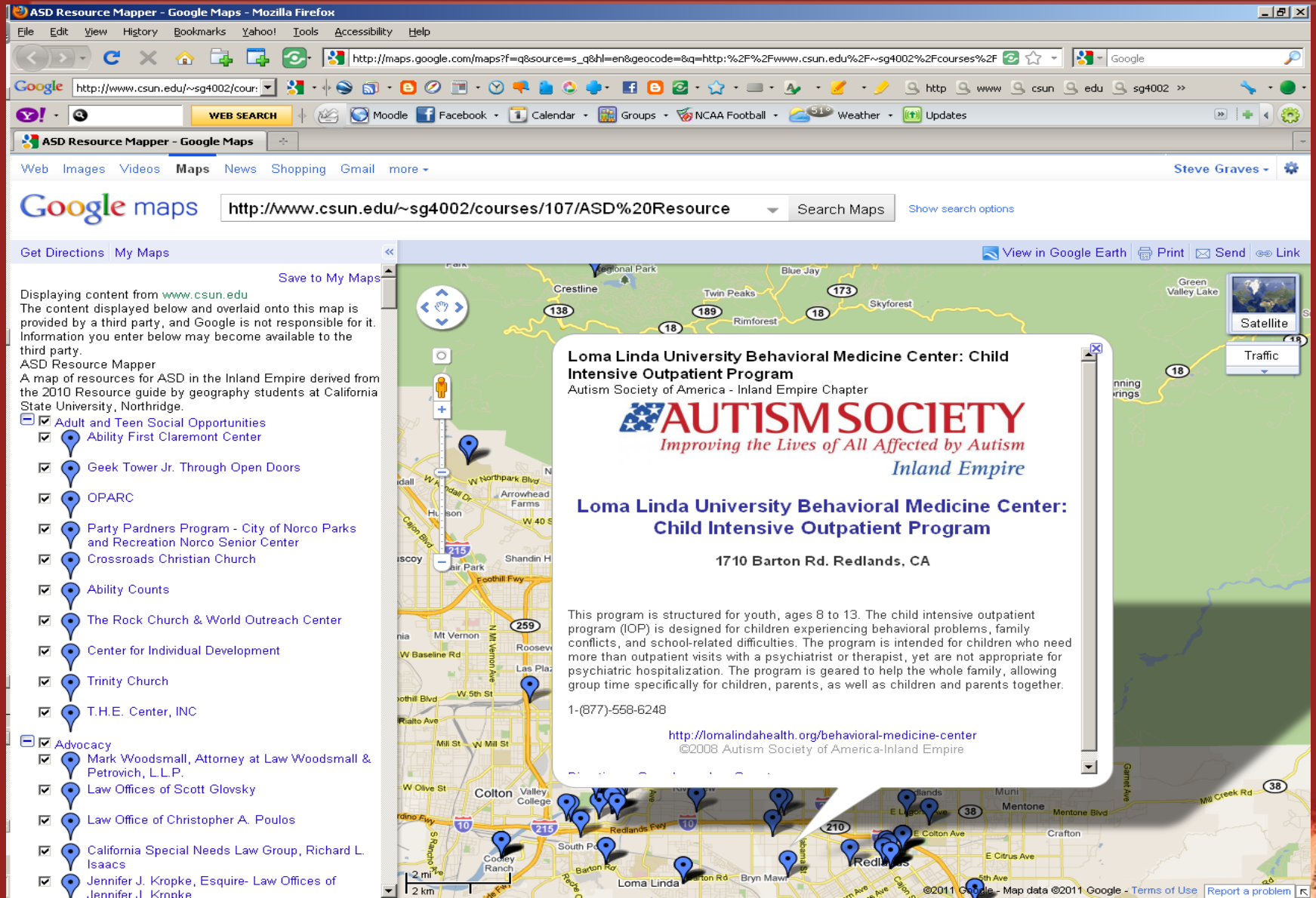


Geography 107 Project

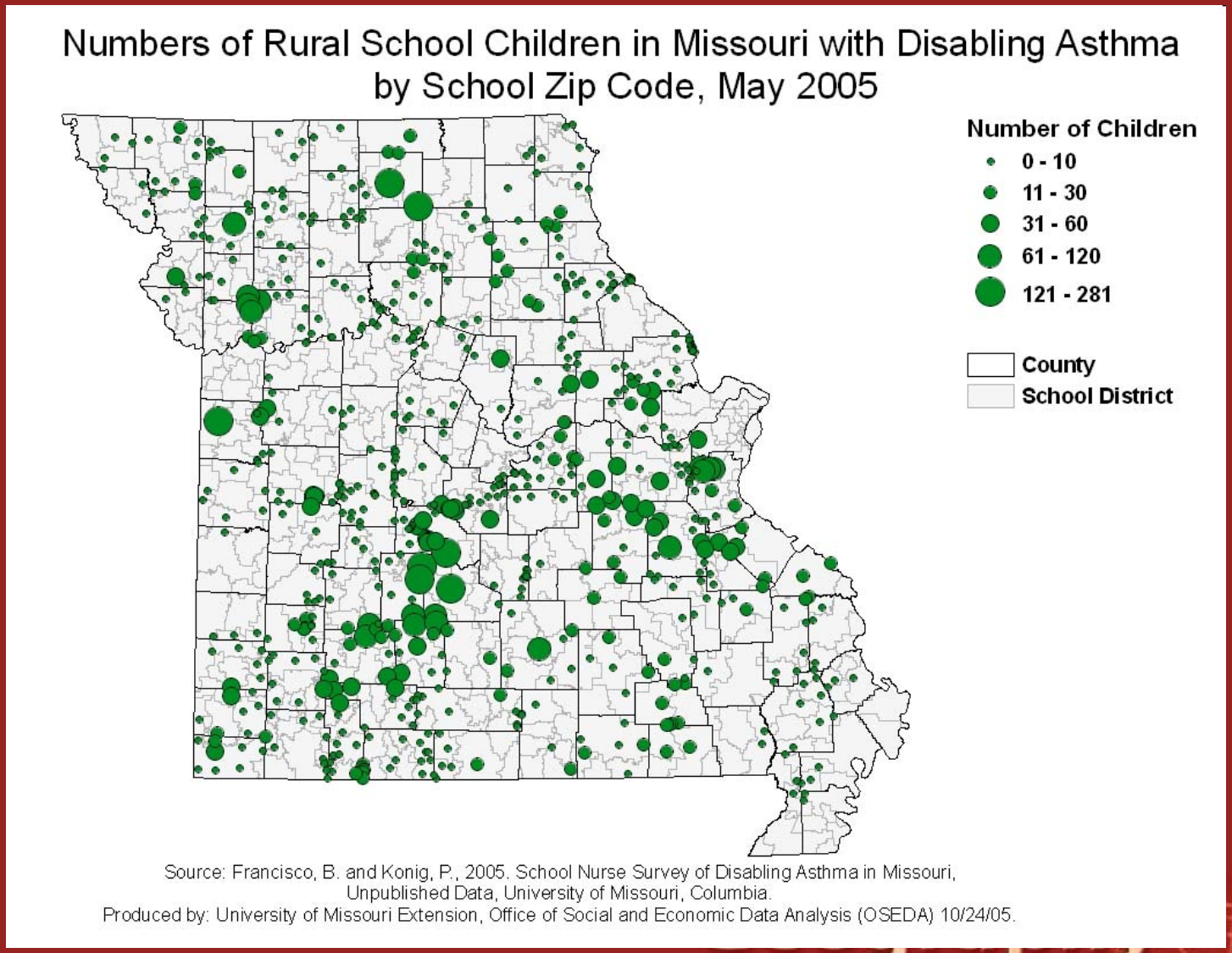
completed by CSUN freshmen



Freshman Project



Asthma Map- Missouri

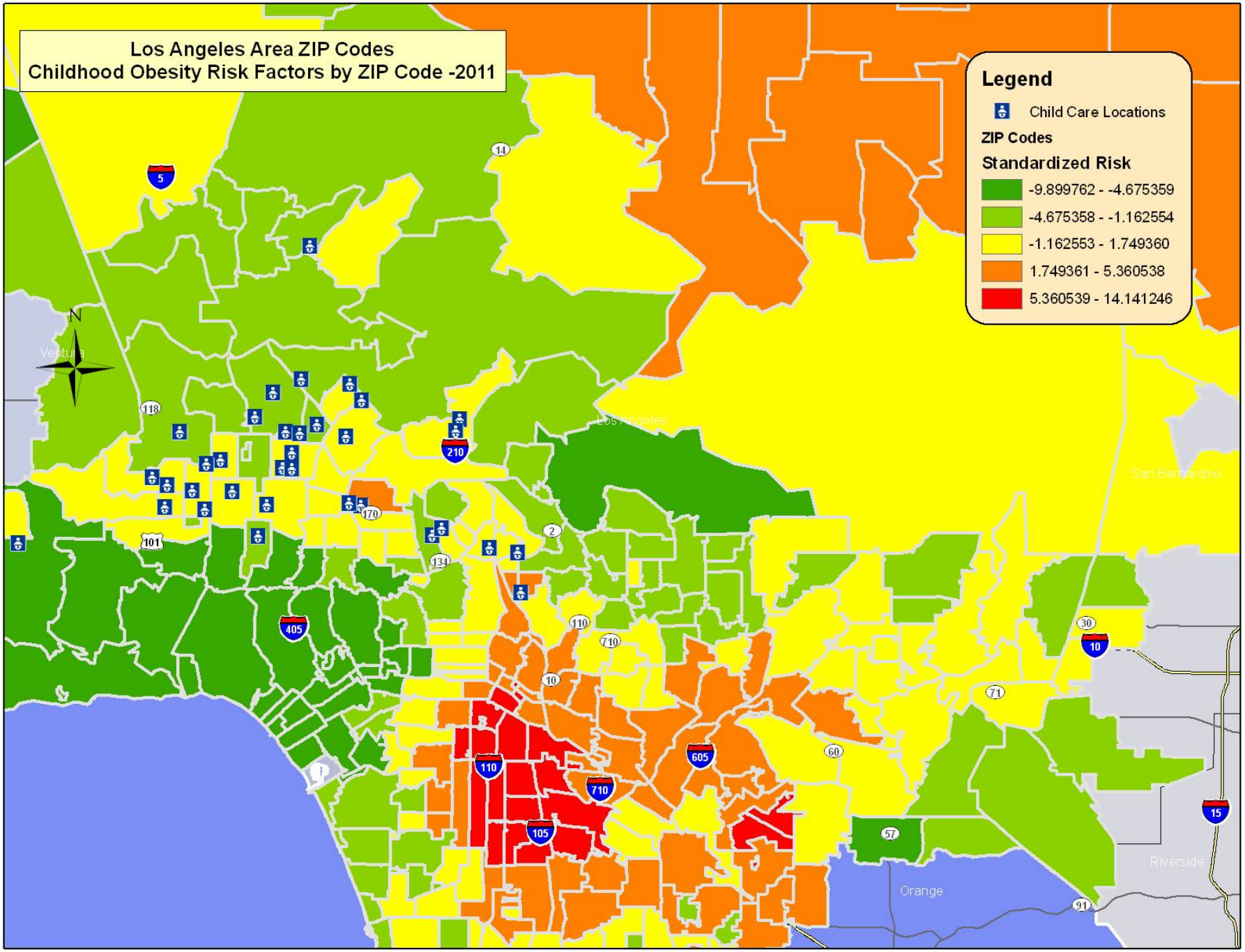


GIS capabilities

- A GIS can layer many *types* of spatial data simultaneously
  - Points, polygons, lines
- The GIS has analysis functions that allow researchers to analyze data at different spatial scales and obtained in different formats
- Many statistical transformations, some of which are unique to spatial data.
- Some simple techniques, like layering, helps researchers and students make predictive models of disease or health threats.

