PUBLIC HEALTH GIS NEWS AND INFORMATION

May 2000 (No. 34)

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

I. Public Health GIS (and related) Events

SPECIAL CDC/ATSDR GIS LECTURES

(1) See below announcement of May 11 CDC/ATSDR Satellite Broadcast **"GIS in Public Health: Using Mapping and Spatial Analysis Technologies for Health Protection;"**

(2) May 17, 2000, 2:00-3:30 P.M., **"Reducing Uncertainties in Applying Spatial Analysis in Environmental Health Research;"** Nina Lam, National Science Foundation and R. J. Russell Professor of Geography, Louisiana State University, and

(3) June 13, 2000: **"ZIP Code Tabulation Areas (ZCTAs™) for Census 2000,"** by Andrew Flora, US Bureau of the Census.

[Both May 17 and June 13 programs will be held at the NCHS Auditorium, **RM1100**, Hyattsville, MD; Envision is available to offsite CDC/ATSDR locations; Abstracts are included in this edition. Note: 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). These presentations are open to all staff and to the public]

****

"GIS in Public Health: Using Mapping and Spatial Analysis Technologies for Health Protection," a Public Health Training Network Satellite Broadcast, May 11, 2000, from 12:00 - 2:30 PM ET. See workshop details in Section II.B., this edition. Note: NCHS will serve as a public viewing site for this satellite program. The program will be shown in **RM 700C**, NCHS, at 6525 Belcrest Rd., Hyattsville, MD [Site facilitator: Chuck Croner at voice (301) 458-4168 or email ccroner @cdc.gov]

****

L ASPRS Annual Conference-DC 2000, "Start the 21st Century: Launching the Geospatial Information Age," American Society for Photogrammetry & Remote Sensing, May 22-26, 2000, Washington, DC [See: http://www.asprs.org/dc2000/]

K Statistics and Health, Edmonton Statistics Conference 2000, June 11-13, 2000, Edmonton, Alberta, Canada [See: http://www.stat.ualberta.ca/~ brg/conf.html]

L Conference on Radiation and Health: "Temporal Factors and Radiation Effects," American Statistical Association, June 24-29, 2000, Park City, UT [See: www.amstat.org/meetings/radiation]

K Office of Behavioral and Social Sciences Research, National Institutes of Health: "Toward Higher Levels of Analysis: Progress and Promise in Research on Social and Cultural Dimensions of Health" June 27-28, 2000, Bethesda, MD [See:http://www1.od.nih.gov/ obssr/ events/conference.html]

L 34th National Immunization Conference, Task Force for Child Survival and Development, July 5-8, 2000, Washington, DC [Contact: Suzanne Johnson-DeLeon at voice (404) 639-8817 or email msj1@cdc.gov]

K 4th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences, July 12-14, 2000, Amsterdam, The Netherlands [See: http://gissrv.iend.wau.nl/Accuracy 2000/]

L International Conference on Spatial Statistics in the Agro-, Bio- and Geosciences, July 19-22, 2000, Freiberg (Saxony), Germany [See:http://fink.mathe.tu- freiberg.de/ conf.htm]

K International Geoscience and Remote Sensing Symposium (IGARSS 2000), July 24-28, Honolulu, HA [Contact: IEEE Geoscience and Remote Sensing Society, at www.igarss.org]

L Public Health Informatics and Distance Learning Conference: "Blending People and Technology to Improve Practice," August 7-10, CDC/ATSDR, Association of Schools of Public Health and Health Resources and Services Administration, New Orleans, LA [See: http://www.bixler.com/asph/conference/]

K Second Annual URISA Street Smart and Address Savvy Conference, October 25-27, 2000, Baltimore, MD [See 1999 conference highlights at http://www.urisa.org/address99/addressprelim.htm]

L First International Conference on Geographic Information Science, National Center for Geographic Information and Analysis (with University Consortium for Geographic Information Science and Association of American Geographers), October 28-31, 2000, Savannah, GA, [Contact: Max Egenhofer at email max@spatial.maine.edu]

K Eighth International Symposium of ACM GIS (within the framework of the 9th International Conference on Information and Knowledge Management), November 10-11, 2000, Washington, D.C. [See: http://acmgis.cs.pusan.ac.kr/html/acmgis 2000/index.html and http://www.csee.umbc.edu/cikm/ 2000/]

L 51st Annual Meeting of the Society for Public Health Education (SOPHE): "Taking Risks: Revitalizing the Revolutionary Spirit of the Profession," November 10-12, 2000, Boston, MA [Contact: SOPHE at voice (202) 408-9804 or see www.sophe.org]

K 128th Annual Meeting of the American Public Health Association, November 12-16, 2000, Boston, MA [See: http://www.apha.org/meetings/]

L 2000 National STD Prevention Conference, "Untapped Opportunities: Connecting Science with Solutions," December 4-7, 2000, Milwaukee, WI [See: www.stdconference.org]

K 2000 CMRC Conference (Crime Mapping Research Center), National Institute of Justice, "Whereunit?: Investigating the Role of Place in Crime and Criminality," December 9-12, 2000, San Diego, CA [See: http://www.ojp.usdoj.gov/cmrc/whatsnew/welcome.html#crimemap]

II. GIS News

(*Please communicate directly with colleagues on any of the following issues*)

A. General News and Training Opportunities

1. From **David Smith**, Department of State: I wanted to let you know that State's Office of the Geographer and Global Issues is planning another Digital Map Expo on June 8, 2000 in the Exhibit Hall of the Department of State, following up on a similar event that we sponsored two years ago. We very much welcome exhibits from member organizations of the FGDC, particularly if they are relevant to international issues. [Contacts: David at email acdsmith@us-state. osis.gov or Al Anzaldua at voice (202) 647-1335]

2. From **Cynthia Taeuber**, University of Baltimore: This is to invite you to a conference (cosponsored with the Bureau of the Census and the US Department of Health and Human Services) to be held June 6-7, 2000 on "Developing Public Policy Applications with the American Community Survey and Community Administrative Records." This conference is for researchers and federal program agencies interested in developing enhanced state and community information systems. It will introduce the American Community Survey and ideas for using it with administrative records to improve the econometric models that provide guidance to those making public policy decisions. Detailed information about the conference and a registration form is provided at http://www. ubalt.edu/jfc/Conf/Flyer.htm [Contact: Cynthia at voice (410) 837 6551 or email ctaeuber@UBmail. ubalt.edu]

3. From **Samuel Soret**, Loma Linda University School of Public Health: This message is in regard to a recent inquiry in CDC's "Interim Public Health GIS User Group Announcements." Here at Loma Linda University School

of Public Health, we recently started a Bachelor of Science in Public Health in Health Geographics.

In addition we have a graduate course for MPH and DrPH students. In the future we would like to broaden our offer to graduate students. Our courses are open to any students on campus but so far we never had any medical students take our courses. I do not believe that folks in our School of Medicine are even aware about GIS or its application to various health fields. I am not aware about any attempts to include courses in their curriculum or even to encourage their students to take GIS courses. I think that events such as the upcoming CDC/ATSDR satellite broadcast in May will help to start changing this situation. Please do not hesitate to contact me for any further clarification. [Contact: Sam, Director, Geographic Information, Analysis and Technologies Laboratory at voice (909) 558-8750 or email ssoret@sph.llu.edu]

4. From **Loren Hall**, USEPA: The next meeting of the National Environmental Justice Advisory Council (NEJAC) will focus on federal efforts to secure disease prevention and health improvement in communities where health disparities exist that may result from, or be exacerbated by, disproportionate effects of environmental pollutants and certain racial, ethnic and socio-economic factors. What strategies and areas of research should be pursued by federal agencies to achieve more effective, integrated community-based health assessment, intervention, and prevention efforts? How should these strategies be developed, implemented, and evaluated to ensure substantial participation, integration and collaboration among federal agencies, in partnership with: impacted communities, public health, medical and environmental professionals; academic institutions; state, tribal and local governments; and the private sector? How can consideration of socioeconomic vulnerabilities: (a) contribute to better understanding of health disparities and cumulative and disproportionate environmental effects; and (b) be incorporated into community health assessments?

The NEJAC was established to ensure that the U.S. Environmental Protection Agency (EPA) receives the viewpoints of diverse stakeholders on issues related to environmental justice. The NEJAC consists of 25 members representing community groups; industry; state, local and tribal governments; and both government and nongovernment organizations. The NEJAC has six subcommittees that focus on issues related to air and water, enforcement, health and research, indigenous peoples, international issues, and waste and facility siting. In addition to the 25 NEJAC members, each of whom sit on a subcommittee, 47 individuals serve as members of the various subcommittees. [See: the NEJAC web site at http:// www.ttclients.com/nejac]

5. From **Tarah Wright**, University of Alberta: Health disparities exist in Canada despite universal health care. To address this inequity, social scientists have traditionally used population-based, and more recently place-based, approaches to focus on population health determinants and the role of place in health. A wealth of methodological innovation and experience exists within the diverse group of health researchers in social sciences, as well as in other disciplines. The goal of Karen Smoyer and Mark Rosenberg is to bring these researchers together to explore, develop and communicate qualitative, quantitative and integrated methods for researching the role of place in health. The Putting Theory Into Practice Workshop will take place at the University of Alberta, August 18-20, 2000. This three-day gathering offers both valuable and stimulating information from leading researchers and specialists, and encourages students, academics and professionals from a variety of backgrounds to discuss experiences with various methods and data sets, and identify new areas for investigation of the role of place in health and well-being. [Contact: Tarah at email tswright@ualberta.ca]

6. **Pia Valeriano**, Emory University: The Centers for Disease Control and Prevention and Emory University's Rollins School of Public Health will co-sponsor a course, "*Epi Info 2000: A Course for Teachers of Epidemiologic Computing*," May 16-19, 2000, at Emory University in Atlanta. This course is intended for those who will teach others to use Epi Info 2000, the Windows version of Epi Info. Applications will be evaluated on the basis of computer experience and the candidate's plans

or opportunities to teach Epi Info 2000 to others. The course includes hands-on experience with Epi Info 2000 and Epi Map 2000 for Windows 95, 98, NT, and 2000, and covers conversion of systems from Epi Info for DOS, relational databases, methods of teaching epidemiologic computing, and the use of interactive exercises for teaching epidemiology and computing. The faculty includes Juan Zubieta, Andrew G. Dean, and other members of the Epi Info 2000 Development and Support Team. [Contact: Pia at (404) 727-3485 or email pvaleri@sph.emory.edu]

7. **Dawn Wright**, Oregon State University: The UCGIS is pleased to announce the addition of a new email listserv- talk@ucgis.org- for the general discussion of scientific or policy issues related to GIScience. Anyone with an interest in GIScience may subscribe and participate. You may subscribe in 1 of 2 ways: (1) Via the web at http://dusk.geo.orst.edu/ cgibin/lyris.pl?enter =talk, or (2) Via email by sending an empty email with no subject to join-talk@ucgis.org [Contact: Dawn, Department of Geosciences, at voice (541) 737-1229 or http://dusk.geo.orst.edu]

8. **Dick Hoskins**, University of Washington: Learn GIS through University of Washington's Summer Institute for Public Health Practice-"Applying GIS to Defining and Solving Public Health Problems," offered both July 5-7 and July 10-12, 2000. Topics include: Making maps that communicate; Making maps that represent data correctly; Getting data onto a map; Using overlays to estimate rates in zip codes when only rate census tracts are known, switching spatial calculations from one geography to another; Investigating disease clusters using spatial statistical methods; Making buffers and assessing health status around toxic sites; Geocoding, getting addresses assigned a longitude and latitude; Making disease maps and dealing with small numbers; Applying spatial statistics and doing modeling when no statistician is around; Using GIS to find the optimum location of a clinic, proximity analysis; Using existing agency, county or city data; Using the Internet to find free data, get help, and keep from re-inventing the GIS wheel, and; Setting up personal GIS unit with no money and no background except this course. [See: http://healthlinks.washington.edu/inpho/gis/course. html]

B. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry (ATSDR)

9. From **Bill Henriques**, GIS Coordinator: Sign up for the CDC/ATSDR Public Health Training Network satellite broadcast entitled "GIS in Public Health: Using Mapping and Spatial Analysis Technologies for Health Protection." This is a Public Health Training Network Satellite Broadcast, scheduled for **May 11**, 2000, from 12:00 - 2:30 PM ET. Course Description- Geographic Information System (GIS) technology has become an important tool for public health professionals to better understand health issues they encounter every day. GIS allows the layering of health, demographic, environmental and other traditional data sources to be analyzed by their location on the earth's surface. GIS is a tool that can serve a wide range of research and surveillance purposes. 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.

