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Wet Weather Management in Pittsburgh: Thinking Beyond Cost Effectiveness

by Mike Blackhurst

The Pittsburgh region is served by a combined sewer, which collects, conveys, and partially treats both stormwater and wastewater in the same infrastructure system.

During dry periods, combined sewers have adequate capacity to manage our wastewater. However, during periods of heavy rainfall, stormwater can exceed the capacity of combined sewers, which are designed to release any excess flow of stormwater and wastewater into nearby rivers and streams.

These combined sewer overflows (CSOs) have caused serious water quality problems. There are two broad strategies that reduce combined sewer overflows. Improvements to "gray" infrastructure—pipes, pumps, storage, and treatment facilities—can increase the capacity of the collection system to accommodate more severe wet weather events.

Conversely, green infrastructure (also known as source reduction, best management practices, or low impact development) includes features that reduce the stormwater entering the collection system by temporarily retaining or diverting stormwater.

In other words, green infrastructure acts like a sponge that absorbs some rainfall and, in turn, reduces the rate

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Pittsburgh Neighborhood Indicators

by Sabina Deitrick and Elizabeth Monk

Changes in technology and renewed understanding of the importance of local knowledge for local development has brought new opportunities for advances in neighborhood indicators and community development. In *PEQ*, we have written recently about important new tools available through UCSUR – Southwestern Pennsylvania Community Profiles (December 2014 and June 2015) and the Western Pennsylvania Regional Data Center (September 2015).

Both of these data tools advance the state of data availability and capitalize on new trends in data sources and services in the region. Through these efforts, UCSUR remains committed to expanding the use of community data for better decision making in planning, policy analysis, and development.

We have also recently been a part of a project dedicated to evaluating the opportunities and challenges faced in data support systems for advancing data-driven community development in the Pittsburgh region.

The project was developed by a consortium of funders with collective interest in developing a better data ecosystem for community development and planning, comprised of data providers, intermediaries, analysts, and users who collectively work to advance data-driven community development.

UCSUR worked with Chris Walker of LISC, Maggie Grieve and Jessica Mulcahy of Success Measures at NeighborWorks America, Jackson/Clark Partners, and local consultant Anne Sekula. The team's mission, in part, was to help community-based organizations become better data users and data analysts in their community development initiatives and planning. The project worked across both primary data collection methodologies and secondary data accessibility and use.

One part of the project focused on developing sets of common indicators in community development and expanding data available through the Southwestern Pennsylvania Community Profiles. The indicators were

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Wet Weather Management in Pittsburgh: Thinking Beyond Cost Effectiveness

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at which stormwater enters the collection system.

By decreasing the flow of stormwater entering the collection system, green infrastructure preserves the capacity of the collection system and, thus, reduces overflow into nearby rivers and streams.

Sewer authorities in the Pittsburgh region are under a consent decree to reduce CSOs. Initial estimates of solutions to Pittsburgh's wet weather problems exceeded $3 billion.

In early 2014, policymakers deemed several wet weather proposals non-compliant. A lesser expensive gray infrastructure plan at $2B did not meet wet weather goals, while a more expensive $3.8B plan did not meet affordability requirements. As a result, policymakers directed regional sewer authorities to consider more strongly green infrastructure.

Many case studies emphasize that green infrastructure could be more cost effective than gray infrastructure and, additionally, offer co-benefits such as providing green space for communities, reducing outdoor peak summer temperatures (and thereby reducing energy use for air conditioning), and improving air and water quality.

However, these benefits can only be fully realized by installing green infrastructure at strategic locations, at appropriate scales, and, given our consent decree, in a relatively short time frame. In other words, policies supporting implementation are just as important as the expected cost and wet weather performance of green infrastructure.

As summarized in Table 1 (see page 3), there are no perfect policy instruments for green infrastructure implementation, as the instruments motivating infrastructure adoption contrast in their strengths and weaknesses. For example, there are no jurisdictional impediments to installing green infrastructure on public property; however, the stock of public assets limits opportunities for green infrastructure installation on public property.

What about private property? There are three instruments for motivating green infrastructure implementation on private property: charging property owners with the stormwater they generate, requiring retrofits through lines of existing municipal authority, and/or providing incentives to motivate property owners to adopt green infrastructure.

