

## Descriptive Data – Computer Mapping and GIS Techniques

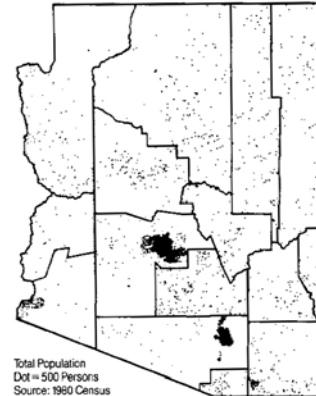
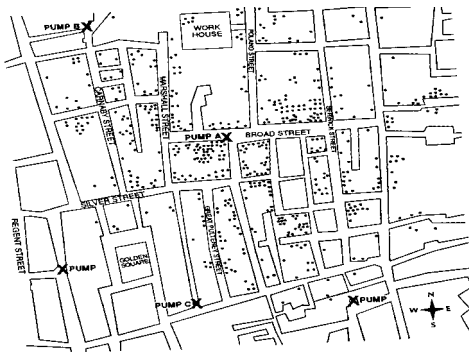
Principles of Epidemiology  
Lecture 6A

## Mapping Techniques

- Dot maps -- John Snow's map of London
- Choropleth maps -- portray data using geographic areas as the unit of analysis
- Proportional maps -- portray density using icons
- Isopleth maps -- portray areas of equal measures, can show diffusion (weather maps)

2

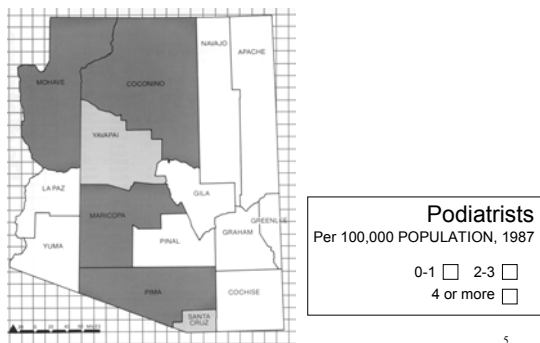
Distribution of Cholera Cases in the Golden Square Area of London, August – September 1854



Arizona  
Population  
Distribution

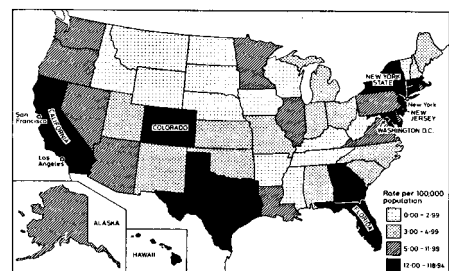
4

Licensed Podiatrists in Arizona, 1987 by Community



5

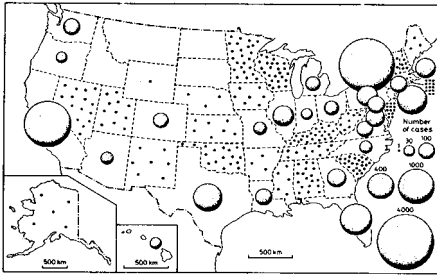
AIDS : The Start of a New Pandemic



Cumulative number of AIDS cases, per 100,000 population, in the United States, 1979 to mid-1987

6

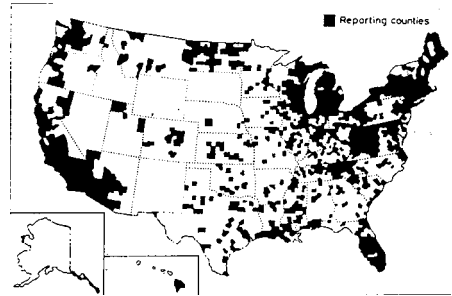
### AIDS: The Start of a New Pandemic



State-by-State distribution of initial 10,000 AIDS cases, in the United States, 1979 to mid-1987

