Interactive Linked Micromap Plots with "nViZn", on the Web, and with S-Plus

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Contents

- Introduction of Micromaps
- EPA's Cumulative Exposure Project (1998/1999)
- Micromaps with nVizN (2000-2003)
- Micromaps at USDA-NASS (9/1999)
- Micromaps at NCI (4/2003-…)
- Micromaps for the West Nile Virus (2003-…)
- French Micromaps with S-Plus (2005-…)

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

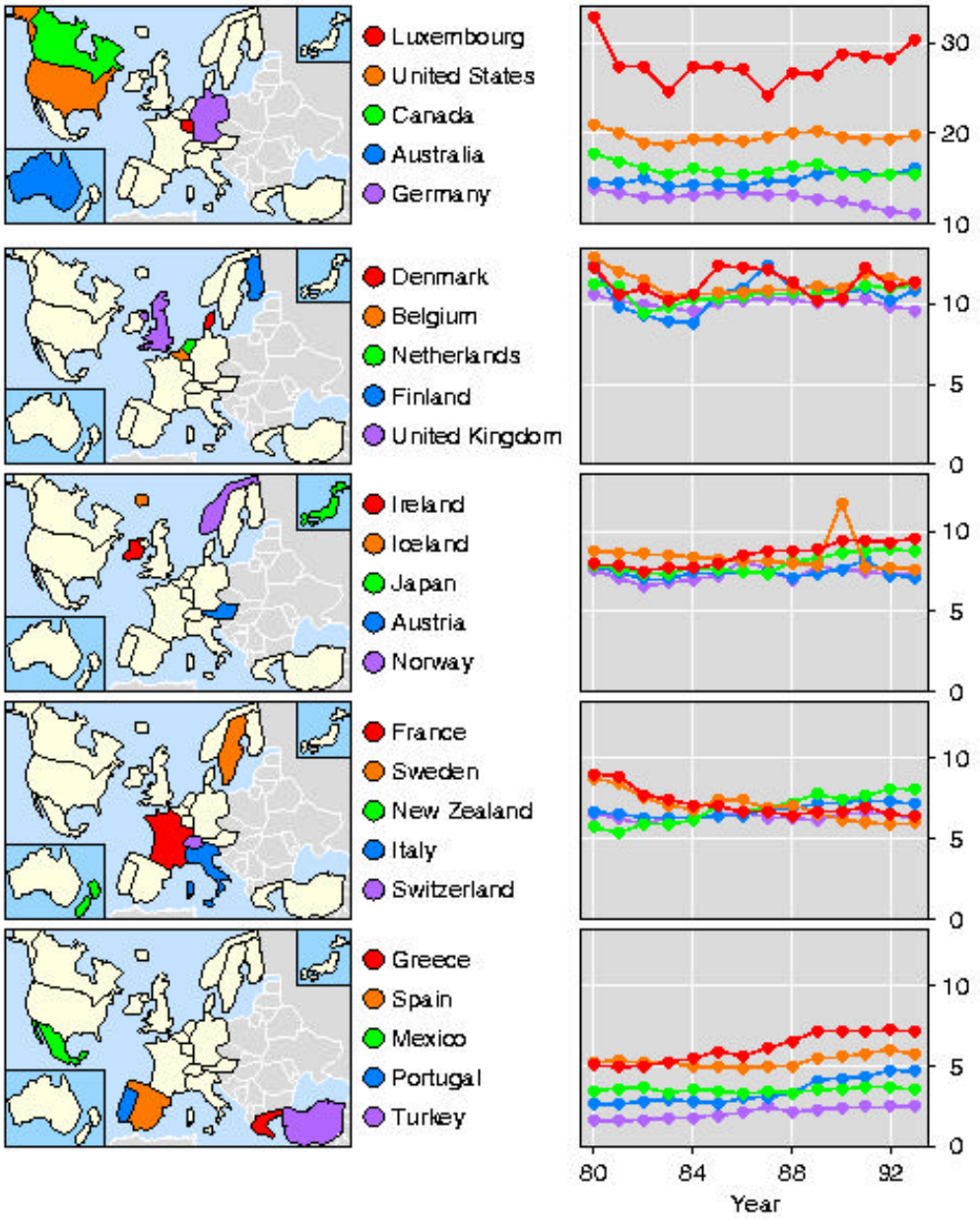
- First presented at 1995 American Statistical Association's annual meeting (Olsen, Carr, Courbois, Pierson)
- First references:
  - Carr, Pierson (1996) Emphasizing Statistical Summaries … with Micromaps, Stat. Computing & Stat. Graphics Newsletter, 7(3)
  - Carr, Olsen, Courbois, Pierson, Carr (1998) Linked Micromap Plots …, Stat. Computing & Stat. Graphics Newsletter, 9(1)

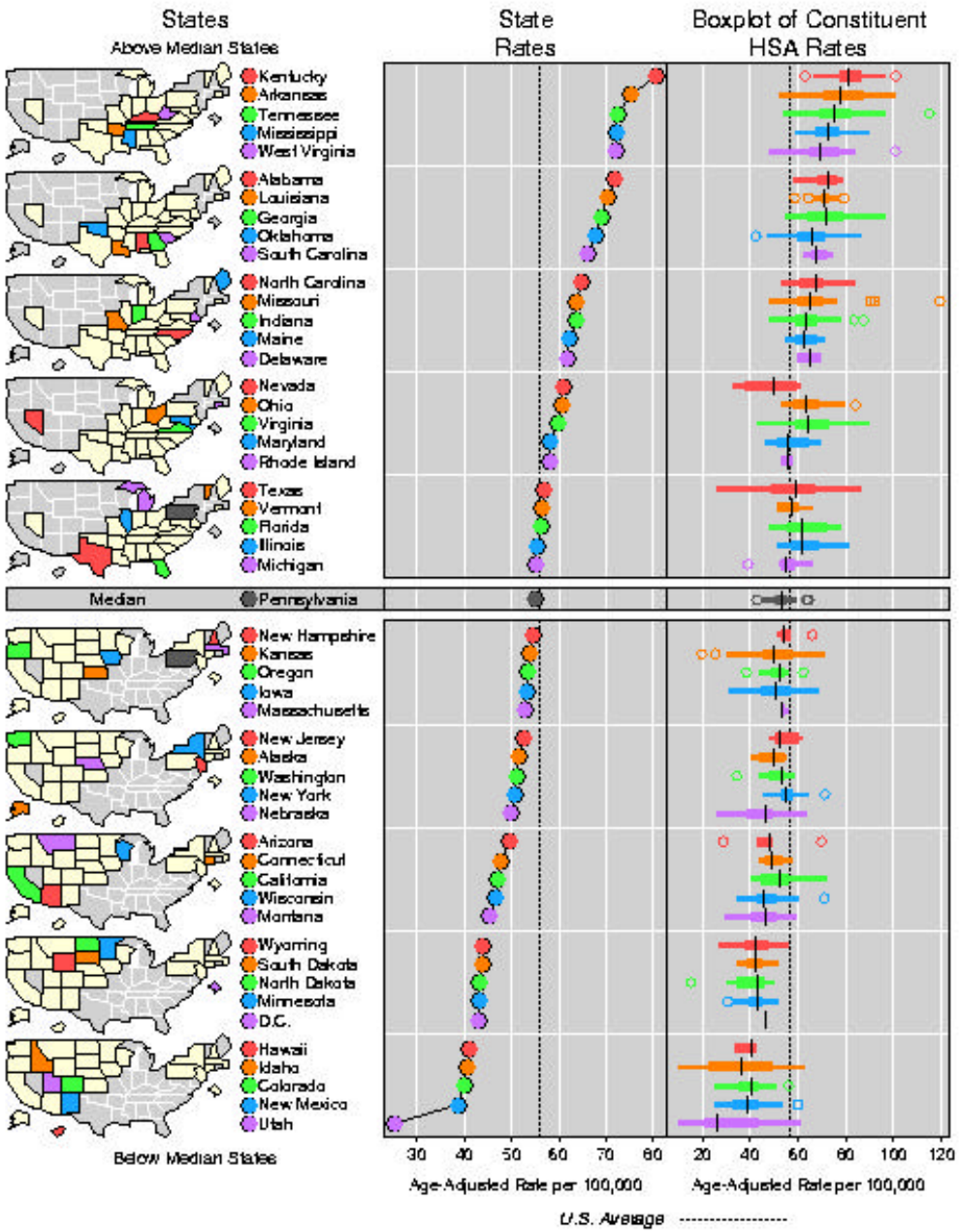
Micromap Examples

- Dan Carr's S-Plus functions available at
  - ftp://galaxy.gmu.edu/pub/dcarr/newsletter/micromap/
  - ftp://galaxy.gmu.edu/pub/dcarr/newsletter/lmplots/
- First 2 examples borrowed from Dan Carr

Annual CO2 Emissions From Energy Use

Units = Tons Per Person




Lung Cancer Mortality Rates By State
White Males, 1988-1992
States
Above Median States
Kentucky
Arkansas
Tennessee
Mississippi
West Virginia
Alabama
Louisiana
Georgia
Oklahoma
South Carolina
North Carolina
Missouri
Indiana
Maine
Delaware
Nevada
Ohio
Virginia
Maryland
Rhode Island
Texas
Vermont
Florida
Illinois
Michigan
Median
Pennsylvania
New Hampshire
Kansas
Oregon
Iowa
Massachusetts
New Jersey
Alaska
Washington
New York
Nebraska
Arizona
Connecticut
California
Wisconsin
Montana
Wyoming
South Dakota
North Dakota
Minnesota
D.C.
Hawaii
Idaho
Colorado
New Mexico
Utah
Below Median States
State Rates
Boxplot of Constituent HSA Rates
30 40 50 60 70 80
20 40 60 80 100 120
Age-Adjusted Rate per 100,000
Age-Adjusted Rate per 100,000
U.S. Average

EPA's Cumulative Exposure Project (CEP)

- Conducted by the U.S. Environmental Protection Agency (EPA) Office of Policy
- Collection of analyses, addressing multiple pollutants from multiple sites (1998/1999)
- National analyses of
  - Air Toxics (Outdoor Concentrations)
  - Food Contaminants (Exposures)
  - Drinking Water Contaminants (Exposures)

Scope of Modeling

- 188 Hazardous Air Pollutants (HAPs) in Clean Air Act
- 148 HAPs modeled for 1990
- Modeled concentrations for each census tract in continental US (> 60,000)
- Includes stationary and mobile sources of air toxics emissions
- Uncertainty bounds derived from model-monitor comparisons

Web-based Access of HAP Data

- Goals:
  - Concise display
  - Easy access
  - Understandable to non-statistical audience
- Solution via:
  - Web
  - Graphics Production Library (GPL)
  - Micromaps

Symanzik, Carr, Axelrad, Wang, Wong, Woodruff (1999): Interactive Tables and Maps - A Glance at EPA's Cumulative Exposure Project Web Page, Proceedings of the Section on Statistical Graphics, ASA, 94-99.

File Edit View Go Communicator Help

Back Forward Reload Home Search Guide Print Security Stop

Internet Lookup New&Cool

Bookmarks Go To: http://www.epa.gov/CumulativeExposure

HOME
AIR
FOOD
DRINKING WATER
ABOUT THE PROJECT
WHAT'S NEW
RESOURCES
COMMUNITY-SPECIFIC STUDY
GREENPOINT/WILLIAMSBURG

EPA United States Environmental Protection Agency

CUMULATIVE EXPOSURE

P R O J E C T

EPA's Cumulative Exposure Project (CEP) is examining how much toxic contamination Americans are exposed to cumulatively through air, food,and drinking water. The study will estimate exposure levels for different communities and demographic groups nationwide, and identify which types of communities and demographic groups appear to have the highest exposures. The Cumulative Exposure Project is being conducted by EPA's Office of Policy.

About the Project

W H A T ' S N E W ?

Modeled 1990 air toxics concentrations are now available.

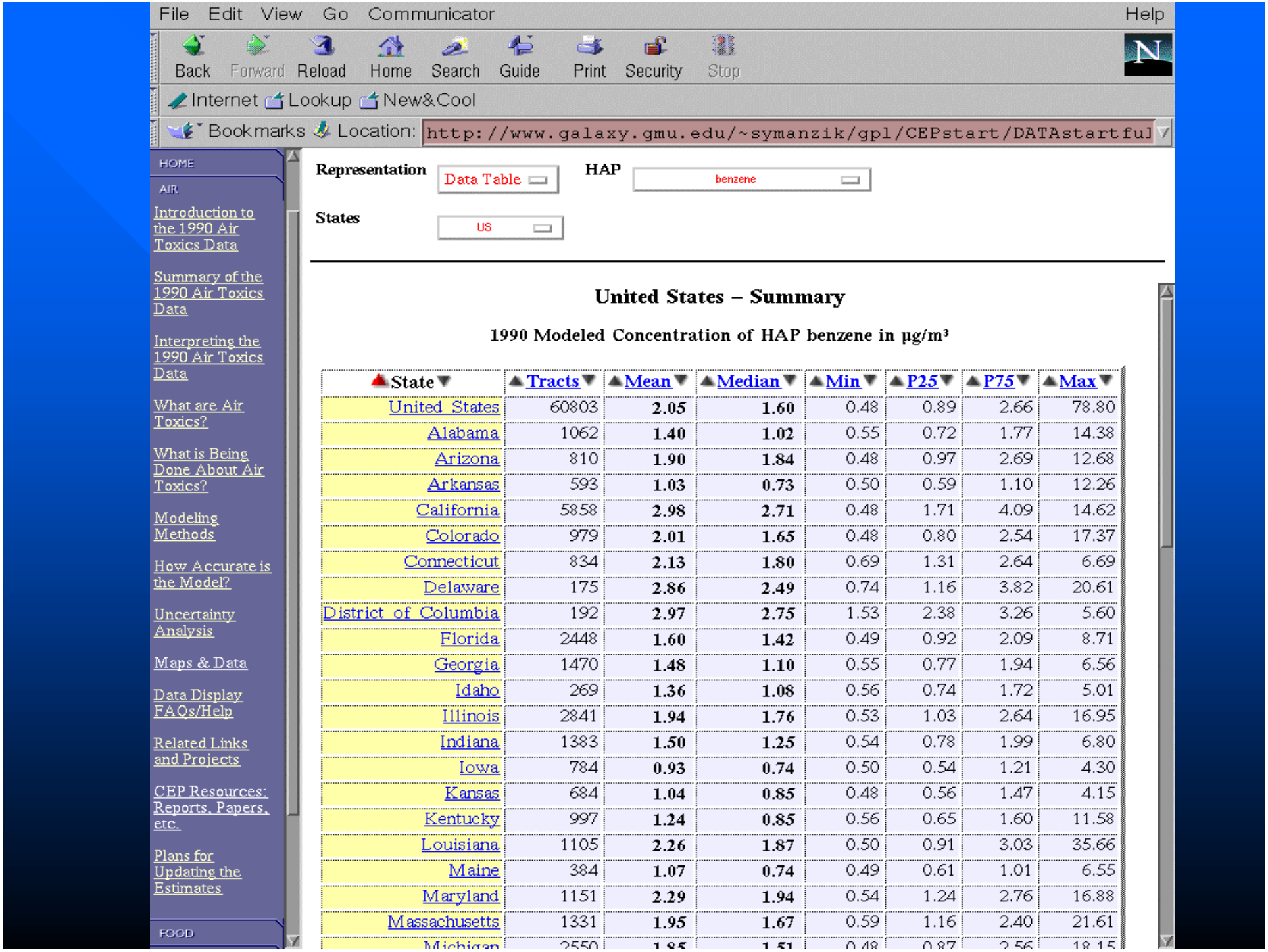
[Cumulative Exposure Project Home | EPA Home | Search | What's new]

http://www.epa.gov/CumulativeExposure/index.htm

last updated 12/3/98

Please send comments about this page to axelrad.daniel@epa.gov

http://www.epa.gov/CumulativeExposure (no longer active)

