

PUBLIC HEALTH GIS NEWS AND INFORMATION

January 2000 (No. 32)

Dedicated to CDC/ATSDR scientific excellence and advancement in disease control and prevention using GIS

Selected Contents: Events Calendar (pp. 1-2); (pp. 6-7); Special Reports (pp. 7-11); GIS Update (pp.14-17); Website(s) of Interest (pp.



News from GIS Users (pp. 2-6); GIS Outreach Lectures (pp. 11-14); DHHS and Federal 16-17); Final Thoughts (pp.17-18)

I. Public Health GIS (and related) Events

SPECIAL CDC/ATSDR GIS LECTURES:

(1) January 25, 2000, **Atlas of Cancer Mortality in the United States, 1950-94**, by Dan Grauman, National Cancer Institute, 2:00-3:30 P.M., at the NCHS Auditorium, Hyattsville, MD and (2) February 15, 2000, Special Workshop- **Managing Confidentiality: Building blocks for the Protection of and Access to Health Data**, by Douglas Neibert and Mark Reichardt, Federal Geographic Data Committee, 2:00-3:30 P.M., at the NCHS Auditorium (Envision available for both January 25 and February 15 programs to offsite CDC/ATSDR locations). Abstracts are included in this edition. Note: These talks are cosponsored by the CDC/ATSDR Behavioral and Social Science Working Group, the CDC Statistical Advisory Group, and the NCHS Cartography and GIS Guest Lecture Series.

☞ The University Consortium for Geographic Information Science (UCGIS), Winter Meeting, February 6-9, 2000, Washington, D.C. [See website at <http://www.ucgis.org/win00.html>]

☞ HAZMAT 2000 Spills Prevention Conference, Gateway to the Future: Working Together, April 4-6, 2000, St. Louis, MO [See website at <http://www.nrt.org/nrt/hazmat2000/hazmat2000.nsf>]

☞ The International Association for Social Science Information Services and Technology (IASSIST), Data in the Digital Library: social, spatial, and government data services, June 7-10, 2000, Evanston, IL [See website at <http://www.src.uchicago.edu/DATALIB/ia2000>]

☞ Edmonton Statistics Conference, "Statistics and Health," June 11-13, 2000, Edmonton, Canada [See website at <http://www.stat.ualberta.ca/~brg/conf.html>]

☞ The 6th annual Innovations in Social Marketing Conference: Managerial and Strategic Approaches to Establishing a Marketing Orientation in Social Change Organizations, June 11-13, 2000, Washington, D.C. [See website at <http://ism2000.cba.hawaii.edu>]

☞ Climate Change Communication: An International Conference, June 22-24, 2000, Ontario, Canada [See website at <http://geognt.uwaterloo.ca/c3confer>]

☞ Toward Higher Levels of Analysis: Progress and Promise in Research on Social and Cultural Dimensions of Health, National Institutes of Health, June 27-28, 2000, Bethesda, MD [Contact: Christine Bachrach at email bachracc@mail.nih.gov; see announcement, Part II, this edition]

☞ 9th International Symposium in Medical Geography, "An agenda for the geography of health and health care in the next century," July 3-7, 2000, Montreal, Canada [See website at <http://www.attcanada.net/~geo2000>]

☞ 34th National Immunization Conference, CDC's National Immunization Program (NIP), July 5-8, 2000, Washington, DC [See website at <http://www.cdc.gov/nip/calendar/default.htm>]

☞ The International Conference on Emerging Infectious Diseases 2000 (ICEID 2000), July 16-19,

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2000, Atlanta, GA [See website at <http://www.asmus.org/mtgsrc/iceid99main.htm>]

☞ 2000 Joint Statistical Meetings of the American Statistical Association, "Celebrate Diversity in Statistics," August 13-17, 2000, Indianapolis, IN [See website at meetings@amstat.org]

☞ 4th International Conference on Integrating Geographic Information Systems (GIS) and Environmental Modeling: "Problems, Prospects, and Needs for Research," September 2-8, 2000, Banff, Alberta, Canada [See website at <http://www.colorado.edu/Research/cires/banff>]

II. GIS News

(Please communicate directly with colleagues on any issues)

A. General News and Training Opportunities

1. From **Baker Perry**, University of Washington: The Department of Geography and Planning at Appalachian State University, Boone, NC, will offer the second annual "GIS in International Health Workshop" June 26-30, 2000, focusing on the applications of geographic information systems (GIS) in International Health. Geographic information systems are powerful tools that can enhance the measurement, monitoring, mapping, and modeling of geographic data. The applications of GIS in international health are far-reaching; topics introduced in this workshop will include the use of GIS to assess physical access to health care, monitor immunization rates, track the spread of infectious diseases, and assist in health care delivery planning. In addition, the workshop will cover such topics as the importance of a geographic approach in international health initiatives, integration of global positioning system (GPS) and remote sensing technology in a GIS, the acquisition and availability of digital cartographic data in developing countries, database design and management, and map interpretation and mapmaking. Participants will have the opportunity to apply skills and concepts learned during the workshop in a final project. All lab sessions will be held in the Spatial Outreach Laboratory, which features state of the art GIS hardware and software. [Contact: Baker Perry at

email perrylb@u.washington.edu]

2. From **Marjorie Roswell**, University of Maryland Baltimore County: I would like to mention one web site which readers might not otherwise think of: access for the blind, who use screen-readers to access the internet (see <http://research.umbc.edu/~roswell/blind-access.htm>). For starters, all images and image maps need to have "alt"ernative text. I have a slew of additional resources on this subject, including a link to "Bobby" which can certify that your site is accessible. I actually think there are plenty of technologies that will enable precisely what we think of as visual tools to be especially useful for blind people. (Say: a GPS system to tell them outloud how to get around, for instance, or special printers which produce tactile 3D maps.) Might make an interesting story sometime for your newsletter. I'm sure I can find you some resources (i.e. people to talk to) on this subject if you're interested. I have a blind friend who struggles with inaccessible web pages: hence my interest. [Contact: Margie, UMBC Center for Health Program Development and Management, at email roswell@umbc.edu; Editor: I will ask Margie to pursue this topic for a future edition of *Public Health GIS News and Information*]

3. From **Tom Usselman**, National Academy of Sciences: On behalf of the Committee on Geography and the Mapping Science Committee, I would like to thank all of you who took the time from your busy schedules to participate in the brief meeting on Place-Based Planning/Decision Support. Your input provide us a valuable perspective, which will be considered in the further development of our activity. We were also pleased to see the enthusiasm that the topic engendered and the need for the activity. The draft prospectus of the study can be found at <http://national-academies.org/msc>. [Contact: Tom at email Usselman@nas.edu; Editor: Tom is an excellent contact for readers having any concerns or questions about spatial data activities sponsored by NAS]

B. Department of Health and Human Services (DHHS)

Agency for Toxic Substances and Disease Registry

4. From **Bill Henriques**: "GIS in Public Health: Using Mapping and Spatial Analysis Technologies for Health Protection," A Public Health Training Network Satellite Broadcast, May 11, 2000, 12:00 - 2:30 PM ET. This program will provide information on essential GIS concepts and terminology, finding and getting data into a GIS, an overview of spatial statistical analysis functions available using GIS software, issues regarding the use of GIS in public health applications, and examples of GIS applications in public health practice and surveillance. To provide public health professionals relevant and timely information regarding the use of GIS technology in public health applications. Target Audience: Public health professionals proficient with computers and databases who are seeking new tools and techniques for the examination and display of health, demographic, and environmental data. [See description at website <http://www.cdc.gov/phtn/gis/crsedescription.htm> or enrollment and viewing specifications at <http://www.cdc.gov/phtn/gis/gis.htm>]

