NLP Assignment #1 - Luke Schwenke

Note: records counts will be different, depending on when you query the API

In [ ]:
```python
import pandas as pd
import requests
```

In [ ]:
```python
%%time

# Define the API endpoint and parameters
url = "https://data.cityofchicago.org/resource/cwig-ma7x.json"

# Fetch the total count of records
def get_total_count(url):
    params = {
        "$select": "count(*)"
    }
    response = requests.get(url, params=params)
    data = response.json()
    return int(data[0]['count'])

total_count = get_total_count(url)
print(f"Total number of records available: {total_count:,.0f}")
```

```
Total number of records available: 265,518
CPU times: user 19.2 ms, sys: 4.95 ms, total: 24.1 ms
Wall time: 834 ms
```

In [ ]:
```python
%%time

# Fetch data and load it into a pandas DataFrame
def fetch_data(url, params):
    response = requests.get(url, params=params)
    data = response.json()
    return pd.DataFrame(data)

# Set the limit parameter equal to the number of available records
params = {
    "$limit": total_count
}

# Fetch the data and load it into a DataFrame
df = fetch_data(url, params)

print(f'Number of records retrieved: {df.shape[0]:,.0f}')
```

```
Number of records retrieved: 265,518
CPU times: user 5.22 s, sys: 918 ms, total: 6.14 s
Wall time: 25.5 s
```

In [ ]:
```
df.head(5)
```

Out[ ]:

	inspection_id	dba_name	aka_name	license_	facility_type	risk	address	city
0	2587625	TAQUERIA EL ARCO #3 EL POLLO FELIZ, INC.	EL POLLO CRIS CRIS #3	1964458	Restaurant	Risk 1 (High)	7023-7025 S PULASKI RD	CHICAGO
1	2587571	ST BERNARD HOSPITAL & HEALTH CENTER	ST BERNARD HOSPITAL & HEALTH CENTER	2204276	Hospital	Risk 1 (High)	326 W 64TH ST	CHICAGO
2	2587633	TACOS MARIO'S LIMITED	TACOS MARIO'S LIMITED	1447643	Restaurant	Risk 1 (High)	4540 W 63RD ST	CHICAGO
3	2587634	TWISTED SPOKE	TWISTED SPOKE	37844	Restaurant	Risk 1 (High)	501 N OGDEN AVE	CHICAGO
4	2587597	LET'S EAT TO LIVE	LET'S EAT TO LIVE	2863029	Restaurant	Risk 1 (High)	619-621 E 67th ST	CHICAGO

5 rows × 22 columns

1. Select only the records corresponding to failed inspection (see "results" column)

In [ ]:
```
# Examine the unique results values
list(df.results.unique())
```

Out[ ]:
```
['Out of Business',
 'Pass',
 'No Entry',
 'Fail',
 'Pass w/ Conditions',
 'Not Ready',
 'Business Not Located']
```

In [ ]:
```
# Filter the results column to where the results are "Fails"
df_f = df[df.results=='Fail']
print("There are now", df_f.shape[0], "rows in the dataset after we subset t
```

```
There are now 51801 rows in the dataset after we subset to only Fail result
s. There were 265518 rows.
```

2. Clean the data, making sure that there are no NaNs in "violations" column

In [ ]:
```
df_c = df_f.dropna(subset=['violations'])
df_c = df_c.reset_index(drop=True)
print("There are now", df_c.shape[0], "rows in the dataset after removing Na
```

```
There are now 48381 rows in the dataset after removing NaN's from violations
```

3. "Violations" column lists the reasons for inspection failure. Those reasons are separated by "|". Each reason consists of a regulation code, regulation description, and comments describing how the regulation was violated.

