Using Maps to Promote Health Equity

This report is one in a series of papers on best practices for using maps to promote health equity. Commissioned by The Opportunity Agenda, in partnership with the Health Policy Institute at the Joint Center for Political and Economic Studies, this project was made possible by The California Endowment. The complete volume of research and case studies is available on-line at: http://www.opportunityagenda.org/mapping.

Community Mapping for Health Equity Advocacy

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June 2009

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Introduction

The field of community mapping – the use of spatial data by community groups to analyze and communicate about community issues, assets, and strategies for change – has evolved tremendously in the past decade. The democratization of geographic data, the rise of free, online mapping tools, and the development of a strong network of community data intermediaries to support data access and use have all contributed to this expansion.[1] With this extensive information and institutional infrastructure in place, equity advocates have dramatically increased their ability to incorporate data and maps into their activities.

While spatial data and mapping have become more robust, accessible and widespread, the field of public health has increasingly embraced the spatial thinking and analysis these tools can help inform. Many public health researchers have grown dissatisfied with individually-oriented explanatory models for understanding obesity and other critical health issues, and have begun to look more closely at the role of community and environmental factors on individual health and health disparities.[2] [3] Strategies that improve community environments have come to the forefront in discussions about how to reduce health inequities and halt health crises like childhood obesity.

These parallel developments have turned community mapping into a cutting-edge practice for health equity advocates, with much innovation in the field. Communities across the country are using GIS tools to analyze neighborhood environments in relation to health disparities and develop projects and policy campaigns to build healthier neighborhoods. In Chicago, New York, Oakland, Louisville and countless other places, communities are mapping grocery stores and fast food outlets in relation to obesity rates. In Los Angeles, Denver, and elsewhere, park advocates are using GIS to analyze the distribution of parks and play spaces in relation to low-income communities and communities of color. Many communities have used mapping to understand and track environmental risks—from vacant and abandoned properties to air pollution.

This paper focuses on the practice of using mapping for community-driven policy advocacy activities. It describes the relationship between mapping and policy advocacy, with a focus on how mapping is being used to advocate for policy and systems changes that reduce health inequities, and highlights best practices in the use of mapping for policy advocacy drawn from communities across the country.

The case studies and examples presented in this paper were drawn from our experience and knowledge from working in this field for the past ten years, and are not based on exhaustive search or survey of maps used in policy advocacy. In order to learn about the

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[1] Treuhaft S, and Kingsley G, *Transforming Community Development with Land Information Systems*, (Cambridge, MA: Lincoln Institute of Land Policy, 2008), available at http://www.lincolninst.edu/pubs/PubDetail.aspx?pubid=1356.

[2] Saalens B, Sallis J, Black J, Chen D. Neighborhood-based differences in physical activity: An environment scale evaluation. *American Journal of Public Health*. 2003;93(9):1552-58.

[3] Robinson T, Sirard J. Preventing childhood obesity: A solution-oriented research paradigm. *American Journal of Preventative Medicine*. 2005;28(2S2):194-201. Also see PolicyLink, *The influence of community factors on health: An annotated bibliography* (Oakland, CA: PolicyLink, 2004) for a broad review of the research on community factors and health.

approach, mapping activities, and policy advocacy experiences and outcomes of groups involved in the efforts discussed in this paper, interviews were conducted with their leaders.

The paper begins by setting the context for community mapping and policy advocacy, providing a framework for thinking about the stages involved in the policy advocacy process and how mapping can be used to further each stage of the process. The bulk of the paper presents examples of how communities have used maps in their policy advocacy activities. The first two case studies describe how maps were used in equitable development campaigns to win the country's first community benefits agreement in Los Angeles and to pass a more inclusive zoning policy in Washington DC. The next three case studies focus on examples from the health field that have used mapping to improve food access, park access, and air quality. The conclusion summarizes lessons learned from the case studies about what is needed to effectively use GIS for health equity advocacy.

Mapping and Policy Advocacy

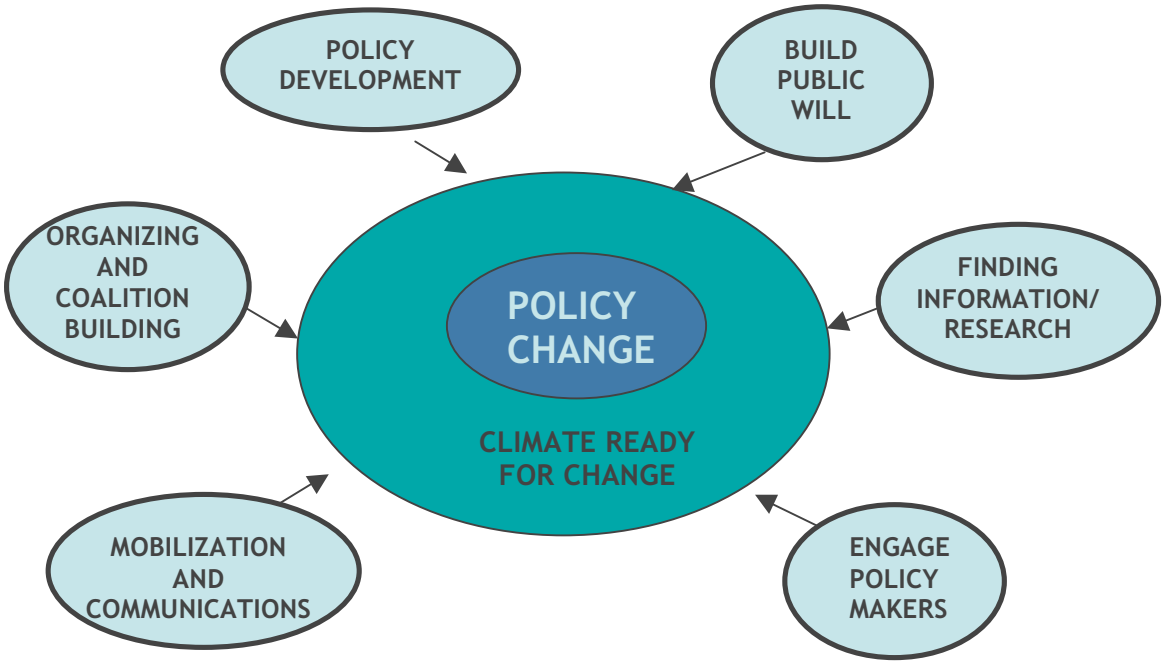
Policy advocacy describes the host of activities that individuals and groups engage in with the goal of changing government, institutional or private sector policy. While decision makers often create their own policies, the nonprofit sector has a long history of engaging in the policy process through framing policy issues, conducting policy research, disseminating information, and lobbying politicians to support their causes.

Advocacy is preeminently about persuasion—convincing legislators, city officials, heads of departments, and others with official power to put in place new or improved guidelines for investment and action. Engaging in the policy process involves a variety of steps including: defining a particular policy problem, researching and analyzing the problem and its potential solutions, selecting a campaign strategy, and implementing the campaign.

Once the advocacy strategy has been chosen, moving forward an advocacy campaign involves another set of activities focused on the "inside strategy" of getting decision-makers on board with your proposal and the "outside strategy" of engaging other advocates, the media, residents, etc. in pushing for your proposal. Activities include educating the public about the issues, communicating messages through the media, building or participating in coalitions, grassroots organizing, and directly lobbying policymakers (Figure 1).[4]

[4] PolicyLink, *Advocating for Change*, (Oakland, CA: PolicyLink, 2005)

Figure 1. The policy advocacy process



Source: PolicyLink

Although nonprofits increasingly engage in the policy process, policy advocacy and mapping remain infrequent activities for nonprofit organizations. A survey conducted by the Strengthening Nonprofit Advocacy Project (SNAP) found that advocacy was on the rise among nonprofits: 75 percent of 1,700 nonprofits surveyed engaged in public policy activities such as direct or grassroots lobbying or testifying at a legislative or administrative hearing. However, these nonprofits were engaging with low frequency and faced numerous barriers to more effective participation.[5]

Community mapping can be an extremely useful tool to build the capacity of nonprofits to effectively engage in policy advocacy. Mapping holds vast potential for advocacy because of the power of maps to both *analyze* and *communicate* complex information and relationships. Maps can add value at different stages of the policy advocacy process and for particular strategic purposes:

1) *Analyzing and identifying policy issues:* All policy campaigns begin by defining a salient social problem that policy can address. Mapping geographic data can help organizations understand conditions, articulate the nature of the policy problem, and analyze the relationships between different community factors. Some of the most important analytical functions of GIS mapping for policy analysis include:

[5] Gary D. Bass, David F. Arons, Kay Guinane, and Matthew F. Carter, *Seen but not Heard: Strengthening Nonprofit Advocacy*, (Washington, DC: The Aspen Institute, 2008)

- Showing concentrations: Maps can be used to quantify the concentration of characteristics that hinder community well-being, such as blighted properties, or document the absence of positive or protective community factors, such as the presence of grocery stores or mainstream financial services.

- Comparing places: One of the most valuable characteristics of GIS for equity analyses is the ease with which comparisons for a given indicator can be made between different geographic areas. Comparing one neighborhood to another, or to the city as a whole, can be extremely useful for illustrating differences that make the case for a particular policy change. The City Project, for example, used the indicator of park acres per thousand residents to compare park access in neighborhoods and council districts across Los Angeles (see Case Study 4). City-region comparisons can also be useful for policy efforts aimed at a regional level.

- Analyzing associations: Maps can also be used to analyze the associations between different community characteristics, such as housing values and vacant properties. Overlaying different variables can help show correlated phenomena and may indicate causal relationships and therefore potential interventions. It is important to add the cautionary note that while associations point to potential causality other methods are needed to prove causation.

2) *Engaging the community in policy research and development*: Mapping is also extremely useful for involving community members in the policy process, and there are many ways to do this. Many community-based organizations engage residents in mapping community assets and deficits. This might be a part of a community planning process where people gather around poster-sized maps to identify neighborhood issues (such as crime hot spots) and plan for how to address them. Or it might involve residents collecting data in the field, either with printed maps and clipboard or with handheld data devices, such as land use or vacancies, for use in a planning process. In the Central Valley, large printed maps served as the basis for community members to identify locations of pesticide drift and community sites (Case Study 5). Mapping can also be used to involve community members after maps have been created. Maps can inform discussions and help working groups track progress. For example, community development groups in Cleveland use maps created by the Center on Urban Poverty and Community Development at Case Western Reserve University to track their efforts to acquire vacant and abandoned properties in their neighborhoods, and the same maps are used to guide community organizing efforts.[6]

3) *Modeling and developing policy solutions:* As an analytical tool, GIS mapping can be used to model neighborhood change based on a set of indicators or to model how new or different policies can produce alternate outcomes. Advocates can use these models to illustrate that change is possible and to argue for why a certain policy solution is feasible and desirable. While this maps are not as commonly used for this purpose as

[6] Treuhaft and Kingsley, 2008.

for the other mapping purposes described here, illustrating the possibility of change can be extremely useful in policy efforts. The example of Washington DC Inclusionary Zoning (Case Study 2) describes how a coalition of advocates used mapping to show how many new affordable units would have already been created, and where, if an inclusionary housing policy had been in place between 2000 and 2003.

