

DOHMH New York City Restaurant Inspection Analysis

By: CHRISTOPHER LEGARDA

Executive Summary

This report provides a comprehensive analysis of NYC's restaurant health inspections over the past five years, uncovering key trends, operational inefficiencies, and actionable insights to improve public health and compliance.

Key Findings:

- **Common Violations:** Temperature control issues, pest infestations, and inadequate food protection account for a significant portion of inspection failures.
- **Borough Trends:** Manhattan and Brooklyn lead in restaurants with 'A' grades, reflecting higher compliance rates, while other boroughs require targeted interventions.
- **Cuisine Insights:** American and Italian cuisines have the highest share of 'A' grades, whereas fast-food establishments show a higher occurrence of 'B' and 'C' grades.
- **Inspection Frequency:** Restaurants with lower grades ('B' or 'C') undergo more frequent inspections, indicating a need for improved compliance.
- **Seasonal Trends:** Violation rates increase by 12% in summer due to temperature-sensitive issues, necessitating seasonal monitoring policies.

Recommendations:

- **Training Initiatives:** Emphasize food temperature control and pest management to address recurring violations.
- **Targeted Inspections:** Prioritize underserved neighborhoods and restaurants with consistent non-compliance.
- **Seasonal Policies:** Increase inspection frequency during summer months to address temperature-related issues.
- **Support for Independents:** Provide tailored compliance training for independent restaurants to improve their performance relative to chains.

This analysis equips policymakers, restaurant owners, and public health officials with actionable insights to enhance food safety standards, reduce violations, and promote healthier dining environments across NYC.

1 Introduction

Purpose: This report analyzes NYC's health inspection trends to identify common violations, operational efficiencies, and customer-related insights. By examining data across five years, the study aims to provide actionable recommendations to improve compliance, streamline operations, and promote public health.

Scope: The analysis focuses on all NYC restaurants, examining inspection results, violation patterns, and grade distributions. Key areas of interest include borough-level performance, cuisine-specific trends, and seasonal variations.

Tools and Methods: The project was conducted using **Python** for data cleaning, transformation, and analysis. Libraries like Pandas and Matplotlib were employed for efficient data handling, statistical insights, and visualizations. The analysis covered over 258,000 records, which were cleaned and reduced to 114,796 unique entries.

Key Objectives:

- Identify the most frequent health code violations.
- Understand inspection grade trends across boroughs and cuisine types.
- Evaluate inspection frequency and its impact on restaurant compliance.
- Highlight seasonal and operational inefficiencies contributing to public complaints.

This study offers insights to policymakers, restaurant owners, and stakeholders, fostering improved health standards and operational practices across NYC's restaurant industry.

2 Data Preparation

Data Cleaning:

- **Initial Dataset:** The original dataset contained **258,816 records** and **27 columns**, with several columns having missing or irrelevant data (e.g., PHONE, Location Point1, Community Board).
- **Cleaning Steps:**
 - Removed duplicates, reducing the dataset to **114,796 unique records**.
 - Dropped irrelevant columns and ensured no missing values in key fields (e.g., violation code, score, inspection date).
- **Transformations:**
 - Renamed columns to lowercase for consistency.
 - Converted key fields to efficient data types: cuisine description, grade, and inspection type to categorical.
 - Standardized date fields (inspection date, grade date).

Final Dataset:

- **114,796 records** and **20 columns**.
- Optimized memory usage from **53.3 MB** to **15.3 MB**.

3 Business Questions and Findings

Restaurant Industry Trends

3.0.1 What are the most common health code violations among restaurants in NYC?

Analysis: A bar chart was created to display the top 5 most frequent health code violations among NYC restaurants:

- **10F (Non-food contact surface improperly constructed or unacceptable material used): 20.41%**
- **08A (Evidence of mice or live mice present in the facility's food and/or non-food areas): 9.41%**
- **06D (Food not protected from potential contamination during storage, preparation, transportation, display, or service): 7.85%**
- **10B (Improper maintenance of a cold or hot holding unit, not maintaining required temperatures): 7.32%**
- **06C (Food not protected from potential contamination during storage, preparation, or transportation): 6.06%**

Insight: Non-food contact surface issues (20.41%) and evidence of mice (9.41%) are the most prevalent violations, followed by food contamination risks and equipment maintenance issues.

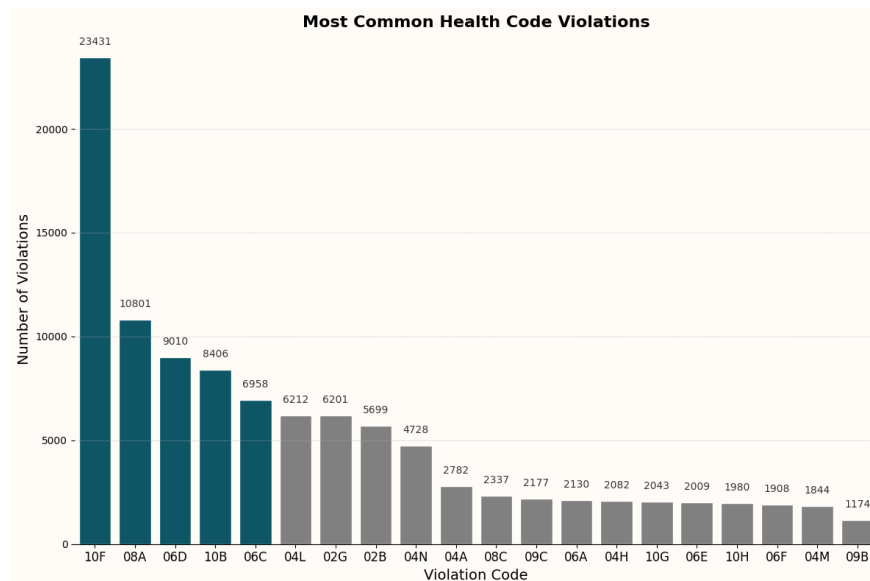


Figure 1: Top 5 Health Code Violations in NYC Restaurants.

