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Indicator Analysis for Unpacking Poverty in New York City

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Indicator Analysis for Unpacking Poverty in New York City

Jochen Albrecht and Mimi Abramovitz

Abstract: This article presents work that is part of a larger and ongoing research agenda exploring the persistence of health and social problems in some parts of New York City. To this end, the authors have developed a GIS framework that translates a highly diverse set of variables into neighborhood indicators that can help local residents as well as decision makers to understand the relationship between “place” and individual behavior. Using the example of two new indices, Community Loss and Neighborhood Risks, the readers will learn how data can be transformed to emphasize the communal nature of phenomena that is typically understood only in relations to individuals.

INTRODUCTION

New York City may not be the most segregated city in the country. But it is notorious for hosting some of the wealthiest and poorest neighborhoods in the country – sometimes in close proximity. Many of these neighborhoods have not changed their economic status for many decades. Some neighborhoods such as the South Bronx or East New York together with East Los Angeles and Chicago’s South Side have become synonymous with enduring social problems that persist despite considerable investment in a wide range of interventions. Looking a little closer at, for example, the South Bronx we find that the demographics have changed but the problems have not. These observations led the authors to develop a research framework for investigating the relationship between the local infrastructure or conditions under which people live and the concentration of health and social problems in some but not other New York City neighborhoods. That is, there something about the place rather than the people that makes the difference?

Part of a larger project designed to unpack poverty (Abramovitz & Albrecht, 2013) this article presents two new social indicators: Community Loss and Neighborhood Risk. Similar to the other place-based indicators in the larger project, they capture phenomena that others have previously studied only in relation to individuals. To ensure a focus on community conditions, the authors structured the project to avoid the “tautology trap” that arises when researchers describe neighborhoods in terms of the behavior of local residents (i.e., teen mothers, criminal behavior, school drop outs, etc.) and then conclude that those behaviors are concentrated in these neighborhoods. To that end, the project’s independent variables consist of neighborhood conditions categorized as economic, housing, education, food, health, or environmental insecurities (without reference of the behavior of residents) and its dependent variable consists of problematic behaviors such as lack of self-care, self-medication, school drops outs, mental health problems, risky sexual behavior, criminal activities, interpersonal violence, etc. (see Figure 1). The project includes ameliorating factors such as self-advocacy, civic participation, and neighborhood resources like libraries, community centers, etc. This framework protects against “blaming the victim”, which often happens when researchers attribute the concentration of health and social problems in poor neighborhoods to the behavior of local residents. In the final analysis, the Neighborhood Stress Projects asks “what happened to the neighborhood?” rather than “what did the residents do wrong”?

Figure 1 about here
This article begins with a discussion of the conceptual underpinnings of the overall project, which seeks to understand what accounts for the concentration of health and social problems in some New York City neighborhoods. As the authors have described this framework elsewhere (Abramovitz & Albrecht 2013), this article focuses on the development of two new indicators for phenomena that scholars have previously ascribed to individuals but not to neighborhoods and on an outline of the GIS methods used to reframe traditional household-based variables into measures that recognize the role of place as an active actor. The ensuing analysis of the resulting maps confirms the hypothesis that exposure to accumulated disadvantage, i.e., living amidst multiple and persistent adverse conditions at the same time, characterizes New York City neighborhoods known to have the highest concentration of health and social problems. The article ends with a discussion of policy implications and suggested further work on neighborhood indicators.

BACKGROUND

If we assume that nobody purposefully engages in behaviors to harm themselves or others (also known as social problems), individual, communities and policy makers can benefit from a better understanding of drives this kind of behavior that negatively affects communities as well as individuals. The model of Drawing on what is known about the ways in which stress affects behavior, the authors posit that stress operates as a pathway between adverse neighborhood conditions (“Place”) and the concentration of health and social problems in some New York City neighborhoods (Abramovitz & Albrecht 2013).

Most discussions of stress focus on the individual and how to reduce the negative consequence of exposure to high levels of singular and acute stress resulting from mass disasters, or from multiple and chronic stress associated with daily life in impoverished neighborhoods. Few scholars examine community level stressors. Even when analyzing such eminently spatial phenomenon as Hurricane Katrina, geographic (GIS) researchers have tended to focus on the individual. Few geoscientists examine how exposure to either mass disaster or the less dramatic adverse local conditions affects the social fabric of neighborhoods. To correct for this singular focus on individuals, the authors ask how exposure to accumulated disadvantage affects community functioning.

