

# **Linked Micromap Plots – In Print And On The Web**

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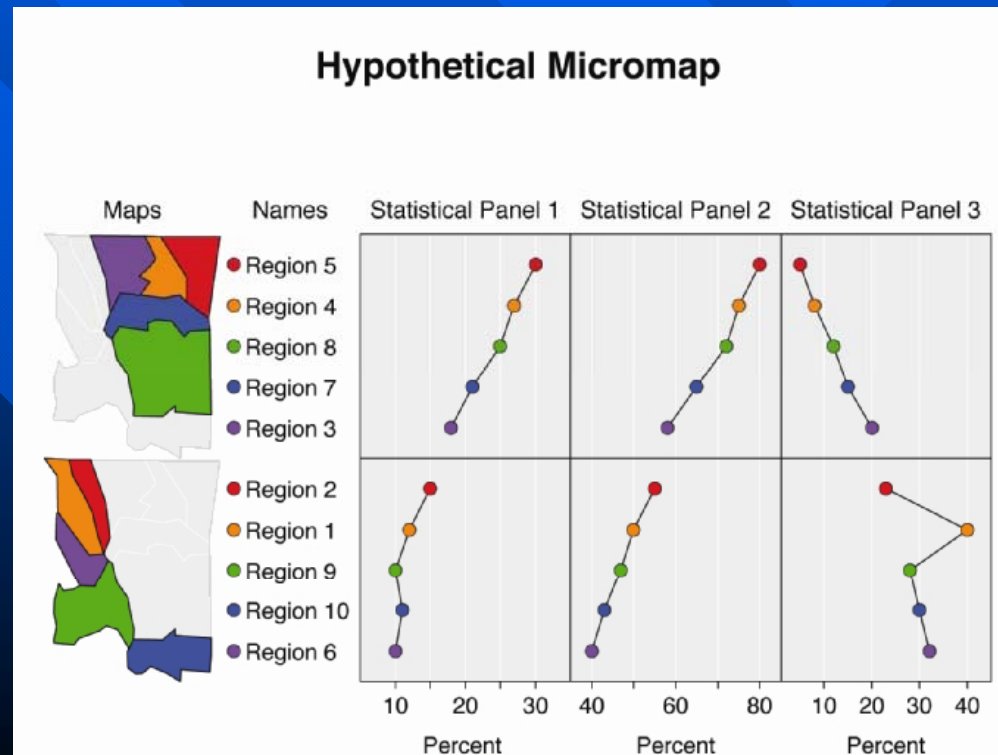
**WWW: <http://www.math.usu.edu/~symanzik>**

# Contents

- Background
- Micromaps for Birth Defects Data
- Regional Micromaps
- Micromaps via NCI Java Code
  - Cancer Micromaps
  - West Nile Virus Micromaps
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- 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



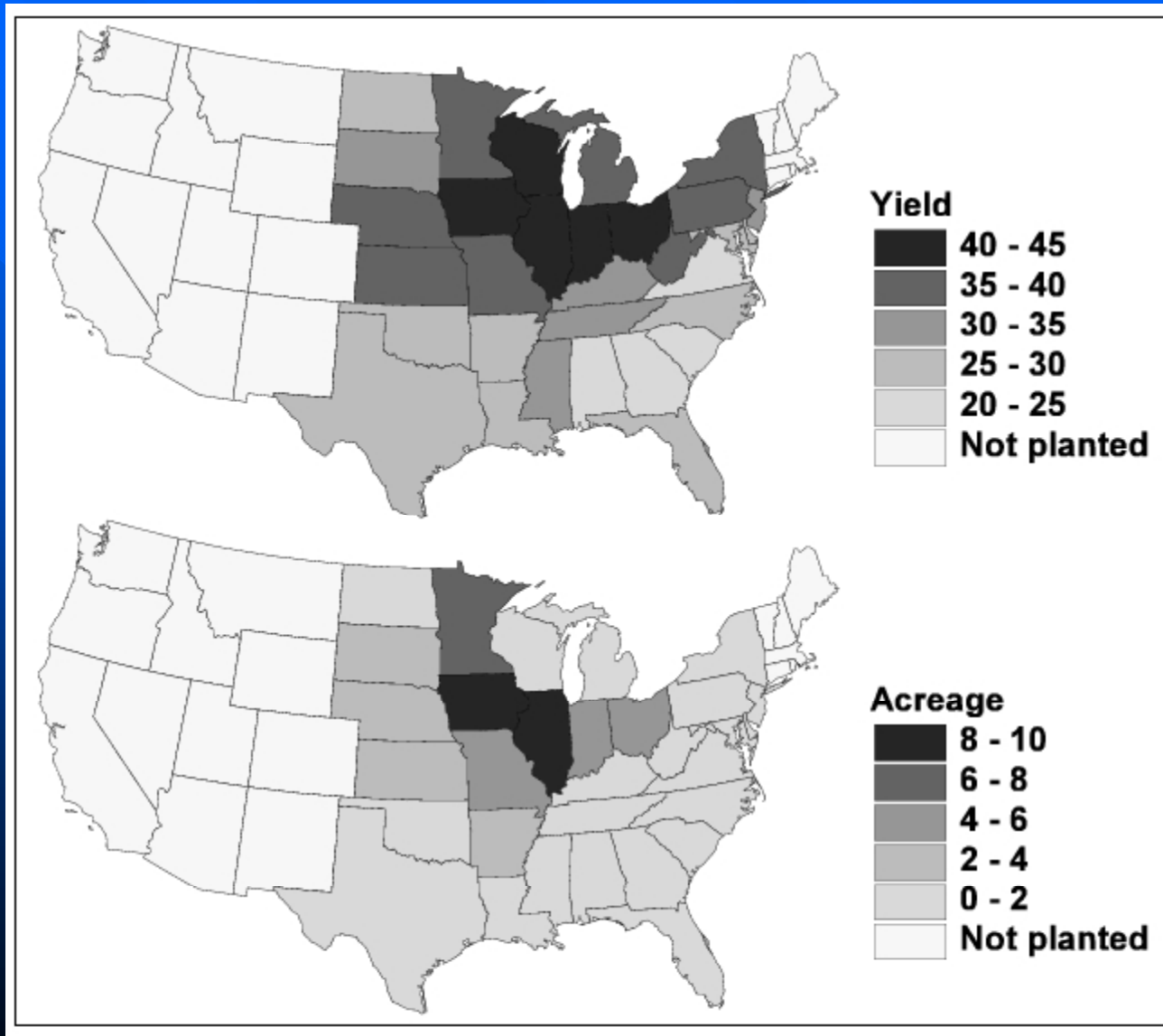
# History of Micromaps

- 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

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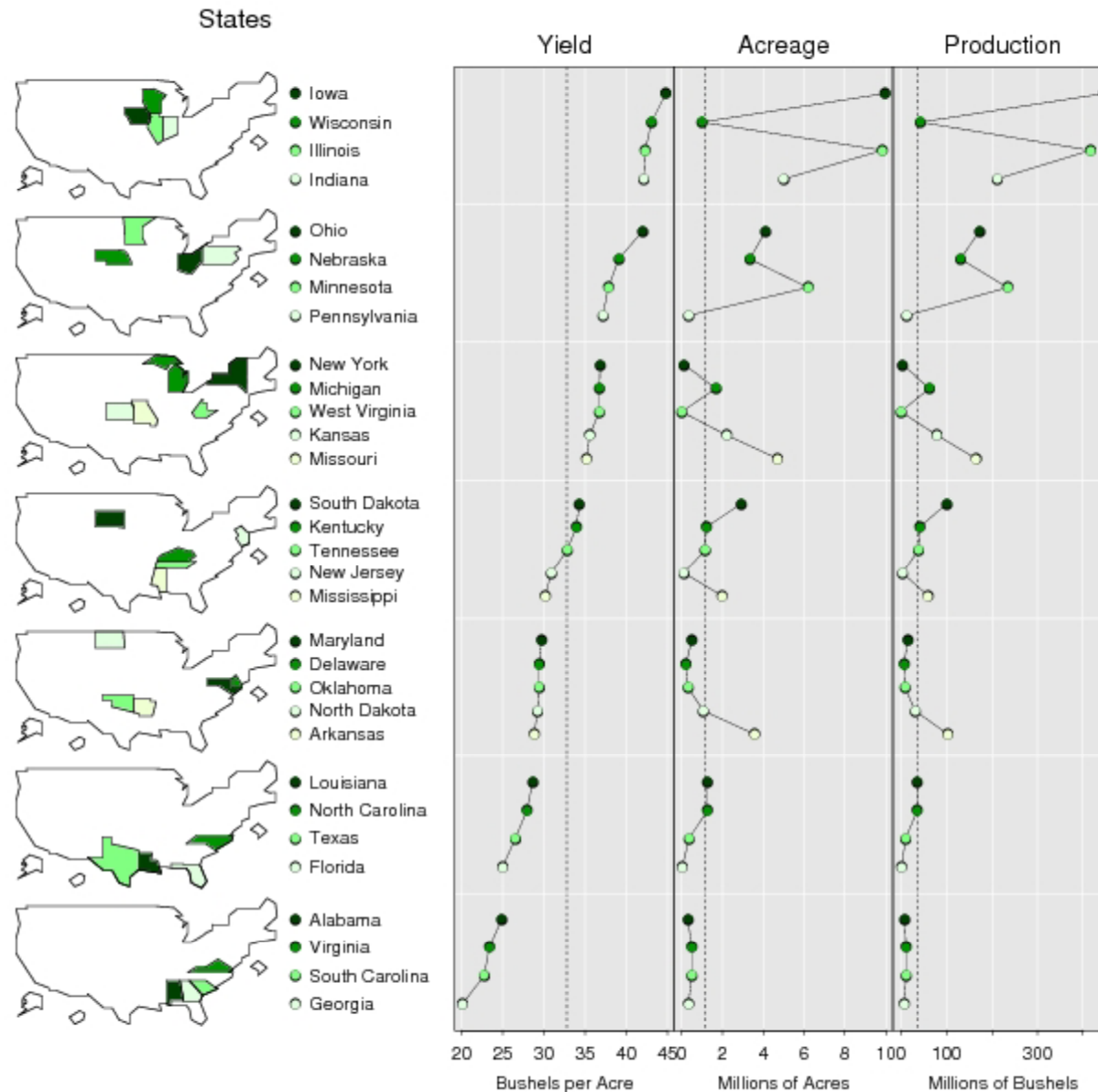
\*Statistical Computing & Statistical Graphics Newsletter:  
<http://www-stat.stanford.edu/~susan/scgn/>