Neighborhood early warning systems are an example of how communities can use spatial modeling to target their efforts. First in Chicago in 1985, and then in Los Angeles in 1995, these systems were initially developed to provide communities with timely data on property conditions to help them intervene early to prevent housing abandonment.[7] The early warning system model can be useful in other issue areas too. The Center for Community Innovation at the University of California, Berkeley is in the process of developing an early warning system to indicate risk of gentrification for Bay Area neighborhoods. The system is being developed through a grant from the regional and state agencies responsible for transportation planning, and the planners engaged in the project hope that the system will be useful in targeting public investments.

4) *Communicating the message to build public and political will:* At various stages of the policy advocacy process, campaigns need to garner support from different audiences such as community residents, the business community, and policy makers. Maps and other visual representations of data can help communicate the policy problem and potential policy solutions. Well-made maps can convey large quantities of complex information quickly and easily. In Los Angeles, a community coalition used a poster-sized map illustrating development issues in the Figueroa Corridor to build support for its community benefits campaign around the Staples Center complex (Case Study 1). Community groups that have used maps to communicate about their issues often find that maps not only clearly tell their story, but they lend the group a certain level of credibility with policymakers.

Issues in Mapping for Health Equity Advocacy

Health equity is an approach that recognizes that the disparate health outcomes that we see across different population groups based on race and class stem from inequitable economic and social conditions that are systemic and largely the result of public policy choices.[8] Those who adopt this approach to improve health focus on the unequal community environments that shape the life opportunities—and health outcomes—of residents. A conceptual framework that PolicyLink developed for understanding these connectors between community factors and health defines neighborhoods in terms of their overlapping social, economic, physical, and service environments and describes

[7] Christopher W. Snow, Kathryn L.S. Pettit, Margery Austin Turner, *Neighborhood Early Warning Systems: Four Cities' Experience and Implications for the District of Columbia*, (Washington, DC: Fannie Mae Foundation, 2004), http://www.knowledgeplex.org/showdoc.html?id=39186

[8] "What is Health Equity?" retrieved January 19, 2009 from http://www.unnaturalcauses.org/assets/uploads/file/What_Is_Health_Equity.pdf

how qualities of each of these neighborhood environments may protect residents from negative health impacts or expose them to health risks.[9]

In addition to recognizing the social and economic roots of health inequities, the health equity approach also focuses on policy and environmental changes – rather than efforts focused on individuals – as the most important levers to improve health and reduce health disparities. The idea is that such changes will be more effective because they reach more people and permanently change the environments that continually influence people's choices. They are also a more efficient use of scarce public and philanthropic resources.

Because of the nature of the field, advocating for health equity presents particular opportunities and challenges for community mapping. As an incredibly well-suited tool for analyzing neighborhood environments, GIS presents one of the greatest opportunities to advocates. GIS has the capacity to capture, store, and analyze massive amounts of geographically-referenced data that are useful to the analysis of neighborhood environments. The types of information compatible with GIS that can be useful for understanding neighborhoods include: retail and business datasets that provide information on neighborhood businesses and services; demographic data at the neighborhood scale; parcel data on property conditions, such as vacancy or lead contamination; spatial data on characteristics on the built environment, such as parks and open spaces; and data on the health of individuals living in a certain community. The ability of GIS to process these diverse datasets makes it an extremely useful tool for understanding the community factors that influence health in a given area, and analyzing how environmental and policy changes could make a difference. GIS analyses can be particularly useful in addresses community health concerns through applications like the following:

- *Analyzing neighborhood access to health-promoting land uses such as supermarkets and parks:* Many researchers are using GIS mapping to understand food and physical activity environments. For example, The New York City Department of Health and Mental Hygiene analyzed rates of obesity and diabetes by neighborhood as well as the locations of grocery stores selling affordable, nutritious foods. Based on their findings, the department targeted its "Green Carts" mobile vending program to areas with high rates of diet-related disease that were underserved by fresh food retailers.

- *Targeting services, resources, and efforts to residents most in need:* Analyzing health inequities and the distribution of environmental and community assets and liabilities can help communities identify areas for strategic, targeted intervention. The HOPE Collaborative in Oakland, one of nine food and fitness collaboratives across the country funded by The W.K. Kellogg Foundation and co-convened by the Alameda County Public Health Department and the Alameda County Food Bank, provides a great example of this approach. The Collaborative analyzed health data compiled and mapped by the health department. Based on this

[9] PolicyLink, *Why Place Matters: Building A Movement for Healthy Communities*. (Oakland, CA: PolicyLink, 2007) http://www.policylink.org/documents/WhyPlaceMattersreport_web.pdf

information, they decided how to concentrate their efforts to increase access to healthy food, ensure that neighborhoods provide safe places to play and recreate, and bolster local economies in the neighborhoods where residents suffered the greatest health inequities.

- *Assessing exposure to environmental risk factors:* GIS mapping can be useful in understanding how communities are affected by environmental risk factors. Researchers Manuel Pastor and Rachel Morello-Frosch used GIS mapping to analyze neighborhood exposure to toxic facilities and air pollution in relation to race and income, and to understand who moved into and out of neighborhoods after the siting of a toxic facility.

Mapping for health equity advocacy also presents some particular challenges. These can include issues like following:

- *Data access and quality.* There are limitations with many of the datasets that are most useful to the analysis of health and place. Some of the most relevant data are unavailable due to confidentiality restrictions, others are very costly, inaccurate, or outdated.

  Health data: Because of the confidentiality of individual health data, data from large health surveys or hospitalization records are oftentimes not available at small geographies (such as census tracts) or with geographic identifiers such that the researcher could link the person to their neighborhood. The California Health Interview Survey, for example, provides data at the county level, which is too large for an analysis of neighborhood environments. One must apply to access the data at finer geographic levels.

  Business data: Data on local businesses is important for understanding the neighborhood economic context, but this data is often inaccurate at the neighborhood scale and/or expensive. Health equity researchers will most typically need data for a particular type of business (such as liquor stores) and the data needs to be accurate at the neighborhood level. Assessments have found that typical datasets such as those prepared by Dunn and Bradstreet are highly inaccurate at the neighborhood level.

  Demographic data: Information on neighborhood demographics such as poverty, income, vehicle ownership, and race is at the core of a health equity analysis. The U.S. Census provides the most accurate and consistent information and is available down to the block group level (an area with about 1500 people) for most indicators. But the most recent census data is from ten years ago, and neighborhoods can change a great deal in a decade. Luckily, the 2010 census is approaching to rectify this challenge. Additionally, the American Community Survey will replace the long-form census and hopefully provide more frequent updates of data at the neighborhood level.

- *Measuring disparities and access.* Beyond the data issues related to health equity analysis, there are methodological challenges with measuring relationships between individuals and their environments. Standards exist for some variables, for many others, there is no consensus about how to measure access and proximity. In addition, the mobility of residents and how it differs across households is a critical variable that is often inadequately captured.

- *Proving causality.* Lastly, the causal linkages between the associations that GIS analysis can so powerfully illustrate are not easy to prove. While there are clear relationships between certain neighborhood factors and health (for example, the presence of supermarkets in a community and obesity), the pathways by which environmental features like supermarkets, eating and shopping behaviors of residents, and health outcomes are complex.

Case Studies

Case Studies: Using GIS Mapping for Policy Change

The following examples illustrate how maps can fit into different stages of policy research and advocacy. Table 1, below, summarizes the mapping examples with respect to their issue area, type of policy activity, and uses.

Table 1. Examples of Mapping for Policy Change

Example	Issue area	Mapping was used to:
Organizing for Community Benefits in Los Angeles	Economic Development	○ Describe ownership patterns and development opportunities ○ Communicate inequities and community needs ○ Illustrate campaign victories
Establishing an Inclusionary Zoning Policy in Washington DC	Housing	○ Illustrate current and planned housing development in the city ○ Model how an inclusionary housing policy could lead to the construction of additional affordable units throughout the city ○ Communicate the policy problem and IZ solution to residents and policy makers
Analyzing Food Deserts and Health in Chicago	Food access	○ Measure neighborhood access to healthy food retailers ○ Compare access across neighborhoods according to racial composition ○ Document relationship between diet-related health and food access
Advocating for Park Equity in Los Angeles	Park access	○ Measure neighborhood access to parks ○ Compare access across neighborhoods according to race/ethnicity, poverty, percent children, and access to a car

		o Determine if a neighborhood is above or below the county average o Calculate park acreage per 1,000 residents
Public Participation GIS to Reduce Pesticide Exposure Among Farmworkers in California's Central Valley	Environmental health	o Quantify pesticide application in two counties and six study communities o Combine community and public data about community conditions o Advocate for improved pesticide drift policy and creation of pesticide-free buffers around schools

Case Study 1: Organizing for the Country's First Community Benefits Agreement, Los Angeles

One of the premiere examples of mapping for policy change comes from an effort to fairly distribute the benefits generated from the construction of the Staples Center Sports Complex in downtown Los Angeles. This effort was spearheaded by Strategic Alliance for a Just Economy (SAJE), an economic justice and popular education center that has been building economic power for working class people in Los Angeles since 1996. SAJE sought to leverage the development to gain jobs and other benefits for local residents. In 2001, the organization spun off a new group, the Figueroa Corridor Coalition for Economic Justice (FCCEJ), devoted entirely to ensuring just development of the 40-block strip, also known as the Figueroa Corridor, where the Staples Center was sited to be built. FCCEJ successfully negotiated the nation's first comprehensive community benefits agreement. Many factors contributed to the campaign's success, but FCCEJ's clear understanding of the complex web of land ownership along the Figueroa Corridor was paramount. The group used mapping to turn their knowledge into action and mobilize grassroots support.

