

# Spatial medicine to better health

Bill Davenhall

*GIS is adding spatial intelligence to a patient's medical history. It is being used by public health officials in their fight against diseases and to protect communities from otherwise overlooked risks and toxic exposures. In this article, Bill Davenhall vouches that the day is not far when a physician will use geospatial technologies to help diagnose, treat and help prevent illness as part of standard medical protocols*

**T**he emerging 'geospatial medicine' will produce a new type of medical intelligence that will leverage national spatial data infrastructures to benefit personal human health. Linking one's own health status to specific geospatial factors can become yet another set of powerful information tools that medical professionals can use to improve the quality of health care. Geospatial medicine, in the future, will mean that we will experience an absolute increase in the number of patients who benefit from a more precise clinical understanding about where they live, work, and play and how, fundamentally, changes in 'place' can reduce exposure or risks to things that adversely affect personal health.

The key to delivering geospatial intelligence to healthcare professional begins by proving that 'place' has clinical value. 'Place', in the context of health, would mean that it could be understood easily in the same fashion as something such as laboratory tests. In most nations, 'place' is increasingly being digitised through the use of comprehensive GIS, which means that nations are moving towards a



geospatial infrastructure that provides a consistent and reliable street addressing schema. The internet, at the same time, is making much of this data available in real-time. Driven by the need to be more accurate about 'place', the ability to geocode a street address will become more common in urban areas where the majority of people live, work, and play. The 'place' history of

a patient, for the most part, will become the clinical marker for 'place' and eventually to unlock everything known about that 'place' – air, water, ground, food, culture, demographic characteristics, service delivery capacities, etc. Address history will become the key to understand the patient's environmental, social and cultural history in the context of health.

Most of this type of information is not immediately available to a clinician at the time of an encounter and thus is not typically part of a comprehensive assessment of a patient condition or the likelihood of knowing a patient's ability to comply with medical directives. A GIS therefore, when delivering real-time geospatial medical information to the medical exam room, will add yet another critical piece of intelligence that can help clinicians extend their reach to assure the health as well as the safety of their patients. In the context of healthcare, a GIS is simply an expert system that adds geospatial intelligence to a patient's medical history. It also means that the underlying business processes of medical care also get more accurate information for other important purposes such as follow-up care, billing, reminder notices and health alerts.

### ***Harnessing the power of geography to improve personal health***

There is abundant evidence that the use of geographic information systems (GIS) has had a dramatic impact on the work related to public health. Medical epidemiologists, the first line 'disease detectives', have extensively used GIS in their fight against diseases that have clear relationships between person, place and time. GIS has also been used by public health officials to protect communities from otherwise overlooked risks and toxic exposures. In the not-too-distant future, a personal physician will use geospatial technologies to help diagnose, treat, and in some cases help prevent illness as part of standard medical protocols. Such uses of GIS could eventually lead physicians to make recommendations to patients on where they might live, work, and play, and where they are more likely to achieve the highest level of health status that they are capable of maintaining.

An explicit goal of healthcare is to

Persistent and unmistakable convergence of two powerful forces—personal human health and environmental conditions will continue to drive geospatial medicine forward. The value of using GIS to deliver medical geospatial intelligence to healthcare practitioners is something that could profoundly alter the way healthcare looks at patient safety and quality of care

produce a quality clinical experience with favourable and expected outcomes, delivered in such a way that a patient's health and safety are not compromised. Typically, as soon as a patient presents himself to a healthcare practitioner, the health provider's ability to produce high quality and safe results, to a large extent, have already been compromised. Perhaps the patient has been getting sick for an undetermined period of time and the sickness may actually be the result of historical conditions and factors that cannot be undone or reversed. If the healthcare provider is expected to help the patient achieve better health, practitioners will be required to understand and evaluate a wider range of historical and temporal information that is both clinically relevant as well as place and time sensitive.

### ***Redefining patient safety***

Major healthcare accreditation and oversight bodies expressed interest in redefining the geographic or spatial scope of patient safety, encouraging healthcare providers to consider the value of integrating internally generated healthcare information with externally available population health information. Principal drivers for such a redefinition of quality care and patient safety include the impact of unintentional toxic exposures, compromised environmental conditions, unexpected situational dangers, untoward outcomes, medical

misadventures (during or after clinical care) and the lack of timely logistical information for dispatching health professionals and medical supplies.

