

GIS: A Timely Antidote for Inequity in Health and Social Care

Bill Davenhall, Global Manager, Esri Health and Human Services



There is little doubt that health and social inequity are often the result of economic disparity within a nation. The first people to feel the “pain” of economic upheavals are the poor and the sick, closely followed by the nearly poor for the same reasons.

In the current global downturn, few nations have escaped the human tragedy that often follows financial implosions, even among the most prosperous of the world. As nations revisit their economic policies, health and social agendas are quickly changing as well. Attempts to understand

the relative impact policy changes have on very specific populations and identify the communities that will be hardest hit becomes essential analysis for both the policy maker and the advocate.

Undoubtedly, the tinkering of health and social care benefits, eligibility rules, and resource redistribution reap uncertain outcomes for many citizens. So it is even more important that geographic information system (GIS) tools and geographic analysis move to the forefront of current discussions and decision making.

Seeing and understanding exactly where people at risk are located, geographically, becomes imperative. GIS professionals must become more proactive and vocal in making sure GIS tools are used and deployed effectively for beneficiaries as well as the agencies dedicated to improving society’s health and social outcomes.

Never before has the use of GIS been more important or meaningful to society in helping governance see and understand more clearly the likely results of policy initiatives or changes.

The health and social care organizations that already have GIS capabilities will, in the long run, be better informed and better equipped to thrive in an economically constrained society. Those that don’t use GIS will likely be less able to serve constituents.

The inherent power of a modern GIS lies in its fundamental ability to reveal important distinctions. Having just read these words, it’s now up to you to make sure that your GIS does, or will do, what it has the intrinsic power to achieve to better serve society.

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Trauma Maps Move to the Cloud

By Jessica Wyland, Esri Writer

On a typical day, traumamaps.org receives 10 to 15 visitors. But occasionally, a public relations campaign will attract thousands of hits in one day. Such heavy traffic overloads the servers. This prompted Tara Jackson, executive director of the Cartographic Modeling Lab at the University of Pennsylvania, to search for a scalable hosting configuration that could quickly respond to usage spikes.

Jackson and her team at the lab developed and maintain traumamaps.org for the American Trauma Society. The site’s interactive map allows users to locate acute care hospitals, trauma centers, and helipads in the United States according to geographic borders for states, counties, ZIP Codes, and voting districts. It also serves as a decision support tool for trauma systems planning and evaluation.

“We looked into several solutions,” Jackson said. “We could have increased the number of servers. We looked at what that would cost and how much staff time it would take. Then we decided to find a cost-saving alternative to buying more servers.”



American Trauma Society online maps identify national trauma center access coverage.

With the launch of ArcGIS for Server on Amazon Elastic Compute Cloud (EC2), Jackson and her team found the cost-saving, scalable solution they needed to support traumamaps.org. They did not have to install

software or maintain hardware, and they have full access to a range of cloud services.

“We realized that it doesn’t make sense to have servers, a load balancer, and the extra staff time,” said

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Mapping Geographic Disparity in Organ Transplant Allocation

By Jessica Wyland, Esri Writer

An interdisciplinary team of researchers from George Mason University and Inova Health System are using ArcGIS to identify, map, and analyze geographic disparities faced by the more than 100,000 people in the United States who are awaiting organ transplants.

The team consists of Naoru Koizumi, associate professor of public policy; Chun-Hung Chen, professor of systems engineering and operations research; Nigel Waters, professor of geography and geoinformation science; and Zobair Younossi, vice president for research, Inova Health System, and executive director of the Center for Liver Diseases at Inova Fairfax Hospital.

“The disparity analysis is our first step to really understand where the areas with a high likelihood of receiving a transplant are and why,” said Koizumi, who is the primary investigator of the research. “Geographic disparity has more serious implications. Our study intends to identify the existence, the trend, and the mechanism of such disparity as well as possible remedies to it.”

In addition to the descriptive spatial analyses, the researchers plan to integrate GIS and stochastic

simulation to analyze how the pattern of geographic disparity may vary if the existing protocol for organ sharing between regions is changed. They will also look into the impacts of using different modes for organ transportation on the spatial pattern of disparity. Through these analyses, they hope to identify some effective ways to alleviate the existing geographic disparities.

