healthyGIS

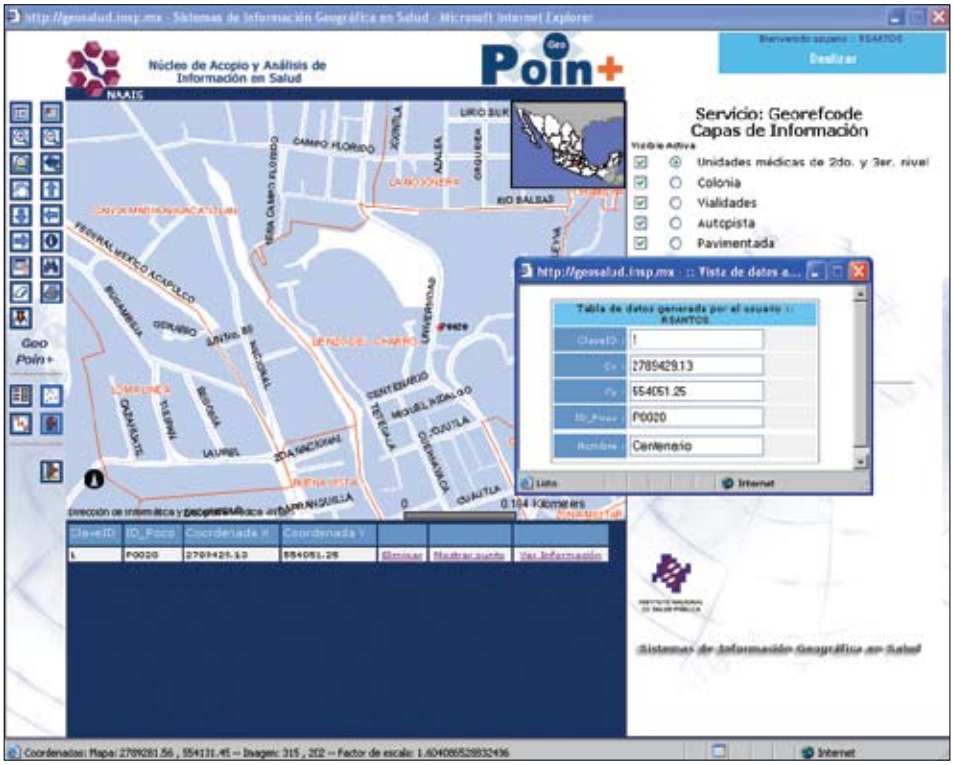
ESRI • Fall 2007

GIS for Health and Human Services

Institute Pioneers Health GIS Applications and Training in Mexico

Mexico's history of public health education programs spans more than eight decades since the founding of the School of Public Health of Mexico (ESPM) in 1922. In 1987, ESPM merged the Center for Public Health Research and the Center for Infectious Diseases Research to give birth to the National Institute of Public Health (INSP), which is dedicated to education and research in public health.

INSP offers master-level programs in public health, health systems and management, and public health nursing as well as both master and doctoral degrees in public health sciences. Professors and researchers in 11 specialized departments hold an impressive number of recognitions for contributions to public health. In 2006, INSP received accreditation from the Council on Education for Public Health. INSP is also the only institution outside the United States and Puerto Rico with membership in the Association of Schools of Public Health (ASPH). Located in the city of Cuernavaca, southwest of Mexico City, INSP educates 200 students annually, with 150 graduates each year.



GeoPoint, an application created and hosted by Mexico's National Institute of Public Health, provides online basemap data layers and tools that help researchers georeference their data points such as the water well location shown in this example.

In This Issue

The institute's Department of Informatics and Medical Geography (DIGM) provides computer and geographic information system (GIS) support to INSP in such topics as

- Risk assessment, health systems performance, and program evaluation
- Health sector strategic planning
- Development of information systems and technology platforms
- Support for distance learning programs
- Information publishing and dissemination including Web pages and Web access to databases

Through its Health Information Analysis and Data Warehousing (NAAIS) group, DIGM developed GIS applications to integrate information collected in various Mexico Ministry of Health information systems with demographic, socioeconomic, and environmental data. The resulting centralized repository for georeferenced data supports public health research and decision making nationwide. Realizing that public health professionals would also benefit from training on using available GIS applications, in 2000 DIGM introduced a three-credit

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Institute Pioneers Health GIS Applications and Training in Mexico

master's level course, *Tools for Spatial Analysis of Information in Public Health Using GIS.*

