



The Controversy between Airbnb Short-term Rentals and Noise Complaints

Is there a correlation between the reduction in Airbnb short term rentals and changes in 311 noise complaints under the LL18 impact?



Urban Noise Lab

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Intended Audience:
Urban policy makers, Researchers,
New York residents, Airbnb hosts

Research Question

Is there a correlation between the reduction in Airbnb short term rentals and changes in 311 noise complaints under the LL18 impact?

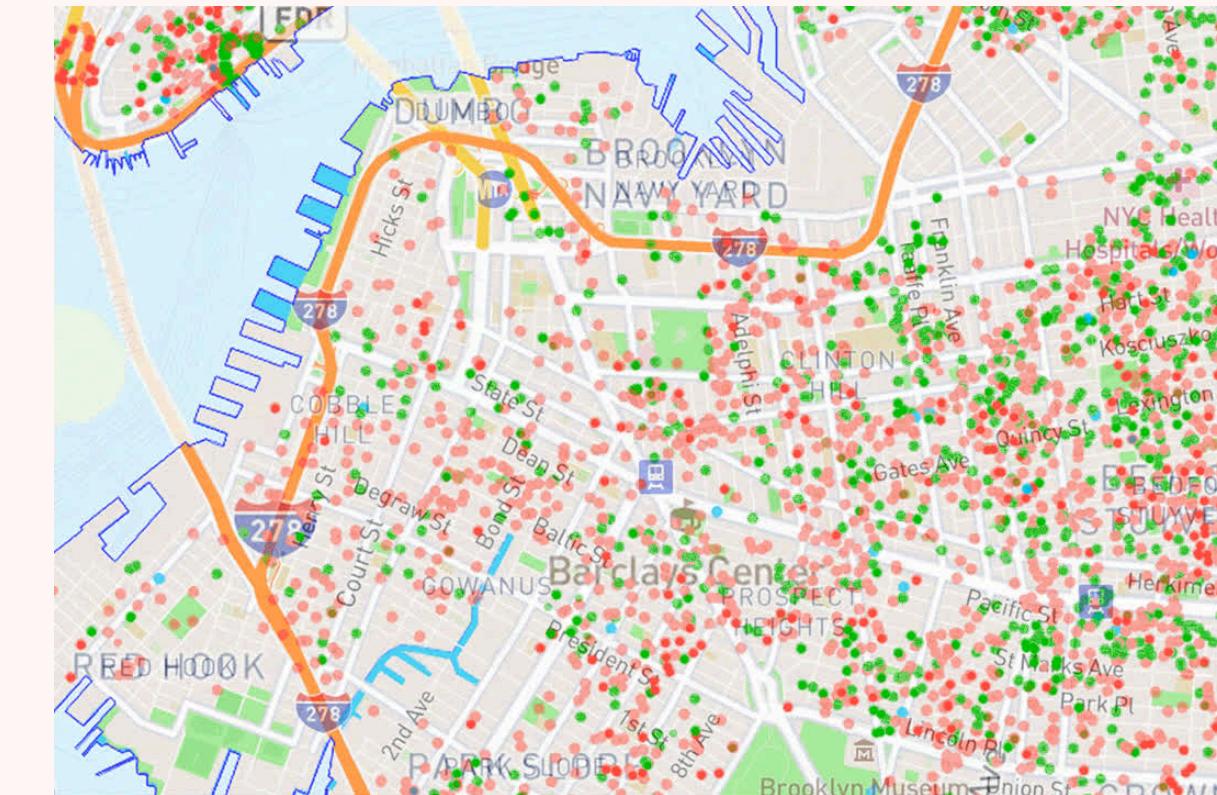
Short-Term Rental Registration and Verification by Booking Services

On January 9, 2022, New York City adopted Local Law 18, also known as the Short-Term Rental Registration Law. The law requires short-term rental hosts to register with the Mayor's Office of Special Enforcement (OSE), and prohibits booking service platforms (such as Airbnb, VRBO, Booking.com, and others) from processing transactions for unregistered short-term rentals.

Starting September 5, 2023, OSE's initial phase of Local Law 18 enforcement will focus on collaborating with the booking platforms to ensure they are using the city's verification system, that all verifications are occurring correctly, and that the platforms stop processing unverified transactions.

Short-term rental hosts are strongly encouraged to abide by all legal requirements that predated Local Law 18, the enforcement of which is ongoing in response to complaints.

Policy: Local Law 18



sharp decrease of legal Airbnb short-term rentals on Aug. 4 and Sept. 5.



Noise from Airbnb st rentals



Complaints from residents

Literature Review

Characteristics of noise complaints and the associations with urban morphology: A comparison across densities

Huan Tong  , Jian Kang 

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<https://doi.org/10.1016/j.envres.2021.111045> 

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Highlights

- Noise complaints are unevenly distributed and clustered around high-density areas.
- Patterns of noise complaint rate seasonally and weekly are revealed.
- Noise complaint rate is higher in areas with a high density of 20-40m roads.
- The more enclosed and denser blocks are, the higher the noise complaint rate is.
- Urban morphology influences noise complaint rate less in high-density areas.

Scale-Dependent Relationships Between Urban Morphology and Noise Perception: A Multi-Scale Spatiotemporal Analysis in New York City

by Siting Chen  , Bingjie Yu  , Guang Shi  , Yiping Cai  , Yanyu Wang  and Pingge He  

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Versions Notes

Abstract

Urban morphology significantly influences residents' noise perceptions, yet the impact across different spatial and temporal scales remains unclear. This study investigates the scale-dependent relationship between urban morphology and noise perception in New York City using noise complaint rates (NCR) as a proxy for perceived noise levels. A multi-scale analysis framework was applied, including four spatial scales (100 m, 200 m, 500 m, and 1000 m) and three temporal classifications (daytime/nighttime/dawn, weekdays/weekends, and seasonal divisions). Statistical analyses, including Spearman correlation, Moran's I test, and Geographically Weighted Regression (GWR), examined spatiotemporal heterogeneity. Results show: (1) NCR and urban morphology indicators vary significantly across spatial and temporal aggregations. (2) Correlations between NCR and urban morphology indicators generally strengthen with larger spatial units, revealing a scale effect. Temporal variations, e.g., residential land ratio (RES) and greenery percentage (SVI Green), show stronger correlations with NCR in summer than in winter. (3) The Moran's I index revealed significant spatial clustering at the 1000 m scale. Multi-temporal GWR analysis revealed spatial variations in urban morphology-noise relationships across different temporal contexts; in residential areas, building density exacerbates complaints more during non-working periods than during working hours. This study enhances understanding of urban sound environments, offering insights required for more precise urban planning policies.

Keywords: urban morphology; noise complaint; scale effect; spatiotemporal analysis; multi-scale analysis

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Airbnb and Noise in New York City: An Empirical Investigation of Home-sharing and Noise-related Externalities

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Noisebnb: An Empirical Analysis of Home Sharing Platforms and Noise Complaints

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Abstract

Digital multisided platforms and their societal implications are increasingly attracting attention from scholars. In this prior work, the predominant focus has been on platform participants, with little consideration given other market actors who coexist with the platform, but do not participate in directly. In this study, we investigate one aspect of the changing economy subject to considerable theoretical ambiguity: the effects of peer-to-peer home sharing on noise complaints, a growing problem associated with urban living. Leveraging the phased expansion of home sharing platform Airbnb into different locations at different times, and a differences-in-differences approach, we find that the entry of Airbnb is associated with a significant decrease in the rate at which city residents file residential noise complaints. This is striking, given the assumption made by academic literature, industry and government reports, and the popular press that externalities will be negative. This significant decrease is intensified further in locations where a material number of tourist attractions exists, suggesting the effect is driven by limited physical occupancy of residential housing. Corroborating this finding, we observe a significant increase in street noise following the entry of Airbnb, indicating that noise moves out of residential space and into streets where tourist attractions mostly take place.

Keywords: Multisided platforms, peer-to-peer home rentals, urban living, urban quality of life, noise, noise complaints

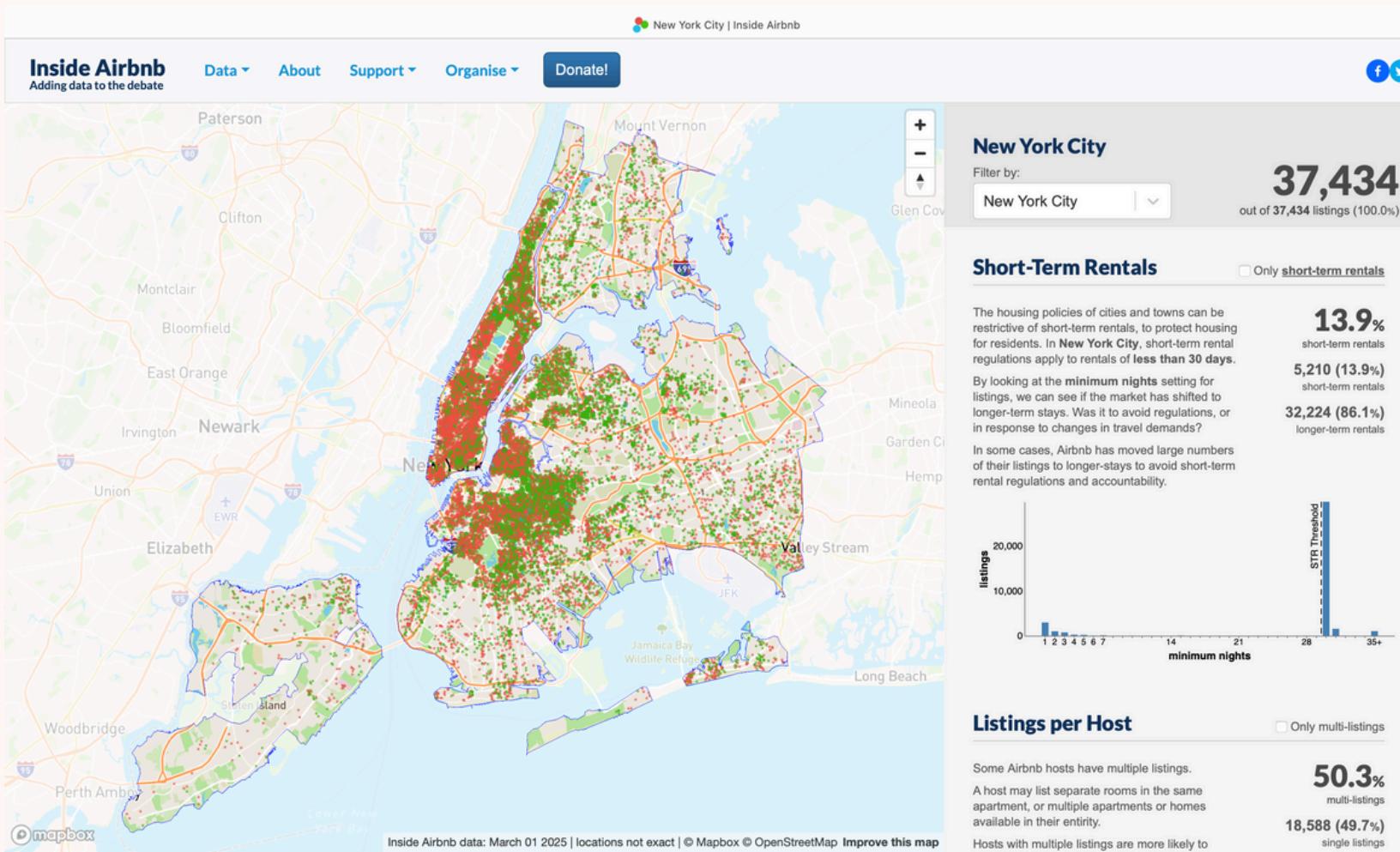
• Temporal and spatial distribution

• Descriptive analysis

• Correlation Analysis

• Empirical research & DID Model

Data Source



Airbnb Listing Data (X)

Short-Term Rental (STR): `minimum_nights_x<30`

The figure shows a screenshot of the NYC311 website under the 'Noise from Neighbor' section. The page has a yellow header and a navigation bar with links like 'NYC Resources', 'NYC311', 'Office of the Mayor', etc.

