Deliverable 2

Permitting Team C

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Problem Statement

- Boston's urban landscape is molded by the myriad of building permits granted each year. Yet, essential questions linger: What types of permits, characterized by worktype, valuation, and occupancy, dominate the approvals? How have these trends evolved over the past five years? Beyond the numbers, who are the key players seeking these permits, and what geographical patterns emerge from both the permit requests and the decisions of the zoning board of appeal? As we venture into this analysis, we also strive to uncover the deeper socio-economic layers, probing into the racial, ethnic, and income profiles of neighborhoods where these permits originate.

Data Collection & Cleaning

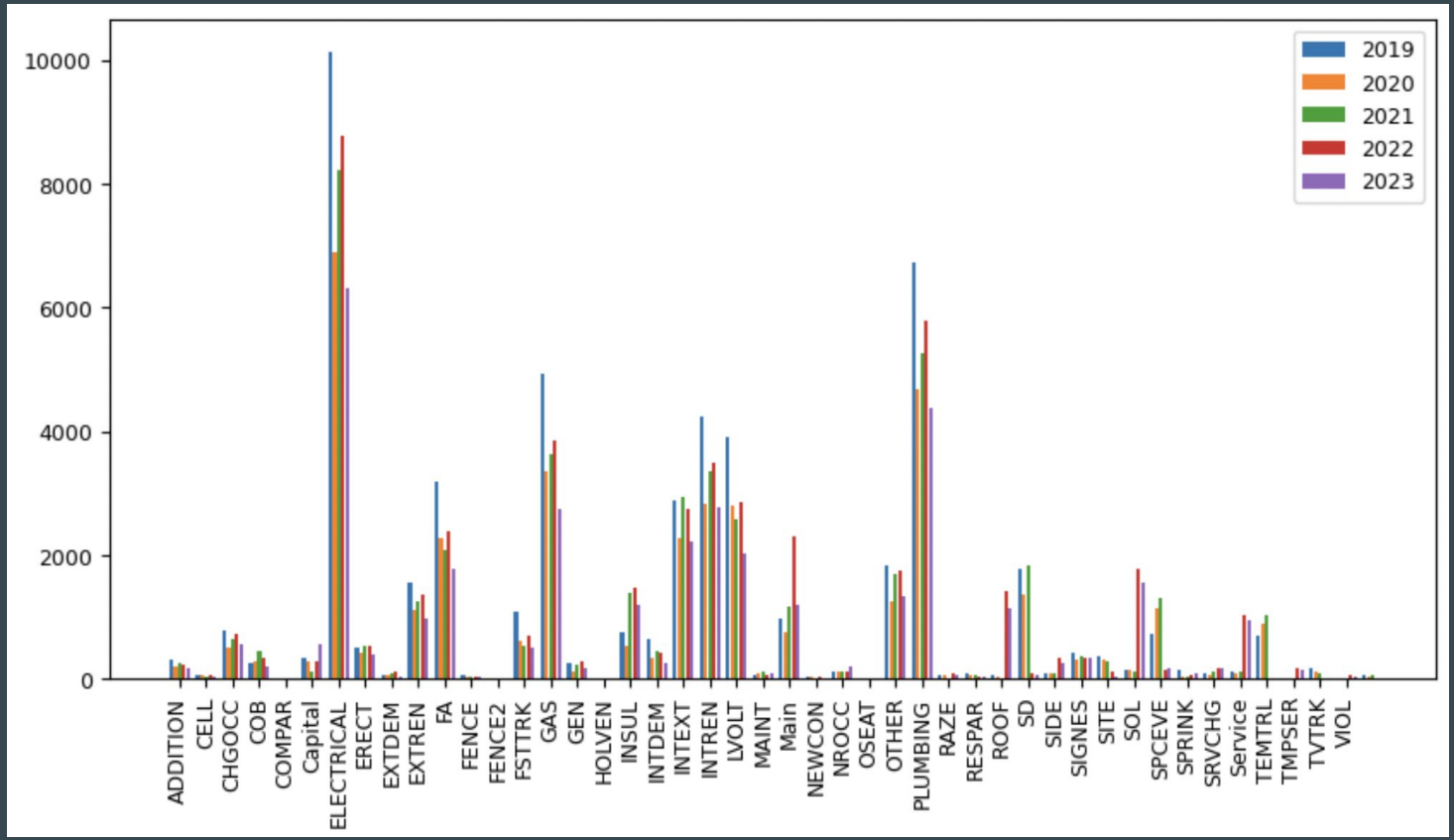
Considering that our project has multiple data sets, we had to go through various collection and cleaning steps for all data sets. Specifically, we had to locate all of our data, create separate notebooks for each dataset for the sake of simplicity, and perform cleaning steps involving:

- Handling missing values
- Converting data types (ie string of dates to date data types) or breaking them down to obtain only desired parts (ie using .split())
- Removing outliers
- Splitting the data set into different parts to only check and analyze necessary data

Our base project questions:

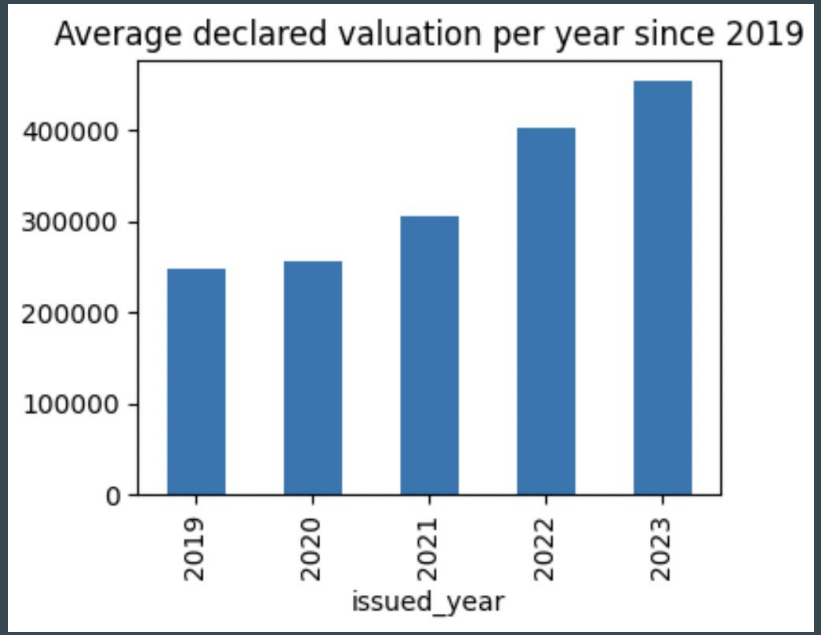
1. What type of building permits are approved each year by type (worktype), description, valuation (declared valuation), square footage, occupancy type?
2. How have these changed over the past 5 years i.e. a year over year analysis?
3. Who is applying for building permits by geography (neighborhood, zip code, zoning district)?
4. What are the year over year trends visible in the zoning board of appeal approvals and denials by geography (neighborhood - listed as city, zip code, zoning district)? You'll want to normalize the data, perhaps ratio of permits to approvals or denials, etc.
5. What are the geographic profiles of the census tracts of the addresses for the permits submitted and zoning board approvals and denials (use project address and match to census data)? Specifically look at: race/ethnicity of the census tract income level (average income in census tracts of approved permits)

