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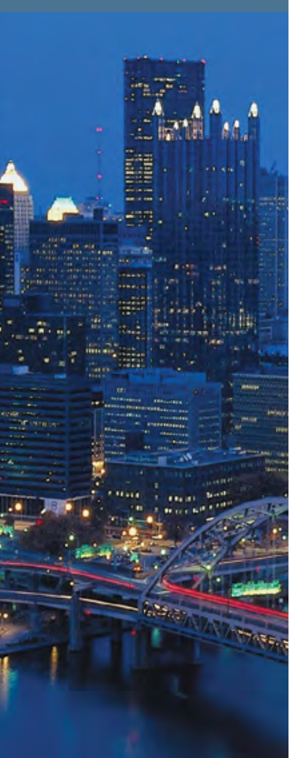
Inside This Issue

New Staff Member at URA 7

Parcel Scale Green Infrastructure Siting and Cost Effectiveness Analysis Map 7



The Use of 311 Requests as a Measure of Neighborhood Conditions in the City of Pittsburgh

by Donald Musa

The 311 data system in Pittsburgh, as in much of the U.S., is a phone number and Web site that people can use for non-emergency City service requests. The system records service requests, and is used internally by the City to manage work orders generated by the requests and to provide feedback to the person requesting the service.

We can now use 311 data to analyze and understand service calls and issues of residents in the City of Pittsburgh through the Western Pennsylvania Regional Data Center (WPRDC). The WPRDC, operated and maintained by UCSUR, is the open data portal for the Southwestern Pennsylvania region. The WPRDC includes many types of large scale administrative data—big data—and is a useful resource for individuals, communities and researchers in the region. The data contained in the WPRDC present many opportunities to examine and analyze local community and neighborhood conditions.

Data from the 311 Request System in the City of Pittsburgh have recently become available for download on the WPRDC Web site. 311 requests are also mapped on the City of Pittsburgh's Burgh's Eye View Web site, drawing on the WPRDC interface, which is populated with data the City of Pittsburgh supplies nightly to the WPRDC. The goal of this article is to illustrate some potentially useful ways the detailed 311 request data can be utilized for research studying communities and neighborhoods.

In addition to the service requested and other information, the system records geographic location, which includes exact or approximate latitude and longitude

continued on page 4

Mining Employment and Industry Trends Across Pennsylvania

by Christopher Briem

The development of new sources of natural gas has been a major economic force across Pennsylvania over the last decade. The application of new unconventional drilling technologies, specifically the use of hydraulic fracturing in the natural gas industry, has made previously inaccessible resources a major source of fuel in the United States.

Since hydraulic fracturing was first used on the Renz I well—drilled by Range Resources in Washington County in 2004—natural gas development has expanded not only in southwestern Pennsylvania, but across the state. Originally this new supply of natural gas was derived from the Marcellus shale formation, located up to 9,000 feet below the surface in Pennsylvania regions, but has since extended to development of deeper Utica shale and other shale formations.

Nearly all Pennsylvania regions have been impacted by the development of new well sites using this new technology. The new supplies of natural gas have enabled new and expanded uses for natural gas in many industries. The rapid expansion of natural gas supply has resulted in major declines in the price for natural gas, resulting in a recent significant slowdown in new well development.

This slowdown has had a marked effect on mining employment trends within Pennsylvania, with much of the slowdown coming in 2016. This article explores recent employment trends across all mining industry subsectors in Pennsylvania, to include natural gas development, but also ongoing shifts in coal and related industries.

Data from the *Quarterly Census of Employment and Wages* (QCEW), distributed by the Pennsylvania Center for Workforce Information and Analysis, can be used to measure recent trends in Pennsylvania's mining industry overall, and specific subindustries. QCEW data is

continued on page 2

Mining Employment and Industry Trends Across Pennsylvania

continued from page 1

collected via payroll information and provides detailed data on the employment and wages at business establishments located within Pennsylvania.

Within the mining industry, four major subsectors are identified here:

- Coal Mining (NAICS 2121)
- Oil and Gas Extraction (NAICS 211)
- Mining Support Activities (NAICS 213)
- Other Mining Industries (NAICS 2122 and 2123)

Other Mining Industries is an aggregate of other related mining employment, made up of the NAICS subsectors Metallic Ore Mining (NAICS 2122) and Non-Metallic Mineral Mining and Quarrying (NAICS 2123).

