PUBLIC HEALTH GIS NEWS AND INFORMATION

November 2004 **(No. 61)**

Dedicated to CDC GIS Scientific Excellence and Advancement in
Disease, Injury and Disability Control and Prevention, and Biologic, Chemical and Occupational Safety

I. Public Health GIS (and related) Events:

SPECIAL NCHS/CDC GIS LECTURES

Please join us December 7, 2004, at 11:00AM, RM 404, at NCHS! "TOXMAP: A GIS Tool for Exploring Environmental Health Data," Marti Szczur, National Library of Medicine (NLM), National Institutes of Health. The NCHS GIS Guest Lecture Series has been presented continuously at NCHS since 1988. Please note the time of **11:00AM** for this presentation. As with all live lectures, Envision will be available to offsite CDC locations. Web access will be available to our national and worldwide public health audience; please request URL for viewing, anytime between now and **December 7, 2004**, from the Editor. The 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). Note: **NCHS Cartography and GIS lectures are open to all**. We look forward to having you with us. [Contact: Editor, *Public Health GIS News and Information* at cmc2@cdc.gov]

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

* International Conference on Social Science Research, November 11-13, 2004, New Orleans LA, [See conference: http://www.centrepp.org/socialscience.html]

2005

* International Conference on Occupational Health Services 2005, January 25-27, 2005, Helsinki, Finland. The Conference celebrates the 60th anniversary of the Finnish Institute of Occupational Health (FIOH). See site http://www.ttl.fi/Internet/English/Information/International+meetings+and+symposia]

* 19th National Conference on Chronic Disease Prevention and Control, "Health Disparities: Progress, Challenges, and Opportunities (Accelerating the rate of progress in improving lives), March 1-3, 2005, Atlanta GA [See: http://www.cdc.gov/nccdphp/conference]

* 18th Annual Towson University GIS Conference and Workshops, "Mapping the Human Landscape: GIS for Public Health, Safety, and Social Services Applications," March 21-25, 2005, Towson MD [See conference at site: http://cgis.towson.edu/tugis2005]

* 2nd Annual CDC Technology Symposium (in conjunction with BioFusion 2005), April 10-12, 2005, Atlanta GA [Contact: Suzanne Shope at (770) 488-8613]

* 8th GSDI (Global Spatial Data Infrastructure) Conference: "From Pharaohs to Geoinformatics," April 16-21, 2005, Cairo, Egypt [See: http://www.gsdi.org]

* National Environmental Public Health Tracking Conference: "Vision to Reality," CDC and other public health partners, April 20-22, 2005, Atlanta GA [See site: http://www.cdc.gov/nceh/tracking/savedate.pdf]

* 9th World Multi-Conference on Systemics, Cybernetics and Informatics: SCI 2005, July 10-13, 2005, Orlando FL [See: http://www.iiisci.org/sci2005/website/default.asp]

* First International Conference on Environmental Exposure and Health 2005, October 5-7, 2005, Atlanta, GA [http://www.ce.gatech.edu/research/MESL/EEH2005]

II. GIS News

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

A. General News and Training Opportunities

1. TerraSeer announces **Fall 2004 Spatial and Temporal Data Analysis Training Series**. (1) Visualization and Analysis of Space-Time Data. November 2-3. This two day course offers an overview

of techniques for the visualization and exploration of space-time pattern in geographic and temporal data. The course is aimed at those interested in going beyond current GIS to space-time datasets and exploration. (2) Advanced Visualization and Analysis of Space-Time Data, November 4-5. This two day course builds on the visualization skills and techniques learned in the first course on space-time analysis, but adds quantification and spatio-temporal statistical analysis.

(3) Geostatistical Analysis of Spatial Data, December 7-8, and (4) Advanced Geostatistical Analysis of Spatial Data, December 9-10. TerraSeer will hold back-to-back courses in geostatistical analysis. This set of two 2-day courses will cover the basics of geostatistical approaches to the modeling and exploration of geographic data. Examples in the course will draw from fields as diverse as soil science, environmental remediation, and public health. [For information on course content and cost, or to register, visit course site www.terraseer.com]

2. The GIS unit of the Information Resources Management Administration, Maryland Department of Health and Mental Hygiene, will hold its 4th Annual GIS Conference, October 27, 2004, in Baltimore. The theme of the conference is **"GIS as a Decision Science."** [Contact: Jim Thomas, Information Systems Division, at JCThomas@dhmh.state.md.us]

3. Martin Kullsdorff, SaTScan developer, reports that **SaTScan v5.0** has now been released. This software was developed to analyze spatial, temporal and space-time count data using the spatial, temporal, or space-time scan statistics. It is a program designed for any of the following interrelated purposes: To evaluate reported spatial or space-time disease clusters, to see if they are statistically significant; To test whether a disease is randomly distributed over space, over time or over space and time; To perform geographical surveillance of disease, to detect areas of significantly high or low rates; and, To perform repeated time-periodic disease surveillance for the early detection of disease outbreaks.

As before, the software is free and located at www.satscan.org. The major improvements are: Ability to simultaneously analyze multiple data sets using a multivariate spatial or space-time scan statistic; Ability to adjust for a limited number of covariates when using the Bernoulli model; An improved graphical user interface; and Ability to adjust space-time analyses for purely spatial clusters when using the Poisson model (previously available for the space-time permutation model). [Contact: Martin, Department of Ambulatory Care and Prevention, Harvard Medical School at the following email address-martin_kulldorff@hms.harvard.edu]

B. Department of Health and Human Services

http://www.hhs.gov

4. Some $2 million in grants have been allocated for the national office of the YMCA (Y-USA) to help build strong partnerships with local communities and promote better health and prevent disease among all Americans. The grants are part of Steps to a HealthierUS initiative, which aims to help Americans live longer, healthier lives by reducing the burden of diabetes, overweight, obesity and asthma and by addressing three related risk factors - physical inactivity, poor nutrition and tobacco use. The most recent figures from the Centers for Disease Control and Prevention show that **65 percent of U.S. adults--or about 129.6 million people--are either overweight or obese**. In addition to decreasing quality of life and increasing the risk of premature death, obesity and overweight cost the Nation an estimated $117 billion in direct medical costs and indirect costs such as lost wages due to illness. With more than 2,500 YMCA's in the country, this funding will help strengthen the network of local YMCA chapters by developing and implementing strategies to work together with previously funded "Steps" communities. [See: http://www.healthierus.gov and related report http://obesityresearch.nih.gov]

Administration for Children and Families

http://www.acf.dhhs.gov

5. The Administration for Native Americans (ANA) was established in 1974 through the **Native American Programs Act (NAPA)**. ANA is the only federal agency serving all Native Americans, including 562 federally recognized tribes, American Indian and Alaska Native organizations, Native Hawaiian organizations and Native populations throughout the Pacific basin (including American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands). The mission of ANA promotes the goal of self-sufficiency for Native Americans by providing social and economic development opportunities through financial assistance, training, and technical assistance to eligible Tribes and Native American organizations representing nearly 4.3

million individuals. Additional ANA information is available at this site.

Administration on Aging

http://www.aoa.gov

6. This year marks the **first U.S./Mexico Border Health Week**, in which nearly 200 health-promotion activities took place in 14 U.S./Mexico sister cities along the border. The event, held the week of October 11th, was a collaboration among the U.S. Department of Health and Human Services, the Mexican Ministry of Health, the U.S./Mexico Border Health Commission, the Pan American Health Organization and local and state organizations and communities.

