# Tweeting Public Service Complaints

WILLIAM O'BROCHTA

Texas Lutheran University, USA

Many local governments have added new methods to report public service complaints like submitting a complaint on Twitter, hoping to expand access to more constituents. But who submits Twitter complaints, and how do those complaints compare to those submitted using other methods? I collect data on complaints submitted to the City of St. Louis and use these data to show that complaints submitted on Twitter are primarily from wealthy white residents concerned about issues related to parks or to their commutes. These types of complaints differ sharply from those submitted using other methods. Hence this descriptive evidence lends credence to the idea that providing a Twitter account to submit complaints may not expand access to local government services as much as previously thought. Local governments may want to carefully consider how the methods that they provide to submit public service complaints could help to determine the types of complaints they are likely to receive.

*Keywords: local government, responsiveness, complaints, e-governance*

Yet another pothole. Members of the public encounter potholes and other problems that require local government attention every day. These problems can be reported to local governments, many of whom use complaint tracking systems to record and process public service complaints. Individuals seeking to get a pothole repaired can

complete a web form, call a telephone hotline, or — in many communities — send a Tweet to a local government Twitter account dedicated to recording public service complaints.

Are there advantages to Tweeting a complaint instead of recording that complaint using other methods? Tweeting a complaint requires using either the Internet or a phone, so collecting public service complaints on Twitter duplicates existing web-based or phone systems. Further, Twitter is not designed to collect public service complaints, meaning that a complaining member of the public may or may not provide all of the required information in their initial Tweet, resulting in back-and-forth interaction with local government staff and slowing down the complaint resolution process (Young, 2022). Therefore, Twitter must have some other perceived advantage in order for local governments to maintain and people to use it to record public service complaints.

The primary argument for using Twitter as a complaint submission platform is that Twitter is convenient (Gao 2018). Many people use Twitter, so a person already on Twitter for some other reason can quickly submit a public service complaint without leaving the website or the app. This could encourage people who do not normally submit public service complaints to do so, increasing equity in the complaint process. This article investigates the extent to which Twitter is an effective mechanism for recording complaints by describing the people who choose to Tweet public service complaints, complaint topics, and response times and comparing them to other methods of submitting complaints.

Previous research has focused on identifying the characteristics of people who submit public service complaints regardless of the platform that they use (e.g., Minkoff 2016; O'Brien et al. 2017) or has taken place in a context where Twitter was the only option to submit public service complaints (Osorio-Arjona et al., 2021). Gao (2018) presents network maps of Tweets and replies from five public service complaint Twitter accounts. Beyond that study, we do not know who is Tweeting what kind of complaints

to local governments and if and how these people and complaints differ from those recorded using other methods.

Studying this question is important because local governments have limited resources to invest in complaint management, particularly if the systems that they adopt tend to cater to certain demographic audiences. At the same time, local government responsiveness to complaints is important because constituents' base future local government interactions on current levels of responsiveness (Sjoberg et al., 2017).[1] Initial interactions either build or break trust between constituents and local government (Kim & Lee, 2012). Indeed, the process of constituents filing public service complaints, the bureaucracy responding, and both groups updating their beliefs about one another's preferences is part of the process of coproduction of government resources (Jackson Schiff, 2022; Nabatchi et al., 2017; Wu, 2021). By investigating the ways in which constituents use different complaint submission mechanisms, this article shows that a digital divide in complaint management remains despite increasingly available Internet access (Thomas & Streib, 2003). Constituents may view their role in coproduction of government resources differently than government officials, with most constituents tending not to rely on Twitter to submit complaints (Berner et al., 2011). While local governments may respond to constituent service requests without regard for the location of the request (Clark et al., 2020), differences in how constituents use complaint submission methods can impact responsiveness and are worth investigating further.

I collect public service complaints recorded in the City of St. Louis using a variety of platforms including Twitter. I examine the Twitter users who submit complaints to see whether their demographics differ from the average St. Louis City resident. I then analyze the locations and types of public service complaints submitted on Twitter and compare them to complaints submitted using other methods. I find that people who use Twitter to submit public service complaints are overwhelmingly white,

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[1] Much of this work looks at the alignment between local partisan shifts and changes in local government policy (e.g., Levine Einstein & Kogan, 2016; Palus, 2010).

and that the complaints that they submit are heavily concentrated in wealthier, majority white areas and focus on issues primarily related to street maintenance. This is despite the fact that Blacks are just as likely as whites to have a Twitter account (Perrin & Anderson, 2019). Perhaps surprisingly, complaints recorded on Twitter are addressed in the same amount of time as complaints recorded via phone. Put differently, providing Twitter as a complaint mechanism does not appear to alter local government responsiveness at that same time that certain demographic groups already well-represented in the complaint process dominate Twitter complaints. Local governments investing in technology to record public service complaints would do well to consider how technology choice may impact the people who report complaints, the types of complaints reported, and their overall level of responsiveness to constituents.

## Research Questions

I focus on two related research questions: 1. who are the people using Twitter to record public service complaints and how do they compare to average city residents? and 2. what are those people Tweeting about? These questions are inherently descriptive, which I argue is appropriate given that this is the first study to examine the characteristics of Twitter users who make public service complaints and to compare complaints recorded on Twitter to complaints recorded in other ways.

Submitting a public service complaint requires at least two conditions to be met. First, a person must perceive that there is a public service problem in need of attention (Minkoff, 2016; O'Brien et al., 2017). Second, a person must know that they can submit a complaint to local government and know how to do it. This step pre-supposes that people trust that their local government will take their complaint seriously and respond to it in a timely manner (Kontokosta et al., 2017). Otherwise, knowledge of a system to record local public service complaints does not motivate people to spend time submitting such a complaint. Prior literature has shown that factors like homeownership (Minkoff, 2016), political involvement (O'Brien et al., 2017; White & Trump, 2018), technological ability

(Lee et al., 2021), and socio-economic status (Kontokosta et al., 2017; Pak et al., 2017) all influence people's willingness to submit a complaint to local government, regardless of the method of submitting the complaint.

Providing Twitter as a method for submitting complaints could be important because different types of people use different modes of communication (Hartmann et al., 2017). To submit a complaint on Twitter, two additional steps are required. First, a person must have a Twitter account. While there are few gender or racial differences in the likelihood that someone uses Twitter, Twitter users tend to be younger, wealthier, and to have graduated from college (Perrin & Anderson, 2019). Second, a person must be aware that a complaint can be submitted on Twitter.

Familiarity with the process of how to submit a complaint requires a high level of political awareness.[2] While local governments may advertise that the public can submit complaints, such campaigns are likely to direct people to a website or a phone number, not to a Twitter account, since more residents have access to submit complaints using these methods compared to using Twitter. Given this, how pervasive might awareness about a city's complaint-related Twitter account be? New York's @NYC311 Twitter account has about 360,000 followers. Assuming 22% of New York City residents are on Twitter, that means that 20% of New York City Twitter users are following this account.[3] This percentage is much lower in other cities, with Philadelphia at an estimated 10% of residents on Twitter following @Philly311 and St. Louis at an estimated 7.5% of residents on Twitter following @STLCSB. While it is easy to follow a Twitter account, it is also not necessary to do so to Tweet at an account. Therefore, the comparison of percentages here is useful in the sense that it demonstrates that awareness about these accounts is not universal. A long line of research has found that education is the greatest

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[2] It would be interesting in future work to survey individuals who submitted complaints on Twitter to see how they learned about Twitter as a possible way to reach local government services.
[3] 22% being the estimated percentage of U.S. residents using Twitter (Perrin & Anderson, 2019).

predictor of political awareness (e.g., Gronlund and Milner 2006; Rasmussen 2016). Additionally, educational attainment is highly correlated with wealth (Bhutta et al. 2020, 7) and race (NCES, 2017). Examining the first research question will investigate how these prior findings translate to a complaint-related environment and compare across complaint submission platforms.

After investigating the types of people who are likely to submit complaints on Twitter, what are those complaints likely to be about? People submit complaints about problems in areas that they frequent. For many people, this means that complaints are focused on their local neighborhoods (O'Brien et al., 2017) or their commute to work (Osorio-Arjona et al., 2021). If prior work on educational attainment and wealth is borne out in this context, then an important aspect to investigate are the characteristics of neighborhoods with more complaints reported on Twitter. Since wealthier neighborhoods tend to have higher quality public services (Conley & Dix, 2004), this means that wealthier individuals are more likely to report public service complaints when they are outside of their neighborhood, most often to commute to work (Davis and Boundy 2019, 8-9).

## Case Description

I explore the ways in which Twitter is used to record public service complaints by examining complaints submitted to the St. Louis Citizens' Service Bureau (CSB). The CSB handles public service complaints within the City of St. Louis, Missouri, an independent city with a population of 301,578 (Whiteley, 2021). The CSB was founded in 1968 by then mayor Alfonso Cervantes and currently operates with a yearly budget of more than $500,000 (Watts et al., 2001). Six full time and two part time customer service representatives and a manger work at the CSB (*City of St. Louis Board of Aldermen Public Safety Committee Meeting September 28, 2021*, 2021).