While charging property owners for the stormwater they generate is likely economically efficient, such a fee could be very regressive if not carefully designed.

Stormwater fees may also be politically challenging given the municipal fragmentation and diffuse decision making that has historically plagued Pittsburgh's wet weather issues.

Requiring property owners to install green infrastructure could be administratively efficient, but the rate of green infrastructure installation will be excessively slow, limited by opportunities for municipal intervention, such as when properties are sold or when a construction permit is opened.

Incentives motivating green infrastructure adoption have been administered elsewhere with mixed success. What is unclear is who would respond to incentives, how many projects would ensue, and what would be the net cost and effectiveness associated with any given outlay of incentives.

The ideal and most tractable solution likely involves combining various green infrastructure approaches with a sizeable investment in gray infrastructure. For example, a fee structure prioritizing properties with aggressive stormwater runoff could produce revenue for high-priority green infrastructure projects or be used to maintain equity.

Clarifying the balance of these approaches would require a coordinated and unbiased assessment of green infrastructure, one that includes not just hydrologic, hydraulic, and cost analyses and also a thorough and transparent vetting of enabling policy instruments. This investment seems worthwhile given the poten-tial of green infrastructure to significantly reduce the costs of meeting our region's wet weather goals.

The Mascaro Center for Sustainable Innovation (MCSI) at the University of Pittsburgh recently sponsored a joint effort between MCCI, the University Center for Social and Urban Research (UCSUR), and Pitt's Department of Economics to assess the efficacy of incentives for green infrastructure adoption on private property given estimated parcel-level variation in green infrastructure performance and correlation between performance, demographics, site characteristics, and building characteristics.

The effort includes administering an interdisciplinary class called Green Infrastructure Implementation and is guided by an advisory board of faculty from Pitt and Carnegie Mellon University, policymakers, and consultants. The hope is that this effort can provide a foundation to continue the interdisciplinary work needed to advance the region's wet weather goals.

Without a disciplined, sustained, and timely effort to fully gauge the efficacy of green infrastructure policies, our region may miss the narrow window of opportunity offered by state and federal authorities to fully vet green infrastructure. In contrast, the pathway to gray infrastructure remains clear, albeit likely very expensive.

Table 1: Comparison of Policy Instruments Available to Increase Green Infrastructure Adoption

Policy Instrument	Property Type	How it works	Examples	Expected Funding Source	Equity Issues	Major Challenges
Pricing	Private	Charging property owners for their stormwater runoff could motivate them to reduce runoff .	Stormwater fee	N/A	Could be significant depending on spatial correlation between runoff and demographics	Politically challenging
Command and Control	Private	Municipalities authorities require infrastructure and land use changes through their existing jurisdiction.	Require pervious concrete, require downspout disconnects	Private property owners with the option of public support (such as grants)	Could be significant depending on spatial correlation between runoff and demographics relative to the infrastructure mandated	Rate of change limited to those opportunities for municipal intervention, such as when a property is sold or a construction permit is sought
	Public	Municipal authorities retrofit property and public right of ways to include green infrastructure.	Plant trees in public right of way, install green roofs on municipal buildings	Ratepayers, stormwater fee, general revenue	Depends on how the projects are funded, but flexibility in funding offers opportunities to reduce inequities	The stock of public assets limits the number of projects and thus their overflow mitigation potential
Incentives	Private	Municipal authorities offer rebates for properties owners to install green infrastructure.	Free rain barrels, rebates for conversions to pervious pavement	Ratepayers, stormwater fee, general revenue	Depends on how the projects are funded, but flexibility in funding and incentive design offers opportunities to reduce inequities	Unclear are who would respond to incentives, how many projects would ensure, and thus overall costs and effectiveness. Policies to maintain infrastructure are unclear, particularly when property title is transferred .

UCSUR Researcher Michael Blackhurst was recently selected as a Science and Engineering Ambassador for the National Academies of Science and National Academies of Engineering. The Science and Engineering Ambassadors Program is a Pittsburgh-based initiative of the National Academy of Sciences and the National Academy of Engineering. Its mission is to connect scientists and engineers with local opinion leaders in order to support and promote informed community decision making. The program selects, prepares, and supports a team of ambassadors and provides them with opportunities to engage members of their community around key topics of science and society.

Pittsburgh Neighborhood Indicators

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developed through community-based participatory research (CBPR) with three local community organizations.