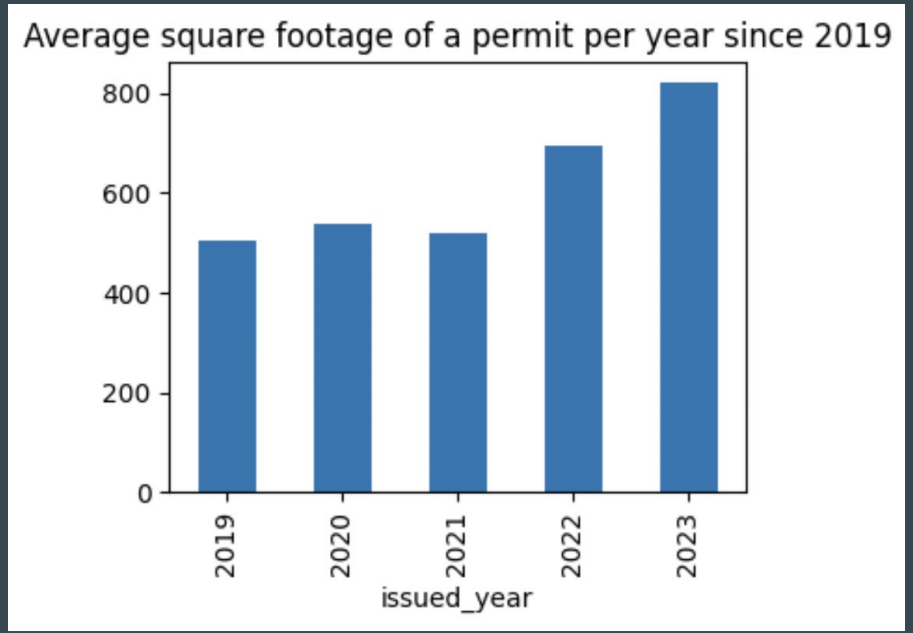
Number of building permits approved per worktype since 2019



(generated from approved permits data)

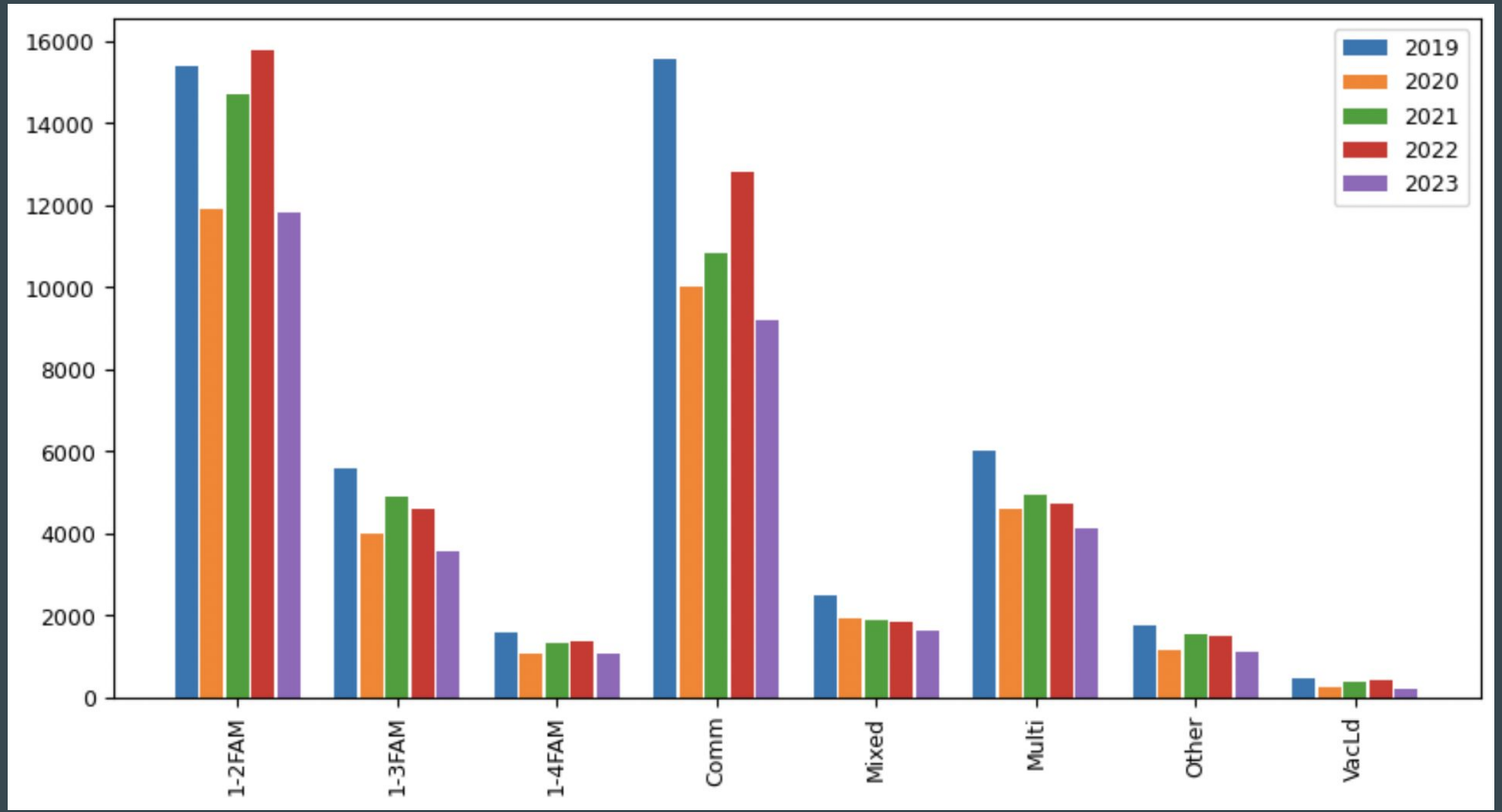
Average declared valuation ($) and square footage of a permit per year since 2019