4. Using regular expression, parse "violations" column to select only regulation descriptions, no code or comments

In [ ]:
```
# Examine a subset of the violations
for i in list(range(3)):
    print("\n")
    print(df_c.violations[i])
```

```
2. CITY OF CHICAGO FOOD SERVICE SANITATION CERTIFICATE - Comments: NO CERTIF
IED FOOD MANAGER WAS PRESENT WHILE TCS FOODS (BEANS AT 141F) WERE BEING PREP
ARED AND SERVED.  MANAGEMENT INSTRUCTED THAT A CERTIFIED FOOD MANAGER MUST B
E PRESENT AT ALL TIMES WHILE TCS FOODS PREPARED AND SERVED.  PRIORITY FOUNDA
TION VIOLATION 7-38-012.  CITATION ISSUED. | 23. PROPER DATE MARKING AND DIS
POSITION - Comments: OBSERVED EXPIRED READY-TO-EAT TCS FOODS IN THE WALK-IN 
COOLER (SALSA AND PORK) REFRIGERATED OVER 24 HOURS AND STORED BEYOND THE MAX
IMUM 7-DAY USE-BY DATE.  MANAGEMENT INSTRUCTED TO DATE MARK ALL APPLICABLE R
EADY-TO-EAT TCS FOODS REFRIGERATED FOR MORE THAN 24 HOURS AND DISCARD THEM O
R CONSUME THEM BEFORE THE USE-BY DATE.  PRIORITY VIOLATION 7-38-005.  CITATI
ON ISSUED. | 49. NON-FOOD/FOOD CONTACT SURFACES CLEAN - Comments: CLEAN THE 
TOP AND SIDES OF THE LOW-TEMPERATURE DISH MACHINE, THE INTERIOR AND EXTERIOR
OF THE DEEP FRYERS, AND THE INTERIOR PLASTIC GUARD INSIDE OF THE ICE MACHIN
```

```
E. | 52. SEWAGE & WASTE WATER PROPERLY DISPOSED - Comments: OBSERVED IMPROPE
R PLUMBING AND SEWAGE WATER POURING OUT OF THE BROKEN DRAIN LINE BENEATH THE
3-COMPARTMENT SINK AND LOW-TEMPERATURE DISH MACHINE.  MANAGEMENT INSTRUCTED
TO REPAIR THE DRAIN LINE SO DISHES COULD BE WASHED, RINSED AND SANITIZED.  P
RIORITY VIOLATION 7-38-030(C).  CITATION ISSUED. | 53. TOILET FACILITIES: PR
OPERLY CONSTRUCTED, SUPPLIED, & CLEANED - Comments: OBSERVED NO COVERED WAST
E RECEPTACLE IN THE WOMEN'S WASHROOM.  MANAGEMENT INSTRUCTED TO PROVIDE. | 5
6. ADEQUATE VENTILATION & LIGHTING; DESIGNATED AREAS USED - Comments: MUST E
XTEND THE VENTILATION LINE FROM THE SMOKER TO REACH UNDER THE VENTILATION HO
OD. | 57. ALL FOOD EMPLOYEES HAVE FOOD HANDLER TRAINING - Comments: OBSERVED
SEVERAL FOOD HANDLING EMPLOYEES WITHOUT A FOOD HANDLER CERTIFICATE.  MANAGEM
ENT INSTRUCTED THAT ALL FOOD HANDLING EMPLOYEES MUST SHOW PROOF OF TRAINING.
| 60. PREVIOUS CORE VIOLATION CORRECTED - Comments: PREVIOUS CORE VIOLATIONS
FROM REPORT #2578345 ON 7/7/23 NOT CORRECTED:  54 - OBSERVED BUILD-UP OF GRE
ASE ON THE EXTERIOR OF A USED COOKING OIL CONTAINER LOCATED IN THE OUTDOOR G
ARBAGE AREA. INSTRUCTED TO CLEAN AND MAINTAIN IN GOOD CONDITION.  58 - OBSER
VED NO ALLERGEN TRAINING CERTIFICATES ON SITE AT THE INSPECTION. INSTRUCTED
ALL EMPLOYEES HOLDING CITY OF CHICAGO FOODSERVICE MANAGER CERTIFICATES TO CO
MPLETE ALLERGEN TRAINING AND MAINTAIN RECORDS THEREOF ON SITE AT ALL TIMES.
PRIORITY FOUNDATION VIOLATION 7-42-090. CITATION ISSUED.


3. MANAGEMENT, FOOD EMPLOYEE AND CONDITIONAL EMPLOYEE; KNOWLEDGE, RESPONSIBI
LITIES AND REPORTING - Comments: NO EMPLOYEE HEALTH POLICIES ON SITE. MANAGE
R STATES THEY ARE IN PERSONEL FILES BUT DID NOT PROVIDE HEALTH POLICIES TO S
ANITARIAN AT TIME OF INSPECTION. INSTRUCTED MANAGER TO HAVE HEALTH POLICIES
AVAILABLE FOR REVIEW AT ALL TIMES.  PRIORITY FOUNDATION 7-38-010 CITATION IS
SUED  | 5. PROCEDURES FOR RESPONDING TO VOMITING AND DIARRHEAL EVENTS - Comm
ents: NO VOMIT/DIARRHEA CLEAN UP KIT OR POLICY ON SITE. KIT OR POLICY WAS NO
T PROVIDED TO SANITARIAN AT TIME OF INSPECTION. INSTRUCTED TO HAVE VOMIT/DIA
