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NYC 311: A Tract-Level Analysis of Citizen–Government Contacting in New York City

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Abstract

311 is a telephone and web service that allows residents of many cities to report nonemergency concerns and problems with city services to their local government. This article explores the Census-tract-level variation in 311 contacting volume within New York City. Drawing on previous research on citizen–government interaction, service delivery, and civic engagement, the article focuses on how contacting propensity and condition both explain spatial variations in contacting volume. These explanations are tested using indicators that describe the people who live and work in the space, the housing in the space, the economic development of the space, and the space's representation in city government. 311 contacting is divided into three categories (government-provided goods, graffiti, and noise) that are separately analyzed using regression models that account for spatial and serial dependence. The article also discusses the theoretical and methodological challenges of using 311 data to understand the distribution of problems within a city.

Keywords

urban politics, public goods, spatial, service delivery, civic engagement

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Over the last two decades cities have implemented and greatly expanded easy-access systems for citizens to contact government and report problems with infrastructure and city services. Among the most prominent of these programs is 311 which allows city residents to report problems by calling the number or making an online submission. 311 and programs like it—which are now being used by many cities across the United States, Canada, and Western Europe—offer city residents low-transaction-cost access to government that have been shown to instill a sense of trust and offer the promise of increased bureaucratic responsiveness (Ahn and Bretschneider 2011; Morgeson, VanAmburg, and Mithas 2011; Tolbert and Mossberger 2006; West 2004). The collection of millions of geocoded data points corresponding to problems also has the potential to reveal important information about the distribution of physical conditions and government-provided goods and services within cities. This article constitutes an early step in this direction by examining the Census-tract-level social, economic, physical, and political attributes that help to explain the spatial distribution of 311 contacting volume within New York City. It is argued that aggregate contacting volume is structured by the contacting propensity and the physical conditions of a space.

The article proceeds with a review of the literatures on urban service provision and citizen–government interaction. From there, New York City's 311 program and the attributes of the contacts examined in this analysis are explained. Analyzed contacts include those pertaining to government-provided goods and services like streets, sidewalks, trees, and waste collection as well as complaints about graffiti and noise. The theory offered for why some areas experience greater 311 contacting volume than others involves engaging with a puzzle that has two entangled concerns: (1) The perception of substandard conditions needs to be present to induce contacting and (2) there must be knowledge of the 311 program and a desire to participate in it for that contacting to occur—There must be a propensity to contact. The theory and data also present modeling challenges related to time, space, aggregation, and estimation. These challenges are discussed in detail along with the modeling approach that involves the use of both serial and spatial lags.

The results of the analysis show that contacting volume is influenced by variables that describe the populations that live in the space (e.g., homeownership) and variables that are associated with the condition of the space (e.g., housing age, population growth). The analysis also considers more political explanations for the distribution of contacting that may come as a result of the attention the city is paying to different areas of the city (e.g., economic development, council member experience). This analysis cannot sort out all of the causal issues that present themselves. It is particularly limited by not having any information about each 311 contact other than the nature and location of the complaint. Although this limitation restricts the inferences that can be made, the analysis is still able to offer interesting and important insights. Previous research going back to the 1970s has examined individual-level citizen interaction with local government but considerably less research has examined what the spatial distribution of contacting actually looks like and how it conforms to theoretical expectations. Indeed, the results presented here paint an interesting, if somewhat complex, picture of contacting in New York City that sheds light on the characteristics of the places where contacting is and is not occurring.

Previous Research

This research sits at the intersection of three literatures. The first is the service delivery literature that has examined quality and equity in the provision of governmental and nongovernmental services. The second is the expansive civic engagement literature that has sought to understand the roots of political participation. And the third is the e-government literature that has explored access to online government systems. In this section, I review the aspects of each that inform the development of the theoretical expectations.

Scholars of urban politics and policy have long been curious about whether goods and services are evenly and equitably distributed by city governments—though such research has fallen somewhat out of favor in recent years. As Koehler and Wrightson (1987) described it, the research has shown that urban services are generally equitably distributed, and when there is a pattern it is more the result of bureaucratic decision rules and/or historical idiosyncrasies than it is a "systematic underclass bias" (Koehler and Wrightson 1987, p. 81). This, for example, was the conclusion of Mladenka (1980) in his study of the Chicago parks system as well as many others who have emphasized the importance of independent bureaucratic culture for urban service provision (Levy, Meltsner, and Wildavsky 1974; Lineberry 1975; Lipsky 1979). As Lipsky (1979) noted in *Street-Level Bureaucracy*, "Although they are normally regarded as low-level employees, the action of most public service workers actually constitute the services 'delivered' by government" (p. 3). Lipsky's argument was that local policy is as more about the people who implement it than it is about the people who make it. However, Appleby's (1949, 1952) seminal works on public policy and public administration ought to give us pause before conceding that local service provision is divorced from top-level politics. Decades of research on community power structures have demonstrated the ties between city officials, upper-class resources, race, ethnicity, and public goods: urban regimes have historically prospered at the expense of certain groups (Erie 1990; Hunter 1953; Stone 1989; Trounstine 2008). Although the intent of this exclusion was not necessarily spatial, the consequences typically were.

Koehler and Wrightson's (1987) reanalysis of Mladenka's Chicago parks data showed that park resources tended to favor areas of the city that were whiter and for which homeownership rates were higher—a patterned and unequal distribution of public goods. And in Mladenka's (1989) own later research, he chronicled the transition in Chicago from a race-based distribution of goods to a class-based distribution of goods. Similarly, Levy, Meltsner, and Wildavsky (1974) examined services in Oakland, California, and found a preference for the rich and occasionally the poor. Feiock's (1986) careful analysis of service expenditures in Erie, Pennsylvania, demonstrates spatial equality but not socioeconomic equality. Lee (1994) showed that more political services tend to favor wealthy areas whereas the distribution of administrative services tends to be more equitable. Similar findings that emphasize the role of political actors—at least at the state and national levels—come from Downs (1967), Bernstein and O'Hara (1979), and Rourke (1984).

The marketing literature has been at the forefront of thinking about how people evaluate service quality in commercial settings. This research has consistently shown that a big part of any service quality evaluation is the expectations that the evaluator brings to the service—expectations that are driven by past experiences, personal needs, and communications with other people (Lewis and Booms 1983; Parasuraman, Zeithaml, and Berry 1985). In the governmental context, Lyons, Lowery, and DeHoog's (1990, 1993) surveys of Lexington and Louisville are the basis of critical research for understanding satisfaction with local public services. Their research showed that satisfaction is rooted in both the characteristics of individuals (e.g., homeownership) and the characteristics of the jurisdiction in which they reside (e.g., racial makeup and impressions of service quality). Instructively, they found that those who were more attached to their community were more satisfied with the services the government was providing (see also Beck et al. 1987; K. Brown and Coulter 1983; Sharp 1984a; Stipak 1977, 1979). More recent work on intracity variation in service evaluations comes from Swindell and Kelly (2005). They combine and analyze community surveys of citizen satisfaction for city services in 17 local governments divided into 141 subcity spatial units and find that there is variation in service satisfaction across these spatial units and that areas with more minority residents, lower-income residents, and elderly residents were less satisfied with services.

During the 1970s and 1980s—before the development of e-government systems—questions about who interacts with urban government about the quality of government services were frequent. These "contacting studies" treated it as a form of political participation. The results of these studies have ran the spectrum and the validity of the measurement of contacting has been questioned (Coulter 1992). Indeed, they have shown that the contacting of local government agencies has a negative (Hero 1986; Vedlitz, Dyer, and Durand 1980), positive (Eisinger 1972), and parabolic (Jones et al. 1977) relationship with socioeconomic status. Results for the impact of perceived needs were more consistent, showing that as the perceived need increases so too does contacting (Hero 1986; Sharp 1984b; Thomas 1982). Hirlinger (1992) demonstrated that the interaction between perceived need and past political activity (what he calls political ties) is a significant relationship of note. And several of these studies found that those who are efficacious are more likely to contact (Sharp 1984b; Vedlitz, Dyer, and Durand 1980; Verba and Nie 1972).