QCEW employment data is specifically derived from wage and salary employment for firms. Not included in QCEW data is employment of many self-employed contractors, or workers not employed by firms that do not register business establishments within the state.

While Pennsylvania's historic oil production continues—dating back to the development of the first commercial oil well near Titusville in 1859—employment supported by natural gas development and operations is currently the largest part of the mining industry subsector Oil and Gas Extraction.

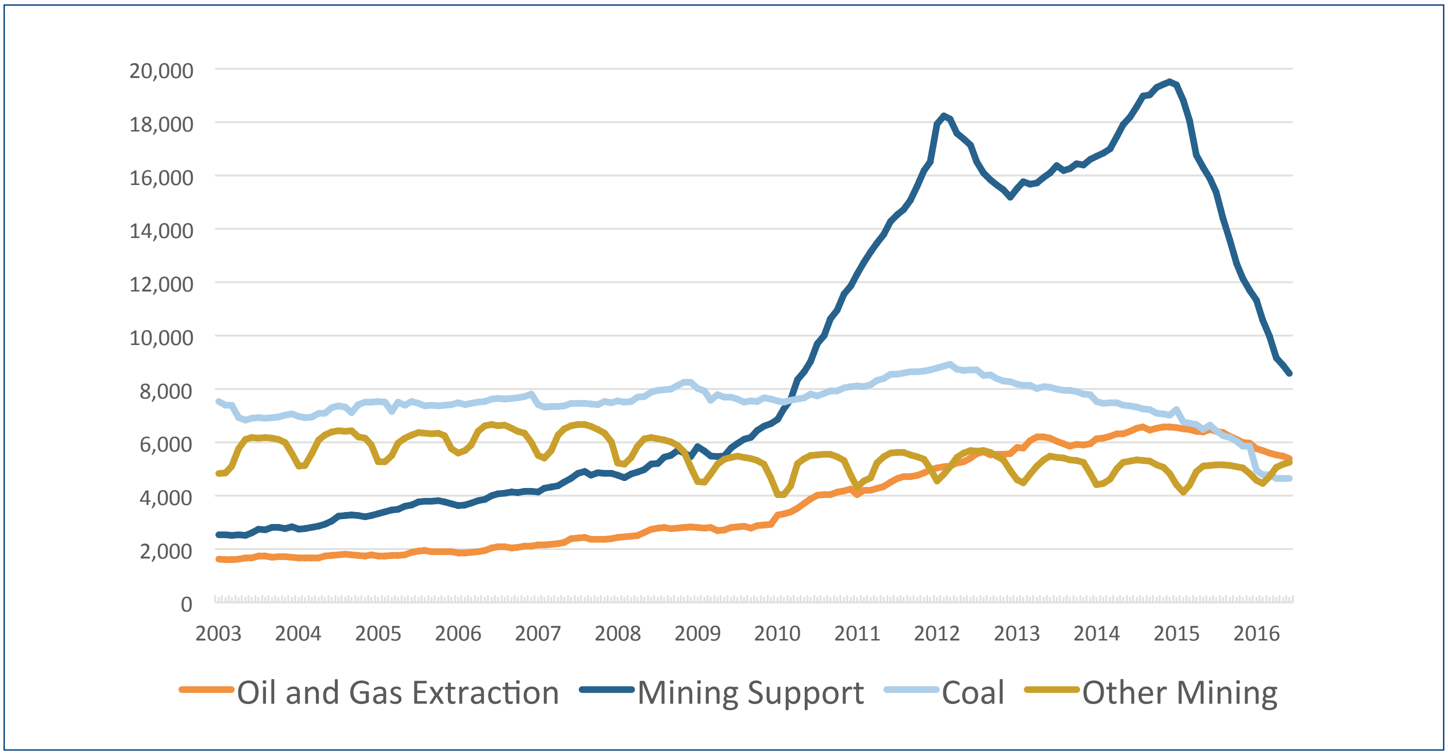
The period of rapid expansion in jobs associated with natural gas development in Pennsylvania extended between 2009 and 2011. This includes an expansion of jobs in Oil and Gas Extraction industries, but also a much larger increase in jobs induced in Mining Support Activities. Market volatility persisted over the following three years, but mining industry employment remained far above historic levels through 2014.

