WWW-based Access and Visualization of Hazardous Air Pollutants

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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
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
- New commercial product based on GPL developed by Dan Rope
- Upgrade and new features added to GPL through BLS and contractors

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, Olsen, Courbois, Pierson, Carr (1998) Linked Micromap Plots …, SCSG, Vol. 9, No.1
Micromap Examples

ftp://galaxy.gmu.edu/pub/dcarr/newsletter/lmplots
Annual C02 Emissions From Energy Use
Units = Tons Per Person

[Map showing annual C02 emissions from energy use for various countries, with charts depicting emissions over time from 1980 to 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

Maps
- D.C.
- New York
- New Jersey
- California
- Delaware
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

States

Average HAP

% Urban Census Tracts

Concentration per State

Percent per State