

The background of the entire page is a monochromatic blue illustration. In the upper half, a single sailboat with a white sail is depicted on the water. Below the main title, the scene transitions to a detailed waterfront promenade. A large, diverse crowd of people is shown walking, standing, and sitting on a wide, light-colored path. To the left, a small, elevated platform or dock extends into the water, with several people standing on it. To the right, two more sailboats are visible on the water, and a small rowing boat with two people is also present. The overall style is clean and modern, using white lines and shapes to represent figures and vessels against the textured blue background.

BOSTON HARBOR FOR ALL

WATERFRONT VISITATION & EQUITY STUDY QUERY SUMMARY

Boston Harbor Now Waterfront Data Project Query Summary

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Introduction

The Boston Harbor Now (BHN) Waterfront Data Project analyzes mobility data from the data provider Veraset using a geospatial data platform Tectonix. Accompanying these datasets are survey and count data from MassInc Polling Group on a subset of five parks included in the wider mobility data. These five parks were Castle Island, Christopher Columbus Park, Martin's Park, Piers Park, and Pope John Paul II Park, each representing a distinct location and park profile.

BHN provided me with [25 queries](#) about the Waterfront regarding access, utilization, and programmatic impact of these areas, among other topics. I analyzed the Veraset data to answer these queries, each supplemented with a corroboration grade. These grades are determined by the degree to which the MassInc data can be used to compare with Veraset data for that query and include the grades **No Corroboration**, **Minimal Corroboration**, **Some Corroboration**, **Moderate Corroboration**, and **High Corroboration**. **No Corroboration** indicates that there was no MassInc data present associated with the query. **Minimal Corroboration** means that associated MassInc data was present, but it did not align with the Veraset data or contradicted Veraset. **Some Corroboration** implies that there was some weak alignment between the two datasets. In the case of **Moderate Corroboration**, there was modest alignment. **High Corroboration** is defined as nearly complete alignment between the datasets. It is important to note that the corroboration grade does not assign nullify or verify the conclusions for the query: the grade merely shows the degree of alignment between the MassInc and Veraset data regarding the query in question.

Key terms

Polygon: Geospatial object representing an area or location, such as a park or an island. The polygons are organized into 4 overlapping polygon sets: the Broad Waterfront, the Narrow Harborwalk, the Waterfront Parks, and the Boston Harbor Islands. The Harborwalk is a 10-12' wide boardwalk along that waterfront that is a subset of the Broad Waterfront, and the Waterfront Parks are important public spaces along the Harborwalk.

Record: A ping from a cell phone application along with its associated data, such as census block information.

Visitor: A calculated value from records representing the number of unique individuals appearing in a specified polygon in a given time frame. Visitor values have some instability, as people acquire new devices over time.

Visit: A calculated value from records representing unique appearances of unique individuals appearing in a specific polygon in a given time frame. Visits are much more stable than visitors over long periods of time.

Home location: Each visit and visitor has associated values for home location, including home state and city. Visits/visitors with a home city of Boston also have a home neighborhood.

Data and Code Availability

Additional resources can be found at <https://www.bostonharbornow.org/waterfrontdatapoint/>

The Python code for this project's analysis can be found on project [GitHub repository](#), and all of the data can be found on [Google Drive](#). Figures can also be found on [Google Drive](#).

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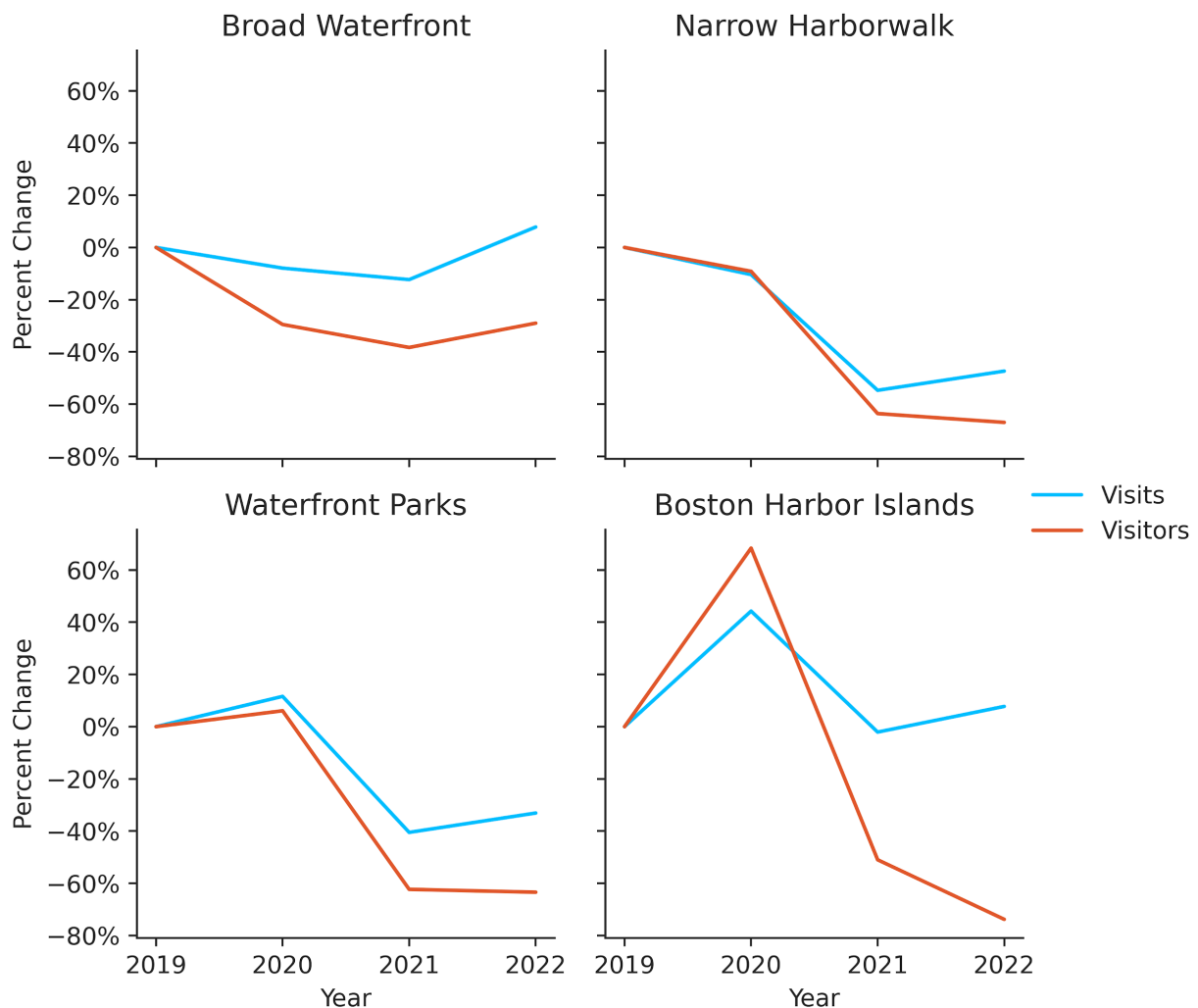
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Demographic Queries

Who is coming to the waterfront?

[Code](#) | [Data](#)

Visits and visitors



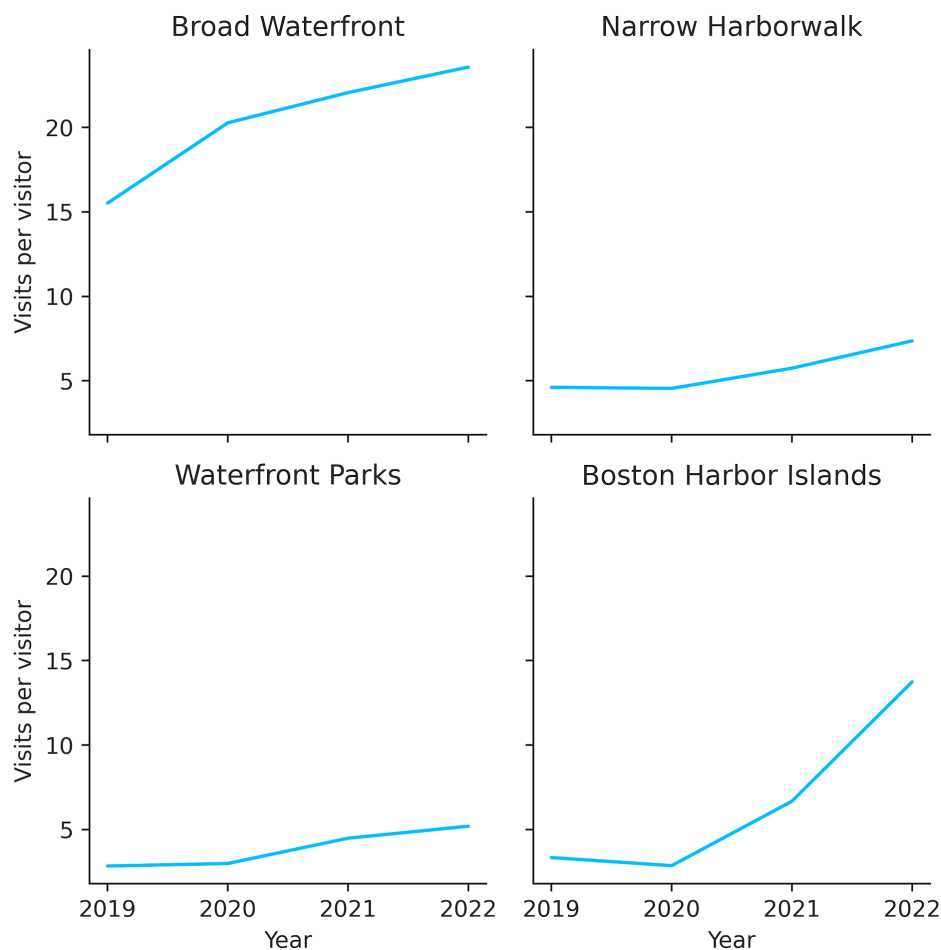
To understand who is coming to the waterfront, I first broke down how the number of visits and visitors has changed from 2019 to 2022, using 2019 as a baseline for visitation. This baseline allowed me to compare a pre-COVID year to those following the advent of the pandemic.

In both the Broad Waterfront and the Narrow Harborwalk, the number of visits and visitors decreased from 2019 through 2021. This drop was most dramatic in the Broad Waterfront in 2020, where visitors were down ~30% from the 2019 baseline. However, in both polygon sets, the number of visits increased in 2022, and in the Broad Waterfront this number was larger in

2022 than in 2019 by 10%, while the Narrow Harborwalk visits still fell short of 2019. The number of visitors in the Broad Waterfront also increased from 2021 to 2022, while visitors in the same year in the Narrow Waterfront decreased slightly.

In contrast, in both the Waterfront Parks and the Boston Harbor Islands, the number of visitors and visits increased in 2020 from 2019, with the number of visitors to the islands up 60%. This is the only occurrence where the number of visitors is much higher above baseline than visits. For both polygon sets, both visits and visitors declined in 2021 below the 2019 baseline, with visitors to islands declining to near 75% below 2019 levels. 2022 saw small increases in visits for both the parks and the islands, but the number of visitors remaining at the 2021 level in the parks and decreasing further in the islands.

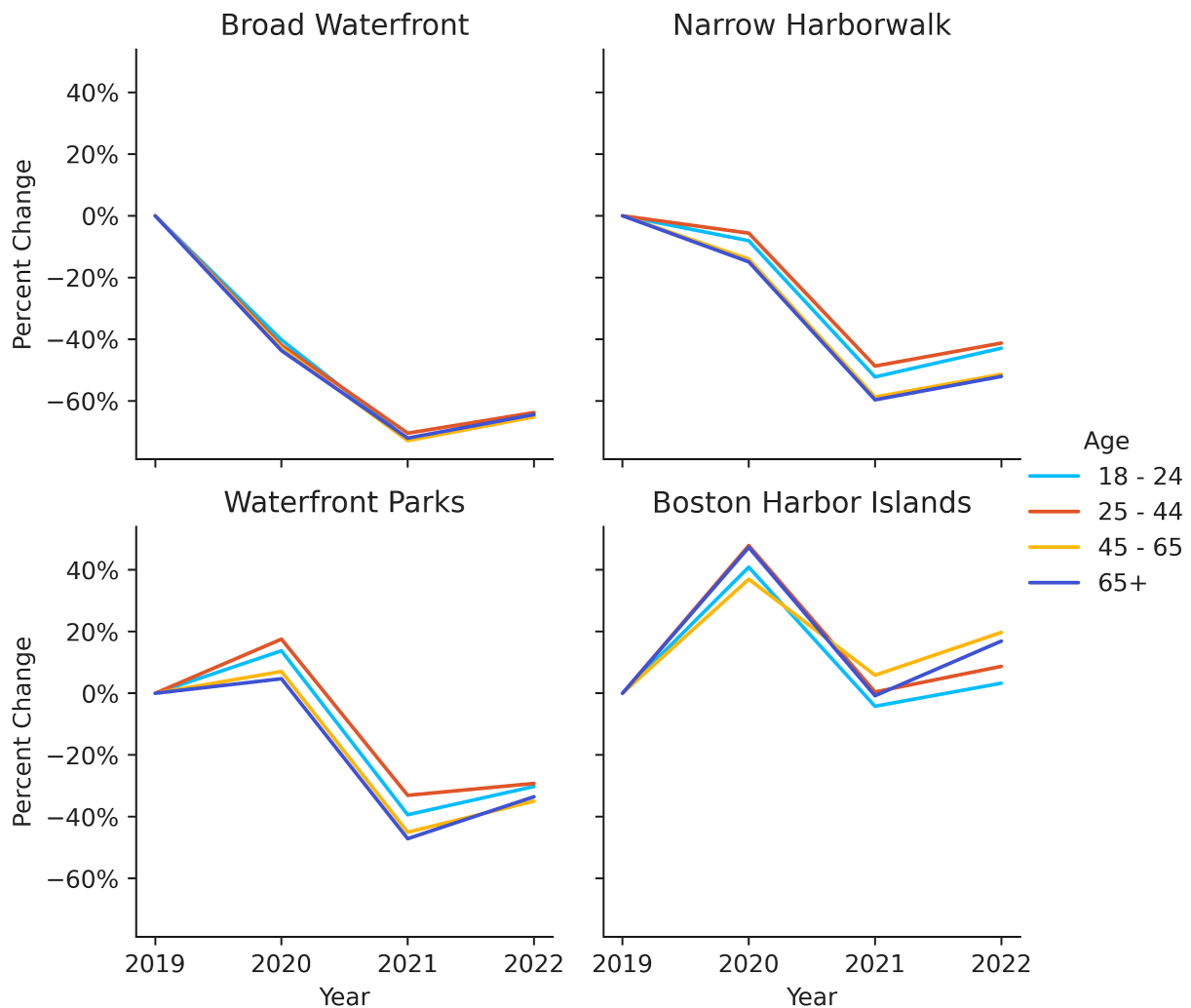
Visits to visitor ratio



Here, I calculated the number of visits per visitor. This metric illustrates how often each visitor returned to a given polygon set. While the number of visitors for all polygon sets was below their

2019 baseline, visits per visitor almost uniformly increased each year, with the most dramatic increases being in the Broad Waterfront and in the Boston Harbor Islands in both 2021 and 2022. The only decline in this value was in 2020 in the Boston Harbor Islands, which was a relatively small decrease.

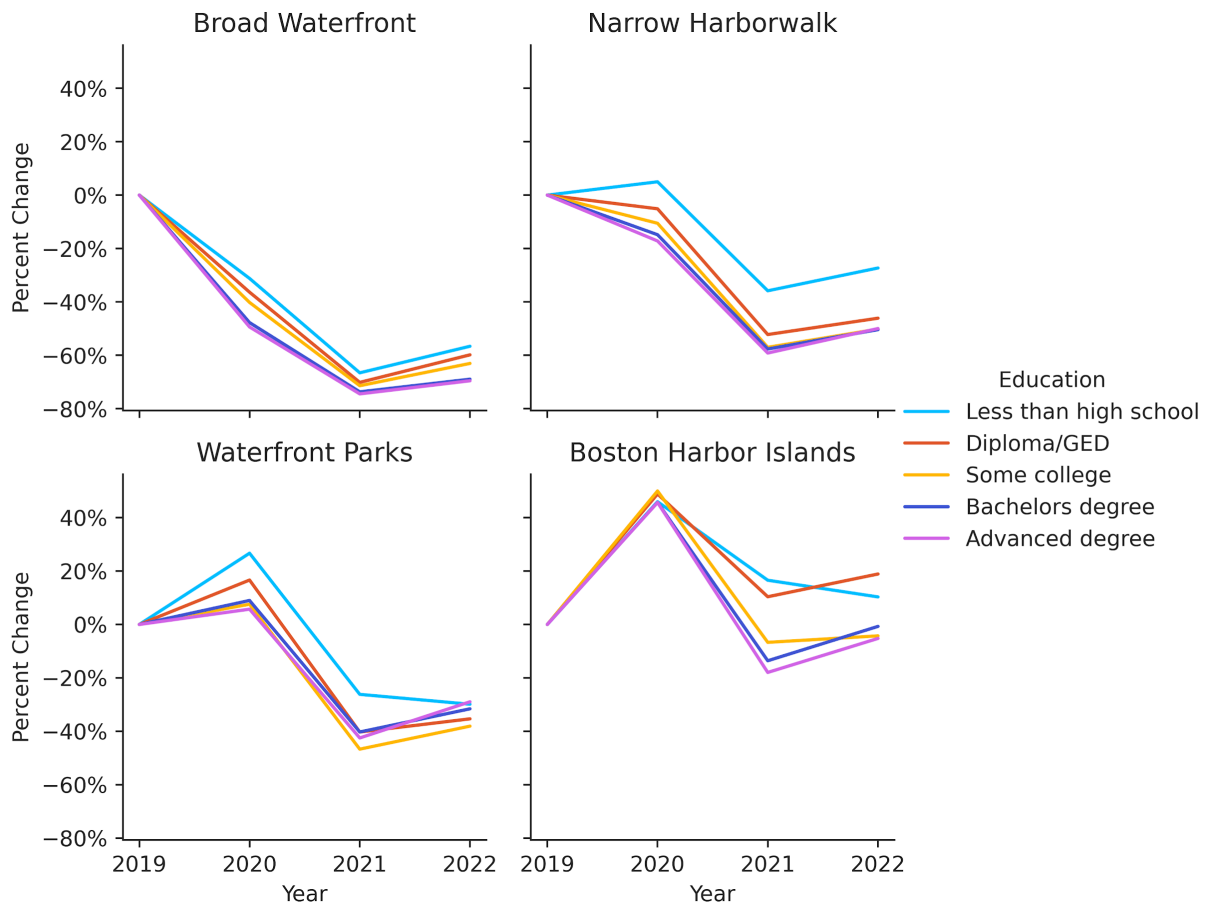
Age



I also broke down the change in visits over the four years by various demographic groupings, starting with age. In the Broad Waterfront, all age groups changed similarly relative to the 2019 baseline over the subsequent years. However, in the Narrow Harborwalk, the ages 44 and below showed smaller decreases from the baseline in 2020 and 2021, as well as a closer return to the baseline in 2022. In the Waterfront Parks, there was a similar story: those 44 and below had larger increases from baseline in 2020, smaller deviations from baseline in 2021, and returned closer to baseline in 2022. The story is more complicated in the Boston Harbor Islands, which may be due to a smaller sample size leading to more random variation. Ages 25 - 44 and