Community-based involvement in indicator development is one of the central lessons of others who have worked on community indicators, including Judith Innes and David Booher in their work on the community indicators movement. Community indicators take time to develop and involve a collaborative learning process. The indicator must be related to a set of actions that give meaning to its importance. The community and residents develop and employ community indicators for locally-driven data analysis and actions.

Community-based involvement then extends to CBPR, where the central focus and components of research build on community engagement and strengths. CBPR builds from the democratizing data movement, which began in the 1990s with desktop computing and geographic information systems and allowed community organizations and residents to be major participants in an area's data ecosystem.

CBPR of this project put the community at the center of data use and data development efforts. The project collaborated with three organizations—Operation Better Block (OBB), ARTEZ, and Oakland Planning and Development Corporation (OPDC)—to select and develop secondary indicators that were essential for their organizations, projects, and programs. There were common, core community indicators included across stakeholders as system indicators, but there were also important contextual differences across the organizations that affected indicator development.

CBPR became a means to discover what different organizations designed for their neighborhood needs, as each community organization identified data relevant to their focus areas and program development.

Figure 1

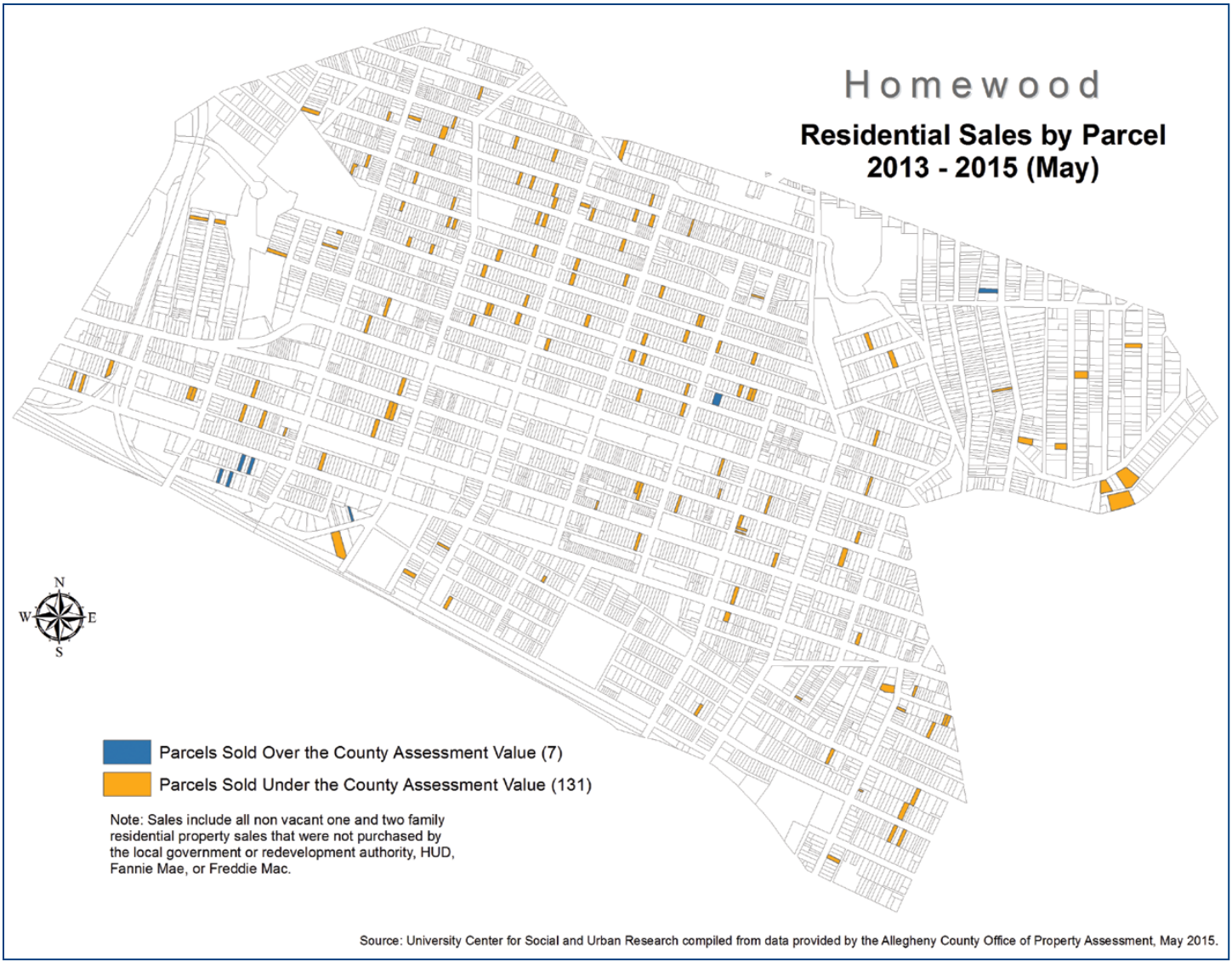

Table 1. Working Residents of Homewood and Homewood Jobs, 2007-2011.

	2007	2008	2009	2010	2011
Number of employed Homewood residents	2,831	2,574	2,510	2,129	1,979
Number of jobs located in Homewood	2,992	2,815	2,558	2,383	2,329
Homewood jobs held by Homewood residents					
Number	62	51	48	46	63
Percent	2.1%	1.8%	1.9%	1.9%	2.7%

As an example, Operation Better Block (OBB) was engaged in cluster plans for 10 residential clusters in the Homewood neighborhood. UCSUR has long worked with OBB on data collection and neighborhood property surveys, but through this project, OBB identified additional real estate and property concerns with which they could build new community indicators. Central here is a comparison of recent residential property sales prices compared to assessment values, which, as a market indicator, continues to show a preponderance of sales prices lower than assessment values (see figure 1 on page 4).