# Choropleth Maps vs Micromaps (1)



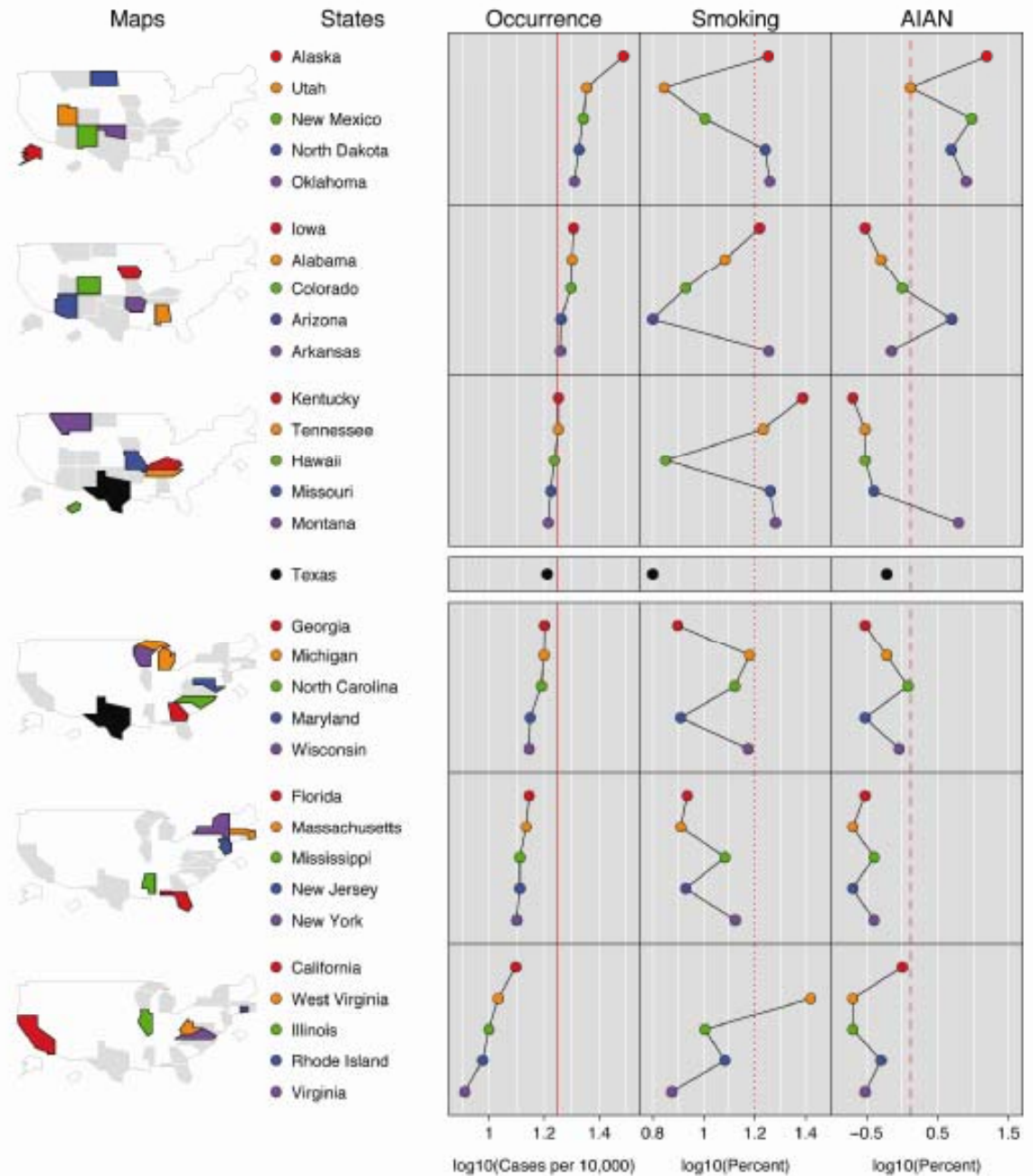
# Choropleth Maps vs Micromaps (2)

