

Recent Advances in Linked Micromap Plots

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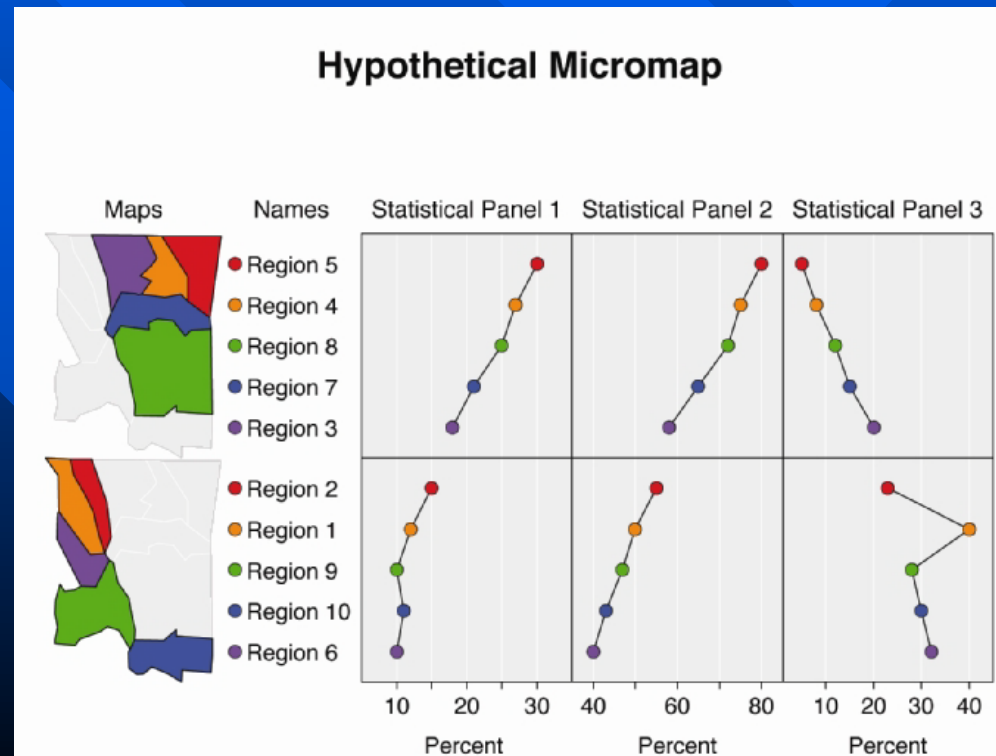


Contents

- Background
- Micromaps for Birth Defects Data
- Regional Micromaps
- Micromaps via NCI Java Code
 - Cancer Micromaps
 - West Nile Virus Micromaps
 - Current Developments
- Some Concluding Examples and Comments

Micromaps

- Link of row-labeled univariate (or multivariate) statistical summaries to corresponding geographical region
- Focus on statistical display and not on maps
- Useful for
 - environmental data
 - agricultural data
 - medical data
 - economical data



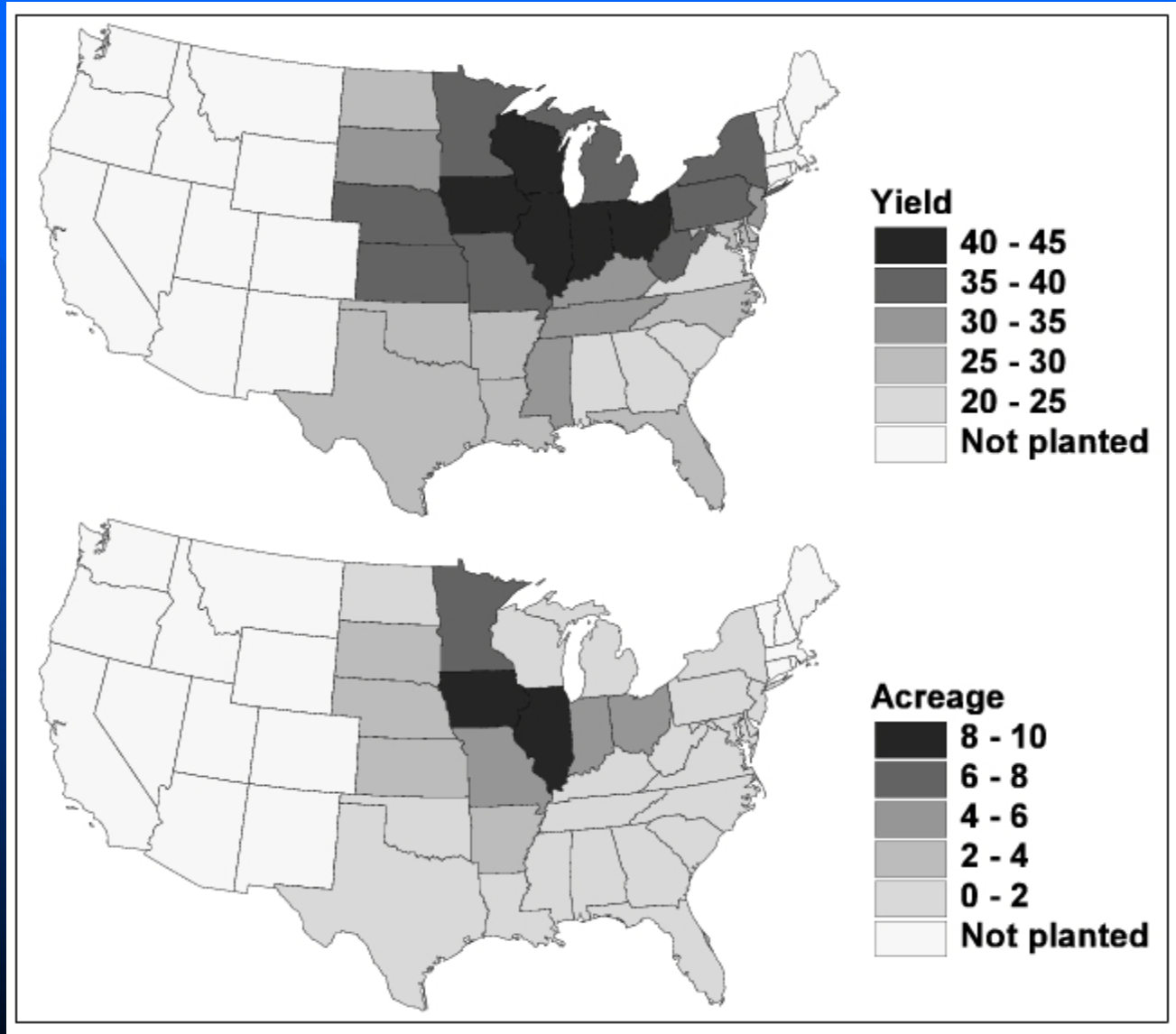
History of Micromaps

- First presented at 1995 American Statistical Association's annual meeting (Olsen, Carr, Courbois, Pierson)
- Initial references:
 - Carr, Pierson (1996) Emphasizing Statistical Summaries ...with Micromaps, SCSG*, Vol.7, No.3
 - Carr, Olsen, Courbois, Pierson, Carr (1998) Linked Micromap Plots ..., SCSG, Vol. 9, No.1

*Statistical Computing & Statistical Graphics Newsletter:

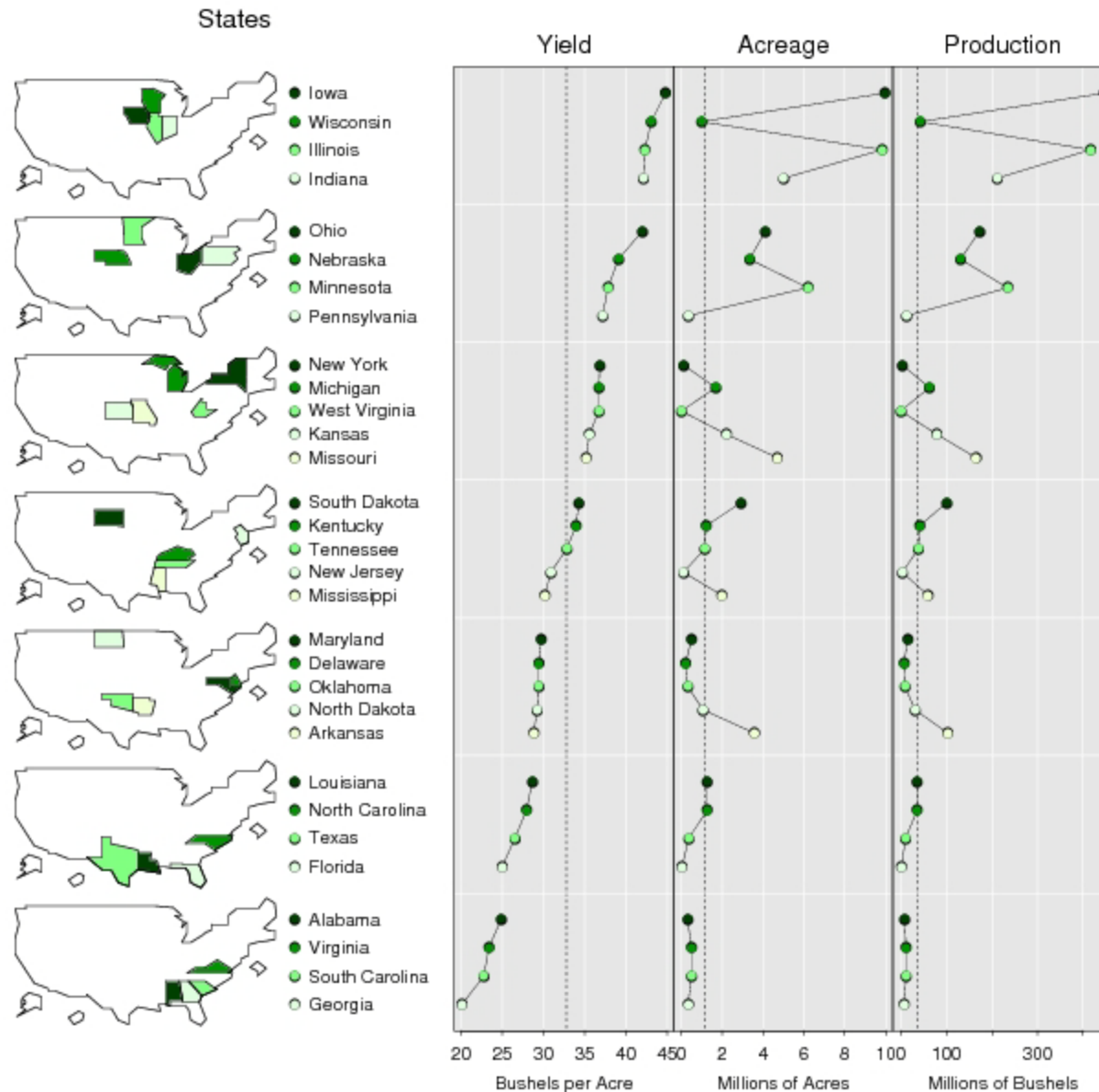
<http://www-stat.stanford.edu/~susan/scgn/>

Choropleth Maps vs Micromaps (1)



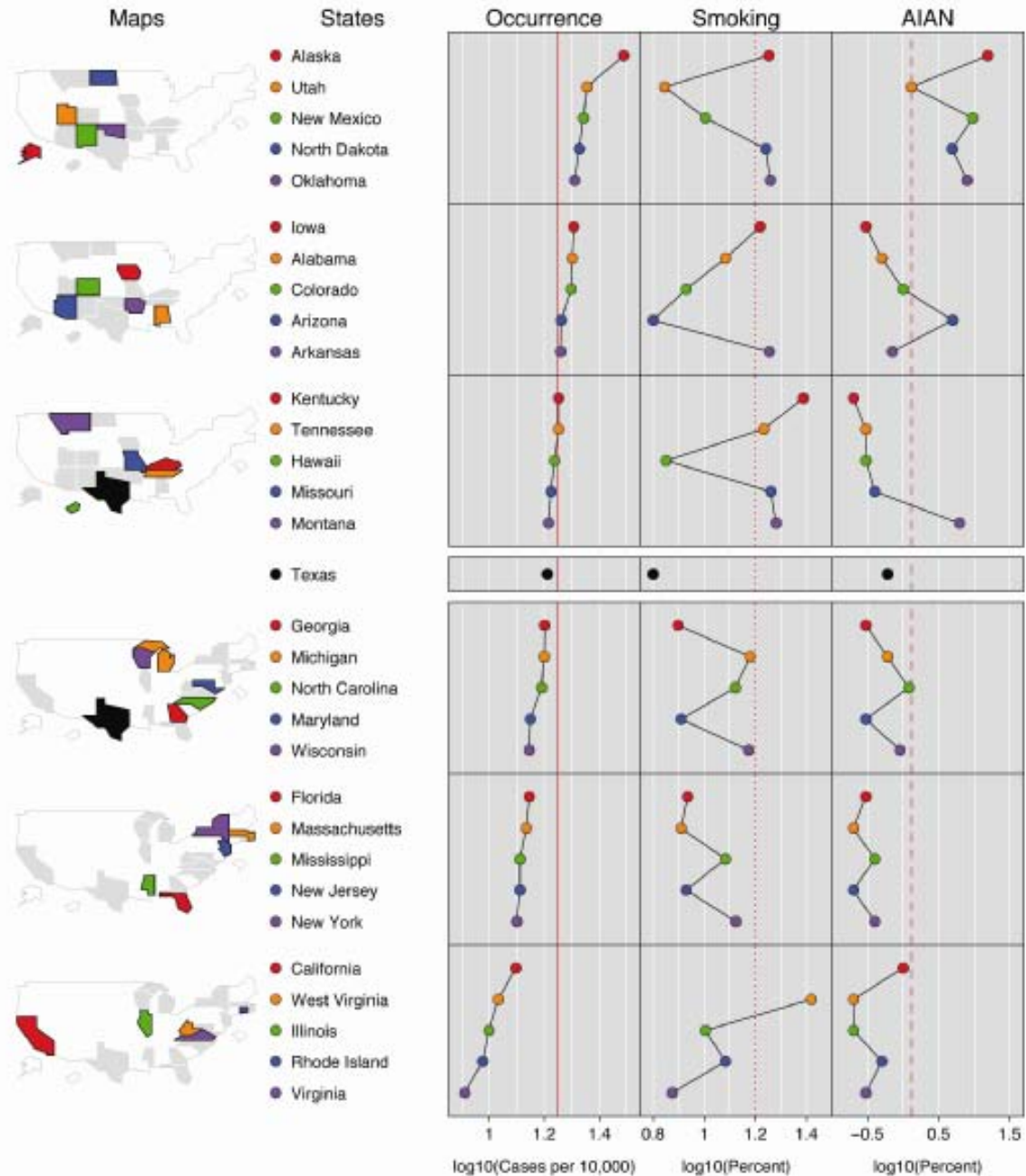
Choropleth Maps vs Micromaps (2)