The site of the Staples Center is surrounded by poor and working-class neighborhoods comprised of 200,000 residents that have historically been left out of development decisions in the area. In 1999, the city and private developers announced plans to create a regional sports and entertainment district along the corridor as part of an urban revitalization effort. The development project would be catalyzed by a large subsidy provided by the City of Los Angeles. Recognizing the need to guard against speculation and potential displacement and to ensure that residents benefited from the influx of investment brought by the new complex, residents organized themselves and formed the FCCEJ. Twenty-five diverse organizations and thousands of residents came together to successfully ensure that the billions of dollars being spent on revitalization resulted in tangible benefits for the surrounding community.

Organizers created a poster-sized map of the neighborhoods adjacent to the proposed new development illustrating real estate ownership patterns and development "hot spots." They used the map to communicate the issues to residents and mobilize grassroots

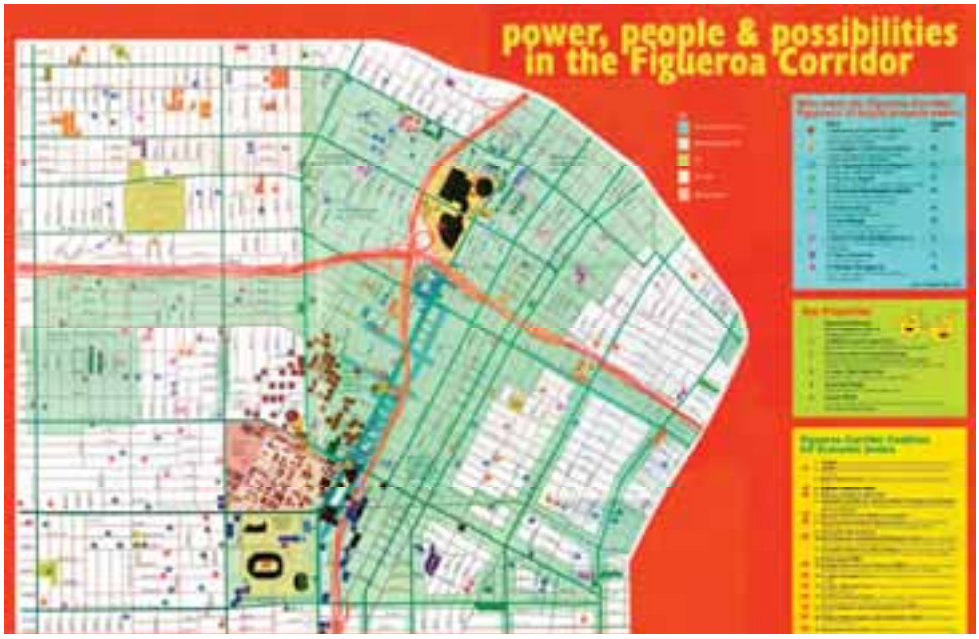
support for their efforts to secure a contractual agreement with the developers, the Los Angeles L.A. Arena Land Company and Flower Holdings, LLC. In May 2001, the Coalition won an historic Community Benefits Agreement, requiring the inclusion of affordable housing, living wage jobs, local hiring, parks as well as other benefits in the $1 billion, four million square foot LA Sports and Entertainment District project. Key features of the Community Benefits Agreement included:

- Living Wage Jobs: 70% of new jobs will be unionized and/or pay a living wage.
- Local Hiring/Job-Training: 50% of new jobs will be hired locally through a community-run job training and placement center funded with $100,000 in seed money from the developer.
- Affordable Housing: A minimum of 20% of housing units must be affordable to low income people.
- Parks and Recreation: The developer will provide $1 million for parks and recreation facilities within a one-mile radius.
- Environmental Planning: An ongoing Coalition Advisory Committee will address such issues as construction, traffic, pedestrian safety, waste management, air quality and "green" buildings.
- Parking: The developer will help establish preferential parking and pay resident parking costs for 5 years.

Implementation of the agreement is already underway. In 2005, Anschulz Entertainment Group joined forces with the Coalition to ensure that developers were held to the affordability standards outlined in the pact. To date, outcomes include:

- $650,000 in zero-interest loans made to two non-profit housing development corporations.
- The opening of the city's first poor people's Preferential Parking District, dedicating evening parking to area residents.
- 30 people have already obtained living-wage union jobs through the Figueroa Corridor Community Jobs Program.
- Ground-breaking for a 500 unit student housing complex happened in Spring 2008, generating an obligation for 100 units of housing that is affordable to low-income people.
- Under the leadership of the Environmental Justice Office of Environmental Defense (a founding Coalition member) and Coalition L.A., hundreds of residents participated in a park planning process to guide investment in the area, resulting in a $500,000 commitment for a free family recreation center and an approximate $415,000 commitment to Hope and Peace Park in Pico Union.

Figure 2. Figueroa Corridor Coalition for Economic Justice's organizing map



Source: Figueroa Corridor Coalition for Economic Justice

Since the Staples Center CBA, the group has continued to use mapping to inform its activities. In 2007, they created a new map, this time in blue, that depicts the coalition's victories.

Figure 3. Later Figueroa Corridor Coalition for Economic Justice map

Case Study 2: Establishing an Inclusionary Zoning Policy in Washington DC

In 2003, DC ACORN, DC Agenda, the Coalition of Nonprofit Housing, Empower DC, and the AFL-CIO Washington DC Metro Council asked PolicyLink to help them launch an inclusionary zoning campaign in the district. For three years, PolicyLink helped build the capacity of the diverse coalition, which called itself the DC Campaign for Mandatory Inclusionary Zoning, to move this policy agenda. Mapping was incorporated into the campaign as an important analytical and communications tool that helped the coalition eventually achieve its policy goal.

The need for an inclusionary housing policy in the District emerged over the past five years, as an economic renaissance brought a surge of both public and private investment to the area. Along with this reinvestment came rising housing prices and gentrification pressures. As a result, DC currently faces the challenge of managing growth in a way that spreads opportunity to the city's lower income residents and disinvested neighborhoods. As in most cities across the country, many District families cannot find affordable housing because their incomes have not kept pace with housing prices. From January 1999–March 2003, the sale price of homes rose four times faster than income, and the price of rentals rose three times faster. A household in DC would need to earn $85,052 to afford the purchase of an average-priced home, and $72,160 to afford an average-priced rental, but the median household income is only $52,300.

Coalition members recognized that sustainable solutions to the city's housing crunch would require more than increasing the supply of affordable homes. Pricing comprises only part of the picture, as many poor neighborhoods' locations can constitute isolation from living wage jobs, quality education, adequate health services, and protection from crime. The 2000 Census revealed an increase in high-poverty neighborhoods in the District, partly attributed to lower income residents being displaced from gentrifying neighborhoods into poorer ones with fewer social services.

Inclusionary Zoning (IZ) has the potential to change this dynamic by producing a more equitable distribution of affordable housing units. IZ requires developers to make a percentage of housing units in new residential developments affordable to low- and moderate-income households. In exchange for building these units, they receive non-monetary compensation that reduces their construction costs, such as density bonuses, zoning variances, and/or expedited permits.

The DC IZ campaign included the production of a report, *Expanding Housing Opportunity in Washington DC*, which outlined the policy problem and presented mandatory IZ as the policy solution. As part of the campaign's strategy, PolicyLink developed a series of maps that analyzed the policy problem and modeled how IZ could result in the production of additional affordable units in neighborhoods throughout the

city. These maps were included in the report and have been used by the campaign coalition to communicate problems and propose solutions to the City Council and other policy makers.

The series of maps included:

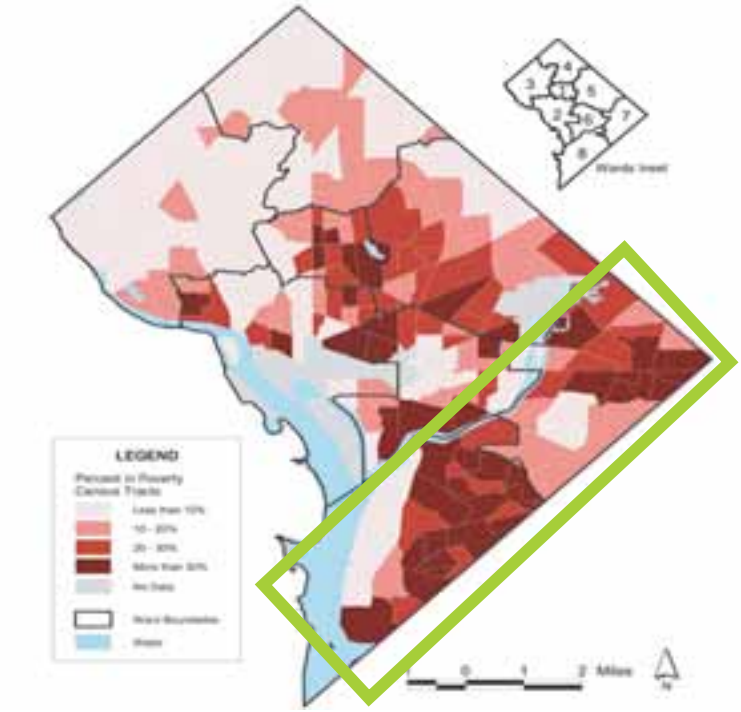
- A map that illustrated the distribution of current and planned residential construction in the city, based on data contained in the DC Office of Planning's Development Activity Database (Figure 3, below). The map showed that development is occurring in most parts of the city, but that almost all of the market rate housing development is occurring west of the Anacostia River, while most of the affordable units are located east of the river in Wards 7 and 8, the poorest communities in the District.

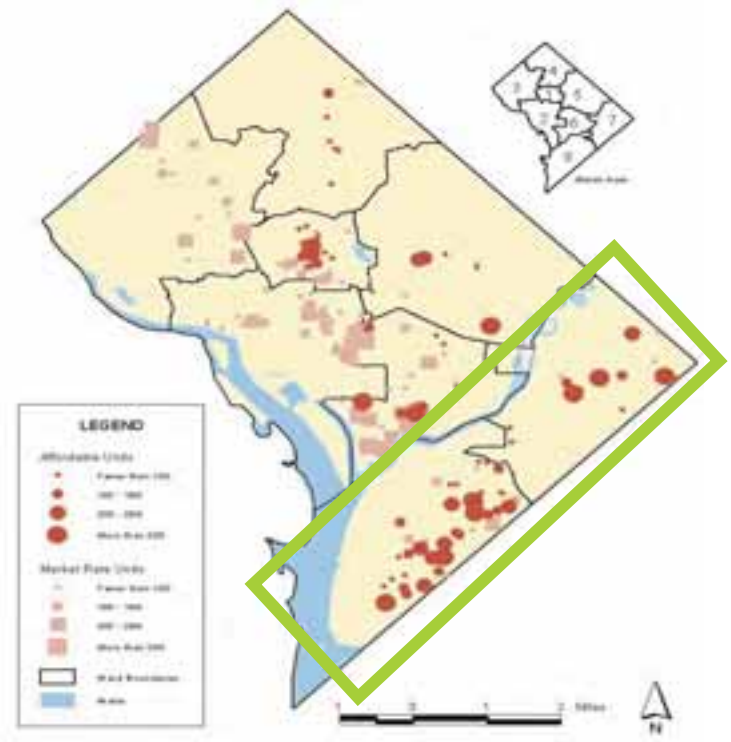
- A map that shows how a mandated IZ policy could help generate additional affordable units and alter the distribution of affordable units in the District (Figure 4, below). Based on current development patterns, an IZ policy that required developers of 10 or more units to make 15 percent of them affordable to low- and moderate-income families would have created 2,336 new affordable units between 2000 and 2003. These units would be built in the same locations where market-rate housing is being built: presumably, in supportive, livable neighborhoods.

