

Improving the communication of geographic patterns of disease through computer-based tools

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ASA meeting
August 10, 2005

Outline

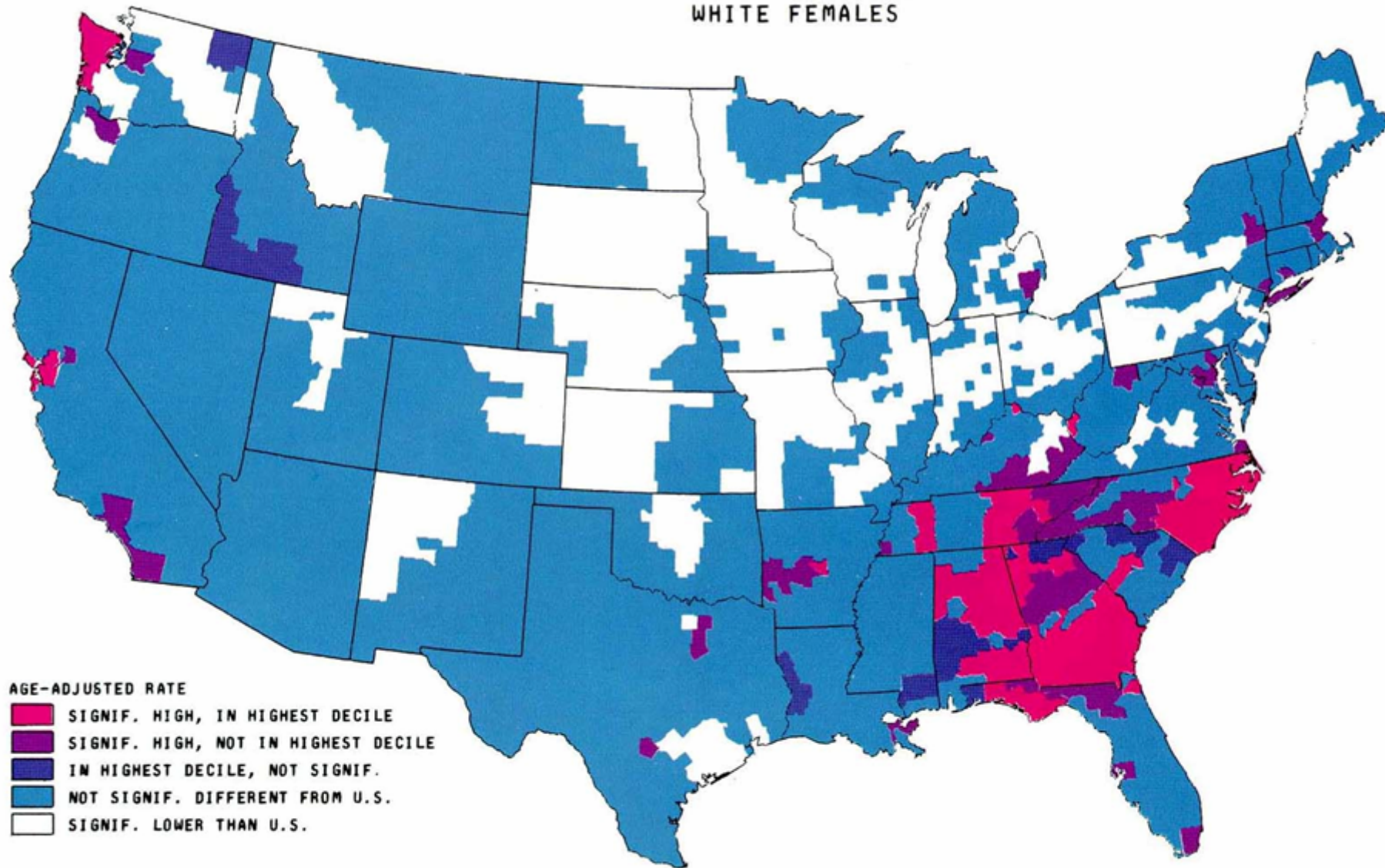
- Background
- Map design research at NCHS & NCI
 - Cognitive research methods
 - Basic map style
 - Legend design
 - Color choices
 - Indication of unreliable rates
 - Classification of rates into color categories
- Development of new graphical tools for communication
 - Smoothing
 - Cluster identification
 - Linked micromap plots
 - Exploratory Spatio-Temporal Analysis Tool (ESTAT)
- Communication over the web
 - NCI Cancer Atlas
 - Long Island Breast Cancer Study GIS
 - State Cancer Profiles

Mortality data by county, sex, race & cancer: Published in tabular form in 1974 (700 p.!)

WHITE: MALIGNANT NEOPLASM OF TONGUE (ICD 141); FLOOR OF MOUTH (ICD 143); OTHER PARTS OF MOUTH AND MOUTH UNSPECIFIED (ICD 144); ORAL MESOPHARYNX (ICD 145); AND PHARYNX, UNSPECIFIED (ICD 148).

ST-CO	MALE		FEMALE		ST-CO	MALE		FEMALE		ST-CO	MALE		FEMALE		
	#	RATE	#	RATE		#	RATE	#	RATE		#	RATE	#	RATE	#
01001	2	1.9	2	1.7	01105	3	3.6	05049	1	.8	06003	1	32.4	1	2.7
01003	8	2.1	4	1.0	01107	4	3.2	05051	26	4.2	06005	5	3.7	2	1.7
01005	1	.9	2	1.3	01109	13	8.7	05053	1	.9	06007	51	5.0	8	.9
01007	2	1.9	3	2.6	01111	1	.6	05055	8	2.9	06009	7	4.3	4	2.9
01009	5	2.0	1	.4	01113	9	4.7	05057	4	2.2	06011	7	4.7	3	2.6
01011	3	6.7			01115	3	1.4	05059	6	3.1	06013	117	4.4	43	1.4
01013	3	2.0	2	1.1	01117	9	3.8	05061	1	.9	06015	7	5.9	1	.8
01015	17	3.2	9	1.4	01119	1	1.9	05063	5	2.0	06017	11	3.3	4	1.5
01017	10	4.5	7	2.4	01121	10	3.0	05065	2	2.0	06019	133	4.7	35	1.2
01019	1	.7	6	4.3	01123	5	2.2	05067	4	2.3	06021	17	9.0	3	1.7
01021	6	2.6	8	3.3	01125	17	2.5	05069	24	6.8	06023	35	4.3	11	1.4
01023	6	7.4	3	3.5	01127	14	2.9	05071	4	2.2	06025	20	3.6	3	.6
01025	7	5.1	3	1.9	01129	2	2.6	05073	2	2.5	06027	10	7.2	2	1.6
01027	1	.7	3	1.8	01131	1	1.5	05075	7	3.7	06029	92	4.5	31	1.4
01029	1	.9	3	2.6	01133	4	2.6	05077	3	3.8	06031	12	3.0	7	1.7
01031	5	2.7	9	3.8	04001	1	1.2	05079	2	3.0	06033	7	2.6	4	2.7
01033	7	2.7	6	1.7	04003	11	3.1	05081	2	2.9	06035	4	2.8	1	.7
01035	2	1.7	1	.7	04005	5	3.2	05083	5	2.0	06037	2277	4.7	770	1.3
01037	6	7.0	2	2.0	04007	7	3.5	05085	3	1.3	06039	15	4.2	3	.9
01039	7	2.2	7	1.9	04009	2	1.8	05087	7	5.2	06041	59	5.0	22	1.6
01041	2	1.7	2	1.5	04011	1	2.6	05089	3	2.9	06043	1	1.1	2	2.8
01043	6	1.4	13	2.7	04013	168	3.3	05091	12	5.0	06045	19	3.5	7	1.4
01045	5	2.8	7	3.6	04015	5	3.8	05093	19	5.2	06047	21	3.5	9	1.6
01047	11	6.5	7	2.7	04017	5	4.3	05095	3	3.2	06049	2	2.1	1	1.4
01049	14	3.5	6	1.4	04019	42	2.1	05097	1	1.6	06053	61	4.8	18	1.2
01051	6	2.8	6	2.6	04021	6	1.7	05099	3	2.8	06055	40	4.7	11	1.4
01053	6	3.2	5	2.3	04023	4	4.6	05101	2	1.8	06057	8	2.5	3	.9
01055	16	2.4	15	2.0	04025	9	2.2	05103	9	4.8	06059	146	3.0	63	1.0
01057	2	1.3	3	1.8	04027	16	5.4	05105	2	.5	06061	26	4.0	7	1.0
01059	3	1.4	8	3.4	05001	8	4.3	05107	7	4.5	06063	5	3.8	1	.8
01061	5	2.4	3	1.3	05003	5	3.7	05109	2	1.7	06065	109	3.6	30	.9
01063	1	3.5	1	2.6	05005	5	3.0	05111	9	3.7	06067	174	4.9	62	1.6
01065	1	1.6			05007	10	2.0	05113	2	.9	06069	7	4.3	3	1.8
01067	6	6.8	5	4.4	05009	7	3.4	05115	8	3.3	06071	169	4.0	61	1.3
01069	11	3.5	6	1.6	05011	4	3.4	05117	2	1.8	06073	286	3.9	118	1.4
01071	8	2.6	8	2.4	05015	5	2.6	05119	78	5.0	06075	683	8.6	203	2.1
01073	189	5.8	76	1.8	05017	5	5.9	05121	2	1.3	06077	123	5.3	27	1.2
01075	5	3.5	1	.6	05019	6	3.6	05123	5	3.9	06079	37	4.2	4	.5
01077	16	4.3	8	1.6	05021	6	2.4	05125	12	4.4	06081	153	4.9	70	1.8
01079	3	1.9	2	1.2	05023	1	.8	05127	1	.9	06083	67	4.7	16	.9
01081	8	4.3	2	.9	05025			05129	1	.8	06085	161	3.8	64	1.2
01083	1	.4	3	1.2	05027	2	1.1	05131	23	3.7	06087	56	5.0	13	1.0
01085	1	3.1			05029	7	5.0	05133	6	4.5	06089	16	3.0	8	1.5
01087	2	4.9	3	5.2	05031	12	2.9	05135	2	1.8	06091	1	2.4		
01089	16	2.9	5	.8	05033	6	2.4	05137	1	1.1	06093	18	4.8	2	.6
01091	4	4.3	3	2.8	05035	7	5.9	05139	15	4.4	06095	34	3.6	9	1.0
01093	5	2.2	1	.4	05037	5	3.6	05141	3	2.9	06097	75	4.4	20	1.1
01095	9	2.2	9	2.0	05039	2	2.1	05143	14	2.4	06099	66	4.2	23	1.3
01097	85	6.2	21	1.2	05041	2	1.9	05145	10	2.5	06101	7	2.3	2	.7
01099	7	6.7	6	4.6	05043	4	3.4	05147	2	2.0	06103	8	3.0	3	1.2
01101	47	6.7	13	1.4	05045	8	3.4	05149	3	1.8	06105	3	3.5	1	1.4
01103	15	3.7	8	1.6	05047	4	3.3	06001	368	5.1	06107	41	2.7	18	1.2

CANCER MORTALITY, 1950-69, BY STATE ECONOMIC AREA
OTHER MOUTH & THROAT
WHITE FEMALES



Cognitive Research Methods

- Focus groups
- Designed experiments
 - Focused on a single map element
 - Random order of maps seen
 - Subjects required to answer several types of questions about each map
 - Statistical analysis of % errors
- Think-aloud: “tell me what you are doing”