This program will provide a live question and answer session, during which participants nationwide can ask instructors questions via toll free telephone lines, by fax, or via TTY lines. Goal- To provide public health professionals relevant and timely information regarding the use of GIS technology in public health applications. Objectives- Upon successful completion of the program, participants will be able to: Describe basic geographic concepts; Discuss GIS functions relevant to public health; List and describe the different types of data used in GIS; Describe the process of spatial analysis; Identify useful GIS data sources for public health and environmental protection; Discuss issues regarding the mapping and analysis of health data; Cite specific examples of GIS applications in the field of public health, and; Acquire resources for further training in GIS for health surveillance and environmental health protection. 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. Presenters. GIS experts from CDC/ATSDR and other public health and academic institutes, including: **Carol Hanchette**, Research Triangle Institute; **Bill Henriques**, GIS Coordinator, ATSDR; **Gerard Rushton**, University of Iowa, and **Samuel Soret**, Loma Linda School of Public Health.

Registration and Viewing Instructions. Site registration is open at http://www.registeramerica. net/gis. We encourage you to make every effort to register using the on-line system. In addition to making the registration process easier and quicker, the on-line site links you to a lot of helpful information about the satellite broadcast. If you do not have Internet access, however, you can also register by phone or fax. Please call 888-232-3299 (or 877-232-1010 for the hearing impaired) and request document #130029 when prompted. After completing the form received, call (1-800-815-8152) or fax (850-784-3081) the information to the Registrar. [Source: Bill at email WHenriques@ cdc.gov]

Centers for Disease Control and Prevention

10. From **Iris Shimizu**, NCHS: The short course "Visualizing Data: Building Statistical Models for Data" will be held May 1-2, 2000, at George Washington University Alexandria Center, Alexandria, VA. The instructor is William Cleveland. Description- The course will present visualization tools that provide deep insight into the structure of data. Dr. Cleveland is a leading researcher in statistical methods. The course is intended for anyone who has data to analyze. Prerequisites are familiarity with basic statistics and the least-square method of fitting equations to data. [See: ASA's web site at: http://www.amstat.org/ education/learnstat.html or contact learnstat@amstat. org]

11. From **Dabo Brantley**, NCEH: The following presentations from Atlanta took place on April 12, 2000- 1) Women and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality, by Michele Casper, Epidemiologist, NCCDPHP/CVD; and David Ray, EDS/TRW, NCCDPHP/OD; 2) Using Epi Map 2000 for Breast Cancer Screening Program Planning and Evaluation, by Catherine Schenck-Yglesias, Informatics Fellow, EPO/DPHSI and3) Geographic Information Systems and Ciguatera Fish Poisoning in the Tropical Western Atlantic Region, by John Stinn, Informatics Fellow (ORISE), PHPPO/PHS [See abstracts this edition, Part V; Contacts: Dabo at voice (770) 488-5111 or email mdb4@cdc.gov and Jerry Curtis at (770) 488-7262 or email gbc1@cdc.gov]]

12. Editor: Of the many questions pertaining to GIS software, the one for which I receive the most inquiry (especially new users), concerns the comparison between MapInfo and ArcView. This same issue currently has been raised on the crime mapping listserv (crimemap @aspensys.com) and Nancy LaVigne, Director, Crime Mapping Research Center, has framed an excellent discussion among members. The response by Glenn Letham, Senior Editor, The GeoCommunity & SpatialNews.com, will be instructive for all of us. Please see his recent review of Mapinfo and ArcView, in SpatialNews.com, at http://www.spatialnews.com/ reviews/mifav.html. [Contacts: Nancy at email lavigne@ ojp.usdoj.gov and Glenn at above site]

National Institutes of Health

13. **Marjorie Cahn**, National Library of Medicine (NLM): As you know, NLM funds telehealth research (seehttp://www.nlm.nih.gov/research/telemedinit.html). As part of this initiative, NLM's contract with the University of Washington for it's Bench to Bedside and Beyond (B3) project (see website at http://www. hslib.washington.edu/b3/) has a significant public health component called EpiQMS, which stands for Epidemiological Query & Mapping System. Dick Hoskins, of the Washington State Dept. of Health (WADOH), is leading this portion of the B3 project. EpiQMS includes the following components: *a Web-based user interface to a query system; *use of MapInfo and SAS to generate thematic maps to display disease rates; *spatial statistics modules, which allow mapping of disease rates with adjustments for small numbers using a

Bayesian smoothing approach; *a security system to allow users to access EpiQMS from any browser; *firewalls and special security precautions with regard to privacy issues with health data; *dynamic mapping capacity through ESRI software, MapObjects; *spatial analysis capacity to allow users to support surveillance and assessment while accounting for small numbers, and; *databases which include death certificate data, birth data, the cancer registry, the sexually transmitted disease database, and the communicable disease database. EpiQMS should go live on the WA-DOH website later this year, and I will let you know when it does. [Source: Marjorie Cahn, Head, National Information Center on Health Services Research and Health Care Technology (NICHSR), at voice (301) 435-2242 or email cahnm@mail.nlm.nih.gov]

14. **Ellen Heineman**, National Cancer Institute: New York State has just released its breast cancer maps by ZIP code. You can go to http://www.health.state.ny.us/nysdoh/cancer/csii/nyscsii.htm, then click on Breast Cancer Incidence, by ZIP Code. In the middle of the page you will see links to: Breast Cancer Incidence, by ZIP Code, New York State, 1993-1997; Index-ZIP Code Listings and Maps by County, New York State; New York State Map and; Entire brochure. See the map by itself (the middle of the three links), or better yet the whole brochure (bottom of three). Maps focusing on Nassau and Suffolk County in particular are on pages 37 and 54-55, respectively. Tables (rates by ZIP code) for the two counties are on pages 74 and 83, respectively. Local coverage of the release of the maps can be read at the New York Times' website (http://www.nytimes.com/library/national/science/health/041200hth-breast-cancer.html) or at Newsday's site (http://www.newsday.com/coverage/current/news/ Wednesday/nd4965.htm) [Contact: Ellen at email heinemae@epndce.nci.nih.gov]

Indian Health Service

15. Childhood Blood-Lead Screening and Lead Awareness Outreach for Indian Tribes: Notice of Funds Availability- Environmental Protection Agency (EPA). Summary: EPA is soliciting pre-application grant proposals from Indian Tribes to conduct blood-lead screening for tribal children, and for conducting lead awareness (educational) outreach activities for Indian Tribes. EPA is awarding grants which will provide approximately $2 million for Indian Tribes to perform those activities and to encourage Indian Tribes to consider continuing such activities in the future. Decisions on awarding the grant funds will be made based on the evaluation of the pre-application proposals. This notice describes eligibility, activities, application procedures and requirements, and evaluation criteria. All pre-applications must be received on or before May 23, 2000. [Contact: Joseph Carra, Deputy Director, Office of Pollution Prevention and Toxics at voice (202) 554-1404 or email TSCA-Hotline@epa.gov; also, see *Federal Register*, February 23, 2000 (Vol. 65, No. 36)]

C. Historical Black Colleges and Universities (HBCUs) and Minority Programs

16. From **Cynthia Warrick**, Howard University: Each year the Howard University Urban Environment Institute (HUUEI) conducts the HBCU Summer Faculty Workshop. This year there will be an HBCU GIS & Environmental Science Technical Assistance Conference, at the Howard University Blackburn Student Center, Washington, D.C., from June 14-16, 2000. The conference is designed to share methods used to advance the teaching and learning process and to increase diversity in the GIS and environmental science fields. It will bring together GIS and Environmental Science faculty and students from HBCUs and Minority Institutions (MIs) and develop a collaborative training and research agenda with federal agencies and the private sector that use GIS in their work.

The conference is the culmination of 16 years of GIS faculty training workshops for HBCUs. The collaborative relationships over the years have been outstanding and include participation and support from the US Geological Survey, US National Park Service, Bureau of Land Management, US Environmental Protection Agency, Federal Emergency Management Agency, Federal Geographic Data Committee, NCHS/CDC and ATSDR, National Imaging and Mapping Agency, Office of Surface Mines, US Fish and Wildlife Service, and ESRI and MapInfo. More than 60 faculty alumni from

over 30 HBCUs and MIs have received training through the workshops and many are the sole points of contact for GIS in their institutions. Students of these faculty are involved in a variety of community-based GIS projects.

Sponsors and participants for this years' HBCU GIS & Environmental Science Technical Assistance Conference are being sought. Funding, exhibits, and speakers are requested. Funding for 30 HBCU faculty and students is needed. Sponsors will be included on the conference web site and receive gratuitous exhibit booth space. [Contact: **Gloria Thurman**, HUUEI, at voice (301) 585-2295 or email gthurman@con-ed.howard.edu]

17. Editor: Information on all U.S. minority institutions, by ethnicity, may be found at http:// www.sciencewise.com/ molis/selectinst.asp. The URL is maintained by the Minority On-Line Information Service (MOLIS).

D. Other Related Agency or Business GIS News

18. From **Bill Davenhall**, ESRI: I have been working with several large academic medical centers on using ArcView linked to CAD files (engineering files) for the purpose of life safety issues as well as infection control. I will keep you posted on their use of GIS in this regard. It appears on the early going that GIS will become a new a dramatic tool for operational use within these large settings. For example, these hospitals have mandated (JACHO) requirements to lower false alarms and hospital acquired infections and they are in search of new tools that allow them to analyze the care environment from a more scientific fashion. [Contact: Bill, Health Solutions Manager, at email bdavenhall@esri.com]

19. From **Lynn Usery**, University of Georgia (UCGIS Process for Examining Emerging Themes in GIScience Research): The Research Committee decided during the 2000 Winter Assembly in Washington, D.C., to solicit "Emerging Themes in GIScience" as a method to further the research goals of UCGIS. A two-year cyclic process for soliciting, evaluating, and publishing the emerging themes was established. The process involves the following stages: 1) Solicit emerging themes from member institutions after each Winter Meeting with deadlines for submissions allowing time for assembly and discussion in the following Summer Assembly, 2) Hold a plenary session at the Summer Assembly on the submitted themes to determine those UCGIS should pursue over the following 1.5 years, 3) Based on the plenary session, have white papers prepared on the themes and available for the following Winter Meeting, 4) From the white papers, the UCGIS Council would vote to approve the new research themes at the Winter Meeting. (Note: A new call for emerging themes could be issued after this meeting), 5) Hold a specialist meeting on the research theme at the next Summer Assembly, and 6) Develop showcase projects on the research theme to be used in the subsequent Winter Meeting. These showcase projects effectively conclude the UCGIS consideration of the theme although the theme continues to be one of the active UCGIS Research Challenges in the same manner that the current 10 Challenges remain active for those research needs not completed. [Contact: Lynn, Chair, UCGIS Research Committee, and Research Geographer, U.S. Geological Survey, and Associate Professor, University of Georgia, at voice (706) 542-2345 or email usery@arches.uga.edu]

