# A Fresh Look at Community Health Using ArcGIS Online

PolSci Students Create Community Health Score Website

In the fall 2012 semester, the students of Political Science 310—Health Policy at Grand Valley State University (GVSU), Allendale, Michigan, set out to think about the overall health of their community in Kent County. As a researcher and associate professor in the School of Public, Nonprofit and Health Administration, Stephen Borders, PhD, recognized the need to prepare students upon graduation for complex challenges like a community assessment. ArcGIS Online provided the powerful mapping visualization tools, and SAS Enterprise Guide On Demand offered the seamless integration of statistical analysis to make such a project possible.

Borders therefore redesigned this upper-level course to focus on the application of problem solving by guiding students in the creation of knowledge and skills. These changes culminated in the creation of Community Health Score (www.communityhealthscore.org)—a collaborative student effort that analyzes and ranks the health status of each of Kent County's 128 census tracts.

Components of the Project

In creating a model for the course, the project was guided by two seminal achievements in visualization and community health analysis. First, in the book *Patchwork Nation* and website (www.patchworknation.org), Dante Chini and James Gimple recognized the problems of the now ubiquitous Republican red and Democratic blue maps of America's counties. The maps represented what they construed as a gross oversimplification of the United States. The authors developed a more detailed and thoughtful typology, categorizing the country into 12 distinct community types.
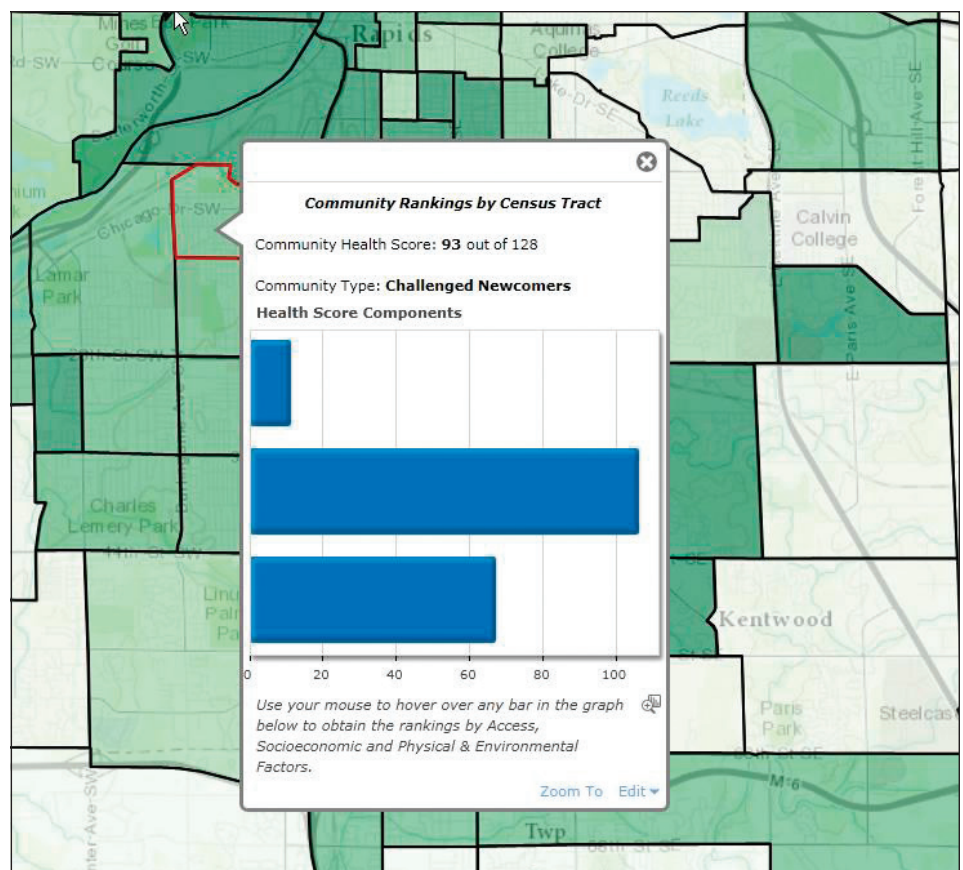
↑ Community Health Score Pop-up Menu

Through a process called principal component analysis (PCA), *Patchwork Nation* provided a model for the project in which the students developed a health typology.

