PUBLIC HEALTH GISNEWS AND INFORMATION

January 2004 (No. 56)

Dedicated to CDC/ATSDR Scientific Excellence and Advancement

(Disease, Injury and Disability Control and Prevention, and Occupational Safety) using GIS

I. Public Health GIS (and related) Events:

SPECIAL NCHS/CDC/ATSDR GIS LECTURES

REMINDER: January 13, 2004. **"The DC Atlas: Online Geospatial Functionality for Government and Citizens"**, presentation by Vicki DeFries, GIS Director, District of Columbia's Office of the Chief Technology Office, Washington D.C. See **abstract** this edition. Please join us for this NCHS Cartography and GIS Guest Lecture Series to be held at NCHS in RM1406, from **2:00-3:30PM**, Hyattsville, MD; **February** lecture (Date TBA)- **"Dynamic Choropleth Maps on the Internet"**, by William Smith, US EPA. The NCHS GIS Guest Lecture Series has been presented continuously since 1988. Envision is available to offsite CDC/ATSDR locations; Web access will be available on the Internet but only at the time of this presentation. Please contact me if you did not receive the URL. 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 and calendar]

* CDC's 8th National Symposium on Biosafety, "Biosafety and Biosecurity: A New Era in Laboratory Science," January 24-28, 2004, Atlanta [Contact: Shanna Nesby at (404) 639-4477]

* 2nd UK National Crime Mapping Conference, March 9-10, 2004, London {See: http://www.jdi.ucl.ac.uk]

* Capital Science 2004, Washington Academy of Sciences, March 20-21, 2004, Alexandria VA [See: http://www.washacadsci.org/Website/Index.htm]

* 2004 Environmental Health Tracking Conference: Many Voices-One Vision, CDC, March 24-26, 2004, Philadelphia PA [See conference website at location: http://www.cdc.gov/nceh/tracking]

* 2004 MidAmerica GIS Symposium, April 18-22, 2004, Kansas City MO [See: http://magicweb.kgs.ku.edu]

* Scientific Approaches to Youth Violence Prevention, New York Academy of Sciences, April 24-26, 2004, New York NY [See: http://www.nyas.org]

* 2nd National Steps to a HealthierUS Summit, Department of Health and Human Services, April 29–30, 2004, Baltimore MD [See summit web location site at: http://www.healthierus.gov/steps/summit.html]

* EPA Science Forum 2004: Human Health and Environmental Solutions for States, June 1-3, 2004, Washington DC [http://www.epa.gov/ord/scienceforum]

* Optimization Conference: Accelerating Site Closeout-Improving Performance-Reducing Costs, US EPA, June 15-17, 2004, Dallas TX [See conference website http://clu-in.org/siteopt/siteopt.htm]

* URISA 3rd Annual Public Participation GIS Conference, July 18-20, 2004, Madison, Wisconsin [See: http://www.urisa.org/ppgis.htm]

* CDC's National Center on Birth Defects and Developmental Disabilities conference- "Navigating the Future: Aligning Strategies and Science," July 26-28, 2004, Washington, DC. [See conference website at: http://www.cdc.gov/ncbddd/conference.htm]

II. GIS News

(Public Health GIS Users 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. **Maryland's Department of Health and Mental Hygiene, Baltimore**, won best paper award on Interactive Health Applications (IHA) at the Geomed 03 conference. Geomed 03 is an international conference showcasing the latest developments, research and accomplishments in the application of geo-spatial analysis techniques in public health. The paper emphasizes the relationship between GIS and public health and discusses major problems encountered by health care professionals in applying GIS to health applications such as extreme learning curve, cost, limitations and data management. Later on, IHA is introduced as a solution to these existing problems. Thirteen divisions within the health department currently use IHA. The ease of use encourages and promotes the idea of a complete GIS. The learning curve for IHA can be accomplished in hours as opposed to months. [Contact: Sam Allen, GIS Coordinator MDHMH, at AllenS@dhmh.state.md.us]

2. **Standard Emergency Map Symbols Available for Public Health GIS Users Review**: You are invited to review a standard set of map symbols. The symbols are intended for use by the emergency management and first responder communities at the national, State, local, and incident Levels.

The Federal Emergency Management Agency, now part of the Department of Homeland Security (DHS), began an initiative in 2001 to develop standard map symbols for use in emergency management mapping. The standard is intended primarily to help first responders and emergency managers at the incident and local levels. The resulting symbol set, when completed and endorsed as a standard, will support disaster response and homeland security efforts by reducing the confusion that can arise from unintuitive, ambiguous, and/or inconsistent use of map symbols.

These symbols were developed through the cooperation of a number of Federal government agencies and the National States Geographic Information Council under the auspices of the Federal Geographic Data Committee's Homeland Security Working Group. An eventual goal of this project is to have the symbols become an official standard through an accredited standards' organization.

The draft set of symbols are available for review by the community of intended users: emergency managers, first responders, and others involved in disaster, hazard, or incident mapping. The review period will conclude on January 31, 2004. After the review period, the comments will be compiled in a report and appropriate changes will be made to the symbols. We expect the report to be available in the early summer of 2004. There will likely be another period of public review as part of a formal standardization process.

Please provide comments using the web-based form at http://www.fgdc.gov/HSWG (case sensitive). The review takes about an hour to complete. [Contact: Scott McAfee, DHS, at scott.mcafee@dhs.gov]

3. **Quality Measures Page, American Community Survey (ACS)**: The ACS, U.S. Census Bureau, is designed to produce high quality survey data to meet the critical needs of data users. Data users must be aware, however, of potential limitations of ACS estimates in order to use them properly. Census recently unveiled a new section of the ACS Web site that provides four key measures of data quality: (1) Sample size: How large of a sample was used to produce the ACS estimates? (2) Response rates: What was the response to the survey? (3) Coverage rates: How well does the ACS cover the population? and (4) Item allocation rates: How complete were the data used to produce a specific estimate?

Please visit the ACS quality measures page at http://www.census.gov/acs/www/UseData/sse. It contains definitions of each of the quality measures listed above, which currently are available at the national and state levels for 2000, 2001 and 2002. The section will be updated as new ACS data are released. The Census Bureau encourages your feedback to assist in evaluating and revising the ACS Web site content. [Please contact: cmo.acs@census.gov]

4. Release of **Crime Mapping News** 5(4) Fall 2003. This issue, the last of 2003, summarizes and presents the work of the Crime Mapping Laboratory (CML) over the last several years. Articles include an overview of the CML, a list of all the products and reports produced by CML staff, a description of the recent Advanced Problem Analysis, Crime Analysis, and Crime Mapping training course, and recommendations made by the problem analysis training participants about what current crime analysts can do to advance problem analysis in their own

agencies. The following website contains this Fall edition [http://www.policefoundation.org/docs/tech_mapping.html].

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

5. (a) **Physical activity** has been identified as one of the Leading Health Indicators (LHI) in Healthy People 2010, the government's published health goals and objectives for the next decade. Physical inactivity contributes to 300,000 preventable deaths a year in the United States. Some 40% of deaths in the United States are caused by behavior patterns that could be modified. A sedentary lifestyle is a major risk factor across the spectrum of preventable diseases that lower the quality of life and kill Americans. [http://www.hhs.gov/news/newsletter/weekly 1(91), DEC 8-14, 2003]

(b) **2nd National *Steps to a HealthierUS* Summit**. You are invited to attend the 2nd national *Steps to a HealthierUS* summit, April 29-30, 2004, Baltimore MD. The April national summit will focus on chronic disease prevention and health promotion and will feature presentations on asthma, obesity, diabetes, heart disease and stroke, and cancer, as well as lifestyle choices, including nutrition, physical activity, and tobacco use. The *Steps* initiative is committed to bringing policymakers, the health, education, and business communities, and the public together to establish model programs and policies that foster healthy behavior changes, encourage healthier lifestyle choices, and reduce disparities in health care. [See calendar events, p. 1 this report]

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

6. The **Head Start** program is administered by the Head Start Bureau, the Administration on Children, Youth and Families (ACFY), Administration for Children and Families (ACF), DHHS. Grants are awarded by the ACF Regional Offices and the Head Start Bureau's American Indian and Migrant Program Branches directly to local public agencies, private non-profit and for-profit organizations, Indian Tribes and school systems for the purpose of operating Head Start programs at the community level.

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

7. The Agency for Healthcare Research and Quality (AHRQ) invites grant applications for **Building Evidence to Promote Bioterrorism and other Public Health Emergency Preparedness in Health Care Systems**. Areas of this grant with strong geospatial components include emergency preparedness of hospitals and health care systems for bioterrorism and other public health emergencies and information technology and emerging communication networks to improve the linkages between the personal health care system, emergency response networks and public health agencies. Applications are due January 14, 2004, 2005; and January 13, 2006.

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

8. ATSDR released its final public health consultation, an exposure investigation of **hydrogen sulfide** in the air, for the Warren Township site in Warren, Trumbull County, Ohio. ATSDR found that an "urgent public health hazard" exists, a conclusion for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful effects that require rapid intervention. Recommendations to alleviate Warren exposures are included in the report.