Agency for Healthcare Research and Quality

http://www.ahrq.gov

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

Centers for Disease Control and Prevention

[Includes the Agency for Toxic Substances and Disease Registry (ATSDR), in CDC's National Center for Environmental Health]

http://www.cdc.gov

8. CDC's **19th National Conference on Chronic Disease Prevention and Control Health Disparities: Progress, Challenges, and Opportunities** will focus on efforts to eliminate disparities and will explore more rigorous approaches for accomplishing the *Healthy People 2010* objectives. The major goal of the 19th National Chronic Disease Conference is to accelerate the rate of progress in improving the lives for those at highest risk for poor health, including racial and ethnic minorities, and low-income and less educated populations. Target audiences include researchers, public health practitioners at all levels of government, community and health advocates, social workers, policy makers, behavioral scientists, hospital administrators, health plan administrators and payers, law enforcement personnel, educators, justice workers, businesses, technology workers, urban planners, rural and migrant health specialists, politicians, and consumer groups. The conference will be held March 1-3, 2005, in Atlanta [See Section I, Calendar Events]

Centers for Medicare and Medicaid Services

http://cms.hhs.gov

9. The **Medicare Current Beneficiary Survey (MCBS)** is the only comprehensive source of health characteristics of the entire spectrum of Medicare beneficiaries. The MCBS Profiles series uses MCBS data to offer interesting insights into health care delivery.

Food and Drug Administration

http://www.fda.gov

10. None of the **influenza vaccine manufactured by the Chiron Corporation for the US market is safe for use**. This determination is based on FDA's evaluation and inspection of Chiron's influenza vaccine manufacturing plant in Liverpool, England. The Department of Health and Human Services will continue to exhaust every avenue to secure more flu vaccine for this season. Literally every known manufacturer of flu vaccine in the world is being contacted and some progress is being made. Additionally the quarantined lots of Chiron vaccine already in the United States are being ever further evaluated. We do not want to create false hope but we want to explore every option. [FDA Statement, October 15, 2004]

Health Resources and Services Administration

http://www.hrsa.gov

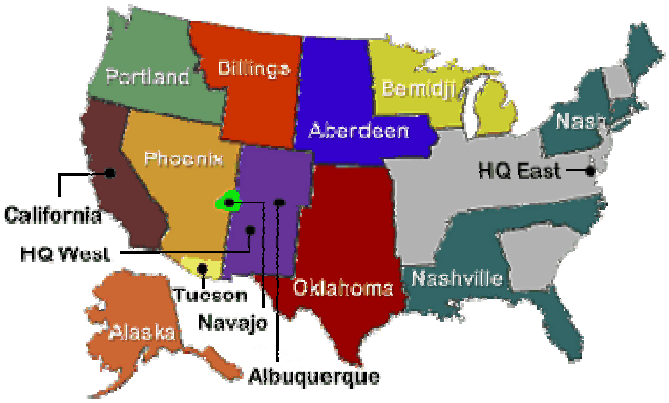
11. HHS Secretary Thompson announced his intention to award 76 **new health center grants** totaling $49 million that will help an estimated 488,000 Americans, including many without health insurance, to obtain comprehensive primary health care services. Health centers deliver preventive and primary care to patients regardless of their ability to pay. Almost 40 percent of the patients treated at health centers have no insurance coverage, and others have inadequate coverage. Charges for health care services are set according to income.

Indian Health Service

http://www.ihs.gov

12. **Institutional Environmental Health Officers** are

available at the IHS site through this interactive map. The IHS Division of Environmental Health Services mission is



to enhance the health and quality of life of all American Indians/Alaskan Natives to the highest possible level, through shared decision making, by eliminating environmentally related disease and injury through sound public health measures.

National Institutes of Health

http://www.nih.gov

13. One year after launching the **NIH Roadmap for Medical Research**, the National Institutes of Health (NIH) has made significant progress toward accelerating the pace of discovery. NIH Roadmap initiatives fall within three overarching themes that are applicable across all areas of science. Researchers from any discipline are free to apply for any of the awards. In fiscal year 2004, NIH awarded $64 million to projects within the New Pathways to Discovery theme, $27 million to Research Teams of the Future projects, and $38 million to projects within the Re-Engineering the Clinical Research Enterprise theme.

Substance Abuse and Mental Health Services Administration

http://www.samhsa.gov

14. **Report to Congress on the Prevention and Treatment of Co-Occurring Substance Abuse Disorders and Mental Disorders**. Seven to 10 million individuals in the United States "have at least one mental disorder as well as an alcohol or drug use disorder" (U.S. DHHS, 1999; SAMHSA National Advisory Council, 1998). Further, as indicated by the U.S. Surgeon General in the 1999 report on mental health: "Forty-one to 65 percent of individuals with a lifetime substance abuse disorder also have a lifetime history of at least one mental disorder, and about 51 percent of those with one or more lifetime mental disorders also have a lifetime history of at least one substance abuse disorder" (U.S. DHHS, 1999). Individuals experiencing these disorders simultaneously - in this report, referred to as co-occurring disorders - have particular difficulty seeking and receiving diagnostic and treatment services, even though, separately, these disorders often are as treatable as other chronic illnesses. **Clearly, co-occurring substance abuse disorders and mental disorders present significant challenges to the Nation's public health and to health policy makers as well.**

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

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

15. **Health Disparities Experienced by Hispanics--United States** (excerpts). In 2001, Hispanics of all races experienced more age-adjusted years of potential life lost before age 75 years per 100,000 population than non-Hispanic whites for the following causes of death: stroke (18% more), chronic liver disease and cirrhosis (62%), diabetes (41%), human immunodeficiency virus (HIV) disease (168%), and homicide (128%); in 2000, Hispanics had higher age-adjusted incidence for cancers of the cervix (152% higher) and stomach (63% higher for males and 150% higher for females). During 1999-2000, Mexican Americans aged 20-74 years reported higher rates of overweight (11% higher for males and 26% higher for females) and obesity (7% higher for males and 32% higher for females) than non-Hispanic whites (3); Mexican-American youths aged 12-19 years also reported higher rates of overweight (112% higher for males and 59% higher for females).

Despite recent progress, **ethnic disparities persist among the leading indicators of good health identified in the national health objectives for 2010**. Hispanics or Hispanic subpopulations trailed non-Hispanic whites in various measures, including 1) persons aged <65 years with health insurance (66% Hispanics versus 87% non-Hispanic whites, 2002) and persons with a regular source of ongoing health care (77% versus 90%, 2002); 2) children aged 19-35 months who are fully vaccinated (73% versus 78%, 2002) and adults aged >65 years vaccinated against influenza (49% versus 69%, 2002) and pneumococcal disease (28% versus 60%, 2002) during the preceding 12 months; 3)

women receiving prenatal care in the first trimester (77% versus 89%, 2002); 4) persons aged >18 years who participated in regular moderate physical activity (23% versus 35%, in 2002); 5) persons who died from homicide (8.2 versus 4.0 per 100,000 population, 2001); and 6) persons aged 6-19 years who were obese (24% [Mexican Americans] versus 12%, 1999--2000), and adults who were obese (34% [Mexican Americans] versus 29%, 1999-2000).

In other health categories (e.g., tobacco use and exposure to secondhand smoke, infant mortality, and low birthweight), Hispanics led non-Hispanic whites. In addition, since the 1970s, ethnic disparities in measles-vaccine coverage during childhood and in endemic measles have been all but eliminated; however, during 1996-2001, the vaccination-coverage gap between non-Hispanic white and Hispanic children widened by an average of 0.5% each year for children aged 19-35 months who were up to date for the 4:3:1:3:3 series of vaccines recommended to prevent diphtheria, tetanus, and pertussis; polio; measles; Haemophilus influenzae type b disease; and hepatitis B. [See: Office of Minority Health, CDC, and *MMWR* 53(40);935-937 OCT 15, 2004 at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5340a1.htm]

D. Other Related Agency or GIS News

16. The Open Geospatial Consortium Inc. (OGC) recently launched a **digital rights management (DRM)-related project** aimed at collecting essential information from governments, businesses, and academia. The data gathered through a five-minute survey, available for the next 30 days for your review and completion (at website http://www.surveymonkey.com/s.asp?u=53777639685), will help to shape the development of open standards to manage digital rights for geospatial data and services. DRM is a technology for describing, identifying, trading, protecting, monitoring and tracking all forms of rights usages, including management of rights-holder relationships. Geospatial DRM manages all rights, not only the rights applicable to permissions over digital geographic data. The current inability to control the flow of such information activities has been a barrier to broader adoption of Web-based geospatial technologies. Some government data has been withheld from public release over the Web because of an inability to manage owner rights after the data is released. The GeoDRM initiative, a partnership of the GeoData Alliance and OGC, will rely on the survey data in working to validate a standards-based interoperability framework. This framework is comprised of OGC Web services specifications and related standards developed by the broader information technology industry. [Contact: Sam Bacharach, OGC, at sbacharach@opengeospatial.org]