The campaign was ultimately successful. In August 2006, the DC Zoning Commission issued an historic ruling establishing a mandatory IZ policy in the nation's capital. The District's new IZ policy requires that half of the units be built at 50 percent of the area median income (AMI) and half at 80 percent of the AMI, except for high-rise development in mixed-use commercial zones where all units will be at 80 percent of the AMI. To reach deeper levels of affordability, the housing authority or a third party—which could be a community land trust or another qualified nonprofit organization—can purchase up to 25 percent of inclusionary units for the purpose of renting them to lower-income households.

With the policy passed, the coalition moved into a phase of advocacy focused on implementing IZ. Attention has shifted to the DC Office of Planning, as it develops and implements workable inclusionary-zoning practices in the city.

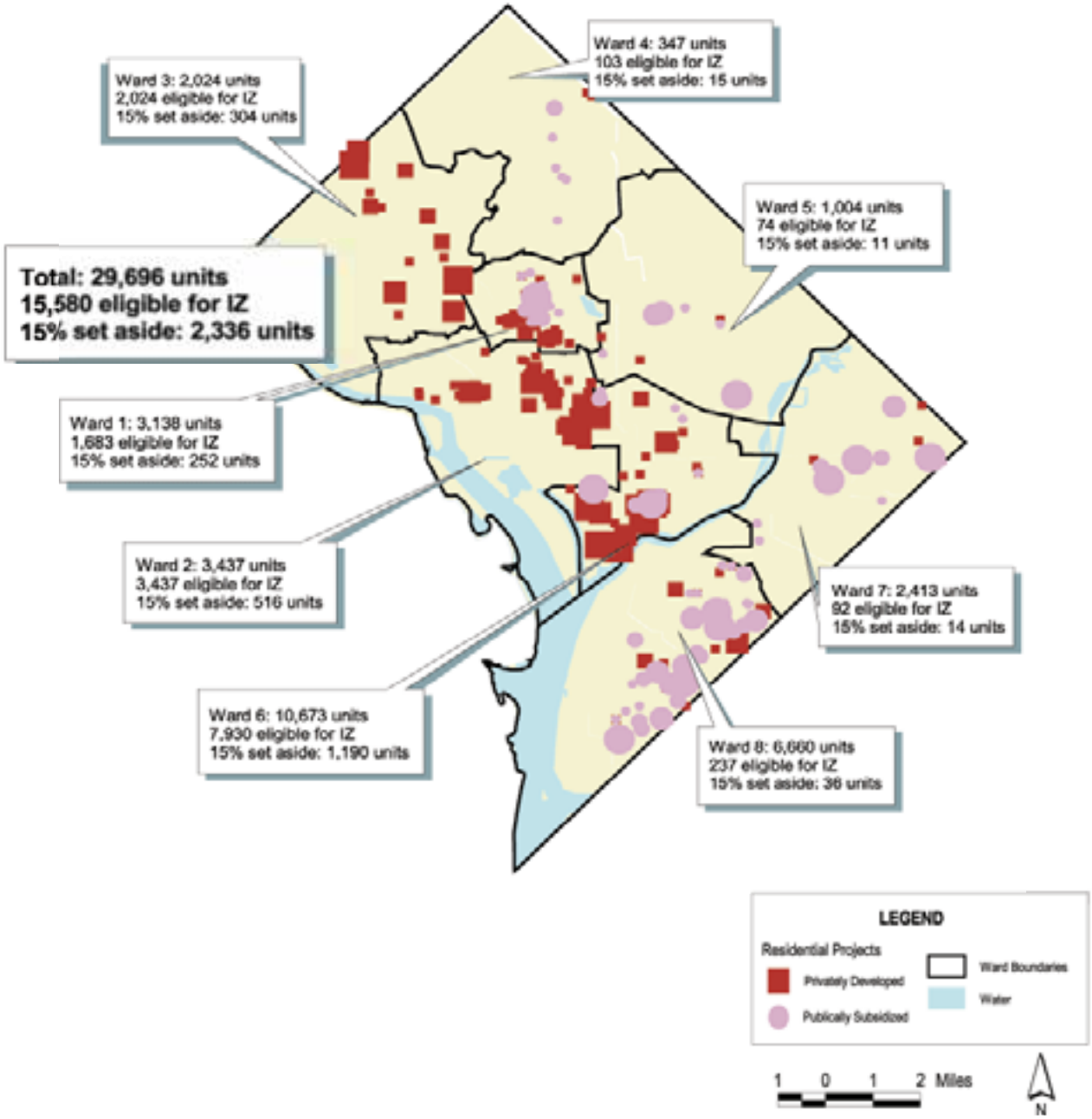
Figure 3. Neighborhood Poverty and Housing Production in Washington DC, 2000-2003





Source: Development Activity Database, DC Office of Planning, January 2000-May 2003. Prepared by PolicyLink, 2003.

Figure 4. Modeling the Effects of an Inclusionary Housing Policy in DC, 2003



Source: Development Activity Database, DC Office of Planning, January 2000-May 2003. Prepared by PolicyLink, 2003.

Case Study 3: Analyzing Food Deserts and Health in Chicago

One of the most productive areas for the use of GIS mapping in public health is in understanding the local "food environment" and its implications for health. Many studies have documented how access to supermarkets and other retailers selling fresh food varies

across given communities based on neighborhood income or racial composition. Others have examined the mix of food retailers (corner and convenience stores, fast-food restaurants, grocery stores, and so on) in relation to community characteristics. Some of these studies go on to examine the relationship between food access and eating behaviors and/or diet-related health conditions like obesity and diabetes. Such studies, some of which use a participatory "community food assessment" methodology, have been conducted at the community level by local government agencies and private and academic institutions.[10]

Examining the Impact of Food Deserts on Public Health in Chicago, written by Mari Gallagher of Mari Gallagher Research and Consulting in partnership with the LaSalle Bank Corporation, was a breakthrough study and an important precedent for further research. Released in 2006, the study popularized the term "food desert" in the United States. The term was originally coined by a resident of a public-sector housing scheme in Scotland in the early 1990s to describe an area with poor access to fresh foods. Gallagher leveraged her experience in community economic development and grocery retailing to describe the challenge of food access in Chicago's low-income and minority neighborhoods, using maps to tell a clear and compelling story about Chicago's uneven retail landscape and its impacts on health.

The analysis was based on three types of information:

- Retail data: Food venue data from Reference USA and other sources;
- Neighborhood data: Income and racial characteristics from the U.S. Census;
- Health data: Body-mass indices from drivers' license data, death records from the county recorder, and cardiovascular diseases from the city's Health Department.

The components of the analysis included:

1. Quantifying access to different types of food venues (chain grocers, independent and small grocers, and fast-food restaurants) at the census block level and assessing how access varies based on neighborhood racial composition;
2. Calculating a "food balance score" for every census block. The food balance score is the distance to the nearest grocer divided by the distance to the nearest fast-food venue;
3. Analyzing the relationship between food access and health.

Food access was mapped and analyzed at three different geographies: census tracts, zip codes, and official City of Chicago Community Areas (defined by the city's Planning Department). The analyses of health variables and food access were conducted on groups of census tracts, zip codes, and community areas segmented by neighborhood racial composition.

The study found that there were major disparities in access to grocery stores according to neighborhood racial composition, as well as statistically significant relationships between food access and health:

[10] K. Pothukuchi, "Community Food Assessment: A First Step in Planning for Community Food Security," *Journal of Planning Education and Research* 23 (2004): 356–77.

- African American communities face the worst food access challenges in Chicago. All the food desert areas are predominantly African American. Moreover, African Americans have the lowest average access to grocers, while they have equal access to fast-food venues (Figure 5).
- There are three large food deserts—large geographic areas with no or distant grocery stores—in Chicago, containing a total of nearly half a million people (Figure 6).
- Residents of Chicago's food deserts have worse diet-related health outcomes compared to Chicagoans not living in food-deprived areas (Figures 7 and 8).

