AnalysisOfYouthJusticeInManitoba

August 11, 2022

Analysis of Youth Detentions and Charges in Canada and demonstration of Jupyter Notebooks

1 Introduction

This is an analysis of datasets provided by the Government of Canada through Statistics Canada and the Government of Canada Open Data Portal. There is no identifying information being used, and all data in this analysis is openly available for anyone to view and use.

This is also a demonstration of using the Python programming language to process data and create visualizations. Jupyter notebook reports will be used to do this. Each step of the process will be explained.

There are three goals for this project.

```
a) - Find insights relating to charges and detentions laid on youth in Manitoba
b) - Create visuals to illustrate those insights
c) - Create files of new datasets that anyone can explore in programs like Excel or Google Sheet
```

1.1 Personal Note:

My purpose for creating this project is to demonstrate the use of Data Analytics in youthwork. I want to use my 17 years of hands on experience working with youth in Manitoba, to assist domain experts (Psychologists, Sociologists, Accountants, and Program Managers) organize data, identify trends relevant to their interests and create visuals to illustrate those trends. Humans are visual creatures, and we internalize information much better through a graphic than a spreadsheet.

```
-Jeremy Klassen
```

2 Boilerplate Python code

[1]:
```
# Required Python libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import os

# setting a variable to the current working directory.
```

```
pwd = os.getcwd()

%matplotlib inline
```

2.1 Reading the data files from government websites into Python.

[2]:
```
YD = pd.read_csv('Youth_Detentions.csv')
```

[3]:
```
pop = pd.read_csv('population.csv')
```

Note: The file below is almost 2 Gb of text (too large for excel to even import). It will take a while to load, so please wait for the '*' change to a number when this code is being run before continuing on.

[4]:
```
data = pd.read_csv('CourtCases/CourtCases.csv', low_memory = False)
```

3 Data Cleaning

3.1 Removing unneeded columns

3.1.1 Youth Detentions

before

[5]:
```
YD.head()
```

[5]:
```
    REF_DATE                       GEO           DGUID  \
0  1997/1998  Provinces and territories  2016A000011124
1  1997/1998  Provinces and territories  2016A000011124
2  1997/1998  Provinces and territories  2016A000011124
3  1997/1998  Provinces and territories  2016A000011124
4  1997/1998  Provinces and territories  2016A000011124

  Admissions and releases             Correctional services     UOM  UOM_ID  \
0        Youth admissions       Total correctional services  Number     223
1        Youth admissions               Pre-trial detention  Number     223
2        Youth admissions        Provincial director remand  Number     223
3        Youth admissions                     Secure custody  Number     223
4        Youth admissions  Custody and supervision (secure)  Number     223

  SCALAR_FACTOR  SCALAR_ID     VECTOR COORDINATE    VALUE STATUS  SYMBOL  \
0         units          0  v32445599      1.1.1  70542.0    NaN     NaN
1         units          0  v32445600      1.1.2  16010.0    NaN     NaN
2         units          0  v32445601      1.1.3      NaN     ..     NaN
3         units          0  v32445602      1.1.4   8019.0    NaN     NaN
4         units          0  v32445603      1.1.5      NaN     ..     NaN
```

```
  TERMINATED  DECIMALS
0        NaN         0
1        NaN         0
2        NaN         0
3        NaN         0
4          t         0
```

[6]:
```
YD = YD.drop('UOM', axis = 1)
YD = YD.drop('DGUID', axis = 1)
YD = YD.drop('COORDINATE', axis = 1)
YD = YD.drop(['UOM_ID', 'SCALAR_FACTOR', 'VECTOR', 'TERMINATED', 'SYMBOL',␣
 ↪'STATUS', 'DECIMALS'], axis = 1)
YD = YD.drop('SCALAR_ID', axis = 1)
```

columns after cleaning

[7]:
```
YD.head()
```

[7]:
```
    REF_DATE                          GEO Admissions and releases  \
0  1997/1998  Provinces and territories        Youth admissions
1  1997/1998  Provinces and territories        Youth admissions
2  1997/1998  Provinces and territories        Youth admissions
3  1997/1998  Provinces and territories        Youth admissions
4  1997/1998  Provinces and territories        Youth admissions

              Correctional services    VALUE
0       Total correctional services  70542.0
1               Pre-trial detention  16010.0
2        Provincial director remand      NaN
3                    Secure custody   8019.0
4  Custody and supervision (secure)      NaN
```