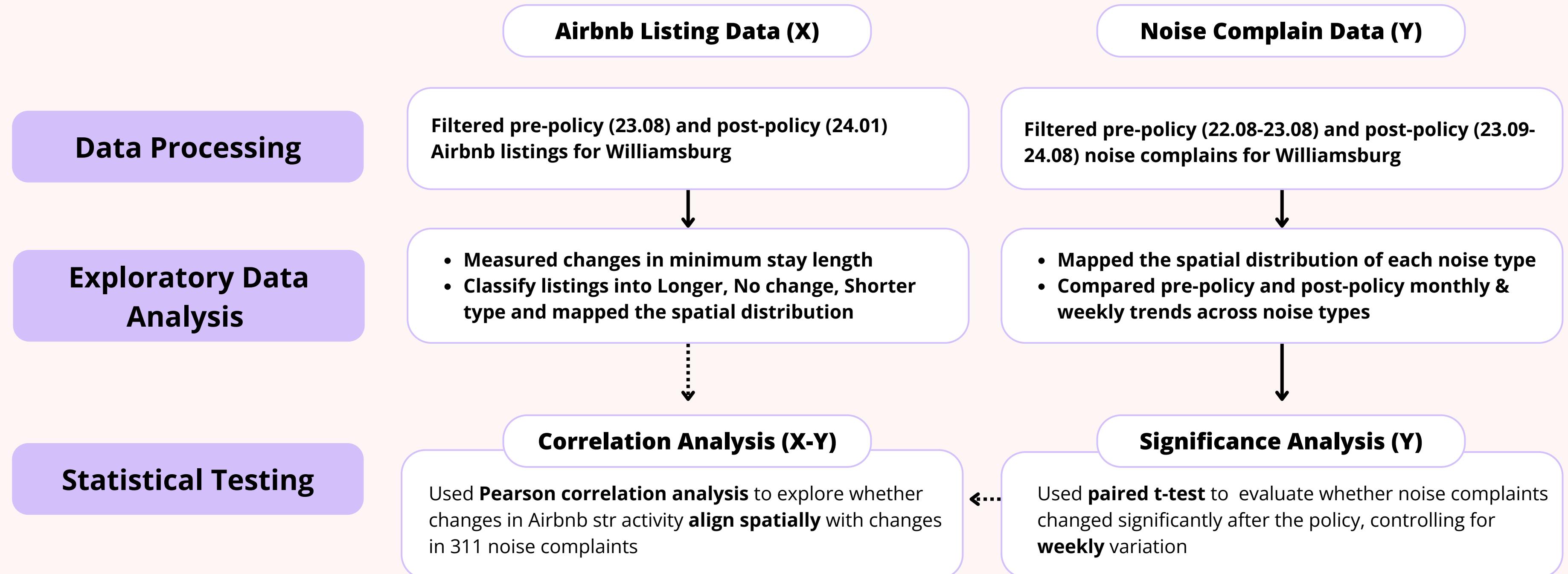
The main form area includes the following fields:

- Problem**: A dropdown menu is highlighted with a purple box, showing options like 'Banging/Pounding', 'Loud Music/Party', 'Loud Talking', and 'Loud Television'. A note says 'maximum 2000 characters'.
- Is this a recurring problem?**: Radio buttons for 'No/Unknown' and 'Yes'.
- When did the problem start**: A date input field with a calendar icon.

Noise Complain Data (Y)

Noise from Neighbor - residential noise- 4 types

Methodology



Executive Overview of Research Results

Study Area:

Williamsburg in Brooklyn, representing one of the highest Airbnb densities in the city;

Lower East Side in Manhattan, a nearby neighborhood that allows us to compare effects across boroughs.

Airbnb Listing Data (X)

Exploratory Data Analysis Key Findings

- Williamsburg has the highest listing density in Brooklyn.
- Minimum stay days mainly cluster around 30 days (KDE result).
- Homogeneity: Trends in Williamsburg and Brooklyn mirror broader Brooklyn and Manhattan patterns.
- Heterogeneity: In Manhattan, Private rooms dominate short-term stays (35.8%). In Brooklyn, Entire homes are more common (34.8%), indicating different visitor characteristics.

Noise Complain Data (Y)

- Homogeneity: Both areas showed a clear decline in 'Loud Music/Party' noise complaints but a sharp increase in 'Loud Talking' noise complaints after the policy.
- Different types of noise complaints were spatially concentrated in distinct regions (KDE results).
- Heterogeneity: Clear seasonal and cyclical patterns were observed, with different peak times between the two study areas.

Statistical Testing Key Result

Correlation Analysis (X-Y)

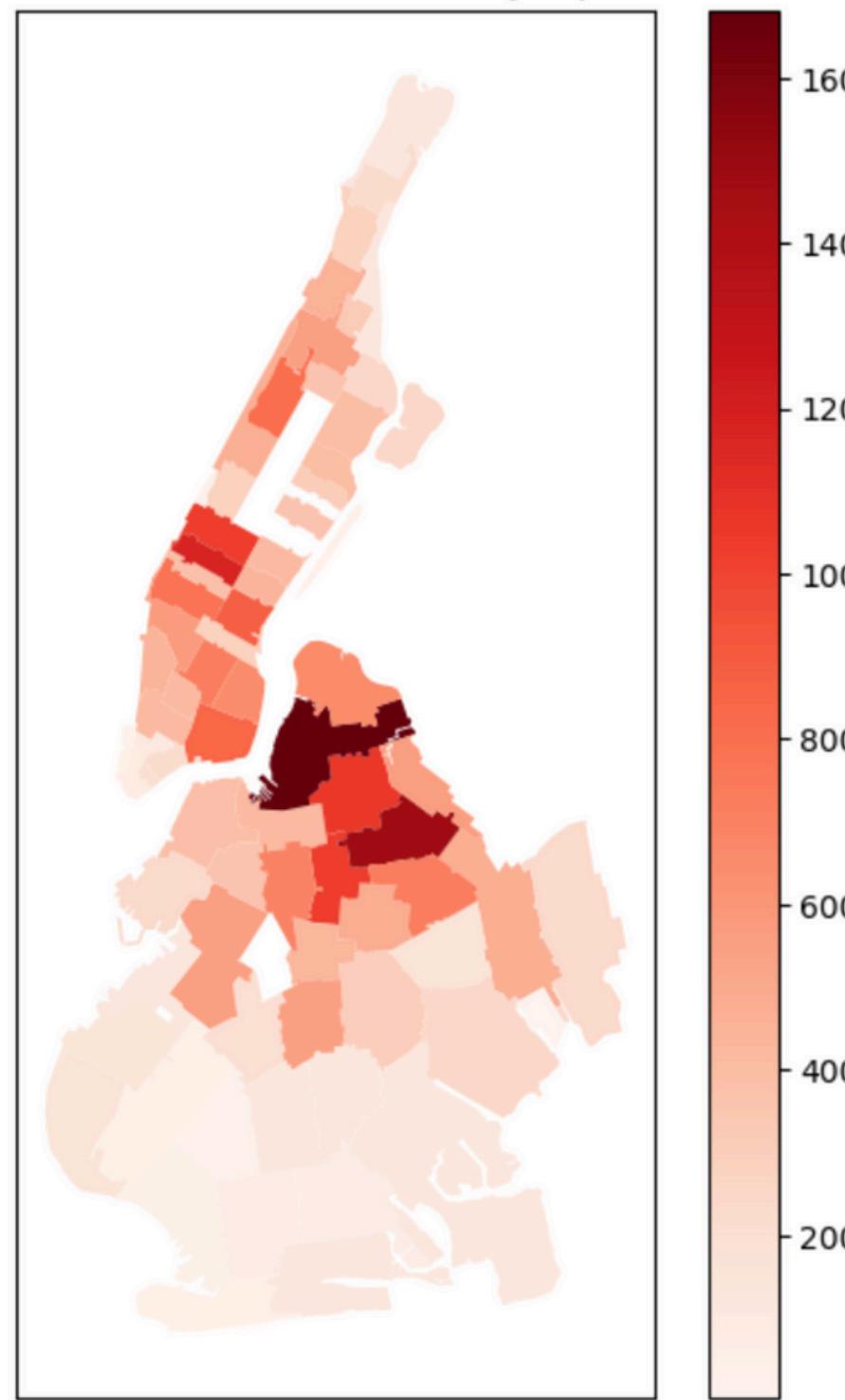
Pearson correlation analysis
Brooklyn study area: $r = 0.223$ weak positive correlation
Manhattan study area: $r = 0.170$ almost no correlation

Significance Analysis (Y)

