

OH RATS!: An Analysis of the Relationship Between Ward Wealth and Government Rat
Treatment Services

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Abstract

In this study, we seek to find a relationship between economic inequality and government services by analyzing 311 call center rat treatment data made available through the Chief Technology Office of the D.C. Mayor. We attempt to find a correlation between average ward income level and rat treatment response by finding if there is a statistically significant difference between the means in two cohorts of wards: high income and low income. Our results show that, substantively, there is no disparity in average wait time for rat treatment between wealthy and poor wards at present. This shows that the D.C. government does not directly or implicitly consider socioeconomic status when implementing rat treatment services.

Background

Currently, D.C. faces a large problem with economic inequality, and it has been found to be among the most economically unequal cities and states in the United States.¹ More specifically, studies show that “the average household income of the top 5 percent of D.C. residents is 52 times the income of the bottom 20 percent.”² In addition, the poorest fifth of D.C. households had an average annual income of just \$9,300 in 2014, as compared to the top 5% which had an average annual income of \$487,000 in the same year.³ This is among the highest found anywhere in the nation. Clearly, there is a large wealth gap at present that likely plays a large role in the wide range of living standards experienced by D.C. residents.

At the same time, Washington D.C. has also been experiencing a trend of increasing rat complaints over the past several years.⁴ The city received close to 2,300 complaints about rats in 2015, and 3,500 in 2016, while as of November 2017, it has gotten 4,869.⁵ These rats cause problems that are greater than just inconvenience; they “contaminate food and carry diseases through feces and urine[...] burrow and cause cracks in a home’s foundation[...] and their chewing can harm wires in basements, attics and vehicles.”⁶ This rapid increase of rats in Washington D.C. has shown the need for a functional rat treatment service.

Response efficiencies for the rat treatment service for wealthy and low income citizens have not been previously analyzed. Therefore, we sought to evaluate if there was a disparity

¹ Perry Stein, “D.C. Has a Bigger Income Disparity Than Any State in the Country,” *The Washington Post*, June 24, 2015.

² Peter Tufts, “A City Breaking Apart,” *DC Fiscal Policy Institute*, February 25, 2016.

³ Ibid.

⁴ Rachel Chason, “A Downside to D.C.’s Population Growth? The Growing Number of Rats.” *The Washington Post*, September 13, 2017.

⁵ Mark Segraves, “D.C. Addressing Growing Rat Problem,” *NBC Washington*, November 13, 2017.

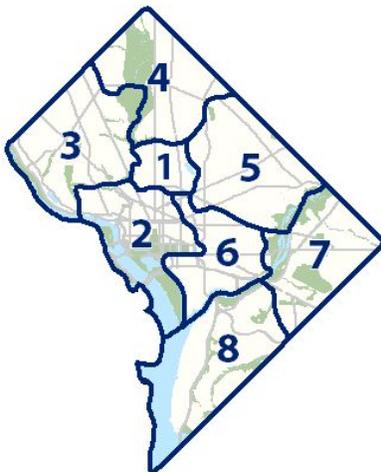
⁶ Dana Hedgpeth, “Rats, Rats and More Rats: D.C. Ranks as One of The Most Rat-Infested Cities in the Country.” *The Washington Post*, October 17, 2017.

between the response of the government to rat complaints in wards with higher average income and those with lower average income; we found that there was not.

Description of Data

The Rodent Inspection and Treatment data from the Chief Technology Office and the Mayor's 311 call center gives an overview of rat service order requests in Washington, D.C., spanning from October 29 - November 21, 2017. This observational data provides unique qualities about each service order request; such as the location and address of the request, which ward the request came from, what date the request was made, when the request was completed, and what date the request was originally scheduled to be completed by.