However, since the beginning of 2015, most metrics of natural gas development have been on the decline across Pennsylvania, pushing employment lower.

Employment specifically within the Oil and Gas Extraction industries peaked at 6,585 jobs in December 2014 and fell by 18 percent to 5,397 jobs as of June 2016. Jobs in Mining Support Activities fell from a peak of 19,521 jobs in December 2014 to 8,579 jobs in June 2016, a decline of 56 percent.

For Pennsylvania's coal mining industry, direct employment remained relatively stable, varying between 7,000 and 9,000 total jobs from 2001 to 2014. However, since the beginning of 2015, coal mining employment in Pennsylvania has dropped continuously and, as of June 2016, coal mining employment in the state fell to 4,649 workers—a drop of over 47 percent from a recent peak of 8,922 workers in March 2012. Statewide employment strictly in coal mining firms dropped below employment in Oil and Gas Extraction industries for the first time in September 2015.

Figure 1. Total Employment in Pennsylvania Mining Industry Sub-Sectors, 2003 through June 2016



Monthly employment data from the Quarterly Census of Employment and Wages (QCEW)
Compiled from data distributed by the Pennsylvania Center for Workforce Information and Analysis (CWIA)
** Other mining includes Metallic Ore Mining and Non-metallic Mineral Mining and Quarrying industries*

However, if the large increase since 2004 in jobs in the Mining Support Activities subsector is attributed to new unconventional natural gas development, the balance between coal and natural gas employment within Pennsylvania shifted much earlier. Assuming that all increases in Mining Support Activities that came after 2004 are attributed to natural gas development, Pennsylvania employment resulting from natural gas development or operations exceeded that of coal from at least the beginning of 2010.

Employment in other mining industries has experienced a moderate decline, but otherwise has remained the steadiest mining subsector over the past decade, experiencing mostly seasonal fluctuations between 4,000 and 6,000 workers since 2009.

Total wages in Pennsylvania mining industry subsectors have generally followed the same trend as employment levels. Total quarterly wages in Coal Mining industries have declined by almost 49 percent, from a peak in the 4th quarter of 2014. Wages in the Oil and Gas Extraction industries have declined by over 55 percent since the first quarter of 2015, but wages in Mining Support Activities has declined by 59 percent since peaking in the 4th quarter of 2014.