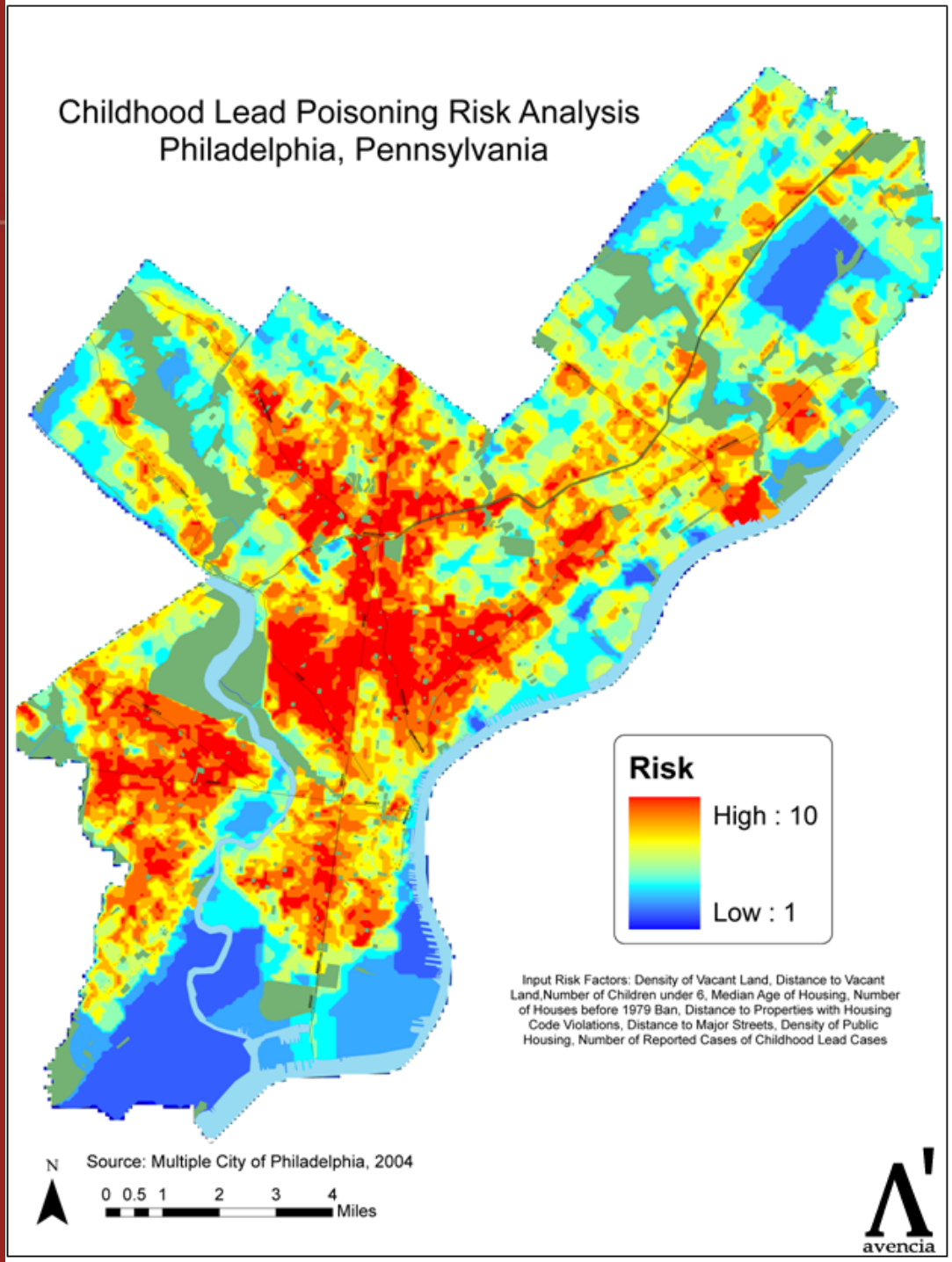
Childhood Obesity Risk – Multiple Factors

- The following slide is a recent project in which several dozens of factors, at different scales and different data types were combined to produce a childhood obesity risk factor map for Los Angeles.
- Included ZIP code data
- Health District Data
- Point / Address Data
- More could be added.


Los Angeles Area ZIP Codes
Childhood Obesity Risk Factors by ZIP Code -2011
Legend
Child Care Locations
ZIP Codes
Standardized Risk
-9.899762 - -4.675359
-4.675358 - -1.162554
-1.162553 - 1.749360
1.749361 - 5.360538
5.360539 - 14.141246
N
Ventura
Los Angeles
San Bernardino
Orange
Riverside
5
14
118
210
170
101
134
2
405
110
710
10
605
105
60
71
30
57
15
91

Lead Poisoning Risk Map - Philadelphia

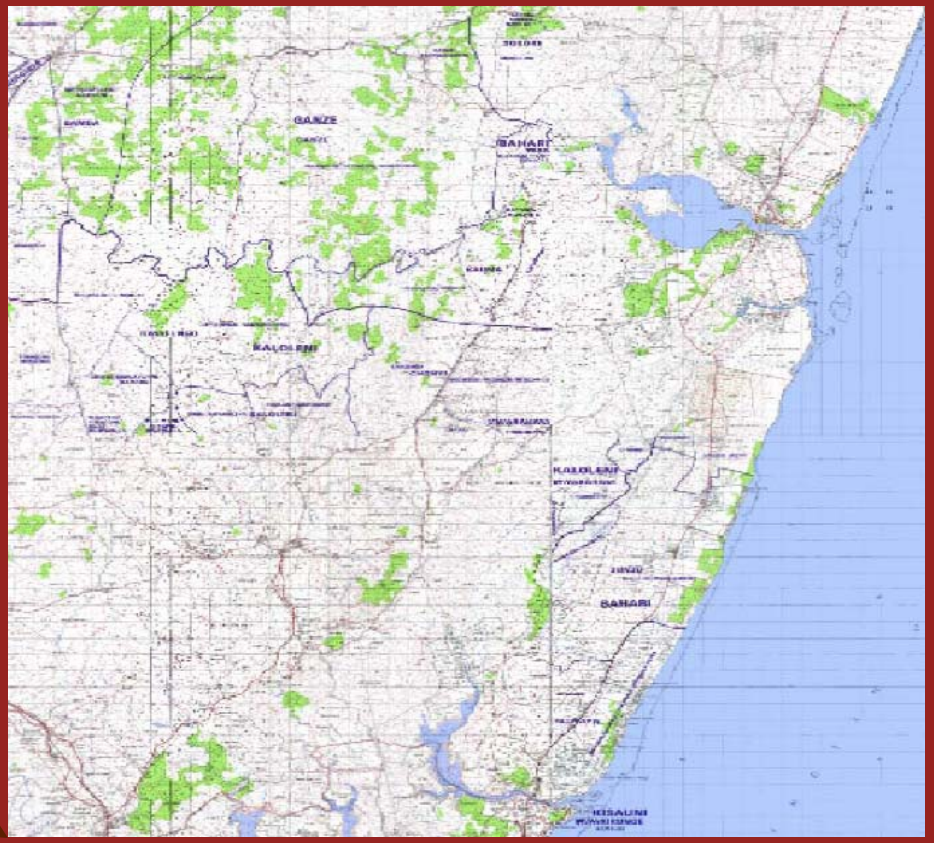
- This analysis allows health officials to efficiently allocate resources for mitigation, prevention and education.