Soybean Statistics by State, 1997 Census of Agriculture



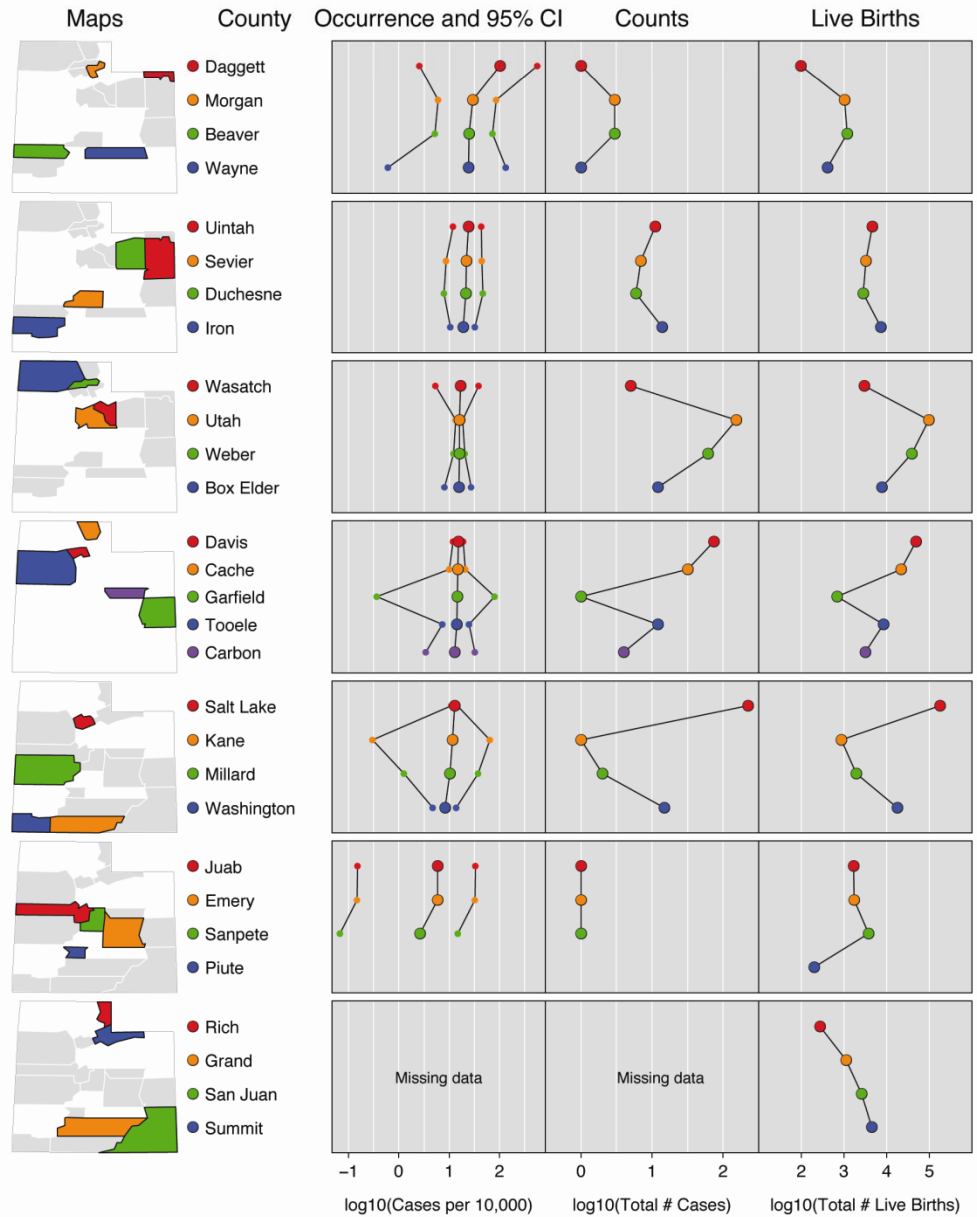
# Oral Cleft Micromap Example: USA

## Oral Cleft Occurrence by State 1998–2002



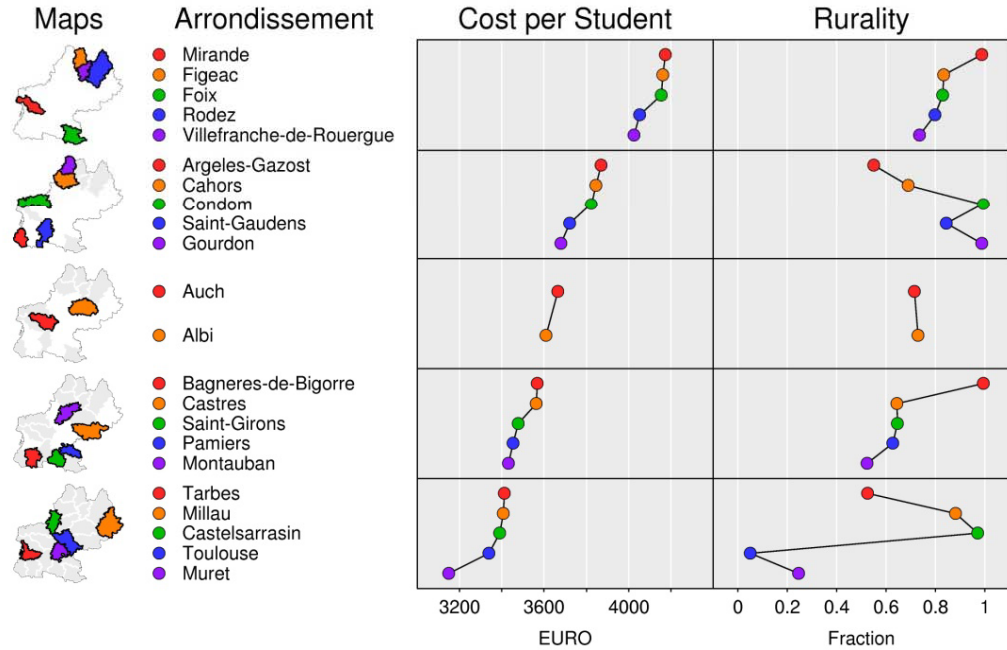
# Oral Cleft Micromap Example: Utah

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



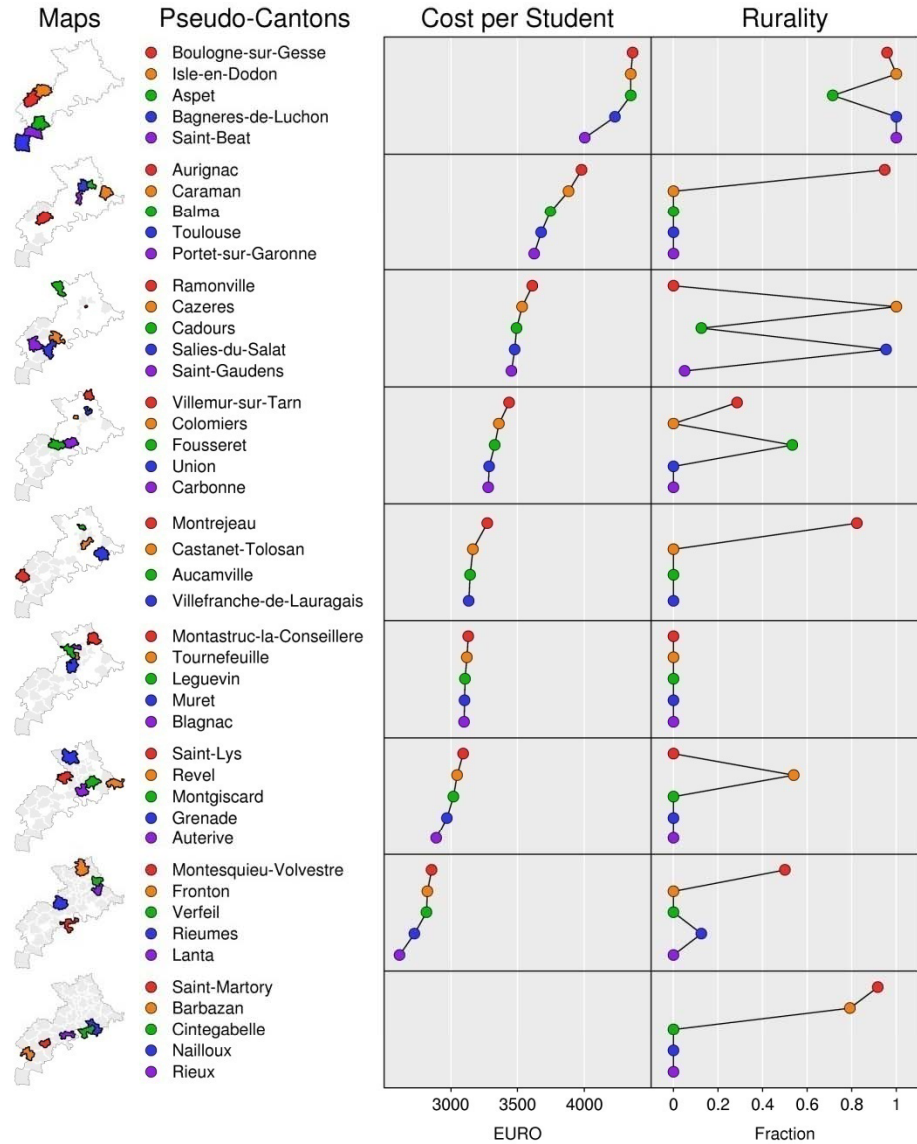
# Regional Micromap Example: France - Region

## 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.

**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

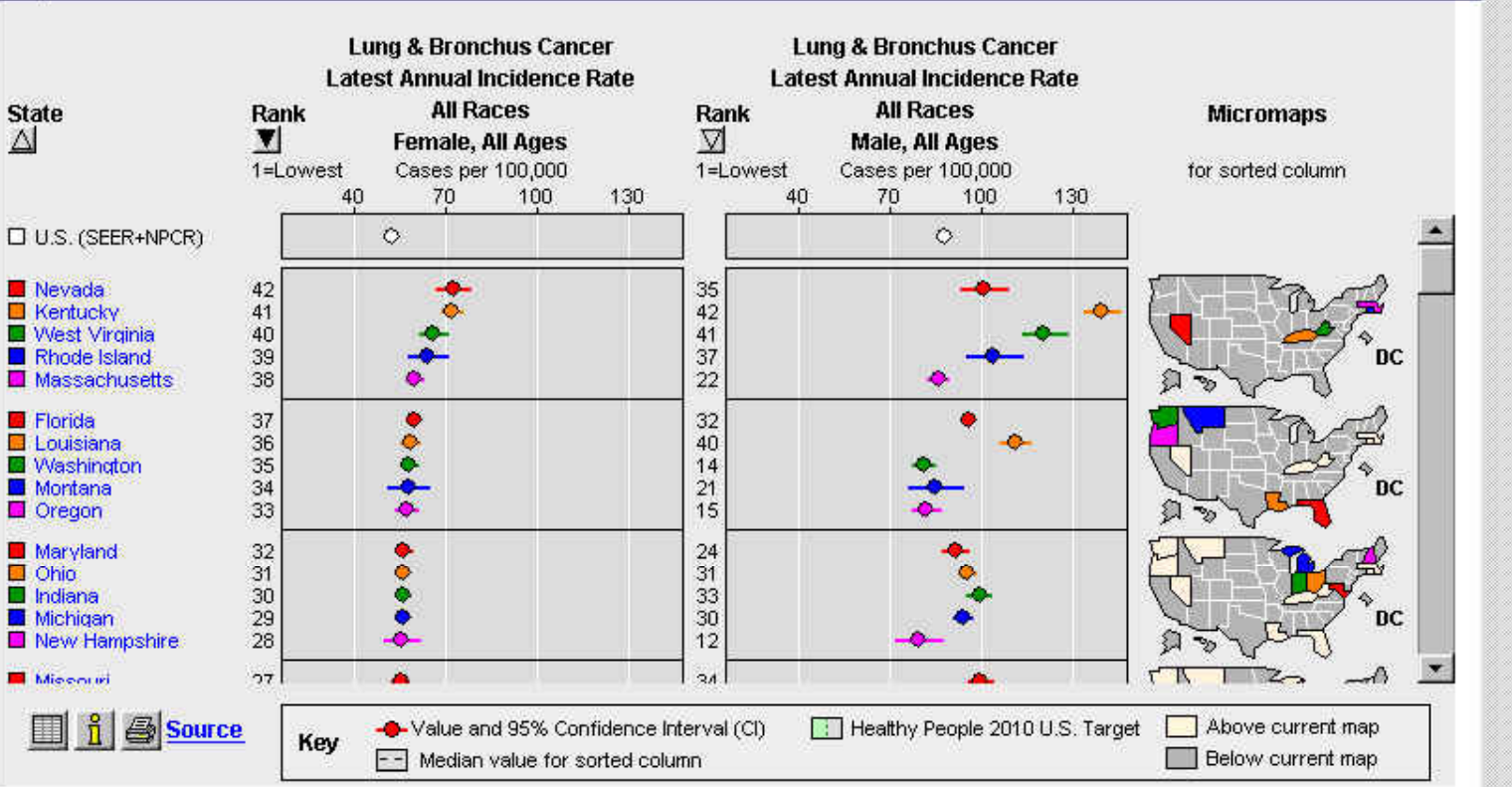
Sex: Male

Age: All Ages

Draw Clear

Overview

Options ? [Print] [PDF]