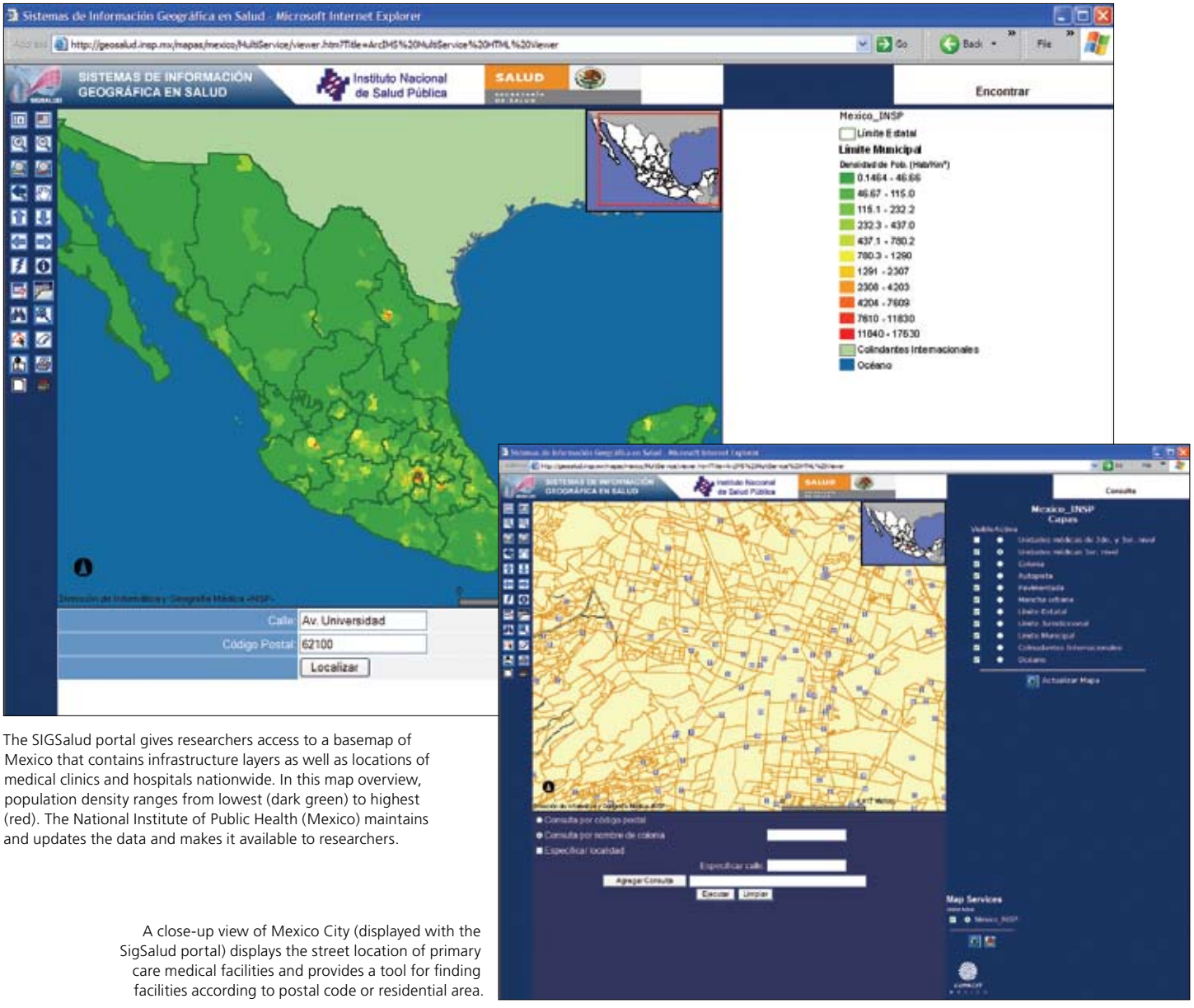
"The use of GIS in public health is growing rapidly, and it's imperative to provide training to the public health workforce to benefit from this technology in epidemiological surveillance and health system planning," says Dr. Juan Eugenio Hernández Ávila, head of DIGM. Many students who sign up for the course are associated with INSP's five public health research centers, but international students from all over Spanish-speaking Latin America have attended.

The 40-hour course is an optional addition to the institute's Summer Program in Public Health and Epidemiology, held annually in collaboration with the Johns Hopkins University School of Hygiene and Public Health. Instructors include Hernández Ávila and Norma Elena Rodríguez Salgado, with guest lectures by René Santos Luna, Susana Román Pérez, Evangelina Morales, Martha Hijar, and Oscar Zepeda, each of the DIGM.

"Each teacher provides his or her own experience on the use of GIS in their particular field," says Hernández Ávila. "For example, Martha Hijar is recognized worldwide as an expert in the field of accidents and injuries, and Oscar Zepeda is an expert in the field of disaster prevention."

The course is designed for professionals interested in applying GIS to research and decision making in public health-related fields. Students learn to use tools for spatial analysis of epidemiological, environmental, health risk, and infrastructure information. Students use real data in exercises that cover using GIS methodologies in cause-of-death analysis, risk evaluation, and health services coverage. Students also learn how to use several NAAIS-developed applications such as GeoPoint and SIGSalud [see sidebar].

Acquiring classroom facilities for the GIS course was relatively easy, since INSP provided access to a 22-computer laboratory. However,



The SIGSalud portal gives researchers access to a basemap of Mexico that contains infrastructure layers as well as locations of medical clinics and hospitals nationwide. In this map overview, population density ranges from lowest (dark green) to highest (red). The National Institute of Public Health (Mexico) maintains and updates the data and makes it available to researchers.

A close-up view of Mexico City (displayed with the SigSalud portal) displays the street location of primary care medical facilities and provides a tool for finding facilities according to postal code or residential area.

The National Institute of Public Health campus is located in Cuernavaca, Mexico.

acquiring ESRI user licenses for so many machines was a challenge. DIGM worked out an agreement with SIGSA, the ESRI distributor in Mexico, to install temporary ArcGIS licenses for the one-week duration of the course. SIGSA benefits from exposing new users of GIS technology to ESRI software and capabilities.

For more information, you can read about DIGM and its projects at www.insp.mx/Portal/Centros/dinf/dinf_mision.html.

Team members from the Health Information Analysis and Data Warehousing group display National Institute of Public Health (Mexico) geospatial applications and information at the 2007 ESRI International User Conference.

About GeoPoint

GeoPoint is a GIS application designed to give researchers, students, and decision makers a Web tool for preparing data for GIS analysis, with tools to

- Georeference research points such as the locations of dengue cases, water sample sites, wells, accidents, sanitary risks, or medical clinics.
- Search for an address based on street name and postal code (which in Mexico is not readily available).
- Access the INSP online basemap that contains national coverages at the state, municipal, local, and more detailed levels.
- Establish a spatial database structure.

