PUBLIC HEALTH GIS NEWS AND INFORMATION

March 2003 (No. 51)

Dedicated to CDC/ATSDR Scientific Excellence and Advancement in Disease Control and Prevention using GIS

I. Public Health GIS (and related) Events:

SPECIAL NCHS/CDC/ATSDR GIS LECTURES

April 17, 2003. **"Landview 5 (DVD): A Spatial Data System for use in Public Health Analysis,"** **Jerry McFaul**, US Geological Survey, **Peter Gattuso**, US Environmental Protection Agency, and **Paul Manka**, Bureau of the Census. See abstract this edition. Please join us for this first NCHS Cartography and GIS Guest Lecture Series to be held in our new NCHS facility (next to the former facility) and Auditorium (1st floor), **10:00-11:30AM**, Hyattsville, MD; This NCHS Series has been presented continuously since 1988. Envision is available to offsite CDC/ATSDR locations; Web access will be available at http://video.cdc.gov/ramgen/envision/live.rm. Cosponsors to the NCHS Cartography and GIS Guest Lecture Series include CDC's Behavioral and Social Science Working Group (BSSWG) and Statistical Advisory Group (SAG). [All NCHS Cartography and GIS presentations are open to the public. Contact: Editor, *Public Health GIS News and Information*]

[*Note: Calendar events are posted as received; for a more complete listing see NCHS GIS website*]

*35th Symposium on the Interface, "Security and Infrastructure Protection," March 12-15, 2003, Salt Lake City, UT [See: http://www.math.usu.edu/~iface03]

* 2003 GeoTec Event "A Spirit of Collaboration," March 16-19, 2003, Vancouver, BC [See website for this event: www.geoplace.com/gt]

* 16th Annual GIS for Transportation Symposium, March 17-19, 2003, Colorado Springs CO [See: http://www.gis-t.org]

* 2nd International Symposium on Spatial Data Quality, March 19-20, 2003, Hong Kong [See: http://www.hk-cyber.net/sdq/index.htm]

* Annual American Congress on Surveying & Mapping (and Arizona Professional Land Surveyors Association) 2003ACSM-APLSConference, March 29-April 2, 2003, Phoenix AZ [See: http://www.acsm.net]

* Natural Science and Public Health: Prescription for a Better Environment [A National conference on USGS Health-Related Research], April 1-3, 2003, Reston VA [See: http://health.usgs.gov/health2003.html]

* Steps to a HealthierUS: Putting Prevention First, Department of Health and Human Services, April 15-16, 2003, Baltimore MD [See: http://www.healthypeople.gov/summit]

* 2003 Health Effects Institute (HEI) Annual Conference, May 4-6, 2003, Boulder CO [See: http://www.healtheffects.org]

* 1st Public Health Information Network Stakeholders Meeting, Centers for disease Control and Prevention, May 13-15, 2003, Atlanta GA [See: http://www.cdc.gov/nedss]

* Using Science To Assess Environmental Vulnerabilities, US Environmental Protection Agency, May13-15, 2003, King of Prussia, PA [See: http://www.reva-maia.org]

* The National Conference on Digital Government Research, May 18-21, 2003, Boston MA [See: http://www.dgrc.org/dgo2003]

* 5th Annual Public Health Prevention Service (PHPS) Conference, "Pulling the Pieces Together: Working Toward a Common Vision," CDC, Division of Applied Public Health Training, Epidemiology Program Office June 9-12, 2003, Atlanta GA [http://www.cdc.gov/epo/dapht/phps.htm]

* 2nd Annual National Community Policing Conference: *Working Together for Safer Communities*, June 16-18, Washington DC [See: http://www.cops.usdoj.gov]

* International Society for Environmental Information Sciences (ISEIS) 2003 International Conference, July 10-11, 2003, Saskatchewan, Canada [See: http://www.iseis.org]

* ISI International Conference on Environmental Statistics and Health, July 16-18, 2003, Santiago de Compostela, Spain [See: http://isi-eh.usc.es]

*2003 Joint Statistical Meetings of the American Statistical Association, August 3-7, 2003 [See: http://www.amstat.org/meetings]

* CityMatCH Urban Maternal and Child Health National Leadership Conference 2003: Where Resilience, Results and Resolve Come Together, August 23-26, 2003, Pittsburgh PA [See: www.citymatch.org]

* CDC's 2003 Cancer Conference, "Comprehensive Approaches to Cancer Control-The Public Health Role," September 15-18, 2003, Atlanta GA [See: http://www.cancerconference.net]

II. GIS News

(You are encouraged to communicate directly with colleagues referenced below on any items*; note that the use of trade names and commercial sources that may appear in Public Health GIS News and Information is for identification only and does not imply endorsement by CDC or ATSDR*)

A. General News and Training Opportunities

1. **Epi Info 2002: A Course for Teachers of Epidemiologic Computing**. CDC and Emory University's Rollins School of Public Health will co-sponsor, "Epi Info 2002: A Course for Teachers of Epidemiologic Computing" during March 10-13, 2003, at Emory University. The course is designed for teachers of epidemiologic computing with intermediate to advanced skills in computing.

The course will cover hands-on experience with the new windows version of Epi Info, programming Epi Info software at the intermediate to advanced level, methods of teaching epidemiologic computing, computerized interactive exercises for teaching epidemiology, and computing.

2. "Natural Science and Public Health: Prescription for a Better Environment"- **A National conference on USGS Health-Related Research**, April 1-3, 2003, Reston VA. The U.S. Geological Survey (USGS), the Nation´s natural resource science agency, is increasingly called upon to provide scientific information on geologic-, atmospheric-, water- and vecto-borne threats to human health and the health of ecosystems. These studies have fostered scientific collaboration within the USGS and between the USGS and other health-related governmental agencies. This conference will highlight USGS research and collaborative efforts with the public health and biomedical research communities. The meeting will promote further interaction of USGS scientists and cooperators in the health field to identify, plan, and implement new research in areas where USGS natural-science expertise can benefit the public health fields.

Conference topical themes

Links Between Environmental Quality and Human Health (1) Environmental determinants of pathogen distribution and disease vectors; (2) links between environmental quality and human disease and developmental disorders; (3) advances in monitoring methods for environmental quality and disease occurrence; and (4) interactions between geologic setting and environmental health.

Partnering to Solve Human Health Problems-Celebrate Our Successes! (1) Case studies of USGS and Interagency collaboration in successful efforts to solve/improve human health problems; and (2) potential role of USGS in developing the Centers for Disease Control and Prevention´s national environmental public health tracking program.

Natural Science Input Into Human Health Standards, Policy and Regulations (1) Scientific implications of new and proposed standards for ground water, surface water, and air quality; (2) discussion of how natural science information can contribute to the development of effective, scientifically based environmental regulations for mining, forestry management, and management of other natural resources; and (3) land-use decision making.

Understanding Ecosystem Health (1) Fish and wildlife as sentinels of environmental health; (2) implications of legacy and emerging contaminants to environmental health; (3) fish and wildlife as carriers of

infectious disease; and (4) advances in data analysis and information delivery; and,

Military and National Security Issues Implications of environmental research for National Security in the 21st century. [Contact: Susan Price sprice@ usgs.gov or visit the conference website at http://health.usgs.gov/health2003.html]

B. Department of Health and Human Services
(http://www.hhs.gov)

HHS Secretary Tommy G. Thompson announced the release of a comprehensive research plan from HHS' National Institutes of Health (NIH) to fight autoimmune diseases, a collection of disorders including multiple sclerosis and rheumatoid arthritis that affect an estimated 14 to 22 million Americans. The plan will foster research to identify genetic, **environmental** and infectious causes of autoimmune diseases and to develop new treatments and prevention strategies.

Autoimmune diseases result when the immune system attacks the body's own organs, tissues and cells. Physicians and scientists have identified more than 80 different autoimmune diseases. Some are well known, such as rheumatoid arthritis, multiple sclerosis, type 1 diabetes and systemic lupus; others are less familiar, such as autoimmune hepatitis, Sjögren's syndrome and pemphigus.

Studies will determine the incidence, prevalence and severity of autoimmune diseases in the United States as well as the number of deaths that result from these disorders. The plan calls for researchers to identify the genetic and environmental factors that lead to autoimmune diseases and to investigate the relationship between them. [See DHHS website for full report at: http://www.hhs.gov/news/newsletter/weekly]

Administration for Children and Families
http://www.acf.dhhs.gov

3. **Head Start Act**.The intent of the legislation is to "promote school readiness by enhancing the social and cognitive development of low-income children through the provision, to low-income children and their families, of health, educational, nutritional, social, and other services that are determined, based on family needs assessments, to be necessary." More information on this and other child health programs are available at this site.

Agency for Healthcare Research and Quality
http://www.ahrq.gov

4. **MEPSnet: A New Interactive Statistical Tool**. MEPSnet is an online service that presents data from the **Medical Expenditure Panel Survey (MEPS)** in an easily used interactive format. MEPS, a survey of the Agency for Healthcare Research and Quality (AHRQ), provides nationally representative estimates of health care use, expenses, sources of payment, and insurance coverage for the U.S. population. AHRQ releases MEPS data to the public in the form of public use data sets that need sophisticated programming resources and statistical software to account for the survey's complex design. Because the skills and resources available to the MEPS user community vary widely, MEPSnet was developed to provide immediate access to the MEPS data in a non-programming environment. It is quick, easy to use through a series of interactive queries, and provides even the most novice user the ability to generate national estimates in a few seconds.

Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov

5. The Agency for Toxic Substances and Disease Registry (ATSDR) released the results of five environmental exposure pathway investigations related to the **Churchill County (Nevada) Leukemia Cluster Investigation**. The investigations were requested by the Nevada State Health Division (NSHD) as part of the state's efforts to explain the incidence of childhood leukemia in Churchill County.