Soybean Statistics by State, 1997 Census of Agriculture



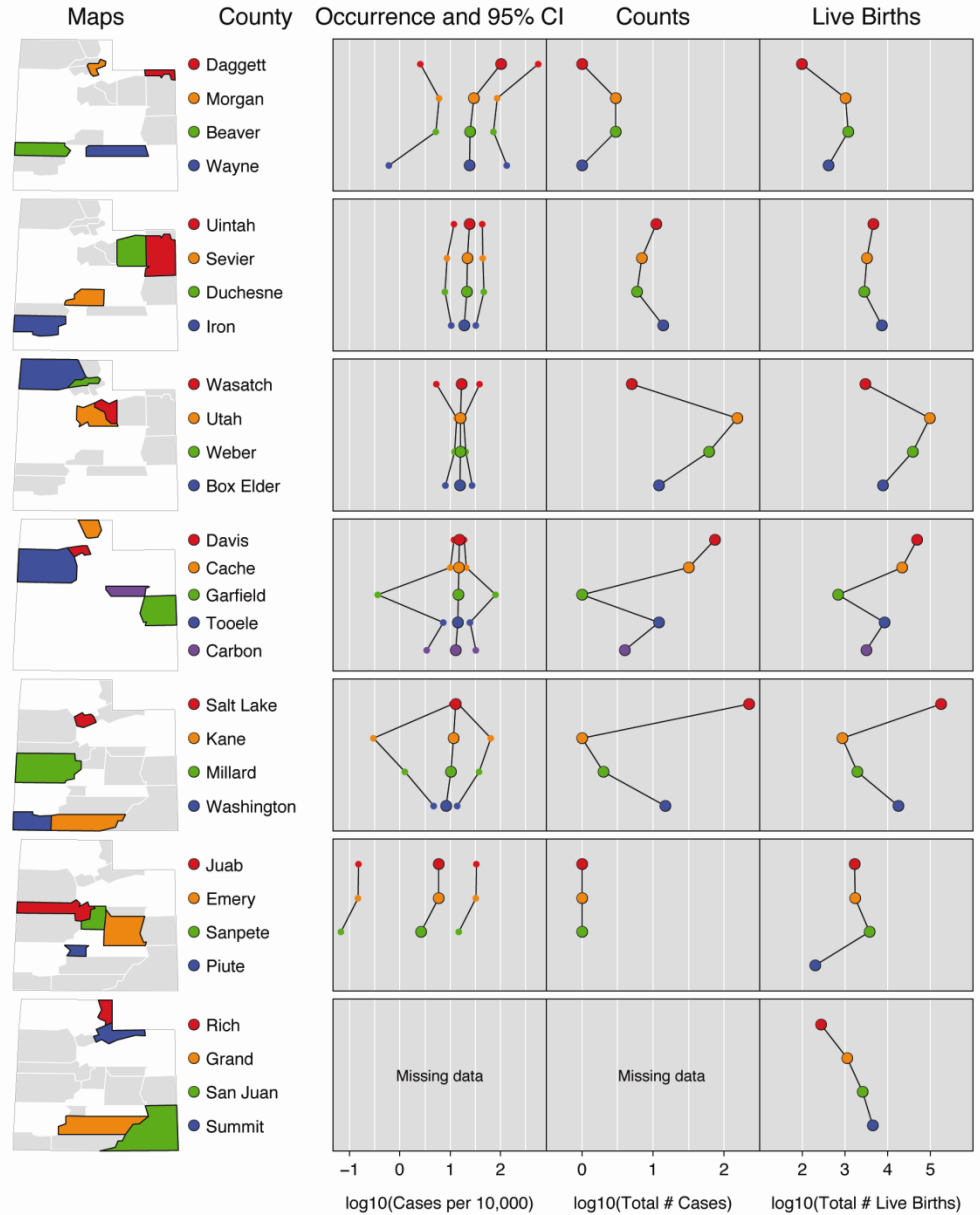
Oral Cleft Micromap Example: USA

Oral Cleft Occurrence by State 1998–2002



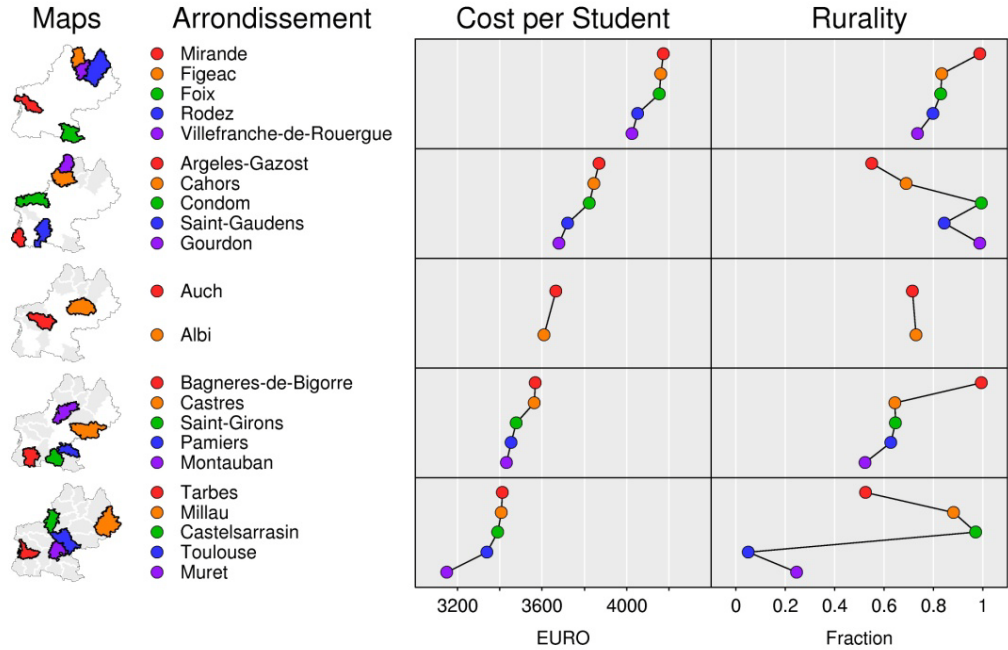
Oral Cleft Micromap Example: Utah

Oral Cleft Occurrence by County for the State of Utah 1995–2004



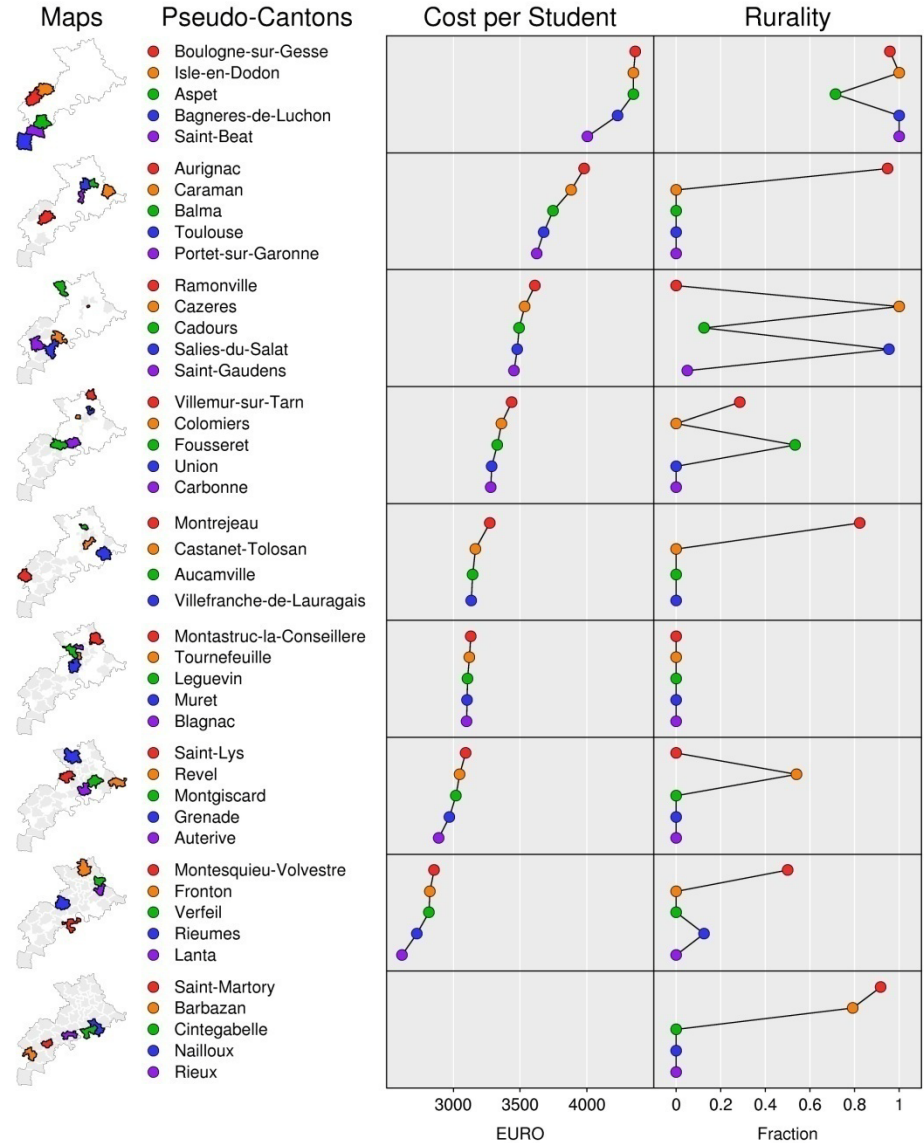
Regional Micromap Example: France - Region

Region Midi-Pyrenees Educational Data



Regional Micromap Example: France - Departement

Haute-Garonne (31) Educational Data



Micromaps at NCI

- National Cancer Institute (NCI)
- <http://www.statecancerprofiles.cancer.gov/micromaps>
- Released in April 2003
- Cancer statistics:
 - Mortality and incidence counts and rates
 - Trends by sex and race/ethnicity
- Fully interactive
- Extensive usability testing

Wang, Chen, Carr, Bell, Pickle (2002): Geographic Statistics Visualization: Web-based Linked Micromap Plots, Computing in Science & Engineering 4(3):90-94.