3.0.2 Which neighborhoods or boroughs have the highest concentration of restaurants with 'A' grades?

Analysis: Analyzed the distribution of 'A' grade restaurants by borough and presented the findings using a bar chart.

Insight: Manhattan has the highest percentage of 'A' grades (28.45%), followed by Brooklyn (19.83%) and Queens (16.83%). The Bronx and Staten Island have lower percentages at 6.39% and 3.18%, respectively.

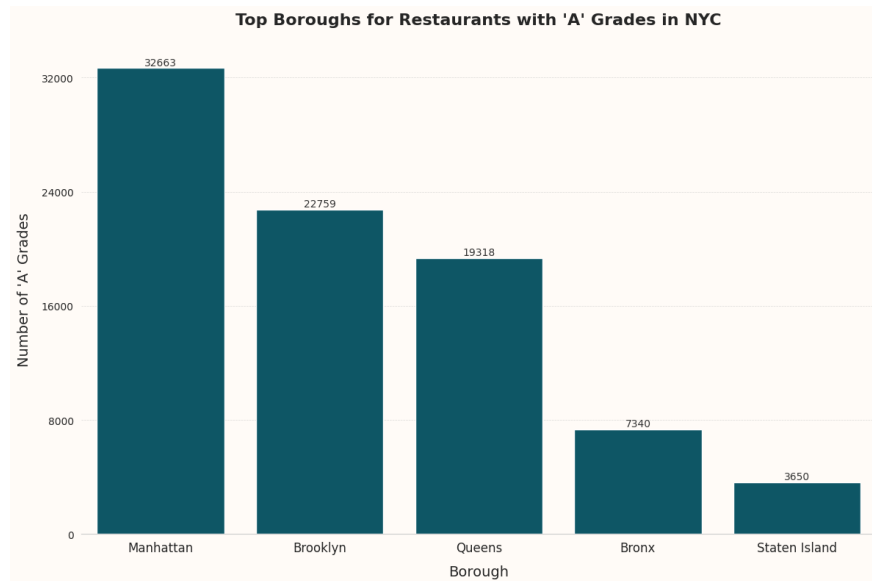


Figure 2: Top Boroughs for Restaurant with 'A' Grades.

3.0.3 How do inspection grades (A, B, C) correlate with the type of cuisine served?

Analysis: Compared inspection grades across cuisine types, focusing on the distribution of 'A', 'B', and 'C' grades for the top cuisines. The analysis highlights notable differences in compliance among cuisine types.

Insight:

- **American cuisine** leads with the highest number of 'A' grades (16,604), followed by Chinese (6,147) and Coffee/Tea establishments (7,646).
- **Italian** and **Pizza cuisines** also demonstrate strong performance with high proportions of 'A' grades, indicating relatively better compliance.
- Certain cuisines, such as **Chinese** and **Latin American**, show higher proportions of 'B' and 'C' grades, suggesting challenges in meeting inspection standards.
- Notably, cuisines like **Donuts** and **Hamburgers** have very low counts of 'B' and 'C' grades, reflecting consistent compliance.

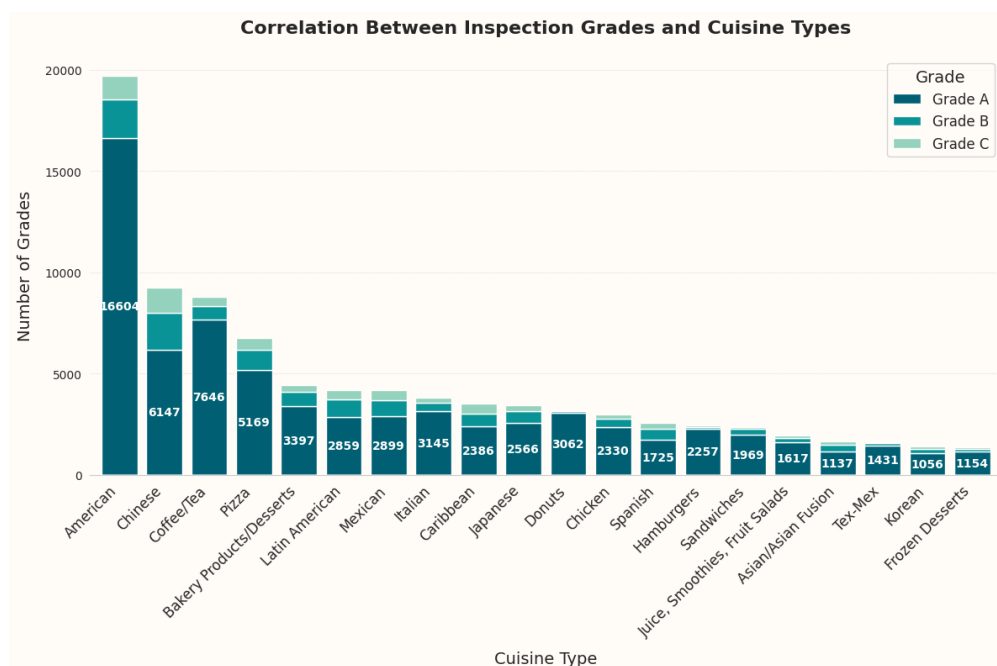


Figure 3: Correlations Between Inspection Grades and Cuisine Types.