ATSDR's investigation reports include the following findings: *ATSDR did **not** find a relationship between environmental exposure pathways and the leukemia cases in Churchill County; *Evidence cross checked by multiple regulatory agencies showed no evidence of leaks from the JP-8 fuel pipeline serving Naval Air Station Fallon; *Activities at Naval Air Station Fallon are not a public health hazard; *Eating the mercury-contaminated fish and duck found in Churchill County is a potential public health hazard for humans, especially for long-term exposures to young children and women of childbearing age. County residents should follow the NSHD health advisories for fish and ducks. *

The results of tap water samples collected in 2002 from 76 homes showed high levels of naturally occurring metals, such as arsenic and uranium. Tap water

from these homes is drawn from private and municipal wells. The sampling results reflect water quality from the three different groundwater sources used for drinking water. *Arsenic levels in many tap water samples substantially exceeded the recently revised Environmental Protection Agency (EPA) drinking water standard for arsenic. Because studies in other parts of the world indicate that long-term exposures to similar levels of arsenic in drinking water can be associated with a number of adverse health effects, ATSDR recommends that, currently, tap water in Churchill County not be used as a primary drinking water source.

*Uranium levels in tap water from some shallow private wells substantially exceeded the EPA drinking water standard for uranium. Toxicological studies indicate that long-term exposures to uranium in drinking water at these concentrations may pose an increased risk of kidney damage. Therefore, people using those wells should consider using alternate sources for drinking water to reduce their exposures.

*Tungsten was found in most tap water samples collected. EPA has no drinking water standard for tungsten. Research on the possible toxicological effects of tungsten is very limited. However, efforts are underway to further define tungsten exposures in Nevada and to evaluate potential routes of exposure.

Centers for Disease Control and Prevention
http://www.cdc.gov

6. National Center for Environmental Health lecture: **Environmental Health Surveillance System in Scotland (EHS3)-Information for Action,** to be presented by George Morris and Carole McRae, Scottish Centre for Infection and Environmental Health, March 17, 2003, at CDC Chamblee, Atlanta [Contact: Jacquelyn Mason at JMason@cdc.gov]

7. The ***Atlas of Stroke Mortality: Racial, Ethnic and Geographic Disparities in the United States*** (see http://www.cdc.gov/cvh) is the third in a series of CDC atlases related to cardiovascular disease, which have been published through a collaboration between CDC and West Virginia University. This Atlas provides, for the first time, an extensive series of national and state maps that show local disparities in stroke death rates for the five largest racial and ethnic groups in the United States (i.e., American Indians and Alaska Natives, Asians and Pacific Islanders, Blacks, Hispanics, and Whites). The interactive maps present heart disease and stroke mortality rates, county-by-county, for the state, racial/ethnic group, and gender of your choice.

8. CDC's 2003 Cancer Conference: The **2003 Cancer Conference** will provide participants from a wide constituency of local, state, territorial, tribal, federal, national, and community-based cancer prevention and control programs with information and skills building to: *Identify strategies to increase and improve public health involvement in developing a comprehensive approach to cancer control; *Identify the public health role for each of the major comprehensive cancer control elements: cancer prevention, early detection, treatment, rehabilitation, and palliation; *Apply skills to enable the improvement, expansion, and use of scientific data for decision making; *Articulate the importance of cancer registries and cancer surveillance data in achieving comprehensive cancer control objectives; *Develop and apply strategies for establishing new partnerships and strengthening existing ones; *Identify mechanisms for improving the infrastructure for comprehensive cancer control at the state, local, and regional levels; *Identify existing strategies and explore innovative community interventions for cancer screening outreach and public education; and, *Identify evaluation strategies for assessing comprehensive cancer control initiatives. [See conference site http://www.cancerconference.net]

9. **MMWR Modifications**: This year, modifications to Tables I and II **Cases of Notifiable Diseases**, United States, *MMWR*, CDC, add diseases designated nationally notifiable by the Council of State and Territorial Epidemiologists (CSTE) in conjunction with CDC. As of January 1, 2003, three diseases have been added to the list of nationally notifiable diseases: chronic hepatitis B infection, hepatitis C virus infection (past or present), and varicella (Table 1). Incidence data for chronic hepatitis B infection and hepatitis C virus infection (past or present) will not be presented in the weekly *MMWR* tables pending evaluation of the data by the Division of Viral Hepatitis, National Center for Infectious Diseases. Except where indicated, National Notifiable Diseases Surveillance System (NNDSS) data presented in the notifiable disease tables are transmitted to CDC through the National Electronic Telecommunications System for

Surveillance (NETSS). [Additional information about nationally notifiable diseases, NNDSS, NETSS, and CSTE is at http://www.cdc.gov/epo/dphsi/phs.htm and http://www.cste.org]

Centers for Medicare and Medicaid Services
http://cms.hhs.gov

10. On October 24, 2000, the Breast and Cervical Cancer Prevention and Treatment Act of 2000 (Public Law 106-354) was signed into law. This Act gives states the option to provide medical assistance through Medicaid to eligible women who were screened through the Centers for Disease Control and Prevention's (CDC) **National Breast and Cervical Cancer Early Detection Program (NBCCEDP)** and found to have breast or cervical cancer, including pre-cancerous conditions. NBCCEDP, which is administered by CDC, provides free breast and cervical cancer screening and follow-up diagnostic services to women in need, such as those who are uninsured or have low incomes. In 2000, CDC began its 10th year of this landmark program, supporting early detection programs in all 50 states, 6 U.S. territories, the District of Columbia, and 12 American Indian and Alaska Native organizations.

Food and Drug Administration
http://www.fda.gov

11. FDA regulates **radiation emitting electronic products**. The purpose is to prevent unnecessary exposure to radiation due to the use of these products. There are specific requirements that **apply to all** radiation emitting electronic products in order to comply with the provisions of the Food, Drug and Cosmetic Act. If the product is also a medical device, the product must also comply with the medical device regulations.

Health Resources and Services Administration
http://www.hrsa.gov

12. The **National Advisory Committee on Rural Health and Human Services (NACRHHS)** is a 21-member citizens' panel of nationally recognized rural health experts that provides recommendations on rural issues to the Secretary of the Department of Health and Human Services. The Committee was chartered in 1987 to advise the Secretary of Health and Human Services on ways to address health care problems in rural America. It was expanded to 21 members in 2002 and charged with focusing on both health and human service issues in rural areas.

Indian Health Service
http://www.ihs.gov

13. **Status Of Open Dumps On Indian Lands, 1998 Report**. Public Law 103-399, The Indian Lands Open Dump Cleanup Act of 1994, enacted October 22, 1994, identified congressional concerns that solid waste open dump sites located on American Indian or Alaska Native (AI/AN) lands threaten the health and safety of residents of those lands and contiguous areas. The purpose of the Act is to identify the location of open dumps on Indian lands, assess the relative health and environment hazards posed by those sites, and provide financial and technical assistance to Indian tribal governments to close such dumps in compliance with Federal standards and regulations or standards promulgated by Indian Tribal governments or Alaska Native entities. [See website: http://www.ihs.gov/PublicInfo/PressPub_index.asp]

National Institutes of Health
http://www.nih.gov

14. From **Ron Abeles**, OD: In April 2002, the Office of Behavioral and Social Sciences Research of the National Institutes of Health convened a meeting, entitled **Racial/Ethnic Bias and Health: Scientific Evidence, Methods, and Research Implications**, of approximately 100 leading scientists to present scientific evidence of the effects of racial/ethnic bias on health and to identify areas for future research to further explicate the relationship. The conference cochairs (James Jackson, David Williams, Nancy Krieger and Virginia Cain) and NIH planning committee designed the conference to consider the historical and contextual factors relating to racial/ethnic bias in the United States today, and the evidence relating various forms of bias and the well-documented disparities in health that are found among the various racial/ethnic groups in US society. [Papers from the conference are published in the February, 2003 *American Journal of Public Health* at website http://www.ajph.org/content/vol93/issue2/index.shtml]

15. Institute of Medicine lecture (at Bureau of Labor Statistics): **Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare**, by Brian Smedley and Adrienne Stith, Institute of Medicine, The

National Academies, March 13, 2003. Abstract: Racial and ethnic disparities in health care are real and unacceptable. They occur across a wide range of medical conditions and heath care services, and exist independently of insurance status, income, and other access-related factors. At the level of health systems, minorities are likely to get poorer care because of several factors, including resource allocation policies that are less favorable to minorities, linguistic and cultural barriers, and the disproportionate representation of minorities in restrictive health plans. Minority patients, for a variety of historic and socioeconomic reasons, are more likely to refuse treatment, or fail to adhere to treatment due to misunderstanding or mistrust. These patient and system-level factors, however, don't fully explain the consistency of racial and ethnic gaps in treatment. Prejudice, bias, and stereotyping by providers, as well as clinical uncertainty, contribute to disparities in health care. This is a major conclusion of an expert panel of the Institute of Medicine, summarized in a report called "Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare." Brian Smedley and Adrienne Stith, program officers at the IOM, will discuss this and other conclusions of the report, along with the reports' recommendations for strategies to eliminate these disparities. [Contact: svm@mitre.org]

16. From **Nancy Nizankiewicz**, International Center for the Integration of Health and Spirituality: The **International Center for the Integration of Health and Spirituality (ICIHS)** is holding a three-day research conference on the campus of NIH at the Natcher Center April 1-3, 2003 (see website http://www.icihs.org). The conference is titled: "Integrating Research on Spirituality and Health and Well-being into Service Delivery: A Research Conference." [Contact: Nancy, Director of Advancement, at Nnizankiewicz@icihs.org]