**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

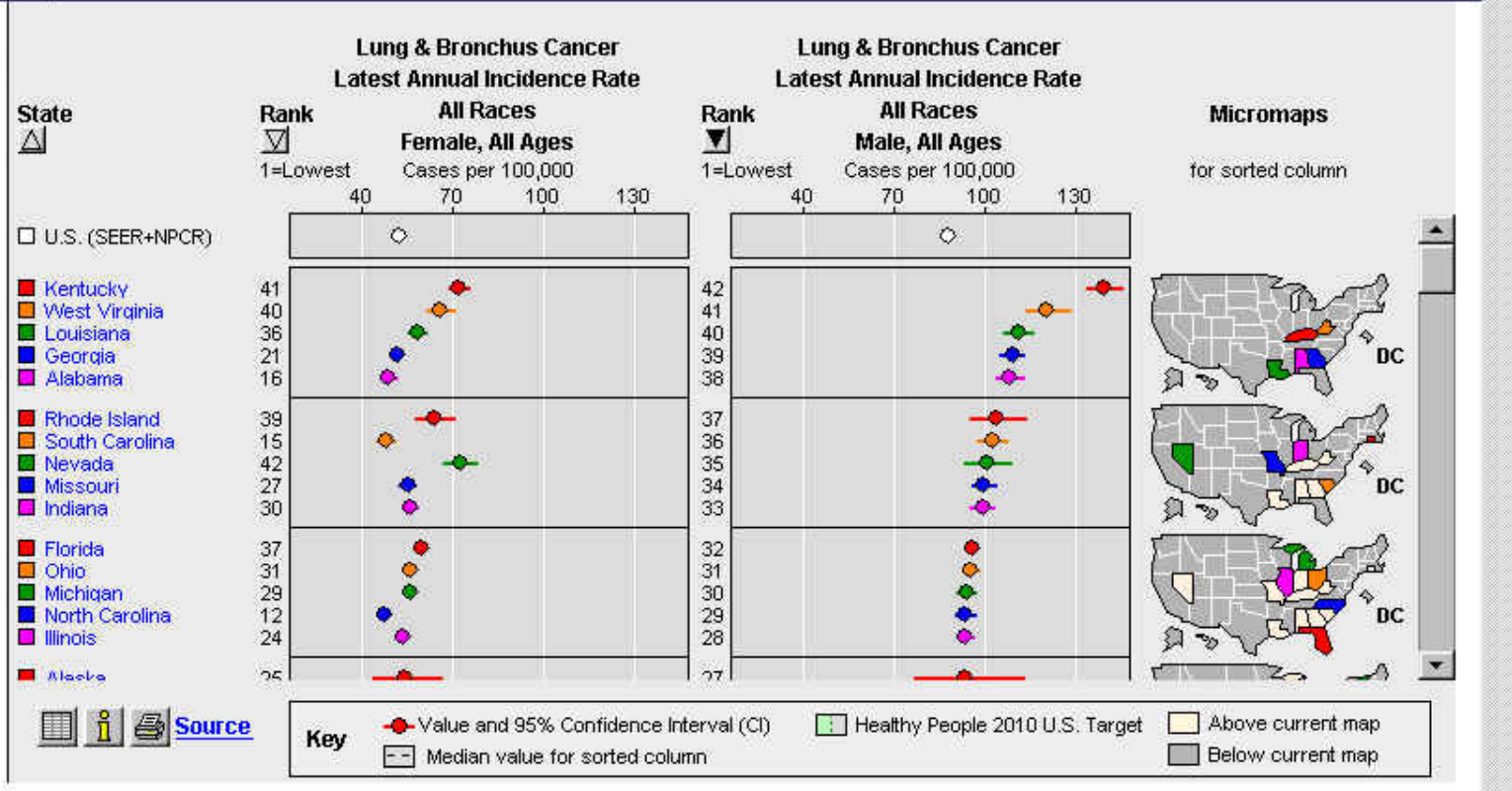
Sex: Male

Age: All Ages


Draw Clear

Overview

Options ? [Icons]



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



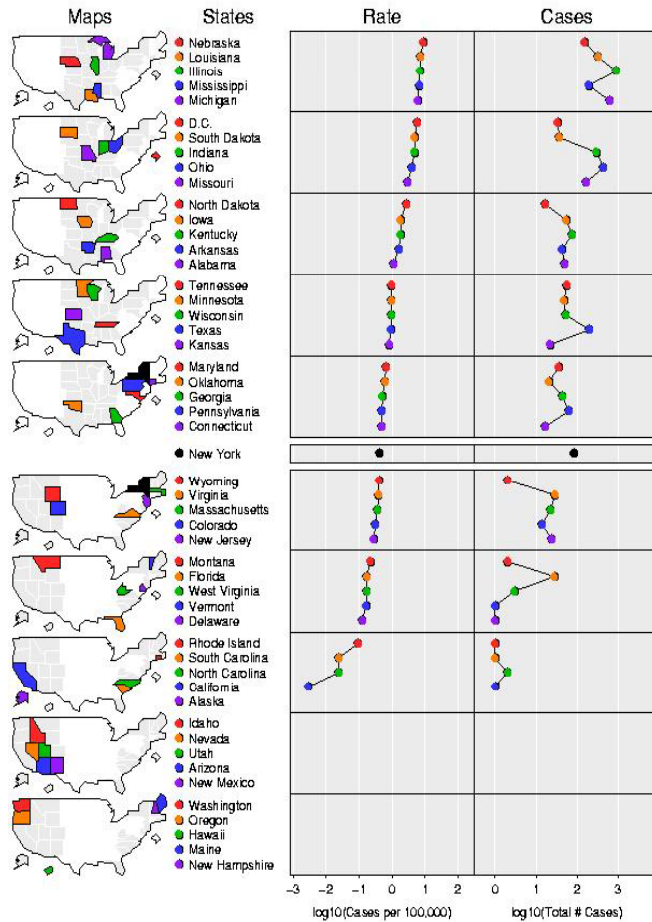
## West Nile Virus (WNV) ???