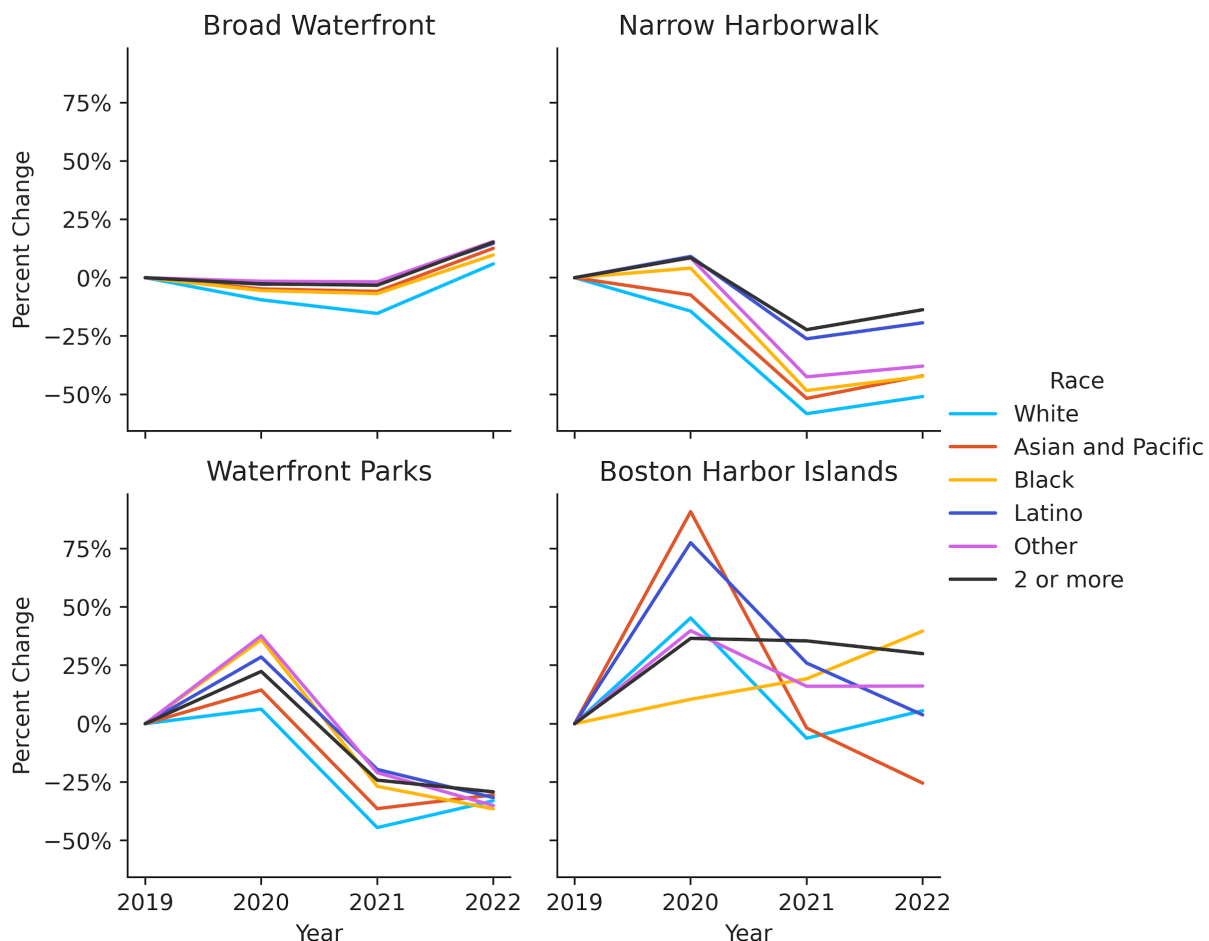
65+ had the largest increase in 2020 compared to baseline, but returned to baseline in 2021. Ages 65+ had a moderately large increase again in 2022, larger than ages 25 - 44. Ages 18 - 24 had a similar but smaller increase in 2020 and a sharper decline in 2021, and remained the lowest relative to baseline in 2022. While ages 45 - 65 experienced the smallest increase in 2020, this age group remained the largest relative to baseline in 2021 and 2022.

Education



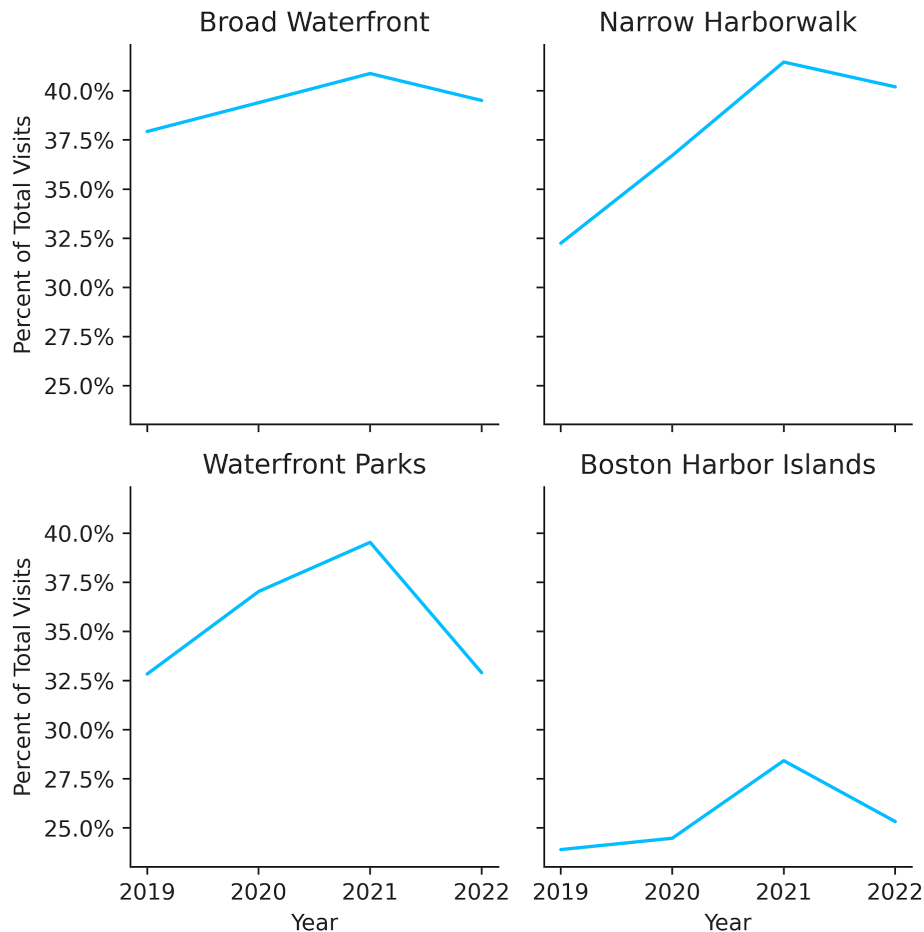
In the Broad Waterfront, we see that visits from individuals with Bachelor's and Advanced degrees were further below their 2019 baseline than the lower levels of education, and the rebound in 2022 was less pronounced in these higher-educated demographics as well. The Narrow Harborwalk showed a somewhat similar trend: higher educated individuals visited less frequently in all years. Additionally, individuals with less than high school education visited the Narrow Harborwalk further above their 2019 baseline than other education levels, even increasing from the baseline in 2020. In the Waterfront Parks, the lower education levels were the highest above baseline in 2020, and less than high school remained the closest to baseline in 2021, above the other groups. In the Boston Harbor Islands, the biggest difference among the education groups was seen in 2021 and 2022, where the lower education groups are above their baseline, and the higher education groups are below the 2019 baseline.

Race



With race, the largest takeaway is that White visits were consistently the furthest below the 2019 baseline in the Broad Waterfront, Narrow Harborwalk, and the Waterfront Parks. In the Broad Waterfront, all other racial groups had similar values in 2020 and 2021 compared to 2019, while White visits were noticeably down. In 2020 in the Narrow Harborwalk, White visits and Asian and Pacific Islander visits decreased from 2019, while Black and Latino visits increased from 2019. Latino visits continued to be the closest to baseline in 2021 and 2022. In the Waterfront Parks, while all races increased in visits in 2020, the largest increase occurred with Black, Latino, and other races. White and Asian and Pacific Islander visits were further from baseline in 2021. Because of the lower number of overall visits to the Boston Harbor Islands, the values were subject to increased random variance. We can make some general conclusions, however. 2020 saw large increases in visits from Asians and Pacific Islanders, but these increases subsided by 2022. Black visits have increased each year since 2019. White visits, after being down in 2021, returned to near 2019 baseline levels in 2022.

Percent of total visits from non-White visitors

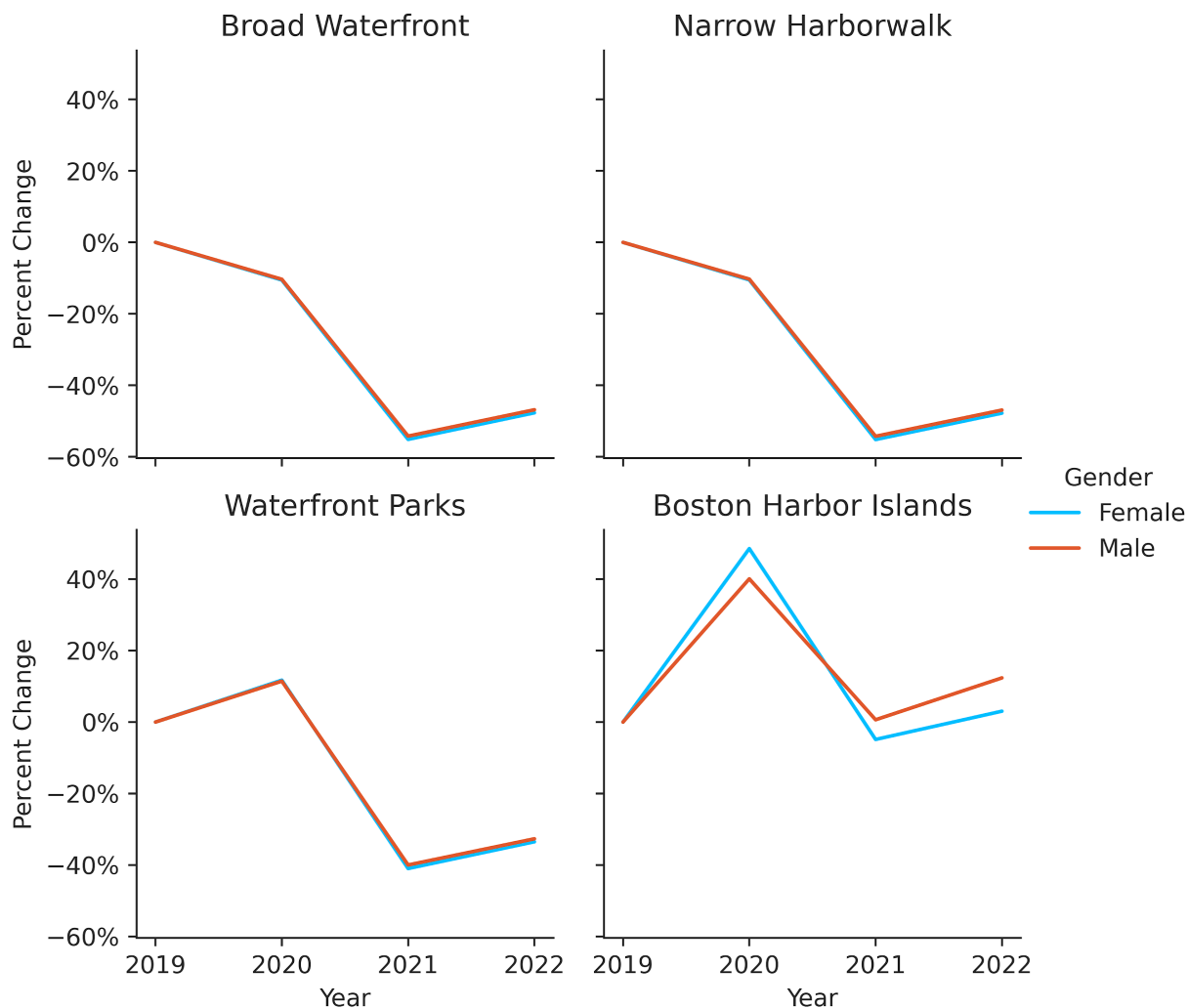


I also looked at the percentage of all visits year over year coming from non-White visitors. In all polygon sets, the percentage of non-White visits was larger in 2020 than the percentage of non-White visits in 2019. These percentages increased again in 2021, as well. These values all peak at around 40% of total visits in 2021 except in the Boston Harbor Islands, where the peak is at a little less than 30%. In all polygon sets, this proportion decreases again in 2022, with the largest decrease coming in the Waterfront Parks, where the proportion is similar to the value from 2019. The Boston Harbor Islands have the smallest proportion of non-White visits, but the same pattern still holds in the islands.

Income

See below under the Demographic Query: [What is the average income of waterfront visitors?](#)

Gender



Here, I show the percentage of visits year over year from female and male visitors. The Broad Waterfront, the Narrow Harborwalk, and the Waterfront Parks all show a similar pattern, with female visits around 51% and 49% for males in 2019. There are very slight shifts to higher percentages of male visits in 2020 and 2021. However, these are very minor changes, of less than a percent. There is more variation in the Boston Harbor Islands, again likely due to sample size. Nonetheless, there is some fluctuation in the gender ratio in the islands, and in 2021 and 2022, there appeared to be an increase in the percentage of men coming to the islands.

Grade: Moderate Corroboration

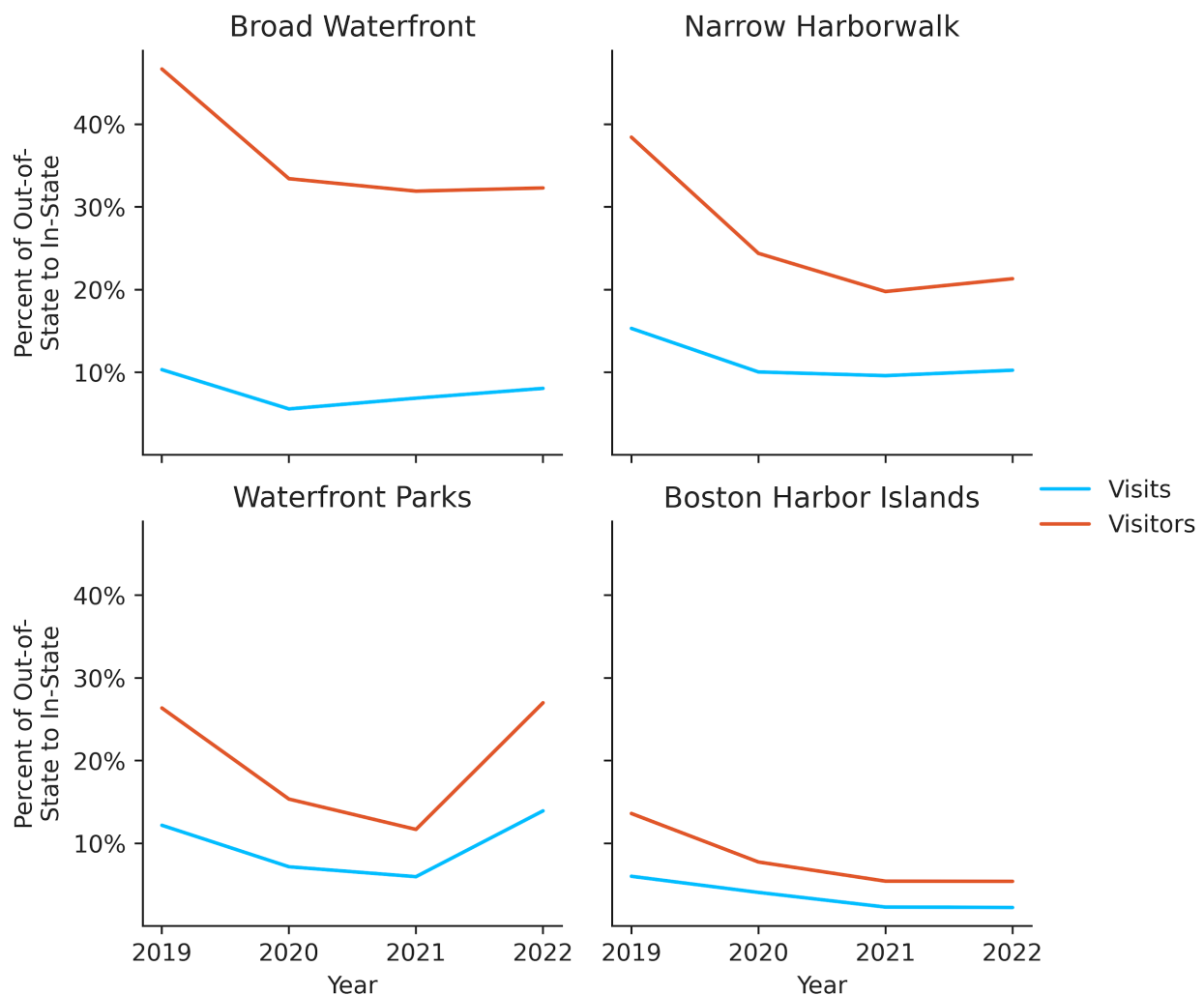
The MassInc and Veraset datasets are highly aligned on race, giving a high degree of corroboration for that aspect of this query. Gender ratios in the two datasets diverged significantly, which is likely due to sampling bias on the side of the survey (fewer men

responding to the survey). Visits, education, and age showed some similarities between the datasets, but also some differences as well.

