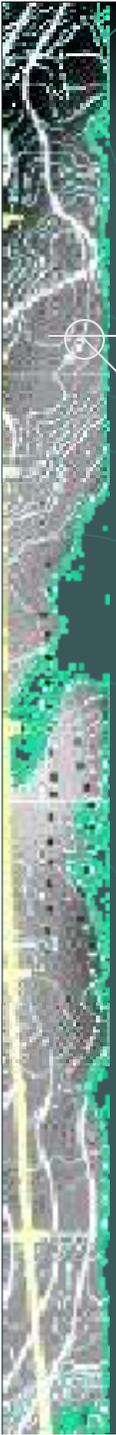




An Overview of GIS Methodology and Its Applications in Public Health

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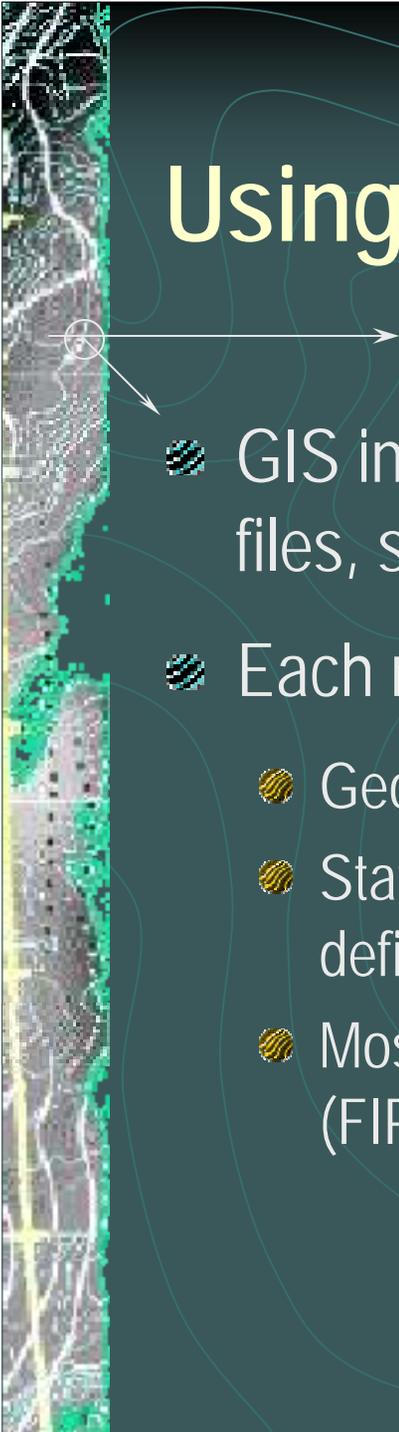
Geographic Information Systems (GIS)

- Integrated hardware and software applications that join relational database management capabilities with automated mapping and spatial analysis tools
- Improvements in computing technology coupled with methodological enhancements and widespread accessibility of geographic reference files and statistical data has led to widespread use in public health



