The Innovative Instructor

Center for Educational Resources

Pedagogy Forum

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What this is

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Visualizing Population Data Geographically

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Nazish Zafar, 4th year Graduate Student in Sociology

The Issue

In most public health courses, statistical data are central to understanding population and health indicators as they relate to issues such as fertility and life expectancy. However, raw statistical data of one country do not usually illustrate that country's geographical relationship to other countries or reveal broader global public health patterns. Visualizing the indicators of the countries based on their locations on the map can be difficult, especially since current resources do not usually map the latest data within a global setting, which is essential for contextual and spatial analysis.

Solution

Understanding relational data based on neighboring regions, as well as topographic, climate and cultural considerations, can help explain the differences between indicator values. To synchronize all of the statistical and spatial data, we created a series of choropleth maps that display countries shaded in a range of color gradient values corresponding to indicator values. Created in ArcGIS, each map shows a dozen population and health indicators from the annual PRB. This project was made possible through a Technology Fellowship grant awarded by the Center of Educational Resources and with ArcGIS assistance from the Government Publications Maps and Law department of the library. Maps were made available to the students through ArcGIS Explorer, a presentation tool for maps created in ArcGIS. ArcGIS Explorer provided an easy way for students to visually compare data across geographical regions.

Why does it matter

In Population, Health and Development, we use the latest data from the Population Reference Bureau (PRB). It provides a spreadsheet of values for every country in the world, indicating variables such as population, mortality, HIV, and more. Viewing the raw numerical values for each country is not a convenient or effective way to extract meaning from the data. In previous semesters, students produced vertical "spike-and-cap" graphs to view the distribution of values for a given region. The students would then compare the graph of their region to other regional graphs - e.g., life expectancies for countries in Oceania compared to those of East Asian countries. Creating graphs for every region can be tedious, and it enables only a limited comparison of the data. Absent from such comparisons is how one country's public health indicators relate to those of other regions within the world system. It is difficult to have a global perspective of a country's indicator values without a clear visualization of the geographic information.

Using ArcGIS Explorer, students can turn on a specific choropleth map that represents an indicator's value (such as life expectancy or fertility) and compare those gradient values to other regions' values. Zooming into a region reveals new gradient values of the individual country data for the region. When students click on countries or regions, a popup box appears, detailing the data that define the choropleth map. This interaction provides an engaging way for students to experience the data in a variety of meaningful ways.

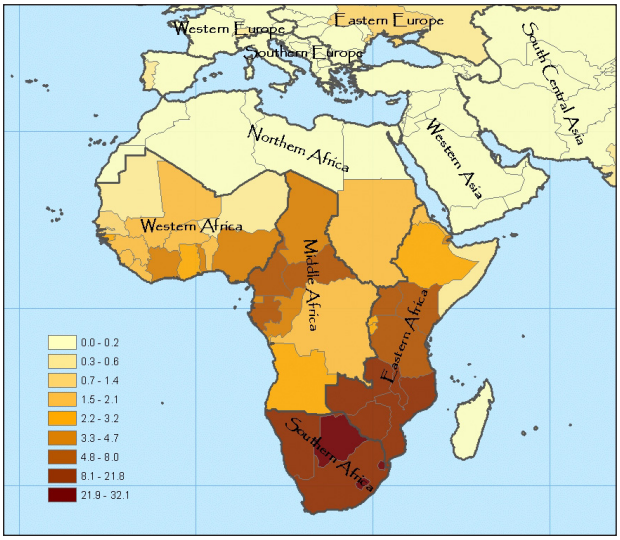
We use these maps during lectures, and we developed related homework assign-

ments to prepare the students for their final group presentation. Most students used ArcGIS to give their presentations; it provided a platform for interacting dynamically with the data and maps supplemented by other material such as images, topographic maps, and videos.

Results

For their final projects, student groups presented their regions (such as West Africa or Eastern Europe) to the class. They were asked to present PRB data for these regions and suggest the cultural, historical or geographical implications that could be derived from those data. Through the final projects, students developed subject area expertise.

Because of ArcGIS Explorer's ease of use and dynamic quality, all but one group chose to use it for final presentations. Students presented their research by 'traveling' virtually around the global map to focus on specific regions and countries. Research material on each country and region could be associated to the exact position on the global map to anchor student analysis in geographical context. Through their presentations students acquired a stronger sense of the world (the sights, sounds, climate, topography, and history) and the data that define each region. For example, they better understood not just specific regions' or country's infant mortality rates, but also the conditions that contributed to those rates.



Example of ArcGIS Explorer displaying the percentage of adolescent women with HIV in 2007/08 for each country within a region

Other Thoughts

We used ArcGIS initially to display our maps in class and created a few assignments to help students to interact with the application. The rather steep learning curve and Windows operating system requirement presented early challenges. During class, we demonstrated the program and performed exercises together to orient students to the program. We quickly realized that there was not going to be enough time to prepare the students adequately to work on their own outside of class because of the complexity of the program.

Fortunately, a new, user-friendly and stable release version of ArcGIS Explorer became available during the semester. Students were inspired by its ease of use and had made comments that ArcGIS Explorer would be their presentation tool of choice for final projects.

The only drawback to ArcGIS software is that it requires a Windows operating system. However, by using Parallels Desktop or VMware Fusion, Mac computers can accommodate the program. The Eisenhower library also has computers in the Maps & Government section with ArcGIS Explorer installed.

Additional Resources

- 2011 World Population Data Sheet: http://www.prb.org
- ArcGIS Explorer: http://www.esri.com/software/arcgis/explorer

Authors' Background

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Stan Becker is a professor in the Department of Population, Family and Reproductive Health at the Bloomberg School of Public Health (BSPH). In addition to the course, Population Health and Development, at Homewood, he teaches Couples and Reproductive Health and co-teaches Population Dynamics and Public Health and Methods and Measures in Demography at the BSPH. His research interests are interventions with couples in reproductive health and estimation of fertility and mortality in developing countries.

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Nazish Zafar is a 4th year doctoral student in Sociology who is studying social inequality from a cross-national comparative perspective. She has lived and worked in Singapore, Russia, and Brazil where she has worked on projects on social policy and welfare. She has been a TA for Population, Health, and Development for three years (2009, 2010, 2011).