What percentage of waterfront visitors are visitors from out of state?

[Code](#) | [Data](#)

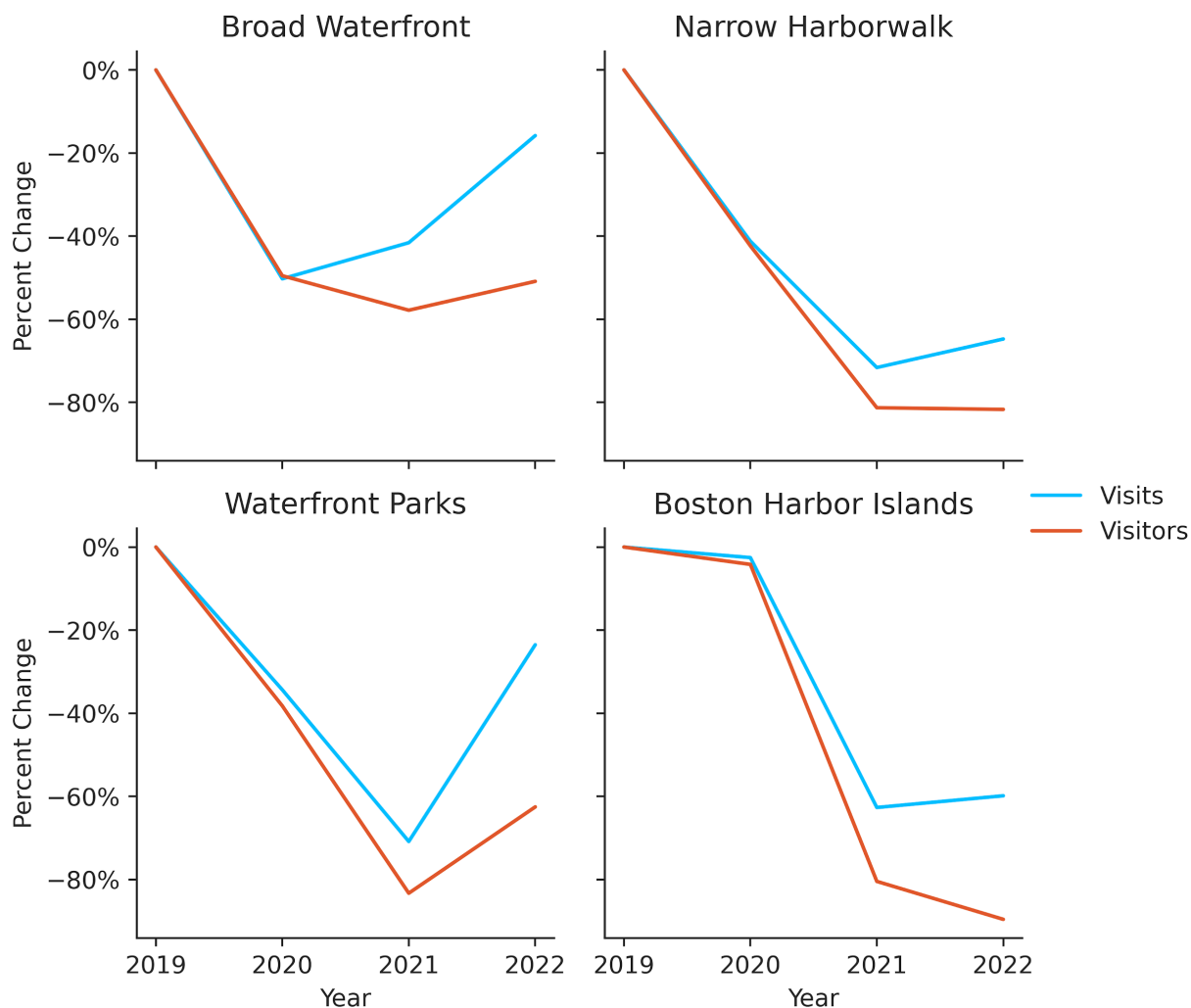
Percentage of out-of-state visits and visitors



Both out-of-state visits and visitors made up a minority of all visits and visitors, respectively, in all polygon sets. Additionally, the percentage of out-of-state visits was below that of out-of-state visitors. Thus, visits per visitor for out-of-state visitors are lower than for instate visitors. In all polygon sets, there was a decline in the percentage of out-of-state visits and visitors from 2019 to 2020, which continued for visitors in 2021. The Boston Harbor Islands did not see any rebound in this percentage, while all other polygon sets did have an increase in out-of-state

percentages in 2022, as well as in 2021 for out-of-state visits. The most dramatic recovery occurred in 2022 for the Waterfront Parks.

Out of state visits/visitors



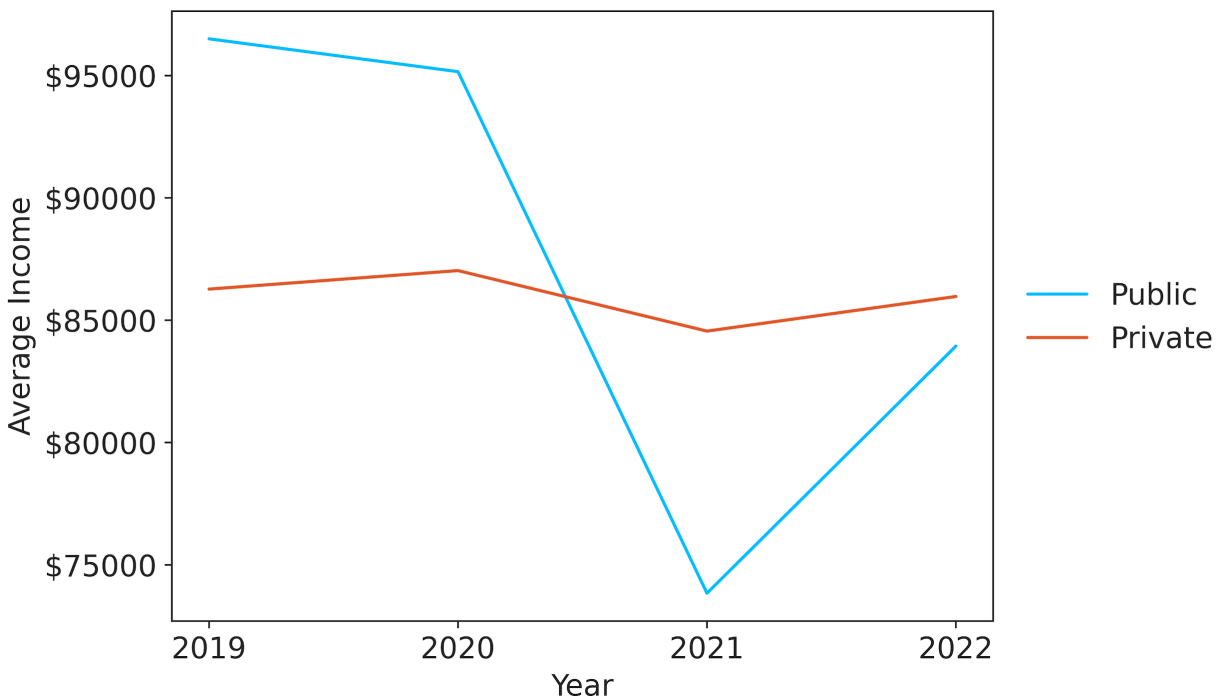
I also compared the raw number of out-of-state visits and visitors to their 2019 baseline. Both visits and visitors were down in all polygon sets in 2020, though the drop was minimal in the Boston Harbor Islands. In the Narrow Harborwalk and Waterfront Parks, this decline continued into 2021, each with visitors 80% lower than the 2019 baseline. However, in the Broad Waterfront, out-of-state visits increased in 2021 relative to 2020, despite a decrease in visitors. This increase continued in 2022, as well. 2022 also showed a rebounding in the out-of-state visit rate in the Waterfront Parks, and a stabilization of out-of-state visits and visitors in the Narrow Harborwalk and Boston Harbor Islands.

Grade: High Corroboration

There was a high degree of alignment between MassInc and Veraset on the percentage of out-of-state visitors to different parks.

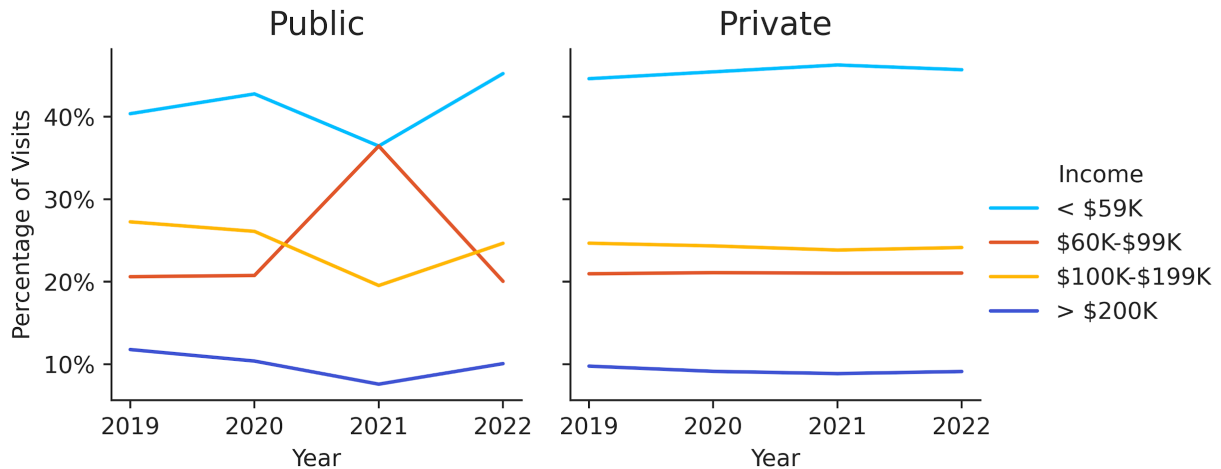
How does income vary between private waterfront and public parks and beaches?

[Code](#) | [Data](#)



The public waterfront is defined as a combination of the Narrow Harborwalk and the Boston Harbor Islands polygon sets. The private waterfront was defined as the entirety of the Broad Harborwalk but excluding polygons that are a part of the public waterfront.

The private waterfront had a relatively constant average income across the four years, at around \$85,000. However, the public waterfront had larger fluctuations. The average income in 2019 and 2020 was near ~\$95,000, much higher than in the private waterfront. However, there was a \$20,000 decline in average income in the public waterfront to ~\$75,000. In the following year, there is a corresponding increase of about \$10,000, still below the average income of the private waterfront.



I also broke down annual visits to the public and private waterfronts by income brackets. In the private waterfront, as shown above by average income, each income bracket does not have large shifts from year to year, with over 40% of visits coming from individuals making less than \$59,000, ~25% making \$100,000 - \$199,000, ~20% making \$60,000 - \$99,000, and ~10% making over \$200,000.

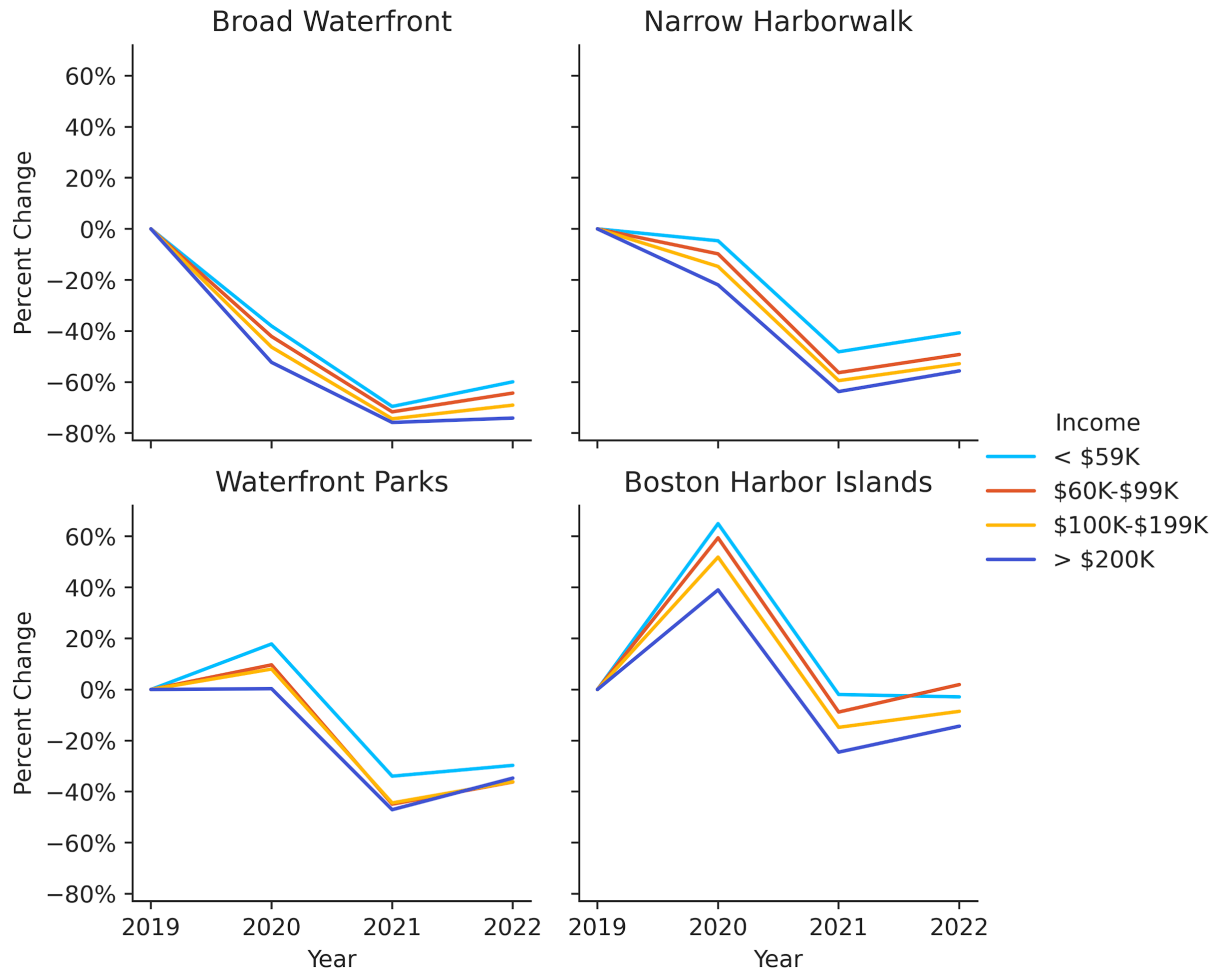
In the public waterfront, the brackets are relatively stable from 2019 to 2020, with similar percentages to the private waterfront. The largest shift in 2021 was an increase in the percentage of visits from individuals making \$60,000 - \$99,000 up to above 35% of annual visits. All other brackets decreased in percentage that year, including the less than \$59,000 bracket. It is possible that 2021 was an aberration, as in 2022, the relative percentages of the brackets of 2022 were more similar to 2019 and 2022, only with a slight increase in visits from individuals making less than \$59,000.

Grade: Minimal Corroboration

While we have income data for both MassInc and Veraset, the two datasets did not closely agree on how frequently individuals from the various income brackets visited the five featured parks.

What is the average income of waterfront visitors?

[Code](#) | [Data](#)



As for the other demographic variables, I broke down visits according to their corresponding income bracket relative to a 2019 baseline. In both the Broad Waterfront and the Narrow Harborwalk, visits from all income brackets were down in 2020 and 2021 and slightly increased in 2022. For both, the higher income groups were further from the baseline in all years. In the Waterfront Parks, the number of visits in 2020 from individuals making more than \$200,000 was in line with the 2019 baseline, but all other groups increased from the baseline in the same year. Visits from individuals making less than \$59,000 increased more than other groups in 2020 and decreased less than the others in 2021, as well. In the Boston Harbor Islands, the higher income brackets consistently had smaller percent changes in 2020 and 2022 than other brackets and are further below the 2019 baseline in 2021. Interestingly, while all other brackets increased from 2021 to 2022, visits decreased in 2022 for individuals making less than \$59,000.