Figure 5. Relative distance in Chicago by race

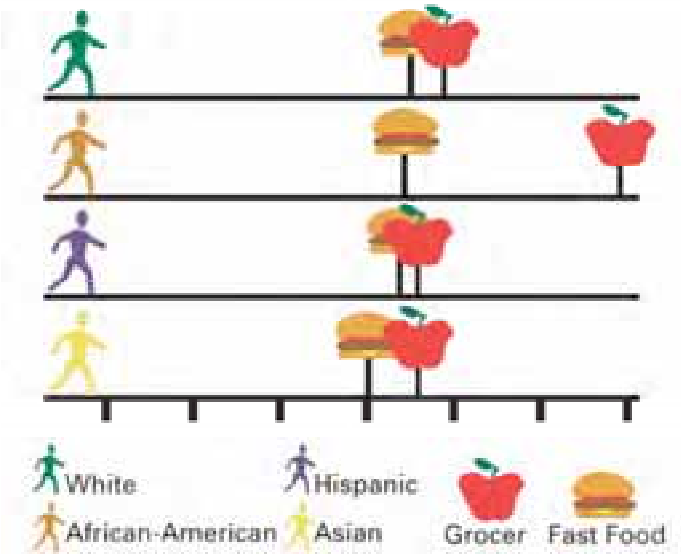
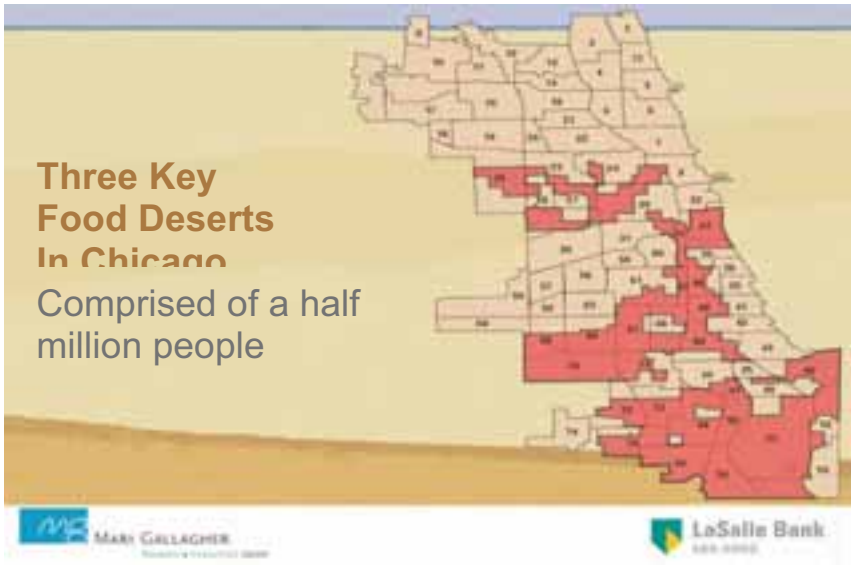
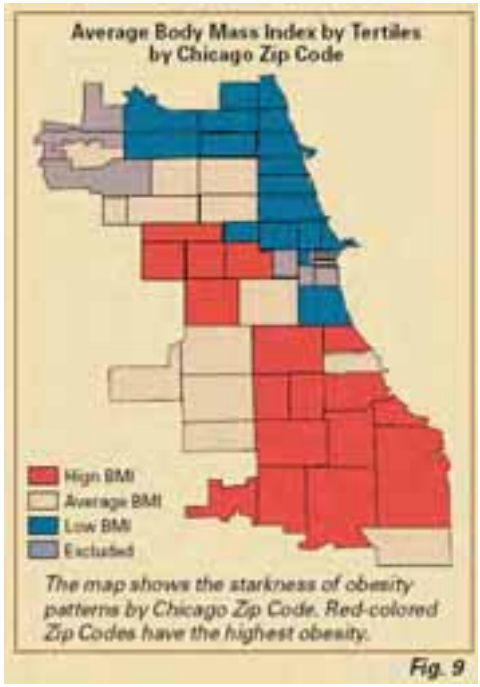


Figure 6. Food Deserts in Chicago, 2006



Source: Mari Gallagher Research and Consulting Group, 2006

Figures 7 and 8. Food Balance and Obesity in Chicago, 2006



Worst Food Balance Scores

Source: Mari Gallagher Research and Consulting Group, 2006

In Chicago the report has led to positive efforts to highlight the issue of food deserts and attract grocery stores to food desert areas:

- Immediately after the release of the report, the Chicago Grocery Access Task Force was convened to make recommendations to the city council. The task force comprised five aldermen, Mari Gallagher and another researcher (Daniel Block), two representatives from the grocery industry, and a children's advocate.[11]
- In September 2006 Food 4 Less opened a store in the Englewood food desert, and in summer 2008 Growing Home, a community group that focuses on training homeless and low-income Chicagoans for jobs in urban agriculture and food-based businesses, opened a farmers' market in the community.
- In February 2006 and again in February 2007, the city and World Business Chicago cosponsored a Chicago Grocery Expo to encourage large and midsize grocery chains to invest in inner-city communities. The exposition introduced grocers to potential sites and provided information about various business assistance and community-development financing programs available to them.
- In 2008 Chicago city planners used a September 2008 updated food desert calculation (including all mainstream grocers that have moved in and out of Chicago since the 2006 study), along with an analysis of public-health impact and market strategy, to prioritize six key sites for grocery stores (Figure 9, below).

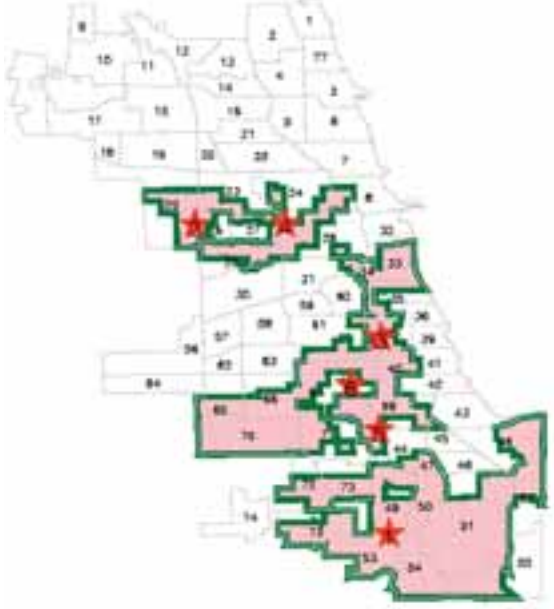
[11] Chicago Grocery Access Task Force, "Chicago Grocery Access Task Force Declarations and Recommendations," http://www.marigallagher.com/site_media/dynamic/project_files/Chicago_Grocer_Access_Task_Force_Recommendations_.pdf, February 6, 2009 (accessed January 19, 2009).

- The city established the Grocery-Anchored Retail Loan Program to help finance grocery-anchored mixed-use retail developments within food deserts. The loans offer below-market interest rates, loan-to-value ratios up to 95 percent of development costs, and potential partial debt forgiveness.[12]

Since the landmark Chicago study, Gallagher has gone on to map food deserts in Louisville and Detroit. The Detroit analysis found that more than 550,000 Detroit residents live in food deserts where they must travel at least twice as far to reach the closest mainstream grocer as to reach the closest "fringe food" location. The study also highlighted the high proportion of USDA food-stamp retailers that are "fringe outlets," specializing in alcohol, money orders, cigarettes, lottery tickets, and other nonfood products, and offer few fresh healthy options (Figure 10, below).

These food desert studies have garnered widespread media attention and have popularized the notion of food deserts, moving the issue of food access into local and national policy debates. Over the past several years there have been many local food-access studies conducted by academic researchers, community groups, and public-health officials, many of which borrow from Gallagher's methodology. In addition, a nationwide study of food deserts is forthcoming. The Chicago food desert study prompted Congressman Bobby Rush, who represents Chicago's South Side, to propose the inclusion of a national study of the issue in the 2008 Farm Bill. PolicyLink and other groups successfully advocated to keep the provision in the legislation, and this study will be completed by USDA in June or July 2009.

Figure 9. Prioritized Grocery Store Sites in Chicago's Food Deserts, 2008



Source: Mari Gallagher Research and Consulting Group, 2008

[12] Grocery-Anchored Retail Loan Program, "Chicago Development Fund Food Desert Areas," http://egov.cityofchicago.org/webportal/COCWebPortal/COC_ATTACH/CDFEligibility_Map_Food_Desert.pdf (accessed January 19, 2009).

Figure 10. “What’s for dinner?”: Fringe and Mainstream Retailers in Detroit

Gallagher does not identify her firm as an advocacy organization but rather as a research institute that provides quantitative and qualitative research to inform private- and public-sector decision-making in realms related to urban development and community health. Gallagher is acutely aware of the power of maps to tell a story about our society, and believes strongly that mapmakers must use the best methods available for ensuring that the picture they present is the most honest and most truthful one that they can create. She also recognizes that maps are most powerful when they are clear and compelling, which requires translating what is learned through cartographic and statistical methods into graphic representations that translate to a broader audience.

Case Study 4: Advocating for Park Equity in Los Angeles

Parks and open spaces are important components of healthy, livable neighborhoods. They provide places for kids to play and for adults to recreate, socialize, exercise, and relax, contributing to physical and mental health. As green spaces, they also contribute to the health of the air and water. But many cities lack adequate park and open space facilities, and of these valuable amenities that do exist, most are distributed unevenly across neighborhoods. Too often, low-income neighborhoods and communities of color—home to the same residents that often face health disparities related to obesity and cardiovascular health—lack safe, attractive parks and other neighborhood features that enable and encourage physical activity.

Community mapping can be a powerful tool for understanding how a city and its neighborhoods are served by public amenities and services and planning for future developments and investments. Equity advocates have used GIS mapping to perform sophisticated analyses of neighborhood deficits and assets, and in a number of cities advocates have used GIS to analyze the distribution of parks and park resources. Once the green spaces are included in a GIS database, comparisons can be made to a given standard, between city neighborhoods or between a given neighborhood and the city as a whole.

The work of The City Project, a nonprofit organization that promotes healthy and livable neighborhoods for all in Los Angeles through policy and legal action, exemplifies how mapping and data analysis can make a real difference when it comes to parks in underserved communities. Led by Robert Garcia, a civil rights attorney and indefatigable social justice advocate, The City Project has used GIS mapping to support its work over the past nine years. The group initially adopted the technology to prove their observation that there was inequitable access to green spaces in LA county and back their observation with hard numbers and statistics.

Recognizing that GIS mapping would provide critical data to inform its legal and policy advocacy efforts, but that their own staff did not possess this technical expertise, Garcia reached out to GreenInfo, a Bay Area nonprofit that provides GIS services for other nonprofits. One of the first maps that the group created was a comprehensive examination of green infrastructure in Los Angeles (Heritage Parkscape Map, Figure 11).

With GreenInfo's assistance, The City Project undertook a comprehensive park equity analysis for Los Angeles county that included the following components:

1. Analysis of park location in relation to neighborhood characteristics including poverty, percentage of youth, race/ethnicity, and access to a car, mapping each variable individually
2. Categorization of each neighborhood (census tract) in relation to the county average for each of the four abovementioned variables
3. Creation of composite measures of disadvantage based on the number of variables for which the neighborhood was above the county average
4. Comparison of park access measures across racial/ethnic groups to assess disproportionate access
5. Calculation of park acres per thousand residents (a widely used standard) for cities and political districts
6. Mapping of child obesity by assembly district
7. Analysis of agency budget and bond allocations for urban parks.