20. From Pan American Health Organization (PAHO) representatives: (1) **Anabel Cruz**: I am very pleased to contact you on behalf of the Publications Program. As you know PAHO selects and disseminates public health information relevant to the Americas and aims to improve the health status of the region. I want to call attention to two recent PAHO publications for your *Public Health GIS News And Information* readers. Both publications, "Hantavirus in the Americas: Guidelines for Diagnosis, Treatment, Prevention, and Control, and "OBESITY in POVERTY: A New Public Health Challenge," address important public health problems in the Americas [Contact: Anabel Cruz, PAHO Publications Program at email cruzanab@paho.org], and; (2) **Manuel Vidaurre**, Special Program for Health Analysis: In the PAHO/Special Program for Health Analysis (SHA), we also have a page for Geographic Information Systems in Health (SIG-EPI) at http://www.paho.org/ english/sha/ SHASIG.htm. In this site we are showing applications of the GIS in Health in the Americas and the objectives, purpose, and activities of The PAHO/SHA SIG-Epi

Project for the Americas. [Contact: Manuel at email mvidaurr@acm.org]

21. From **Wendy Shaw**, Southern Illinois University: This is to announce a new online journal entitled *Geography On-Line: Geographic Research on the Web*, which is now soliciting submissions. The purpose is to widen the availability of geographic scholarship on the internet. [For further information contact Wendy at voice (618) 650-3623 or visit http:// www.siue.edu/geography/online/]

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]

F From **Kelly Heilman**, Maryland Department of Health and Mental Hygiene: I attended the 2nd International Health Geographics Conference and it became very clear that no one in public health has real money for GIS, especially as few understand its power for depicting, analyzing, and communicating information. If health and human services agencies in state and local government are ever to get monies for GIS infrastructure, the case needs to be made for financial parity with the "infrastructure" agencies (environment, transportation, natural resources, planning, housing, etc). However, for issues like Welfare-to-Work, Boost for Kids, Safe Communities, etc, the health and human services agencies need to have GIS technology (hardware, software, training, a statewide access and use master plan, etc) so mapped information can readily be shared among all agencies ("infrastructure" and health and human services). Proposal: Last November there was the First National GIS Day which will probably be repeated this year. What if a national organization asked health and human services representatives from every state to visit all of their federal Congressional members on the next GIS day to show how they are using GIS technology and make the case for financial parity with the infrastructure agencies? Can anyone recommend an organization (APHA, NASTO, etc) that might be willing to take on the coordination of such a project? [Editor: Kelly also has planned a very informative GIS Symposium, sponsored by the Department of Health and Mental Hygiene, Information Resources Management Administration, for May 11-12. The symposium will include the CDC Satellite Broadcast as part of its program. Contact: Kelly, Data Administrator, at voice (410) 767-5696 or email heilmank@dhmh.state.md.us]

? From **Ginger Midgett**, Albemarle Regional Health Services: Our agency is a District Health Department in Northeastern North Carolina. We are beginning a new program on Vector Control within our Environmental Health Section. I would be very appreciative of communication from Public Health GIS Users Group members with experience in establishing and applying GIS to vector control. [Contact: Ginger, GIS Coordinator, at voice (252) 338-4406 or email ggm@pocono.ppcc.dst.nc.us]

F From **Ric Skinner**, New Jersey State Cancer Registry: I would be interested in how others are handling the issue of confidentiality, particularly as it relates to geocoded health data on individuals. One commonly cited approach is to not release any individual patient data at a geographic level that would could result in mapping 5 or fewer cases in an defined area. Another is to randomly shift the points, however this could result in assignment of points to the incorrect census tract or block group. I am not only interested in guidelines protecting patient confidentiality for distributed geocoded data. I am also interested in how health and environmental agencies have addressed the likely flood of inquiries from the public, legislators, citizen action groups, etc. once they know that geocoded point locations of cancer and disease cases exist within the agency. What are others doing? [Contact: Ric at email wskinner@fast.net]

? From **Hilda Adams**, St. Louis: I am looking for any writings about confidentiality in the use of GIS. I map disease incidence and have concerns when the number of cases in a ZIP code is less than 5. [Contact: Hilda at email adamsh@stlouiscity.com]

F From **Eileen Koski**, Quest Diagnostics: I am working in the Advanced Research Center of Quest Diagnostics

and I have been working with Dr. Dan Jernigan, from the surveillance branch of the CDC. I am working on some new approaches to public health surveillance using our corporate data warehouse. We definitely want to plot the incidence rates of certain conditions-as well as testing rates, using GIS data. I would like to know what I would need to do to get some assistance in identifying a GIS map that I could use to plot data by ZIP code. Thanks in advance for your help. [Contact: Eileen at voice (201) 729-7809 or email koskie@questdiagnostics.com]

? From **Sabah Sumo**, University of North Carolina: I recently subscribed to "Public Health GIS News and Information." I am interested in downloading African maps, and was wondering if you could refer me to a source. [Contact: Sabah at email ssumo@imap.unc. edu]

F Editor: In the March 2000 edition of *Public Health GIS News and Information*, a question was raised by a project officer who was undertaking a study of diabetes surveillance among American Indians using "BRFSS-like" methods. His interest was to come up with an alternate sampling plan that would increase the number of American Indians in the Arizona BRFSS. His question concerned how one can derive a sampling frame of phone numbers by census tracts. It has generated some interesting responses which may be helpful to other GIS Users contemplating similar sampling efforts:

Response 1-That is not an easy one. The reasons are: Some numbers are not listed, thus biasing the sample; The source of the telephone numbers may not give the actual location of the telephone, thereby bringing into question the value of using a fine grained geographic unit; Some households have multiple lines, thereby biasing the sample; Some households have no telephone, but use a public phone, say in the hall of an apartment house, again biasing the sample, and Some households have cell phones and land lines, again biasing the sample, particularly if the phones are in different names of the same household members. Personally, I would not use telephone as a sample frame unless the thing I was sampling was people with a telephone. Then I would still have the problem of address vs. location vs. non-listing bias to contend with. Frankly, a telephone is just one means of locating a person; nothing else. In the past, some investigators have used the telephone as an indication of economic or social status, but this was arrived at by asking the people if they had a phone; not calling them to ask if they had a phone! Given that, how to set it up? Well, the easy answer is to address code the telephone address to the tract level. Then, if desired,using the tract statistics, weight the results by population characteristics (or whatever), and draw the sample. After that, just use good sampling techniques.

Response 2- My understanding is that ATT provides CDC with the master list of phone numbers used for the BRFSS survey. The ATT Web page (see-http://www.att.com/directory) currently includes a reverse directory look-up feature. If you only need to look up one or two addresses, then this feature is excellent. For a survey where you likely have a relatively large number of phone numbers, a more efficient approach would be to request that ATT (in exchange for an additional fee) attach the reverse look up address information to the master list of phone numbers (i.e., provide you with the phone numbers and addresses as a batch electronic file). Of course, once you have street address information, you can then use standard GIS/geocoding methods to assign respondents to street address level point locations and/or census tract boundaries. In terms of "reverse look-up" telemarketing type information, another potential source to keep in mind for your future surveys might be something along the lines of Claritas Tele-PRIZM (see- http://www.claritas. com/pr%5F99 tpr.htm)-which allows PRIZM lifestyle marketing segmentation clusters to be added to phone numbers. For an example along these lines, see MedStat Inforum PULSE Healthcare Research Database (see-http:// www.inforumonline.com/) which adds PRIZM profile data to each survey respondent. Building on this approach, a future CDC BFRSS model might be something as follows: 1) Request ATT to provide the master list of phone numbers to CDC and/or the state; 2) Have CDC and/or the state use Claritas Tele-PRIZM to assign PRIZM socio-demographic cluster profile information to each telephone number; 3) Select the sample of survey respondents based on phone numbers (as usual) and/or PRIZM clusters (different than usual);

4) The state then could collect the survey responses (as usual); 5) The state could then remove all externally recognizable identifiers such as the phone number, but leave the Claritas PRIZM code for each respondent; 6) The state could then send the data to CDC (as usual); and 7) CDC could do national level BRFSS analysis, but also make national estimates/projections for PRIZM lifestyle segmentation clusters, which in turn also might be used to make estimates/projections for geographic units/levels smaller than the (current) state unit/level. If this type of approach was of potential interest, a long term public health research problem is how to develop a new and improved, public health "marketing" equivalent to the Claritas PRIZM clusters- that would have improved scientific basis, avoid the problems with the terminology for PRIZM clusters developed by marketers, have lower cost (i.e., be public domain or "free"), and that could be linked to information about how communication channels to reach priority target audiences (e.g., how to best use television, newspapers, and radio to deliver health promotion messages/public service announcements to high risk groups).

Response 3- "By using a national telephone directory that includes longitudes and latitudes and that is updated frequently, one can situate on the maps several case records with incomplete or inaccurate addresses. For example, by using Selectphone, a software program updated quarterly, we were able to obtain the location coordinates (that is latitudes and longitudes) of providers in the Massachusetts child care licensing lists whose addresses were incorrect but whose telephone numbers were listed in this national telephone directory. In addition, bad ZIP codes (a common problem) can be corrected with the help of the United States Postal Services Web site (http:// www.usps.gov/ncsc/)." [Source: Queralt M. and Witte AD. 1998. A Map for You? Geographic Information Systems in the Social Sciences," *Social Work*, September, 43:5, p. 460]

Response 4- For a national perspective, it may be instructive to read "National Immunization Survey: The Methodology of a Vaccination Surveillance System," *Public Health Reports*, January/February 2000, Vol. 115, Issue 1:65-77, by Zell ER, et al: Abstract. The National Immunization Survey (NIS) was designed to measure vaccination coverage estimates for the US, the 50 states, and selected urban areas for children ages 19-35 months. The NIS includes a random-digit-dialed telephone survey and a provider record check study. Data are weighted to account for the sample design and to reduce nonresponse and non-coverage biases in order to improve vaccination coverage estimates. Adjustments are made for biases resulting from nonresponse and nontelephone households, and estimation procedures are used to reduce measurement bias. The NIS coverage estimates represent all US children, not just children living in households with telephones. NIS estimates are highly comparable to vaccination estimates derived from the National Health Interview Survey. The NIS allows comparisons between states and urban areas over time and is used to evaluate current and new vaccination strategies. [Contact: Coauthor Trena Ezzati-Rice, NCHS, at email tme1@cdc.gov]

? From **Renee Johnson**, National Center for Injury Prevention and Control, CDC: I have a couple quick questions concerning using ZIP codes as a geographic marker. 1) How does ZIP code relate to census tract? 2) Are there softwares available to convert ZIP codes to county? 3) Is ZIP code utilized in the GIS software?, and 4) If the answers to the above are no, does it have any standardized utility for understanding population issues? [Contact: Renee at voice (770) 488-1479 or email rej2@cdc.gov]

Early response (Editor): One has to be cautious with ZIP codes- they were not established as geographic or polygonal areas...more for U.S. Postal Service mail delivery (linear) location. For example, a single building with high mail volume can be assigned a ZIP code. ZIP code boundaries are defined by streets. In 1990 the Census Bureau did tabulate data by ZIP code- STF3B, which came out later than other products. This product contained all of the variables available in STF3A (i.e. the full range of variables available from the 1 in 6 sample file). Their boundaries do not correspond to homogeneous SES communities. There is no relationship between census tracts and ZIP Codes although they are both sub-county areas used to generate census and other statistics. In some areas ZIP Codes align with county boundaries

but for the most part they don't. There are some ZIP/County relationship files available on-line. ZIP Codes also are subject to frequent change which makes them difficult to compare over time e.g., date of data and ZIP code boundaries need to correspond.

However, sometimes the data available may only have a ZIP code identifier e.g., hospital admissions or discharges, crime events, disease incidence, etc. I have seen studies that effectively analyze spatial patterns by ZIP codes in order to go below county boundaries. Use of ZIP codes can obscure spatial patterns that otherwise would show up at block group or census tract level. Small numbers (numerator) can be a problem in computing rates. The size of ZIP codes may vary significantly too. Generally, as mentioned, they are much larger than census tracts and do not adhere to county boundaries. ZIP codes appear tailored to marketing and advertising, through surveys, and easily linked to demographic characteristics. To use ZIP codes, you must obtain ZIP code boundaries (or centroids) from a data vendor. For example, some vendors ship them with their software and others offer them with quarterly updates.