St. Louis is an ideal city in which to study complaint response because of the emphasis that the City places on the CSB. Former Mayor Lyda Krewson characterized the provision of public services in St. Louis as "complaint-driven," meaning that unless a complaint is submitted to the CSB, a public service problem is unlikely to be resolved (Bott & O'Dea, 2019). Further, St. Louis is a medium-sized city, so there are a larger number of comparable cities in the United States where the results might generalize.

The CSB functions as an intermediary between the public and other City departments, and its responsibility is to record and route complaints, not to assess the complaint or to complete the work (Bott & O'Dea, 2019). The program was modernized in 2008 and uses the Internet-based Cityworks platform to electronically log complaints. Between September 2, 2008 and September 12, 2021, 911,844 complaints were recorded in the CSB system. Of those complaints, 15,352 (2.18%) were sent to the CSB Twitter page @STLCSB, which was introduced as a complaint mechanism in April 2010.[4] The most complaints, 858, were recorded on January 9, 2014, whereas the maximum number of complaints recorded on Twitter was 35 on March 15, 2021. The overwhelming majority of complaints are recorded via phone (489,055 or 69.56%) or via the CSB website (154,979 or 22.04%). Fewer than 1% of complaints were e-mailed, submitted from another City department, sent via a web chat feature, mailed, or faxed.

This complaint management structure is common across medium and large-sized cities. Cityworks states that it is used in more than 700 organizations, most of them presumably cities.[5] Many cities set-up departments or agencies to handle complaints. These departments or agencies can range from a simple online form or phone number with one person responsible for routing complaints in smaller cities to large complaint management departments. As Minkoff (2016) describes, a laundry list of major cities have complaint management systems and departments like those established in St. Louis. Gao (2018) compares Tweet volume from complaint management Twitter accounts

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[4] Of the 911,844 complaints, the method of complaint was recorded in 703,033 cases. The latter number is used for the percentages.

[5] See https://www.cityworks.com.

across five cities --- Philadelphia, New York, San Francisco, Chicago, and Kansas City, Missouri. St. Louis CSB's 30,721 replies is toward the higher end of the total number of complaint-related Tweets sent by these different cities. By these measures, the St. Louis CSB is effective at routing complaints to the appropriate city department.

Though the St. Louis CSB office and complaint management system was modernized in 2008, campaigns to encourage the public to submit complaints started in 2013. Before 2013, the yearly number of complaints reported to the CSB was fewer than 4,000; after 2013 the yearly number of complaints was about 107,000. Complaint numbers have been consistent between 2014 and 2020, changing by at most 2.32% per year. Figure 1 shows that web, phone, and Twitter complaints have remained consistently popular between 2014 and 2020.[6] The Figure displays points for the total number of complaints submitted by each method by month-year. No time trend is immediately apparent. Phone remains the most popular way of reporting a problem to the CSB with the online web form as the second most popular option. There is no marked increase in Twitter usage to report complaints over time. This is interesting, as we might expect Twitter to become more popular and reporting complaints via phone to become less popular over time.

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[6] It appears that a data error in 2020 and 2021 failed to record the way in which some web complaints were submitted.
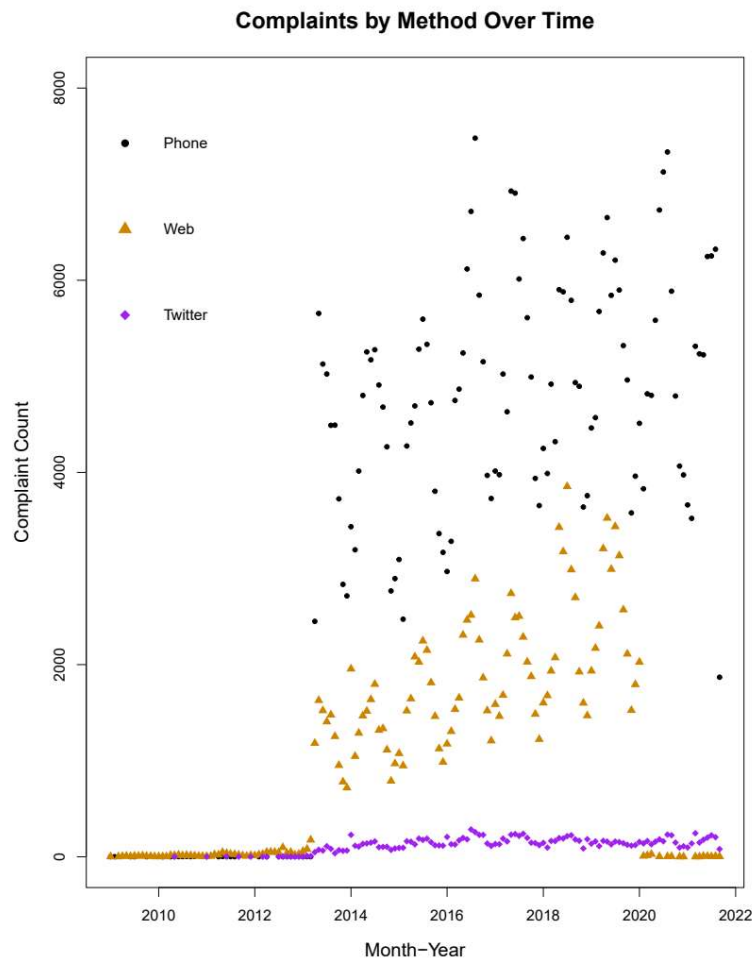
**Figure 1. Complaints by Method Over Time.**

*Note.* Number of complaints by method with observations by month-year.

Complaints are recorded in the Cityworks database. Each unique complaint submitted to the CSB is assigned a service request identification number. This means that if multiple people complain about the same issue at the same location, the initial complaint will be recorded in the CSB database and additional complaints will be notated on the initial complaint. The CSB database records the same information irrespective of the method used to report the complaint. This information includes the complaint location

(geo-coordinates, address, neighborhood, and ward), a description of the nature of the complaint selected from pre-assigned categories, and the City department responsible for addressing the complaint. No information about the person reporting the complaint is recorded.

Once the CSB assigns a City department responsible for addressing the complaint, the CSB is no longer involved in updating the status of the complaint or checking to ensure that the complaint is resolved. These functions fall to the responsible City department. The CSB can respond to requests to view the status of the complaint and can open a new complaint if the original complaint was marked as "closed" (i.e., complete or resolved), but a member of the public is unhappy with the resolution. Anyone with Internet access can view the status of any complaint themselves by inputting a service request identification number into a web form.

The City department responsible for handling the complaint receives it through Cityworks, dispatches an inspector to verify the problem, and then sends a crew to address the problem. The inspector and crew document their work by taking pictures of the work completed, if possible (*City of St. Louis Board of Aldermen Public Safety Committee Meeting September 28, 2021*, 2021). A supervisor in the responsible department marks the complaint as closed when it has been addressed. The CSB aims for all complaints to be inspected within 14 days, though completing the requested work often takes longer. Prior to 2013, complaints took a long time to close. Post-2013, the yearly median length of time for a complaint to be closed was fewer than 8 days.

Most complaints are directed to the Forestry Division (185,814, 20.38%, median 14 day close) or the Streets Department including the Refuse Division (173,064, 18.98%, median 3 day close) and the Traffic Division (125,804, 13.80%, median 2 day close). The top two complaints to the Forestry Division are to inspect a City-owned tree for potential trimming (43,733) and to inspect an occupied property for high grass or weeds (28,876). The top two complaints to the Refuse Division are for a damaged trash container (31,192)

and debris dumped in the street or alley (23,697) and for the Traffic Division are a traffic sign in need of repair (26,930) and single (street) light(s) out on the block (23,581).[7]

Along with the CSB data, I collected Tweets and replies from the @STLCSB Twitter account. This account Tweeted 31,032 times between its creation in 2010 and September 17, 2021 with 30,721 replies (99% of all Tweets). The fact that almost all Tweets are replies indicates that this Twitter account is exclusively designed to reply to public complaints, not to broadcast other information to followers. The CSB provides two kinds of replies: those that report a service request identification number and those that do not. About 62% of CSB replies include a service request identification number. Replies with this number indicate that the CSB has either used the information provided by the person Tweeting at them to record a new complaint or has checked on the status of a complaint and reported back. The other replies typically ask the person making the request for more information about their complaint. A common problem is that people provide incomplete information because people Tweeting @STLCSB are not guided through the complaint process like they would be if they used the web form or called the complaint hotline. For example, people often provide an address that is not precise enough for the complaint to be recorded, so the CSB replies asking for clarification.

In addition to the replies from the CSB, I collected the initial Tweets sent to CSB and the user profiles of the individuals sending those Tweets. Some Twitter users delete their Tweets or accounts, so of the 30,721 CSB replies, I collected 24,319 original Tweets from 2,691 unique users.

I matched the Tweets with a service request identification number to the CSB complaint database. 15,762 complaints were matched. Of these complaints 13,493 were first reported on Twitter and the remaining complaints were discussed on Twitter, but first reported using another complaint method (most frequently via phone).

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[7] This means that burnt out bulbs need to be replaced. There is a different complaint code for electrical issues resulting in a block of street lights going out.

I proceed to analyze these data in two ways. First, I focus on the users' Tweeting complaints @STLCSB to assess their demographic characteristics. Second, I examine the location and content of the Twitter complaints and compare them to the content of complaints delivered in other ways.