Substance Abuse and Mental Health Services Administration
http://www.samhsa.gov

17. The U.S. Departments of Housing and Urban Development, Health and Human Services and Veterans Affairs have developed a single application joint funding opportunity aimed at moving individuals and families experiencing chronic homelessness off the streets into permanent housing. The $35 million Notice of Funding Availability (NOFA) published in the Federal Register January 27, 2003 is a first ever effort by these three agencies to utilize a consolidated application process to deliver the full range of housing and supportive services dollars together in a coordinated funding stream. [See: http://www.samhsa.gov/news/cl_interagency.html]

C. Historical Black Colleges and Universities (HBCUs) and Other Minority Health Activities

[A listing of HBCUs may be found at the website: http://www.smart.net/~pope/hbcu/hbculist.htm]

18. Facts about racial disparities in American health care: ·Rates of death from cardiovascular disease are about 30 percent higher among African-American adults than among white adults.·African Americans suffer from diabetes at 70 percent high rates than whites.·A baby born to an African-American mother has more than twice the risk of dying the first year of life than a baby born to a white mother. African Americans and Hispanics accounted for roughly 75 percent of all adult AIDS cases in 2000, even though they comprise just 25 percent of the U.S. population. African Americans and Hispanics make up 81 percent of all pediatric AIDS cases. In 2000, 67 percent of older white Americans received the flu vaccine-compared to 48 percent of African Americans and 56 percent of Hispanics. [Source: *HHS Weekly Report*, January 15-19, 2003]

D. Other Related Agency or Business GIS News

19. From **Mark Reichardt**, OGC: (a) The Open GIS Consortium (OGC) announces the approval and release of **Geography Markup Language version 3.0 (GML 3)**. GML 3 defines a data encoding in XML that allows geographic data and its attributes to be moved between disparate systems with ease. The new release is modular, meaning that users can select out only the parts necessary for use, which simplifies and minimizes the size of implementations. New additions in GML 3 include support for complex geometries, spatial and temporal reference systems, topology, units of measure, metadata, gridded data, and default styles for feature and coverage visualization. GML 3 is almost entirely backwards compatible with GML 2, so that developers and users familiar with GML 2 can begin working immediately with GML 3. Like GML 2, GML 3 will play a key role in both spatial data encoding and transport, and in the description of geographic objects for geospatial Web services.

(b) The Open GIS Consortium, Inc. (OGC) just announced industry approval of an expanded version of the OpenGIS® Catalog Service Implementation Specification. The OGC **OpenGIS Catalog Service Specification** documents industry consensus regarding an open, standard interface to online catalogs for geographic information and web-accessible geoprocessing services. Industry agreement on a common interface for publishing metadata and supporting discovery of geospatial data and services is an important step toward giving Web users and applications access to all types of "where" information. The specification is available at www.opengis.org/techno/implementation.htm.

Doug Nebert, US Federal Geographic Data Committee (FGDC), and chair, OGC Technical Committee Catalog Working Group, said "In government, business and academia, technical and semantic non-interoperability have long frustrated discovery and sharing of digital geographic information. This specification is the world's industry-approved design for a key part of all future internet-based solutions to these problems." Catalog services support the ability to publish and search collections of descriptive information (metadata) for data, services, and related information objects. [Contact: Mark at mreichardt@opengis.org]

20. From TerraSeer: **Introduction to disease clustering and spatial epidemiology,** March 13-14, 2003, Ann Arbor, MI. This course offers an overview of techniques for the analysis of disease patterns and health outcomes in space, time and space-time, using ClusterSeer(r) software. The course emphasis is on the effective and appropriate use of techniques to accurately identify whether there is a statistically significant excess of events. This course is the second in TerraSeer's 2003 Spatial and Temporal Analysis Training Series. [See: http://www.terraseer.com]

21. CSISS Software Tools Project. The **Center for Spatially Integrated Social Science (CSISS)** is a five-year project funded by the U.S. National Science Foundation under its program of support for infrastructure in the social and behavioral sciences. CSISS promotes an integrated approach to social science research that recognizes the importance of location, space, spatiality and place. One of the CSISS programs is devoted to "Spatial Analytic Tools" for the social sciences. It is directed by Luc Anselin and housed in the Spatial Analysis Laboratory of the Department of Agricultural and Consumer Economics at the University of Illinois, Urbana-Champaign. The Tools Project aims to develop and disseminate a powerful and easy to use suite of software for spatial data analysis, to advance methods of statistical analysis to account for spatial effects, and to integrate these developments with GIS capabilities. [See Websites of Interest this edition]

III. GIS Outreach

[Editor: All requests for Public Health GIS User Group assistance are welcomed; readers are encouraged to respond directly to colleagues]

From **Bob Kay**, ATSDR: I have been playing around with SAS/GIS on my PC SAS version, but have not used it yet on any special projects to know much about its utility, but I hope to learn. To answer the question on how it compares with ArcView 8.2, I cannot answer that because I have not used SAS/GIS enough, nor have I used ArcView 8.2. It might be worth asking all GIS users and all SAS users in their respective user groups on (1) the positives/negatives of ArcView 8.2 and its statistical applications or ease at interfacing SAS, SPSS, S-PLUS, GLIM, or other statistical packages versus (2) the positives/negatives of SAS/GIS. The benefits of either might vary greatly depending on the task or question that needs to be answered using them. [**Editor**: Bob raises a timely issue. If anyone has any comments on how SAS/GIS compares to ArcGIS 8.2 (e.g., what are the strengths and weaknesses of each), please send your comments to me. I would be happy to publish any responses to this question]

IV. Public Health GIS Presentations and Literature

NCHS Cartography and GIS Guest Lecture Series

(Now held in new NCHS Auditorium)

April 17, 2003. **"Landview 5 (DVD): A Spatial Data System for use in Public Health Analysis," Jerry McFaul**, US Geological Survey, **Peter Gattuso**, US Environmental Protection Agency, and **Paul Manka**, Bureau of the Census. Abstract: **LandView 5** reflects the collaborative efforts of the U.S. Environmental Protection Agency (EPA), the U.S. Census Bureau, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS) to provide the public readily accessible published federal spatial and demographic data. It is composed of two

software programs: the LandView® database manager and the MARPLOT® map viewer. These two programs work in tandem to create a simple computer mapping system that displays individual map layers and the demographic and spatial information associated with them.

LandView 5 represents one of the largest single releases of spatial data by the Federal Government. The LandView 5 product consists of a pair of DVD-ROM discs containing over 10 GB of spatial data from CENSUS, EPA, and USGS. In addition to the 36 layers of spatial data that come with the product, users can import their own point, line, and polygon data. The software included on the discs was created by agencies of the U.S. Government and is in the public domain. It can be copied, used and distributed freely without the requirement for royalty payments or further permissions.

LandView 5 Capabilities

*Browse, query, and plot records from the EPA Envirofacts Warehouse, the Census 2000 Demographic Profiles, and the USGS Geographic Names Information System;
*Calculate Census 2000 population and housing unit counts within a user-specified radius;
*Export data in ten different spreadsheet and database formats.
*Locate a street address range on the map;
*Create thematic maps displaying census demographic data;
*Create customized digital maps by selecting individual map layers;
*View EPA regulated sites and USGS names for features and places;
*Map detailed road data (over 6.3 million miles), rivers, and railroads based on the Census Tiger/Line® files;
*Map Census 2000 legal and statistical entities, including urban areas;
*Select and display sites based on feature location within a user-defined radius;
*Identify geographic entities such as state, county, census tract, and block group on the map view using the MARPLOT® map pointer tool;
*Link via the Internet interface to sponsoring agencies to retrieve the most recent data;
*Create thematic maps using several color schemes and automatic range scaling;
*Calculate Census 2000 population and housing estimates within a user-specified radius, based on more than 8 million census blocks;
*Display Census 2000 demographic data including ZIP Code Tabulation Areas (ZCTAs), which are generalized area representations of U.S. Postal Service ZIP Codes.

[For product ordering information, as well as a free LandView® demonstration, visit the LandView® Web page, http://landview.census.gov]

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CDC *Emerging Infectious Diseases* and *MMWR*

Emerging Infectious Diseases

Emerging Infectious Diseases (EID) is indexed in Index Medicus/Medline, Current Contents, Exerpta Medica, and other databases. Emerging Infectious Diseases is part of CDC's plan for combating emerging infectious diseases; one of the main goals of CDC's plan is to enhance communication of public health information about emerging diseases so that prevention measures can be implemented without delay (EID articles may be found at http://www.cdc.gov/ncidod/EID/index.htm). A **February 2003** edition is available and includes possible GIS-related articles**:** Preparing for a bioterrorist attack: legal and administrative strategies; Emerging Pattern of Rabies Deaths and Increased Viral Infectivity; Risk factors for sporadic giardiasis: a case-control study in southwestern England; and others.

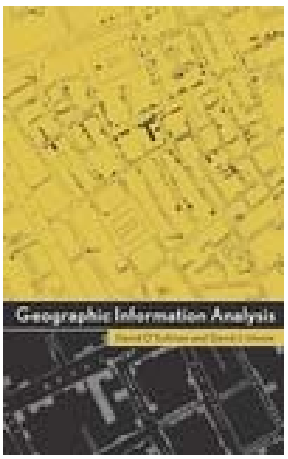
Morbidity and Mortality Weekly Report

Selected articles from CDC's ***Morbidity and Mortality Weekly Report*** (MMWR): [Readers may subscribe to MMWR and other CDC reports, without cost, at http://www.cdc.gov/subscribe.html and access the MMWR online at http://www.cdc.gov/mmwr]: Recommendations and Reports, *MMWR* Dispatch, Vol. **52**- *Recommendations for Using Smallpox Vaccine in a Pre-Event Vaccination Program: Supplemental Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Healthcare Infection Control Practices Advisory Committee (HICPAC)*; Vol. **52**, No. **7**- Potential Exposures to Airborne and Settled Surface Dust in Residential Areas of Lower Manhattan Following the Collapse of the World Trade Center-New York City, November 4-December 11, 2001; Smallpox Vaccine Adverse Events Among Civilians-United States, January 24-February 18, 2003; Notice to Readers: Release of Atlas Highlighting Burden of Stroke Death; Vol. **52**, No. **6**- *MMWR* Series

on Public Health and Aging; Trends in Aging-United States and Worldwide; Increase in Coccidioidomycosis-Arizona, 1998-2001;Vol. **52**, No. **5**- Hypothermia-Related Deaths-Philadelphia, 2001, and United States, 1999; Notice to Readers: Smallpox Vaccine Adverse Events Monitoring and Response System for the First Stage of the Smallpox Vaccination Program; Vol. **52**, No. **3**- Norovirus Activity-United States, 2002; Human Rabies-Iowa, 2002; Notice to Readers: Conference on Vaccine Research; Vol. **52**, No. **1**- Accelerated Measles Control-Cambodia, 1999-2002; Tobacco Use Among Middle and High School Students-New Hampshire, 1995-2001; Notice to Readers: Changes in National Notifiable Diseases List and Data Presentation; Notice to Readers: Epi Info 2002: A Course for Teachers of Epidemiologic Computing.