State Cancer Profiles

Dynamic views of cancer statistics for prioritizing cancer control efforts in the nation, states, and counties

Help us improve! Contact us with feedback.



Profiles Home > Latest Rates, Percents, and Counts

Left Column Data

Area:

Data Group:

Cancer:

Statistic:

Race:

Sex:

Age:

Right Column Data (optional)

Data Group:

Cancer:

Statistic:

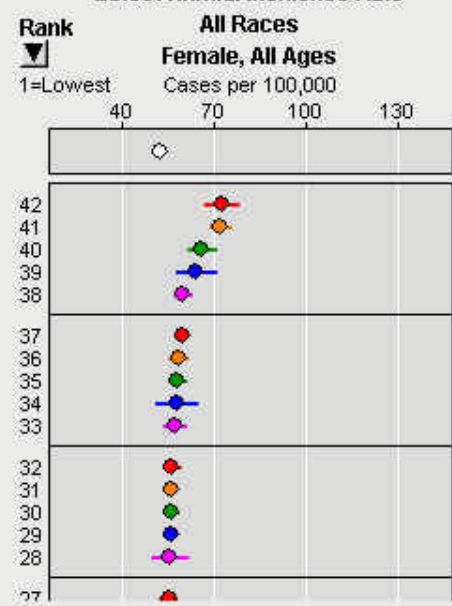
Race:

Sex:

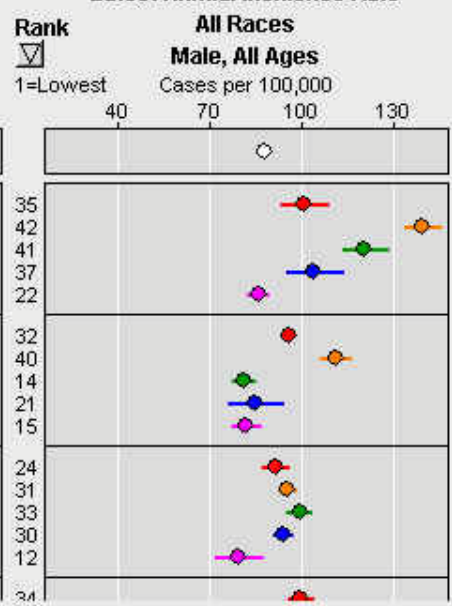
Age:

- State U.S. (SEER+NPCR)
- Nevada
 - Kentucky
 - West Virginia
 - Rhode Island
 - Massachusetts
 - Florida
 - Louisiana
 - Washington
 - Montana
 - Oregon
 - Maryland
 - Ohio
 - Indiana
 - Michigan
 - New Hampshire
 - Missouri

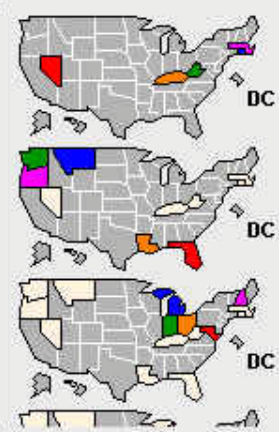
Lung & Bronchus Cancer Latest Annual Incidence Rate



Lung & Bronchus Cancer Latest Annual Incidence Rate



Micromaps for sorted column



Key

- Value and 95% Confidence Interval (CI)
- Healthy People 2010 U.S. Target
- Above current map
- Below current map
- Median value for sorted column

cancer.gov

NATIONAL CANCER INSTITUTE

State Cancer Profiles

Dynamic views of cancer statistics for prioritizing cancer control efforts in the nation, states, and counties

Help us improve! Contact us with feedback.

CDC

Profiles Home > Latest Rates, Percents, and Counts

Left Column Data

Area: US - state level

Data Group: Cancer Statistics

Cancer: Lung & Bronchus

Statistic: Incidence Rate

Race: All Races

Sex: Female

Age: All Ages

Right Column Data (optional)

Data Group: Cancer Statistics

Cancer: Lung & Bronchus

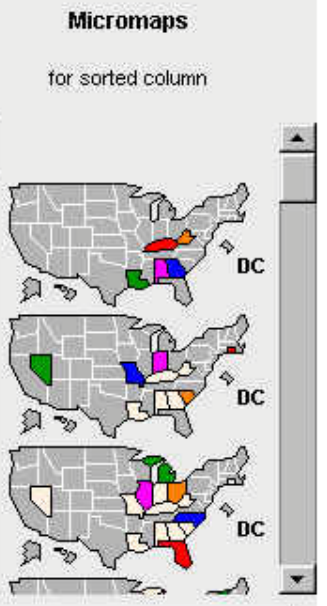
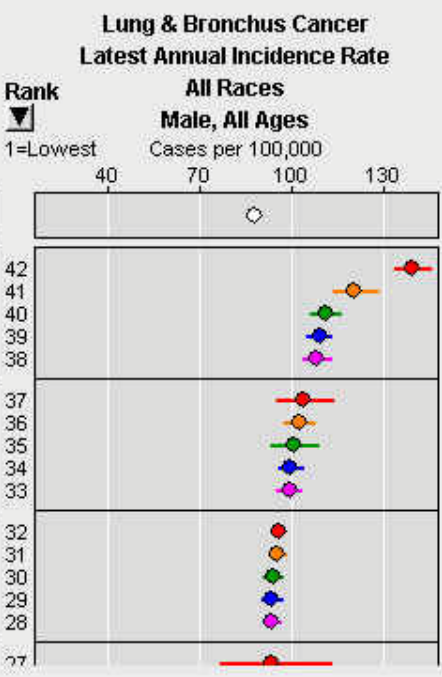
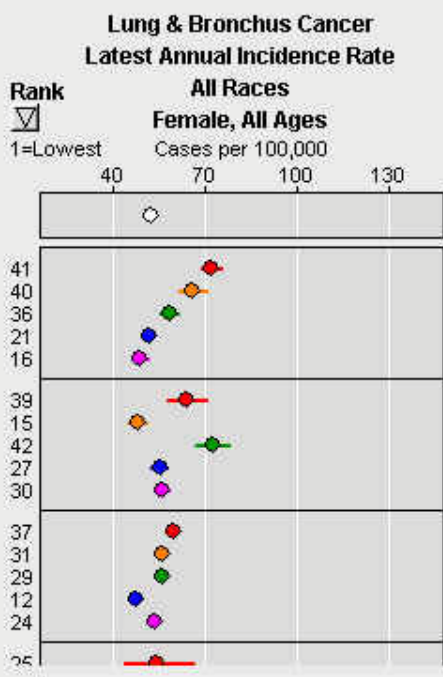
Statistic: Incidence Rate

Race: All Races

Sex: Male

Age: All Ages

- State
- U.S. (SEER+NPCR)
- Kentucky
 - West Virginia
 - Louisiana
 - Georgia
 - Alabama
 - Rhode Island
 - South Carolina
 - Nevada
 - Missouri
 - Indiana
 - Florida
 - Ohio
 - Michigan
 - North Carolina
 - Illinois
 - Alaska



Draw Clear

Overview

Options ? [Icons]

Source

Key

- Value and 95% Confidence Interval (CI)
- Healthy People 2010 U.S. Target
- Above current map
- Below current map
- Median value for sorted column

Micromaps for the Display of West Nile Virus (WNV) Data

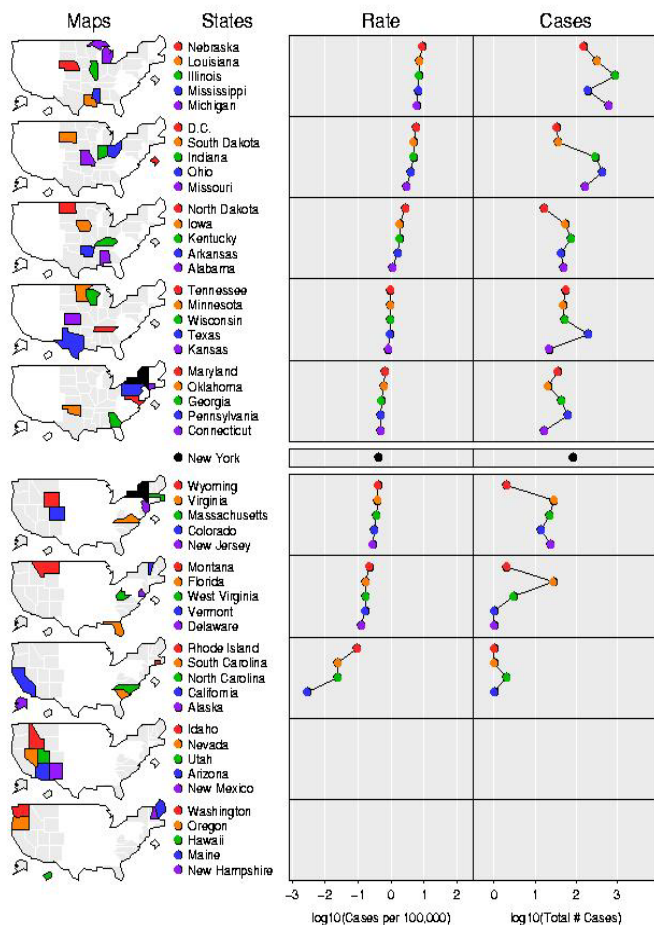
West Nile Virus (WNV) ???