In working with the consulting team, OBB turned to their interests in resident self-sufficiency in the neighborhood, and through CBPR, dialog revealed a metric of neighborhood employment critical to OBB's focus (see table 1). In 2011, though there were 2,329 jobs located in Homewood and 1,979 employed Homewood residents, only 3.2 percent of Homewood residents were employed in jobs located in the Homewood neighborhood.

This gives a turn on what is known as spatial mismatch, which typically occurs when residents in lower income neighborhoods must commute long distances for employment opportunities. Job sprawl is often cited as one reason for the increase in spatial mismatch between those looking for employment and the location of employment.

In Homewood, through CBPR, the spatial mismatch revealed also a sector mismatch. Homewood residents were much more likely to be employed in the health care and social assistance category than the sector's share of jobs in the neighborhood.

Likewise the share of Homewood residents working in professional, scientific, and technical services, educational services, and accommodation and food services was much less than the share the three sectors comprised of all jobs located in Homewood. These three sectors comprised nearly 50 percent of all employment located in Homewood in 2011.

The success of CBPR extended to the data dialog across the community participants, where dissemination created more learning opportunities for organizations to share in data stories and expand their own data learning and interpretation. The mix between where neighborhood residents worked and who worked in neighborhood jobs is also critical for OPDC and their community engagement in the Oakland neighborhood.

Here the indicator for percentage of residents working in the neighborhood showed that approximately 25 percent of Oakland residents worked in the Oakland neighborhood over the 2007–11 period, a figure much closer to neighborhood expectations and a metric to gauge proximity and walkability in Oakland in the future. The data were further detailed by each sub-neighborhood of Oakland, with North Oakland residents the most likely to be living and working in Oakland.

In reflecting back on the work of Innes and Booher, their proposition "if an indicator is to be useful, it must be clearly associated with a policy or set of possible actions." In the Oakland 2025 Master Plan, completed in 2012, one of the plan's 10 most important recommendations was to "increase the