New Books

Geographic Information Analysis, David O'Sullivan and David J. Unwin. New York: J. Wiley and Sons, Inc. 2002 [http://www.wiley.com/cda/product/0,,0471211761|print|2777,00.html]. *Geographic Information Analysis* presents clear and up-to-date coverage of the foundations of spatial analysis in a geographic information systems environment. Focusing on the universal aspects of spatial data and their analysis, this book covers the scientific assumptions and limitations of methods available in many geographic information systems.



Throughout, the fundamental idea of a map as a realization of a spatial stochastic process is central to the discussion. Key spatial concepts are covered, including point pattern, line objects and networks, area objects, and continuous fields. Analytical techniques for each of these are addressed, as are methods for combining maps, exploring multivariate data, and performing computationally intensive analysis. Appendixes provide primers on basic statistics and linear algebra using matrices. It contains descriptions of Openshaw's GAM and most of the popular methods of point pattern analysis such as density estimation, Monte Carlo simulations of point patterns, Moran's I for spatial autocorrelation etc. Complete with chapter objectives, summaries, "thought exercises," a wealth of explanatory diagrams, and an annotated bibliography, *Geographic Information Analysis* is a practical book for students, as well as a resource for researchers and professionals in the industry.

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Public Health Informatics and Information Systems, O'Carroll, PW, Yasnoff, WA, Ward, ME, Ripp, LH, Martin, EL, eds., 2002. New York: Springer-Verlag Publishers Contents: Part I. The Context for Public Health Informatics: Introduction to Part I; Introduction to Public Health Informatics; History and Significance of Information Systems and Public Health; Better Health Through Informatics: Can Informatics Improve Health?; The Governmental and Legislative Context of Informatics. Part II. The Science of Public Health Information: Introduction to Part II; Information Architecture; Core Competencies in Public Health Informatics; Assessing the Value of Information Systems; Managing IT Personnel and Projects; Public Health Informatics and Organizational Change; Privacy, Confidentiality, and Security; Data Standards in Public Health Informatics; Evaluation for Public Health Informatics; Ethics, Information Technology, and Public Health: Duties and Challenges in Computational Epidemiology; Part III. Key Public Health Information Systems: Introduction to Part III; The National Vital Statistics System; Morbidity Data; Risk Factor Information Systems. [http://www.springer.de/cgi/svcat/search_book.pl?isbn=0-387-95474-cookie=done&bookdealer=]

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- **Optimal water management for reservoir based irrigation projects using geographic information system,** Ali H, Shui LT, Walker WR, *J Irrig Drain E-ASCE*, 129 (1):1-10 JAN-FEB 2003;

-**Time-location analysis for exposure assessment studies of children using a novel global positioning system instrument,** Elgethun K, Fenske RA, Yost MG, Palcisko, GJ, *Environ Health Persp*, 111 (1):115-122 JAN 2003;

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- **Discovering and composing distributed atomic agents for imagery and geospatial problem solving**, Nolan JJ, Sood AK, Simon R, *Int J Pattern Recogn Art Intel*, 16 (8): 995-1019 DEC 2002;

- **CORBA-based distributed geographic information systems for transportation for emergency medical services**, Hu TY, *Transport Res Rec* (1800): 27-34 2002

- **Density and local attribute estimation of an infectious disease using MapInfo**, Atkinson PJ, Unwin DJ, *Computers & Geosciences*, Nov 2002; 28 (9): 1095-1105

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Journal Articles and Other Submissions

***Annual Reviews* Public Health**

Reviews in Advance-Vol. 24, 2003-GIS

[http://publhealth.annualreviews.org/pap_articles.shtml]

*Ellen K. Cromley, **GIS and Disease**; *Sara L. McLafferty, **GIS and Health Care**; *Gerard Rushton, **Public Health, GIS, and Spatial Analytic Tools**; *Charles M. Croner, **Public Health, GIS, and the Internet**; *Thomas C. Ricketts, **Geographic Information Systems and Public Health**;

[In Publication]

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Other Literature: Special Reports

Bioavailability of Contaminants in Soils and Sediments: Processes, Tools, and Applications (2002), Water Science and Technology Board, Committee on Bioavailability of Contaminants in Soils and Sediments, National Research Council, The National Academies Press [Online prepublication edition at http://www.nap.edu/catalog/10523.html]; Contents are: Introduction; Current Use of Bioavailability in the Management of Contaminated Soil and Sediment; Processes; Tools; and, Moving forward with Bioavailability in Decision-Making.

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West Nile Virus: Wildlife Health Workshop

Smithsonian Environmental Research Center
Edgewater, Maryland, February 5-6, 2003

Scientists participated in a National workshop hosted by the Smithsonian Institution titled **"Impacts of West Nile Virus on Wildlife Health."** The two-day workshop held included scientists from the U.S. Geological Survey (USGS), U.S. Department of Agriculture (USDA), U.S.Centers for Disease Control and Prevention (CDC), U.S. Fish and Wildlife Service (USFWS) and other federal, state and university researchers who met to examine ways to better understand the West Nile virus (WNV) and its effects on wildlife. Topics of discussion included mapping the spread of WNV, assessing the risk of human illness, and determining susceptibility of indicator species. WNV is currently found in 44 states and five Canadian provinces infecting 150 wild bird species, 15 mammal species, and one reptile species in the U.S. Surveillance activities, public observations, and preliminary analysis suggest that WNV has caused extensive mortality in many avian species, particularly crows and hawks. Scientists are concerned that the virus could devastate populations of threatened and endangered species, migratory birds, other wildlife, and the high risk wild horse and burro populations. [For a listing of papers presented and participants see http://www.serc.si.edu/migratorybirds/current_events_fin.htm]

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Injury Maps: CDC's Web-Based GIS Application for Injury Mortality

Overview. In 1998, injury accounted for 146,941 deaths in the United States. *Unintentional injury, suicide, and homicide ranked among the top 15 leading causes of death in the U.S., with unintentional injury as the fifth leading cause of death*. Consequently, many people--from health professionals to students--are interested in injury prevention. When designing and implementing injury prevention programs, geographic or spatial patterns in injury death become important considerations

for analysis. CDC interactive injury mortality maps display county, state and national geographic patterns in injury death.

To assist with the planning of injury prevention programs, CDC's Injury Center developed two publications, *Injury Mortality Atlas of the United States* (out of print) and *State Injury Profiles* (published annually). Together, these publications have received very favorable response for 13 years. However, printing limits the number of maps that CDC's Injury Center can produce and, consequently, the number of people reached. Furthermore, any print document is not interactive and cannot be tailored to meet individual needs. For example, print maps cannot be adjusted to add more detail or associated geospatial attributes. Also, a print map cannot be repurposed (used again in another way) easily. That is, one cannot incorporate a print map into another document, such as a slide presentation, without scanning and graphics software.

To address these challenges, CDC's Injury Center contracted with MapInfo Corporation to develop an interactive, web-based mapping system called Injury Maps (www.cdc.gov/ncipc/maps). Injury Maps provides the geographic distribution of injury-related mortality in the U.S. The system contains county, state and national maps of age-adjusted mortality rates in the contiguous U.S. Injury Maps offers maps of mortality rates for nine major causes or types of injury-related deaths: Firearm, homicide, suicide, traumatic brain injury (TBI), motor-vehicle (traffic-related), fall, fire and burn, drowning, unintentional poisoning. Injury Maps online is cost effective and currently averages 486 overall hits, 133 unique visits, and 584 map requests daily.

About the Data. All maps drawn and their corresponding figures express rates as the number of deaths per 100,000 population. The methods that CDC's Injury Center used to compute age-adjusted mortality rates for these maps are described in detail in *Injury Mortality Atlas of the U.S.* County-level age-adjusted mortality rates were adjusted using an empirical Bayes smoothing method to account for counties with small populations. Both the number of injury-related deaths and the population denominator data--except for traumatic brain injury (TBI)--were taken from the Compressed Mortality File (CMF) produced by the National Center for Health Statistics (NCHS). Number of deaths and population estimates used to calculate mortality rates for TBI were obtained from the NCHS multiple-causes-of-death data tapes and the U.S. Bureau of Census, respectively. The county-level national and state maps feature mortality rates for the period 1989-1998. The state-level national maps feature mortality rates for the period 1996-1998.

In addition to the injury mortality rates, the maps incorporate geographic data, such as county boundaries, congressional district boundaries, highways, and bodies of water. CDC's Injury Center supplied the geocoding of county boundaries and purchased the other geographic data from MapInfo® Corporation.