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

9. **The Mining Accident, Injury, and Illness Data Exploration Tools**, or MAIIDETS, is an interactive web site that allows the user to examine U.S. mining case reports. The Spokane Research Lab, NIOSH, CDC, has developed a set of tools for (beta application) accessing mine accident reports. Click on http://nbl7-146254.niosh.cdc.gov/maiidetsii/home.htm and explore the variety of ways of looking at the data. The data comes from the Mine Safety and Health Administration (MSHA) web site (http://www.msha.gov).

One can obtain lists of mines, their addresses, operating status, maps showing their locations, and data on their employment histories. One can search the accident, injury and illness data base by key words and produce lists of narrative descriptions of cases. Also, one can look at past mine disaster statistics, build datasets for exporting to other programs, create graphs and charts of case counts by state, for example, and produce lists of case incidence rates. This is not a comprehensive list.

An interesting aspect of the integrated GIS mapping, is that a user can create multiple on-the-fly queries, save as individual datasets and plot up to four spatial data layers at one time on the map. The ability to map calculated incidence rates thematically, based on a user's SQL query, is in development.

Eventually, we will hope to move an abbreviated version of the application to the Internet for mine safety officers, mine safety trainers, and MSHA inspectors to utililize. The major difference between this application and MSHA's application is that MAIIDETS can aggregate data and provide analysis tools to a user. MSHA provides data on a mine by mine basis, provides no analysis to speak of, and is limited in output capabilities. [Contacts: Ted Lowe at nbl7@cdc.gov or Patrick Coleman at pjc1@CDC.gov]

Centers for Medicare and Medicaid Services

http://cms.hhs.gov

10. Home Health Compare gives detailed information about **Medicare-certified home health agencies** that were certified as of January 2003. Readers may search for home health agencies by state, county or ZIP Code. Data are provided in tabular form but include addresses in the identifying information.

Food and Drug Administration

http://www.fda.gov

11. The Food and Drug Administration's (FDA) Food Advisory Committee (FAC) met in December to receive an update regarding the recommendations made during the July 2002 FAC regarding **fish consumption and methylmercury**. The revisions have resulted in the first unified FDA and EPA revised advisory concerning all fish and shellfish consumption for populations at risk from exposure to high mercury levels: pregnant women, nursing mothers, women who may become pregnant, and young children.

Health Resources and Services Administration

http://www.hrsa.gov

12. HRSA recently released **Teens in Our World: Understanding the Health of U.S. Youth in Comparison to Youth in Other Countries**, the first HRSA-supported overview of health and well-being among U.S. adolescents compared with European teens.

Indian Health Service

http://www.ihs.gov

13. **IHS and Nike** have signed a Memorandum of Understanding (MOU) to collaborate on the promotion of healthy lifestyles and healthy choices for all American Indians and Alaska Natives. The MOU is a voluntary collaboration between business and government that aims to dramatically increase the amount of health information available in American Indian and Alaska Native communities. The goal of the MOU is to help those communities gain a better understanding of the importance of exercise at any age, particularly for those individuals with diabetes.

National Institutes of Health

http://www.nih.gov

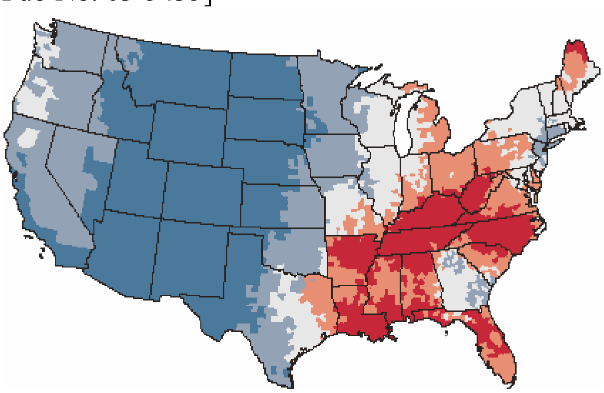
14. NIHannouncment **"Supplements for Methodological Innovations in the Behavioral and Social Sciences"** (http://grants.nih.gov/grants/guide/rfa-files/RFA-RM-04-013.html). The Institutes, Centers and Offices of NIH invite NIH-funded investigators to submit supplemental research grant applications to develop methodological innovations in the behavioral and social sciences. These modest supplements will support the addition of a methodological development component to already-funded NIH research projects. Methodology issues include research design, data collection techniques, measurement, and data analysis techniques in the social and behavioral sciences.

The goal of this RFA is to encourage methodological and technological innovation that will improve the quality and scientific power of data collected in the behavioral and social sciences. Development of methodology and technology for multidisciplinary, interdisciplinary, multimethod, and multilevel analytic approaches that integrate behavioral and social science research with biomedical research is particularly encouraged. [Letter of Intent Receipt Date: January 13, 2004, Application Receipt Date: February 13, 2004]

15. **NIH Roadmap Initiative**: Developed with input from more than 300 nationally recognized leaders in academia, industry, government and the public, the NIH Roadmap provides a framework of the strategic investments that NIH needs to make to optimize its entire research portfolio. The NIH Roadmap builds on the tremendous progress in medical research achieved, in

part, through the recent doubling of the NIH budget. In setting forth an ambitious vision for a more efficient and productive system of medical research, the NIH Roadmap focuses on the most compelling opportunities in three main areas: new pathways to discovery, research teams of the future and re-engineering the clinical research enterprise. Many new grant opportunities, such as RFA-MH-04-007 Interdisciplinary Health Research Training: Behavior, Environment and Biology, are becoming available. [See http://nihroadmap.nih.gov]

16. From Surveillance Research Program, NCI: **US Predicted Cancer Incidence, 1999: Complete Maps by County and State from Spatial Projection Models**. The results presented in this report are computed by a spatial projection model that predicts the number of cases in each county based on the sociodemographic and lifestyle profile for that county. The purpose is to present, for the first time, complete county and state maps and tables of rates and case counts for 1999 estimated by these new statistical models. From a national perspective, the maps included in the report allow examination of the geographic distribution of cancer incidence across the country and of the magnitude of differences among states. Estimates of the numbers of new cancer cases and rates expected in an area are useful for cancer surveillance, cancer control, health resource planning, and quality control activities. [See website at: http://srab.cancer.gov/incidence/monograph.html, NIH Pub No. 03-5435]



Smoothed predicted lung cancer incidence rates by county, 1999

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

17. SAMHSA's Center for Substance Abuse Prevention (CSAP) recently launched a national public education initiative called **"Too Smart to Start"**. Part of the Centers for Disease Control and Prevention's National Youth Media Campaign to Change Children's Health Behaviors, the initiative provides research-based materials and strategies that professionals and volunteers at the local level can use to educate their communities' children-and parents or other caregivers-about the dangers of underage drinking.

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. (a) **Health Status of American Indians Compared with Other Racial/Ethnic Minority Populations, Selected States, 2001-2002.** Despite overall declines in morbidity and mortality in the United States in recent years, a persistent gap in health status remains between American Indians (AIs) and non-Hispanic whites. This report compares the health status of AIs with that of other racial/ethnic minority populations by using data from a survey conducted during 2001-2002 in 21 communities through the Racial and Ethnic Approaches to Community Health (REACH) 2010 project. The results indicate that although AIs had a higher prevalence of chronic disease risk factors than other racial/ethnic minority populations, they also were more likely to use preventive services. Culturally sensitive primary prevention strategies to reduce risk factors and disease burden in AI communities should be developed and implemented. [Source: CDC's *MMWR*, November 28, 2003/52(47);1148-1152]

(b) **Diabetes Among Hispanics--Los Angeles County (LAC), California, 2002-2003**. This report summarizes the results of that analysis, which indicate that the prevalence of diabetes is approximately two times higher among Hispanics than among non-Hispanic whites and is strongly associated with living below poverty level. These findings underscore the need to provide additional diabetes prevention and treatment interventions for Hispanics in LAC, particularly those living in poverty. [Source: CDC's *MMWR*, November 28, 2003/52(47);1152-1155]

D. Other Related Agency or Business GIS News

19. Lockheed Martin: Lockheed Martin has been awarded a seven-year contract by the Centers for Disease Control and Prevention (CDC) to provide **enterprise-**

wide information technology solutions and services. The contract, valued at up to $465 million, will serve the Atlanta-based CDC and its sister organization, the Agency for Toxic Substances and Disease Registry (ATSDR). The company will provide applications development and related information technology support services for CDC headquarters and ATSDR, plus support CDC centers, institutes and offices, as well as employees located in 47 state health departments and overseas in 45 countries. [Contact: Ramon Olivero Lockheed Martin Information Technology, ramon.olivero@lmco.com]

20. AVTEX Inc. provides a GIS based **Emergency Alert Notification System** that is currently deployed in several hundred Mission Critical Government facilities including Emergency Management Agencies, Public Health Agencies (HAN Networks), Military, Nuclear, Emergency Management Agencies, the National Communications System (Homeland Security) and more.