RRHEA CLEAN UP KIT ON SITE AND AVAILABLE AT ALL TIMES.  PRIORITY FOUNDATION
7-38-005 CITATION ISSUED   | 16. FOOD-CONTACT SURFACES: CLEANED & SANITIZED
- Comments: FOUND INTERIOR OF ICE MACHINE WITH BROWN AND PINK SUBSTANCE AT I
CE CHUTE.  INSTRUCTED MANAGER TO REMOVE ALL ICE, CLEAN AND SANITIZE AREA. MA
INTAIN AREA CLEAN AND SANITIZED NOT TO CONTAMINATE ICE (FOOD ITEM)  PRIORITY
FOUNDATION 7-38-005 CITATION ISSUED   | 22. PROPER COLD HOLDING TEMPERATURES
- Comments: FOUND 30 POUNDS OF PARCOOKED ITALIAN SAUSAGE IN WALKIN COOLER AT
54-55 DEGREES. INSTRUCTED MANAGER TO COOL BEFORE PUTTING IN CLOSED PLASTIC C
ONTAINER WITH LID WHERE SAUSAGE CAN NOT CONTINUE TO COOL PROPERLY.  ALL SAUS
AGE WAS DISCARDED AT THIS TIME.  PRIORITY VIOLATION 7-38-005 CITATION ISSUED
| 39. CONTAMINATION PREVENTED DURING FOOD PREPARATION, STORAGE & DISPLAY - C
omments: INTERIOR OF DISH MACHINE IN NEED OF DETAIL CLEANING TO REMOVE ALL B
UILD UP WHITE SUBSTANCE AND FOOD DEBRIS. INTRUCTED TO DETAIL CLEAN AND MAINT
AIN.  | 40. PERSONAL CLEANLINESS - Comments: PROPER HAIR RESTRINTS NEEDED FO
R FOOD HANDLERS. ALL HAIR MUST BE IN A RESTRAINT. HAIR CAN NOT HANG DOWN. CO
RRECT AND MAINTAIN.  | 47. FOOD & NON-FOOD CONTACT SURFACES CLEANABLE, PROPE
RLY DESIGNED, CONSTRUCTED & USED - Comments: LARGE CAN OPENER IN NEED OF DET
AIL CLEANING TO REMOVE ALL BUILD UP. INSTRUCTED TO DETAIL CLEAN AND MAINTAI
N.  | 49. NON-FOOD/FOOD CONTACT SURFACES CLEAN - Comments: INSTRUCTED TO CLE
AN EXTERIOR OF COLD HOLDING UNITS, COOKING EQUIPMENT AND ALL SODA DISPENSORS
TO REMOVE ALL BUILD UP. CORRECT AND MAINTAIN. | 55. PHYSICAL FACILITIES INST
ALLED, MAINTAINED & CLEAN - Comments: FLOORS THROUGHOUT PREP AREAS IN NEED O
F DETAIL CLEANING ALONG WALL BASES AND UNDER EQUIPMENT TO REMOVE FOOD SPILL
```

```
S, BUILD UP AND OTHER DEBRIS. INSTRUCTED TO DETAIL CLEAN AND MAINTAIN AT ALL
TIMES.


3. MANAGEMENT, FOOD EMPLOYEE AND CONDITIONAL EMPLOYEE; KNOWLEDGE, RESPONSIBI
LITIES AND REPORTING - Comments: UNABLE TO PRODUCE SIGNED COPIES OF THE EMPL
OYEE HEALTH POLICY; INSTRUCTED TO PROVIDE AND MAINTAIN.  PRIORITY FOUNDATION
VIOLATION 7-38-010 ISSUED. | 37. FOOD PROPERLY LABELED; ORIGINAL CONTAINER -
Comments: NO NAME ON BULK STORAGE CONTAINERS IN KITCHEN; INSTRUCTED TO LABEL
CONTAINERS WITH THE NAME OF THE PRODUCT INSIDE OF THE CONTAINER AND MAINTAI
N. (CORRECTED ON SITE). | 38. INSECTS, RODENTS, & ANIMALS NOT PRESENT - Comm
ents: OBSERVED RODENT ACTIVITY ON PREMISES.  FOUND 40 OR MORE MOUSE DROPPING
S ON THE SHELF UNDERNEATH THE STEAM TABLE IN THE FRONT SERVING AREA; INSTRUC
TED TO CLEAN AND REMOVE DROPPINGS.  PRIORITY FOUNDATON VIOLATION 7-38-020(A)
ISSUED. | 49. NON-FOOD/FOOD CONTACT SURFACES CLEAN - Comments: INSTRUCTED TO
CLEAN AND MAINTAIN THE FOLLOWING:  INTERIOR BOTTOM OF FRYER, PREP TABLES, IN
TERIOR AND EXTERIOR SURFACES OF REFRIGERATION UNITS AND FREEZERS AND ROLLING
STORAGE CART AT WOK STATION. THE STORAGE SHELVES INSIDE OF THE WALK-IN COOLE
R ARE UNCLEAN AND RUSTED; INSTRUCTED TO CLEAN AND/OR REPLACE SHELVES. | 55.
PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN - Comments: INSTRUCTED TO
CLEAN THE WALLS AROUND AND BEHIND EQUIPMENT WHERE NEEDED.  INSTRUCTED TO CLE
AN THE FLOORS AND FLOOR DRAINS UNDER COOKING EQUIPMENT, AT THREE COMP SINK A
ND BY ICE MACHINE AND MAINTAIN.  CLEAN FLOOR INSIDE OF THE WALK IN COOLER UN
DERNEATH THE SHELVES AND MAINTAIN.   INSTRUCTED TO CLEAN CEILING VENTS IN KI
TCHEN AREA WHERE NEEDED.
```