- Introduced to the US in 1999
- Spread across North America in 5 years
- Initial event - Culex mosquito transmits virus within avian populations
- Bridging Aedes albopictus transmits virus from birds to animals and humans

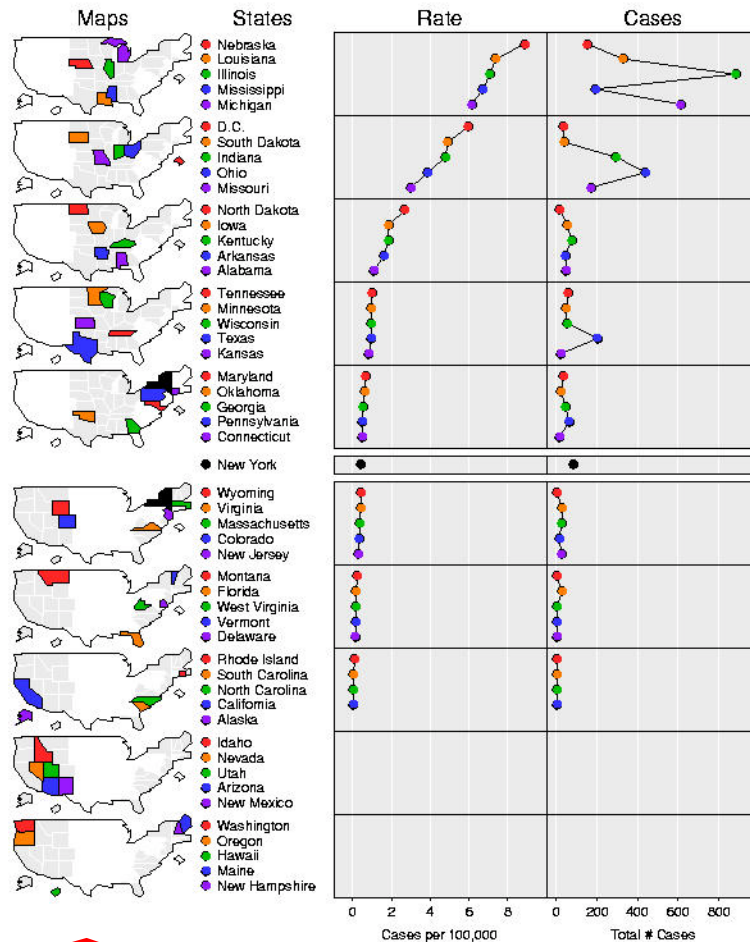


From 2002 CDC Web Page to Micromaps

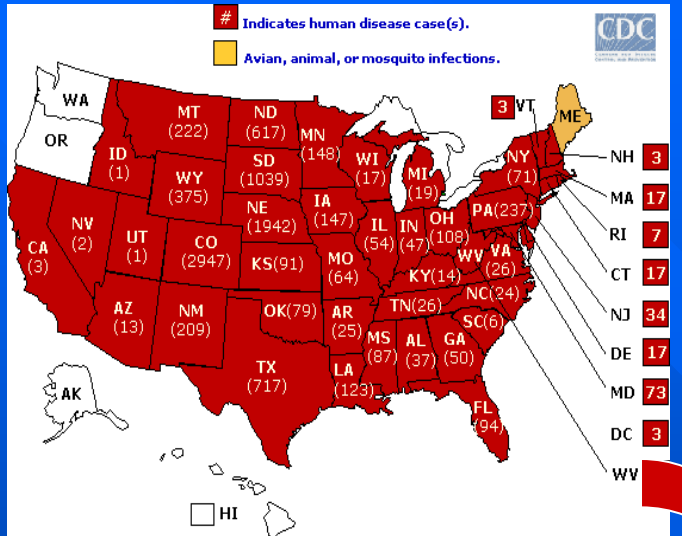
West Nile Virus 2002
Lab-Positive Human Cases



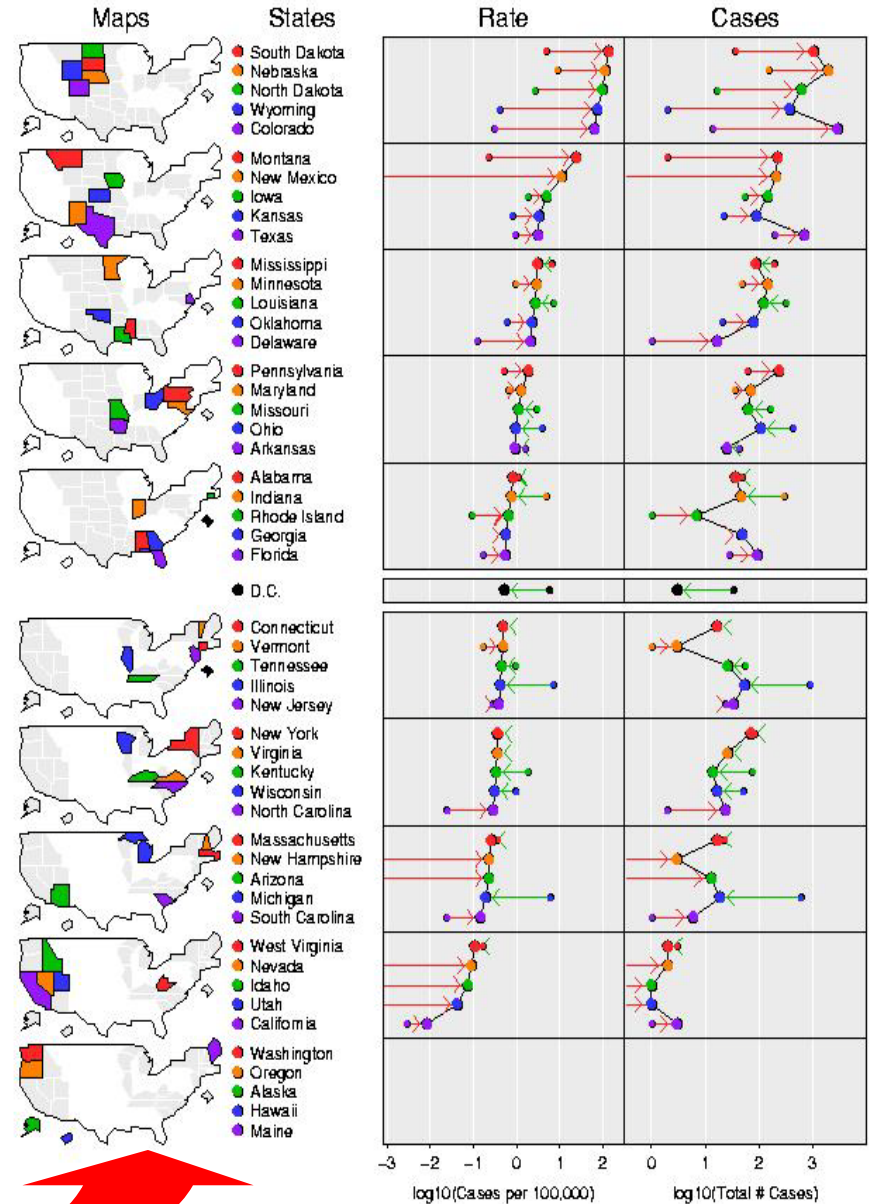
West Nile Virus 2002
Lab-Positive Human Cases