The CityWatch Emergency Notification System platform incorporates the ESRI based MapObjects GIS software to enable users to target an alert notification to a specific Geographic Area of their city, county, or state. The system enables users to define virtually any geographic area on the GIS maps, select a data set (i.e. households/businesses/hospitals/emergency responders/ etc.), and quickly, accurately, and automatically send an alert notification to telephones, pagers, text devices, email, fax, TDD-TTY, wireless devices, and more. [Contact: Don Denman for a CityWatch powerpoint demo at ddenman@avtex.com]

21. NIMA now NGA: On Nov. 24, the President signed the fiscal 2004 Defense Authorization Bill, a provision of which authorized the National Imagery and Mapping Agency (NIMA) to formally change its name to the **National Geospatial-Intelligence Agency** (NGA). The new name is the latest step in a transformation process underway since NIMA inception in 1996 and to introduce a new geospatial intelligence discipline within the Intelligence Community. [Contact: NIMA Office of Corporate Relations at http://www.nima.mil]]

III. GIS Outreach

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

From **Julian Kardos**, University of Otago, Dunedin NZ: I am a PhD student studying ways to **visualize uncertainty when using socioeconomic data in GIS**. Uncertainty is present in all spatial systems, therefore expressing a measure of uncertainty can make GIS users aware that their data quality is not 100% accurate nor should firm decisions be made when utilizing such visualizations. In particular, I have created a new technique to visualize attribute and spatial uncertainty using the output from hierarchical structures. I have compiled a survey to assess this uncertainty technique and would appreciate if you could spend five to ten minutes of your time by going to website http://info-nts-05.otago.ac.nz/research/uncertainty/metaphor, completing the survey and helping to progress research in this imperative and timely aspect of GIS. [Contact: Julian at Julian at jkardos@infoscience.otago.ac.nz]

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From **Mike Hartzell**, Lt Col, USAF: I work in the Department of Defense's military healthcare system (MHS). The MHS is in the process of developing a web-based GIS which we expect to deploy sometime next year (2004). We are in the process of developing data layers which will be available to our users and one that we'd like to include is the locations of all **US civilian healthcare facilities** (clinics, hospitals, other). Is there an existing dataset of US healthcare facilities that includes a facility's latitude/longitude? [Contact: Mike, Director, Epidemiology, at michael.hartzell@tma.osd.mil]

IV. Public Health GIS Presentations and Literature

NCHS Cartography and GIS Guest Lecture Series

January 13, 2003. **"The DC Atlas: Online Geospatial Functionality for Government and Citizens"**, Vicki DeFries, GIS Director, District of Columbia's Office of the Chief Technology Office, Washington D.C. **Abstract**: State and local governments are key players in this new era of geospatial preparedness and response. Location-based information is a valuable asset to all agencies but it requires investment, planning and management. This past year, the District of Columbia successfully launched the **DC Atlas**, a web-based GIS Intranet tool for mapping and location-based information. It provides quick and easy access for employees to pooled and standardized geographic information, including crime and public safety, across the District's agencies. This Intranet GIS functionality will be extended this year to an Internet **DC Citizen Atlas**. The citizen atlas is an exciting development that will become a one-stop geospatial resource for the public. For example, a powerful search capacity will allow detailed (block level) online route determination. Many other data layers, including aerial photography, neighborhood characteristics, health advisories and related resources also will be accessible. And still to be unveiled is the innovative **Emergency Information Atlas** that will be the definitive source for public emergencies in the nation's capital. [Vicki at Vicki.defries@dc.gov]

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CDC's *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 The **December 2003** and **January 2004** editions are available on the web at [http://www.cdc.gov/ncidod/EID/index.htm]. Also, the February 2004 issue will include more than 40 articles on SARS origins, epidemiology, transmission, infection control, and laboratory and clinical studies. Readers may elect to view these articles online and ahead of print [http://www.cdc.gov/ncidod/EID/upcoming.htm].

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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 site http://www.cdc.gov/subscribe.html as well as access the MMWR online at http://www.cdc.gov/mmwr]: Vol. **52**, No. **49**: Revised U.S. Surveillance Case Definition for Severe Acute Respiratory Syndrome (SARS) and Update on SARS Cases; Tuberculosis Outbreak Among Homeless Persons; Inclusion of Official Counts of SARS-CoV Disease in National Notifiable Diseases Surveillance System Data Presentation; Vol. **52**, No. **47**: Health Status of American Indians Compared with Other Racial/Ethnic Minority Populations; Diabetes Among Hispanics; Call for Abstracts: International Conference on Emerging Infectious Diseases 2004; Vol. **52**, No. **45**- Tobacco Use Among Middle and High School Students, United States, 2002; First Human Death Associated with Raccoon Rabies, Virginia, 2003; Vol. **52**, No. **SS-8**- *State-Specific Prevalence of Selected Chronic Disease-Related Characteristics-Behavioral Risk Factor Surveillance System, 2001*; Vol. **52**, No. **43** Building Epidemiology Capacity; Prevalence of Selected Risk Factors for Chronic Disease; Assessment of the Epidemiologic Capacity in State and Territorial Health Departments; Terrorism Preparedness in State Health Departments.

Titles

- **Exploratory spatio-temporal visualization: an analytical review**, Andrienko N, Andrienko G, Gatalsky P, *J VisLang Comp* 14 (6): 503-541 DEC 2003;

- **Concepts and techniques of geographic information systems** (by Lo CP, Yeung AKW), Schiewe J (Book Review), *Int J Geogr Info Sci* 17 (8): 819-820 DEC 2003;

- **Local spatial data infrastructure, Trujillo-Peru**, Turkstra J, Amemiya N, Murgia J, *Hab Inter* 27 (4), 669-682 DEC 2003;

- **Using GIS (geographic information systems) to link older at-risk populations to community-based public health services**, Hirshorn B, Hirshorn B, Stewart J, *Gerontologist* 43: 344-344 Sp. Iss. 1 OCT 2003;

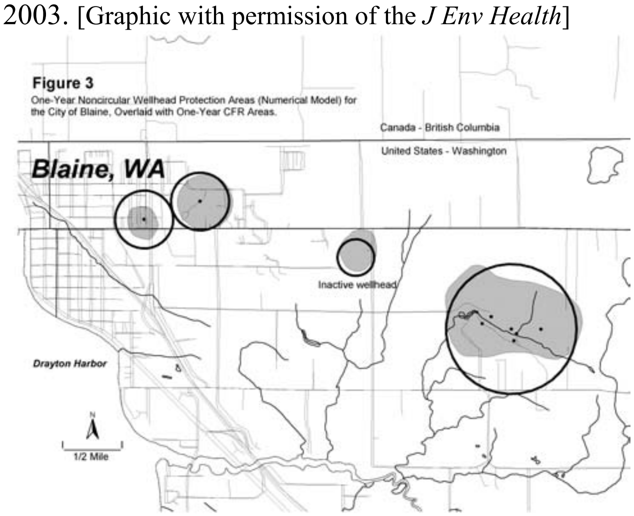
- **Application of geographic information systems (GIS) and spatial analysis in epidemiological research,** Hu W, Zhang J, Tong S, Oldenburg B, *Epi*, 14 (5): S16-S16 Suppl. 1 SEP 2003;

- **Geographic information systems as a tool for forensic science**, Wilson RE, *Forensic Sci Inter* 136: 11-12 Suppl. 1 SEP 2003;

- **Development and adoption of a simple nonpoint source pollution model for Port Phillip Bay, Australia**, Argent RM, Mitchell VG, *Environ Manage* 32 (3): 360-372 SEP 2003;

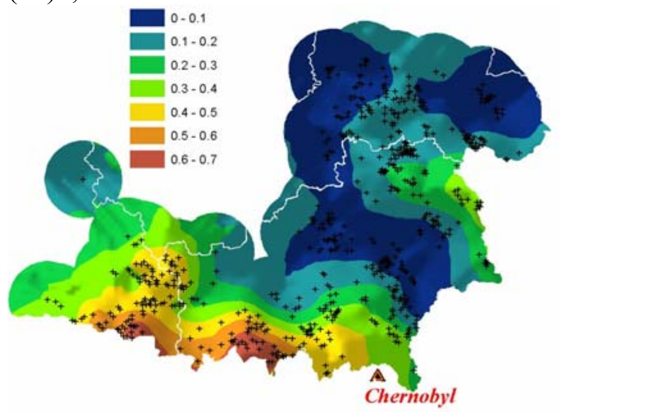
- **Geographic analysis of diabetes prevalence in an urban area**, Green C, Hoppa RD, Young TK, Blanchard JF, *Soc Sci Med* 57 (2003) 551–560 [This paper uses the Spatial Scan Statistic (Satscan) to identify and model clusters of diabetes in Winnipeg, Manitoba. The spatial clustering approach was then compared to the results obtained from spatial regression; Relative Risk shown in below graphic, reflects three shades (darker=higher) of grey scale. The triangulation of methods will be of interest to readers. [Courtesy Chris Green, Manitoba Health]

