

# Accessibility Analysis of Affordable Rental Housing in King County and Chicago

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2023-03-10

## Introduction

In the second half the pandemic, rental housing in America boomed, with over 44 million renter households by the end of 2021 and a record low rental vacancy rate of 5.8 percent not seen since the mid-1980s (America's Rental Housing, Joint Center for Housing Studies of Harvard University). At the same time, the unaffordability of rental housing has posed a major problem to many Americans, and in particular those with incomes less than \$30,000. Since 2001, renters with annual incomes of less than \$30,000 dollars have accounted for more than 75% of renters who experience severe rent burden, defined as spending 50% or more of one's monthly income on rent (America's Rental Housing, Joint Center for Housing Studies of Harvard University). The primary support for renters unable to afford housing comes in the form of federal subsidies. These federal subsidies, including the Low Income Housing Tax Credit Program (LIHTC), the Consolidated Appropriations Act of 2021, the CDC's two federal eviction moratoriums (late 2020 and early 2021), and the American Rescue Plan, determine eligibility through income requirements relative to Area Median Income (AMI). For example, the Consolidated Appropriations Act of 2021 uses <80% of AMI as an eligibility requirement, whereas LIHTC uses <60% of AMI as the main eligibility requirement. The "Area" in AMI is defined as a metropolitan region, extending beyond the central city of a region to include surrounding areas, as people searching for housing are likely to look beyond the city itself for places to live (HUD). In some cases, the "Area" can cover several counties. The goal of this report is to conduct an in-depth investigation into the accessibility of affordable rental housing in two metropolitan regions, King County, Washington, and Chicago, Illinois, and evaluate the findings with the AMI eligibility requirements of rental housing subsidy programs.

## Methods

This report applies a lens of spatial accessibility to affordable housing for renters in King County and Chicago. Before discussing what distance measure is appropriate to use for an accessibility analysis of affordable housing, it is worth noting that the literature on residential mobility establishes that motivations for residential mobility are extremely heterogeneous, as the unique stage of the family life cycle or personal course determines particular housing and location needs (Brown and Moore, 1970; Clark and Maas, 2015). This report's response to the consensus that there are various drivers for residential migration is that the target population in this analysis can be grouped under the assumption that affordability of housing is the primary motivation for considering relocating (although this assumption cannot be entirely true). When considering the process of moving from one location to a new one, the "friction of distance," or the cost that overcoming a physical distance entails, is particularly pronounced. Research has established that rural residents tend to be willing to move farther than urban residents (Chai and Lu, 2019), and so when considering accessibility in the urban environment of Seattle and its King County surroundings, as well as in Chicago, a relatively short distance should be used to determine accessibility. However, there is no further consensus in the literature on what the ideal distance for determining the accessibility of affordable housing should be, likely because local environments greatly vary. Moreover, as will be expanded upon in later discussion,

the rent burden data shows that in both King County and Chicago, more than half of the zip codes have a shocking zero other zip codes in which the median rental price is deemed affordable for them (by the HUD definition of 30% of monthly income). As such, it does not make sense to employ an additional distance metric such as a buffer analysis of a certain amount of miles, since the median number of other affordable zipcodes in both King County and Chicago is 0. Thus, this report proceeds by considering, for a given zip code in King County/Chicago, every other zip code in King County/Chicago as a resource within accessible range. The visualization goal of this report is to generate count maps that illustrate the total number of affordable zipcodes in King County/Chicago for every zip code in King County/Chicago. Two such maps are generated - the first is based on the normal HUD classification of rent burden as spending 30% or more of one's monthly income on monthly rent. In technical terms, this means if the median monthly rent in zip code B is less than 30% of the median monthly income in zip code A, then zip code B is considered affordable for zip code A (a major drawback of this method is that it does not account for intra-zipcode wealth variance, and assumed the median income in a zip code is representative of the income of all its residents). The second is based on the HUD classification of severe rent burden as spending 50% or more of one's monthly income. The methods for gathering the data are now represented.

Data on per capita income (annual) by zipcode was pulled using tidycensus from the American Community Survey for the year 2020, and median rent (monthly) by zipcode was gathered from the Zillow Observed Rent Index (ZORI). The ACS data was only downloadable for the entire US, while the ZORI was downloadable for specific states such as Washington and Illinois, and was then wrangled to create two datasets, one only including zip codes in King County, and one including only zip codes in Chicago. While ideally, Cook County would have been used instead of Chicago to fall more in line with the "Area" definition in AMI, the ZORI rent data had a crippling amount of missing values for zip codes in Cook County, but outside of Chicago, and so the decision was made to reduce the geographical region to just Chicago. After taking the spatial intersection of the ACS zipcodes and the ZORI zipcodes, 80 zipcodes covering the vast majority of King County were outputted, and 62 zip codes were outputted for Chicago. The difference in total number of zipcodes between King County and Chicago, as well as differences in total geographic area, makes direct comparisons of total count statistics inappropriate, and statistical comparison between the two metropolitan regions is limited to variables expressed as ratios. Annual median income was divided by twelve to calculate monthly median income, and normal and severe rent burden (30% and 50% ratio) were determined by the ratio of monthly rent to monthly median income.