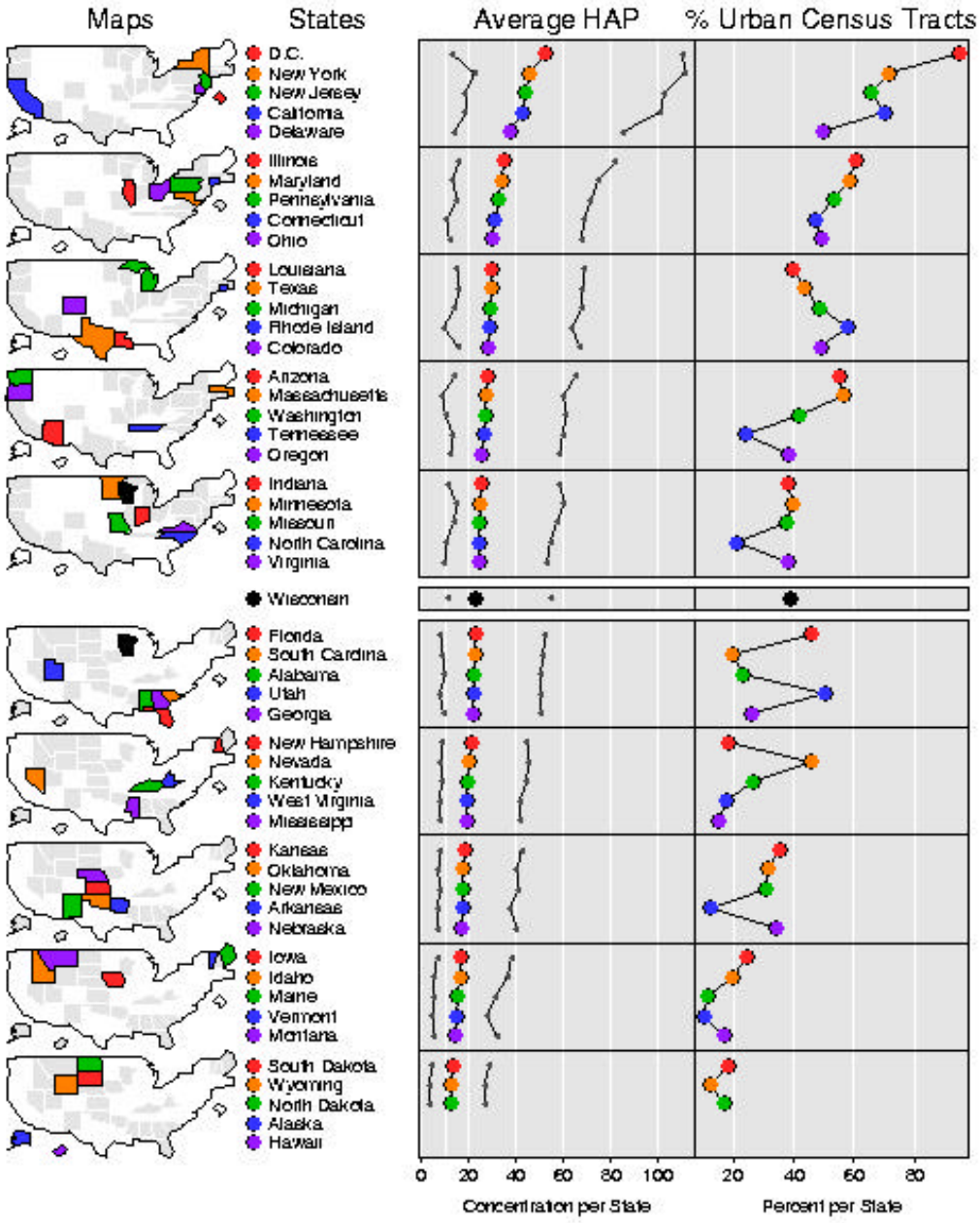


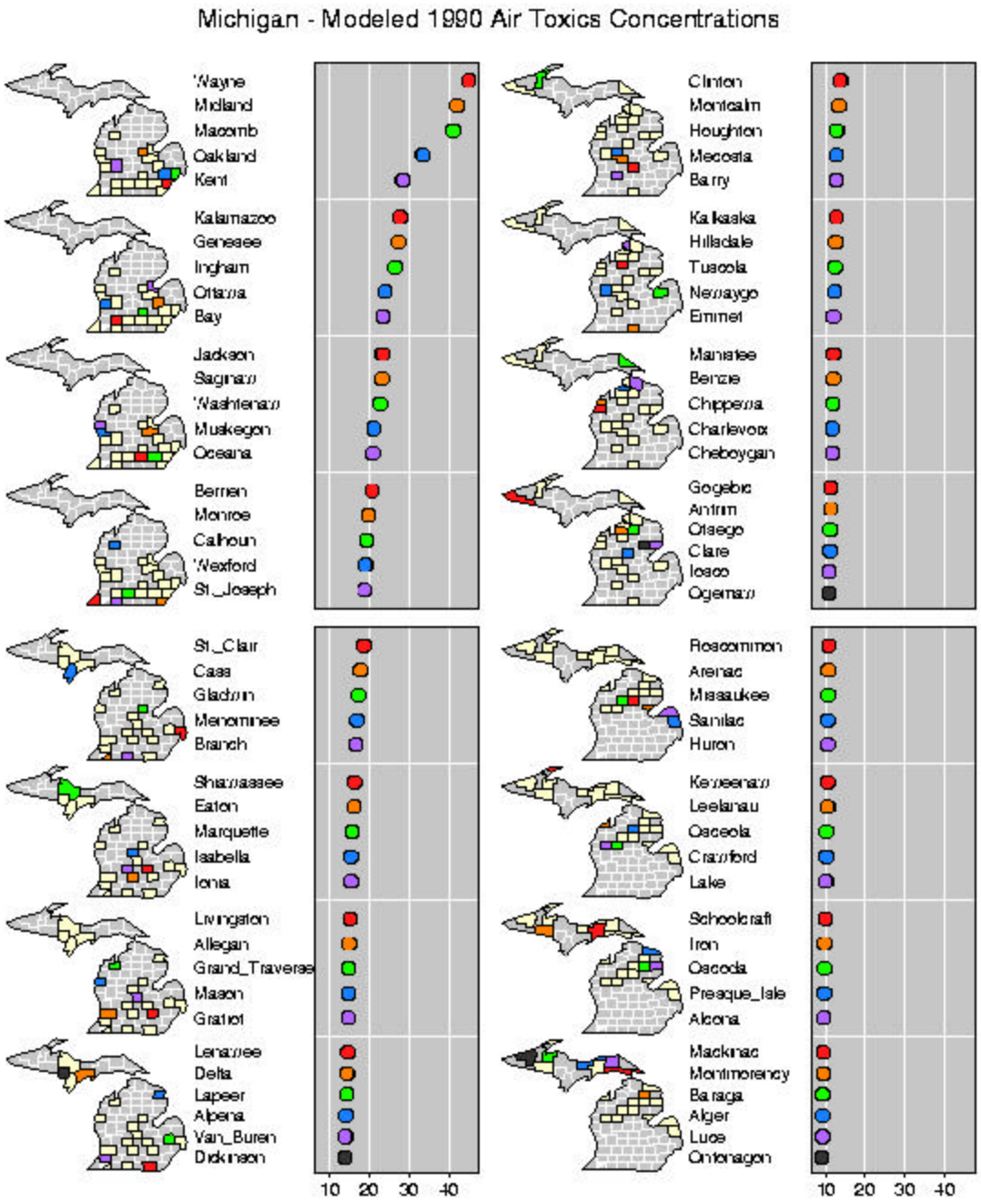
United States – Summary

1990 Modeled Concentration of HAP benzene in µg/m³

State	Tracts	Mean	Median	Min	P25	P75	Max
United States	60803	**2.05**	**1.60**	0.48	0.89	2.66	78.80
Alabama	1062	**1.40**	**1.02**	0.55	0.72	1.77	14.38
Arizona	810	**1.90**	**1.84**	0.48	0.97	2.69	12.68
Arkansas	593	**1.03**	**0.73**	0.50	0.59	1.10	12.26
California	5858	**2.98**	**2.71**	0.48	1.71	4.09	14.62
Colorado	979	**2.01**	**1.65**	0.48	0.80	2.54	17.37
Connecticut	834	**2.13**	**1.80**	0.69	1.31	2.64	6.69
Delaware	175	**2.86**	**2.49**	0.74	1.16	3.82	20.61
District of Columbia	192	**2.97**	**2.75**	1.53	2.38	3.26	5.60
Florida	2448	**1.60**	**1.42**	0.49	0.92	2.09	8.71
Georgia	1470	**1.48**	**1.10**	0.55	0.77	1.94	6.56
Idaho	269	**1.36**	**1.08**	0.56	0.74	1.72	5.01
Illinois	2841	**1.94**	**1.76**	0.53	1.03	2.64	16.95
Indiana	1383	**1.50**	**1.25**	0.54	0.78	1.99	6.80
Iowa	784	**0.93**	**0.74**	0.50	0.54	1.21	4.30
Kansas	684	**1.04**	**0.85**	0.48	0.56	1.47	4.15
Kentucky	997	**1.24**	**0.85**	0.56	0.65	1.60	11.58
Louisiana	1105	**2.26**	**1.87**	0.50	0.91	3.03	35.66
Maine	384	**1.07**	**0.74**	0.49	0.61	1.01	6.55
Maryland	1151	**2.29**	**1.94**	0.54	1.24	2.76	16.88
Massachusetts	1331	**1.95**	**1.67**	0.59	1.16	2.40	21.61
Michigan	2550	**1.85**	**1.51**	0.48	0.87	2.56	18.15

Hazardous Air Pollutants (HAPs)
1990 Annual Average Per State




Michigan - Modeled 1990 Air Toxics Concentrations
Wayne
Midland
Macomb
Oakland
Kent
Kalamazoo
Genesee
Ingham
Ottawa
Bay
Jackson
Saginaw
Washtenaw
Muskegon
Oceana
Berrien
Monroe
Calhoun
Wexford
St_Joseph
St_Clair
Cass
Gladwin
Menominee
Branch
Shiawassee
Eaton
Marquette
Isabella
Ionia
Livingston
Allegan
Grand_Traverse
Mason
Gratiot
Lenawee
Delta
Lapeer
Alpena
Van_Buren
Dickinson
Clinton
Montcalm
Houghton
Mecosta
Barry
Kalkaska
Hillsdale
Tuscola
Newaygo
Emmet
Manistee
Benzie
Chippewa
Charlevoix
Cheboygan
Gogebic
Antrim
Otsego
Clare
Iosco
Ogemaw
Roscommon
Arenac
Missaukee
Sanilac
Huron
Keweenaw
Leelanau
Osceola
Crawford
Lake
Schoolcraft
Iron
Oscoda
Presque_Isle
Alcona
Mackinac
Montmorency
Baraga
Alger
Luce
Ontonagon
10
20
30
40
10
20
30
40

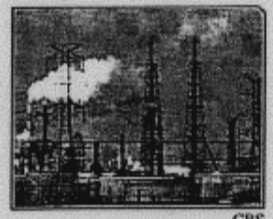
Death of the CEP

NATIONAL ‹ back to NEWS

Is House Paint Killing Us?

- *Industry May Not Be The Only Polluter*
- *Toxins Lurk In House Paint And Lawn Mowers*
- *But Some Question Validity Of Data*

UNION COUNTY, New Jersey
Saturday, February 20,1999 - 08:44 PM ET



CBS

(CBS) Breathing can be hazardous to your health. A groundbreaking study by the Environmental Protection Agency has found that virtually every American is inhaling unsafe levels of chemicals, reports **CBS News Correspondent Jeffrey Kofman.**

"It's almost: We found the problem, and it's us."
Robert Shinn, New Jersey environmental commissioner

VIDEO
CBS News Correspondent Jeffrey Kofman Reports

The study looked beyond high-profile pollution problems like lead and carbon monoxide, testing for 148 toxins that haven't been examined closely before. It found unsafe levels of at least eight cancer-causing chemicals virtually everywhere in America.