- **A Comparison of Wellhead Protection Area Delineation: Methods for Public Drinking Water Systems in Whatcom County, Washington**, Miller C, Chudek, P, and Babcock S, *J Envir Health* 66(2) SEPT 2003. [Graphic with permission of the *J Env Health*]



- **Cancer screening estimates for US metropolitan areas**, Nelson DE, Blen J, Marcus S, Wells HE, Meissner H, Am J Prev Med 2003; 24(4): 301-309;

- **Analyzing the Consequences of Chernobyl Using GIS and Spatial Statistics**, Krivoruchko K, *ArcNews* (25)3, FALL 2003



[Using disjunctive kriging, this map illustrates the probability that radiocesium milk contamination exceeded 75 percent of upper permissible levels in southern Belarus in 1993. Milk accounted for approximately 36 percent of the internal radiocesium dose received by populations in rural settlements; Courtesy Konstantin Krivoruchko, ESRI]

NewJournalActivities

Preventing Chronic Disease (*PCD*) is a new CDC peer-reviewed electronic journal established to provide a forum for public health researchers and practitioners to share study results and practical experience (see http://www.cdc.gov/pcd/issues/2004/jan/toc.htm). The journal is published by the National Center for Chronic Disease Prevention and Health Promotion, one of eight centers within CDC. The mission of the journal is to address the interface between applied prevention research and public health practice in chronic disease. *PCD* focuses on chronic disease prevention, such as preventing cancer, heart disease, diabetes, and stroke, which are among the leading causes of death and disability in the United States.

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We are pleased to announce the publication of Volume 1, Number 4 issue of ***Journal of Data Science*** (JDS). Please see http://www.sinica.edu.tw/~jds/ (this URL is a new URL). This issue is a special issue on applications of statistical and data mining methods to chemistry and traditional Chinese medicine data. [Contact: Min-Te Chao, Editor, JDS, at mtchao2@stat.sinica.edu.tw]

GAO Reports

Homeland Security

Challenges in Achieving Interoperable Communications for First Responders. Public safety officials generally recognize that interoperable communications is the ability to talk with whom they want, when they want, when authorized, but not the ability to talk with everyone all of the time. However, there is no standard definition of communications interoperability. Nor is there a "one size fits all" requirement for who needs to talk to whom.

Traditionally, first responders have been considered to be fire, police and emergency medical service personnel. However, in a description of public safety challenges, a federal official noted that the attacks of September 11, 2001, have blurred the lines between public safety and national security. According to the Commission, effective preparedness for combating terrorism at the local level requires a network that includes public health departments, hospitals and other medical providers, and offices of emergency management, in addition to the traditional police, fire, and emergency medical services first responders. Furthermore, Congress recognized the expanded definition of first responder in the Homeland Security Act of 2002, which defined "emergency response providers" as "Federal, State, and local emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities." [Released November 6, 2003; http://www.gao.gov/cgi-bin/getrpt?GAO-04-231T]

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Nuclear Waste Cleanup

Preliminary Observations on DOE's Cleanup of the Paducah Uranium Enrichment Plant. In 1988, radioactive contamination was found in the drinking water wells of residences located near the federal government's uranium enrichment plant in Paducah, Kentucky, which is still in operation. In response, the Department of Energy (DOE) began a cleanup program to identify and remove contamination in the groundwater, surface water, and soil located within and outside the plant. In 2000, GAO reported that DOE faced significant challenges in cleaning up the site and that it was doubtful that the cleanup would be completed as scheduled by 2010, and within the $1.3 billion cost projection. GAO was asked to testify on (1) how much DOE has spent on the Paducah cleanup and for what purposes, and the estimated total future costs for the site; (2) the status of DOE's cleanup effort; and (3) the challenges DOE faces in completing the cleanup.This testimony is based on ongoing work, and GAO expects to issue a final report on this work in April 2004. [Highlights of GAO-04-278T, December 6, 2003, testimony before the Committee on Energy and Natural Resources, U.S. Senate; See report website at http://www.gao.gov/highlights/d04278thigh.pdf]

GAO REVIEW OF FEDERAL GEOGRAPHIC INFORMATION SYSTEMS COORDINATION

The General Accounting Office (GAO) has initiated a new review of efforts to coordinate federal Geospatial information systems and data standards. The forwarded messages provided background. The Chairman, House Subcommittee on Technology Policy, Information Policy, Intergovernmental Relations and the Census, and Congressman Pete Sessions, have asked GAO to determine: (1) what oversight measures does the Office of Management and Budget have in place, via the Exhibit 300 budget submissions and other processes, to identify and reduce redundancies in the acquisition of federal Geospatial data systems; (2) to what extent has the federal government made progress in coordinating the efficient sharing of Geospatial data assets as required by OMB Circular A-16, including activities associated with the Federal Geographic Data Committee, the Geospatial One-Stop initiatives, the National Spatial Data Infrastructure, and setting national spatial data policy; and (3) to what extent have the Federal Geographic Data Committee and the Geospatial One-Stop initiative made progress in setting and coordinating Geospatial data standards with those used by state and local governments and coordinating standard activities with commercial or international practices or standards? The design phase of this project is expected to be completed by February 2004.

Special Reports

Using Online Geographic Data for Public Health: An Overview of the Interactive Atlas of Reproductive Health.

Mary D. Brantley, CDC Epidemiologist, Division of Reproductive Health, NCCDPHP. The Interactive Atlas of Reproductive Health is an online geographic information system (GIS) that is dedicated to reproductive health issues such as infant mortality, fertility and low birth weight. The atlas project contributes to a CDC-wide initiative to promote geographic information science capabilities within public health, and provides policymakers and service providers with easily obtainable spatially-based data for program support. The Atlas data is compatible with locally developed databases and can be used to conduct additional investigations. The Atlas web pages are specifically designed to be accessible for persons with a variety of disabilities.

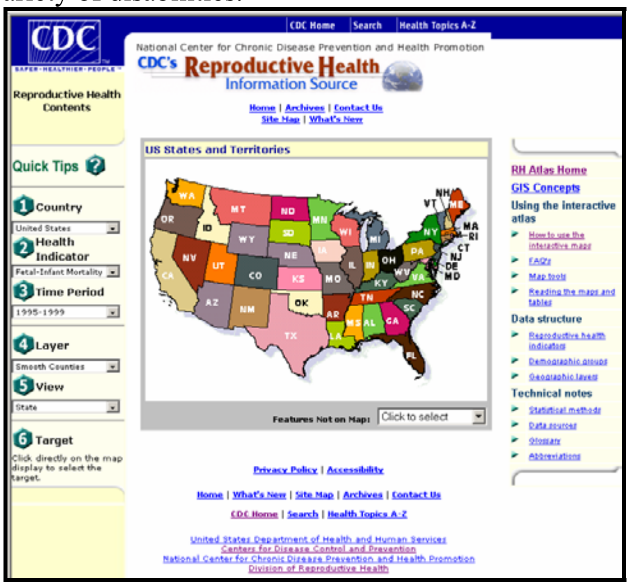

Fig1. Interactive Selection

The thematic maps generated are visual representations of reproductive health data based on their geographic location. The county-level data has been spatially smoothed to allow the viewer to easily recognize clusters and other spatial associations. An interactive table can be displayed in a separate window at the same time as an interactive map. Each window contains elements that can be manipulated independently; such as, sorting table columns or adding an additional layer outline to the map.

The Atlas strength lies in the richness of its database. The Atlas allows for specific types of comparisons across time, geography, and population groups. An almost infinite choice of comparisons can be made between and among the risk and demographic characteristics of the population. As the Atlas evolves, more information will be available on the Web site regarding updates, opportunities for data use, actual case studies, and technical notes.

Currently, the Atlas uses data from the CDC's National Center for Health Statistics (NCHS). The datasets provide a "snapshot" in time, and have been restricted to eliminate identifiable information. Therefore indicators derived from the Atlas may differ slightly from those provided by a local or state health department or an analysis performed by other published health statistics sources.

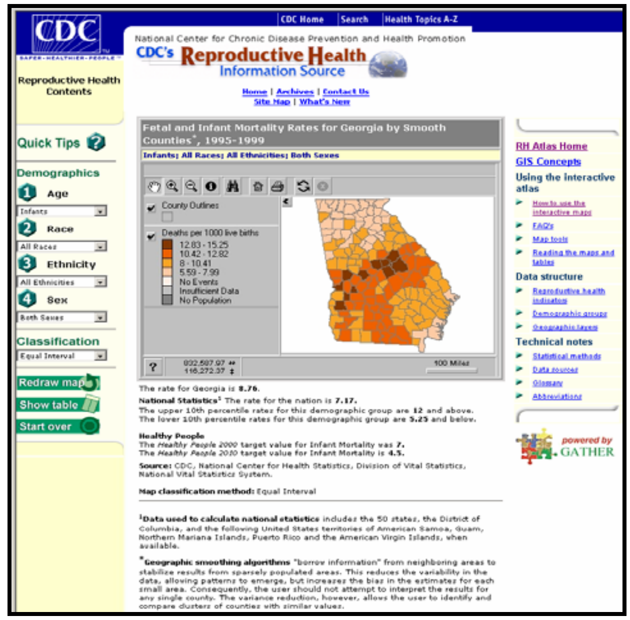

Fig2. Analysis page

The atlas has two major sections. The first includes the interactive pages that provide an extensive series of national, regional, and state maps and tables of reproductive health indicator rates by selected demographic and risk groups in the United States and territories. The second features help pages that explain geographic information science and systems; define the indicators and the demographic and risk options; and explain how to use the interactive portion of the site.