## Results

Note that Figures 1-5 correspond to King County, and figures 6-10 correspond to Chicago.

A preliminary mapping of rent burden for King County is shown in Figure 1, and rent burden for Chicago is shown in Figure 6. Note that empty white space within the King County border (bolded outline) is either bodies of water or forest. While both maps are quite spatially homogenous, rent burden in Chicago has a little more spatial variation, where zip codes in the same quartiles are not always necessarily located adjacently as is almost always the case in King County.

For King County, summary statistics of the affordable housing count based on the 30% rent/income ratio (HUD definition of normal rent burden) show the median count to be 0, the mean count to be 9, and the max count to be 69. For Chicago, summary statistics of the affordable housing count based on the 30% rent/income ratio show the median count to also be 0, the mean count to be 13, and the max count to be 21. Coupled with the fact that the area contained in the Chicago dataset contains 18 less zipcodes than the King County data set (62 to 80), affordable rental housing is slightly more affordable in Chicago than King County, but still woefully unaffordable overall due to a median of 0.

Due to the abnormal distribution of affordable housing counts based on the criteria of normal rent burden, to effectively map the count data based on the 30% rent/income ratio, custom breaks classification are needed. For King County, the breaks are "0-1", "1-7", "7-18", "18-69", in which the first category contains all the zip codes with 0 options for affordable zip codes, the second category goes up till the third quartile of 7 options for affordable zip codes (the actual third quartile is 7.5, but only integer values are possible for number of

accessible zip codes), the third category goes until the 18 ( $3Q + 1.5IQR$ ), and the fourth quartile contains all outliers (greater than  $3Q + 1.5IQR$ ). The count map for King County based on the 30% rent/income ratio is shown in Figure 3. The custom breaks for the count data based on the 30% rent/income ratio for Chicago shown in Figure 7 follow the same scheme, and are “0-1,” “1-23,” “23-58,” and “58-61.” The count maps look like inverses of the rent burden, as the zip codes with the highest rent burden generally become the zip codes with the lowest count of accessible zip codes deemed affordable. Strikingly, any semblance of spatial heterogeneity Chicago had in the rent burden map vanishes in the count map, where only zip codes in the Near North Side area have access to other affordable zip codes.

The count maps based on the 30% ratio are extremely homogeneous, and to get a closer spatial understanding of rent burden by zip code, the report proceeds with an analysis of accessibility of affordable housing based on the 50% rent/income ratio (HUD definition of severe rent burden). The box plots of accessibility of affordable housing based on the 50% rent/income ratio are shown in Figure 4 (King County), and Figure 9 (Chicago), and as the distributions are much more normal, natural breaks maps of accessibility of affordable housing based on the 50% rent/income ratio are shown in Figure 5 (King County) and Figure 10 (Chicago).

While in general the same patterns are as in the maps of accessibility of affordable housing based on the 30% rent/income ratio are preserved, the count maps based on the 50% rent/income ratio highlight that the zip codes that fall into the highest category of rent burden in Figures 1 and 6 are the same zipcodes that fall into the lowest accessibility categories in Figures 5 and 10. Overall, the spatial analysis makes clear that high rent burden is strongly spatially correlated with low accessibility to affordable rental housing.

## Discussion

To evaluate the effectiveness of federal subsidy program eligibility requirements, this report takes the Consolidated Appropriations Act of 2021 as a representative sample ( $<80\%$  of AMI). A simple statistical test is conducted - for all zip codes that would not be eligible for federal subsidies, the total number of zip codes with access to zero other affordable zip codes (based on 30% ratio) is summed. For Chicago, 22/60 zip codes fall under this classification, meaning roughly a third of zip codes with a high danger of not having access to affordable rental housing would not receive support. For King County, 32/80 zip codes fall under this classification, meaning over a third of zip codes with a high danger of not having access to affordable rental housing would not receive support. While there are of course many economic and political constraints, it is clear that most income requirements based off AMI are not sufficient in the metropolitan areas of King County and Chicago, and do not provide a much needed safety net for renters who do not qualify for the programs but are still in a dire situation when it comes to affordable housing.

Additionally, while many of these subsidy programs are federal, the implementation of actual assistance programs to spend the federal money is often implemented by states (America’s Rental Housing, Joint Center for Housing Studies of Harvard University). Thus, states should understand the unique spatial clustering of rent burden in their metropolitan areas, as the spatial distribution of accessibility to affordable housing is strongly spatially correlated with rent burden, as shown in this report. This will allow states to effectively strengthen rental housing in core vulnerable areas.

This report now turns to directions for further research and dataset improvement.

It is important to consider the difference in geographical area between the “Area” in AMI and the area of King County and Chicago in this analysis. With a changing geographical scale, the results of how well federal programs cover areas with low access to affordable housing may also change, and exploring these different geographical scales is a good direction for further research, to make a spatial analytical lens of affordable rental housing more robust.