III. GIS Outreach

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

*****

IV. Public Health GIS Presentations and Literature

NCHS/CDC Cartography and GIS Guest Lecture Series

"TOXMAP: A GIS Tool for Exploring Environmental Health Data," Marti Szczur and Colette Hochstein, National Library of Medicine, National Institutes of Health, and Chris Krahe, Aquilent Inc., **December 7, 2004, at 11:00AM, in RM 1404, NCHS**. **Abstract**: The National Library of Medicine (NLM) has an extensive collection of environmental health information, including bibliographic and factual data on hazardous chemical substances in its TOXNET databases. TOXNET also provides access to the EPA Toxics Release Inventory (TRI) data, which covers air, water, and land releases, as reported by industrial facilities around the United States. Using ESRI's ArcIMS, NLM has developed a web-based system, TOXMAP (http://toxmap.nlm.nih.gov), in which users can dynamically create maps that show where TRI chemicals are released and provide direct links to the appropriate chemical data records in TOXNET. By extracting the associated regional geographic terms from the displayed map (e.g., rivers, towns, county, state), TOXMAP also provides customized chemical and/or region-specific searches of NLM's bibliographic biomedical resources. The presentation will focus on the TOXMAP features, implementation strategy, challenges, and feedback from users. It will also address issues associated with data accuracy, the risk of data misinterpretation, and future directions. [Contact: Colette Hochstein, D.M.D., MLS, National Library of Medicine, Division of Specialized Information Services, at hochstec@mail.nlm.nih.gov]

*****

CDC's *Emerging Infectious Diseases* and *MMWR*

Emerging Infectious Diseases

Emerging Infectious Diseases (EID) is indexed in Index Medicus/Medline, Current Contents, Exerpta Medica, and other databases. Emerging Infectious Diseases is part

of CDC's plan for combating emerging infectious diseases; one of the main goals of CDC's plan is to enhance communication of public health information about emerging diseases so that prevention measures can be implemented without delay.

The abstract for the October article **"West Nile Virus Economic Impact, Louisiana, 2002,"** reads: "West Nile virus (WNV) is transmitted by mosquitoes and can cause illness in humans ranging from mild fever to encephalitis. In 2002, a total of 4,156 WNV cases were reported in the United States; 329 were in Louisiana. To estimate the economic impact of the 2002 WNV epidemic in Louisiana, we collected data from hospitals, a patient questionnaire, and public offices. Hospital charges were converted to economic costs by using Medicare cost-to-charge ratios. The estimated cost of the Louisiana epidemic was $20.1 million from June 2002 to February 2003, including a $10.9 million cost of illness ($4.4 million medical and $6.5 million nonmedical costs) and a $9.2 million cost of public health response. These data indicate a substantial short-term cost of the WNV disease epidemic in Louisiana." [The **October 2004 10(10) and November 2004 10(11) editions of EID are available for download**. The latter includes an article on the 2004 International Conference on Emerging Infectious Diseases; See: http://www.cdc.gov/ncidod/EID/index.htm]

*****

Morbidity and Mortality Weekly Report

Selected articles from CDC's ***Morbidity and Mortality Weekly Report*** (MMWR): [Readers may subscribe to MMWR and other CDC reports, without cost, at site http://www.cdc.gov/subscribe.html as well as access the MMWR online at website http://www.cdc.gov/mmwr]. Note: Efforts are made to include themes which may lend themselves to spatial distribution. Vol. **53, RR-13**-Newborn Screening for Cystic Fibrosis: Evaluation of Benefits and Risks and Recommendations for State Newborn Screening Programs; Vol. **53, SS-8**-Surveillance for Waterborne-Disease Outbreaks Associated with Recreational Water-United States, 2001-2002; Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water-United States, 2001-2002; Surveillance Summaries Vol. **53, SS-6 REACH 2010 Surveillance for Health Status in Minority Communities United States, 2001-2002**. This Surveillance Summaries provides information regarding the Racial and Ethnic Approaches to Community Health (REACH) 2010 Risk Factor Survey, which is conducted annually in minority communities in the United States. The survey focuses on four minority populations (blacks, Hispanics, Asians/Pacific Islanders, and American Indians). Substantial variations in the prevalence of risk factors, chronic conditions, and use of preventive services among different minority populations and in communities within the same racial/ethnic population provide opportunities for public health interventions. These variations also indicate that different racial/ethnic populations and different communities should have different priorities in eliminating health disparities. The continuous surveillance of health status in minority communities is necessary so that culturally sensitive prevention strategies can be tailored to these communities and program interventions evaluated; Vol. **53, No. RR-13**-Newborn Screening for Cystic Fibrosis: Evaluation of Benefits and Risks and Recommendations for State Newborn Screening Programs; Vol. **53, No. SS-8**-Surveillance for Waterborne-Disease Outbreaks Associated with Recreational Water-United States, 2001-2002; Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water-United States, 2001-2002; Vol. **53(40)**- Health Disparities Experienced by Hispanics-United States; Access to Health-Care and Preventive Services Among Hispanics and Non-Hispanics, United States, 2001-2002; Effect of Revised Population Counts on County-Level Hispanic Teen Birthrates, United States, 1999; Vol. **53(39)**- State Estimates of Neonatal Health-Care Costs Associated with Maternal Smoking, United States, 1996; Vol. **53(37)**-Childhood Influenza-Vaccination Coverage, United States, 2002-03 Influenza Season; Alcohol-Attributable Deaths and Years of Potential Life Lost, United States, 2001.

Titles

Air Pollution Mix and Emergency Room Visits for Respiratory and Cardiac Diseases in Taipei, Hwang J-S, Hu T-H and Chan CC, *J Data Sci* 2(4) OCT 2004;

Use of satellite imagery in constructing a household GIS database for health studies in Karachi, Pakistan, Ali M, Rasool S, Park J-K, Saeed S, Ochiai RL, Nizami Q, Acosta CJ and Bhutta Z,, *Int J Health Geog* 3(20) SEP 2004;

Using environmental concentrations of cadmium and lead to assess human exposure and dose, Hellstrom L,

Jarup L, Persson B, Axelson O, *J Expo Anal Env Epid* 14 (5): 416-423 SEP 2004;

Distance, rurality and the need for care: access to health services in South West England, Jordan H, Roderick P, Martin D and Barnett S, *Int J Health Geog* 3(21) SEP 2004;

Fire station districting using simulation: Case study in Centre Region, Pennsylvania, Yang BY, Viswanathan K, Lertworawanich P, Kumar S, *J Urban Plan D-Asce* 130 (3): 117-124 SEP 2004;

Quantification and index of non-point source pollution in Taihu Lake region with GIS, Guo HY, Wang XR, Zhu JG, *Environ Geochem Hlth* 26 (2): 147-156 JUN-SEP 2004;

Creating spatially defined databases for equitable health service planning in low-income countries: the example of Kenya, Noor AM, Gikandi PW, Hay SI, Muga RO, Snow RW, *Acta Trop* 91 (3): 239-251 AUG 2004;

Assessment of exposure to traffic pollution in epidemiological studies: a review, Reungoat P, Chiron M, Momas I, *Rev Epidemiol Sante* 52 (3): 271-296 JUN 2004;

Exploration of residential history and breast cancer risk in Wisconsin using geographic information systems, McElroy JA, Remington PL, Robert SA, Hampton JM, Trentham-Dietz A, *Am J Epidemiol* 159 (11): S38-S38 Suppl. S JUN 1 2004.