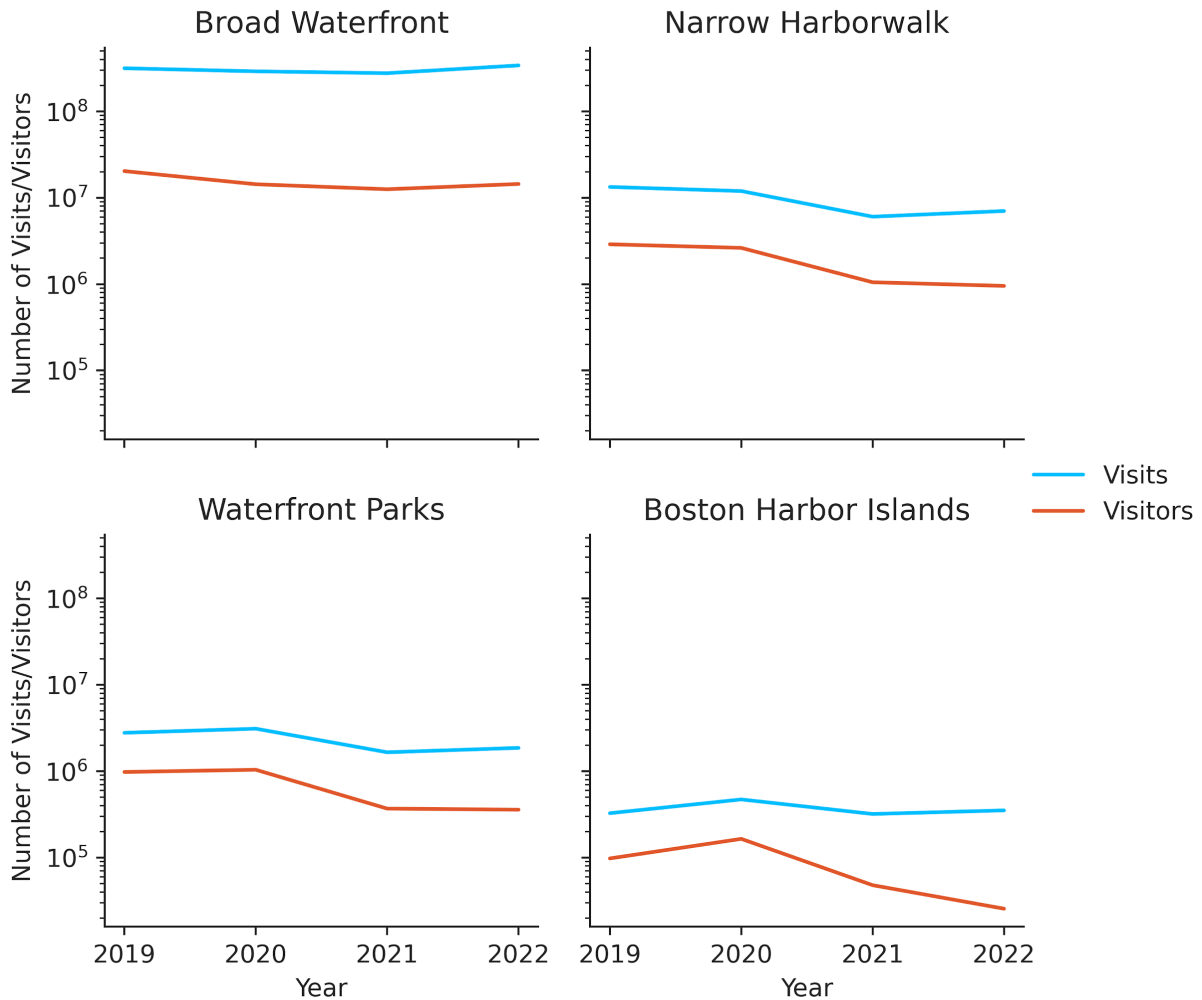
Grade: Minimal Corroboration

As stated above, while we have income data for both MassInc and Veraset, the two datasets did not closely agree on how frequently individuals from the various income brackets visited the five featured parks.

Visitation Queries

Overall waterfront visitation year over year, Salem to Scituate

[Code](#) | [Data](#)



Polygon set	Average Annual Visits	Average Annual Visitors
Broad Waterfront	306M	15M
Narrow Harborwalk	10.6M	1.9M
Waterfront Parks	2.4M	0.7M
Boston Harbor Islands	367K	84K

Above is the raw number of visits and visitors year over year for the 4 polygon sets, as well as a table showing the average over the 4 years. To see the further analysis of visitation across the polygon sets, please see [Visits and Visitors](#) above.

Grade: Moderate Corroboration

The MassInc and Veraset datasets show some agreement on visitation data.

What is the average length of visits and how often do people visit?

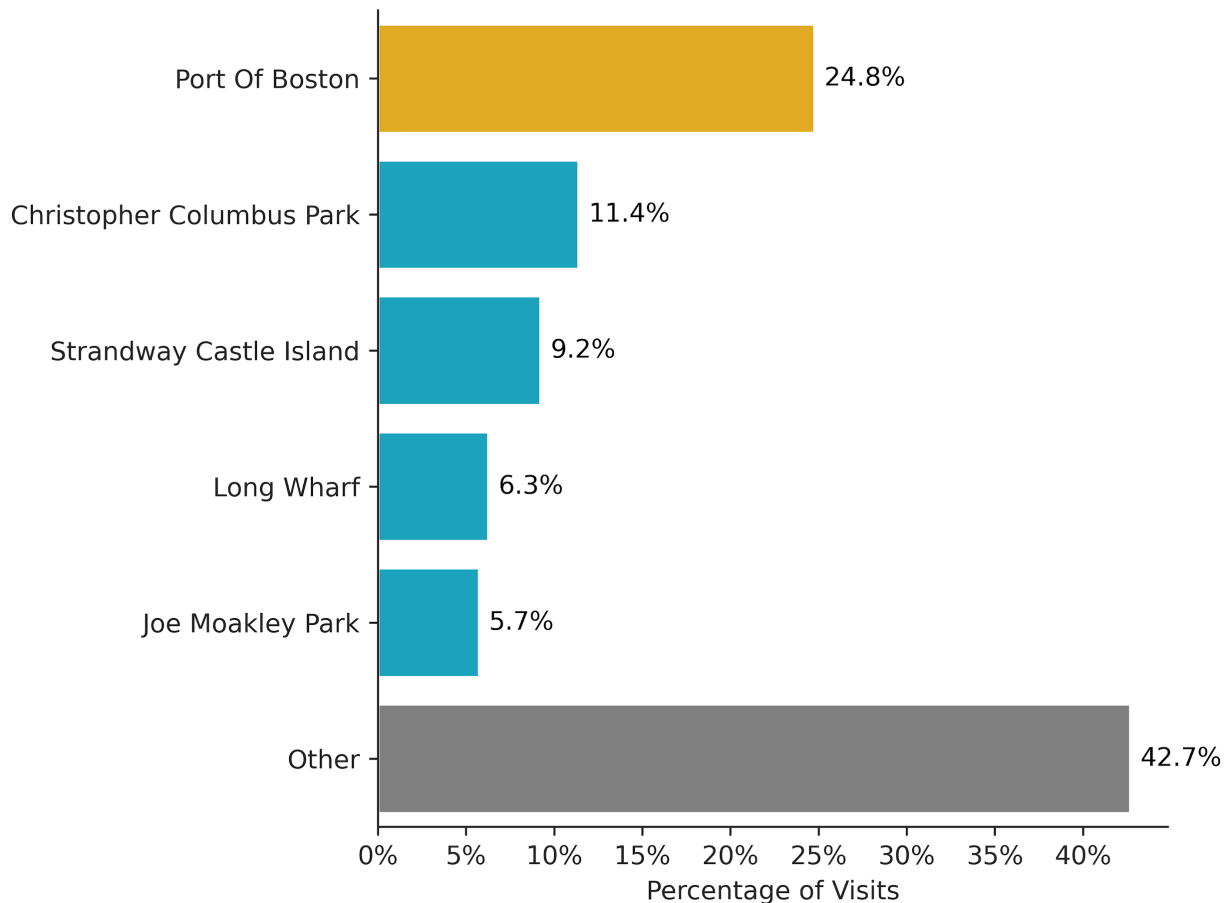
While we cannot determine the length of the average visit, as those data are not a part of the Tectonix platform, I have analyzed how often people visit by looking at visits per visitor in a previous section. Please see [Visits to Visitor Ratio](#) for more information.

Grade: Some Corroboration

While both MassInc and Veraset datasets included information about repeat visitation, the two did not agree on which parks had the most repeat visitation.

The "most popular" visited sections of the waterfront by neighborhood

[Code](#) | [Data](#)



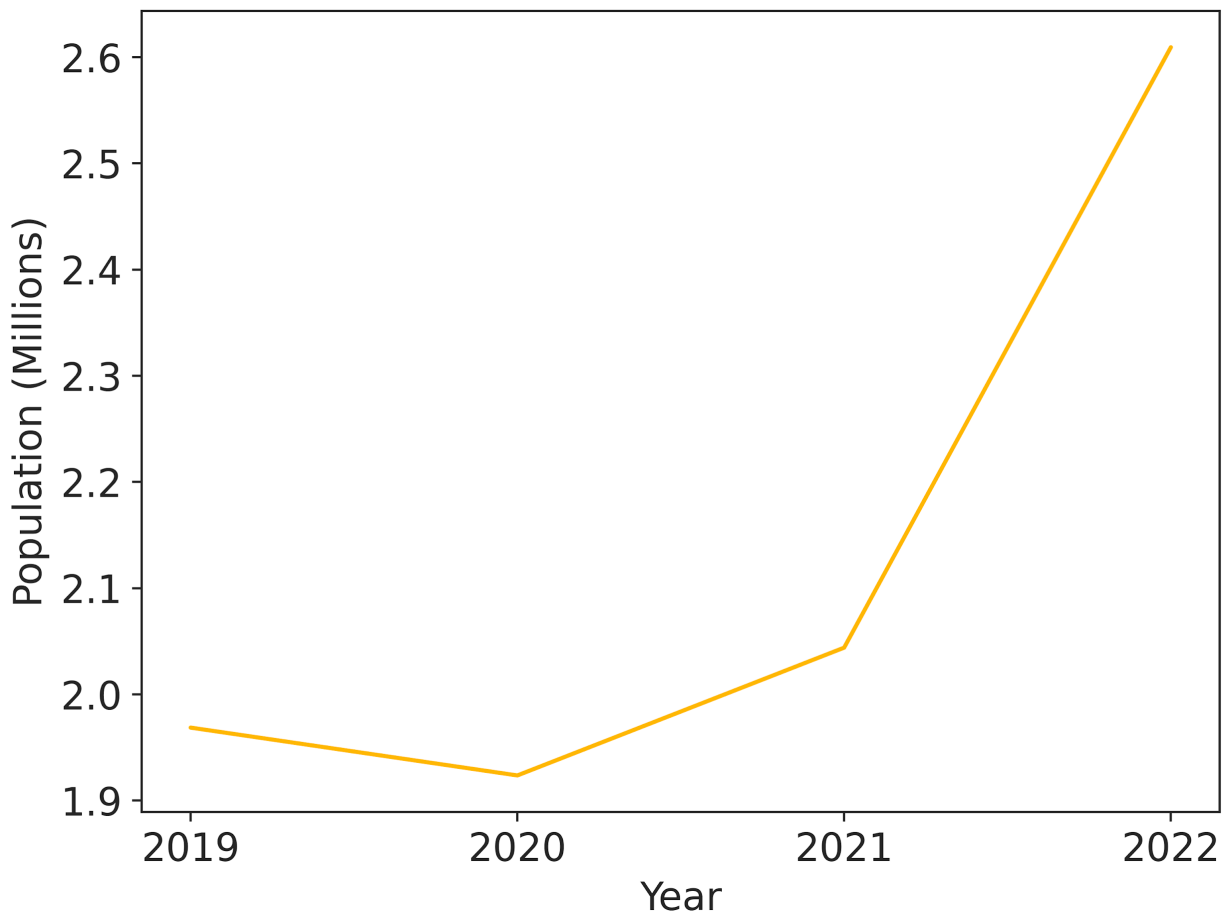
The Veraset mobility was enriched with Safegraph data, which allowed for the tagging of visits with locations of interest. Some of these include parks that are parcels in the Narrow Harborwalk and Waterfront Parks. Here, we show the top five areas in the Narrow Harborwalk. The top location was the Port of Boston, receiving a quarter of tagged visits. Three of the locations are parks: Christopher Columbus Park, Strandway Castle Island, and Joe Moakley Park. Many other locations received a large proportion of the tagged visits (>40%).

Grade: No Corroboration

The MassInc data does not contain information about the popularity of different locations in the Narrow Harborwalk.

Population living within a 10-minute walk of the waterfront

[Code](#) | [Data](#)



The population that lives within a 10-minute walk of the waterfront is defined as the number of visitors in the broad harborwalk currently in their residence, as defined by their census block group. From 2019 through 2021, this population was around 2 million, with a slight dip in 2020 and a slight increase in 2021. In 2022, there was a relatively large population spike up to nearly 2.6 million.

Grade: Minimal corroboration

While visitation showed some degree of agreement between MassInc and Veraset, because the MassInc dataset does not include any information about populations or use visits as a proxy for population, as it was only studying parks, which have no population.

Which segments of the HW are most heavily used? Which are least used or underutilized?

I performed a qualitative analysis looking at areas in the Narrow Harborwalk with large numbers of records in close proximity to those with low numbers. Those with disproportionately large numbers of records were labeled as overutilized, and those with disproportionately small numbers of records were labeled as underutilized. A disproportionate amount of records is loosely defined as when a polygon has much more or fewer records than nearby polygons. This was determined by a visual analysis of the heatmap. Any polygons not included were deemed to have baseline usage. No regard was given to the name or type of area the polygons contained.

Note: There is no code for this query, as there was a visual analysis, and there is no available data due to our NDA with Tectonix.

Overutilized

Underutilized

Dorchester:

- Dorchester Yacht Club
- McConnell Park
- Old Yacht Club
- Port Norfolk Yacht Club
- Savin Hill Yacht Club
- Dorchester Shores at Columbia Point
- Dorchester War Memorial
- Joseph Finnegan Park
- Malibu Beach
- National Grid
- Victory Road Park

Charlestown:

- Barry Field
- Naval Yard Central
- Little Mystic
- Naval Yard North
- Schrafts

East Boston:

- The Eddy
- Facing downtown
- LoPresti Park Overutilized
- Mystic DPA North

- Piers Park
- Condor Street
- Condor Street Urban Wild
- Mari Umana Academy
- McArdle Bridge Port
- Shore Plaza

North End:

- Residential
- US Coast Guard Sector
- Langone Park & Puopolo Playground
- Prince Street Section

Seaport:

- Cruiseport
- 88 Black Falcon
- Conley Terminal
- Dry Dock Park
- Maritime and Fish Processing

Grade: No Corroboration

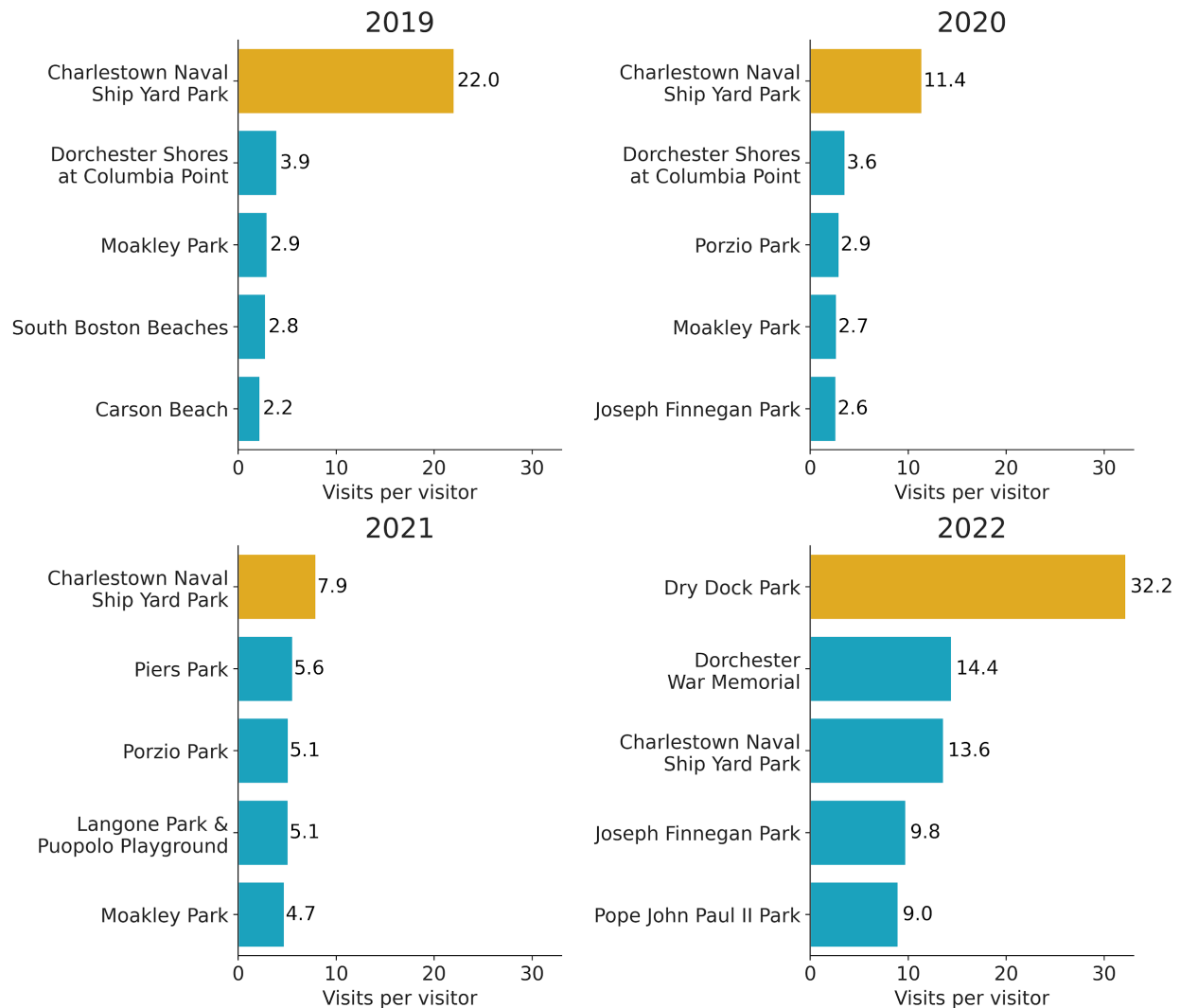
The MassInc data does not include data regarding over or underutilization of parks or parcels.

Which areas have the most frequency of visitation?