The data used for this analysis included:

- Park data: A layer was created by professor Leo Estrada and Eric Lomeli of UCLA using state and local data
- Neighborhood data: Income and racial characteristics from the US Census
- Health data: Child obesity data for assembly districts from the California Center for Public Health Advocacy

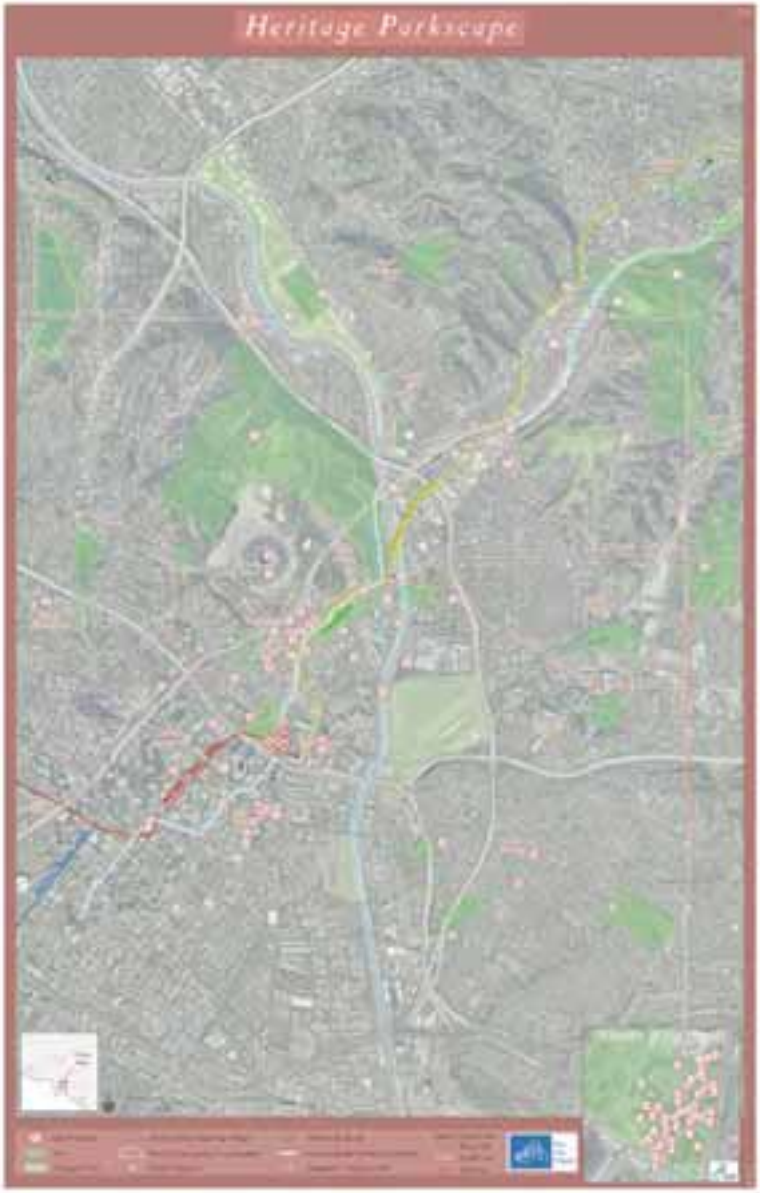
The report *Healthy Parks, Schools, and Communities: Mapping Green Access and Equity for the Los Angeles Region* presents the mapping and data analysis. Findings included:

- As a whole, Los Angeles County is park poor. 101 of the 131 analyzed communities fall below the national average of 6–10 acres of parks per thousand residents.
- There are wide disparities in park acreage across neighborhood, political, and administrative boundaries in Los Angeles. Some of the healthiest cities have well

over 400 acres per thousand residents, while some impoverished communities had less than one acre per thousand residents.

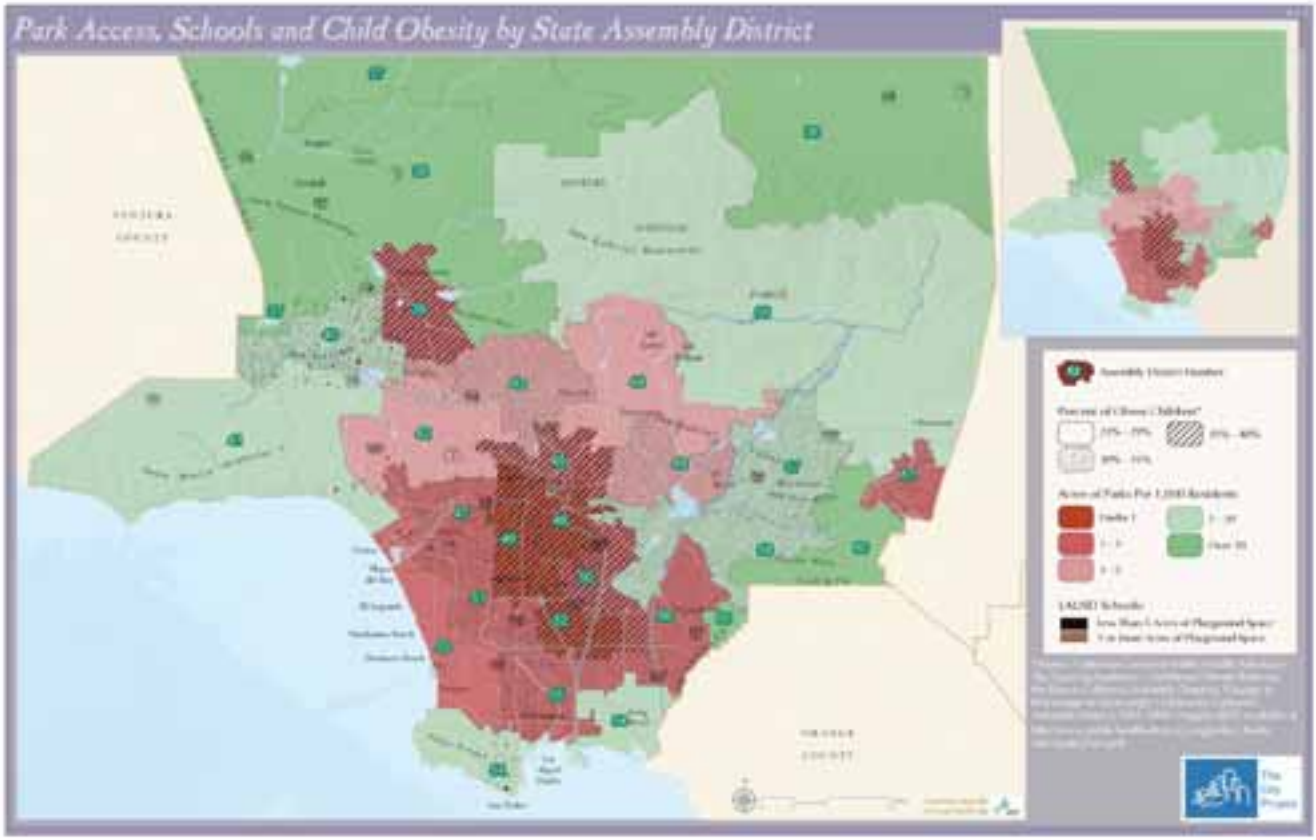
- The state assembly districts with the highest levels of childhood obesity were also had low park access (Figure 12).
- The distribution of parks and recreation is not random with respect to neighborhood racial composition: communities of color in Los Angeles have worse access to natural public places compared to predominantly-white neighborhoods. Children of color living in poverty with no access to cars have the worst access to parks, and to schools with five acres or more of playing fields, and the highest levels of obesity (Figure 13).

Figure 11. Heritage Parkscape Vision Map, 2004



Source: The City Project, 2004

Figure 12. Park Access, Schools and Child Obesity by State Assembly District



Source: The City Project, 2006

The report was presented to the full Los Angeles City Council on March 18, 2008 along with a letter outlining ten recommendations for park planning in the city.[13] One of the recommendations was about how to target park funding should be allocated based on need as defined by relative park access (less than 3 acres per thousand residents) and poverty level (100 to 300 percent of poverty).

The City Project has used GIS mapping and data analysis to assess the current state of access to natural places in Los Angeles against its vision for healthy communities, and use objective data on levels of access to advocate for policies that increase equitable access to green infrastructure. Having solid numbers that demonstrate inequitable access has helped the organization talk to officials about the state of park equity in the county and hold them accountable for improving access. The data and maps have served as a critical information base for The City Project's advocacy and organizing efforts, which include engaging communities, working in coalitions, taking legal action, and informing policymakers. And they have helped the group focus local media attention on the issue of park access.[14]

[13] Letter re: Healthy Parks, Schools, and Communities Presentation before the City Council, retrieved January 19, 2009 at http://www.cityprojectca.org/blog/wp-content/uploads/2008/03/city-council-healthy-parks-schools-communities.pdf

[14] Deborah Schoch," How can L.A. create better places to play?" Los Angeles Times, June 1, 2007, retrieved January 19, 2009 at http://www.cityprojectca.org/blog/archives/356

Figure 13. Park Access and Schools for Children of Color Living in Poverty with No Access to a Car

Source: The City Project, 2006

Campaigns informed by the group's mapping and data analysis include:

- Creating the Los Angeles State Historic Park (Cornfield) in 2004 by halting plans for a warehouse project and securing $32 million in state funds to bring a new park to a low-income community of color in downtown Los Angeles adjacent to the Los Angeles River.
- Advocating for the inclusion of active playfields in the park plan at Taylor Yard, an abandoned rail yard about two miles north of Cornfield along the river, that was purchased by the state for park development.
- In Baldwin Hills, an historic African-American neighborhood, working with Concerned Citizens of South Central Los Angeles, Community Health Councils, members of the community, and various agencies in order to prevent various proposals for environmentally harmful uses and building a two-square-mile park instead.
- Building a new park in the East Los Angeles community of Ascot Hills on 140 acres of surplus land owned by the City of Los Angeles and managed by the department of water and power.
- With Native American Acjachemen people, protecting the sacred sites of Panhe and San Onofre State Beach for public access and preventing the development of a toll road (Figure 14).
- With allies including the Alianza de los Pueblos del Rio, greening the Los

Angeles and San Gabriel Rivers and creating a new urban park at Griffith Park.

- Ensuring that over $20 billion in infrastructure bonds for parks and schools are invested in park poor and economically poor communities.

Figure 14. San Onofre State Beach Campaign Map: Green Access, Child Obesity, Youth, Poverty, People of Color by County, 2008

Source: The City Project, 2008

The City Project continues to press for park equity in Los Angeles, and has begun to map park equity throughout the state of California. The San Onofre example above illustrates

the analysis they are conducting at the county level, and they are currently producing maps for all census tracts in the state.