Special Report

Review of Cluster Analysis Software

Luc Anselin. Springfield (IL): North American Association of Central Cancer Registries, SEPT 2004

Executive Summary

This report reviews four free software packages (as of August 2003) that can be used in a spatial analysis of cancer clusters: CrimeStat, GeoDa, SaTScan, and packages developed in the open source R programming environment (specifically, the packages spatial, splancs, spatstat and spdep). The selection of these specific packages was carried out in consultation with and agreed upon by NAACCR and based on the following criteria: (i) they were free and/or open source; (ii) they are up to date and under active development; (iii) they come with a manual and documentation; (iv) they are downloadable from the internet; and (v) they work in a Microsoft Windows operating system.

To carry out an exploratory analysis of cancer clusters, an effective software environment should include (i) efficient data input; (ii) spatial data manipulation functions; (iii) descriptive spatial statistics; (iv) point pattern analysis; (v) spatial autocorrelation analysis; (vi) visualization of the results; and (vii) flexible program output. None of the four packages reviewed satisfies all these criteria, although they come quite close and to some extent they are complementary. It should be noted that there is no single commercial alternative that meets these criteria (commercial software was not included in the review).

Methods to detect cancer clusters should at least include Kulldorff's scan statistic and the Local Moran. Both of these allow for the assessment of significance as well as the identification of the location of clusters. The SaTScan software is the only one of the four reviewed that includes Kulldorf's scan statistic. However, this is also the only method implemented in SaTScan. Also, its data input and output capabilities are somewhat cumbersome. The other three software packages include the Local Moran. It is thus recommended that a basic software infrastructure for cancer cluster detection should consist of SaTScan and at least one of the other three packages.

The packages differ in terms of range of functionality, ease of use and statistical sophistication required from the user. At the introductory end of the spectrum are CrimeStat and GeoDa, which are relatively accessible, even to non-expert (non-statistician) users. Crimestat has more extensive point pattern analysis functionality, whereas GeoDa is geared towards interactive data exploration and spatial autocorrelation analysis. While there is some overlap between the two packages, they are largely complementary. At the high end of the spectrum are the packages developed in the R software environment. They are the most demanding in terms of technical sophistication (both in terms of statistical background and with respect to programming skills), and only appropriate for power users. However, its extensibility and the existence of a large library of

sophisticated statistical functions make R a powerful platform to implement a strategy that goes beyond exploratory analysis. In terms of ease of use, SaTScan is somewhere in the middle, requiring a more than elementary understanding of the underlying scan statistic, but otherwise fairly straightforward to use.

Of the four packages, GeoDa is the only one that implements mapping and visualization and does not require external GIS software for this functionality. The other packages do not include explicit visualization tools, but export results in files for import into GIS or other mapping software. Without such GIS software, they are of limited usefulness in a spatial analysis strategy.

All four packages are under active development at the time this review was written (August 2003). The R packages undergo continuous change and new ones appear all the time. In this respect, it may be worthwhile to note that in early 2004, the experimental R package DCluster was released, containing several cluster detection methods and scan statistics (http://sal.agecon.uiuc.edu/csiss/Rgeo/index.html). SaTScan released Version 4.03 in February 2004, GeoDa released Version 0.95-i in February 2004, (which includes spatial regression), and CrimeStat is likely to release a version 3 by summer 2004. On the commercial side, ESRI's ArcGIS 9.0, to be released by mid 2004, will include a "geoprocessing toolbox" covering some methods of exploratory spatial data analysis and point pattern analysis. [See full report comparing these methods at: http://www.naaccr.org/index.asp?Col_SectionKey=9&Col_ContentID=281]

Special Report

"TOXMAP: A GIS Tool for Exploring Environmental Health Data"

Marti Szczur and Colette Hochstein, National Library of Medicine, National Institutes of Health, and Chris Krahe, Aquilent Inc. [See: Abstract, Section IV, lecture series].

Background. The National Library of Medicine (NLM) is part of the National Institutes of Health (NIH). Within NLM, the Specialized Information Services Division (SIS) is responsible for the Toxicology and Environmental Health Information Program (TEHIP). TEHIP currently offers a broad array of information products and services serving researchers, industry, students, and the general public.

A federal law called the Emergency Planning and Community Right to Know Act (see the EPCRA website at http://www.epa.gov/region5/defs/html/epcra.htm) requires facilities in certain industries which manufacture, process, or use significant amounts of specified toxic chemicals, to report annually on their releases of these chemicals. The reports contain information about the types and amounts of toxic chemicals that are released each year to the air, water, and land as well as information on the quantities of toxic chemicals sent to other facilities for further waste management. The U.S. Environmental Protection Agency (EPA) maintains this information in a database called the Toxics Release Inventory (http://www.epa.gov/tri).

TEHIP provides the TRI data (from 1987 to 2002, the most current year available) within TOXNET, a multi-database web application which provides easy-to-use access to a collection of selected authoritative environmental health resources (http://toxnet.nlm.nih.gov).

TOXMAP. NLM is interested in exploring new ways to facilitate more effective understanding of its database contents, including investigation of new data presentation techniques and integration of data from different health data sources. TOXMAP GIS (http://toxmap.nlm.nih.gov/toxmap/main/index.jsp) uses maps of the United States to show locations where companies are releasing specific chemicals. TOXMAP integrates the map display with access to relevant bibliographic references and other data on the TRI chemicals, providing a map-based portal to these resources.

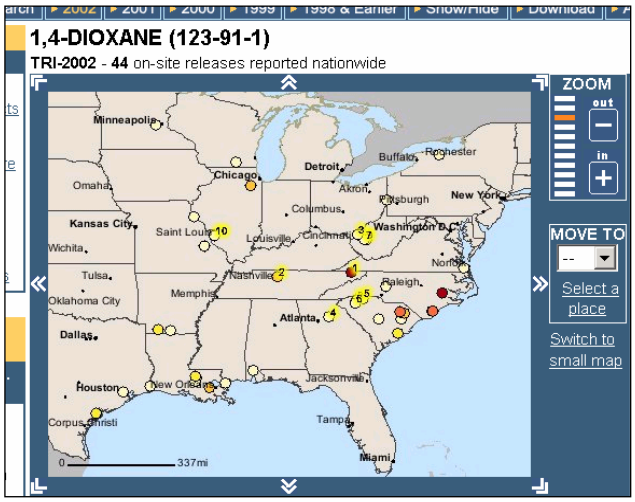
TOXMAP is designed to serve a variety of important geospatial database and information functions: *Show the geographic distribution of releases by chemical; *Show how the amount of chemical releases have changed over time; *Use chemical and geographic terms from the displayed map to search bibliographic databases; *Link to chemical information in TOXNET's Hazardous Substances DataBank (HSDB) and other authoritative resources; *Integrate geographically coded data from other sources; *Provide general information about GIS, data quality, and map interpretation; and, *Make information easy to navigate and understandable to those unfamiliar with GIS.

TOXMAP Frequently Asked Questions. Since many users may not be experienced in reading maps or understanding map data, TOXMAP provides Frequently Asked Questions (FAQ). The FAQ provides questions/answers to supplement the user's ability to understand the map displays and data. The initial release of TOXMAP includes questions from "What is GIS?"

and "What is TOXMAP?" to "How accurate is TRI Data?" (http://nlm-gis.aquilent.com/toxmap/help/5_21) and "What are some tips for reading maps critically?"

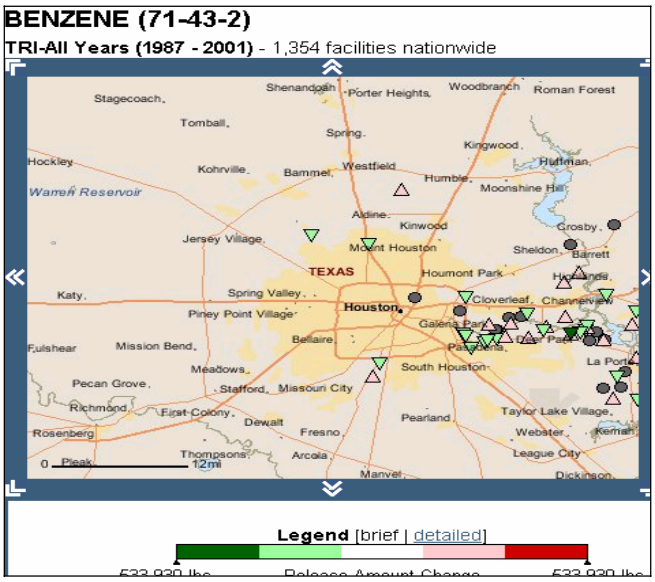
Custom Maps. TOXMAP allows users to create nationwide or local area maps that show where chemicals are released into the air, water, and ground, and also provides region-specific links to chemical and bibliographic information. These scenario examples help to illustrate the application's capabilities.