Six reproductive health indicator groups are currently available for analysis-fetal and infant mortality, pregnancy outcomes, maternal risks, teen risks, infant health, and maternal interventions. These indicators can be displayed as maps or tables by time, geographic level (state, county or metropolitan statistical area), geographic view (national, regional, or state), and different demographic and risk categories. There are an estimated 6 million displays that can be generated.

For users who are not familiar with health statistics and surveillance reporting, the Atlas provides accurate reporting and comparisons of specific reproductive health indicators for given time periods. It is not intended to replace public health data or reports published by local or state jurisdictions for professionals and others involved in disease control and prevention. The Atlas is available to help programs and managers obtain data needed for decision making, especially when there is limited statistical or technological support.

Fetal-Infant Mortality Rates for Georgia by Smooth Counties*, 1995-1999	
Infants; All Races; All Ethnicities; Both Sexes	
NAME	VALUE
Webster County	15.25
Randolph County	14.8
Jones County	14.2
Chattahoochee County	14.04
Talbot County	13.98
Hancock County	13.83
Washington County	13.64
Crawford County	13.59
Wilkinson County	13.54
Schley County	13.54
Baldwin County	13.09
Taylor County	12.82
Monroe County	12.75
Peach County	12.66
Sumter County	12.66
Marion County	12.6
Putnam County	12.48

Fig3. "Show Table"

The dynamic nature of health statistics reporting is reflected in this Atlas. Datasets used for the Atlas may be subject to change as information is updated or better analytic methods are applied. A set of Frequently Asked Questions (FAQs) along with a Technical Notes section can be found on the Atlas web site should there be questions concerning the dataset, analysis, or methods used to develop the Atlas and its content. The Interactive Atlas of Reproductive Health is now available through the CDC's Reproductive Health Information Source website under Surveillance & Research or at http://www.cdc.gov/reproductivehealth/GISAtlas. [Contact: Dabo at DBrantley@cdc.gov]

Invited Paper

Creating Exposure Maps Using Kriging

K. Krivoruchko[a] and C.A. Gotway[b]

[a]Environmental Systems Research Institute, Redlands, CA; [b]Centers for Disease Control and Prevention; 1600 Clifton Road NE Atlanta, GA. **Abstract**: Understanding the geographic distribution of disease can aid in identifying important risk factors contributing to disease incidence. Determining the spatial distribution of environmental exposures can be an important component of this understanding. Maps of both disease and potential exposures form the basis for geographical correlation studies that attempt to draw inferences about disease risk in relation to environmental risk factors. Recent advances in (GIS), and the development of ESRI's Geostatistical Analyst extension in particular, have made it easy to create many different types of exposure maps.

While many public health practitioners who use GIS are now familiar with the spatial data analysis tools useful for health data (e.g., smoothing rates, looking for clusters, Moran's *I*), geostatistical methods for mapping exposure data still seem to be mysterious and difficult to understand. This paper briefly discuses one of the most popular approaches to exposure mapping, called *kriging*, and illustrates its use with radiocesium food contamination data collected in Southern Belarus in 1993 by the Byelorussian Institute of Radiation Safety under the supervision of Professor Nesterenko.

Exposure Data

Exposures are usually estimated from measurements of air, food, or soil contamination recorded at a limited number of meteorological or radioecological stations, or based on a limited number of soil samples analyzed in a laboratory for various contaminants. Because such measurements can potentially be made anywhere within a given study area of interest, such data are said to be ***spatially-continuous***. This is in contrast to disease rates that are aggregated over defined geographical units, and to individual disease cases (and controls) that can only occur where people live. A GIS can be used to post the locations of the environmental samples on a map, and creative use of color can delineate the relative magnitudes of the measurements recorded at these locations.

Interpolation, Spatial Prediction and Mapping

Obtaining environmental measurements can be expensive, time consuming and is often both costly and laborious. Moreover, we rarely have the luxury of measuring exposure to an environmental contaminant at the exact location where it can be directly associated with a particular person (e.g., at a person's home or work location). Thus, in exposure assessment, we may want to predict a measurement at a location where we have not recorded an observation. ***Interpolation*** is the process of obtaining a value for a variable of interest at an unsampled location based on surrounding measurements. To aid in visualization, it is also useful to have a smooth map of the spatial variation in exposure and not just a posting of the measurements that can be obtained using a graduated color map. This is obtained by systematically interpolating many values throughout the region of interest, and then graphically displaying the results using a contour or surface map.

There are many methods for interpolating spatial data. These fall into two broad classes: deterministic and probabilistic. Deterministic methods have a mathematical development based on assumptions about the functional form of the interpolator (e.g., inverse distance interpolation). Probabilistic methods have a foundation in statistical theory and assume a statistical model for the data. When probabilistic methods are used for interpolation, they are referred to as methods for ***spatial prediction***. These predictors have standard errors that quantify the uncertainty associated with the predicted, or interpolated values. Just as most public health studies report standard errors and confidence intervals for estimated parameters, results from spatial analysis should also report comparable measures of uncertainty. Thus, the requirement of providing information on prediction uncertainty limits the choice of interpolators to statistical ones. For example, the inverse distance weighting interpolator does not provide this information and it should not be used for prediction of human exposures for further use in ecological analysis.

What is Kriging?

Kriging is the name given to a class of statistical techniques for optimal spatial prediction. It was originally developed in 1959 in meteorology, but in 1963 was adapted to the mining industry to assist engineers with making mines more profitable. Since then, it has been used in many disciplines, including geology, agriculture, and the environmental sciences. Kriging predictors are called optimal since they are statistically unbiased (e.g., on the average, the predicted value and the true value coincide) and they minimize prediction mean-squared error, a measure of uncertainty or variability in the predicted values.

Kriging uses the semivariogram, a function of the distance and direction separating two locations, to quantify the spatial autocorrelation in the data. The semivariogram is then used to define the weights that determine the contribution of each data point to the prediction of new values at the unsampled locations. This is another way in which kriging differs from its deterministic counterparts: rather than assume a functional form for the weights (e.g., inverse distance) the data are used to determine this form through the semivariogram.

The main statistical assumption behind kriging is one of ***stationarity*** which means that statistical properties (such as mean and variance) do not depend on the exact spatial locations, so the mean and variance of a variable at one location is equal to the mean and variance at another location. Also, the correlation between any two locations depends only on the vector that separates them, and not on their exact locations. When data cannot be assumed to satisfy this assumption of stationarity, detrending techniques are used. The assumption of stationarity is very important since it provides a way to obtain replication from a single set of correlated data and allows us to estimate important parameters and make valid statistical inference.

The Different Types of Kriging, their Uses, and their Assumptions

Simple, ordinary, and ***universal*** kriging predictors are all linear predictors, meaning that prediction at any location is obtained as a weighted average of neighboring data. The difference between these three models is in the assumptions about the mean value of the variable under study: simple kriging requires a known mean value (or mean surface, if local searching neighborhood is used) as input to the model, while ordinary kriging assumes a constant, but unknown mean and estimates the mean value as a constant in the searching neighborhood. Thus, these two approaches model a spatial surface as deviations from a constant mean, where the deviations are spatially correlated. Even though the assumption of a constant mean is rather simple, the surfaces that can be modeled can be quite complex. Universal kriging models local means as a sum of low order polynomial functions of the spatial coordinates and then estimates the coefficients in this model. This type of model is appropriate when there are strong trends or gradients in the measurements (e.g., as with temperature where there is a systematic increase from north to south).

If the data are Gaussian, the best predictor, one that minimizes the prediction mean-squared error, is a linear predictor (i.e., a linear combination of data values). For other distributions, the best predictor is not linear in the data. Thus, simple, ordinary and universal kriging are optimal for Gaussian data only. If the data are not Gaussian, statistical transformations (e.g., log, Box-Cox) can be used to transform them so that they do follow a Gaussian distribution. However, with the exception of the log-transform, it is not possible to directly back-transform the data to the original scale without bias. One method for adjusting for this back-transform bias is ***Trans-Gaussian*** kriging, which uses second-order Taylor series expansions to make the back-transformed predictor approximately unbiased.

Indicator kriging uses thresholds to create binary data (0 or 1 values), and then uses ordinary kriging to make spatial predictions based on the indicator data. Predictions using indicator kriging are interpreted as the probability of exceeding the specified threshold. The validity of indicator kriging relies heavily on the assumption of stationarity and it should not be used with data having a trend.