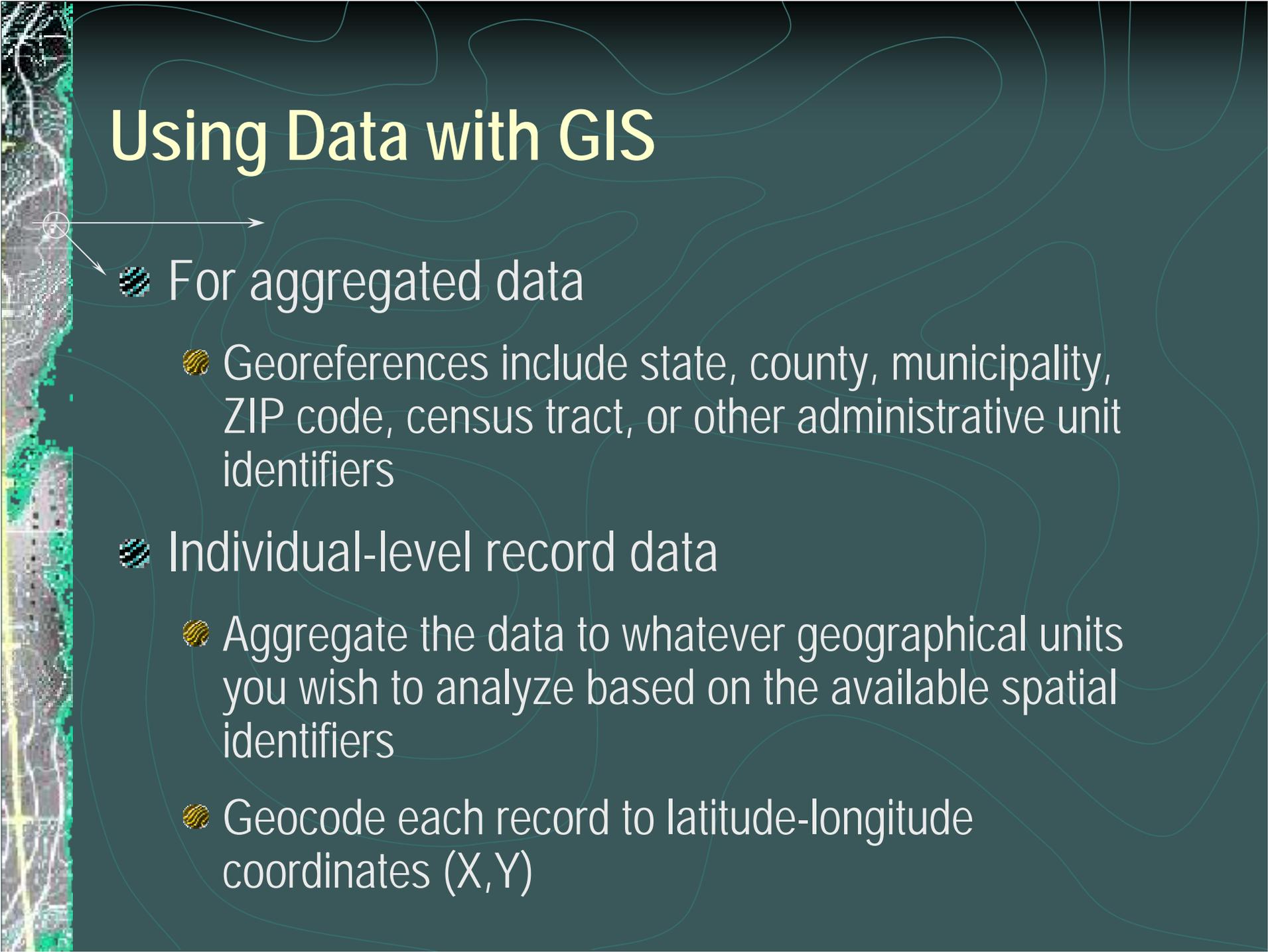
Uses of GIS in MCH

- To map specific health variables
- To look for clustering or locally elevated risks
- To examine patterns of health care utilization and/or access to care
- As a resource to facilitate data acquisition for multi-level modeling and contextual analysis



Using Data with GIS

- GIS include hardware, software, geographical reference files, spatially referenced statistical data, and analysts
- Each record must be georeferenced
 - Geographical reference files (commonly known as “shapefiles”)
 - Statistical data georeferenced to the locations or areal units defined in the shapefile(s)... or “spatial” data
 - Most shapefiles use Federal Information Processing Standards (FIPS) codes, so you may need to recode the identifier field