Scenario 1: Toxic Releases. A public health professional is reading about a particular chemical in

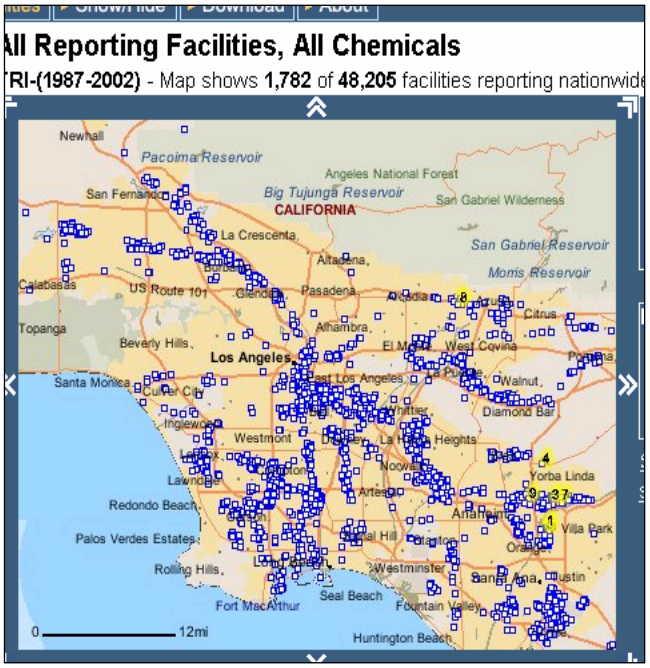


HSDB (dioxane) and wants to investigate where it was released in the southeast United States. After entering "dioxane" in the Quick Search box, a map is generated showing all the facilities releasing dioxane in the United States. The analyst zooms in on an area showing a large amount of chemical release. Note that sites are color-coded by amount released. One of any number of facilities can then be selected that reported releasing a large amount of dioxane to find more detailed facility-specific information.

Scenario 2: Trends. A researcher is aware that the Houston, Texas area is known to contain high concentrations of benzene. TOXMAP can then be used to generate a map of that area which shows the most recent data on the released amounts of benzene, as reported in the Toxic Release Inventory. After studying the map, the person can quesry to see how the amount of benzene released has changed over time, and a new map showing trends is generated. Finally, one might be interested in seeing what research studies may have been published relating to benzene in Houston. Results from a search of the database TOXLINE are displayed.



Scenario 3: TRI Facility Location. A family is preparing to move to Los Angeles, California, and they want to learn more about environmental health issues in the area. They create a map of all TRI facilities in the area by entering "Los Angeles" in TOXMAP's Quick Search box. When they "identify" the facilities listed on this map, they are presented with information about each chemical released by each facility. For a consumer-



oriented information resource, they click to "learn more" about the released chemicals in ATSDR's ToxFAQs; for

more technical information about the health effects of chemicals, they select the link to NLM's Hazardous Substances Data Bank (HSDB, located at the website http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB).

Future Directions. Users of TOXMAP have suggested several additional system features for future releases, such as: Multiple chemicals displayed on a single map; Maps showing releases of one or more types of releases-air, water, land, and/or underground injection; Tables and graphs of release data (bar charts and pie charts with percentages); and, Updated and expanded U.S. Census demographics (population, race, age, income). To further enhance TOXMAP's capabilities, users have suggested addition of many different types of data to overlay with the TRI data. In addition to more demographic data, recommendations include health statistics, superfund sites, water quality data, pesticide usage, floodplain data, and school and neighborhood sites. Users have also requested demographics data at a more granular level (e.g. Census tract). Information that assists with using and interpreting maps is also being considered for future versions of TOXMAP. [More information about TOXMAP can be found at the website: http://www.nlm.nih.gov/pubs/factsheets/toxmap.html; queries about TOXMAP can be sent to: tehip@teh.nlm.nih.gov]

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

Federal Geographic Data Committee (FGDC)

[The Federal Geographic Data Committee (FGDC) is an interagency committee, organized in 1990 under OMB Circular A-16, which 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 19 federal agencies that make up the FGDC, including HHS, are developing the NSDI in cooperation with organizations from state, local and tribal governments, the academic community, and the private sector. See http://www.fgdc.gov]

The National Grid (excerpts)

[Note by Editor, *Professional Surveyor*: This is the first in a series of articles on geoaddressing and the US National Grid (USNG). Geoaddresses are a long overdue component of our national information infrastructure. Originating from a grass roots citizens effort, The Public XY Mapping Project, it evolved through the Federal standards process. **The results are a national grid optimized for local applications such as geoaddresses.** This initiative will improve public safety and enhance the daily activities of the general public. Recently an FGDC Geoaddressing Sub-Working Group was formed, and a National Information and Support Center for Geoaddressing (NISCG) has been established at George Mason University, VA. This Center approved by the Public XY Mapping Project will serve as a community link to a body of knowledge on the practical issues of implementing the USNG. For more information check www.usnationalgrid.org]

Here's a quiz question for you: What do the following countries have in common? Great Britain, Finland, Ireland, Italy, The Netherlands, New Zealand, Sweden. Answer: They all have an official national coordinate system that assigns a unique geoaddress to any point in the country. Until recently, the United States had no such system, but thanks to a widespread grass roots effort and adoption by the Federal Geodetic Data Committee (FGDC), the United States National Grid (USNG) is a reality. The USNG is an alphanumeric point reference system that overlays the Universal Transverse Mercator (UTM) numerical coordinate system. A USNG geoaddress consists of three parts, the: Grid Zone Designation (GZD); for worldwide unique geoaddresses, two digits plus one letter, developed from the UTM system; 100,000-meter Square Identification for regional areas, two letters; and, Grid Coordinates; for local areas, always an even number of digits between 2 and 10 depending upon precision. For example, the geoaddress of the Department of Interior headquarters building in Washington would break down as:

-- Grid Zone Designation (GZD) 18S. The longitudinal grid zone is 18, the latitude belt is S, thus 18S -- 100,000-meter Square Identification -UJ. The digraph system for establishing this designation is retrievable from a USNG-gridded map or GPS receiver. -- Grid Coordinates Ð An even number of digits giving a point's location within the 100km square. On the map always "read right, then up." (i.e., 22850707, think 2285 easting, 0705 northing.) In sum: 18SUJ22850705. To be completely correct, the geodetic datum would then be added in parentheses (i.e., [NAD 83]).

This format allows a geoaddress to be truncated and abbreviated. For example, stationery letterhead or business cards for the Department of Interior headquarters building might portray the geoaddress to a precision of ten meters as: Department of Interior, 1849

C Street, NW. A complete USNG geoaddress provides a unique value over the world and is necessary for use with current GPS receivers and Geographic Information Systems (GIS). The USNG geoaddress from the above stationery letterhead is for the building's centroid. On the other hand, a Department of Interior employee might shorten it to tell someone coming to visit from the local area, "Our visitor's entrance is on 1849 C Street NW, at grid 2285 0694." Another geoaddress might identify the north visitor's entrance, and another might identify the loading ramp for delivery vehicles. [Source: Terry T, *Professional Surveyor* 24(10):12 OCT 2004, at the URL http://www.profsurv.com/ps_scripts/article.idc?id=1307; See also: "Standard for a United States National Grid," FGDC-STD-011-2001, http://www.fgdc.gov/standards/status/usng.html]

*****

Emergency and Hazard Mapping Symbology Standard

[Recent developments towards a national standard-Draft excerpts] The purpose of the Emergency and Hazard Mapping Symbology standard is to specify a standardized mapping image language to specify the location, geographic feature type, and damage/operational level or condition of a geographic feature placed on map. The clear need for a standard of this type became dramatically evident during the New York City, NY and Washington, DC emergencies in September 2001. The Emergency and Hazard Mapping Symbology Standard will reduce confusion and error in the interpretation of maps provided to assist Emergency Managers and First Responders in the event of an emergency, either natural or man-made.