Disjunctive kriging tries to do more than simple kriging and indicator kriging by considering functions of the data, rather than just the original data values themselves. As usual, to get greater rewards stronger assumptions are needed. Disjunctive kriging assumes all data pairs come from a bivariate normal distribution and the validity of this assumption should be checked. When this assumption is met, and the functions of the data are indicator variables that transform the continuous data values to binary values based on a threshold, then disjunctive kriging is an alternative to indicator kriging. ***Cokriging*** combines spatial data on several variables to make a single map of one of the variables.

Types of Output Maps by Kriging

Prediction maps are by contouring many interpolated values, systematically obtained throughout the region of interest. ***Standard Error*** maps are produced from the standard errors of interpolated values, as quantified by the minimized (root) prediction mean squared error that makes kriging optimal. ***Probability*** maps show where the interpolated values exceed a specified threshold. ***Quantile*** maps are particular probability maps where the thresholds are the quantiles of the data distribution.

Probability maps are especially useful in exposure analysis. However, they require careful estimation of the prediction variance, which depends heavily on the semivariogram. Thus, in order to validity interpret the uncertainty maps associated with kriging (standard error, probability, or quantile) it is a crucial that the semivariogram be well estimated and modeled with a valid function that fits the empirical semivariogram very well. Probability and quantile maps also depend heavily on the assumptions of stationarity and Gaussianity. When these assumptions are met, linear kriging and disjunctive kriging will always perform better than their nonparametric counterparts (indicator kriging) that are based on fewer assumptions.

Another important property of kriging that distinguishes it from smoothing is that kriging ***honors the data***. This means that the interpolated surface will pass through the original data points. However, all real exposure data are far from being perfect and prediction model should be able to filter out measurement errors. At the present time, only linear kriging models can do this and the mapping procedure is called ***filtered*** kriging. Indicator and disjunctive kriging assume that data are precise. This is not critical for mapping since the contouring will smooth over the details at any given point, but it may be very important for prediction of new values when these predicted values are to be used in subsequent computations.

Mapping radiocesium food contamination data collected in Southern Belarus in 1993

For the purposes of this short article, we will illustrate a few of the kriging techniques that allow us to produce risk maps based on the probability that a specified threshold of contamination was exceeded. This is one possible way to combine predictions and prediction uncertainties. In general, the thresholds that result in unacceptable risks to human health are usually known for most environmental data, including concentrations of various radionuclides in air, soil, and food.

The event that beset the nuclear power plant at Chernobyl in the Ukraine on April 26, 1986 is the most striking of all environmental disasters. Due to the long half-life of radiocesium (about 30 years) that was deposited across Europe, agricultural effects have continued to last many years after the immediate health effects had ceased. For this reason, it is important to assess the eventual health effects of radiocesium consumed through contaminated food. Today, internal exposure from food contaminated by radiocesium contributes to more than half of the entire radiation dose received by Byelorussian people. The incomes of the inhabitants of villages in southern Belarus do not afford them access to non-contaminated food. They consume vegetables, potatoes, and milk produced on their own, often contaminated, personal properties. This diet is often supplemented with mushrooms and berries from nearby forests that were also contaminated.

After intake, cesium is quickly absorbed and distributed almost uniformly in the human body. It is removed from the body through the kidneys. Cesium accumulation eventually slows down due to the exponential nature of the radioactive decay, as well as due to the elimination of the radionuclide from the body by metabolism. According to legislation, the maximum radiation dose in unrestricted areas shall be such that an individual would not receive a dose in excess of one milliSievert to the whole body per year. In southern Belarus, a person can receive a one milliSievert dose during the summer simply by eating regular food. If this person leaves this territory and moves to a non-contaminated place, three months later there will still be half of the dose in his or her body.

A database containing 53,207 records on ^{137}Cs concentration in 83 types of food was available for the present investigation. To create the database, local people provided food from their private properties and "forest gifts." To measure radioactivity, a relatively large amount of food is required, e.g., at least a liter of milk/water or at least two pounds of berries. All measurements were related to the village where the data were collected and in fact, some samples were taken from nearby villages where a radioecological station was not established, but people were interested to know the level of contamination on their property.

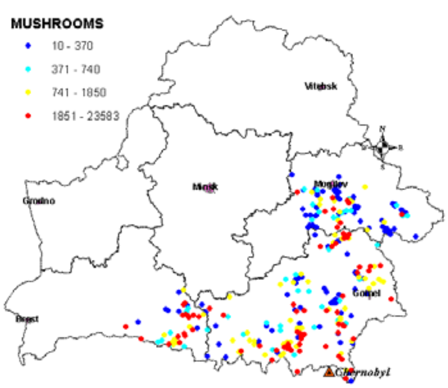

Fig 1. Locations of mushrooms samples and the corresponding cesium contamination (units are Bq/kg) in wild mushrooms, 1993, in southern Belarus

Radiocesium contamination is distributed very non-uniformly both geographically and across the different types of food, and the statistical data analysis is valuable in understanding and informing at-risk populations. Figure 1 shows the locations of the mushrooms samples using a graduated color plot to denote the relative cesium contamination.

Measurements of cesium soil contamination were made in almost all Byelorussian settlements, but they are practically useless for inferences about internal human dose because there is not a linear relationship between cesium soil and food contaminations (Compare Figs. 2a and 2b). Universal kriging was used to map the soil contamination since there is a trend or gradient in the soil concentrations, with the highest concentrations near the source and then a general decline in concentration with increasing distance from Chernobyl. Disjunctive kriging was used to map the probability of exceeding the upper permissible level of 370 Bq/kg for cesium concentrations in wild mushrooms, based on the data displayed in Fig 1.

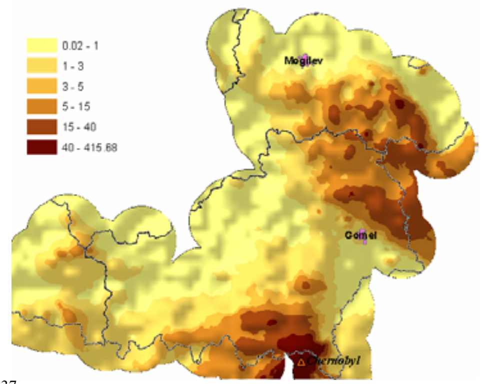

Fig 2a. ^{137}Cs soil contamination (universal kriging) and probability that upper permissible level 370 Bq/kg in wild mushrooms was exceeded

A number of factors influence the uptake of radionuclides from soil to plants, including the level of soil contamination, the soil type, the meteorological conditions at the time of radionuclide deposition, and the type and extent of counter measures. Thus it is important produce maps based on measurements taken from foods (and not just soil concentrations) and maps that show the probability that the upper permissible level for each type of food is exceeded can be very informative.

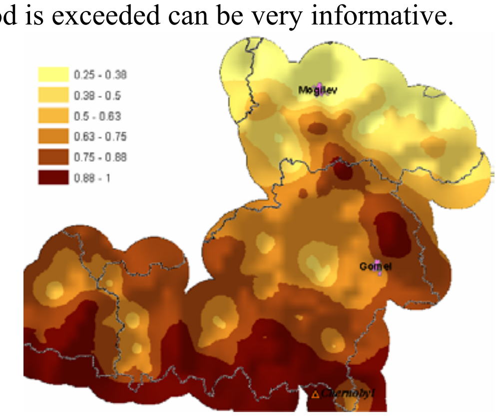

Fig 2b. Disjunctive kriging in southern Belarus (1993)

The concentration levels in the various types of food and milk products are likely to be related and we can use this information when mapping. Figure 3 shows areas where the probability of drinking contaminated milk was high in 1993, using both data on contaminated milk and data on contamination in wild mushrooms.

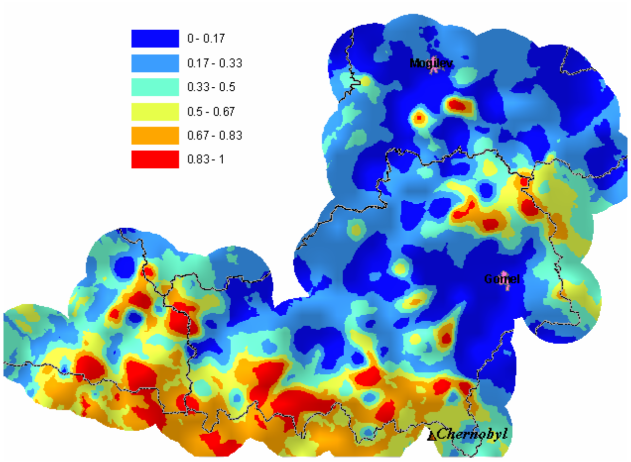

Fig 3. Probability that radiocesium milk contamination was larger that half of upper permissible level in 1993 (ordinary lognormal cokriging)

To create this map we used ordinary lognormal cokriging on residuals, obtained by estimating a low-order polynomial function of the spatial locations and then subtracting this function from the data values. The residuals were transformed to be approximately normally distributed using a log transformation. Additional spatial information about cesium concentrations in wild mushrooms was used with the data on radiocesium milk contamination to make the predictions, and the results were then back-transformed and corrected for bias before mapping. This procedure sounds complicated and there is indeed much statistical theory behind it, but using the ArcGIS Geostatistical Analyst extension this map can be created in a few minutes.

