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The AAG Initiative for an NIH-Wide GIS Infrastructure

The AAG has been working with the National Institutes of Health (NIH) for nearly a decade now, and I have discussed some of these collaborations previously in this column.[1] Two years ago, the AAG began building on the foundation of these previous projects[2] and relationships with a new initiative, called the *AAG Initiative for an NIH-Wide GIS Infrastructure*. This column describes this AAG Initiative and a significant jointly-sponsored AAG-NIH Workshop held in February, 2011, which has resulted from this work.

Richardson

The AAG Initiative

The rationale for this AAG initiative is the unmet need for spatial and spatiotemporal data and analyses, as well as for geographic context, across nearly all of NIH's thirty individual institutes. This need is pressing on research undertaken at NIH ranging from gene-environment interaction in biomedical research to the tracking of disease outbreaks and the assessment of health-service delivery. While some progress has been made in recent years in developing geographic information systems, geocoding services, mapping, and associated standards, problems nevertheless abound in the lack of interoperability among proprietary systems, longitudinal variation in data collection, difficulties of sharing inadequately documented data, issues of confidentiality of location-specific data, and lack of understanding of the basic concepts of geographic/environmental context and of spatial and spatiotemporal data and analysis. Although problems and their solutions vary somewhat by institute across NIH, they also share a great deal in common, and therefore very substantial scale economies can be achieved by addressing them collectively. While many individual NIH institutes have made independent and fragmented investments in spatial data and tools, a coordinated approach through a common GIS infrastructure offers significant advantages.

The AAG Initiative for an NIH-Wide GIS Infrastructure has been exploring the potential for a more integrated solution, in consultation with many individual institutes and the NIH leadership. We are addressing opportunities and obstacles to establishing such an ambitious infrastructure, strategies for optimizing the long-term research value of an NIH-wide GIS infrastructure, common standards and protocols, a catalog of available data resources, training programs and examples of best practice, collective negotiation of software and data licenses, and tools specifically adapted to the needs of health research. The overall vision of the Initiative is to enhance the ability of NIH researchers to make use of this rapidly growing and increasingly important area of research infrastructure, while taking advantage of economies of scale.

The AAG Initiative is led by a Steering Committee appointed by the AAG Council, consisting of five leaders in health research and applications of spatial and spatiotemporal technologies: Michael Goodchild, Doug Richardson, Mei-Po Kwan, Jonathan Mayer, and Sara McLafferty. It receives input from a larger Advisory Group that includes geographers and health researchers from across the disciplines represented at NIH.[3] The first phase of the Initiative has focused on creating a broad roadmap for the development of a GIS infrastructure for health research, assessing and documenting the demand for such an infrastructure across the institutes and among NIH leadership, and developing a sustainable funding model.

The AAG-NIH Workshop

After much interaction with NIH officials across multiple institutes, the AAG recently received funding support from NIH to hold a special high level workshop to explore these concepts and ideas with senior scientists and administrative leaders from all across NIH. This workshop, co-sponsored by the AAG with NIH's National Cancer Institute (NCI) and its National Institute for Drug Abuse (NIDA), was highly successful and represents what many attendees have characterized as a seminal event.

Presentations included an overview of current GIS activities at NIH institutes, perspectives from the GIScience research community, extramural researchers' views on GIS needs at NIH, and discussions of system architecture

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options for an NIH-wide geospatial infrastructure. Breakout groups in the workshop focused on identifying common needs, key challenges, and implementation alternatives. Recommendations, priorities, and next steps in this process were discussed and will be the subject of a forthcoming report by the AAG and NIH.

Participants in the workshop agreed that developing a broader and deeper GIS infrastructure throughout NIH for medical research is needed. The discussion highlighted numerous benefits of geography and GIScience to NIH's health research programs. Examples of the benefits of a large-scale GIS infrastructure to health and biomedical researchers include: generation of research hypotheses through discovering geographical patterns and by analyzing data in ways that would not otherwise be possible; increased ability to understand gene-environment interactions and their role in disease occurrence; ability to advance mobile health systems by incorporating real-time GPS/GIS technologies; and the potential to integrate and link other major health databases with such an infrastructure.

Workshop participants also discussed challenges to the implementation of such an ambitious project. These challenges include dealing with locational privacy and confidentiality; developing and disseminating GIS and analytical modeling tools specific to the needs of health and biomedical researchers; and incorporating training and education in GIS, geospatial tools, and spatial thinking for health and biomedical researchers. Participants also recognized the importance of having a forward-looking strategy in developing an NIH-wide GIS infrastructure, being mindful of new and emerging technologies including, for example, the geospatial web, social media, new information from electronic medical records, real-time health monitoring, and developments in sensor and location-aware technologies.

The next steps for pursuing the concept of a large-scale, NIH-wide geospatial infrastructure to support health research will include: wide dissemination of the forthcoming Workshop Report to the geography and heath and biomedical research communities; preparing a more detailed inventory of the portfolio of intramural and extramural GIS projects supported by NIH; and developing NIH RFPs and focused workshop proposals that address specific research needs related to such a complex infrastructure. Potential research would need, for example, to address spatio-temporal analysis in health research, where issues of scale, privacy, large datasets, and computational capacity are just some of the areas that need to be investigated; defining a distributed computing architecture (including cloud computing) for an NIH-wide GIS; developing a common language or ontology shared by biomedical researchers and geographers to foster collaboration; and addressing other needs and challenges described above.

The workshop concluded with an executive briefing for senior NIH leadership from many institutes across NIH. If successful, I believe this AAG Initiative will open new doors for geographic research and discovery, both in collaboration with biomedical scientists at NIH, and with related public health researchers as well. For geographers and medical researchers alike, it also holds real promise for making a meaningful difference in the health and lives people around the world.

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[1]D. Richardson, "Making Connections: Geography and Drug Addiction" (*AAG Newsletter*, September, 2005), and "Geography and Mental Health" (May, 2009).

[2]For example, NIDA and AAG's continuous joint symposia at AAG Meetings since 2006, and our collaborative publication of the book, *Geography and Drug Addiction* (Thomas, Y., D. Richardson, and I. Cheung, eds). Springer, Dordrecht, The Netherlands, 2008.

[3]The AAG welcomes input and ideas from all geographers and medical researchers. For more information, see www.aag.org/health_geographies.