For reference, the District of Columbia is separated into Wards 1 through 8, as shown on the map below. Using NeighborhoodInfo DC, we classified each ward by socioeconomic status



and created two cohorts: high income and low income wards.⁷

Wards 3 and 4 comprise the High Income group, while Wards

7 and 8 comprise the Low Income group. We chose these

specific wards because data shows that the average income of

D.C. wards vary significantly, and these represent the extremes

of the gap in average income. According to NeighborhoodInfo

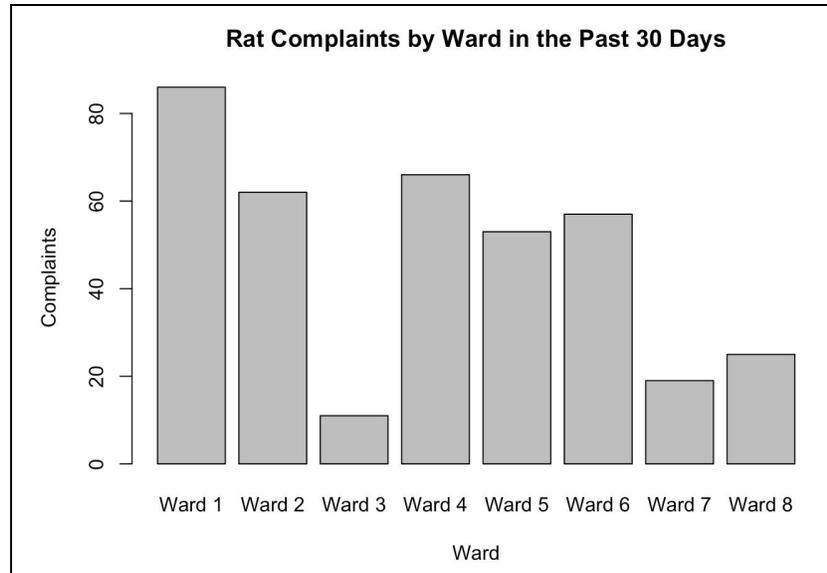
DC, Ward 3 has an average family income of \$257,224, and

Ward 4 has an average family income of \$123,353. In contrast, Ward 7 has a median family income of \$56,759, and Ward 8 has a median family income of \$45,239.⁸ This illustrates the

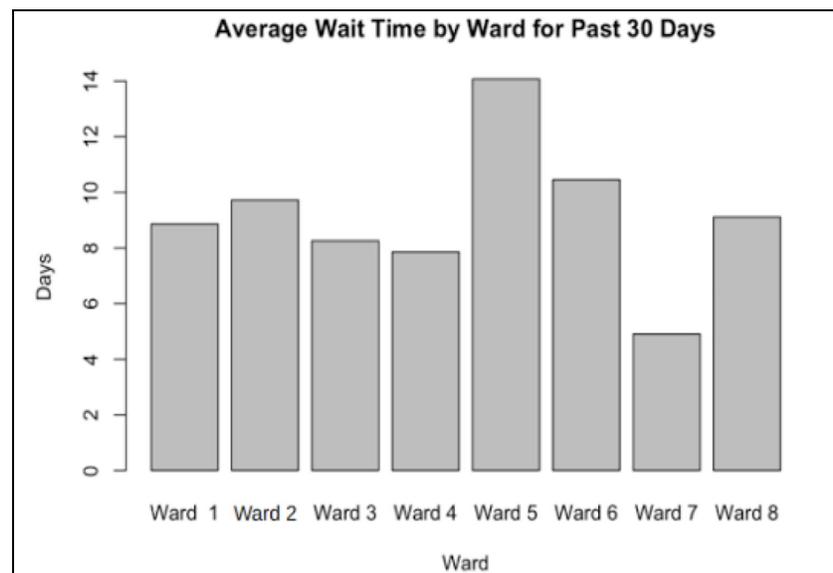
⁷ Neighborhood Profiles”, *NeighborhoodInfo DC*, Accessed December 01, 2017

⁸ Ibid.

socioeconomic disparity between the two cohorts, which is necessary to accurately evaluate rat service request differences in relation to the average income of each ward.



In total, the data included 29 variables and 379 observations of rat treatment requests at the time it was compiled. Of these requests, 149 had been resolved, and 229 remained open. The most complaints were made in Wards 1, 4, 2, and 6, in that order. For our purposes, we created a new variable for the service order resolution wait time by subtracting the resolution date from the requested date. Overall, the average wait time was 9.44 days among all of the wards.



Methods

Our null hypothesis (H_0) states that there is no difference in the average rat treatment wait time between the High Income group (Wards 3 and 4) and the Low Income group (Wards 7 and 8). This can be characterized by the following: $H_0: \mu_{\text{rich}} = \mu_{\text{poor}}$, where μ_{rich} = the mean of the High Income group and μ_{poor} = the mean of the Low Income group.