[Code](#) | [Data](#)

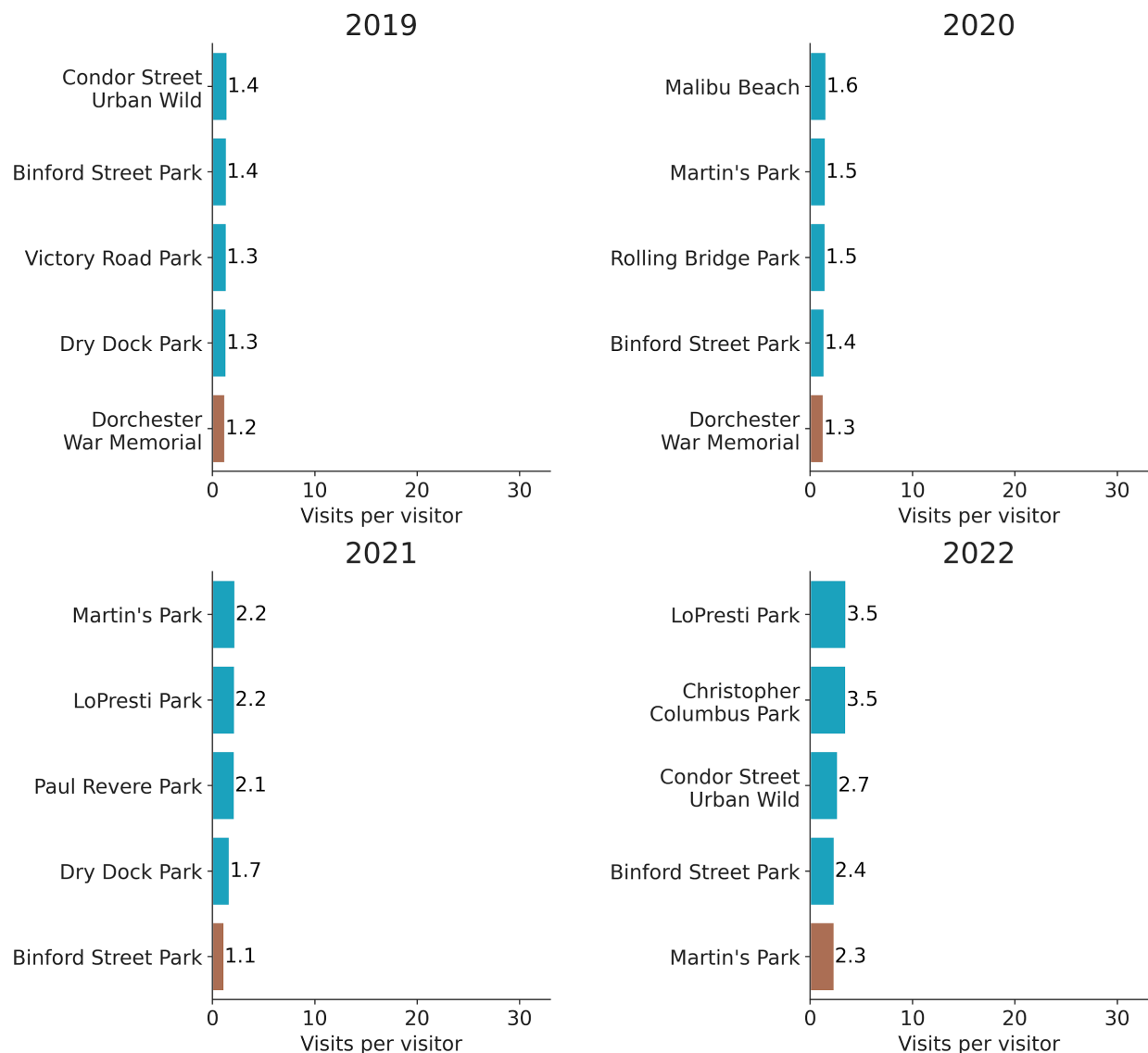
I ranked all of the waterfront park polygons by frequency of visitation. I define the frequency of visitation as the number of visits per visitor at each polygon. Below, I display the top five and bottom five parks by frequency of visitation year over year.

Top 5 parks by frequency of visitation



The Charlestown Naval Shipyard Park was the most frequently visited park from 2019 to 2021 and was third overall in 2022, ranging from 7.9 to 22.0 visits per visitor. In 2022, Dry Dock Park and Dorchester War Memorial also received a large number of visits per visitor, 32.2 and 14.4 respectively. These are quite large numbers, perhaps suggesting something anomalous about these polygons. Other highly frequented parks included Moakley Park (2.7 - 4.7 visits per visitor) which was in the top 5 from 2019 to 2021, as well as several that were in the top 5 for 2 years: Dorchester Shores at Columbia Point (3.6 - 3.9 visits per visitor), Porzio Park (2.9 - 5.1 visits per visitor) and Joseph Finnegan Park (2.6 - 9.8 visits per visitor). As noted in [Visits to Visitor Ratio](#), the number of visits per visitor was highest in all polygon sets in 2022, so it follows that park polygons had the highest peak visits per visitor in 2022.

Bottom 5 parks by frequency of visitation



Binford Street Park was one of the five least visited parks in all four years, ranging from 1.1 to 2.4 visits per visitor. Martin's Park was in the bottom five in all years but 2019 with 1.5 to 2.3 visits per visitor. Other parks showing up in the bottom five in multiple years include LoPresti Park (2.2 - 3.5 visits per visitor), Condor Street Urban Wild (1.4 - 2.7 visits per visitor), Dry Dock Park (1.3 - 1.7 visits per visitor), and Dorchester War Memorial (1.2 - 1.3 visits per visitor). Dry Dock Park and Dorchester War Memorial were also in the top five most frequently visited parks in 2022 with high numbers of visits (see above), so it may be of interest to further examine these parks in future studies. Notably, even the lowest value of visits per visitor in 2022 was higher than the fifth lowest in any other year, continuing the trend that repeat visitation was up in 2022.

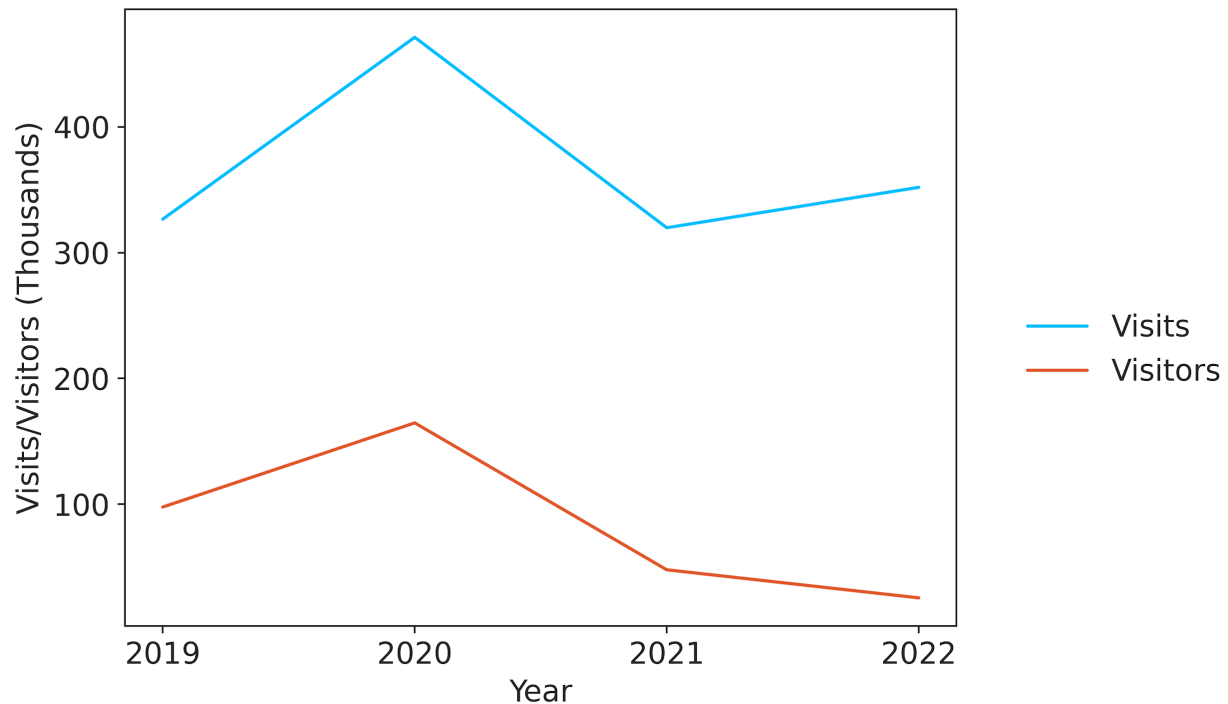
Grade: Minimal Corroboration

While both MassInc and Veraset datasets included information about repeat visitation, the two did not agree on which parks had the most repeat visitation.

BHI Queries

How many people visit the Park annually including its watershed?

[Code](#) | [Data](#)



There were 367,000 average annual visits from an average of 84,000 annual visitors to the Boston Harbor Islands. Both visits and visitors increased in 2020 in the islands before decreasing in 2021, with visits reaching their pre-pandemic level, and visitors slightly below their 2019 level. In 2022, visits slightly increased, while the number of visitors declined again.

For more information on visitation to the Boston Harbor Islands, please see [Visits and Visitors](#).

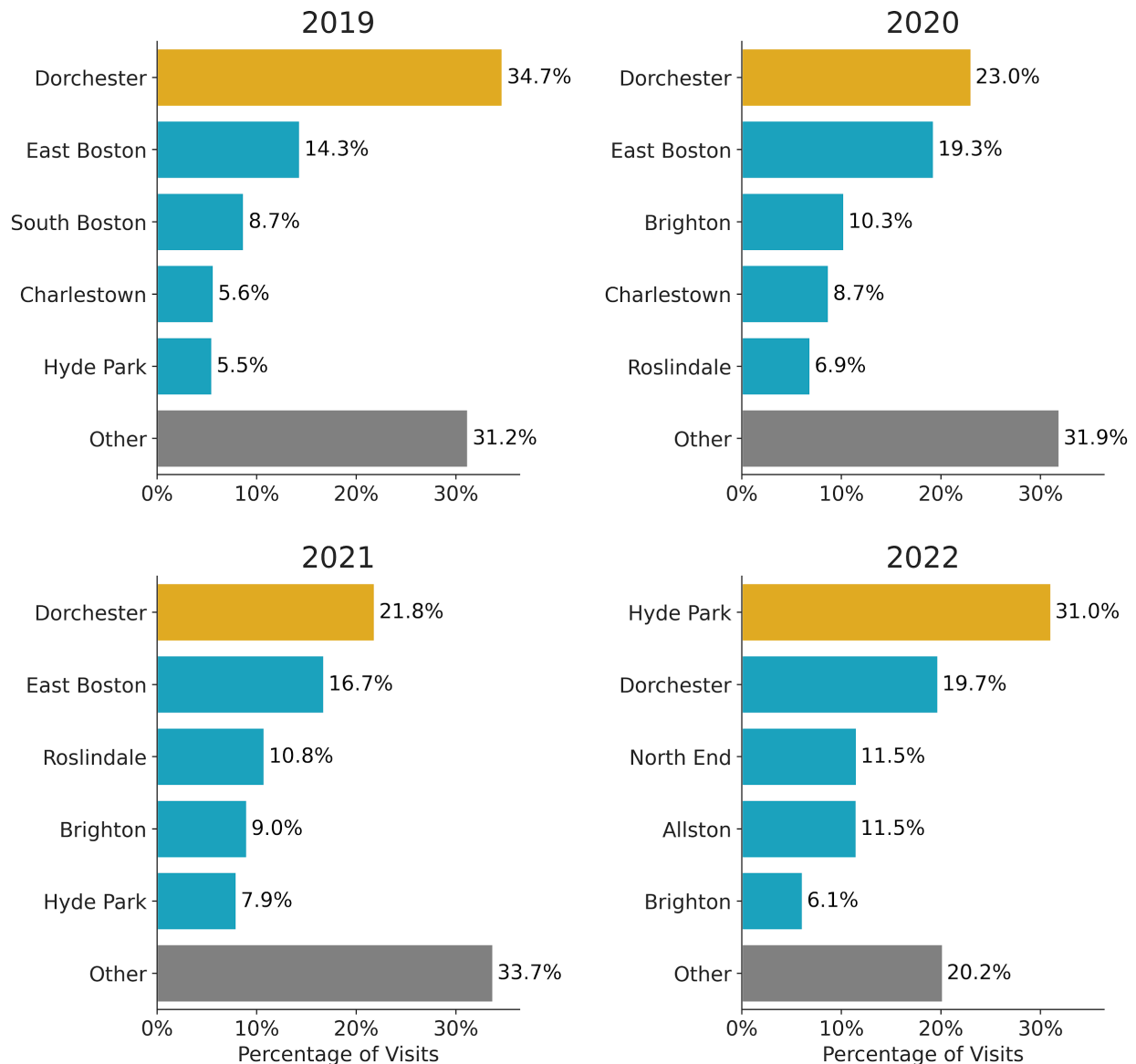
Grade: Moderate Corroboration

There is some agreement between MassInc and Veraset on the number of visits to different parcels, though they are not in perfect agreement. Additionally, there is no MassInc data directly related to the Boston Harbor Islands.

Hometowns for Boston Harbor Islands visitorship

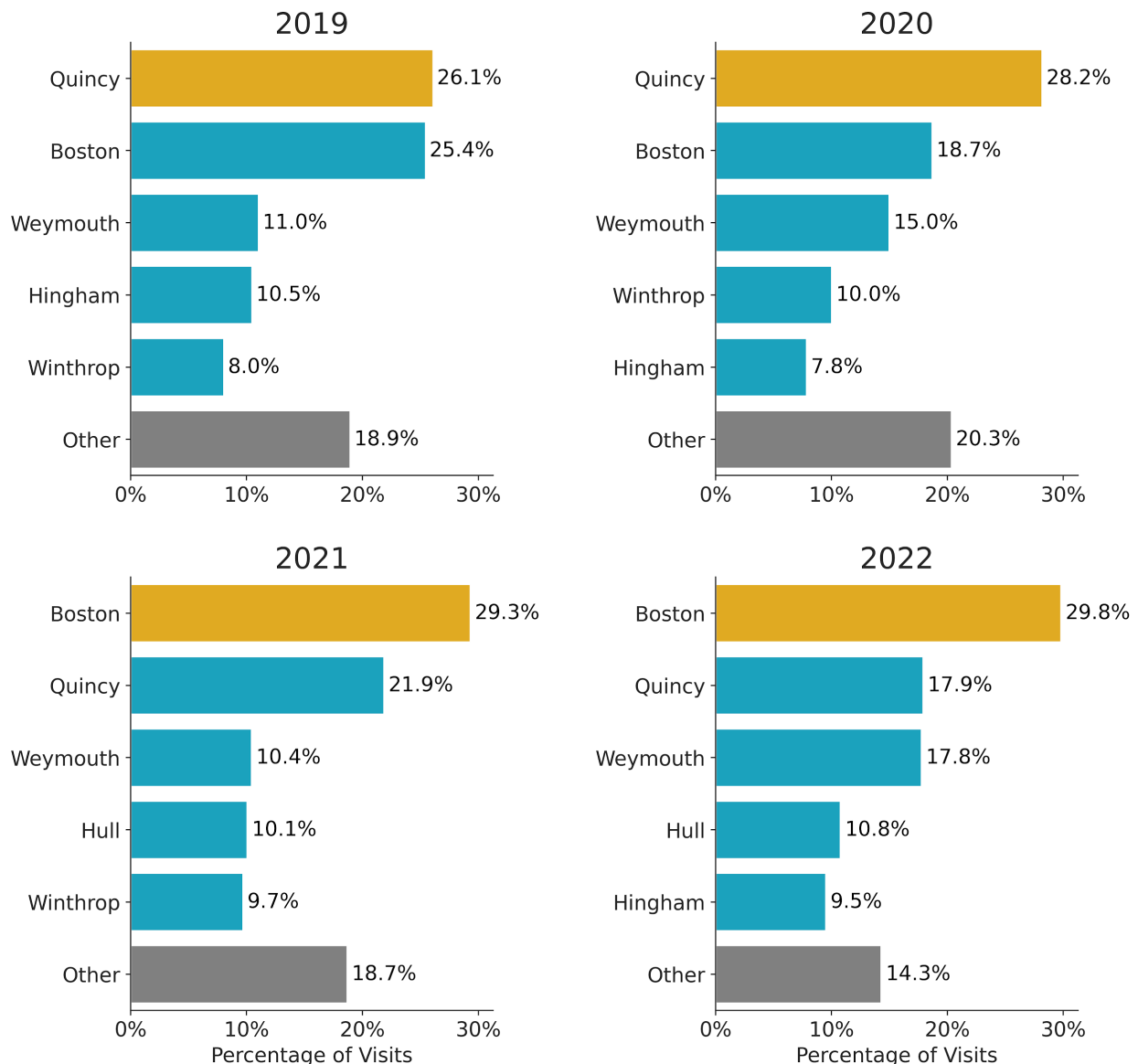
[Code](#) | [Data](#)

BHI visits: Home neighborhoods



Above are the percentage of visits from the Boston neighborhoods to the Boston Harbor Islands by year. Dorchester was the source of most visits to the Boston Harbor Islands, but its percentage of total annual visits declined steadily since 2019 from over a third to below a fifth of annual visits. Other prominent neighborhoods included East Boston and Brighton.

BHI visits: Home cities



Here I present a similar analysis but for home cities. The Boston Harbor Islands saw a large change in the home cities of those coming to the islands following 2020. In 2019 and 2020, the city with the most visits was Quincy with a little more than a quarter of the total annual visits. In 2021 and 2022, Boston was the source of nearly 30% of annual visits, up from under 20% in 2020.