5. From **Jeanetta Churchill**: Public Health Informatics Fellowship Program Educational Session co-sponsored by the CDC/ATSDR GIS Users Group (Atlanta), Friday, January 14, 2000, 9:00 A.M. to Noon, Executive Park, Building 35, Room 3514. Special presentation: Geographic Information Systems: An Introduction for Informaticians, moderated by Luis Kun, Distinguished Fellow, PHPP/INPHO- Presentation 1: Allen Hightower, Chief, Data Management Activity, NCID/DPD, "GPS and GIS applied to a Malaria Field Study in Western Kenya"; Presentation 2: Vishnu-Priya Sneller, Epidemiologist, NIP and Lance Waller, Associate Professor, Biostatistics, Emory School of Public Health, "Spatial Patterns of Reported Hepatitis B Cases in Dade County, 1986-1995," and; Presentation 3: Jerry Curtis, NCEH, "Making Maps with Data." [Contact: Jeanetta at email fzc3@cdc.gov]

6. From **Vishnu-Priya Sneller**: The animated part of my APHA presentation can be found on the web at

<http://www.sph.emory.edu/~abarcla/dade> [Editor: I made this entry for Vishnu-Priya having seen what she created on Dade County Hepatitis Intensity Maps and Animations. I think you will enjoy this presentation; Contact: Vishnu-Priya at vbs6@cdc.gov]

CDC Centers for Disease Control and Prevention

7. From **Cheri Broeker**, Health Resources Management Office: The CDC Corporate University has hosted the University of South Florida (USF), College of Public Health's (COPH) distance-based Master of Public Health program since August 1998 at the Human Resource Management Office (HRMO) Learning Resource Center, Stanford Building, in Atlanta. Satellite Course: "Epidemiology of Diseases of Major Public Health Importance"- Monday evenings 6:00-8:50pm (EST), January 10 - April 24, 2000, Learning Resource Center, Stanford Building, [Contact: Cheri at voice (770) 488-1832]

8. From **The Epi Info Development Team**: An upgrade to make the DOS version of Epi Info Y2K compliant has been available on the Epi Info Website since 1997. Those who believe in the "just-in-time" inventory system may want to upgrade this week. If you downloaded the upgrade prior to December, a couple of small bug-fixes are included in the current version (concerning export of dates to dBASE and setting a RANGE for a date in the CHECK program). To make Epi Info 6.04B Year 2000 Compliant, download the 4BUPDATE.EXE file from the website: <http://www.cdc.gov/epo/epi/downepi6.htm>. It is a self-expanding file that will overwrite existing EpiInfo executable files, but WILL NOT delete data files. Enter "Y" (Yes) to all 17 "overwrite" prompts you will see. INSTALLING: Before installing the 4BUPDATE, YOU MUST BE SURE THAT YOU HAVE THE CURRENT version 6.04(b) installed on your PC. Place the 4BUPDATE.EXE (a self-extracting compressed file) in your EPI6 directory. By using the mouse, copy the 4BUPDATE to C:\EPI6. Double click on the 4BUPDATE.EXE file, a black DOS screen should appear asking a series of OVERWRITE questions. Please type "Y" for yes, then enter after each question until the update is complete. Check the

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main screen of EPI-INFO for the version number and the upgrade. The screen should read: version 6.04b to c upgrade. Your software is now Y2K compliant. Note: A complete beta-test version of Epi Info 2000 for Windows 95, 98, and NT is expected soon, to be followed, within the first quarter of 2000, by the released version. [If you need further assistance with Y2K compliance, please contact: Epi Info Technical Support, Centers For Disease Control and Prevention, at voice (770) 488-8440 or email epiinfo@cdc.gov]

Health Care and Financing Administration

9. From **Suzanne Rotwein**, HCFA: I work in the Center for Beneficiary Services at HCFA and we are interested in using our (and other) data to map our beneficiaries. We have begun a social marketing strategy which will target and segment our population, but so far we have missed some of the beneficiaries who should be getting our materials and messages. Our goal is to accurately find these target populations, profile and then map them for use within HCFA in health promotion campaigns. One piece of the puzzle is the psychographic database which we have not been able to purchase. [Contact: Suzanne at voice (410) 786-6621 or email SRotwein@hcfa.gov]

[Editor: In 1999, HCFA posted a request for proposals to explore the use of lifestyle segmentation and cluster profiling of populations eligible for services under Medicare, Medicaid, the Children's Health Insurance Program, and the Health Insurance Portability and Accountability Care Act (approximately 70 million people) to help the agency in "its outreach, health promotions, educational campaigns, and in identifying the best channels for reaching these beneficiaries." (DHHS. PSA # 2334. Commerce Business Daily 1999 Apr 28). None of the responses to this request for proposals were selected for funding (for a variety of reasons).

HCFA continued to have interest, however, in developing a geographic information system (GIS) initiative that would help clean up HCFA "address information" and ultimately also would integrate lifestyle information (e.g. Claritas PRIZM data) for social marketing purposes (i.e., help create a picture of

the population to be targeted, and the best media to communicate with that population). HCFA has now awarded a contract to help develop GIS capabilities. The contractor is Applied Geographics, Inc (Boston, MA at <http://www.appgeo.com/homepage>). Under this contract, HCFA also will have input from the Lewin VHI Group (Fairfax, VA at <http://conservation.esri.com/library/userconf/proc98/PROCEED/ABSTRACT/A173.HTM>). Thinking towards the future, areas of potential interest might include: 1) how to link HCFA data with other data sets (especially any data sets that CDC might have); 2) osteoporosis; 3) mammography; and/or 4) influenza immunizations. If anyone wants to communicate directly with Suzanne, please feel free to do so]

Health Resources and Services Administration

10. From **Jim Sutherland**: HRSA GIS- Mapping Project of Oral Health Data, HRSA West Central Cluster, Denver Regional Office- This project was initiated from the HRSA Denver Regional Dental Consultant to perform a comprehensive assessment of the public health infrastructure and dental service utilization in three states within PHS Region VII, and couple the assessment with the utility of computer-based mapping. The assessment will be based on data collected from national, state, and local data sets. The results will be posted to the HRSA Oral Health Initiative website and disseminated via the Internet. A data book will be prepared containing both tabular and interpretive information, and maps displaying the findings. State participants will be provided training in the use of the database and the mapping software selected. In this manner, the state personnel will be able to continue their planning, analytical and presentational activities beyond the end of the contract effectively adding another important tool to data interpretation and presentation within states concerning oral health.

The dataset will be assembled from standardized national data and data provided by the three participating states; Colorado, North Dakota, and South Dakota. These states have considerably different dental data collection capabilities and amounts of historical data. It will be instructive to the states, the

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HRSA regional office, and the central office to consider the impact of this project and the feasibility to implement this with other states. An advisory group has been empaneled to comment on the design, tools, and performance of the project. This group has representation from a university, federally funded community health center, state dental directors, HRSA regional office staff, and a state dental society representative. [Contact: Project Officer Dr. Jim Sutherland at voice (303) 844-3204, ext. 1218 or email jsutherland@hrsa.gov]

National Institutes of Health

11. From **Linda Pickle**, National Cancer Institute: I have started a GIS Special Interest Group (GISSIG) over here and there is lots of interest at NCI. [Contact: Linda, Division of Cancer Control and Population Sciences, at email picklel@mail.nih.gov]

12. From **Christine Bachrach**, National Institute of Child Health and Human Development: Toward Higher Levels of Analysis: Progress and Promise in Research on Social and Cultural Dimensions of Health, June 27-28, 2000, Natcher Auditorium, National Institutes of Health. The conference is sponsored by the Office of Behavioral and Social Sciences Research. Summary: Social, behavioral, and biological processes affecting health are intricately linked, and the complexities of each level and their interrelationships must be better understood to prevent and treat disease. This conference will highlight the unique contributions of social and cultural factors on health in an effort to inform research on other levels and improve understanding of the interdependent nature of the multiple levels of analysis in health research. Scientists will describe research exploring: sociocultural constructs such as race, ethnicity, SES, gender; sociocultural linkages between demographic factors and health; social/cultural factors in prevention, treatment, and health services; interpersonal, neighborhood, and community influences on health; health justice and ethical issues, and; global perspectives on health. [Conference Co-Chairs: Christine Bachrach, at voice (301) 496-1174 or email cbachrach@nih.gov and David Takeuchi].