The research is informed by Hobfoll’s (1989) Conservation of Resource (COR) theory, which is relevant to the experiences of low-income people and communities that are already financially strained. COR theory suggests that the struggle to secure and sustain basic resources can lead to a downward spiral of resource loss that, in turn, may effectively drain an individual’s ability to cope effectively. The authors apply COR to neighborhoods and argue that when large numbers of people are exposed to multiple neighborhood-based stressors at the same time, the experience can drain the community’s capacity to function. Fullilove (2004) uses the term “root shock” to describe the stress reaction to the loss of one’s emotional ecosystem as a consequence of urban renewal projects. The dependent variable list above includes many of the ways that people cope with stress.

The social indicators introduced here move from the study of individuals to the study of communities. The experiences of loss and risk have previously been ascribed to individuals. The Community Loss and Community Risk indicators assume that since local communities are places of interaction and interdependence, something happens to communities when a large number of people living in close proximity regularly suffer multiple losses and risks at the same time. This differs from the ways that most researchers use neighborhood indicators. Where individual data is not available, they describe populations and then infer about individuals. GIS allows us to aggregate individual experiences. With
this, the Community Loss and Neighborhood Risk indicators shed light on the ways in which adverse local conditions affect community-wide functioning. The new indicators paint a picture of New York as a “tale of two cities”, in which New Yorkers live in different, and some would argue incomparable neighborhoods. By identifying variations in smaller geographic units, the research also unpacks poverty and disrupts the view of poverty as a uniform experience.

COMMUNITY LOSSES AND RISKS

The concept of Community Loss was not part of the original set of insecurities depicted in Figure 1; rather it emerged from the data itself and reflects the notion that there are tangible community-level resources that are an integral component of the community beyond the well-studied losses experienced at the individual level. They are grouped here into the removal of people and the removal of material assets (see Table 1). Missing people include individuals removed from the home and community due incarceration, foster care placement, premature death, and long-term hospitalization. The missing assets include loss of job and home due to unemployment and foreclosure. Other measures of missing people were excluded such as college students living out of state, or deployed members of the armed services. Students were excluded as they leave voluntarily, which suggests minimal stress. Armed services personnel were also excluded. To the surprise of the investigators, they turned out to be recruited in almost equal proportions from all parts of New York City. As such deployment was not a spatially distinguishable phenomenon. In the category of missing assets, the project excluded library and hospital closings because they were too rare to have a statistically significant impact; and school closings were more than made up by the creation of new schools1. The authors failed to find city-wide high resolution data on business closings and were quite surprised about the lack of job loss data at spatial resolutions smaller than Public Use Microdata Areas (PUMAs).

Table 1 about here

The authors gained access to census tract-level unemployment figures from both early and late 2008, i.e., just before and after the last recession through a special FOIA request of a colleague working on another project. This was especially helpful given that the US Census American Community Survey (ACS) data compromises on either the temporal or spatial resolution and would therefore not have been useful for this study. The only physical (loss of) assets measure used in this study are foreclosures, which in a city with as high a percentage of rental units as New York City introduces some caveats. Data sources and preparation of each component of the loss indicator will be described in the methods section of this article.

As with the community loss indicator, the concept of neighborhood risks were not part of the author’s original list of insecurities (Figure 1). They too emerged from the subsequent compilation of data, (see Table 2). Cutter (1995), Evans & Marcynyszyn (2001), and Schlosberg (2007) have identified the constant presence of hazards as an environmental justice issue. They are here expanded to include structural fires and traffic injuries, in addition to the environmental nuisances associated with bus/truck depots and garages. Other hazards were explored but rejected because of they had no significant spatial variation or were too similar to those already included in the index. They included school crime rates, bullying in

1 School closing may nevertheless be considered as disruptive but without exception, the argument of the authorities was that the schools were failing to provide their students with an adequate education – which arguably would have a larger long-term negative impact.
schools, building vacating orders, complaints about rats, traffic deaths, and noise complaints (highly correlated with bar/restaurant activities).