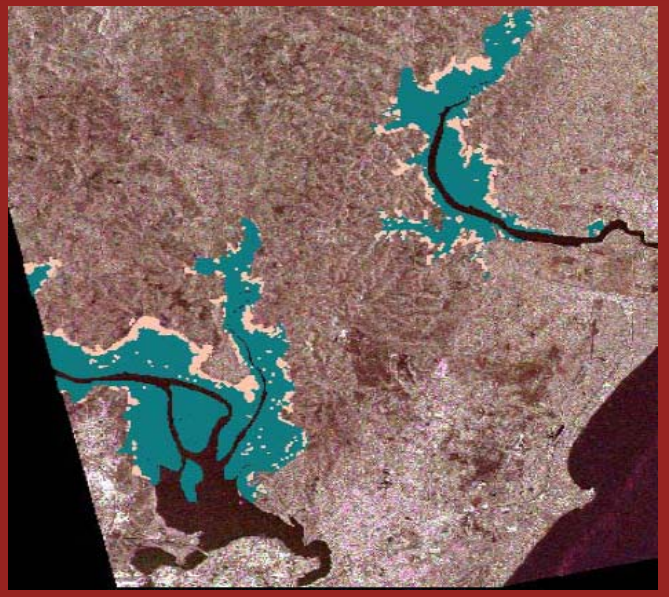
Map Layering Example

- The location where malarial mosquitoes can be predicted by collecting and layering maps showing known causal variables.
  - Low lying, stagnant water bodies
  - Vegetation types and shade cover
  - Soil types
  - Elevation
  - Population density, etc.

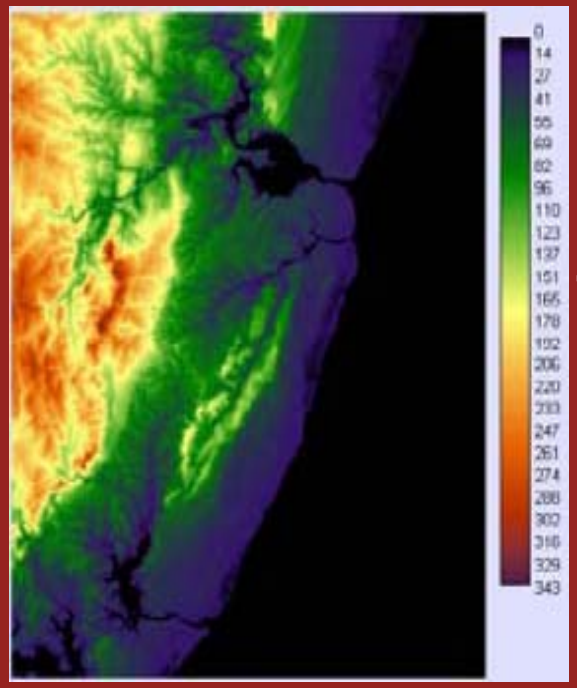
Multilayer Mapping: Mosquito Vectored Disease