GeoPoint users can export their newly georeferenced information in a shapefile format for further analysis with GIS software. (GeoPoint was developed by INSP GIS application developers Verónica Sánchez Castañeda and Ana Lidia Salgado and map server administrator Victor Hugo Ríos Salgado. It is available with permission by visiting http://sigsalud.insp.mx/naais/.)

About SIGSalud

SIGSalud is DIGM's GIS in Health portal that gives access to a basemap of Mexico containing locations of outpatient referral clinics, general hospitals, and regional specialized hospitals. Other layers include roads and highways; urban, state, municipal, and sanitary jurisdictional boundaries; and topographic information.

SIGSalud is a constantly-evolving application with the purpose of providing evidence to support decisions in the public health sector and research projects and to orient the general population to public health services. Visit http://geosalud.insp.mx.

HealthLandscape Empowers Health Planners with Online Mapping Tools

Health planners, advocates, and educators have long endeavored to customize and display data relevant to health and health care. Data visualization helps them better interpret strategic planning needs and explain a program's value to sponsoring hospitals and their communities and states. A new online resource, HealthLandscape, aims to provide an easy and accessible way to visualize data. This new GIS tool allows users to create and display maps and tables from population, workforce, clinical, and community data relevant to health and primary care.

"HealthLandscape was created to bring the power of GIS to the data users in a novel fashion while filling a real gap in customizable data delivery," says Andrew Bazemore, M.D., M.P.H., assistant director of the American Academy of Family Physicians (AAFP) Robert Graham Center in Washington, D.C. The project was born of the shared visions of two organizations, the AAFP Graham Center (www.graham-center.org) and the Health Foundation of Greater Cincinnati (www.healthfoundation.org).

In 2001, the Graham Center was already using ArcView technology to create data, maps, and charts and received high praise from constituents nationwide. However, demand for more products and customization produced a challenge. How could they overcome the barriers of limited staff, the time and energy required for customized mapping, and the growing desire of users to have some control over the map and data outputs to ensure local relevance? "The growing capabilities of

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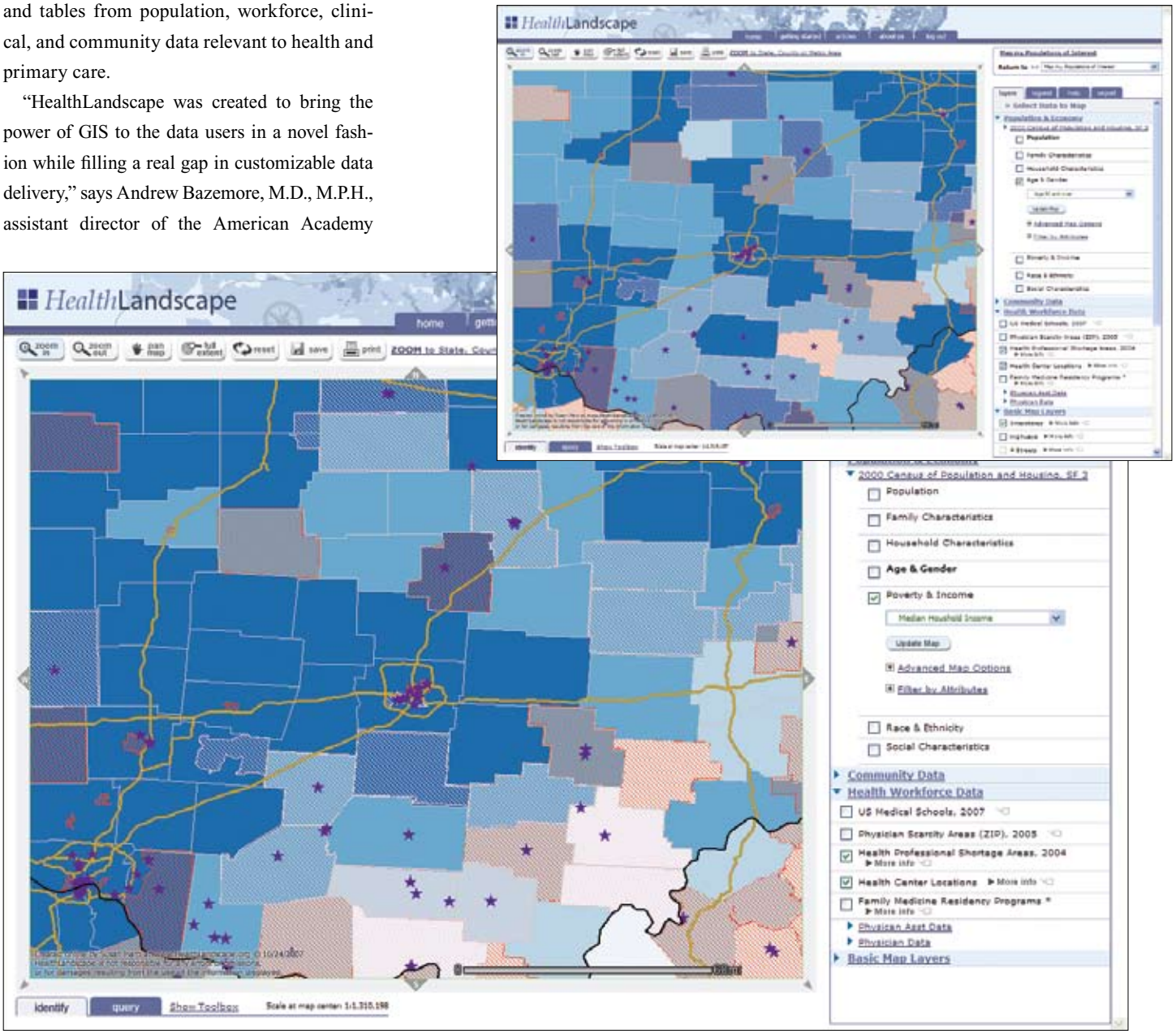

The HealthLandscape Web-based atlas gives users many ways to combine data such as in these maps that display health professional shortage areas (hatched lines) and health center locations (stars) on county maps that show the distribution of median household income (bottom) and of population over 65 years of age (top). Dark blue indicates counties with highest median income (bottom map) and highest population over 65 (top map).