Neighborhood fears include weapons confiscated in one’s neighborhood, prosecutions by Immigration and Customs Enforcement (ICE), the presence of registered sex offenders, and parental perception of lack of safety in schools. Like loss, fear is a well-known individual stressor (Nasar & Jones 1997, Dohrenwend 1998). As with loss, the impact of omni-present risks (hazards and fears) have on communities had not been studied. A look at social science literature but also real estate reports such as Neighborhood Scout (2014) or Better Homes and Gardens (2014) clearly demonstrate that fear can have a debilitating effect on the neighborhood as a whole.

METHOD

Other than US Census Data, it was not easy to collect the other data needed for this project. Given that the US Census Bureau does not include relevant information at the fine spatial resolution necessary to describe phenomena at the neighborhood level, it was necessary to obtain administrative data from New York City agencies. However, New York City lacks open data for many dimensions of neighborhood life, so for administrative data collection the authors relied on personal networks of professional and academic colleagues as well alumni who now occupy important administrative positions in New York City. For these and other reason research in other part of the country might use a different set of variables.

A classic challenge when working with spatial data from a variety of different source agencies is the change in support of what is also known as the modifiable area unit problem (Openshaw 1983, Wong 2009, Kwan 2012). Similarly, there is no clear definition as to what constitutes a neighborhood. In the case of New York City, the term is used for the political outline of community districts (NYC DCP 2014a), the neighborhood planning areas of the Mayor’s Office (NYC DCP 2014b), the marketing terms of real estate agencies (Zillow 2014) and crowd-sourced attempts such as NYCWiki (2014) neighborhood descriptions. With the exception of health data, all other data used in this study is originally available at either the ZIP code tabulation area (ZCTA), US Census tract, or individual address level. ZCTAs were finally chosen as the spatial support for this study based on the following two arguments:

1. For a number of data sets, this spatial footprint is available natively, or can be aggregated to from finer resolution data;
2. The scale of analysis should represent the behavioral space of an average citizen, in New York City that is approximately two square miles².

Two data sets required significant spatial adjustments with subsequent uncertainties about the true spatial footprint. Health data, although internally available at the ZCTA scale, is publicly released only at aggregations of on average five ZCTAs. The authors rasterized the data and then used pycnophylactic

² In urban planning, and here in particular in transit-oriented planning, US literature says that Americans are willing to walk ¼ mile to a transit stop. New Yorkers are willing to walk a lot more (on average 20 minutes) and faster (3 miles an hour), which amounts to covering a distance of one mile. Compromising to arrive at a conservative estimate and to include children and the elderly, we used a figure of 0.8 miles, which using the formula for the area of a circle results in approximately two square miles (Thompson 2007, America Walks 2013).
interpolation (Tobler 1979) to redistribute death rates in the Community Loss Index to where people actually live (which is available at a very high spatial resolution). The school-based variables in the Neighborhood Risk Index, available at address level, were redistributed in a three-step process. First, Thiessen polygons were created using enrolment figures as weights. These were then overlaid with Census data on the number of school-aged children to assign each census tract to one school or another, which would then inherit the school-based attributes. The Census tracts were then finally aggregated to ZCTAs resulting in ZIP code-level school data. Both of these methods (especially for the health data) may not pass academic muster. But given the lack of alternatives, they are the best available approximation.3

The measurement scales available for each variable vary widely (for example, people per 100,000 households, per capita income, days of hospitalization, etc.). To make them comparable, the data were standardized into deciles (using Jenks natural breaks), where the lowest decile represents the neighborhoods with fewest adverse conditions and the highest decile represents areas with extremely high losses or risks. Jenks is regularly used in spatial data analysis because it divides the data into classes based on natural breaks and thus provides a scale based on actual distribution of the data’s characteristics (Jenks 1967, Congalton 1991). This procedure was applied to each of the variables presented here. Thus, every neighborhood can be described and compared to the city as a whole on thirteen attribute dimensions. At the level of ranks, the constituent variables for both indicators (loss and risks) were then aggregated to depict the accumulated loss/risk for each neighborhood. The indices identify ZIP code areas where residents are regularly exposed to multiple losses and risks at the same time, denoting a stressed community. The data are presented in visual form on choropleth maps that use different colors or shades to depict the average values in each area. The maps of Figures 2 and 3 depict the distribution of each ranked variable as well as their accumulation in New York City.