Statistical map reading tasks

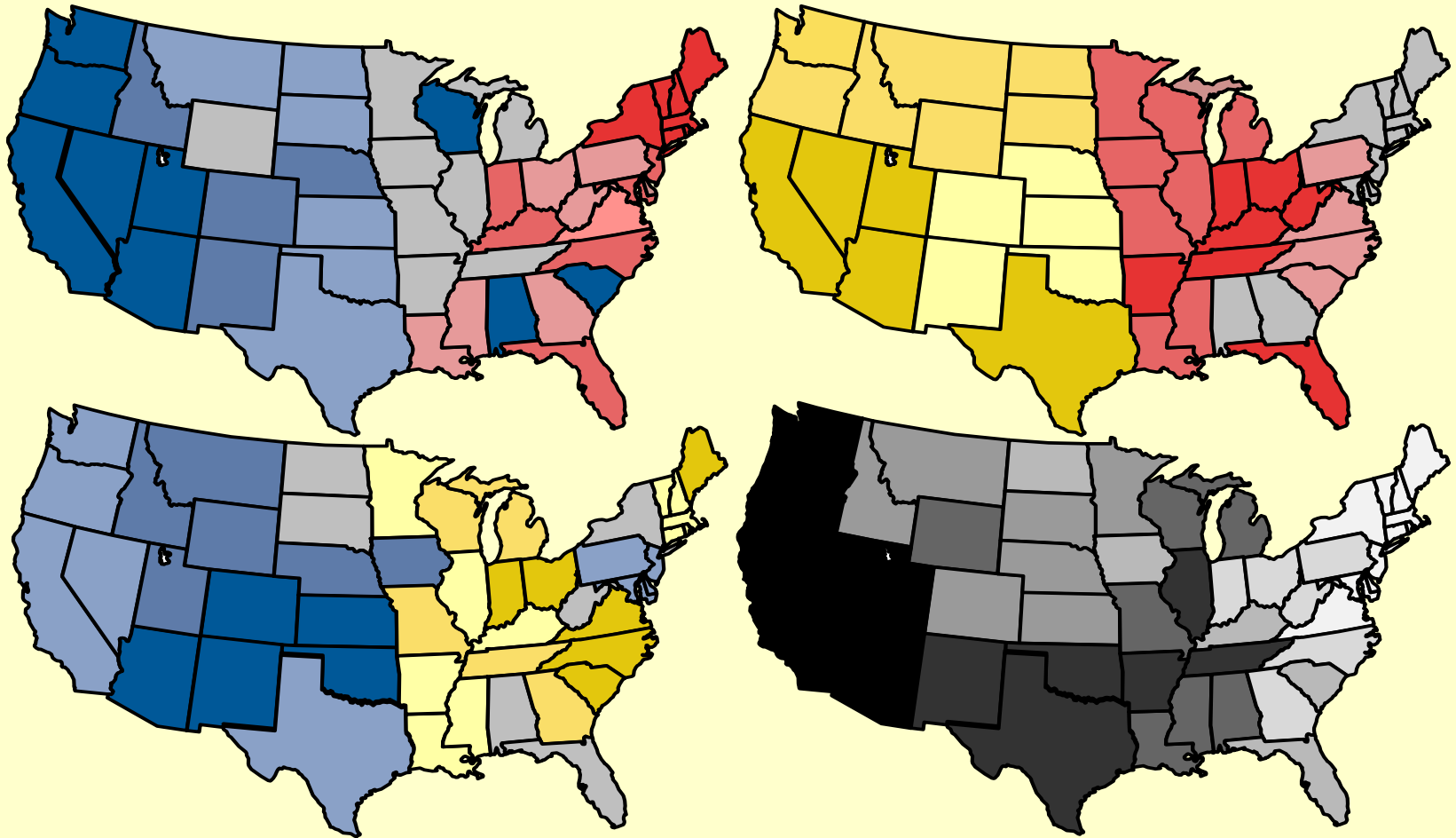
- Rate readout - what is approx. rate?
- Pattern recognition -clusters? outliers?
-regional patterns?
- Pattern comparisons - compare maps

Target audience: Epidemiologists,
public health professionals

Results of early studies

- Choropleth (area-shaded) maps preferred & used most accurately by epidemiologists
- Legend: standard vertical fixed-box style
- Colors:
 - Very distinct colors best for rate readout (Hastie 1995)
 - Color gradient best for pattern recognition (Lewandowsky 1995)
 - Double-ended (diverging) scale combines gradients of 2 distinct hues; further tested for both types of questions
 - Color conventions (expectations) matter: darker or warmer color used for higher rates

What do you expect? Do color conventions matter?



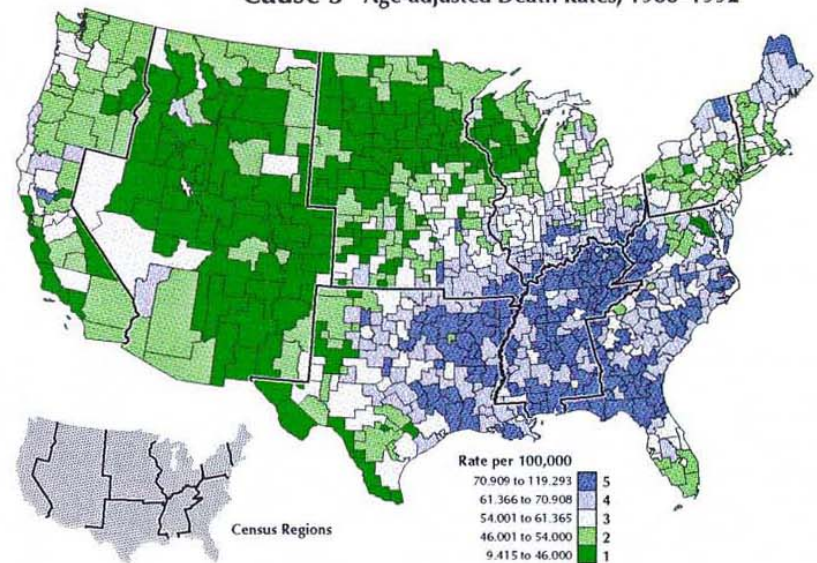
Source: Carswell M, in Pickle & Herrmann, eds., *Cognitive Aspects of Statistical Mapping*, 1995

Evaluating color schemes - Sample test maps

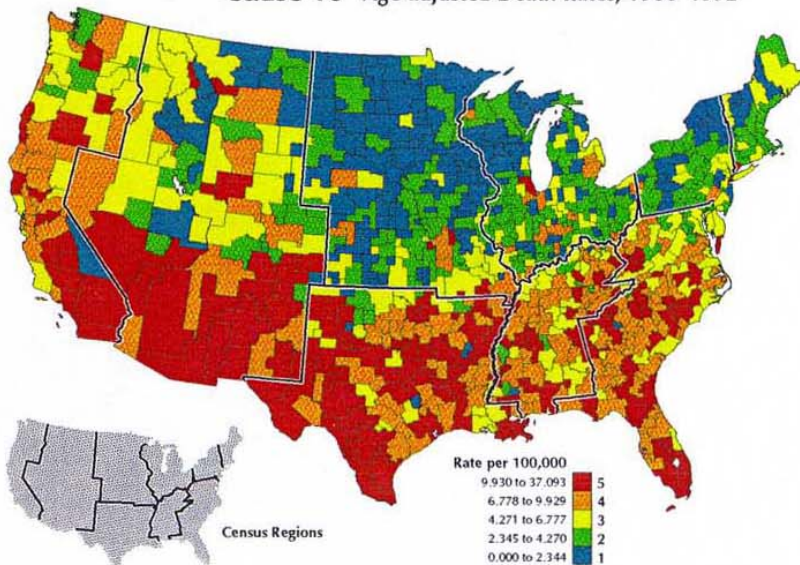
Figure 3. Example Quarter-Scale Test Maps

Mapped variables 5, 16, and 18 are shown with the five-class Purple/Green diverging, Spectral, and Red-Yellow sequential schemes.

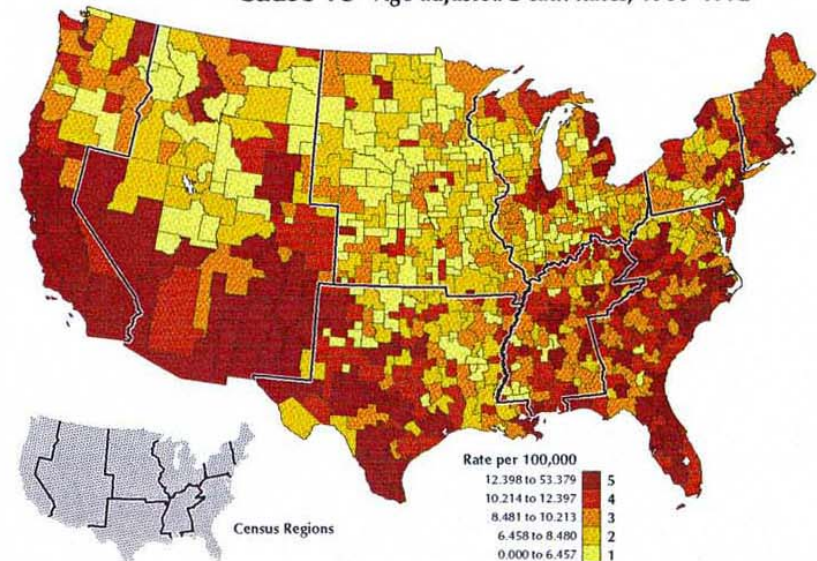
Cause 5 Age-adjusted Death Rates, 1988-1992



Cause 16 Age-adjusted Death Rates, 1988-1992

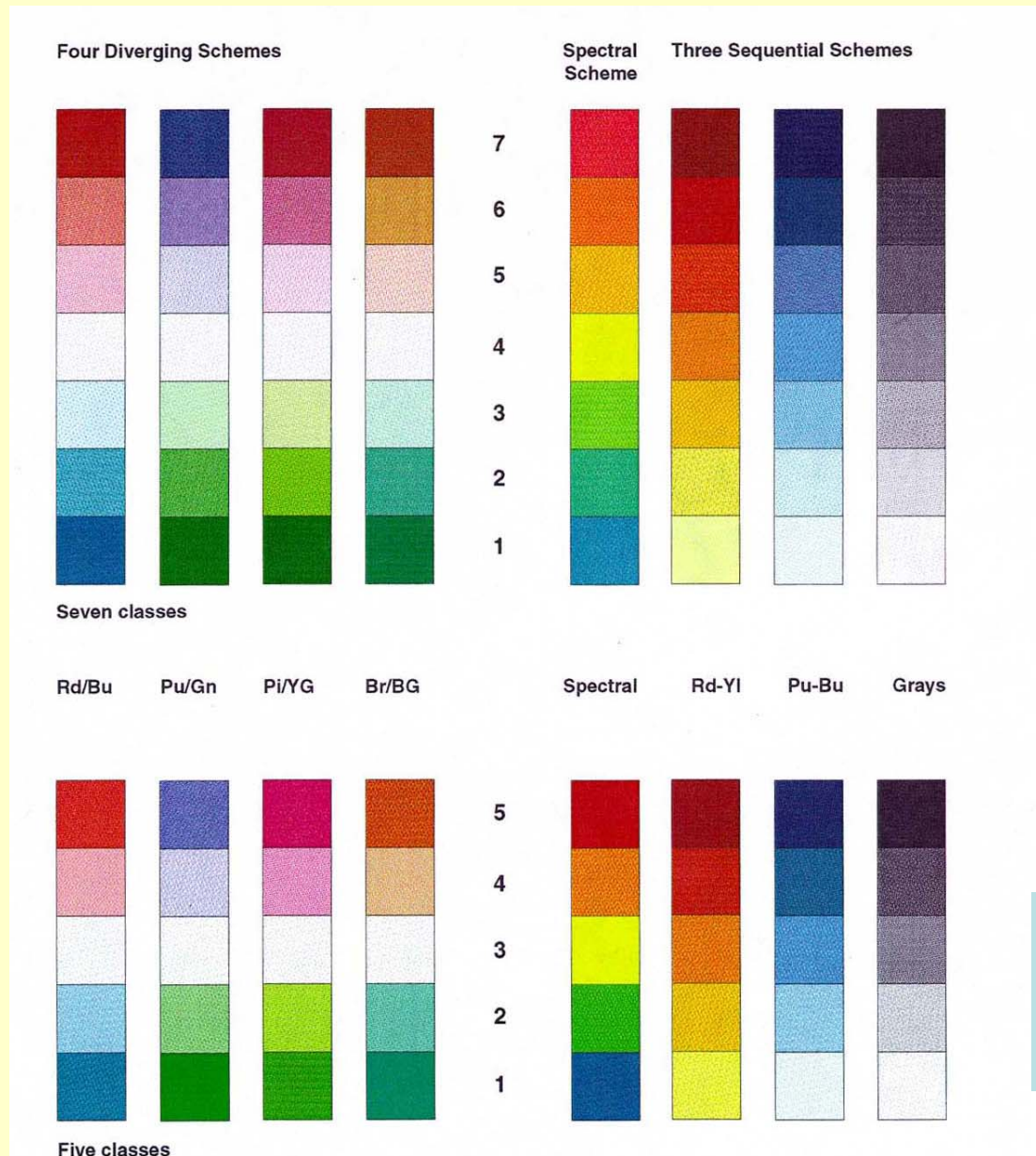


Cause 18 Age-adjusted Death Rates, 1988-1992



Source: Brewer et al., Annals of the Assoc of Amer Geographers, 1997.