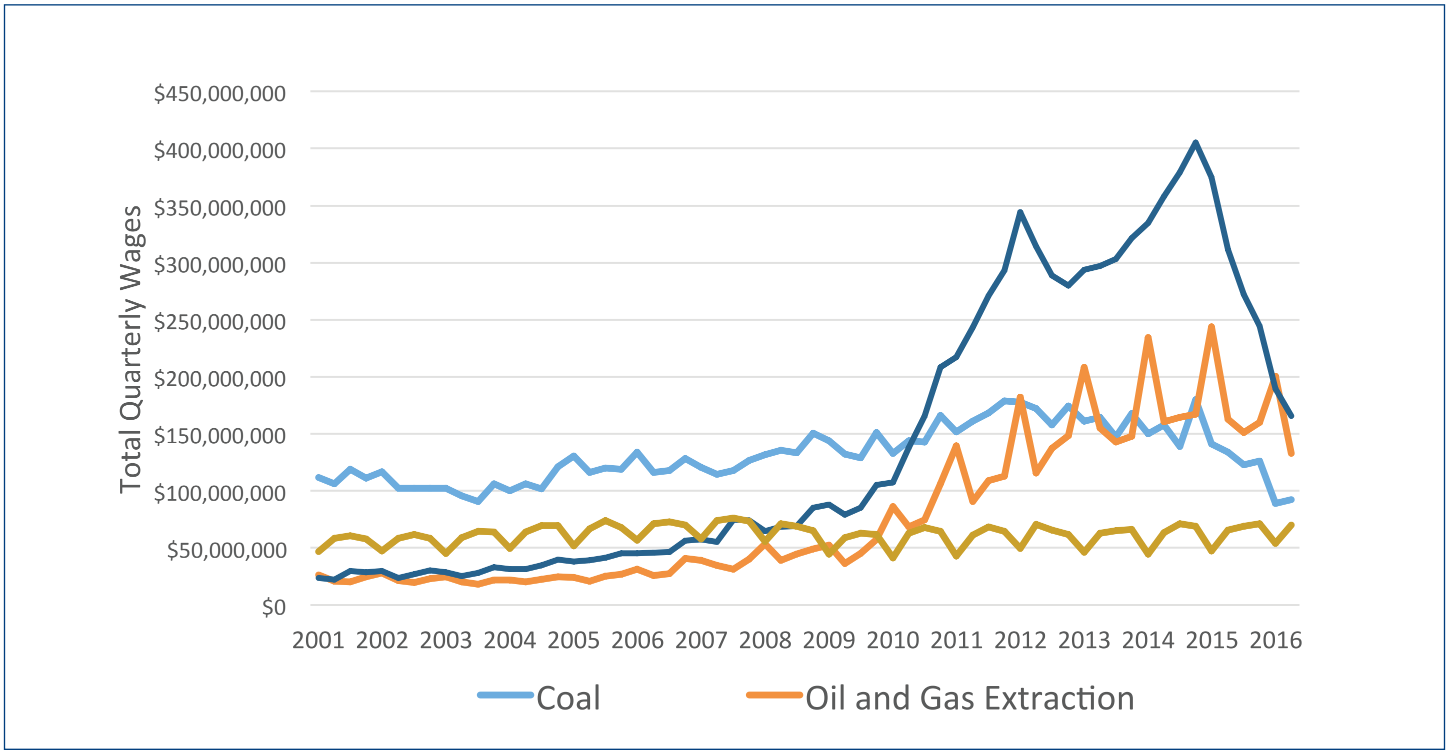
Unlike employment trends, wages in Oil and Gas Extraction industries show a regular seasonal peak well above their average levels in the 1st quarter of each year since 2010. The recurring pattern likely reflects the timing of bonus payments to employees among major firms within the industry.

Note that these figures include only workers directly employed in establishments in mining industries that are located within Pennsylvania. Not included is the employment or wages induced by mining activities in other secondary industries. Additional employment generated from mining, especially the impact of new unconventional gas development, extends across a broad range of other industries, including professional and business services, as well as hospitality and other service industries.

Many authors have generated estimates of the total employment impact of new unconventional gas development to include the direct, indirect and induced economic impacts across industries. The estimates of employment gained by Marcellus shale development varied widely, from a high of 211,000 jobs, estimated by Penn State University researchers in 2010, during the surge in the industry, to a December 2016 Commonwealth of Pennsylvania estimate of 52,531 total jobs associated with Marcellus shale development, reflecting more recent contractions in the industry.

QCEW data documents changes taking place through the 2nd quarter of 2016. This most recent data indicate that declines in total mining industry employment across Pennsylvania continued to decline through the end of the year, but at a significantly slower rate than in 2015 and 2016.

Figure 2. Total Wages in Pennsylvania Mining Industry Sub-Sectors, 2001 through June 2016



Quarterly wage data from the Quarterly Census of Employment and Wages (QCEW)
Compiled from the Pennsylvania Center for Workforce Information and Analysis (CWIA)
** Other mining includes Metallic Ore Mining and Non-metallic Mineral Mining and Quarrying industries*

The Use of 311 Requests as a Measure of Neighborhood Conditions in the City of Pittsburgh

continued from page 1

depending on the sensitivity of the request. This facilitates locating the request in various geographic areas, including the neighborhood and census tract levels.

While Pittsburgh's 311 system was first launched in 2006, the City purchased new software in 2015 to manage the system, which made data distribution more feasible. As of the data download for this article, the 311 database on the WPRDC Web site contained 116,350 requests for service. This reflects considerable growth in the total number of 311 calls since the 2015 software launch. There has been considerable growth in the total number of 311 calls over this period as the system was publicized and more citizens came to know about and use it.

To illustrate some potential uses of the 311 requests for research about neighborhoods, this article presents a brief analysis of one year of 311 data requests for service, which totaled 71,166 requests between December 1, 2015 and November 30, 2016. While data update hourly on the system, more recent data were not included for this analysis since data are potentially modifiable for one to two months after recording.