Living On Earth TOP STORY

EPA Air Pollution Study Put On Hold

Air Date: Week of January 22, 1999

CURWOOD: This is Living on Earth. I'm Steve Curwood. The results of a groundbreaking new Federal study of air pollution might have been available at the click of a button. But they're not, because of objections from the nation's mayors. The Environmental Protection Agency's Cumulative Exposure Project is looking at airborne toxic chemicals. So far it has found that at least 8 of these chemicals are present at dangerous levels in every neighborhood in the continental US. The EPA was ready to post the city-by-city results on their Web site last month, but it decided not to, after the Conference of Mayors questioned the findings, saying they were based on untested models and old data. Scott Allen covers the environment for the Boston Globe. He says the report's conclusions are disturbing.

ALLEN: If you are living anywhere in the United States and taking a breath as we speak, you're getting at least an 8 in a million lifetime cancer risk of exposure from what you're breathing. That may not sound like a whole lot, but when you multiply it over a city's population, a couple million people living in a city or 5 million people in a state, it adds up to hundreds and thousands of cancers spread across a lot of people. And you have to also consider that there are some places, in fact about 10% of the United States, has got a significantly higher risk of cancer from the toxic chemicals in the air. Their risk is at least one in 10,000. And that means in any small town in America, practically, 1 or 2 people are getting cancer from breathing the air. Not any special pollution, but just the regular everyday air.

CBS, 2/20/1999

NPR, 1/22/99

nViZn

- Follow-up to the GPL
- JAVA-based software development kit (SDK) for the creation and modification of interactive statistical graphics applications (tables, charts, micromaps, ...)
- *http://www.spss.com/nvizn*
- Related book “The Grammar of Graphics” by Leland Wilkinson

nViZn Features

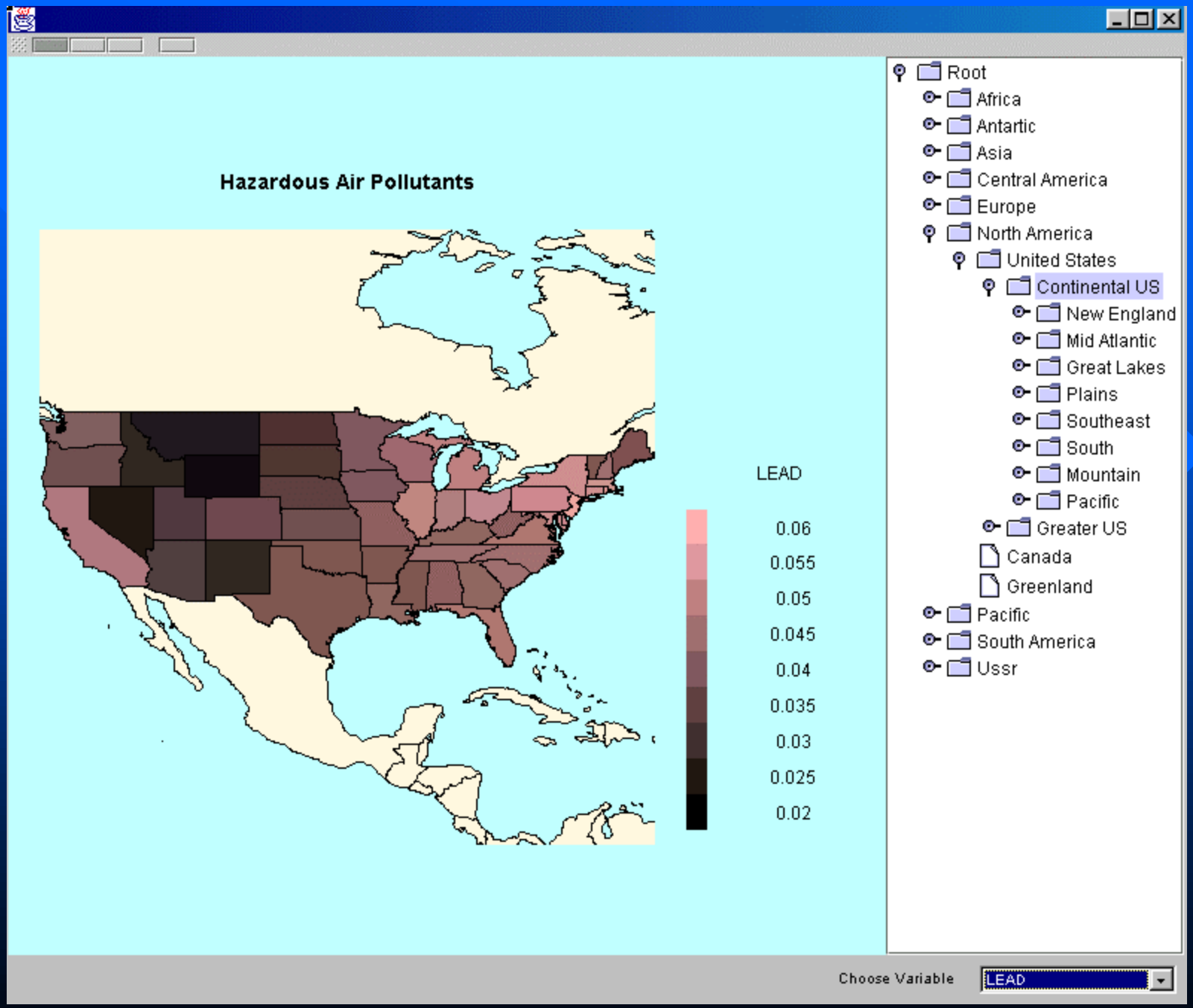
- Follows guidelines of modern statistical graphics with analytics completed within the SDK
- Interactive abilities include dynamic data filtering, brushing/linking, mouse roll-overs, pan-and-zoom, drill-down, 3-D rotation, and animation

Micromaps with nViZn

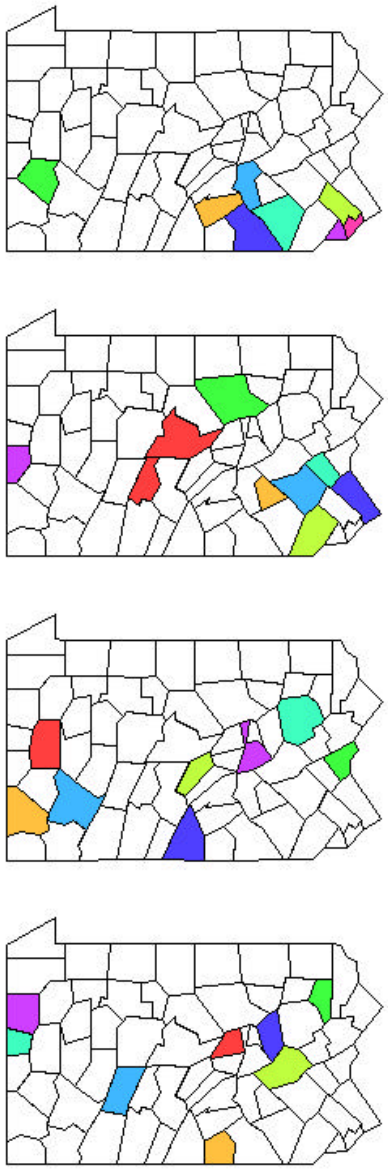
- Hierarchical clickable micromaps and tables for the display of Federal statistical data
  - Micromaps and tables under nViZn
  - Clickable maps and tables
  - Hierarchy of maps and tables
  - Selection of variables
  - Use of EPA HAP data for demo purposes

Pennsylvania: 1990 Modeled Benzene Concentrations
Upper Half

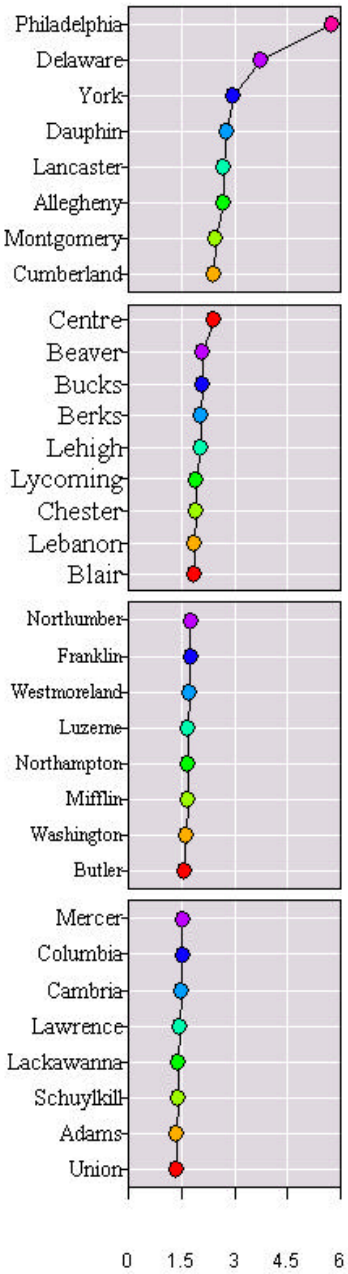
	Minimum	Mean	Maximum	Quartile1	Median	Quartile3
Philadelphia	2.79	5.75	15.9	4.19	5.16	6.44
Delaware	1.98	3.76	18.91	2.69	3.21	4.13
York	0.94	2.96	12.07	1.23	1.72	3.9
Dauphin	0.92	2.79	6.17	1.54	2.63	3.61
Lancaster	0.91	2.68	10.38	1.26	1.92	3.39
Allegheny	1.18	2.68	8.74	2.01	2.58	3.07
Montgomery	1.24	2.45	4.24	2.0	2.43	2.86
Cumberland	0.87	2.42	7.4	1.12	2.33	2.74
Centre	0.64	2.4	9.82	0.72	1.31	3.56
Beaver	1.0	2.09	4.63	1.19	1.81	2.79
Bucks	1.14	2.08	14.34	1.74	2.01	2.22
Berks	0.88	2.07	5.71	1.22	1.96	2.73
Lehigh	0.82	2.03	4.4	1.42	1.94	2.51
Lycoming	0.6	1.93	5.92	0.75	1.03	2.91
Chester	0.96	1.91	5.66	1.34	1.77	2.11
Lebanon	1.01	1.86	3.4	1.21	1.44	2.46
Blair	0.72	1.86	4.39	0.97	1.81	2.45
Northumber	0.79	1.75	3.02	0.88	1.82	2.79
Franklin	0.76	1.75	3.71	0.93	1.06	3.12
Westmoreland	0.72	1.73	4.87	1.08	1.49	2.21
Luzerne	0.7	1.69	4.06	0.98	1.59	2.31
Northampton	0.94	1.68	2.9	1.3	1.65	1.98
Mifflin	0.75	1.67	3.96	0.81	0.9	2.78
Washington	0.74	1.63	4.47	1.01	1.2	2.29
Butler	0.71	1.57	4.8	0.96	1.09	1.83
Mercer	0.68	1.52	2.55	0.87	1.35	2.17
Columbia	0.7	1.52	3.64	0.8	0.96	2.12
Cambria	0.69	1.51	4.07	0.79	1.14	2.13
Lawrence	0.83	1.46	2.71	0.96	1.3	1.86
Lackawanna	0.77	1.42	2.08	1.14	1.44	1.68
Schuylkill	0.76	1.4	3.36	0.87	1.04	1.79
Adams	0.8	1.36	3.95	0.95	1.01	1.43
Union	0.7	1.35	3.94	0.8	0.84	1.26
Venango	0.61	1.31	3.86	0.69	0.86	1.57


Hazardous Air Pollutants
LEAD
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
Root
Africa
Antartic
Asia
Central America
Europe
North America
United States
Continental US
New England
Mid Atlantic
Great Lakes
Plains
Southeast
South
Mountain
Pacific
Greater US
Canada
Greenland
Pacific
South America
Ussr
Choose Variable
LEAD