DISCUSSION OF RESULTS

Figure 2 includes nine inset maps (a-i) that visualize community loss in New York City neighborhoods. (1) Six individual maps (b-g) depict the citywide distribution of each of the following losses: foster care placement, incarcerations, unemployment, long-term hospitalizations, pre-mature deaths, and foreclosures. (2) The aggregated loss map (inset a) is a composite of all 6 losses that effectively depicts high loss areas suffering multiple losses at the same time, creating a condition of accumulated disadvantage. (3) Detailed maps of an exemplary high (inset h) and low (inset i) neighborhood with bar charts that depict the variation of losses across different ZIP code areas.

In the high-loss areas, the rank of each of the six losses rises far above the citywide average of five with the exception of incarceration, whose rank of five matches the citywide average. With an average rank of eight, foster care placement consistently accounts for the most severe experience of community loss in the high-loss area. In the low-loss areas, the rank of each of the six losses falls far below the citywide average. Four of the losses (unemployment, foreclosure, untimely deaths, and long term hospitalization) all ranked just above or below three; foster care placement averaged two; and incarceration averaged one.

3 The authors are taking pain to explain the caveats whenever they present the results to decision makers.
Taken together, all the Community Loss maps show New York City to be sharply divided by the experience of loss. Digging deeper into smaller spatial units reveals that the high and low loss areas are not all the same. This important variation effectively disrupts poverty as a uniform or singular experience. That is, the new social indicators make it possible to unpack poverty as well as document accumulated disadvantage.

Neighborhood risks are portrayed in Figure 3. Here, a ten-class visualization was chosen to illustrate the detail contained in the data (and somewhat washed over on the maps in Figure 2). The accumulated risks are represented in inset (a) – they show a large agreement with accumulated losses of Figure 2. Inset maps (b-h) render each individual community hazard and fear variable. They show a much higher degree of variation than the loss variables. This variability could be interpreted as the constituting variables to represent different phenomena. However, an analysis of internal consistency (Cronbach's α) reveals that there is a very high likelihood for the eight variables to describe the same phenomenon, in this case: neighborhood risks.

The comparison of the two indicator maps with each other raises another question: What is the degree of congruence between the loss and risk areas? A non-spatial correlation analysis results in an $r^2$ of 0.64; that goes up to an impressive $r^2$ of 0.9 after accounting for distortions due to spatial autocorrelation. The rank difference between the two indicators rarely reaches 2.0 ranks and can usually be explained by the old housing stock (resulting in more fires) and higher traffic density in Manhattan. The only neighborhood that defies initial explanation for why the losses do not match risks is Corona, Queens. Corona is bordering the highlighted low-loss area in Figure 2 (i), and is the latest candidate for gentrification in New York City.

CONCLUSIONS

The research presented here disrupts the notion of poverty as a uniform event. In spite of significant differences among the contributing factors, there is overwhelming evidence that negative conditions accumulate in exactly those neighborhoods that are known to be the hearth of persistent social (and as we increasingly recognize also health) problems.

The methods are mostly part of the toolset of basic GIS analysis. The challenges (beyond the fact that New York City consists of over 200 neighborhoods resulting in pretty big datasets by the standards of indicator analysis) are mostly on the side of finding appropriate data and developing conceptual models that avoid tautological traps. The ability to drill down and compare areas in both a local (neighborhood) as well as a regional (all of New York City) context opens new doors for policy makers. This has become evident is the uptake of place-based rather than case-based initiatives by health and human services departments in the City as well as non-for-profit organizations.

This is a new chapter in the dialog between service providers, who in the past tended to work with very broad geographic brushes and community-based organizations who were limited by their myopic local knowledge and lacked the means to compare their neighborhoods with others.

Finally, the indicator building method, while not new to an academic audience, has now been demonstrated to and subsequently applied by local residents to allow them to set their own priorities in classic PPGIS fashion.
ABOUT THE AUTHORS:

Dr. Jochen Albrecht is an Associate Professor for Computational and Theoretical Geography at Hunter College, City University of New York. His areas of interest include bridging the quantitative/qualitative divide, spatio-temporal modeling, and geospatial program management.