Kriging Disease Rates

Kriging and other geostatistical methods were created for use with spatially-continuous data whose values follow a continuous statistical distribution (e.g., contamination, temperature). It is very unlikely that the kriging assumptions will be satisfied in the case of disease rates, because they are inherently nonstationary: the variance of each rate depends on the denominator which varies with geographic region. This is likely to persist even after transformation, unless the transformation allows for weighting that can adjust for the unequal population sizes. Also, the variance of the rates often depends on the mean, something that traditional geostatistical methods cannot incorporate. The main impact of these problems will not affect the prediction maps as much as it will distort the uncertainty maps: the semivariogram needed for kriging cannot be validly estimated with rates and so the standard error maps may be very misleading. Thus, using kriging to make smooth maps of disease rates should only be done for preliminary data exploration. More appropriate geostatistical methods for mapping disease rates can be done with the SAS GLIMMIX macro (Gotway and Wolfinger 2003) and may be implemented as part of the polygonal analysis extension currently under development for the next release of the ArcGIS Geostatistical Analyst extension.

Summary

In this short article, we have provided a very brief overview of some of the geostatistical methods that can be used for mapping environmental data. The main purpose of this article is to introduce the reader to the types of maps that can be made and their utility in a public health setting. For those interested in more comprehensive or more detailed discussions, we provide a few references below. While ESRI's Geostatistical Analyst was used for the analyses in this article, there are other software packages (see software links below) that can be used to implement several of the geostatistical mapping methods we describe in this paper, as well as other methods we have not described here. We have included the links to the most popular geostatistical software packages after the references.

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Research papers available online at the ESRI website http://www.esri.com/software/arcgis/ and under the section arcgisxtensions/geostatistical/research_papers.html as well as from the Geostatistical Analyst manual.

Software Links:
GS+ from Gamma Design Software at the following website : http://www.gammadesign.com; GSLIB: Geostatistical Software Library. Based on Fortran routines in the book of the same name by Deutsch and Journel, 1992, Oxford University Press: http://www.gslib.com; GEOPACK: http://www.scisoftware.com/products/geopack_details/geopack_details.html; and, AI-GEOSTATS: Central information server for GIS and spatial statistics that includes a comprehensive overview of geostatistical software: http://www.ai-geostats.org.

V. Related Census, HHS, FGDC and Other Federal/State 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]

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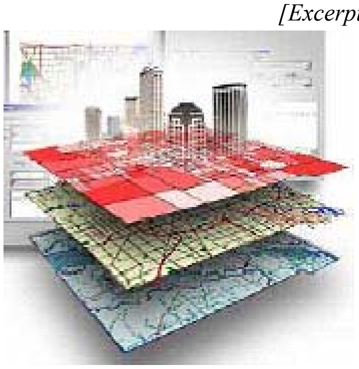
2003 Survey on the Use of GIS Technology in Local Governments

[Excerpts]



[The 2003 Survey on the Use of GIS Technology in Local Governments was developed and executed by Public Technology, Inc. (PTI) in collaboration with the International City/County Management Association (ICMA), the National League of Cities (NLC), and the National Association of Counties (NACo). This survey is part of a collaborative effort, sponsored by the US Department of Interior, to work with local governments to develop a national Geospatial One Stop (GOS) system. Geospatial One Stop is an Office of Management and Budget (OMB) sponsored E-Gov initiative that would more effectively organize, broaden and accelerate Federal Government plans to develop and provide improved access to Geospatial data]

Summary of Survey Results

Over 10,000 local governments (counties, cities, towns, townships, villages, and boroughs) were invited to respond to a national local government survey that included contact information, usage, application, data distribution, data standards, and policy questions. The survey was conducted in the summer of 2003. More than 10% (1,156) of the local governments contacted responded to the survey.

The survey results show that GIS technology is recognized as an essential tool by many local governments but there are a significant number of local governments that do not recognize the benefits of GIS. There are a small number of local governments that effectively use GIS as an enterprise solution with a significant return on their investment. The benefits of using GIS technology to support homeland security, public works, public safety, and economic development efforts are clearly defined. Federal, state, and local government leaders must take action to provide awareness, education, resources, and funding for more local governments to achieve these benefits.

Survey Highlights (Note that many questions allow multiple responses and therefore the cumulative percentage may be greater that 100%)

Barriers to Using GIS More Effectively

There are many barriers to the effective use of GIS technology in local government. The biggest barrier is funding. The cost of developing and maintaining GIS systems and accurate data layers can be expensive. Leading organizations have developed regional cooperative programs that share information, data, and costs associated with maintaining effective GIS infrastructures. The problem is that these organizations are 'far and few between'. It is the inherent nature of governments to operate independently. Because essential data comes from various sources, GIS technology promotes necessity of sharing data and working cooperatively. Over 64% of respondents are interested in GIS systems, but do not have the funding to move forward; Over 42% are interested in GIS systems, but do not have the technical expertise to move forward; and Over 35% would like to know more about GIS systems to determine whether it makes sense to acquire them.

Who is Using GIS

Early adopters of GIS principally used GIS technology for geographic planning functions. With this use the technology was a priority for larger government jurisdictions. GIS technology is becoming a priority for all governments now that solutions are being effectively used in public safety, health, public works, revenue collection, and economic development. The challenge is to provide awareness, education, and funding to late adopters of GIS technology. Over 97% of respondents with populations of over 100,000 use GIS technology and 56% of respondents with populations of less than 50,000 use GIS technology. County use of GIS (72%) is slightly higher than city use of GIS (64%).

Cost vs. Benefit Assessment of GIS

Though an effective GIS technology infrastructure can be expensive to implement, the benefits of enterprise GIS applications produce a clear and measurable return on investment (ROI). Some 86% of respondents have achieved benefits from their use of GIS technology that justify the associated cost for software, hardware, and labor.

Implemented GIS Applications

GIS applications have become integral resources for public works, financial, public safety, and economic development. GIS applications have moved from the desktop (analysis) to significant components of essential technology systems (i.e., CAD, Emergency Management, Land Use, Tax Assessment, etc.). On the horizon, GIS technology will become a key component of every government applications system. In addition to the visual analysis of data, a key driver for enterprise GIS applications is that location is the connection point for the interoperability of desperate systems. Some 77% of respondents use GIS technology to view aerial photography; 70% use GIS technology to support property record management and taxation services; 57% of respondents use GIS technology to provide public access information; 41% use GIS technology to support capital planning, design, and construction; 38% use GIS technology to support permitting services; 38% use GIS to support emergency preparedness and response activities; 33% use GIS to support computer aided response activities; and 28% use GIS activities to support crime tracking and investigative activities.

Most Beneficial Assistance

Many governments that developed GIS applications through grant funds have difficulty funding the required ongoing maintenance costs. There are thousands of dormant GIS applications that had grant funded development and local government funded maintenance. Local governments would like federal or state financial support to hire the experienced staff required to maintain the applications. They would also like financial support for training first responders who use GIS as a primary tool during their response and recovery efforts.

Homeland Security Support

Local government leaders see a clear application of GIS technology for homeland security efforts. The concern that homeland security technology funding would not be applied as intended is diminished when applied to GIS. GIS applications and solutions clearly resonate with emergency management and public safety executives as an essential tool to provide the most effective support of their efforts. When you combine ground-truthing imagery, GPS, and digital maps, the possibilities are limited only to your imagination. Some 95% of respondents think that GIS technology usage can be improved with federal Homeland Security funding; 80% would build additional GIS data layers with Homeland Security funding; 76% would build new GIS applications that support Homeland Security initiatives; 66% would improve their maintenance of GIS data; 65% would provide GIS staff training; 54% would improve the accuracy of their GIS data; 43% would hire skilled GIS staff; 32% would design enterprise GIS architecture; and 29% would hire GIS consultants.

Policy for Sharing GIS Data

Local government policies for sharing GIS data are evolving. Though many policies are to share data with federal agencies, local governments often put limits on how and whom the data is shared with. There is a clear desire to share the cost for developing and maintaining GIS technology with organizations that use the technology. There is also a desire to maintain control of that data as it is being shared as opposed to providing organizations with data extracts. Emerging web service technology allows governments to share their data through the Internet (as opposed to data extracts) therefore maintaining control of the security and interpretation of the data. Some 97% of respondents would allow the federal government to use their GIS data for floodplain mapping; 96% would allow federal government agencies to use their GIS; data in land use and land cover programs; 98% would allow federal government agencies to use their GIS data for Homeland Security purposes; and 97% would allow federal agencies to use their data for emergency preparedness and response.