The one year period also reflects the seasonality of requests and a growth rate that stabilized over the year. Of the total requests, 66 percent were made by phone through the Call Center, and the remainder through electronic means, including Web site, e-mail, twitter, phone apps, and the City Control Panel for internal City requests.

Request categories were developed by the City, and may be modified or new categories added as needed. The top ten requests over the one year period by request type are shown in Table 1. Weeds/debris, potholes, and building maintenance requests made up 57.2 percent of all the call listed.

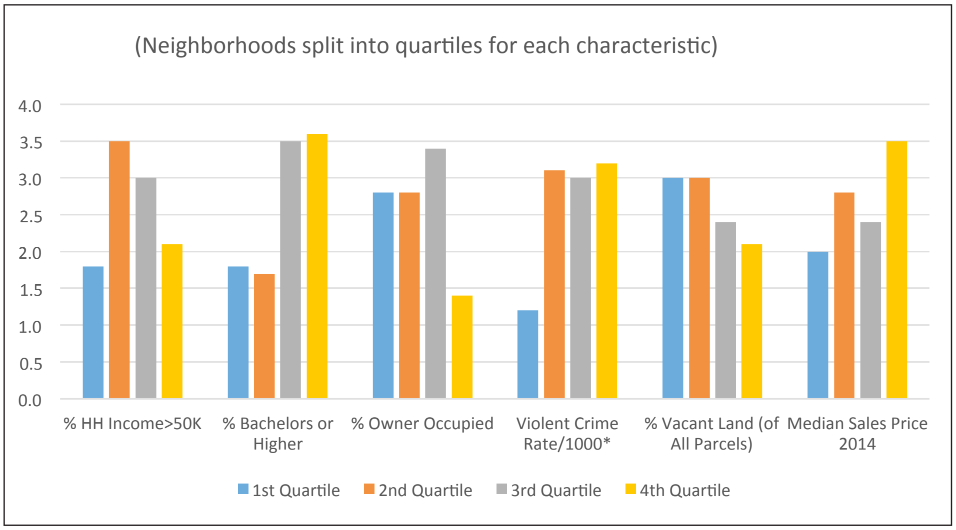
For this analysis, the data were aggregated to the City neighborhood level. The data shows the total number of requests over the one year period per 100 residents for the neighborhoods of Pittsburgh (see Figure 1). Clearly, some neighborhoods generate more requests per capita than others, such as the South Side, North Shore and Strip District, where there is significant nightlife activity. Analysis of the distribution of the types of requests in each neighborhood can show how these differences arise.

To illustrate this, based on face validity as well as on an exploratory factor analysis of a number of the most frequently occurring types of requests at the neighborhood level, three categories of request types that are similar and tend to occur together were identified. For this preliminary analysis, the labels chosen for the categories of types ("Public Space," "Private," and "Neighborhood Disorder") are somewhat arbitrary and attempt to capture a common theme of each category. "Private" requests are relevant primarily to an individual and his/her property, while "Public Space" requests

Table 1. Top Ten 311 Requests, City of Pittsburgh, December 1, 2015 – November 30, 2016

Request type	Total Requests	Percent of Total
Weeds/Debris	7,129	22.0%
Potholes	6,404	19.7%
Building Maintenance	5,039	15.5%
Refuse Violations	2,688	8.3%
Snow/Ice removal	2,610	8.0%
Abandoned Vehicle (parked on street)	2,378	7.3%
Illegal Parking	1,660	5.1%
Missed Pick Up	1,595	4.9%
Replace/Repair a Sign	1,485	4.6%
Street Light - Repair	1,463	4.5%
Total of Top Ten Requests	**32,451**	

Figure 1. "Private" Service Requests Per 100 Residents by Neighborhood Characteristics



reflect things that affect neighborhood infrastructure more than just the individual, mainly streets and roads. Finally, requests related to "Neighborhood Disorder" indicate a larger scale deterioration of community conditions.

The service requests in each of these categories were summed and a measure of each category constructed—the sum of requests per 100 population of each type. These measures were examined in relation to demographic and other characteristics of the neighborhoods.

The three figures show the types of requests by each demographic characteristic broken into quartiles. Each quartile represents 25 percent of the neighborhoods broken out by the demographic characteristic. For example, the first quartile of household income represents the neighborhoods with the lowest household incomes, and each succeeding quartile represents neighborhoods with greater household incomes.