This National Standard is applicable to the federal, state, county, and city agencies, private companies, and any other organizations that create maps for Emergency Management or First Responder communities. It is applicable for both paper and electronic maps (AM/FM and GIS). It has been developed under the auspices and through the efforts of the Homeland Security Working Group of the Federal Geographic Data Committee (FGDC). [Contact: Michael Domaratz, Co-Chair, FGDC Homeland Security Working Group at mdomarat@usgs.gov]

*****

"Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns" [Interim Version, September 7, 2004]. The guidelines provide standard procedures to: (1) Identify sensitive information content of geospatial data that pose a risk to security. (2) Review decisions about sensitive information content during reassessments of safeguards on geospatial data. Additionally, the guidelines provide a method for balancing security risks and the benefits of geospatial data dissemination. If safeguarding is justified, the guidelines help organizations select appropriate risk-based safeguards that provide access to geospatial data and still protect sensitive information content.

From May 3 through June 2, 2004, the Homeland Security Working Group of the Federal Geographic Data Committee sponsored a public review of the guidelines. This interim version of the guidelines includes changes that resulted from consideration of the comments. The revised guidelines and a companion document that summarizes significant comments received during the public review and provides responses are available through the FGDC working group's web site located at http://www.fgdc.gov/fgdc/homeland/index.html. The working group is submitting the guidelines for adoption by the Federal Geographic Data Committee Steering Committee.

*****

Recent Government Accountability Office (GAO) Reports, 2004

[http://www.gao.gov/docsearch/repandtest.html]

Drinking Water: Safeguarding the District of Columbia's Supplies and Applying Lessons Learned to Other Systems, GAO-04-974T, July 22, 2004. The District of Columbia Water and Sewer Authority (WASA) faces challenges in collecting the information needed to identify District citizens at greatest risk from lead in drinking water. Specifically, WASA has partial information on which of its customers have lead service lines, and is in the process of obtaining more complete information. GAO's future work will examine the efforts of other water systems to go one step further by linking data on at-risk populations (such as pregnant mothers, infants, and small children) with data on homes suspected of being served by lead service pipes and other plumbing fixtures that may leach lead into drinking water. Nationally, much is known about the hazards of lead once in the body and how lead from paint, soil, and dust enter the body, but little research has been done to determine actual lead exposure from drinking water, and the information that does exist is dated. In future work, the plans of EPA and other organizations to fill this key information gap will be examined.

*****

Infectious Disease Preparedness: Federal Challenges in Responding to Influenza Outbreaks, GAO-04-1100T, September 28, 2004. Influenza is associated with an average of 36,000 deaths and more than 200,000 hospitalizations each year in the United States. Persons aged 65 and older are involved in more than 9 of 10 deaths and 1 of 2 hospitalizations related to influenza. The best way to prevent influenza is to be vaccinated each fall. In the 2000-01 flu season, and again in the 2003-04 flu season, this country experienced periods when the demand for flu vaccine exceeded the supply, and there is concern about the availability of vaccines for this and future flu seasons. There is also concern about the prospect of a worldwide influenza epidemic, or pandemic, which many experts believe to be inevitable. Three influenza pandemics occurred in the twentieth century. Experts estimate that the next pandemic could kill up to 207,000 people in the United States and cause major social disruption. Public health experts have raised concerns about the ability of the nation's public health system to respond to an influenza pandemic. GAO was asked to discuss issues related to supply, demand, and distribution of vaccine for a regular flu season and assess the federal plan to respond to an influenza pandemic. GAO based this testimony on products it has issued since October 2000, as well as work it conducted to update key information.

*****

September 11: Health Effects in the Aftermath of the World Trade Center Attack, GAO-04-1068T, September 8, 2004. When the World Trade Center (WTC) buildings collapsed on September 11, 2001, nearly 3,000 people died and an estimated 250,000 to 400,000 people who were visiting, living, working, and attending school nearby, or responding to the attack, were exposed to a mixture of dust, debris, smoke, and various chemicals. In the months to follow, thousands of people who returned to the area to live and work, as well as responders who were involved in the search for remains and site cleanup, were also exposed. In addition, people in New York City and across the country were exposed to the emotional trauma of a terrorist attack on American soil. Concerns have been raised about the short- and long-term physical and mental health effects of the attack. Various government agencies and private organizations established efforts to monitor and understand these health effects. GAO was asked to describe the health effects that have been observed in the aftermath of the WTC attack and the efforts that are in place to monitor and understand those health effects. GAO searched bibliographic databases such as Medline to determine the pertinent scientific literature, reviewed that literature, and interviewed and reviewed documents from government officials, health professionals, and officials of labor groups. [Editor: Please see Vol 53(35) of CDC's *MMWR* for related articles. These include: Physical Health Status of World Trade Center Rescue and Recovery Workers and Volunteers, New York City, July 2002--August 2004; Mental Health Status of World Trade Center Rescue and Recovery Workers and Volunteers, New York City, July 2002--August 2004; and, Preliminary Results from the World Trade Center Evacuation Study, New York City, 2003; See: http://www.cdc.gov/mmwr/PDF/wk/mm5335.pdf]

*****

Homeland Security: Effective Regional Coordination Can Enhance Emergency Preparedness, GAO-04-1009, September 15, 2004. As requested, GAO reviewed coordination practices in various metropolitan areas to find regional programs with lessons learned that could be applied in the National Capital Region (NCR) and elsewhere. We addressed the following questions: (1) In selected metropolitan areas, what factors enhance regional coordination? (2) What features of federal programs enhance regional emergency preparedness coordination? (3) How does regional coordination for emergency preparedness in the NCR incorporate features from other areas and federal programs? For detailed analysis, we selected Dallas, Los Angeles, New York, Philadelphia, San Francisco, and Tampa-St. Petersburg--considered by DHS to be high-threat urban areas because of their population and critical infrastructure, among other factors. We also analyzed regional coordination in the planning and implementation of transportation and environmental programs because of their history of requiring such collaboration. DHS and the District of Columbia's Deputy Mayor/City Administrator generally agreed with our report regarding the characteristics of regional coordination and that the NCR's Urban Area Security Initiative governance structure was relatively advanced.

[**Editor's Note**: GAO Reports and Testimony are archived and searchable for your convenience by date, topic and agency; please see website leading this section]

Web Site(s) of Interest for this Edition

http://www.envdatastandards.net The **Environmental Data Standards Council** (EDSC or Council) develops environmental data standards to promote the exchange of information among States, Native American Tribes, and US EPA. This Web site provides the authoritative information on Council actions, environmental data standards, and related information. The Council identifies those areas of information for which having standards will render the most value in achieving environmental results, prioritizes the areas, and pursues the development of data standards. The Council involves Tribes, other State and Federal agencies, business groups, nongovernmental organizations, and other interested parties as the standards are developed.

http://www.floridacharts.com/charts/search.aspx Presenting the **Florida Community Health Assessment Resource Tool Set (CHARTS)**. This site includes such health statistics as births, deaths, disease morbidity, population and behavioral risk factors. The interactive subcounty maps display selected indicators at the census tract level. The County Health Profile Report answers the questions, *"How healthy are our residents?"* and *"What does the health status of our community look like?"* The results of the report provide each community with an understanding of the community's health status and ensure that the community's priorities consider specific health status issues, such as high diabetes death rates or low immunization rates.

http://www.asc.org.uk One Day Conference on Mobile Computing, April 22, 2005, Imperial College, London (rescheduled from September 2004). Contributions are invited from organisations that are either developing or exploiting new technology in the field of mobile data collection. The platforms being used include laptops, tablet PCs, PDAs, kiosks, mobile phones and digital pens. These may be running a variety of operating systems. The conference will explore both the opportunities and limitations of the mobile mode with particular reference to: * Usability for both respondent and data collector; * Sampling implications; * Quality control; * Limitations in the length of questionnaire and the size of the dataset; * Communicating with the host; and, * Cost and efficiency benefits.