Call to Action for Government Officials

As demonstrated through examples provided in Exhibit B, GIS is an essential technology for all local governments. The survey results show significant shortfalls in the effective use of GIS technology across the nation. The common barriers to the effective use of GIS technology in local government include funding, awareness, and education. Overcoming these barriers will require strong leadership at the federal, state, and local levels. Leading organizations have overcome many of these barriers through cooperative information and cost sharing programs. Several examples of regional, state, and federal programs exist. Regional best practice examples of cooperative GIS programs include Cincinnati's Cooperative Agents in a Global Information Space (CAGIS) project and the San Francisco Bay Area Automated Mapping Association (BAAMA). State best practice examples include the Maryland State Geographic Information Committee (MSGIC) and the state of Pennsylvania's GIS Consortium (PAGIS). Federal best practice examples include the Geospatial One Stop project that sponsors geodata.gov (a national GIS data sharing portal).

Actions for Federal Government Officials

1. Sponsor outreach programs that provide awareness for local government officials and training for local GIS practitioners;
2. Sponsor volunteer programs that allow experienced GIS practitioners to assist local governments with essential project work;
3. Provide GIS tools and resources that can be accessed via the Internet.

Actions for State Government Officials

1. Conduct periodic state surveys on the availability and use of GIS data;
2. Support GIS information and cost sharing organizations and programs;
3. Support information sharing Internet portals that provide awareness and education resources.

Actions for Local Government Officials

1. Lead and participate in regional cost and information sharing organizations and initiatives;
2. Promote the development of Enterprise GIS (shared infrastructure) across government organizations;
3. Promote the awareness and education on GIS technology and applications;
4. Promote ROI models that promote the effective use of GIS technology.

[Survey responses have been recorded into an online relational database that can be accessed through the PTI website at www.pti.org]

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Open Data Consortium Project and Study

Report to the FGDC Coordination Group

Bruce Joffe, ODC, November 2003

The Open Data Consortium (ODC) examined digital geographic information (DGI) trends and created a model data distribution policy. DGI is a strategic asset and local governments create the highest quality data but don't tend to distribute it well. Some local governments sell their data at a high price, others give it away for free but it's not easily accessible and customer requests are not fulfilled. Some local governments may not have a data distribution policy at all and so refuse to share their data even though State laws say that public records must be provided in the format of use at the cost of reproduction. The private sector could more effectively distribute the local governments' data, and could add value by providing services and repackaging the data.

The ODC project to formulate a model data distribution policy was organized through the GeoData Alliance with seed funding grant money from USGS. It was a collaborative effort with 117 reviewers and 67 participants. (The policy and PPT presentation are available at www.OpenDataConsortium.org.) The article "10 Ways To Support Your GIS Without Selling Data" gets to the core issue: the public's right to public data and the public agency's need to fund their geospatial operations. The article provides general framework guidance for easy public access to public-record geospatial data and focuses on revenue produced from existing taxes and service fees, as well as cost savings and support from internal budgeting. (The article also is available on the above ODC website.)

It's a faith-based issue. Most governments don't make money selling data; they may as well put it on the web for free. A KPMG study showed that the income produced from selling data equaled 2% of the cost of setting up a data sales mechanism. Selling data is counterproductive. The value of geodata is through its usage. We need to change local governments' accounting practices to identify and measure savings from GIS and allocate that money back to the GIS departments. To build the NSDI we need to release local governments' proprietary interests in GIS by helping them get money other ways. A policy for the free flow of information would be beneficial for the NSDI. The purpose of government is to do what the market doesn't do. There is a confluence where the government, citizens, and private sector could work towards a wider distribution of data. [Contact person for the project and study: Bruce Joffe at Bruce@OpenDataConsortium.org]

Web Site(s) of Interest for this Edition

http://www.census.gov/acs/www The American Community Survey (new website), US Census Bureau, provides quick and easy access to basic survey information and statistical data. The site includes a page on new quality measures (under "Advanced Methodology"). The American Community Survey is a new nationwide survey designed to provide communities a fresh look at how they are changing. It is a critical element in the Census Bureau's reengineered 2010 census plan.

http://www.canadian-health-network.ca CHN is a national, non-profit, bilingual web-based health information service. CHN's goal is to help Canadians find the information they're looking for on how to stay healthy and prevent disease. CHN does this through a unique collaboration-one of the most dynamic and comprehensive networks anywhere in the world. This network of health information providers includes Health Canada and national and provincial/territorial non-profit organizations, as well as universities, hospitals, libraries and community organizations.

http://www.ccohs.ca The Canadian Centre for Occupational Health and Safety (CCOHS) is a Canadian federal government agency based in Hamilton, Ontario, which serves to support the vision of eliminating all Canadian work-related illnesses and injuries. The Centre is governed by a Council representing three key stakeholder groups: government (federal, provincial and territorial), employers, and workers- a structure that mandates the CCOHS' impartial approach to information dissemination.

http://www.spatialhydrology.com/health/health.htm Health and GIS is the theme of this site. It contains a variety of topics including a data warehouse, useful glossaries, published research and other related topics.

http://users.erols.com/turboperl/dcmaps.html This is the Dynamic Choropleth Maps (DC Maps) developmental site posted by William Smith, U.S. EPA, featuring a dynamic mapping tool for visualizing possible relationships between environmental, health, and demographic factors. The reader can use a map slider control to make data layer interactions visible.

http://www.neha.org/JEH/JEH_Positions_NEHA.html The National Environmental Health Association (NEHA) now has officially adopted positions on Children's Environmental Health, Global Climate Change and Endocrine Disrupters. These are published at this site. For example, it includes NEHA's Resolution to Support Public Health Principles and Guidance for Brownfields Policies and Practices

Final Thoughts

Welcome GIS and Public Health 2004!

As we embrace the arrival of a new year there is much to look forward to in the GIS and public health field. For all of us, there is the immediate job to build upon prior efforts in order to advance our piece of GIS and public health. Each of us is part of the big picture. There is no better feeling than knowing what you did, and do--or hope to do, will somehow contribute to the greater good of GIS and public health. Personally, I have always admired and been motivated by anyone of you who helps raise our collective GIS and public health consciousness, whether through questions, ideas, study, exploration or accomplishment. There is a momentum to our field that clearly depends on this individual commitment to engage and be part of GIS and public health.

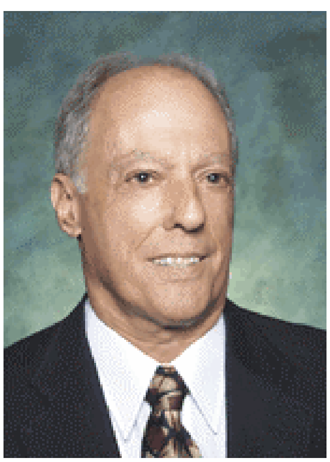
I have just a few New Year thoughts to share with you. These involve the settings in which we ply our individuality. In 2004, both in the United States and internationally, we can move the public health piece of our National Spatial Data Infrastructure (NSDI) forward on all institutional fronts. In the US (my focus for this discussion), our State and local health departments are the critical mass for a successful public health NSDI. Each of these agencies needs to be connected with one another through standardized data models, metadata and web interoperability. In reality, these agencies depend on extremely scarce resources and often find operational GIS investment an unrealistic priority (see 2003 Survey on the Use of GIS Technology in Local Governments, this edition). Thus we need to develop workable GIS and public health strategies, whether through partnerships and/or regional collaborative activities, that are cost effective and insure participation by all in building the GIS and public health infrastructure.

My hope is that the Department of Health and Human Services (DHHS) will assume definitive leadership for the public health infrastructure goal. The President's Geospatial One-Stop (GOS) initiative is causing DHHS to mobilize in terms of documenting data holdings. Federal health metadata, and its geographical or spatial extent, is now required to be identifiable in all public health databases for all agencies through the public GOS portal. State and local public health agencies, where possible, are following suit.

Moreover, DHHS should provide the lead for data models by establishing, encouraging and supporting common or standardized protocols for geospatial data storage and structure (XML), web transmission and interoperability (Open GIS Consortium standards), data standards, and other consensus approaches to support data comparability at all levels of government in support of a geospatial public health infrastructure. Some investment by DHHS may be required, in the short term, to help support and jump start those State and local public health agencies that have no means to become connected.

For long-term return on investment, DHHS needs to become geospatially proactive. This may require creation of a special office devoted to the multiple issues associated with building an effective public health geospatial infrastructure. For example, several other federal agencies recently have created geography offices to specifically address these many geospatial challenges and to secure an orderly enterprise rollout of their respective infrastructures. Needed in public health are DHHS-wide uniform best designs, guidelines, protocols and even policies for public health institutional approaches to geocoding, Section 508 geospatial web accessibility, and the creation of privacy and confidentiality templates for the use and release of geospatial databases, to name a few.

DHHS and every State and local public health department must become geospatially connected and operational in order to build the foundation for a readied and responsive public health spatial data infrastructure. It is doable. Welcome GIS and public health 2004!



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The NCHS GIS home page contains current GIS events, archived GIS reports and other GIS links
http://www.cdc.gov/nchs/gis.htm