While the work of cities has not changed much since these studies were carried out in the 1970s and 1980s, the ways in which residents interact with government has. With websites, mobile phones, apps, and text messaging, the ability to obtain information about government and contact it with concerns is easier than ever. These reduced barriers to entry offer an opportunity to uncover the factors that underlie government activity, civic awareness, and political response. The research on contemporary citizen contacting has tended to fall in the domain of "e-government research" that includes everything from the ability to email a government official to online permitting. These studies have results that conform with expectations about government contacting, political participation, and Internet usage; namely, that socioeconomic status, perceived usefulness, and trust in government are positively associated with usage (McNeal, Hale, and Dotterweich 2008; Nam and Sayogo 2011; Reddick 2011; Tolbert and Mossberger 2006).

New York City's 311 Program

311 is a nonemergency phone number and web service that residents of many cities (Baltimore, Buffalo, Chicago, New York City, San Francisco, Seattle, and Washington, D.C., to name just a few) can contact to report problems and ask city-related questions. The first pilot program began in Baltimore in 1996 (Cardwell 2002) though the primary innovator in the technology was Chicago (Schellong 2008). In New York City, the location of this study, the program began in March 2003 with the stated mission of

> [Providing] the public with quick, easy access to all New York City government services and information while maintaining the highest possible level of customer service. [So as to] help agencies improve service delivery by allowing them to

> focus on their core missions and manage their workload efficiently [and] provide insight into ways to improve City government through accurate, consistent measurement and analysis of service delivery Citywide. (City of New York)

311 systems fit within the citizen-as-consumer new public management (NPM) approach to local governance (Barzelay 1992; Hood 1991; McLaughlin, Osborne, and Ferlie 2001).[1] And, as part of open-government initiatives, many cities are making their 311 data publicly available (City of New York 2011; Lathrop and Ruma 2010).

As Paul J. Cosgrove, the Commissioner of the New York Department of Information Technology (the agency that runs New York City's 311 program) indicated at the time of the program's development, the idea is that people should not need to know what agency is responsible for fixing problems (City Room 2008). When Mayor Michael Bloomberg outlined plans for the program in 2002, he noted,

> It's a big challenge in New York . . . we have enormous volume, we have a complex city, we have many different languages spoken and we have a populace that rightly expects to have government be responsive in ways that, in many other cities, government is not. (Cardwell 2002, pp.B3)

As part of the launch, the city ran a campaign that included signs on taxis, garbage trucks, billboards, and agency publications (Schellong 2008). The campaign for public awareness of the program remains to this day. The program was substantially expanded in 2004 to include a host of other services including assistance for tourists and information about public events. The city is also actively using the data to improve its operations; a 2010 article by Steven Johnson in *Wired* magazine reported that New York City uses 311 to identify problems (everything from potholes to public health concerns) and respond to them (Johnson 2010).

The New York City 311 Data

New York City has made its service-request 311 call data available through its NYC Open Data project (City of New York 2013). "Service requests" are only a subset of 311 calls and online submissions. In fact, a majority of contacts with the service are not "service requests" but rather inquiries of another nature. For example, assistance with using the subway or parking tickets ranks among the top reasons for contacting (Salas 2008)—a 2013 *New Yorker* cartoon featured a 311 operator informing a caller that "311 cannot bring you hangover nachos" (Flake 2013). The data are also limited in several important ways. Foremost, nothing is known about the contactors themselves. All that is known is the purpose, location, and time of the contact. Another limitation is that the number of 311 contacts from a space is not necessarily reflective of the seriousness of the complaint. In particular, it is unknown how many contacts come in response to the same problem. If 1 person calls about a problem with the sewer, it is observed 1 time in the data set. If 10 people call about the same pothole, it is observed 10 times in the data set.

The goal of this analysis is to develop a more complete understanding of the geographic distribution of 311 contacting in New York City—one that can tell us about the attributes of the spaces that contact at the highest and lowest rates. To do this, the analysis will focus on three categories of 311 serviced requests. The first category is comprised of those contacts related to spatially focused city services (what I refer to as "government goods"). These are contacts pertaining to streets, trees, sidewalks, garbage, water, and lighting, and other problems that can be generally classified as being associated with the condition and upkeep of government-provided goods in a specific place. These are goods that everyone has access to (i.e., they are nonexcludable) but through use, natural deterioration, and/or unsatisfactory upkeep, their condition may decline. In addition to government goods, I also examine two categories of contacts that are associated with government goods and responsiveness but come as the result of human behavior: graffiti complaints and noncommercial noise complaints.

For this analysis, I do not examine categories of complaints where the cause of the complaint or the response to it is unrelated to governmental provision (e.g., heating problems, health-code violations) or a likely consequence of economic development (e.g., building permit complaints). Although it is certainly the case that much can be learned from examining these excluded contacting categories, they are beyond the scope of this analysis. A breakdown of which specific complaints makeup the three contacting categories can be found in the appendix.[2] The 311 categories analyzed here makeup 37% of the service-request contacts made from the residential tracts analyzed from 2007 to 2012 (more details on residential tracts are given below) and 31% of all 311 service-request contacts during the same period. Although the overall 311 contacting volume for New York City has been steadily climbing (City of New York 2014), the city's data reveal a steady annual tract-level decline in the analyzed categories (Figure 1).

Theoretical Approach

In this section I offer a theoretical approach for understanding the tract-level distribution of contacting volume for the three contacting categories. The previous research on citizen–government contacting has examined individual-level explanations for the behavior. Although the analysis here is

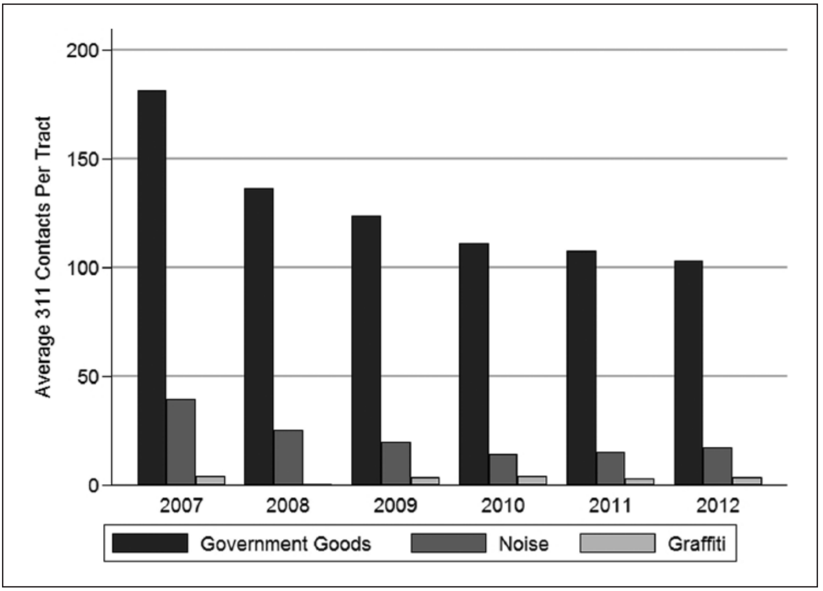

Figure 1. Annual tract-level average contacting by category.

aggregated, it is helpful to begin by thinking about things at the individual level. One can think about citizen contacting with local governments as having two categories of causes. The first category is causes associated with the space the person is situated in and the second is causes associated with the attitudes of the person who is contacting. Causes associated with the space are foremost about individual perceptions of need—something that likely varies across groups and urban contexts (Sharp 1984b). If contacting occurs in response to the perception of unsatisfactory conditions, then perceived unsatisfactory conditions need to be present to induce the contacting. Whether it is potholes, dirty sidewalks, downed trees, graffiti, noise, or any other problem, people need a reason to contact the city before they contact the city. Causes connected with the attitudes of the people who live in a space primarily include what can be broadly defined as "contacting propensity." Given the same unsatisfactory conditions, we would not expect all people to contact the city in response. At the individual level, contacting propensity is the likelihood that a person will contact the government using 311 independent of the actual conditions.