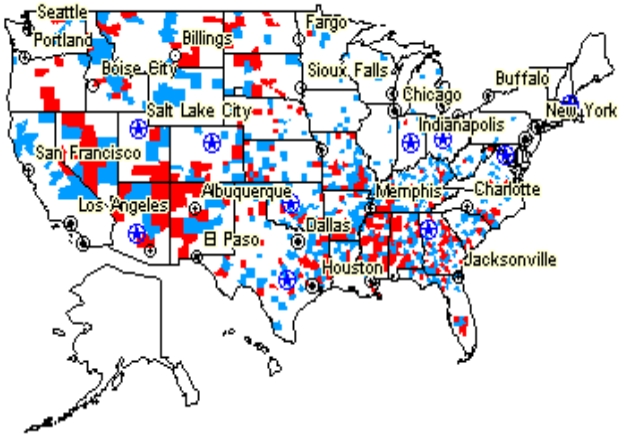
Mapping Features. Injury Maps offers features that allow users to tailor the appearance of national and state maps to suit their needs as well as use it for other purposes: **Color scheme and shading**. Injury Maps uses color schemes to shade polygons of Census administrative units. In the default color scheme, red is equal to the 90th percentile and greater; blue is equal to the 75-89th percentiles; and white equals the lowest percentile. Two other three-color options are green and grayscale. Injury Maps also offers one four-color option that maps rates by quartiles. In this color scheme, red equals the 75th percentile and greater; blue equals the 50-74th percentile; gray equals the 25-49th percentile; and white equals the lowest percentiles. The default color scheme is the color scheme used in the print atlas. In addition to color schemes, the national map options allow users their own preferences to shade either states or counties.

Layer. This feature allows a user to add or remove layers of detail. This feature includes Show/hide cities and city names, Show/hide water boundaries and names of bodies of water, Show/hide highways and highway names, Show/hide congressional district boundaries and names, Show/hide state boundaries and names, and Show/hide county boundaries and names. **Zoom**. With zoom, users can focus on the geographic area desired. For instance, a user could zoom into the northwest U.S. or certain counties of a state. **Print**. Of course, this feature allows the user to print the map. A user also can copy or save the map, which is a GIF file, using browser controls. CDC's Injury Center is exploring ways to make downloading a map easier. In addition to these display features, the system provides alongside each national, county-level map a table summarizing the

distribution of injury mortality rates. The "Info" feature provides the mortality rate for a particular county.

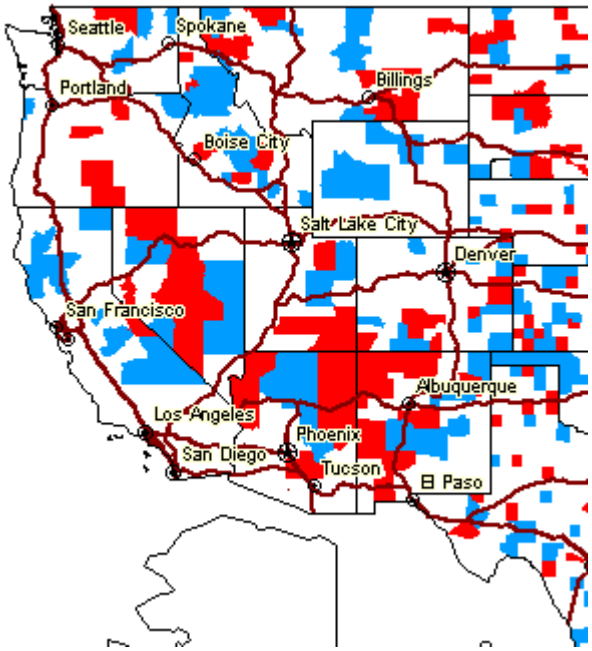
Sample Maps--National

National Map, Motor Vehicle, Traffic-Related, 1989-1998 (Shaded by county)



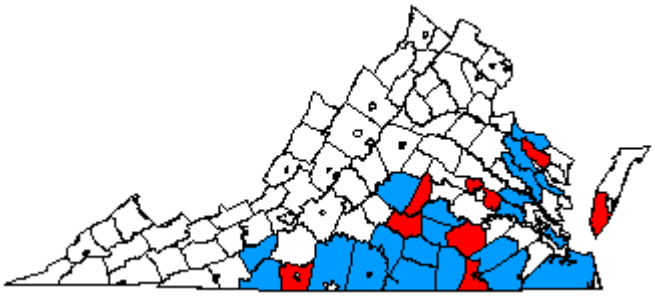
This map is in the default color scheme, so red indicates injury mortality rates at the 90th percentile and above and blue indicates injury mortality rates between the 75th and 90th percentiles. Zooming into the west and showing the major highways (see map below) provides more detail.

Zoom of National Map, Motor Vehicle, Traffic-Related, 1989-1998



The red and blue appear concentrated mostly in areas distant from capital cities and major highways, suggesting the areas with high motor vehicle (traffic-related) mortality rates may be rural. For more detailed information, a person could zoom in further or create maps for each state of interest.

Sample Map: Virginia Counties Homicide, 1989-1998



In the sample map of homicide in Virginia counties, 1989-1998 above, the default color scheme shows a spatial concentration of high homicide mortality rates in southern and southeastern Virginia. One might be interested to see if these spatial trends continue into neighboring states.

About the Application Development

Injury Maps was developed with two software products offered by MapInfo® Corporation: MapInfo Professional®, the mapping tool, and Map Xtreme®, the mapping server and application development software. CDC's Injury Center used MapInfo Professional® to create maps for *Injury Mortality Atlas of the U.S.* and currently uses it to create maps for the *State Injury Profiles*, so using it to design the maps for the web application provides visual consistency between the print documents and the web maps. CDC's Injury Center contracted with MapInfo developers to code the web application. The CDC web team helped refine the interface, tested the application, and developed the help file. The application requires minimum maintenance, such as occasional software upgrades and periodic updates to the data. [For more information about Injury Maps, visit the application at www.cdc.gov/ncipc/maps or contact CDC's Injury Center at ohcinfo@cdc.gov]

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Using GIS to Map Campylobacter Notifications in South Australia

Charlotte Morgan, Flinders University
Lecturer in GIS
School of Geography, Population and Environmental Management

This report describes the identification and interpretation of spatial patterns in South Australian Campylobacter notification data. In this work, a GIS was used to map the distribution of Campylobacter cases notified in metropolitan Adelaide, successfully integrating the results of surface mapping and space-time cluster analysis. Interpretation of the results shows how mapped patterns of Campylobacter infection, even though supported by the presence of statistically significant clusters, need to be interpreted carefully, with attention paid to the original data quality.

In South Australia, notification rates of Campylobacter infection (a gastrointestinal illness) increased during the late 1980s and continue to increase today. Despite high numbers of cases, health authorities have experienced some difficulty finding patterns in the data. The aim of this project was to look for spatial and temporal patterns in the surveillance data and try to find outbreaks. While outbreaks (two or more related cases) are relatively rare compared to sporadic cases, finding them was expected to lead to a better understanding of this infection.

The project was undertaken in two distinct parts. Firstly the aspatial analysis considered notification rates and timing and made use of all the data for South Australia. The second part used spatial analysis to concentrate on the distribution of cases in space and time, and was restricted to cases geocoded in the metropolitan area. South Australia is the most urbanised state in Australia, with almost 75 percent of its 1.5 million people living in the Adelaide metropolitan area. Spatial analysis of the metropolitan cases included the calculation of annual notification rate surfaces using a kernel density estimator (CrimeStat), and the evaluation of apparent hot and cold spots with a space-time scan statistic (SaTScan). This analysis assumes that place of residence contributes significantly to the epidemiology of this infection.

The project data consist of over 21000 Campylobacter cases notified in South Australia between 1990 and 1999. Each case record is attributed with age, gender, timing of onset and residential address. For the aspatial analysis, the data were divided into two age groups: children (0 - 14 years) and adults (15 years and over) according to a bimodal distribution in the number of cases over 10 years. Age and gender specific annual and monthly notification rates were then calculated comparing the number of cases in the group to the population for the same group and expressed as a rate per 100 000. A time series of monthly notification rates for each age group was then decomposed into its component parts to highlight the long-term trend, seasonal cycles and random fluctuations. Throughout this aspatial analysis, any apparent differences in rates and timing were quantified using log linear modelling.

Results of aspatial analysis show that Campylobacter notification rates have increased during the 1990s. Crude rates increased from 63.8 per 100 000 in 1990 to 156.9 per 100 000 in 1999, peaking at a rate of 189.1 per 100 000 in 1995. Log linear modelling of variable interactions in the case data found that children's notification rates were significantly higher ($p = 0.05$) than adult rates. However, the only significant differences involving gender occurred in children where male rates were significantly higher than female rates ($t = 11.7$, $p = 0.05$). No significant gender difference was found in adult rates ($t = 2.7$, $p = 0.05$). Temporal analysis highlighted a strong seasonality in notification rates for both age groups and the presence of significant random fluctuations. Seasonally, rates are highest in winter/spring and at their lowest in late summer. Log linear modelling confirmed the significance of random rate fluctuations. The similarity between long term temporal patterns in both adults' and children's rates suggest that the same factors may control incidence in both age groups. The seasonality in rates implies an environmental control on timing of infection while age and gender differences in rates could result from differences in behaviour affecting exposure of individuals to campylobacters in the environment.

Having identified the major features of the data through aspatial analysis and confirmed their importance through log linear modelling, the second phase of the project used spatial analysis to map the distribution of cases in space and time. Campylobacter cases reporting a residential address in the Adelaide metropolitan area were geocoded using ArcView software, and then aggregated to collection district centroids. Population censuses in Australia are collected every 5 years and

collection districts are the smallest levels of data aggregation. The aggregated case data were then used to calculate annual rate surfaces for each age group. Surfaces were calculated as the log ratio of the density of cases to the density of the 1996 population, and then standardised to make them comparable with each other. Density ratios were calculated with CrimeStat v1.1 (see site http://www.icpsr.umich.edu/NACJD/crimestat.html) using a quartic adaptive kernel and an adaptive bandwidth. For data aggregated to collection district centroids, an adaptive bandwidth of 100 points produced rate surfaces most similar to global rates for the metropolitan area. Space-time cluster analysis using SaTScan v2.1 (see http://srab.cancer.gov/satscan), tested for the random distribution of cases in space and time, and identified clusters of significantly high and low notification rates. The space-time scan statistic takes population distribution into consideration and applied a temporal correction for long-term changes in rates.