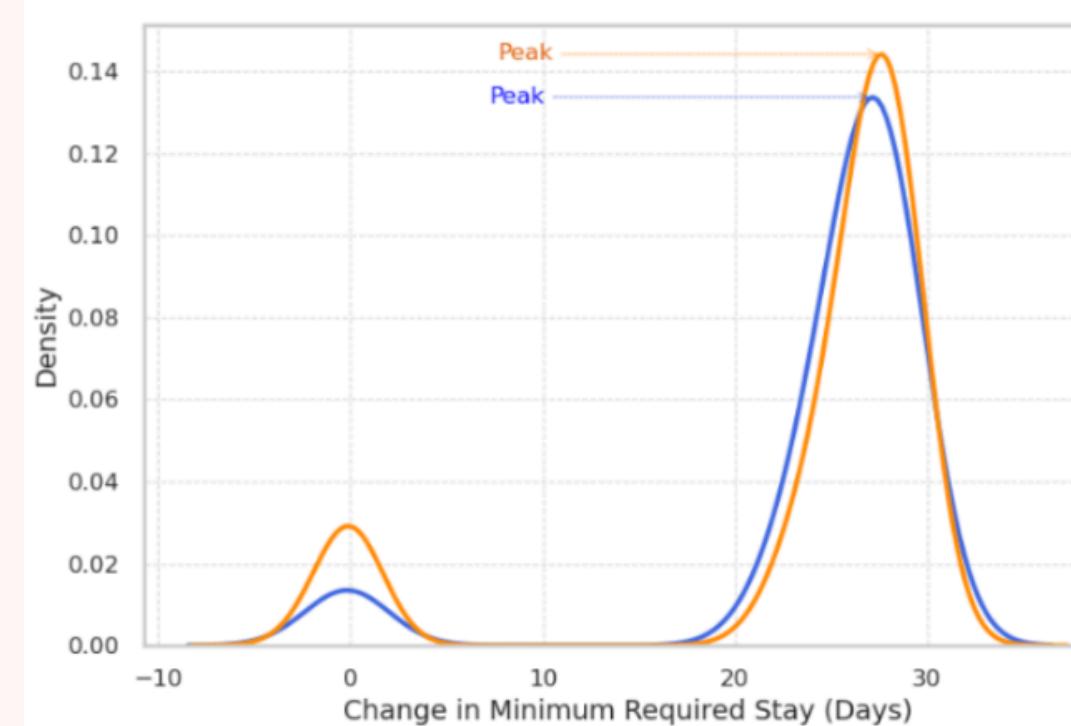
Weekly aggregated 'Loud Music/Party' complaints:
Brooklyn study area: significantly reduction observed
Manhattan study area: no significant change detected

Site Selection: Williamsburg (with Comparative Analysis of the Lower East Side)

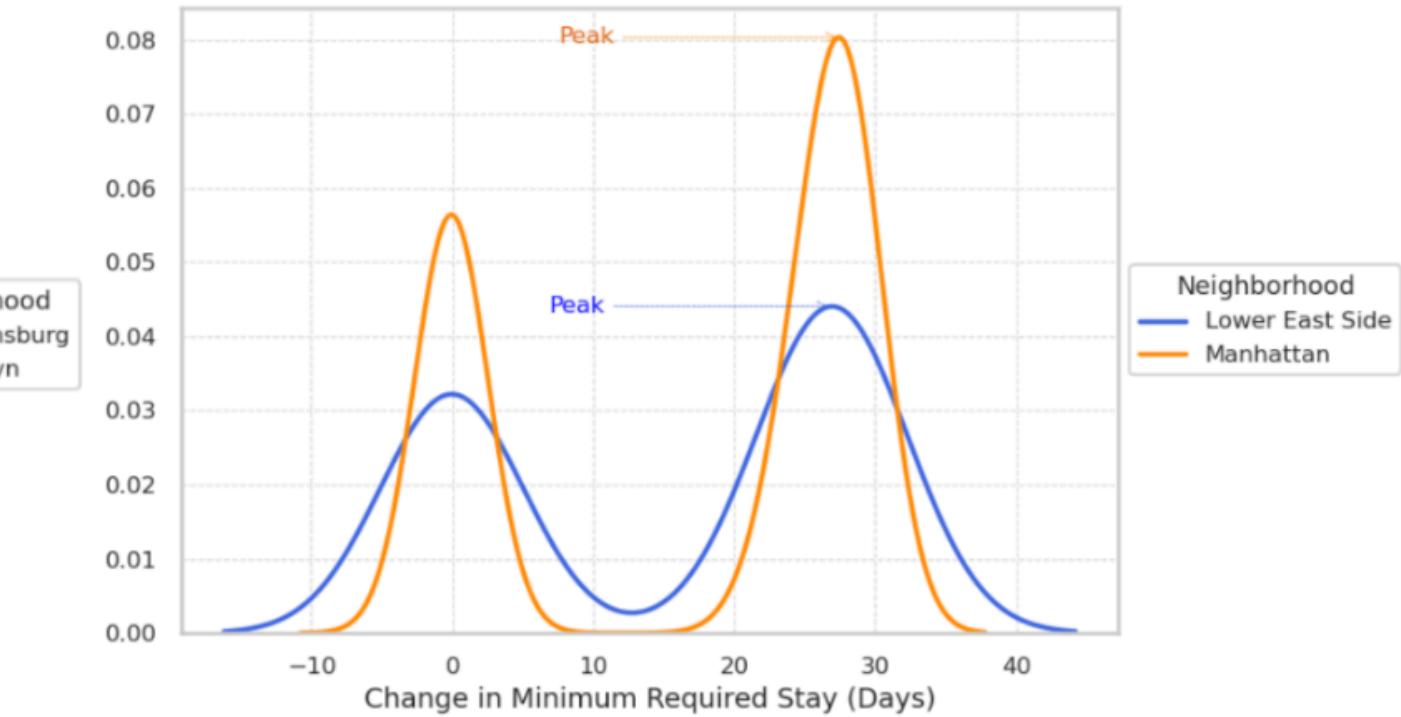
Airbnb Distribution of NYC by Zipcode



KDE of Change in Minimum Nights in Brooklyn



KDE of Change in Minimum Nights in Manhattan



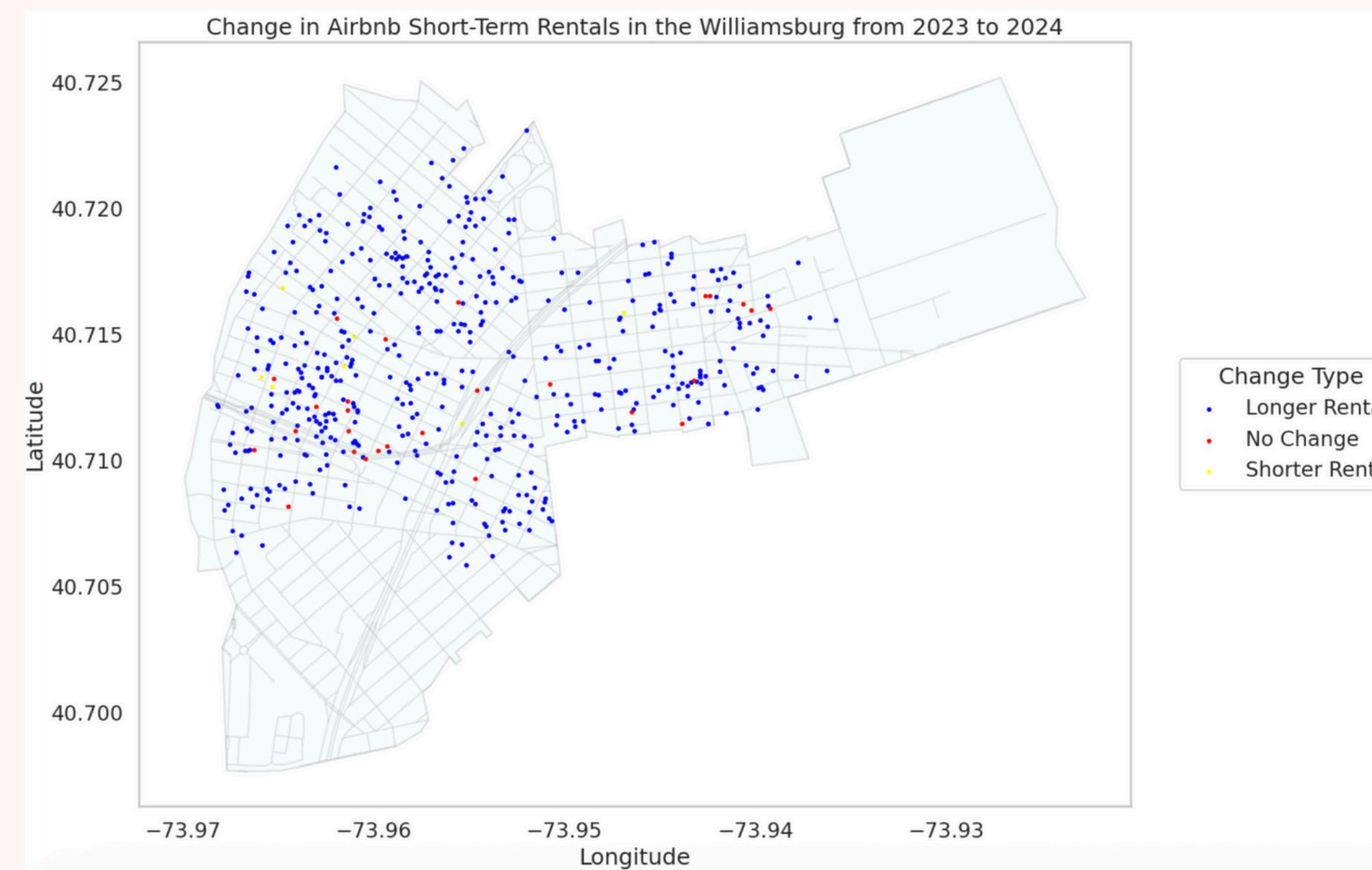
- **Highest Airbnb Density:** Williamsburg has the highest density of Airbnb listings in Brooklyn.
- **Consistent Change Pattern:** Williamsburg and the Lower East Side exhibit similar trends in the distribution of day-to-day changes, indicating parallel patterns in Airbnb dynamics.
- **Geographical Context:** The Lower East Side serves as a comparative neighborhood adjacent to Williamsburg, reflecting broader trends consistent with those observed throughout Manhattan.