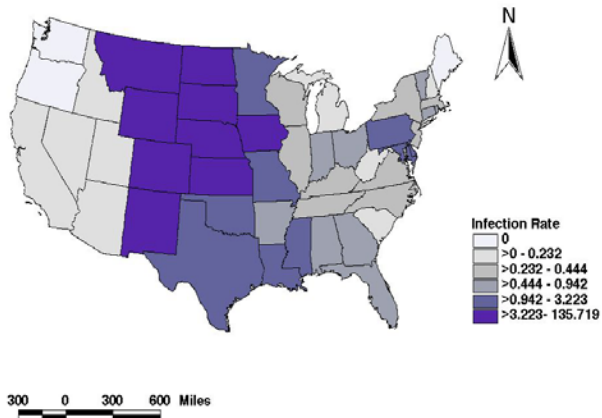
From 2003 CDC



West Nile Virus 2003 Lab-Positive Human Cases



Human West Nile Infection Rate for 2003
(Cases per 100,000)



Web-Based Access to WNV Data

- Work at Utah State University (USU):
 - Obtained NCI Java code for Web-based WNV micromaps
 - Upgrades made for the display of WNV data

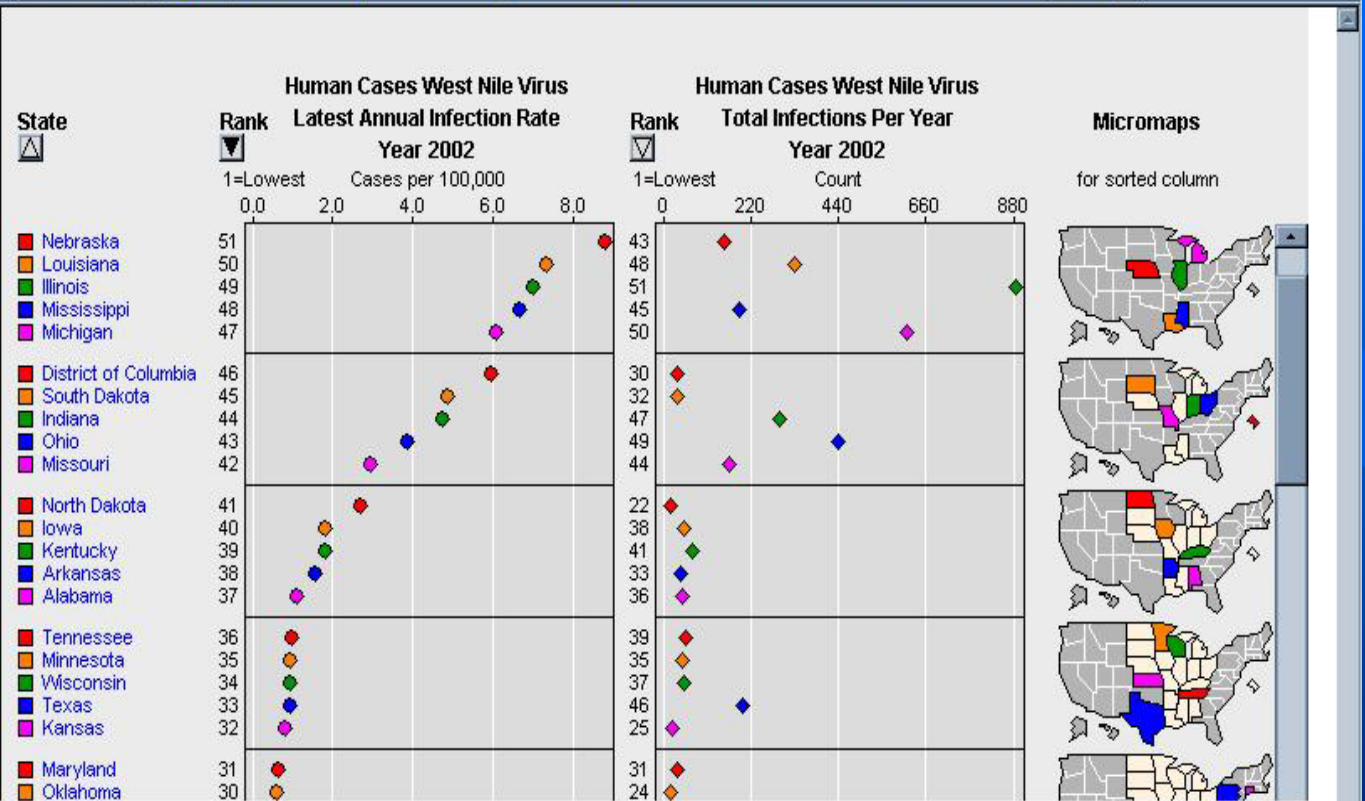
Left Column Data

Area: US - state level
 Data Group: West Nile Virus
 Host Group: Human Cases
 Statistic: Infection Rate
 Year: 2002
 Sex: Both Sexes

Right Column Data (optional)

Data Group: West Nile Virus
 Host Group: Human Cases
 Statistic: Infection Count
 Year: 2002
 Sex: Both Sexes

Draw Clear
 Overview
 Options ?



■ <http://webcat.gis.usu.edu:8080/index.html>

Left Column Data

Area: US - state level

Data Group: West Nile Virus

Host Group: Human Cases

Statistic: Infection Rate

Year: 2003

Sex: Both Sexes

Right Column Data (optional)

Data Group: West Nile Virus

Host Group: Human Cases

Statistic: Infection Count

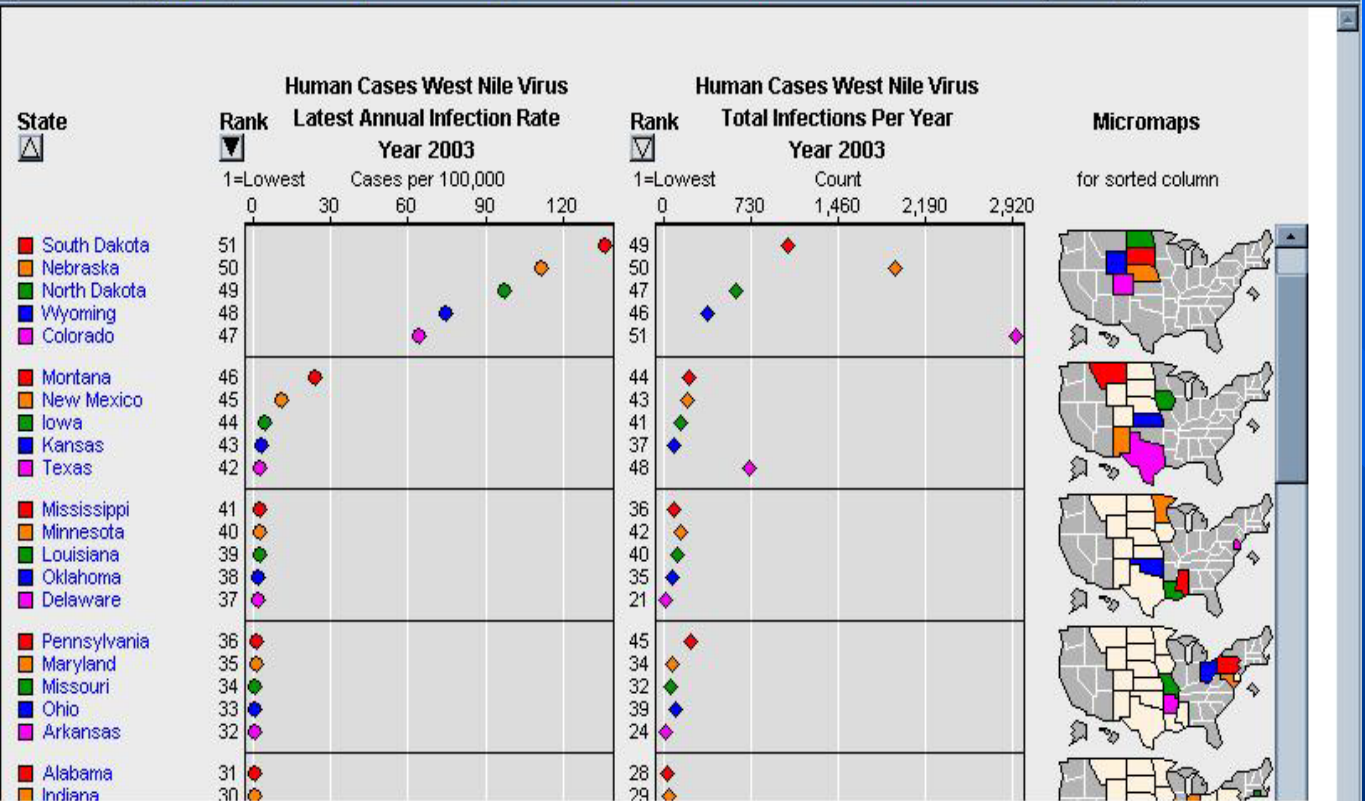
Year: 2003

Sex: Both Sexes

Draw Clear

Overview

Options ?