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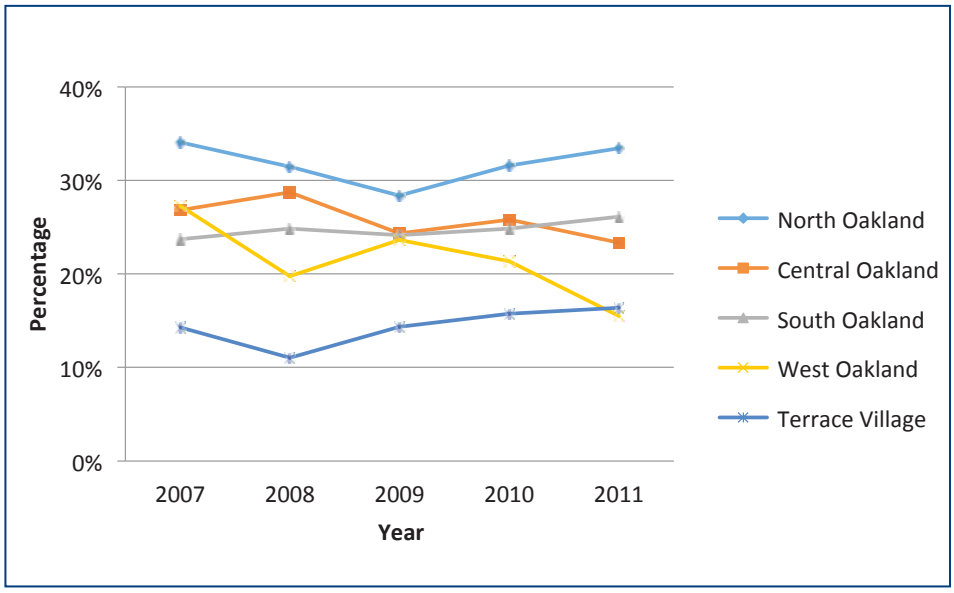
Figure 2: Percentage of Employed Oakland Residents Who Work in Oakland, by Neighborhood



Pittsburgh Neighborhood Indicators

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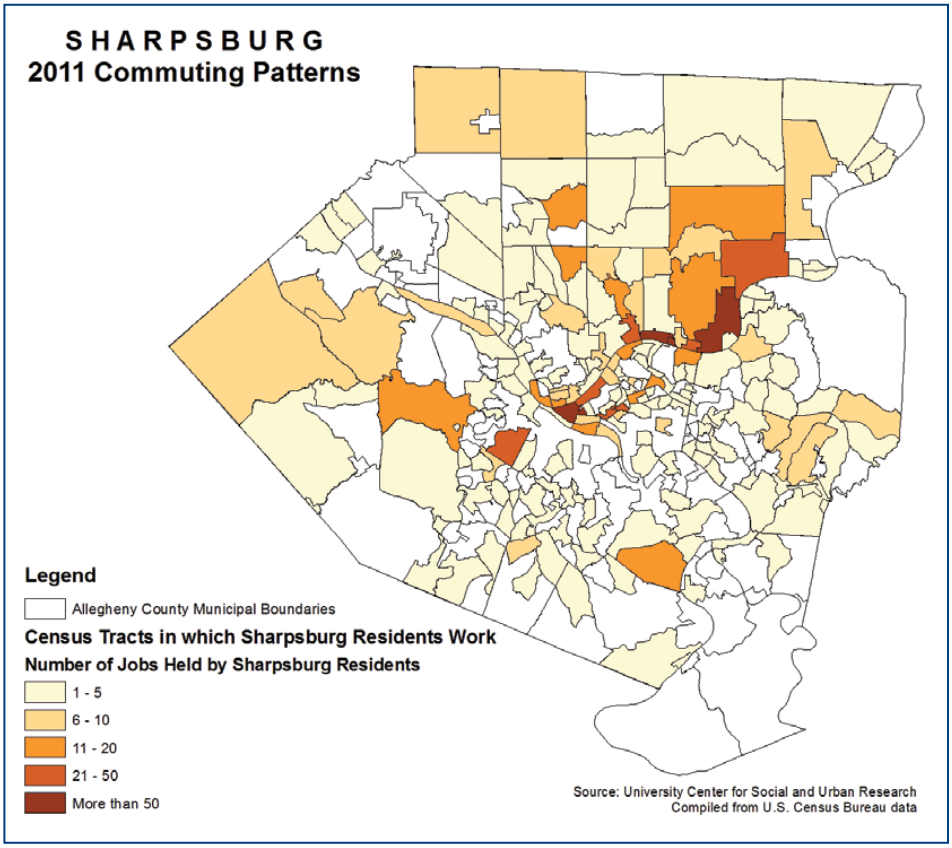
number of people who both live and work in Oakland." Useful and clear indicators, such as the examples here, developed through collaborative partnerships of stakeholders, become part of the dialog and discussions that lead to change.