Color schemes tested

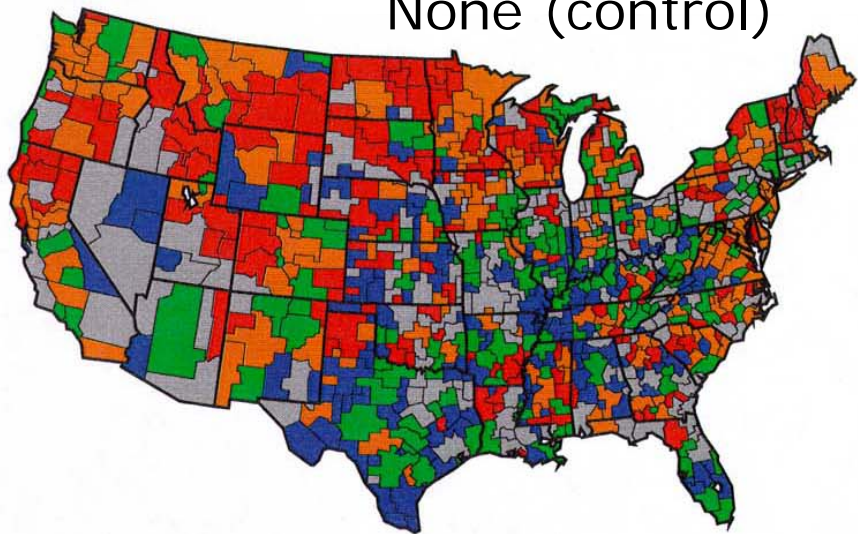


A new web tool for choosing colors: colorbrewer.org

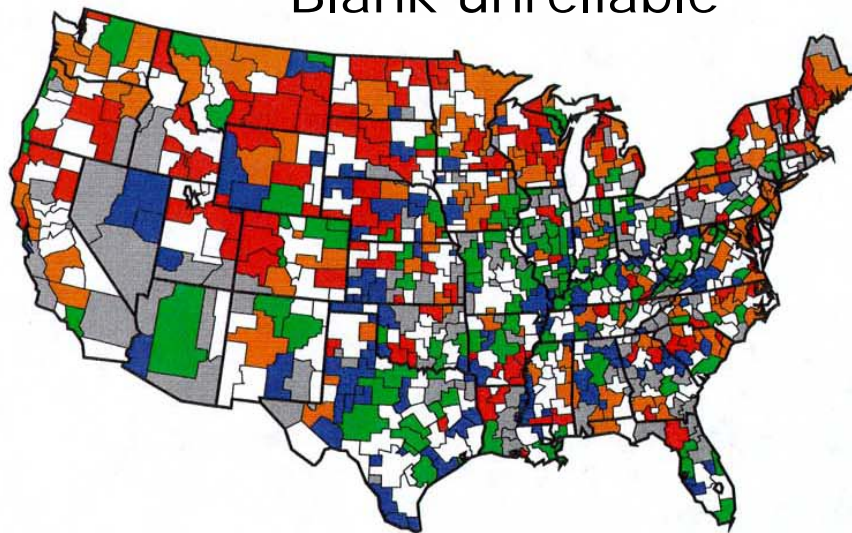
Source: Brewer et al., Annals of the Assoc of Amer Geographers, 1997.

Reliability Representation (study #1)

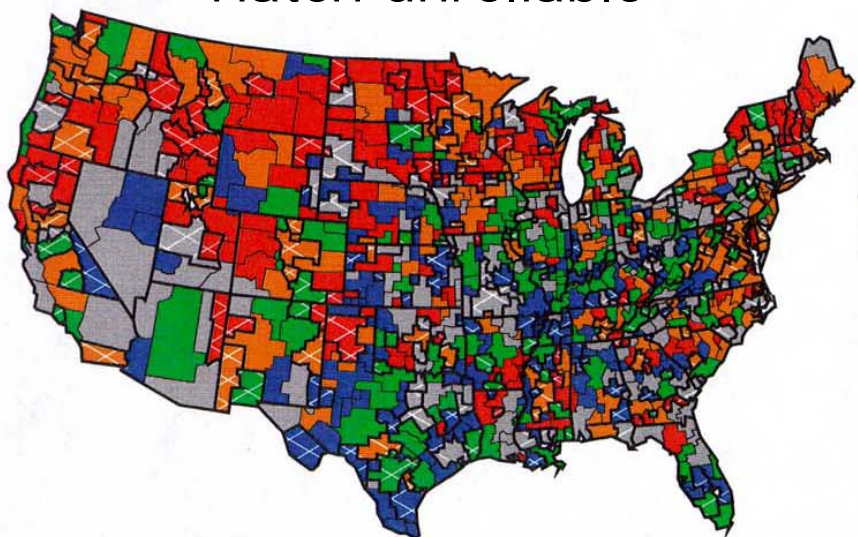
None (control)



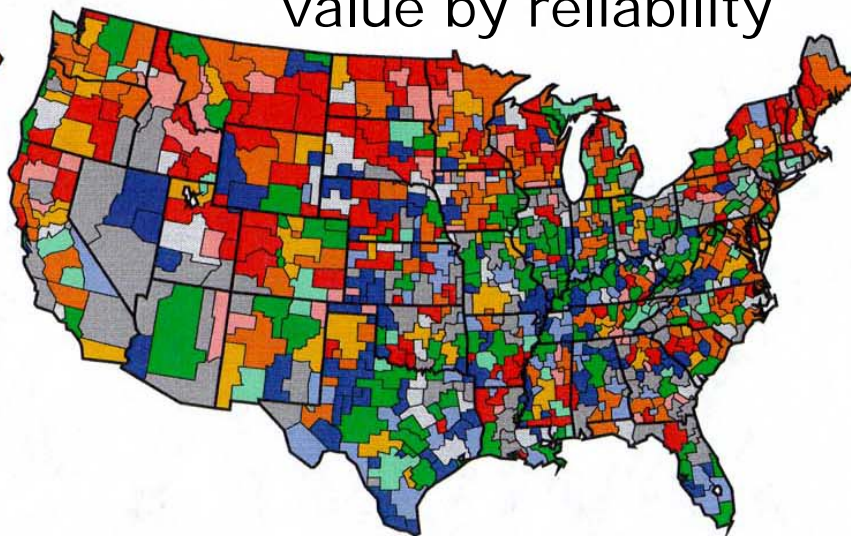
Blank unreliable



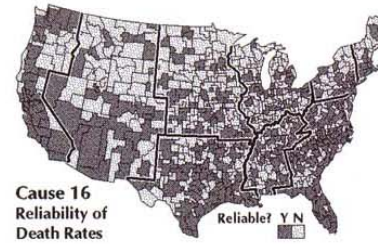
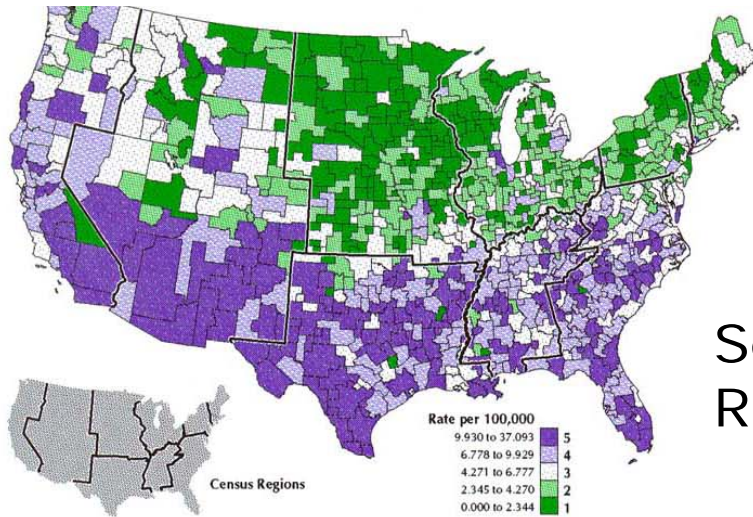
Hatch unreliable



Bivariate color scheme –
value by reliability



Reliability Representation (Study #2)

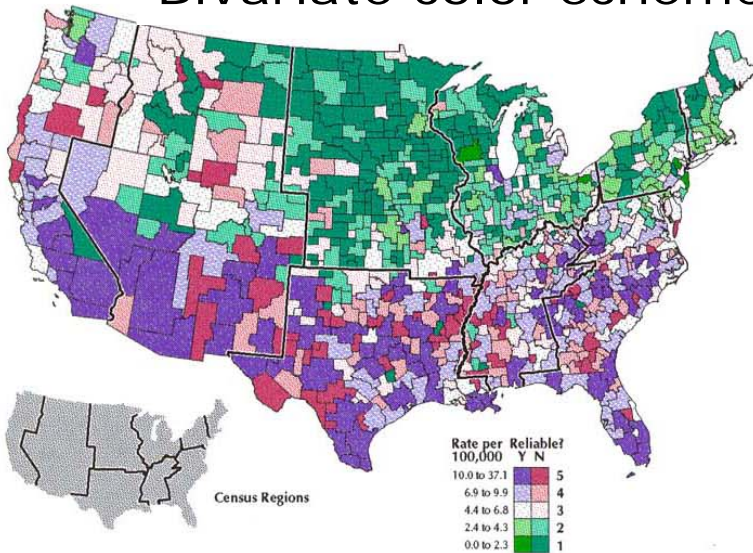


Sample Test Maps:

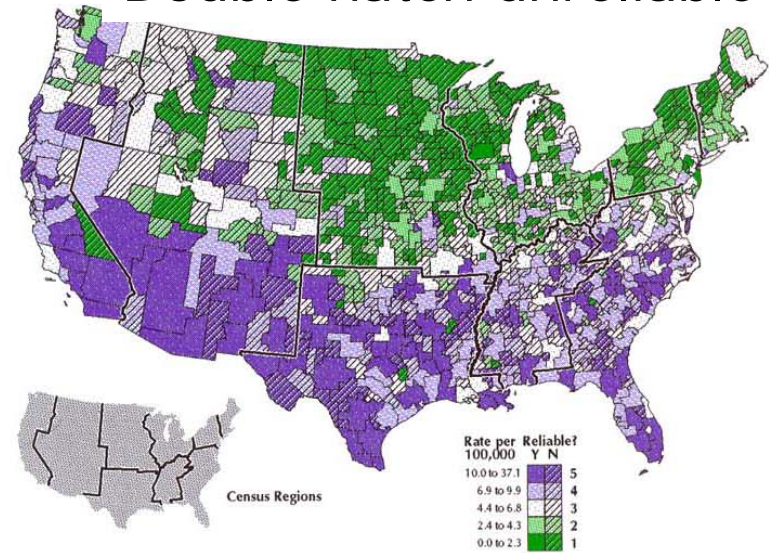
- cause: 16
- scale: quarter
- color scheme: purple-green
- reliability schemes:
map pairs
color change
texture overlay