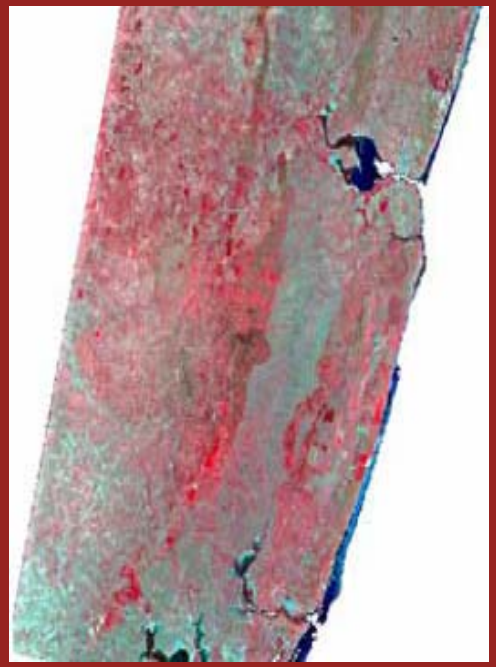


Topography and Water

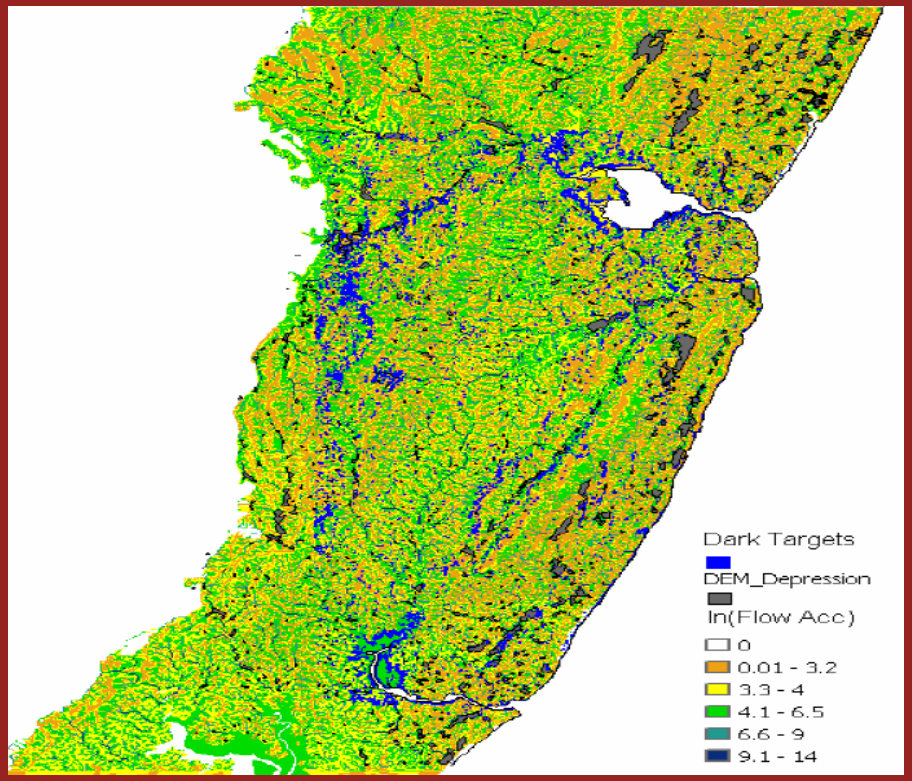


Digital Elevation Models, Soil and Vegetation

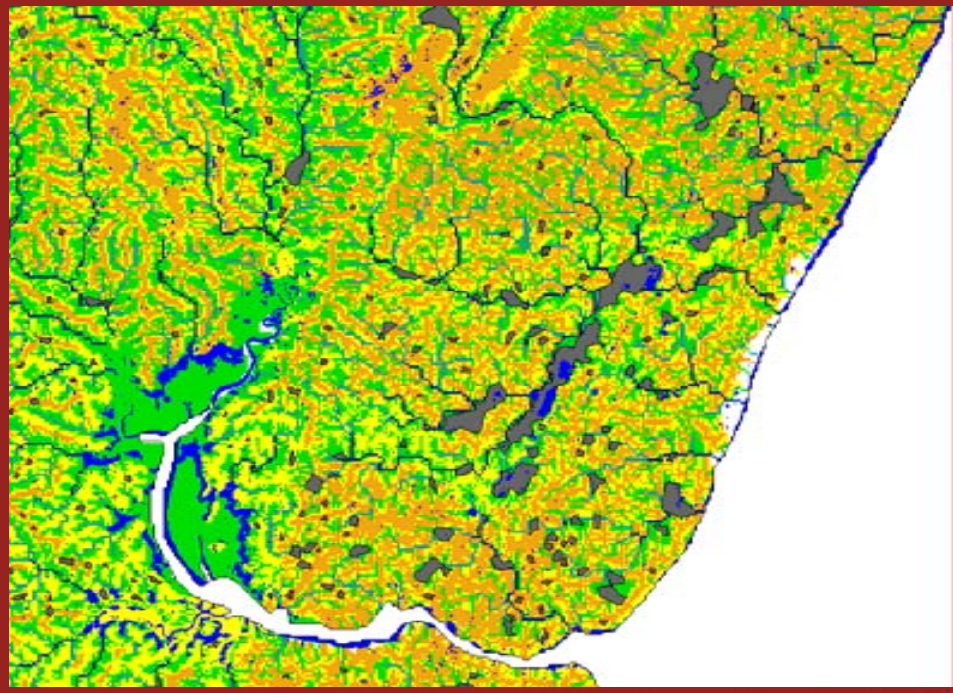
- 

+  + 

Mosquito Habitat Map



- Could be used to disburse much needed medicine or mosquito nets.

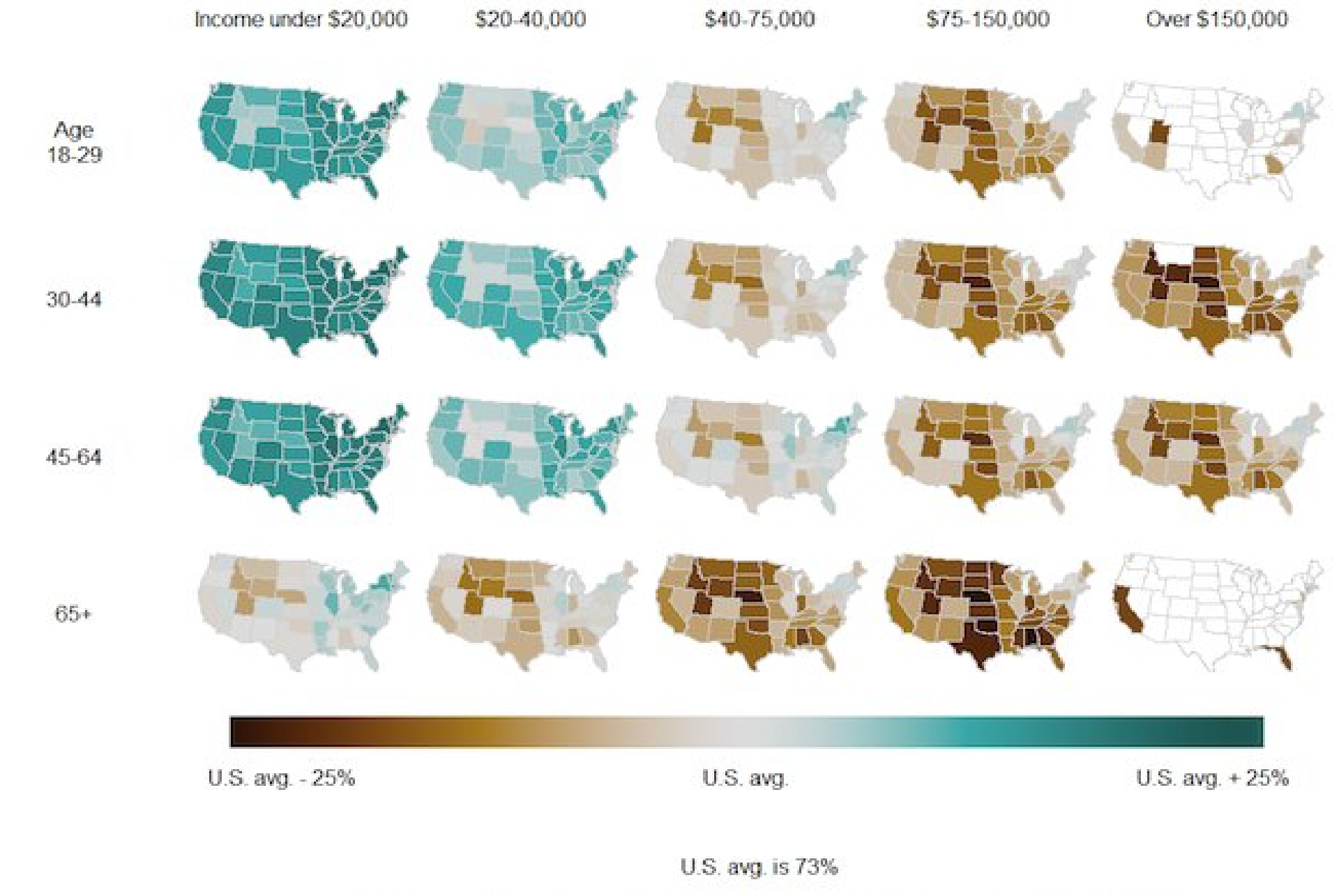


- Maps show (in blue) locations where risk is greatest.