In [ ]:
```python
# First, remove the number and period for the code
pattern = r'\d+|\.'
df_c.violations = df_c.violations.str.replace(pattern, '', regex=True)
```

In [ ]:
```python
# Confirm the numbers and period are removed in the first record
df_c.violations[0]
```

Out[ ]:
```
" CITY OF CHICAGO FOOD SERVICE SANITATION CERTIFICATE - Comments: NO CERTIFI
ED FOOD MANAGER WAS PRESENT WHILE TCS FOODS (BEANS AT F) WERE BEING PREPARED
AND SERVED  MANAGEMENT INSTRUCTED THAT A CERTIFIED FOOD MANAGER MUST BE PRES
ENT AT ALL TIMES WHILE TCS FOODS PREPARED AND SERVED  PRIORITY FOUNDATION VI
OLATION --  CITATION ISSUED |  PROPER DATE MARKING AND DISPOSITION - Comment
s: OBSERVED EXPIRED READY-TO-EAT TCS FOODS IN THE WALK-IN COOLER (SALSA AND
PORK) REFRIGERATED OVER  HOURS AND STORED BEYOND THE MAXIMUM -DAY USE-BY DAT
E  MANAGEMENT INSTRUCTED TO DATE MARK ALL APPLICABLE READY-TO-EAT TCS FOODS
REFRIGERATED FOR MORE THAN  HOURS AND DISCARD THEM OR CONSUME THEM BEFORE TH
E USE-BY DATE  PRIORITY VIOLATION --  CITATION ISSUED |  NON-FOOD/FOOD CONTA
CT SURFACES CLEAN - Comments: CLEAN THE TOP AND SIDES OF THE LOW-TEMPERATURE
DISH MACHINE, THE INTERIOR AND EXTERIOR OF THE DEEP FRYERS, AND THE INTERIOR
PLASTIC GUARD INSIDE OF THE ICE MACHINE |  SEWAGE & WASTE WATER PROPERLY DIS
POSED - Comments: OBSERVED IMPROPER PLUMBING AND SEWAGE WATER POURING OUT OF
THE BROKEN DRAIN LINE BENEATH THE -COMPARTMENT SINK AND LOW-TEMPERATURE DISH
MACHINE  MANAGEMENT INSTRUCTED TO REPAIR THE DRAIN LINE SO DISHES COULD BE W
ASHED, RINSED AND SANITIZED  PRIORITY VIOLATION --(C)  CITATION ISSUED |  TO
ILET FACILITIES: PROPERLY CONSTRUCTED, SUPPLIED, & CLEANED - Comments: OBSER
VED NO COVERED WASTE RECEPTACLE IN THE WOMEN'S WASHROOM  MANAGEMENT INSTRUCT
ED TO PROVIDE |  ADEQUATE VENTILATION & LIGHTING; DESIGNATED AREAS USED - Co
mments: MUST EXTEND THE VENTILATION LINE FROM THE SMOKER TO REACH UNDER THE
VENTILATION HOOD |  ALL FOOD EMPLOYEES HAVE FOOD HANDLER TRAINING - Comment
s: OBSERVED SEVERAL FOOD HANDLING EMPLOYEES WITHOUT A FOOD HANDLER CERTIFICA
TE  MANAGEMENT INSTRUCTED THAT ALL FOOD HANDLING EMPLOYEES MUST SHOW PROOF O
F TRAINING |  PREVIOUS CORE VIOLATION CORRECTED - Comments: PREVIOUS CORE VI
OLATIONS FROM REPORT # ON // NOT CORRECTED:   - OBSERVED BUILD-UP OF GREASE
ON THE EXTERIOR OF A USED COOKING OIL CONTAINER LOCATED IN THE OUTDOOR GARBA
GE AREA INSTRUCTED TO CLEAN AND MAINTAIN IN GOOD CONDITION   - OBSERVED NO A
LLERGEN TRAINING CERTIFICATES ON SITE AT THE INSPECTION INSTRUCTED ALL EMPLO
YEES HOLDING CITY OF CHICAGO FOODSERVICE MANAGER CERTIFICATES TO COMPLETE AL
LERGEN TRAINING AND MAINTAIN RECORDS THEREOF ON SITE AT ALL TIMES  PRIORITY
FOUNDATION VIOLATION -- CITATION ISSUED"
```

In [ ]:
```python
# Second, remove the comments
pattern =  r'- Comments:.*?(\||$)'

df_c.violations = df_c.violations.str.replace(pattern, '', regex=True)
df_c = df_c.reset_index(drop=True)
```

In [ ]:
```python
# Confirm the comments have been removed
df_c.violations[0]
```

Out[ ]:
```
' CITY OF CHICAGO FOOD SERVICE SANITATION CERTIFICATE   PROPER DATE MARKING
AND DISPOSITION   NON-FOOD/FOOD CONTACT SURFACES CLEAN   SEWAGE & WASTE WATE
R PROPERLY DISPOSED   TOILET FACILITIES: PROPERLY CONSTRUCTED, SUPPLIED, & C
LEANED   ADEQUATE VENTILATION & LIGHTING; DESIGNATED AREAS USED   ALL FOOD E
MPLOYEES HAVE FOOD HANDLER TRAINING   PREVIOUS CORE VIOLATION CORRECTED '
```

In [ ]:
```python
# Now split the string into lists of individual reasons for each row -- this
df_c['split_elements'] = df_c.violations.str.split('\s{3}', expand=False)
```

In [ ]:
```python
df_c.split_elements[0]
```

```
Out[ ]: [' CITY OF CHICAGO FOOD SERVICE SANITATION CERTIFICATE',
         'PROPER DATE MARKING AND DISPOSITION',
         'NON-FOOD/FOOD CONTACT SURFACES CLEAN',
         'SEWAGE & WASTE WATER PROPERLY DISPOSED',
         'TOILET FACILITIES: PROPERLY CONSTRUCTED, SUPPLIED, & CLEANED',
         'ADEQUATE VENTILATION & LIGHTING; DESIGNATED AREAS USED',
         'ALL FOOD EMPLOYEES HAVE FOOD HANDLER TRAINING',
         'PREVIOUS CORE VIOLATION CORRECTED ']
```

```
In [ ]: # Remove leading whitepsace for consistency
        df_c['split_elements'] = df_c['split_elements'].apply(lambda x: [element.lst
```

```
In [ ]: # Confirm the final product
        for i in list(range(3)):
            print("\n")
            print(df_c.split_elements[i])
```

```
['CITY OF CHICAGO FOOD SERVICE SANITATION CERTIFICATE', 'PROPER DATE MARKING
AND DISPOSITION', 'NON-FOOD/FOOD CONTACT SURFACES CLEAN', 'SEWAGE & WASTE WA
TER PROPERLY DISPOSED', 'TOILET FACILITIES: PROPERLY CONSTRUCTED, SUPPLIED,
& CLEANED', 'ADEQUATE VENTILATION & LIGHTING; DESIGNATED AREAS USED', 'ALL F
OOD EMPLOYEES HAVE FOOD HANDLER TRAINING', 'PREVIOUS CORE VIOLATION CORRECTE
D ']


['MANAGEMENT, FOOD EMPLOYEE AND CONDITIONAL EMPLOYEE; KNOWLEDGE, RESPONSIBIL
ITIES AND REPORTING', 'PROCEDURES FOR RESPONDING TO VOMITING AND DIARRHEAL E
VENTS', 'FOOD-CONTACT SURFACES: CLEANED & SANITIZED', 'PROPER COLD HOLDING T
EMPERATURES', 'CONTAMINATION PREVENTED DURING FOOD PREPARATION, STORAGE & DI
SPLAY', 'PERSONAL CLEANLINESS', 'FOOD & NON-FOOD CONTACT SURFACES CLEANABLE,
PROPERLY DESIGNED, CONSTRUCTED & USED', 'NON-FOOD/FOOD CONTACT SURFACES CLEA
N', 'PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN ']


['MANAGEMENT, FOOD EMPLOYEE AND CONDITIONAL EMPLOYEE; KNOWLEDGE, RESPONSIBIL
ITIES AND REPORTING', 'FOOD PROPERLY LABELED; ORIGINAL CONTAINER', 'INSECTS,
RODENTS, & ANIMALS NOT PRESENT', 'NON-FOOD/FOOD CONTACT SURFACES CLEAN', 'PH
YSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN ']
```

