

# Using maps to better understand populations, programs, and health



## MEASURE Evaluation Fact sheet GIS: geographic information systems

At MEASURE Evaluation, we know that improved analysis and use of data lead to better health program decision making and, ultimately, improved health outcomes. This fact sheet introduces one of the innovative toolsets created for monitoring & evaluating public health interventions.

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To learn more about MEASURE Evaluation and our current activities, visit us on the Web at [www.cpc.unc.edu/measure](http://www.cpc.unc.edu/measure).



**Overview:** Geographic information systems map the distribution of services, populations, and other features of countries or regions. These maps will be an important part of improving global monitoring and evaluation efforts.

Geographic information systems (GIS) provide researchers with spatial tools they can use to map and analyze characteristics of people, objects, and events. Recorded locations of populations, health facilities, roads, regional boundaries, and other variables can be stored as different “layers” of multi-dimensional maps. Researchers can then perform detailed analyses of the complex interactions between those layers.

Using spatial analysis techniques, GIS can estimate health accessibility throughout a region, identify populations at risk, and determine the characteristics of regions regarding population, administrative boundaries, proximity to health services, or any variable that can be mapped. The rich data analysis that GIS provide supports better decision-making at

the district, regional, and national levels. GIS can be used as the primary component of a project, or as a supplementary effort to provide greater depth to existing projects.

**More Than Just Location:** GIS use high-quality data and multiple variables to maximize understanding. While a single dot may represent health facility’s location on a conventional map, that facility’s impact reaches far beyond that one point. Researchers using GIS can calculate and display that health facility’s service area, or “reach.” Researchers can then display that service area with population data or other information to better understand the relationship between services and populations in need.

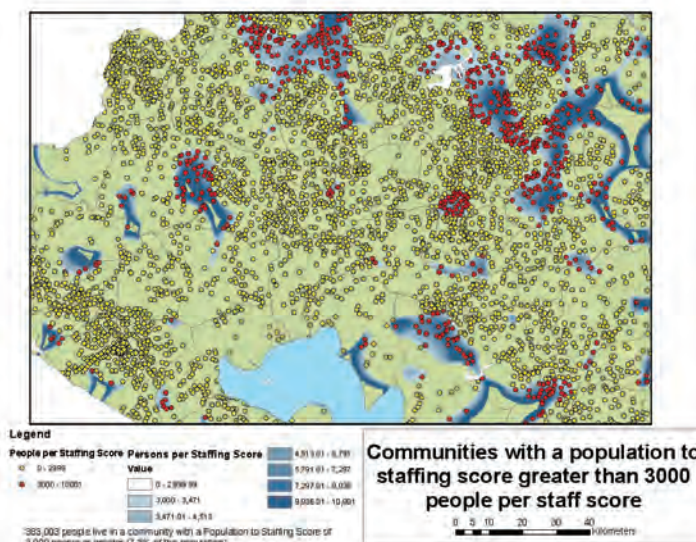
**What GIS Need:** Geographic information systems require accurate

location-based data and researchers trained to use GIS software. In the past, these requirements have meant that GIS carry a considerable expense. However, stronger spatial-data infrastructures in many developing countries, low-cost GIS analysis programs, and improved software and training materials have dramatically reduced the costs of using GIS in recent years. The wide availability of global positioning system (GPS) receivers have also offered researchers a portable, cheap, and accurate way to calculate locations.

**How MEASURE Evaluation Uses GIS:** Researchers at MEASURE Evaluation have used GIS for a variety of important projects, including the following:

- **Slums of Urban Bangladesh:** In 2005, MEASURE Evaluation collaborated with the Centre for Urban Studies to map the slums surrounding the six largest cities in Bangladesh. Researchers identified and collected data from more than 9,000 slums, and then used GIS to produce detailed maps that mark each slum's geographic boundaries, population size and distribution, water sources, legal status, and other information. These comprehensive maps will enable policymakers to target slum populations with far greater efficiency and precision than in the past.
- **Orphans and Vulnerable Children:** MEASURE Evaluation will work with the USAID missions in Haiti, Vietnam, Cote d'Ivoire, Nigeria, Ethiopia, Uganda, Rwanda, Tanzania, Mozambique, Zambia, Botswana, and Namibia to create maps to evaluate services for orphans and vulnerable children (OVC). MEASURE Evaluation will also provide guidance to missions in those countries strengthen their OVC data infrastructures and use those data to make better decisions.
- **Mapping Health Service Availability in Nicaragua:** In 2001, the Nicaraguan Health Facility Survey (NHFS) mapped and recorded characteristics of every health facility in Nicaragua. Since then, secondary analysis of NHFS data conducted by MEASURE Evaluation has uncovered important salient features of Nicaragua's health system and provided new testing and validation of a data analysis technique called Kernel Density Es-

timation (KDE). MEASURE Evaluation researchers inputted NHFS data into a GIS and used KDE to calculate accurate ratios of health facilities and facility staff members to nearby populations.



**Technical Assistance around the World:** MEASURE Evaluation provides guidance and technical assistance in using and adapting GIS to governments, NGOs, and other decision makers. MEASURE Evaluation has produced standardized protocols for using GIS to record locations and created a GPS toolkit to facilitate data collection, and currently leads the MEASURE GIS Working Group, which meets to improve collaboration and communication regarding the use of GIS. Additionally,

MEASURE Evaluation collaborated with the World Health Organization to produce a data collection protocol for health facility surveys that can be used to uniquely identify health facilities across multiple surveys.

GIS have also allowed MEASURE Evaluation to identify areas with high HIV prevalence and limited service availability in Tanzania, create an inventory of health facilities in the Caribbean, and to complete and improve other projects.

**The Future:** GIS have become an increasingly important tool for public health M&E. Maps created by GIS have the potential to help health district managers, project planners, and funders make decisions that will improve the state of global health care. MEASURE Evaluation is committed to providing these stakeholders with the best possible GIS and finding new ways to tap GIS's ultimate potential.

## For more Information

- John Spencer (spence2@email.unc.edu)

MEASURE Evaluation, Carolina Population Center  
 University of North Carolina at Chapel Hill  
 206 W. Franklin St., CB 8120  
 Chapel Hill, NC 27516

919-966-7482 <http://www.cpc.edu/measure/>