The real question for public health is whether there are important questions that can be answered better with ZIP level data than some other geocode? The New York Department of Health published maps of cancer rates by county last year. As from last week they have released cancer rates by ZIP code for the state. They have concluded that ZIP codes generally have population totals such that cancer rates can be reasonably accurately computed for multiple year periods. The spatial detail is better than from county data.

The Census Bureau is developing a new ZIP Code Tabulation Area (ZCTA) geography based on Census 2000 which will approximate area representations of ZIP code service areas. ZCTAs are postal ZIP Codes generalized to census statistical areas and may be available with the Census 2000 TIGER/Line files. These public domain ZIP Code boundaries are designed to meet user needs for statistical data by ZIP code. (See: http://www.census. gov/geo/ZCTA/zcta.html). NCHS will host an Envision lecture on ZCTAs on **June 13**. [Note: User views on this topic are welcome; Appreciation is extended to **Carol Hanchette**, Research Triangle Institute, **Gerry Rushton**, University of Iowa, and **Jon Sperling**, Census Bureau, for their assistance with this response]

F 4. From **Craig Long**, NOAA: I received an inquiry from a Public Health GIS User as to how one can download the NOAA UV Index data in electronic format (e.g., which might be useful as part of a research project on the spatial distribution of melanoma). The following may be helpful to others. The NOAA Web site is located at http://www.cpc.ncep.noaa.gov/products/stratosphere/uv_index/uv_annual.html and includes graphs and maps of UV Index data and selected UV Index time series for selected cities.

1) As a preliminary step, use Windows Explorer to create several new file folders for downloading the data on your hard drive (e.g., Readme, Cities, 1999, 1998). The reason for this is that there are multiple files to be downloaded for a single year. There is one file for each of 58 data collection stations. Each data collection station usually reports a UV Index measurement each day for the entire year, so you have about 365 or so (not every day is reported) observations in the file for each data collection station.

2) Go on the Web, and in the browser type: ftp://ftp.ncep.noaa.gov.

3) Wait for a while (the FTP response time is slower than "normal Web") and eventually the NOAA FTP site appears.

4) By clicking on a series of folders, migrate to: pub/cpc/long/uv/cities.

5) Click on a folder for one of the years (e.g., 1999) to open that folder and display all the files inside that folder. Each folder contains about 58 ASCII text files that end with the extension .uvi.

6) Go to Edit, and "Select all" (this will select all 58 files).

7) Click on "Copy".

8) Go to "File" and select "Copy to Folder." Wait until the "Save to" window appears, and then save to the appropriate file folder on your hard drive.

9) The "Readme" file is a Word document that indicates that each city file includes: the forecast date, the station id, clear sky UV index, UV Index issued (inclusion of cloud effects), percent probability clear, percent

probability scattered, percent probability broken, total ozone amount.
10) The "Cities" file is a SAS file that gives the 3 letter abreviation used for the city data collection station.
11) The ".uvi" files are ASCII text files. In order to read with DBMS/COPY (to convert to whatever format is desired) , change the the ".uvi" extension to a ".dat" extension.
[Contact: Craig, NOAA's National Centers for Environmental Prediction, at voice (301) 763-8000, x7557, or emailclong@ncep.noaa.gov]

IV. Special Reports

[The following Guest Editorial, "GIS to Improve Public Health," by Professor **Gerard Rushton**, Department of Geography, University of Iowa, was recently published in *Transactions in GIS* , Vol. 4, No. 1, January 2000, pp. 2-5. Appreciation is extended to copyright holder, Blackwell Publishers, Ltd, of Oxford, England and Journals Rights & Permissions Manager, Melanie Charge, for reproduction of this editorial]

"GIS to Improve Public Health"

by Gerard Rushton, Ph.D., University of Iowa

Among public health practitioners, GIS is seen as an emerging technology. Yasnoff and Sondik (1999), from the U.S. Centers for Disease Control and Prevention, recently noted that "we see GIS as one of the new core technologies in public health, providing the universal link that allows integration of data needed for effective public health decisions."

Despite this endorsement of a pivotal role for GIS, it is uncommon for public health officials to discuss the need for research to support efforts to use GIS in the analysis of health data. Two issues of the Journal of Public Health Management and Practice were devoted to "Geographic Information Systems in Public Health" in 1999 (Vol. 5, nos. 2 & 4); but none of the articles or editorial introductions in these issues discussed the need for research to support this effort. The Centers for Disease Control in the U.S. has sponsored three annual conferences on GIS and health in recent years and similar specialized conferences have also occurred in Australia, Finland, Germany, New Zealand, the U.K., and elsewhere. And yet GIS is rarely seen as a science for which basic research is required to answer questions that arise when it is used for public health purposes. From these activities a picture is beginning to emerge of an incipient interdisciplinary research area awaiting better definition.

Like many emerging research areas, improvements in materials and methods are needed to counter the obstacles placed before the enthusiastic adopters of this new technology. Some of these have been widely discussed others have not. For example, it has not been a common practice to record the locations of health events and the locations of factors that may be related to these events with the kind of specificity needed by researchers investigating the relationships of environmental factors to health. In fact, until recently, it was common for disease registries to keep on record only the current address of the person, successively erasing earlier addresses when a person changed their residence. Among the ten cancer registries supported by the U.S. National Cancer Institute (NCI), for example, there is not yet a consensus on how an address should be coded.

GIS Should Enable More Efficient Research Designs. Many current applications of GIS in health are extremely wasteful of resources in that their ad hoc nature requires that costly GIS resources be developed to support single projects. The National Cancer Institute (NCI) in collaboration with the National Institute of Environmental Health Sciences (NIEHS), under Public Law 103-43 requested proposals to develop a health-related geographic information system (GIS) for Long Island. "The prototype health-related GIS will provide researchers a new tool to investigate relationships between breast cancer and the environment on Long Island, and to estimate exposures to environmental contamination" (NCI 1999). This valuable infrastructure could in theory support countless applications of GIS and health yet, in practice, it will be developed and accessed selectively for investigation of female breast cancer. No plans exist for it to become a permanent infrastructure for GIS and health applications in this region.

A GIS advisory committee to the U.S. National

Cancer Institute identified a minimum set of functions needed in a GIS utility that would support researchers studying the relationship of six possible environmental factors to the geographic distribution of breast cancer on Long Island, New York. The list contained citations to their use. Many of the functions on the list were well-known GIS functions that could be embraced and put to work to the service of improving health. Others, however, were less developed, with few attempts to systematically evaluate their performance in health research (NCI 1999).

It is common in epidemiologic studies to measure environmental exposures for a group of people known to have a particular disease and then to compare their exposures with a control group of persons selected at random from a sampling frame of individuals with comparable social and demographic characteristics. If statistically significant differences in exposures are found between the two groups, the materials to which the diseased group is more exposed are implicated in the etiology of the disease. How does GIS change this research approach? If exposure agents are geo-coded and all people, including the disease group are geo-coded, then the diseased groups' exposure can be compared with the exposures of everyone else. The comparison is more readily implemented in multi-dimensional analysis than in the classic case-control design. By this I mean that in addition to the simple test of difference between case and control groups, comparisons can be made between each demographic group within the disease group and its counterpart outside. These differences can be analyzed in selected geographical spaces. While the classic case-control study presupposes a hypothesis of possible causal connection and then tests for its presence, in a GIS framework, a wider variety of relationships can be tested. That certain locations may contain clusters of disease cases has long been noted. Although some experienced public health professionals are skeptical that any notable advances in health knowledge can be attributed to cluster investigations, the public and some public health professionals continue to believe that better cluster detection methods and better geographically referenced data will lead to knowledge that will benefit the public.

For many decades, a common use of geographic data was to determine locations or areas to which health resources should be targeted. Health shortage areas, medically underserved areas, and Project START areas for reducing high infant mortality rates, are only three of many U.S. government initiatives that identify locations or areas that qualify for government assistance to improve local health outcomes. Traditionally, GIS data for small areas, typically counties, were processed as separate entities. Spatial relationships between the entities were not part of the analysis. Such analyses assume that the demands and supplies of health services are met within the entities themselves and that these areas are rational health service areas—neither of which is correct. Better models of service location and health need allocation are needed.

Special Problems in Applying GIS to Health. Special problems arise in using GIS in health applications. So far, however, little effort has been made to identify problems and no recognized group of scholars has emerged to collectively address them. In the case of diseases such as most cancers, exposures to agents that might cause the disease often predate by 10 to 20 years the diagnosis of the disease. Therefore, location of diagnosis and location of probable exposure are unlikely to be the same. With a population that moves its residence so frequently, the challenge of estimating the places of likely exposure of people whose location at time of first diagnosis is known is challenging. We are not aware of any geographic demographic research that estimates the likelihood that a person whose current residence at time of first diagnosis is at x might have lived in exposure area y, t years ago. However, it seems possible that such inter-locational probabilities could be discovered.

Protecting the confidentiality of health records is widely acknowledged to be essential. As with any national census, public health and medical research has dealt with this problem by releasing data to the public only for aggregations of individuals. The problem with this approach to protecting privacy is that many relationships cannot be researched with data in this form. The relationship between lead in the blood levels of children, for example, has been far more successfully linked to

environmental factors when measurements on individual children were available rather than on aggregates. A second and newer method of ensuring privacy is for the institution with direct access to the health records to prepare micro-data files in which the detailed location is not recorded but other variables measured using GIS are attached to the health record. A third method is to mask the location data by adding uncertainty to the location information. A common geographic mask is a displacement function that moves the true location randomly within a fixed distance in all directions from the true location. All three methods are used only when the institution holding the health records aims to release the information to the public. Alternatively, the institution may analyze the data by its own staff within the protected environment itself and its computer system. It may then release the results of its analyses to the public.

The problem with these approaches is that valuable information is lost when data is masked, by whatever method. When the data is analyzed within the public health agency the public may worry that political pressures may have been used to withhold information from the public or that the agency may not have the time or resources to analyze the data as well as others. One solution is to allow people outside the agency to make queries of the data with some "firewall" in the computer system ensuring that confidential information is not released. Analysis modules might be behind the firewall with outside users calling on their use as appropriate. These modules would have access to the health data. There is scope for research to determine the relative costs and benefits of these alternative approaches to ensuring the confidentiality of health records and still permitting valid conclusions to be reached.

An important problem in the geographic analysis of health data is that most diseases are relatively rare so that even when geographic patterns of disease are simulated from the null hypothesis of equality of risk, large geographic differences in disease rates exist in the simulated maps. These differences clearly exist by chance and it is known that their local variances depend on numbers of people at risk in the local area. This leaves the crucial question of how real differences can be separated from differences that might occur by chance. Most cluster analysis methods were developed for data defined by administrative areas. Attention needs to shift to methods for point data.

This list, though far from exhaustive, illustrates the large range of issues that need to be addressed by scientists who hope to contribute to the task of improving public health with GIS.

References

-National Cancer Institute 1999 Geographic Information System (GIS) for the Long Island Breast Cancer Study Project (LIBCSP). Research Contracts Branch, Request for Proposal Number (N02-PC-85074-39, http://rcb.nci.nih.gov/RFP/85074/appendb.pdf).

-Yasnoff W A, and Sondik W A 1999 Editorial: Geographic Information Systems (GIS) in Public Health Practice in the New Millennium. Journal of Public Health Management and Practice 5 (4): ix-xii.

-G Rushton, The University of Iowa, Iowa City, IA, U.S.A.