Descriptive Statistics

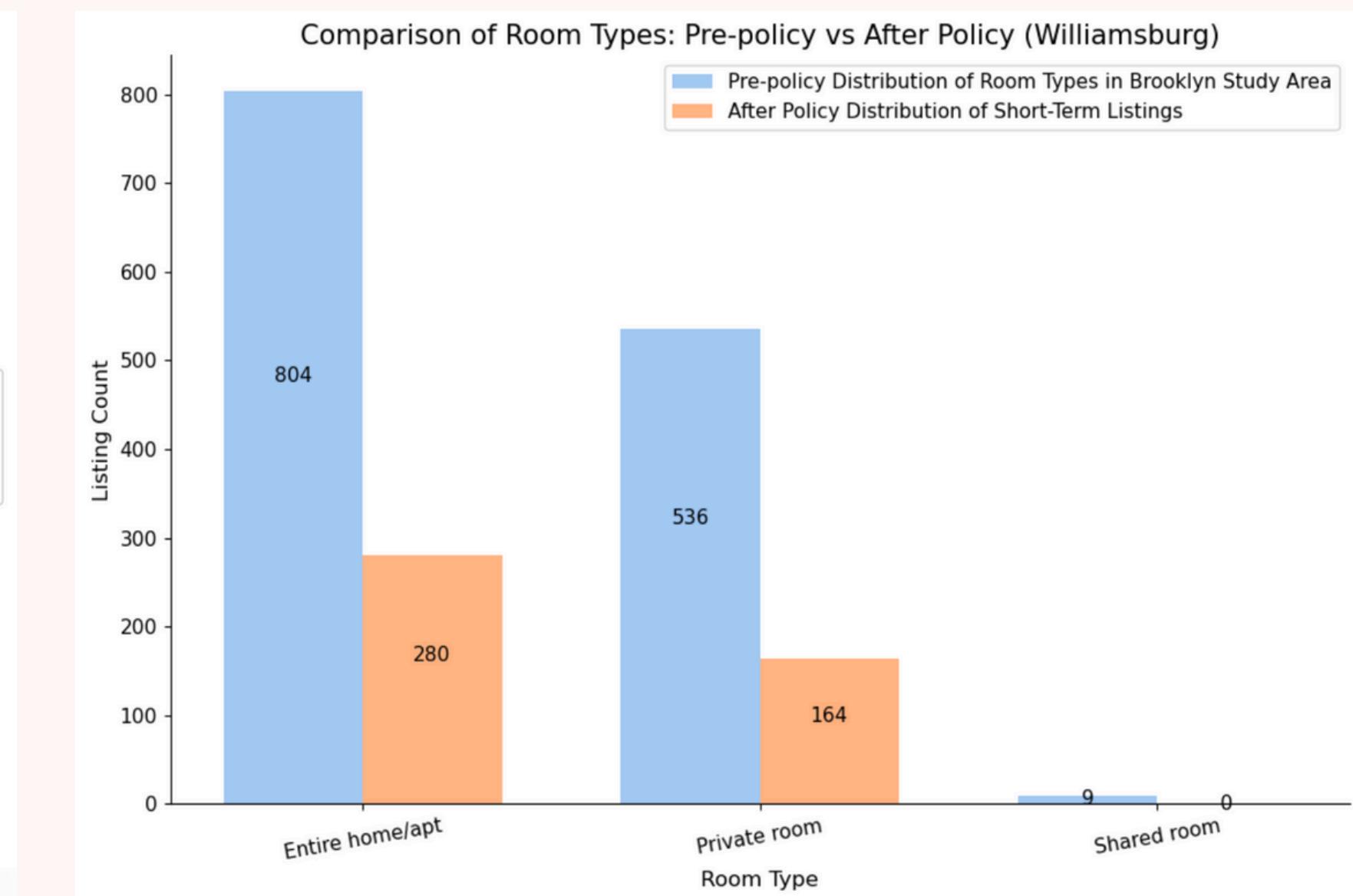
Variable	Sample Size	Mean	Median	Max	Min	Sum	Standard Deviation
Days Change(Brooklyn)	4312	23.5	27.00	32.0	-3.00	NA	9.4
Days Change(Williamsburg)	444	24.8	27.00	30.00	-2.00	NA	7.3
Days Change(Manhattan)	3431	17.1	26	30	-3	NA	13.2
Days Change(Lower East Side)	194	19.2	26	29.0	-1.0	NA	12.2
2022.9-2023.8 Daily Residential Loud Music/Party Noise Complaint Counts(Williamsburg)	365	7.3	4	64	0	2634	8.6
2023.9-2024.8 Daily Residential Loud Music/Party Noise Complaint Counts(Williamsburg)	365	6.3	3	74	0	2263	8.4
2022.9-2023.8 Daily Residential Loud Music/Party Noise Complaint Counts(Lower East Side)	365	4.6	4	24	0	1693	4.4
2023.9-2024.8 Daily Residential Loud Music/Party Noise Complaint Counts(Lower East Side)	365	4.4	3	35	0	1607	4.5

Airbnb Short - Term Rental Distribution (In the Brooklyn Study Area)

Change in Airbnb Short-Term Rentals in the Williamsburg from 2023 to 2024



Comparison of Room Types: Pre-policy vs After Policy (Williamsburg)



Longer Rental: Increased minimum stay



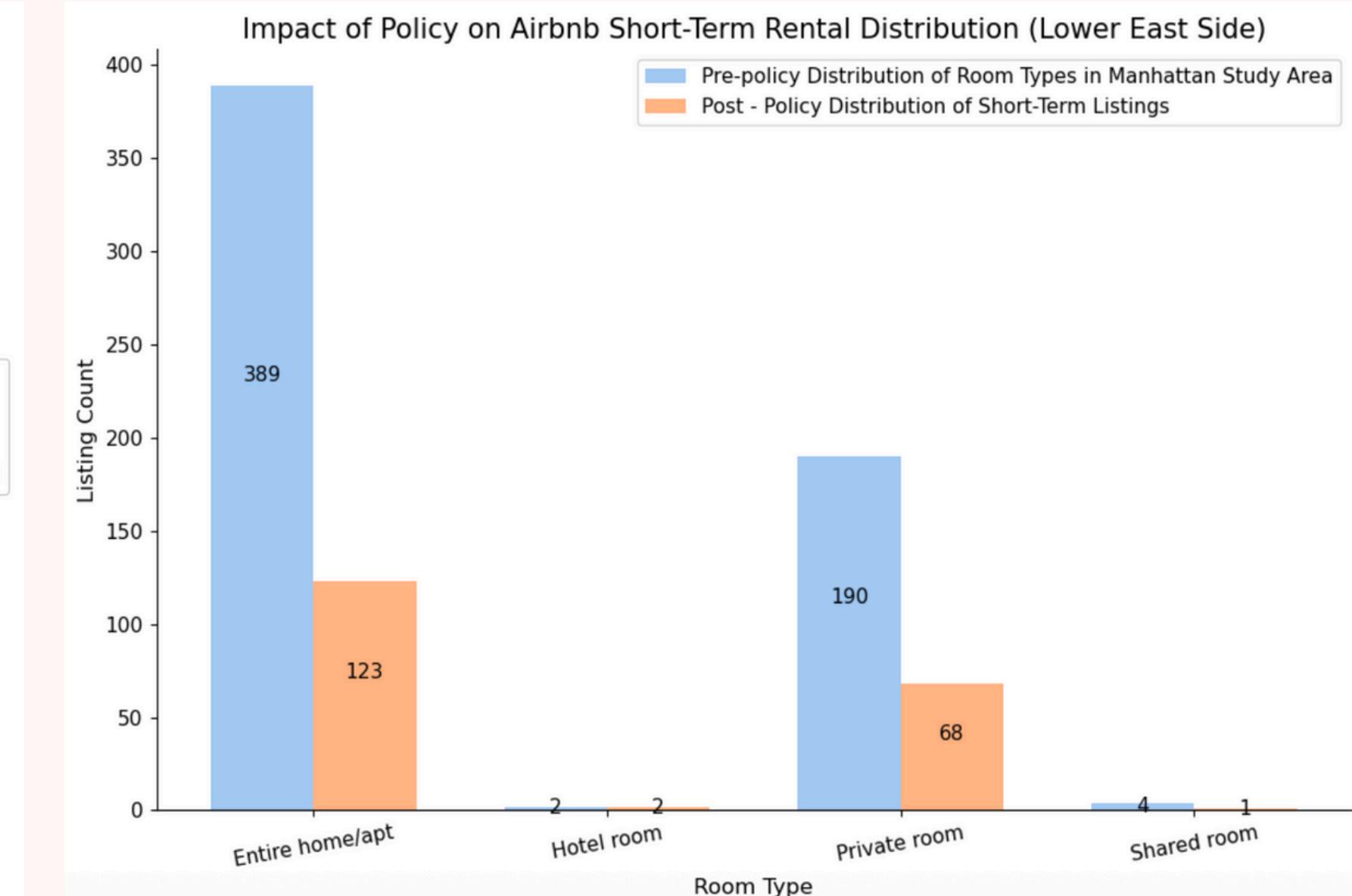
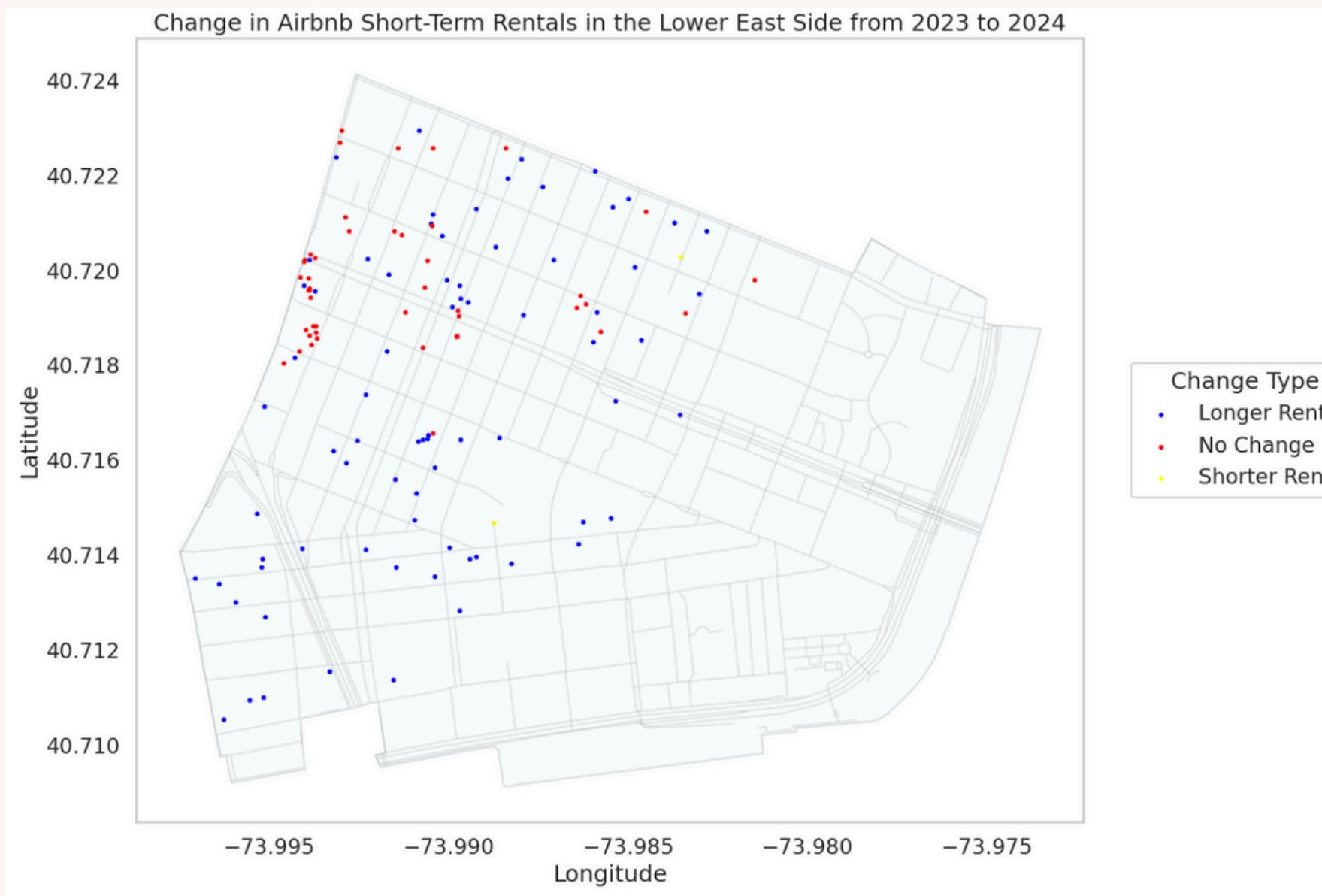
Shorter Rental: Decreased minimum stay

