

WWW-based Access and Visualization of Hazardous Air Pollutants

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Contents

- Cumulative Exposure Project
- Graphics Production Library (GPL)
- Micromaps
- Bringing all together

Cumulative Exposure Project

- Conducted by EPA's Office of Policy
- Collection of analyses, addressing multiple pollutants from multiple sites
- National analyses of
 - Air Toxics (Outdoor Concentrations)
 - Food Contaminants (Exposures)
 - Drinking Water Contaminants (Exposures)
- Pilot Community-level study:
Greenpoint/Williamsburg, NYC

Air Toxics

- 188 Hazardous Air Pollutants (HAPs) in Clean Air Act
- Limited availability of air toxics monitoring data
- Atmospheric dispersion modeling provides understanding of concentrations of toxics in outdoor air

Scope of Modeling

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

WWW-based Access of HAP Data

■ Goals:

- Concise display
- Easy access
- Understandable to nonstatistical audience

■ Solution

- WWW
- GPL
- Micromaps

Graphics Production Library (GPL)

- Tool for creation and modification of statistical graphics on the WWW
- Follows guidelines of modern statistical graphics
- JAVA-based
- Works with Netscape and Internet Explorer

History of the GPL

- Main developer: Dan Rope
- Main reference: Carr, Valliant, Rope (1996): Plot Interpretation and Information Webs..., SCGS*, Vol. 7, No. 2
- New commercial product based on GPL developed by Dan Rope
- Upgrade and new features added to GPL through BLS and contractors

*Statistical Computing & Statistical Graphics Newsletter:
<http://cm.bell-labs.com/cm/ms/who/cocteau/newsletter/index.html>

GPL Examples

- WWW:

http://www.monumental.com/dan_rope/gpl/

Micromaps

- Link of row-labeled univariate (or multivariate) statistical summaries to corresponding geographical region
- Focus on statistical display and not on maps
- S-Plus functions (available at <ftp://galaxy.gmu.edu/pub/dcarr/newsletter/micromap/>)

History of Micromaps

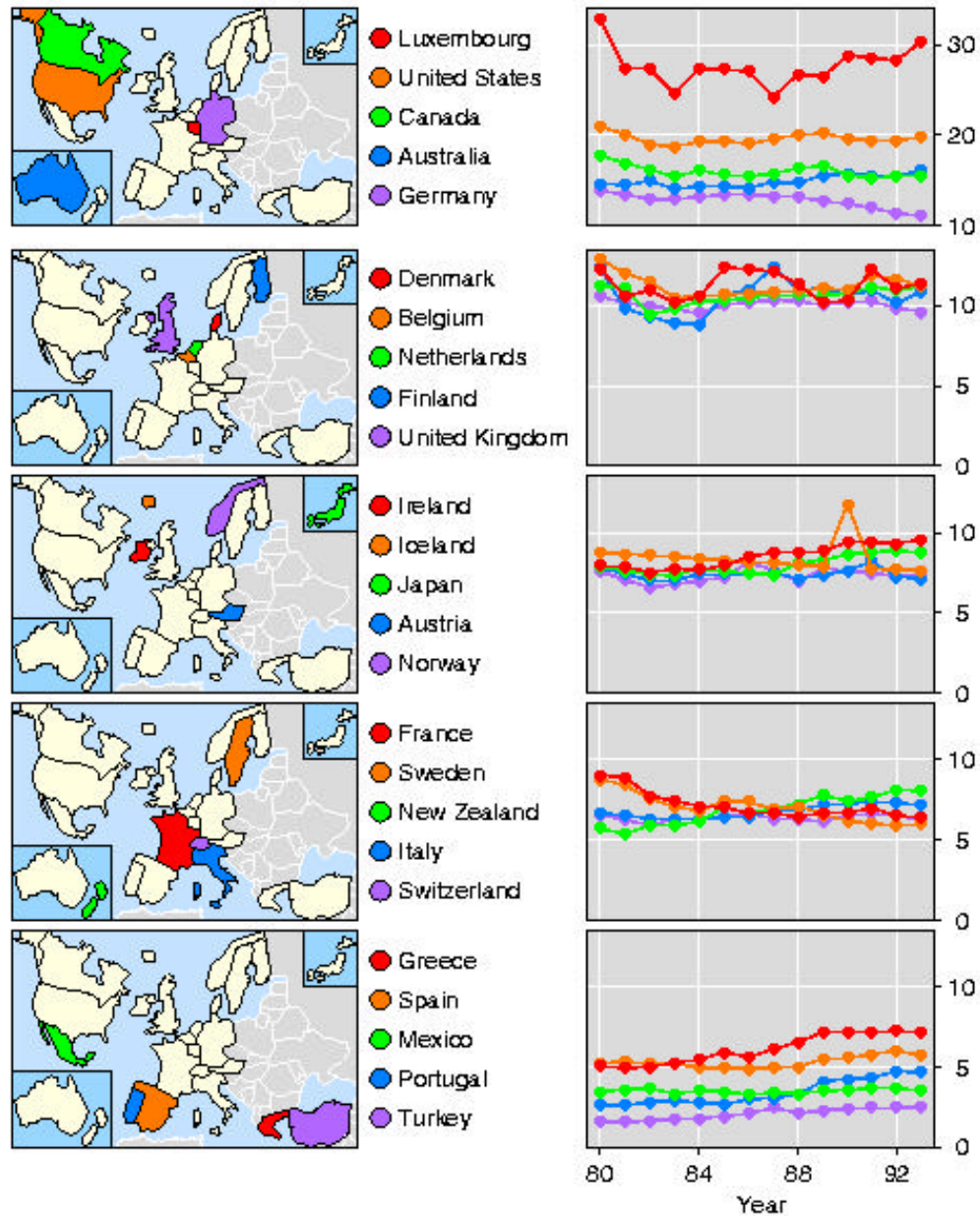
- First presented at 1995 American Statistical Association's annual meeting (Olsen, Carr, Courbois, Pierson)
- Main references:
 - Carr, Pierson (1996) Emphasizing Statistical Summaries ... with Micromaps, SCSG, Vol. 7, No.3
 - Carr, Olsen, Courbois, Pierson, Carr (1998) Linked Micromap Plots ..., SCSG,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