## Who is Tweeting?

Table 1 displays information about the top ten Twitter users sending Tweets to the CSB. The first two users alone account for more than 10% of Tweets sent to the CSB. Of these top ten users, four --- Pam Boyd, Marie Ceselski, Cara Spencer, and Scott Ogilvie --- are well-recognized political figures in St. Louis. Others are people who sometimes identify themselves by their name and sometimes use a pseudonym. Interestingly, these people seem not to simply Tweet more frequently at the CSB because they are posting to Twitter a lot. Fully 30.54% of Mista_Dont_Play and 71.08% of putgeorge's Tweets are to the CSB. The well-known political figures have a relatively large number of followers, but user JDPhd has only 34 followers, meaning that follower count is not necessarily indicative of complaint activity. One common theme in these users' descriptions is a direct mention of their location. For example, user putgeorge identifies himself as a "City dweller," whereas TomLeb says "St. Louis" in his description. This could indicate a particular interest or investment in St. Louis that motivates these users to try to improve the City by submitting public service complaints.

I focus on who I define as "active users," those users who have Tweeted at the CSB five or more times. Submitting a CSB request often involves an initial Tweet, a Tweet providing additional information, and sometimes a Tweet thanking the CSB for recording the complaint. Therefore, users who have Tweeted at the CSB five or more times are likely

**Table 1. Top 10 Users Tweeting at STLCSB.**

| Handle | Name | Description | Followers | Statuses | Tweets to CSB |
|---|---|---|---|---|---|
| Mista_Dont_Play | pianoboi83 | Determined to Shine!!!! | 192 | 6083 | 1858 |
| boydstuff | 27th Ward Pam Boyd | Life long resident of 27th Ward. 27th Ward Alderwoman Community organizer Life long democrat. | 1158 | 2393 | 581 |
| truckey | truckey | Fixer | 763 | 4334 | 402 |
| stl7thward | 7th Ward For [vaccine emoji] + [mask emoji] | Fmr 7th Ward Dem Cmtewoman Marie Ceselski. Retired, Not Dead. Proponent of Secession from Misery to become Great State of St. Louis. Join us for #GardenSunday. | 4843 | 113102 | 334 |
| CaraSpencerSTL | Cara Spencer | Alderman Ward 20, City of St. Louis. | 7610 | 6013 | 304 |
| JDPhd | Jay Pea | [none] | 34 | 2237 | 278 |
| putgeorge | George Stair | Retired systems designer and teacher. House rehabber. Chinese language student. City dweller. Love Grace Paley. Have opinions. | 43 | 332 | 236 |
| ScottOgilvieSTL | Scott Ogilvie | Program Manager for the City of St. Louis Planning & Urban Design Agency. Velodrome builder. 228Former St. Louis Alderman. Maintenance requests: @stlcsb | 7140 | 8281 | 235 |
| micahhainline | Micah Hainline | Interested in a plural society. Non-binary (they/them). #BlackLivesMatter #DefundPolice | 253 | 4422 | 228 |

| TomLeb | AmericaHQ 2Exotic | St. Louis & Missouri: Hiking & Bicyclin. State Parks, Music, Beer, Heavy Industry, Watersheads/Environment, History. #Mizzou | 900 | 28055 | 226 |
|---|---|---|---|---|---|

*Note.* User names and descriptions for top users who Tweeted most at the CSB as of September 2021.

to have recorded at least a couple of complaints.[8] 950 of the 2,691 total users (35.3%) are active users by this definition. I categorize active users into either individual or organizational accounts, where organizational accounts are those for businesses, community groups, and government agencies. Also included are what I call "complaint accounts." These accounts are anonymous, Tweet about problems in St. Louis, and frequently direct complaints at the CSB. For example, the user stlsidewalkczar has Tweeted at the CSB 120 times, mostly about obstructed sidewalks. Only 34 of the 950 active users are organizations (3.58%); the rest are individual accounts.

Next, I examine the gender, race, and self-reported occupation of individual active users. I generate the gender and race codings based on user descriptions and profile photographs.[9] Occupations are coded based on user descriptions. Table 2 displays the results. The overwhelming majority of active users are white men. Compared to the racial demographics of St. Louis, the high percentage of white respondents is perhaps surprising.[10] In terms of occupation, 9% of respondents listed an occupation somehow related to public service issues the CSB addresses like real estate or urban planning (coded as "complaint related"). These results suggest that providing a mechanism to

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[8] This is important because it signifies that a Twitter user sees Twitter as a viable method to submit complaints if they use it to submit more than one complaint. Our interest is characterizing people who use Twitter to report complaints to the CSB. Those who Tweet at the CSB for only one complaint are more likely to be using other means to record their complaints and just tried out Tweeting on one occasion.

[9] These codings, therefore, are socially identified and may not match self-identification. Social identification is relevant here because race or gender-based discrimination occurs based on social perceptions.

[10] Even if all uncoded active users were Black, white users would still dominate.

report complaints on Twitter may not be associated with increased access for everyone, instead systematically providing access to white residents.

**Table 2. Gender, Race, and Occupation of Active Users.**

| Metric | Categories | N | % | St. Louis %[11] |
|---|---|---|---|---|
| Gender (0.828 coverage) | Male | 448 | 0.591 | 0.484 |
| | Female | 310 | 0.409 | 0.516 |
| Race (0.783 coverage) | White | 655 | 0.914 | 0.439 |
| | Black | 61 | 0.085 | 0.431 |
| Occupation (0.268 coverage) | For-profit | 93 | 0.380 | |
| | Non-profit | 53 | 0.216 | |
| | Media | 40 | 0.163 | |
| | Complaint related | 22 | 0.090 | |
| | Elected official | 19 | 0.078 | |
| | Government | 11 | 0.045 | |
| | Party leader | 7 | 0.029 | |

*Note.* Gender, race, and occupation of active users (5 or more Tweets to the CSB) as of September 2021. Gender and race coded based on user descriptions and profile photographs; occupation coded based on user descriptions.

Active users strongly identified with St. Louis City. The words "Louis" and "STL" were the third and fifth most used words in users' descriptions, along with "and," "the," and "for." Further "St. Louis" was the most common two-word phrase, occurring 87 times. Other two-word phrases like "th Ward" (indicating living in a certain ward) and "City of" were also common. Here again, these patterns suggest that those users submitting complaints are not representative of the City as a whole. Users who refer to the City in their Twitter description are more likely to be particularly invested in St. Louis and, therefore, to have high intrinsic motivation to make an extra effort to report problems that they see in the community.

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[11] Gender is from 2019 Census estimates. Race is from the 2020 Census release.

**What are they Tweeting about?**

Individuals who Tweet at the CSB are demographically different than the diversity of the City of St. Louis as a whole. But does this translate into where they are Tweeting and what they are Tweeting about? To provide a basis by which to evaluate this question, Figure 2 displays both the percentage of Black residents (left panel) and the percentage of vacant housing (right panel) by St. Louis Census block based on data from the 2020 Census. The percentage of vacant housing is an indicator of poverty. The Figure clearly shows that Census blocks in North St. Louis are overwhelmingly Black and have the highest percentage of vacant housing.
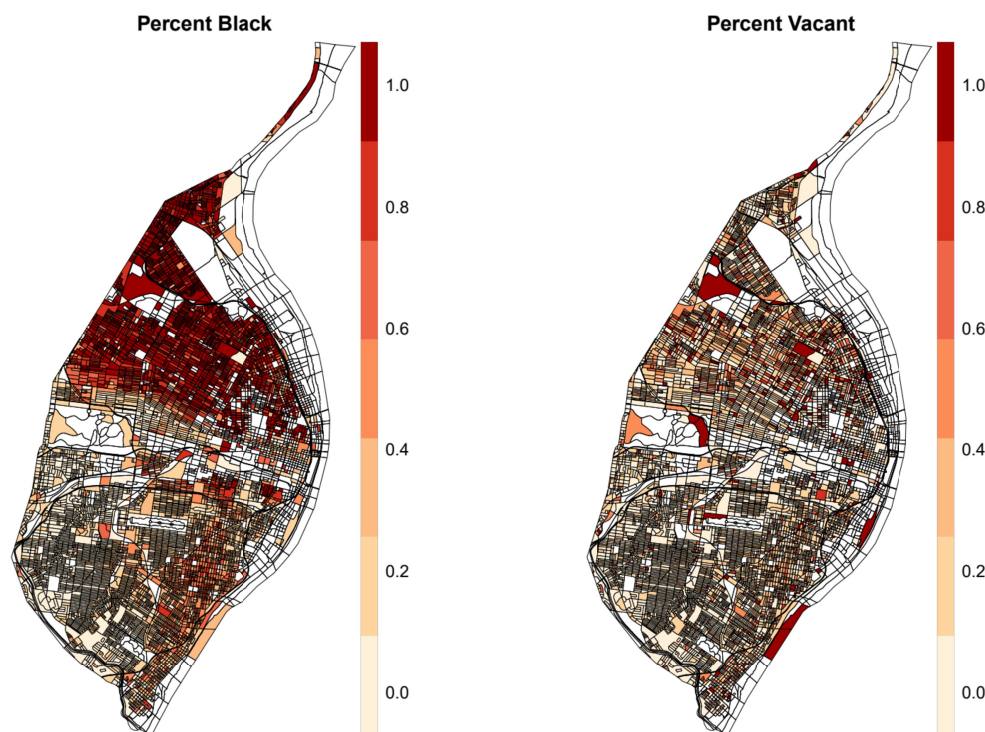


**Figure 2. Percentage Black Residents (Left), Percentage Vacant Housing (Right).**

*Note.* Percentage Black residents and percentage vacant housing by Census block using 2020 Census data. Blank Census blocks are uninhabited.