From My View . . .

By Peggy Harper
Professional Health Education Specialist
Health and Human Services
ESRI

Making GIS Instruction Essential in Health-Related Schools

From my view, GIS is increasingly an essential part of health-related schools' research and academic programs. My evidence is the growing number of colleges and universities that offer health-related GIS courses and use GIS technology in their research. In fact, health-related schools incorporating GIS in their program offerings have increased by more than 20 percent over the past 10 years in the United States alone.

Further research shows that the majority of accredited schools of public health in the United States use GIS technology in either academia, research, or both. This year, the Association of Schools of Public Health (ASPH) accredited its first international school of public health, the National Public Health Institute of Mexico, an institution that is already deeply involved in using GIS in research projects, application development, and an intensive summer study course (see cover story).

Another trend is that, for new health-related schools, GIS occupies a prominent role in their overall offerings to health students. For example, the University of Nebraska, responding to the high demand for programs for health professionals, is opening a new college of public health that includes a center for GIS; and Humboldt State University in northern California, traditionally a non-health-related school, recently established a new center for rural health policy. The university will extend its existing GIS program to include offerings for students pursuing studies and research in both health and social work. Still another example is the University of Niigata's School of Medicine (in northern Japan), which established research centers for human health GIS as well as environment and disaster mitigation GIS. These two new centers at Niigata University will offer medical students in-depth experience with GIS technology.

Finally, as more public health and social service agencies, hospitals, and health-focused businesses seek to hire health professionals with GIS training (or GIS professionals with health interests), GIS certification is gaining ground. For example, to meet workforce demands for GIS-trained personnel, Loma Linda University in California has established the Health Geoinformatics Program. The program gives instruction and experience in the use of GIS technology to students—all of whom are headed into some type of health profession such as medicine, nursing, allied health, and public health. Another example is the University of Mississippi Medical Center (UMMC), where students, including nurses and dentists, are learning about GIS technology through the GIS and Remote Sensing Laboratory. UMMC researchers use GIS in workforce development to help identify areas in the state that need more dentists. Recently, the prestigious professional organization Urban and Regional Information Systems Association (URISA) began providing GIS certification, a program that now attracts many health professionals.

You can see from my brief overview that GIS is moving strongly into academic institutions that supply much of the health workforce. Just as non-health-related programs at universities and colleges have increased their GIS offerings to meet the demands of their respective workforces, now health and human service-related programs are discovering that, to attract the best and the brightest students, GIS offerings are essential.

Health and human services-related schools need to incorporate GIS offerings into their curricula as well as research activities. This not only helps schools to stay one step ahead of the others in attracting students, but it also results in a better prepared workforce.

Let me know your opinions and suggestions.

Submit Your Article to *HealthyGIS*

Share your knowledge and innovative ideas about real-world GIS solutions in health and human services research, analysis, and delivery. Submit an article to *HealthyGIS* that identifies an issue solved using GIS; mentions the entities involved, budget, key personnel, software, and hardware; and, most importantly, describes benefits or return on investment realized and lessons learned. Broaden your professional experience and stimulate discussion among your peers—submit your 800-word article today. For more information, visit www.esri.com/health and click on *HealthyGIS* Newsletter or contact the editors, Peggy Harper (e-mail pharper@esri.com) or Susan Harp (e-mail sharp@esri.com).

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HealthLandscape Empowers Health Planners with Online Mapping Tools

HealthLandscape Tools

- Community HealthView holds data relevant to health in communities to depict populations at risk, health outcomes, and the distribution of health interventions. It will grow as new users add their own community-related data.
- The Primary Care Atlas allows users and educators to explore the relationship between primary care, the physician workforce, and populations and places that these providers serve.
- The Health Center Mapping Tool is an HIPAA-compliant, secure site for uploading, geocoding, and mapping clinical data and other secure information and offering tools to understand patient distribution, service areas, market penetration, and their relationships to local and regional populations.
- My HealthLandscape allows users to upload, geocode, and map their own health-related data, either for public sharing in Community HealthView, limited group use, or private mapmaking.

The tools help answer questions such as the following:

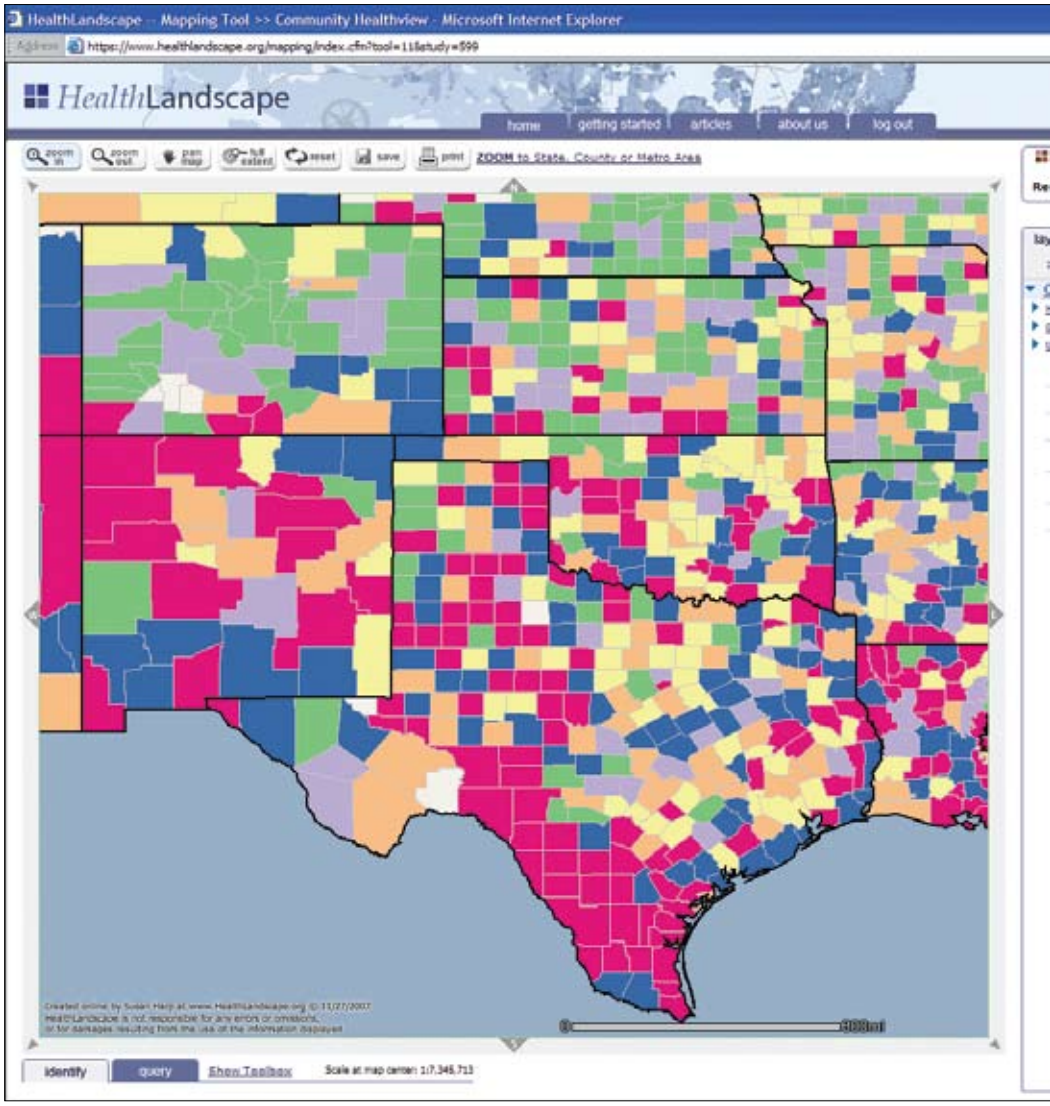
- What does the combination and display of health-related community datasets (e.g., Ohio infant mortality data, a Cincinnati community health status survey, and census data) reveal about community needs? How can I combine this data to enhance my community's understanding of a problem and support my advocacy efforts for change?
- How many specialists of a particular type are there in my state, county, or neighborhood? How many per capita? Where are the related gaps in care availability?
- What counties in my state would become Primary Care Health Professional Shortage Areas if one type of primary care physician were withdrawn?
- What is the distribution, or footprint, of medical school or residency training program graduates, and what counties depend on them most? How do graduates of one program overlay with federally designated shortage areas or with areas of significant poverty?
- Where and who does my clinic or hospital serve? Who depends on us, and on which subpopulations should we focus our outreach efforts?
- To which state or federal political districts do the problems illustrated above relate?

Web-based GIS software provided a solution," says Bazemore, "and an opportunity to build a dynamic data resource that could grow according to user input."

Because they already shared several projects, the Graham Center and Health Foundation agreed to combine funding in 2005 and prepared a design for the kind of application they envisioned. After reviewing the work of several ESRI business partners, they chose Blue Raster LLC, an Arlington, Virginia-based company that specializes in customized Web applications and GIS, to provide coding and programming services. The resulting system combines ESRI's ArcIMS data delivery software for the Web with an Adobe ColdFusion Web interface and manages stored data with ArcSDE technology and Microsoft's SQL Server.

The resulting Web-based atlas offers users the capacity to upload, geocode, and map their own data in a secure environment. This means that certain datasets can be designated for sharing with the user community at large while Health Insurance Portability and Accountability Act (HIPAA)-sensitive clinical data can remain secure, or proprietary datasets can be locked down for mapping by a single user or self-designated group. This makes it possible to give all interested users access to HealthLandscape tools with specific permissions.

"HealthLandscape is invaluable for residency program directors," says Perry Pugno, M.D., M.P.H., director of the AAFP Division of Medical Education. Pugno explains, "Hospitals are asking the question, 'This residency program is a significant investment. What am I



getting for it?' HealthLandscape mapping shows real-time program benefits in terms of giving people health care access, including preventive care, without relying on the emergency room. Too many communities find out how much the residency program is doing for the community only after the program closes and that resource is lost."

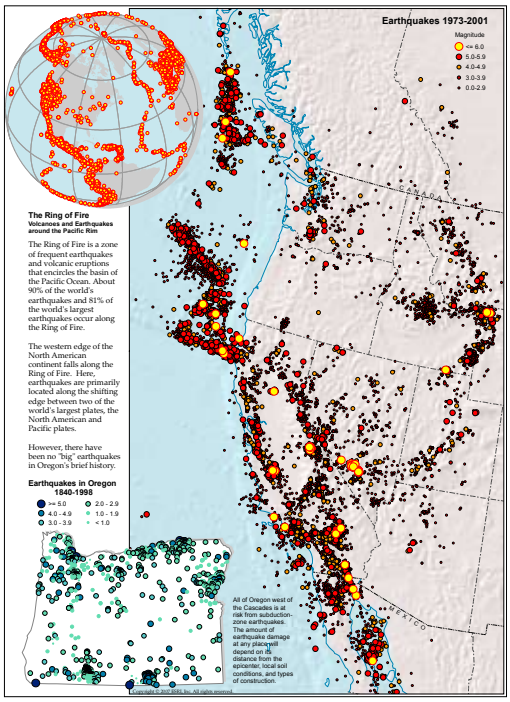
With these initial offerings, HealthLandscape aims to democratize the use of GIS for understanding health and to empower users to explore their own data in new and novel ways.