C. Other Related Agency or Business News

Department of Housing and Urban Development : HUD introduces community 2020® COMPUTER BASED TRAINING (CBT) CD-ROM. The Community 2020 Planning Software is a powerful and user-friendly geographical information systems (GIS) software. Users like you are learning to print detailed tables and colorful maps to show exactly where and how HUD supports their programs. Other users are examining current and projected U.S. Census data for any city, state, county, congressional district or census tract. We are proud to bring you the new CBT (computer based training tutorial), winner of the 1999 Government Technology Leadership Award. Now you can learn the basic and advanced features of the Community 2020® planning software (C2020). It is so easy to use that you can do the training at home or at your office. Training modules include: Module 1: Course Introduction Lesson 1: Welcome to Community 2020 Lesson 2: Getting Started Module 2: Opening and Styling Maps Lesson 1: Viewing Your Community Lesson 2: Using the Map Library Lesson 3: Layering Information Lesson 4: Enhancing Your Map Module 3: Adding Your Own Data to Maps Lesson 1: Proposing Your Own Projects Lesson 2: Adding Local Properties to Your Map Lesson 3: Customizing Your Properties Map Module 4: Analyzing Your Community's Demographics Lesson 1: Defining Your Community's Boundaries Lesson 2: Displaying Community Statistics Lesson 3: Displaying Only Your Community Lesson 4: Creating Bands and using Overlays Module 5: Analyzing HUD Funding Lesson 1: Using Map Library Markers to Display HUD Data Lesson 2: Selecting a Geographic Area to Display HUD Data Lesson 3: Displaying CPD Consolidated Plan Lesson 4: Public Housing Authorities and Developments Lesson 5: Displaying State/Small Cities Project Data Lesson 6: Displaying C2020 [For more information see <http://www.hud.gov/cpd/2020soft.html>]

The GIS Day Committee, ESRI, Inc.: The date for GIS Day 2000 has been set! GIS Day will again be scheduled during National Geographic's Geography Awareness Week. Geography Awareness week will be

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November 12-18. GIS Day will be on Wednesday November 15th. Mark your calendars and plan for GIS Day 2000. Don't forget to give us your thoughts on GIS Day 99 and help us prepare for GIS Day 2000 by filling out a quick survey online at <http://www.gisday.com/gisday/survey.html>.

NationsHealth Corporation: A new reference work containing health and healthcare data for every county in the U.S. is now available from NationsHealth Corporation. The book, *Health and Healthcare in the United States*, includes nearly 90 different data items grouped into four major categories: Population Characteristics, Vital Statistics, Healthcare Resources, and Medicare. Another section of the compendium includes most of the same statistics for all metropolitan areas in the U.S. Reference maps allow users to locate counties and metropolitan areas. Included with the book is a searchable CD-ROM that allows users to create detailed reports on any county or metropolitan area. The new book brings together health and healthcare data from numerous sources, including the National Center for Health Statistics, the Health Care Financing Administration (HCFA) and the Bureau of the Census. The book allows users access to a wide variety of authoritative data without searching numerous databases and volumes of government statistics. The book is especially valuable for healthcare planning and marketing professionals, as well as health plans, pharmaceutical companies, and medical product companies. [Additional information can be obtained at www.nationshealth.com].

StatSci: Mathsoft is offering an online S-Plus Course "S-PLUS Graphical User Interface (GUI) Basics". This course is a web based introduction to the fundamental commands in the S-PLUS 2000 GUI (Graphical User Interface). The goals of the course are to familiarize you with the layout of the graphical user interface, basic graphing, data manipulation and statistical modeling. Objectives. After completing this course, you will be able to: Create histograms, boxplots, scatter plots, scatter matrices and line plots; Make modifications to plots (color, symbol style, titles, fonts, etc.); Create and edit new data; Create

Trellis graphics; Copy data and transform variables in your data; Stack columns and extract subsets of data; Extract subsets of data; Perform sophisticated data analysis and make predictions; Understand the basic modeling syntax used in S-PLUS; Import and export data, and; Save graphs to different formats. Audience. This course is designed for those who are new to the Graphical User Interface in S-PLUS 2000. [For additional information please contact Cathie Lynch at voice (800)569-0123 x246 or email cathie@statsci.com or visit <http://www.mathsoft.com/splus/train/schedule.htm>]

III. GIS Outreach

(Editor: All requests for Public Health GIS User Group assistance are welcome; please 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)

✉ From **Michael Rip**, Michigan State University: I write to inquire about your knowledge of the use of John Snow and his mapping of cholera in London last century (1854). I am quite close to finishing a book about Snow for The Oxford University Press (due out in the late Fall 2000), and wish to use some examples of how folks within the GIS community have used or use Snow's work. The book, while a biography, has a few chapters about disease mapping, history of cartography, GIS and disease mapping, scientific reasoning and cartographic analysis, etc. I would be most grateful for any assistance you may be able to render. [Contact: Mike at email rip@pilot.msu.edu]

Response from **Bill Henriques**, ATSDR: Several folks have replicated Snow's research in the context of 'If John Snow had a GIS in 1854'. One of our GIS Specialists, Andy Dent, has created an exercise for our GIS course based on Snow's investigation. This training data set will become part of the training exercises for the EpiMap 2000 software developed by CDC. [Contact: Bill, GIS Coordinator, at email wdh2@cdc.gov and Andy at email aed5@cdc.gov]

Response from colleague, CDC NCCDPHP: If Mike has not already done so, my suggestion would be to contact Dr. Andrew Cliff. Dr. Cliff developed a

number of interesting (black and white) maps in his Atlas of Disease Distributions (1998)-for example, showing how "drainage" and "elevation" may have played a role. Dr. Cliff also includes several (small size) maps (but in color) in his chapter in the book by Longley P, Batty M, Spatial analysis: modeling in a GIS environment. Cambridge: Geoinformation International 1996. The advantage of Dr. Cliff's maps is that they include a "larger area" than strictly the "small area" map in John Snow's original report.

Response from **Andrew Dean**, CDC EPO: Catherine Schenck-Yglesias is developing the Epi Map version of the exercise, using materials provided by Andy Dent in ATSDR, who obtained data on London Streets in 1854 and set up the "Geocoding" for the XY coordinates. [Contacts: Andy at email agd1@cdc.gov and Catherine at email czs8]

☛ From **Harvey Lipman**, PHPPO CDC: I just received a request from Phil Brachman (former CDC staffer, now at Emory University, and an editor of the *International Journal of Epidemiology*). He asked if I could help him find a reviewer for an article entitled "Birds of a feather: Using a rotational box plot to assess ascertainment bias." The keywords for the manuscript are GIS, exploratory spatial data analysis, and sampling bias. Is there anyone among the GIS User Group who might be willing to review this paper? If so, have him/her contact me [Contact: Harvey, Chair, CDC Statistical Advisory Group at email hxl0]

☛ From **David Williamson**, EPO CDC: EPO has been working on a proposal with CDC OD and the Behavioral and Social Sciences Working Group (BSSWG) for a Coordinating Focus in Analytic Methods which would facilitate/coordinate broad-based analytic methods activities across various disciplines at CDC. One of the next steps is to bring together a few good methodologists/thinkers to discuss various interests in analytic methods, more focused on the behavioral and social sciences, and identify several topics in that area to include in a seminar and commissioned paper series and methods handbook. We are hopeful of including the papers in a journal

supplement. Anyone who would like to participate in this effort (someone with interest in behavioral and social sciences) should contact me by Friday, January 14 for further information. [Contact: David at voice (770)488-8188]