No Change: No difference

Change Ratio for Entire Home/Apt: 34.82%

Change Ratio for Private Room : 30.5%

Airbnb Short - Term Rental Distribution (In the Manhattan Study Area)



Longer Rental: Increased minimum stay



Shorter Rental: Decreased minimum stay

No Change: No difference

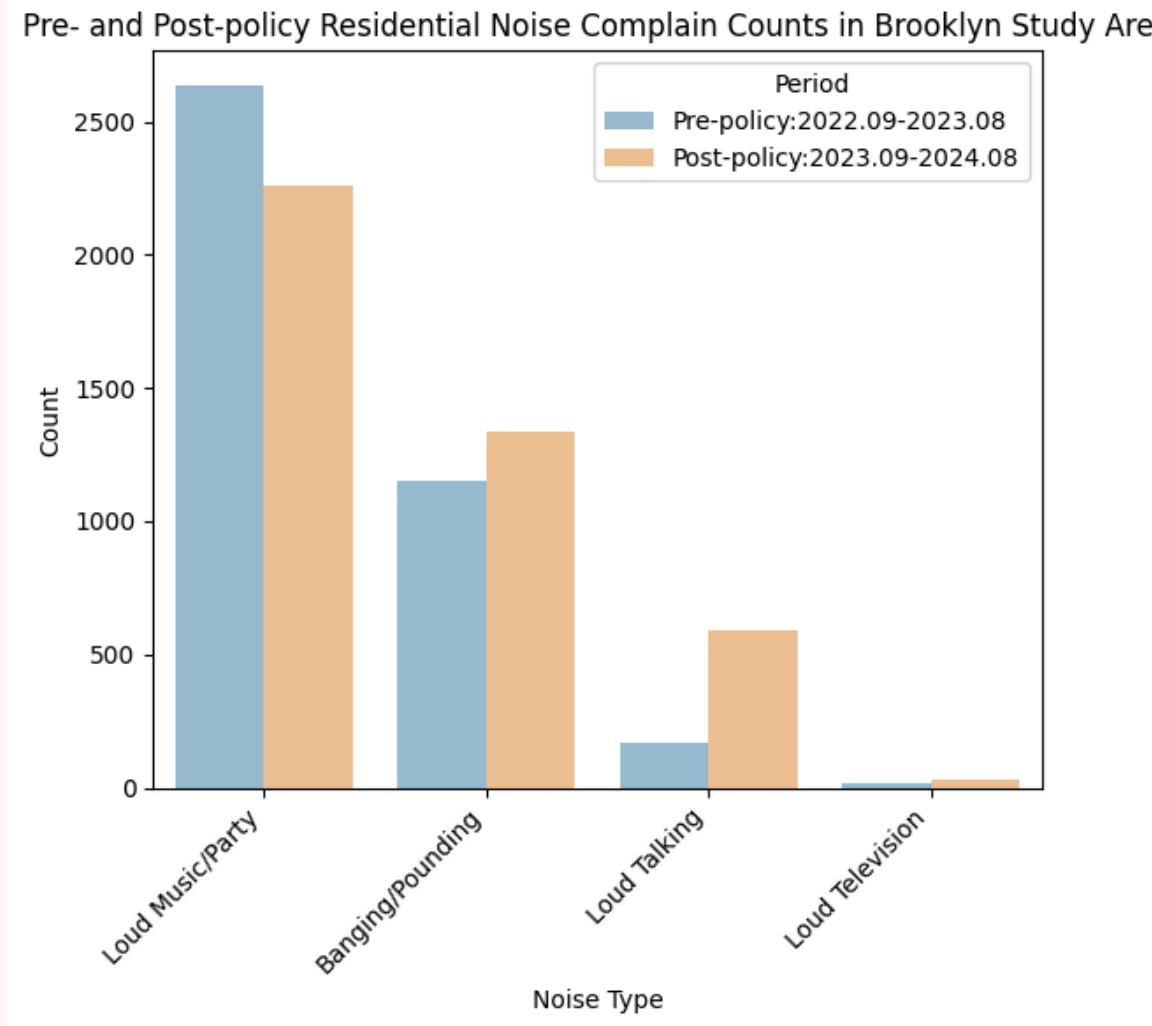
Change Ratio for Entire Home/Apt: 31.61%

Change Ratio for Private Room: 35.8%

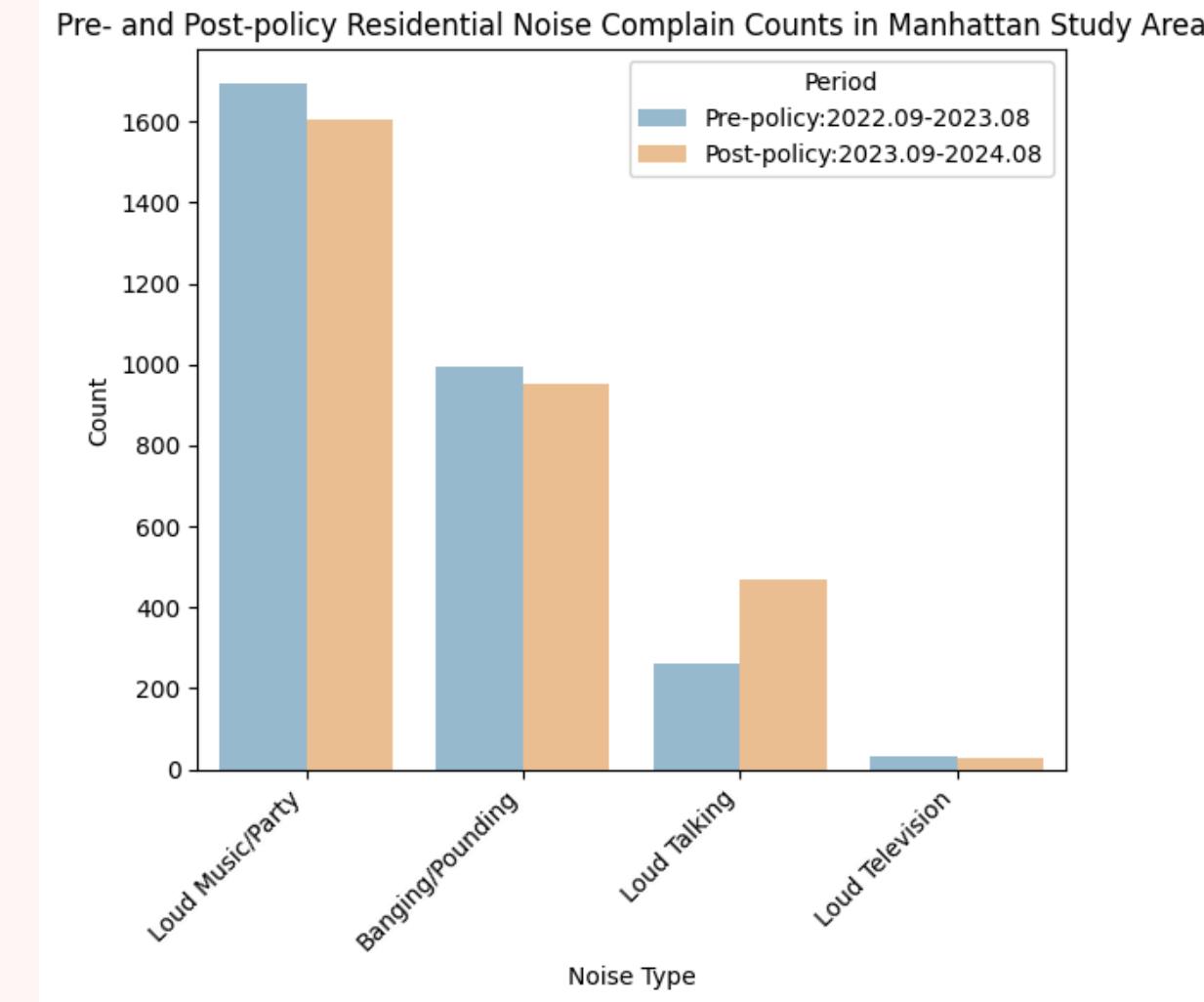
Residential Noise Complaint Counts

Pre-policy & Post-policy

Brooklyn Study Area



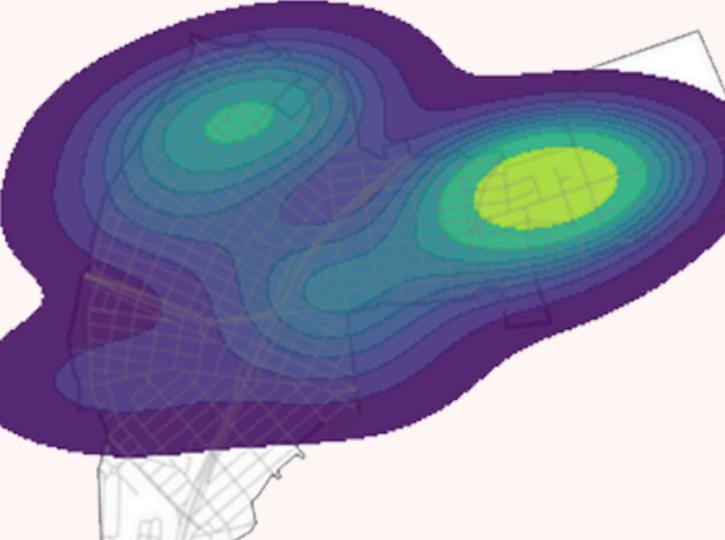
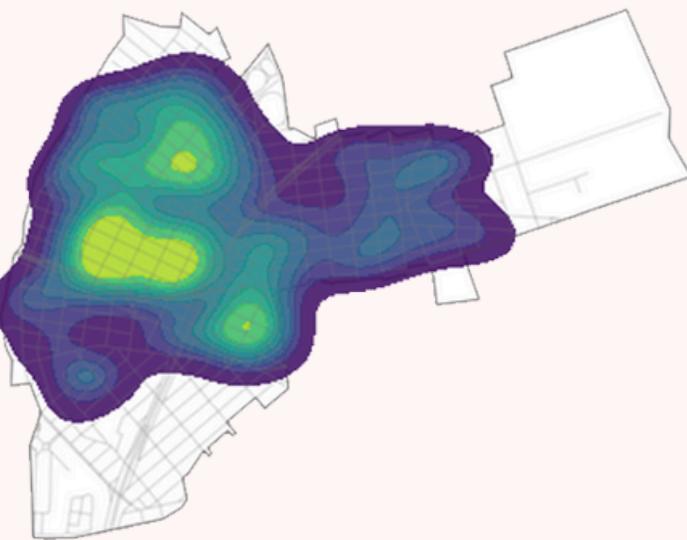
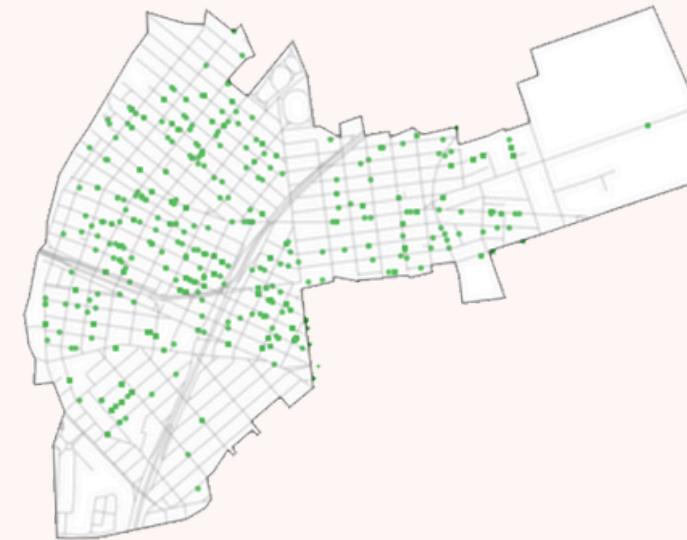
Manhattan Study Area