This spatial analysis used GIS to map variations in the distribution of cases over time and compare them to the location of statistically significant clusters. In general, there appears to be good agreement between the mapped variability in notifications and the location of significant clusters. Two rate surfaces, 1992 for children (Figure 1) and 1996 for adults (Figure 2) demonstrate this agreement between areas of high rates and the location of statistically significant cluster centres. Both surfaces show considerable rate variation from areas with values more than 2 standard deviations below the mean to areas with values more than 2 standard deviations above the mean. Superimposed on each surface are the locations of statistically significant cluster centres. The circle around each centre shows the extent of the cluster. Collection district centroids falling inside the circle are included in the cluster. Clusters that do not have a date are purely spatial clusters- this means that they are relevant throughout the time period. Space-time clusters include a date label, which shows the duration of the cluster. For example, the small cluster of high rates for children in June 1992 coincides with high rates in the 1992 surface (Figure 1). Similarly, in Figure 2 the cluster centre of high rates (8.96 - 7.97) also coincides with areas where adult notification rates were more than 2 standard deviations above the mean in 1996.

Before we get too excited about interpreting these patterns we need to think about data quality. There are two obvious problems; the population changed between census dates and not all the metropolitan cases could be geocoded. To investigate the problem of changing population, population growth between the 1991 and 1996 census years was modelled by calculating the log ratio of the population density in 1996 to the population density in 1991. Population growth surfaces clearly showed areas where the population density either increased or decreased between 1991 and 1996. Unfortunately, some of the areas which experienced substantial growth also coincide with the location of space-time clusters, suggesting than the change in population density may have affected the results, and should be taken into consideration in the interpretation of rate surfaces and coincident cluster locations.

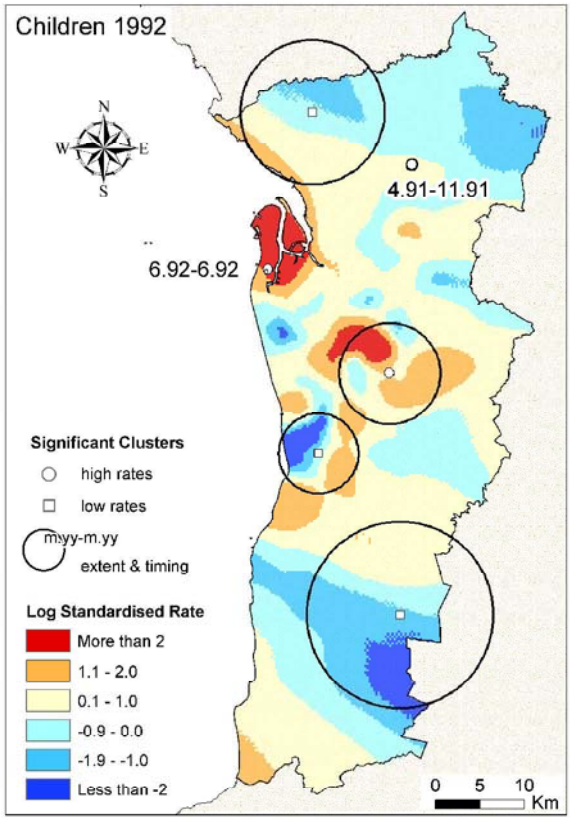

Fig. 1 *Campylobacter notification rates for children (0-14 years) in metropolitan Adelaide during 1992; based on data aggregated to 1996 collection district centroids*

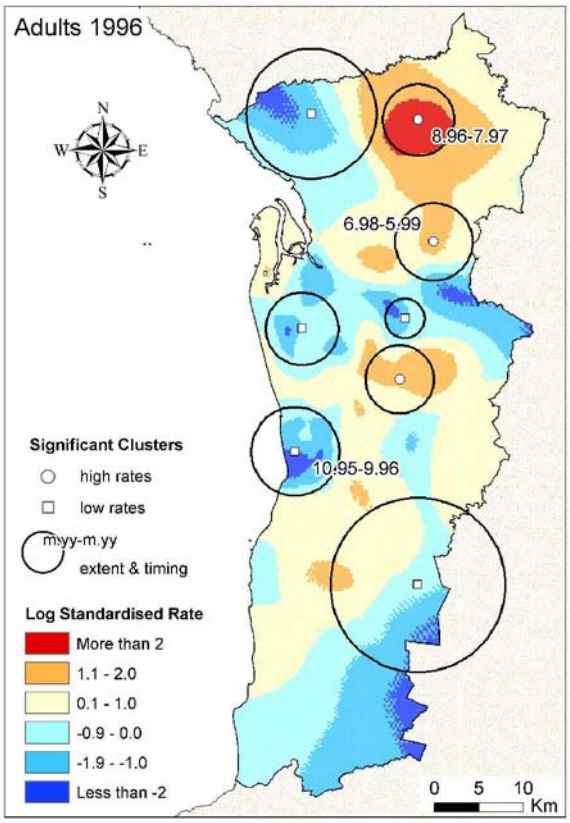

Figure 2 Campylobacter notification rates for adults (15 years and over) in metropolitan Adelaide during 1996; based on data aggregated to 1996 collection district centroids.

Using a geographically weighted regression, it can be demonstrated that in most places the change in population density does not explain the change in case density, suggesting that high rates are real and not an artefact of population change. However, in some areas the change in case density can be explained by the change in population density, implying that cluster centres in these areas such as the cluster of high adult rates (8.96 - 7.97) should be discounted.

In an attempt to address the second problem, the metropolitan case data were remapped at a coarser scale of census data aggregation. The cases were assigned to postcode centroids on the basis of their residential address, removing any geocoding error. In general, surfaces at this scale were much smoother, fewer cluster centres were identified and there was less agreement between rate surfaces and cluster locations. It appears that at this scale the rate surfaces were over smoothed and important variations lost. However, significant cluster centres found at postcode scale do coincide with the significant clusters identified at collection district scale. This implies that the spatial scan statistic is still relevant to the analysis of more highly aggregated data, and that the potential error caused by poor geocoding is of little importance to the recognition of large scale patterns in the data. In both adults and children, significant purely spatial clusters occur in the inner eastern suburbs while localised, though not always significant, space-time clusters occur through out the metropolitan area. The presence of purely spatial clusters of high rates in the inner eastern suburbs, an area of relatively high socio-economic status, suggests that a social bias exists in the notification data.

Attempts to combine the spatial and aspatial findings highlighted the fact that, in general, the significant space-time clusters do not correspond with either the seasonal or random components of the smoothed time series. The lack of coincidence between spatial and aspatial findings suggests that few of the significant random rate fluctuations are spatial clusters. Consequently, outbreaks of Campylobacter infection in South Australia may be temporally defined but spatially diffuse, appearing as significant high monthly rates and not necessarily as significant space-time clusters.

This work has not only led to a better understanding of Campylobacter infections, it also shows that although we may not want to be data-driven in our research, that responding to the data can be productive. The bimodal approach to age classification taken here is different from that of traditional epidemiological practice but has been shown to be relevant in this case. This work also shows that mapped patterns, even if supported by statistics, need to be interpreted very carefully, taking into consideration the quality of the source data. [Contact: Charlotte Morgan at email charlotte.morgan@flinders.edu.au]

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Conversation on Geographic Weighted Regression

[**Editor**: The spatial-statistical analytical technique of geographically weighted regression was presented in the January 2003 edition of *Public Health GIS News and Information*, in the announcement of Dr. Stewart

Fotheringham's (with Charlton and Brunsdon) new book Geographically Weighted Regression: The Analysis of Spatially Varying Relationships (J. Wiley & Sons, Inc.). It prompted an informative and excellent discussion between Stewart and Dr. Glen Johnson, New York State Cancer Registry, Bureau of Chronic Disease Epidemiology and Surveillance, New York State Department of Health. Appreciation is extended to both Glen and Stewart who have given their kind permission to reprint this conversation].

Glen: I've looked "a little bit" into this Geographic Weighted Regression methodology developed by Stewart Fotheringham, and it seems like something quite valuable. It is not just a way to incorporate spatial autocorrelation into the error in order to reduce bias in the variance estimates. Rather, it appears to allow spatially varying estimates of the linear regression coefficients themselves. This is not done by simply including a dummy variable for location, but applies weighted regression using weights defining the strength of association between each location (for which a linear coefficient is desired) and the actual data points. A result can be a map of regression coefficient ranges, thus showing how the association between a response and a predictor varies over space, after adjusting for the other predictors in the model. It shows how even the sign of a regression coefficient can change over space. This not only brings out much more information about the association between a response and a predictor, but I would expect it to also provide much more accurate predictions of the response variable (if this were one's interest, as with kriging). The only immediate concern I foresee is the impact of losing many degrees of freedom by allowing so many parameters in the model; however, bear in mind that I have not yet looked into this with much depth.