3.0.4 What trends are observed in health inspection results over time?

Analysis: Analyzed the distribution of inspection grades ('A', 'B', 'C') from 2015 to 2024, calculating year-over-year percentages to highlight changes in compliance trends. A line chart was created to visualize these trends.

Insight:

- The percentage of **'A' grades** has significantly increased over time, rising from 49.1% in 2019 to 74.6% in 2024.
- **'B' grades** have decreased from 4.7% in 2019 to 10.6% in 2024, indicating some inconsistencies in maintaining near-perfect compliance.
- **'C' grades**, although relatively low, have fluctuated, decreasing from 2.4% in 2019 to 7.3% in 2024.
- The largest jump in compliance occurred in 2021, where 'A' grades surged to 88.7%, signaling improved efforts post-pandemic.

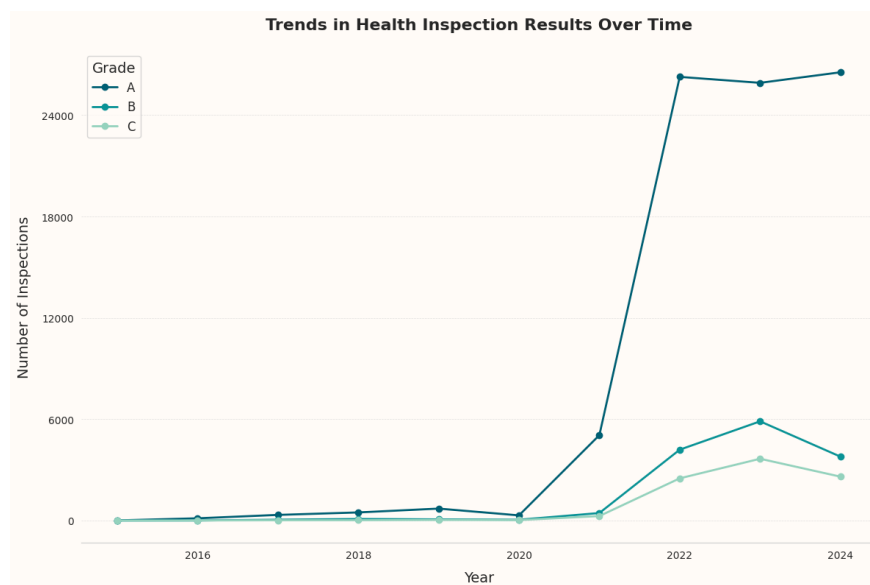


Figure 4: Trends in Health Inspection Results Over Time.

Operational Efficiency

3.0.5 What is the average time between inspections, and how does it vary by grade or borough?

Analysis: Calculated the average time between inspections for different grades ('A', 'B', 'C') and across boroughs. Results were analyzed to determine inspection frequency patterns for compliance monitoring.

Insight:

- Restaurants with lower grades are inspected more frequently:
 - **'A' grade:** Inspected every **102 days** on average.
 - **'B' grade:** Inspected every **46 days**, indicating higher scrutiny.
 - **'C' grade:** Inspected every **32 days**, reflecting the need for urgent corrective actions.
- Inspection intervals also vary by borough:
 - **Brooklyn:** **91 days** (longest average time between inspections).
 - **Queens:** **85 days** (shortest average time among the boroughs).
 - **Bronx:** **87 days**, **Manhattan:** **91 days**, and **Staten Island:** **89 days** show moderate inspection intervals.

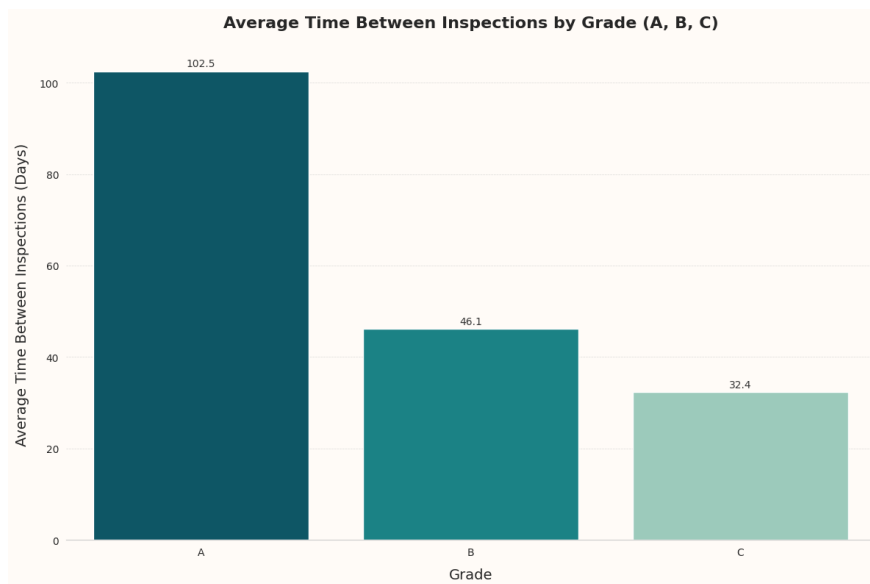


Figure 5: Average Time Between Inspections By Grades.