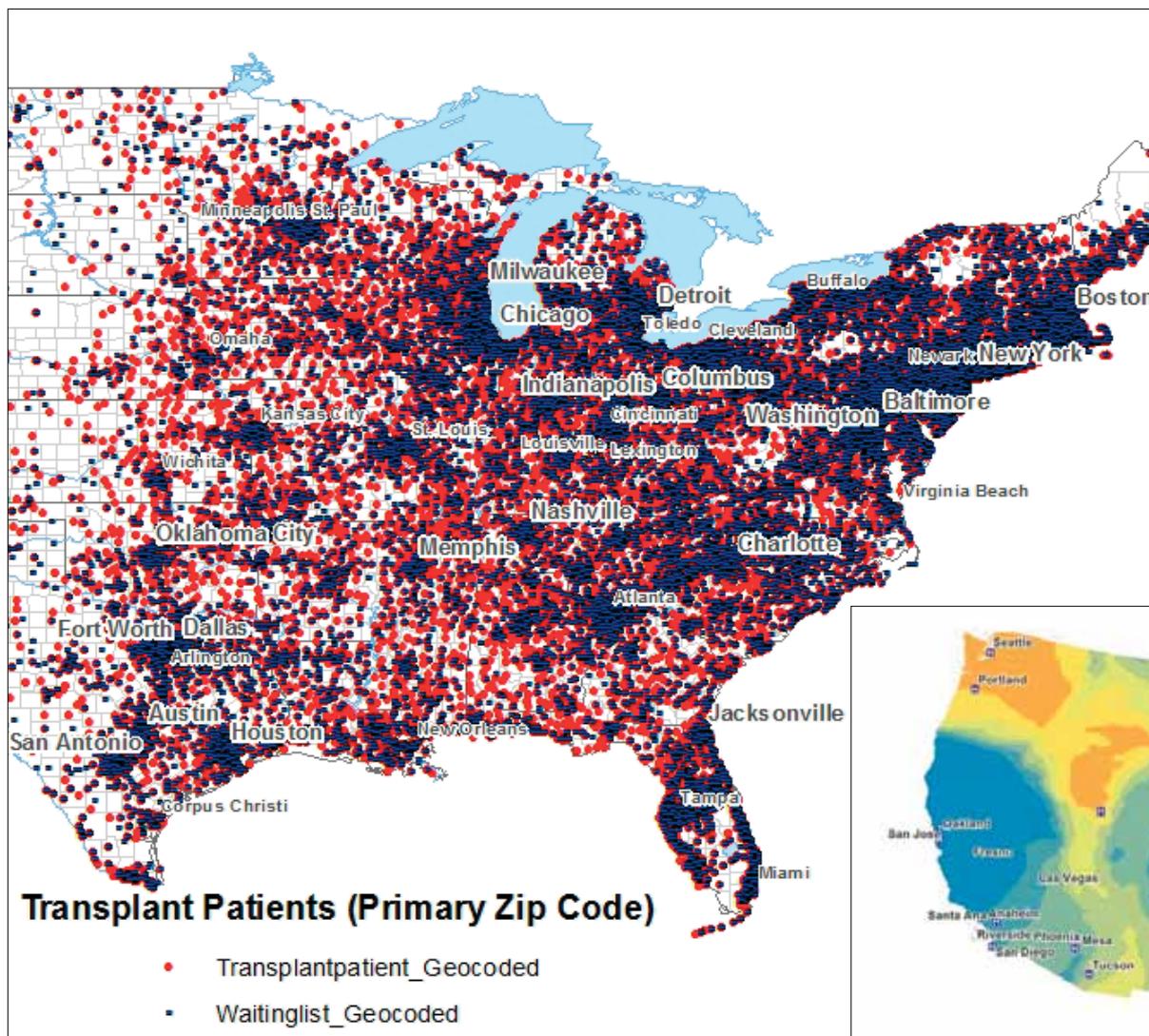
“So far, we have been observing some consistent results to show that where we live does matter in terms of getting good access to a liver transplant, even after controlling for socioeconomic variables such as racial and age compositions and median income measured at the county level,” Koizumi said.