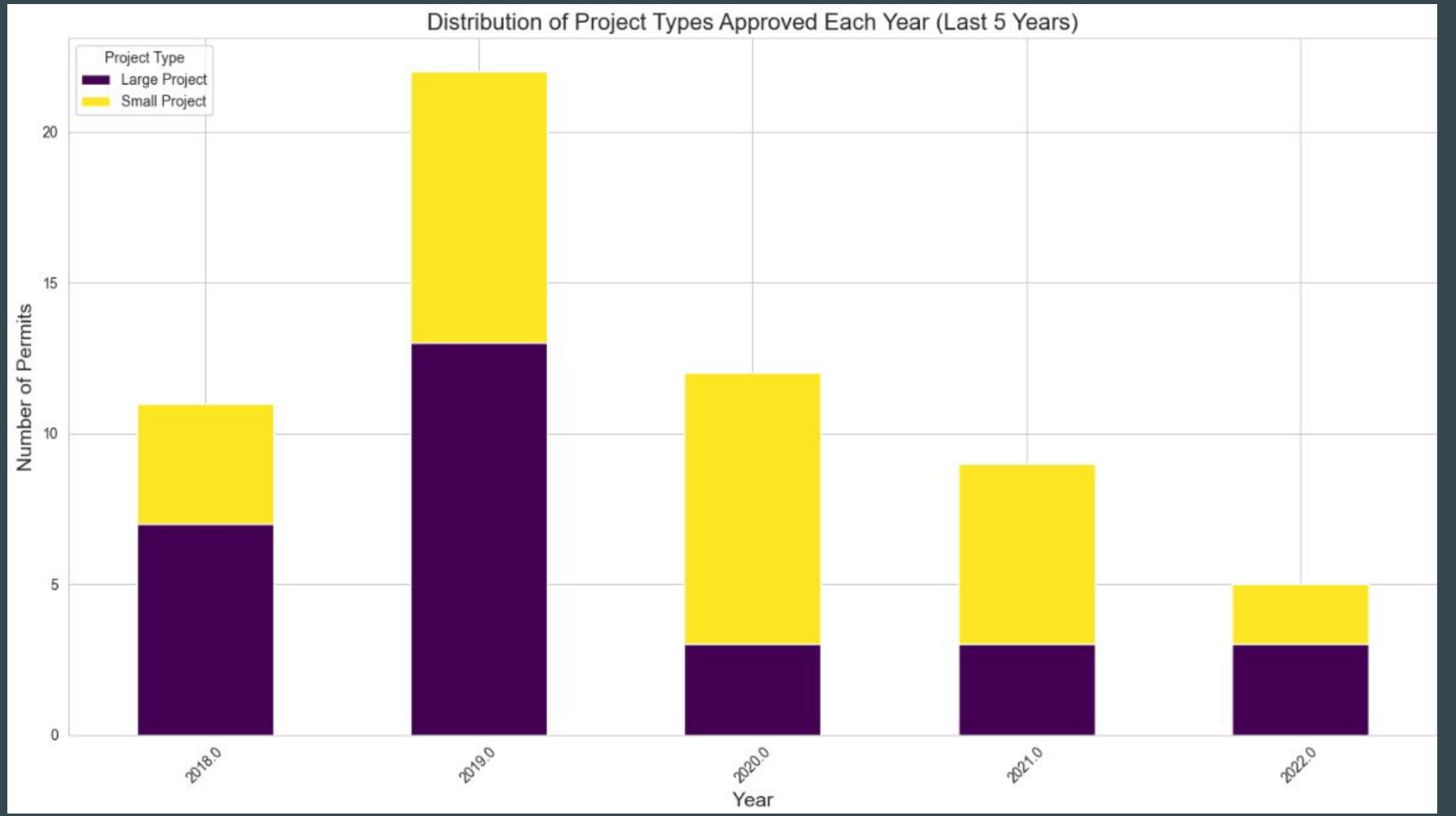


(generated from approved permits data)

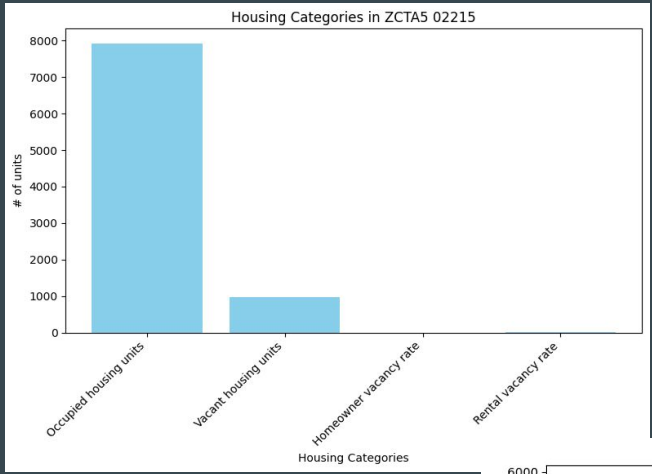
Number of building permits approved per occupancy type since 2019