☛ From **David Bott**, Dartmouth University: I am a health services researcher at Dartmouth College and am involved in a project to create primary care health service areas (PCSA). I have been discussing with several members of the North American Primary Care Research Group about creating a Special Interest Group within the association devoted to GIS applications to primary care research. I would be most interested in being informed of any public health activities by GIS users that addresses the application of GIS to research and the problems/solutions related to such projects. [Contact: Dave at email David.M.Bott@Dartmouth.edu]

☛ From **Keerti Bhusan Pradhan**, Tamil Nadu, India: I am interested in knowing more about GIS in health for clarity in understanding and if any one could explain me how GIS can be used in eye care services. If any one has any published literature kindly send them to me. [Contact: Keerti, MHA(TISS), Faculty, at email keerti@aravind.org]

IV. Special Reports

GIS Model of Power Lines Used to Study EMF and Childhood Leukemia

by Joseph Bowman, National Institute for Occupational Safety and Health

A GIS model of household magnetic fields from power lines has shown a significant association with childhood leukemia where exposure measurements showed none (1,2). This study by a collaboration between NIOSH and the University of Southern California (USC) sheds new light on the difficult question of whether electric and magnetic fields (EMF) from AC electricity cause cancer (3). This GIS wiring model can be used in other epidemiologic studies where residential EMF is a possible risk factor, such as the Long Island Breast Cancer Project (see *Public Health GIS News and Information*, November

1999).

The suspected link between EMF and cancer has been a scientific mystery and the subject of contentious debate for nearly two decades. Part of the problem has been exposure assessment. The original report by Wertheimer and Leeper (4) assessed exposures with a simple "wire code" that crudely predicted residential magnetic fields from observable configurations of the electrical lines around the subject's homes. When better funded studies took household measurements, childhood leukemia risks were more strongly associated with wire codes than with the EMF measurements. This "wire code paradox" led to a decade-long debate over the meaning of the observed associations. Were they artifacts due to study flaws or undetected leukemogens correlated with electric lines? Or was household EMF actually a carcinogen, but measurements failed to show an association due to exposure assessment errors and selection biases that wire codes somehow avoided?

To approach this wire code paradox in a new way, the NIOSH/USC collaboration proposed a wiring configuration model that might predict long-term magnetic field exposures better than either wire codes or measurements. The model was based on the formulas of electromagnetism where the unknown parameters were determined by a regression against household measurements. The hypothesis was that magnetic field exposures predicted by the model should be more strongly associated with leukemia than either measurements or wire codes. Data to test this hypothesis was available from an EMF-leukemia study in Los Angeles County which used both wire codes and 24-hour measurements of the magnetic fields in the child's bedroom (5).

The key to this EMF exposure model was a GIS procedure for analyzing the wiring around the homes where the subjects had lived since conception. The USC team had originally used GIS in the late 1980s to determine wire codes objectively. Field technicians had sketched maps of all electrical lines around the subject's homes and measured relevant distances (see figure). From electric utilities in the area, they obtained scaled maps of the neighborhood electric lines which had detailed information on

voltage, wire thickness and other parameters relevant to magnetic field production.

These wiring and geographic data were entered into an early GIS program called *Facility Mapping System with AutoCAD* (Facility Mapping Systems, Mills Valley, CA). FMSAC then produced scale maps with the attribute data attached to the lines, poles, transformers, and the subject's residence. Since the electric utilities had not yet started using GIS for their wire maps, the maps had to be traced on a computerized tablet, and other data entered by hand. A standardized coding manual and rigorous quality control measures were crucial to successful data entry. In the end, FMSAC could extract a database for each residence that contained all the data needed for both wire coding and the more sophisticated exposure model.

The exposure model was based on the Law of Biot and Savart, the equation for the magnetic field at a distance from a wire carrying an electric current (1). From electrical engineering principles, we derived a reasonable formula for the magnetic fields in the child's bedroom. All the necessary parameters in this formula were provided by our GIS data except for the current in the lines. The unknown currents were assumed to be linear functions of relevant wire configuration parameters, with coefficients to be determined by regression against 24-hr average magnetic fields measured in the child's bedroom. To calculate these empirical current functions, Prof. Duncan Thomas (USC) developed a stepwise non-linear regression procedure.

For the regression, the GIS databases were merged with measurement data on the homes where we had obtained access. The study design attempted EMF measurements only at the residence where the subject lived the longest, and access was denied at many such residences. So wiring data was available for 709 residences, but measurements were taken in only 315 homes. (This was a potential source of selection bias in the original study.) The model's predictions produced a bootstrap correlation of 0.40 with the measured fields, an improvement on the 0.27 correlation obtained with the wire code.

The risk analysis from the case-control data

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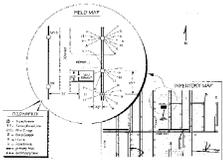
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was then repeated with the predicted magnetic fields (2). Although the measured fields had no association with childhood leukemia (p for trend = 0.88), the risks were significant for the highest predicted magnetic fields (OR = 2.00, 95% CI = 1.03-3.89), and a significant dose-response was seen (p for trend = 0.02). When exposures were determined by an empirical Bayes combination of predictions and measurements, the odds ratio (OR = 2.19, 95% CI = 1.12-4.31) and the trend showed somewhat greater significance ($p=0.007$).

These findings support the hypothesis that magnetic fields from electrical lines are causally related to childhood leukemia, but that this association has been inconsistent among epidemiologic studies due to different types of exposure assessment error. This result bolsters the conclusions of a recent U.S.

assess the leukemia risks from a child's long-term residential magnetic field exposures better than the 24-hr measurements. One reason is that the model can be assess exposures with more subjects and more previous residences because the maps do not require access to homes. This increases the study's power and reduces the potential for selection bias.

This wiring model should also be better for retrospective exposure assessments since electric lines in residential neighborhoods seldom change. In contrast, EMF measurements are strongly influenced by short-term fluctuations in electrical usage which create errors in assessing long-term average exposures. The regression over many residences tends to average out such fluctuations. Where measurement data is available, the empirical Bayes estimator combines the advantages of measurements and modeling.



risk assessment which found EMF to be a possible carcinogen (3).

The GIS wire configuration model appears to

Our exposure model can be applied to other studies with far less work than the original study. In

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the decade since the USC team collected its data, GIS technology has completely taken over mapping at electric utilities. Instead of laboriously visiting residences and tracing maps, a wiring configuration model can be developed today by merging GIS databases. The only active data collection needed is magnetic field measurements in homes. In order to apply our model to new electrical service areas, regression against local measurements is desirable because the parameters depend on the engineering details of the electrical distribution system.

The Long Island Breast Cancer Study Project (LIBCSP) appears to be a perfect setting for the wiring model. EMF has been implicated as a breast cancer risk factor by animal toxicology, cellular studies and some preliminary epidemiology (3). LIBCSP is therefore measuring magnetic field exposures and mapping adjacent electric lines in a subset of 1200 subjects. In addition, NCI has just contracted for a \$4.8 million GIS system which will incorporate data on many possible environmental risk factors. According to the GIS contractor's Internet site (6), their data sources include high-voltage powerlines (from the US Geologic Survey) and electric distribution lines (from the Long Island Light Co). When the GIS system is complete in a couple years, all the data needed to apply the wiring model to the LIBCSP should be readily available.

