Rob Strong

MINING BIG DATA TO MAP CANCER CARE

TRACY ONEGA'S OFFICIAL TITLE is Associate Professor of Biomedical Data Science. But that designation seems altogether too dry when one learns a bit more about the nature of her work, which could be described as electronic excavation. Onega spends her days mining the healthcare ecosystem–from cancer registries and the U.S. census to huge data sets and the web–to reveal the ways in which an individual's locale impacts one's health status, the care received, and the outcomes realized, particularly with respect to cancer care in rural areas.

Onega has travelled a circuitous path to this point, earning master's degrees in geography and health informatics and becoming a physician assistant before earning her doctorate in clinical epidemiology and health services research from Dartmouth in 2007. "As a geographer, I worked a lot with geographic information systems (GIS), utilizing geospatial technology to examine habitat distribution and animal populations–a theme that translates from the natural sciences to health sciences in relation to healthcare and people," she explains. "Now, I'm able to work at the intersection of all my interests in terms of training."

Just as Onega's interests have shifted and coalesced over the years, so, too, have research methodologies. "In the 1970s, we relied on information derived from sources such as population-based cancer registries and the census. Today, however, we can utilize data technology and informatics methodologies to access massive amounts of data from myriad digital sources very soon after it's gathered."

For example, Onega says, she and her fellow researchers have used web content mining and purpose-built algorithms to explore the diffusion of new technologies such as 3-D mammography. "In the past, it's been hard to determine how new technologies disseminate across populations until well after the fact–data is frequently retrospective, delayed, and oftentimes incomplete." But new methodologies allow researchers to rapidly bring big data into the spatial and location realm in ways that are quite revealing.

3-D mammography was being used before insurers covered the procedure, Onega explains, so no claim code existed for billing, making it exceedingly difficult to get a sense of the technology's spread in real time, such as who has the equipment, who doesn't, who's using it, who isn't. Using geoinformatics, however, Onega can plumb the contents of the web to find places that are employing the technology. "Scale is no longer an issue–through machine learning and specialized algorithms, we can search the web and look for entities offering 3-D mammography any place we want and as often as we want."

What Onega has found is that the move from digital to 3-D mammography is more rapid and widespread than the move from film to digital mammography, meaning that access to this valuable cancer prevention tool is gaining equity at a rapid rate.

In this study as in much of her research, Onega's focus is cancer care. "The disease is pervasive–I've been touched by cancer within my own family, and one out of every two people in this country will be touched directly or indirectly sometime in their lifetime," she says. Onega is particularly interested in how cancer care resources are apportioned across populations and how those decisions impact cancer patients. Public policy agencies like the National Cancer Institute and the American Cancer Society are interested as well, and they look to research like Onega's for guidance in allocating and distributing cancer care across the country, particularly in rural areas.

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While Onega is pleased to contribute to national research initiatives, she is also eager to make a difference on a regional level. "I'm interested in partnering with the state of New Hampshire to conduct research with a more local focus. I would very much like to translate our findings into interventions that help to improve delivery of care and outcomes right here in our region."

Onega loves this area and says that her affiliation with Dartmouth is a perfect match on many levels. "I prefer rural areas with low population density, and the Upper Valley is beautiful–I can walk out my back door and be on a cross-country ski trail in minutes." But the region's natural beauty is just one aspect of Dartmouth's allure, she continues, "I love the Dartmouth environment–it's a vibrant medical school community, yet it's small enough to foster broad, collegial ties. There are many opportunities for cross-disciplinary activity within Geisel, and Norris Cotton Cancer Center is one of only two, rural National Cancer Institute-designated cancer centers in the U.S. In short, as a researcher, it's an incredibly rewarding place to be."

LORI FERGUSON