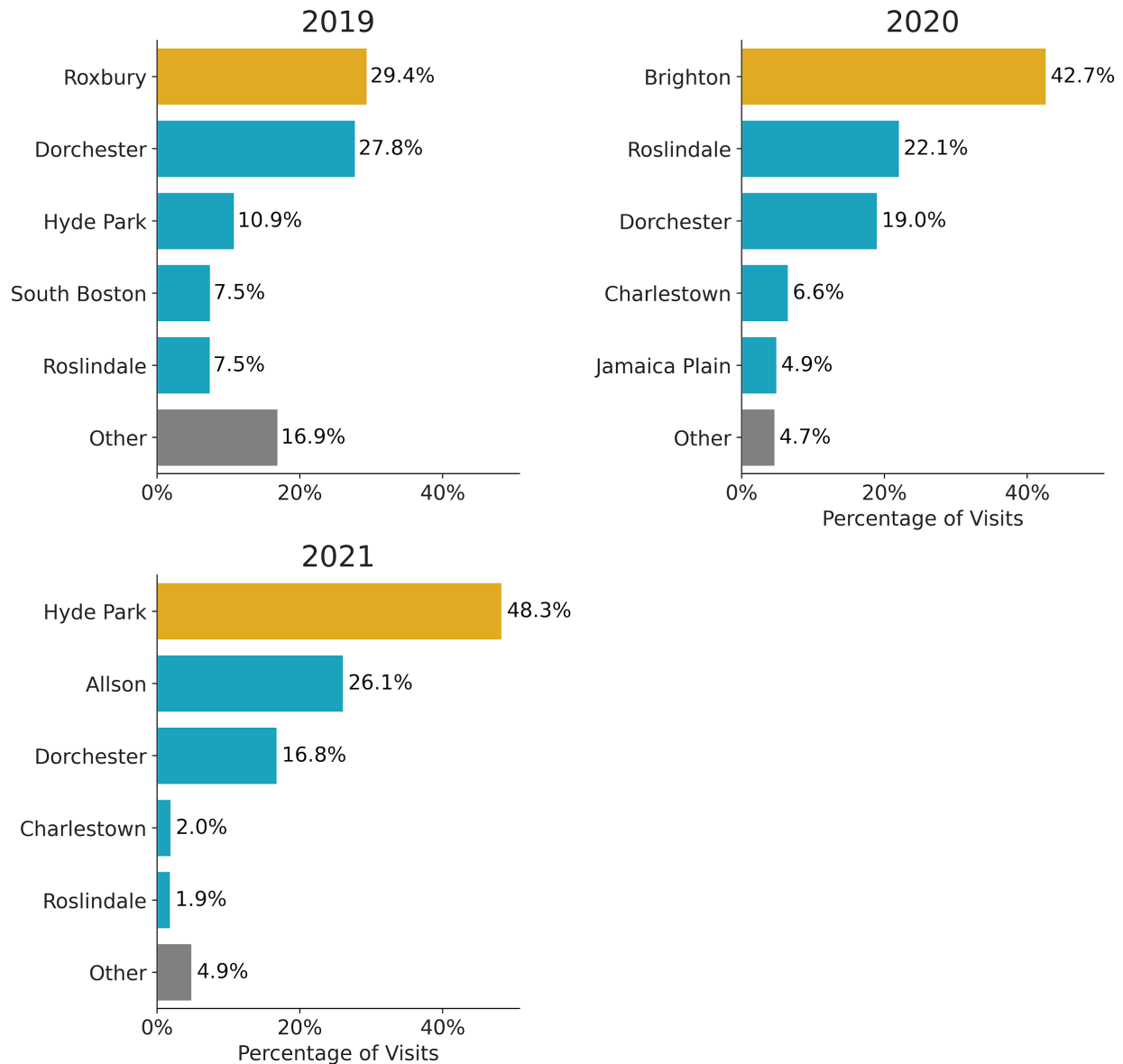
Grade: Moderate Corroboration

While the MassInc and Veraset datasets heavily align regarding visitor home location, MassInc does not contain information directly about the home location of visits to the islands.

Communities who visit Boston Harbor Islands more than once

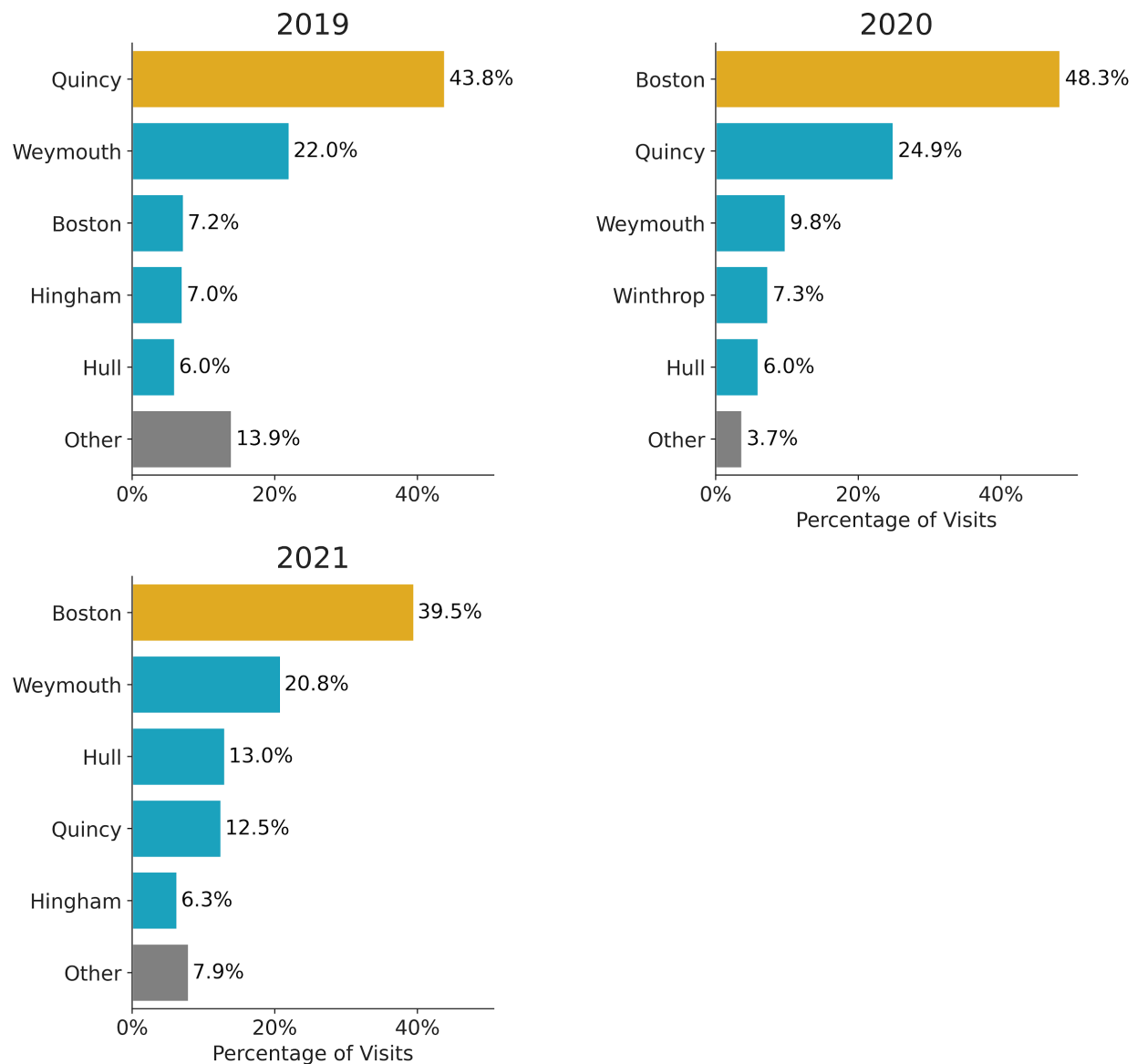
[Code](#) | [Data](#)

BHI Visits from Repeat Visitors, by Year of Original Visit - Home Neighborhoods



These plots are similar to the ones in the prior query, but they represent repeat visits from people visiting from specific years. For instance, the first plot shows home neighborhoods of repeat visits from people who originally came in 2019 and returned in 2020 or later. The three years with data were relatively inconsistent in terms of the top neighborhoods. Roslindale was a top-five neighborhood in all 3 years, as was Dorchester. Hyde Park and Charlestown were in the top five for two years.

BHI Visits from repeat visitors, by year of original visit - Home cities



Similarly to all visits, repeat visits switched from being predominantly from Quincy to Boston over time, with Quincy falling to 12.5% of repeat visits from 2021 visitors compared to 43.8% of 2019 visitors. Boston increased from 7.2% to 39.5% in the same period. Weymouth, on the other hand, was always the city with the second most visits. Hull was in the top five in visitors of all years, and Hingham was also in the top five for two years.

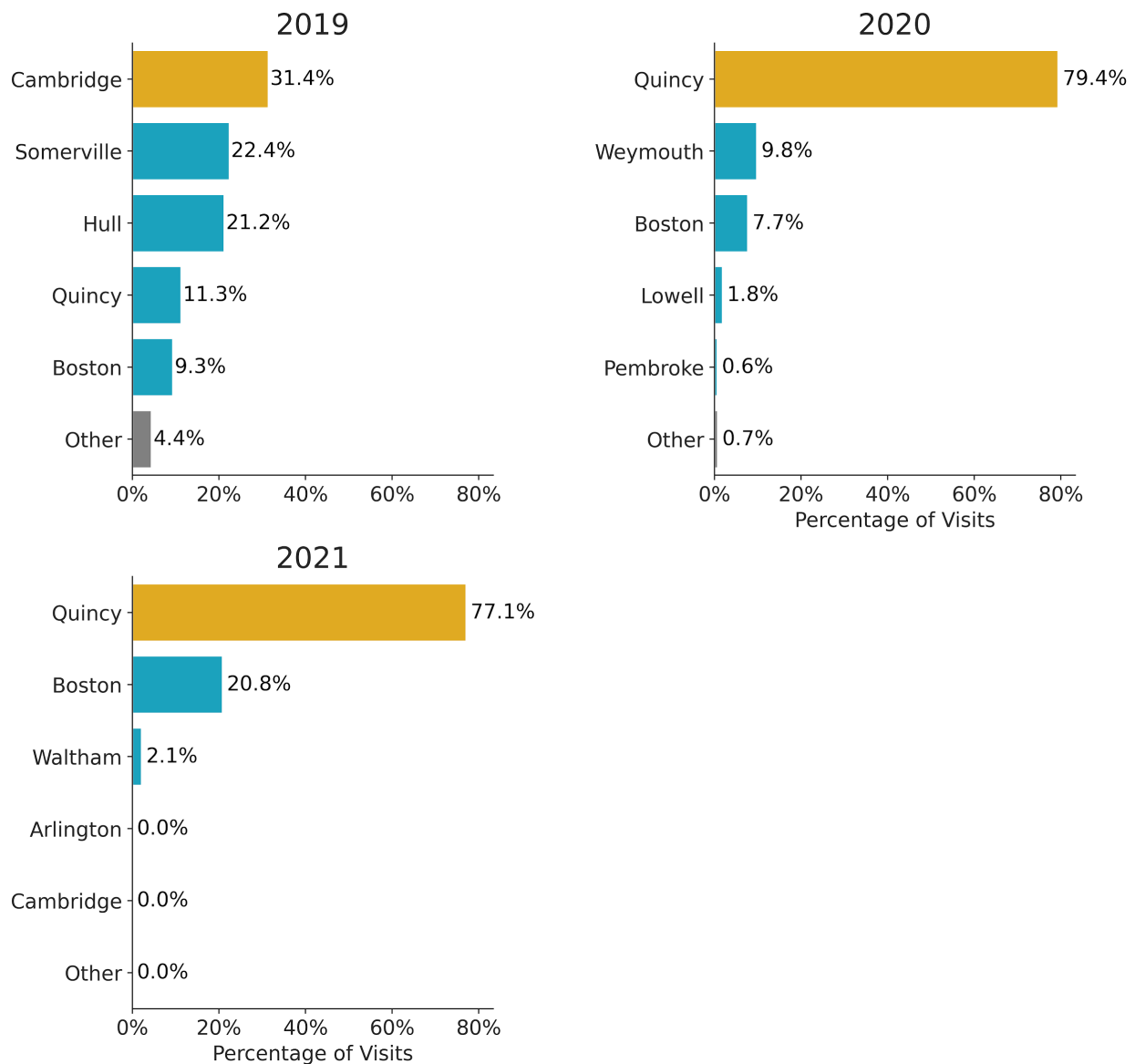
Grade: Moderate Corroboration

Similar to the query above, the MassInc and Veraset datasets heavily align regarding visitor home location, but MassInc does not contain information directly about the home location of visits to the islands.

Who are the biggest users (most frequent) of the Harbor Islands (Georges and Spectacle and Peddocks)?

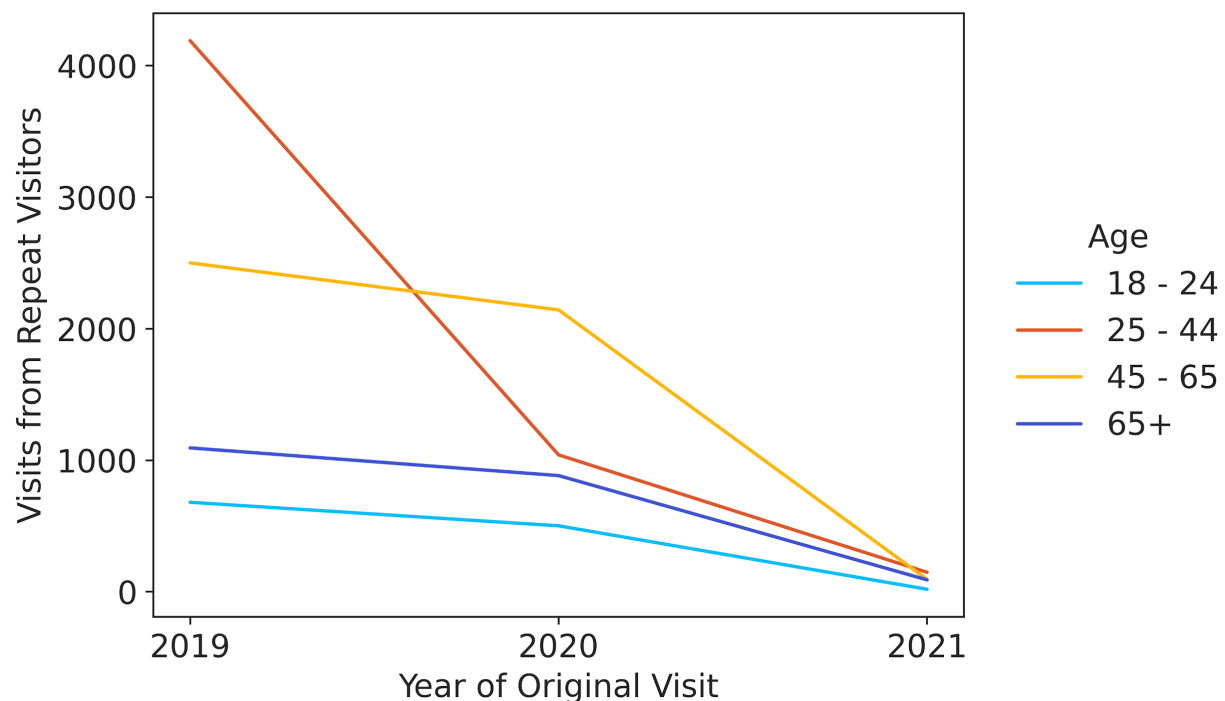
[Code](#) | [Data](#)

Georges, Spectacle, and Peddocks: Visits from repeat visitors by year of original visit - Home cities



This query first repeats the analysis from the previous query but focuses on Georges, Spectacle, and Peddocks Islands. Overall, the sample size was smaller here than in other Queries due to the repeat visit rate for these islands, and the number of repeat visits to the islands declined after 2019. Repeat visits from 2019 visitors were primarily from Cambridge and Somerville, while 2020 and 2021 repeat visitors predominantly came from Quincy. Because the visits from Boston made up only a small percentage of an already small number of visits, Boston neighborhood information was not included here.

Georges, Spectacle, and Peddocks: Visits from returning visitors by age and year of original visit



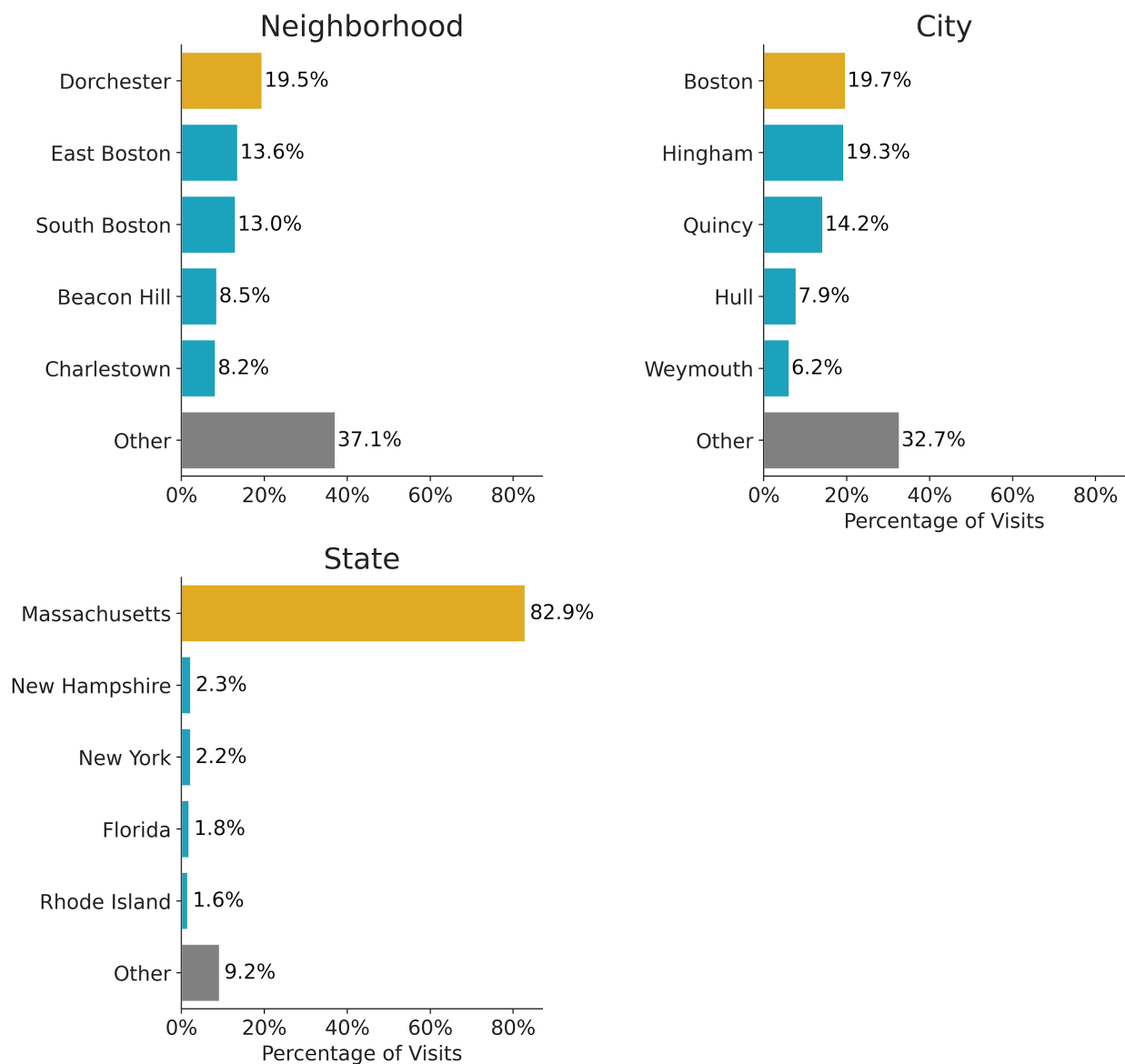
The number of visits from returning visitors is shown plotted by age bracket for the 3 years following the original visit. The two most relevant years are 2019 and 2020, as 2021 has a very small sample size. In both the 2019 and 2020 cohorts, repeat visits were more common from the ages of 25-65 and less common in ages 18 - 24 and 65+. While repeat visits were more common from the 2019 cohort than the 2020 cohort, the greatest difference between the two was the reduction in visits from ages 25-44, while all other age brackets remained at similar levels to 2019. This made for a qualitative change between the cohorts: the largest number of repeat visits from 2019 visitors was from ages 25 - 44, while from 2020 visitors, the largest number was from ages 45 - 65.