Left Column Data

Area: US - state level

Data Group: West Nile Virus

Host Group: Human Cases

Statistic: Infection Rate

Year: 2003

Sex: Both Sexes

Right Column Data (optional)

Data Group: West Nile Virus

Host Group: Human Cases

Statistic: Infection Count

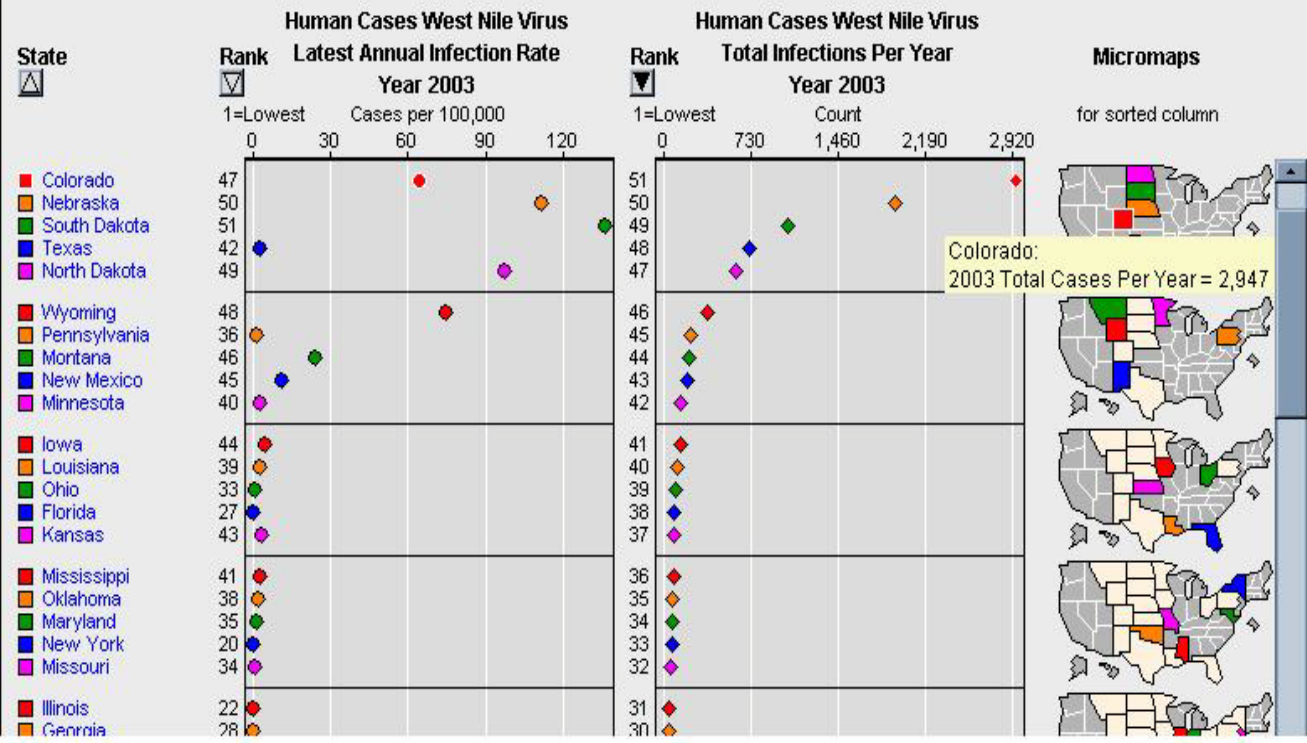
Year: 2003

Sex: Both Sexes

Draw Clear

Overview

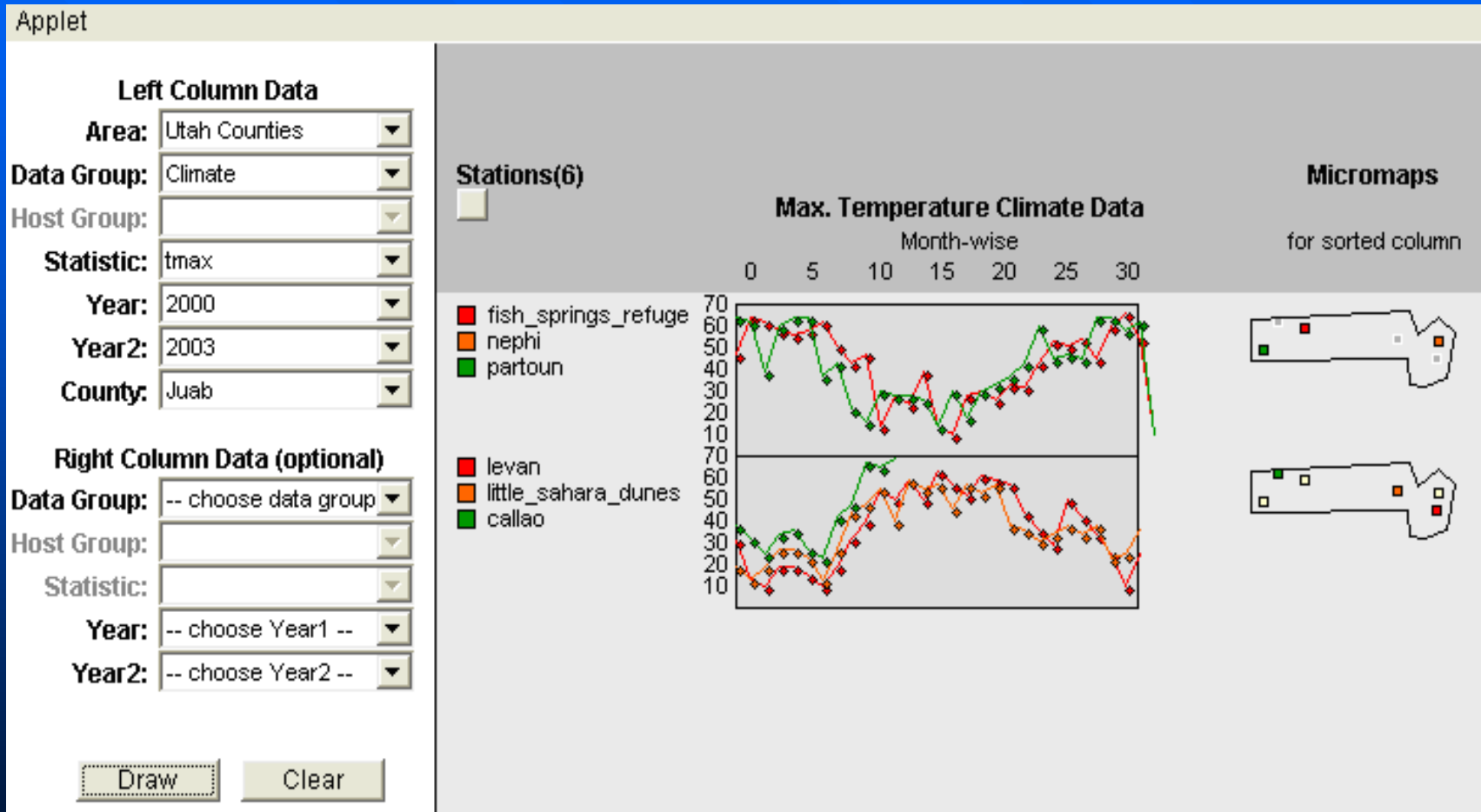
Options ?