Separate maps for Rate and reliability

Bivariate color scheme

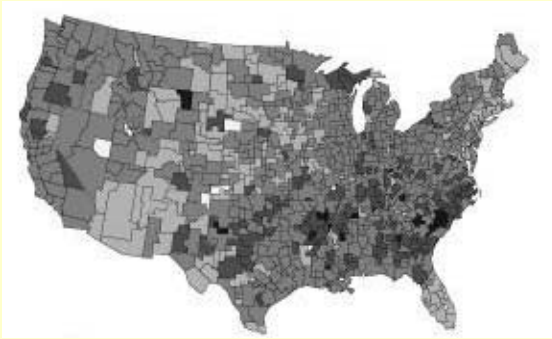


Double hatch unreliable

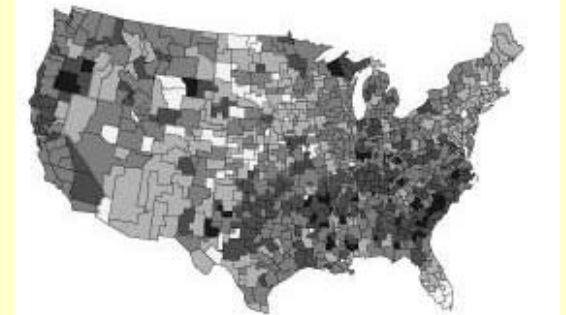


Cutpoint Methods Tested

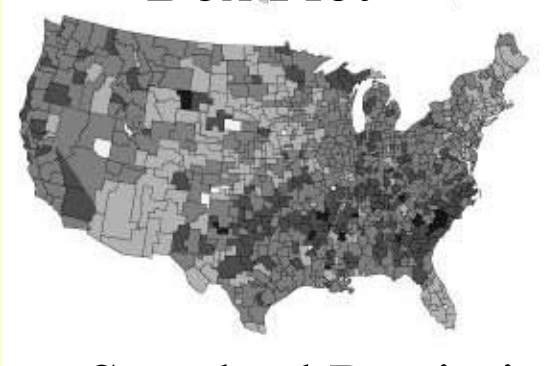
Equal Width



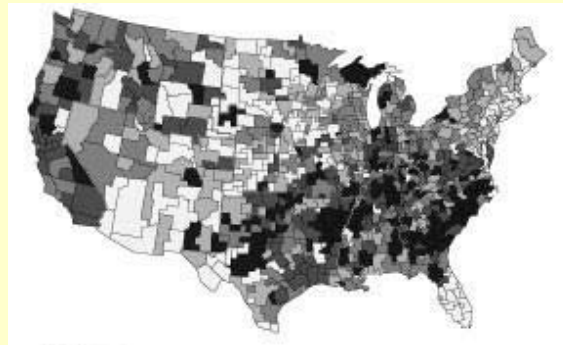
Natural Breaks (Jenks)



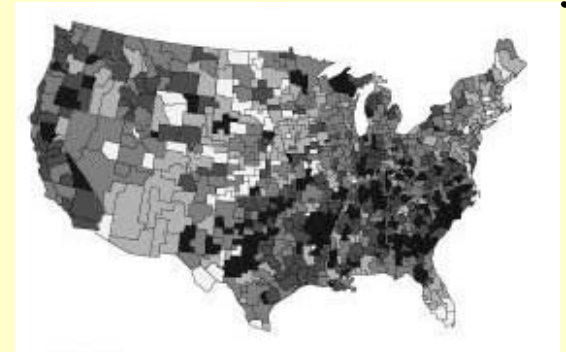
Box Plot



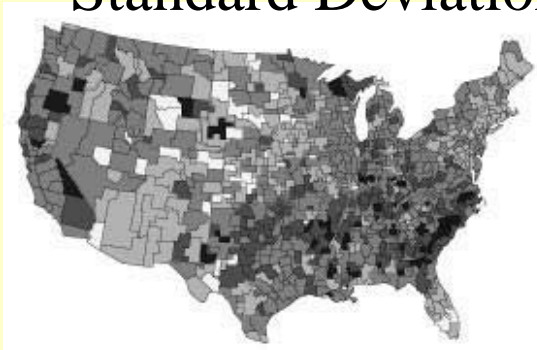
Quintile



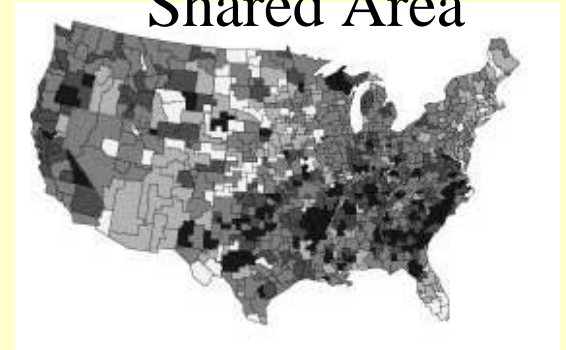
Minimum Boundary



Standard Deviation



Shared Area



Recommendations for rate map design

- Design for particular audience and purpose & TEST PROPOSED DESIGNS FOR THESE
- Quantile-categorized choropleth map works well
- Use standard legend design
- Colors should be chosen for visually impaired and consistent with conventions
- Identify unreliable rates, don't blank out
- Accept that multiple maps are often needed
 - to address different questions,
 - to focus attention on different scales,
 - to compare modeled (smoothed) to observed...

Extensions of Map-based Research at NCI

- Extension of map research to computer-based maps, web-based data dissemination
- Development of new graphical tools for data exploration and communication
- Usability of interactive systems by the public
- Examples
 - **Visualization tools: Smoothing, Cluster identification**
 - Linking maps & graphs: Linked micromap plots, Exploratory Spatio-Temporal Analysis Tool (ESTAT)
 - Communication over the web
 - Cancer atlas
 - Long Island Breast Cancer GIS
 - State Cancer Profiles

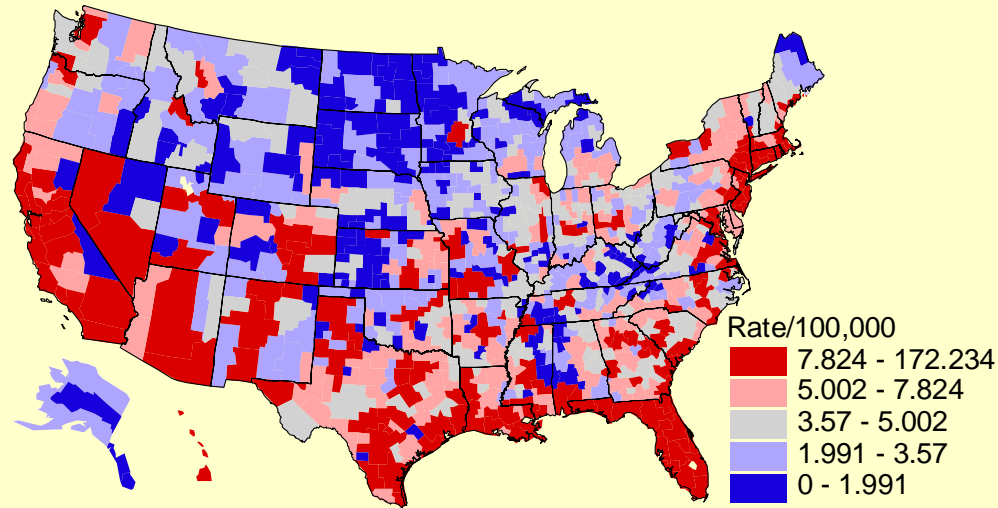
Map smoothing methods

- 2D Smoothing is a method of removing some variability in a quantitative map
- Maps of cancer rates for small areas can be difficult to interpret because of background “noise”
- Previous methods ignored population differences
- Methods now can incorporate weights
 - very stable rates are smoothed less
 - more unstable rates (due to small populations) are smoothed more

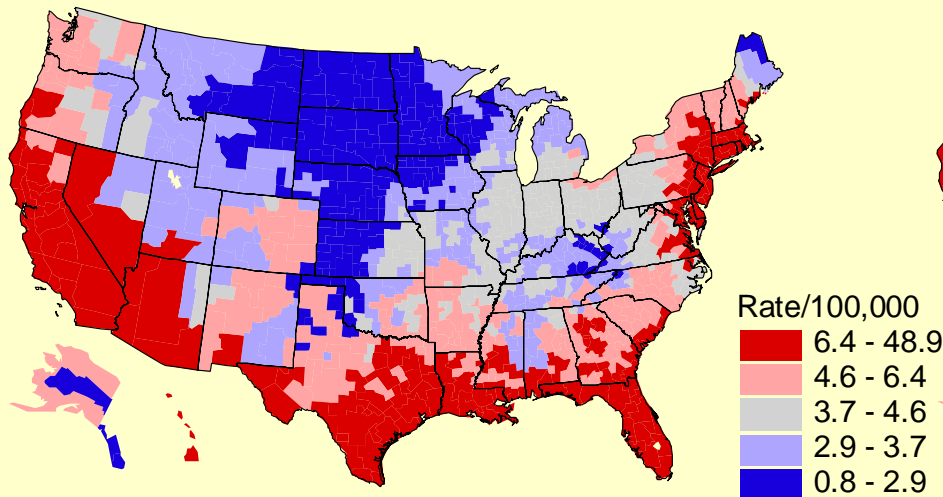


HIV mortality rates, 1988-92

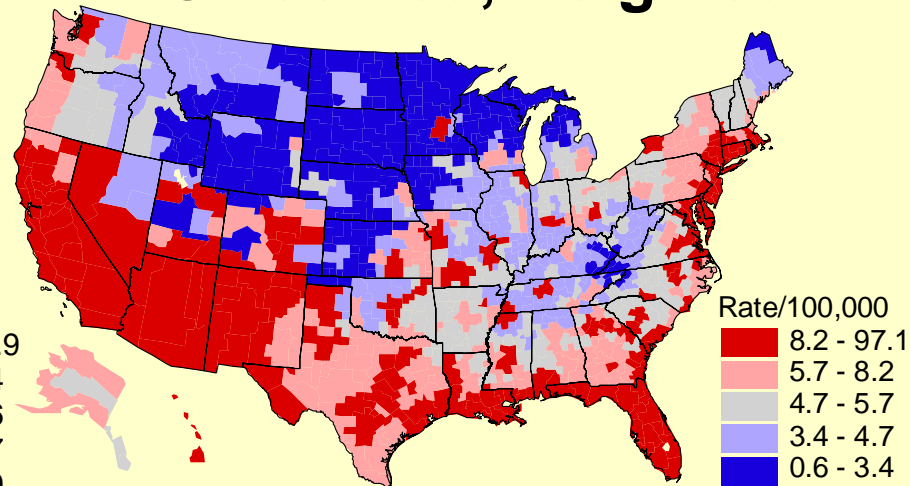
Original data:



Smoothed, unweighted



Smoothed, weighted



Source: Pickle et al., Atlas of United States Mortality, NCHS, 1996.

Headbang software available from <http://srab.cancer.gov/headbang/>

GUI Interface

HeadBang

File Help

Input Filename

C:\Headbang\NewPgm\HBTest.csv

Browse...

Options

Nearest Neighbors 30 Iterations 10

Triples 20 Angle in Degrees 135

First row contains field names.

First column contains row labels.

Missing Values blank/null space

Go

S+ call to C+ program

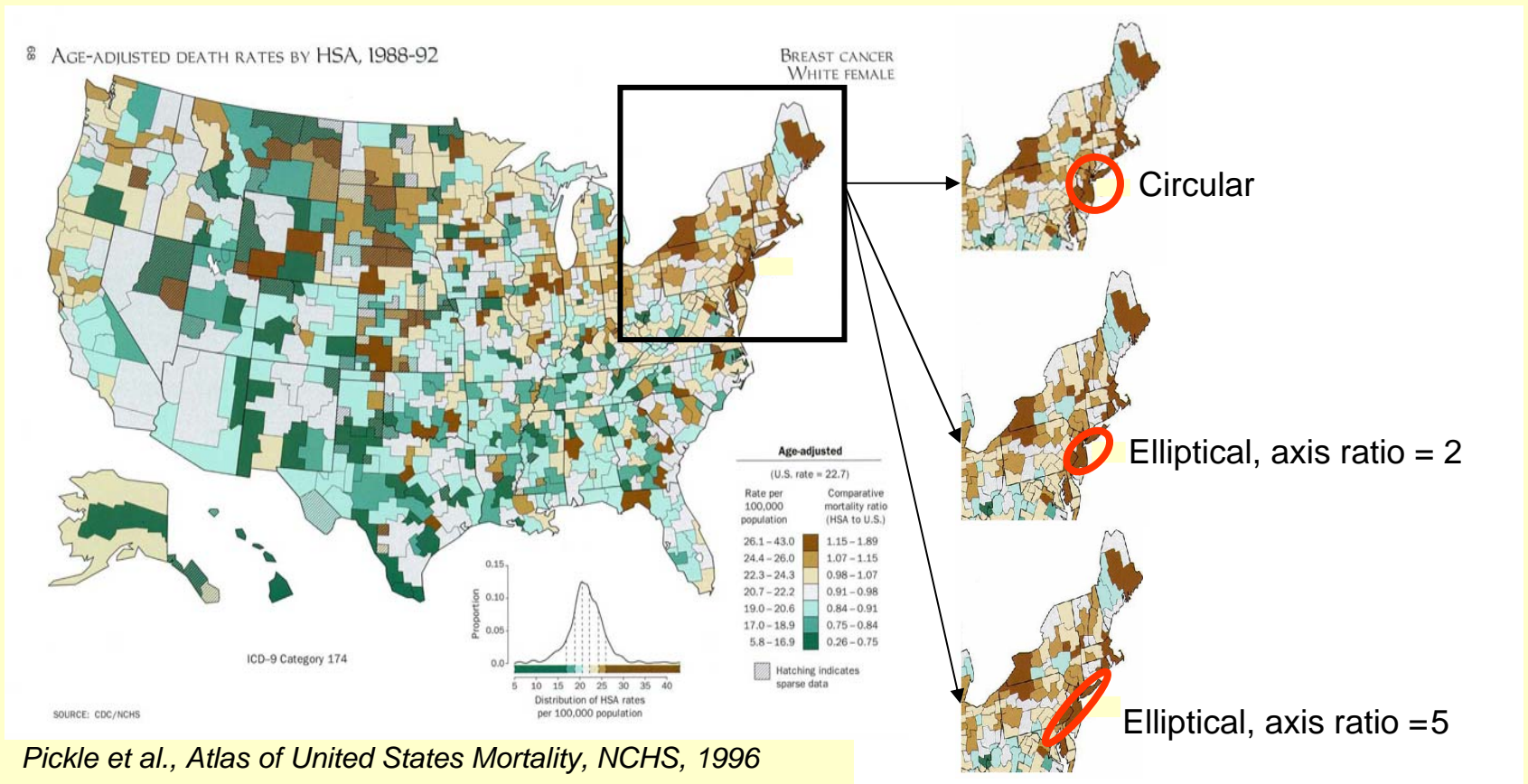
```
ResultNew<-dos(paste("headbang.exe",  
nn,ntrip,niter,thetastar),rbind(X,Y,rate,wgt))
```