****

[The following article appeared in the Science Gram section of the Fall/Winter 1999 edition of CDC's *EIS Bulletin*. Appreciation is extended to Douglas H. Hamilton, Director, EIS Program and Editor, and Valerie Johnson, Managing Editor, for their kind permission to reproduce the article]

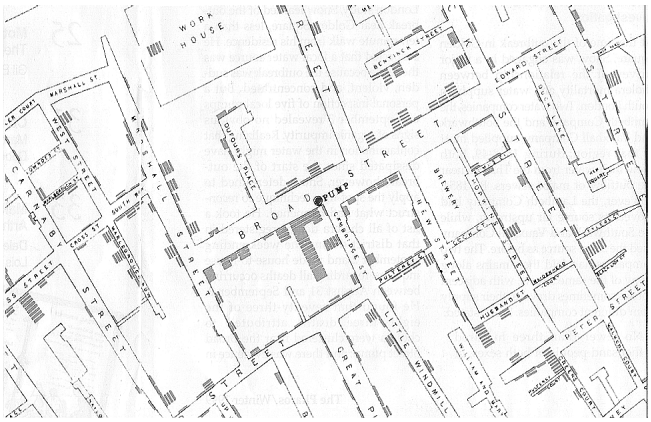
GIS and EIS: Geographic Information Systems and the Epidemic Intelligence Service

by Charles M. Croner, Ph.D., and Donna F. Stroup, Ph.D., M.Sc.

— GIS needs to be linked with traditional epidemiologic principles and methods.

In conducting his investigation of London's cholera outbreak in 1854-- which, with a spot map (see illustration), revealed a marked clustering of fatalities around a community pump on Broad Street[1]--Dr. John Snow first linked the science of epidemiology with the use of geographic information to reveal relationships between environment and disease. Now, nearly 150 years later, we recognize that timely and positionally accurate spatial or georeferenced information, in a digital format, is improving our ability to better monitor and understand disease occurrence, health inequalities, environmental exposures and related health risks, and

advance hypothesis generation about the associative causation of disease etiologies and outcomes.[2] This computer mapping technology, collectively termed Geographic Information Systems (GIS), has introduced a new era in computational epidemiology.



Broad Street pump and related cholera deaths

From the U.S. Bureau of the Census national digital street and geographic boundary files, or Topologically Integrated Geographic Encoding and Referencing (TIGER) system, for example, epidemiologists can translate or geocode street addresses into unique latitude and longitude locations.[3] These locations then can be examined with computationally rigorous spatial statistical data analysis techniques and GIS. With the increasing availability of georeferenced public health and related information,[4] coupled with georeferenced measurements from other environmental, biological (including genetics), social, and behavioral science databases, epidemiologists now have greater opportunities than in the past to investigate for clues to disease etiologies. New and continually expanding computational opportunities permit integrated and dynamic space-time modeling of georeferenced data on the extent, structure, and association of diseases and suspected covariates.[5]

Compared with traditional methods of mapping, GIS offers potentially significant cost savings for local or neighborhood and community disease surveillance and prevention activities. For example, epidemiologists in local health departments can use GIS to design automated early warning surveillance systems for newborns with a known residential potential for elevated exposures to nitrate-nitrogen in drinking water. Through the combined information of geocoded household locations dependent on private wells and georeferenced groundwater quality data, households potentially at risk for methemoglobinemia can be flagged routinely by linked computerized birth certificate records, notified by public health officials of the danger, and advised to prepare formula with purified water.[6] Similar environmental- and disease-related scenarios have been studied with GIS databases and methods, resulting in the identification of locations with elevated risks of Lyme disease,[7] low-birthweight babies,[8] infant mortality,[9] lead poisoning,[10-13] unintentional releases of radioactive Iodine-131,[14] and rodent bite and infestation.[15]

GIS is rapidly expanding to other epidemiologic themes. For example, GIS has helped to identify persons (e.g., low-income people, the elderly, female heads of households, and recent U.S. residents) at greatest risk of morbidity and death in disaster response;[16] determine the location of partners of sexually transmitted disease cases;[17] evaluate the relationship of alcohol sales locations and motor vehicle crashes;[18] and assess diverse conditions such as childhood immunizations, high-risk pregnancies, homicides, and motor vehicle-related injuries.[19–22]

GIS analysis in public health appears best optimized through a multidisciplinary approach. Statistical analysis of spatial data is a key component for quantifying and testing relationships associated with point or regional data.[23] Some basic statistical methods for GIS exploratory data analysis include statistical tests for spatial randomness and the use of spatial filters.[24] Advanced methods might require data exchange between the GIS and specialized spatial analytic software to compute such functions as variograms, covariograms, and correlograms (e.g., distance- and directional-based measures of spatial correlation and autocorrelation), as well as logistic regression and other multivariate data analyses.[25–29]

Because GIS analysis can require large amounts of data, including remotely sensed digital satellite imagery and aerial photographs, appropriate hardware and software decisions are essential to GIS investment.

Hardware requirements include a large hard drive and enhanced image display and redraw capabilities. Software options range from CDC's EpiMap 2000, an EpiInfo-compatible system in the public domain with limited GIS capabilities, to more sophisticated, fully functional packages that can cost thousands of dollars.[30]

Importantly, public health policy and program managers now have a tool in GIS to show the results of a rather complex analysis clearly and convincingly. Dynamic 3-dimensional views and animation can be included. However, GIS map interpretation and analysis depend on the availability of reliable, and reliably geocoded, data. City-style street addresses, other coordinates of location, as well as earth, social, and behavioral science measurements often can be missing or inaccurate. Community decision makers also need to be educated about epidemiologic methods such as unstable rates related to small numbers, statistical methods involving multiple comparisons, and the potential for ecologic confounding.[31]GIS needs to be linked with traditional epidemiologic principles and methods. As Goodman and Wennberg report, "In the public health practitioners' search for understanding the spatial aspects of health and health care, they must not confuse an elegant map with a completed analysis."[32]

As of 1999, there remains considerable room for GIS growth within the U.S. Department of Health and Human Services (DHHS) and in state and local public health practice. Many public health agencies and state and local health departments still are not yet fully GIS enabled. GIS training and software availability are basic requirements. In general, a more enterprising approach toward GIS might be beneficial where guidelines and standards are established for more uniform GIS use in epidemiologic studies. CDC's Epidemic Intelligence Service (EIS), other DHHS and CDC prevention training programs, and state and local public health departments can help decide the role CDC should play in developing and articulating public health GIS agendas and strategies.

Because of increased societal concerns about any potential disclosure of individual or household identification in public databases, creating mechanisms that facilitate data sharing for GIS and epidemiologic research will be a key issue in the twenty-first century. For public health agencies, solutions can include options such as state health department Intranets with access restricted to local health departments or creation of a secure environment. One example would be a secure environment maintained by a state health department or by a federal agency such as NCHS in which public health researchers can conduct epidemiologic studies and be monitored carefully to ensure protection of individual and household confidentiality.[33] In fact, NCHS has developed such a secure environment (Research Data Center) at its Hyattsville, Maryland, facility and is considering expanding this environment to other venues.[33]

Epidemiologists will embrace new opportunities with GIS to advance disease control and prevention in the twenty-first century. GIS already is strengthening the science associated with environmental exposure and risk assessment, survey and case-control study designs, spatial data exploration and analysis, data visualization, hypothesis generation, cost-effective identification and targeting of interventions, and other public health applications.[34,35] Geocoding address and event information in many longstanding databases that support environmental public health surveillance[36] will add new potential for furthering understanding of place-based disease epidemiology. Future databases will be designed to take into account exposures, both in time and place, such that "GIS could evolve into an important tool in cancer prevention and control.[37] Public Law 103-43 represents a major national initiative with GIS in the epidemiologic study of possible environmental causes of breast cancer.[38] In the spirit of Dr. John Snow, GIS is evolving into an indispensable tool in epidemiology and public health. Perhaps only fittingly, GIS one day will have played an integral role in the eradication of cholera.[39,40]

References

1. Garrison FH. An introduction to the history of medicine, 4th ed. Philadelphia, PA: W.B. Saunders Co., 1929:658–59.

2. Croner CM, Sperling J, Broome FR. Geographic Information Systems (GIS): new perspectives in understanding human health and environmental relationships. Stat Med 1996; 15:1961–77.

3. Broome FR, Meixler DB. The TIGER Database Structure. In: Marx RW, ed. The Census Bureau's TIGER System,

Cartography and Geographic Information Systems. Bethesda, Maryland: American Congress on Surveying and Mapping, 1990;17:39–97.
4. Lee CV, Irving JL. Sources of spatial data for community health planning. J Public Health Manag Pract 1999;5(4):7–22.
5. Anselin L. Exploratory Spatial Data Analysis in a geocomputational environment. In: Longley P, Brooks S, McDonnell R, MacMillan M, eds. Geocomputation, a primer. New York, NY: Wiley, 1998;77–94.
6. Boria W, Berke R, Clark M, Reisenweber GM. Public notification to families with newborns at risk of methemoglobinemia from drinking water exposure, Clymer, New York, 1996–1998. J Public Health Manag Pract1999; 5(2):37–8.
7. Glass GE, Schwartz BS, Morgan JM III, Johnson DT, Noy PM, Israel P. Environmental risk factors for Lyme disease identified with geographic information systems. Am J Public Health 1995;85: 944–8.
8. McLafferty S, Tempalski B. Restructuring and women's health: implications for low birthweight in New York City. Geoforum 1995;26:309–23.
9. Rushton G, Krishnamurti D, Krishnamurti R, Song H. A geographic information analysis of urban infant mortality rates. Geo Info Systems 1995;5:52–6. [Available on the Internet at <http://www.uiowa.edu/~geog/health/mapping>.]
10. Duclos C, Johnson T, Thompson T. Development of childhood blood lead screening guidelines. Duval County, Florida. J Public Health Manag Pract 1999;5(2):9–10.
11. Wilkinson S, Gobalet JG, Majoros M, Zebrowski B, Olivas G. Lead hot zones and childhood lead poisoning cases, Santa Clara County, California, 1995. J Public Health Manag Pract 1999;5(2):11–2.
12. Hanchette CL. GIS and decision making for public health agencies: childhood lead poisoning and welfare reform. J Public Health Manag Pract, 1999;5(4):41–7.
13. Griffith DA, Doyle P.G., Wheeler DC, Johnson DL. A tale of two swaths: urban childhood blood-lead levels across Syracuse, New York. Ann Assoc Am Geographers 1998;88(4) :640–65.
14. Henriques WD, Spengler RF. Locations around the Hanford nuclear facility where average milk consumption by children in 1945 would have resulted in an estimated median Iodine-131 dose to the thyroid of 10 rad or higher, Washington. J Public Health Manag Pract 1999;5(2):35–6 [erratum in J Public Health Manag Pract 1999;5(4):vi].
15. Childs JE, McLafferty SL, Ramses S, et al. Epidemiology of rodent bites and prediction of rat infestation in New York City. Am J Epidemiol 1998;148(1):78–87.
16. Morrow BN. Identifying and mapping community vulnerability. Disasters 1999;23:1–18.
17. Zenilman JM, Ellish N, Fresia A, Glass G. The geography of sexual partnerships in Baltimore: applications of core theory dynamics using a geographic information system. Sex Transm Dis 1999;26(2):75–81.
18. Stevenson M, Brewer RD, Lee V. The spatial relationship between licensed alcohol outlets and alcohol-related motor vehicle crashes in Gwinnett County, Georgia. J Safety Res 1998;29:197–203.
19. Devine J, Gallo WK, Janowski HT. Identifying predicted immunization "pockets of need," Hillsborough County, Florida, 1996–1997. J Public Health Manag Pract 1999; 5(2):15–6.
20. Cai J, Welch Q.B. Age-adjusted homicide rates by ZIP Codes, Kansas City, Missouri, 1991–1995. J Public Health Manag Pract 1999;5(2):27–8.
21. Liao H, Wang H, Laymon P. Predicting teen live birth rates using selected Census-derived indicators, Lancaster County, South Carolina, 1990. J Public Health Manag Pract 1999; 5(2):21–2.
22. Zuyle PV. Automobile accidents to teenagers requiring emergency medical transport, Ventura County, California, 1996. J Public Health Manag Pract 1999;5(2):25–6.
23. Cressie NAC. Statistics for spatial data. Revised edition. New York, NY: Wiley, 1993.
24. Kulldorff M. Geographic Information Systems (GIS) and community health: some statistical issues. J Public Health Manag Pract 1999;5(2):100–6.
25. Cliff AD, Haggett P. Atlas of disease distributions: analytic approaches to epidemiological data. Oxford, England: Basil Blackwell, 1988.
26. Venables WN, Ripley BD. Modern applied statistics with S-Plus. New York, NY: Springer-Verlag, 1994
27. Kaluzny SP, Vega SC, Cardoso TP, Shelly AA. S+SpatialStats: user's manual for Windows and Unix. New York, NY: Springer-Verlag, 1997.
28. SAS Institute, Inc. SAS/STAT software: changes and enhancements through release 6.11. Cary, NC: SAS Institute, Inc. 1996.
29. Norusis MJ. SPSS for Windows: base system user's guide, release 6.0. Chicago, IL: SPSS, Inc, 1993.
30. Thrall SE. Geographic Information System hardware and software. J Public Health Manag Pract 1999;5(2):82–90.
31. Morgenstern H. Ecologic studies. In: Rothman KJ, Greenland S, eds. Modern epidemiology. 2nd ed. Philadelphia, PA: Lippincott-Raven, 1998;459–80.
32. Goodman DC, Wennberg JE. Maps and health: the challenges of interpretation [Editorial]. J Public Health Manag Pract 1999;5(4):xiii–xvii.
33. Yasnoff WA, Sondik EJ. Geographic Information Systems (GIS) in public health practice in the new millennium [Editorial]. J Public Health Manag Pract 1999;5(4):ix–xii.
34. Richards TB, Croner CM, Rushton G, Brown CK, Fowler L.