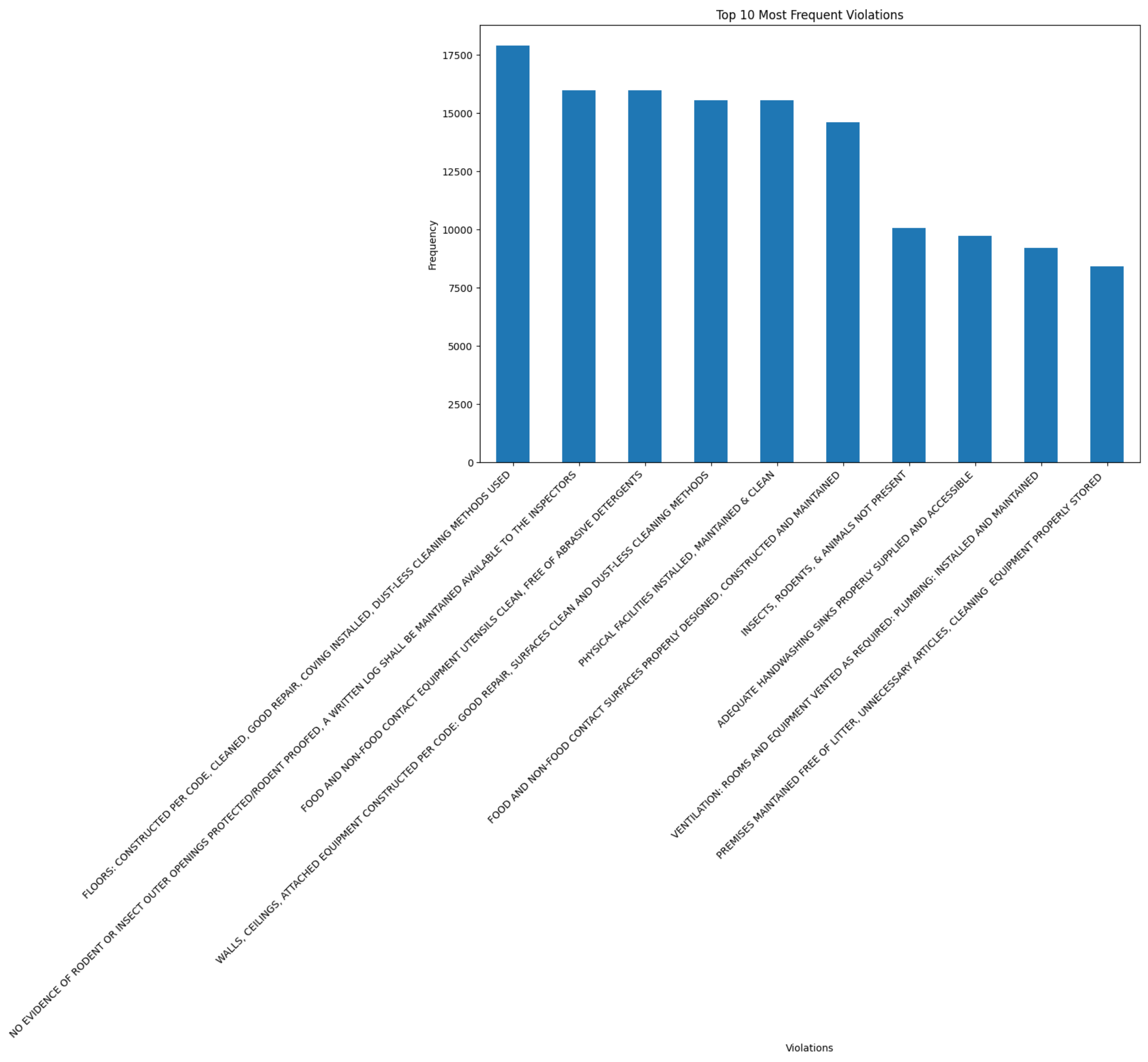
5. Count how many times each regulation description occurred in the table and visualize top-10 the most frequent regulation descriptions