3.1.2 Population

dropping Symbol columns

before

[8]:
```
pop.head()
```

[8]:
```
                  Geography     Q1 1997  Symbol     Q2 1997  Symbol.1  \
0                    Canada  29,751,536     NaN  29,818,012       NaN
1  Newfoundland and Labrador     555,432     NaN     553,115       NaN
2       Prince Edward Island     135,935     NaN     135,931       NaN
3                Nova Scotia     932,349     NaN     931,832       NaN
4              New Brunswick     752,334     NaN     752,447       NaN

      Q3 1997  Symbol.2     Q4 1997  Symbol.3     Q1 1998  ...     Q2 2021  \
0  29,905,948       NaN  29,994,790       NaN  30,028,506  ...  38,153,211
```

```
1     550,911       NaN     547,639       NaN     545,769  ...     519,693
2     136,095       NaN     136,165       NaN     135,938  ...     162,596
3     932,402       NaN     932,735       NaN     932,549  ...     985,776
4     752,511       NaN     752,248       NaN     751,969  ...     785,819

  Symbol.97     Q3 2021 Symbol.98     Q4 2021 Symbol.99     Q1 2022  \
0       NaN  38,246,108       NaN  38,436,447       NaN  38,526,760
1       NaN     520,553       NaN     521,758       NaN     522,453
2       NaN     164,318       NaN     165,936       NaN     166,331
3       NaN     992,055       NaN     998,832       NaN   1,002,586
4       NaN     789,225       NaN     794,300       NaN     797,102

  Symbol.100     Q2 2022 Symbol.101
0        NaN  38,654,738        NaN
1        NaN     522,875        NaN
2        NaN     167,680        NaN
3        NaN   1,007,049        NaN
4        NaN     800,243        NaN

[5 rows x 205 columns]
```

[9]:
```
# Remove all 'symbol' columns

pop = pop.drop('Symbol', axis = 1)
count = 1
for i in pop:
    if count == 102:
        break
    pop = pop.drop('Symbol.' + str(count), axis = 1)
    count += 1
```

after

[10]:
```
pop.head()
```

[10]:
```
                   Geography     Q1 1997     Q2 1997     Q3 1997     Q4 1997  \
0                     Canada  29,751,536  29,818,012  29,905,948  29,994,790
1  Newfoundland and Labrador     555,432     553,115     550,911     547,639
2       Prince Edward Island     135,935     135,931     136,095     136,165
3                Nova Scotia     932,349     931,832     932,402     932,735
4              New Brunswick     752,334     752,447     752,511     752,248

      Q1 1998     Q2 1998     Q3 1998     Q4 1998     Q1 1999  ...  \
0  30,028,506  30,080,180  30,155,173  30,231,639  30,260,117  ...
1     545,769     542,479     539,843     537,908     536,515  ...
2     135,938     135,635     135,804     135,908     135,994  ...
3     932,549     932,033     931,836     932,740     932,145  ...
4     751,969     751,080     750,530     750,708     750,127  ...
```

```
      Q1 2020     Q2 2020     Q3 2020     Q4 2020     Q1 2021     Q2 2021  \
0  37,908,599  38,000,056  38,037,204  38,033,014  38,068,872  38,153,211
1     523,287     522,465     521,364     520,194     519,664     519,693
2     159,387     160,417     161,329     161,402     161,514     162,596
3     977,519     979,175     981,889     981,552     982,012     985,776
4     780,707     782,199     783,204     783,257     784,156     785,819

      Q3 2021     Q4 2021     Q1 2022     Q2 2022
0  38,246,108  38,436,447  38,526,760  38,654,738
1     520,553     521,758     522,453     522,875
2     164,318     165,936     166,331     167,680
3     992,055     998,832   1,002,586   1,007,049
4     789,225     794,300     797,102     800,243

[5 rows x 103 columns]
```

This data set has extra null value rows on the bottom that need to be removed.