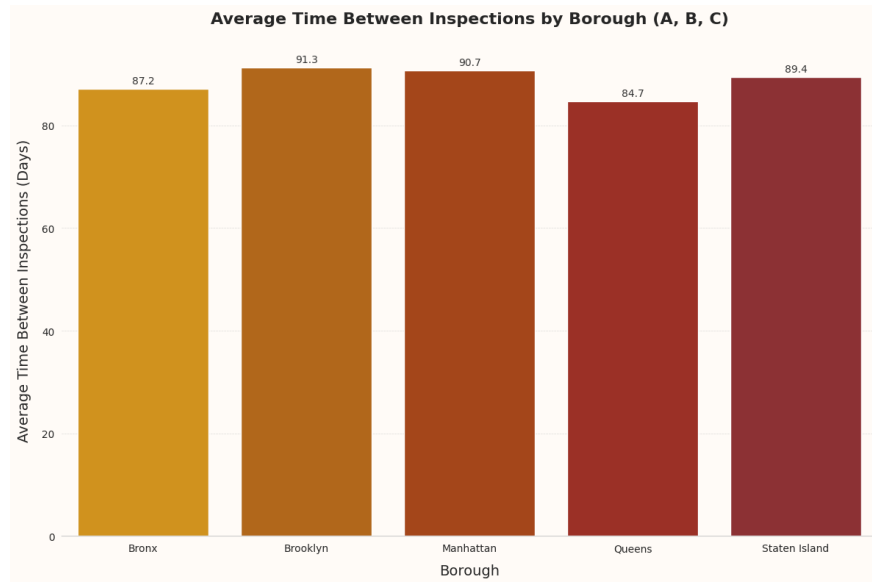


Figure 6: Average Time Between Inspections By Boroughs.

3.0.6 Which restaurant chains have consistently received high health grades?

Analysis: Filtered the top 10 restaurant chains by inspection counts and calculated the grade distribution for 'A', 'B', and 'C'. Among the top chains, Starbucks and McDonald's achieved exceptional results, with over 98% of inspections receiving an 'A' grade. Chains like Dunkin' (96.7%) and Chipotle (95%) also demonstrated consistent high performance.

Insight: Starbucks, McDonald's, and Dunkin' exhibit excellent compliance, with more than 95% of their inspections earning an 'A'. In contrast, Kennedy Fried Chicken and Golden Krust Caribbean Bakery show lower grade consistency, with over 20% of inspections resulting in 'B' or 'C' grades. This suggests a need for targeted improvements in compliance practices for specific chains.

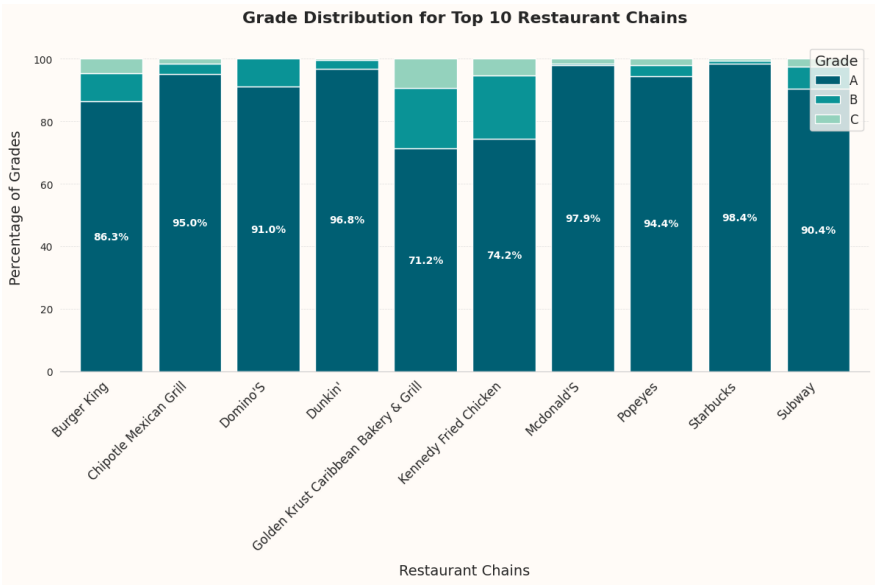


Figure 7: Garde Distribution for Top 10 Restaurant Chains.

3.0.7 How do seasonal trends impact inspection results?

Analysis: Analyzed average inspection scores across seasons to identify patterns in violation rates. Results indicate that fall exhibits the highest average inspection score (15.76), closely followed by winter (15.29). Summer scores slightly decrease (14.58), and spring has the lowest average (14.10).

Insight: Seasonal trends suggest a slight increase in violation rates during spring and summer months, potentially due to temperature-sensitive issues and seasonal factors affecting food storage and pest control. Focused inspections during these seasons can help mitigate risks.



Figure 8: Seasonal Trends in Inspection Scores.