- Both areas showed a clear decline in Loud music/party complaint after the policy.
- Both areas showed a sharp increase in Loud Talking complains, suggesting additional heterogeneity factors may influence the noise patterns.

Residential Noise Complaint Spatial Distribution

Accumulated Complaints in the Brooklyn Study Area



Loud music/party

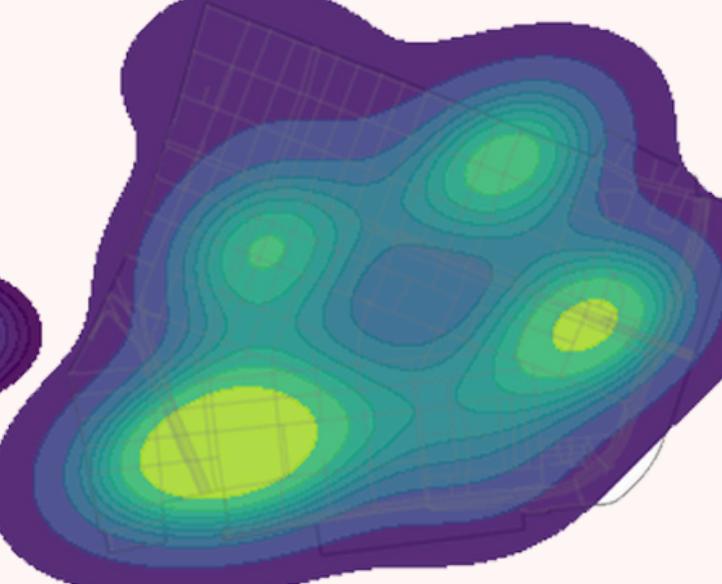
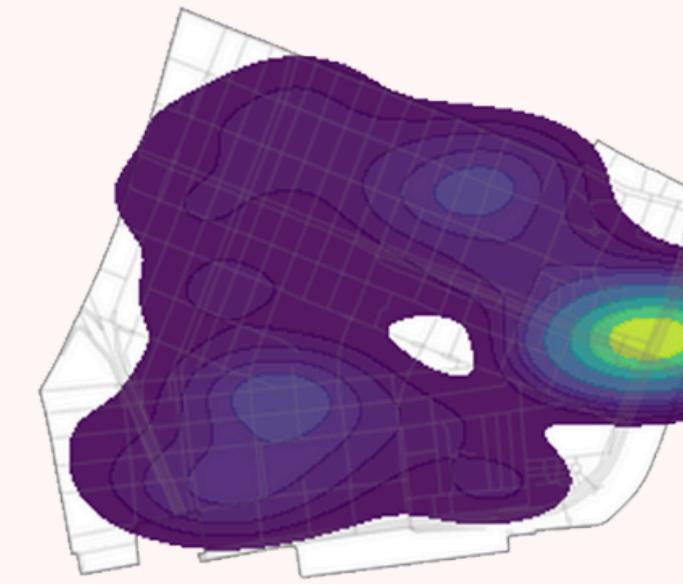
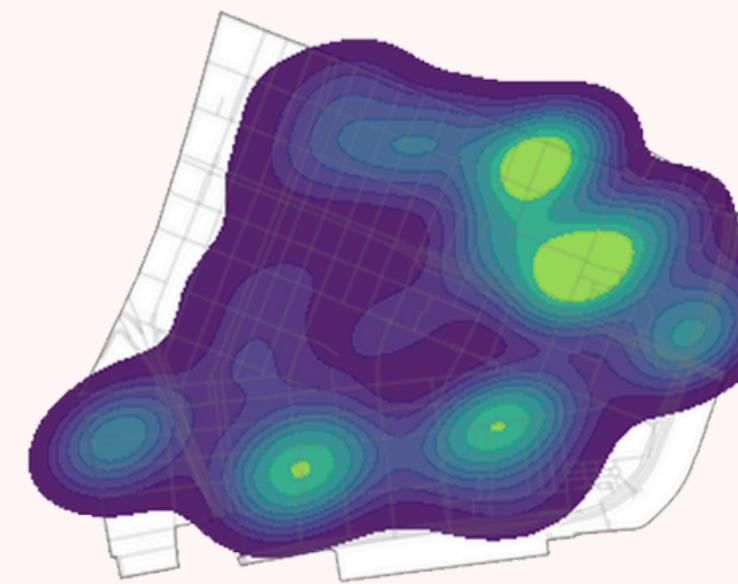
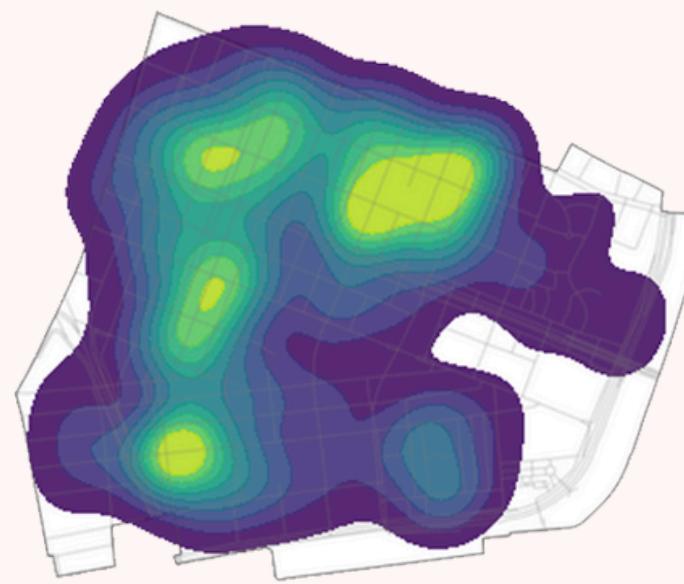
Banging/ pounding