before

[11]:
```
pop.tail()
```

[11]:
```
                                           Geography Q1 1997 Q2 1997 Q3 1997  \
33                                               NaN     NaN     NaN     NaN
34                                               NaN     NaN     NaN     NaN
35                                               NaN     NaN     NaN     NaN
36  How to cite: Statistics Canada. Table 17-10-00...     NaN     NaN     NaN
37  https://www150.statcan.gc.ca/t1/tbl1/en/tv.act...     NaN     NaN     NaN

   Q4 1997 Q1 1998 Q2 1998 Q3 1998 Q4 1998 Q1 1999  ... Q1 2020 Q2 2020  \
33     NaN     NaN     NaN     NaN     NaN     NaN  ...     NaN     NaN
34     NaN     NaN     NaN     NaN     NaN     NaN  ...     NaN     NaN
35     NaN     NaN     NaN     NaN     NaN     NaN  ...     NaN     NaN
36     NaN     NaN     NaN     NaN     NaN     NaN  ...     NaN     NaN
37     NaN     NaN     NaN     NaN     NaN     NaN  ...     NaN     NaN

   Q3 2020 Q4 2020 Q1 2021 Q2 2021 Q3 2021 Q4 2021 Q1 2022 Q2 2022
33     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
34     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
35     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
36     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
37     NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN

[5 rows x 103 columns]
```

after

[12]:
```
pop = pop.dropna()
pop.tail()
```

[12]:

	Geography	Q1 1997	Q2 1997	Q3 1997	Q4 1997	\
9	Alberta	2,799,561	2,813,157	2,829,848	2,847,526	
10	British Columbia	3,914,490	3,931,056	3,948,583	3,964,677	
11	Yukon	31,633	31,659	31,797	31,556	
12	Northwest Territories 5	41,528	41,668	41,625	41,411	
13	Nunavut 5	25,736	25,839	25,884	25,994	

	Q1 1998	Q2 1998	Q3 1998	Q4 1998	Q1 1999	...	Q1 2020	\
9	2,859,305	2,876,753	2,899,066	2,915,781	2,926,079	...	4,401,180	
10	3,972,821	3,977,912	3,983,113	3,990,451	3,995,643	...	5,137,137	
11	31,510	31,320	31,149	30,877	30,748	...	41,700	
12	41,222	40,968	40,802	40,635	40,635	...	45,269	
13	26,082	26,183	26,373	26,449	26,575	...	38,721	

	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	\
9	4,415,700	4,420,029	4,424,557	4,431,454	4,438,772	4,442,879	
10	5,150,616	5,158,728	5,156,587	5,163,919	5,185,990	5,214,805	
11	42,017	42,174	42,300	42,344	42,586	42,986	
12	45,363	45,372	45,265	45,323	45,629	45,504	
13	38,836	39,155	39,109	39,255	39,336	39,403	

	Q4 2021	Q1 2022	Q2 2022
9	4,464,170	4,480,486	4,500,917
10	5,249,635	5,264,485	5,286,528
11	43,095	42,982	43,249
12	45,515	45,640	45,607
13	39,589	39,710	40,103

[5 rows x 103 columns]

Only one population value per year is needed. The other 3 quarterly values therefore will be dropped. The 'Q2' value left in each column header will also be removed.

[13]:
```
# isolate Q2 populations

count = 1997
for i in pop:
    pop = pop.drop('Q1 ' + str(count), axis = 1)
    if count == 2022:
        break
    pop = pop.drop('Q3 ' + str(count), axis = 1)
    pop = pop.drop('Q4 ' + str(count), axis = 1)
    count += 1
```

[14]:
```
# Drop 'Q2' from head and make years an int

count = 1997
for i in pop:
    pop.rename(columns={'Q2 ' + str(count): count}, inplace=True)
    if count == 2022:
        break
    count += 1
```

result

[15]:
```
pop.head()
```

[15]:

	Geography	1997	1998	1999	2000	\
0	Canada	29,818,012	30,080,180	30,314,696	30,594,030	
1	Newfoundland and Labrador	553,115	542,479	534,498	529,574	
2	Prince Edward Island	135,931	135,635	136,025	136,289	
3	Nova Scotia	931,832	932,033	932,116	934,291	
4	New Brunswick	752,447	751,080	750,075	750,543	

	2001	2002	2003	2004	2005	...	\
0	30,910,996	31,253,382	31,550,768	31,846,669	32,141,943	...	
1	523,235	520,228	518,813	517,940	515,358	...	
2	136,499	136,892	137,120	137,629	137,788	...	
3	932,909	934,177	935,800	938,783	937,991	...	
4	749,789	748,777	749,265	749,336	748,693	...	