With the clear racial and income segregation present in St. Louis in mind, the left panel of Figure 3 displays the number of complaints recorded by Census block, while the right panel displays the percentage of those complaints recorded on Twitter. The mean percentage of complaints reported on Twitter by Census block was only 0.4%, so the scale for the right panel of Figure 3 was adjusted to account for the fact that Twitter is a much less popular medium for reporting complaints compared to phone (69%) or a web form (22%).
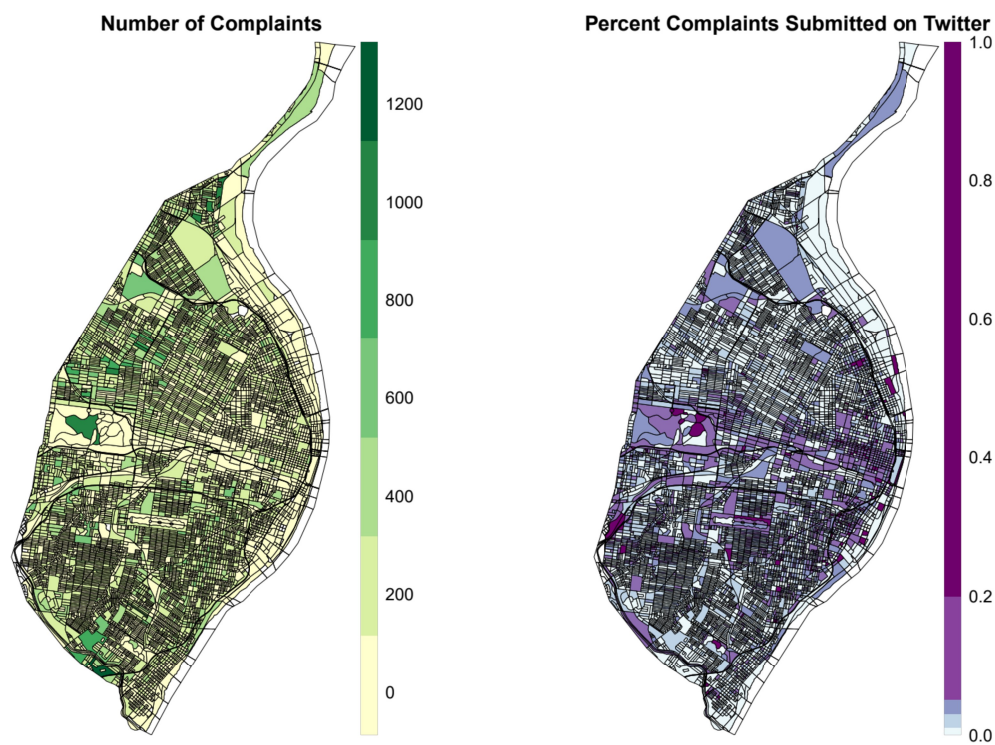


**Figure 3. Number of Complaints (Left), Percentage of Twitter Complaints (Right).**
*Note.* Number of complaints and percentage of complaints recorded on Twitter by Census block through September 2021.

The map of the number of complaints by Census block reveals no overriding North-South St. Louis divide in reporting complaints to the CSB. Parks --- denoted by their unusually large Census areas --- seem to be complaint hotspots. At the same time,

the map of the percentage of complaints in a Census block submitted on Twitter indicates heavy Twitter use in the central corridor of St. Louis, with some additional activity again around parks located both in South St. Louis and North St. Louis. Using Twitter to report complaints in parks is logical: people who are out at a park are taking time off from work and may already be using social media. However, the large percentage of complaints reported using Twitter in the central corridor is interesting because this encompasses the wealthy mixed residential and commercial Central West End neighborhood and the almost exclusively corporate Downtown neighborhood. Indeed, the right panel of Figure 2 shows that there is no housing in many of these Census blocks. This could mean that employees of companies located in the Downtown neighborhood are Tweeting complaints while at work.

Table 3 displays the ten locations with the most complaints. Parks and major government buildings are the sources of the most complaints. Carondelet Park has the third highest number of complaints and the largest number of complaints recorded on Twitter. The other most popular locations reported on Twitter are parks not listed as top overall complaint locations. Indeed, the correlation between the total number of complaints and the number of complaints reported on Twitter at the Census block level is 0.32 a positive, medium correlation.

Thus far, the evidence suggests that Twitter is not used to record complaints uniformly across Census blocks. However, recall that two users --- Mista Dont Play and Alderwoman Pam Boyd --- each Tweeted at the CSB more than 500 times, with Mista Dont Play accounting for fully 12% of all Tweets sent to the CSB. I subset out these two "super users" and map the locations of the complaints that they submitted compared to other Twitter users. Figure 4 displays the percentage of Twitter complaints recorded from these two users (left panel) and the percentage of Twitter complaints from accounts other than these two users (right panel). The difference is stark and immediate: while relatively few complaints are submitted via Twitter in North St. Louis, almost all of the complaints that are submitted on Twitter in North St. Louis come from these two super users.

**Table 3. Top Complaint Locations.**

| Address | Description | Num Complaints | Pct. Complaints | Num Twitter | Pct. Twitter |
|---|---|---|---|---|---|
| 1520 Market St. | City Municipal Court | 802 | 0.0011 | 8 | 0.0003 |
| 5600 Clayton Ave. | Forest Park | 426 | 0.0009 | 23 | 0.0005 |
| 3900 Holly Hills Ave. | Carondelet Park | 291 | 0.0005 | 75 | 0.0015 |
| 1200 Market St. | St. Louis City Hall | 210 | 0.0003 | 15 | 0.0050 |
| 1515 N Kingshighway | Sherman Park | 198 | 0.0002 | 2 | 0.0001 |
| Hampton Ave & Fyler Ave | Tilles Park | 191 | 0.0002 | 8 | 0.0005 |
| 4300 Goodfellow Blvd. | Federal Center | 178 | 0.0002 | 8 | 0.0005 |
| 3715 Natural Bridge Ave. | Fairgrounds Park | 168 | 0.0002 | 5 | 0.0003 |
| 5300 Donovan Ave. | Francis Park | 163 | 0.0002 | 16 | 0.0010 |
| Goodfellow Blvd. & Lillian Ave. | North St. Louis Intersection | 159 | 0.0002 | 10 | 0.0006 |

*Note*. Ten locations with the most complaints reported to the CSB through September 2021 with percentage of overall complaints and number and percentage of complaints on Twitter. Addresses are from CSB records; author description.
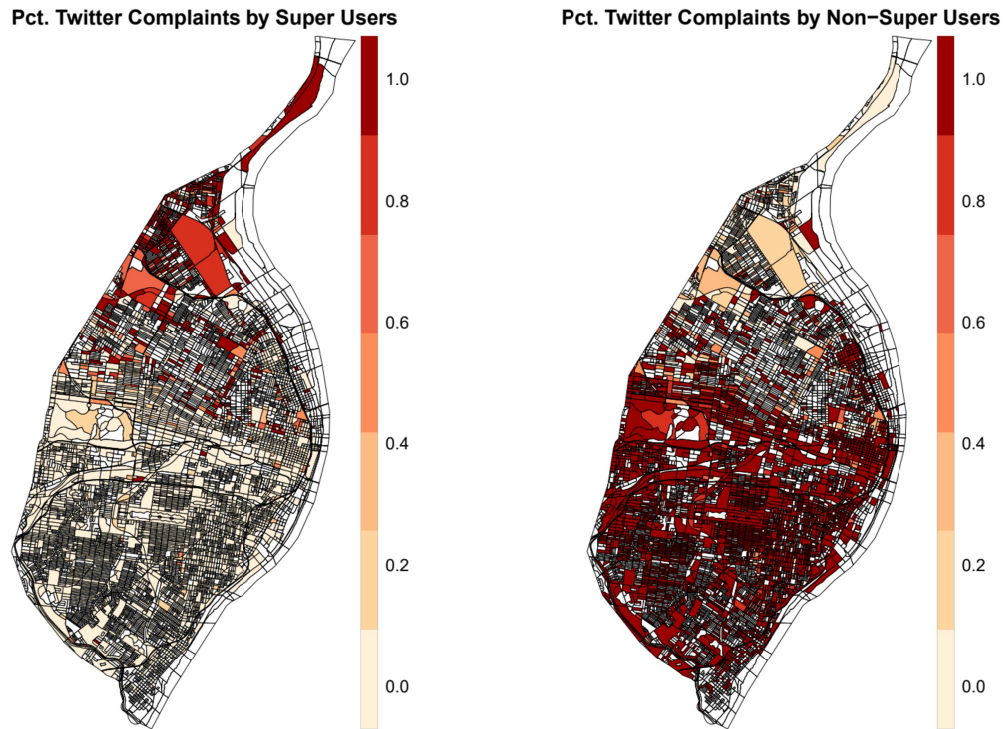
**Figure 4. Twitter Complaints from Top Two Users (Left), Other Users (Right)**

*Note.* Percentage of Twitter complaints reported by top two users and other users by Census block through September 2021.