In terms of dataset quality, finding robust data sources for rental affordable housing prices on the census tract would also greatly improve the analysis. The main drawback of zip codes is that it does not account for intra-wealth variance within zipcodes. Moreover, there is available census data on the type of housing by census tract, and so only census tracts with high levels of rental housing could be included. This consideration is particularly important - the location of rental housing is becoming more and more concentrated, as developers

are trending towards building rental housing in large apartment complexes with 50 or more households (Joint Center for Housing Studies of Harvard University, America's Rental Housing). As a result, the majority of rental housing can be concentrated in just a few zip codes in a metropolitan area, and so certain zip codes should not be included in a count of accessibility to affordable housing if they do not contain much rental housing stock.

Another potential data improvement would be locating datasets on rental housing stock density. For example, a certain zip code could be affordable for a resident but not have enough open listings, while another zip code that is unaffordable overall (in terms of median rent), may have a dense rental housing supply such that the resident is still able to find individual outlier listings that are affordable for them. Unfortunately, the ZORI only contains housing stock data on single family homes and not rental housing, and so more publicly available data on rental stock housing would greatly improve the analysis.

## Appendix

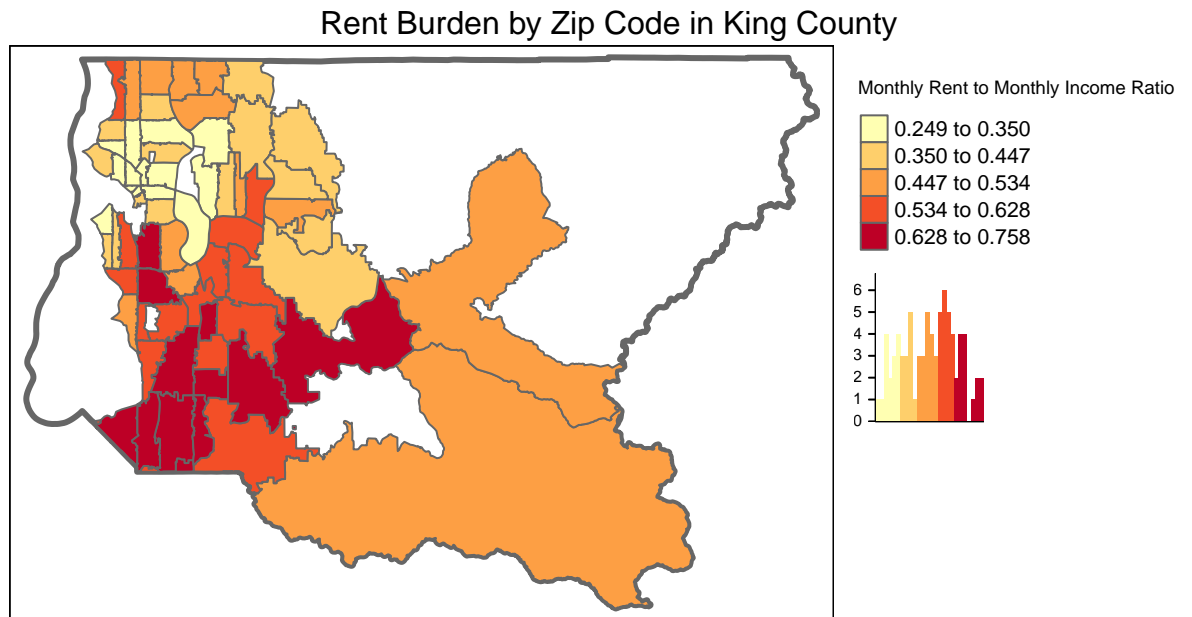


Figure 1

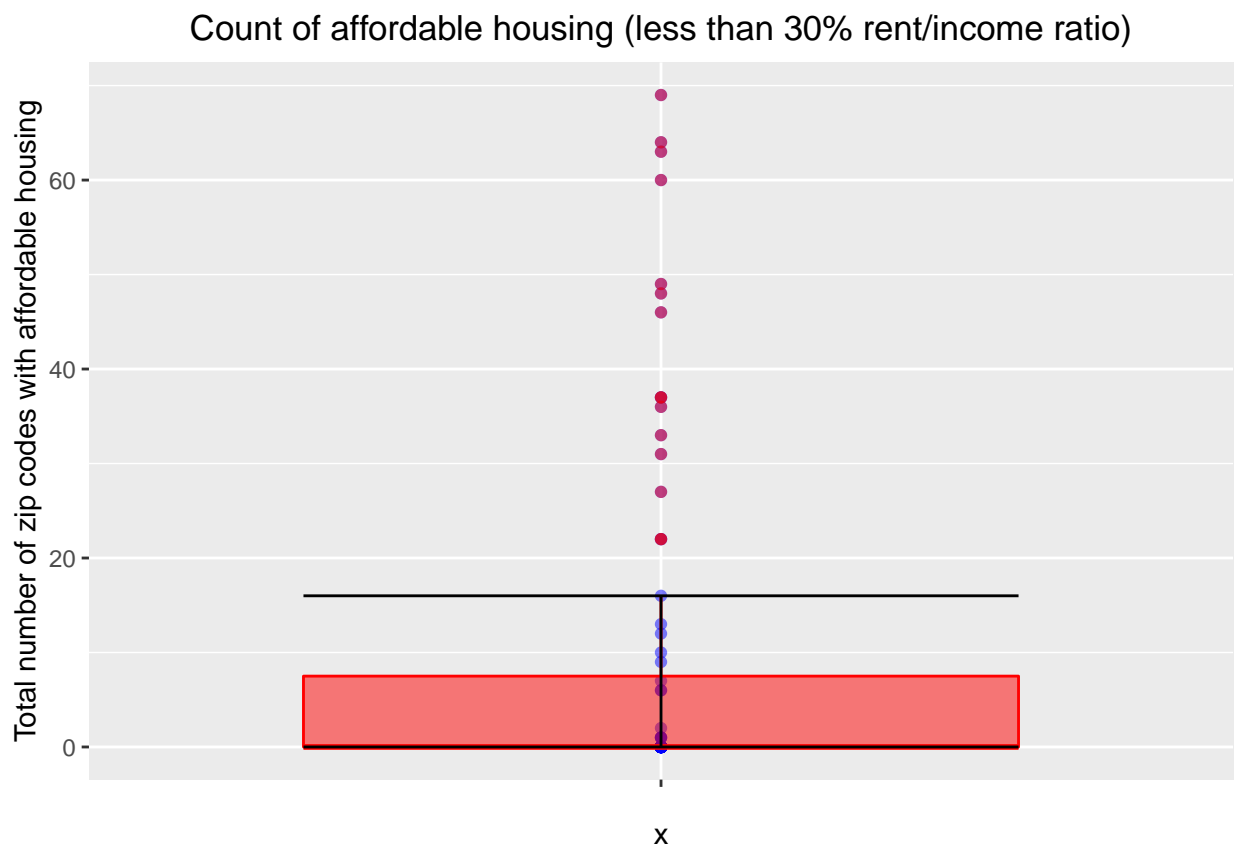


Figure 2

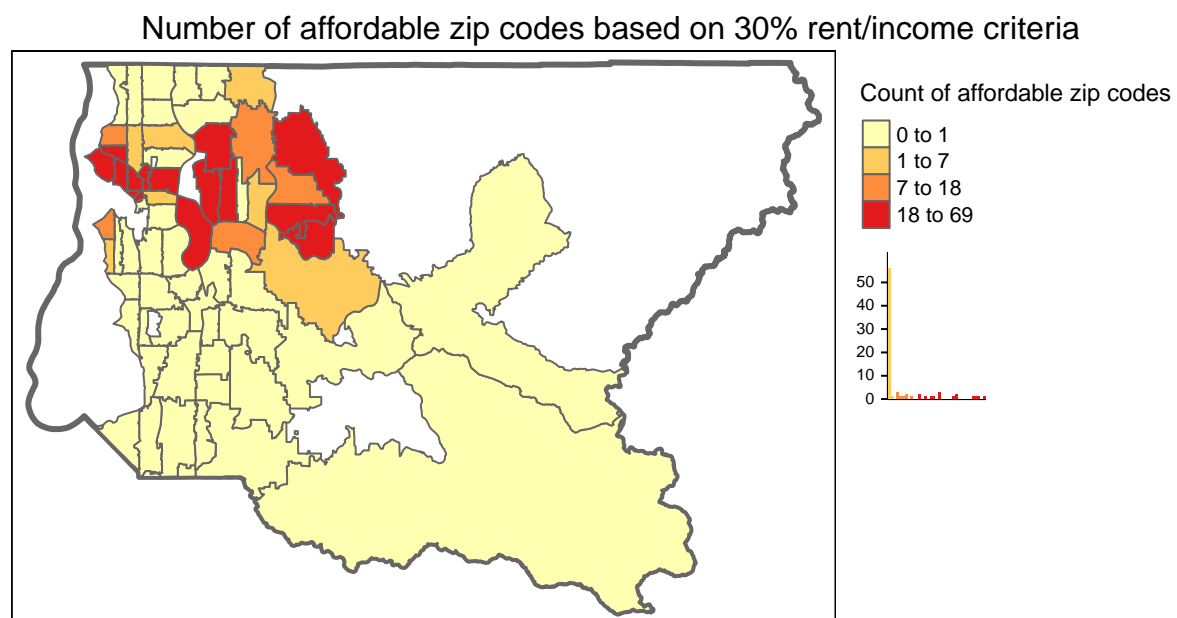
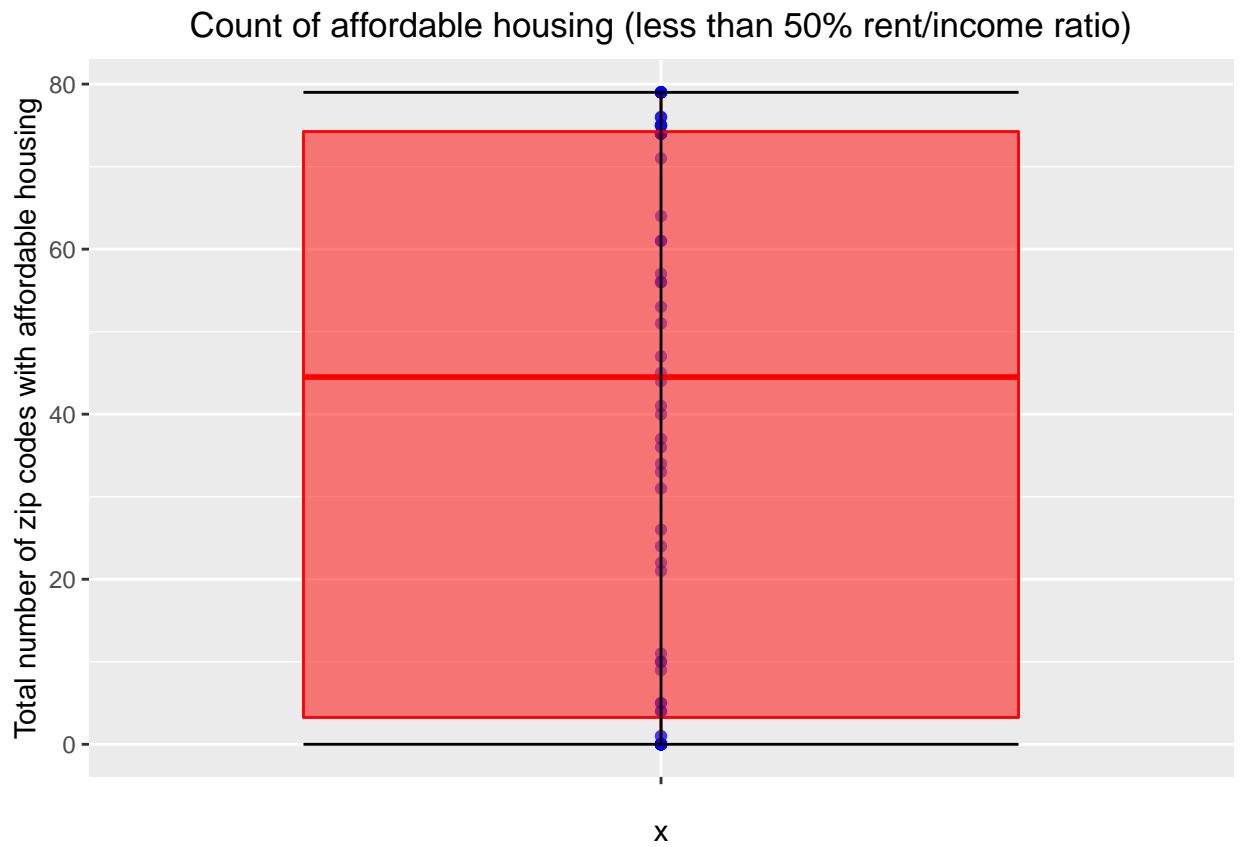