Before going into more detail on the theory that underlies condition and propensity, consider that in examining citizen contacting about the condition of goods using tract-level data, the researcher faces concerns about aggregation, endogeneity, and causal direction that should be considered alongside the theoretical development. The ecological challenges of the tract-level aggregation are discussed in more detail in the "Aggregating Contacts" section. With respect to endogeneity and causality, propensity and conditions likely have some of the same underlying social and economic causes and, if the 311 system is working, contacting rates may even impact actual conditions over time (Johnson 2010). The multicausal nature of contacting could also mean that the spaces with the least problems have more citizens contacting than spaces that have the most problems. Indeed, the question of "where are conditions poor?" and the question of "what people contact the government?" cannot be entirely separated. And perhaps more frustratingly, the data cannot tell whether a social or demographic characteristic (e.g., income, race) of a space is a cause of increased/decreased propensity or a cause of better/worse conditions. Although causal direction is an issue, the analysis will be able to show the extent to which attributes explain the geography of 311 contacting and are consistent with different theoretical expectations associated with both conditions and propensity.

Propensity-Connected Explanations

Propensity-connected explanations are those tract-level attributes for which there is an associated individual-level explanation pertaining the likelihood that people will contact government about perceived problematic conditions, independent of the actual conditions. If propensity is randomly distributed about New York City, then it can be ignored in an aggregated study such as this one; however, we know from decades of research that civic engagement is tied to factors that are not randomly distributed in space. The focus here is on attributes associated with the *stake* people have in the neighborhood and the *efficaciousness* of the people in the tract. A person with a stake in the neighborhood is invested (financially, culturally, or otherwise) in the community's success. Spaces where more people have a stake in the community should have more people who become concerned when unsatisfactory conditions present themselves. Efficacy is the extent to which people believe they can make a difference (internal efficacy) or believe that government is responsive to their needs (external efficacy). Spaces with greater internal or external efficacy are probably going to have higher contacting volume when a perceived problem arises (Niemi, Craig, and Mattei 1991). At the individual level, efficacy may come from program awareness, political awareness, disposition toward government, or other beliefs and preferences. Stake and efficacy are not entirely exogenous to one another and may have some of the same roots. Being invested in one's community, for example, causes people to become more politically aware of how they can improve it (Kingston and Fries 1994; Rohe and Stewart 1996; Rohe, Van Zandt, and McCarthy 2013). Both may also have socio-economic and cultural derivations. Highly educated people are likely to be more invested in their communities through homeownership and thus tend to have higher efficacy (Anderson 2010).

To measure stake in the community, I use the percentage of the homes in a tract that are owner-occupied. The literature on the connection between homeownership and local political activity is robust. As William Fischel (2001) so nicely put in his book *The Homevoter Hypothesis*, "Homeowners are acutely aware that local amenities, public services, and taxes affect ('are capitalized in') the value of the largest single asset they own" (p. 4). And work by DiPasquale and Glaeser (1999) shows that homeowners tend to have higher social capital and involvement in local politics owing to their lower mobility rates and community investment. The other stake variable I include is the percentage of households with children under 18; families with children are less mobile (Greenwood 1997; Van Dijk et al. 1989) and may as a result have a greater stake in the physical quality of the neighborhood.

Identifying variables that correspond to the efficaciousness of a tract is less straightforward—Efficaciousness is revealed less explicitly in our actions than stake is. So what I turn to are (primarily socioeconomic) variables that are associated with civic engagement and the inclination to politically participate more generally. Tracts where more people have financial resources (median income) can be expected to have more people with the civic resources necessary to dedicate time to political and social activities (Brady, Verba, and Schlozman 1995; Verba, Schlozman, and Brady 1995)—whether this extends to 311 contacting remains to be seen. (Note that education, another indicator of resources, is too highly correlated with income to be considered simultaneously.) I also consider the racial and ethnic attributes of a tract. Specifically, I estimate the percentage of the tract that identifies as Black, the percentage that identifies as Asian or Pacific Islander, and the percentage that identifies as Hispanic. There is no reason that race or ethnicity itself would be a cause of contacting though there may be cultural norms, programmatic awareness, and government experience differences that are common among racial groups that these tract-level aggregations can pick up on. Based on the literature, there is no theoretical reason to expect that areas that have high percentages of minority residents would be in better condition, so a negative relationship between percent minority and contacting would be an indicator that minority areas have lower contacting propensity whereas a positive relationship would be an indicator that minority areas are in poorer condition. An insignificant relationship would be inconclusive in either direction.

In addition to these socioeconomic variables, I examine two more social-contextual variables. I look at whether religious organizations and other nonprofits (501c3 and 501c4) serve as social development engines that boost contacting volume in the area (Brady, Verba, and Schlozman 1995; R. K. Brown and Brown 2003; Jones-Correa and Leal 2001). I also look to see whether the crime rate—specifically the annual number of misdemeanors and violations per 1,000 people in the police precinct—impacts contacting volume. Crime may lead to conditions that necessitate more contacting (namely, graffiti and damage to infrastructure), but it could also lead to social isolation that suppresses civic engagement (Alex-Assensoh 1997; Wilson 2012).

Condition-Connected Explanations

Contacting is also based on the perceived physical attributes of the places a person is situated in. Unfortunately, an exogenous measurement of conditions is not available (were it available, it could be analyzed to directly reveal the distribution of conditions). Instead, what I look at are variables that are likely associated with (or drive) a higher frequency of actual problems in a space. The median age of the housing is an imprecise (but best available) measure of the infrastructure age—The construction of new housing often corresponds with nearby infrastructure maintenance and development. I use the ratio of workers in the tract (people for whom the Census tract is their place of work) to residents of the tract to measure how "commercial" a tract is. The expectation is that these more commercial areas are going to have significantly higher foot and vehicle traffic and are consequently more likely to have problems.[3] Population growth in the tract from 2000 to 2010 tells us where there has been a recent influx of people subjecting the space to new abuse.

An important question in thinking about the actual condition a space is in is the political-governmental context. Goods provided by the government are the responsibility of government. Although declines in their condition may be, in part, due to the actions of residents, it remains the responsibility of government to provide and maintain them. Geographic variation in the distribution and implementation of public policies is a reality. Spaces may get taken better care of by the government for any number of reasons from benign geographical happenstance to the characteristics of the people who live and work there to the more political reasons associated with representation in government. Understanding the full scope of how the government provides and cares for public goods is beyond the scope of this project—Indeed, a significant portion of that is likely due to bureaucratic decisions made in the bowels of government or by street-level bureaucrats (Lipsky 1979). However, within the scope of the article is the consideration of basic political–economic contexts that social science research suggests *could* impact conditions. I consider three political-economic contexts.

The first of these variables is a measure of economic development in the form of the percentage growth in median incomes for the tract between 2000 and 2010. Income growth, economic development, and gentrification in New York City neighborhoods (and elsewhere) are well-documented phenomena that have received scholarly, popular, and political attention (Davidson 2014; Freeman and Braconi 2004) and the connection between urban growth and urban politics is perhaps the most well documented in the subfield (Logan and Molotch 1988; Peterson 1981; Stone 1989). A simple expectation that fits with the literature is that areas that are experiencing economic growth will be getting increased attention from the city bureaucracy and thus be in better condition (leading to a lower 311 contacting volume).