The Pittsburgh Data Use and Evaluation Pilot project examined a number of other components of the community development regional ecosystem and recommended a series of steps to strengthen the links between sound data and data analysis and community development decision-making in the region. Collaboration and enhanced capacity through CBPR is an important component of improving community development data readiness and applications, such as UCSUR's data tools, to a greater number of users and stakeholders.



Urban and Regional Brown Bag Seminar Series Winter/Spring 2016 Calendar of Events

University of Pittsburgh University Center for Social and Urban Research (UCSUR)

Unless otherwise noted, all presentations begin at noon and take place at UCSUR (3343 Forbes Avenue, across from Magee-Womens Hospital of UPMC).
RSVP to swpa@pitt.edu. ucsur.pitt.edu/events/brown-bag-seminar/

2016 Winter/Spring Presentations

The Monroeville Doctrine: The Suburbanization of Industrial Research in Twentieth Century Pittsburgh
Friday, January 22, 2016
Patrick Vitale, PhD
Faculty Fellow, Draper Program,
New York University

Coupling Systems, Building Coalitions: Connecting Housing, Energy, and Transit in U.S. Cities
Friday, February 26, 2016
Barbara Wilson Brown, PhD
Assistant Professor of Urban and Environmental Planning,
University of Virginia

Operating the Game-theoretic National Interstate Economic Model: A Numerical Example of Aviation Cyber Security
Friday, April 15, 2016
Jiyoung Park, PhD
Associate Professor, Department of Urban and Regional Planning,
University at Buffalo

Exacting a Pound of Flesh: How Neighborhood Environments Contribute to Childhood Food Insecurity and Obesity
Friday, May 20, 2016
Anna Maria Santiago, PhD
Professor, School of Social Work, Michigan State University
Senior Editor, *Journal of Community Practice*

Update on SWPA Community Profiles

by Elizabeth Monk

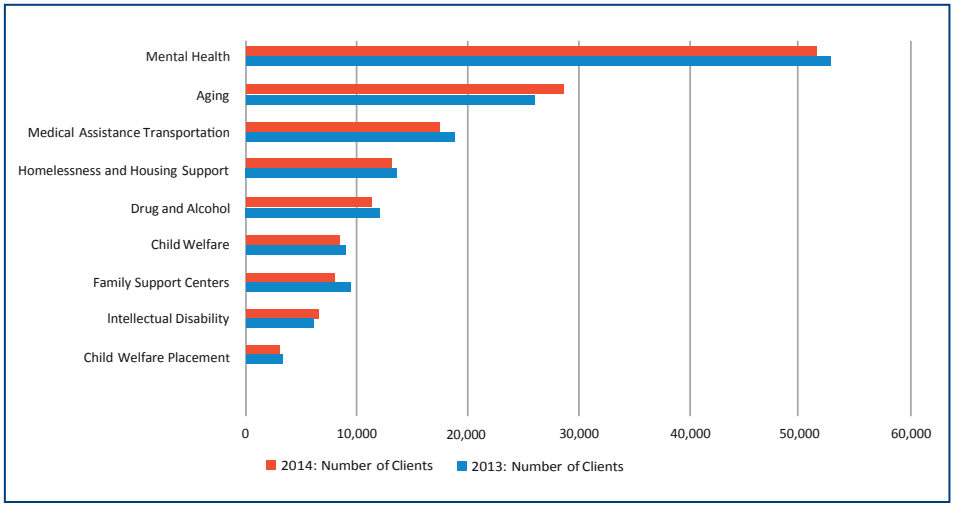
Southwestern Pennsylvania Community Profiles (SWPA Community Profiles) collects and analyzes information across a range of domains in order to understand our neighborhoods and communities. Community data and indicators are presented in a series of interactive tables and maps.