Grade: Some Corroboration

For the same reason as the two previous queries, home location aligns strongly between the two datasets, but the MassInc data does not possess location information for the islands. Additionally, the age data do not perfectly align between the two datasets, as well.

Where do boaters come from? What neighborhoods, cities, and towns?

[Code](#) | [Data](#)



I repeated another similar analysis as described above but for boaters and without breaking down by year. Boater visits were defined as visits occurring in the water sheet and not the Boston Harbor Islands or Broad Waterfront polygon sets. The neighborhood with the most visits

is Dorchester (19.5%), but many neighborhoods are represented here, as “Other” is the largest group displayed (37.1%). It is a similar story with the cities, as Boston has the most visits (19.7%), but “Other” is again the largest group (32.7%). For home state, nearly 83% of all visits came from Massachusetts.

Grade: Some corroboration

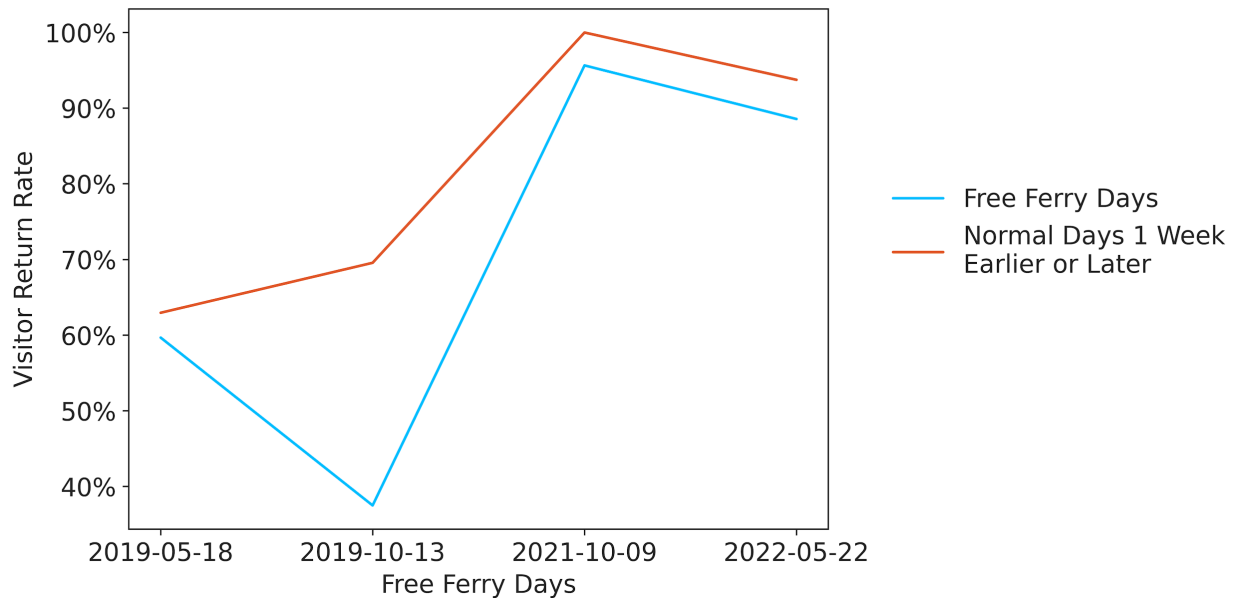
The MassInc data does not include any information about boaters, though home location, in general, aligns with Veraset. Additionally, it is difficult to determine if all of those labeled as boaters are in fact boaters.

Individual Day Queries

Do access programs result in repeat visitation?

[Code](#) | [Data](#)

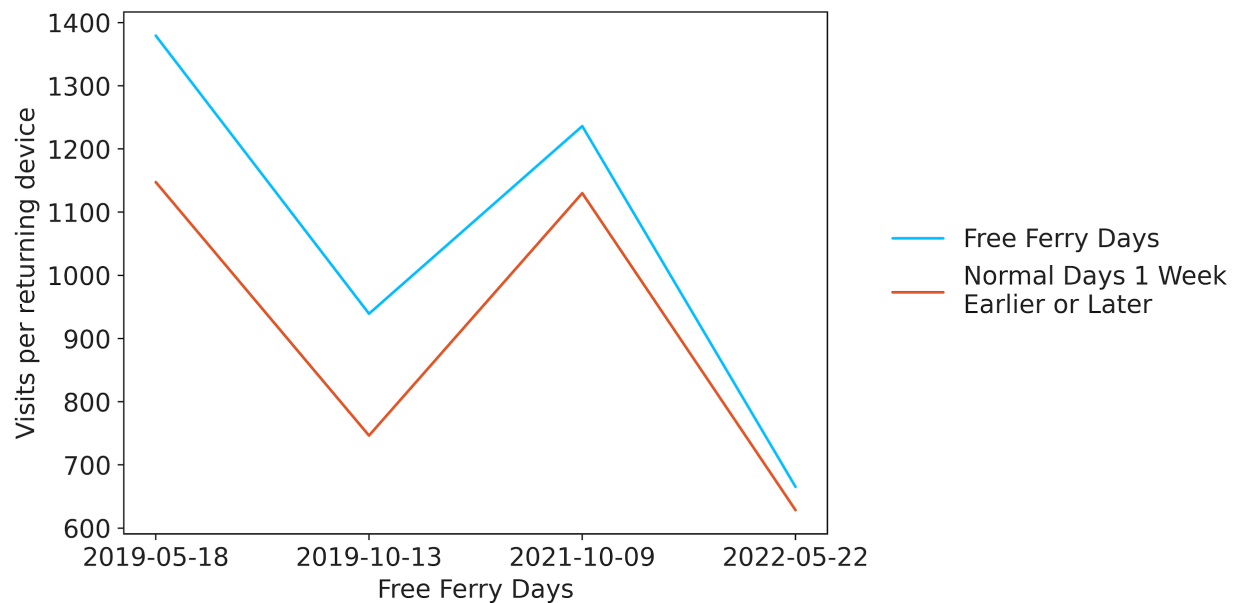
Return rate of visitors on Free Ferry Days vs Normal Days



Here, I analyzed the number of visitors who returned to the Boston Harbor Islands after initially visiting them on a Free Ferry Day. I compared this to the number of visitors who returned who initially visited on a normal day either one week earlier or later.

The data show that when compared to visitors on normal days, fewer visitors on free ferry days return across all 4 free ferry days captured. The difference is most stark in Fall 2019, but the difference is consistent for all four days.

Visits per returning device on Free Ferry Days vs Normal Days



Here, I display the number of visits from devices originally visiting on a free ferry day or the corresponding normal day. This metric roughly correlates to how many returning visits each device had, though the raw value of this metric can be ignored. Each device is normally associated with a handful of visitors, which would be more directly comparable to visits. However, for repeat visitors, this calculation was not functioning as intended in Tectonix. Therefore, visit per returning device serves as a proxy for the number of return visits per visitor.

These data show that although fewer visitors returned from Free Ferry Days than normal days, the visitors that did return did so more frequently. Again, this difference was apparent across all years, though the gap decreased for the Free Ferry Days in 2021 and 2022.

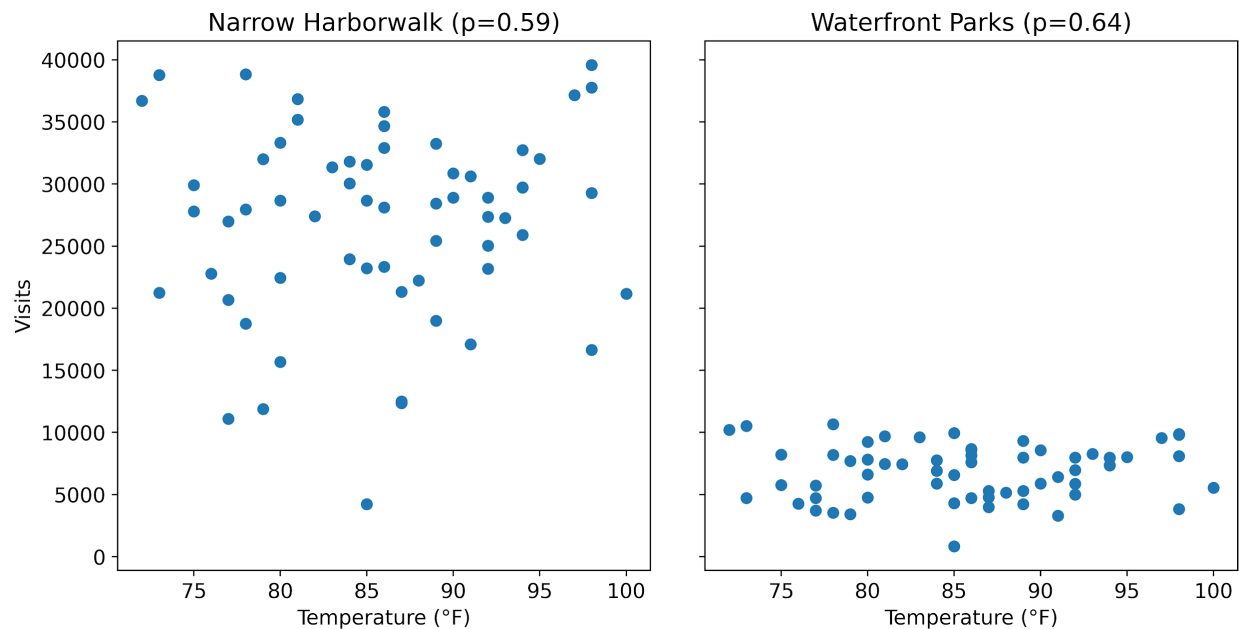
Grade: Minimal Corroboration

While the MassInc study gives information regarding the reliability of visit/visitor data, it does not directly tell us anything about the Boston Harbor Islands or about the return rate of visitors from specific days.

Where are people using the harbor most during extreme heat and flood risks? And what are the demographics?

[Code](#) | [Data](#)

Visits during extreme heat vs normal heat



I analyzed data from July and June of 2022 using temperature data for the city of Boston to understand if visitation and temperature correlated in both the Narrow Harborwalk and the Waterfront Parks. Above, I show scatter plots of the daily high temperature (°F) on the x-axis and visits on the y-axis.

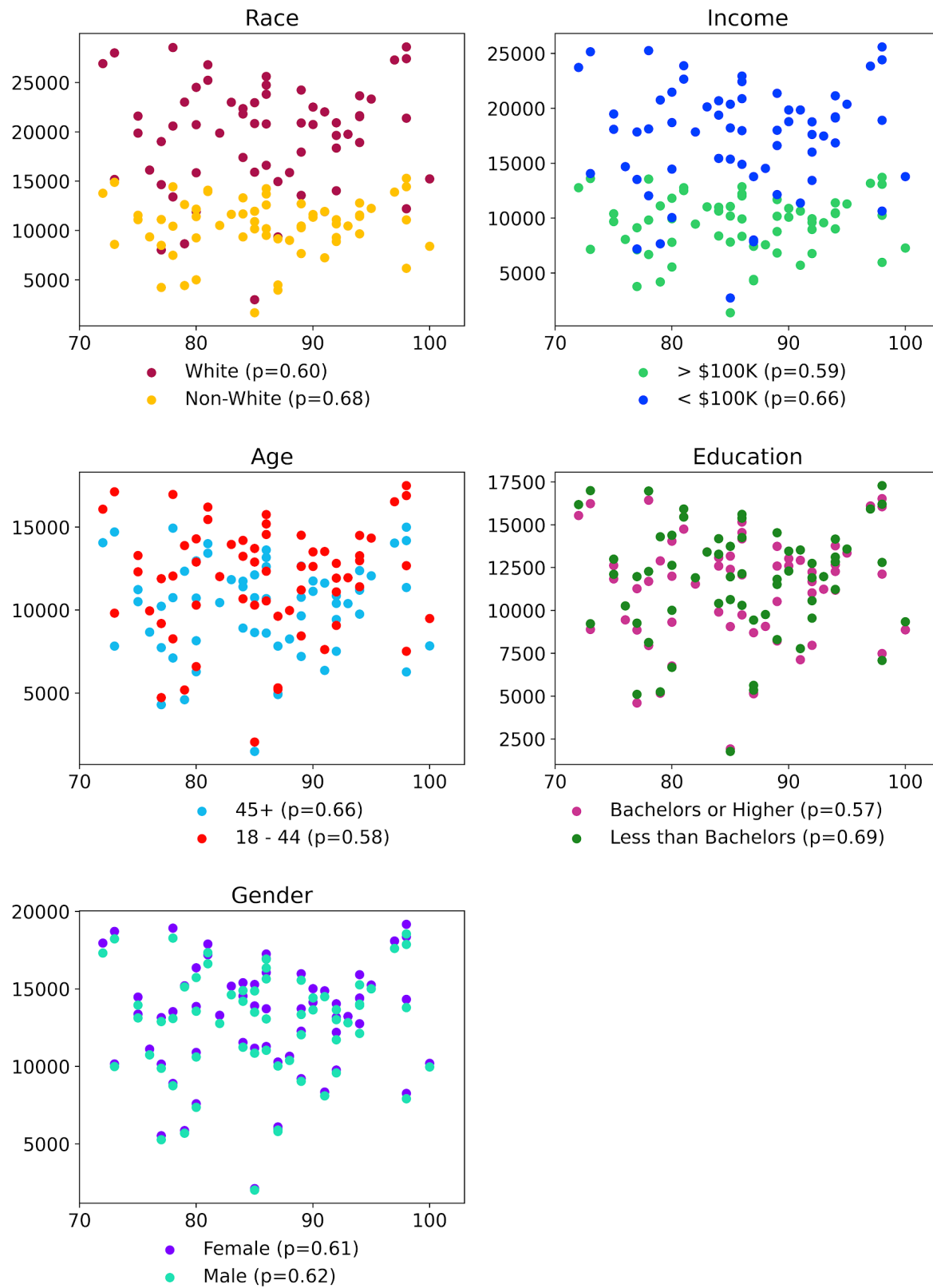
There is no discernable relationship between temperature and the number of visits to either the Narrow Harborwalk or the Waterfront Parks. For both polygon sets, I calculated Pearson's R, which is a measure of correlation between continuous variables. Both calculations resulted in p-values greater than 0.05, which indicates that there is no statistically significant correlation between the number of visits and temperature.

Below, I show scatter plots for breaking down different demographic categories in the Narrow Harborwalk and the Waterfront Parks visit and temperature. These categories included race, income, age, education, and gender. I calculated the correlation between the daily high temperature and visits of a given demographic group, such as individuals making less than \$100,000. For every demographic group, the p-value was greater than 0.05, indicating no statistically significant correlation between temperature and visits.

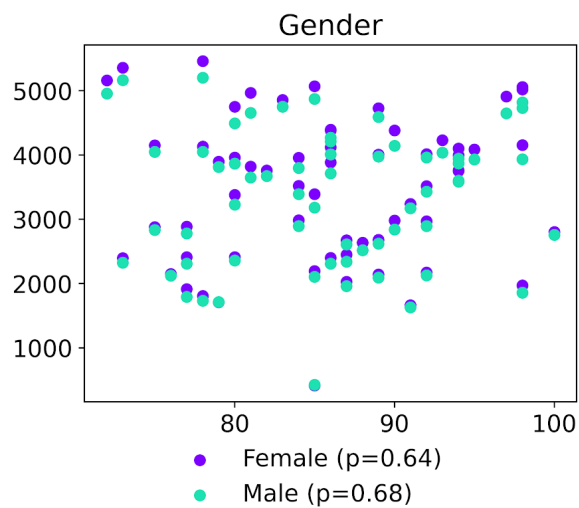
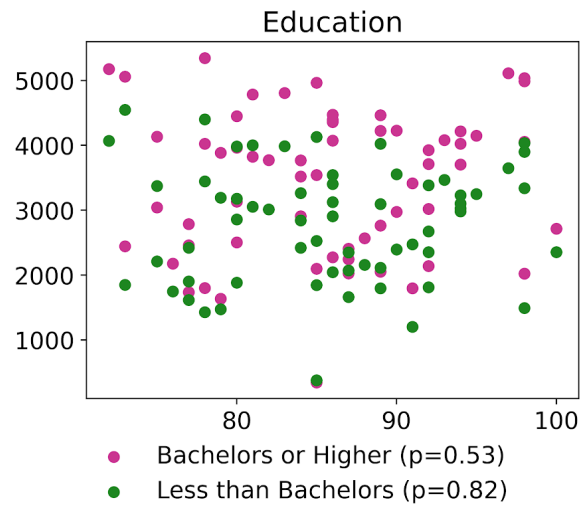
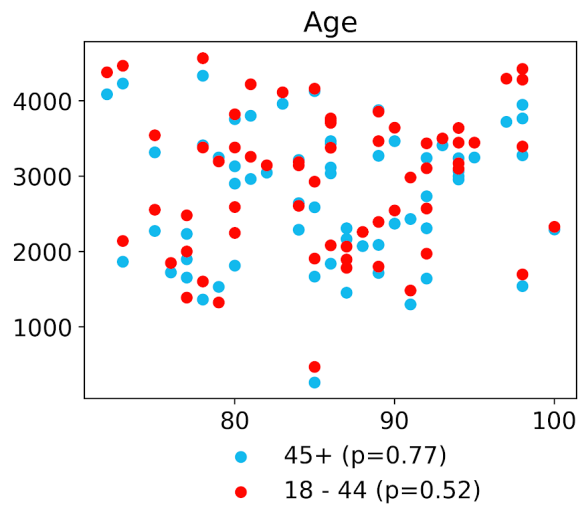
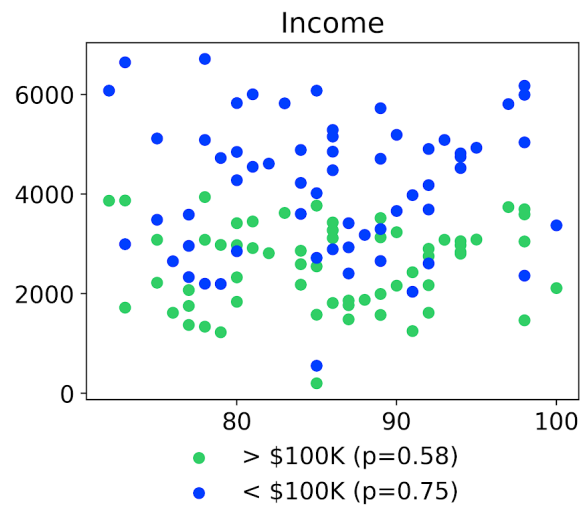
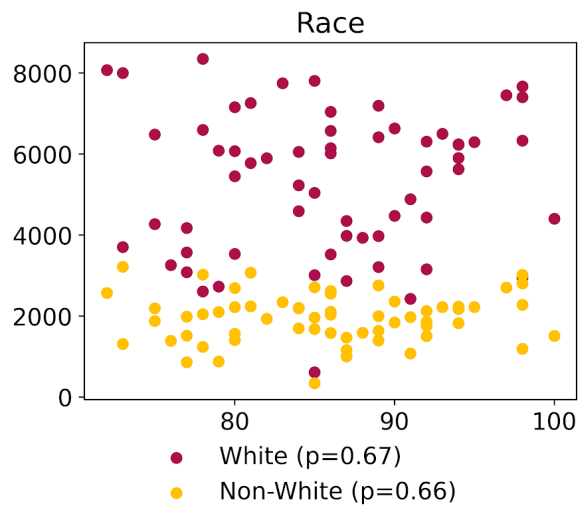
Grade: Moderate Corroboration

The MassInc and Veraset data somewhat agree on visitation, as well as some demographic groupings, though the MassInc data does not compare temperature and visits.