There may also be aspects of elected officials and their offices that impact condition. Most political institutions within New York City are constant across the city: The mayor represents everyone and the city has a single-bureaucratic apparatus for the provision and maintenance of goods. Political variation does exist in the form of borough governance and representation on the city council. Borough governance is likely of limited consequence for conditions. Each of the five boroughs has a Borough President, but this is a role with limited power and responsibility for a space larger and more varied than most cities (Berg 2007). It is possible, however, that city council representation impacts community conditions. In New York City, the Council has been a critical center of city power as the Board of Estimates was eliminated in the 1990 charter revisions that came in response to the Supreme Court's ruling in (Board of Estimates of City of New York v. Morris 1989). In addition to endowing it with substantially more policy authority than it previously had, that charter revision also expanded the Council from 35 to 51 single-member districts. As Bruce Berg (2007) noted in his definitive work on New York City politics and governing, *New York City Politics: Governing Gotham*, the job of city council members involves more than just city budget, city tax, and city land-use decisions (though those are perhaps its most critical functions); their job also involves a lot of casework and oversight of the executive branch:

> Elected officials, the mayor, the city council, have a number of mechanisms at their disposal to achieve a degree of bureaucratic accountability. And there is

> anecdotal evidence that elected officials can move executive branch agencies in a desired direction using appointments, budgets, reorganizations, and other tools. (p. 279)

Although city councils have been a subject of great interest to scholars of urban politics, how council members use their offices for political gain and their ability to impact the bureaucracy has not received much attention in more recent postreform years. But just like any official elected by a district, it is in the interest of city council members to keep their district in good working order (Bickers and Stein 1996). What leads to variation in how well they do these more distributive aspects of their job is almost certainly tied to a member's experience working with city government, electoral prospects, and even their personality. Measuring things like bureaucratic acuity is beyond the scope of this project, but two variables can be used to begin to assess whether council representation has an impact on conditions and, by extension, 311 contacting volume. The first is the use of council district fixed effects to determine whether there is meaningful variation in contacting by council district–this is a blunt measure and does not speak to the mechanism that might be driving said variation, should it exist. Council districts contain between 158,000 and 169,000 people and do a fairly good job of keeping neighborhoods together. As such, a potential risk of the fixed-effects approach is that council district effects are really neighborhood effects. By using spatial-lag models (discussed in more detail below), I am able to guard against this problem. The second variable is the experience a district's representative has in the city council at each time period for which contacting is being analyzed. I use the average months of experience for the year—This increases as members spend more time in office and decreases when new people are elected for a district. The expectation is that, all else equal, more experience ought to lead to reduced contacting (see Table 1 for a complete list of variables and theoretical expectations).

Aggregating Contacts

The limited nature of the 311 data necessitates aggregation to an areal unit and a temporal unit. 311 contacts are provided with their longitude, latitude, time, and date, so there are many aggregation options. For this analysis, the contacts are aggregated to the Census tract-year. By aggregating to the Census tract, the contacts can be analyzed with tract-level Census data.[4] There are 2,215 2010 Census tracts in New York City. I eliminate Census tracts from the analysis with 2010 populations under 500 people (these are mostly nonresidential tracts that are primarily industrial, commercial, or park and for

Table 1. Independent Variables and Theoretical Expectation.

Variable	Space	Time[a]	Theoretical Expectation[b]
Spatial and serial lags			
Spatially lagged dependent variable (queen, first order)	Tract	Annual	Positive spatial autocorrelation: Y_{it} is positively associated with Y_{ijt}
Serially lagged dependent variable (t-1)	Tract	Annual	Positive serial autocorrelation: Y_{it} is positively associated with Y_{it-1}
Control variables			
Tract area (square miles, logged)	Tract	2010, TI	More space associated with more contacts
24-hour population (residential + place of work)	Tract	2010, TI	Greater population associated with more contacts
Contacting-propensity variables			
% owner-occupied	Tract	2010, TI	Higher ownership rate associated with more contacts
Median income (thousands)	Tract	2010, TI	Higher income associated with more contacts
% households with kids	Tract	2010, TI	Higher family rate associated with more contacts
% Black, Asian, Hispanic	Tract	2010, TI	Greater minority population associated with fewer contacts (indicates decreased contacting propensity) Greater minority population associated with more contacts (indicates unsatisfactory conditions)
Tax-exempt organizations per 1,000 people	Tract	2010, TI	More nonprofits associated with more contacts
Misdemeanors and violations per 1,000 people	Police precinct	Annual	Increased crime associated with increased contacting
Condition variables			
Worker-to-resident ratio	Tract	2010, TI	More workers relative to residents associated with more contacts
Median age of housing (2010)	Tract	2010, TI	Older housing associated with more contacts
Population growth (2000–2010)	Tract	2010, TI	Population growth associated with more contacts
Income percent growth (2000–2010)	Tract	2010, TI	Income growth associated with fewer contacts
Average council member months of experience in office (logged)	Council district	Annual	Increased experience associated with fewer contacts
Council district fixed effects	Council district	2010, TI	Significant effect indicates that council members impact conditions

a. "TI" indicates data are time-invariant, "annual" indicates data are collected annually.
b. Y_{it} is the variable Y for tract i at time t. Y_{it-1} is the variable Y for tract i at time t-1. Y_{ijt} is the spatial lag for Yi at time t.

which Census data are often unavailable).[5] The decision to aggregate to the year was done because there was no benefit to be gained in this analysis for aggregating to a narrower temporal unit—All of the other data in the analysis are either time invariant or annual.[6] Although 311 data are available back to when the program took its current form in 2004, I begin the panel time series in 2007 and end it in 2012 to maintain temporal proximity to the 2010 Census (from which much of the data come), to put some distance between the beginning of the analysis and the learning curve associated with the inception of the program, and to keep the analysis relatively current. The resulting analysis is of 1,859 Census tracts which is 11,154 tract-years.

The concern with spatial aggregation is that aggregated data are not necessarily reflective of the individuals the data are aggregated from (this is the ecological inference problem, for more on it, see King 2013 and Robinson 1950). Measures aggregated up from the individual (e.g., income, race, contacting) and the relationships between variables tell us about the space as a whole and not any particular individual who resides in the space. For example, high contacting volume in tracts that have a high percentage of homeowners indicates that areas with lots of homeowners have higher contacting volume and not necessarily that any individual homeowner is more likely to contact than a nonhomeowner.

There is also a question of whether 311 contacts ought to be analyzed as a count of the calls in a given year or as a normalized quantity. There is no doubt that tracts with more people and more area produce more contacts (the correlation coefficients for contacts and population are .34 for government goods, .30 for graffiti, and .45 for noise). However, contacting in a tract is not completely constrained by either of these variables. Given that there are multiple constraints and no constraint is absolute, I elect to use the contacting count for the multivariate regression analysis presented below. The count approach allows for the estimation of the effect of population and area on the right-hand side—which may vary across dependent variables—in addition to controlling for it. I use the tract's "24-hour population" rather than simply its residential population. The "24-hour population" (which I sometimes refer to as the tract's "inhabitants") is the sum of the number of people who reside in the tract and the Census Bureau's estimate of the number of people who work in the tract (the daytime population). Because many of a tract's residents are only at home at night and the weekends, this is a better measure of the potential number of contactors.[7]

Looking at the contacting data, there is a sizable difference in the average number of contacts for each of the dependent variables. Tracts average 127.2 government goods contacts (29.3 per tract inhabitant) per year, 21.9 noise

Table 2. Dependent Variable Correlation Matrix.

	Government Goods		Graffiti	
	Count	Per Inhabitant	Count	Per Inhabitant
Graffiti	.09	.10		
Noise	.28	.27	.19	.10

contacts (3.9 per tract inhabitant) per year, and only 3.2 graffiti contacts (0.71 per tract inhabitant) per year. The dependent variables are slightly to moderately correlated, but it is clear that they are measuring different things (see Table 2). In other words, the spaces that have high government goods contacting volume are not necessarily the same spaces that have high graffiti or noise contacting volume—though there is certainly some overlap.

Figures 2 and 3 show the tract-level distribution of government goods contacts (2007–2012 annual average) in two different ways. Figure 2 shows the count of contacts in each tract and Figure 3 shows contacts per inhabitant in each tract. These figures clarify the spatial unit being analyzed (the tract) relative to the city as a whole. They also show that depending on how you measure aggregate contacting, the spatial distribution changes. Notably, Manhattan tracts tend to be the highest contactors on a raw count basis but among the lower contactors on per-inhabitant basis. Alternatively, more suburban areas of the city (e.g., Outer Queens, Staten Island) are on the high end no matter how contacting is operationalized. The figures thus emphasize the need for a modeling strategy that is able to control for multiple baseline factors simultaneously.