Using Data with GIS

- For aggregated data

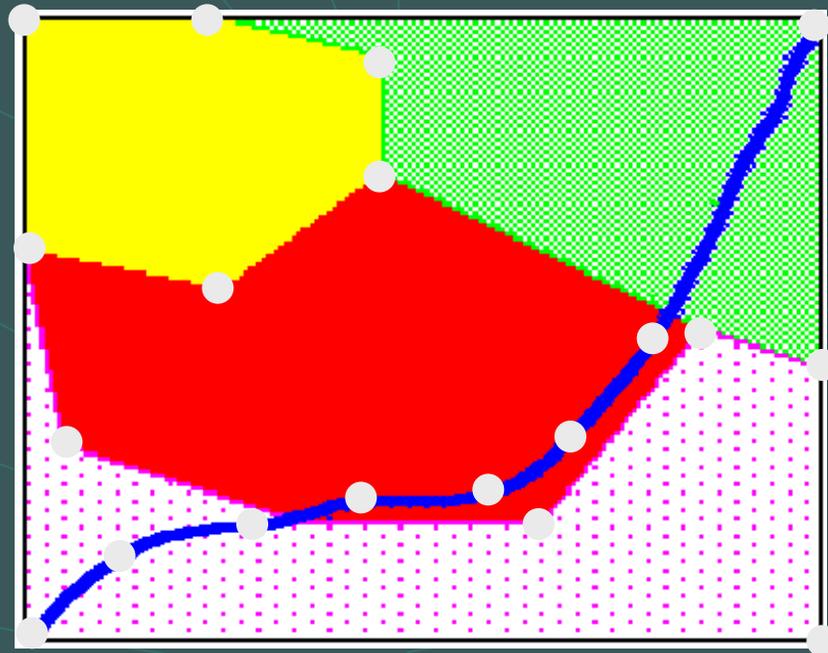
- Georeferences include state, county, municipality, ZIP code, census tract, or other administrative unit identifiers

- Individual-level record data

- Aggregate the data to whatever geographical units you wish to analyze based on the available spatial identifiers
- Geocode each record to latitude-longitude coordinates (X,Y)

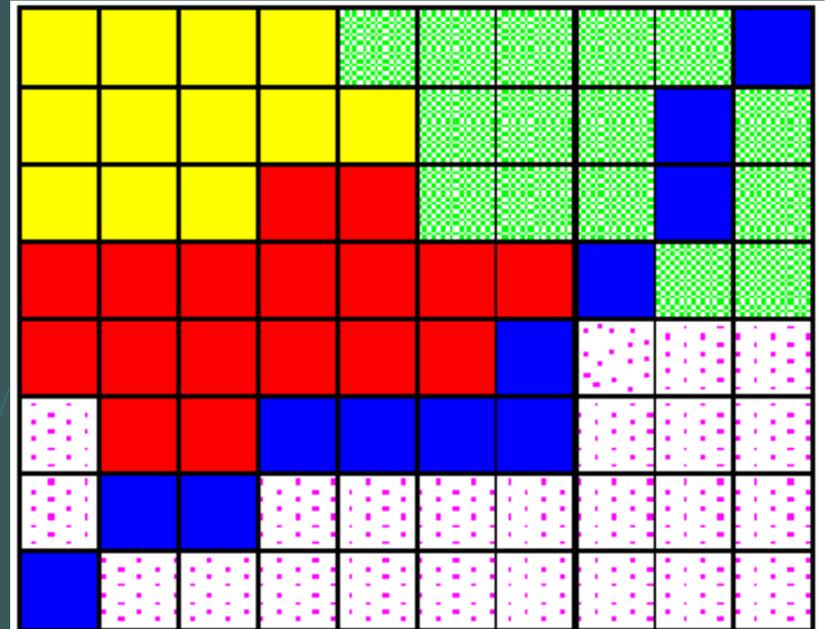
Vector

- Allows user to specify specific spatial locations and assumes that geographic space is continuous, not broken up into discrete grid squares
- Stores features as sets of X,Y coordinate pairs