Geographic Information Systems and public health: mappingthe future. Public Health Rep 1999;114:359–73.
35. Richards TB, Croner CM, Novick LF. Geographic Information Systems (GIS) for state and local public health practitioners, Part 2. J Public Health Manag Pract 1999; 5 (4):1–6.
36. Thacker SB, Stroup DF, Parrish RG, Anderson HA. Surveillance in environmental public health: issues, systems, and sources. Am J Public Health 1996;86(5):633–8.
37. Surveillance Implementation Group. Cancer Surveillance Research Implementation Plan. Bethesda, Maryland: National Cancer Institute, 1999:30.
38. National Cancer Institute. NCI announces award of contract for GIS to support breast cancer on Long Island, May 1999 (Press Release). [Available on the Internet at http://www-dccps.ims.nci.nih. gov/LIBCSP/GIS.html]
39. Colwell RR. Global climate and infectious disease: the cholera paradigm. Science 1996;274:2025–31.
40. Colwell RR, Testimony before the Basic Research Subcommittee, House Science Committee [Hearing on remote sensing as a research and management tool, September 28, 1998]. Washington, DC: U.S. Congress. [Available on the Internet at http://www.nsf.gov/od/lpa/congress/rc80928.htm]

V. GIS and Related Presentations and Literature

(This section may include literature citations, abstracts, syntheses, etc., and submissions are invited)

NCHS Cartography and GIS Guest Lecture Series- Hyattsville, MD- **May 17, 2000**: **"Reducing Uncertainties in Applying Spatial Analysis in Environmental Health Research,"** by Nina Lam, PhD, Program Director, Geography & Regional Science, NSF, and R. J. Russell Professor of Geography, Louisiana State University, 2:00-3:30PM, at the NCHS Auditorium, Hyattsville, MD. **Abstract**: It has been widely recognized that the nature of environmental health research requires interdisciplinary expertise and rigorous spatial and non-spatial analyses of various data defined in different forms. As such, spatial analysis is playing an increasingly important role in environmental health research. However, a key problem in environmental health research involving spatial analysis is the uncertainties in the findings. For example, an important spatial question that has been asked over and over again is: do hazardous waste sites post a long-term adverse effect on the health of nearby population? So far, the research conducted on this problem has not been able to provide conclusive answers. Conflicting results were generated from using different definitions of data, spatial scale, time scale, and methods of analysis. The uncertainties involved in the existing methods for environmental health risk assessment remain to be a major obstacle in finding the possible links between environment and health.

In this paper, I argue that the uncertainties involved in environmental health research are an inherent property that could arise from various stages in the research process, including the type of data used, analysis methods applied, interpretations of the findings, as well as reactions to the findings. Therefore, it is necessary to develop strategies to reduce uncertainties rather than ignoring them. I propose the development of a spatial analytical framework so that one can explore the spatial relationships between environmental variables and health outcomes under various conditions (e.g. spatial and time scale of data). The results derived from specifications under the various conditions could serve as sensitivity analysis or benchmarks, so that the magnitude of uncertainties can be evaluated. This paper will first provide an overview of the nature of health risk assessment and its underlying problems. The need for a spatial analytic framework and what are in the framework will then be outlined. A case study on the health impacts of a national Priority List (NPL) Superfund hazardous waste site in Louisiana will be used to illustrate the uncertainty problem and the importance of a comprehensive spatial analytical framework. [Contact: Nina at voice (225) 388-6197 or email nlam@nsf.gov]

June 13, 2000: "ZIP Code Tabulation Areas (ZCTAs™) for Census 2000," by Andrew Flora, Geographer, US Bureau of the Census. **Abstract**: The United States Bureau of the Census is creating ZIP Code Tabulation Areas (ZCTAs) as a new statistical area to support Census 2000 data tabulations. ZCTAs are generalized area representations of United States Postal Service ZIP Code service areas based on the ZIP Codes and block locations of addresses collected for Census 2000. The Bureau of the Census generated the first prototype ZCTAs for the Census 2000 Dress Rehearsal areas. Efforts are currently underway to delineate the

national ZCTA coverage that will become available in early 2001.

The Census Bureau undertook the delineation of ZCTAs to meet data user needs for an area representation of ZIP Codes for which statistical data can be provided. The challenge was to translate ZIP Codes used to facilitate mail delivery into the Census Bureau's spatial frame work of tabulation geography based on census 2000 tabulation blocks. By necessity, ZCTAs are a departure from true ZIP Codes, but still fairly accurately reflect the ZIP Codes of the addresses that fall within them.

Unlike other statistical areas such as census tracts, ZCTAs result from automated processing rather than the design of local statistical area program participants. Like ZIP Codes, ZCTAs may cut across diverse community and governmental unit boundaries. ZCTAs also are not stable over time. Because ZIP Codes change to accommodate mail deliveries, the Census Bureau will periodically update ZCTA codes and boundaries to keep ZCTAs current. To summarize, the presenter will discuss the following topics: 1) ZCTA codes and area characteristics, 2) The methodology for delineating ZCTAs; 3) ZCTA applications and limitations, and 4) The availability of ZCTAs in Census data products. [ZCTA™ is a trademark of the U. S. Census Bureau; Contact: Andy at voice (301) 457-1100 or email aflora@geo.census.gov]

****

GIS Grand Rounds- Geographic Information Systems: Demonstration and Discussion of 3 Current Projects at CDC/ATSDR- April 12, 2000- CDC/ATSDR GIS Users Group-Atlanta

1. *Women and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality* by Michele Casper and David Ray, NCCDPHP. Abstract: The first national atlas of heart disease death rates among women was recently published by the Centers for Disease Control and Prevention and West Virginia University. The Atlas contains national and state-specific maps portraying county-level geographic patterns of heart disease death rates for African American women, American Indian and Alaska Native women, Asian and Pacific Islander women, Hispanic women, and white women. In addition to the hardcopy of the atlas, an interactive website was developed to enable interested parties to access the data. The major findings from the atlas and a live demonstration of the website will be presented. [Contact: Michele at voice (770) 488-2571 or email myc5@cdc.gov]

2. Using Epi Map 2000 for Breast Cancer Screening Program Planning & Evaluation by Catherine Schenck-Yglesias, EPO. Abstract: Illustrating geographic differences in cancer surveillance and mortality data by using maps aids cancer control resource allocation to at-risk, underserved populations. At both national and state levels, breast and cervical cancer have been the focus of publicly and privately funded early detection programs in recent years. This influx of resources provides an opportunity for state and local health departments to review the continuum of screening, incidence, and mortality data for breast and cervical cancer control. This type of GIS report, in the cancer control conceptual framework, implemented at the state level, assists in targeting resources to the areas with the greatest unmet need for health education, screening, and treatment. Using Epi Map 2000 software, the investigator follows the Kentucky 4-Step Model for cancer control, presenting a health geographic report that identifies county and regional differentials in breast cancer screening, morbidity and mortality. The report includes maps of data from standard breast and cervical cancer data sources that are available by county. Data sources for this GIS report include: (1) CDC National Breast and Cervical Cancer Early Detection Program, (2) state cancer registry, (3) Census, (4) state data center, and (5) state vital statistics. States with mammography registries and healthcare access programs could add screening and treatment access detail. For the presentation, Kentucky breast cancer data from the 1990s are used for illustrating the conceptual model and mapping elements. [Contact: Catherine at voice (770) 488-8377 or email czs8@cdc.gov]

3. *Geographic Information Systems and Ciguatera Fish Poisoning in the Tropical Western Atlantic Region* by John Stinn, PHPPO. Abstract: Little is known about the epidemiology of ciguatera fish poisoning, the most commonly reported marine toxin disease. In endemic areas and beyond, ciguatera is a seafood-borne illness that affects persons of all ages and socioeconomic

groups. Integrating an existing ciguatera database into a geographic information system (GIS) will give researchers new insight into the epidemiology of ciguatera and allow linkage between disparate epidemiological and oceanographic datasets. A voluntary Ciguatera Hotline has collected data from 1977-1998 in the endemic ciguatera area of South Florida. Descriptive statistics and spatial trends of ciguatera cases and the fish sources were examined using ArcView GIS software. A total of 777 cases, 442 on record, with 304 index cases were analyzed from the database. Cases were distributed geographically throughout Miami-Dade County, Florida. A high concordance was shown between the location of ciguatoxic fish and specific coral reef areas in the Caribbean. Using GIS in the future may help prevent disease by pinpointing ciguatera hotspots and facilitating the exploration of possible etiologic relationships between oceanographic and anthropogenic changes in the sources of ciguatera. [Contact: John at voice (770) 488-2449 or email zjj8 @cdc.gov]

Emerging Infectious Diseases

The March-April 2000 issue of CDC's journal, *Emerging Infectious Diseases* (EID), is now available at site http://www.cdc.gov/ncidod/eid/upcoming.htm. Selected articles include (titles only): Disease in the Global Village: Outbreak Verification; Human Population Movement and Malaria Transmission; American Robins as Reservoir Hosts for Lyme Disease; *Vibrio cholerae* O139 in Calcutta, 1992-1998; Multivariate Markovian Modeling of Tuberculosis; Haff Disease: From the Baltic Sea to the U.S. Shore; and, Detection of Cyclosporiasis Outbreaks in California. [Source for article submissions: send an e-mail to the EID Help mailbox at email eidhelp@cdc.gov]