For more information, visit www.healthlandscape.org or write to Andrew Bazemore at abazemore@aafp.org. Contact Blue Raster by visiting www.blueraster.com or writing to Michael Lippmann at mlippmann@blueraster.com.

HealthLandscape results display states in the south-central United States according to the age-adjusted rate of mortality by county for 1999–2004. Clusters of higher mortality rates (red and blue) are noticeable in New Mexico and southern Texas.

ESRI's Mapping Center Helps GIS Users Make Better Maps

Visit the new Web site at www.esri.com/mappingcenter.



Learn more about cartographic concepts and best practices for mapmaking with ArcGIS at the Mapping Center, a new Web site hosted by ESRI. The site is designed to provide quick answers to mapmaking problems through information and sample maps. Check out the maps to see a wide variety of cartographic techniques and effects along with tips and instructions on how to reproduce the featured effects on your own maps.

"Our goal is to encourage ArcGIS users to employ the same concepts when using GIS software that professional cartographers do when making maps," says Dr. Aileen Buckley, a member of ESRI's Mapping Center team, which created the new site. "We want to help identify and support members of the growing community of GIS users making maps and cartographers using GIS in their work by offering instructions, providing links to other resources, and providing a forum for them to share information and ask questions related to mapping with GIS."

Mapmakers at all levels of experience will find answers and assistance, from help showing coastlines and boundaries on a thematic map to advice about designing custom symbols and labels on a locator map to recommendations for using specific styles and fonts or simply suggestions for choosing color ramps and tinting schemes.

Mapping Center visitors will find other resources such as

- **Blog**—Offers the opportunity to read about and participate in the latest topics of conversation
- **ArcGIS Resources**—Features downloads you can use for creating your own cartographic effects
- **Ask a Cartographer**—Presents solutions to your particular mapping challenges
- **Other Resources**—Contains links to publications, conference presentations, and ESRI training courses as well as a special collection of Cartographers' Favorites providing links to other cartography-related Web sites, forums, blogs, professional organizations, academic and scientific journals, and a list of suggested textbooks for further reading and research

For more information on ESRI's Mapping Center Web site, visit www.esri.com/mappingcenter.

There's No Place Like Close to Home

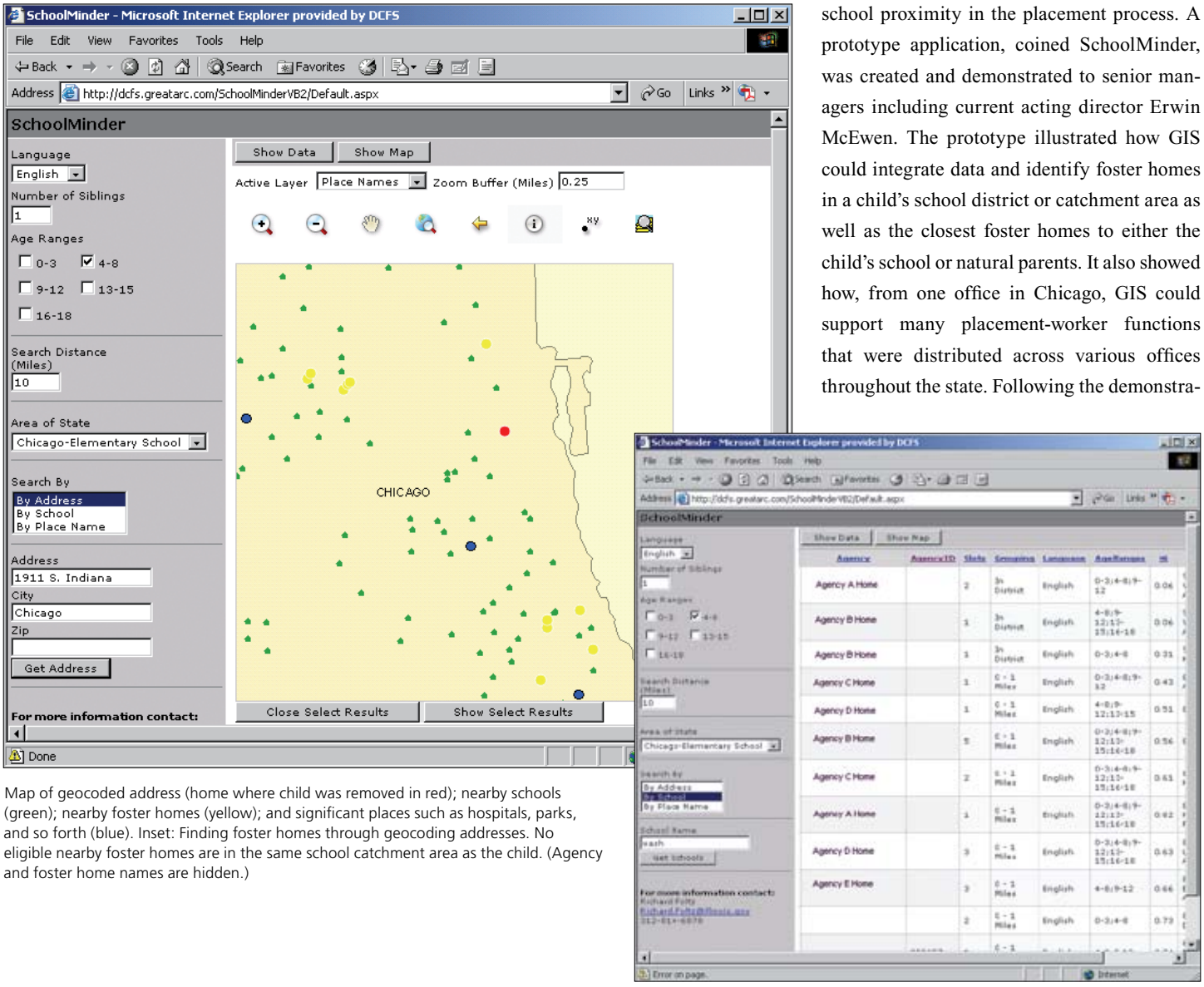
Illinois Takes a Geographic Approach to Foster Care