http://www.pitt.edu/~super1/index.htm Two new courses on physical activity and health are now available (beta) for readers to review and use in their own instructional settings. These are: “Physical Activity & Health” and “Exercise and Health, an Olympic Ideal.” The Supercourse has 10,300 faculty from 151 countries who created a Library of Lectures with more than 1400 lectures on the Internet with quality control, and cutting edge cognitive design. This is being shared world wide.

http://clearinghouse1.fgdc.gov/FGDCgateway.html EROS Data Center (EDC) Entry Point to Geospatial Data Clearinghouse. Select one of the following interfaces to search for spatial data. These options allow you to search for digital geographic data based on its location, time period of content, full-text, and fielded search and to select one or more collections to query. These interfaces may also be used to search for spatial data that has been made available using the OpenGIS Web Mapping specifications. Once discovered, these map services can be collectively viewed together for visualization.

http://www.gao.gov/docsearch/repandtest.html This is the Public Health GIS Unit at the University of Sheffield, established in 1999. The Unit has been involved with work in a variety of areas related to geographic analysis of public health data. These include: Travel time analysis e.g., using traveltime/distance as a variable in modelling treatment uptake rates; Health inequalities e.g., calculating life expectancy at a small area level to determine local variations in health experience; Disease distribution analysis e.g., producing smoothed disease surface maps based on Census Enumeration Districts (EDs) to highlight the distribution of mortality; Small area statistical analysis e.g., using spatial analysis techniques to model small area data, where numbers would be ordinarily too small to give meaningful results; Environment and health e.g., modelling cardiovascular and respiratory mortality and admissions against ambient air pollution levels, to determine the effects of chronic air pollution on health; Service planning and evaluation e.g., option appraisal for location of new screening units to optimise coverage and quality; Health impact assessment e.g., analysing road data with respect to nearby residents to determine the likely impact of increased traffic flows due to a major development; Database management e.g., assessing the use of graph theoretical methods for storing

and retrieving public health data; Training in public health geographic data analysis e.g., training courses run in-house and at client locations from basic introductions to GIS to advanced spatial analysis; and, Public Health GIS consultancy e.g., offering advice and support to public health professionals using GIS and spatial analysis techniques.

Final Thoughts

"Minorities have poorer health than majority populations. Achieving a healthy nation is impossible without healthy minority populations and without eliminating racial/ethnic health disparities"*

GIS Visualization of Infant Mortality

In this issue's Appendix ("Mapping Health Inequalities"), GIS is used to examine infant mortality, and its spatial dimensions, in Cuyahoga county, Ohio. Keep in mind that the United States infant mortality rate of 6.8 deaths per 1,000 live births (2001) ranks about 27th or so in the world in terms of this important measure of public health. The United States has one of the highest infant mortality rates in the developed world. Part of the reason for the high rate in the United States is the disproportionate burden of infant mortality among African Americans.

Infant mortality is considered a, if not the, key indicator of the well-being of a nation and its people. The infant mortality rate generally reflects a society's grade to protect those most vulnerable at the outset of life. Life expectancy at birth is strongly influenced by infant mortality.

Importantly, "Infant mortality, the risk of death during the first year of life, is related to the underlying health of the mother, public health practices, socioeconomic conditions, and availability and use of appropriate health care for infants and pregnant women."[1] Significant causes of infant death include congenital malformations, disorders related to short gestation and low birthweight, and Sudden Infant Death Syndrome (SIDS). Other ranking causes included maternal complication of pregnancy; newborn affected by complications of placenta, cord and membranes; newborn respiratory distress; unintentional injuries; bacterial sepsis; circulatory system diseases; and intrauterine hypoxia and birth asphyxia. The total listed preceding causes accounted for 67 percent of all 2001 infant deaths.[2]

In the United States, about two-thirds of infant deaths occur in the first month after birth and are due mostly to health problems of the infant or the pregnancy, such as preterm delivery or birth defects. About one-third of infant deaths occur after the first month and may be influenced by social or environmental factors, such as exposure to cigarette smoke or inadequate access to health care.[3]

Infant mortality rates in the United States are reported by county of residence. What makes GIS so crucial to understanding the disproportionate burden or inequalities of infant mortality is that each infant death (up to age one) can be geocoded e.g., address matched to its approximate location on a digital street map. The infant deaths then can be geographically analyzed, well below the county level, either as point information or some aggregation of census block, using GIS. To protect the public confidentiality of records, point data can be statistically smoothed through a variety of kernel density estimation techniques or data can be aggregated to sub-county geographical areas, often over time, to insure their statistical reliability and an individual's residential anonymity.

Small area information on infant deaths, or most any type of public health outcome, is especially useful for focused prevention planning by community agencies and policymakers. Mapping these small area distributions can help in the spatial visualization of existing inequities which otherwise e.g., tabular form, would be challenging for anyone to sort or comprehend. Recently, the mapping approach has been successful in identifying elevated lead exposures among children, be census tracts, in New Orleans.[4] It resulted in implementation of an ordinance regulating power-sanding as part of a community-level lead poisoning prevention strategy.

Turning to Cuyahoga county (see Appendix), it is clear that GIS allows us to "see beneath" the national and even county level measures of infant mortality to locations within the community. Unequal burden of infant death is clearly associated with those census tracts within the municipal limits of Cleveland and concentrated among predominantly African Americans neighborhoods in the eastern portion of the city. In fact, the infant mortality rates shown by authors Lenahan and Weiner for Cuyahoga county and Cleveland African American census tracts are alarmingly high by any standard of the developed world. Their maps of spatial patterns of two key risk factors e.g., maternal smoking during pregnancy and alcohol usage, appear highly coincident with infant deaths and provide important insight into suspected covariate associations with these elevated mortality rates.

References:

*REACH 2010 Surveillance for Health Status in Minority Communities-United States, 2001-2002, *MMWR* Surveillance Summaries, August 27, 2004/53(SS06);1-36 [See: p. 2, http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5306a1.htm]

[1]Fried VM, Prager K, MacKay AP, Xia H. Chartbook on Trends in the Health of Americans. Health, United States, 2003. Hyattsville, MD: National Center for Health Statistics, 2003.

[2] Anderson, RN. "Deaths: Leading causes for 2001." *National Vital Statistics Reports*; vol. 52, no. 9. Hyattsville, Maryland: National Center for Health Statistics, 2003.

[3]Whatcom county, Washington State [See: http://whatcom.healthycities.org/demo/index.htm]

[4]"From Research to Policy: Targeting the Primary Prevention of Childhood Lead Poisoning," Rabito FA, White LE, Shorter C, Public Health Reports 119: 271-277 MAY-JUNE 2004.