Ongoing Work

- Linking of West Nile Micromap Server with USU Climate Data Base
- Extension of Micromap Server with
 - Inclusion of Point Data Sources
 - Displays for Climate Data

Micromaps with Time Series for Point Sources



Applet

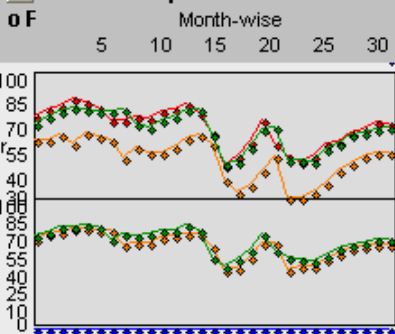
Left Column Data

Area: Utah Counties ▾
Data Group: West Nile Virus ▾
Host Group: Human Cases ▾
Statistic: Infection Count ▾
Year: 2002 ▾
Year2: 2003 ▾
County: Salt_Lake ▾

Right Column Data (optional)

Data Group: -- choose data group ▾
Host Group: ▾
Statistic: ▾
Year: ▾
Year2: ▾

Max. Temperature Climate Data



Micromaps

for sorted column



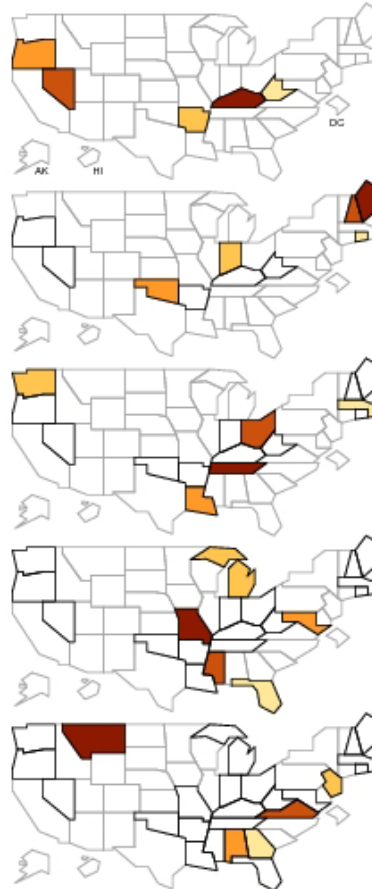
Key ● Value
-- Median value for sorted column

 Above current map
 Below current map

Some Nice Examples (1)

Lung and Bronchus Cancer: White Female Mortality 2002

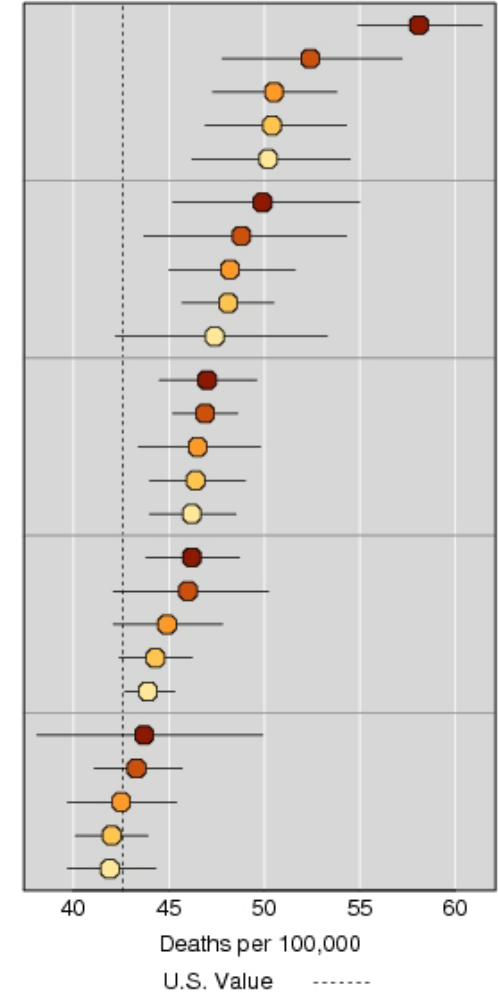
Linked Micromaps
With Cumulative States



U.S. States
25 Highest Rates

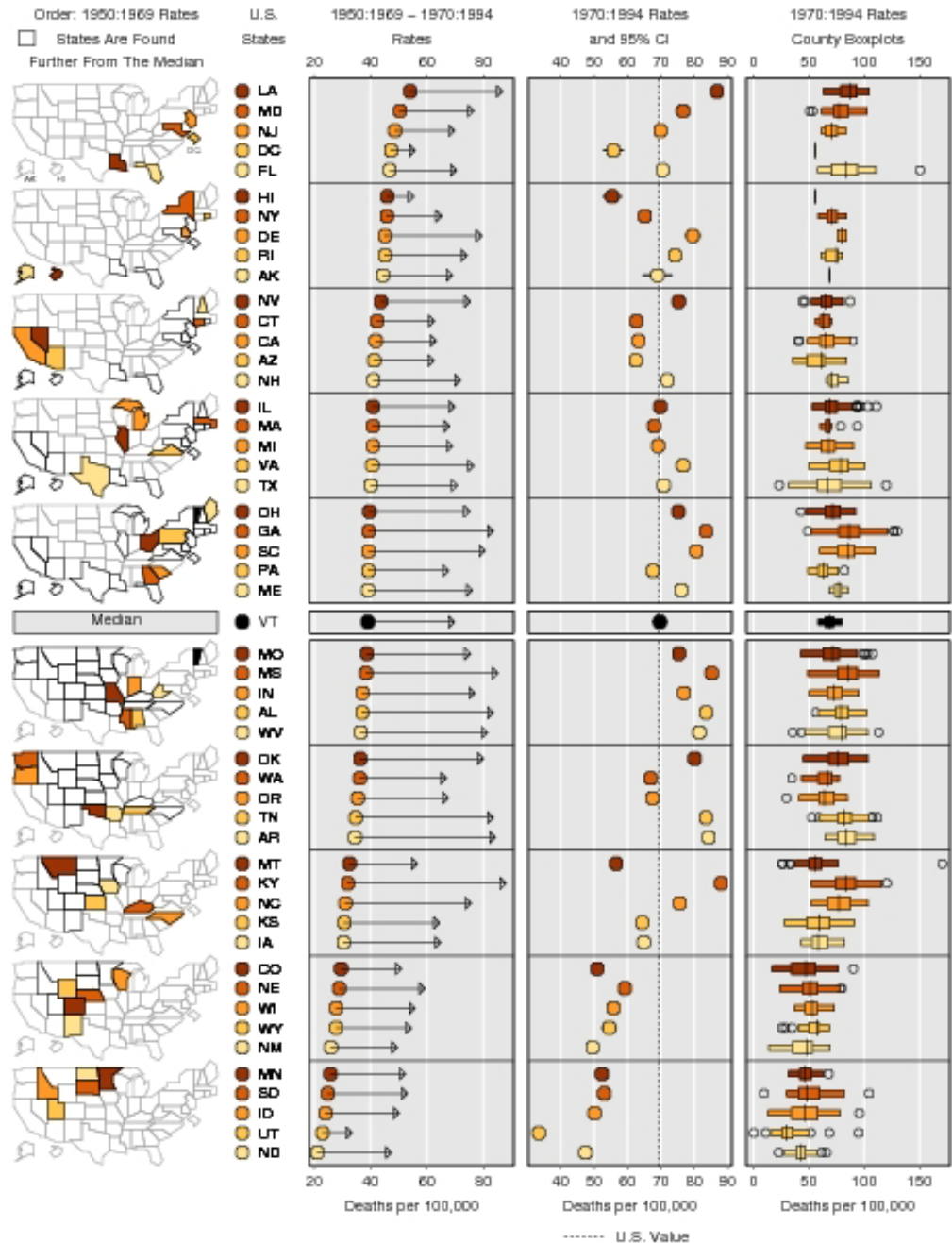


Mortality Rates 2002
and 95% CI



Some Nice Examples (2)

White Male Lung Cancer Mortality Rates



Concluding Remarks

- Micromaps useful to display spatially complex data from environmental, agricultural, medical, economical sources, etc.
- Regional similarities quickly observed
- Easily understood by general audiences, such as “everyday” Web users and employees in government agencies and medical fields

■ References:

Symanzik, J., Gebreab, S., Gillies, R. Wilson, J. (2003): Visualizing the Spread of West Nile Virus, 2003 Proceedings, American Statistical Association, Alexandria, Virginia, CD .

Gebreab, S. Y., Gillies, R. R., Munger, R. G., Symanzik, J. (2008): Visualization and Interpretation of Birth Defects Data Using Linked Micromap Plots, *Birth Defects Research (Part A): Clinical and Molecular Teratology*, Vol. 82, 110-119.

Symanzik, J., Carr, D. B. (2008): Interactive Linked Micromap Plots for the Display of Geographically Referenced Statistical Data, In: Chen, C., Härdle, W., Unwin, A. (Eds.), *Handbook of Data Visualization*, Springer, Berlin/Heidelberg, 267-294.

