Mapping It Out

using geography to identify and analyze public health disparities

Steve Graves
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.
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
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/

WEST HILLS HOSPITAL & MEDICAL CENTER
7300 MEDICAL CENTER DR
WEST HILLS, CA 91307
(818) 676-4100

Standard of Care Scores
- Heart Attacks - 91.40%
- Heart Failure - 88.00%
- Pneumonia - 93.00%
- Surgical Infection Prevention - 93.14%

Click here for more details on this hospital...
Freshman Project

Loma Linda University Behavioral Medicine Center: Child Intensive Outpatient Program
Autism Society of America - Inland Empire Chapter

Loma Linda University Behavioral Medicine Center: Child Intensive Outpatient Program
1710 Barton Rd, Redlands, CA

This program is structured for youth, ages 8 to 13. The child intensive outpatient program (ICP) is designed for children experiencing behavioral problems, family conflicts, and school-related difficulties. The program is intended for children who need more than outpatient visits with a psychiatrist or therapist, yet are not appropriate for psychiatric hospitalization. The program is geared to help the whole family, allowing group time specifically for children, parents, as well as children and parents together.

1-(909)-556-0240

http://lomahealth.org/behavioral-medicine-center

©2009 Autism Society of America - Inland Empire
Asthma Map - Missouri

Numbers of Rural School Children in Missouri with Disabling Asthma by School Zip Code, May 2005

Produced by: University of Missouri Extension, Office of Social and Economic Data Analysis (OSEDA) 10/24/05.
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.
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

- Can 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)?

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

United States of America

Worldmapper Gridded Population Cartograms

Click here for a full view of the United States
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…
Student Projects

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

- Cities with 250,000 or Greater Population
- Rivers
- Percentage Female-Headed Households with Children
  - 0% to 4%
  - 4% to 8%
  - 8% to 12%
  - Greater than 12%

Mortality per 100,000 White Males
- 0 - 30
- 30 - 60
- 60 - 90
- 90 - 120
- 120 and greater
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

Cervical and Ovarian Cancer by Health District in Los Angeles County in Black Females from 2000 to 2006

LA_CNTY_Hlth_Dist
Mortality Rate Black Females
- 0.00000
- 0.000001 - 12.300000
- 12.300001 - 16.800000
- 16.800001 - 22.800000
- 22.800001 - 27.800000
Intro Course

• [http://www.csun.edu/~sg4002/courses/107/107_lab_map_health.html](http://www.csun.edu/~sg4002/courses/107/107_lab_map_health.html)