Raster

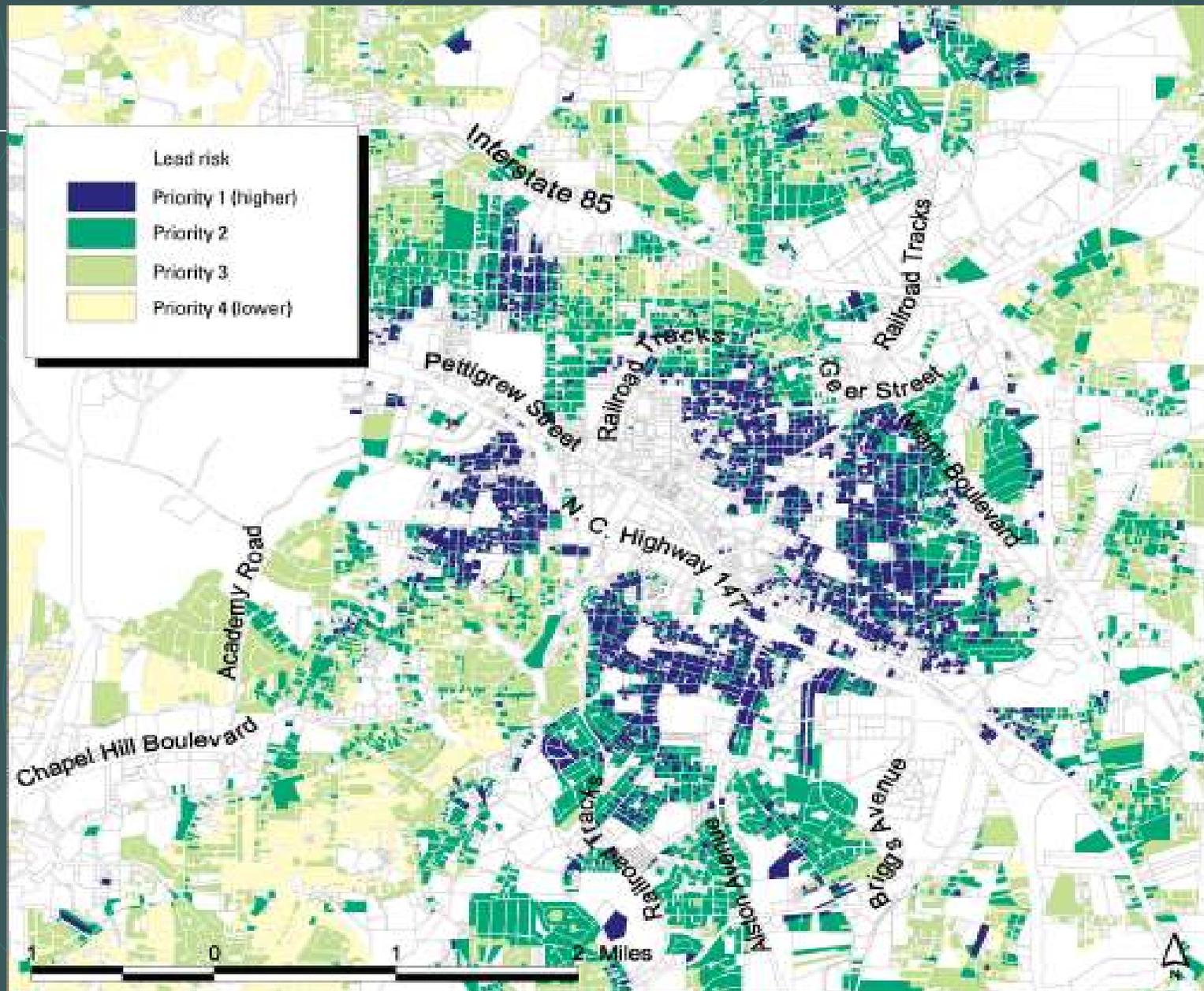
- Stores images as rows and columns of numbers with a Digital Value/Number (DN) for each cell
- Units are usually represented as square grid cells that are uniform in size
- Data are classified as "continuous" or "thematic"
- Numerous data formats (e.g., TIFF, GIF, ERDAS)