Maps: Great Communicators!

- Graphic representations of data frequently more powerful than numeric or textual representations.
- Maps seem authoritative to policy makers and stake holders.
- See following images..

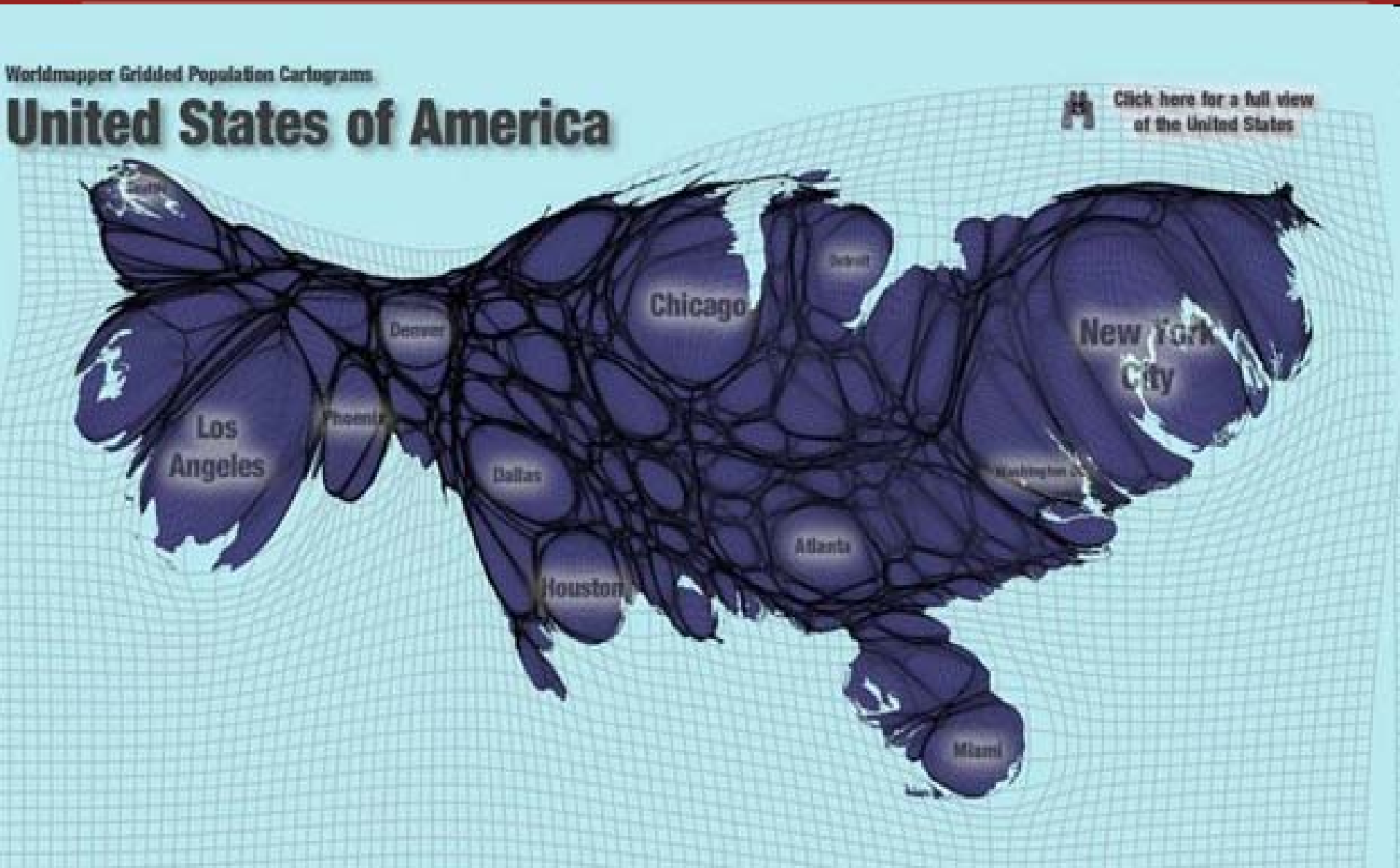
Should federal gov't spend more money on health care for the uninsured (2004 survey)?



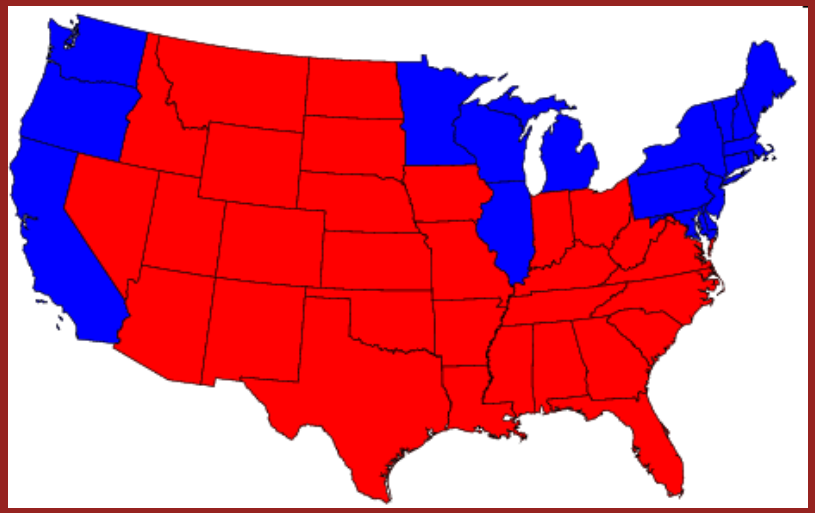
U.S. avg. is 73%

The state is left blank where a category represents less than 1% of the voters of a state.