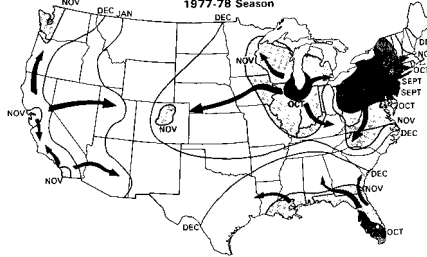
7

### US Counties Reporting Measles, 1978



8

### Influenza Diffusion Pathways

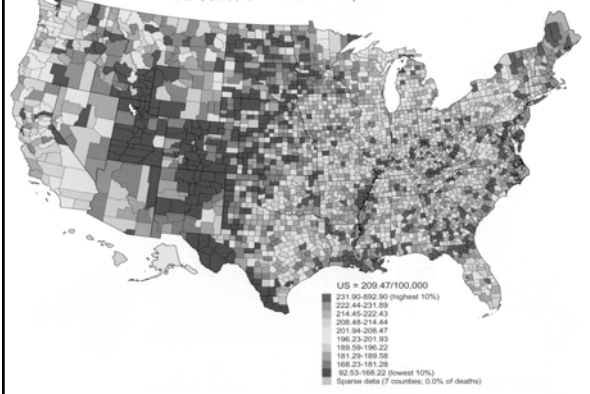


Influenza diffusion pathways during the autumn of 1977, using harmonic measures with isopleths.

9

### Cancer Mortality Rates by County (Age-adjusted 1970 US Population)

All Cancers: White Males, 1970-94



### Comparison of white male age-adjusted cancer mortality rates: Strongly urban, moderately urban, rural counties, and the United States, 1950-54

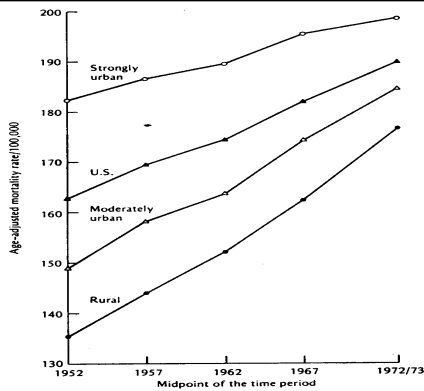
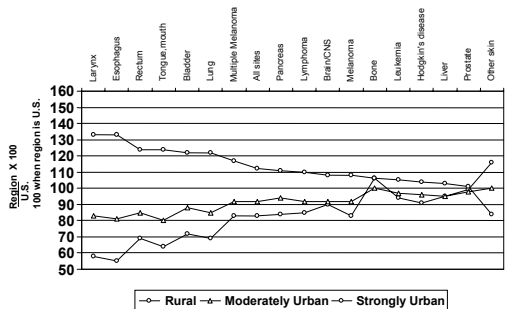


Figure 4-2. Trends in cancer mortality, white males: Strongly urban, moderately urban, and rural counties, 1950-75

12

## CHILDHOOD CANCERS IN NEW JERSEY

Incidence & Mortality Rates  
by Race, Sex & County for  
Total Cancer  
&  
Major Sites  
1980-1988



Division of Epidemiology, Environmental and Occupational Health Services  
Cancer Registry Program  
Data Applications Program

Christie Todd Whitman  
Governor

Len Fishman  
Acting Commissioner of Health

13

## Total Cancer Incidence Among New Jersey Children (Birth-14 years)



Co. vs. NJ Rate ( $p \leq 0.05$ )

- Significantly Higher
- No Significant Difference
- Significantly Lower

14

## Brain & CNS Cancer Incidence Among New Jersey Children (Birth-14 years)



Co. vs. NJ Rate ( $p \leq 0.05$ )

- Significantly Higher
- No Significant Difference
- Significantly Lower

15

## GIS Technology and Spatial Epidemiology

Concerned with describing, quantifying, and explaining geographical variations in health outcomes, especially with respect to variations in exposures at the small-area scale