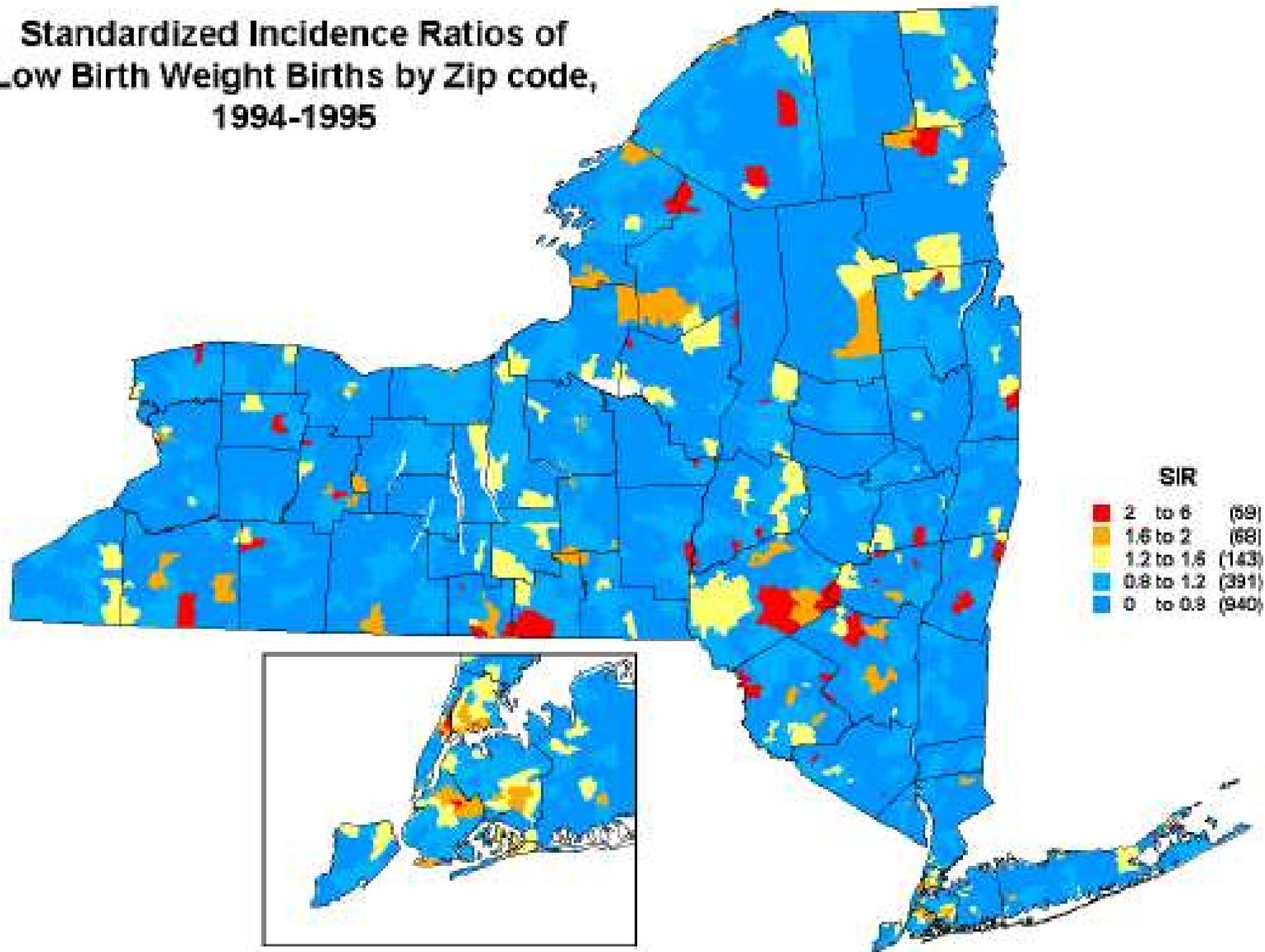
Choropleth Maps

- Classifies areas into categories based on values of one or more variables
- Most common method of mapping health data

Choropleth Map: Figure 5. Lead risk priorities mapped at the tax parcel unit level for the city of Durham, NC. From Miranda ML et al., Environmental Health Perspectives, 110:947–953 (2002).