- 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

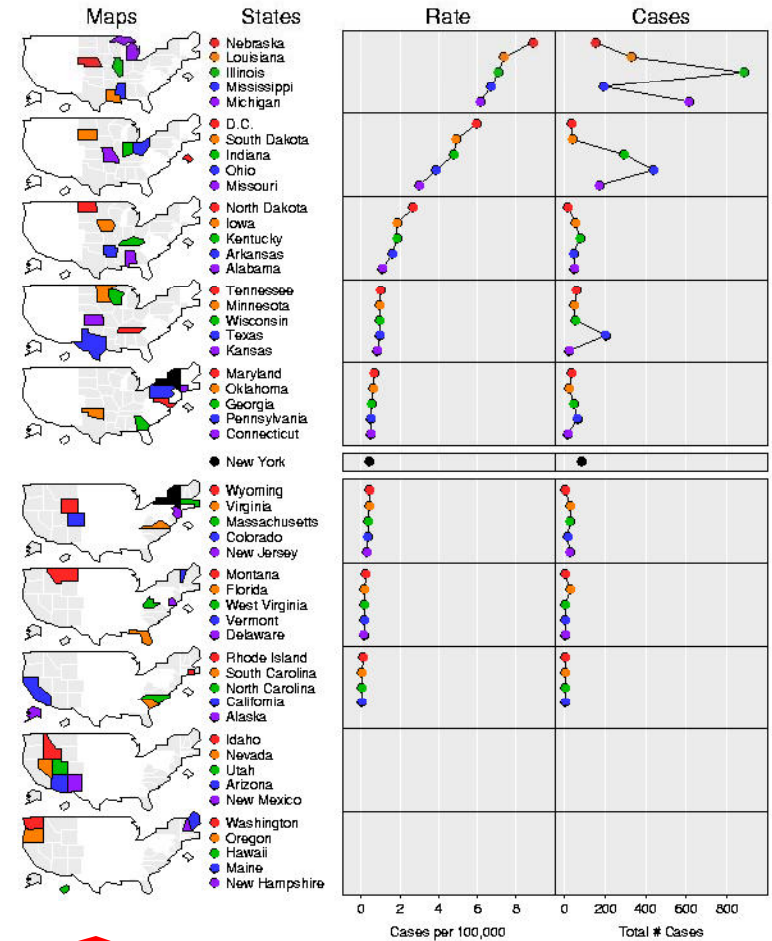


# From 2002 CDC Web Page to Micromaps

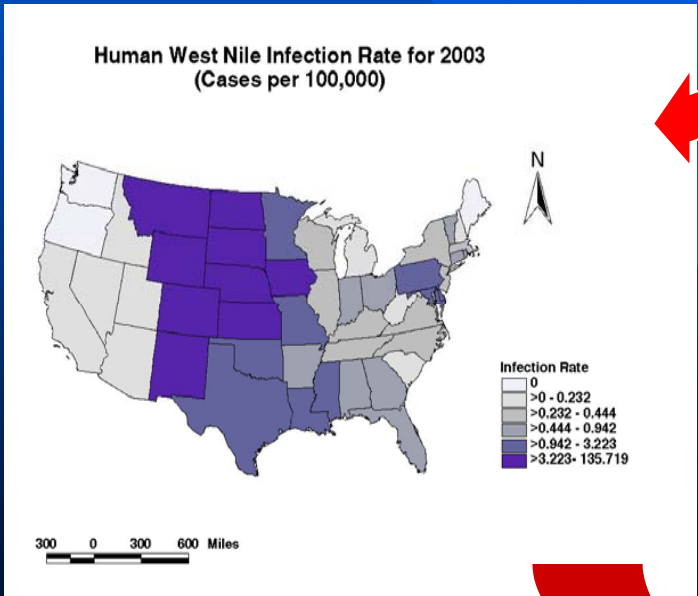
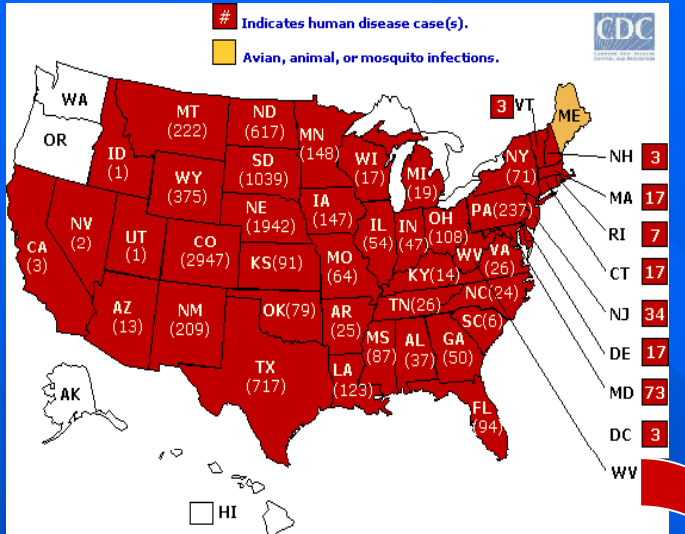
West Nile Virus 2002  
Lab-Positive Human Cases



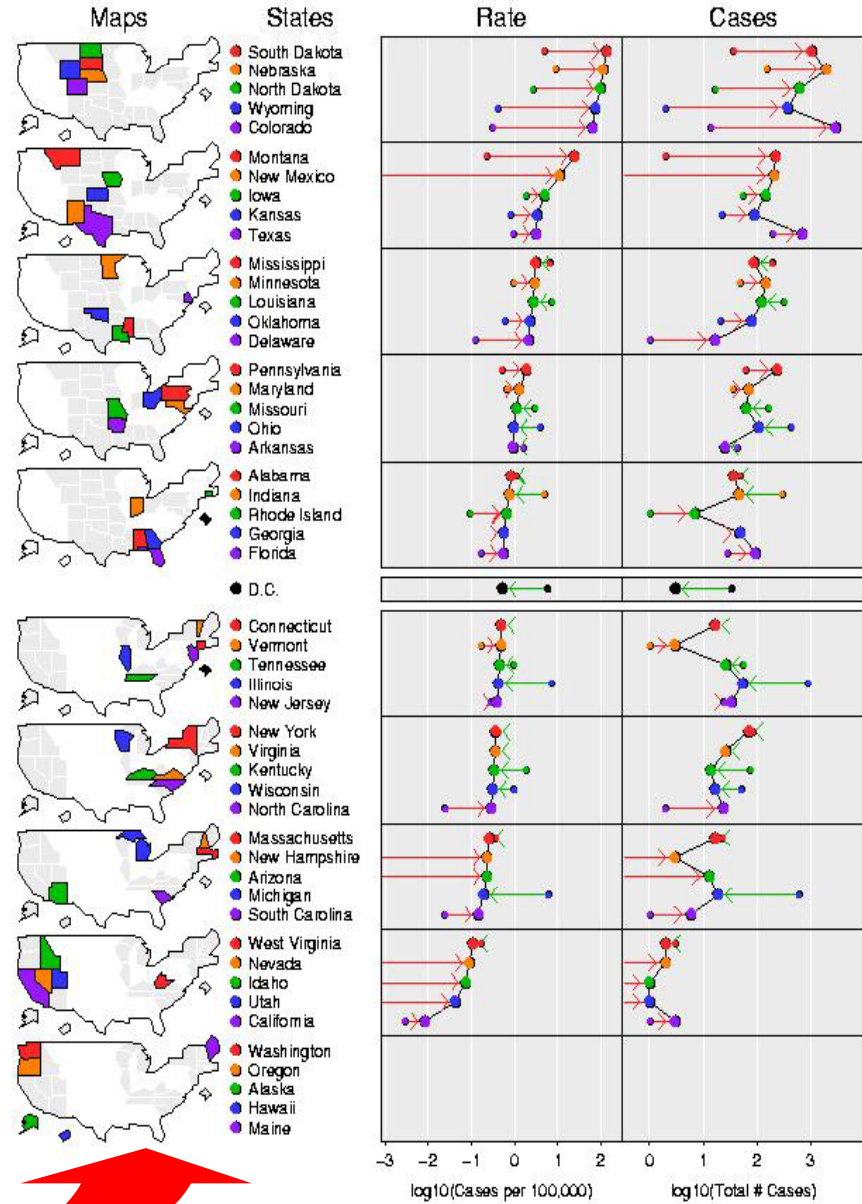
West Nile Virus 2002  
Lab-Positive Human Cases



# From 2003 CDC



## West Nile Virus 2003 Lab-Positive Human Cases



## 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

WEST NILE VIRUS MICROMAPS - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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

Search Web Mail My Yahoo! Games Yahoo! Personals LAUNCH Sign In

**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 ?

State	Rank	Latest Annual Infection Rate Year 2002	Rank	Total Infections Per Year Year 2002
		Cases per 100,000		Count
	1=Lowest		1=Lowest	
Nebraska	51		43	
Louisiana	50		48	
Illinois	49		51	
Mississippi	48		45	
Michigan	47		50	
District of Columbia	46		30	
South Dakota	45		32	
Indiana	44		47	
Ohio	43		49	
Missouri	42		44	
North Dakota	41		22	
Iowa	40		38	
Kentucky	39		41	
Arkansas	38		33	
Alabama	37		36	
Tennessee	36		39	
Minnesota	35		35	
Wisconsin	34		37	
Texas	33		46	
Kansas	32		25	
Maryland	31		31	
Oklahoma	30		24	