Stewart: I am happy to try to answer any specific questions anyone has about the technique because I think it could be of some use in the spatial analysis of health-related data; indeed, one of our earliest applications concerned spatial variations in 'health-wealth' relationships, which proved quite insightful. In the meantime, may I offer the following general comments (primarily in response to Glen's points):

1. Glen is correct in that the primary impetus for developing GWR was to investigate the existence of spatial non-stationarity in relationships previously examined with typical global regression models. GWR allows the estimation of local parameter estimates (and also local standard errors, local t values, local leverage values, local goodness-of-fit statistics etc), which can usefully be mapped to depict spatial variation in the measured relationships.
2. Statistical tests are available to assess the level of spatial non-stationarity and to separate that which results from sampling variation from that which might be caused by a substantive change in the nature of the relationship being measured.
3. In our recent book on GWR, we offer the following analogy, which I think, helps to understand the essence of GWR. We are typically not happy with global descriptive statistics (such as an average daily temperature for the US or a statistic describing some characteristic of a point pattern averaged across a study area); why then should we be happy with global measures of relationships (such as are provided by global regression models)? Standard regression models applied to spatial data present averages of local relationships which might disguise some useful information on the way measured local relationships vary.
4. How we interpret local variations in relationships is somewhat dependent upon our point of view. In many cases I suspect that spatial non-stationarity in regression relationships is symptomatic of model misspecification. The spatial distribution of an estimated parameter might provide some useful clues as to what this misspecification might be or it might be a very useful way of incorporating something that is otherwise unmeasurable and would otherwise end up in an error term. In some cases, however, the spatial variation in local parameter estimates might reflect substantive variations in a relationship that is being measured-something varies due to the intrinsic variations in localities.
5. A serendipitous outcome of local modeling such as GWR is that the error terms from the model exhibit much lower (and often insignificant amounts of) spatial autocorrelation. At the same time, as Glen hypothesized correctly, the fit of the model is much better. Of course, one would expect the latter given the increase in the number of parameter estimates but even accounting for the increase, as with say an Akaike IC, the fit is generally better. Our book gives the formula for calculating the number of parameters in a GWR model and also the degrees of freedom.
6. There is user-friendly windows-based software that

does all of this automatically. If anyone is interested, please contact me for further details or check the GWR web site http://www.ncl.ac.uk/geography/GWR. Hope this helps a little.

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V. Related Census, HHS, FGDC and Other Federal Developments

Federal Geographic Data Committee (FGDC)

[The Federal Geographic Data Committee (FGDC) is an interagency committee, organized in 1990 under OMB Circular A-16, that promotes the coordinated use, sharing, and dissemination of geospatial data on a national basis. The FGDC is composed of representatives from seventeen Cabinet level and independent federal agencies. The FGDC coordinates the development of the National Spatial Data Infrastructure (NSDI). The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data. The 17 federal agencies that make up the FGDC, including HHS, are developing the NSDI in cooperation with organizations from state, local and tribal governments, the academic community, and the private sector. See http://www.fgdc.gov]

Update: Census Bureau's American Community Survey

As an experiment requested by the Congress, the Census Bureau will conduct the American Community Survey beginning on March 1 as a voluntary survey. The monthly survey will continue to be voluntary for at least three months and possibly longer, depending on funding.

The Census Bureau has worked closely with Congress to design a test that will gauge the impact on data quality and costs. We expect costs to increase when the survey is voluntary, rather than mandatory. The American Community Survey is designed to replace the census long form in 2010. The census is mandatory. The Census Bureau will monitor and assess closely survey expenses and response rates. It does not plan to conduct the survey on a voluntary basis indefinitely.

Change profiles from the Census 2000 Supplementary Survey and 2001 Supplementary Survey, the national test of the ACS program currently under way in 1,239 counties nationwide, confirm anecdotal evidence of a statistically significant rise in the median value of single-family homes in the New York City Primary Metropolitan Statistical Area (PMSA)-from $224,334 to $242,811. That kind of information is a forerunner of the wealth of data on housing topics that policymakers will have once the American Community Survey is fully implemented.

Information collected on housing and homeownership for different population groups gives policymakers a "heads up" on the effectiveness of housing programs, and helps identify the kinds of services-such as financing, repair, or renovation-that homeowners might need.

Homeownership is the traditional indicator of community stability. High rates of homeownership are often synonymous with access to good schools, health care, and emergency and other services that attract long-term capital investment and growth. Tables produced as data products from the American Community Survey program showing homeownership as it relates to other characteristics of households (such as the average age, income, or number of vehicles owned per household) reveal important trends in household mobility. Using this kind of information, Fulton County, PA, an ACS test site, was able to demonstrate a need for, and fund, a mobile medical van to serve homebound elderly populations.

Federal policymakers will use data from the ACS to manage a variety of programs relating to housing and community development. A recent report commissioned by the U.S. Department of Housing and Urban Development (HUD) identified a number of ways the ACS could improve housing programs sponsored by that agency and concluded: "Despite the differences between the ACS and the long form and the adjustments HUD will have to make to use ACS data, the Department and its clients will be better off with more current data than the long form can provide." [See: http://www.huduser.org/publications/pdf/ACS_FINAL_REPORT.pdf]

What kind of HUD programs will benefit from these data? One example is the Worst Case Needs report, which identifies areas with severe housing problems, especially excessive rent burden. Additional data from the ACS will allow HUD to "expand its discussion of severe housing problems to the State, metropolitan, and jurisdiction levels." Building strong communities is a commitment at all levels of government. Current data from the American Community Survey can contribute significantly to achieving this goal. [Source: American Community Survey Alert Number 10, February 20, 2003; Contact: Elaine Quesinberry, Census Bureau at elaine.v.quesinberry@census.gov]

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Geospatial One-Stop Geographic Information Framework Data Content Standards-Governmental Unit Boundary Data Exchange Standard, Draft January/2003 [Completed and available for review at http://www.census.gov/geo/www/standards/index.html]

The purpose of the Geographic Information Framework

Data Content Standards-Governmental Unit Boundary Exchange Standard is to establish the content requirements for the collection and interchange of governmental unit (GU) and other legal entity boundary data and to facilitate the maintenance and use of that information. This Standard identifies and defines terminology, encoding scheme, and the data components required for describing the GU or other legal entity and its boundary, along with the metadata needed for boundary data exchange. This standard is applicable to all generally recognized GUs and other legal entities, organization-recognized GUs, and other geographic areas. This Standard adopts the ANSI X3.31 (Federal Information Processing Standard (FIPS) Publication 55-3) description of a GU as,

A legally bounded geographic entity that has the ability to have elected or appointed officials and raise revenues through taxes.

In addition, the Standard accommodates other legal entities and adopts the ANSI X3.31 (FIPS Publication 55-3) description for such entities. Thus, this Standard defines a legal entity as,

A geographic unit with legally defined boundaries established under federal, state, tribal, or local law as a governmental unit or as an area for the administration of some governmental function.

This standard also applies to entities that are statistically equivalent to a legal entity for data reporting purposes, e.g. incorporated places that are independent of counties and serve as equivalent to a county. GUs and other legal entities recognized by this Standard are defined in Annex E (normative). Principles described in this standard may be extended to other geographic entities to facilitate the exchange of boundary data, such as those listed in Annex F (informative).

The Standard specifies the content and its organization necessary for the successful interchange of GU or other legal entity boundary data. The Standard does not specify a particular structure for interchange of boundary data. Further, data producers and users may structure GU or other legal entity boundary data in any format for their internal use.

Web Site(s) of Interest for this Edition

http://www.cancer.org/docroot/STT/stt_0.asp **American Cancer Society (ACS)** tracks cancer occurrence, including the number of deaths, cases, and how long people survive after diagnosis. ACS also tracks data regarding behaviors that influence the risk of developing cancer and the use of screening tests. The annual **"Report to the Nation on the Status of Cancer"**, produced by the ACS, CDC, NCI and the North American Association of Central Cancer Registries will be published in the May 15 edition of the journal *Cancer*. It is very important to note that the incidence and mortality data in the 2003 report will be age-adjusted to the 2000 population standard of the United States. This change in method will affect the comparability of the new report's data with that of previous years. The new approach will result in some dramatic changes in the rates of cancer incidence and mortality, rates at different ages, magnitude of improvement in cancer, and racial and ethnic differences.

http://www.thedataweb.org **TheDataWeb and Data Ferrett**.is a newly revised Census product that provides easy access to a network of online data libraries where data can be integrated for basic statistical and GIS analysis (in development). Data can be accessed on: census, economic, health, income and unemployment, population, labor, cancer, crime and transportation, family dynamics, and vital statistics. As a participant in TheDataWeb you can publish your data to TheDataWeb and, in turn, benefit as a provider to the consumer of data.

http://www.census.gov. **State & County QuickFacts**. Quick, easy access to facts about people, business, and geography. This site is loaded with census information that can be mapped thematically to national, state and county levels, in either color or grey scale. Now you can map many key census variables in a matter of seconds. Improvements to the site may include a layer of geography below the county level.

http://www.healtheffects.org The **Health Effects Institute** (HEI) is an independent, nonprofit corporation chartered in 1980 to provide high-quality, impartial, and relevant science on the health effects of pollutants from motor vehicles and from other sources in the environment. Supported jointly by the U.S. Environmental Protection Agency (EPA) and industry, HEI has funded over 170 studies and published over 100 Research Reports, and several Special Reports, producing important research findings on the health effects of a

variety of pollutants, including carbon monoxide, methanol and aldehydes, nitrogen oxides, diesel exhaust, ozone, and most recently, particulate air pollution. HEI has also been called upon periodically to produce special reports reviewing an entire area of scientific literature on topics such as the health effects of asbestos, diesel exhaust, and oxygenates in fuel.

http://multilevel.ioe.ac.uk/team/index.html The Centre for Multilevel Modelling has been funded since 1987 by the Economic and Social Research Council (ESRC). Its aims include **the development of statistical models for the analysis of hierarchically structured data**, training in the use of such models, and the provision of appropriate software. It collaborates with researchers in a number of substantive disciplines, including education, epidemiology, geography, economics and demography, runs workshops and publishes a newsletter. *MLwiN* is a software package for fitting multilevel models [See: http://multilevel.ioe.ac.uk/features/index.html]

http://www.csiss.org/clearinghouse/index.php3 **Center for Spatially Integrated Social Science (CSISS)**. The CSISS Tools Clearinghouse is an ongoing program to develop a collection of links to spatial data analysis software, as well as links to information about tools for spatial analysis. The development of these tools is a lively research area and the goal of the clearinghouse is to provide up-to-date information on work carried out by others, as well as by the CSISS project staff. The Clearinghouse consists of three main facilities: a search engine, a collection of links to portals, and a collection of links to selected tools.