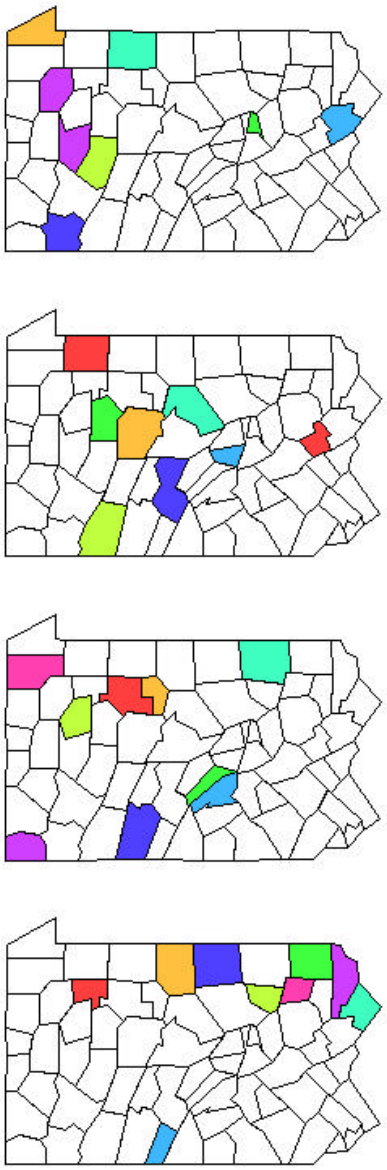
Pennsylvania: Upper Half



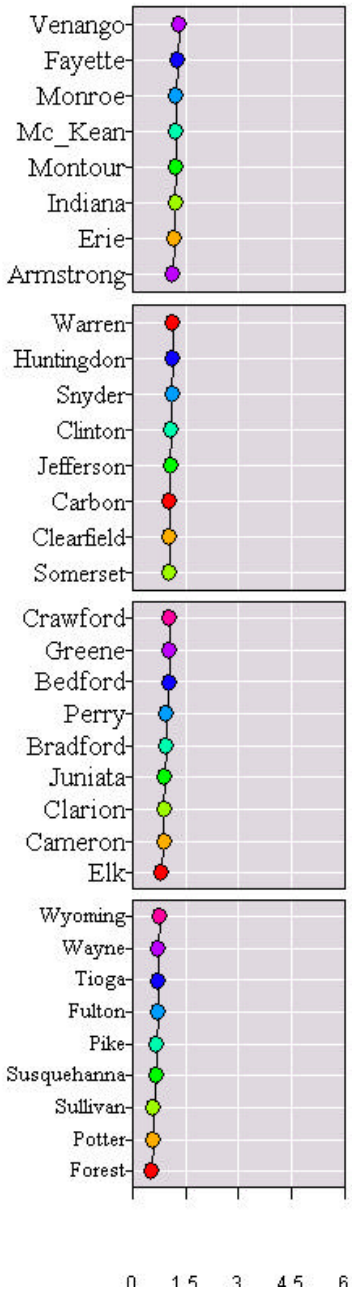
1990 Modeled Benzene Concentrations



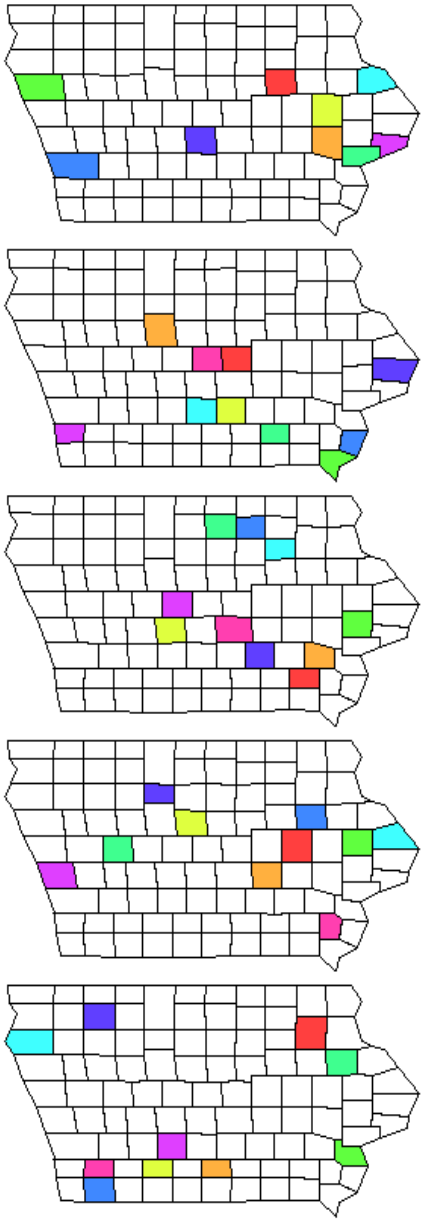
Pennsylvania: Lower Half



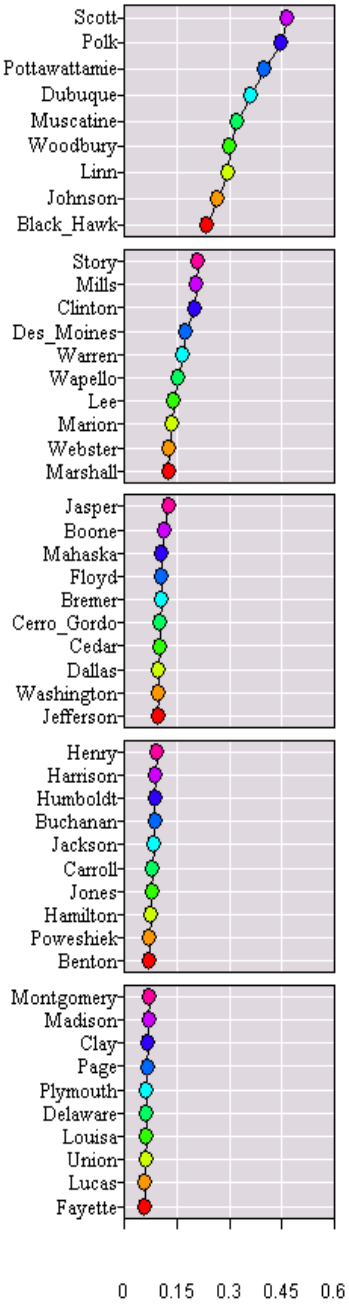
1990 Modeled Benzene Concentrations



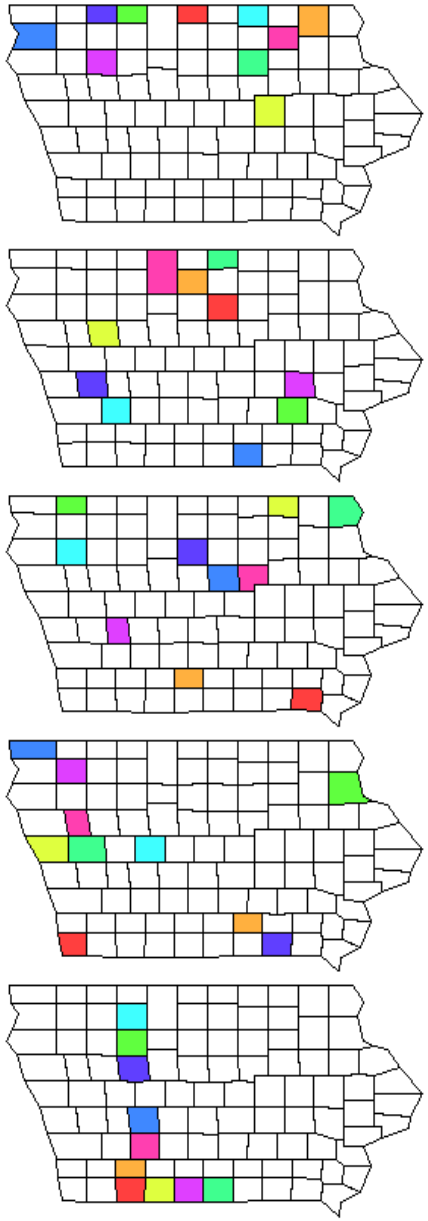
Iowa: Upper Half



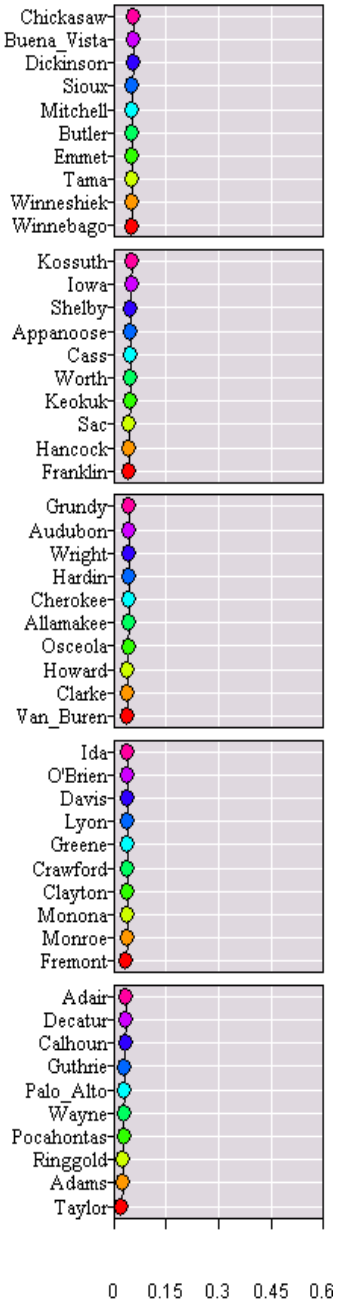
1990 Modeled Lead Concentrations



Iowa: Lower Half



1990 Modeled Lead Concentrations



Completed Work

- Interactive displays: Queries & meta data
- Access of multiple micromaps and tables through main display
- Scrollable maps and tables
-  Demo

Possible Future Work with nViZn

- Final goal: Hierarchical clickable micromaps and tables for the display of Federal statistical data
  - Hierarchy of maps and tables
  - Full selection of variables
  - Sorting w.r.t. multiple criteria
  - Access to Federal data base

Advantages of nViZn

- New versions released every few months
- Training courses offered by SPSS
- Good communication with users
- Might become a very useful tool to deliver interactive statistical graphics on the Web
- Huge potential for use with Federal statistical data

Disdvantages of nViZn

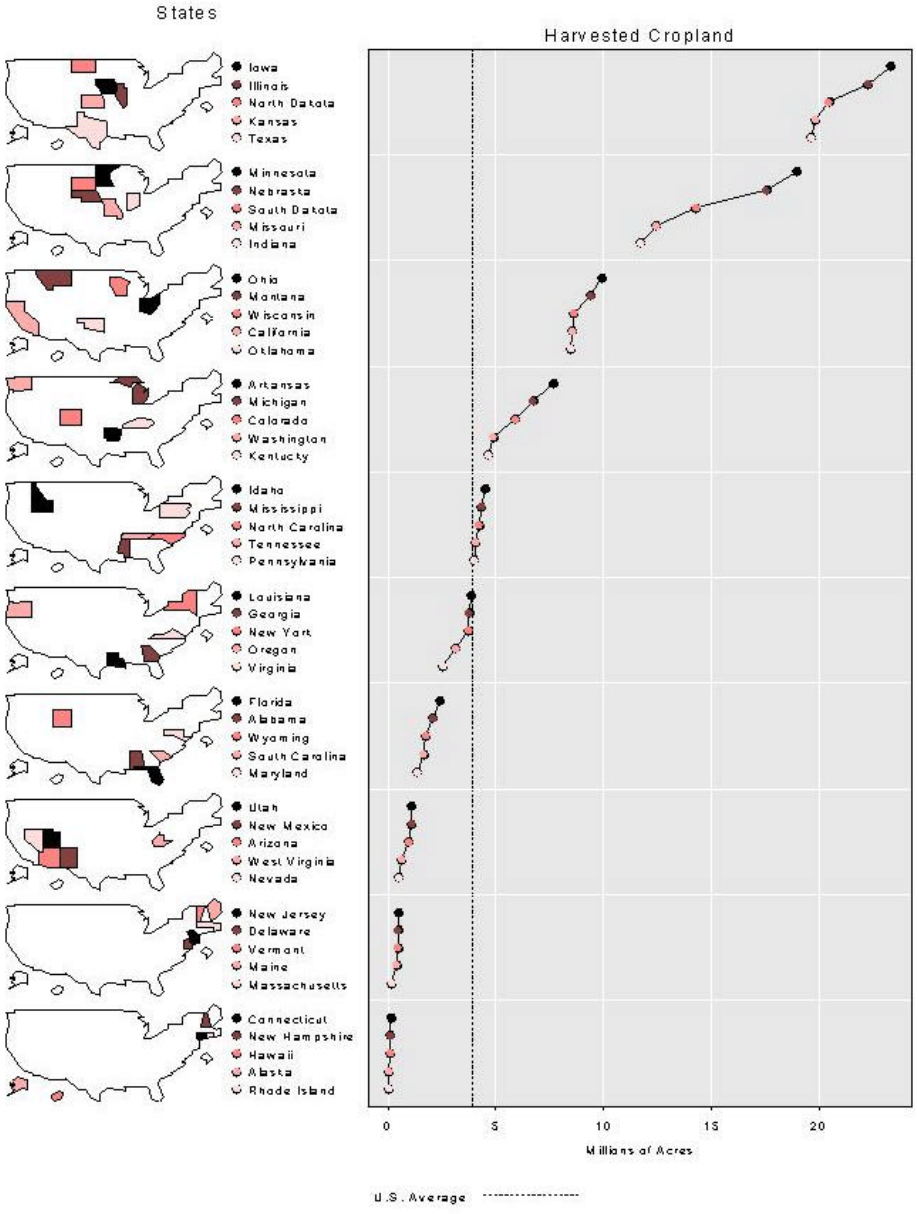
- Little documentation available
- Good JAVA knowledge required
- Sensitive to browsers and plugins
- High cost
- Huge overhead of Java code when only micromaps are needed

- **Meanwhile . . .**

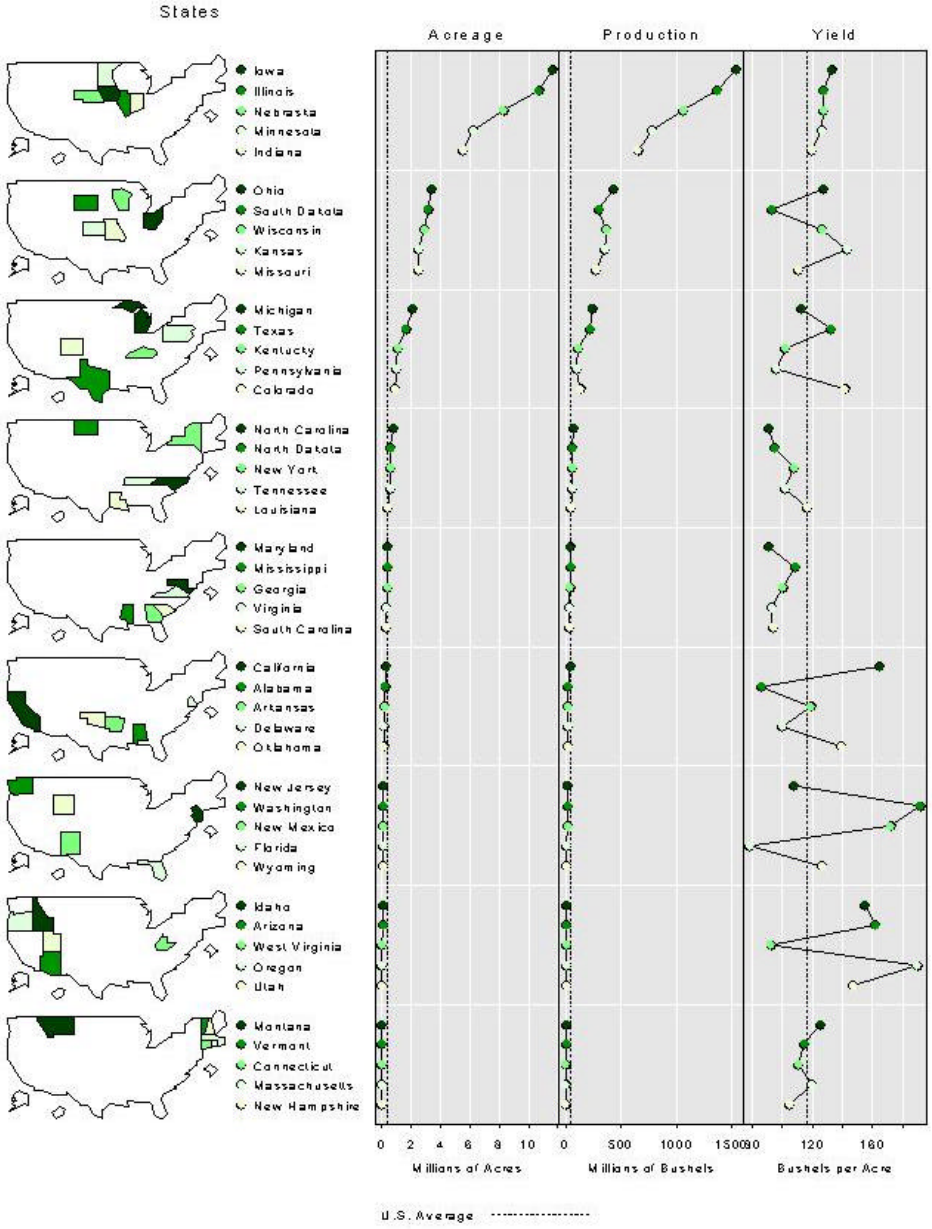
Micromaps at USDA-NASS

- U.S. Department of Agriculture - National Agricultural Statistics Service (USDA-NASS)
- *http://www.nass.usda.gov/research/sumpant.htm*
- Released in September 1999
- 1997 Census of Agriculture:
  - Acreage, production, yield
  - Corn, soybeans, wheat, hay, cotton
- Pre-calculated micromaps