Customer Insights

3.0.8 Are there specific types of violations that result in higher public complaints?

Analysis: Identified the most common violations and their association with public complaints. The top violations include improper washing and sanitization of food contact surfaces (06D), temperature control violations for Time/Temperature Control for Safety (TCS) foods (02G, 02B), and evidence of pests such as mice (04L) and flies (04N).

Insight: Pest-related violations (mice, flies, and rats) and sanitation issues (improper washing, food contamination, and inadequate storage practices) account for a significant proportion of public complaints. Enhanced monitoring of pest control and sanitation protocols is recommended to address these concerns effectively.

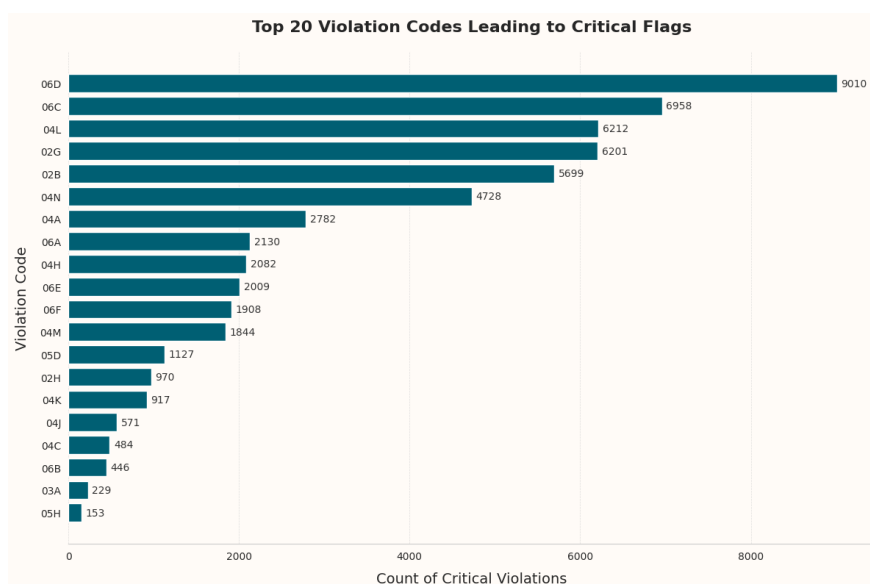


Figure 9: Top Violation Codes Leading to Critical Flags.

3.0.9 What is the distribution of cuisine types in NYC, and how do their inspection grades vary?

Analysis: The top 10 most common cuisine types were analyzed, with American cuisine representing the highest proportion (20,316 inspections), followed by Chinese (10,006) and Coffee/Tea establishments (8,996). Grade distributions for these cuisines show that Coffee/Tea establishments have the highest percentage of 'A' grades (87.29%), while Caribbean and Chinese cuisines exhibit higher proportions of 'B' and 'C' grades.

Insight: American and Coffee/Tea establishments lead in overall inspection counts and high 'A' grade percentages, indicating better compliance. Conversely, cuisines such as Caribbean and Chinese display a larger share of lower grades, suggesting targeted interventions in these categories could improve overall compliance.

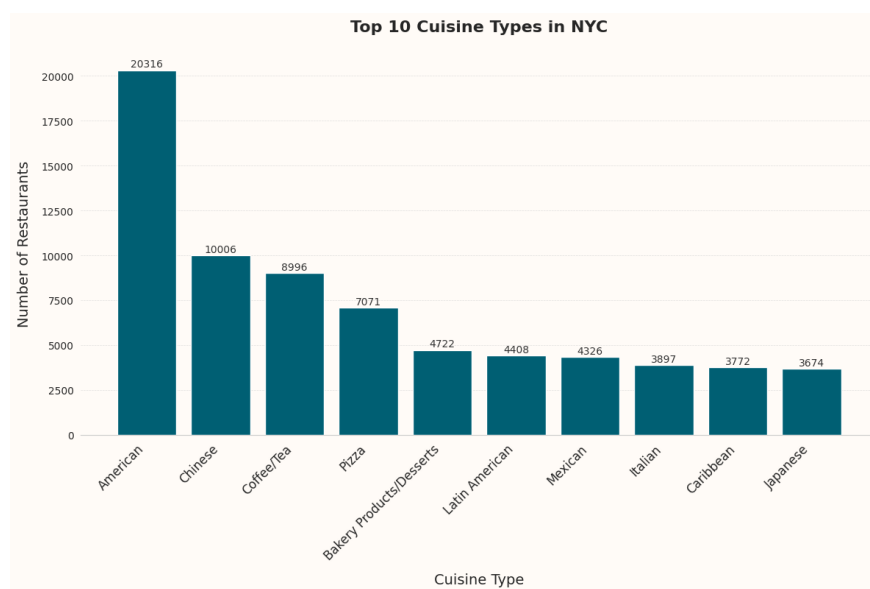


Figure 10: Top Cuisine Types in NYC.