Micromap Examples

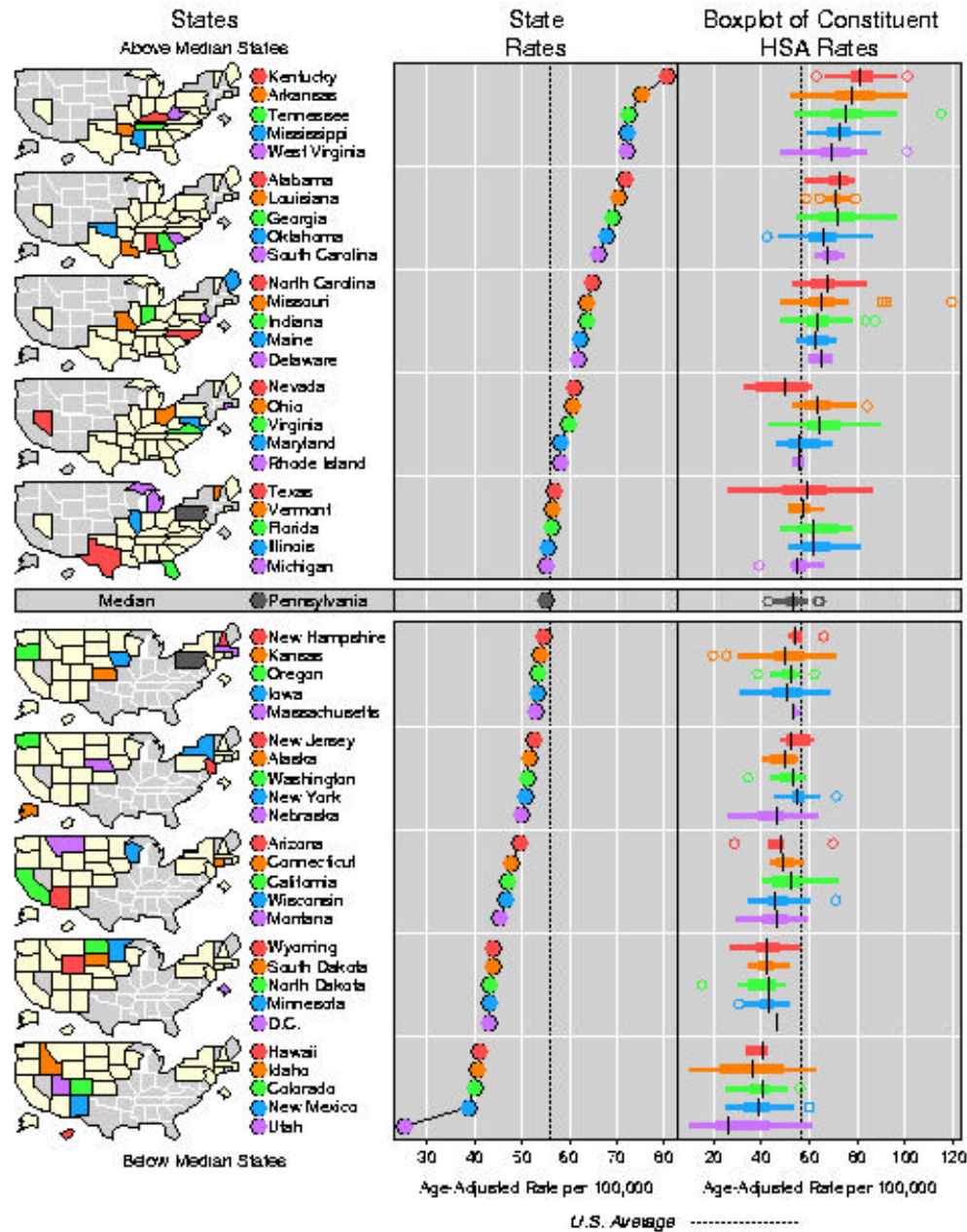
- <ftp://galaxy.gmu.edu/pub/dcarr/newsletter/Implots>

Annual CO2 Emissions From Energy Use

Units = Tons Per Person



Lung Cancer Mortality Rates By State White Males, 1988-1992



Bringing All Together

- **Hierarchical Clickable Micromaps in the GPL Environment for the Display of Hazardous Air Pollutants Data**
- GPL extended micromaps
- Selection of HAPs
- Clickable maps
- Hierarchy of maps

Realization

- Automatic one-time creation of micromaps
- C code and PERL scripts used to create follow-up data sets and Web pages
- Political vs. scientific design and layout
- Availability: late 1998/early 1999
- <http://www.epa.gov/CumulativeExposure>

Hazardous Air Pollutants (HAPs) 1990 Annual Average Per State