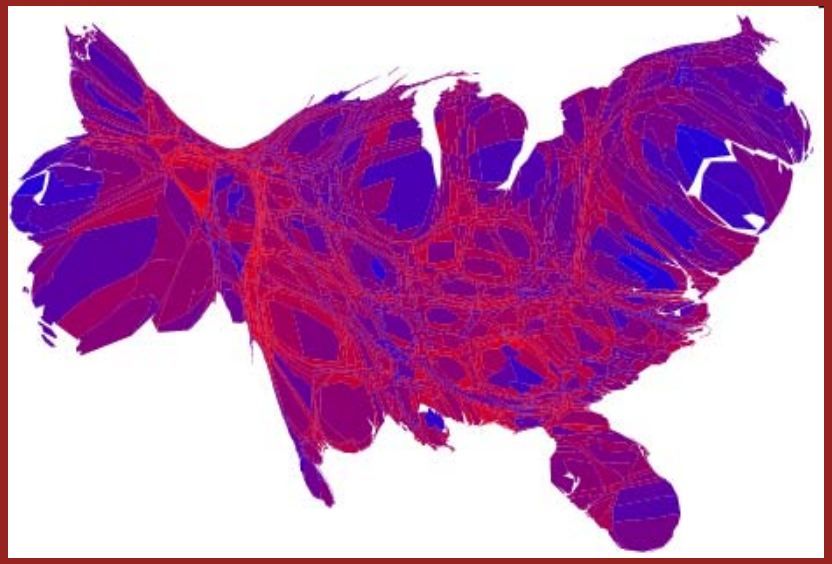
Cartogram of US Population



Red State Blue State Cartogram



- Note how this map represents election results much differently?



- Is America polarized or are we centrists?

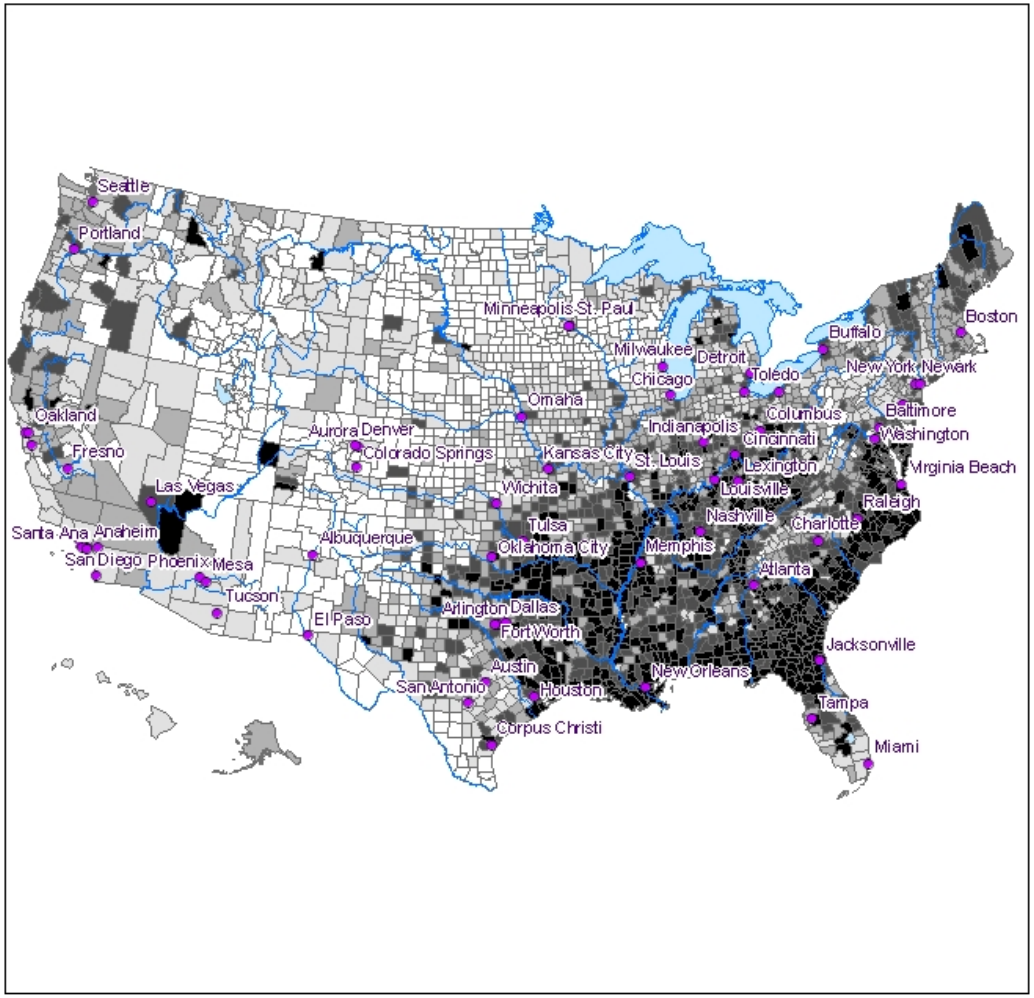
Cartography – Art and Science

- Maps can also be entertaining, especially when they are interactive (not in this presentation), even while they are informative.
- The following map shows access to McDonald's restaurants nationwide.
- Fast food nation indeed…


The Contiguous United States
Visualized by distance to the nearest McDonald's
Created by Stephen Von Worley
http://www.weathersealed.com/tags/maps/
Location data courtesy of AggData
http://www.aggdata.com/