Narrow Harborwalk demographics during extreme heat vs normal heat



Waterfront Parks demographics during extreme heat vs normal heat

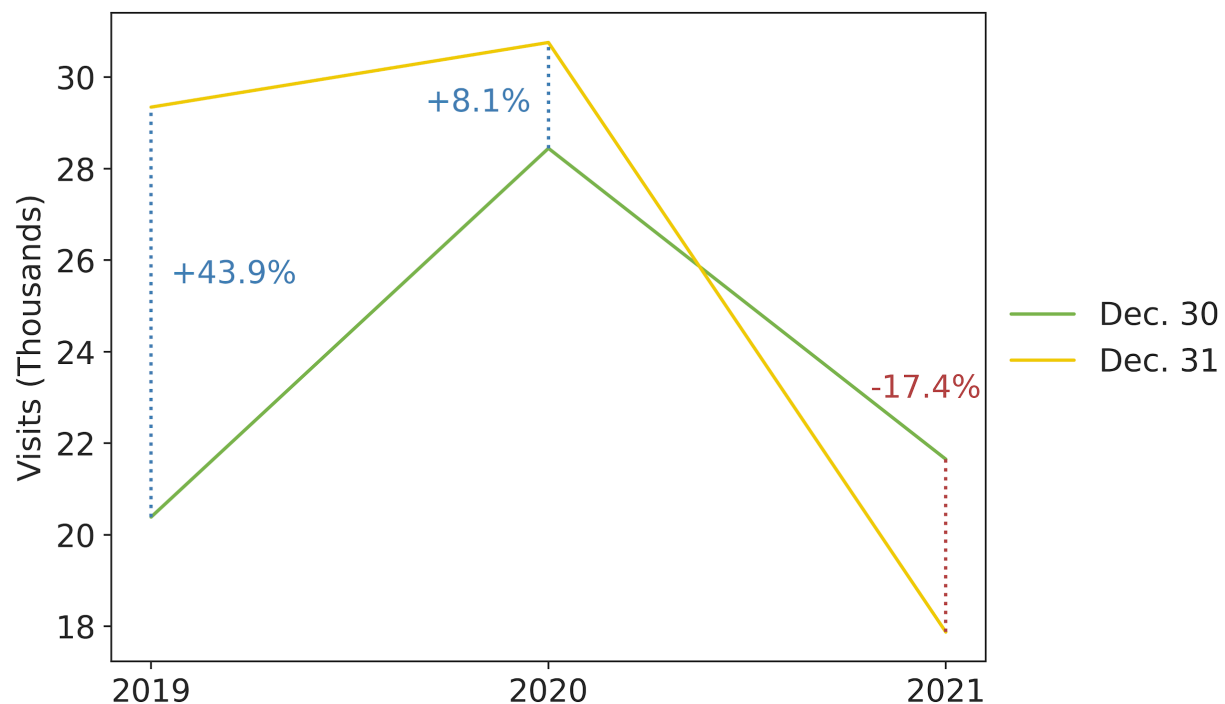


Number of people and from where on 12/31 on various years

[Code](#) | [Data](#)

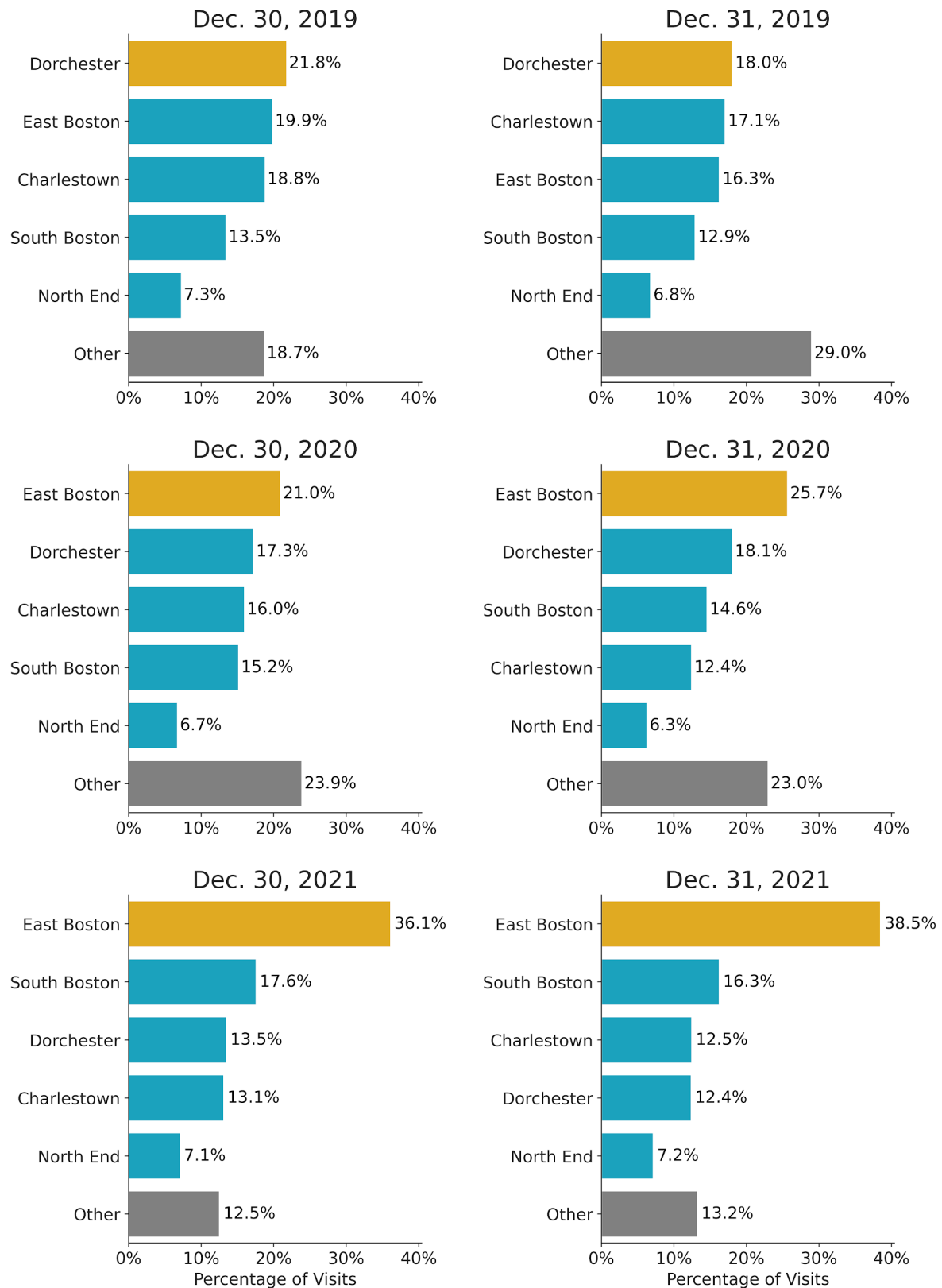
For this query, I examined to what degree there was an influx of visits on New Year's Eve (December 31) to the Narrow Harborwalk in 2019, 2020, and 2021 compared to December 30 as a baseline. I also examined how home neighborhoods and cities of the visits changed between the two days. I did not include 2022 because the Veraset data stops on December 31, 2022, well before the end of the day.

Narrow Harborwalk visit differential between Dec. 30 and Dec. 31



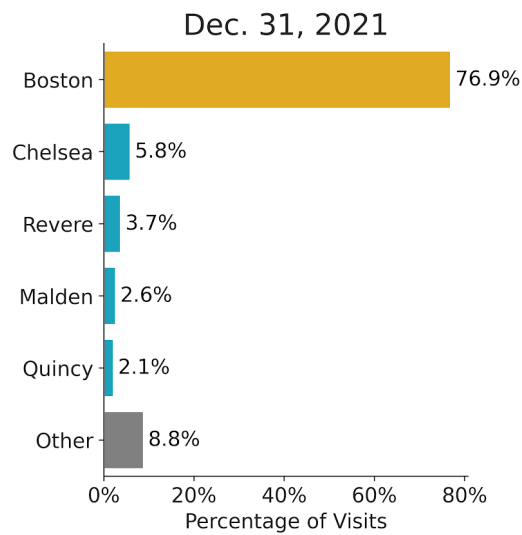
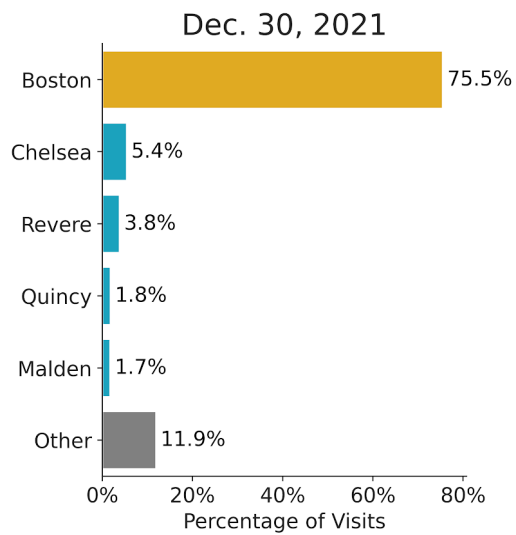
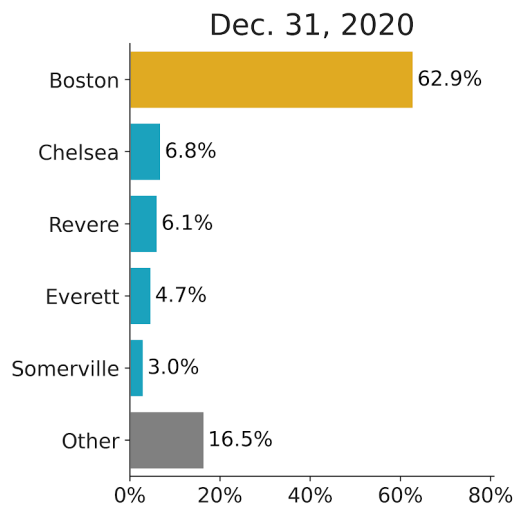
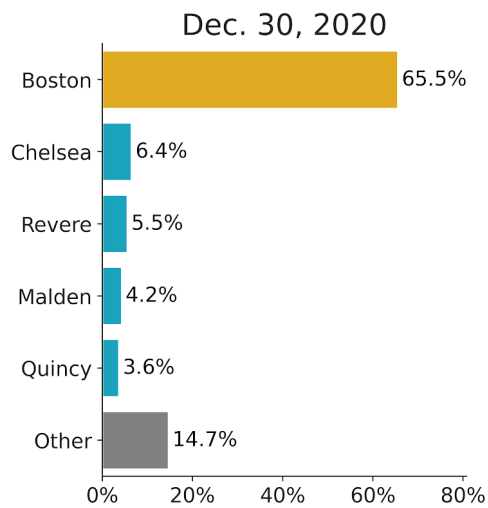
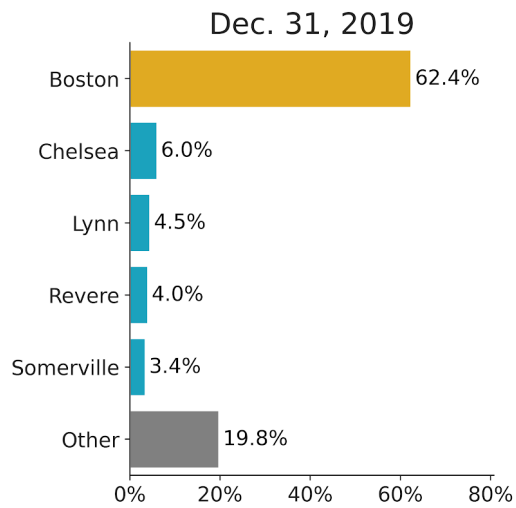
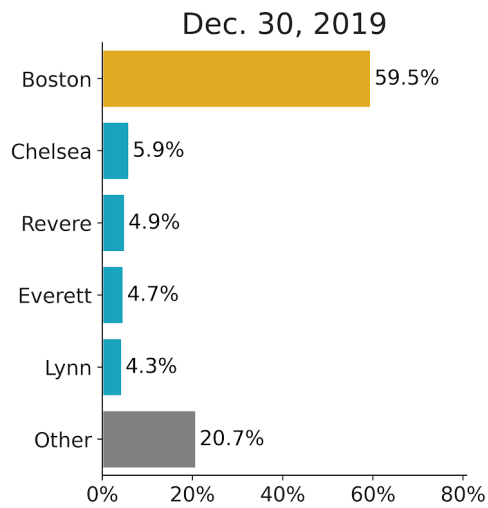
In 2019 and 2020, there were influxes of visits on December 31 compared to December 30. In 2019, there was a 43.9% increase in visits, followed by a more modest increase of 8.1%. This difference is mostly due to a relatively larger number of visits on Dec. 30, 2020, compared to in 2019. Both 2019 and 2020 saw ~30,000 visits on Dec. 31. New Year's Eve in 2021 bucked the trend. While Dec. 30 visits were at a similar level to 2019, there was a 17.4% decrease in visits on the 31st, with just over 18,000 visits that day, over 10,000 fewer visits than in the previous years.

Home neighborhoods of NYE Visits



In 2019, there was little difference in the neighborhoods in the top five visits for Dec. 30 and 31, with the majority of visits coming from Dorchester, East Boston, Charlestown, South Boston, and the North End. However, there was a higher percentage of visits from other neighborhoods on December 31, going from 18.7% to 29.0% In 2020, there again was very little difference between Dec. 30 and 31 in the home neighborhoods of visits. However, one shift that occurred in 2020 was that East Boston became the top home neighborhood of visits, taking over the top spot from Dorchester. In 2021 again, there is little difference between top home neighborhoods on Dec. 30 and Dec. 31. However East Boston visits were up again, with between 35-40% of total visits being from East Boston. Visits from Dorchester decreased in percentage, while South Boston visits increased.

Home cities of NYE visits



In all years, the vast majority of visits to the Narrow Harborwalk on Dec. 30 and 31 were from Boston. Each year, the percentage of visits from Boston increased, starting at 59-62.4% in 2019, to 62.9-65.5% in 2020, all the way up to 75.5-76.9% in 2021. Chelsea always held the second-highest spot, ranging from 5.4%-6.8% of total visits. Revere was most often the home of the third most visits, except for Dec. 31, 2019, when Lynn had slightly more. There was little differentiating Dec. 30 and Dec. 31 across the years. One observation was that Somerville had the fifth most visits on New Year's Eve in 2019 and 2020, and did not appear in the top five for those years the day before. Even in this case, there may be limited predictive power in analyzing the remaining cities, as each only makes up a small number of total visits.

Grade: Some Corroboration

We cannot use the MassInc data to understand how visitation changes on specific dates across years. However, home location aligns strongly between the two datasets.

Unanswered Queries

Average distance traveled on the Harborwalk

The Tectonix platform does not have a method for identifying multiple pings from the same device in a day and returning their respective distances from each other. Without this information, this query cannot be addressed.

Can we learn anything about the proximity of amenities such as the MBTA, parking, restaurants, etc. to use of the HW?

While technically possible to answer, this would require a massive effort to identify all points of interest relevant to the harborwalk. This would have required more time than the BHN contract with Veraset/Tectonix allowed.

What's the average distance traveled to visit a waterfront?

Average distance traveled was a metric included as part of the Veraset data. However, this field was nonfunctional during analysis, and there was no other method for calculating a similar value, making this query impossible to answer.

How many public parks outside of their neighborhoods do people visit on average?

The Tectonix platform does not have a way to count how many polygons a device was detected at, let alone summarize that information in a way to answer this query.

Does proximity to a public library increase waterfront usage?

While possible to determine, the Tectonix platform limits our ability to answer this query. Identifying library locations is possible, as is calculating the distance from each parcel to the nearest library, though time intensive. However, Tectonix does not allow easy export of data per polygon without manually selecting each one, making this query difficult to answer in a meaningful manner.

What are people doing on the waterfront?

While the Safegraph that enriches the Veraset data includes categories for the type of business or venue in which a ping was recorded, we deemed the categorization to be insufficiently complete or comprehensive for analysis.