Developers: Katherine Hansen Simonson
and IMS, Inc. staff

Example: Breast cancer clusters

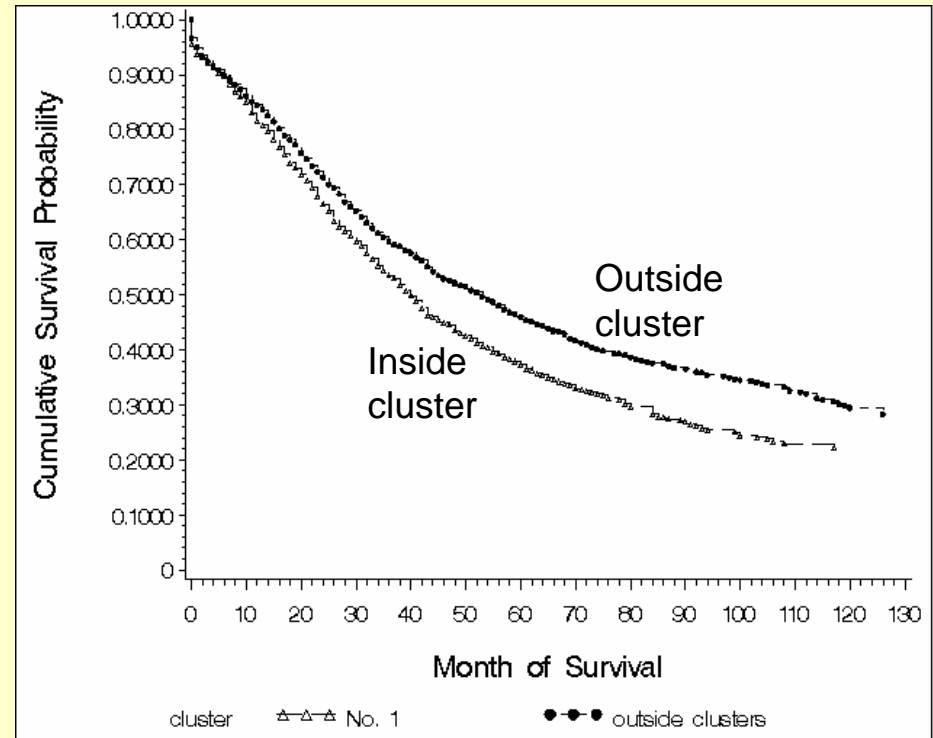
Breast cancer mortality rates

Most likely cluster



Spatial clustering of survival for stage III colorectal cancer in Los Angeles, among male cases diagnosed 1988-2002

Significantly short survival, $p=0.01$, radius=17km



Source: Huang et al. (NCI), manuscript in preparation

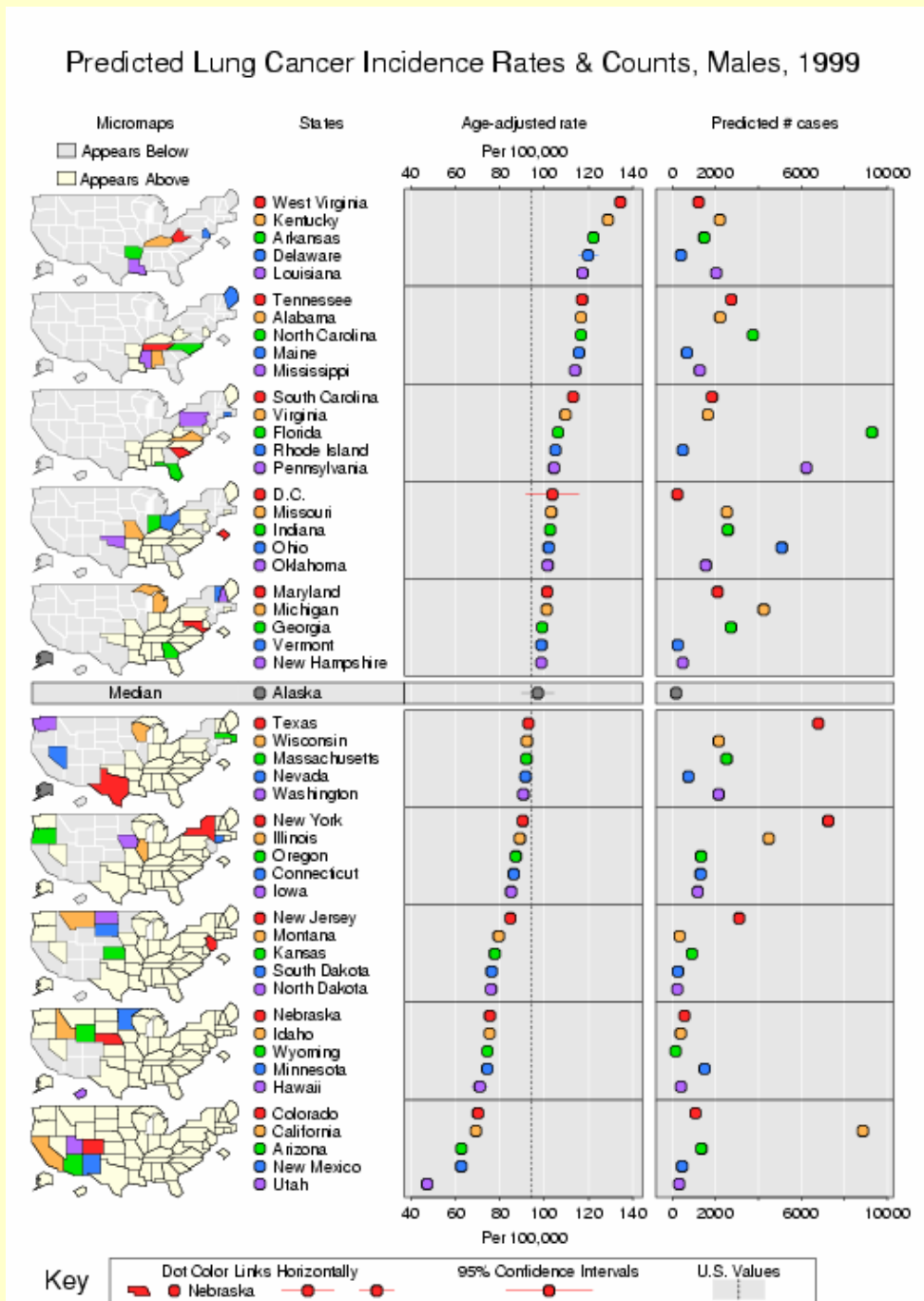
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Linked Micromap Plot

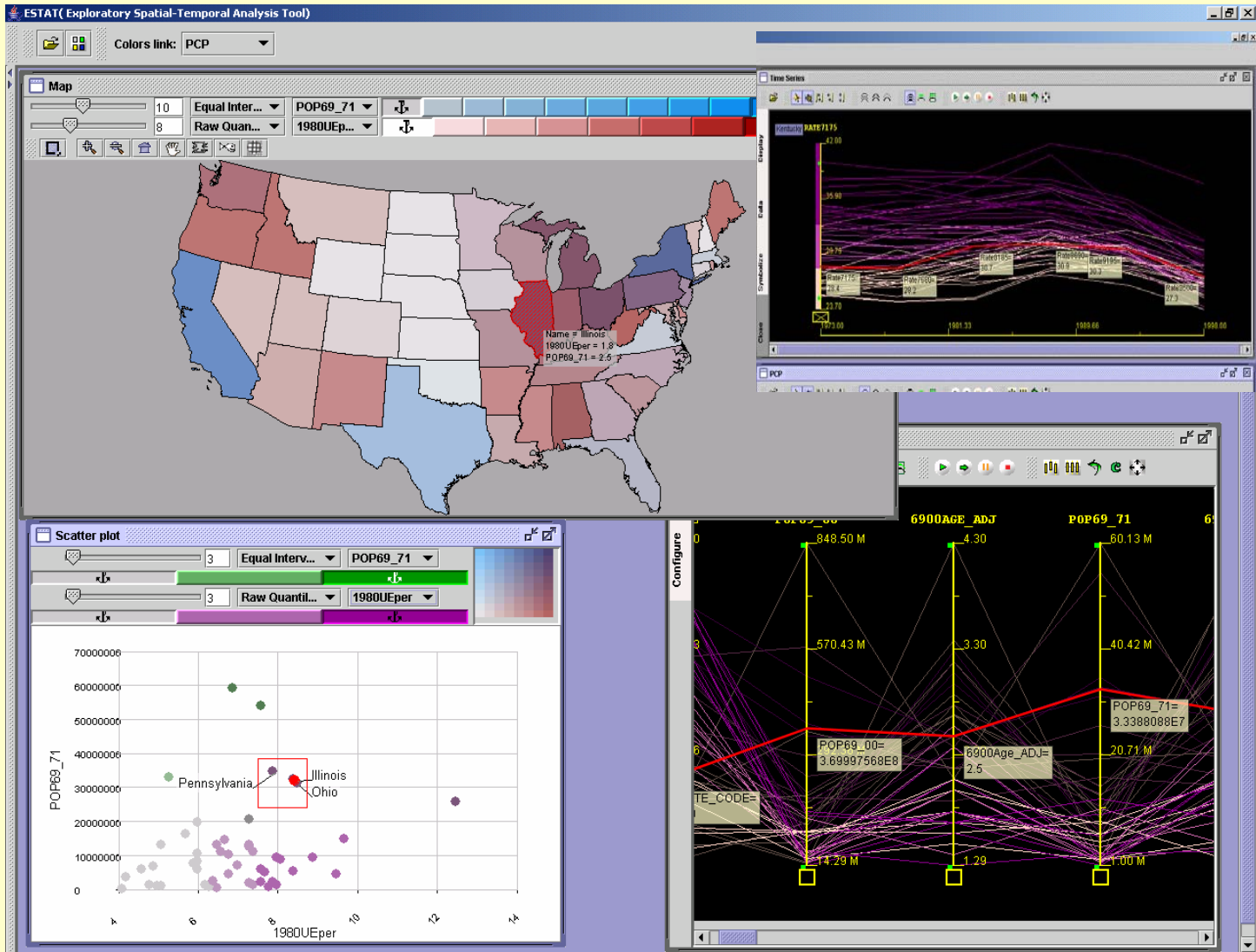
Linking geographic patterns with statistical detail

Source: Carr, Wallin & Carr, Stat in Med 2000



Exploratory Spatio-Temporal Analysis Tool (ESTAT)