	2013	2014	2015	2016	2017	2018	\
0	34,958,216	35,323,533	35,611,271	35,970,303	36,398,013	36,898,431	
1	527,313	527,498	528,063	529,063	528,544	526,395	
2	143,948	143,984	144,259	145,784	148,860	152,039	
3	941,230	938,913	936,271	940,382	947,384	954,618	
4	758,132	758,876	758,948	762,289	764,813	768,522	

	2019	2020	2021	2022
0	37,422,946	38,000,056	38,153,211	38,654,738
1	524,131	522,465	519,693	522,875
2	155,916	160,417	162,596	167,680
3	965,553	979,175	985,776	1,007,049
4	774,035	782,199	785,819	800,243

[5 rows x 27 columns]

3.1.3 Court Cases

Drop unneeded columns

before

[16]:
```
data.head()
```

[16]:
```
     REF_DATE     GEO           DGUID        Offences         Age of accused  \
0  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
1  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
2  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
3  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
4  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused

          Sex of accused Charge and case            Type of decision  \
0  Total, sex of accused   Total charges             Total decisions
1  Total, sex of accused   Total charges  Transferred to adult court
2  Total, sex of accused   Total charges                      Guilty
3  Total, sex of accused   Total charges           Percentage guilty
4  Total, sex of accused   Total charges                    Acquitted

           UOM  UOM_ID SCALAR_FACTOR  SCALAR_ID     VECTOR   COORDINATE  \
0       Number     223         units          0  v60156628  1.1.1.1.1.1
1       Number     223         units          0  v60156629  1.1.1.1.1.2
2       Number     223         units          0  v60156630  1.1.1.1.1.3
3  Percentage     242         units          0  v61279858  1.1.1.1.1.4
4       Number     223         units          0  v60156631  1.1.1.1.1.5

      VALUE STATUS  SYMBOL TERMINATED  DECIMALS
0  218802.0    NaN     NaN        NaN         0
1     321.0    NaN     NaN        NaN         0
2  119838.0    NaN     NaN        NaN         0
3      55.0    NaN     NaN        NaN         0
4    4307.0    NaN     NaN        NaN         0
```

[17]:
```
data = data.drop('UOM', axis = 1)
data = data.drop('UOM_ID', axis = 1)
data = data.drop('SCALAR_FACTOR', axis = 1)
data = data.drop('SCALAR_ID', axis = 1)
data = data.drop('DECIMALS', axis = 1)
data = data.drop('SYMBOL', axis = 1)
data = data.drop('STATUS', axis = 1)
data = data.drop('TERMINATED', axis = 1)
```

after

[18]:
```
data.head()
```

[18]:
```
     REF_DATE     GEO           DGUID        Offences         Age of accused  \
0  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
1  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
2  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
3  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
```

```
4  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused

          Sex of accused Charge and case            Type of decision  \
0  Total, sex of accused   Total charges             Total decisions
1  Total, sex of accused   Total charges  Transferred to adult court
2  Total, sex of accused   Total charges                      Guilty
3  Total, sex of accused   Total charges           Percentage guilty
4  Total, sex of accused   Total charges                    Acquitted

      VECTOR   COORDINATE     VALUE
0  v60156628  1.1.1.1.1.1  218802.0
1  v60156629  1.1.1.1.1.2     321.0
2  v60156630  1.1.1.1.1.3  119838.0
3  v61279858  1.1.1.1.1.4      55.0
4  v60156631  1.1.1.1.1.5    4307.0
```

3.2 Date Cleaning

the 'REF_DATE' column in the Court Cases and Youth Detention datasets need to have one year listed instead of two. The data type then needs to be changed from a string to a number in order to make graphs.

3.2.1 Youth Detention dataset

before

[19]:
```
YD.head()
```

[19]:
```
    REF_DATE                        GEO Admissions and releases  \
0  1997/1998  Provinces and territories        Youth admissions
1  1997/1998  Provinces and territories        Youth admissions
2  1997/1998  Provinces and territories        Youth admissions
3  1997/1998  Provinces and territories        Youth admissions
4  1997/1998  Provinces and territories        Youth admissions

              Correctional services    VALUE
0       Total correctional services  70542.0
1               Pre-trial detention  16010.0
2        Provincial director remand      NaN
3                    Secure custody   8019.0
4  Custody and supervision (secure)      NaN
```

[20]:
```
YD[['REF_DATE', 'Delete']] = YD['REF_DATE'].str.split('/', expand = True)
YD = YD.drop('Delete', axis = 1)
YD['REF_DATE'] = pd.to_numeric(YD['REF_DATE'])
```

after

[21]:
```
YD.head()
```

[21]:
```
   REF_DATE                      GEO Admissions and releases  \
0      1997  Provinces and territories        Youth admissions
1      1997  Provinces and territories        Youth admissions
2      1997  Provinces and territories        Youth admissions
3      1997  Provinces and territories        Youth admissions
4      1997  Provinces and territories        Youth admissions

              Correctional services    VALUE
0       Total correctional services  70542.0
1               Pre-trial detention  16010.0
2        Provincial director remand      NaN
3                    Secure custody   8019.0
4  Custody and supervision (secure)      NaN
```