A study with the GIS exposure model would be especially important if the present breast cancer study finds no association with EMF measurements, raising the specter of the wire code paradox. In that case, the wiring configuration model could clarify the assessment of EMF's breast cancer risks. [Contact: Dr. Bowman, Radiation Section, Division of Biomedical and Behavioral Sciences, Cincinnati, OH at voice (513) 533-8143 or email jdb0]

References

1. Bowman JD, Thomas DC, Jiang L, Liang F, Peters JM. Residential magnetic fields predicted from wiring configurations: I. Exposure model. *Bioelectromagnetics*, 20:399-413, 1999.
2. Thomas DC, Bowman JD, Jiang L, Liang F, Peters JM. Residential magnetic fields predicted from wiring configurations: II. Relationships to childhood leukemia. *Bioelectromagnetics*, 20:414-422, 1999.

3. National Institute of Environmental Health Sciences. *NIEHS Report on Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields*. NIH Report No. 99-4493, 1999. (Also available at <http://www.niehs.nih.gov/emfrapid/>.)

4. Wertheimer N, Leeper E. Electrical wiring configurations and childhood cancer. *Am J Epidemiol*. 109:273-284, 1979.

5. London SJ, Thomas DC, Bowman JD, Sobel E, Cheng TC, Peters JM. Exposure to residential electric and magnetic fields and risk of childhood leukemia. *Am J Epidemiol* 134: 923-937, 1991.

6. The Geographical Information System for the Long Island Breast Cancer Study Project. Internet address: <http://www.healthgis-li.com>.

Atlas of Cancer Mortality in the United States, 1950-94

The National Cancer Institute (NCI) has published a new atlas, the *Atlas of Cancer Mortality in the United States, 1950-94*, showing the geographic patterns of cancer death rates in over 3,000 counties across the country over more than four decades. Except for the United States, few countries have mapped cancer mortality data over such an extensive time period and in such geographic detail, making it a unique resource. The 254 color-coded maps in the atlas will make it easy for researchers and state health departments to identify places where high or low rates occur, and to uncover patterns of cancer that would escape notice if larger areas, such as states, were mapped. The atlas will not tell researchers why death rates are higher in certain localities than in others, but it will provide important clues for further in-depth studies into the causes and control of cancer.

For the first time, maps will be presented for both white and black populations, since earlier mortality statistics lacked data that would permit a separation of blacks from the nonwhite category. In addition, the patterns for liver cancer and for biliary tract cancer will be shown for the first time. Previous disease classification schemes did not permit separate analyses of these cancers. "It's not easy to sort out why cancer mortality rates vary among geographic areas and why they might be changing," said Joseph F. Fraumeni Jr., M.D., director of NCI's Division of Cancer Epidemiology and Genetics, and the senior

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author of the current and earlier atlases. "It's natural to want to know why cancer rates are elevated in a particular area, but it's important not to jump to conclusions before careful studies can be conducted in these areas."

Many of the patterns displayed in the current atlas are very similar to previous ones. High breast cancer rates, for instance, have been seen for four decades in urban centers in the Northeast. Studies have shown that regional variations in breast cancer rates are partially, but not entirely, due to established risk factors, including late age at first birth, early menarche, and late menopause, and to certain other factors, including education and mammography history. Likewise, colon cancer mortality rates have been elevated in the Northeast for at least four decades. Dietary and nutritional factors are thought to be involved, but the specific causative elements are not clear.

"There are some geographic changes over time, however, that are particularly provocative," said Susan S. Devesa, Ph.D., lead author from NCI's Division of Cancer Epidemiology and Genetics. "The greatest changes are seen with lung cancer. The national annual lung cancer rate among white men rose from 39 per 100,000 during 1950-69 to 69 per 100,000 during 1970-94. In earlier atlases, elevated rates were seen in men in the Northeast and Southern Coastal areas of the United States. The highest rates now occur among white men in broad stretches across the South, among white women in the far West, and among the black population in northern urban areas," she explained. "These changes generally coincide with regional and time trends in cigarette smoking." The patterns of prostate cancer deaths, which in the past showed little distinct geographic variation, have also changed. High rates among white men are much more prominent now in the north central areas. In contrast, among black men, rates are excessive in the southeastern United States, particularly in rural areas.

"We don't know right now why the patterns for prostate cancer are changing," said Robert N. Hoover, M.D., also at the Division of Cancer Epidemiology and Genetics and an author of both current and past atlases. "But the atlas provides clues that will

stimulate efforts to find out what characteristics of these populations and their exposures are responsible for the higher rates." Earlier atlases have been successful in generating leads that prompted further studies, particularly in high-risk areas of the country. The results of these studies are reported in the new atlas. Some of the findings include:

*The high rates of lung cancer among men in Southern Coastal areas were related to asbestos exposure resulting from work in shipyards, particularly during World War II.

*Elevated death rates for mouth and throat cancers among women living in the rural South were associated with use of smokeless tobacco.

*High death rates of esophageal cancer in Washington, D.C. and the coastal areas of South Carolina were linked to alcohol consumption and tobacco use, along with deficiencies in fruit and vegetable consumption.

*High lung cancer death rates were seen not only among smelter workers but also among people who live close to arsenic-emitting smelters.

*High colon cancer death rates in eastern Nebraska occurred mainly among persons of Czechoslovakian background, in whom dietary factors appeared to contribute to the risk.

"We've discovered that the reasons for high rates are quite varied," said Hoover. "Sometimes they're due to occupational exposures. For example, in addition to lung cancer in shipyard workers, we've seen elevated rates of nasal cancer among furniture and textile workers in particular areas of the Southeast. On the other hand, increased rates may be due to general environmental exposures, such as arsenic and lung cancer, or lifestyle differences, such as the regional patterns for breast cancer and, most likely, colon cancer."

One study has already been initiated in response to the new atlas. Bladder cancer among men has tended to cluster in the urban Northeast since the 1950s, particularly in areas with chemical industries. Previous studies in high-risk areas have also shown elevated risks among truck drivers and other workers exposed to motor exhausts. The main risk factor is cigarette smoking, which accounts for one-half of

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bladder cancer. But the new atlas has shown that Maine, Vermont, New Hampshire, and upstate New York have elevated rates in both sexes that have become more pronounced over time. "We have been working with the states and with some of the academic departments in these states to develop a pilot study to pursue some of the current hypotheses for why the rates for bladder cancer have become more pronounced," said Hoover.

There are, however, some limitations to the atlas data. The atlas is less useful in generating research leads for cancer sites in which death rates do not vary much across the country, such as cancers of the pancreas and brain. In addition, for cancer sites with higher survival rates, such as breast and cervix, it is difficult to tell whether the geographic variation reflects environmental influences, factors related to medical care and health care delivery systems, reporting practices, migration patterns, or combinations of these variables. The Atlas of Cancer Mortality in the United States, 1950-94 is a continuation of the cancer mapping project in NCI's epidemiology program. The first atlas with color-coded mortality maps at the county level was published in 1975 and covered the years 1950-69. The current atlas adds 25 years of data to the original atlas and compares the patterns for 1950-69 with those for 1970-94.