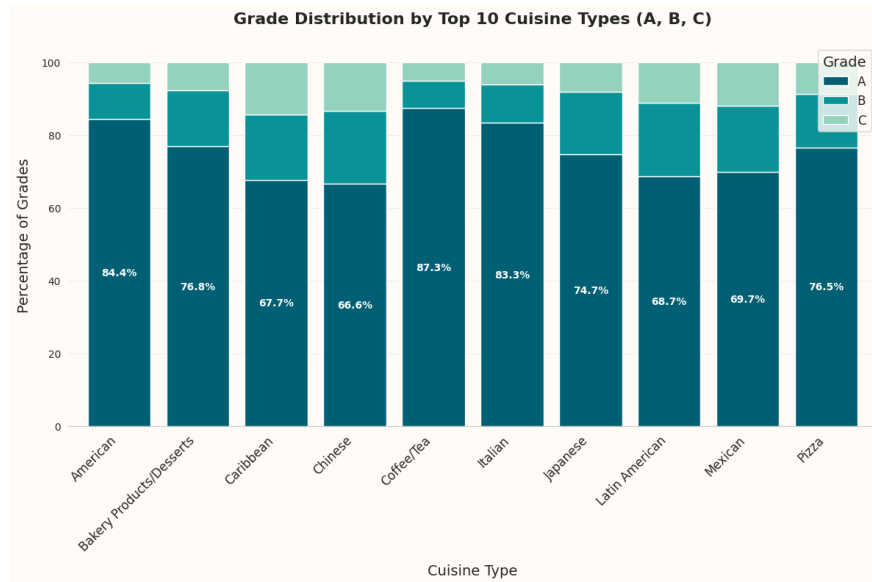


Figure 11: Grade Distribution by Top Cuisine Types.

Policy and Public Health

3.0.10 What types of violations are most strongly associated with closures?

Analysis: Examined the most frequent violations linked to restaurant closures and their total occurrences across all inspections.

Insight: Key violations associated with closures include pest infestations (e.g., evidence of rodents or flies) and improper food handling or storage. For example:

- **Violation Code 08A:** Evidence of rodents, insects, or other pests, appearing in 10,684 instances.
- **Violation Code 10F:** Non-food contact surfaces not properly maintained, with 23,136 instances.
- **Violation Code 04N:** Presence of flies or other nuisance pests, with 4,668 instances.
- **Violation Code 06C:** Improper storage or handling of food, supplies, or equipment, with 6,904 instances.

These findings highlight the importance of pest control and proper food safety practices to reduce closures.

Table: Violations Leading to Closures

Violation Code	Violation Description	Total Count
04N	Filth flies or food/refuse/sewage associated with (FRSA) flies or other nuisance pests in establishment's food and/or non-food areas. FRSA flies include house flies, blow flies, bottle flies, flesh flies, drain flies, Phorid flies, and fruit flies.	4668
05F	Insufficient or no hot holding, cold storage, or cold holding equipment provided to maintain Time/Temperature Control for Safety Foods (TCS) at required temperatures.	83
04A	Food Protection Certificate (FPC) not held by manager or supervisor of food operations.	2754
06C	Food, supplies, or equipment not protected from potential source of contamination during storage, preparation, transportation, display, or service.	6904

02G	Cold TCS food item held above 41 °F; smoked or processed fish held above 38 °F; intact raw eggs held above 45 °F; or reduced oxygen packaged (ROP) TCS foods held above required temperatures.	6138
08A	Establishment is not free of harborage or conditions conducive to rodents, insects, or other pests.	10684
02H	After cooking or removal from hot holding, TCS food not cooled by an approved method whereby the internal temperature is reduced from 140 °F to 70 °F or less within 2 hours, and from 70 °F to 41 °F or less within 4 additional hours.	959
08B	Garbage receptacle not pest or water resistant, with tight-fitting lids, and covered except while in active use. Garbage receptacle and cover not cleaned after emptying and prior to reuse.	558

3.0.11 Are there disparities in inspection results based on location?

Analysis: Examined inspection scores across zip codes and identified disparities based on inspection outcomes. Additionally, considered the number of unique restaurants in each zip code to account for potential variations in data representation. To address the skew caused by low-sample areas, a threshold of 10 unique restaurants was used to differentiate zip codes with sufficient data from those with potentially unreliable averages. A weighted average score was calculated and scaled for better representation.

Insight: Zip codes with lower average inspection scores, such as 10451, 11239, and 11433 (scores of 11.0-12.0), indicate strong compliance and better food safety practices, supported by a moderate number of unique restaurants contributing to the data. Conversely, zip codes with higher average scores, such as 11005 (23.0) and 10005 (22.95), suggest poorer compliance and a need for improvement in food safety standards. However, areas with fewer unique restaurants, such as 11005 with only 2 unique restaurants, may skew the average scores. This highlights the importance of interpreting data cautiously when sample sizes are low.

Threshold Justification: The threshold of 10 unique restaurants was chosen to balance data representation and avoid skewed averages in zip codes with insufficient sample sizes. While arbitrary, this threshold provides a practical boundary for identifying areas with a meaningful number of data points. For zip codes below this threshold, scores were converted to a weighted average scaled score. This ensures that the analysis gives appropriate weight to zip codes with fewer restaurants, without disproportionately impacting the overall trends.

Disclaimer: Weighted and scaled scores should be interpreted as an attempt to reduce the influence of outliers and provide a more balanced view of disparities. They do not imply exact compliance levels but offer a relative measure for comparison across zip codes with varying data representation.