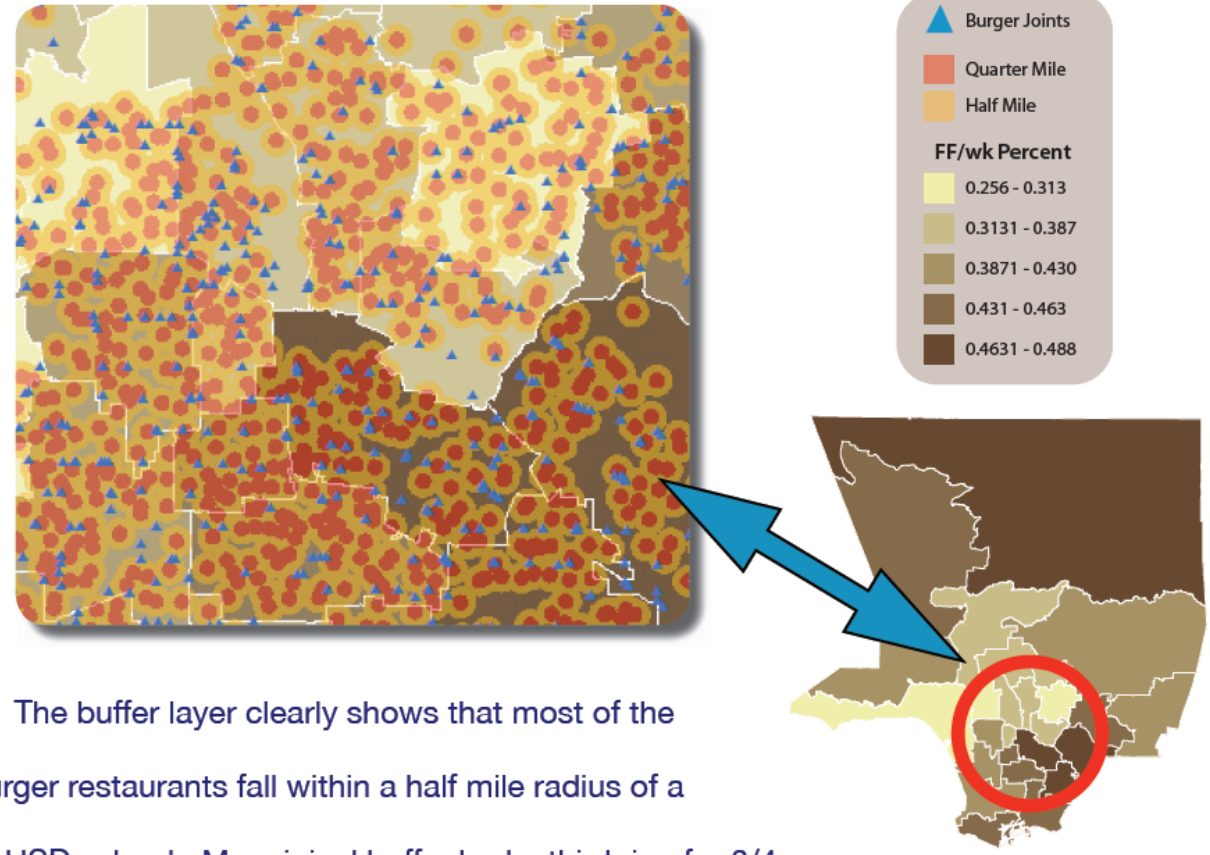
Student Projects

Lung Cancer Mortality
per 100,000 White Males, 1970 - 1994



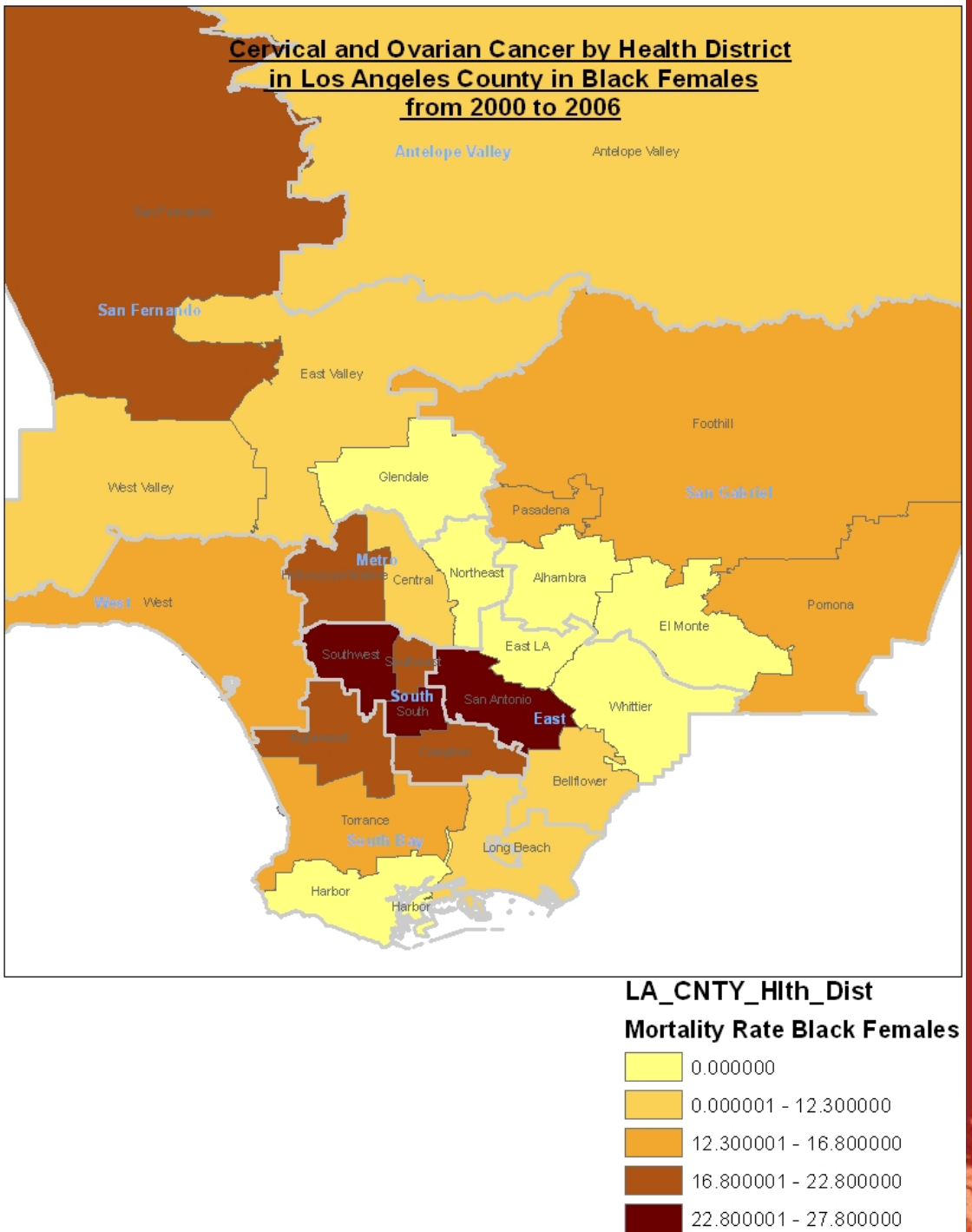
Fast Food and Diabetes

I created a map of burger joints with a quarter and half mile buffer around to Los Angeles Unified School District (LAUSD) schools.



The buffer layer clearly shows that most of the burger restaurants fall within a half mile radius of a LAUSD school. My original buffer had a third ring for 3/4

LA – Cervical Cancer Rates



Intro Course

- http://www.csun.edu/~sg4002/courses/107/107_lab_map_health.html