The persistent and unmistakable convergence of two powerful forces—personal human health and environmental conditions will continue to drive geospatial medicine forward. The value of using GIS to deliver medical geospatial intelligence to healthcare practitioners is something that could profoundly alter the way healthcare looks at patient safety and quality of care.

### ***The need for clinically relevant geospatial medical research***

A key element of the growing acceptance of geospatial medicine will be the body of research produced by the health science community. Also critical will be their ability to build and organise relevant medical content that link 'place' to health conditions, risks and outcomes. Medical practice will also have to translate geospatial intelligence into actionable protocols and practices. For example, research examining the impact of ambient air quality on cardiovascular and respiratory disease is underway in many nations of the world and research is confirming that a patient's proximity to dense and high volume roadways is being examined using GIS. There is a substantial body of scientific literature that describes the impact of geographic location on

Much like the abilities of lab systems to make clinicians aware of 'panic values', GIS will provide the same 'early warnings' to suggest that the clinicians investigate environmental 'place' factors that could be contributing to patients' symptoms and help patients make life changing decisions that could impact their health in a more direct way

health problems such as cancer, diabetes, hypertension and osteoporosis and the importance of 'place' in medicine is becoming increasingly better understood.

**Making GIS work for the clinician**

Integrating a patient's place history into existing electronic medical and personal health records is the principle role of today's GIS. A GIS, in the context of healthcare, is an expert system to add geospatial accuracy to a patient's medical history. It also means that the underlying business processes of medical care also get more accurate information for other important functions such as follow-up care, billing, reminder notices and health alerts.

Just as the collection of family medical history helps a clinician look for certain predispositions to diseases, place will provide the context within which the clinician can assess environmental factors and make judgements about diagnosis, treatment and prognosis. Much like the abilities of lab systems to make clinicians aware of 'panic values', GIS will provide the same 'early warnings' to suggest that the clinicians investigate environmental 'place' factors that could be contributing to patients' symptoms as well as in helping patients make life changing decisions that could impact their health in a more direct way.

In the not-too-distant future, geospatial medicine will produce a large body of clinically sound geospatial health intelligence that when tied to accurate personal place histories will unravel many of the confounding environmental health issues that confront modern urban life. Because certain types of personal health information when provided to medical clinicians launch their diagnostic instincts, GIS then, when delivering real-time geospatial medical information to the medical exam room, will add yet another critical piece of intelligence that can help clinicians extend their diagnostic, treatment and preventative reach beyond what they have available to them today.

Geospatial intelligence and its delivery through a GIS is clearly a technology that can be leveraged successfully today to benefit the transformation of healthcare that is so desperately sought after by nations in attempts to not only improve personal health status but more effectively and affordably deliver necessary health services.



**Bill Davenhall**  
*Global Health and Human Services  
Solution Manager, ESRI  
bdavenhall@esri.com*

For more information on geographic information systems technology in areas such as

- Public Health
- Hospitals & Health Systems
- Managed Care
- Social Services
- Data Exchange
- Academic Health Centers

please visit

[www.esri.com/health](http://www.esri.com/health)





## ESRI

380 New York Street  
Redlands, California  
92373-8100 USA

Phone: 909-793-2853  
Fax: 909-793-5953  
E-mail: [info@esri.com](mailto:info@esri.com)

*For more than 35 years, ESRI has been helping people make better decisions through management and analysis of geographic information. A full-service GIS company, ESRI offers a framework for implementing GIS technology and business logic in any organization from personal GIS on the desktop to enterprise-wide GIS servers (including the Web) and mobile devices. ESRI GIS solutions are flexible and can be customized to meet the needs of our users.*

## For More Information

**1-800-GIS-XPRT** (1-800-447-9778)

[www.esri.com/health](http://www.esri.com/health)