To create the disparity analysis maps, Koizumi and her team started with the five-digit primary residence ZIP Code for each transplant candidate and recipient in the United States between 2005 and 2008. This data was provided by United Network of Organ Sharing (UNOS), the organization that administers organ transplant issues in the United States.

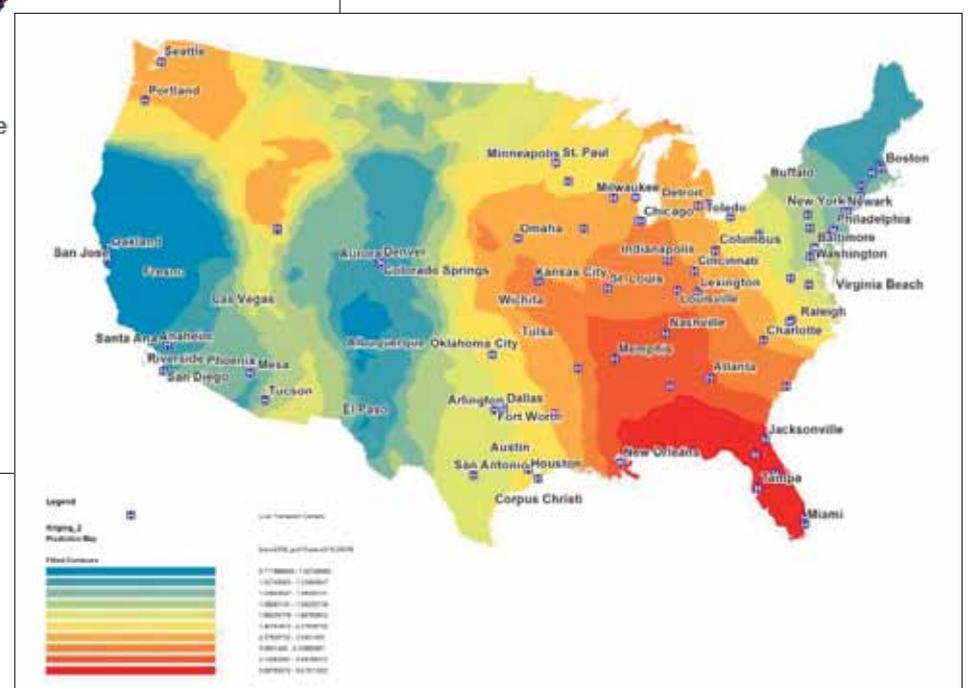
The team used ArcGIS to geocode more than 90,000 transplant recipients and more than 70,000 candidates at the ZIP Code level. Next, they created grid points, spaced evenly across the map, and calculated a location-quotient-like indicator called Standardized Transplant Ratio (STR) for each grid point. The radius around each grid point was determined to cover a sufficient number of transplant candidates and recipients.

To create a smooth map of STR, they applied universal kriging using the ArcGIS Geostatistical Analyst extension. As an alternative approach, they also used indicator kriging with the value 0 for a candidate and 1 for a recipient to predict the likelihood of receiving a liver transplant at any given location.

“We hope that our proposed framework will eventually lead to an improved and fairer decision-making process for the allocation of organs to people awaiting lifesaving transplants,” Koizumi said.



Geocoded Transplant Patients at the ZIP Code Level



A kriging map shows regional differences in access to liver transplants.

Health GIS Conference in Review

The 2011 Esri Health GIS Conference brought together hundreds of health and human services professionals from around the globe to Arlington, Virginia, in early September. Conference speakers set the tone by highlighting trends in health and gauging the direction GIS applications will go in the near future.

Keynote speaker **Todd Park**, chief technology officer for the US Department of Health and Human Services, pointed out how incentives in the health care system are shifting to reward improvements in quality, health, and value. He noted that key information to power these improvements is being liberated at multiple levels and a growing ecosystem of innovators is embracing this historic opportunity to help reinvent American health care.