The figures suggest that "Private" requests tend to come from neighborhoods with a higher level of education, greater home values, less vacant parcels, but with more violent crime.

"Public Space" requests tend to be distributed more evenly across neighborhoods but are somewhat more likely to come from neighborhoods with higher income and a higher percent owner occupied, but where more violent crime occurs.

"Neighborhood Disorder" requests are associated more strongly with neighborhoods having lower income, lower education, more violent crime, more vacant parcels, and lower home values.

These preliminary findings are not meant to be definitive, but do indicate that 311 requests fall into different types and that these request types are related to demographic and other characteristics of neighborhoods. Work remains to be done to develop reliable and valid measures of neighborhood conditions and to understand what these indicators measure and how they may be used in specific research studies.

continued on page 6

Table 2. Types of Requests by Category

Indicators of "Private" Requests	Indicators of "Public Space" Requests	Indicators of Requests related to "Neighborhood Disorder"
• Broken Sidewalk • Graffiti, Documentation • Illegal Parking • Building Without Permit • Litter Can Public • Refuse Violations	• Potholes • Snow/Ice Removal • Replace/Repair a Sign • Request New Sign • Street Light–Repair • Paving Request • Pruning City Tree • Street Cleaning/ Sweeping	• Weeds/Debris • Building Maintenance • Litter-Street • Illegal Dumping • Rodent control • Vacant Building • Drug Enforcement • Overgrowth-Street • Abandoned Vehicle (parked on street)

Figure 2. "Public Space" Service Requests Per 100 Residents by Neighborhood Characteristics

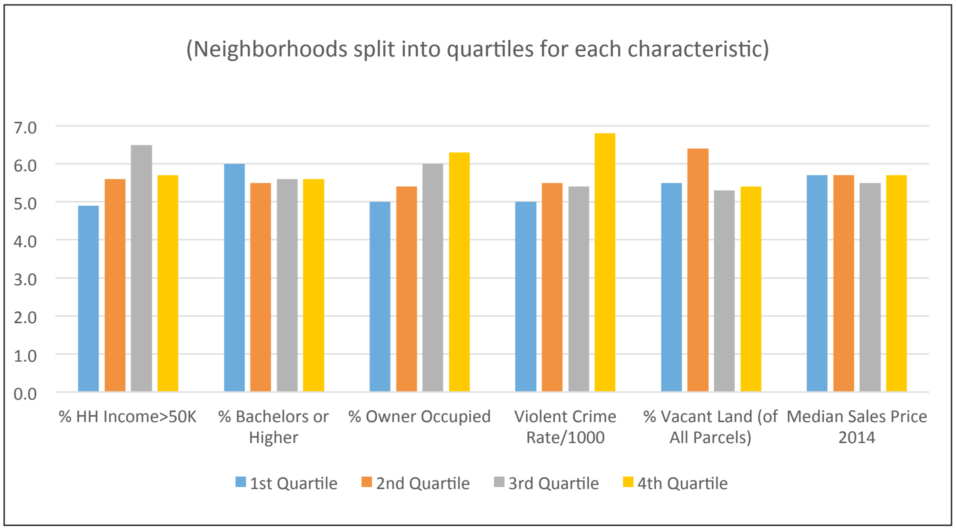
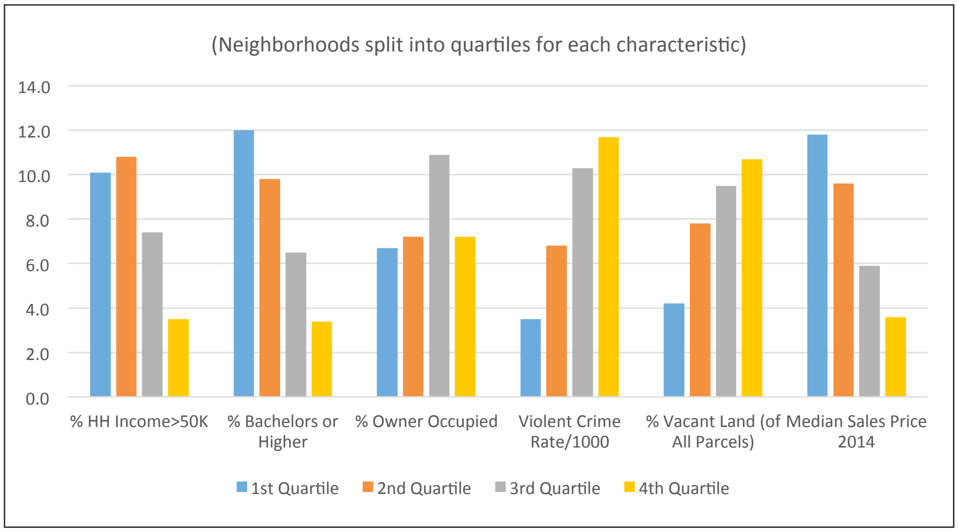