3.2.2 Court Cases

before

[22]:
```
data.head()
```

[22]:
```
     REF_DATE     GEO           DGUID        Offences         Age of accused  \
0  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
1  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
2  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
3  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused
4  1991/1992  Canada  2016A000011124  Total offences  Total, age of accused

          Sex of accused Charge and case            Type of decision  \
0  Total, sex of accused   Total charges             Total decisions
1  Total, sex of accused   Total charges  Transferred to adult court
2  Total, sex of accused   Total charges                      Guilty
3  Total, sex of accused   Total charges           Percentage guilty
4  Total, sex of accused   Total charges                    Acquitted

      VECTOR   COORDINATE     VALUE
0  v60156628  1.1.1.1.1.1  218802.0
1  v60156629  1.1.1.1.1.2     321.0
2  v60156630  1.1.1.1.1.3  119838.0
3  v61279858  1.1.1.1.1.4      55.0
4  v60156631  1.1.1.1.1.5    4307.0
```

[23]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9587200 entries, 0 to 9587199
Data columns (total 11 columns):
 #   Column            Dtype
---  ------            -----
 0   REF_DATE          object
```

```
 1   GEO                object
 2   DGUID              object
 3   Offences           object
 4   Age of accused     object
 5   Sex of accused     object
 6   Charge and case    object
 7   Type of decision   object
 8   VECTOR             object
 9   COORDINATE         object
 10  VALUE              float64
dtypes: float64(1), object(10)
memory usage: 804.6+ MB
```

[24]:
```
data[['REF_DATE', 'Delete']] = data['REF_DATE'].str.split('/', expand = True)
data = data.drop('Delete', axis = 1)
data['REF_DATE'] = pd.to_numeric(data['REF_DATE'])
```

after

[25]:
```
data.head()
```

[25]:

	REF_DATE	GEO	DGUID	Offences	Age of accused	Sex of accused	Charge and case	Type of decision	VECTOR	COORDINATE	VALUE
0	1991	Canada	2016A000011124	Total offences	Total, age of accused	Total, sex of accused	Total charges	Total decisions	v60156628	1.1.1.1.1.1	218802.0
1	1991	Canada	2016A000011124	Total offences	Total, age of accused	Total, sex of accused	Total charges	Transferred to adult court	v60156629	1.1.1.1.1.2	321.0
2	1991	Canada	2016A000011124	Total offences	Total, age of accused	Total, sex of accused	Total charges	Guilty	v60156630	1.1.1.1.1.3	119838.0
3	1991	Canada	2016A000011124	Total offences	Total, age of accused	Total, sex of accused	Total charges	Percentage guilty	v61279858	1.1.1.1.1.4	55.0
4	1991	Canada	2016A000011124	Total offences	Total, age of accused	Total, sex of accused	Total charges	Acquitted	v60156631	1.1.1.1.1.5	4307.0

[26]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9587200 entries, 0 to 9587199
Data columns (total 11 columns):
 #   Column            Dtype
---  ------            -----
```

```
 0   REF_DATE          int64
 1   GEO               object
 2   DGUID             object
 3   Offences          object
 4   Age of accused    object
 5   Sex of accused    object
 6   Charge and case   object
 7   Type of decision  object
 8   VECTOR            object
 9   COORDINATE        object
 10  VALUE             float64
dtypes: float64(1), int64(1), object(9)
memory usage: 804.6+ MB
```

3.3 Remove spaces from headers

Headers cannot have spaces in them in order to make use of many functions programs and coding languages. Youth Detentions and Court Cases dataframes need to have ' ' replaced with '_'. Additionally we will replace the 'VALUE' term in Youth Detentions to 'Corrections'.