Figure 3



Number of affordable zip codes based on 50% rent/income criteria

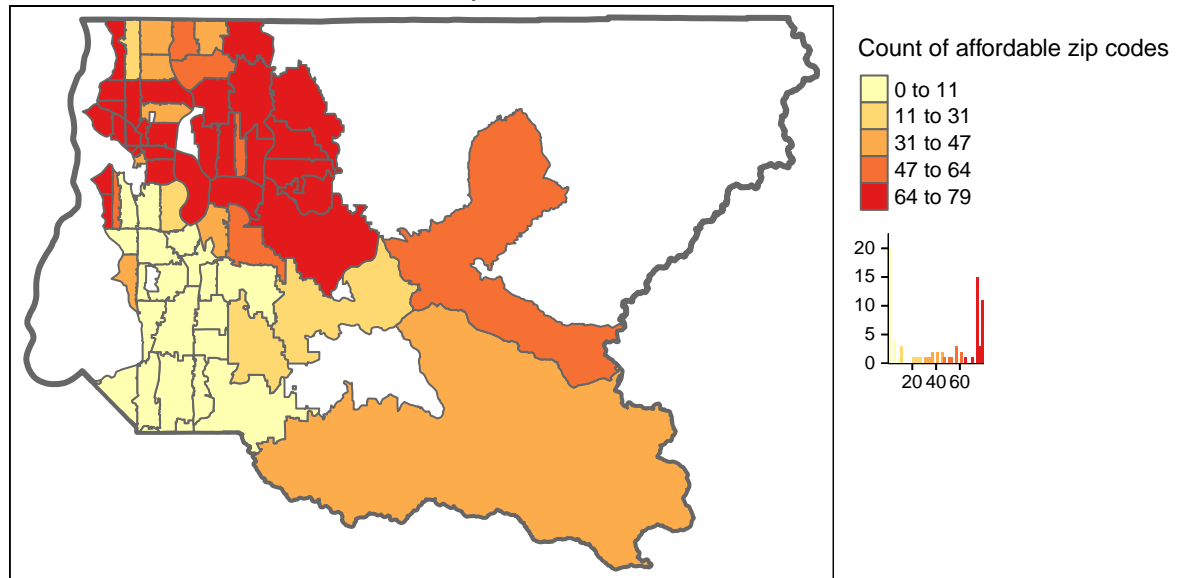


Figure 5 \_\_



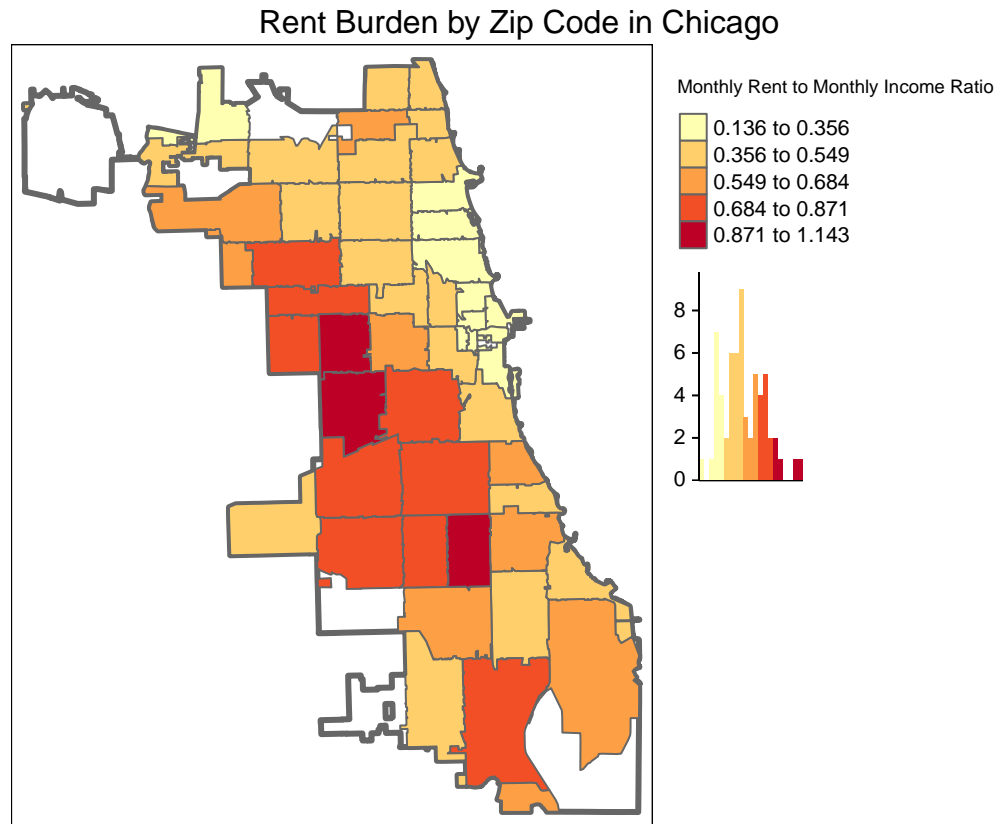


Figure 6