Finally, I quantify these patterns by running linear regression models with robust standard errors at the Census block level. Table 4, model 1 predicts the log number of complaints based on the percentage of residents in the Census block who are Black. I include controls for the size of the Census block, the percentage of residents who are female, the average age of residents, the percentage of occupied houses, the number of houses, and the total population in that Census block. Table 4, model 2 predicts the percentage of complaints reported on Twitter based on the log number of complaints and the other controls mentioned.

While Census blocks with a higher percentage of Black residents are more likely to report complaints to the CSB (model 1), those Census blocks are less likely to report

complaints on Twitter (model 2). This result is substantively significant: moving from the first quartile to the third quartile in percent Black population is associated with a 38% decrease in the use of Twitter as a means to report complaints. Therefore, the Census blocks most in need of government responsiveness to their complaints do not receive it. These results are robust to including all Census blocks (including unpopulated areas), removing super users and large areas like parks, and using spatial modeling techniques (see the Appendix).

**Table 4. Main Models.**

|  | *Dependent variable:* | |
|---|---|---|
|  | Log Complaints | Pct. Twitter |
|  | (1) | (2) |
| Log Complaints |  | 0.003** |
|  |  | (0.001) |
| Pct. Black | 0.212*** | -0.016*** |
|  | (0.031) | (0.002) |
| Log Area | 0.591*** | -0.001 |
|  | (0.026) | (0.002) |
| Pct. Female | -0.161 | -0.013** |
|  | (0.110) | (0.006) |
| Pct. Occupied | -0.023 | -0.0001 |
|  | (0.049) | (0.003) |
| Num. Houses | 0.004** | 0.0001** |
|  | (0.002) | (0.00005) |
| Avg. Age | -0.004*** | -0.0002** |
|  | (0.001) | (0.0001) |
| Population | 0.0001 | -0.00005** |
|  | (0.001) | (0.00002) |
| Constant | 7.854*** | 0.022 |
|  | (0.182) | (0.014) |
| Observations | 2,391 | 2,391 |

*p<0.1; **p<0.05; ***p<0.01

*Note.* Linear regression with robust standard errors with St. Louis Census blocks as the unit of analysis. Only populated areas included.

**What are They Saying?**

In addition to Twitter complaints not being representative of the geographic diversity of overall complaints, they also differ in the type of complaint. Table 5 breaks down complaints by type.

**Table 5. Complaints on Twitter and Not on Twitter by Type.**

| Type | Not Twitter | Twitter | t-value | p-value |
|---|---|---|---|---|
| Admin | 0.025 | 0.018 | 5.680 | 0.000 |
| Animal | 0.051 | 0.017 | 31.128 | 0.000 |
| Construction | 0.013 | 0.004 | 16.109 | 0.000 |
| Debris | 0.094 | 0.058 | 18.492 | 0.000 |
| Degrade | 0.111 | 0.111 | -0.548 | 0.584 |
| Disturbance | 0.009 | 0.004 | 11.328 | 0.000 |
| Event | 0.000 | 0.000 | 3.317 | 0.000 |
| Health | 0.029 | 0.006 | 33.187 | 0.000 |
| Landscape | 0.164 | 0.095 | 28.220 | 0.000 |
| Law | 0.046 | 0.039 | 4.709 | 0.000 |
| Maintenance | 0.055 | 0.123 | -25.386 | 0.000 |
| Nature | 0.004 | 0.010 | -6.789 | 0.000 |
| Road | 0.072 | 0.128 | -20.535 | 0.000 |
| Sewer | 0.023 | 0.017 | 6.052 | 0.000 |
| Traffic | 0.132 | 0.245 | -31.884 | 0.000 |
| Waste | 0.172 | 0.124 | 17.875 | 0.000 |

*Note.* Complaints through September 2021 categorized by type. Type codes from Christopher Prener and Branson Fox's stlcsb R package.

Twitter complaints are much more likely to be about maintenance, road, or street issues. This suggests either that Twitter users are Tweeting complaints on the go and/or that these users experience fewer neighborhood quality-of-life issues so that their complaints are primarily focused on road and street issues. The top categories for non-Twitter complaints are waste and landscaping (including tree trimming).

In order to further investigate the content of Tweets sent to the CSB, I ran structural topic models (STM) on these Tweets. Tweets are, by their nature, short. After removing stop-words and common phrases, the median Tweet length was only 15 words. STM is designed for use with longer documents, so results should be interpreted with caution. Several authors (e.g., Chae & Park, 2018; Qiang et al., 2016; Wüest, 2018) have successfully used STM with short-text responses (see Table A.6 and A.7 for the most popular two-word phrases, an alternate method to analyze these data). I prepared the STM corpus using standard techniques that involve stripping punctuation and removing common stop-words in this corpus like "thank you." I included the year the Tweet was sent, the number of Tweets the user sent to the CSB, the number of statuses the user posted, and the number of followers the user had as metadata. I run a standard optimization procedure to choose the number of topics, following this up with a series of standard diagnostic tests on a range of topics from 10 to 50.

Figure 5 shows the results for thirty topics ordered from the most to least prevalent with the top three terms most representative of each topic also listed. Topics tended to involve specific problems that residents were experiencing, as expected for this kind of medium. For example, topic 17 is referring to street lights needing to be repaired or replaced, topic 4 is referring to problems at city parks, and topic 5 is referring to trimming a city-owned tree. All of these topics are common complaints and involve the most frequently requested city departments --- forestry and streets.
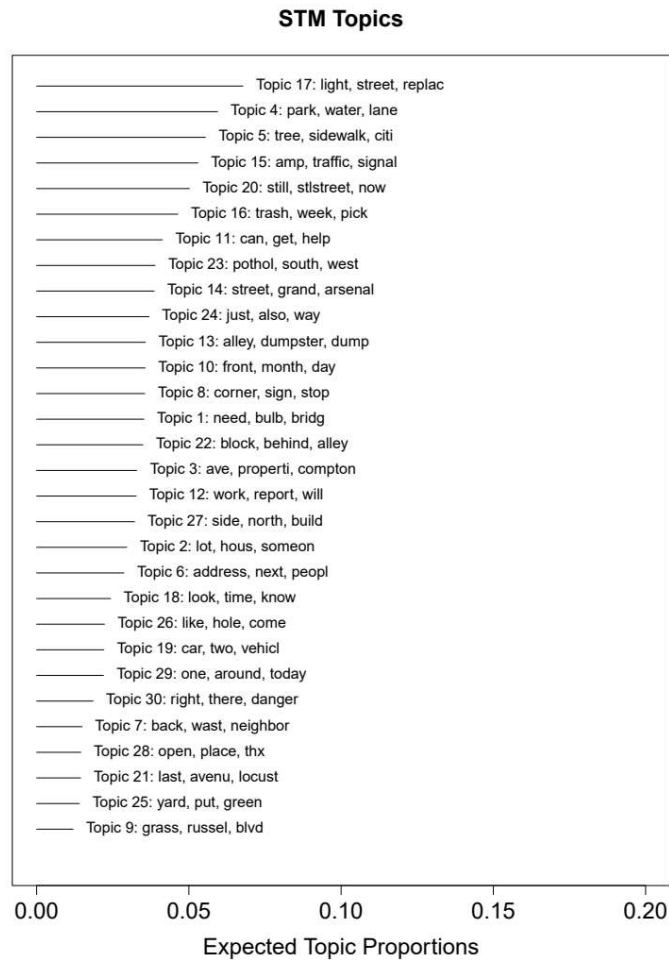
**Figure 5. Topic Proportions for Tweets to CSB.**

*Note.* Topic proportions from structural topic model with thirty topics.

## Time to Tweet?

The argument for providing Twitter to record complaints is that it is more convenient for people compared to calling on the phone or using a web form. Many people may choose to submit Twitter complaints because they see Twitter as a place to receive a fast --- and therefore convenient --- response. Indeed, calls to the CSB are often

put on hold, resulting in wait times of 10 to 15 minutes (*City of St. Louis Board of Aldermen Public Safety Committee Meeting September 28, 2021*, 2021). I investigate this convenience argument by searching Tweets sent to the CSB that mentioned phone or website issues using common keywords for such issues.[12] Eighty-nine Tweets described some problem related to recording a complaint using either the CSB phone number or web form. The most common types of these Tweets mentioned being placed on hold or the web form website not working properly.

Sending a Tweet to the CSB resolves these problems. However, sending a Tweet does not record the complaint automatically in the Cityworks database. CSB employees must read the Tweet, reply to it, and then log it in Cityworks. These are extra steps not present when a complaint is recorded over the phone or using the web form. I calculate the time from when an initial Tweet is sent to the CSB until the CSB replies in business hours --- the number of hours it takes for the CSB to respond when the CSB office is open. It takes a median of 5.6 business hours for the CSB to reply to a Tweet. The median time from when an initial Tweet is sent to the CSB until the CSB logs it in Cityworks is 0.7 business hours. Therefore, individuals submitting a complaint to the CSB via Twitter can expect to wait as long, if not longer, for a response as they would if they had called the CSB and been put on hold before their complaint was recorded.