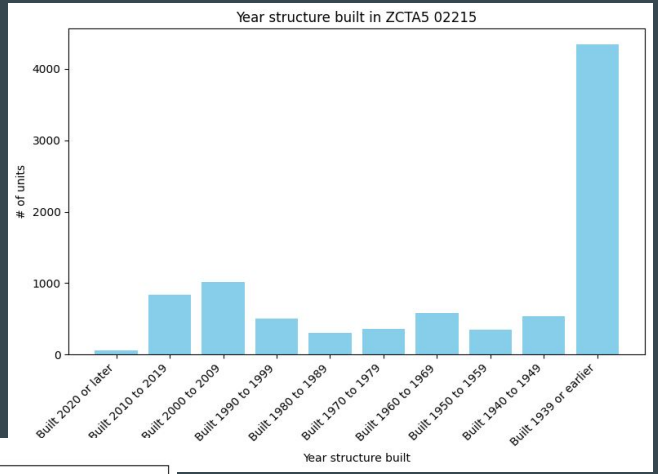


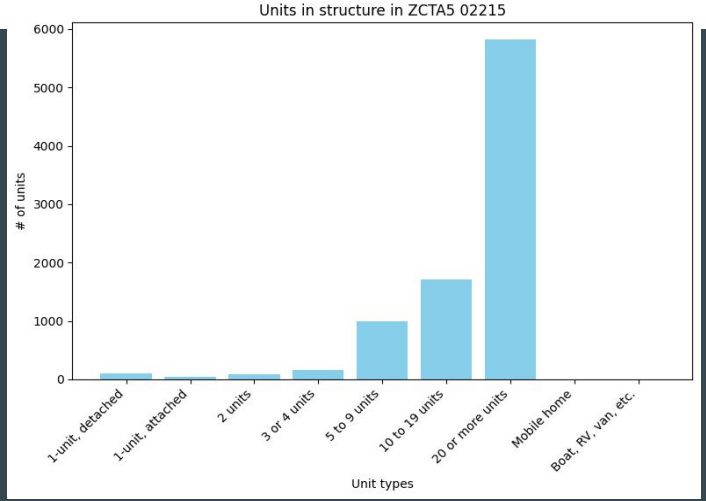
(generated from approved permits data)

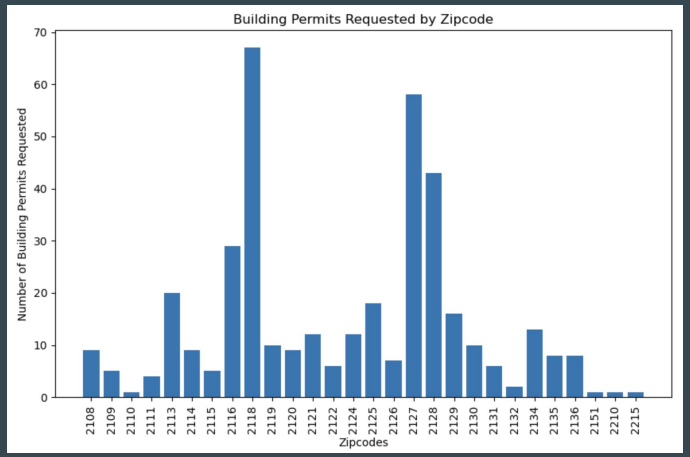

Distribution of Project Types Approved Each Year (Last 5 Years)
Project Type
Large Project
Small Project
Number of Permits
0
5
10
15
20
2018.0
2019.0
2020.0
2021.0
2022.0
Year