Estimation

Two ordinary least squares (OLS)–based regression models are estimated for each dependent variable.[8] The first of the two regressions is aimed at curbing the effects of serial and spatial autocorrelation. Spatial and serial autocorrelations violate the OLS independence assumption and lead to inefficient estimates and frequently Type 1 errors (Kennedy 2003). A first-order serial lag (Y_{it-1}) controls for serial autocorrelation (as in a Koyck distributed lag model)—the extent to which 311 contacts at time t are a function of the contacts at time $t - 1$. Tests for first-order serial autocorrelation in the panel data using the Wooldridge (2002) test indicate that the autocorrelation is significant for all three dependent variables. The spatial lag (Y_{ijt}) controls for spatial autocorrelation—the extent to which nearby Census tracts are similar to one

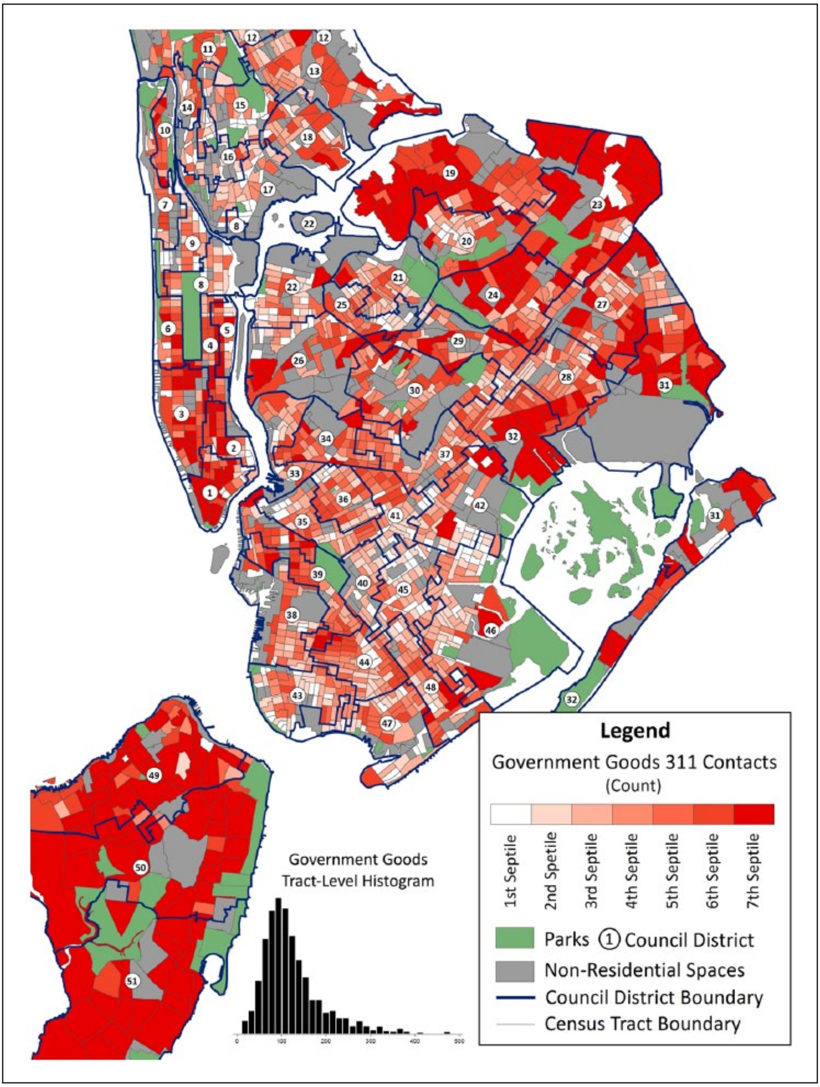

Figure 2. Tract-level government goods contacting in New York City (2007–2012 average count).

another. The spatial lag is the average number of 311 contacts for all adjacent tracts for each year and by including it, the model effectively becomes a

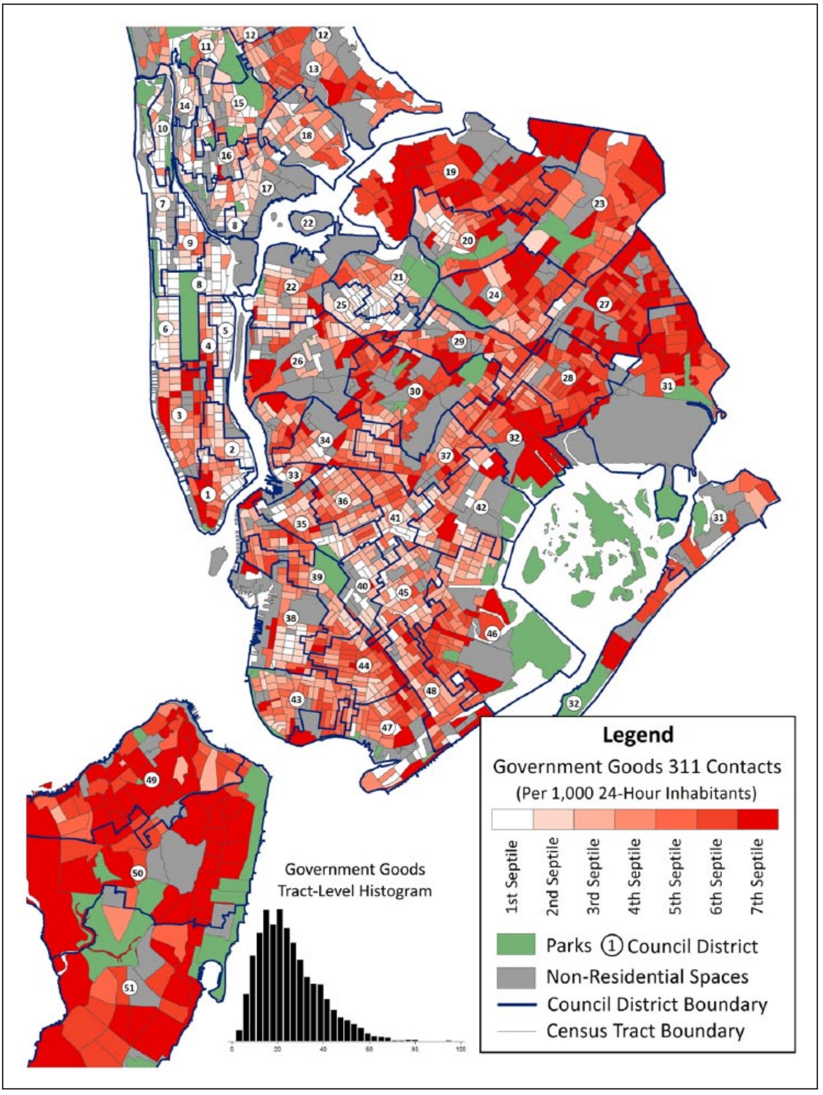

Figure 3. Tract-level government goods contacting in New York City (2007–2012 average per 1,000 inhabitants).

spatial OLS (S-OLS) model with a time component.[9] The variable serves to filter the dependent variable of its spatial dependence and produces a

Table 3. Global Moran's *I* Statistics (2007–2012, Pooled).

Contacting Category	Count Moran's *I*	Per Inhabitant Moran's *I*	*N*
Government goods	0.547**	0.669**	10,158 (1,693/year)
Graffiti	0.477**	0.482**	10,158 (1,693/year)
Noise	0.609**	0.946**	10,158 (1,693/year)
Total	0.518**	0.789**	10,158 (1,693/year)

Note. Moran's *I* statistic is for residential tracts only (more than 500 residents). However, all tracts (residential and nonresidential) were used in the creation of the spatial lag.
†$p < .10$. *$p < .05$. **$p < .01$.

parameter that estimates the dependence effect (Anselin and Bera 1998).[10] Table 3 reports the Global Moran's *I* statistics for each dependent variable (pooled) and confirms that the three dependent variables are positively and significantly spatially autocorrelated meaning that as 311 contacts increase in a tract, so do 311 contacts in neighboring tracts. The spatial autocorrelation is an example of Tobler's (1970) first law of geography: Near places tend to be more alike than distant places.

One concern with this approach is that the serial and spatial lags will overfit the model and suppress the effects of the other independent variables. Achen (2000) has documented these effects, noting that lags can improve fit but can also cause "sensible substantive coefficients to disappear" (p. 1). For the dependent variables analyzed here, the serial and spatial lags alone produce R^2 statistics between .52 and .83, so I estimate a second regression model for each dependent variable with the lags omitted.