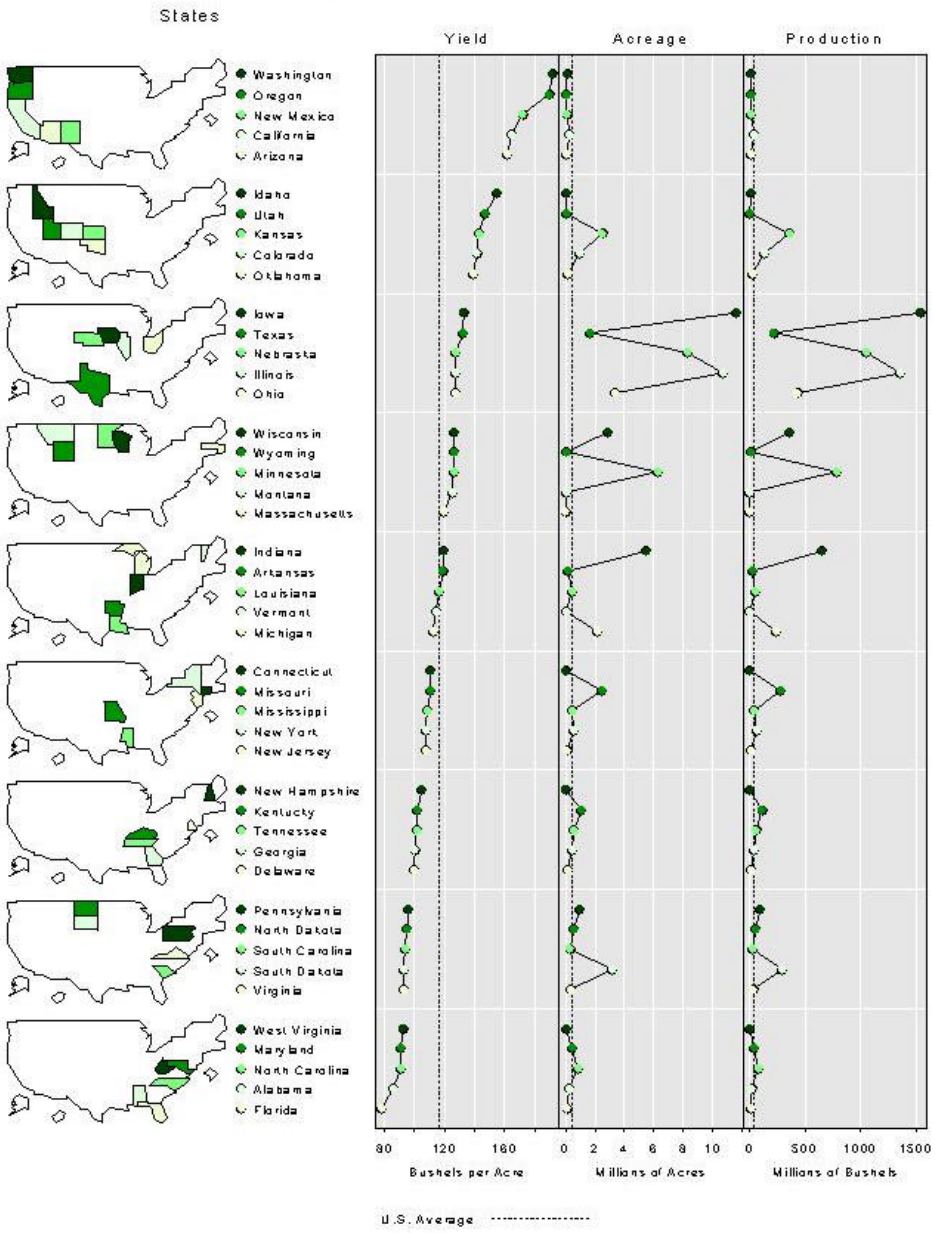
Harvested Cropland by State, 1997 Census of Agriculture



Corn Statistics by State, 1997 Census of Agriculture



Corn Statistics by State, 1997 Census of Agriculture



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.

statecancerprofiles.cancer.gov - Microsoft Internet Explorer provided by America Online

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Links Address http://statecancerprofiles.cancer.gov/micromaps/

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

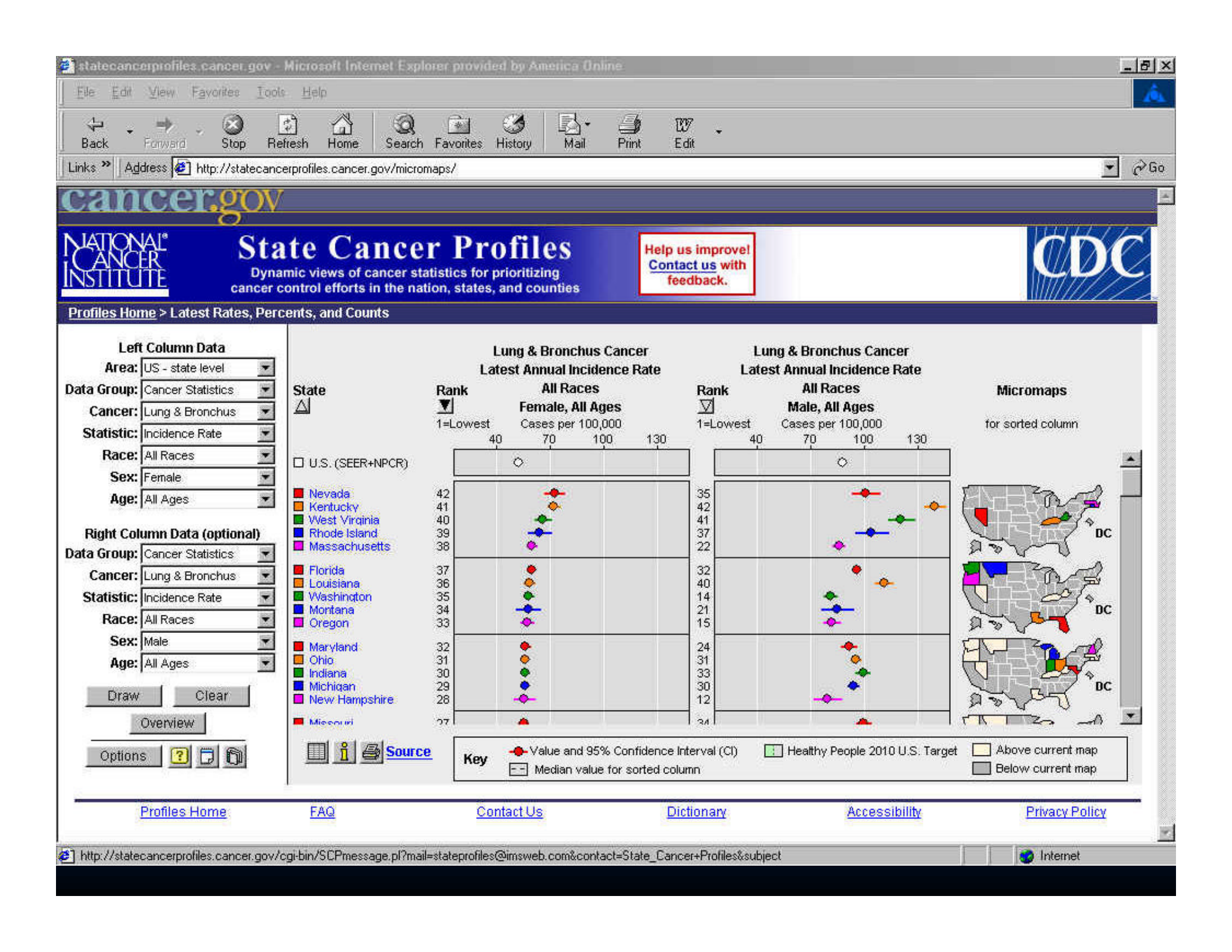
Right Column Data (optional)

Data Group: Cancer Statistics
Cancer: Lung & Bronchus
Statistic: Incidence Rate
Race: All Races
Sex: Male
Age: All Ages

Draw Clear

Overview

Options



Profiles Home FAQ Contact Us Dictionary Accessibility Privacy Policy

http://statecancerprofiles.cancer.gov/cgi-bin/SCPmessage.pl?mail=stateprofiles@imsweb.com&contact=State_Cancer+Profiles&subject

Internet

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Links Address http://statecancerprofiles.cancer.gov/micromaps/

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

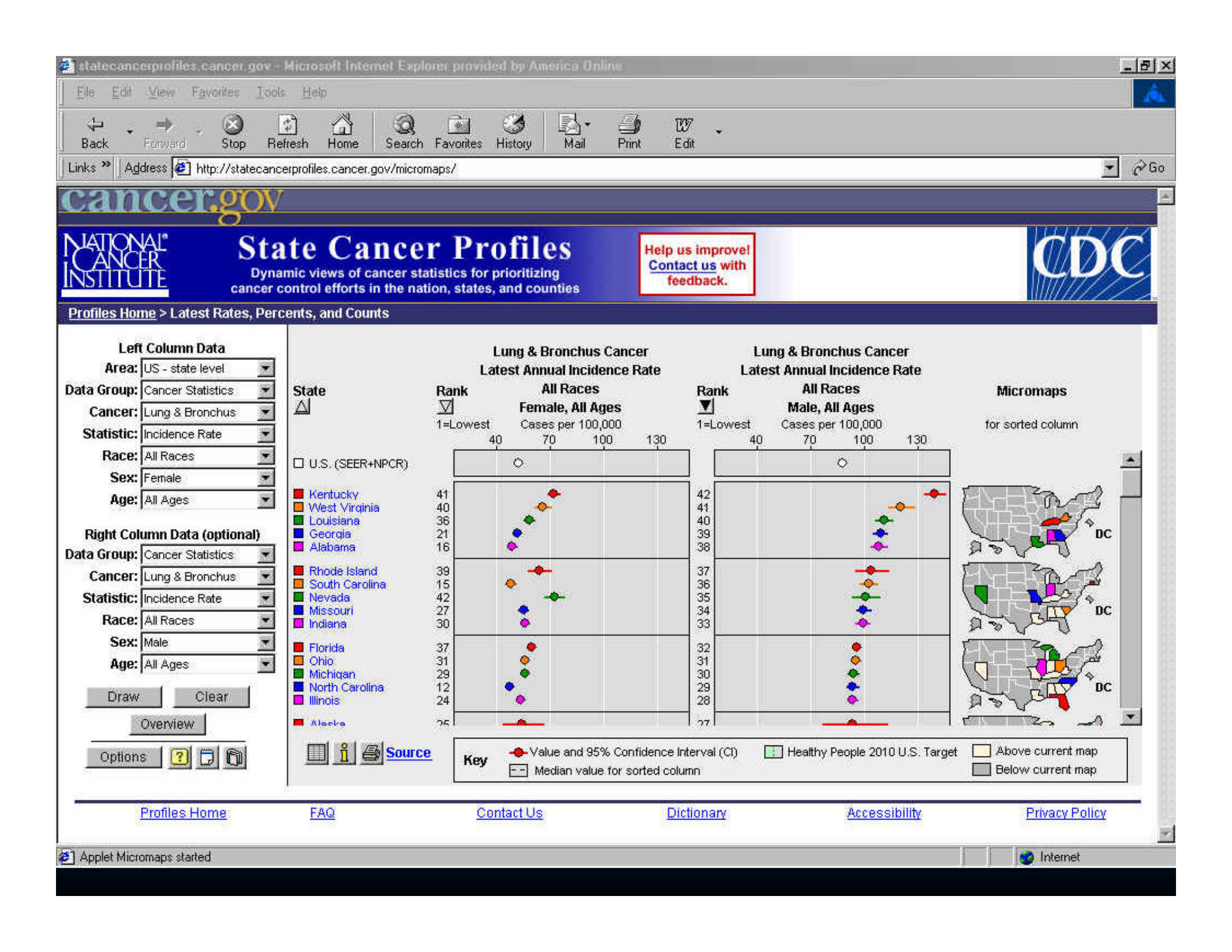
Right Column Data (optional)

Data Group: Cancer Statistics
Cancer: Lung & Bronchus
Statistic: Incidence Rate
Race: All Races
Sex: Male
Age: All Ages

Draw Clear

Overview

Options



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Applet Micromaps started

Internet

statecancerprofiles.cancer.gov - Microsoft Internet Explorer provided by America Online

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Links Address http://statecancerprofiles.cancer.gov/micromaps/

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: White
Sex: Both Sexes
Age: All Ages