Figure 3. "Neighborhood Disorder" Service Requests per 100 Residents Indicating by Neighborhood Characteristics



The Use of 311 Requests as a Measure of Neighborhood Conditions in the City of Pittsburgh

continued from page 5

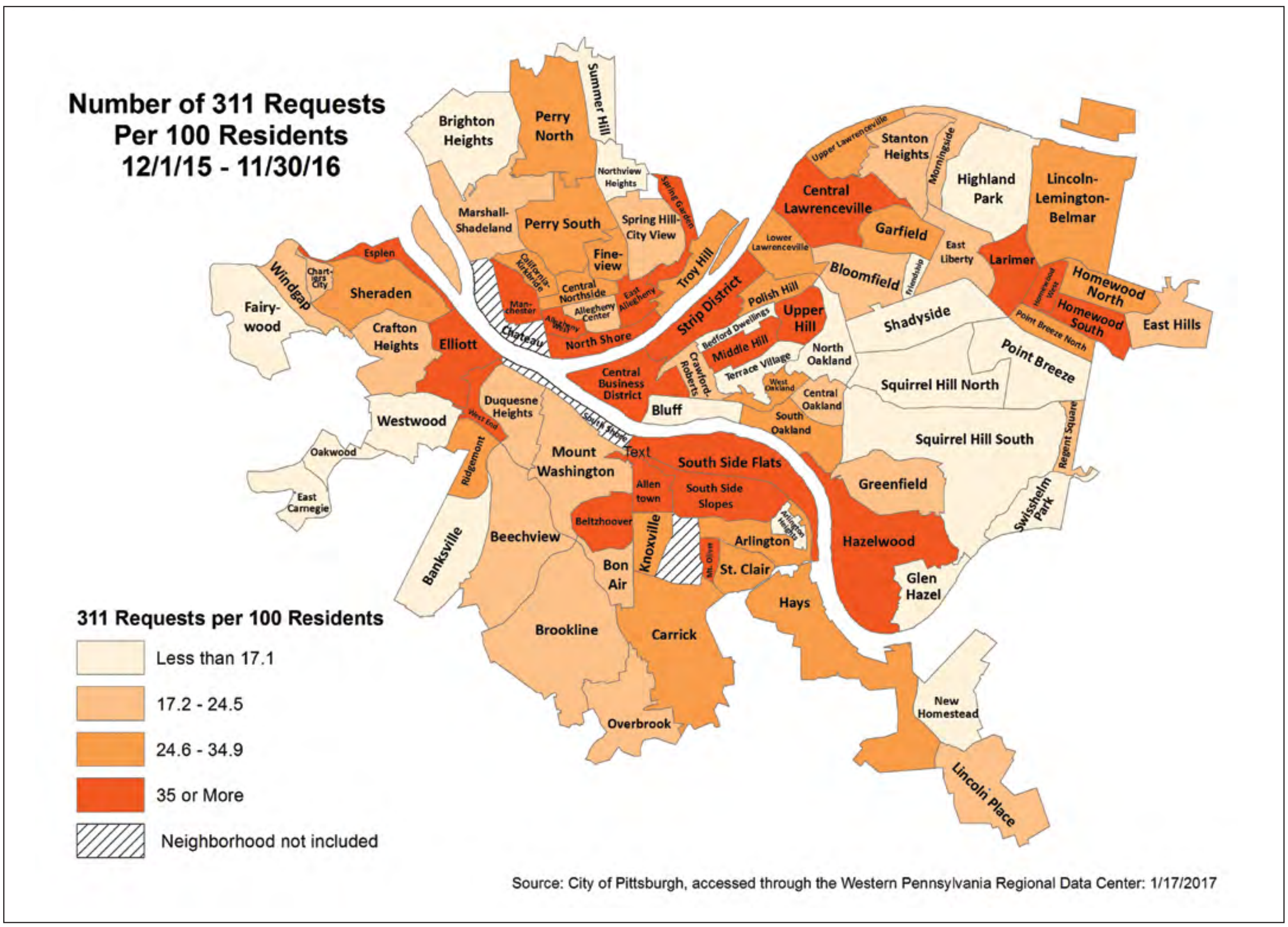
However, the analysis does provide evidence of the potential for using 311 request data, as well as other administrative data; e.g., building permits, 911 calls, crime data, to measure local neighborhood conditions and to longitudinally track change.