Results

The results of the regression models are presented in Table 4. Two points about interpretation are necessary before getting into what the results reveal. First, the presence of the lags means that the effects of independent variables actually continue through time and space, so the standard interpretation of the coefficients is not a complete interpretation. That said, the coefficients in the lag models are reflective of the direct (or short-run) effects of a change in X_t on Y_t. For the serial lag, this is the immediate impact of X_t on Y_t but not the extent to which a change in X_t persists into the future (Kennedy 2003). For the spatial lag, this is the impact of a change in X_t on Y_t factoring in changes in the neighboring tracts. What this interpretation ignores is the extent to which a change in X_t impacts a change in Y_t in neighboring tracts (Ward and

Table 4. Regression Estimates: Tract-Level 311 Contacting Volume.

	Government Goods Contacts		Graffiti Contacts		Noise Contacts	
	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)
Y_{it-1}	0.565** (0.005)		0.145** (0.008)		0.453** (0.006)	
Y_{ijt}	0.108** (0.009)		0.892** (0.012)		0.158** (0.013)	
Square miles	22.941** (0.876)	71.690** (1.411)	0.955** (0.115)	1.142** (0.139)	1.251** (0.345)	2.414** (0.595)
24-hour population (thousands)	1.924** (0.140)	6.328** (0.247)	0.121** (0.020)	0.184** (0.024)	0.878** (0.062)	2.762** (0.104)
Population growth (thousands)	4.483** (1.160)	13.863** (2.110)	0.830** (0.170)	1.162** (0.208)	3.673** (0.512)	10.902** (0.890)
Worker-to-resident ratio	0.124** (0.038)	0.500** (0.069)	0.013* (0.006)	0.020** (0.007)	0.111** (0.017)	0.296** (0.029)
Median age of housing	0.282** (0.032)	0.723** (0.057)	0.038** (0.005)	0.076** (0.006)	0.103** (0.014)	0.280** (0.024)
Median income (thousands)	0.061* (0.025)	0.136** (0.046)	−0.001 (0.004)	−0.026** (0.005)	0.044** (0.011)	0.135** (0.019)
Median income percent growth	−0.028** (0.008)	−0.057** (0.015)	−0.001 (0.001)	0.006** (0.002)	−0.007† (0.004)	−0.020** (0.006)
% owner-occupied housing	0.110** (0.027)	0.175** (0.049)	−0.010* (0.004)	−0.016** (0.005)	−0.057** (0.012)	−0.169** (0.020)
% households with children	0.033 (0.035)	0.240** (0.063)	0.003 (0.005)	0.005 (0.006)	−0.047** (0.015)	−0.153** (0.027)
% Black	−0.047* (0.023)	−0.343** (0.041)	0.002 (0.003)	−0.009* (0.004)	0.003 (0.010)	−0.007 (0.017)
% Asian	−0.012 (0.033)	−0.285** (0.059)	0.023** (0.005)	0.067** (0.006)	−0.008 (0.014)	−0.106** (0.025)
% Hispanic	−0.047 (0.031)	−0.342** (0.057)	0.006 (0.005)	0.022** (0.006)	0.011 (0.014)	0.027 (0.024)
Crime rate (police precinct level)	0.006 (0.008)	0.049** (0.014)	−0.000 (0.001)	−0.000 (0.001)	0.007* (0.003)	0.019** (0.006)

(continued)

Table 4. (continued)

	Government Goods Contacts		Graffiti Contacts		Noise Contacts	
	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)	β (*SE*)
Nonprofits (per thousand people)	0.230** (0.043)	1.044** (0.078)	0.014* (0.006)	−0.026** (0.008)	0.053** (0.019)	0.149** (0.033)
Member experience	−2.221** (0.525)	−2.082* (0.917)	0.062 (0.077)	−0.309** (0.090)	0.764** (0.231)	−0.968* (0.387)
Constant	55.256** (4.665)	208.005** (7.695)	−2.012** (0.632)	1.066 (0.759)	−11.159** (1.898)	−12.096** (3.245)
N	9,285	11,154	9,285	11,154	9,285	11,154
R^2	0.785	0.395	0.455	0.077	0.590	0.161
Adjusted R^2	0.783	0.392	0.451	0.071	0.587	0.156
AIC	88,491.41	121,754.48	52,870.50	70,069.98	73,239.89	102,489.08
BIC	88,619.86	121,871.60	52,998.95	70,187.09	73,368.34	102,606.19
R^2 (within)	0.785	0.395	0.455	0.077	0.590	0.161
R^2 (between)	0.992	0.900	0.959	0.230	0.994	0.829
R^2 (overall)	0.848	0.526	0.527	0.092	0.780	0.395
ρ	0.024	0.077	0.018	0.135	0.059	0.314
Fixed effects *F*-test	2.426**	13.617**	1.990**	21.535**	3.780**	40.856**

Note. All models contain council district fixed effects. ρ is the fraction of the variance due to council district differences. See Table 1 for variable details.
AIC = Akaike information criterion; BIC = Bayesian information criterion.
†$p < .10$. *$p < .05$. **$p < .01$.

Gleditsch 2008).[11] Second, the ranges on the dependent variables vary—There are far more government goods contacts made than graffiti and noise contacts, so a one-contact increase in government goods is pretty small whereas a one-contact increase in graffiti and noise is more substantial. To more consistently compare effects across dependent variables, I examine coefficients as a percentage change for the stated changes in X in addition to the raw expected change in contacting volume.

The lag models (with council district fixed effects) perform the best in terms of adjusted R^2, Akaike information criterion (AIC), and Bayesian information criterion (BIC). This is expected given how powerful the lags are. Also as expected, the lags are positive and significant ($p < .01$). The positive serial lags mean that, on average, contacting in a tract is fairly consistent over time—Contacting volume at time t is positively influenced by contacting volume at $t - 1$. This is consistent with problems in tracts having some persistence over time and the residents of tracts not fluctuating dramatically on an annual basis. The positive spatial lags indicate that, on average, neighboring tracts experience similar levels of contacting. This is because adjacent tracts tend to have similar populations and similar problems. In addition, the Census tract is not a boundary of significance to citizens, so a 311 contactor in a tract may also be a 311 contactor in an adjacent tract. This spatial clustering of contacting ought to be viewed as more than just a modeling nuisance though. The clustering of 311 contacts reflects the notion that neighborhoods act and experience public policy in cohesive ways.

As previously noted, one concern with the inclusion of the lags is that they explain a very large portion of the variance of the dependent variable (this is particularly true of the serial lag) and thus may be masking some other results (Achen 2000). Indeed, across the board, the results in the nonlag models have greater magnitude with effects often more than doubling or tripling when the lag is removed. Unless noted, my interpretation of the results refers to the lag models.

24-Hour Population and Area

The population and area variables perform as expected. Tracts with larger 24-hour populations have more contacts and so do tracts that are physically larger. All else being equal, each additional 1,000 people who live and work in a tract results in additional 0.95 city service, 0.06 graffiti, and 0.44 noise contacts annually. A similar phenomenon is occurring with the tract area variable where a 5% increase in tract area produces an additional 1.14 government goods, 0.05 graffiti, and 0.07 noise contacts, but the estimates from the models with no lags are considerably stronger. These variables are good examples of the impact of the lags on effect size: X_{t-1} explains Y_{t-1}, so a considerable portion of the effect of X_t on Y_t has already been accounted for by Y_{t-1} and thus does not get revealed in the estimate for X_t. Certainly, some quantity of contacts at time t are truly a function of contacts at time $t - 1$, but the lag likely overstates this quantity. It is difficult to know what the "true" effect is, but it likely lies somewhere in between the lag and nonlag model estimates.