In [ ]:
```
df_exploded = df_c.explode('split_elements')

# Count the occurrences of each element and sort the counts in descending or
element_counts = df_exploded['split_elements'].value_counts().sort_values(as

# Display the counts
print(element_counts[0:10])
```

```
FLOORS: CONSTRUCTED PER CODE, CLEANED, GOOD REPAIR, COVING INSTALLED, DUST-L
ESS CLEANING METHODS USED                                              17912
FOOD AND NON-FOOD CONTACT EQUIPMENT UTENSILS CLEAN, FREE OF ABRASIVE DETERGE
NTS                                                                    16017
NO EVIDENCE OF RODENT OR INSECT OUTER OPENINGS PROTECTED/RODENT PROOFED, A W
RITTEN LOG SHALL BE MAINTAINED AVAILABLE TO THE INSPECTORS             16017
WALLS, CEILINGS, ATTACHED EQUIPMENT CONSTRUCTED PER CODE: GOOD REPAIR, SURFA
CES CLEAN AND DUST-LESS CLEANING METHODS                               15581
PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN
15527
FOOD AND NON-FOOD CONTACT SURFACES PROPERLY DESIGNED, CONSTRUCTED AND MAINTA
INED                                                                   14620
INSECTS, RODENTS, & ANIMALS NOT PRESENT
10061
ADEQUATE HANDWASHING SINKS PROPERLY SUPPLIED AND ACCESSIBLE
9712
VENTILATION: ROOMS AND EQUIPMENT VENTED AS REQUIRED: PLUMBING: INSTALLED AND
MAINTAINED                                                             9238
PREMISES MAINTAINED FREE OF LITTER, UNNECESSARY ARTICLES, CLEANING  EQUIPMEN
T PROPERLY STORED                                                       8427
Name: split_elements, dtype: int64
```

In [ ]:
```
top_elements = element_counts.head(10)

plt.figure(figsize=(12, 8))
top_elements.plot(kind='bar')

# Set the title and labels
plt.title('Top 10 Most Frequent Violations')
plt.xlabel('Violations')
plt.ylabel('Frequency')

# Rotate the x-tick labels for better readability
plt.xticks(rotation=45, ha='right')

# Show the plot
plt.tight_layout()  # Adjust the plot to ensure everything fits without over
plt.show()
```

```
/var/folders/rx/2jqwhb8d31960xlz0g9vlmdh0000gn/T/ipykernel_70220/2177976754.
py:15: UserWarning: Tight layout not applied. The bottom and top margins can
not be made large enough to accommodate all axes decorations.
  plt.tight_layout()  # Adjust the plot to ensure everything fits without ov
erlapping
```



6. Identify whether any of these restaurants are repeat offenders (explore a combination of License, Business Name, and Address variables to determine what is the best way to uniquely identify a business) and whether the violations are the same or different for these repeat offenses

In [ ]:
```python
# Rename the license column
df_exploded.rename(columns={'license_': 'license'}, inplace=True)
```

In [ ]:
```
# Create a smaller dataframe of the columns we are examining
off = df_exploded[['inspection_date', 'license', 'aka_name', 'address', 'res
off = off.reset_index(drop=True)
```

Solution Option #1: For each unique business (license, address, name) and violation, we will count how many occurrences that combination shows up. If this new count is greater than 1 it indicates they are repeating the same violation.

In [ ]:
```
repeats = off.groupby(['license', 'address', 'aka_name', 'split_elements']).
repeats['count'] = repeats['count'].apply(int)
```

In [ ]:
```
# Filter to repeat offenders where they have the same violation occurence mo
repeats_f = repeats[repeats['count'] > 1]

# Sort the DataFrame in descending order based on the 'count' column
repeats_f = repeats_f.sort_values(by='count', ascending=False)
```

Here are the top 10 repeat offenders who are violating with the same violation (repeating the same offense). We also list what that offense is. All of these business seem to keep violating the cleaning and maintenance of their physical facilities.

In [ ]:
```
repeats_f.head(10)
```

Out[ ]:

	license	address	aka_name	split_elements	count
114526	2289197	9273 S SOUTH CHICAGO AVE	ROMA'S RESTAURANT	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	24
185021	2738649	7617 S RACINE AVE	POPEYE'S	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	23
140527	2432140	8559 S STONY ISLAND AVE	HOE TOY CHOP SUEY	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	21
166009	2583156	7723 S STATE ST	JERK TACO MAN	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	20
106774	2240254	8940-8944 S STONY ISLAND AVE	FAMILY DEN	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	20
158605	2536489	2464-2466 N LINCOLN AVE	DOG HAUS	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	20
103171	2216095	1935-1939 W 79TH ST	SMART FROM THE START	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	19
118124	2307811	2455 S KEDZIE AVE	MANOLO'S TAMALES #3	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	19
216706	60184	2829 N MILWAUKEE AVE	TAQUERIA EL RANCHITO	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	18
1414	1042888	1440 W DEVON AVE	DEVON MARKET	PHYSICAL FACILITIES INSTALLED, MAINTAINED & CLEAN	18

Solution Option #2: For each unique business (license, address, name) we will see who has more than 1 violation (doesn't have to be the same type multiple times)

In [ ]:
```
#repeats_2 = off.groupby(['license', 'address', 'aka_name', 'inspection_date
repeats_2 = off.groupby(['license', 'address', 'aka_name']).size().reset_ind
repeats_2['count'] = repeats_2['count'].apply(int)
```

In [ ]:
```
# Filter to repeat offenders with multiple offenses
repeats_v = repeats_2[repeats_2['count'] > 1]

# Sort the DataFrame in descending order based on the 'count' column
repeats_v = repeats_v.sort_values(by='count', ascending=False)
```

Here are the top 10 repeat offenders who have multiple violations. Note, unlike Solution #1 above they do not have to keep repeating the same offense.

In [ ]:
```
repeats_v.head(10)
```

Out[ ]:

	license	address	aka_name	count
20928	60184	2829 N MILWAUKEE AVE	TAQUERIA EL RANCHITO	211
320	1095992	4770 W GRAND AVE	LAS ISLAS MARIAS	200
7790	2125165	4212 W MADISON ST	LUIGI'S PIZZA	185
3800	1893655	2446 S WESTERN AVE	MARISCOS LAS ISLITAS	179
3951	1909713	4623-4627 N BROADWAY	IYANZE	175
11958	2359305	3046-3050 W 63RD ST	LA MIXTECA POBLANA 2 LLC	172
158	1042888	1440 W DEVON AVE	DEVON MARKET	169
20274	39623	11601 S WESTERN AVE	LUMES PANCAKE HOUSE	159
11133	2308713	3714 W LAWRENCE AVE	SU NUEVA CASA DEL GALLO BRAVO, INC.	156
20974	6231	2312 S WENTWORTH AVE	SEVEN TREASURES	156

7. Review the restaurants "Out of Business", is there an extended history of prior violations for these closed restaurants?