"A child's universe is about 10 square blocks," observes Nancy Hughes, president and CEO of Volunteers of America of Illinois, a nonprofit organization involved in foster care in the Chicago area. "Within that world are the familiar touchstones of life—school, playgrounds, neighbors, and friends—a geography reflected in its familiarity, constancy, and comfort." As part of its mission, Volunteers of America of Illinois serves foster children referred by the Illinois Department of Children and Family Services (IDCFS), which now makes GIS part of the process for matching a child in need of foster care.

Until recently, the assignment process could match a child with a foster home that was possibly 5, 10, or more miles from a child's community, removing them not only from parents and perhaps siblings but from school, teachers, coaches, and friends as well. That changed when IDCFS began exploring how it might keep a child's existing school or school district in mind as a factor in foster placement. Keeping a child's school, services, activities, and social network constant while the child is going through disruptive changes at home could contribute to better outcomes in everything from academic performance to chances for reunifying the child with the natural parents. Hughes illustrates the importance of this with an example; as she worked late one evening to help place three children who had just been removed from their home, one child said to her, "Tell me I'm going to the same school and I can handle everything else."

The Geographic Approach

Since July 1, 2006, IDCFS has been using GIS software from ESRI for geographic analysis in foster placement decisions. The process began several months earlier when IDCFS's Richard Foltz was asked by his boss, Jim Gregory, to give a demonstration of how GIS could support school proximity in the placement process. A prototype application, coined SchoolMinder, was created and demonstrated to senior managers including current acting director Erwin McEwen. The prototype illustrated how GIS could integrate data and identify foster homes in a child's school district or catchment area as well as the closest foster homes to either the child's school or natural parents. It also showed how, from one office in Chicago, GIS could support many placement-worker functions that were distributed across various offices throughout the state. Following the demonstra-



Map of geocoded address (home where child was removed in red); nearby schools (green); nearby foster homes (yellow); and significant places such as hospitals, parks, and so forth (blue). Inset: Finding foster homes through geocoding addresses. No eligible nearby foster homes are in the same school catchment area as the child. (Agency and foster home names are hidden.)

tion, the decision was made to move forward and begin using the SchoolMinder application to integrate school proximity in the foster placement process.

How It Works

SchoolMinder uses school point and polygon as well as street line datasets available from other Illinois state and local government agencies along with foster parent point files IDCFS maintains for 50 partner agencies that have performance or incentive-based contracts for supervising thousands of licensed foster care homes throughout the state.

When a child needs foster services, a placement worker has one hour to identify a home and arrange with a partner agency to make the placement. To begin, the placement worker uses SchoolMinder to enter either the school of the child or the address of the home from which the child was removed. The application performs a spatial search to determine which of the available homes match the child's school geography. The results are then appended to a mainframe system for performance contract analysis of the partner agencies that are supervising the matching homes identified by SchoolMinder. The result is a rank-ordered "call list" of the partner agencies, which the placement worker uses to decide which partner agency to contact first. Final clinical analysis of the compatibility between the child needing placement and nearby homes occurs in the dialog between the partner agency and the child protection investigator. If the first partner agency on the call list decides not to place the child, the placement worker moves to the second partner agency on the call list, and so forth.

Benefits to Children

Since deploying the SchoolMinder application, the average distances for initial foster care placement in Cook County dropped from 9.9 to 2.5 miles (median numbers dropped from 6.4 to 1.5 miles). Outside Cook County, the average and median dropped from 22.5 to 11.4 miles and from 7.7 to 3.1 miles, respectively. Hughes observes that such an impact is an example of the potential nobility of technology. "There are so many things we can't control when removing a child from an unsafe situation and placing them in foster care," says Hughes. "It's amazing that we've found a way to leverage the spatial information."

The Need for 24-Hour GIS

The benefits of the prototype application were clearly measurable, but so were the limitations. "We found with our prototype that not all children were receiving the benefits of GIS equally," Foltz says. Over half of placements occur outside business hours when the unit with access to the desktop GIS application has gone home for the day. Moving SchoolMinder to a server environment could make it available 24/7 throughout the state.

IDCFS turned to Great Arc Technologies, Inc., an ESRI business partner, to rewrite the desktop application into a Web-based interface served by ArcGIS Server technology. Brett Ward of Great Arc coordinated the development work. "Everyone is familiar with a Web browser, and most people are comfortable with that type of interface," notes Ward. By moving SchoolMinder to a Web interface, placement workers can log in from any department connection, day or night. Additional improvements will enable staff to perform multipass geocoding and search on place-names when both a child's school and parent's address are unknown.

"The big benefit for me," says IDCFS's Foltz, "is that this system is both industry standard and department compliant. It is a wise choice for the department both for maintaining our SchoolMinder application as well as for developing new server-based applications in the future. It's nice knowing I can call on existing department expertise in Visual Basic for Applications (VBA) and ASP.NET if necessary. That leaves me more free time to concentrate on new GIS analysis and reporting than on maintenance of an existing system."