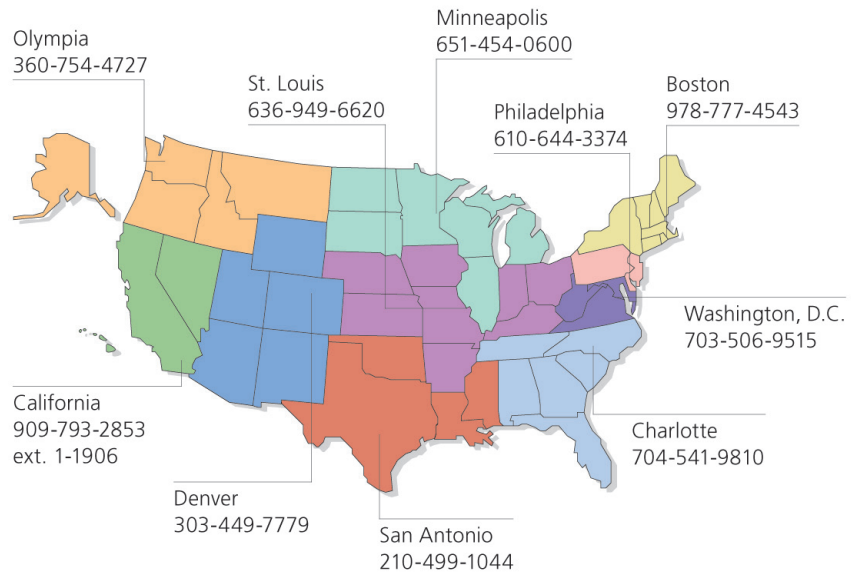
Locate an ESRI value-added reseller near you at

[www.esri.com/resellers](http://www.esri.com/resellers)

Outside the United States, contact your local ESRI distributor. For the number of your distributor, call ESRI at 909-793-2853, ext. 1-1235, or visit our Web site at

[www.esri.com/distributors](http://www.esri.com/distributors)

## ESRI Regional Offices



## ESRI International Offices

Australia  
[www.esriaustralia.com.au](http://www.esriaustralia.com.au)

Belgium/Luxembourg  
[www.esribelux.com](http://www.esribelux.com)

Bulgaria  
[www.esribulgaria.com](http://www.esribulgaria.com)

Canada  
[www.esricanada.com](http://www.esricanada.com)

Chile  
[www.esri-chile.com](http://www.esri-chile.com)

China (Beijing)  
[www.esrichina-bj.cn](http://www.esrichina-bj.cn)

China (Hong Kong)  
[www.esrichina-hk.com](http://www.esrichina-hk.com)

Finland  
[www.esri-finland.com](http://www.esri-finland.com)

France  
[www.esrifrance.fr](http://www.esrifrance.fr)

Germany/Switzerland  
[www.esri-germany.de](http://www.esri-germany.de)  
[www.esri-suisse.ch](http://www.esri-suisse.ch)

Hungary  
[www.esrihu.hu](http://www.esrihu.hu)

India  
[www.esriindia.com](http://www.esriindia.com)

Indonesia  
[www.esrisa.com.my](http://www.esrisa.com.my)

Italy  
[www.esriitalia.it](http://www.esriitalia.it)

Japan  
[www.esrij.com](http://www.esrij.com)

Korea  
[www.esrikr.co.kr](http://www.esrikr.co.kr)

Malaysia  
[www.esrisa.com.my](http://www.esrisa.com.my)

Netherlands  
[www.esri.nl.com](http://www.esri.nl.com)

Northeast Africa  
202-516-7485

Poland  
[www.esripolska.com.pl](http://www.esripolska.com.pl)

Portugal  
[www.esri-portugal.pt](http://www.esri-portugal.pt)

Romania  
[www.esi.ro](http://www.esi.ro)

Singapore  
[www.esrisa.com](http://www.esrisa.com)

Spain  
[www.esri-es.com](http://www.esri-es.com)

Sweden  
[www.esri-sweden.com](http://www.esri-sweden.com)

Thailand  
[www.esri.th.com](http://www.esri.th.com)

United Kingdom  
[www.esriuk.com](http://www.esriuk.com)

Venezuela  
[www.esri-ven.com](http://www.esri-ven.com)