In [ ]:
```
full = fetch_data(url, params)
```

In [ ]:
```
full = full.dropna(subset=['violations'])
```

In [ ]:
```
full.results.value_counts()
```

Out[ ]:
```
Pass                    103866
Fail                     48380
Pass w/ Conditions       39713
No Entry                   652
Not Ready                   76
Out of Business             43
Name: results, dtype: int64
```

In [ ]:
```
# Subet to only Out of Business restaurants
oob = full[full['results'] == 'Out of Business']
```

In [ ]:
```
print("There are", oob.shape[0], "out of business rows")
```

```
There are 43 out of business rows
```

In [ ]:
```
def get_violations(dataset):
    data = dataset.dropna(subset=['violations'])
    data = data.reset_index(drop=True)
    #data = dataset

    pattern = r'\d+|\.'
    data.violations = data.violations.str.replace(pattern, '', regex=True)

    pattern =  r'- Comments:.*?(\||$)'
    data.violations = data.violations.str.replace(pattern, '', regex=True)
    data = data.reset_index(drop=True)

    data['split_elements'] = data.violations.str.split('\s{3}', expand=False
    data['split_elements'] = data['split_elements'].apply(lambda x: [element

    data = data.explode('split_elements')
    return data
```

In [ ]:
```
oob = get_violations(oob)
print("There are", oob.shape[0], "violations total where the result = Out of
```

```
There are 128 violations total where the result = Out of Business
```

In [ ]:
```
history = oob.groupby(['license_', 'address', 'aka_name']).size().reset_inde
history['count'] = history['count'].apply(int)
```

In [ ]:
```
# Filter to repeat offenders with multiple offenses
history_v = history[history['count'] > 1]

# Sort the DataFrame in descending order based on the 'count' column
history_v = history_v.sort_values(by='count', ascending=False)
```

In [ ]:
```
history_v.head(10)
```

Out[ ]:

	license_	address	aka_name	count
3	1225937	1118 W FULLERTON AVE	BRANKO'S RESTAURANT	8
17	2064712	622 E 71ST ST	THE BURGER BAR	8
27	2374155	6406-6408 N OAKLEY AVE	MAWA PARADISE	7
33	2589624	5439-5441 S HALSTED ST BLDG	54 IN & OUT	6
10	1768136	1220 W TAYLOR ST	TAYLOR MADE PIZZA	6
4	12327	3407 N HALSTED ST	7-ELEVEN #25431	6
13	1843205	1 E DELAWARE PL	STARBUCKS COFFEE #13468	6
14	1844157	48 E GARFIELD BLVD	MOBIL ONE STOP CAR WASH	5
5	1242	323 E WACKER DR	PALM RESTAURANT	5
9	1767089	1102 W 35TH ST	PHIL'S PIZZA	4

Q7 Answer: Yes, there is a history of violations for Out of Business (closed) restaurants. Above are the top 10 restaurants that are out of business and the number of violations they had before closing.

8. Food inspection data has 10+ years of history, do you see any changing trends in most common violations? Plot the results for top-5 most frequent violations over time

In [ ]:

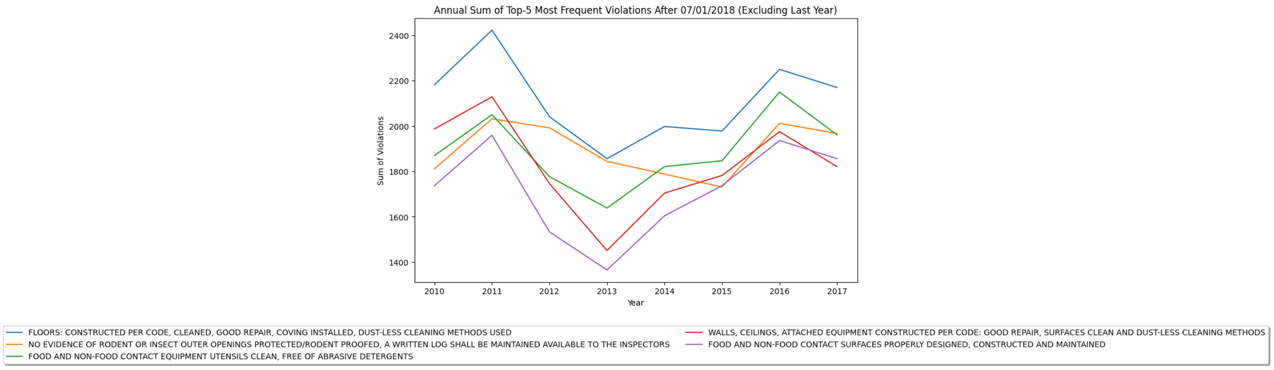
```
# Reuse a dataset from above
df_exploded.head(3)
```

Out[ ]:

	inspection_id	dba_name	aka_name	license_	facility_type	risk	address	city	s
0	2587634	TWISTED SPOKE	TWISTED SPOKE	37844	Restaurant	Risk 1 (High)	501 N OGDEN AVE	CHICAGO	
0	2587634	TWISTED SPOKE	TWISTED SPOKE	37844	Restaurant	Risk 1 (High)	501 N OGDEN AVE	CHICAGO	
0	2587634	TWISTED SPOKE	TWISTED SPOKE	37844	Restaurant	Risk 1 (High)	501 N OGDEN AVE	CHICAGO	