Propensity-Connected Variable Results

I identified two variables aimed at measuring the *stake* the residents of a tract have in the neighborhood—reasoning that as the stake increases, so too should contacting volume. These two variables were the percentage of the housing in the tract that is owner-occupied and the percentage of the households with children under 18. Both perform in interesting ways. Owner-occupied housing is significant across the board but not in the same direction for all three dependent variables. For the government goods dependent variable, the relationship is positive whereas for graffiti and noise, the relationship is negative. Controlling for the tract's 24-hour population and all the other variables, a 10% increase in homeownership for a tract results in an increase of 1.11 contacts (0.96%) for government goods and a decrease of −0.1 contacts (−3.02%) and 0.5 contacts (−2.82%) for graffiti and noise, respectively. Although not large, these are substantive and statistically significant changes. Moreover, the effects roughly double when the lags are removed from the model. The results for the percent families variable were not as robust. The variable is significant only for government goods and noise and only in the nonlag models. When significant, it has effects that are slightly stronger than homeownership.

What do these results tell us about stake in the neighborhood and 311 contacting volume? First, areas of the city where people own their homes and have children do appear to contact the city more with complaints about government goods. Because there is no theoretical reason to believe that government goods in high ownership, family-centric areas are worse than other areas of the city—In fact, we would expect the opposite—This result supports the idea that homeownership and family life drive contacting on problems related to general government goods provision. At the same time, these areas are probably subject to less graffiti and less unwanted noise, so the insignificant coefficients for graffiti and negative coefficients for noise reflect this. The effect of stake in the neighborhood is not so strong that it overcomes conditions—We cannot observe contacting on a problem if the problem is not present. So in addition to being able to say that homeownership and family life impact contacting, the results suggest that homeownership and family life in a space likely reduce the presence of graffiti and noise.

The variables that measure efficacy and participation tendencies were income and race/ethnicity. The expectation laid out above was that resources ought to lead to increased contacting. What we see in the results is a story that is similar to the one for the stake in the neighborhood variables. As the median income of a tract increases, there is a modest increase in government goods contacting: A $20,000 (US) increase in median income is associated with 0.16 (1.05%) additional contacts. The effect for noise is also positive, significant, and modest. These two results fit with the previous literature on political participation that says resources afford people what they need to engage civically. Graffiti performs slightly differently: insignificant in the lag model but negative and significant in the nonlag model, which is consistent with the expectation that wealthier areas experience less graffiti. Whatever amount of graffiti there is in these areas, it does not appear to be enough that the increased propensity associated with resources makes the coefficient positive.[12]

Race and ethnicity also follow a similar pattern. As the percentage Black, Asian/Pacific Islander, or Hispanic increases, government goods contacts decrease and graffiti contacts increase (though significance and effect size differ based on the presence of the lag). Noise contacting volume does not appear to be impacted by race and ethnicity, all else being equal. Like homeownership, there is no theoretical reason to expect better provision in minority areas, so a reasonable interpretation of the results is that contacting propensity is slightly lower in heavily minority spaces, but graffiti is also more prevalent.

I also looked to see if there was an effect for social-contextual variable in the form of nonprofits and crime rates. The results for the nonprofits variable (501c3 and 501c4 organizations per 1,000 24-hour inhabitants) are quite robust. Controlling for all the other variables in the model (including how commercial the space is), the effect is positive and significant in eight of the nine models. Like the other variables in the model, a direct causal connection cannot be made for relationship between *X* and *Y*, but this is certainly reflective of the notion that social organizations facilitate civic engagement and participation in programs like 311. The impact of crime (misdemeanors and violations per 1,000 police precinct residents) on contacting is less clear-cut. The variable is insignificant in both graffiti models and significant and positive in the noise models. For government goods, the crime variable is positive but significant only when the lags are removed. The first takeaway from the crime variable results is that there is no evidence of a statistically significant suppression effect for crime. The second takeaway is that areas with more crime have more noise complaints. That the result does not hold for graffiti is somewhat unexpected but the insignificance is likely a function of low overall graffiti contacting volume and the crime variable being measured at the precinct level rather than the tract level.

Condition-Connected Variable Results

There were three baseline condition variables in the model (worker-to-resident ratio, population growth, and median age of housing) and they perform similar for all variables in all models. This means that areas that are more commercial, experiencing greater population growth, and have older housing (and by extension aging infrastructure) experience more 311 contacting, all else being equal. Of particular note here is the population growth variable where 500 additional residents (about one standard deviation above the mean) results in an additional 2.24 government goods contacts (1.86%), 0.41 graffiti contacts (11.19%), and 1.83 noise contacts (8.37%). Together, these three positive and significant variables support the idea that 311 contacting is not merely about individual behavior but also about the distribution of conditions.

Much more interesting is the effect of 2000–2010 income growth on government goods contacting. A tract-level income change of 40% (which is the average) is associated with a 1.1 contact decrease (−0.93%) in government goods contacts. This effect indicates that areas of the city that are economically prospering have fewer city service contacts per year. Note that higher median income for a tract is associated with a modest increase in contacting, so there is no empirical or theoretical reason to believe that these growth areas have a lower contacting propensity. Consequently, this result is consistent with the theory that higher growth areas are paid better attention to by the city's service providers. The effects for graffiti and noise are less consistent.

One causal concern is that people and business might be locating in better maintained areas, so the relationships for population and income growth are reflective of a sorting process rather than government action. In other words, the lower call volume in growth areas may be because those areas were getting attention from government prior to the growth. These models cannot say decisively which way the causal arrow goes, but an endogenous relationship between condition and development seems likely and would still mean increased attention to growth areas by government.

The final two variables to consider are those that pertain to the New York City Council. In all of the models, the council district fixed effects add significantly to the model ($p < .01$). At its most basic, this means that different council districts have different average 311 contacting levels. Of course, City Council districts conform loosely to collections of neighborhoods, and neighborhoods are comprised of similar people, contexts, and conditions. So why take these fixed effects seriously? There are two reasons. First, many of these factors are controlled for in the model. Second, the fixed effects remain significant even in the models with the spatial lag. Recall that the spatial lag is the average number of contacts in neighboring tracts—a very close proxy for true overall neighborhood contacting levels. That the fixed effects remain significant in the presence of this explained variance is a good indicator that council district representation is impacting conditions in some way. In an effort to consider one potential explanation for these effects, I included the average months in office (back to the representative joining the council) as a covariate. There is a negative and significant relationship in the government goods models and a mixed set of results (direction and significance) in the graffiti and noise models—However, in all cases, when the serial lag is removed the relationship is negative and significant. Although nothing can be said conclusively about the relationships between council member experience, condition, and contacting propensity, there is enough evidence here to suggest that the theory ought to continue to be examined. Most importantly, it suggests that the politics of representation may be part of the causal web of 311 contacting volume.

Discussion

For local governments to learn about their cities from 311 data it is going to necessitate examining the spatial distribution of aggregated contacting volume. Although 311 data are deficient in several ways, the openness of the program and the geographical precision of the data offer considerable possibilities for understanding government action and city life. Prior research had identified individual-level causes of citizen–government contacting, but the extent to which these propensities are connected to actual geographic distributions had not been considered. Indeed, the results presented above are strongly suggestive of patterns in the distribution of 311 contacting volume and should inform how we think about both local civic engagement and the condition of government-provided goods in neighborhoods. This analysis may also help set the stage for other analyses of citizen contacting that seek to understand its causes and what it tells us about the spaces we live in.

Theoretically, 311 contacting volume is driven by both the condition a space is in and the attributes of the people who inhabit that space. Although that statement may seem obvious, empirically reckoning with it is a more difficult proposition. At the heart of the methodological problem is that we have large quantities of data that tell us where people have identified problems, but we know absolutely nothing about the people who have identified them. This makes it is difficult to sort out the extent to which contacting volume is a function of uneven government distribution of quality goods or uneven contacting propensity. The approach taken here was to aggregate three categories of 311 contacts to the Census tract level for a six-year period and analyze what variables correspond with increases and decreases in contacting volume. The analysis was carried out by estimating regression models with serial and spatial lags to deal with independence problems. The analysis explains how contacting volume corresponds to the geography of the city even if it cannot tell us precisely what makes individuals more or less likely to use the service. Attributes like older housing, high foot and vehicle traffic, and high population growth all lead to a higher contacting volume. It would be difficult to chalk these results up to propensity—especially as income and other demographic attributes are controlled for—so they tell us that these areas of the city likely have more of the kinds of the problems that necessitate communication with the city.