Morbidity and Mortality Weekly Report

Selected articles from CDC's *Morbidity and Mortality Weekly Report* (MMWR): Vol. **49**, Number **SS-3**- *Surveillance for Lyme Disease-United States, 1992-1998 and Surveillance for Influenza-United States, 1994-95, 1995-96, and 1996-97 Seasons*; Vol. **49**, No. **16**- Surveillance for Adverse Events Associated with Anthrax Vaccination-U.S. Department of Defense, 1998-2000; Alcohol Policy and Sexually Transmitted Disease Rates-United States, 1981-1995; Progress Toward Global Poliomyelitis Eradication, 1999; Notice to Readers: National Melanoma/Skin Cancer Detection and Prevention Month-May 2000Vol. **49**, No. **15**-Public Health Aspects of the Rainbow Family of Living Light Annual Gathering-Allegheny National Forest, Pennsylvania, 1999; Prevalence of Leisure-Time Physical Activity Among Overweight Adults-United States, 1998; Notice to Readers: National Minority Cancer Awareness Week-April 17--23, 2000; Vol. **49**, No. **RR-4**- *Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response Recommendations of the CDC Strategic Planning Workgroup;* Vol. **49**, Number **RR-3**-*Prevention and Control of Influenza Recommendations of the Advisory Committee on Immunization Practices (ACIP);* Vol. **49**, No. **13**- National Infant Immunization Week--April 16-22, 2000; Progress in Development of Immunization Registries--United States, 1999; Community Indicators of Health-Related Quality of Life--United States, 1993-1997; Vol. **49**, No. **RR-2**- CDC Recommen dations Regarding Selected Conditions Affecting Women's Health Vol. **49**, No. **12**- Imported Dengue--United States, 1997 and 1998; Progress Toward Poliomyelitis Eradication--Democratic Republic of Congo, 1996-1999; Public Opinion About Public Health--United States, 1999; Notice to Readers: Injury-Related Mortality Reports Database Available on Internet; Notice to Readers: National Vaccine Program Office Workshop on Aluminum in Vaccines; Vol. **49**, Number **SS-2** (Surveillance Summaries)- *State-Specific Prevalence of Selected Health Behaviors, by Race and Ethnicity-Behavioral Risk Factor Surveillance System, 1997;* Vol. **49**, No. **11**- Rubella Among Hispanic Adults--Kansas, 1998, and Nebraska, 1999; National Public Health Week--April 3-9, 2000; Notice to Readers: Availability of Work-Related Lung Disease Surveillance Report, 1999; Notice to Readers: Satellite Broadcast on HIV Prevention; Vol. **49**, No. **10**- Preliminary FoodNet Data on the Incidence of Foodborne Illnesses-Selected Sites, United States, 1999; Hantavirus Pulmonary Syndrome-Panama, 1999--2000; Notice to Readers: Update: West Nile Virus Isolated from Mosquitoes-New York, 2000; Notice to Readers: National Colorectal

Cancer Awareness Month-March 2000; Notice to Readers: Introduction to Public Health Surveillance Course; Surveillance Summaries, Vol. **49**, No. **SS1**-*Surveillance for Foodborne Disease Outbreaks-United States, 1993-1997*; Appendix A: CDC Form 52.13, Investigation of a Foodborne Outbreak; Appendix B: Guidelines for Confirmation of Foodborne-Disease Outbreaks; Vol. **49**, No. **9**- Update: Influenza Activity-United States, 1999-2000 Season; Update: Surveillance for West Nile Virus in Overwintering Mosquitoes-New York, 2000; Vol. **49**, No. **8**- Corporate Action to Reduce Air Pollution-Atlanta, Georgia, 1998-1999; Developing and Expanding Contributions of the Global Laboratory Network for Poliomyelitis Eradication, 1997-1999; Notice to Readers: Publication of Atlas of Geographic and Racial and Ethnic Disparities in Women's Heart Disease Death Rates; Notice to Readers: Satellite Broadcast on Epidemiology and Prevention of Vaccine-Preventable Diseases; Notice to Readers: Epidemiology in Action Course.

Other Related Presentations and Literature

Alternate Ranging Methods for Cancer Mortality Maps by Dan J. Grauman, Robert E. Tarone, Susan S. Devesa, Joseph F. Fraumeni, Jr. [*Journal of the National Cancer Institute*, Vol. 92, No. 7, 534-543, April 5, 2000; *Affiliations of authors:* Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD] Abstract: *Background:* Mapping techniques can highlight the spatial or temporal variations in rates of cancer mortality. In mapping geographic patterns of cancer mortality, spatial units are grouped into categories defined by specified rate ranges, and then the units in each category are assigned a particular color in the map. We examined the consequences of using different ranging methods when comparing maps over several time intervals. *Methods:* Maps of mortality rates for cancers of the breast, lung (including the lung, trachea, bronchus, and pleura), and cervix uteri in the United States by county or state economic area are created for different time intervals between 1950 and 1994. Two ranging methods are employed: 1) Ranges are defined for individual time interval by the deciles of rates in that interval (ranging *within* intervals), and 2) constant ranges for all time intervals are defined by the deciles of rates for the entire 45-year period from 1950 through 1994 (ranging *across* intervals). The time intervals from 1950 through 1969 and from 1970 through 1994 were chosen to accommodate the availability of detailed county-level population estimates specifically for blacks starting in 1970. *Results:* The ranging method has little impact on maps for breast cancer mortality, which changed little over time. For lung cancer, which increased over time, and cervix uteri cancer, which decreased over time, ranging *within* time intervals shows the geographic variability but does not convey the temporal trends. Trends are evident when ranging *across* time intervals is employed; however, geographic variability is partially obscured by the predominance of spatial units in the highest rate categories in the recent time intervals for lung cancer and in the early time intervals for cervix uteri cancer. *Conclusions:* Ranging *within* time intervals displays geographic patterns and changes in geographic patterns, regardless of time trends in rates. Ranging *across* time intervals shows temporal changes in rates but with some loss of information about geographic variability.

****

[CSS 2000 is the annual meeting of the Association for Computing in the Social Sciences, whose journal is the *Social Science Computer Review*. Below is an abstract of a paper that should be of interest to GIS users. The conference is to be held online from April 15 through May 15, 2000. "Online Data Collection and Beyond: The Promise of Data Streams for Social Science," by Alaina Kanfer and Melanie Loots, National Center for Supercomputing Applications, University of Illinois, Champaign, IL]

Abstract: In 1995, Rockwell et al. implied that we stood on the threshold of a new age of social science computing. Sometimes it seems that we have been standing there for a long time! For decades, psychologists have been using computers as a tool for data collection. This has helped the field of psychology to increase data accuracy and expand the types of data collected from subjects. Now widespread Internet access among the general population allows sociologists and other social scientists who utilize survey methods to also benefit from computer mediated data collection. However, these online data collection methods still require social science

survey respondents to make judgements about what data to enter and to expend their own energy to input data. Therefore social science survey design still is quite limited and online data collection may still be fraught with errors. We argue that the real revolution in social science will come with data automatically collected from monitoring devices, World Wide Web transactions and emerging networked appliances. Data will be recorded at an increasingly high sampling rate, approaching continuous recording of activities, resulting in data sets that look like data streams. These data streams will be captured in the course of communication, commerce, education and civic participation through server logs, traditional electronic data services (EDS), digital telephone exchanges, global positioning units, archived videoconferences as well as other technologies under development.

In this article we present some of the potential benefits of such data streams for the social sciences. We also outline potential problems associated with relying on large scale data streams for our research For instance the nature of sampling in the social sciences may change when nearly complete population data become available. Moreover, social sciences may benefit greatly from multiple ways to view or segment the data. On the other hand, the issues associated with the unprecendented amounts of data that will be available to social scientists include consolidation data from multiple data sources, data ownership, and data management. These issues are currently being dealt with in other disciplines. Therefore we compare the situation of the computational social scientist to that of the radioastronomer analyzing large datasets from arrays of instruments, as well as other scientists to draw from lessons learned in other fields. In addition, we speculate on how the adaptation of data warehousing and data mining tools currently used in business and other sciences to social science research may accelerate the move of social scientists to high performance computing architectures, particularly large shared memory machines for database work and clusters for analysis. Finally, when the social sciences do move beyond online data collection and begin examining the streams of data generated by our networked lives online, we will still have to confront concerns about the privacy and confidentiality of data. Thus we will also discuss the social, legal and technical constraints on conducting social science research with automatically collected data streams. [For further information and registration, see http://www2.chass.ncsu.edu/CSS2000/invoice.htm]

VI. Related Census, DHHS and Other Federal Developments: Department of Health And Human Services Updated Strategic Plan- Draft Fy 2001- 2006. Message from Donna E. Shalala, Secretary DHHS. I am writing to solicit your comments on a revised version of the Department of Health and Human Services strategic plan. You may be aware that an initial Department strategic plan was published in September 1997. Pursuant to the Government Performance and Results Act, we are required to update the plan every three years. Currently, we are in the process of doing this update and would like to obtain the views of those who might be interested in or affected by the revised plan. These views will be considered before we finalize the plan this coming September. The plan is drafted to provide a clear statement of the mission and programmatic goals of the Department. In this way, we clearly signal our leadership role and most important priorities in the provision of health and human services to the American public. The plan also provides a guide to show how Department programs will contribute to achieving the stated goals and how we will work with our service delivery partners to assure results. In doing the update, we have tried to improve and build on the 1997 plan as a way of assuring consistent direction toward improving the health and well-being of our nation. If you would like to obtain a copy and comment on the draft update, we are providing an easy way to do so via the Internet. If you have a web capable browser, you can access an electronic version of the document at http://aspe.hhs.gov/hhsplan/. You will then be able to send us comments on the document directly from that site. If, however, you wish to obtain a hard copy of the draft or send us written comments, you can do so by writing to: Department of Health and Human Services, Office of Program Systems, Room 447D (Attn: Strategic Planning Office), 200 Independence Ave., S.W., Washington, D.C. 20201. Please send your comments to us by May 15, 2000. I look forward to hearing from you.

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 (pending DHHS membership) 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*]

Funds Available

The FGDC Secretariat is accepting requests for funds to support activities related to the development or implementation of NSDI standards. These funds will be disbursed to the lead agency of an FGDC Subcommittee or Working Group for which a request is approved. The standards activity for which funding is provided must support the development of the NSDI and must be for an activity that demonstrably broadens participation in FGDC standards development and implementation beyond the Federal community. In order to receive funds, the activity must be related to a standards project by the FGDC Standards Working Group (see Status of FGDC Standards at http://www. fgdc.gov/standards/status/ textstatus.html). Note that Funding requests will be accepted for amounts up to $10,000. Requests must be received by the FGDC no later than Friday, May 12, 2000. Examples of appropriate funding requests:

To reimburse members of state, local, or private organizations who provide tangible support services to the development of a standard and who act to provide outside community input in the development process. These funds may be awarded to fund the travel of members of non-Federal organizations to participate in meetings that are dedicated to FGDC standards development (for example, editing committee meetings following the public review period).

To obtain support to conduct a survey on user requirements that will help in understanding the needs of a broader community and further the development of relevant broad based standards.

To obtain support to conduct a test implementation of an FGDC standard in order to demonstrate that the needs of state and local governments are being met. [Examples of what will not be funded: Work or travel of Federal personnel; Contracting for services that may be required in standards development process, but which, in themselves, do not broaden or enhance community involvement; Travel for non-Federal personnel to attend general SC/WG meetings not specifically dedicated to standards development]

The Chair of the FGDC Subcommittee or Working Group shall submit request for funding to Julie Binder Maitra, FGDC Standards Coordinator, via fax (703-648-5755), e-mail (jmaitra@usgs.gov), or postal mail (FGDC Secretariat, 590 National Center, Reston, VA 20192). It is suggested that requests are submitted in Microsoft Word or Rich Text Format (RTF) file formats. Please provide the following information in the request: Name of standards project; Brief description of standards project; Justification for funding request; Amount of funding requested (include an estimation of how much of this funding will be applied to travel expenses).

A panel of volunteers from the FGDC Secretariat and the FGDC Standards Working Group will review proposals and individually rank the projects by merit. A composite ranking will be prepared, and recommendations for funding will be submitted to the Chair, FGDC Coordination Group, for approval. [Contact: Julie Binder Maitra at voice (703) 648 4627]

****

Metadata Workbook 2.0 Available

The FGDC is pleased and excited to announce the availability of the CSDGM Metadata Workbook, Version 2.0 in electronic form (Adobe PDF-bookmarked enabled). The workbook if free of charge and is easily down-loadable (130 pages, 1Mb). The workbook complies with the latest version of the FGDC Content Standard for Digital Geospatial Metadata (CSDGM), FGDC-STD-001-1998 and contends both textual and color graphical information about the FGDC CSDGM including background information, how to read and use the Standard, a color graphical and textual representation of the content information of the Standard, a description

of Profiles and User Defined Metadata Extensions, and some metadata examples. Please feel free to download the workbook and distribute it among your organization, located at http://www.fgdc.gov/metadata/meta_workbook.html.