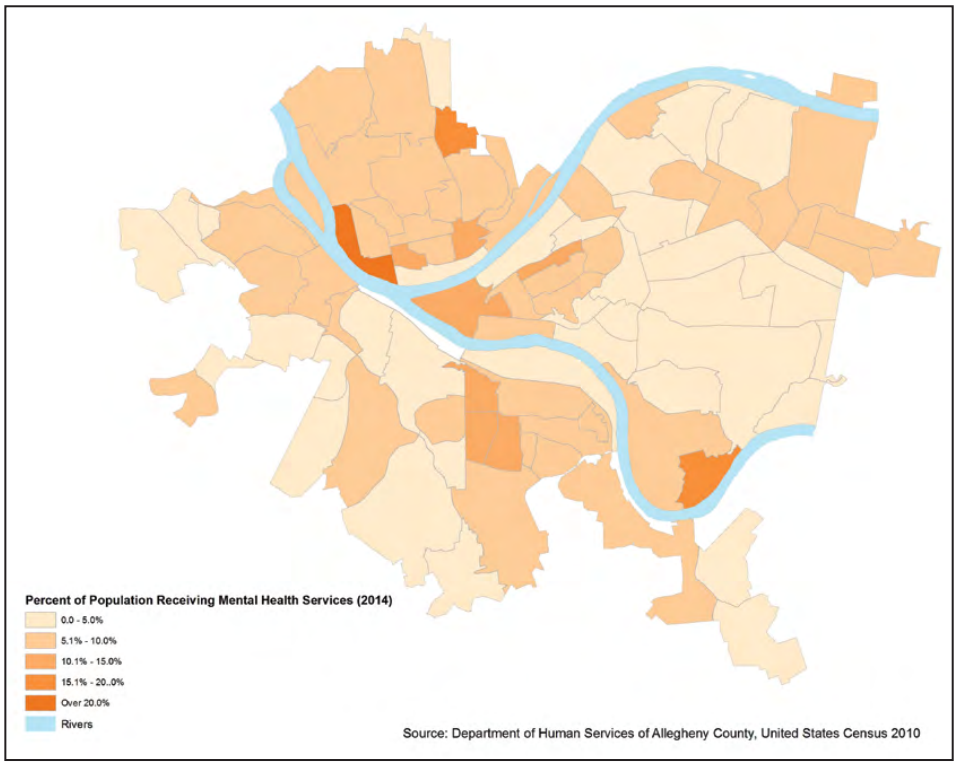
With data and indicators from local, state and federal government sources, along with a select set of other databases, SWPA Community Profiles allows users to understand and visualize data along a range of geographic areas in our communities and region over eleven different domains. The website officially launched in June of 2015 at the University Center for Social and Urban Research (UCSUR) annual data users' conference. We have reached over 550 community members through trainings and informational sessions.

SWPA Community Profiles is currently targeting our outreach to support social service organizations both through our trainings as well as interviews and focus groups and publishes data provided by the Allegheny County Department of Human Services (DHS). The graph here displays mental health services from DHS accessed in 2014: 51,547 residents received Mental Health Services and the maps below show the percent services by municipality and neighborhood.

In Allegheny County, 4.2 percent of total population received mental health services from Allegheny County Department of Human Services. When mapped at the municipal level, it becomes evident that the city of Pittsburgh and some areas outside of the city have a higher percentage of residents receiving mental health services. Mapping by neighborhood allows more insight into percent of population receiving mental health services.

Allegheny County Department of Human Services
Number of Clients by Service Type: Allegheny County





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Recent Publications by the University Center for Social and Urban Research

State of Aging in Allegheny County (6/14)
Hilltop Housing Market Analysis (2013)
Report on Undergraduate Withdrawal with an Emphasis on Freshman Withdrawal after the First Term: 2007-08 to 2012-13 (2013)
Marcellus Shale series (2012-2013)
Pittsburgh Today & Tomorrow: The Facts and the Future of our Region (ongoing)
The Pittsburgh Regional Environment Survey (2013)
The STEM Gap (2013)
Hazelwood Neighborhood Profile 2010 (10/12)
Young Adults Report (8/12)
The Pittsburgh Regional Quality of Life Survey (7/12)
Who Moves to Lawrenceville and Why? (5/12)
Migration Trends in the Pittsburgh Region: Update (12/11)
City of Pittsburgh Neighborhood Profiles—American Community Survey, 5-Year Estimates, 2005–2009 (6/11)
Incorporating Mt. Oliver Borough's Data in the PNCIS: Project Summary and Lessons Learned (7/11)
Foreclosure in South Pittsburgh's Hilltop and Effective Responses (7/11)
City of Pittsburgh Neighborhood Profiles—Census 2010 Summary File 1 (SF1) Data (7/11)
Allegheny County Health in Black and White, Volume Two, Black Papers on African American Health (8/11)
Estimating the Supply and Demand of Affordable Housing in Allegheny County (3/11)

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