Map



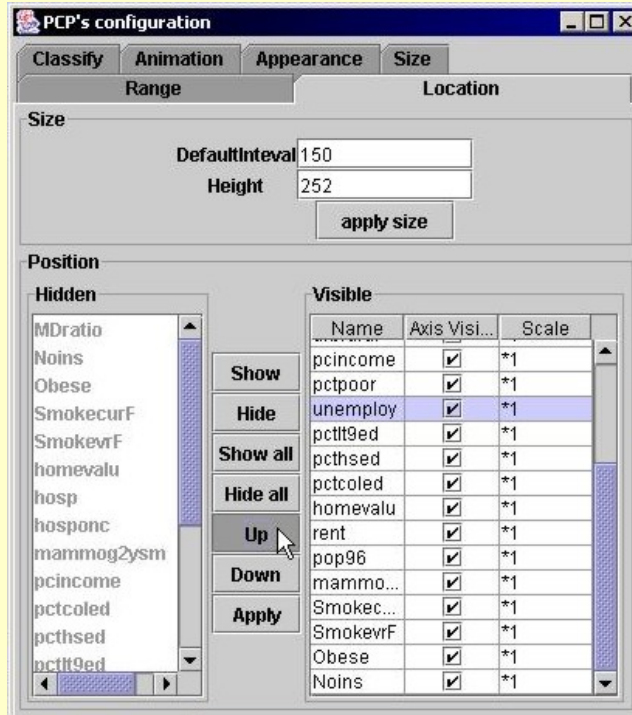
Rate Time Series Plot

Scatter plot

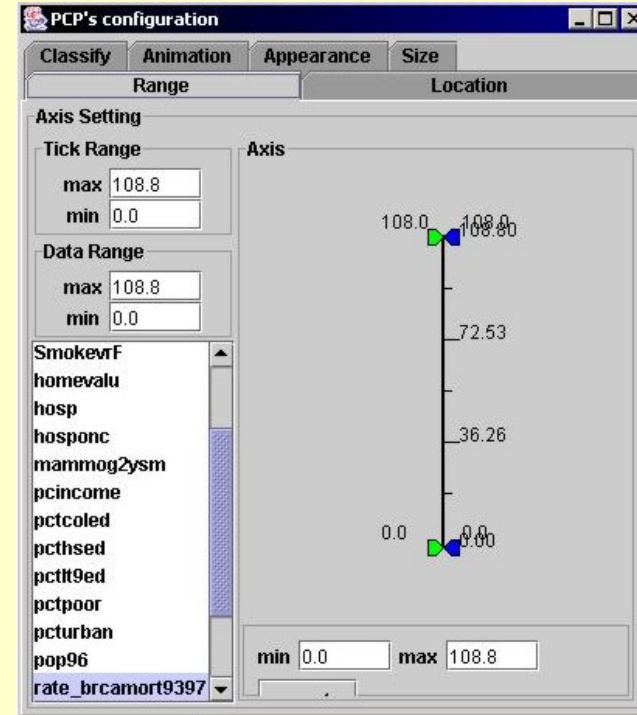
Covariate PCP plot

Examples of ESTAT's extensive user controls

Select and order PCP variables



Restrict range of PCP axis



Also, dynamic linking & brushing, color specification, simple summary statistics, etc.

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Web-based interactive cancer mortality maps

www.cancer.gov/atlasplus

Controlplanet.cancer.gov:8080/atlas/index.jsp

NATIONAL CANCER INSTITUTE Cancer Mortality Maps & Graphs

Home
Contact Us
Dictionary

Customizable Mortality Maps [Charts and Graphs Home](#)
Create maps by selecting from the variables below. View values associated with a geographic area by moving cursor over that area. Drill down from state to county by clicking on state (or "Detail for [state name]" for [d] link).

View Entire US by	Age	Race/Gender	Time Period	Rate intervals for color shading
<input type="radio"/> State	<input checked="" type="radio"/> All Ages	<input checked="" type="radio"/> White Male	<input type="radio"/> 1950-1994	<input checked="" type="radio"/> 10 Intervals with equal no. of regions
<input checked="" type="radio"/> State Economic Area	<input type="radio"/> 0-19	<input type="radio"/> White Female	<input type="radio"/> 1950-1969	<input type="radio"/> User-defined intervals
<input type="radio"/> County	<input type="radio"/> 20-49	<input type="radio"/> Black Male	<input type="radio"/> 1950-1954	
	<input type="radio"/> 50-74	<input type="radio"/> Black Female	<input type="radio"/> 1955-1959	
	<input type="radio"/> 75+		<input type="radio"/> 1960-1964	
			<input type="radio"/> 1965-1969	
			<input type="radio"/> 1970-1974	
			<input type="radio"/> 1975-1979	
			<input type="radio"/> 1980-1984	
			<input type="radio"/> 1985-1989	
			<input type="radio"/> 1990-1994	

Map color scale (high rates/low rates)
 Atlas (red/blue)
 Monochrome (red/white)

Compare maps

Map image format: [D] Flash JPEG SVG
 Place cursor over map to view geographic location, rate, lower bound to upper bound, no. of deaths, and/or to drill down (outline around state indicates drill down capability)

To print, right-click anywhere on graph and select Print from the popup menu

Cancer mortality rates by state economic areas (age-adjusted 1970 US population)
 All Cancers: white males, 1970 to 1994, all ages

Cancer

- All Cancers
- Bladder
- Bones and joints
- Brain and other nervous system
- Breast
- Cervix uteri
- Colon
- Connective tissue
- Corpus uteri and uterus NOS
- Endocrine glands, other
- Esophagus
- Eye
- Hodgkin's disease
- Kidney, renal pelvis, and ureter
- Larynx
- Leukemia

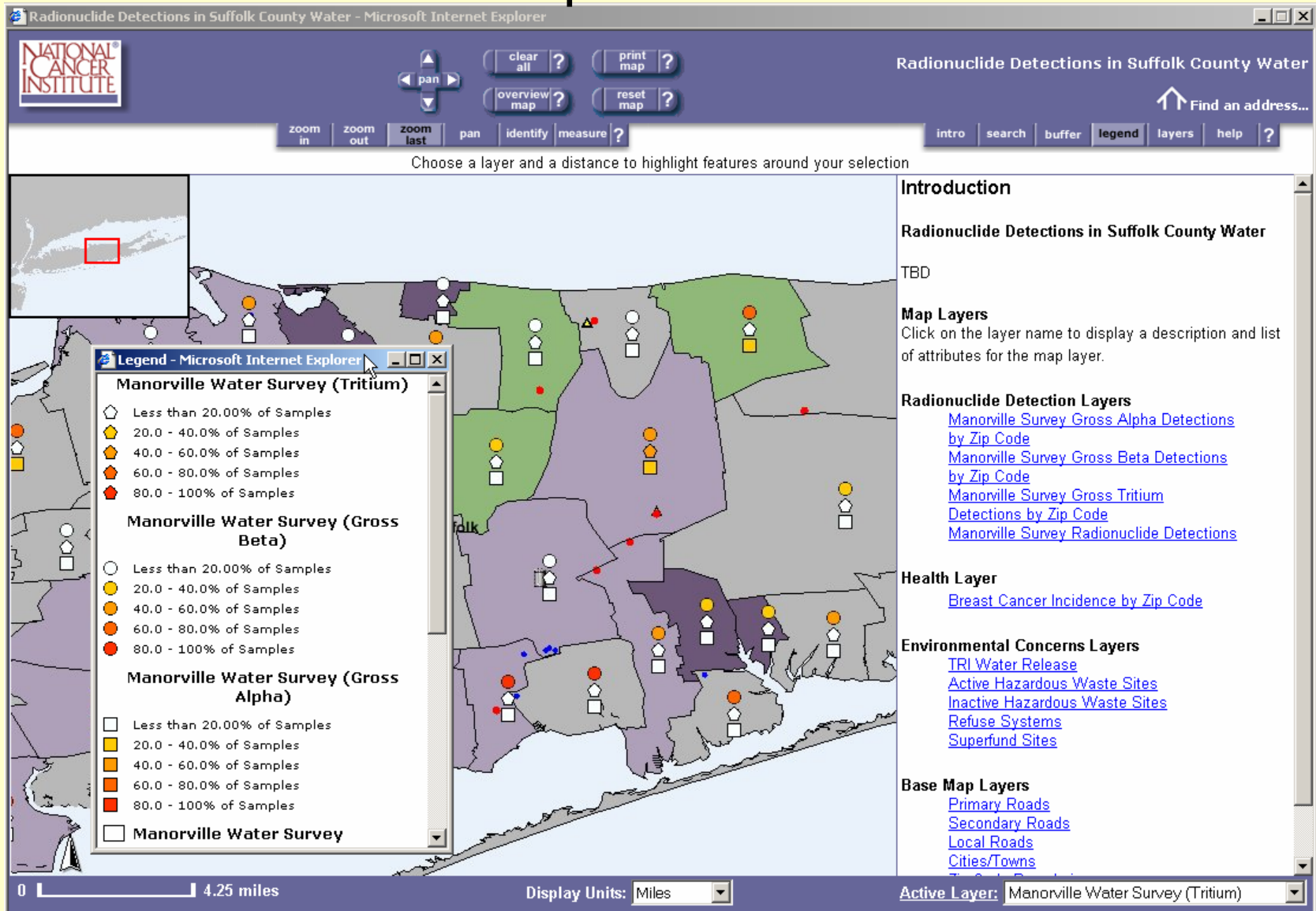
Print Presentation Author: James Cucinelli Title: Sli 3.73 MB

My Computer

My Computer

My Computer Presentation1 GIS-SEER PI ... L:\DCCPS\SR... LIGIS2004.ppt

Long Island Breast Cancer Study Project GIS: A more complex web-based tool



Web-based Communication of Cancer Statistics: State Cancer Profiles Web Site

- Goal: provide a system to characterize the cancer burden in a standardized manner to:
 - Motivate action
 - Integrate surveillance into cancer control planning
 - Characterize areas & demographic groups
 - Expose health disparities
- Target audiences:
 - Health planners
 - Policy makers
 - Cancer information providers

Extensive usability testing

- Tested at several professional meetings that members of target audience attended as well as in NCI Usability Lab
- Focus groups + hands-on testing conducted by a specialist in usability tests of web pages
- Tested on and/or approved by federal, state and local health department staff; cancer control professionals; policy makers
- Many iterations of prototypes
- Released to state health departments a week early so that they could verify their own data before general release

URL: statecancerprofiles.cancer.gov



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

Quick Profiles

Area

Cancer

Comparison Tables



[Rate/Trend Comparisons](#)

set higher priority for cancer control when rates are high or rising
[learn more...](#)

- [by State/County](#) prioritize cancer sites
- [by Cancer](#) prioritize states or counties in a state



[Death Rates](#)

for states or for counties in a state
[learn more...](#)



[Incidence Rates](#)

for states with high quality cancer registries
[learn more...](#)

Interactive Graphs and Maps



[5-Year Rate Changes](#)

in cancer mortality or incidence for all major cancer sites by user selectable criteria
[learn more...](#)



[Historical Trends](#)

compare trends in cancer mortality and incidence by user selectable criteria
[learn more...](#)



[Latest Rates, Percents, and Counts](#)

explore relationships across geography of mortality, incidence, demographics, or risk factors
[learn more...](#)



[Interactive Maps](#) **NEW**

for states or for counties in a state
[learn more...](#)

Support Data



[Screening and Risk Factors](#)

prevalence percents by state from behavioral surveys
[learn more...](#)



[Peer Counties](#)

identify counties that are comparable based on a user specified criteria
[learn more...](#)



[Age Distribution](#)

male and female population sizes by age groups by user selectable criteria
[learn more...](#)

[Cancer Control PLANET Home](#)

New Releases

[2002 & 2003 BRFSS Survey Data](#)

[2001 USCS Incidence Data](#)

2002 SEER Incidence Data (also released in the [Cancer Statistics Review](#))

[2002 Mortality Data](#)

[Release Schedule](#)

Help & About

[About this Site](#)

[Quick Reference Guides](#)

[Tutorials](#)

[Interpret Rankings](#)

[Data Use Restrictions](#)

[Low Vision/Accessibility](#)

Note: This Web site is best viewed in [Internet Explorer](#) (version 5.0 or higher) or [Netscape](#) (version 7.0 or higher) at a [screen resolution](#) of 1024 by 768 or more.