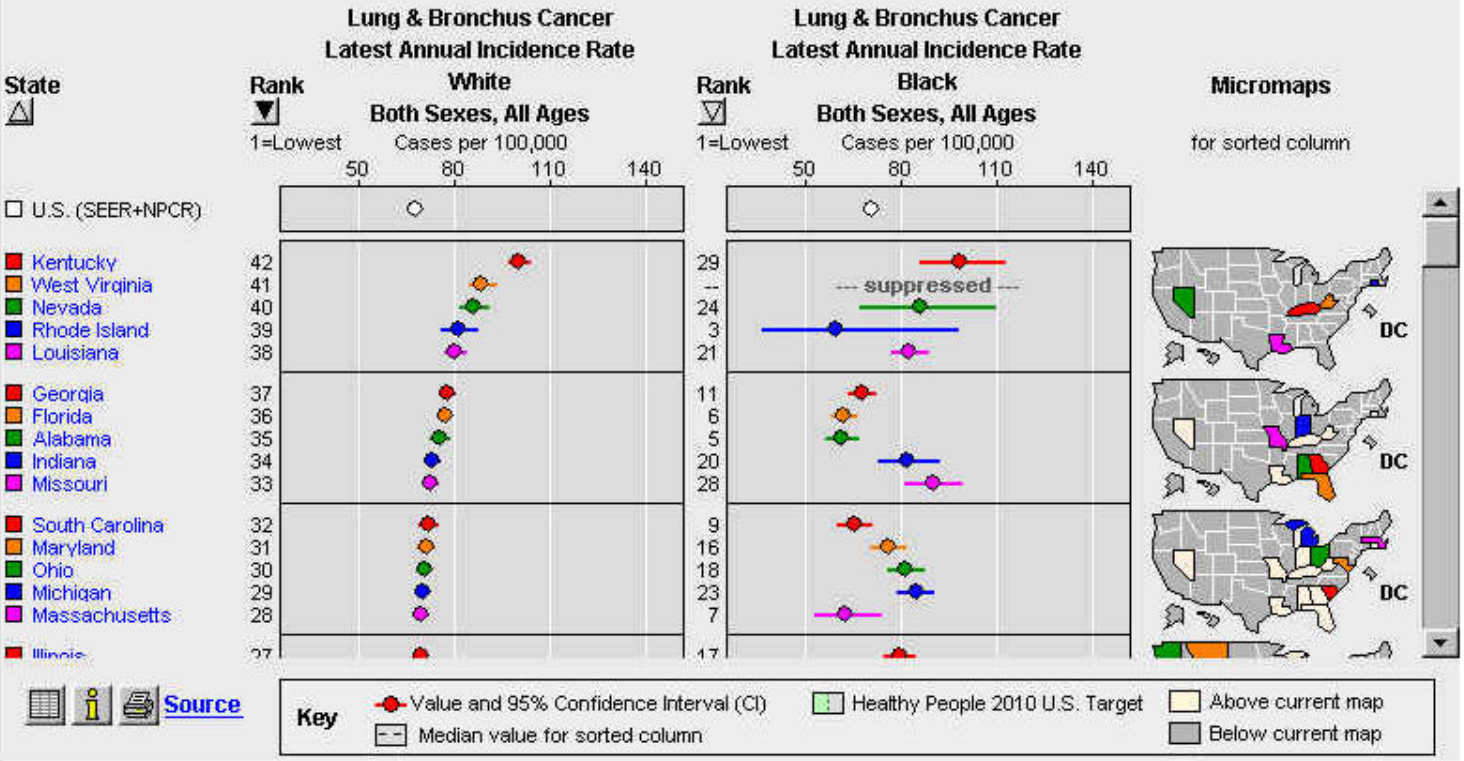
Right Column Data (optional)

Data Group: Cancer Statistics
Cancer: Lung & Bronchus
Statistic: Incidence Rate
Race: Black
Sex: Both Sexes
Age: All Ages

Draw Clear

Overview

Options



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Left Column Data

Area: US - state level
Data Group: Cancer Statistics
Cancer: Lung & Bronchus
Statistic: Incidence Rate
Race: White
Sex: Both Sexes
Age: All Ages

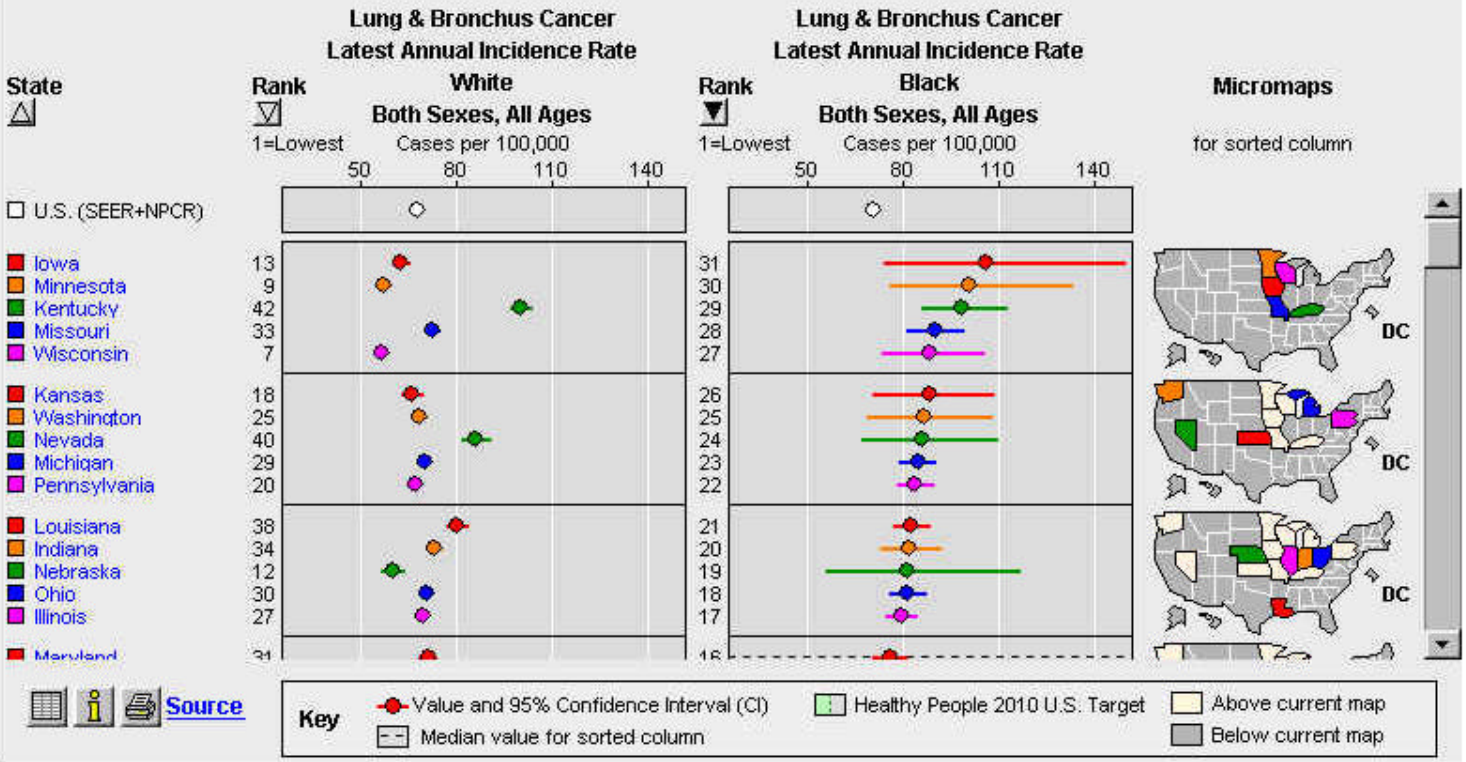
Right Column Data (optional)

Data Group: Cancer Statistics
Cancer: Lung & Bronchus
Statistic: Incidence Rate
Race: Black
Sex: Both Sexes
Age: All Ages

Draw Clear

Overview

Options



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Applet Micromaps started

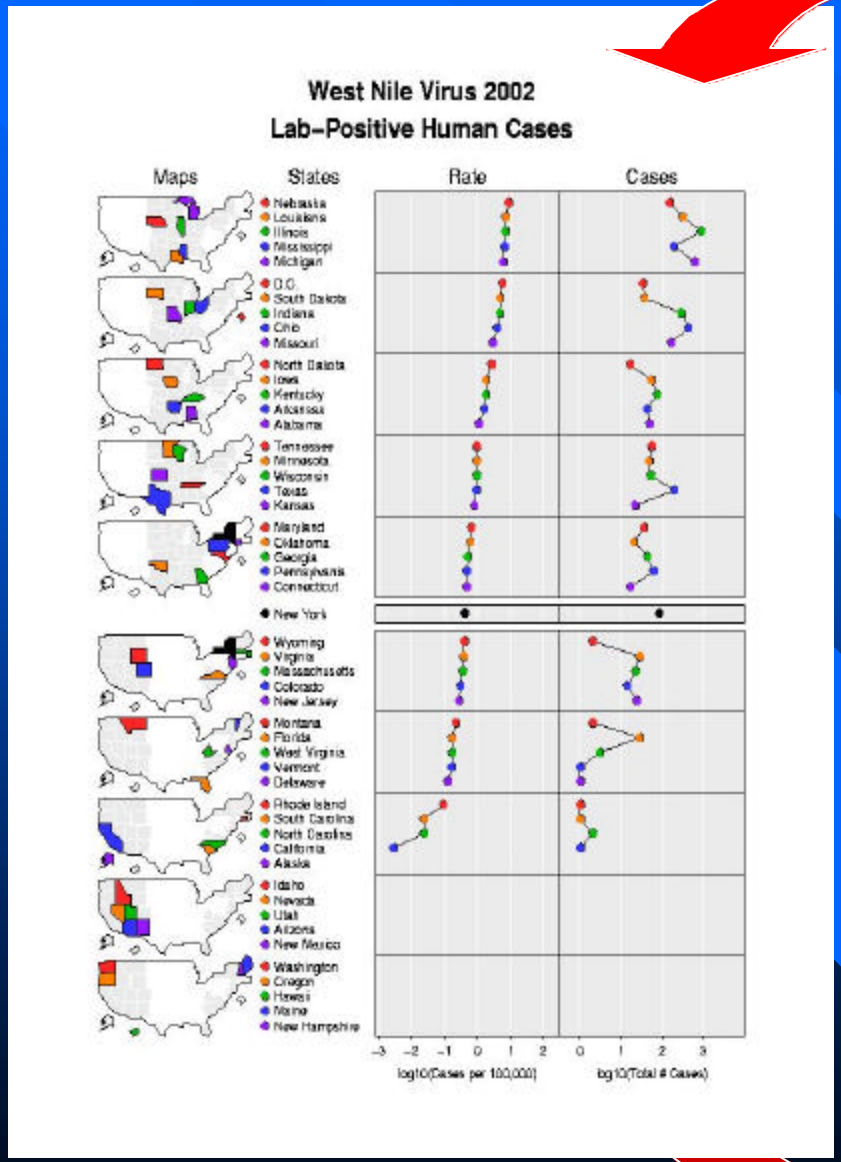
Internet

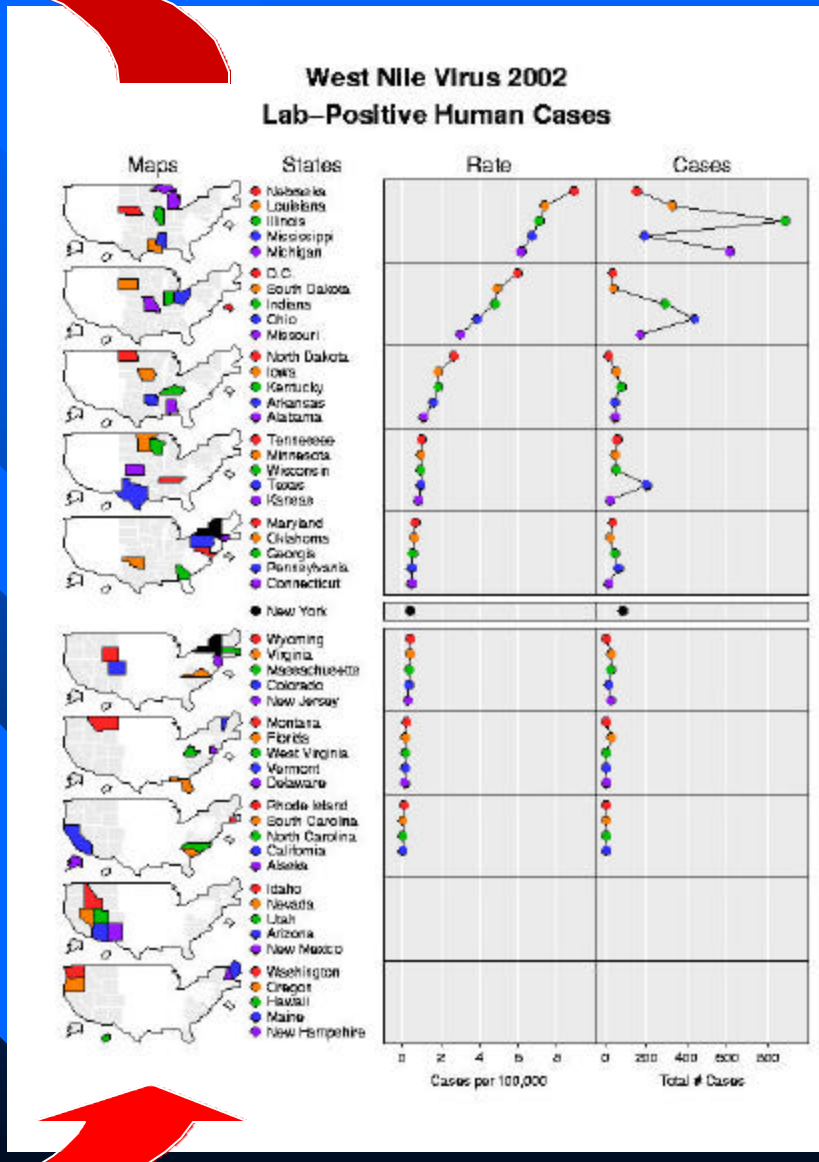
Micromaps for the Display of West Nile Virus (WNV) Data

West Nile Virus (WNV) ???