3 rows × 23 columns

In [ ]:
```
# Define the cutoff date
cutoff_date = pd.to_datetime('2018-07-01')

# Filter the DataFrame for violations before the cutoff date
before_cutoff = df_exploded[df_exploded['inspection_date'] < cutoff_date]

# Count each violation
violation_counts_before = before_cutoff['split_elements'].value_counts()

# Identify top-5 violations
top_violations_before = violation_counts_before.head(5).index.tolist()

# Determine the last year in your dataset
last_year = before_cutoff['inspection_date'].dt.year.max()

# Plot over time for the period before the cutoff date excluding the last ye
fig, ax = plt.subplots(figsize=(10, 6))

for violation in top_violations_before:
    # Filter the DataFrame for each violation
    violation_data = before_cutoff[before_cutoff['split_elements'] == violat
    # Exclude the last year
    violation_data = violation_data[violation_data['inspection_date'].dt.yea
    # Group by year and sum the violations
    annual_violations = violation_data.groupby(violation_data['inspection_da
    # Plot the results
    annual_violations.plot(ax=ax, label=violation)

ax.set_title('Annual Sum of Top-5 Most Frequent Violations After 07/01/2018 
ax.set_xlabel('Year')
ax.set_ylabel('Sum of Violations')
ax.xaxis.set_major_locator(plt.MaxNLocator(integer=True))  # Force x-axis to

# Set legend at the bottom
ax.legend(loc='upper center', bbox_to_anchor=(0.5, -0.15), shadow=True, ncol

plt.show()
```



In [ ]:
```
# Define the cutoff date
cutoff_date = pd.to_datetime('2018-07-01')

# Filter the DataFrame for violations after the cutoff date
before_cutoff = df_exploded[df_exploded['inspection_date'] > cutoff_date]

# Count each violation
violation_counts_before = before_cutoff['split_elements'].value_counts()

# Identify top-5 violations
top_violations_before = violation_counts_before.head(5).index.tolist()

# Determine the last year in your dataset
last_year = before_cutoff['inspection_date'].dt.year.max()

# Plot over time for the period before the cutoff date excluding the last ye
fig, ax = plt.subplots(figsize=(10, 6))

for violation in top_violations_before:
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    violation_data = violation_data[violation_data['inspection_date'].dt.yea
    # Group by year and sum the violations
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plt.show()
```

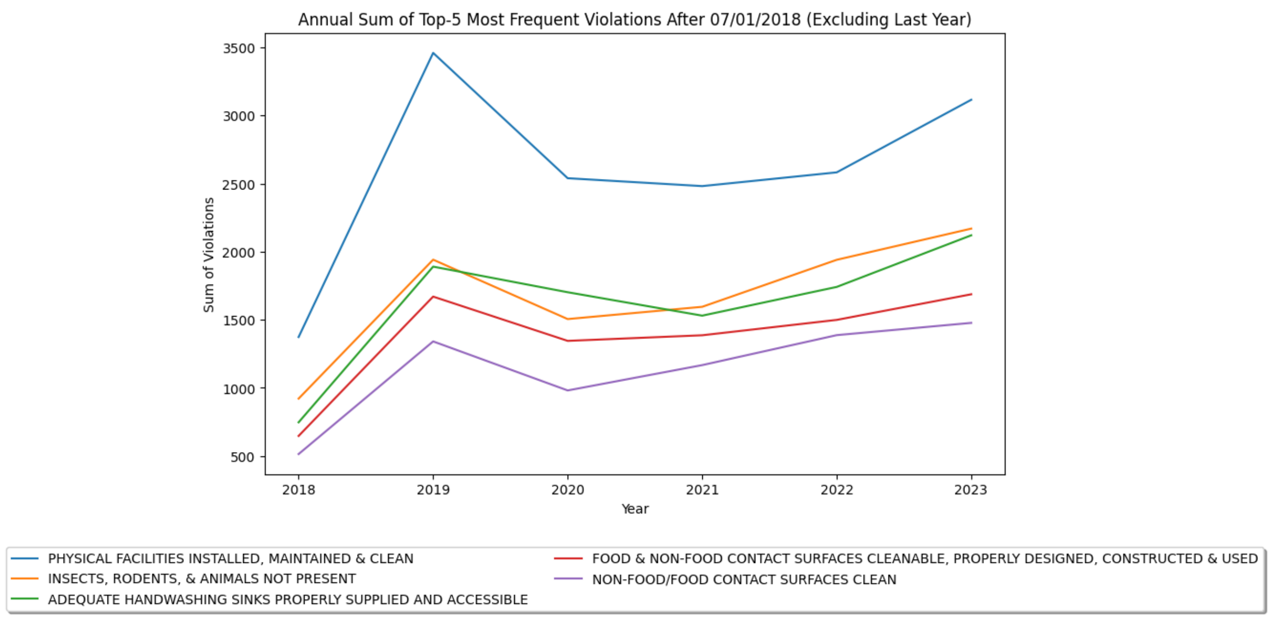

Q8 Answer: documentation indicates there was a food inspection violation change on 07/01/2018. For this reason I have broken the data out into 2 plots to show the trend in top 5 violations over time. Plot #1 indicates a downward trend as time approaches 2018 but then an increase afterwards. Plot #2 indicates an increase in violations around 2019 but then a drop around COVID 2020-2022 before increasing again closer to 2023.

Documentation Reference:
https://web.archive.org/web/20190907034257/http://dev.cityofchicago.org/o
violations-changes.html