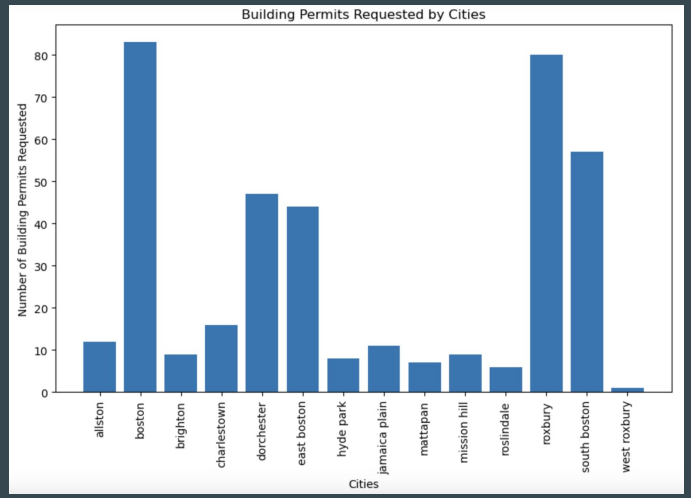
Generated from census data

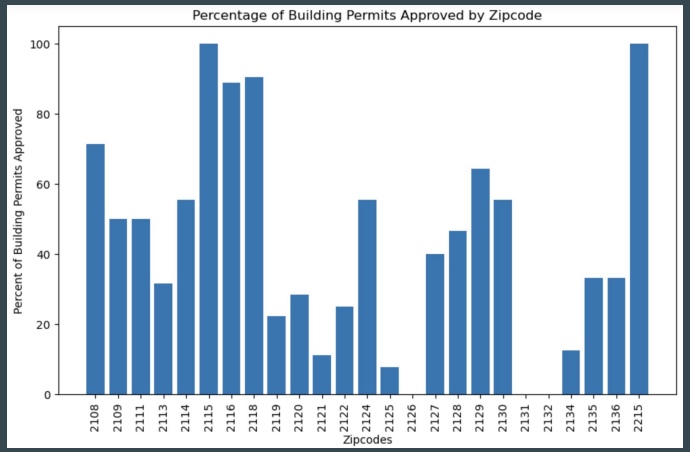


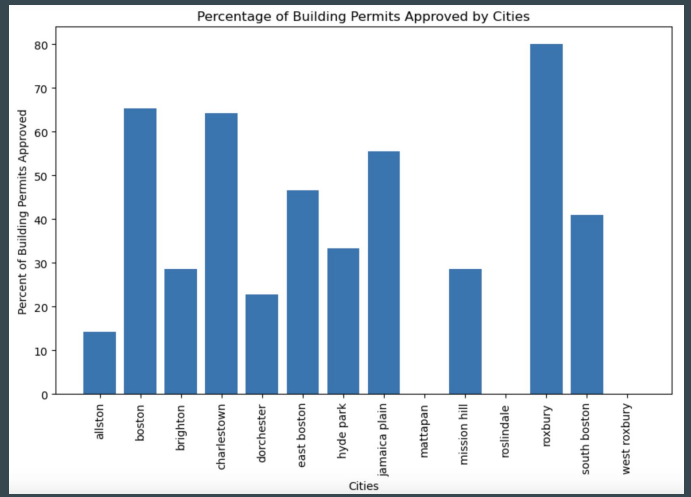


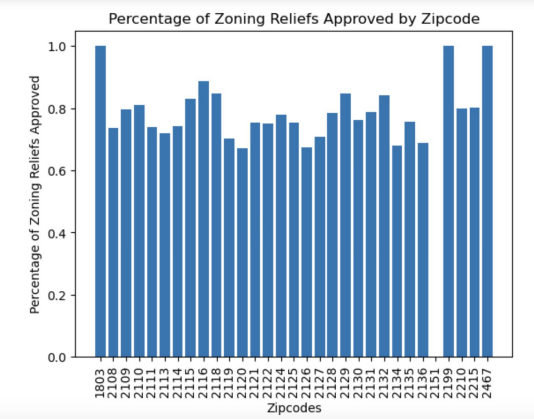


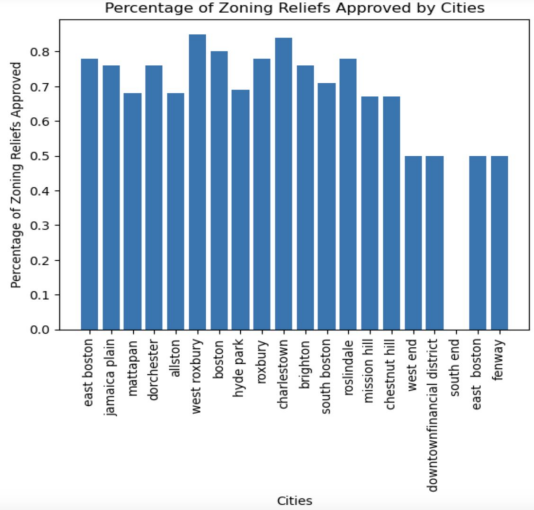

Building Permits Requested by Zipcode
Number of Building Permits Requested
Zipcodes
2108 2109 2110 2111 2113 2114 2115 2116 2118 2119 2120 2121 2122 2124 2125 2126 2127 2128 2129 2130 2131 2132 2134 2135 2136 2151 2210 2215

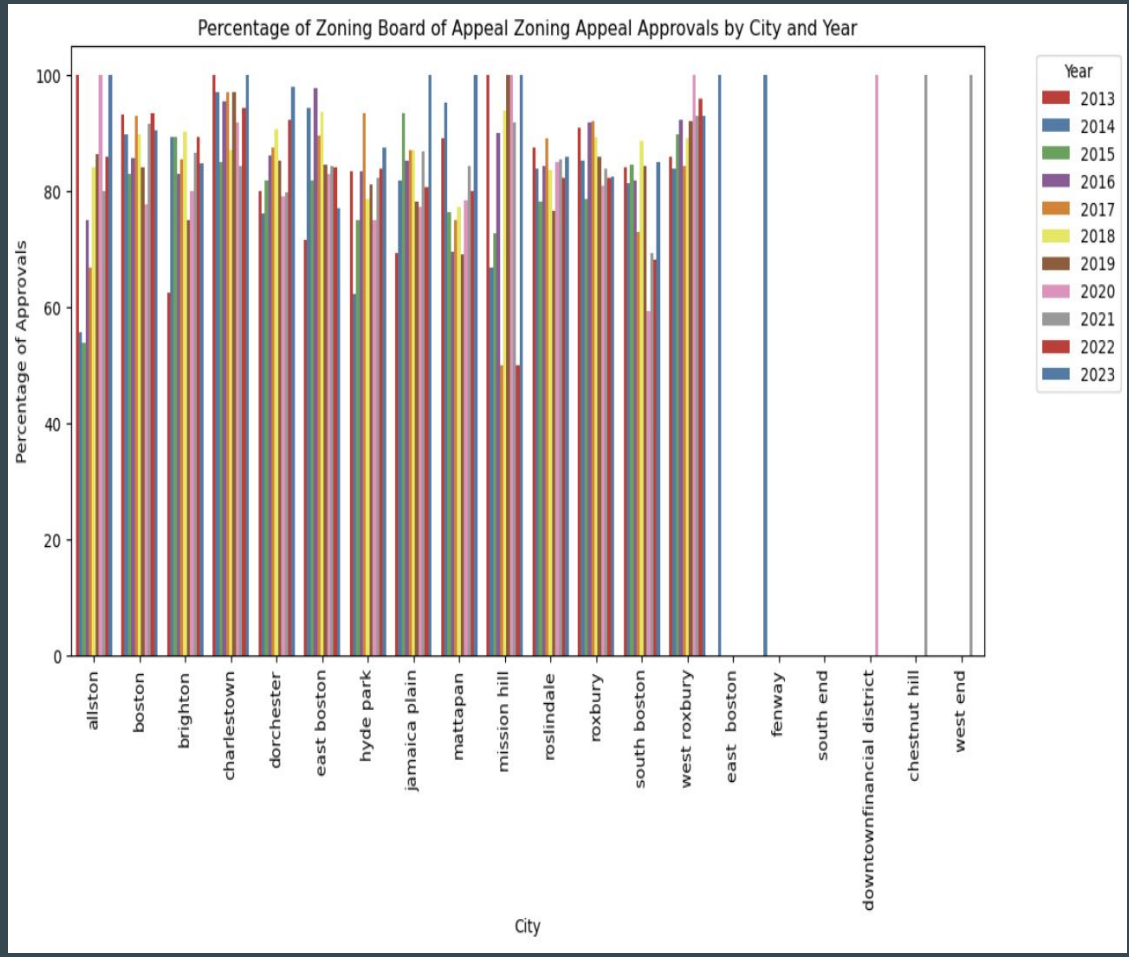

Building Permits Requested by Cities
Number of Building Permits Requested
Cities
allston boston brighton charlestown dorchester east boston hyde park jamaica plain mattapan mission hill roslindale roxbury south boston west roxbury