In addition, for the first time, an interactive version of the data will be available on the Internet. Web accessibility makes several new features possible. Not only can the maps, text, tables, and figures from the hard copy be downloaded from the Web site, but national and state mortality rates are also available, as are the tabulated data used to generate the maps. Another feature of the atlas Web site is that the user can create customized maps. For example, the user can compare rates in different time periods, look at rates for any cancer in any county, zoom and pan different areas of the country, and make color selections. [Source: Linda Anderson, Director of Communications, Long Island Breast Cancer Study Project, Epidemiology and Genetics Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute at voice (301) 496-

9600 or email la30e@nih.gov; Note: the atlas Web site is at <http://www.nci.nih.gov.atlas> and, while supply lasts, the atlas may be ordered for free on-line]

V. GIS and Related Presentations and Literature

(This section may include literature citations, abstracts, syntheses, etc., and submissions are open)
January 18, 2000: "The National Center for Health Statistics Research Data Center: New research Opportunities," by John Horm, Negasi Beyene, Vijay Gambhir, and Robert Krasowski, National Center for Health Statistics, at the Bureau of Labor Statistics, Room 2990, Postal Square Building, 12-1:50 P.M. (sponsored by the Washington Statistical Society).
Abstract: The National Center for Health Statistics (NCHS) has developed a Research Data Center (RDC) which allows researchers and data users to access internal data files from its numerous surveys containing data items which have not been available to the research community until now. Internal NCHS files contain lower levels of geography such as state, county, census tract, block-group, or blocks, depending on the survey. Examples of data systems that are available through the RDC include the National Health Interview Survey, the National Health and Nutrition Examination Survey, the National Hospital Discharge Survey, the National Survey of Family Growth Contextual Data Files (these consist of the survey data and about 1,300 contextual variables and is only available through the RDC) the National Ambulatory Medical Care Survey among others. Researchers may use internal NCHS data files to merge data from the Census Bureau, the Area Resource File, or other data collected or provided by the researcher (air pollution data, state, county, or local laws or ordinances, reimbursement policies, medical facilities, etc.) to perform contextual analyses while maintaining respondent confidentiality. Because of the confidentiality constraints NCHS has not been able to release survey data with lower levels of geography to its data users which has limited the amount and types of research, policy, and programmatic projects that could be undertaken with its data systems. The development of the RDC begins an exciting new era for NCHS and its data users.

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[Contact: Karen Jackson at voice (202) 691-7524]

NCHS Cartography and GIS Guest Lecture Series

January 25, 2000: "The Atlas of Cancer Mortality in the United States, 1950-94," by Dan Grauman, Division of Cancer Epidemiology and Genetics, National Cancer Institute, at the NCHS Auditorium (with Envision), 2:00-3:30 P.M. **Abstract:** The geographic patterns of cancer around the world and within countries have provided important clues to the environmental and occupational determinants of cancer. In the mid-1970s the National Cancer Institute prepared county-based maps of cancer mortality in the U.S. that identified distinctive variations and hot-spots for specific tumors, thus prompting a series of analytic studies of cancer in high-risk areas of the country. We have prepared an updated atlas of cancer mortality in the United States during 1950-94, based on mortality data from the National Center for Health Statistics and population estimates from the Census Bureau. Rates per 100,000 person-years, directly standardized using the 1970 US population, were calculated by race (whites, blacks) and gender for 40 forms of cancer. The new atlas includes more than 140 computerized color-coded maps showing variation in rates during 1970-94 at the county (more than 3000 counties) or State Economic Area (more than 500 units) level. Summary tables and figures are also presented. Over 100 maps for the 1950-69 period are also included. Accompanying text describes the observed variations and suggests explanations based in part on the findings of analytic studies stimulated by the previous atlases. The geographic patterns of cancer displayed in this atlas should help to target further research into the causes and control of cancer. Two Web sites associated with the atlas will be demonstrated (see <http://www.nci.nih.gov/atlas>). The first, a static Web site, enables the user to view the entire contents of the atlas, as well as to download graphic images and data used to generate the maps. The second Web site is dynamic, and allows the user to change the number of ranges and ranging method. The user can also focus on a specific geographic region. [Contact: Chuck Croner at email cmc2@cdc.gov]

February 15, 2000. "Managing Confidentiality: Building blocks for the Protection of and Access to Health Data," by Douglas Neibert and Mark Reichardt, Federal Geographic Data Committee, USGS, at the NCHS Auditorium (with Envision), 2:00-3:30 P.M. Goals: To provide an overview of the value of NSDI practices and methods to improve the management of and access to health data. To determine areas of collaboration between the FGDC and CDC for management of health related data.

Abstract: A growing problem in the management of health data is the proper handling of data that must remain confidential to protect the identity of individuals, or to meet the requirements of local authorities for use. With the growing amount of health related information, particularly those data that are geographically referenced, there must be a simple and effective set of practices and mechanisms for researchers, and decision-makers to inventory, advertise, and enable proper access to data at various levels of authority. The basic elements of the National Spatial Data Infrastructure are discussed as a solution to establishing an effective process to inventory, advertise, and manage access to geographically referenced health information intended for restricted use and open public access. Specific Discussion Points: Metadata: Cataloging to inventory, advertise, and protect data use; Clearinghouses: Searching for and locating exactly what you are looking for; Advantages of Metadata and Clearinghouses over Search Engines; The basics of geographic information. [Contact: Chuck Croner at email cmc2@cdc.gov]

Emerging Infectious Diseases

The November-December 1999 issue of CDC's journal, *Emerging Infectious Diseases* (EID), is now available at <http://www.cdc.gov/eid>. Selected articles include (titles only): Evidence of Human Ehrlichiosis in Israel; Tuberculosis Surveillance with HMO Data; Managing Tuberculosis with Pharmacy Records; Hantavirus Reservoir Hosts in Argentina; Toxic Shock Syndrome in the U.S., 1979-1996; Epidemiology with Computer-Generated Dot Maps; HIV as a Risk Factor for Shigellosis; and, Dengue among Travelers to Tropical Countries.

Morbidity and Mortality Weekly Report

Selected articles from CDC's *Morbidity and Mortality Weekly Report* (MMWR): Vol. **48**, No. **50**- Achievements in Public Health, 1900-1999: Changes in the Public Health System; Community Needs Assessment and Morbidity Surveillance Following an Earthquake-Turkey, August 1999; Imported Dengue-Florida, 1997-1998; Notice to Readers: Epi Info 2000: A Course for Teachers and Practitioners of Epidemiologic Computing; Vol. **48**, Nos. **51** and **52**- Abortion Surveillance: Preliminary Analysis-United States, 1997; Notifiable Diseases/Deaths in Selected Cities Weekly Information-Weeks 51 and 52; Vol. **48**, No. **49**- Global Measles Control and Regional Elimination, 1998-1999; Notice to Readers: Publication of the Updated Inventory of Managed-Care-Related Projects, 1998; Notice to Readers: Epidemiology in Action: Intermediate Methods; Notifiable Diseases/Deaths in Selected Cities Weekly Information; Vol. **48**, No. **SS-8**- Surveillance for Selected Public Health Indicators Affecting Older Adults-United States, Foreword; Overview: Surveillance for Selected Public Health Indicators Affecting Older Adults-United States; Surveillance for Morbidity and Mortality Among Older Adults-United States, 1995-1996; Surveillance for Injuries and Violence Among Older Adults; Surveillance for Use of Preventive Health-Care Services by Older Adults, 1995--1997; Surveillance for Five Health Risks Among Older Adults-United States, 1993-1997; Surveillance for Sensory Impairment, Activity Limitation, and Health-Related Quality of Life Among Older Adults-United States, 1993-1997; Volume **48**, Number **RR-13**- Guidelines for National Human Immunodeficiency Virus Case Surveillance, Including Monitoring for Human Immunodeficiency Virus Infection and Acquired Immunodeficiency Syndrome; Appendix: Revised Surveillance Case Definition for HIV Infection; Vol. **48**, No. **48**- Evaluating Newborn Screening Program Data Systems-Georgia, 1998; Update: Respiratory Syncytial Virus Activity - United States, 1998-1999 Season; Notifiable Diseases/Deaths in Selected Cities Weekly Information; Vol. **48**, Number **47**- Achievements in Public Health, 1900--