Micromaps for sorted column

United States Internet

Start WEST NILE VIRUS ... 11:48 AM

■ <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

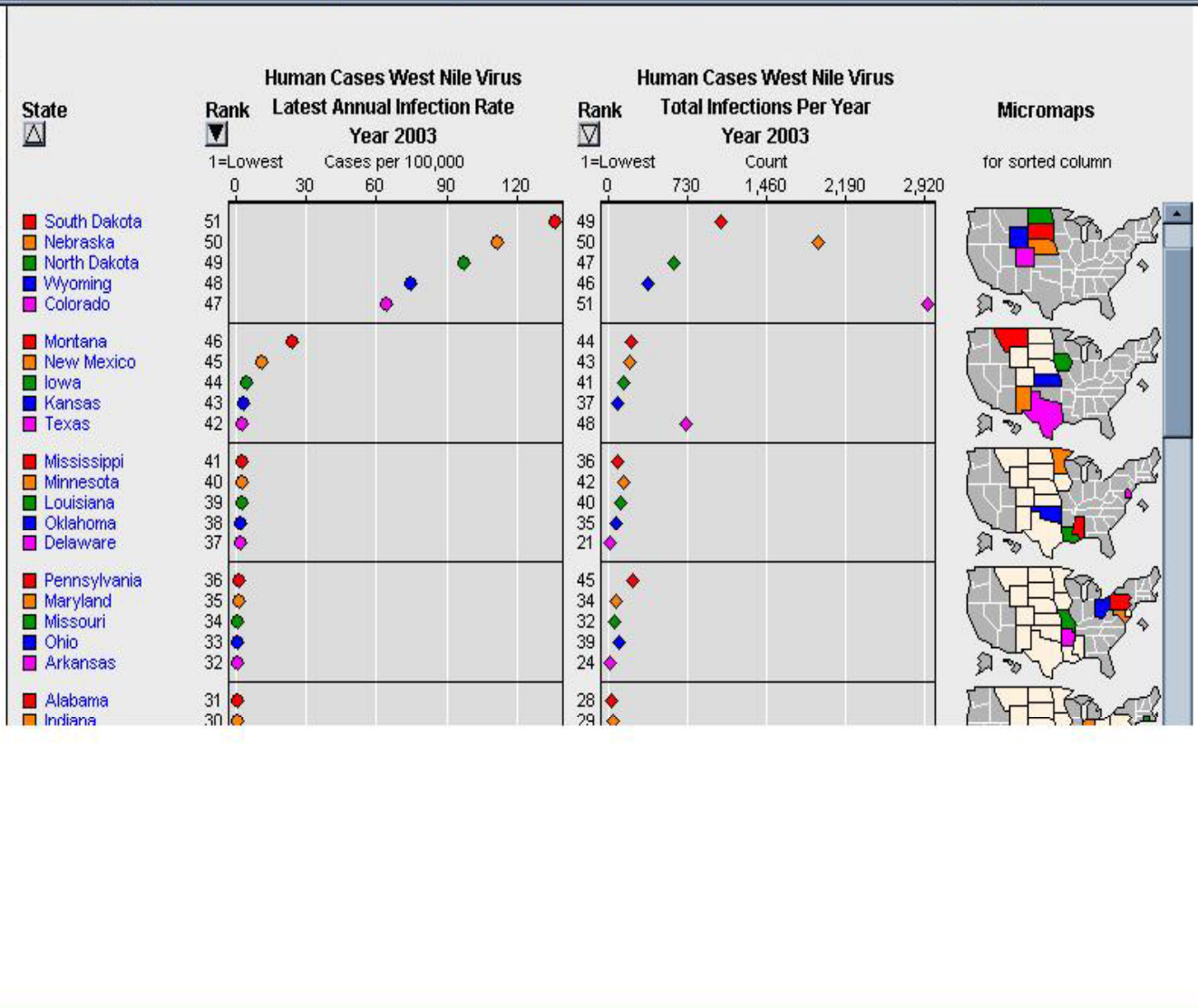
Year: 2003

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

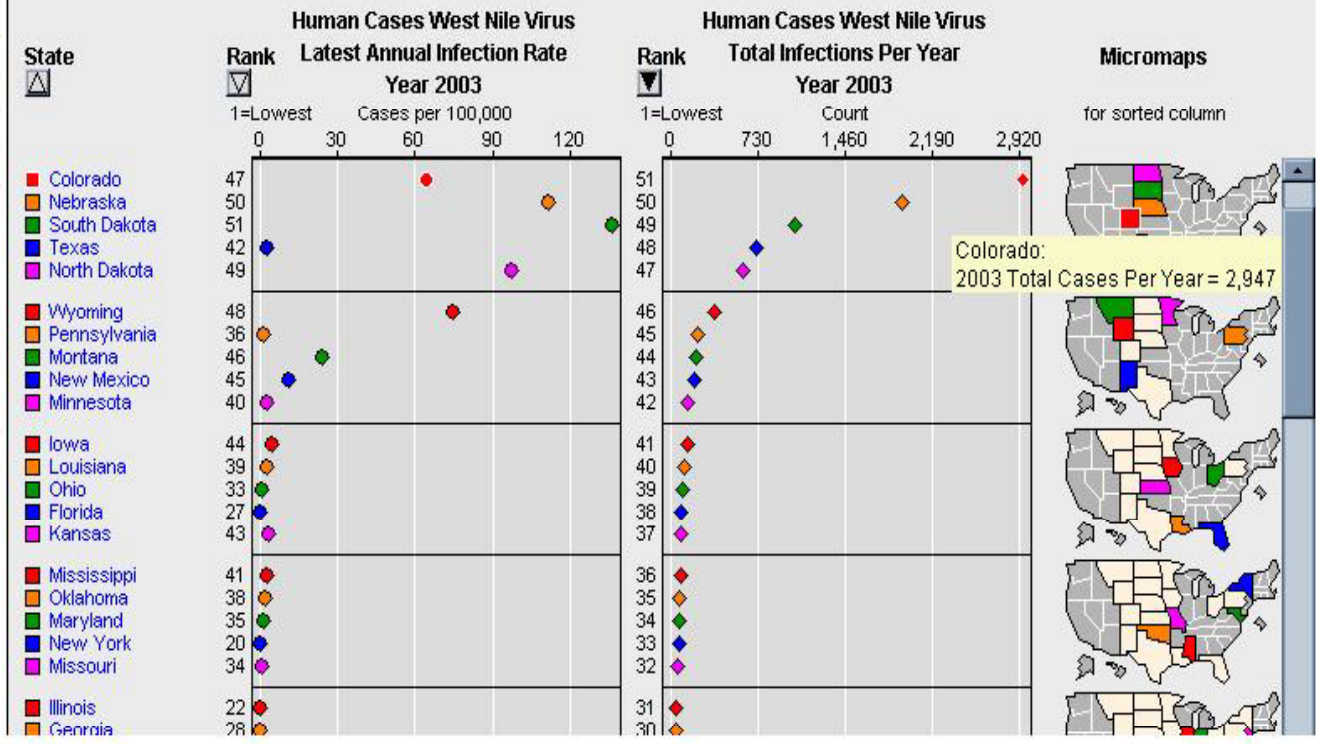
Year: 2003

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

*Micromaps*

Utah Climate Center Beta

## Left Column Data

**Data Group:** Climate   
**Area:** Utah   
**County:** Salt\_Lake   
**Statistic:** maximum temperature   
**Ref. Year:** 2005   
**Month:** August

## Right Column Data (optional)

**Data Group:**   
**Statistic:**   
**Ref. Year:**

Draw

Clear

Overview

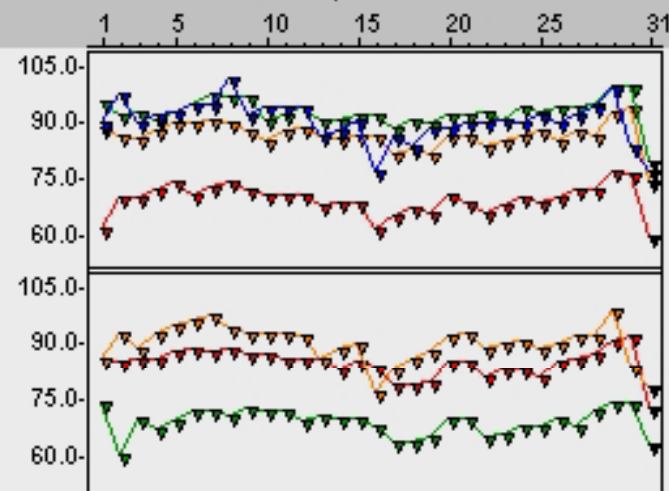
## Stations



- Alta
- Cottonwood weir
- Draper point of
- Garfield
  
- Mountain dell d
- Salt lake city
- Silver lake bri
- Salt lake triad

## Maximum Temperature for stations Year 2005

Maximum Temperature in 'Farenheit



## Micromaps

for sorted column



# Micromaps

Utah Climate Center Beta

## Left Column Data

**Data Group:** Climate   
**Area:** California   
**County:** Santa\_Barbara   
**Statistic:** minimum temperature   
**Ref. Year:** 2003   
**Month:** January

## Right Column Data (optional)

**Data Group:**   
**Statistic:**   
**Ref. Year:**

Draw

Clear

Overview

## Stations

## Minimum Temperature for stations Year 2003

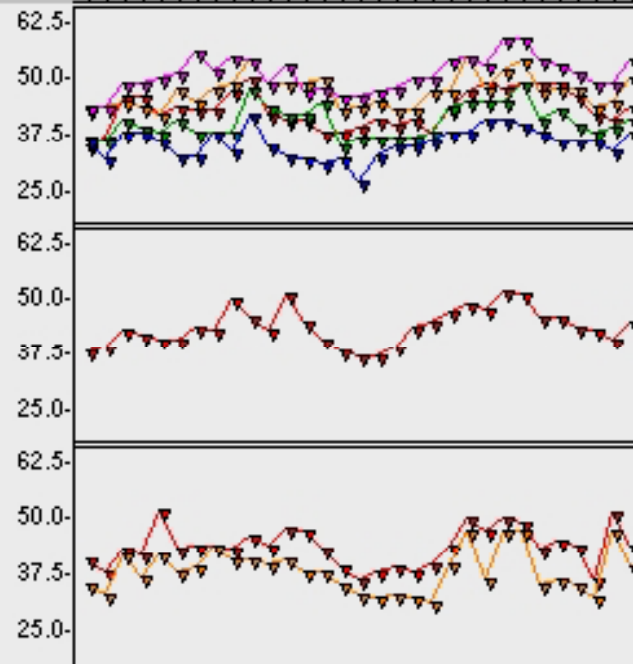
Minimum Temperature in Farenheit

1 5 10 15 20 25 31

- Cachuma lake
- Lompoc
- Los alamos
- New cuyama fire
- Santa barbara

- Santa barbara m

- Santa maria pub
- Twitchell dam
- Gibraltar dam 2
- Juncal dam
- Salsipuedes gag