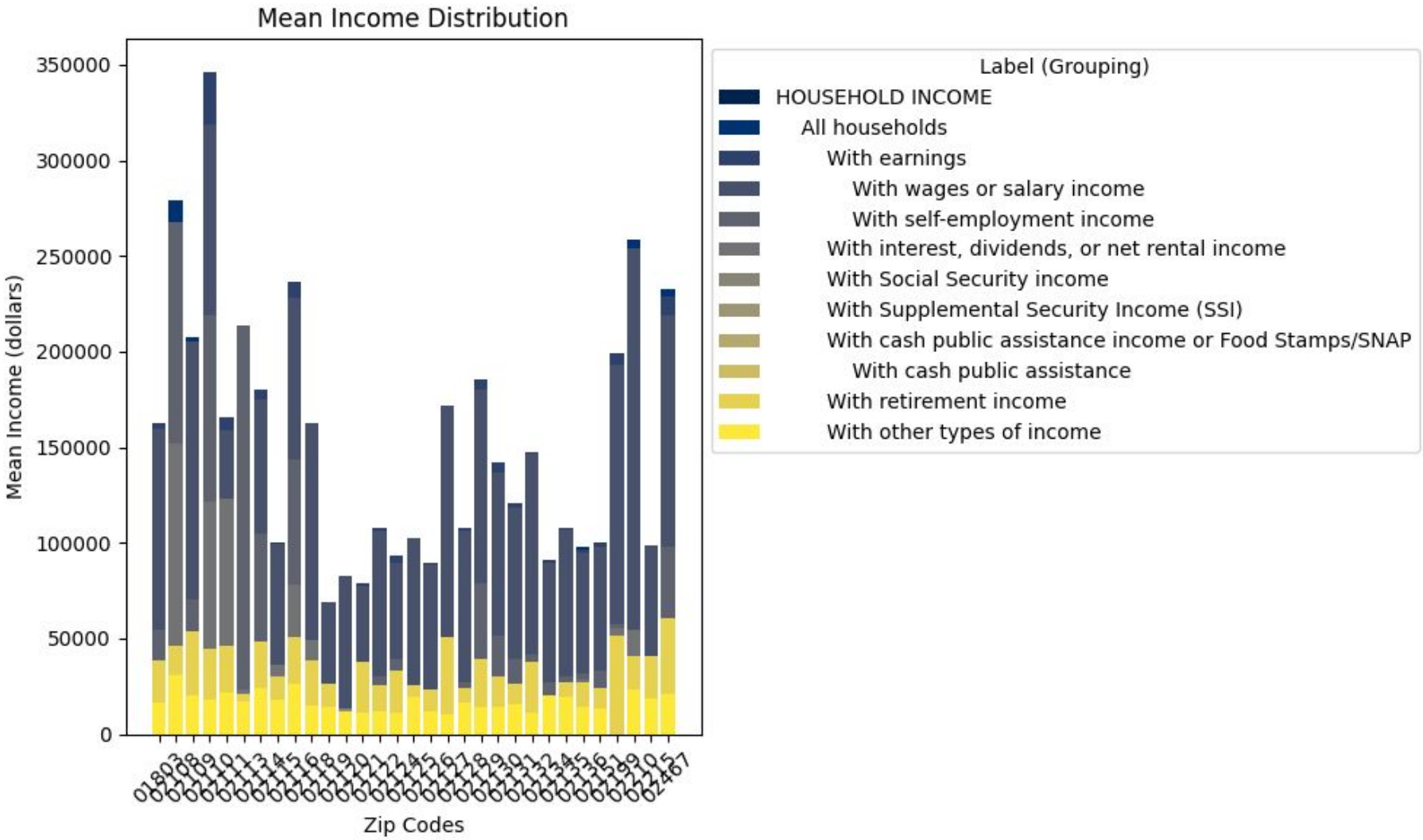

Percentage of Building Permits Approved by Zipcode
Percent of Building Permits Approved
Zipcodes
2108 2109 2111 2113 2114 2115 2116 2118 2119 2120 2121 2122 2124 2125 2126 2127 2128 2129 2130 2131 2132 2134 2135 2136 2215

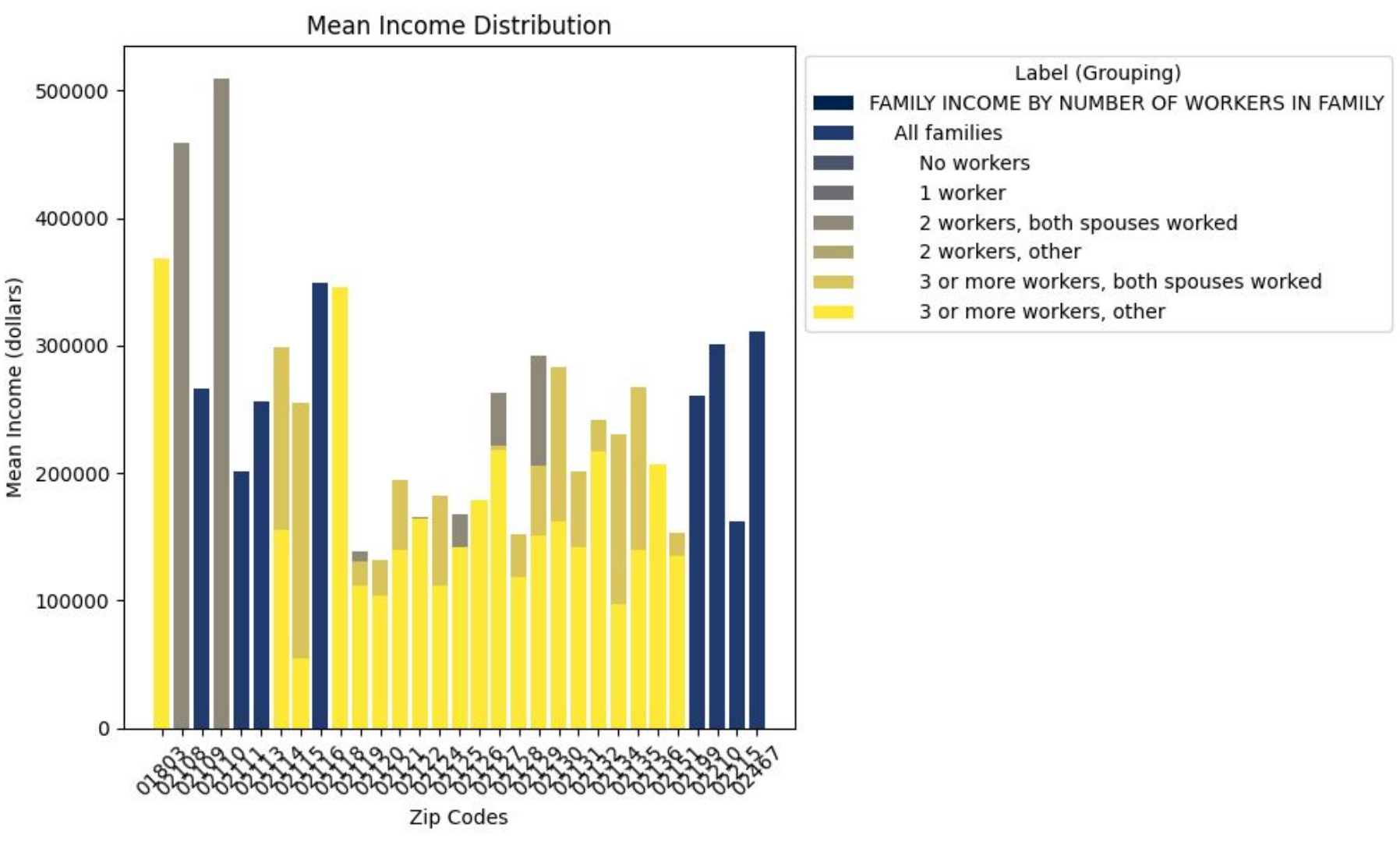

Percentage of Building Permits Approved by Cities
Percent of Building Permits Approved
Cities
allston boston brighton charlestown dorchester east boston hyde park jamaica plain mattapan mission hill roslindale roxbury south boston west roxbury