Results also vary by dependent variables in important ways. A good example of this is the effect of owner-occupied housing rates. The results show that contacting on problems pertaining government goods like streets, waste collection, and trees is higher in areas of the city where a greater percentage of the residents live in homes they own. This conforms to expectations about how the stake people have in their neighborhood impacts how they interact with government. Because there is no reason to expect that the city is systematically underserving areas with high rates of homeownership, the result also serves as a good baseline indicator that usage of the service is higher in areas of the city where people have a greater stake in the success of the neighborhood. This means that problems pertaining to government goods are likely going underreported in low ownership areas of New York City. The results for government goods also inform our understanding of the results that indicate that contacting on graffiti and noise decreases as owner-occupied housing increases. While the government goods result conforms to theoretical expectations about propensity, the graffiti and noise results conform to theoretical expectations about how people behave in different areas of the city—Namely, that in areas of the city where people rent, people are more likely to make bothersome noise and mistreat their environment.

The results match up with the previous work done on civic engagement in that they show that the overall socioeconomic status and resources of a space are tied to contacting volume. However, the effects are decidedly weak. The weak effects are in keeping with some of the older contacting research but also with the idea that the barriers to entry for 311 contacting are low enough that resources are not a major obstacle to participation.

Contacting volume is a function of a lot of different attributes. To look at it only through the lens of infrastructure age or socioeconomic status is clearly not enough. One of the possibilities explored in this article is that choices made by government officials impact the condition of spaces and these variations manifest themselves in 311 contacting. Although it is difficult to make definitive statements, three results support this idea. One, controlling for median income, income growth is associated with decreased contacting. Two, council district fixed effects contribute significantly to the models even with the spatial lags included. And three, for government goods, more council member experience means decreased contacting. At the very least, these results suggest the need for additional exploration of a link between government and spatial variation in service quality in cities.

A dearth of data has left a lot of potentially very interesting questions pertaining to contemporary intracity variation unexplored. Questions about civic engagement and public policy implementation are just the tip of the iceberg as researchers develop new and different ways to take advantage of open-government and e-government data sources. The limitations of the data discussed above should not stop researchers from trying to leverage them as measures but those who employ them should be cautious in how they are implemented and interpreted.

Appendix

Dependent Variable Contacting Breakdown (for Analyzed Tracts and Years Only).

Dependent Variable	311 Contacting Categories	Contact Count	% of Total Contacts[a]	% of Dependent Variable Contacts
Government goods	Street condition	217,480	5.07	16.51
	Street light condition	172,680	4.02	13.11
	Water system	168,035	3.92	12.76
	Sewer	146,633	3.42	11.13
	Dirty conditions	85,093	1.98	6.46
	Sanitation condition	74,038	1.73	5.62
	Damaged tree	67,702	1.58	5.14
	Rodent	60,783	1.42	4.61
	Missed garbage/recycling collection	45,276	1.05	3.44
	Derelict vehicle	37,801	0.88	2.87
	Overgrown tree/branches	37,743	0.88	2.87

(continued)

Appendix (continued)

Dependent Variable	311 Contacting Categories	Contact Count	% of Total Contacts[a]	% of Dependent Variable Contacts
	Broken muni meter	35,802	0.83	2.72
	Root/sewer/sidewalk condition	20,869	0.49	1.58
	Dead tree	20,384	0.47	1.55
	Sidewalk condition	19,683	0.46	1.49
	Snow	16,382	0.38	1.24
	Broken parking meter	14,226	0.33	1.08
	Street sign—Damaged	14,047	0.33	1.07
	Street sign—Missing	8,687	0.20	0.66
	Water conservation	8,277	0.19	0.63
	Maintenance or facility	8,106	0.19	0.62
	Litter basket/request	6,625	0.15	0.50
	Industrial waste	4,734	0.11	0.36
	Highway condition	4,694	0.11	0.36
	Water quality	4,284	0.10	0.33
	Street sweeping	3,839	0.09	0.29
	Street sign—Dangling	3,548	0.08	0.27
	Recycling enforcement	3,395	0.08	0.26
	Overflowing litter baskets	3,072	0.07	0.23
	Standing water	1,133	0.03	0.09
	Wear and tear	714	0.02	0.05
	Indoor sewage	591	0.01	0.04
	Beach/pool/sauna complaint	458	0.01	0.03
	Bridge condition	202	0.00	0.02
	Bike rack condition	135	0.00	0.01
	Highway sign—Damaged	106	0.00	0.01
	Curb condition	51	0.00	0.00
	Highway sign—Missing	41	0.00	0.00
Noise	General	106,061	2.47	44.07
	Street/sidewalk	76,038	1.77	31.59
	Vehicle	48,004	1.12	19.95
	Park	7,056	0.16	2.93
	House of worship	3,519	0.08	1.46
Graffiti	Graffiti	34,183	0.80	100.00

a. Total contacts includes all "service delivery" contacts made to New York City 311 including those not included in the three dependent variables.

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Notes

1. The idea for a 311 program was considered during the Giuliani administration; however, the New York City Police Department's (NYPD) concerns over whose responsibility it was to handle nonemergency police-related calls put exploration on hold (Schellong 2008).
2. Some of the categorization of 311 calls has changed over the years or is ambiguous back to the beginning. To achieve consistent and uniform categories over time call category names were carefully inspected and interyear correlations between seemingly similar categories were examined. Reported 311 categories were combined when it was clear that they were either the same or very similar.
3. Denser areas are also subject to more wear and tear, but density is too highly correlated with population to be estimated together (r = .69). Residential tracts in New York City are fairly consistent in their area (the interquartile range is 0.03 square miles), so population and density increase together.
4. Census tracts are used instead of Census block groups for two reasons. First, tracts and block groups have arbitrary boundaries, so using too small or too big of an areal unit may inappropriately divide 311 contacts. This is the modifiable areal unit problem (Anselin 1988; Cho and Baer 2011; Openshaw 1983) and in any geographically aggregated analysis, it is a concern. Areal units that are too small may lead to a lower 311 contacting volume than is appropriate for a space and to socioeconomic measures that are too concentrated. The author believes that Census tracts strike a balance between too small (e.g., block groups) and too big (e.g., zip codes, boroughs) though additional analysis would need to be conducted to see how modifying the areal unit impacts the results. The second reason is that some data are available at the tract level that are not available at the block group level.
5. Taylor et al. (1995) offered evidence from Philadelphia and Baltimore that residential and nonresidential spaces deteriorate in different ways.
6. Month-to-month changes in contacting are appear to be primarily a function of changes in the weather with more contacts in warmer months.
7. The Census Bureau uses its commuting and other American Community Survey data to estimate the number of people who work in a tract (McKenzie et al. 2010). Residential and worker population are highly correlated in tracts with residential populations (r = .89).

8. Because of the already complex nature of the models (time series with spatial dependence), I do not use a count model (e.g., Poisson, negative binomial). However, when simplified versions of the models are estimated with a count estimator, the results are similar.
9. Spatial ordinary least squares (S-OLS) regression can be inconsistent and suffers from simultaneity bias though it has been shown to perform acceptably under most conditions (Franzese and Hays 2007). In a typical spatial regression scenario with no time component, a spatial maximum likelihood (S-ML) estimator would be preferred (Franzese and Hays 2007; Ord 1975). However, the S-ML estimator does not, to the author's knowledge, allow for estimation as a panel time series. The S-OLS approach also allows for considerable modeling flexibility such as the elimination of outlier observations. Although it is certainly possible that a more complex time–space estimator would produce different results, the author believes that, on the whole, the results presented here are reliable.
10. Spatial lags (and the Moran's I-test statistic) were computed for each tract at each year using a queen first-order spatial weights matrix—Any tract j that shares any border with tract i is treated as a neighbor of i.
11. It should also be noted that these are time–space models, so the effect of X not only persists over time but also over space–time. In other words, a change in X in a tract has an effect on neighboring tracts *and* on how those neighboring tracts change over time.
12. When the percent of the tract that has a college degree is substituted for income, the results are very similar.

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