Ellen K. Cromley, assistant clinical professor, University of Connecticut School of Medicine, Department of Community Medicine and Health Care, discussed normative methods in health research and reviewed GIS applications that will lead to new directions in health research and software development.

Seth Foldy, director of the Public Health Informatics and Technology Program Office at the Centers for Disease Control and Prevention shed light on the trend toward greater record linking by location, person, time, and condition. He highlighted the implications and challenges this presents for geoenabled systems.

Bob Wiseman, vice president for facilities management at the University of Kentucky (UK), shared a custom GIS application that is designed to support maintenance of the UK Chandler Hospital by storing asset information and generating room data sheets for tracking and analyzing the status of occupancy.

Summer Knight, the featured speaker during the annual awards luncheon, discussed human interoperability—what do people who design information systems really need to be thinking and feeling about

what they are building? She also challenged the audience to see the “big picture” when it comes to serving the health and human services needs of people. She encouraged the audience to imagine how information and the IT systems designed to deliver it can actually improve a person’s life.

At the Awards Luncheon, Esri presented awards to three organizations that exemplify the accomplishments that can be made with ArcGIS.

The **Vision Award** went to the University of Kentucky for finding a spatially enabled way to orchestrate occupancy of a new hospital, manage asset information during the move-in, and centrally manage data once the hospital was operational. Bob Wiseman and Andrew Blues from the university created a custom GIS-enabled facilities management application that integrated with existing GIS infrastructure.

The **Communication Award** was presented to Duke University for its GIS-optimized recruiting in the REACH (Reaching, Educating, and Advocating to Change Health) Project, a community-based observational study of 900 African-American female residents of Durham County, NC. Map intelligence was successfully used as a marketing tool, demonstrating that these methods can also be used to improve recruitment in public health studies.

The **Service Award** was given to the Health Data Initiative, a joint project by the Institute of Medicine and the US Department of Health and Human Services. The team is working to make public health data—such as obesity rates, smoking rates, and information about access to healthy food—available to everyone, including software developers, researchers, and private industry.

Stay informed about next year’s Esri Health GIS Conference and access proceedings from this year’s event by visiting esri.com/healthgis.



Bill Davenhall gives the Vision Award to Bob Wiseman of the University of Kentucky.



Ann Bossard, Esri’s global hospital and health systems specialist, gives the Communication Award to Melissa Tosiano of Duke University.



Bill Davenhall gives the Service Award to Robert Shankman of the US Department of Health and Human Services.