1999: Family Planning; Progress Toward Measles Elimination - Eastern Mediterranean Region, 1980-1998; Alcohol Involvement in Fatal Motor-Vehicle Crashes - United States, 1997-1998; National Drunk and Drugged Driving Prevention Month - December 1999; Notice to Readers: Epidemiology in Action: Intermediate Methods; Notifiable Diseases/Deaths in Selected Cities Weekly Information; Vol. **48**, No. **46**- Suicide Prevention Among Active Duty Air Force Personnel-United States, 1990-1999; Progress Toward Poliomyelitis Eradication-Eastern Mediterranean Region, 1998-October 1999; Vol. **48**, No. **45**- Nonfatal and Fatal Firearm-Related Injuries-United States, 1993-1997; State-Specific Prevalence of Current Cigarette and Cigar Smoking Among Adults-United States, 1998; Influenza Activity-United States, 1999-2000 Season; Notice to Readers: Internet Availability of Tobacco Industry Documents; Vol. **48**, No. **44**- Reptile-Associated Salmonellosis- Selected States, 1996-1998; Notifiable Diseases/Deaths in Selected Cities Weekly Information; Vol. **48**, No. **43**- Great American Smokeout-November 18, 1999; Achievements in Public Health, 1900-1999: Tobacco Use-United States, 1900-1999; Cigarette Smoking Among Adults-United States, 1997; Recommendations Regarding the Use of Vaccines That Contain Thimerosal as a Preservative; Withdrawal of Rotavirus Vaccine Recommendation; Notifiable Diseases/Deaths in Selected Cities Weekly Information;

VI. Related Census, DHHS and Other Federal Developments

National Science Foundation (NSF) News

The Report of the European-United States joint workshop on **Large Scientific Databases** has recently been made available at <http://www.cacr.caltech.edu/euus/index.html>. Many geospatial data issues are explicitly recognized and discussed. **Executive Summary:** Science is continuing to generate ever larger amounts of valuable data, but we are in danger of being unable to extract fully the latent knowledge within the data because of insufficient technology. To address this we propose the establishment of an Expedition Center, a virtual "center", hosted at multiple geographical sites, similar in scope and thrust

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to the US-NSF Science and Technology Centers. Features include: *unification of information and knowledge management between US and Europe; *strong leadership and continuity of purpose; *funding in the millions per year; *longevity of 5 years or more, and; *flexibility to seize new opportunities quickly and to shift the agenda rapidly.

The center would be a network of excellence in specific research domains, emphasizing trans-Atlantic teams, supporting both basic and applied research, with large-scale testbeds and large-scale demonstrations. It would have a strong education and outreach component. There might be four sites in the EU and US with independent funding for visitors, travel, and workshops. These regional centers could share the resources of independently-funded facilities to create large-scale demonstrations and prototypes; such sharing could be achieved by collaboration agreements or by rental. There would be liaison to other activities, for example the Framework 5 in the EU, the Grid Forums and Digital Library Initiatives in the US.

A crucial requirement for this kind of collaboration is trans-Atlantic data communication that provides high bandwidth, high availability, and low latency. We recommend a study to consider and cost the options in detail. We recommend funding application driven, multidisciplinary research, with the creation of prototypes, testbeds and full-scale implementations. Such research should always be close to the needs of a particular community, and preferably directly connected to scientifically-interesting research. Such a scientific community should be geographically distributed and international.

We encourage the creation and reconciliation of data object and metadata standards, but only in a strongly-defined, discipline-specific environment, and with enough funding to produce relevant and useful software, not just a report. Further work could define metadata semantics, discipline specific data dictionaries, information models for organizing metadata, and data models for describing data set structure. We encourage projects that use established, extensible metadata standards. Where an existing

standard exists, new projects should use, subset, or extend one of these standards, or provide good reason for any decision to start afresh.

Interoperability projects should be encouraged, that begin with two or more existing scientific databases, preferably already catalogued and/or online, together with a good reason and mechanism for combining the data. We should then encourage the implementation of this federation.

We recommend specific research on the following aspects of distributed and/or large databases: data clustering and caching; data redundancy, dynamic summarization, and query formulation to allow machine optimization and brokering; splitting queries into separate, local queries and cost estimation of queries; parallel multi-dimensional access and search methods, approximate search methods, and data compression; load-balancing of computational work and data in distributed systems, replication of data among regional centers, protocols for high-speed, parallel dataflow, and protocols for real-time steering and control of running jobs.

We also recommend supporting work on security mechanisms, especially work that coexists with other security mechanisms. We recommend that creators of scientific databases should be encouraged to consider in advance the preservation of the data. Preservation description information should be associated with the digital objects being preserved. We recommend investigation of ways to standardize requirements for IT-courses in the educational curricula of the domain sciences with emphasis in data modeling and use of databases. We recommend exploration of the profound impact of databases and networking on the process of science, including publishing, peer-review, collaboration, and data ownership. [Contact: Alan Gaines, Senior Science Associate for Spatial Data and Information, NSF, at voice (703) 306-1517 or email againes@nsf.gov]

Federal Geographic Data Committee (FGDC)

From **Bob Pierce**, USGS: The FGDC Subcommittee on Spatial Water Data has been reactivated over the

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last several months. This notice is to let you know what they have been working on and encourage your participation in their upcoming meetings and workshops. The following is a notice from the Subcommittee: Subcommittee on Spatial Water Data. Hydrologic Unit Code Regional Meetings- There has been a convergence of interest between many Federal and State agencies and, in general, a consensus has been reached that current hydrologic unit maps are unsatisfactory for many purposes because of inadequate bases or scales. The need for subdivision of the existing hydrologic units to the 5th and 6th levels (watershed and subwatershed respectively) has been recognized. There is a need to ensure groups are using compatible criteria for names, codes, and hydrographic boundaries. Discussions among Federal and State representatives in national committees such as the Advisory Committee on Water Information (ACWI) and the Federal Geographic Data Committee (FGDC) have led to agreement there is a critical need to develop uniform and widely acceptable hydrologic boundaries and to present them on nationally consistent base maps.

The Subcommittee on Spatial Water Data (SSWD, subcommittee to FGDC and ACWI) is sponsoring workshops to facilitate production of a seamless and nationally consistent Watershed Boundary Dataset (WBD). Workshop participants will have the opportunity to share hydrologic maps under development and to work with participants from adjacent States on common boundaries. Karen Siderelis, North Carolina Center for Geographic Information and Analysis, has joined the Subcommittee as Executive Secretary. The first workshop was held in Marlboro, MA on June 9-10, 1999. Minutes of the SSWD will be posted on the ACWI website at <http://water.usgs.gov/wicp/acwi/spatial/index.html/>. [For more information about the workshops contact Bob at (770) 903-9113 or Debbie Polen (703) 648-5743]

From **Richard A. Pearsall**, USGS: Help review the ISO Metadata Standard 19115: The Technical Committee 211 of the International Standards Organization (ISO) has reissued the International

Metadata Standard 19115 (formerly 15046-15) as Committee Draft-Version 2, allowing for a review by the broader geospatial data community. To participate in this review you must register with the Federal Geographic Data Committee (FGDC) and be a U.S. citizen or represent a U.S. organization. The review closes January 26, 2000. You may also register to help adjudicate the comments that are received in this review. This review will help the FGDC establish a position on the draft International Metadata Standard which has been under development since 1996. It is in the interest of the U.S. geospatial data community to assure that the proposed ISO Metadata Standard be compatible with existing FGDC-compliant metadata records. To register, contact the FGDC (email: fgdc@www.fgdc.gov; mail: FGDC/ISO, USGS, 12201 Sunrise Valley Drive, MS590, Reston, VA 20192) or visit the FGDC web site at: http://www.fgdc.gov/metadata/iso_reg.html. You will receive a copy of the ISO Metadata Standard 19115 for the sole purpose of review and comment. The ISO Metadata Standard is a copyrighted document and cannot be copied in any form without written consent of the ISO. [Contact: Richard, FGDC Metadata Coordinator, USGS, at voice (703) 648-4532 or email rpearsall@usgs.gov]

From **Kimberly Burns-Braidlow**, USGS: Proposed National Digital Elevation Program. An elevation focus group was assembled by the Subcommittee on Base Cartographic Data (SBCD) to explore the interest and feasibility of forming a coalition of federal agencies to address common issues on this category of data, especially with respect to laser and radar altimetry. Representatives from USGS, NOS, USACE, NIMA, FS, BLM, TVA, NGS, and FEMA met at USGS on 11/15/99 to discern common interests and consider further actions.