One of the key lessons from the work of The City Project and other groups that use maps to pursue legal strategies is the importance of collecting and analyzing demographic data on race/ethnicity. Disparate impact on protected classes serves as the legal standard for civil rights violations according to Title VI, and while minority status and economic disadvantage are highly correlated, racial and ethnic minorities are protected classes while impoverished is not a protected class.[15]

Case Study 5: Public Participation GIS and Pesticide Exposure Among Farm workers in California's Central Valley

Exposure to pesticides is an everyday occupational hazard for farm workers active on farms in the United States. Despite the increasing popularity of organic foods, 99.5 percent of farmland is cultivated with conventional techniques,[16] and nearly 190 million pounds of pesticides were applied to California crops in 2006.[17] One of the most productive agricultural regions in the country, California's Central Valley employs many farm workers, the vast majority of whom are Latino immigrants. Farming is one of the most dangerous occupations in the country, and exposure to pesticides and the associated risks of chronic disease are a growing concern at the community level for farm worker and among health professionals.

In 2007 a university-community partnership between the California Center for Rural Policy and the Institute for Spatial Analysis, both at Humboldt State University, Arcata, and Poder Popular, a community-based group established to empower California's farm worker communities, undertook a year-long participatory research project using public participation geographic information systems (PPGIS) and other methods to understand pesticide drift and farm worker health in two counties in California's Central Valley. (Note: All maps, reports, and educational materials created for this project can be downloaded at the following website: http://www.peopleplaceandhealth.org/). PPGIS is a process for engaging community residents in the gathering and analysis of geographic data in order to understand local issues and take action. It is a community-based participatory research methods in which residents participate by posing research questions, collecting relevant data, sharing community data they have based on lived experience, and using the results of the study for their own purposes. The value of this approach is that it allows community members to define issues based on their own observations and experiences.[18]

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[15] See the "Mapping Race" section of the website for the Legal Services of Northern California for more information about GIS mapping and race-based advocacy: http://lsnc.net/equity/mapping-race-gis-resources/.
[16] USDA, "Organic Production," http://www.ers.usda.gov/Data/Organic/index.htm#tables (accessed January 19, 2009).
[17] California Department of Pesticide Regulation, 2006.
[18] Sheila Lakshmi Steinberg and Steven J. Steinberg, *People, Place and Health: A Pesticide Atlas of Monterey County and Tulare County, California*, 2008, http://www.peopleplaceandhealth.org/. OR http://hdl.handle.net/2148/429.

The goals of the project were several: to understand the environmental and social conditions in the study areas; to analyze patterns in land use, pesticide use, illness, and perceptions of health; to integrate the research into Poder Popular's activities; and to provide the farm worker communities with information to use to improve their own social and environmental contexts.

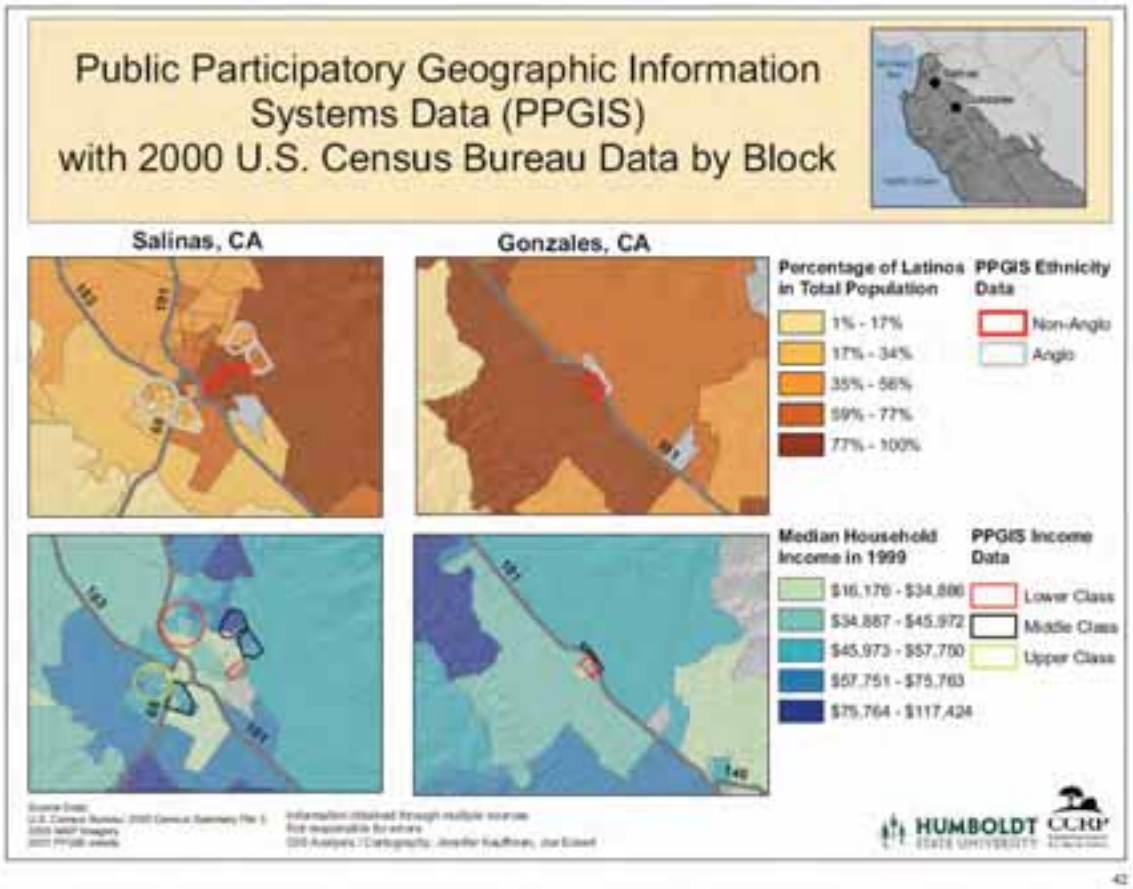
The mixed-methods approach included a spatial-analysis component and a qualitative component. The mapping part of the project included quantitative data analysis and participatory community mapping sessions. Activities included:

1. Assembling a GIS database with the following data:
    - Pesticide data: from the 2005 Pesticide Use Database from the California Department of Pesticide Regulation (DPR). Data was available for sections of approximately one square mile, so pesticides were mapped in pounds of active ingredient applied per square mile, and total amount in pounds applied per square mile;
    - Land use data: from the Monterey and Tulare County Assessors and the California Department of Conservation;
    - Topographic data: from the 10m National Elevation Dataset;
    - School-location data: from multiple sources;
    - Weather data: more specifically, wind direction and speed from the National Weather Service National Digital Forecast Database for July 1–7, 2006.
2. Mapping pesticide application data (total pesticides and individual active ingredients) and prevailing wind data for counties and study communities.
3. Conducting a spatial analysis of the amount of agricultural land located within a quarter-mile buffer zone around schools in the study-area communities.
4. Holding three community mapping sessions (in Salinas, Fresno, and Visalia), in which residents identified various community locations (ethnic neighborhoods, play spaces, health care facilities, churches, parks, schools, housing) and pesticide drift on large printed maps of the study communities. Figure 15, below, illustrates how the participants identified ethnic communities in comparison to the U.S. Census data on race/ethnicity of area residents.

A "pesticide atlas" was created that includes the results of the mapping analysis combined with quotes from interviews.[19]

[19] Sheila Lakshmi Steinberg and Steven J. Steinberg, *People, Place and Health: A Pesticide Atlas of Monterey County and Tulare County, California*, 2008, http://www.peopleplaceandhealth.org/. OR http://hdl.handle.net/2148/429.

Figure 15. PPGIS Data and Census Data on Ethnic Communities in Salinas and Gonzales

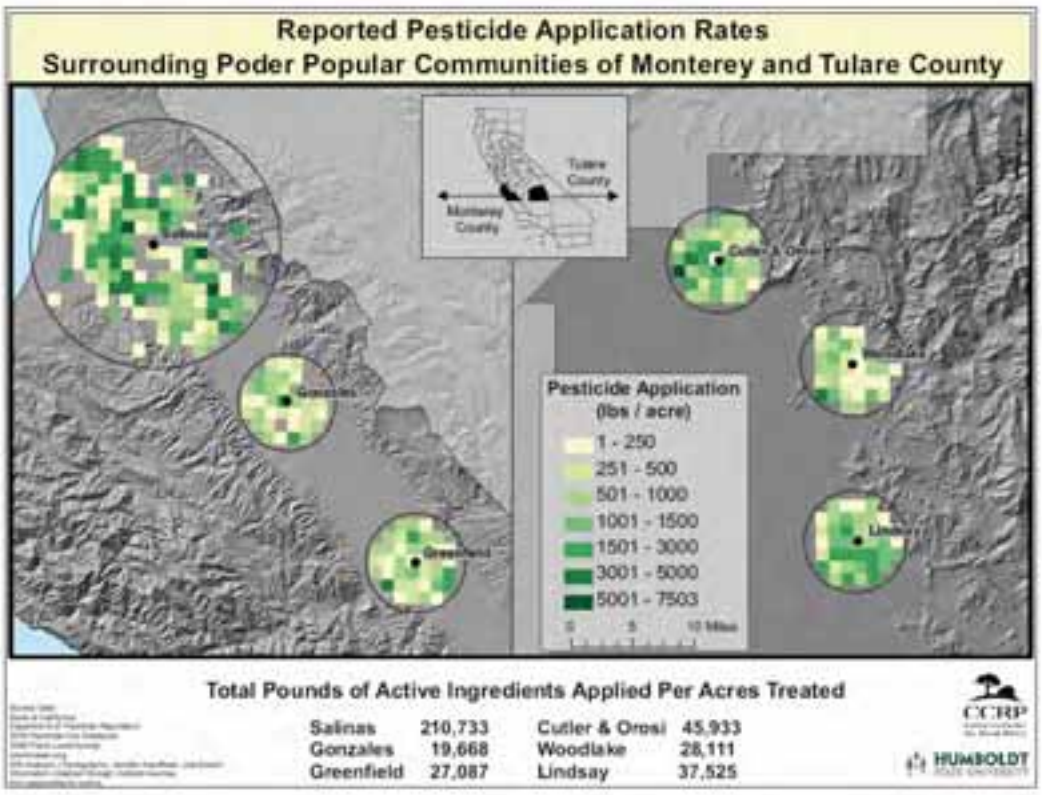


Source: Steinberg and Steinberg, 2008

In addition to the spatial analysis, the team also gathered qualitative data on the issues by:

1. Conducting interviews with 16 key informants to understand the network of groups working in the study communities as well as key themes.
2. Convening community meetings at which the pesticide maps were presented to community members in order to ground truth the maps for accuracy and to capture local knowledge about topics.
3. Conducting fieldwork, which included making presentations at public meetings, attending Poder Popular policy meetings and interacting with its leaders, touring study-area towns, and conducting visits to community members' homes to discuss pesticide drift.
4. Presenting preliminary results at three meetings.