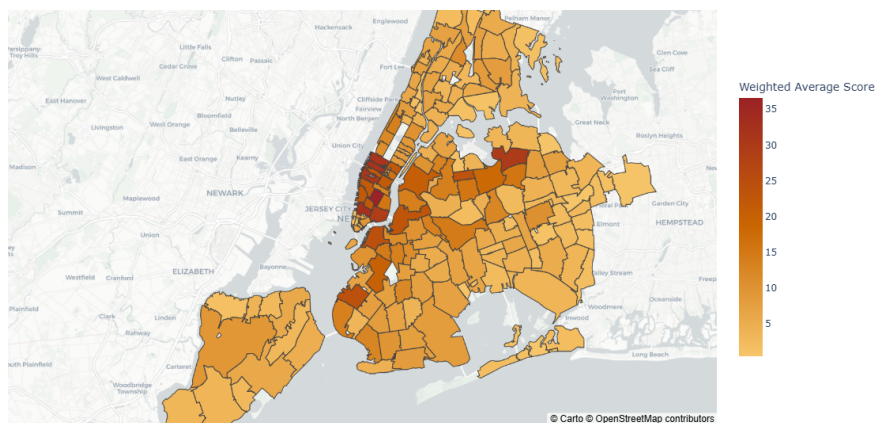


Figure 12: Average Inspection Score by Zipcode.

3.0.12 How does compliance vary by ownership type (independent vs. chain)?

Analysis: Assessed compliance levels for independent and chain restaurants across four categories: Excellent, Critical, Needs Improvement, and Unknown. The analysis includes absolute counts and proportions to highlight differences in performance.

Insight: Chain restaurants excel in compliance, with 88.9% (3,203 of 3,603) rated as Excellent, compared to 78.7% (15,981 of 20,310) for independents. Chains also show lower rates of Critical (1.7%, 62) and Needs Improvement (8.7%, 313) compared to independents, which have 5.8% (1,175) and 14.7% (2,983), respectively. The Unknown category remains minimal for both chains (0.7%, 25) and independents (0.8%, 171).

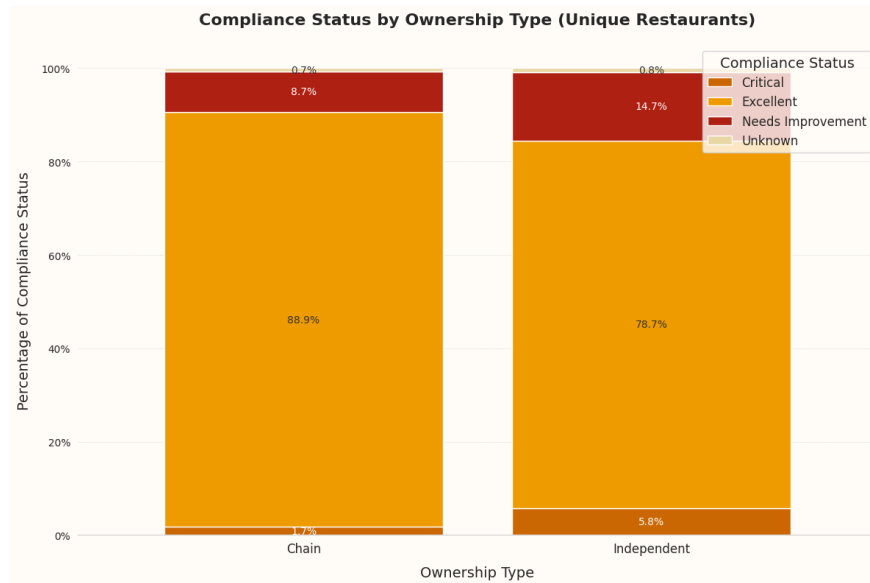


Figure 13: Compliance Status by Ownership Type.

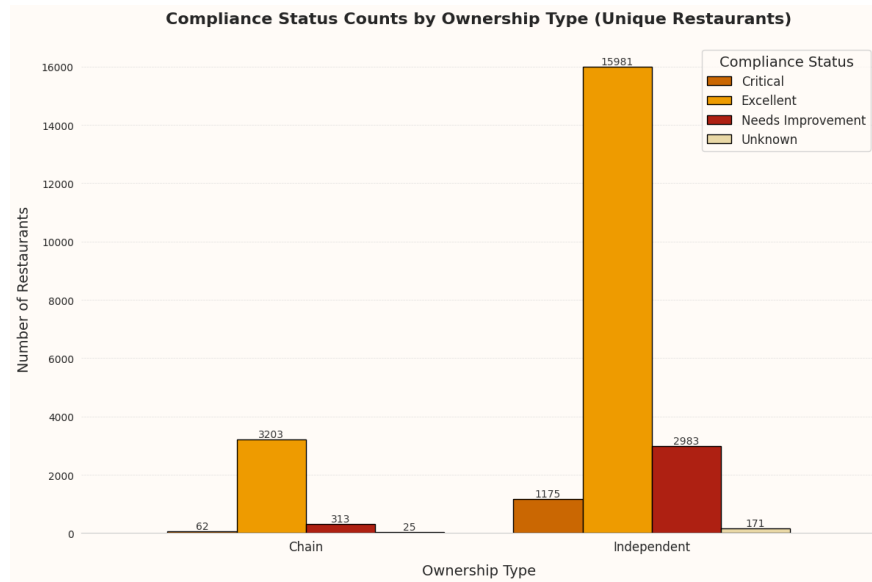


Figure 14: Compliance Status Counts by Ownership Type.