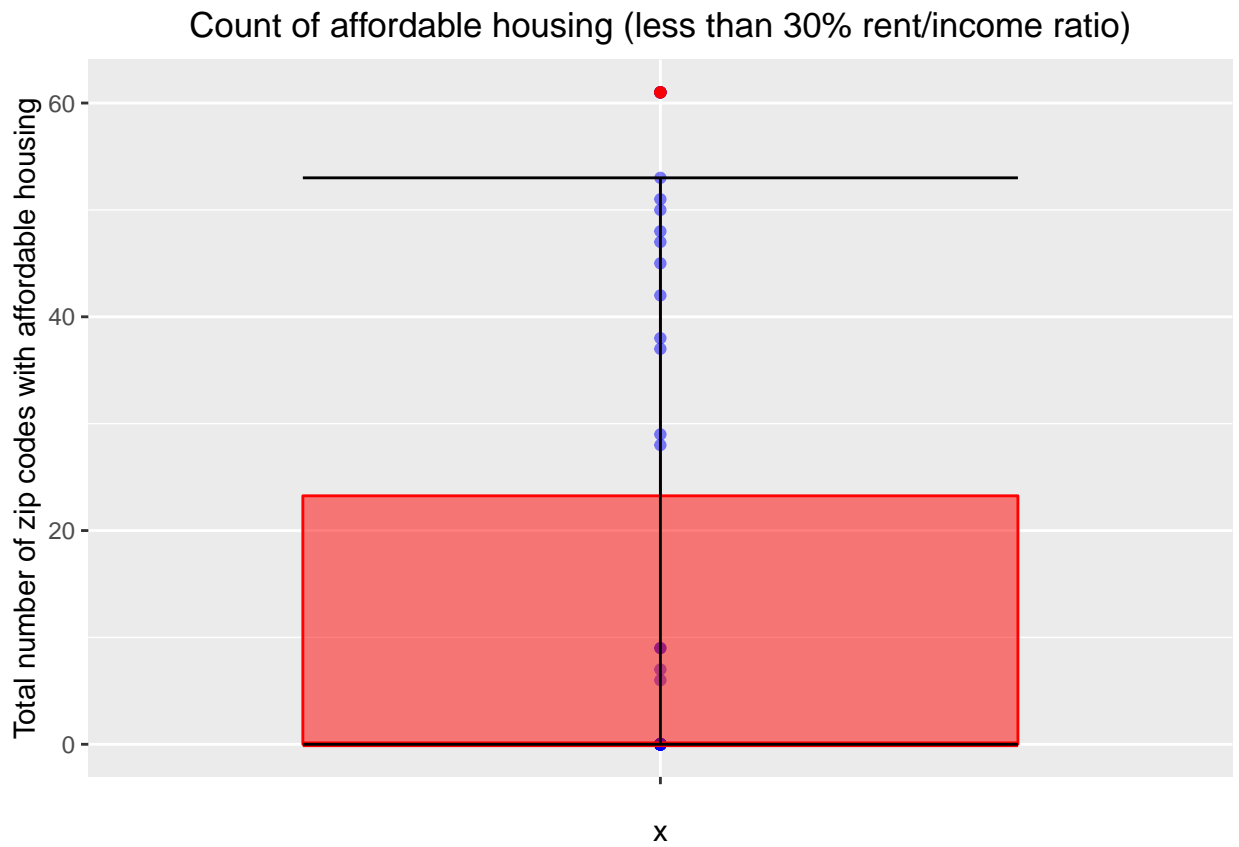


Figure 7

Number of affordable zip codes based on 30% rent/income criteria

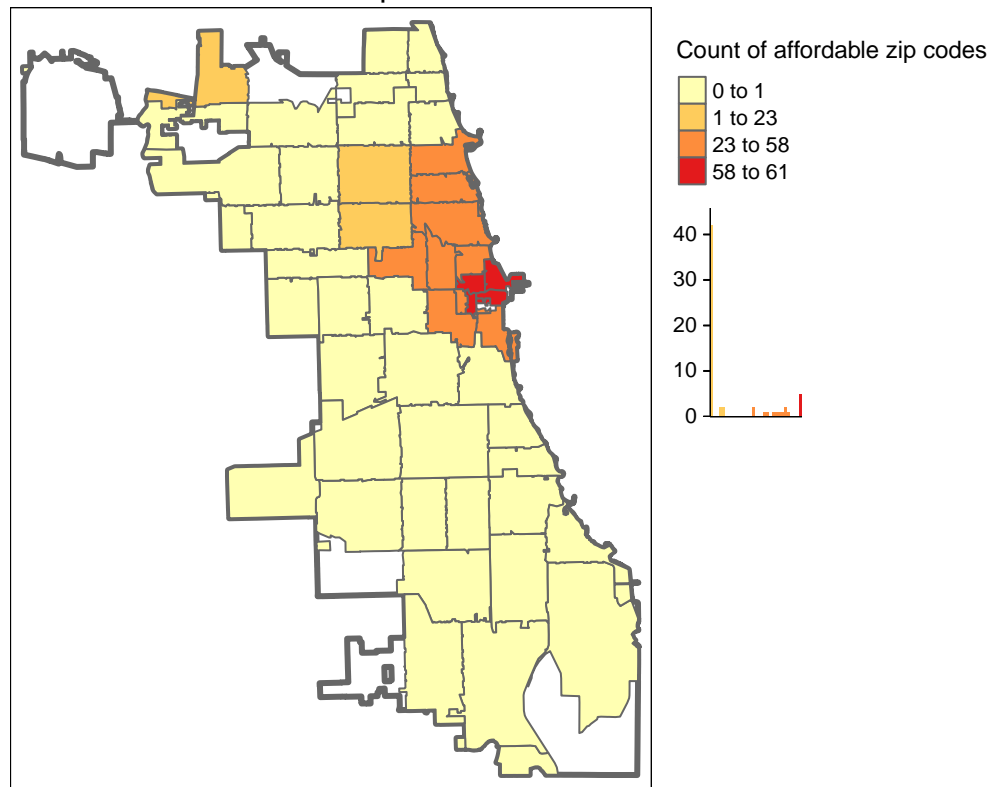


Figure 8

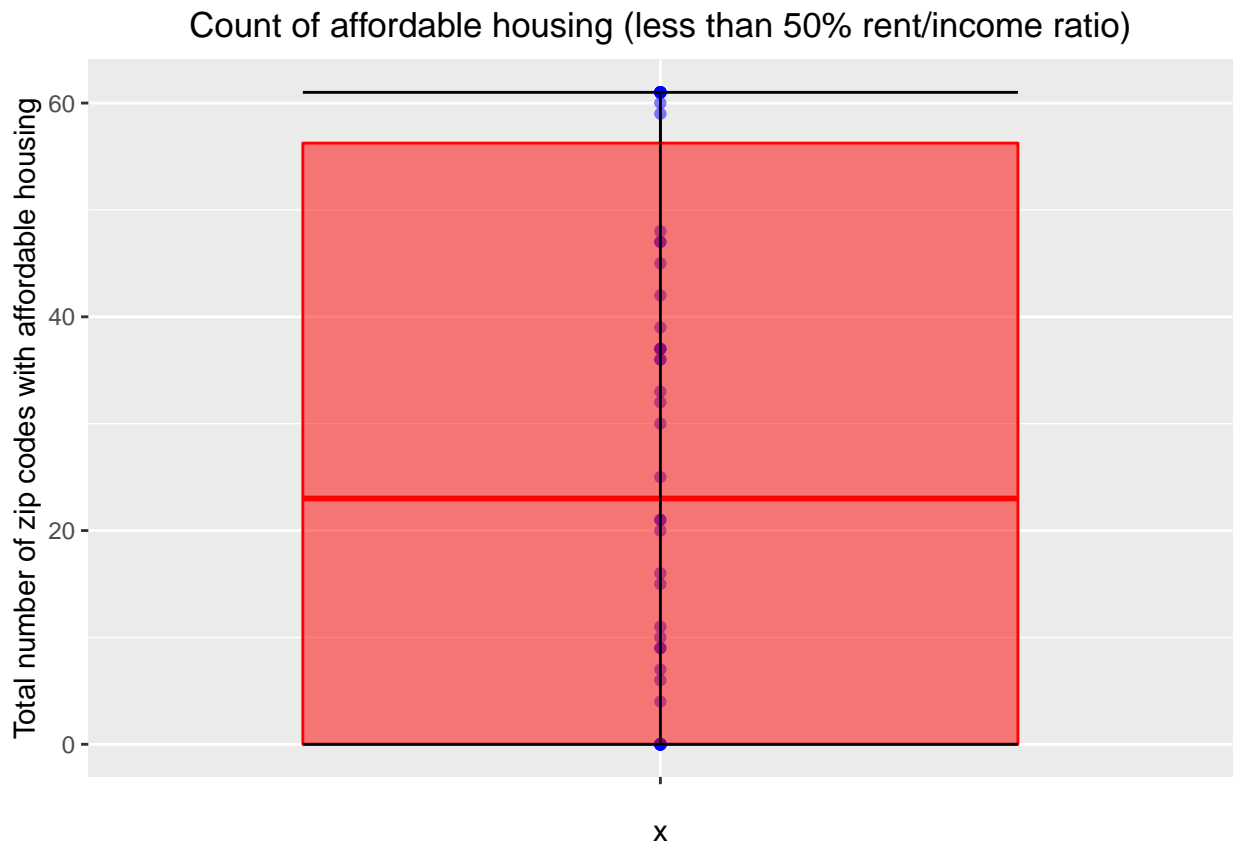