Dr. Mimi Abramovitz is the Bertha Capen Reynolds Professor of Social Policy at the Silberman School of Social Work at Hunter College and the CUNY Graduate Center. Her interests include social welfare policy, women and the welfare state, the impact of privatization on human service agencies and workers and the impact of social policy on “place”. She conceptualized the accumulated disadvantage and stress framework for this study.

REFERENCES:


Table 1. Community loss variables, their spatial footprint and their sources.

<table>
<thead>
<tr>
<th>Loss variable</th>
<th>Unit of Measurement</th>
<th>Spatial resolution</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term hospitalization</td>
<td>Hospitalizations lasting longer than 180 days divided by number of households</td>
<td>ZCTA</td>
<td>NY Statewide Planning and Research Cooperative System (SPARCS)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>Number of people receiving unemployment insurance divided by the number of households</td>
<td>Census track</td>
<td>US Census ACS</td>
</tr>
<tr>
<td>Incarceration</td>
<td>Incarcerations per ZIP code area divided by number of households</td>
<td>Home address</td>
<td>NYS Prison Administration</td>
</tr>
<tr>
<td>Foster placement</td>
<td>Placements per ZIP code area divided by number of households</td>
<td>ZCTA</td>
<td>NYC Administration for Children and Families</td>
</tr>
<tr>
<td>Untimely death</td>
<td>Given as a rate 1/1,000</td>
<td>Community district*</td>
<td>NYC Department of Health</td>
</tr>
<tr>
<td>Foreclosure</td>
<td>Relative need value compared to the neediest in New York State as per HUD calculation</td>
<td>ZCTA</td>
<td>Local Initiatives Support Cooperation Center of Housing Policy, Urban Institute</td>
</tr>
</tbody>
</table>

* see Methods section for redistribution of community district-level data to ZCTAs
Table 2. Hazard and fear variables, their spatial footprint and their sources.

<table>
<thead>
<tr>
<th>Risk variable</th>
<th>Unit of Measurement</th>
<th>Spatial resolution</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depots and garages</td>
<td>Total number of MTA, NYPD, Sanitation and school bus depots per ZCTA</td>
<td>Address</td>
<td>NYC Department of Information Technology (DOITT)</td>
</tr>
<tr>
<td>Ladder runs (fires and building collapses)</td>
<td>Total number of ladder runs divided by number of households</td>
<td>Address</td>
<td>NYC Fire Department</td>
</tr>
<tr>
<td>Traffic injuries</td>
<td>Traffic injuries resulting in bodily harm divided by daytime population in census tract</td>
<td>Address</td>
<td>NYC Department of Transportation</td>
</tr>
<tr>
<td>Perception of unsafe schools</td>
<td>Percent of parents surveyed that perceived their children’s school as unsafe*</td>
<td>School address</td>
<td>NYC Department of Education</td>
</tr>
<tr>
<td>Weapons confiscated in a Stop &amp; Frisk (S&amp;F)</td>
<td>S&amp;F incidents where weapons were confiscated divided by number of households</td>
<td>Address of Stop &amp; Frisk</td>
<td>NYC Police Department</td>
</tr>
<tr>
<td>Prosecutions by Immigration and Customs Enforcement</td>
<td>ICE Apprehensions divided by number of households</td>
<td>ZCTA</td>
<td>Families for Freedom and the Immigrant Defense Project (who FOILed the data from ICE)</td>
</tr>
<tr>
<td>Sex offenders</td>
<td>Total number of registered sex offenders per ZCTA</td>
<td>Residential address</td>
<td>NY State Division of Criminal Justice Services</td>
</tr>
</tbody>
</table>

* see Methods section for redistribution of address-level data to ZCTAs
Independent variables → Stress → Dependent variables

Conditions/Securities
- Economic
- Housing
- Education
- Food
- Health
- Environmental

Outcomes:
- Lack of self-care
- Mental health problems
- Criminal activities
- Interpersonal violence
- Community violence
- Substance abuse
- Other

Mediators: • Self-advocacy • Civic participation • Essential resources

Figure 1. General overview of generic indicator categories (insecurities) for Hunter Neighborhood Stress project.
Figure 2. Geography of Community Loss in New York City.
Figure 3. Geography of Community Risks in New York City.