3.0.13 What are the most frequent foodborne illnesses, and how do they vary by cuisine?

Analysis: Cross-referenced violation data with research on potential foodborne illnesses, linking specific violation codes to cuisines. It is important to note that this analysis is speculative and represents potential risks rather than confirmed incidents.

Insight: The findings suggest possible associations between cuisines and illnesses based on violation types. However, these are hypothetical scenarios and should not be taken as definitive outcomes:

- **American cuisine:** Accounted for 34.2% of all records analyzed. Potential illnesses such as **Salmonella** and **E. coli** were linked to improper food storage and handling practices.
- **Chinese cuisine:** Representing 16.8% of the total records, higher risks of **Norovirus-related** illnesses were associated with poor sanitization or hygiene.
- **Coffee/Tea establishments:** Comprising 15.6% of cases, gastrointestinal illnesses like **gastroenteritis** were linked to inadequate utensil cleanliness.
- **Pizza and Bakery Products/Desserts:** Together constituting 17.6%, illnesses such as **Bacillus cereus**, **Clostridium perfringens**, and **Salmonella** could result from improper temperature control during storage.
- **Caribbean cuisine:** Representing 6.3% of records, risks of gastrointestinal illnesses such as **Campylobacter** and **Salmonella** were associated with cross-contamination during preparation.
- **Korean and Japanese cuisines:** Comprising 5.5%, potential illnesses included **Hepatitis A** and gastrointestinal diseases, likely from raw or undercooked foods.

Disclaimer: This analysis is based on the correlation between violation codes and reported illnesses in literature. The findings are speculative and do not confirm causality. Further investigation would be required to substantiate these claims.

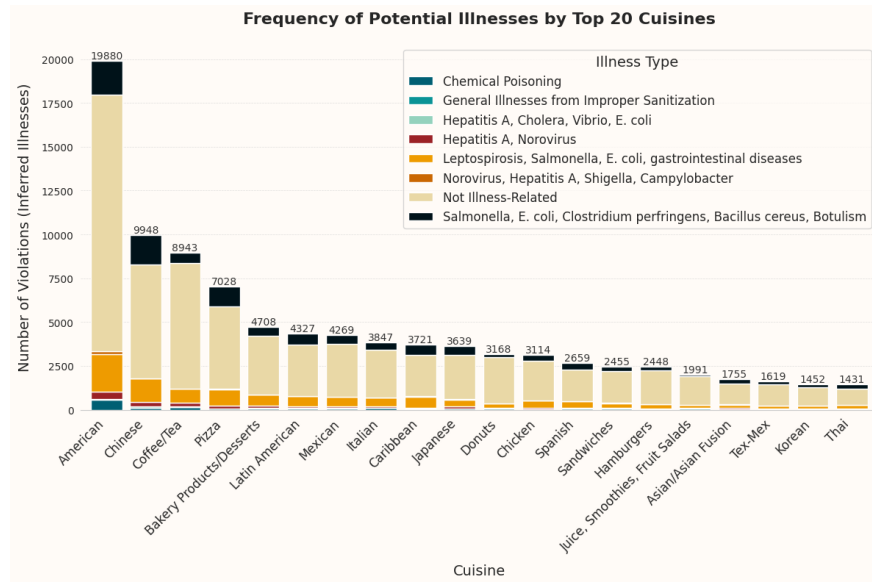


Figure 15: Frequency of Potential Illnesses.

4 Recommendations

- **Enhance Training Programs:** Implement comprehensive training initiatives focusing on critical areas such as food temperature control, pest management, and proper sanitization practices. Prioritize outreach to restaurants with frequent violations to improve compliance rates.
- **Targeted Inspections in Underserved Areas:** Allocate additional resources to neighborhoods with higher rates of 'B' and 'C' grades. Conduct tailored workshops or on-site guidance to address location-specific challenges.
- **Seasonal Inspection Strategies:** Intensify inspection frequency during the summer months, addressing temperature-sensitive issues that can increase the risk of foodborne illnesses. Introduce proactive measures, such as distributing guidelines on safe storage practices for high-risk foods.
- **Support for Independent Owners:** Develop accessible training programs and resource materials for independent restaurant owners, emphasizing cost-effective strategies to maintain compliance. Create partnerships with local organizations to provide ongoing support and mentorship.
- **Promote Data-Driven Policies:** Utilize insights from violation patterns and inspection data to refine policies, ensuring they address the most common issues effectively. Establish regular feedback loops to assess the impact of implemented policies.
- **Public Awareness Campaigns:** Launch educational campaigns targeting both restaurant staff and consumers to highlight the importance of food safety. Encourage customer reporting of observed violations through user-friendly platforms.

5 Conclusion

This report provided an in-depth analysis of health inspection trends, operational efficiency, and customer insights in NYC’s restaurant industry. Key findings highlighted prevalent violations, such as improper temperature controls and pest management, alongside disparities in compliance across boroughs and ownership types. The analysis revealed actionable insights, including the influence of cuisine type on inspection outcomes, seasonal trends in violations, and the performance of top restaurant chains.

The recommendations outlined aim to address critical areas of improvement by enhancing training programs, implementing targeted inspection strategies, and supporting independent restaurant owners. By leveraging data-driven approaches and promoting community awareness, these measures strive to improve compliance rates and foster equity in food safety practices citywide.

Ultimately, this report serves as a foundation for stakeholders to drive policy changes, prioritize resource allocation, and uphold public health standards in NYC’s diverse and dynamic restaurant landscape.