Finally, I compare the time it takes from a complaint being logged in Cityworks until the complaint is closed by the appropriate City department. It is possible that complaints reported on Twitter are resolved more quickly once they are input into Cityworks. If this is the case, then members of the public would have a strong reason to submit complaints on Twitter. I use a Cox Proportional-Hazards model predicting the time it takes between when a complaint is input into Cityworks and when it is marked as completed. I calculate this time in business days to account for the CSB not being open to record complaints on evenings and weekends. The main independent variable is the

---

[12] Those keywords were "phone," "call," "calling," "busy," "no answer," "e-mail," "website," "online," and "hold." There were 734 pattern matches with 89 Tweets related to these issues.

method used to record the complaint: Twitter, phone, web, or other (the reference category). Controls for year, month, complaint type, and the percentage of Black residents and vacant houses in the ward in which the complaint was submitted are included. Figure 6 shows that complaints recorded on Twitter or via phone are answered 8-9% faster than complaints submitted by other means and 14% faster than complaints submitted via the web form. However, the speed of response is essentially the same for Twitter and phone complaints, meaning that Tweeting a complaint provides no advantage in responsiveness over calling the complaint in over the phone. Getting a complaint resolved via Twitter takes just as long as does reporting the complaint on the phone, even considering phone hold times.
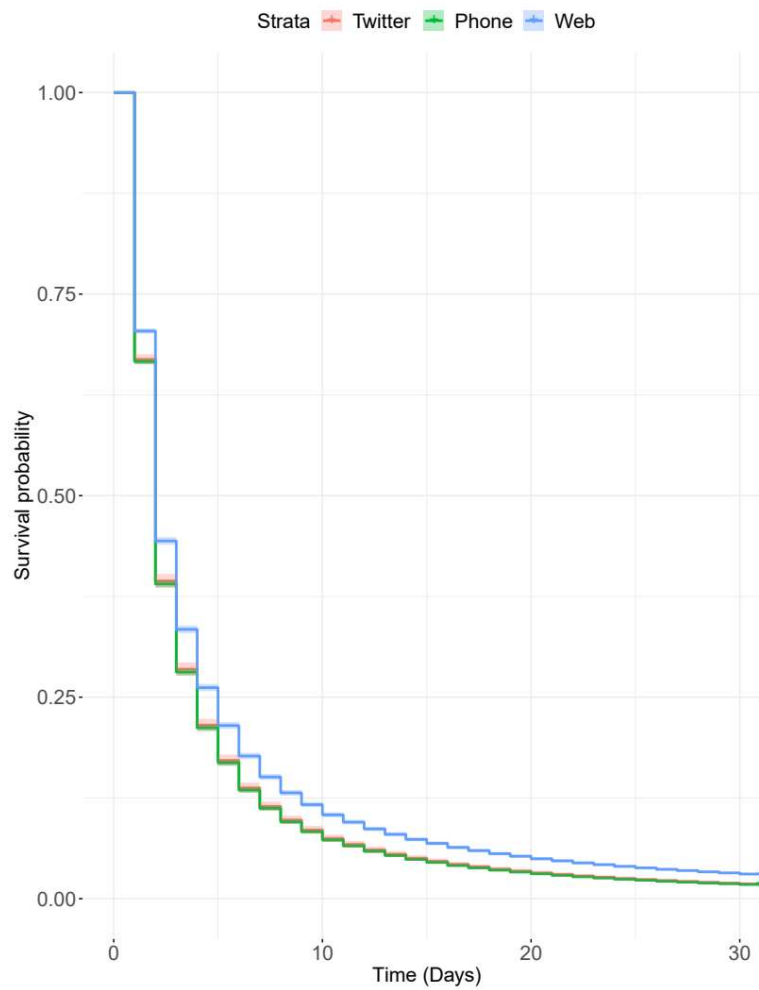
**Figure 6. Survival Curves for Twitter, Phone, and Web Complaints.**

*Note.* Survival curves from Cox Proportional-Hazards model. Phone and Twitter curves overlap. See Model 1 of Table A.8 for full results.

## Discussion

To answer the initial research questions regarding who Tweets complaints and what are they Tweeting about, this article has shown that those Tweeting complaints in St. Louis are primarily white residents from South St. Louis Tweeting about road related issues. In other words, Twitter complaints do not appear to be representative of the

overall types of complaints submitted to the CSB. In an ideal setting, local governments could provide an endless number of potential mechanisms by which to register a public service complaint (Hartmann et al., 2017). However, local governments have limited resources, so it is important to consider the opportunity costs associated with maintaining a Twitter complaint response system when such a system encourages a non-representative collection of complaints.

The CSB sends fewer than twenty Tweets per workday, on average. CSB customer service representatives must actively monitor the @STLCSB Twitter account throughout the day to notice and to reply to these Tweets. Instead of Tweeting a complaint, members of the public could submit the complaint using the web form or by phone. Complaints submitted using the web form save CSB time because all of the required information is collected without CSB staff intervention. Phone complaints take time to process; the maximum wait time to submit a complaint is about ten minutes (*City of St. Louis Board of Aldermen Public Safety Committee Meeting September 28, 2021*, 2021). Thus, if we assume that most of the people Tweeting complaints would submit their complaint using the web form, then this could free up CSB time to take complaints by phone, reducing the wait time. The key trade-off is whether those who currently Tweet complaints would be willing to use the web form instead of Tweeting and whether people would call to submit a complaint, but hang up when they are waiting if submitting the complaint via Twitter was not an option.

Another approach to thinking about the benefits and costs of maintaining a Twitter complaint channel is to consider the ways in which the Twitter account can be used. Many cities bundle their complaint resolution service within a broader 311 public information system (Gao, 2018; Minkoff, 2016; Zavattaro et al., 2015). This means that the local government actively sends Tweets to engage and inform the public instead of solely responding to public service complaints (Johnson et al., 2020; Stone & Can, 2020). Using a Twitter account to both provide information and to record complaints could draw in more followers to the account and lower the level of political awareness necessary to

know about the process for submitting a complaint on Twitter. In fact, St. Louis already has a Twitter account fulfilling this purpose --- @STLCityGov --- that has 8,700 followers. But instead of handling complaints on this Twitter account, the account's description directs people to @STLCSB for public service complaints. Combining these accounts could help to better market using Twitter to submit public service complaints and draw a more representative group of complaints as a result.

**Conclusion**

Providing additional ways for members of the public to interact with local government seems beneficial. But, this article shows that awareness of and ability to access these methods of registering a complaint interact to encourage engagement from certain people on certain topics while excluding others. In St. Louis, public service complaints submitted on Twitter come from wealthier white residents who complain mostly about street and traffic related issues. These complaints exclude much of North St. Louis and quality of life complaints that are commonly delivered via a web form or phone. Some of the complaints delivered via Twitter come from prominent local politicians who may be using Twitter as a platform to demonstrate their commitment to performing public service. Alternatively, these individuals may just use Twitter more frequently and have the political awareness to utilize the platform effectively. Future research could build on the descriptive results found here to investigate the motivations that people have for selecting a method to submit a complaint or for deciding to submit a complaint at all.

The St. Louis Citizen's Service Bureau is just one example of a local government office that manages public service complaints on Twitter and using other mechanisms. The demographics of users Tweeting complaints to local governments and the types of complaints that they report may be different in other cities, especially in cities where Twitter is a primary and well-known way to access government services. St. Louis is, however, a relative leader in using technology to manage public service complaints. The

@STLCSB Twitter account was registered in 2010 --- around the same time as cities like New York and San Francisco (Gao, 2018) --- and CSB employees are quite responsive to complaints recorded on Twitter. Future research would do well to investigate strategies for managing public service complaints on social media in other local governments. Medium sized cities are of particular interest because they are large enough to warrant a complaint response department, but they may also have limited financial resources. In particular, collecting data from across different cities may help to provide sufficient sample size to do a time-series comparison of Twitter and non-Twitter complaints. While Twitter complaints in St. Louis are relatively stable over time, there might be interesting variation in the types of complaints or how the platform is used in 2014 compared to 2020. Since Twitter is not a popular way to submit a complaint in St. Louis, breaking down the geographic data further to look at temporal variation results in a small sample problem where observations would be made based on only a few Twitter complaints. Other cities with more available data or who rely more heavily on Twitter as a complaint resolution mechanism may be able to provide this variation in order to more effectively study Twitter complaints over time.

Besides the focus on a single case, this article only provides data on the demographic characteristics of members of the public submitting complaints on Twitter. We do not know the demographic characteristics of people who submit complaints using the web form or via phone. Based on complaint locations, it looks like people who submit complaints using the web form or via phone are more demographically representative of St. Louis, but conducting a survey of residents and asking about past complaints that they had submitted and the method they used to submit these complaints could help to confirm this hunch. Qualitative interviews could also be helpful to gain insights into why people chose to submit a complaint using a particular method. Both of these strategies are worth pursuing, though identifying a representative sample of people who submit complaints via web form or phone may be difficult. In St. Louis, contact information for complainants is not available. Such information might be recorded and publicly available

in a different city context, thereby enabling researchers to survey people who have submitted complaints.

Perhaps the most important lesson for policymakers is to carefully consider how public service complaints are recorded and how resources are allocated in order to record these complaints. The choices that local governments make partially determine the types of complaints that they receive. Responding to complaints from members of the public is one of the primary functions of local government. While additional research in other contexts is needed, this article has described how seemingly routine decisions about how complaints are collected can have a meaningful impact on public service delivery.