On the basis of this meeting there was general consensus that a federal consortium could be established. A draft charter based on an existing consortium, the National Digital Orthoimagery Program (NDOP) was favorably received and the concept is now being more widely briefed and considered at the agencies represented and by other interested parties. The original group, with some

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anticipated augmentation, will meet on January 13, 2000 at FEMA.

FEMA, in the course of preparing flood risk maps, has had elevation data manufactured by contractors. The idea of having partners share both the costs and results of such data gathering, to meet multiple missions, illustrates part of the appeal for forming a federal consortium. A draft charter for an arrangement that may include opportunities for partnerships of this nature, based on the model of the federal consortium for digital orthoimagery (National Digital Orthoimagery Program, NDOP) was circulated soon after the 9/29/99 meeting and the general concept was discussed at this meeting. The draft charter was represented as a strawman for a National Digital Elevation Program (NDEP). Agency representatives will carry this strawman back to their organizations (including potential stakeholders who were not present at this meeting) to discuss the merits of participation, potential roles, and similar details. The group will meet again in mid-January [tentatively 1/13/2000 at FEMA] to cover reactions, hopefully initiate a signatory process, and plan for a technical session at which prospective NDEP members can interact with vendors of new elevation gathering technologies.

The NDOP, in operation for the past 7 years, has been a very successful partnership of USGS, NRCS, FSA, and a number of States (and will soon include FEMA and possibly EPA). The Program is on the brink of completing initial, consistent, 1m resolution Digital Orthophoto Quadrangle (DOQ) coverage of the conterminous US, an objective that would have been financially impossible as independent efforts by the individual partners. Like the NDOP, the NDEP would seek to share information about new technologies, influence commercial developments, and provide a mechanism for partnering over areas of common geographic interest. It would also create an environment favoring more standardized data and metadata, and could offer a means for negotiating more beneficial price and licensing terms in commercial contracts. [Contact: Tom Connolly, USGS/NMD, at email tconnoll@usgs.gov]

Web Site(s) of Interest for this Edition

There are several sites to examine with this edition which complement my discussion of the National Spatial Data Infrastructure (NSDI). The first reflects one of the FGDC endorsed mapping projects entitled "Digital Earth." This is an ambitious project to put innovative mapping tools within access of all citizens. The National Aeronautic and Space Administration (NASA) has lead responsibility for its development (see <http://www.digitalearth.gov>). There are other sites that similarly provide a variety of interactive data. In fact, the USGS' new digital National Atlas of the United States of America (see www.nationalatlas.gov) is part of the Digital Earth initiative. The U.S. Geological Survey and its partners began work on The National Atlas of the United States of America in 1997. The National Atlas is designed to promote greater geographic awareness through the development and delivery of products that provide easy to use, map-like views of our natural and socio-cultural landscapes. The National Atlas is being designed to serve the interests and needs of a diverse populace in many ways; as an essential reference; as a framework for information discovery; as an instrument of education; as an aid in research; and as an accurate and reliable source for scientific information. More than 700 websites now link to the National Atlas (for example, see <http://teraserver.microsoft.com>). All of these developments are part of the emerging NSDI which I discuss below. If you really want to "drill down" to our basic unit of earth space, this too is achievable through an internet parcel lookup system (see <http://www.webgis.net>). Feedback from citizens, especially real estate agents, land surveyors, appraisers, attorneys and others working daily with property records actively web-based, has been overwhelmingly positive. For example, local government agencies (such as the mappers office in Ashe County, N.C.) have seen a 50% reduction in foot traffic into the office, freeing up critical personnel and allowing them more time to keep their records up to date. Finally, I think a good academic source (and there are many) for exploring the NSDI landscape and the many GIS and data links available on the web can be found at Rice University (see [#org](http://riceinfo.rice.edu/Fondren/GDC/gislinks.shtml)).

Final Thought(s)

The NSDI is Emerging: Credit OMB's Federal Geographic Data Committee

Although at times it may not appear completely crystalized, the many years of continuous dedicated effort by OMB's Federal Geographic Data Committee (FGDC) to direct our national digital spatial data revolution, or National Spatial Data Infrastructure (NSDI), I believe, has us right on target. As we enter the new Millennium, the NSDI is evolving now into a reality in which everyone, especially the public, has a vested stake. We are benefitting from FGDC leadership to structure and standardize the very processes associated with the collection, use, dissemination, warehousing and sharing of spatial data. Without this amazing vision and blueprint, there would be no ability to move spatial data- cost effectively- either horizontally or vertically.

The NSDI is gaining critical momentum. Although conceived originally to provide Federal direction, the FGDC model for NSDI now counts more than 2500 agencies, in all sectors, working to make it a success. To date, approximately 105 Clearinghouse nodes nationally, and almost 60 internationally, comprise the NSDI network across which metadata queries and data sharing can be conducted. In conjunction with spatial data standards, new supercomputing capabilities, open-ended architectures, high speed broadband and wireless communications, dynamic self-updating GPS and GIS databases, and multidimensional virtual realities on demand will fuel the NSDI to enable spatial data applications that will serve our society in extremely beneficial and cost-effective ways. Many ideas are in the process for web mapping testbeds and scientific examination. The FGDC model provides a basis for order in the sometimes perceived chaos associated with the accelerated and even warp speed of the digital spatial changes to which we are exposed or experience. Amidst this revolutionary backdrop the NSDI is emerging.

As interim DHHS representative to FGDC, and long-standing member of the Subcommittee on Cultural and Demographic Data, I am witness to the enormous amount of activities spawned by FGDC to have helped launch NSDI. I think it significant that every action has in mind a way to make NSDI more accessible and usable by all sectors of our society, from national institutions to neighborhood constituents. The message from FGDC's recent National GeoData Forum was to bring NSDI to all through increased data discovery and sharing with metadata and data standards. Appropriately entitled "Making Livable Communities a Reality," Mark Schaefer, Deputy Assistant Secretary for Water and Science, Department of the Interior, stated "We can now provide citizens and decision makers with concrete examples of how geographic information technologies are being used everyday to solve real world problems."

The FGDC Coordination Group and Steering Committee meeting agendas provide some idea of the consistent, focused and pervasive energies directed toward NSDI over time. Discussions and reviews concern metadata profiles and standards (14 now adopted) development; metadata and digital data clearinghouses; the Digital Earth initiative; the NSDI Cooperative Agreements Program to support metadata projects, spatial data framework implementation at the community level (includes Tillamook county, OR, Tijuana River Watershed, CA, Gallatin county, MT, Dane county, WI, the Upper Susquehanna/Lackawanna River Watershed, PA, and Baltimore City, MD) and web-mapping demonstration projects (e.g., interoperability of geographic data and tools on the web, see www.opengis.org/wmt/index.htm); Public Safety Infrastructure initiative; International spatial data standards coordination; and many others. Then there are the various thematic subcommittees whose agendas are directed at the extensive challenges of creating and constructing the very standards upon which NSDI has emerged. By whatever measure, the FGDC deserves our collective credit for outstanding service to launch and help guide NSDI into a national enterprise. Truly, each of us now is an NSDI stakeholder.

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[Postnote: I extend our appreciation to former FGDC Chairpersons, Gene Thorley and Nancy Tosta, and current Chair, John Moeller, for their enlightened leadership of FGDC. Readers are encouraged to visit FGDC activities at website <http://www.fgdc.gov>]

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Please join us at NCHS for our January 25 and February 15 GIS Presentations