Links

[State Registry Contacts](#)

[US Cancer Statistics: 2001 Incidence](#)

[Resources for Cancer Control: Cancercontrolplanet.cancer.gov](#)

Includes linked micromap plots...

statecancerprofiles.cancer.gov - Microsoft Internet Explorer

Address: http://www72.ims.nci.nih.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
CDC
 CCPLANET

Profiles Home > Latest Rates, Percents, and Counts

Left Column Data

Area: US - state level

Data Group: Cancer Statistics

Cancer: Lung & Bronchus

Statistic: Mortality Rate

Race: White

Sex: Males

Age: All Ages

Right Column Data (optional)

Data Group: Risk Factors / Scree

Cancer:

Statistic: Current Smokers

Race: All Races

Sex: Males

Age: 18+

Draw Clear

Overview

Options

Lung & Bronchus Cancer

Year 1999

Death Rate

White Males, All Ages

Deaths per 100,000

Rank: 1=Lowest

State: United States

- Kentucky
- Mississippi
- West Virginia
- Arkansas
- Tennessee
- Alabama
- Louisiana
- Oklahoma
- Georgia
- Indiana
- North Carolina
- Delaware
- South Carolina
- Rhode Island
- Missouri
- Ohio

State	Rank	Value (95% CI)	Target
United States		~85	~85
Kentucky	51	~95	~85
Mississippi	50	~90	~85
West Virginia	49	~85	~85
Arkansas	48	~80	~85
Tennessee	47	~75	~85
Alabama	46	~70	~85
Louisiana	45	~65	~85
Oklahoma	44	~60	~85
Georgia	43	~55	~85
Indiana	42	~50	~85
North Carolina	41	~45	~85
Delaware	40	~40	~85
South Carolina	39	~35	~85
Rhode Island	38	~30	~85
Missouri	37	~25	~85
Ohio	36	~20	~85

Year 2001

Current Smokers

All Races Males, Age 18+

Percent

Rank: 1=Lowest

--- not available ---

State	Rank	Value (95% CI)	Target
United States		~25	~25
Kentucky	51	~30	~25
Mississippi	48	~28	~25
West Virginia	46	~26	~25
Arkansas	38	~24	~25
Tennessee	31	~22	~25
Alabama	29	~20	~25
Louisiana	45	~18	~25
Oklahoma	50	~16	~25
Georgia	28	~14	~25
Indiana	49	~12	~25
North Carolina	44	~10	~25
Delaware	43	~8	~25
South Carolina	41	~6	~25
Rhode Island	39	~4	~25
Missouri	30	~2	~25
Ohio	47	~1	~25

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

See data table for source information

Profiles Home Search Contact Us Dictionary Accessibility Privacy Policy

United States Internet

New interactive map feature

Area: [? About this Map](#)

Cancer: [Quick Reference Guide](#)

Race: [Tutorial](#)

Sex:

Age:

Year(s):

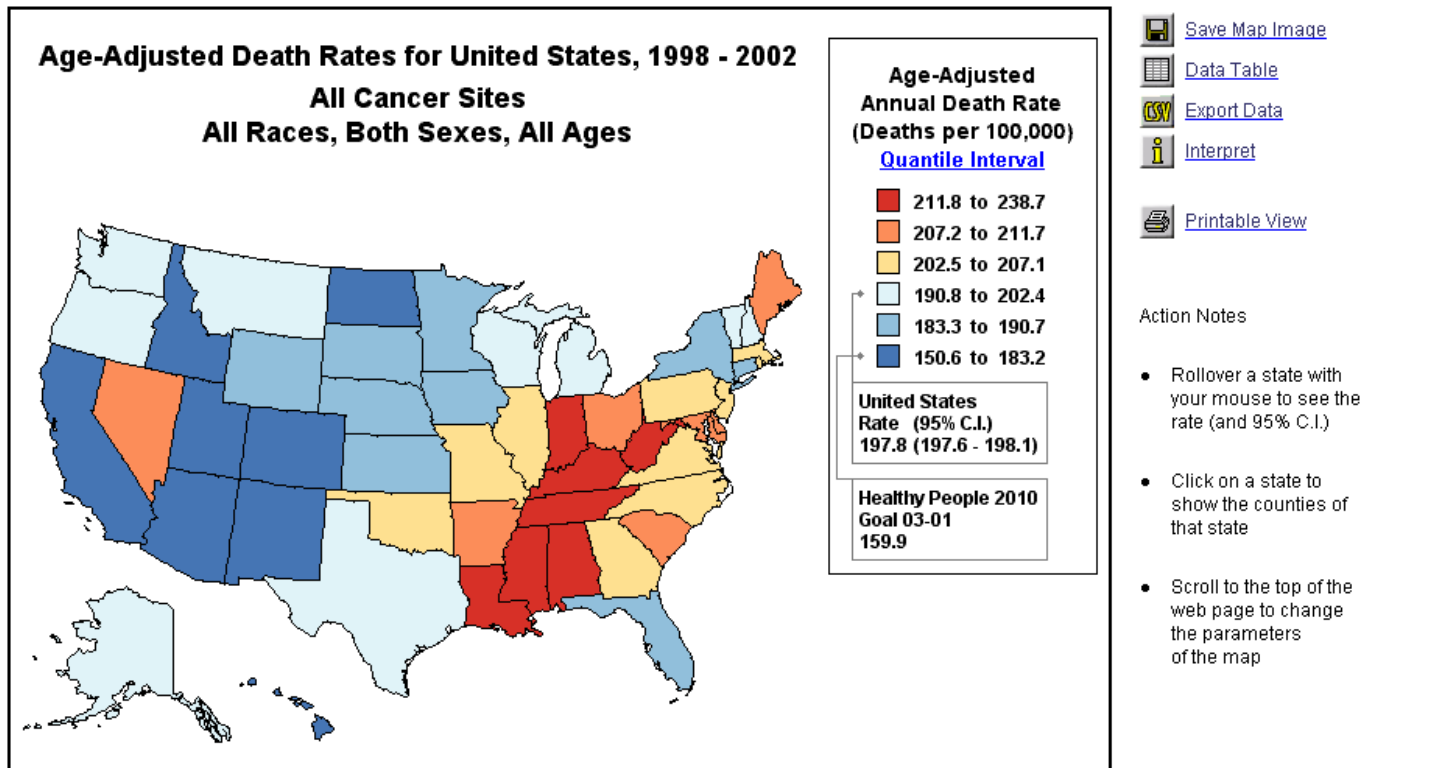
Map Options

Interval Type: [? Interval Type](#)

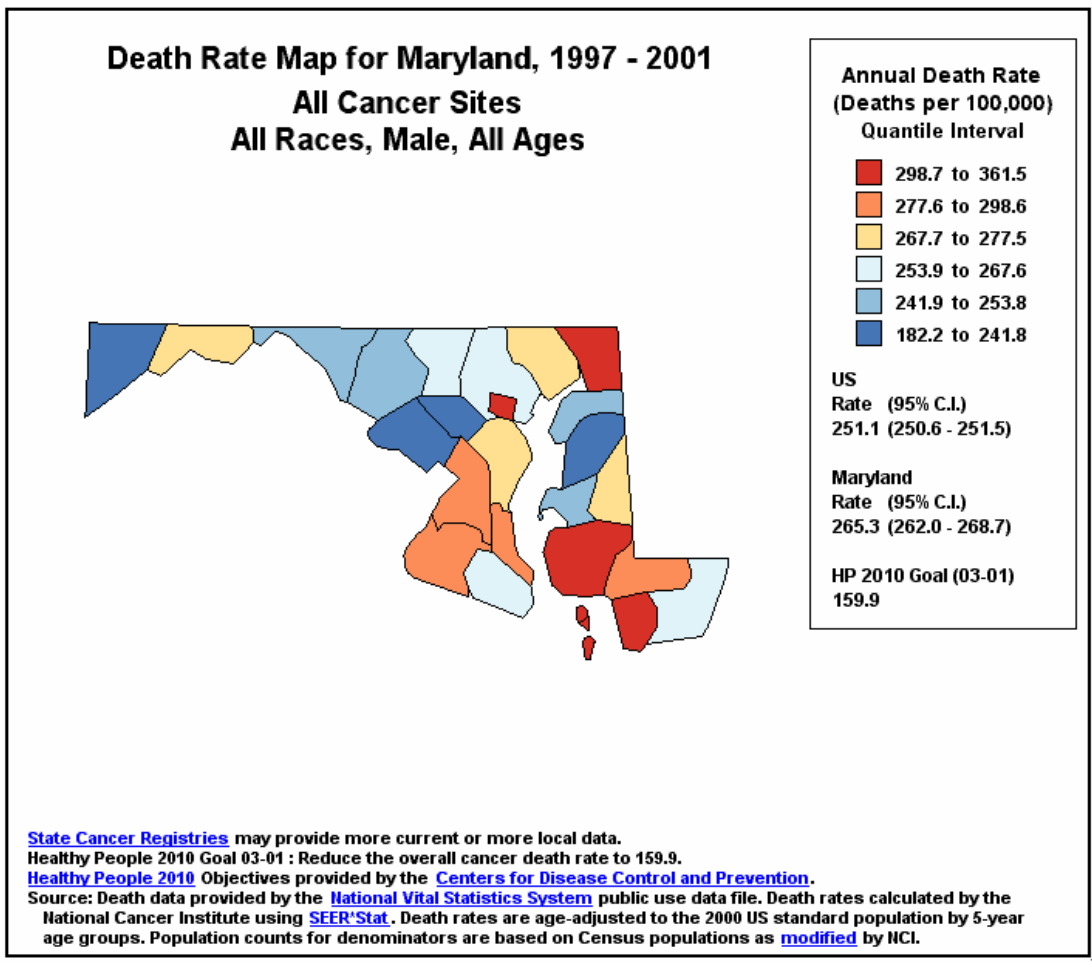
Number of Intervals:

Color Scheme: [Color Scheme](#)

[Data Use Restrictions](#)



Basic mapping functions for states or counties within state



[Data Table](#) [Export Data](#) [Interpret](#) [Printable View](#)

All Cancer Sites All Races, Male, All Ages				
County	Rate 95% Confidence Interval	Count	Group Range	Map Color
Maryland	265.3 (262.0 - 268.7)	26,108	N/A	N/A
United States	251.1 (250.6 - 251.5)	1,422,173	N/A	N/A
Baltimore City	361.5 (351.0 - 372.2)	4,660	298.7 - 361.5	
Dorchester	331.6 (293.3 - 374.5)	279	298.7 - 361.5	
Somerset	330.4 (283.2 - 384.2)	184	298.7 - 361.5	
Cecil	322.0 (291.6 - 356.3)	478	298.7 - 361.5	
Calvert	298.6 (266.0 - 335.0)	356	277.6 - 298.6	
Charles	295.5 (267.5 - 326.4)	507	277.6 - 298.6	
Wicomico	283.2 (257.8 - 311.0)	484	277.6 - 298.6	
Prince Georges	283.1 (272.2 - 294.5)	3,107	277.6 - 298.6	
Caroline	277.5 (238.5 - 321.8)	187	267.7 - 277.5	
Allegany	272.2 (249.4 - 296.8)	542	267.7 - 277.5	
Anne Arundel	272.1 (260.2 - 284.6)	2,298	267.7 - 277.5	
Harford	269.3 (251.2 - 288.7)	980	267.7 - 277.5	
Carroll	267.6 (247.6 - 289.0)	718	253.9 - 267.6	
Baltimore	263.7 (255.9 - 271.7)	4,497	253.9 - 267.6	
Worcester	259.0 (232.3 - 288.6)	381	253.9 - 267.6	
St. Marys	256.7 (230.5 - 285.6)	381	253.9 - 267.6	
Frederick	253.8 (236.0 - 272.9)	828	241.9 - 253.8	
Kent	253.1 (213.9 - 299.2)	150	241.9 - 253.8	
Washington	252.4 (234.2 - 271.8)	741	241.9 - 253.8	
Talbot	249.8 (220.4 - 283.1)	269	241.9 - 253.8	
Queen Annes	241.8 (210.1 - 277.8)	225	182.2 - 241.8	

Zoom To
Maryland

Zoom

Zoom from Center
[Zoom In](#)
[Zoom Out](#)
[Reset View](#)

Pan Control
[North](#)
[East](#)
[South](#)
[West](#)

Done

Where is there a problem?