Figure 16. Pesticide Application in Study Communities, 2008

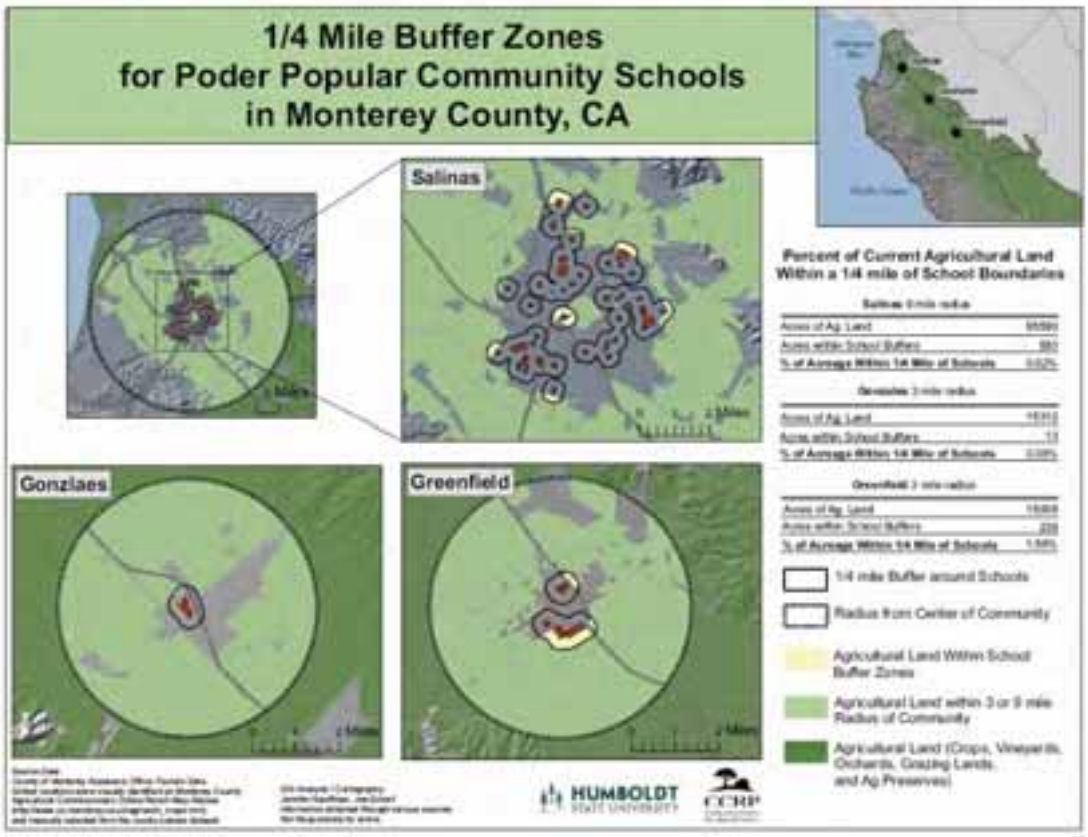


Source: Steinberg and Steinberg, 2008

The research surfaced information about the pesticide problem in these areas and the concerns and interests of community members:

- Pesticide exposure is known anecdotally as contributing to ill health: 14 out of the 16 interviewees said they knew someone who had gotten sick because of exposure.
- The average amount of pesticides was between 695 and 993 pounds per square mile in Gonzales, Salinas, Woodlake, and Greenfield, and 1,326 and 1,623 pounds per square mile in Lindsay and Cutler and Orosi, respectively.
- Community members provided data on pesticide drift incidences, block demographics, and sites of community use with more precision than available through public data.
- Pesticide drift around schools, and other sensitive sites like day-care centers, is a major area of concern.
- There is a high level of community interest in designating protective buffer zones around schools.
- Many schools are located at the periphery of the study communities in both counties.
- The amount of agriculturally zoned land that falls within the school buffer zones is relatively small: less than 1 percent of total agricultural land in Tulare County, and approximately 2 percent of agricultural land in its three study communities.

Figure 17. Agricultural Land in Buffer Zones in Monterey County Study Communities, 2008



Source: Steinberg and Steinberg, 2008

The participatory research project provided community members with critical information to use in their organizing and policy work. Community groups in Monterey and Tulare Counties have been holding trainings, meeting with agricultural commissioners and health officials, and mobilizing community members and victims of pesticide drift to speak to members of the public, as well as with policy-makers and officials involved in pesticide regulation.

In Tulare County Poder Popular and other stakeholders continued an advocacy campaign to create pesticide-free buffer zones around schools. While a 2002 state law (AB 947) gave agricultural commissioners the ability to regulate pesticide use near schools, the law had never been implemented. Community members presented data and documentation of pesticide drift and collected signatures in support of buffers. After years of work they were successful. In January 2008 the Tulare County agricultural commissioner mandated pesticide protection zones for aerial spraying within a quarter mile of schools, residential communities, and sensitive areas such as preschools and farm labor camps.

In Monterey County the data were useful in a successful effort around pesticide drift policies, and advocates were able to secure improvements in the county's emergency hazardous response plan.

Lessons Learned

The preceding examples of how nonprofit organizations, community groups, and coalitions have undertaken to integrate mapping into their policy research and advocacy activities provide important insights about how mapping can best be used to inform and propel efforts to change policy.

Mapping can be useful at multiple stages of the advocacy process, and different aspects of the policy process require different types of maps. Maps are powerful tools to advance policy campaigns—when they are applied at the right moment. Campaign leaders need to determine whether and how maps can help them during each of the four different stages and aspects of advocacy campaigns:

1) Analyzing and identifying policy issues;
2) Modeling and developing policy solutions;
3) Engaging the community in policy research and development;
4) Communicating the message to build public and political will.

During the research and analysis stage, it can often be useful to generate multiple exploratory maps to interpret phenomena and detect patterns. When exploring different policy options, advocates can employ spatial analysis and mapping to help project future scenarios under given sets of assumptions. If the goal is to use a map to mobilize support for a policy campaign, the key to success is ensuring that the map communicates a clear and compelling story in order to make the case for action while simultaneously maintaining the truth of the data. In the final stages of a campaign, one or a few maps should be used to communicate the primary campaign messages.

Web-based mapping is an incredibly useful tool for advocates, but is probably not sufficient to support advocacy campaigns. Over the past decade Web-based data systems and interactive mapping have proliferated. Given its ability to transmit large quantities of data in record speed, the Internet is an excellent communications and distribution resource. It has played an important role in democratizing data and mapping. Many data intermediaries at the local and national levels have created online "neighborhood information systems" that provide extremely useful information to advocates about neighborhood demographics, housing-market trends, schools, and other community characteristics. Anyone with Internet access can now create maps and access neighborhood data. While this has placed new tools in the hands of advocates and has enhanced data access, there are limitations to the types of analyses that can be performed using Web-GIS as well as to its power to produce presentation-level maps. Internet-based mapping tools can be incredibly useful for exploratory research and the initial stages of policy campaigns, but are likely to be insufficient for the advanced advocacy mapping activities described in these case studies.

There is a continued need for data and mapping intermediaries to help community groups incorporate maps into their work. As William Craig and David Sawicki pointed out more than ten years ago in a seminal article on the democratization of data, community groups do not only need access to the data; they need help making data actionable and applying mapping and data to policy action.[20] This is still true today. Intermediaries—organizations that enable nonprofits to more effectively carry out their missions—are key to bridging the gap between potential and reality. In the 1990s a number of local intermediaries emerged with the specific goal of helping community organizations access and use geographic data. Recognizing the potential of data and GIS for community organizations, these intermediaries launched data-gathering efforts, adopted GIS technology, and began building their capacity to use data and mapping to support the advocacy and program activities of community groups. In most of the examples of best practices in this report, the maps that made policy action possible were produced by partnerships between capacity-building/mapping intermediaries and advocacy organizations.

Participatory mapping can capture precise, meaningful, and powerful data, while fostering community engagement in the process. Community residents, by virtue of their everyday presence in their neighborhoods, possess vital information for understanding neighborhood-level phenomena. Participatory mapping processes, such as the farm worker mapping in Central Valley described in this paper can empower communities and arm them with powerful data for advocacy.

Data access and sharing are crucial in enabling advocates to access the data they need, and particularly in linking place and people data, which is critical for health-equity advocacy. One of the biggest challenges in health-equity mapping is accessing health data at a scale that is meaningful for understanding the linkages between people and their environment. Increased sharing of data among government agencies and additional university-community partnerships are needed to link these datasets for such mapping projects.

Additional research is needed on the best measures of access and equity. Surprisingly little empirical analysis has been done to determine the best indicators for measuring access to positive community land uses, such as parks and grocery stores. More research is needed to understand the trade-offs involved in using different measures and to describe the conditions under which certain measures might be chosen over others.

Data on race and ethnicity are essential for understanding patterns and for using maps for legal advocacy purposes. As discussed in the park-equity mapping case study, the collection of race-based data is important for building legal advocacy cases around issues of community disparities.

[20] D. Sawicki and W. Craig, "The Democratization of Data: Bridging the Gap for Community Groups," *Journal of the American Planning Association* 62, no. 4 (1996): 512–23.

Blending different datasets and combining maps with qualitative information can help tell stories effectively through maps. Many types of data are available for GIS analyses, and maps are only as strong as the data upon which they are built. In each of the case studies, policy advocates blended several datasets to produce the maps used in the campaign process. While public datasets such as those from the U.S. Census Bureau are the easiest to obtain, the level of analysis required for policy analysis and advocacy usually means enriching census data with administrative datasets, such as housing and school data maintained by city or county government agencies and/or survey data collected by organizations. In some cases, commercially produced data on business locations and spending patterns are used in analyses. The dataset in the Chicago food desert maps illustrates how retail, neighborhood, and health data can be blended to create a powerful dataset for analyzing and mapping food access, diabetes, and obesity.

Lead with the policy goal, not with maps. Each of the case examples reinforces this final recommendation: the policy advocacy process must shape maps; mapmaking technology should not. With GIS quickly becoming a common tool for advocates, it is essential to keep the desired advocacy goal—informed by the knowledge and wisdom of community groups, residents, and other advocates—at the forefront. These goals can then be translated into data and maps that can be used at different points along the campaign continuum. If the mapmaking process itself leads the development of maps for policy change, there can be no guarantee that advocates' knowledge will be included in the maps