[Editor's Note: This is the fourth in a series examining the use of GIS to reveal maternal and child health inequalities in Cuyahoga county. Special appreciation is extended to The Center for Community Solutions, of Cleveland, Ohio, for their dedicated and invaluable GIS work to advance community public health understanding and prevention planning]

Charles M. Croner, PhD, Geographer and Survey Statistician, and Editor, ***Public Health GIS News and Information*****,** Office of Research and Methodology, National Center for Health Statistics, and DHHS Representative, Federal Geographic Data Committee, at cmc2@cdc.gov. Celebrating our **61th** edition with continuous reporting since **1994.**

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

PUBLIC HEALTH GIS NEWS AND INFORMATION
November 2004 (No. 61)—11th year of continuous reporting
16

APPENDIX: MAPPING HEALTH INEQUALITIES
[Fourth in Series: See also May, July and September 2004 editions]

Infant Mortality Rates by Maternal Race

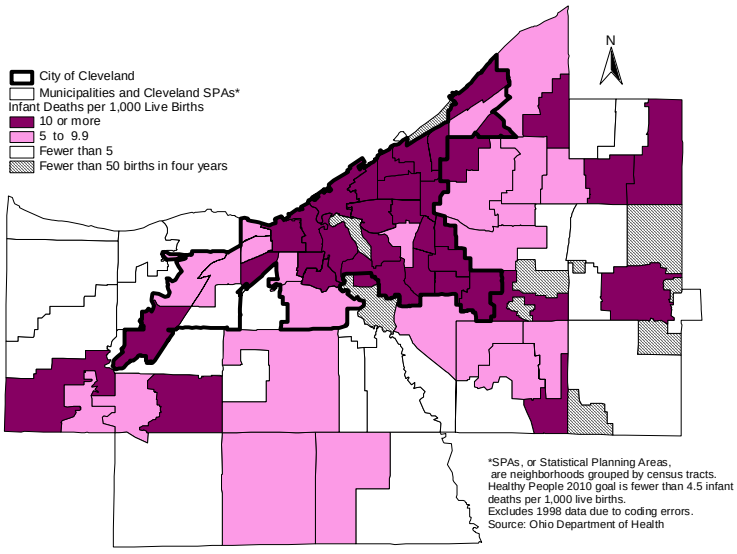
1997 to 2001

Terry Lenahan[1] and George D. Weiner, Ph.D.[1,2], Ph.D., [1]The Center for Community Solutions and [2]Maxine Goodman Levin College of Urban Affairs, Cleveland State University, Cleveland OH

Infant mortality is defined as death under one year of age. Leading causes of infant death include congenital and chromosomal abnormalities, problems related to short gestation and low-birth-weight, and sudden infant death syndrome (SIDS).[1] Other causes of infant mortality include teen births, poverty, and maternal health behaviors, such as smoking and drinking alcohol during pregnancy.

The Healthy People 2010 goal is no more than 4.5 infant deaths per 1,000 live births. In 2000, the U.S. rate was 6.9 infant deaths per 1,000 live births.[2] Infant mortality was a much greater problem among African-American mothers, whose infants are 2.4 times more likely to die as infants born to White mothers (13.9 and 5.8 infant deaths per 1,000, respectively, for years 1998 to 2000). Infant mortality rates have declined for all racial and ethnic groups since 1983, but large disparities remain.[3]

Average Annual Infant Mortality Rate
Cuyahoga County, 1997 to 2001



Because the number of infant deaths is relatively low, we used a four year average of death certificate data obtained from the Ohio Department of Health for 1997, and 1999 through 2001. Deaths from 1998 were excluded due to an unusually high number of incomplete addresses on the death certificates.

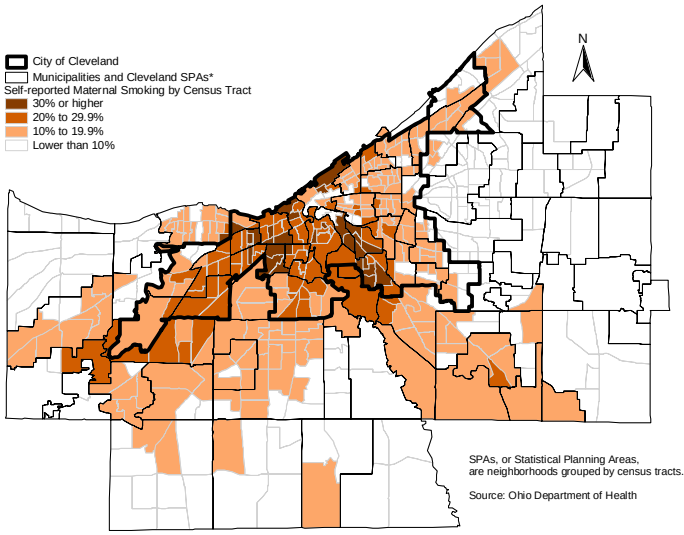
In Cuyahoga County, Ohio, an average of 180 infants died annually during the study period. At 9.6 deaths per 1,000 live births, the infant mortality rate in Cuyahoga County is the highest in Northeast Ohio and higher than the Ohio or U.S. rates. This rate was also higher than the infant mortality rates in some less developed countries such as Cuba (7.4), Chile (9.4), and Hungary (9.0).[4] The racial gap persists in Cuyahoga County--for Whites, the infant mortality rate was 6.7 compared to 15.3 for African-Americans. Infant mortality rates decreased for both racial groups during the study period.

---

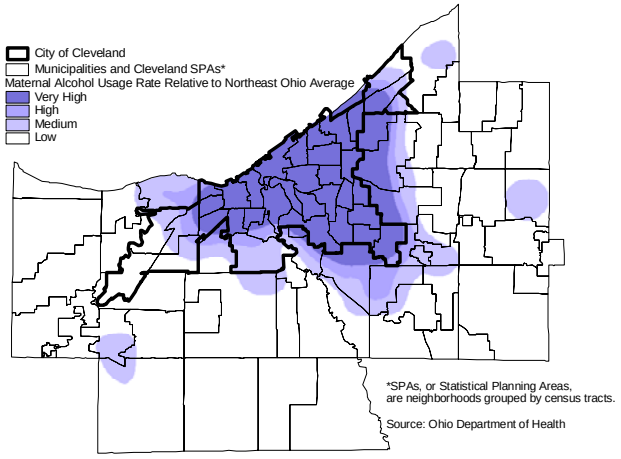
[1] Anderson, RN. "Deaths: Leading causes for 2000." *National Vital Statistics Reports*; vol. 50, no. 16. Hyattsville, Maryland: National Center for Health Statistics, 2002. Pages 11 and 13.
[2] Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System, from *Health, United States, Chartbook on Trends in the Health of Americans.*
[3] *Health, United States, 2003*. Table 19.
[4] Table 1312, Vital Statistics by Country, 2001 and 2010, *Statistical Abstract of the United States*, U.S. Census Bureau, 2002.

In the city of Cleveland, an average of 109 infants died annually during the study period, 60 percent of the infant deaths in the county (although Cleveland only accounts for one-third of the total population in the county). At 13.2 deaths per 1,000 live births, the infant mortality rate in Cleveland was almost double the U.S. rate and 38 percent higher than Cuyahoga County's rate. Cleveland's infant mortality rate was similar to the former Soviet Republic of Belarus.[4] For White infants in Cleveland, the rate was 9.8, and for African-American infants, 16.1- a rate identical to that of Sri Lanka.[4] Overall, the infant mortality rate has been declining 4.7 percent per year since 1997. The rate among Whites decreased faster at 5.2 percent per year than among African-Americans at 4.5 percent per year.

Percentage of Maternal Smoking during Pregnancy
Cuyahoga County, 1996 to 2001 Average



Relative Maternal Alcohol Usage Rate
Cuyahoga County, 1996 to 2001 Average



Maternal smoking and alcohol usage were higher in the city of Cleveland compared to the suburbs. Maps shown here were derived from Ohio Department of Health birth certificate files. Researchers have long known that smoking during pregnancy increases the risk for delivering a low-birth-weight baby and one that may die of SIDS. Alcohol exposure during pregnancy can lead to birth defects as well as severe mental and behavioral problems. The health problems associated with smoking and alcohol usage during pregnancy come at a great economic cost to society.

[Note: Density map was generated from point features to calculate usage rate per square mile using ESRI Spatial Analyst. Smoothing was achieved by Kernel method]

Maps created by: Ms. Terry Lenahan, Policy and Planning Associate in Research, The Center for Community Solutions. Infant mortality rates were calculated by Lucy Malakar. Data was geocoded to census tract level by Brian McNamara, GIS specialist. Ellen Cyran, systems programmer/analyst, provided programming for the infant mortality rate data. Brian and Ellen are with the Northern Ohio Data and Information Service at the Maxine Goodman Levin College of Urban Affairs, Cleveland State University. "Infant Mortality Rates by Maternal Race" was one of 37 indicators from *Social Indicators 2003: Community Health*, produced by The Center for Community Solutions and United Way Services of Greater Cleveland. [The complete report may be seen at Community Solutions' website (www.communitysolutions.com). Contact: Terry at tlenahan@communitysolutions.com]