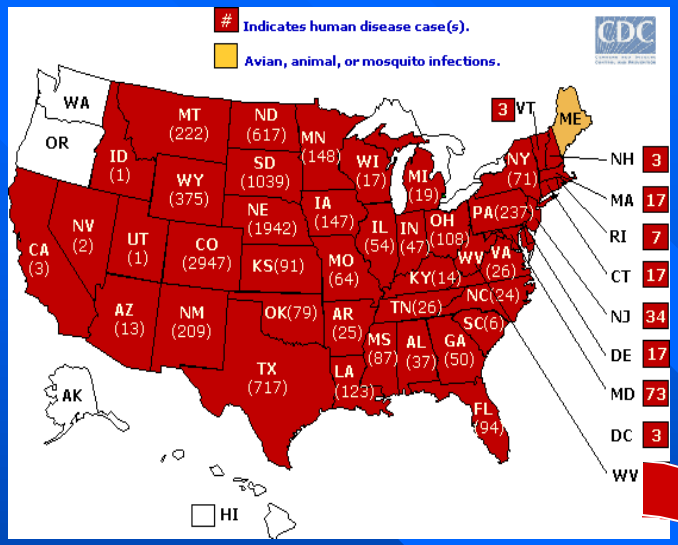
- Introduced to the US in 1999
- Spread across North America in 5 years
- Initial event - Culex mosquito transmits virus within avian populations
- Bridging Aedes albopictus transmits virus from birds to animals and humans