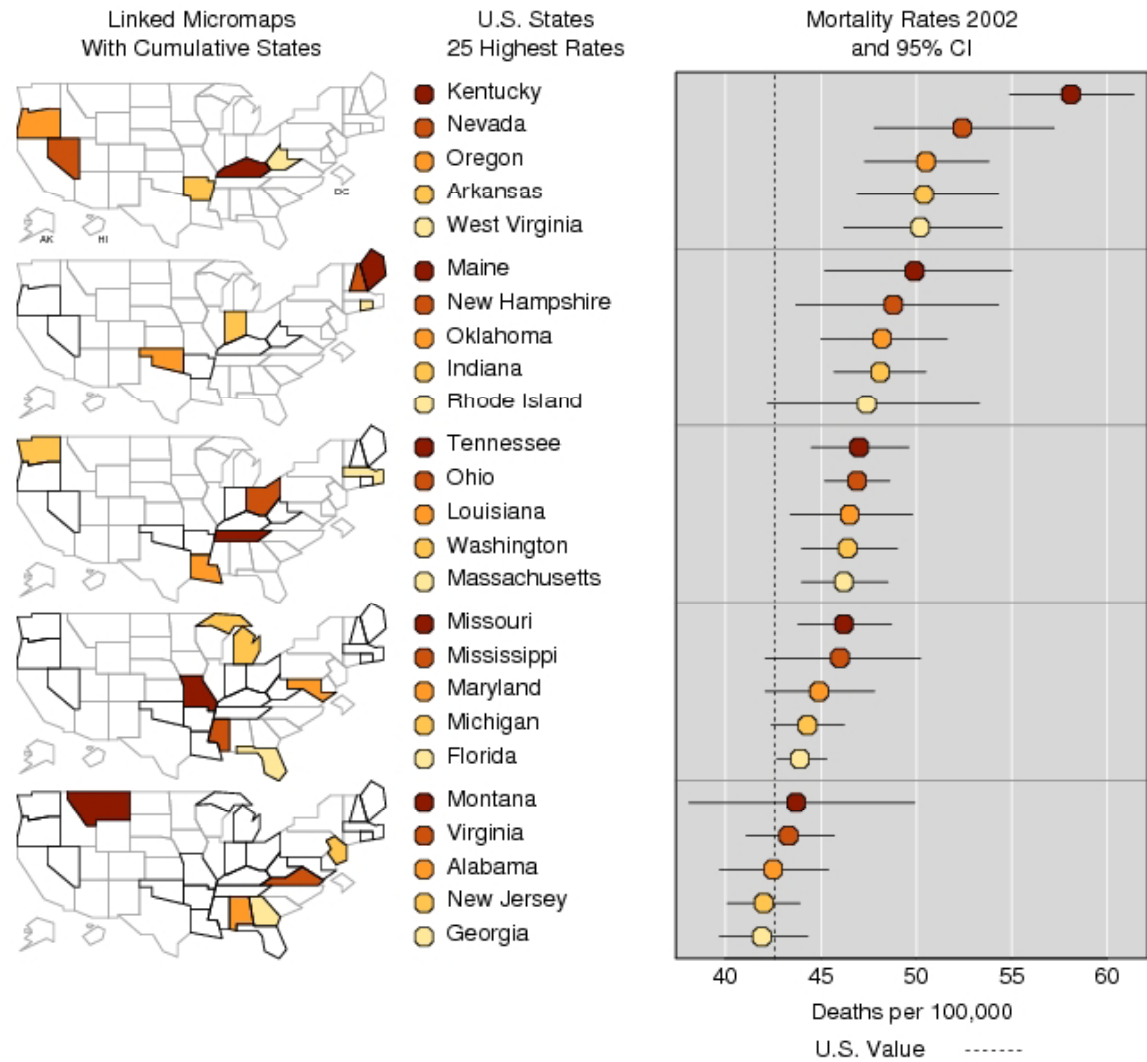
## Micromaps

for sorted column



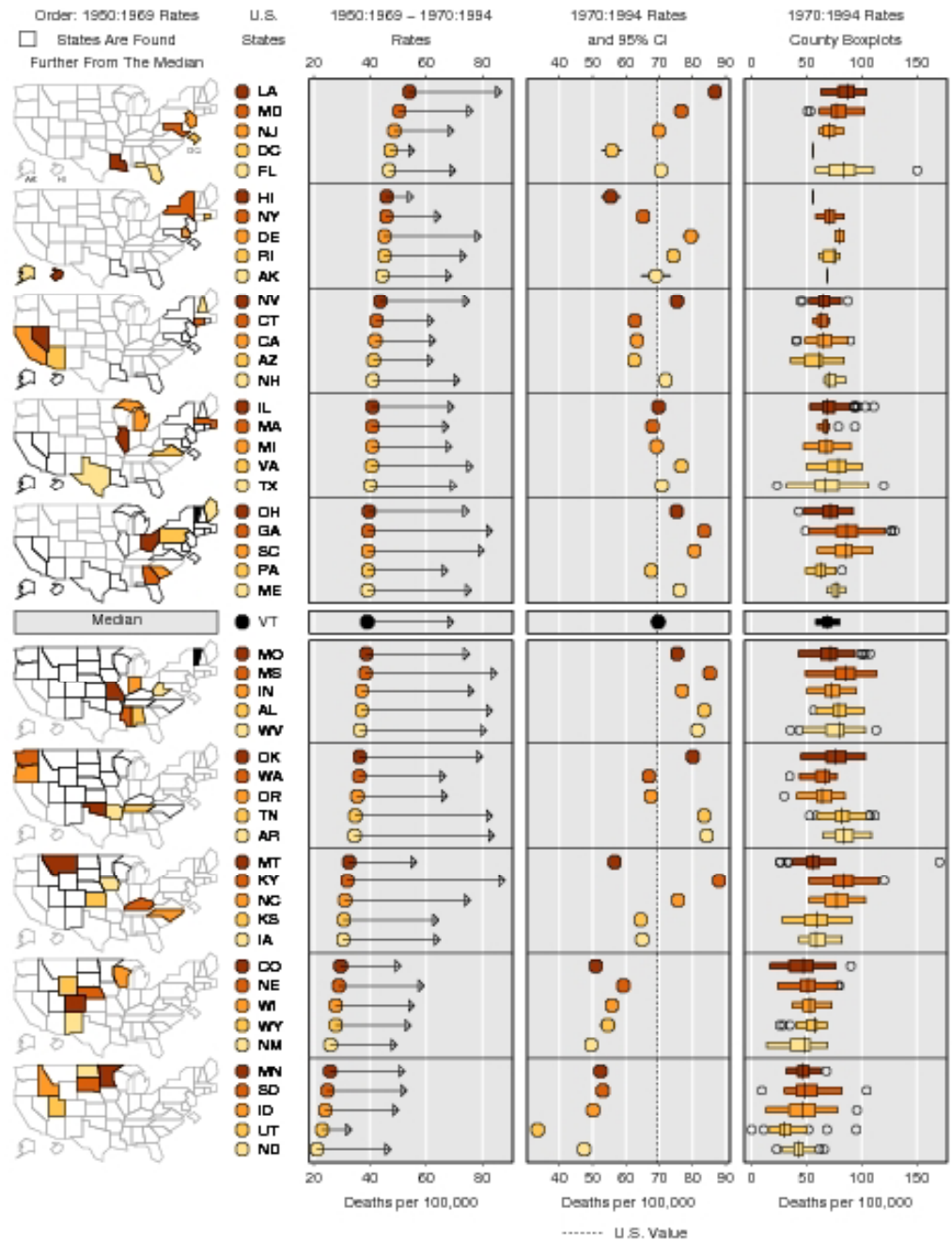
# Some Nice Examples (1)