Figure 9

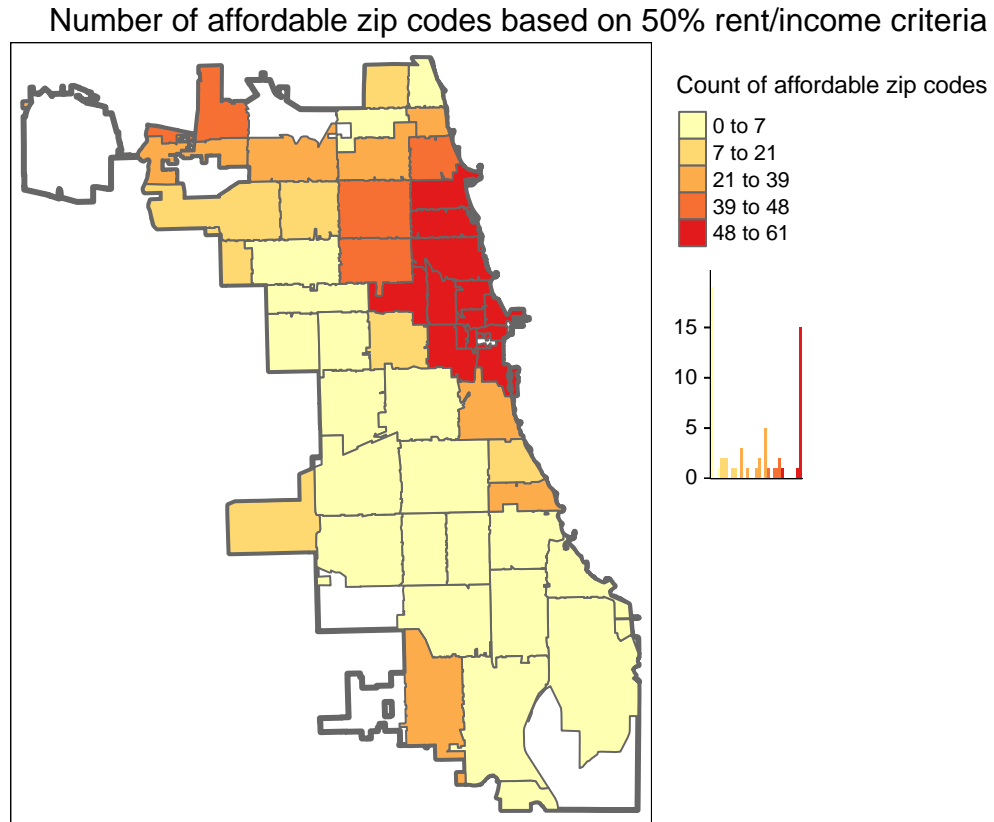


Figure 10

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## Dataset Sources

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