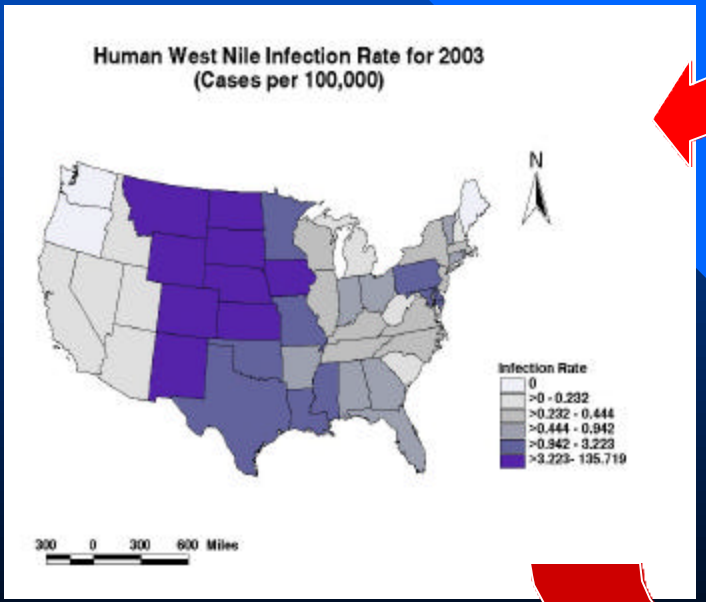
From 2002 CDC Web Page to Micromaps

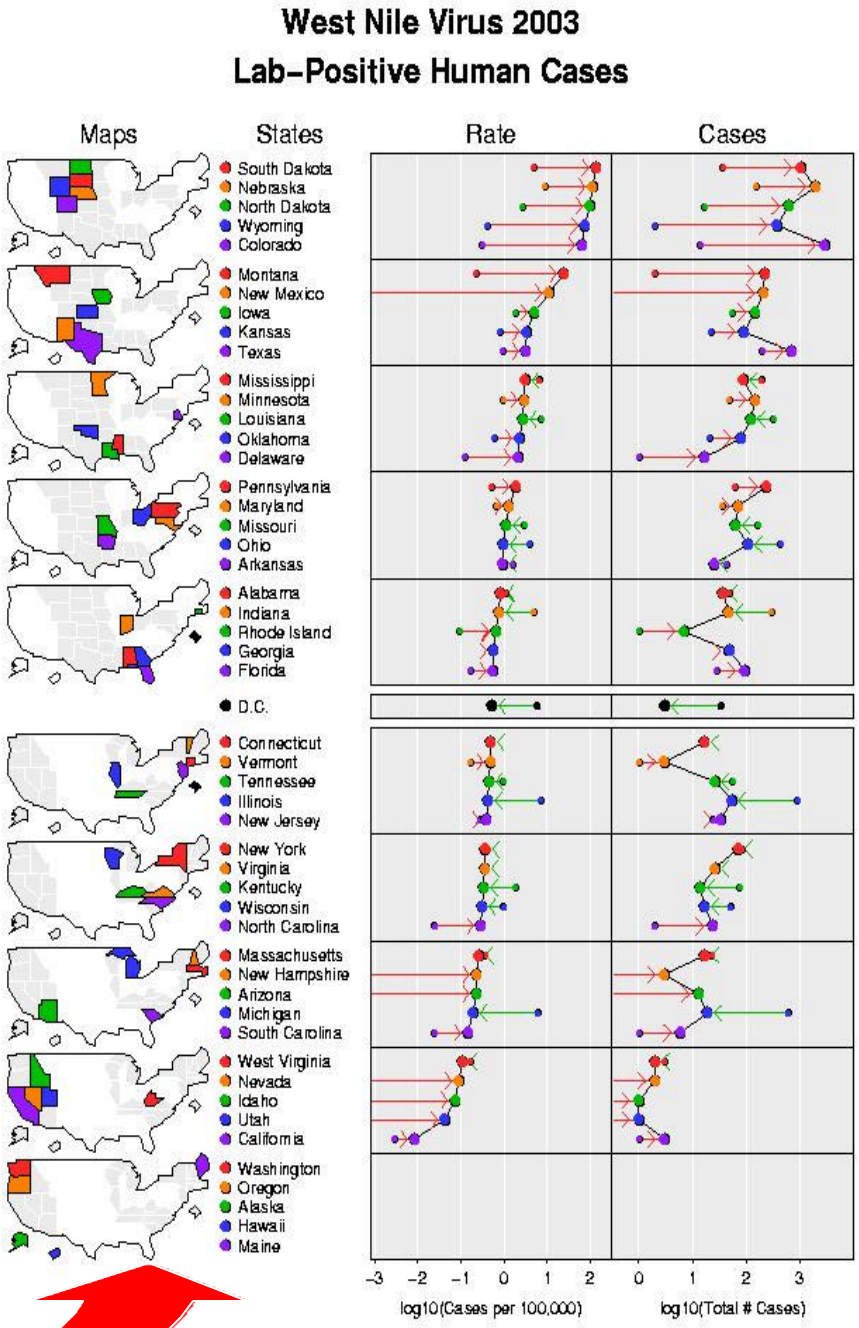




From 2003 CDC

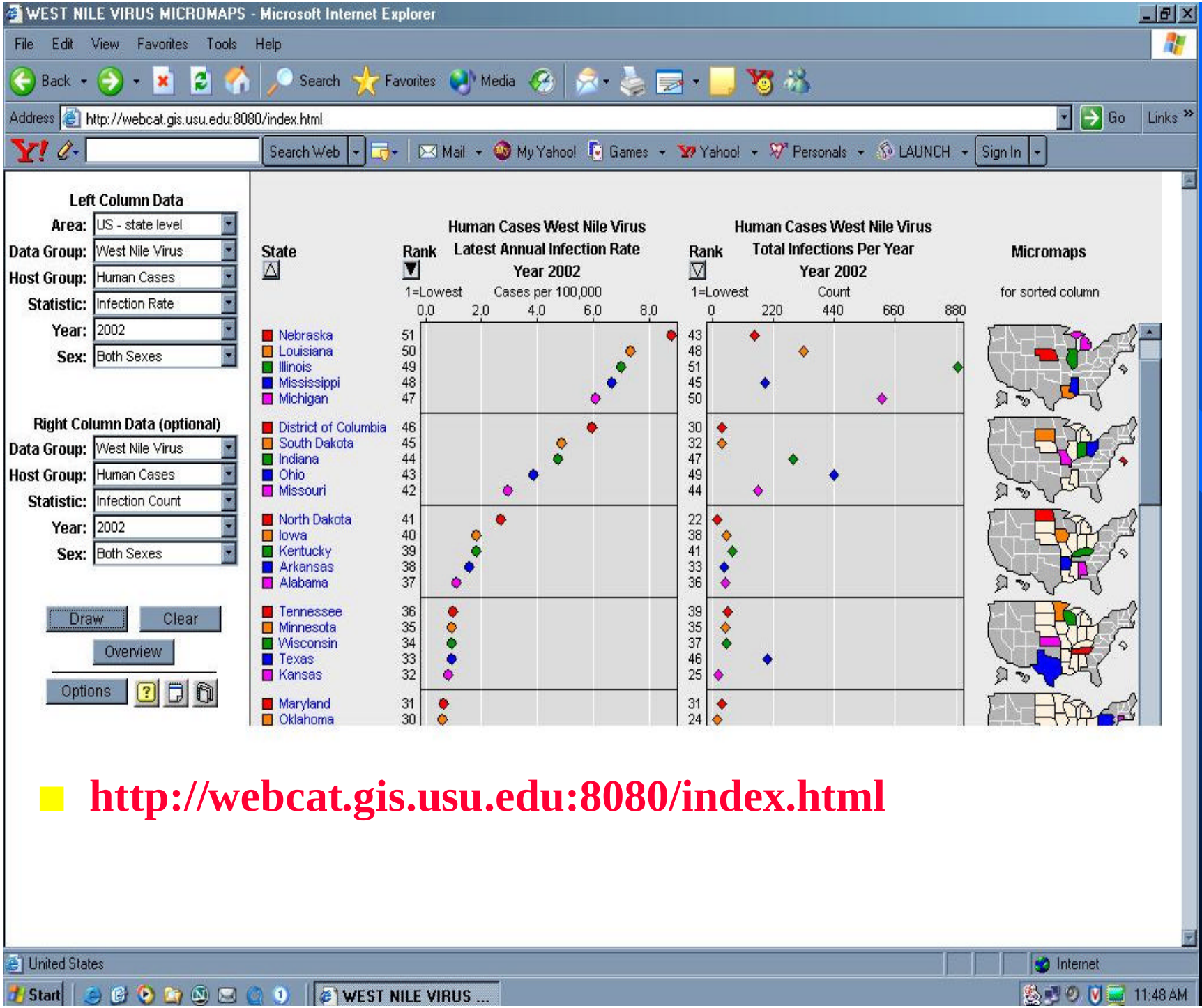




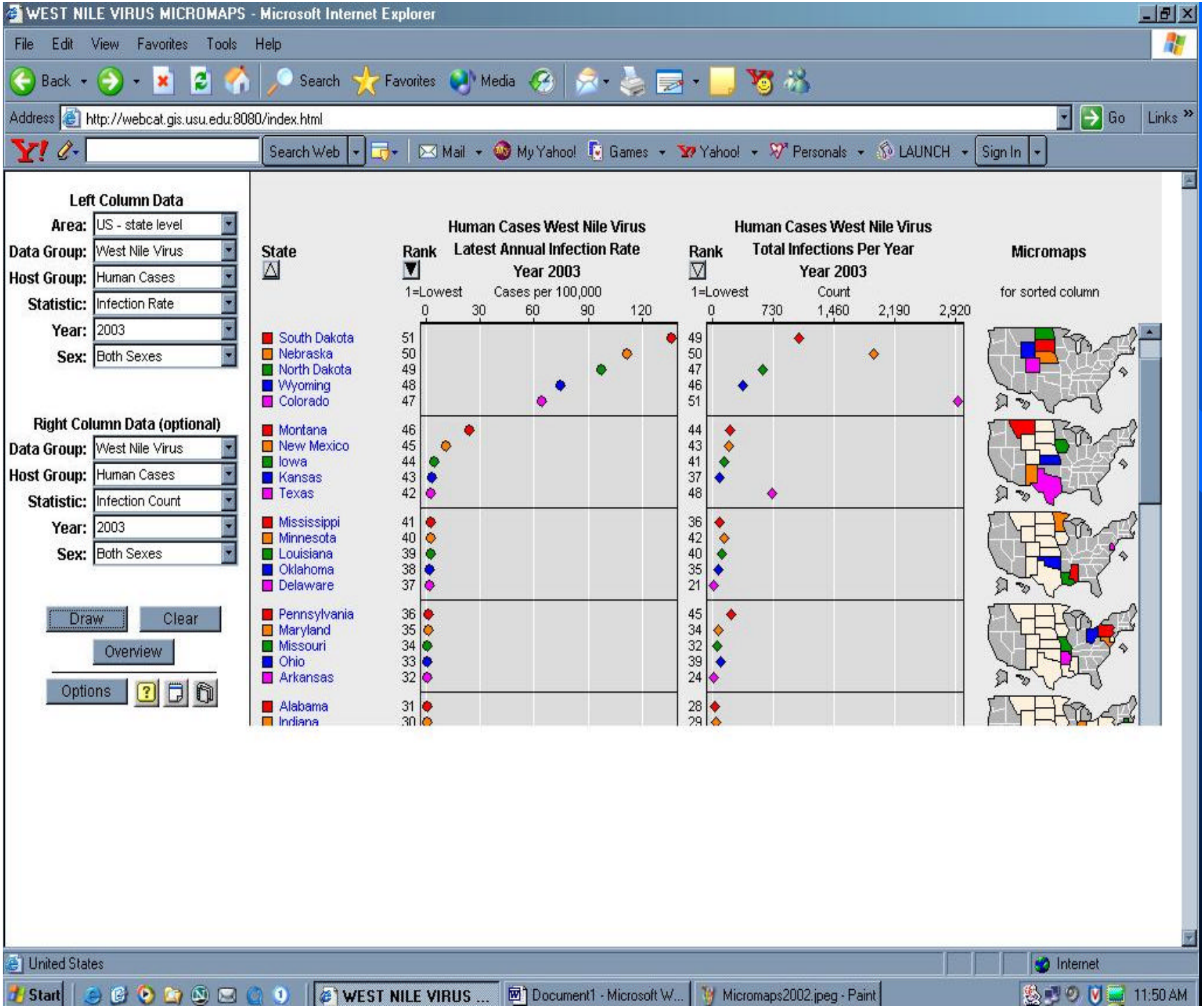


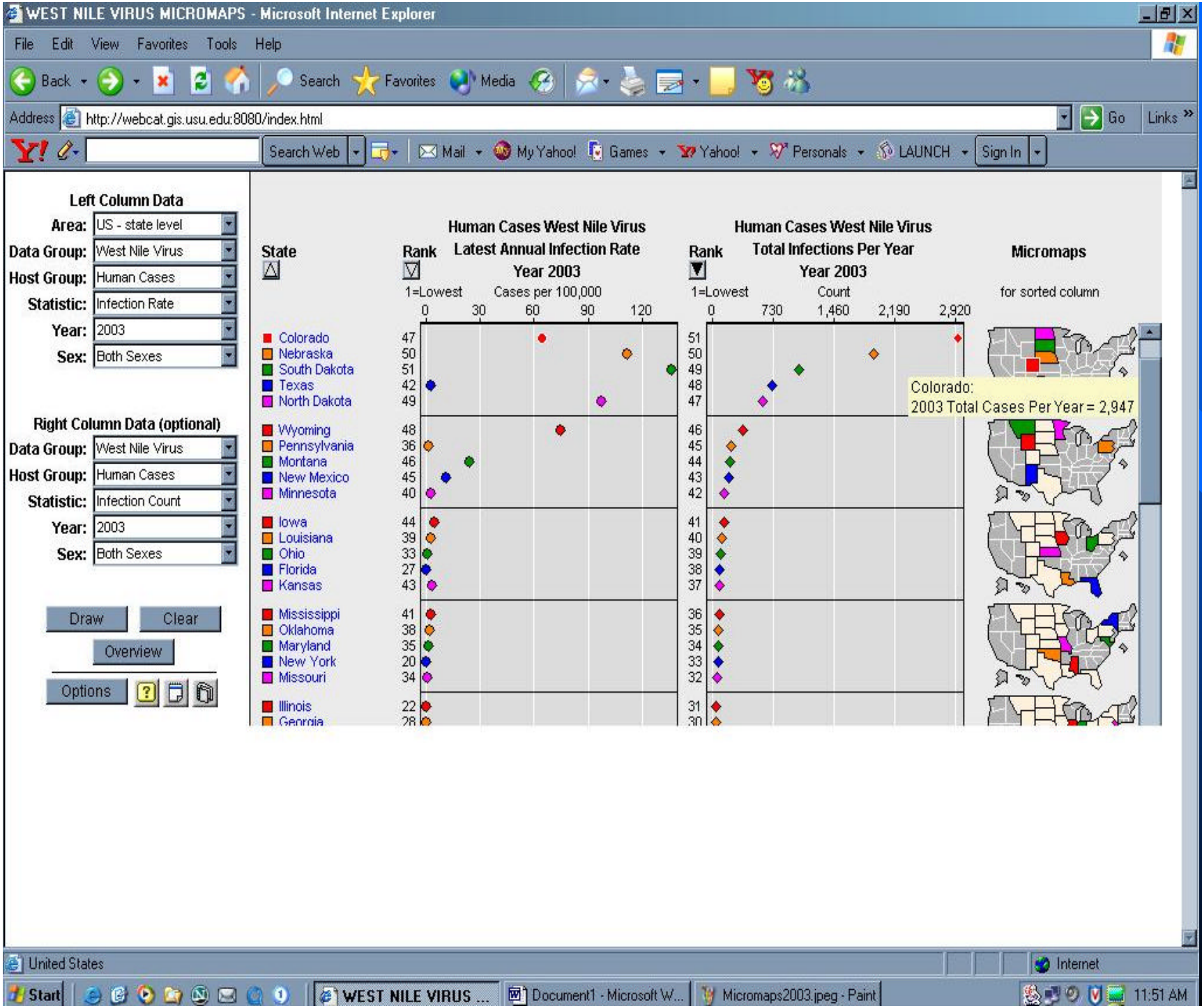
Web-Based Access to WNV Data

- Decision at Utah State University (USU):
  - Obtain NCI Java code for Web-based WNV micromaps
  - Upgrades for the display of WNV data
  - Reference: Symanzik, Gebreab, Gillies, Wilson (2003): Visualizing the Spread of West Nile Virus, Proceedings, ASA, CD.



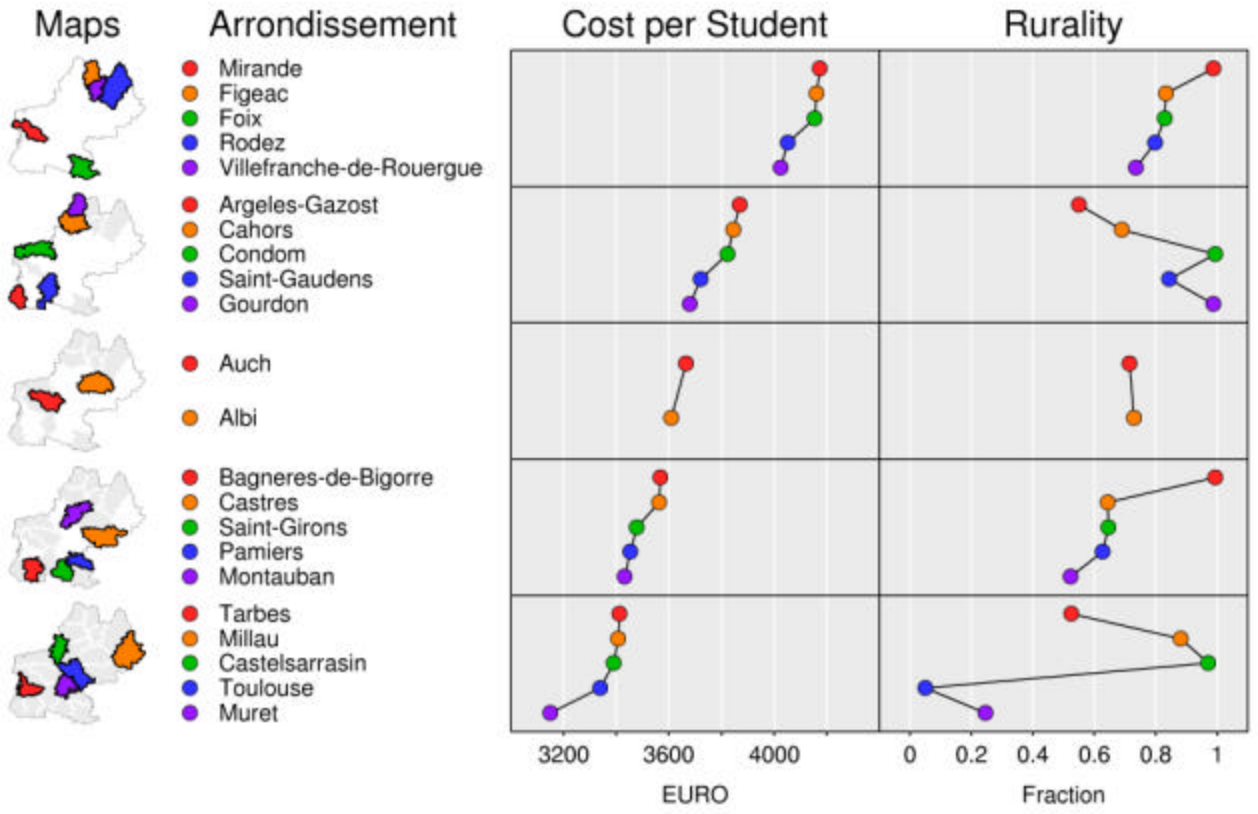
- **http://webcat.gis.usu.edu:8080/index.html**


WEST NILE VIRUS MICROMAPS - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://webcat.gis.usu.edu:8080/index.html
Go Links
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: 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
State
Human Cases West Nile Virus
Latest Annual Infection Rate
Year 2003
Rank
1=Lowest
Cases per 100,000
0 30 60 90 120
Human Cases West Nile Virus
Total Infections Per Year
Year 2003
Rank
1=Lowest
Count
0 730 1,460 2,190 2,920
Micromaps
for sorted column
South Dakota 51 49
Nebraska 50 50
North Dakota 49 47
Wyoming 48 46
Colorado 47 51
Montana 46 44
New Mexico 45 43
Iowa 44 41
Kansas 43 37
Texas 42 48
Mississippi 41 36
Minnesota 40 42
Louisiana 39 40
Oklahoma 38 35
Delaware 37 21
Pennsylvania 36 45
Maryland 35 34
Missouri 34 32
Ohio 33 39
Arkansas 32 24
Alabama 31 28
Indiana 30 29
United States
Internet
Start
WEST NILE VIRUS ...
Document1 - Microsoft W...
Micromaps2002.jpeg - Paint
11:50 AM

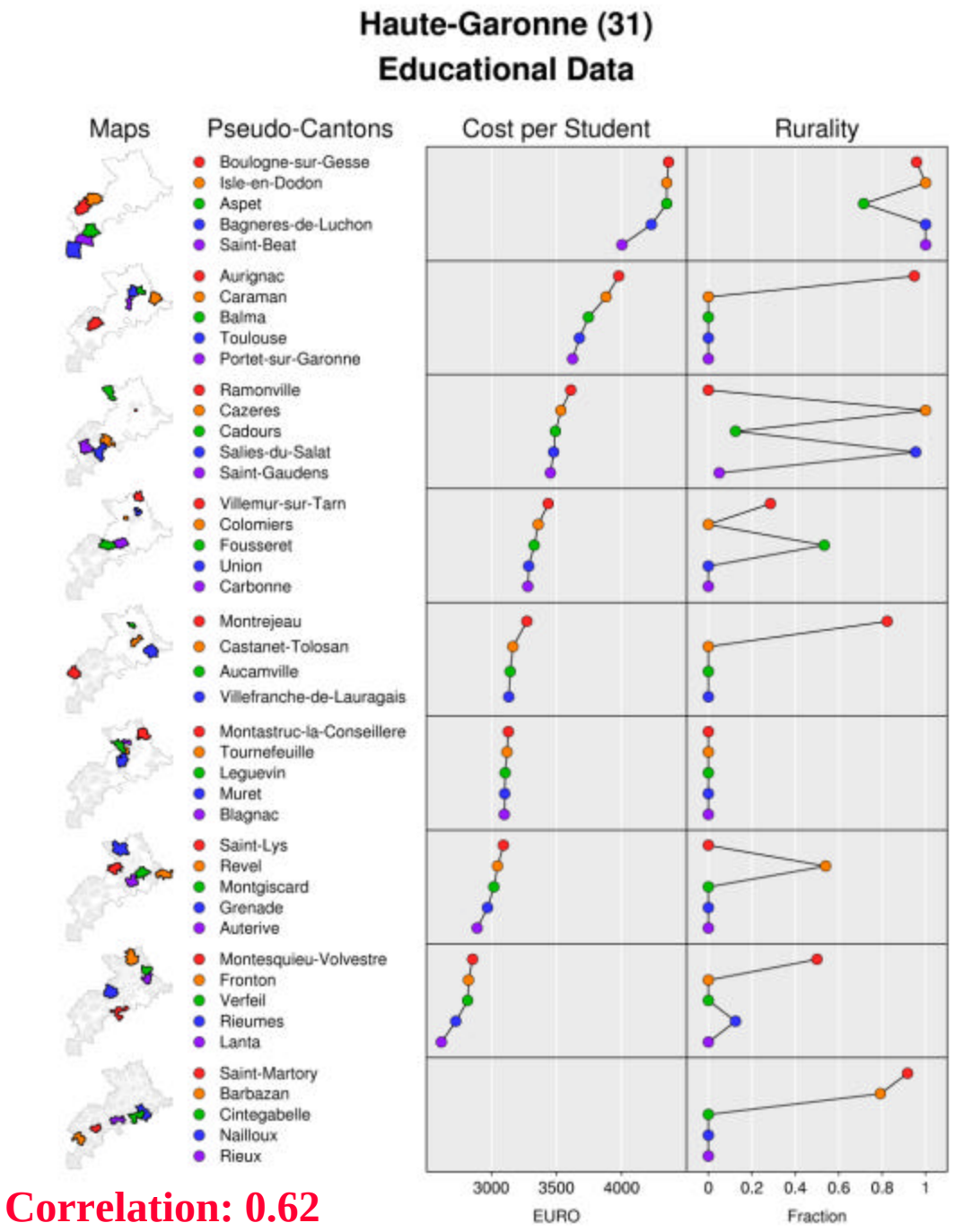

WEST NILE VIRUS MICROMAPS - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://webcat.gis.usu.edu:8080/index.html
Go Links
Search Web Mail My Yahoo! Games Yahoo! Personals LAUNCH Sign In
Left Column Data
Area: US - state level
Data Group: West Nile Virus
Host Group: Human Cases
Statistic: Infection Rate
Year: 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
State
Human Cases West Nile Virus
Latest Annual Infection Rate
Year 2003
Rank
1=Lowest
Cases per 100,000
0 30 60 90 120
Human Cases West Nile Virus
Total Infections Per Year
Year 2003
Rank
1=Lowest
Count
0 730 1,460 2,190 2,920
Micromaps
for sorted column
Colorado 47 51
Nebraska 50 50
South Dakota 51 49
Texas 42 48
North Dakota 49 47
Wyoming 48 46
Pennsylvania 36 45
Montana 46 44
New Mexico 45 43
Minnesota 40 42
Iowa 44 41
Louisiana 39 40
Ohio 33 39
Florida 27 38
Kansas 43 37
Mississippi 41 36
Oklahoma 38 35
Maryland 35 34
New York 20 33
Missouri 34 32
Illinois 22 31
Georgia 28 30
Colorado:
2003 Total Cases Per Year = 2,947
United States
Internet
Start
WEST NILE VIRUS ...
Document1 - Microsoft W...
Micromaps2003.jpeg - Paint
11:51 AM

French Micromaps with S-Plus

Region Midi-Pyrenees
Educational Data



Correlation: 0.50



Correlation: 0.62

Concluding Remarks

- Interactive 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

Ongoing Work

- Upcoming micromap chapter in Springer "Handbook of Computational Statistics" series (2006)
- Article on French micromaps in preparation
- Linking of USU West Nile Micromap Server with USU Climate Data Base

Questions ???