## Acknowledgements

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## Appendix

**Table A.1. Complaints by Method Over Time**

| Year | Chat | E-mail | Fax | Internal | Letter | Other | Phone | Twitter | Web |
|------|------|--------|-----|----------|--------|-------|-------|---------|-----|
| 2008 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| 2009 | 0 | 2 | 0 | 5 | 0 | 0 | 5 | 0 | 64 |
| 2010 | 0 | 0 | 0 | 1 | 0 | 0 | 21 | 1 | 123 |
| 2011 | 0 | 0 | 0 | 7 | 0 | 0 | 11 | 6 | 244 |
| 2012 | 0 | 1 | 1 | 16 | 3 | 1 | 24 | 10 | 487 |
| 2013 | 0 | 90 | 9 | 792 | 9 | 11 | 36518 | 632 | 11232 |
| 2014 | 0 | 711 | 5 | 534 | 4 | 15 | 50667 | 1496 | 16231 |
| 2015 | 0 | 786 | 3 | 127 | 1 | 445 | 50321 | 1695 | 19077 |
| 2016 | 0 | 1531 | 0 | 342 | 2 | 5070 | 60118 | 2265 | 22697 |
| 2017 | 0 | 1067 | 6 | 318 | 13 | 7056 | 62123 | 2146 | 23478 |
| 2018 | 73 | 706 | 3 | 559 | 28 | 6082 | 58726 | 2013 | 28427 |
| 2019 | 91 | 303 | 0 | 292 | 3 | 3883 | 63416 | 1676 | 30805 |
| 2020 | 194 | 506 | 1 | 56 | 14 | 6772 | 63458 | 1897 | 2087 |

| 2021 | 130 | 288 | 0 | 72 | 5 | 4598 | 43647 | 1515 | 27 |

*Note.* Number of complaints received by different methods over time.

**Table A.2. Percentage of Complaints on Twitter and Not on Twitter by Ward.**

| Ward | Not Twitter | Twitter | t-value | p-value |
|------|-------------|---------|---------|---------|
| 1 | 0.039 | 0.008 | 39.272 | 0.000 |
| 2 | 0.048 | 0.026 | 17.327 | 0.000 |
| 3 | 0.051 | 0.034 | 10.850 | 0.000 |
| 4 | 0.044 | 0.010 | 39.347 | 0.000 |
| 5 | 0.028 | 0.052 | -13.426 | 0.000 |
| 6 | 0.031 | 0.042 | -6.819 | 0.000 |
| 7 | 0.039 | 0.109 | -27.702 | 0.000 |
| 8 | 0.030 | 0.047 | -9.568 | 0.000 |
| 9 | 0.035 | 0.062 | -13.577 | 0.000 |
| 10 | 0.031 | 0.030 | 0.597 | 0.551 |
| 11 | 0.038 | 0.022 | 12.475 | 0.000 |
| 12 | 0.031 | 0.012 | 21.849 | 0.000 |
| 13 | 0.031 | 0.022 | 7.281 | 0.000 |
| 14 | 0.033 | 0.015 | 17.303 | 0.000 |
| 15 | 0.031 | 0.051 | -10.856 | 0.000 |
| 16 | 0.035 | 0.025 | 7.603 | 0.000 |
| 17 | 0.028 | 0.044 | -9.747 | 0.000 |
| 18 | 0.033 | 0.015 | 18.794 | 0.000 |
| 19 | 0.026 | 0.039 | -7.920 | 0.000 |
| 20 | 0.038 | 0.057 | -10.151 | 0.000 |
| 21 | 0.042 | 0.008 | 44.921 | 0.000 |
| 22 | 0.041 | 0.022 | 16.035 | 0.000 |
| 23 | 0.032 | 0.052 | -11.248 | 0.000 |
| 24 | 0.042 | 0.053 | -5.687 | 0.000 |
| 25 | 0.036 | 0.028 | 6.012 | 0.000 |
| 26 | 0.032 | 0.020 | 10.415 | 0.000 |
| 27 | 0.053 | 0.039 | 8.772 | 0.000 |
| 28 | 0.023 | 0.057 | -17.818 | 0.000 |

*Note.* Percentage of complaints on Twitter and not on Twitter by Ward with results t and p-values from t-tests included.

**Table A.3. Robustness Check Models.**

| | *Dependent variable:* | | |
|---|---|---|---|
| | All Census Blocks | Non-Large Areas | Non-Super Users |
| | (1) | (2) | (3) |
| Log Complaints | | 0.004*** | 0.002** |
| | | (0.001) | (0.001) |
| Pct. Black | -0.015*** | -0.014*** | -0.013*** |
| | (0.001) | (0.002) | (0.001) |
| Log Area | | -0.004** | -0.0003 |
| | | (0.002) | (0.001) |
| Pct. Female | | -0.014** | -0.011*** |
| | | (0.007) | (0.004) |
| Pct. Occupied | | 0.0005 | -0.0001 |
| | | (0.003) | (0.002) |
| Num. Houses | | 0.0001* | 0.00004 |
| | | (0.0001) | (0.00003) |
| Avg. Age | | -0.0002** | -0.0001** |
| | | (0.0001) | (0.00004) |
| Population | | -0.0001 | -0.00002 |
| | | (0.00005) | (0.00002) |
| Constant | 0.028*** | -0.007 | 0.017** |
| | (0.001) | (0.017) | (0.008) |
| Observations | 6,174 | 2,139 | 2,391 |

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

*Note.* Linear regression with robust standard errors with St. Louis Census blocks as the unit of analysis. Model 1 includes all Census blocks including unpopulated areas. Model 2 subsets to just Census blocks smaller than 0.1 square miles (excluding parks). Model 3 subsets to just non-super users.

**Table A.4. Spatial Models.**

|  | _Dependent variable:_ | | | |
|---|---|---|---|---|
|  | Pct. Twitter | | | |
|  | (1) | (2) | (3) | (4) |
| Log Complaints |  |  | 0.002** | 0.003** |
|  |  |  | (0.001) | (0.001) |
| Pct. Black | -0.007*** | -0.010*** | -0.010*** | -0.013*** |
|  | (0.001) | (0.002) | (0.002) | (0.002) |
| Log Area |  |  | 0.0001 | 0.0001 |
|  |  |  | (0.001) | (0.001) |
| Pct. Female |  |  | -0.005 | -0.001 |
|  |  |  | (0.006) | (0.005) |
| Pct. Occupied |  |  | -0.0003 | -0.00001 |
|  |  |  | (0.002) | (0.002) |
| Num. Houses |  |  | 0.0001* | 0.00004 |
|  |  |  | (0.00003) | (0.00003) |
| Age |  |  | -0.0001* | -0.0001 |
|  |  |  | (0.0001) | (0.0001) |
| Population |  |  | -0.00004* | -0.00003 |
|  |  |  | (0.00002) | (0.00002) |
| Constant | 0.014*** | 0.025*** | 0.013 | 0.017 |
|  | (0.001) | (0.001) | (0.012) | (0.013) |
| Observations | 6,174 | 6,174 | 2,391 | 2,391 |

$^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

_Note._ Spatial autoregressive models (Models 1 and 3). Spatial error models (Models 2 and 4). Unit of analysis is Census blocks. Some are unpopulated and have no neighbors. Moran's statistic: Model 1 -0.027, Model 2 -0.027, Model 3 -0.023, and Model 4 -0.024. P-values are greater than 0.1, indicating that spatial autocorrelation has been corrected.
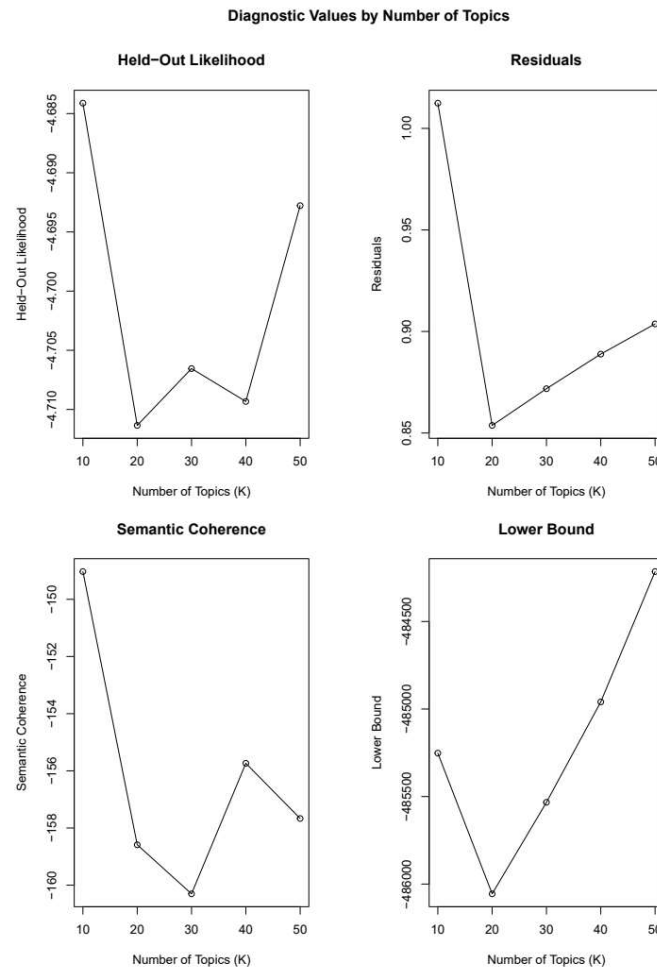
**Figure A.1. STM Diagnostics.**

*Note.* Diagnostic tests for structural topic models for Tweets to the CSB. Best fitting models have the highest held-out likelihood, lowest residuals, highest semantic coherence, and highest exclusivity.