As to the greater impact of integrating a child's geography into the placement process, Foltz says, "We'll be looking to see its effects on natural family reunifications, school outcomes, disruptions in foster care placements, and other things. It's something we'll be watching in the future."

More Information

For more information, contact Richard Foltz, Illinois Department of Children and Family Services (tel.: 312-814-6878, e-mail: Richard.Foltz@illinois.gov).

ESRI on the Road

Thirteenth Annual Maternal and Child Epidemiology Conference
December 12–14, 2007, Atlanta, GA
www.cdc.gov/reproductivehealth/MCHEpi/2007/AboutConference.htm

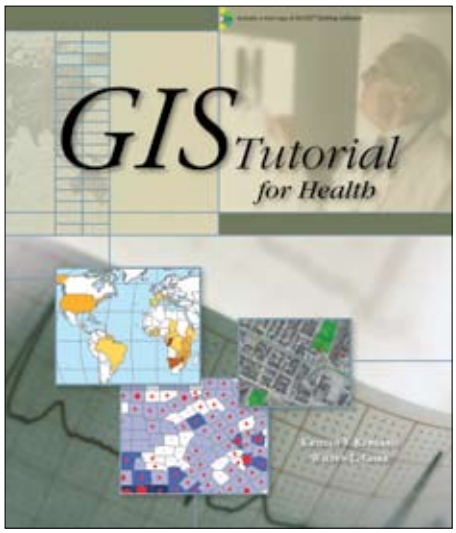
Health GIS 2008
January 14–16, 2008, Bangkok, Thailand
http://e-geoinfo.net/hgis.html

2008 Local, State, Federal Public Health Preparedness Summit
National Association of County and City Health Officials (NACCHO)
February 19–22, 2008, Atlanta, GA
www.naccho.org/conferences/current.cfm

Healthcare Information and Management Systems Society (HIMSS) 2008 Annual Conference and Exhibition
February 24–28, 2008, Orlando, FL
www.himssconference.org/

For registration and information about ESRI-sponsored events, visit www.esri.com/events.

Popular Health GIS Book Adds ArcGIS 9.2 Updates



"I have been using GIS Tutorial for Health *in my GIS class since fall of 2006. As a 10-year user of GIS, I have found the tutorials to be the most helpful addition to the software that I have ever seen or evaluated. They have made a fundamental contribution to the teaching of GIS, not just in the classroom, but in professional settings as well."*

Kim Elmore, Ph.D.
Part-Time Faculty, Georgia State University
Department of Geosciences

Health GIS instructors and professional health GIS practitioners have a new tool for learning about the most recent ArcGIS 9.2 software release and GIS applications in health at the same time. Now available, *GIS Tutorial for Health,* Updated for ArcGIS 9.2 adjusts discussions and exercises to reflect ArcGIS 9.2 software menus and capabilities. Since the book's first edition release in 2006, *GIS Tutorial for Health* has consistently placed among the top 10 sellers for ESRI Press books.

The book is designed to help students and health practitioners use GIS to solve problems in health care and gain hands-on experience visualizing and analyzing health-related data. Coauthors Kristen S. Kurland and Wilpen L. Gorr, who share more than 35 years of teaching experience between them, explain how data analysis and mapping technology can be applied in creating health care and public health policies and plans.

Step-by-step instruction guides students as they learn to design maps to investigate patterns of uninsured and poor populations and prepare spatial data to analyze environmental hazards, youth pedestrian injuries, and much more. With the new edition, each tutorial includes a Your Turn section and each chapter ends with challenge exercises for students to do on their own.

A 180-day trial version CD of ArcGIS 9.2 comes with the textbook, making it a great way to experience ESRI's newest release while learning about GIS health applications. In addition, instructors at an institution with a campuswide ESRI site license may also order ArcGIS One-Year Time-Out Student Edition software for their students. (Look into the promotion under License Options at www.esri.com/university.)

A second CD contains data to complete the tutorials, exercises, and case studies. To help those who are just starting to teach GIS, teachers can also order a resource CD with supplementary materials such as lecture content for each chapter, student project ideas, supporting documents for building a course syllabus and managing the book's datasets, and answer keys. Instructors can find more about the book and this supplemental resource at www.esri.com/esripress/gistutorial.

GIS Tutorial for Health, Updated for ArcGIS 9.2 (ISBN: 978-1-58948-179-4, 2007, 340 pages, $79.95) is available at online retailers and bookstores worldwide or can be purchased at www.esri.com/esripress or by calling 1-800-447-9778. Outside the United States, contact your local ESRI distributor. Books published by ESRI Press are distributed to the trade by Independent Publishers Group. Call 1-800-888-4741 or visit www.ipgbook.com.

About the authors:

Kristen S. Kurland holds a joint faculty appointment at Carnegie Mellon University's Heinz School of Public Policy and Management and School of Architecture, where she teaches GIS, CAD, 3D visualization, and computer-aided facilities management (CAFM).

Wilpen L. Gorr is a professor of public policy and management information systems at the H. John Heinz III School of Public Policy and Management, Carnegie Mellon University, where he teaches and researches GIS applications.

Notable Links

http://apps.nccd.cdc.gov/dcpcglobalatlas/default.aspx
The Global Cancer Atlas Online is an interactive version of the American Cancer Society's *The Cancer Atlas.* It provides color maps, graphics, and charts; baseline measures by nation; and data on prevention strategies and cancer risk factors.

www.esri.com/industries/health/resources/training.html
GIS courses and programs in health fields are offered by colleges and universities around the world. The Health-Related University GIS Courses link displays a list of schools that offer such courses and provides an opportunity for educators to submit additional course and program information.

ArcGIS and Public Health

STC

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