"All Public Health is Local" - The Community Perspective on GIS and Public Health
Russell Kirby, University of South Florida

The late Speaker of the House Tip O’Neill famously said "All politics is local", and public health professionals will certainly agree with the paraphrased expression "All public health is local". However, the application of GIS to community-level public health data has been slow to evolve. In this presentation we will explore both theoretical and practical rationales for taking GIS in public health to this scale, review some noteworthy examples, and discuss some of the opportunities and challenges involved.

Creating Community Health Indicators Using Spatial Smoothing, Aggregation and Masking
Tom Talbot, New York State Department of Health

Providing data for small areas is a challenge due to fluctuations in rates due to small numbers and risks of disclosing confidential health information. This presentation provides an overview of tools and methods used to spatially aggregate, smooth or mask health outcome data so they can be presented on maps without violating patient confidentiality. In addition, some of these methods can be used to reduce random fluctuations in rates due to small numbers. Kernel density, spatial filtering and spatial aggregation techniques will be reviewed. In addition masking techniques which obscure specific data elements by replacing sensitive data with realistic but not real data are examined with examples provided from health departments and the US Census. Algorithms for random moving data points and data swapping are provided.

An Adolescent Sexual Health Community Needs Index: Solutions from Merging Spatial Statistics with GIS
Glen Johnson, New York State Department of Health

Assessing the needs of local communities for planning teen pregnancy prevention programs has traditionally been based on the latest data on teen pregnancy rates by postal ZIP code; however, it has long been recognized that multiple indicators of risky behavior should be considered and also incorporated with much more information about community structure. This issue in part gave rise to a workgroup in the New York State Department of Health to bring together different programs that address the common goal of reducing risky adolescent/teen sexual behavior. One result is the integration of data from several sources into a common “geo”database that links these data to common units of geography like counties and ZIP codes in a way that is interactive with Geographic Information Systems (GIS) software.

The multiple community-level variables that are stored in the geodatabase were synthesized into one community needs index for each ZIP code through a statistical tool called “Generalized Linear Mixed Models”. This results in an estimate of teen pregnancy caseload and incidence of sexually-transmitted diseases by ZIP code that is “risk-adjusted” by underlying community variables derived from the census in a way that adjusts for spatial proximity of ZIP codes.

While a GIS plays a central role in managing and visualizing both the inputs and results of this type of community needs assessment, it can also be used to export maps for (non-GIS) end users to visualize interactively through free virtual globe browsers.
Global Geographies of Environmental Injustice and Health: Using GIS to Estimate Populations at Risk
Florence Margai, Binghamton University-SUNY

Global environmental injustice, the unfair distribution of hazardous substances in disadvantaged communities, is increasingly evident in the African continent through transboundary pollution and illegal disposal of hazardous wastes. Studies are needed to uncover the underlying factors that account for these trends and the detrimental health effects among residents living in these host communities.

This paper will examine a recent incident that involved the disposal of hazardous wastes in Abidjan, Ivory Coast. Hazardous mixtures of mercaptans, hydrogen sulfide, phenols, and hydrocarbons were dumped illegally in seventeen locations resulting in approximately fifteen deaths and thousands of injuries. The research explores the circumstances under which the incident occurred and the communities that were most affected by the incident. Using atmospheric dispersion models, the chemical plume footprints are delineated and imported into a GIS for environmental risk assessment.

Effects of Material and Relational Deprivation on Community Health Status
David Gregorio, University of Connecticut School of Medicine

Communities that operate with a deficiency of material and social resources that are available in other settings put residents of those communities at-risk of a variety of health and social conditions. This cross-section, population-based study of U.S. census data utilized principal component analysis (PCA) to establish valid and usable indices of material and relational deprivation for 64,586 census tracts and 3,141 counties and for two census periods (1990 and 2000). A 2-factor, 10-variable solution was produced that estimates material (e.g., income, occupation, education, housing, public assistance and female-headed household) and relational (e.g., tenancy, non-traditional family, marital status and residential mobility) deprivation of communities.

The correlation of these factors with available community health indicators is discussed and the implications of community deprivation on health are highlighted. Our analysis suggests that attention to deprivation should emphasize deficiencies of material resources within communities as population-level sources of health inequities, but shouldn't discount the impact of deprivation in social relationships that limit a community's ability to promote self-interests and overcome resource deficiencies.

Dynamic GIS during Public Health Emergencies
David Gruber, New Jersey Office of Homeland Security and Preparedness

An advantage of traditional GIS is the use of static data layers for incorporation into mapping systems and for use in data analysis. However, in response to the rapid need for information during emergencies, significant advantages in knowledge management, information brokerage and decision making are gained through use of dynamic GIS and the dashboard depiction of real-time or near real-time data into GIS system displays. This presentation will examine the advantages of this capability with demonstration of an existing system that incorporates this technology.