**Table A.5. Terms Corresponding to Topics.**

| Topic | Term 1 | Term 2 | Term 3 | Term 4 | Term 4 | Term 6 | Term 7 |
|---|---|---|---|---|---|---|---|
| 17 | light | street | replac | repair | west | broadway | near |
| 4 | park | water | lane | near | gravoi | broken | graffiti |
| 5 | tree | sidewalk | citi | remov | larg | dead | limb |
| 15 | amp | traffic | signal | left | turn | kingshighway | hampton |
| 20 | still | stlstreet | now | fix | respons | issu | complet |
| 16 | trash | week | pick | recycl | empti | pickup | overflow |
| 11 | can | get | help | bus | intersect | citi | near |
| 23 | pothol | south | west | intersect | streetlight | washington | tucker |
| 14 | street | grand | arsenal | red | pole | bridg | intersect |
| 24 | just | also | way | see | truck | call | good |
| 13 | alley | dumpster | dump | trash | truck | left | minnesota |
| 10 | front | month | day | move | abandon | plate | sever |
| 8 | corner | sign | stop | miss | intersect | pole | danger |
| 1 | need | bulb | bridg | near | west | street | broadway |
| 22 | block | behind | alley | larg | truck | left | now |
| 3 | ave | properti | compton | cut | high | minnesota | bridg |
| 12 | work | report | will | servic | updat | stl | locat |
| 27 | side | north | build | east | cover | west | graffiti |
| 2 | lot | hous | someon | new | clean | illeg | alley |
| 6 | address | next | peopl | broadway | vacant | well | check |
| 18 | look | time | know | go | year | happen | lydakrewson |
| 26 | like | hole | come | dont | make | sure | water |
| 19 | car | two | vehicl | sinc | tire | week | now |
| 29 | one | around | today | morn | done | much | now |
| 30 | right | there | danger | fill | road | now | intersect |
| 7 | back | wast | neighbor | use | now | hous | alley |
| 28 | open | place | thx | weed | hous | amp | front |
| 21 | last | avenu | locust | night | loui | week | danger |
| 25 | yard | put | green | problem | now | hous | left |
| 9 | grass | russel | blvd | forestri | along | amp | hous |

*Note.* Terms corresponding to topics.

Table A.6 displays the most common two-word phrases in the complaints Tweeted to the CSB. Phrases are associated with specifying the location of the complaint. Tweets to the CSB were generally respectful, with only 69 instances of profanity used and a median sentiment score (positive minus negative word count from Hu and Liu (2004)) of 0 and a mean of -0.187.

**Table A.6: Top Tweet Phrases.**

| Phrase | Frequency |
|---|---|
| In the | 1752 |
| On the | 1462 |
| Thank you | 1403 |
| Street light | 1178 |
| Of the | 1104 |
| Block of | 1028 |

*Note.* Two-word phrases from Tweets to the CSB through September 2021.

Table A.7 shows the CSB replies to Twitter complaints. Only eight replies contained profane language --- most of which were not profanity, instead referring to a problem with dog waste --- and the median sentiment score was 1 with a mean of 0.998.

**Table A.7. Top CSB Tweet Replies.**

| Phrase | Frequency |
|---|---|
| Thank you | 16255 |
| Has been | 13361 |
| Submitted to | 13250 |
| Been submitted | 11881 |
| SR has | 10631 |
| To the | 7974 |

*Note.* Two-word phrases from replies from the CSB through September 2021.

Figure A.2 indicates that the CSB replies were generally more positive than the initial Tweets, meaning that the CSB maintained professional correspondence even when initial complaints were angry.
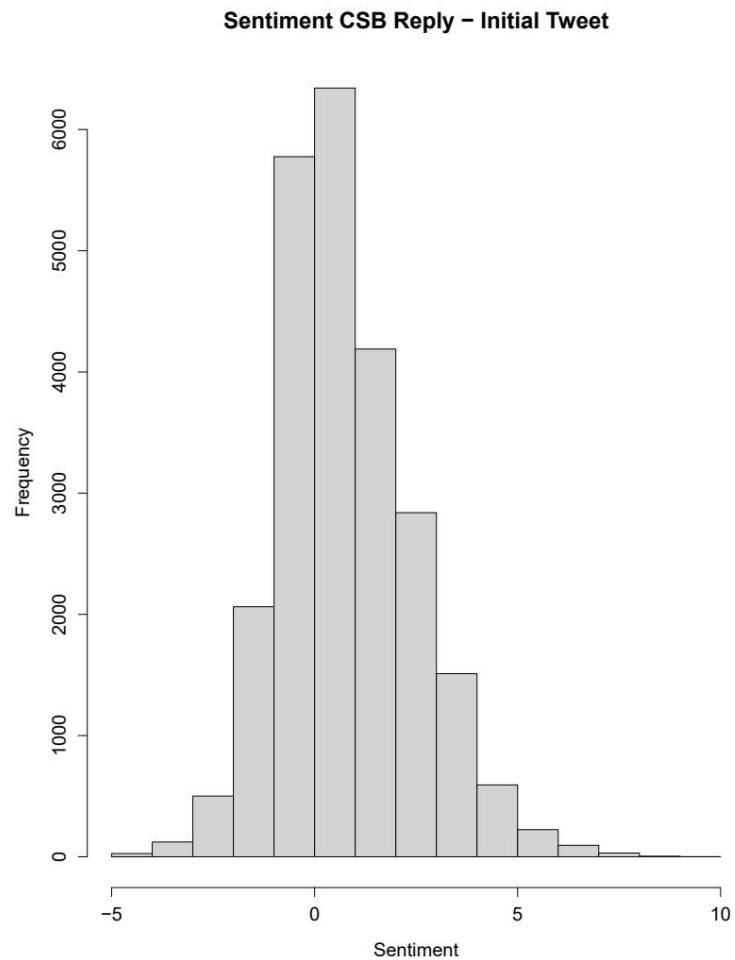
**Figure A.2. Sentiment Score of CSB Reply Minus Initial Tweet.**

*Note.* Histogram of CSB sentiment minus initial Tweet sentiment using list of positive and negative words from (Hu and Liu 2004).

**Table A.8. Days to Close a Complaint.**

|  | Dependent variable: | |
|---|---|---|
|  | Days (censored) | Days |
|  | (1) | (2) |
| Twitter | 0.080*** | 0.079*** |
|  | (0.011) | (0.011) |
| Phone | 0.090*** | 0.079*** |
|  | (0.005) | (0.005) |
| Web | -0.056*** | -0.051*** |
|  | (0.006) | (0.006) |
| Pct. Black | -0.028*** | -0.009 |
|  | (0.009) | (0.008) |
| Pct. Vacant | -0.306*** | -0.303*** |
|  | (0.035) | (0.034) |
| Month FE | Yes | Yes |
| Year FE | Yes | Yes |
| Problem Code FE | Yes | Yes |
| Observations | 623,550 | 623,550 |

$^*p<0.1; ^{**}p<0.05; ^{***}p<0.01$

*Note.* Cox Proportional-Hazards models. Model 1 is censored at 31 days. Model 2 is uncensored.

**Table A.9. Reply Time Among Complaints Sent Via Twitter.**

| | *Dependent variable:* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | All Users | | | | Exclude Super Users | | | |
| | Twitter Reply | | Record Complaint | | Twitter Reply | | Record Complaint | |
| | Censored | Not | Censored | Not | Censored | Not | Censored | Not |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Super User | -0.190*** | -0.190*** | -0.133*** | -0.132*** | | | | |
| | (0.038) | (0.038) | (0.038) | (0.038) | | | | |
| Tweets (log) | | | | | -0.011 | -0.011 | 0.002 | 0.002 |
| | | | | | (0.008) | (0.008) | (0.008) | (0.008) |
| Followers | 0.008* | 0.009* | 0.008 | 0.008 | 0.009* | 0.010** | 0.008 | 0.008 |
| (log) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| Pct. Black | -0.024 | -0.021 | 0.030 | 0.031 | -0.020 | -0.023 | 0.038 | 0.040 |
| | (0.076) | (0.075) | (0.077) | (0.076) | (0.087) | (0.086) | (0.087) | (0.087) |
| Pct. Vacant | -0.107 | -0.130 | -0.286 | -0.291 | -0.161 | -0.161 | -0.389 | -0.397 |
| | (0.300) | (0.298) | (0.301) | (0.300) | (0.348) | (0.346) | (0.350) | (0.350) |
| Month FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Problem Code FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 10,130 | 10,130 | 9,921 | 9,921 | 8,728 | 8,728 | 8,556 | 8,556 |

$^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

*Note.* Cox Proportional-Hazards models. Models 1, 3, 5, and 7 are censored at 31 days. Models 2, 4, 6, and 8 are uncensored. Sample consists of Tweets matched to CSB complaint logs.