The **Spatial Tools Search Engine** provides and indexed collection of over 700 (and growing) URLs related to spatial analysis methods and software tools. Due to its specialized indexing, it is designed to be more effective in locating useful sources than a generic search engine.

The **Links to Portals** is a collection of URLs to portal sites that deal with spatial data analysis and issues related to spatial analysis. These portals provide an ideal entry into a vast number of sites, organized by type of analysis or type of software.

The **Select Tools Links** consist of specific URLs of sites that provide spatial analysis software packages, scripts, code and other useful tools. These have been checked by CSISS staff, and, while their inclusion here does not constitute an endorsement, many have been used in the development of course materials and exercises. The sites include commercial vendors, as well as non-profit operations, academics and individuals. The ***CSISS Tools Clearinghouse*** is intended to grow into a robust collection of spatial analysis software, software links, and links to information about tools for spatial analysis.

http://www.sas.com/products/gis SAS/GIS software provides an interactive Geographic Information System (GIS) within the SAS System. This software also enables you to do more than simply view data in its spatial context. It allows you to interact with data by selecting features and performing actions based on those selections. SAS/GIS software draws on computing capabilities of the SAS System and enables you to access, manage, analyze, and present your data.

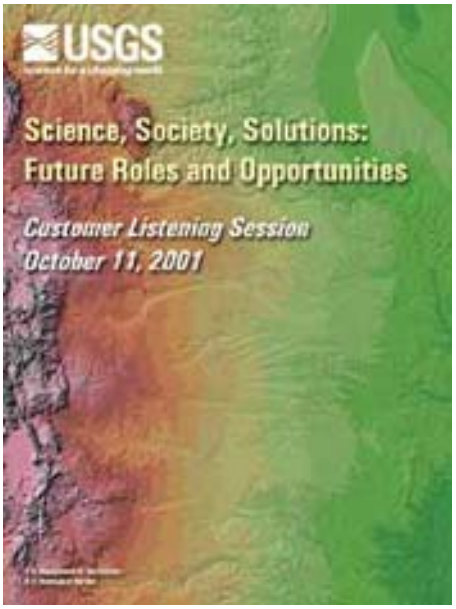
http://www.geoplace.com/pressrelease/detail.asp?id=4296 **ESRI Announces Grant Program to Support UN's Efforts to Improve Quality of Life for Urban Poor**. The goal of the grant program is to provide GIS technology and training for up to 1,000 cities in the least-developed countries so they can participate in the collection of urban indicator information and improve both city management and the lives of urban citizens. These indicators are the foundation for the Global Urban Observatory. The data will be analyzed in support of the Millennium Declaration goal, adopted by the General Assembly of the United Nations in 2000, to improve the lives of 100 million slum dwellers by the year 2020. This declaration is closely related to UN-HABITAT's Goal 7, Target 11, which states a similar purpose.

http://www.sanantonio.gov/ProjectWORTH/br2001/?res=800&ver=true Project WORTH. Interactive map of 1999-2001 birth rates for females 15-17 years old by Census Tract, Bexar County, TX. See full Teen Pregnancy Report by JP Realini and J Berlanga, San Antonio Metropolitan Health District, Bexar County, February, 2003, at http://www.sanantonio.gov/ProjectWORTH/report2001/index.asp.

Final Thoughts

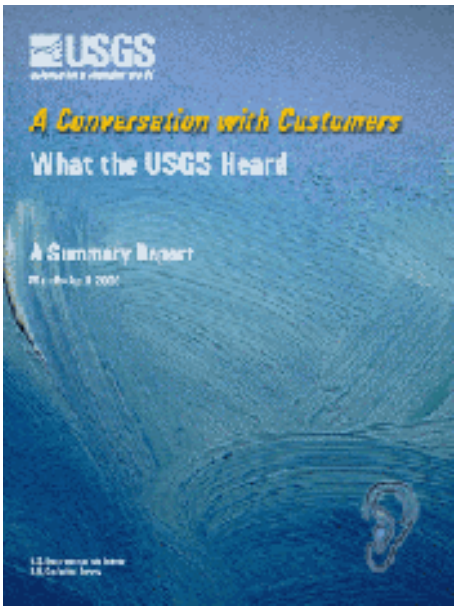
USGS "Customer Listening Sessions"
Public Health-Public Safety-Public Prosperity: The Role of Public Science

It is not often that government institutions formally "open the doors" to listen to their external customers, partners, and collaborators to improve upon their mission and services. In fact, the U.S.Geological Survey (USGS), U.S. Department of the Interior (DOI), may be conducting the only institutional Customer Listening Sessions (CLS) of record. Under the direction of USGS Director Charles G. "Chip" Groat, and assisted by his leadership team, the third in a series of CLS recently convened January 29-30, 2003, in Washington D.C. This was my first opportunity to attend.



The first CLS was conducted in March of 2000 and the second in October 2001. Both CLS session reports are publicly available at http://www.usgs.gov/customer/conversation. In several months or so the 2003 session report will be finalized and posted. I bring these to our attention because they provide the blueprint for a very effective approach to gain insight and guidance from the constituents USGS serves. In my limited experience with web surveys, I don't think that particular vehicle can provide the same results as the CLS. USGS essentially has engaged a very representative portion of their users in a robust and dedicated two days of listening and facilitated discussion. I thought the communication structure and flow was excellent between all parties. It generated ideas and interactions that could never have arisen from an electronic survey. I see why Director Groat considers these sessions to be important to help USGS best perform the role of a science agency and meet the Nation's needs in addressing pressing issues. The 2003 CLS panel discussion questions were framed around issues of public health, public safety and public prosperity.

The key questions guiding the Public Health session (my focus) were: How can natural and earth science information in its many forms best be brought into the public realm and serve as a foundation for informed policy decisions? On what issues is the science of the USGS most needed? What is the role of the USGS as a translator of its scientific information to address public health needs? Oral summary statements were limited to five minutes. I provided testimony as did colleagues from the American Farm Bureau Federation, Association of Public Health Laboratories, Association of State and Interstate Water Pollution Control Administrators, National Institute of Environmental Health Sciences, USDA's Agricultural Research Service, EPA's Office of Prevention, Pesticides & Toxic Substances, EPA's Office of Wetlands, Oceans and Watersheds, and Water Environment Federation.



In our session, there were discussions on the importance of environmental exposure and toxicity databases, the need to develop remote sensing data sets for land cover and land use for sampling purposes, the need to predict changes in terrestrial and biological habitats for risk assessment, improving monitoring models for water quality standards, the issue of genetically modified crops and livestock, emerging contaminant pollutants in water, and other topics. It was acceptable that discussions sometimes went beyond public health such as issues of scientific data versus regulatory data needs, the life cycle of data, barriers to seamless geospatial data integration, leadership versus concensus, the need to more clearly define USGS mission oriented objectives, the need to continue to build partnerships, the need to prioritize given scarce resources (for example, weigh the benefits and costs to

public health regarding sampling of source drinking water or treated water that is consumed), and others. Discussions by USGS and DOI staff on new cost-recovery guidance for USGS partnerships and the new Department of Interior's Unified Strategic Plan were included, and made for a robust agenda.

For my part, I was pleased to enter into the record the Memorandum of Understanding, "Integrating Human Health Statistics and Earth Science Information," enacted between the National Center for Health Statistics (NCHS), CDC, and USGS in 1992. It was a defining moment for USGS geographer David Wolf (now at EPA) and myself to have crafted this formal partnership between our respective agencies. It has facilitated many scientific exchanges between USGS and CDC, and remains active today. I won't speak to all of my comments but I do think it important that state and local public health departments be considered among the most important beneficiaries to the rich and varied USGS environmental and earth science geospatial databases.

It was a very satisfying experience to be part of the 2003 USGS CLS program. As the word spreads, I hope there will be other public health agency participation in the future. I believe partnering between public health science and environmental and earth science could not be more timely. Many of you may be interested in the forthcoming April 1-3, 2003 USGS sponsored conference "Natural Science and Public Health: Prescription for a Better Environment" (see http://health.usgs.gov/health2003.html) which aims to: (1) provide scientific presentations of current USGS research on links between environmental quality and human health, and to discuss implications of environmental research for National Security; (2) identify linkages, causalities, and promising next steps for USGS health-related research through the synergy of exchange; (3) promote the establishment of additional collaborations between the USGS and human health community; and (4) discuss new and proposed standards for ground water, surface water, and air quality.

I applaud USGS Director Groat for his vision to create the CLS venue and to see its valued recurrence through time. In my opinion, it is an excellent model for institutional and customer dialogue. Congratulations for a job well done are extended to USGS and the Leadership Team of Barbara Ryan (Associate Director for Geography), Karen Siderelis (Associate Director for Information and Geographic Information Officer), Susan Haseltine (Acting Associate Director for Biology), Robert Hirsch (Associate Director for Water); Patrick Leahy (Associate Director for Geology) and staffers Gail Bingham (Moderator) and Gail Wendt (Office of Communications).

Charles M. Croner, PhD, Geographer and Survey Statistician, and Editor, *Public Health GIS News and Information*, Office of Research and Methodology, National Center for Health Statistics, and DHHS Representative, Federal Geographic Data Committee, at cmc2@cdc.gov. Celebrating our 51st edition with continuous reporting since 1994.

The NCHS GIS home page contains current GIS events, archived GIS reports and other GIS links
http://www.cdc.gov/nchs/gis.htm
Please join us April 17: NCHS Cartography and GIS Guest Lecture Series