**Standardized Incidence Ratios of
Low Birth Weight Births by Zip code,
1994-1995**

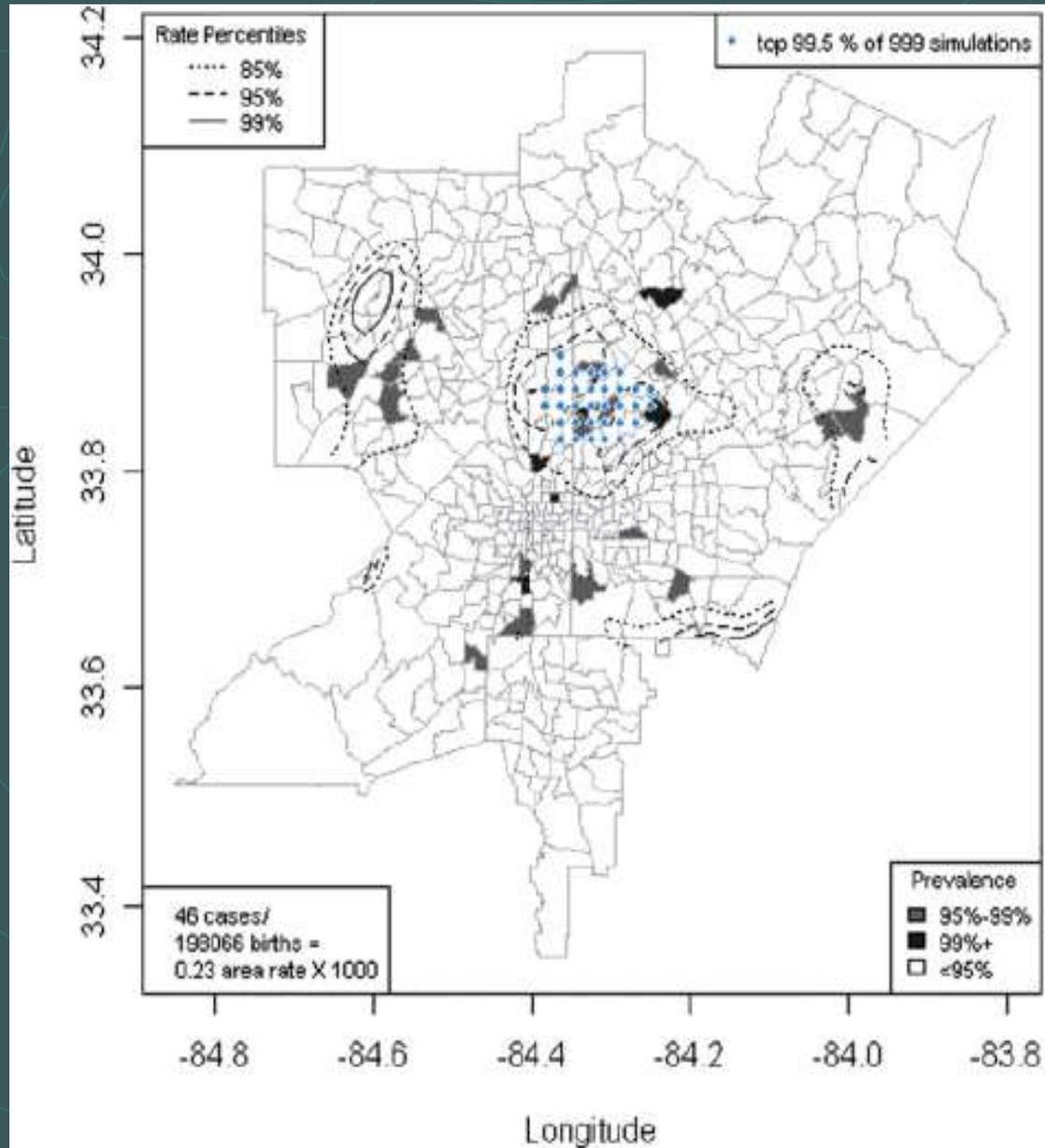


Talbot TO et al., *Statistical Medicine*, 2000; 19:2399–2408.

Isopleth Maps

- Interpolates lines of equal value across the spatial surface, independent of administrative boundaries
- Examples include weather maps and topographic maps