- Disease mapping
- Geographical correlation studies
- Assessment of risk in relation to a point, line or area source
- Cluster analysis

17

## Problems with Small Area Analysis

- Numbers of cases are small
- Large variability across the map may merely reflect random variation
- Large sparsely populated areas with few cases may predominate

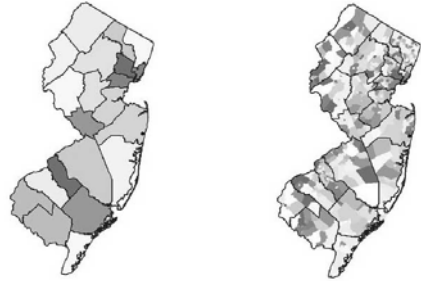
18

## New Jersey Birth Data

- In 1998, the NJ Center for Health Statistics completed a multi-year project involving the application of address standardization software to convert mailing-label type information so that birth records could be accurately assigned to geographic areas.

19

## Percent Low Birth Weight Births 1998



County

Municipality

20

## Percent Low Birth Weight Births 1998



Census Tract

Block Group

21

## Number of Low Birth Weight Infants 1998



County

Municipality

22

## Percent Low Birth Weight Births 1998



Municipality

Census Block Group

23

## Methods for Handling Small Numbers

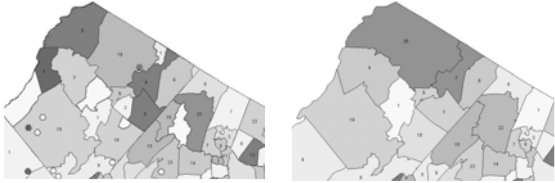
- Aggregating polygons until a certain size met (space and time)
- Dropping out units which have small denominator
- Smoothing
- Statistical Approaches

24

## Aggregated Zipcodes with Small Numbers of Births

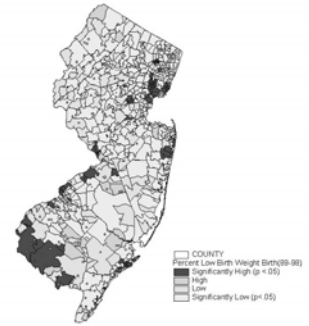
Before Aggregation

After Aggregation



25

## Percent of Low Birth Weight Births with Statistical Significance

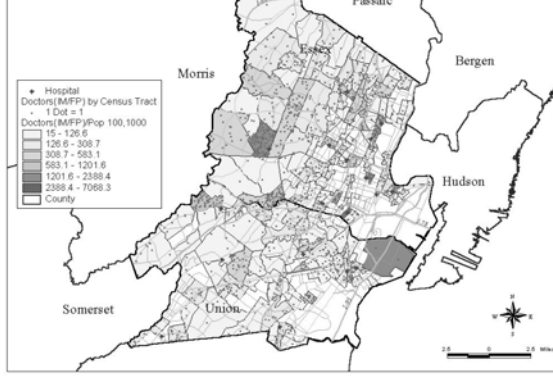


## Problems

- Coding Differences and Changes with Time (ICD-10)
- Boundary Changes
  - Zipcode, Census Tract, Municipalities

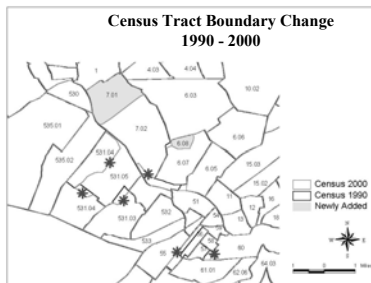
28

## Physician Office Location By Census Tract



## Geographical Area Boundary Changes

- Municipality annexation
- Zipcode change
- Census boundary change



29

## Be aware of

- Limitations of health outcome data
- Limitations of GIS data layers
- Limitations and options of various visualization and cartographic techniques

30

Maps are Powerful Tools

USE THEM CORRECTLY!

– Thanks to Wansoo Im, PhD at VERTICES.com