Loud talking

Loud television

Residential Noise Complaint Spatial Distribution

Accumulated Complaints in the Manhattan Study Area



Loud music/party

Banging/ pounding

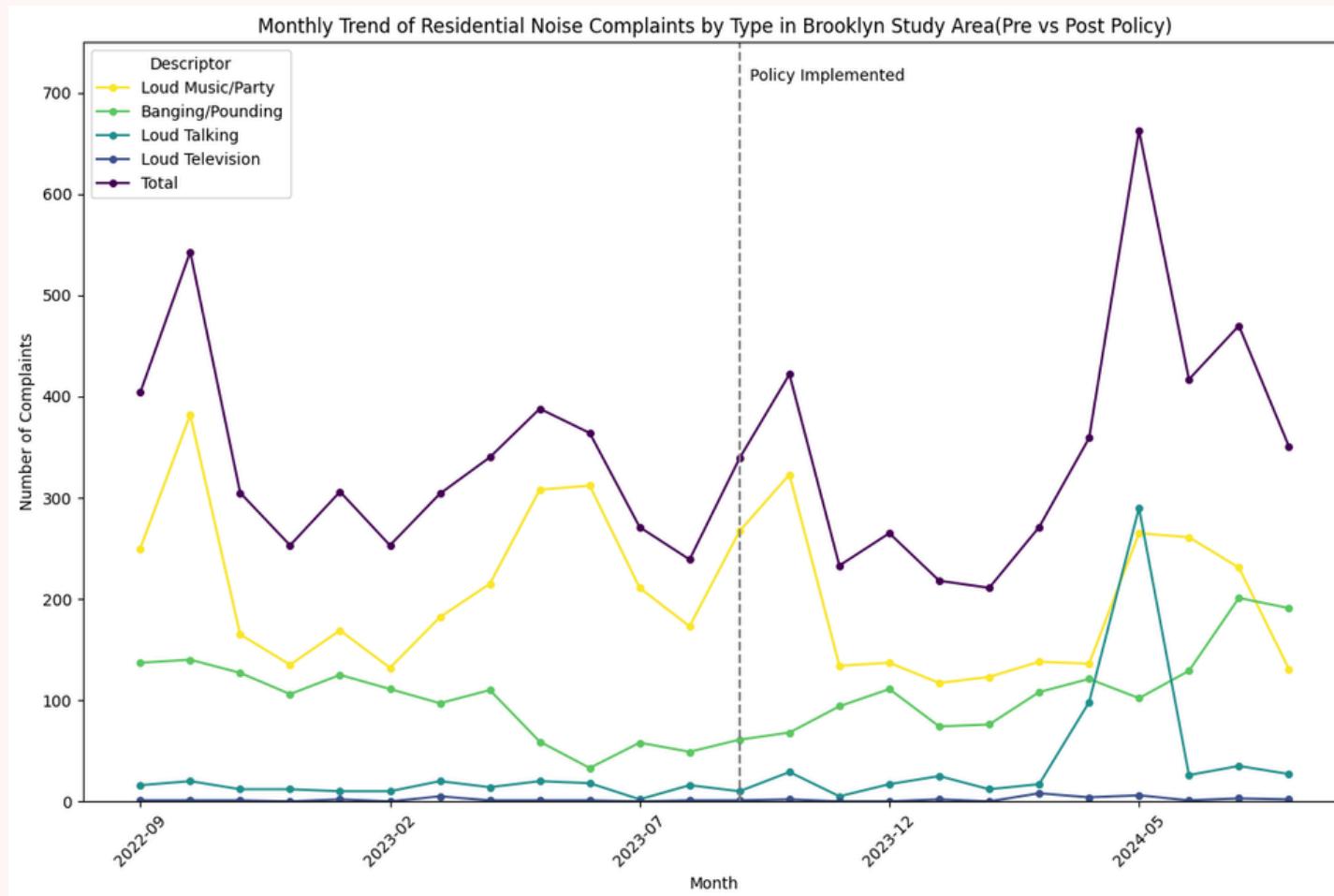
Loud talking

Loud television

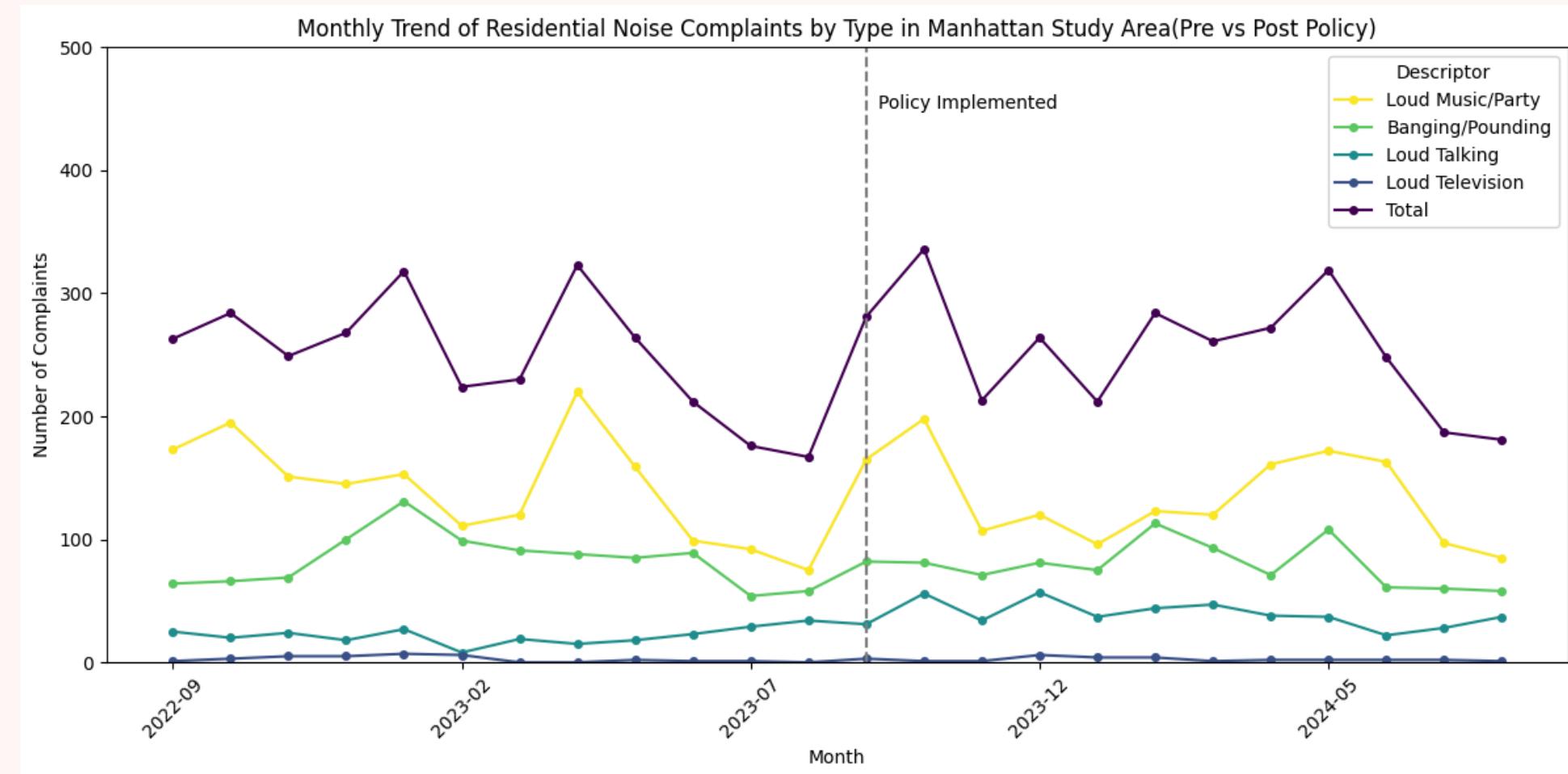
Residential Noise Complaint Monthly Trend

Pre-policy & Post-policy

Brooklyn Study Area



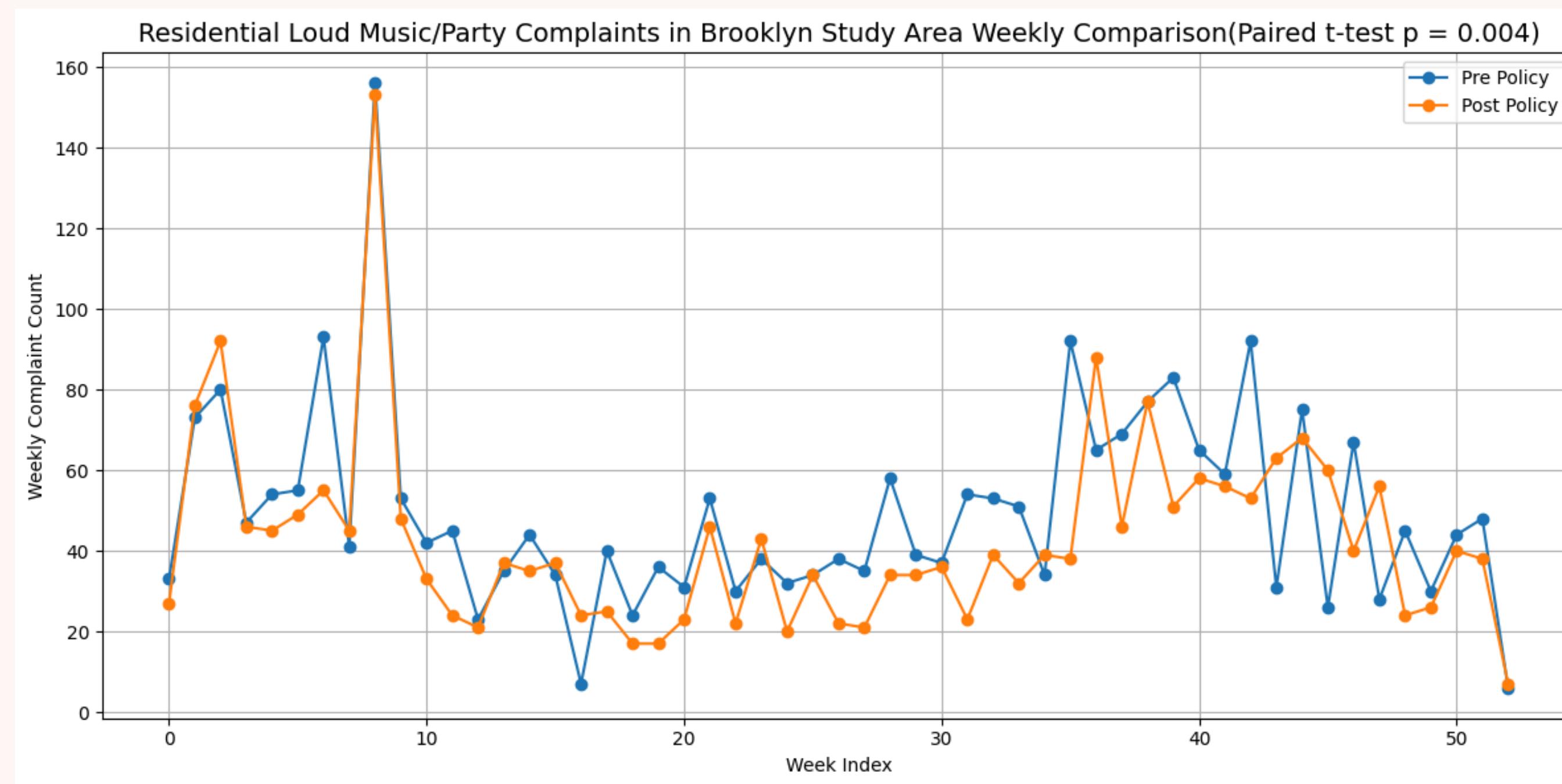
Manhattan Study Area



- Clear seasonal and cyclical patterns observed.
- Different peak times between the two study areas.
- Brooklyn study area: Loud music/party complaints dropped after the policy; others remained stable or increased.
- Manhattan study area: Changes were much less noticeable.

Loud Music/Party Noise Complaint Weekly Trend

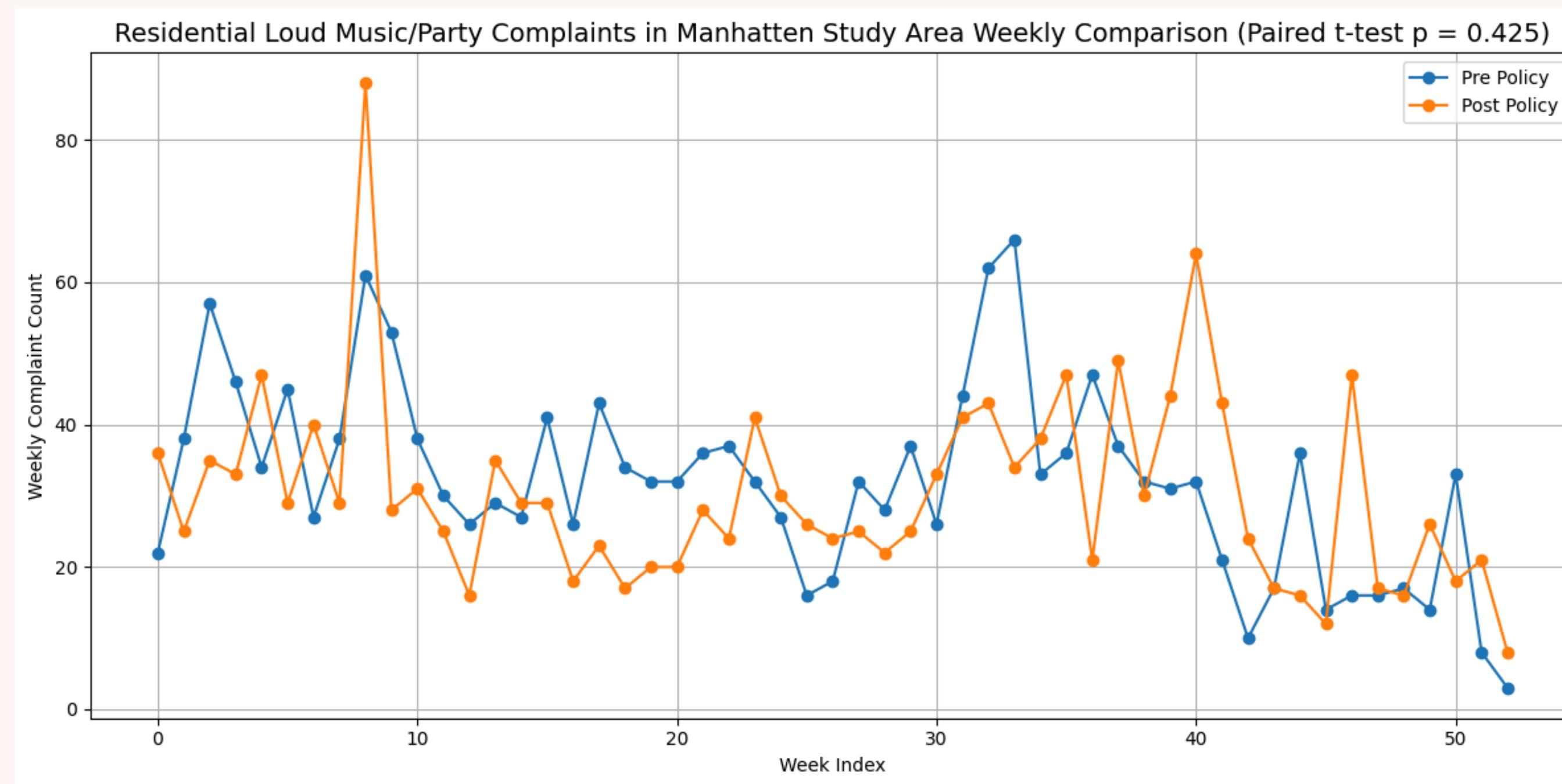
Pre-policy & Post-policy Paired T-test in the Brooklyn Study Area