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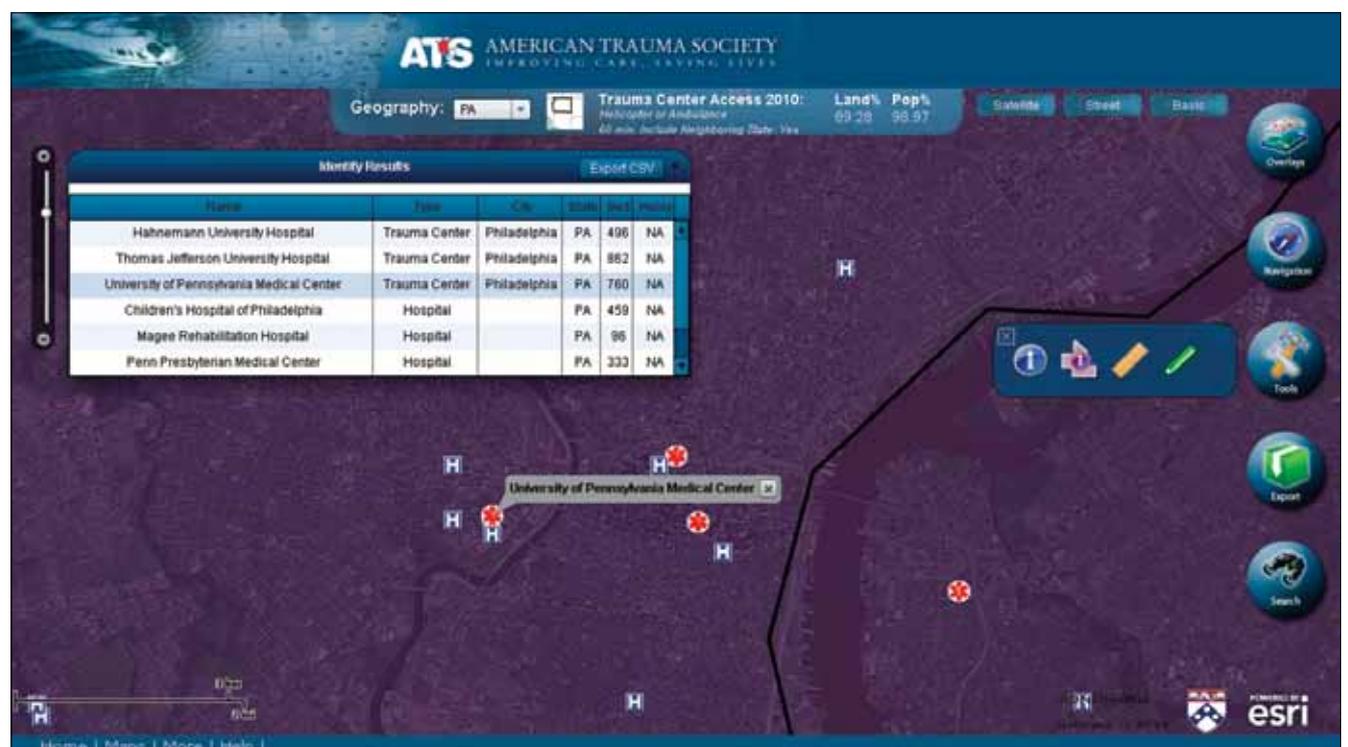
Karl Dailey, database administrator for Cartographic Modeling Lab. “The cloud is beneficial because we can scale up or scale down. That is a huge cost savings.”

After the move to ArcGIS for Server on Amazon EC2, the Cartographic Modeling Lab administrators were able to very quickly reallocate the time staff used to spend maintaining hardware and software.

“We were able to transition, initiate the account, and have everything up and running in one day,” said Vicky Tam, senior GIS analyst, Cartographic Modeling Lab. “We found a lot of helpful information online including step-by-step Esri videos.”

Staff members at the Cartographic Modeling Lab anticipate traumamaps.org will now be able to handle more requests with a quicker response time.

“We were able to improve our bandwidth, and we are already seeing a decrease in terms of cost and staff hours,” Jackson said. “During the next public relations campaign, we foresee the site having the capacity to meet demand.”



Local trauma center access coverage is displayed with additional features drawn on the map. This illustrates how much data can be mapped on the fly or cached for any single request in a user session.

On the Road

Healthcare and Information Management Systems Society (HIMSS) Annual Conference and Exhibition

February 20–24, 2012
Las Vegas, Nevada, USA
www.himssconference.org

Esri Federal GIS Conference

February 22–24, 2012
Washington, D.C., USA
esri.com/feduc

Esri International User Conference

July 23–27, 2012
San Diego, California, USA
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iOS App Puts Geomedicine at Your Fingertips



Geomedicine produces a new type of medical intelligence that leverages national spatial data infrastructures to benefit personal human health and improve the quality of the care medical professionals deliver.

Now this intelligence is as accessible as your mobile phone. The free application, My Place History, links public health information with your environmental experience to give you a greater understanding of how your local environment can affect your health.

Using US street addresses to create and maintain a personal place history, My Place History allows you to gather general information about your proximity to environmental hazards or exposures and unlock a wealth of geographically relevant health information.

My Place History links your personal place history to several governmental databases including the Dartmouth Atlas of Health Care; the Toxic Release Inventory (TRI) of the United States Environmental Protection Agency; and Haz-Map, US National Library of Medicine.

Download the My Place History app and read the free Geomedicine e-book at esri.com/geomedicine.