For example, 311 request types may be used as measures of civic involvement and caring about the community and may reflect community development efforts or informal social control efforts. Changes in types of service requests over time may reflect neighborhood/community change. It has been suggested, for example, that change in service requests may be related to gentrification of a neighborhood (i.e., certain types of requests increase and other types decrease). Thus, 311 calls may be a leading or concurrent indicator that a process of gentrification is occurring.

This analysis also illustrates some of the difficulties in working with administrative data. Administrative data are collected for programmatic functions and for purposes other than research. For example, the request type categories were developed as a tool for the management of the 311 system. Consistency in their use and exactly what each type of request means are somewhat problematic from the point of view of the data user. For the purpose of measuring concepts in neighborhood research, the request categories may be vague or ill-defined, may sometimes overlap (for example similar requests to different City departments), and often may require methodological development to arrive at valid and reliable measures.

In sum, this analysis has demonstrated the utility of 311 calls for research into neighborhoods and communities by showing that potentially useful indicators of neighborhood conditions may be constructed which reflect neighborhood physical and social circumstances. Other "big data" collected for administrative purposes has a similar potential for research studies. The same indicators can also be valuable for neighborhood and community organizations interested in monitoring change and working to improve neighborhood conditions and quality of life.

For more on 311: See the City of Pittsburgh 311 Data User Guide on the WPRDC Web site.



New Staff Member at URA

Colleen Cain, PhD, has joined UCSUR as a research scientist in the Urban and Regional Analysis program. She is the project manager for a new project at URA, Comprehensive Economic Impact Analysis: Pennsylvania's Military and Defense Installations, 2017. This project is being conducted for the Pennsylvania Military Community Enhancement Commission to study the economic impacts and strategic values of Pennsylvania's military installations. Dr. Cain was previously Senior Policy Analyst at the Northeast-Midwest Institute in Washington, D.C. where she specialized in regional demographic trends, the revitalization of older cities, and federal funding to states and cities. She received her PhD in sociology at the University of Florida and her doctoral dissertation focused on Pittsburgh's first Community Benefits Agreement. A native Pittsburgher, Colleen is happy to be back in the 'burgh!

Parcel Scale Green Infrastructure Siting and Cost Effectiveness Analysis Map

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 periods of heavy rainfall, stormwater can exceed the capacity of combined sewers, which causes overflow into nearby rivers and streams. While these combined sewer overflows (CSOs) mitigate upstream flooding, they release untreated wastewater into receiving water bodies.

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 includes features that reduce the stormwater entering the collection system by temporarily retaining or diverting stormwater. Types of green infrastructure vary from completely natural systems, such as converting a parking lot to a park, to single purpose engineered systems, such as pervious paving.

The interactive map available at the site demonstrates potential green infrastructure project sites in the City of Pittsburgh. These were estimated using planning-level siting criteria applied discretely to each individual parcel in the City of Pittsburgh.

Multiple data sources are combined and modeled to characterize land cover. Cost effectiveness (in units of gallons of inflow reduced per installed cost) is estimated by performing a hydrologic simulation of each discrete installation for each parcel. It is important to emphasize that hydrologic simulations were done at the parcel scale.

Please note that the estimates published here are intended for planning level applications. Site specific conditions will influence the ultimate efficacy of any green infrastructure category. Data documentation and limitations are further discussed in the link below.

Visit the map at: http://sb.ucsur.pitt.edu/steve/green/index.html

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