Color & position classify rates & trends

Death Rate/Trend Comparison by Cancer, death years through 2001
US States versus US

Lung & Bronchus
All Races, Both Sexes

	Above US Rate	Similar to US Rate	Below US Rate
Rising Trend	Priority 1: rising ↑ and above ↑ Mississippi	Priority 2: rising ↑ and similar = Montana Vermont Wyoming	Priority 3: rising ↑ and below ↓ [none]
Stable Trend	Priority 4: stable → and above ↑ Indiana Kentucky Oklahoma Tennessee West Virginia	Priority 6: stable → and similar = Alabama Iowa Kansas Minnesota Missouri Nebraska North Carolina North Dakota South Carolina South Dakota Wisconsin	Priority 7: stable → and below ↓ Idaho Utah
Falling Trend	Priority 5: falling ↓ and above ↑ Arkansas Delaware Louisiana Nevada	Priority 8: falling ↓ and similar = Alaska California Connecticut District of Columbia Florida Georgia Illinois Maine Maryland Massachusetts Michigan New Hampshire	Priority 9: falling ↓ and below ↓ Arizona Colorado Hawaii New Mexico

Experimental Rate/Trend Table with Maps

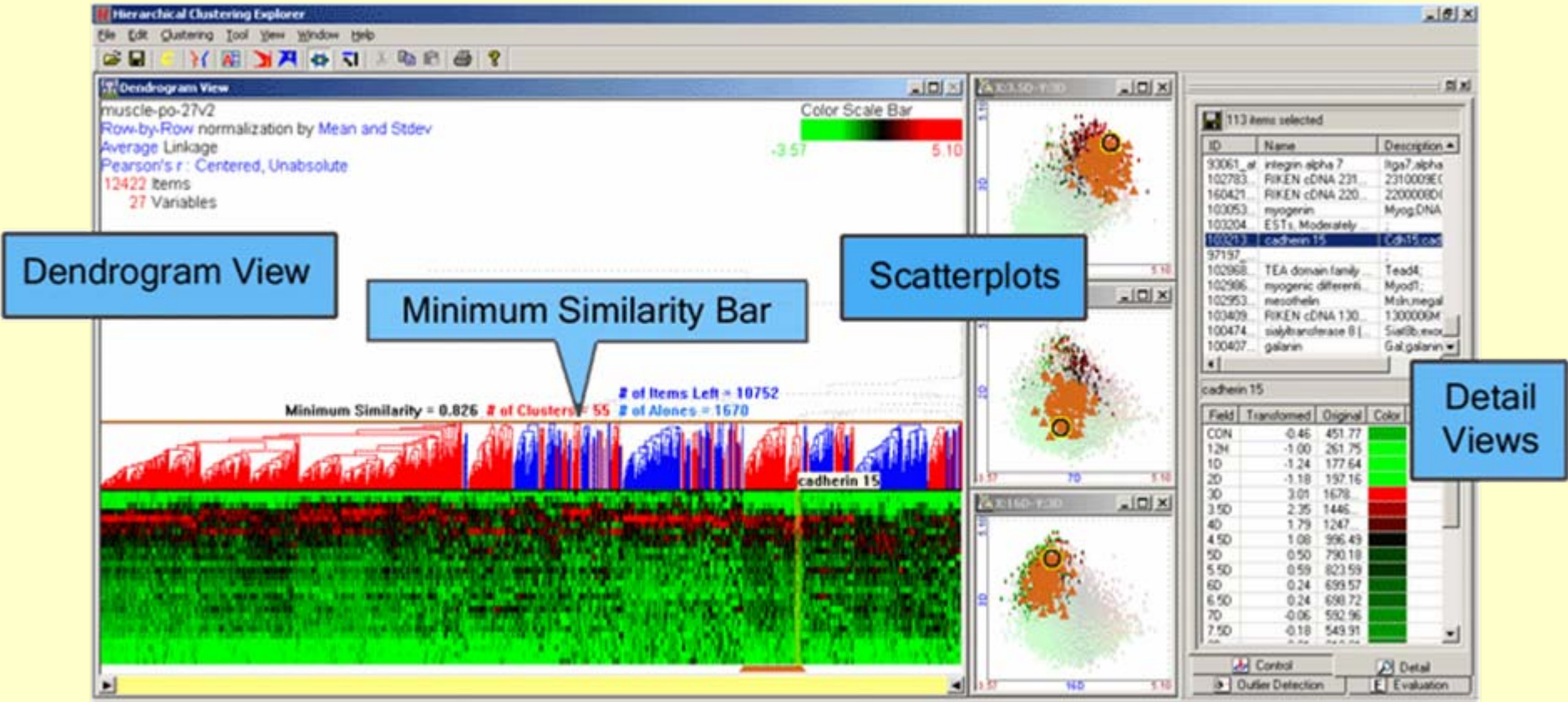
	Above US Rate	Similar to US Rate	Below US Rate
Rising Trend	Priority 1: rising ↑ and above ↑  Mississippi	Priority 2: rising ↑ and similar =  Montana Vermont Wyoming	Priority 3: rising ↑ and below ↓  [none]
Stable Trend	Priority 4: stable → and above ↑  Indiana Kentucky Oklahoma Tennessee West Virginia	Priority 6: stable → and similar =  Alabama Iowa Kansas Minnesota Missouri Nebraska North Carolina North Dakota South Carolina South Dakota Wisconsin	Priority 7: stable → and below ↓  Idaho Utah
Falling Trend	Priority 5: falling ↓ and above ↑  Arkansas Delaware	Priority 8: falling ↓ and similar =  Alaska California	Priority 9: falling ↓ and below ↓  Arizona Colorado

Cf. Conditioned
 Choropleth
 Maps: Carr,
 Wallin, & Carr,
*Statistics in
 Medicine*, 2000

Identification of Peer Counties in State Cancer Profiles system

- A common question: One county in my state has unusually high cancer rates compared to the rest of the state, but we know that county is different from the others, e.g., in terms of income, education, etc.
How do the rates in this county compare with others in the US with a similar sociodemographic profile?
- How to identify “peer counties” for this comparison?

Hierarchical Clustering Explorer for Interactive Exploration of Multidimensional Data



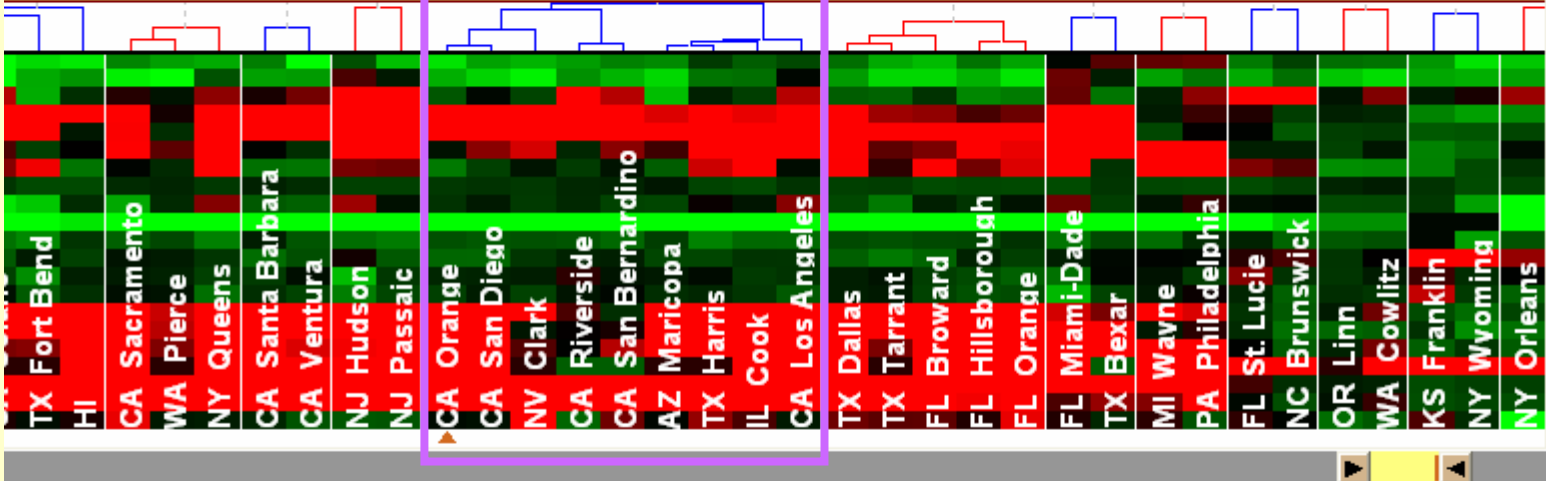
Peers of Orange County, CA

Primary common factors:

- Crowding
- Urban/rural
- % Hispanic
- % Asian/Pacific

of Items Left = 1420

Minimum Similarity = 0.934 # of Clusters = 472 # of Alones = 1654



3.02

Adjust Bar Height

Show Min Similarity

Show Detail Similar

Show Clustering Inf

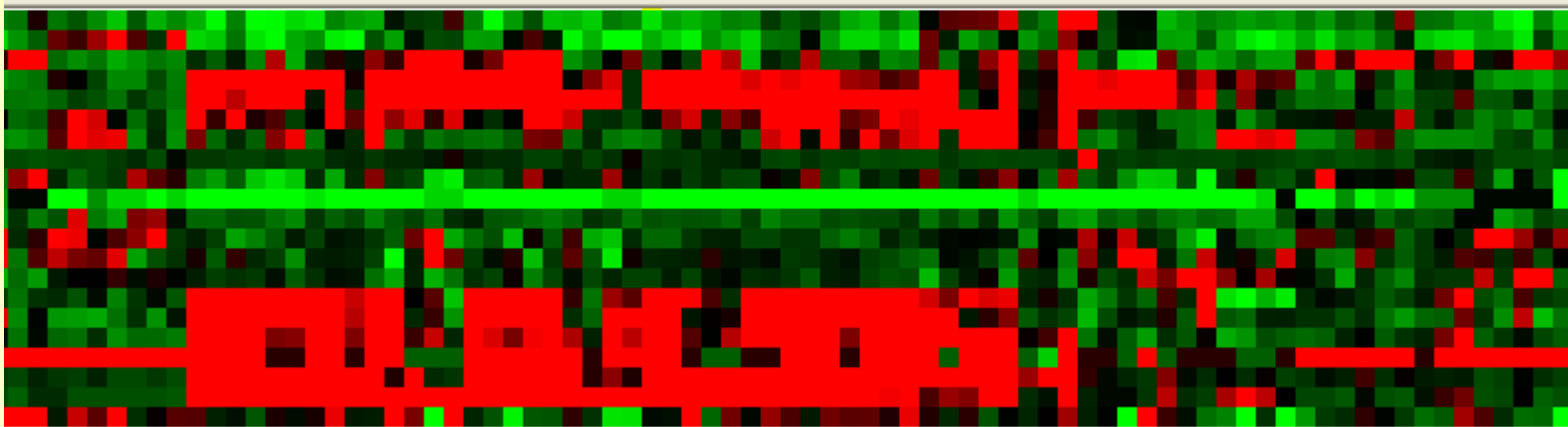
Show Color Scale E

Show Item Names

Change Mark

Cont

Detail



PCTPOOR

PCTLT9ED

UNEMPLOY

CROWDED

PCTHISP2K

PCTFEMHH

PCTB2K

PCTAIAN2K

NOINS

URBRURAL

SCRNMAMM

OBESE

SMOKEM

SMOKEF

PCINCOME

PCTCOLED

MDRATIO

MEDAGE90

TOTPOP2K

PCTAPI2K

MAMMOG

Collaborators

- **NCI was a partner in an NSF Digital Government Initiative grant to develop better visualization tools (web site: diggov.org)**

Dan Carr, George Mason University

Alan MacEachren, Penn State University

David Scott, Rice University

- **NCI geographic information systems grant & contracts to develop ESTAT**

Alan MacEachren, Penn State University

- **NCI sabbatical**

Dan Carr, George Mason University

- **Web sites for more info:**

– gis.cancer.gov (for a poster on NCI research in GIS)

– srab.cancer.gov (for headbang, SaTScan, etc)

– statecancerprofiles.cancer.gov

- **Email: PICKLEL@MAIL.NIH.GOV**