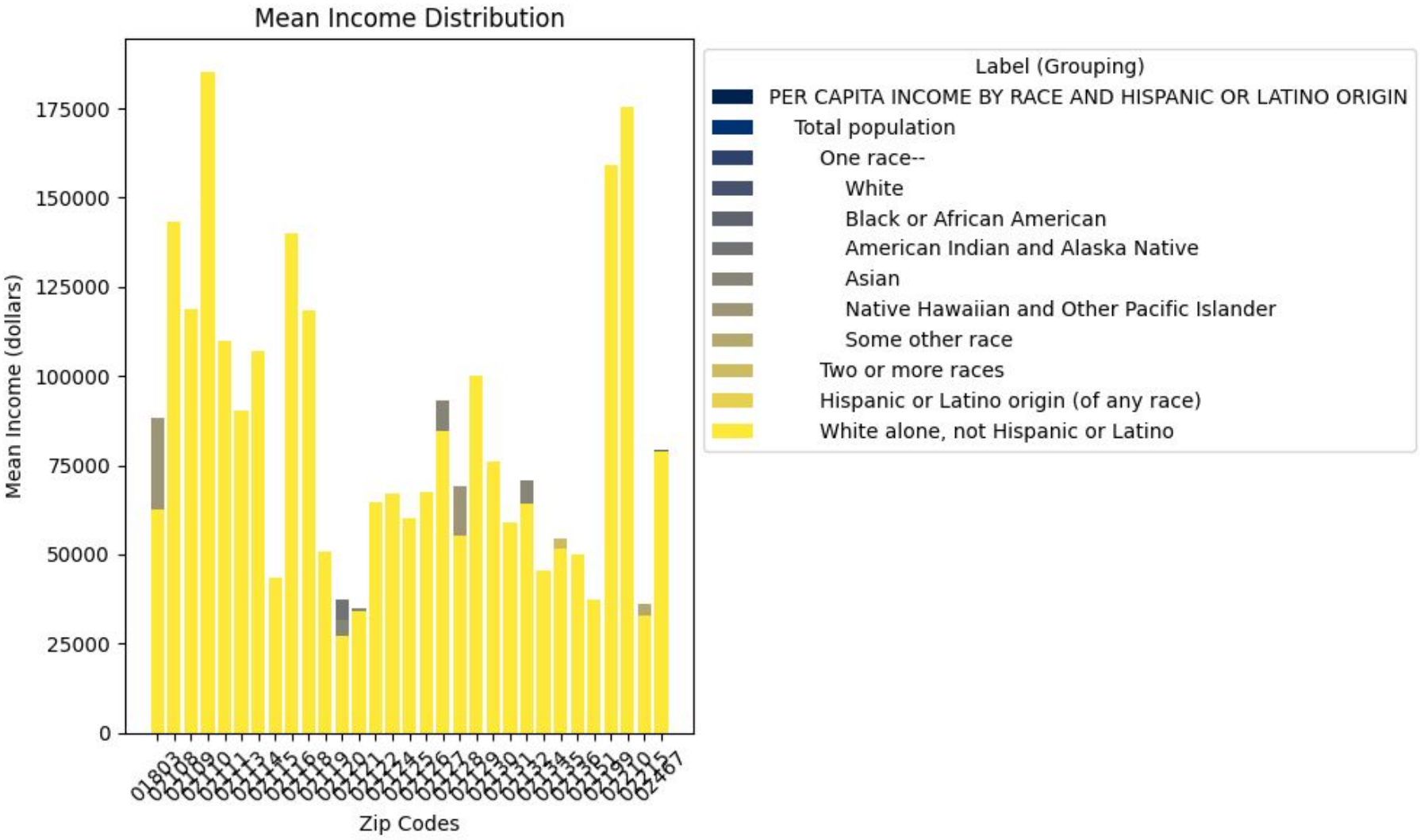

Percentage of Zoning Reliefs Approved by Zipcode
Percentage of Zoning Reliefs Approved
1.0
0.8
0.6
0.4
0.2
0.0
1803
2108
2109
2110
2111
2113
2114
2115
2116
2118
2119
2120
2121
2122
2124
2125
2126
2127
2128
2129
2130
2131
2132
2134
2135
2136
2151
2199
2210
2215
2467
Zipcodes


Percentage of Zoning Reliefs Approved by Cities
Percentage of Zoning Reliefs Approved
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
east boston
jamaica plain
mattapan
dorchester
allston
west roxbury
boston
hyde park
roxbury
charlestown
brighton
south boston
roslindale
mission hill
chestnut hill
west end
downtownfinancial district
south end
east boston
fenway
Cities


Percentage of Zoning Board of Appeal Zoning Appeal Approvals by City and Year
Percentage of Approvals
100
80
60
40
20
0
allston
boston
brighton
charlestown
dorchester
east boston
hyde park
jamaica plain
mattapan
mission hill
roslindale
roxbury
south boston
west roxbury
east boston
fenway
south end
downtownfinancial district
chestnut hill
west end
City
Year
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


Mean Income Distribution
Mean Income (dollars)
350000
300000
250000
200000
150000
100000
50000
0
Zip Codes
01803
02108
02109
02110
02111
02113
02115
02116
02118
02119
02120
02121
02122
02124
02125
02126
02127
02128
02130
02131
02132
02134
02135
02136
02151
02199
02210
02467
Label (Grouping)
HOUSEHOLD INCOME
All households
With earnings
With wages or salary income
With self-employment income
With interest, dividends, or net rental income
With Social Security income
With Supplemental Security Income (SSI)
With cash public assistance income or Food Stamps/SNAP
With cash public assistance
With retirement income
With other types of income


Mean Income Distribution
Mean Income (dollars)
0
100000
200000
300000
400000
500000
Zip Codes
01803
02108
02109
02110
02111
02113
02114
02115
02116
02118
02130
02131
02132
02134
02135
02136
02151
02199
02210
02215
02467
Label (Grouping)
FAMILY INCOME BY NUMBER OF WORKERS IN FAMILY
All families
No workers
1 worker
2 workers, both spouses worked
2 workers, other
3 or more workers, both spouses worked
3 or more workers, other