- 54 observations for statistical testing.
- Brooklyn study area: significant reduction with 0.004 p-value.

Loud Music/Party Noise Complaint Weekly Trend

Pre-policy & Post-policy Paired T-test in the Manhattan Study Area

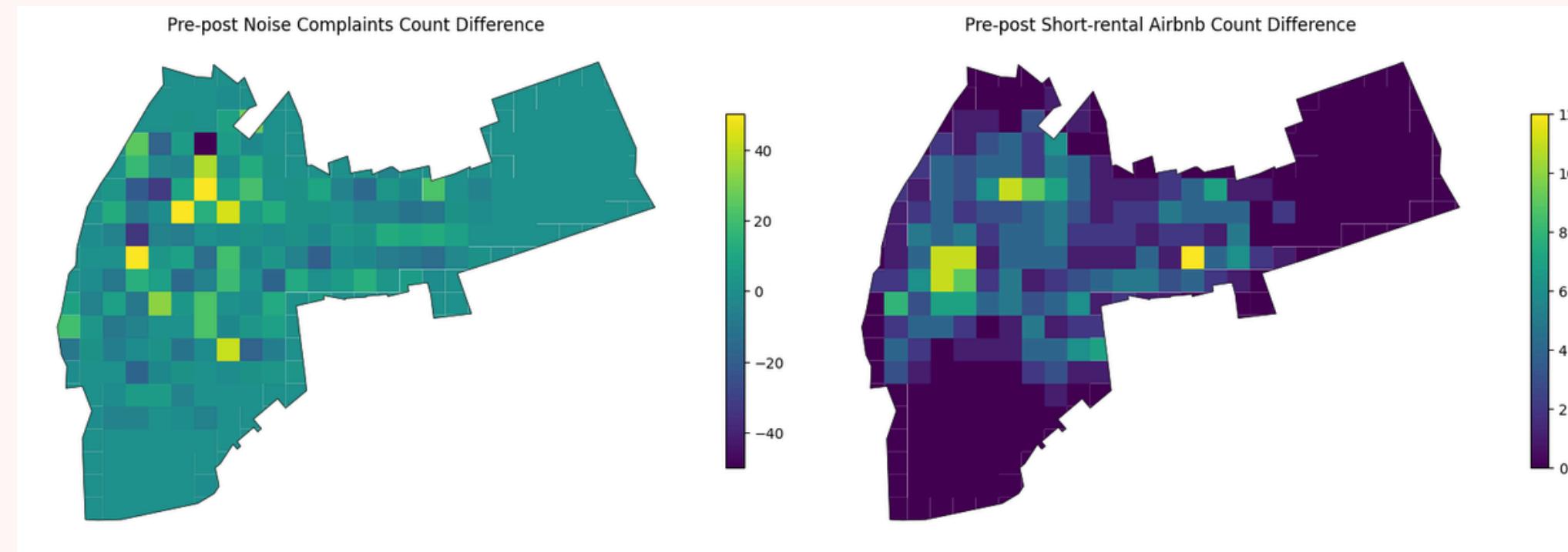
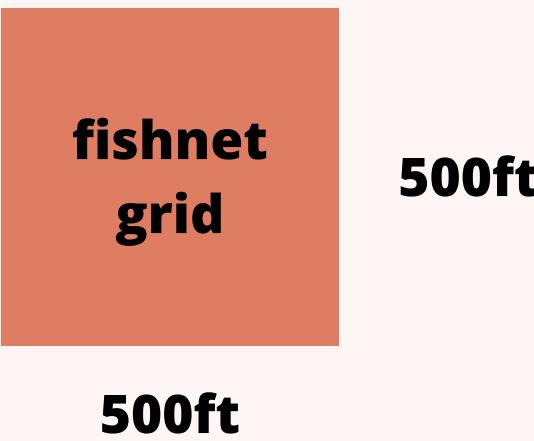


- 54 observations for statistical testing.
- Manhattan study area: no significant change with 0.425 p-value.

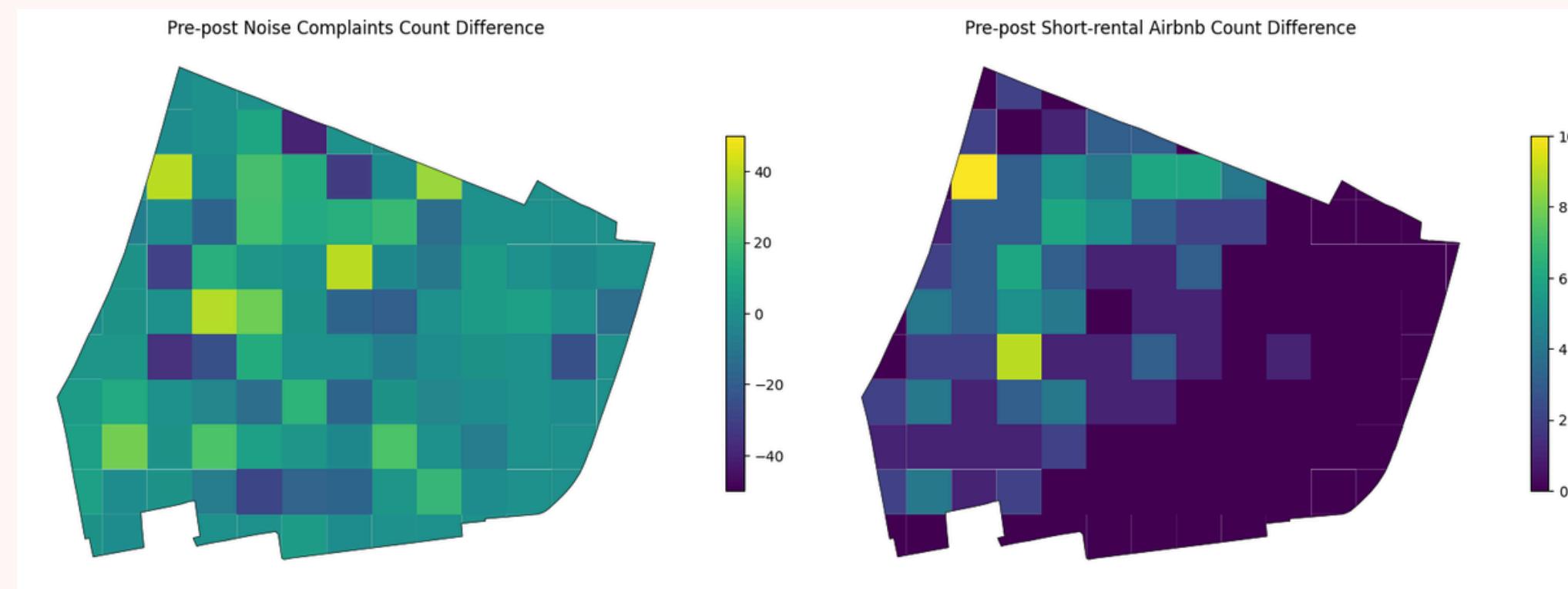
Grid-based Pearson Correlation Analysis

Pre-post Policy Changes in Short-rental Airbnb & Noise Complaints

Brooklyn Study Area



Manhattan Study Area



Grid-based Pearson Correlation Analysis

—How changes are distributed across space

Results of Pearson correlation analysis:

Brooklyn (ZIP code 11211 / Williamsburg area) $r = 0.223$

→ LL18 **may helped** reduce noise in certain high-impact zones

Manhattan (ZIP code 10002 /Chinatown) $r = 0.170$

→ short-term rentals **do not appear** to be a significant driver of noise complaint patterns

Conclusion

Brooklyn - Williamsburg



Manhattan - Lower East Side



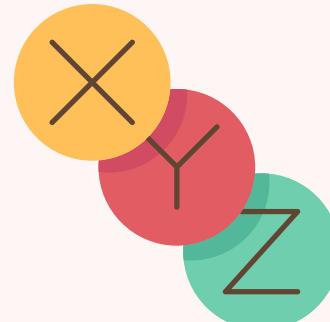
Our results show that noise complaints related to “Loud Music/Party” slightly decreased in **Williamsburg** after the implementation of policy, indicating that the regulation **may have helped reduce certain types of disturbances regarding noise**.

However, the correlation between Airbnb activity and noise complaints was **not strong** enough to conclude on the relevance, and the effects in Manhattan were less clear. These findings show that policies like LL18 may help improve the community conditions on noise level, but it might be influenced by many other factors, such as building types, different districts, etc.

Reflection & Next Step

Incorporate additional variables

Include socio demographic data such as income, housing type, nightlife density



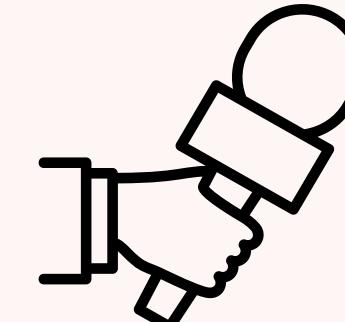
Expand the geographic scope

Apply our framework to additional neighborhoods beyond Williamsburg and Manhattan to see whether patterns work for the whole city.



Qualitative context

Enrich our findings with interviews or surveys of residents and hosts in key areas to validate patterns and gather insight into lived experiences



Interactive visualization

If time permits, we aim to build an interactive visualization dashboard to make our findings more accessible to policymakers and community stakeholders.



Thank You!



Urban Noise Lab