## Lung and Bronchus Cancer: White Female Mortality 2002



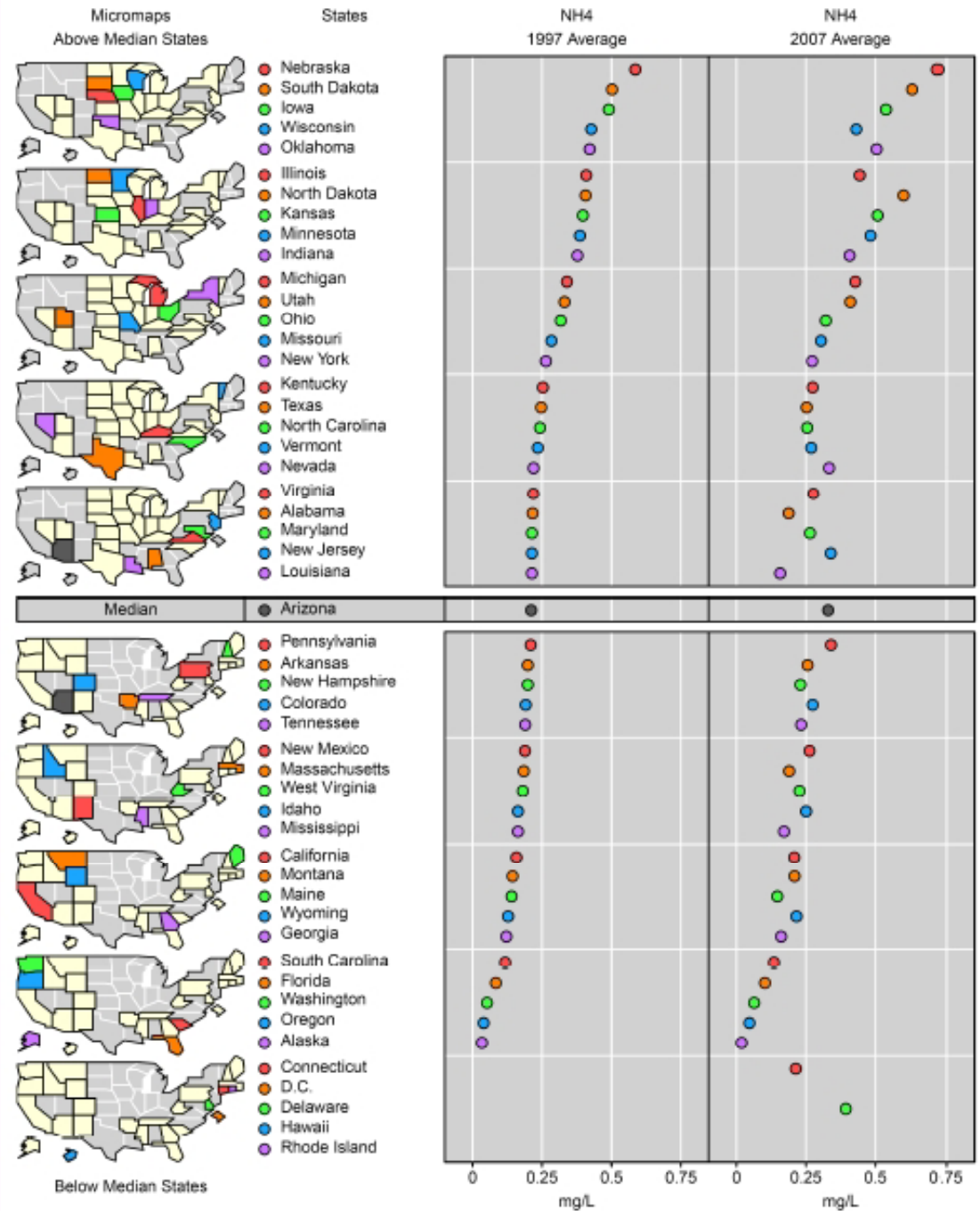
# Some Nice Examples (2)

## White Male Lung Cancer Mortality Rates



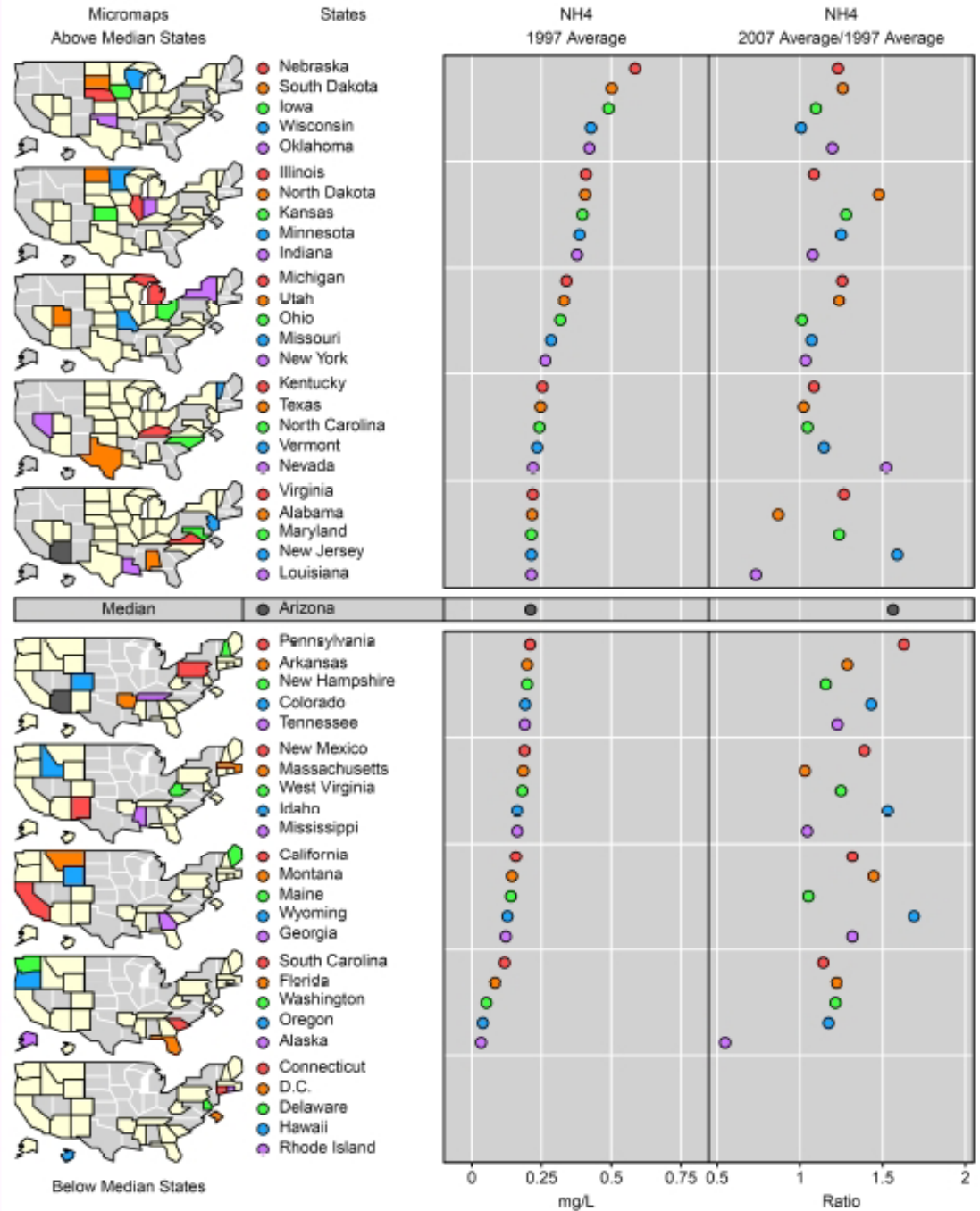
# Most Recent Examples (1)

Air Quality Index By State, 1997 and 2007 Average Values



# Most Recent Examples (2)

Air Quality Index By State, 1997 and 2007 Average Values



## Concluding Remarks

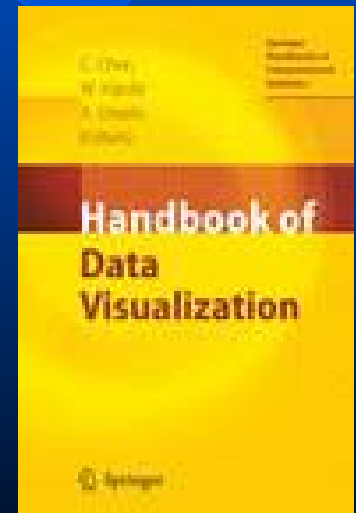
- Micromaps useful to display spatially complex data from environmental, agricultural, medical, economical sources, etc.
- Regional similarities quickly observed
- Easily understood by general audiences, such as “everyday” Web users and employees in government agencies and medical fields

## ■ 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.**



## ■ Forthcoming Book:

### Visualizing Data Patterns with Micromaps

Daniel B. Carr, *George Mason University, Fairfax, Virginia, USA*; Linda Williams Pickle, *StatNet Consulting, LLC., Gaithersburg, Maryland, USA*

Series: Chapman & Hall/CRC Interdisciplinary Statistics Series [Click to see all the publications in this series.](#)



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#### Summary

[A Full-Color Treatment of a Graphical Innovation That Brings Statistics to Life](#)

After more than 15 years of development drawing on research in cognitive psychology, statistical graphics, computer science, and cartography, micromap designs are becoming part of mainstream statistical visualizations. Bringing together the research of two leaders in this field, **Visualizing Data Patterns with Micromaps** presents the many design variations and applications of micromaps, which link statistical information to an organized set of small maps. This full-color book helps readers simultaneously explore the statistical and geographic patterns in their data.

*Questions ???*