The Metadata Workbook-Version 1.0 has been one of the top requested FGDC Publications and the FGDC feels the conversion of the printed document to the electronic form will make the Metadata Workbook - Version 2.0 document an even more useful product Since the electronic version is bookmarked-enabled, the document is easily navigated. In addition, the document is easily and completely searchable using the "find" command. Please note that with the workbook now available in electronic form, the electronic form will be the primary form/method of distribution of the workbook by the FGDC. [Contact: Rick Pearsall, FGDC Metadata Coordinator at email rpearsall@usgs.gov]

****

Update on GeoData Organizational Initiative

Editor: I am pleased to inform all Public Health GIS Users that the Federal Geographic Data Committee (FGDC) Geodata Organizational Initiative is under way. A team of geodata professionals, representative of nearly all sectors of the economy, has been formed to prepare formal organizational plans and protocols to help launch the “GeoData Organizational Initiative.” This is a major and exciting development for all of us in the world of spatial information, data collection and sharing, and analysis and mapping.

This initiative is modeled after the successful efforts of Dee Hock, VISA International CEO Emeritus, from parallel business experiences in establishing an international credit system to serve a diverse audience of users. It was at the 1999 GeoData Forum meetings in Washington, D.C. that the concepts of “chaos” and “order,” on which Mr. Hock built “The Chaordic Alliance,” were presented to the FGDC and the geospatial data community. FGDC and geodata leaders, in consultation with the Chaordic Alliance, now will develop a more streamlined approach to distributing authority and responsibilities for the national organizational stewardship of geospatial data and information. A new geodata governance structure that is inclusive, from the ground up, is in the making. This is no small undertaking but the rewards should be enormous for everyone involved in our National Spatial Data Infrastructure (NSDI).

Plans now call for formation of a "Working Group" to meet four times over the next several months to prepare formal organizational materials and documents, which will be considered by a newly established "Drafting Team" in officially launching the new "GeoData Organizational Initiative." Working Group members are: **Kathy Covert**, Project Manager, Federal Geographic Data Committee, Reston, VA; **Randall Johnson**, Staff Coordinator for MetroGIS, St. Paul, MN; **Susan Carson Lambert**, Executive Director of the Kentucky Office of GIS and President-Elect of the National States Geographic Information Council; **Jeanne Murday**, Manager of Regional Offices, Environmental Systems Resources Institute, Inc., Redlands, CA, and **Gene Thorley**, Senior Liaison for Washington State, U.S. Geological Survey. A Team composed of **Dee Hock**, **Tom Hurley**, and **Steve Hock** from The Chaordic Alliance and **Ken O’Brien** from R.W. Beck will create a set of materials from prior experience as a context for the work of the Working Group and Drafting Team.

The Drafting Team is drawn from the geospatial data community as a whole. Over the next eight months, this team will review materials developed by the Working Group on the purpose, principles, participants, organizational concept, and the constitutional documents written in conjunction with legal counsel; provide guidance concerning all substantive issues; and make decisions concerning the content of all organizational elements (e.g., purpose, principles) and documents.

Initial Drafting Team members are: **Eric Anderson**, City Manager, City of Des Moines, IO; **Tim Case**, Senior GIS Analyst, Parsons Brinckerhoff Quade, Douglas, Inc., Boston, MA; **Claudia Haack-Benedict**, GIS Manager, City of Fort Collins, CO; **Francis Harvey**, Assistant Professor, University of Kentucky, Department of Geography; **Will Hopkins**, Executive Director, Cobscook Bay Resource Center, Inc., Eastport, ME; **Bert Jarreau**, Chief Technology Officer, National Association of Counties; Commissioner **Randy Johnson**, Hennepin County, MN; **John Moeller**, Staff Director, FGDC; **Bruce Oswald**, Project Director, New York

State Office for Technology; **Marilyn Otto**, General Manager, Information Business Americas, MapInfo, Troy, NY; **Robbie Rand**, Coordinator, U.S. Department of Agriculture Global Change Data and Information Management, and; **CloAnn Villegas**, Vice-Chairman, Inter-Tribal GIS Council. Additional Drafting Team members from the private sector will be added to the team. Meetings of the Drafting Team are scheduled for March 27-29; May 8-10; July 11-13; and September 6-8.

Organizers of the new initiative are also planning for a series of informal "open house" town-meetings to keep geodata interests and others apprized of plans and progress in better meeting needs of spatial data providers and users. Specific plans and schedules for those sessions will be posted online at http://www.fgdc.gov/GeoAll/. [Please contact: **Kathy Covert**, USGS and FGDC, at (703) 648-4144 or email klcovert@usgs. gov]

Web Site(s) of Interest for this Edition

http://www.oms.dk/country/readme.htm. *Atlas of Leading and "Avoidable" Causes of Death in Countries of Central and Eastern Europe*: The atlas contains three different types of map, covering different resolutions and areas. Maps of type 1 show all the countries that are Member States of the WHO European Region. The purpose of these maps is to show the situation around 1985 and 1990 in the eastern half of the Region in a broader European context, by east-west comparisons of mortality. Selected HFA indicators, such as life expectancy at birth and age-standardized mortality rates from leading causes of death, should only be used with this type of map. Maps of type 2 show the area of the 14 countries presented in the atlas, down to the level of administrative subdivisions of each country. These maps show variations in mortality at small-area level in these countries. It allows the identification of single areas or clusters of areas with high levels of mortality, compared with the average. Standardized mortality ratios (SMRs), using a common standard for "avoidable" and leading causes of death (group 1) should normally be used with this type of map. Maps of type 3 show individual countries at the level of their administrative subdivision. SMRs based on the national standards (group 2) should normally be used with this type of map. The purpose is to show variations in mortality compared with national averages. Countries or small regions in all three types of map are coloured according to the values of the indices: mortality rates or the SMR for a given cause of death.

http://www.ojp.usdoj.gov/cmrc/research/welcome.html#lead. Spatial Analysis of Elevated Blood Lead Levels in Children: A Case Study. [Research team: Cynthia Mamalian, Bruce Nilles (ENRD), Dr. Oxitis Barbot (Upper Cardoza Health Clinic, Washington, DC), and CMRC Staff] Approximately one million children in the United States are estimated to be exposed to levels of lead detrimental to their health and development. This study will map the spatial distribution of elevated blood lead levels in children patients of the Upper Cardoza Health Clinic, Washington, DC for the years 1996 to the present. This study will include hot spot analysis, and spatial analysis of environmental and community characteristics such as toxic release places, age of housing, income, school and day care center locations, and assess housing values and their relation to children's elevated blood lead levels. Results of this study will inform enforcement, abatement, and prevention efforts in this section of the District, and serve as a pilot test for mapping these data for the entire District.

http://www.uic.edu/sph/cade/citymatch99/. Video streaming technology is now here. The 1999 Joint Conference "Healthy Cities Safe Harbors for Children and Families," sponsored by CityMatCH Urban MCH Leadership & National League of Cities, is available online for you viewing. The workshop "Basics & Potential Uses of Geographic Information Systems (GIS) in Public Health" can be viewed in its entirety. Presenters include Fred Broome and Jonathan Sperling, Geography Division, Bureau of Census and Chuck Croner, Office of Research and Methodology, National Center for Health Statistics, CDC.

http://www.ph.ucla.edu/epi/snow.html. The first site contains several maps, but is primarily about Dr. John Snow, a nineteenth century British physician with an interesting scientific past. The second is a single large map of London from 1859, with internal ties to various

historical locations at http://www.ph.ucla.edu/epi/snow/1859map/map1859.html [Source: Ralph R. Frerichs, Chair of Public Health, UCLA, and for distribution, Stephen A. Matthews, Population Research Institute, The Pennsylvania State University]

Final Thought(s): One Step Closer to Comprehensive Emergency Management
The U.S. Coast Guard's National Response Center

This past month I had the distinct pleasure of introducing Captain Dennis ("Mike") Egan, U.S. Coast Guard, to the Working Group, Federal Geographic Data Committee (FGDC). Mike serves as Chief, Office of Command Control and Preparedness, of our nation's National Response Center (NRC). Mike's presentation epitomized, to a large degree, the importance of the National Spatial Data Infrastructure (NSDI) theme of spatial data coordination and sharing. In this case, our nation's public safety may depend on it.

The NRC, established in 1974 under the National Oil and Hazardous Substance Pollution Contingency Plan (see http://www.nrc.uscg.mil), was designated by Congress as the sole federal point of contact for reporting the spill or release of hazardous materials. These include oil, chemicals, explosives, radioactive material, shipping, rail and pipeline accidents, and bioterrorism and release of biological agents into the environment anywhere in the U.S. and its territories and adjacent areas. Mike's NRC purview is the front-end of the National Response System, oncall 24 hours a day and seven days a week, year-round (reached at the nationwide hotline 1-800-424-8802). His office records about 30,000 alerts annually.

The NRC uses an Incident Reporting Information System (IRIS) for telephonic reports which are immediately relayed to predesignated Federal On-Scene Coordinators (FOSC). It is the responsibility of the FOSC to organize the response, including the marshaling of financial resources. Each governor in an impacted area must carefully weigh the decision to request a Federal Declaration (from the President and FEMA) since 25 percent of the remediation costs will be borne by the state. Funds also can come from the National Superfund program.

Response technology is evolving. The not-so-good news is there is no fluid top to bottom system. We are living with a very fractured and limited response capability. And rapid assessment is critical in any emergency response situation. For example, a toxic spill on the Ohio River requires rapid assessment for containment before the plume can move to new locations. There are problems with current response technology in that these are dispersed programs, some proprietary and some standalone. Few employ real-time dynamic elements. GIS use is rudimentary with no rebroadcast mechanism for plotting real-time Global Positioning System (GPS) coordinates. Radio, cellular and satellite coordination is limited. I understand now why the recent IRIDIUM (satellite system) collapse was a set back to the plans for improvements in response assessment and deployment.

Even with available GIS databases, NRC faces the distributed problem of "who owns the turf?" Questions regarding the location of sensitive environmental and cultural set asides, and other related issues of propriety, must be determined and negotiated in order to avoid potential post response litigation. The rapid access to spatial data and coordinated use now is very limited.

The good news is that change is on the way. Technology is converging in the form of GIS and GPS with new high speed data mining and supercomputing capacities. It may sound somewhat "Star Wars" but the NRC vision for initial response situational analysis and consequence management is to develop a dynamic 3-dimensional geographic spatial data and GIS-GPS correlated framework. Think of it as a dynamic database that can update itself over a supercomputing geographic grid from web-based servers and other types of databases including environmental sensors. Think of it as a system of high speed simulation and modeling of environmental and physical processes, such as surface winds, sea state, ocean currents, oil or hazardous chemical slicks, and toxic gas plumes. Then add web-based sampling of the resultant composite display images through compression and exporting via high speed digital datalinks (e.g., using

satellite or fiber, wide bandwidth data paths and digital streams) to remote display areas for use by FOSC and Commanders.

NRC is proposing the collaborative development of this GIS-GPS spatial data infrastructure through the creation of a test bed hosted by the National Center for Supercomputing Applications in Ballston, VA. It will require a consortium of federal agencies, and university and industry partners. Two key federal supporters of this plan include the Federal Emergency Management Agency (FEMA) and the National Guard Bureau (NGB). This is a digital government initiative and promises significant involvement from state and local government agencies, the 27 other federal agencies and the American Red Cross that comprise the Federal Response Plan. The prospects for comprehensive emergency management now are part of our NSDI reality.

[Postnote: Mike Egan served during the first two years of the Clinton-Gore administration as a Special Assistant to the Vice President for the National Performance Review and was the first System Operator of the Federal Executive Board Network (FEBNET). He spent the last three years as the Alaska Regional Response Team Co-Chairman and Director of the first Oil Spill of International Significance Exercise among the Russians, Japanese and United States. Contact: Mike at voice (202) 267-2182 or email dennise@tmn.com]

Charles M. Croner, Ph.D., Editor, ***PUBLIC HEALTH GIS NEWS AND INFORMATION***, Office of Research and Methodology, National Center for Health Statistics <cmc2@cdc.gov>.

Please join us at NCHS for our May 11 (Special Satellite), May 17, and June 13 GIS Presentations