Our alternative hypothesis (H_A) is that there is a statistically significant difference in the average wait time for rat treatment service requests between the High Income group and the Low Income group. Or, $H_A: \mu_{\text{rich}} \neq \mu_{\text{poor}}$. In other words, we predicted that people who live in a ward with a higher average income tend to get priority for rat treatment.

First, we found that the mean resolution wait times for the High Income group (Wards 3 and 4) and the Low Income group (Wards 7 and 8) were $\mu_{\text{rich}} = 7.92$ days and $\mu_{\text{poor}} = 7.49$ days, respectively. This shows that the two groups have fairly similar wait times, with an estimated difference between the means of 0.42 days and a standard error of 0.90 days.

In finding the 95% confidence interval, we used the estimated difference between the means and the standard error, along with the critical value of 1.96, to find the lower and upper bounds to be -1.34 and 2.19 days, respectively. This means that we are 95% confident that we have captured the true value of the difference between those two values. Since zero is captured in the confidence interval, we can conclude that there is a possibility of the true difference in wait time being zero; in other words, there is no substantive difference between the two groups.

To further assess the relationship between ward and resolution time, we created a linear model; the equation is $Y = 7.602 + 0.092x$. Running a two-sample t-test, we found a p-value of 0.7935. Since this is greater than our alpha level of $\alpha = 0.05$, we fail to reject the null hypothesis

and therefore conclude that there is no statistically significant difference in the mean wait time between the two groups.

Results

There is no statistically significant difference in the mean wait time for rat treatment between the High Income and Low Income groups. We found that the wait times for the High Income group and the Low Income group were 7.92 days and 7.49 days. This small difference was found to be insignificant in the perspective of overall wait times, because the p-value of 0.7935 was greater than the alpha level of $\alpha = 0.05$.

In addition, our confidence interval for the difference between the means spans from -1.34 and 2.19 days. This range captures zero, which further supports the conclusion that there is no difference between the means of the two groups.

Discussion

The High Income group and the Low Income group have similar average wait times for rat treatment services, which means that residents in the wards with high average income and those with low average income can expect to wait around the same amount of time to have their treatment request fulfilled. Therefore, this shows that the D.C. government does not favor high income citizens over low income citizens when it comes to distributing social services.

However, wealth itself could be an indicator of better prevention and management of rat infestations, since the number of rat treatment requests varies by ward, with richer wards like Ward 3 exhibiting fewer requests than others. Alternatively, this could be caused by differences

in neighborhood structure. Ward 3 is more suburban than some others, with more space between buildings and homes. In contrast, areas like Ward 1 and 2 are more urban in nature. These wards are located in the downtown area of D.C., which is highly populated with a lot of tall buildings, restaurants, and apartment complexes that are harder to maintain.

This suggests the possibility of a geographic confounder, which could influence both the presence of rats and the wait time for the government to respond. For example, more urban areas with closely spaced buildings might make for a more hospitable environment for the proliferation of rats, while the distance from the center of the city could delay services from getting to the site quickly.

It is important to note that we do not intend this to pass judgement on the overall rat treatment response, or make claims about the effectiveness or sufficiency of the program. Instead, our analysis only looks at the difference between response times for wealthy and poor neighborhoods, so it does not measure how efficient the DC government is at responding to rat requests overall. This could be a potential avenue for future inquiry, since studies have indeed shown a growing rat problem in the District of Columbia.⁹

A similar avenue that would complement our findings would involve analyzing how fast the response times for rat treatment requests are overall in the District in Columbia. One may go about this by comparing how efficient other cities are at responding to rat treatment requests to how efficient D.C. is. Although the average wait time for most wards of around 7 to 8 days does not seem like much, living with rat infestations for that long could be challenging for residents, regardless of their income.

⁹ Rachel Chason, "A Downside to D.C.'s Population Growth? The Growing Number of Rats." *The Washington Post*, September 13, 2017.

Also, due to the geographic confounder brought about by the differences in urban and suburban landscapes throughout the city, an analysis of how rat treatment and prevention processes differ in these areas should be analyzed. This could help identify treatment processes that work best in the urban areas with lots of buildings and concrete, and suburban areas with more space between homes and more grass and vegetation. Hopefully, this could increase the efficiency of the rat treatment services.

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