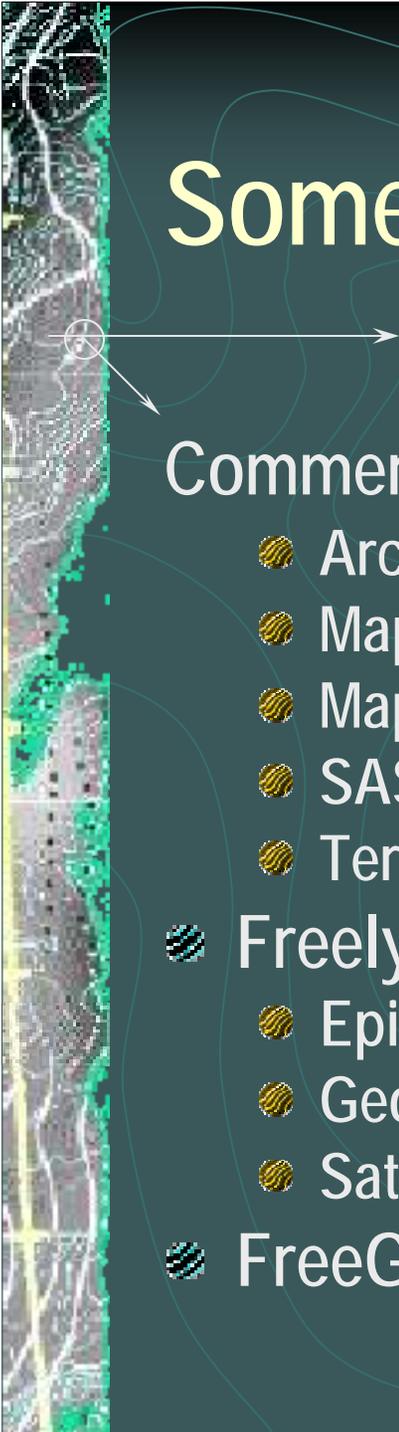
Isopleth Map: Figure 3. Automated Spatial Surveillance Project (ASSP) map of crude prevalence, smoothed prevalence contours, and potential clusters of birth defects in Atlanta. Birth Defects Research Part A 2006; 76:825–833.



Isopleth Map



Source: G. Rushton, Univ. of Iowa



Some GIS Resources

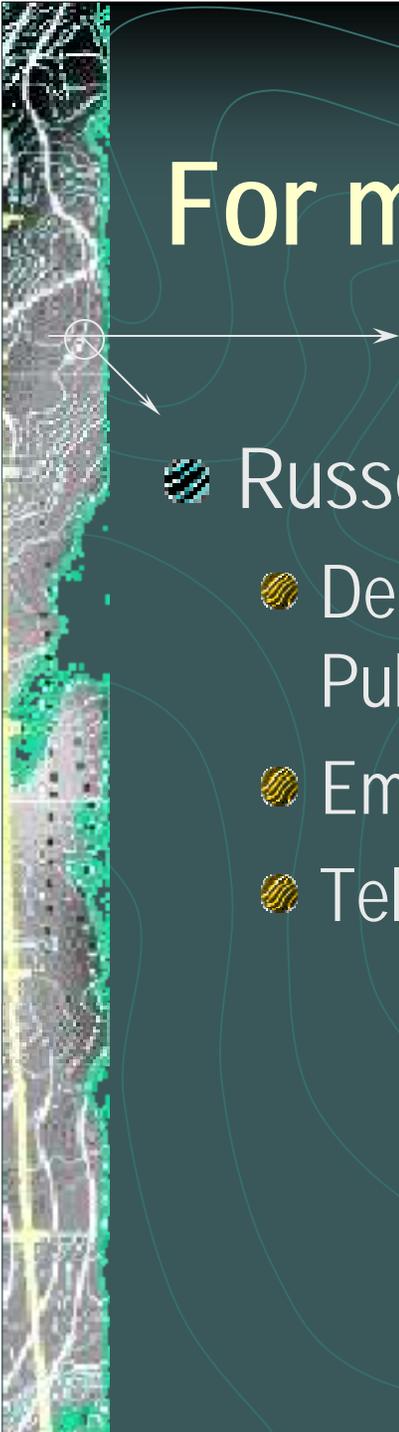
Commercial Software (listed alphabetically):

- ArcGIS (ESRI)
- MapInfo
- Maptitude
- SAS/Graph
- TerraSeer

● Freely Available Software:

- EpiMap: <http://www.cdc.gov/epiinfo/maps.htm>
- GeoDa: <https://www.geoda.uiuc.edu/>
- SatScan: <http://www.satscan.org/>
- FreeGIS: <http://freegis.org/>

For more information:



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