"PCA is frequently utilized as a data reduction technique to discover patterns within multiple variables that can be difficult to detect otherwise," Borders observed.

The second component of the project was inspired by the University of Wisconsin Population Health Institute's County Health Rankings (www.countyhealthrankings.org).

The rankings are designed to assist communities in creating solutions, making it easier to be healthy. County rankings within each state are based on key health and socioeconomic variables. When possible, many of the indicators in the GVSU project were modeled on those developed by the rankings, Borders explained. The key difference is that he and his class seek

to provide clues about the health of the communities within Kent County, developing rankings and community types for each of the county's 128 census tracts.

Classifying the Communities

"Although most students taking the course had little or no experience with GIS, the design and ease of use of ArcGIS Online gave each student an opportunity to contribute to the project," Borders said. Using data, primarily from publicly available sources such as the US Census's American Community Survey, Esri Business Analyst, and select vital records data, he created a master shapefile from an extensive list of variables selected by the students. The shapefile was loaded into ArcGIS Online, where each student created an individual account, joining the Community Health Score group.

According to Borders, students experimented with the data, working with ArcGIS Online and SAS Enterprise Guide, exploring relationships between variables that seemed to most affect public health in Kent County. For example, the students created scatterplots and correlations to better understand how socioeconomic variables such as poverty and educational attainment are related to prenatal care access.

After working with the data, the class made recommendations to include in the PCA model. PCA reduced the broad set of indicators into a more manageable five-factor solution—each factor grouped by the common characteristics it exhibits. The students then developed a name for each community type that summarizes its essence:

- Decidedly Disadvantaged: Our most vulnerable communities, primarily urban, are characterized by high levels of poverty, minorities, transportation barriers, and poor access to prenatal care.
- Burgeoning Challenged Newcomers: Although most residents are white, these communities have the highest proportion of Latinos, with nearly half of the households with children under 18.
- Convenienced Common Laborer: Mostly suburban communities with the highest numbers of working residents yet most do not have well-paying jobs.
- Fortunate Fringe: Our most affluent, suburban communities that are overwhelmingly white with high per capita incomes and level of educational attainment and low levels of single-female-headed households with children.
- Emptying Nests: Communities with large swaths of aging baby boomers where the grown children have moved out on their own. The communities are more likely to have households with seniors and the least likely to have children under 18, with about 15 percent of households comprised of seniors living alone.

Scoring the Communities

Defining the five community types was instructive by adding new understanding to the complexities of Kent County communities. Yet, it also left the students with little information about how to prioritize community needs, Borders explained. The solution: using a similar approach to the county health rankings, the students developed a series of rankings for each census tract. That turned the Community Health Score into a weighted composite measure, developed from three domains that impact the health of the community: Access to Care (40%), Socioeconomic factors (40%), and Physical and Environmental factors (20%).

"By seeing the results at a more granular level, we improved identification of areas likely to suffer from health disparities," said student Ashley Miller, who led the project scoring efforts.

The students also calculated scores in SAS Enterprise Guide and created powerful visualizations by embedding those maps into the website for each of the three health domains. Most notable among the visualizations are embedded maps that feature pop-up menus, providing additional analysis for each community, Borders said.

Pop-up Menu

The methodology was developed from class discussions, a careful review of the literature, and the clear documentation on the County Health Rankings website.

"This comprehensive approach forced the students to consider that community health includes the social determinants as well as a system of hospitals and health care providers," Borders said.

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