Mean Income Distribution
Mean Income (dollars)
0
25000
50000
75000
100000
125000
150000
175000
Zip Codes
01803
02108
02109
02110
02113
02114
02115
02116
02118
02119
02120
02121
02124
02125
02126
02127
02128
02129
02130
02131
02132
02134
02135
02136
02199
02210
02215
02467
Label (Grouping)
PER CAPITA INCOME BY RACE AND HISPANIC OR LATINO ORIGIN
Total population
One race--
White
Black or African American
American Indian and Alaska Native
Asian
Native Hawaiian and Other Pacific Islander
Some other race
Two or more races
Hispanic or Latino origin (of any race)
White alone, not Hispanic or Latino

Challenges and limitations

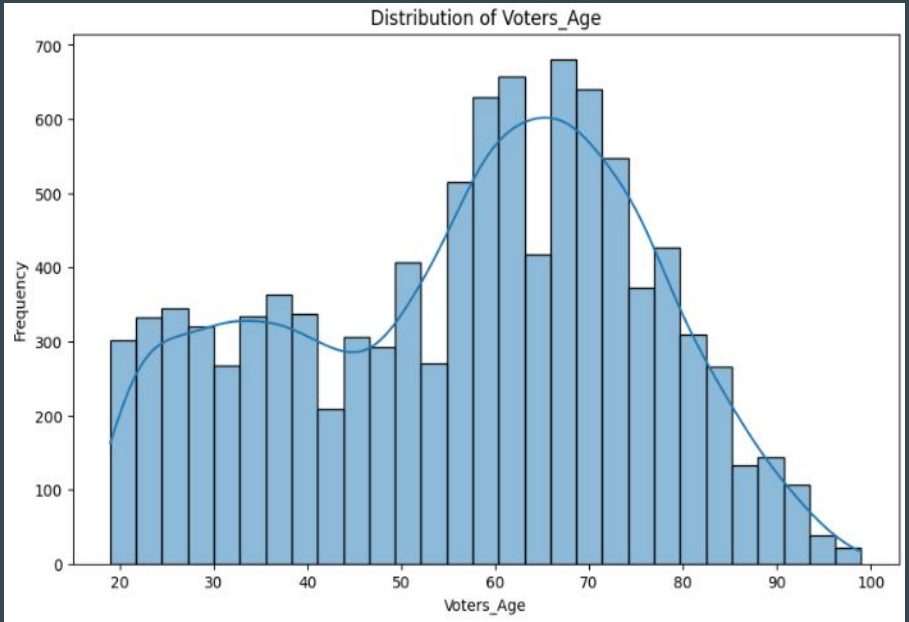
Some potential limitations include:

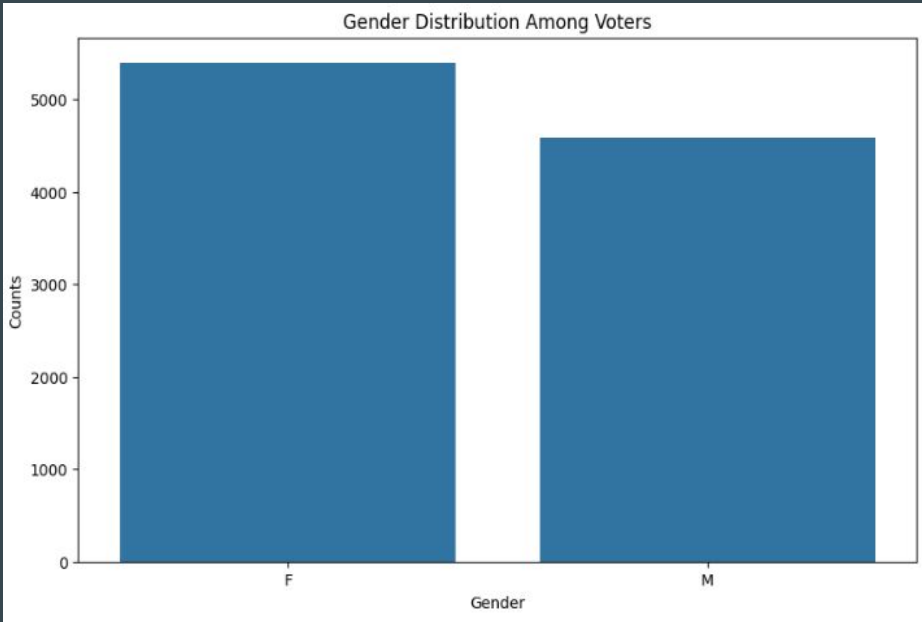
- Data availability and accuracy regarding permits, appeals, etc.
- Navigating the complexity of the permitting process and understanding the accuracy modeling and analyzing this process might be challenging.
- We have multiple data sets, integrating them together could prove to be a challenge.
- Our lack of expertise on this topic, not having a background in permitting, could prove to be a challenge. We need to engage with our go to experts to make sure we are on the right path to complete the project.

Extension Project

- Look into Voter File for Boston data and conduct analysis in regards to what the voting profile for census tracts where there is a high ratio of approved permits and zoning board of appeal decisions is. Voting is important when concerning approved permits and the zoning board of appeal as zoning regulations are largely determined by the local government and will vary from community to community. Analyzing this data would show us the correlation between the government and the approval of appeals and whether there are systemic inequalities engrained in municipal politics in permitting. By analyzing the Voter File for Boston data, we hope to find out how the local government affects approvals

Early Extension Insights





Individual Contributions

Jasper: Selectively performed EDA for census data for relevant census tracts. Added graphs of relevant census data to checkpoint A slides to answer base questions.

John Dohyun Kim: Performed EDA for zoning board of appeals data and answered third and fourth base questions. Created and added relevant graphs go the checkpoint A slides and worked on Deliverable 2, including looking into the new data set on Voting Files.

Dima: Organizing notebooks, creating visualizations for Article80 data, graphs relating to the number of permits approved for each year by project type, graphs relating to distribution of project types approved each year, and others. Loaded voting data, created notebook.

Aryan: Data cleaning and EDA work on Article80 data. Visualizations relating to the number of projects filed each year, distributions of projects by neighborhood, and others.

Brianna: Finished extracting and visualizing important data from approved permits data for the first two base project questions for Checkpoint A and Deliverable 2, and made informational slides. Started looking into the extension proposal to determine which data sets to focus on.

For More Information

Thank You