Before

[27]:
```
YD.head()
```

[27]:
```
   REF_DATE                       GEO Admissions and releases  \
0      1997  Provinces and territories        Youth admissions
1      1997  Provinces and territories        Youth admissions
2      1997  Provinces and territories        Youth admissions
3      1997  Provinces and territories        Youth admissions
4      1997  Provinces and territories        Youth admissions

              Correctional services    VALUE
0       Total correctional services  70542.0
1               Pre-trial detention  16010.0
2        Provincial director remand      NaN
3                    Secure custody   8019.0
4  Custody and supervision (secure)      NaN
```

[28]:
```
data.head()
```

[28]:
```
   REF_DATE     GEO           DGUID        Offences         Age of accused  \
0      1991  Canada  2016A000011124  Total offences  Total, age of accused
1      1991  Canada  2016A000011124  Total offences  Total, age of accused
2      1991  Canada  2016A000011124  Total offences  Total, age of accused
3      1991  Canada  2016A000011124  Total offences  Total, age of accused
4      1991  Canada  2016A000011124  Total offences  Total, age of accused

           Sex of accused Charge and case            Type of decision  \
```

```
0  Total, sex of accused   Total charges             Total decisions
1  Total, sex of accused   Total charges  Transferred to adult court
2  Total, sex of accused   Total charges                      Guilty
3  Total, sex of accused   Total charges           Percentage guilty
4  Total, sex of accused   Total charges                    Acquitted

      VECTOR   COORDINATE     VALUE
0  v60156628  1.1.1.1.1.1  218802.0
1  v60156629  1.1.1.1.1.2     321.0
2  v60156630  1.1.1.1.1.3  119838.0
3  v61279858  1.1.1.1.1.4      55.0
4  v60156631  1.1.1.1.1.5    4307.0
```

After

[29]:
```
YD.rename(columns={'Admissions and releases': 'Admissions_and_releases',␣
 ↪'Correctional services': 'Correctional_services', 'VALUE': 'Corrections'},␣
 ↪inplace=True)
YD.head()
```

[29]:
```
   REF_DATE                      GEO Admissions_and_releases  \
0      1997  Provinces and territories        Youth admissions
1      1997  Provinces and territories        Youth admissions
2      1997  Provinces and territories        Youth admissions
3      1997  Provinces and territories        Youth admissions
4      1997  Provinces and territories        Youth admissions

              Correctional_services  Corrections
0       Total correctional services      70542.0
1               Pre-trial detention      16010.0
2        Provincial director remand          NaN
3                    Secure custody       8019.0
4  Custody and supervision (secure)          NaN
```

[30]:
```
data.rename(
    columns = {'Age of accused': 'Age_of_accused', 'Sex of accused' :␣
 ↪'Sex_of_accused', 'Charge and case' : 'Charge_and_case', 'Type of decision':␣
 ↪'Type_of_decision'}, inplace=True
)
data.head()
```

[30]:
```
   REF_DATE     GEO           DGUID        Offences         Age_of_accused  \
0      1991  Canada  2016A000011124  Total offences  Total, age of accused
1      1991  Canada  2016A000011124  Total offences  Total, age of accused
2      1991  Canada  2016A000011124  Total offences  Total, age of accused
3      1991  Canada  2016A000011124  Total offences  Total, age of accused
4      1991  Canada  2016A000011124  Total offences  Total, age of accused
```

```
          Sex_of_accused Charge_and_case            Type_of_decision  \
0  Total, sex of accused   Total charges             Total decisions
1  Total, sex of accused   Total charges  Transferred to adult court
2  Total, sex of accused   Total charges                      Guilty
3  Total, sex of accused   Total charges           Percentage guilty
4  Total, sex of accused   Total charges                    Acquitted

      VECTOR   COORDINATE     VALUE
0  v60156628  1.1.1.1.1.1  218802.0
1  v60156629  1.1.1.1.1.2     321.0
2  v60156630  1.1.1.1.1.3  119838.0
3  v61279858  1.1.1.1.1.4      55.0
4  v60156631  1.1.1.1.1.5    4307.0
```

3.4 Drop rows with summaries of other rows in Court Cases and Youth Detentions

The various offence categories in the Court Cases dataset have been summarized into other rows. These summary rows need to be removed to avoid duplicate data. In addition rows with values of 0 or null will be dropped in order to make graphs cleaner.

3.4.1 Court Cases

[31]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9587200 entries, 0 to 9587199
Data columns (total 11 columns):
 #   Column            Dtype
---  ------            -----
 0   REF_DATE          int64
 1   GEO               object
 2   DGUID             object
 3   Offences          object
 4   Age_of_accused    object
 5   Sex_of_accused    object
 6   Charge_and_case   object
 7   Type_of_decision  object
 8   VECTOR            object
 9   COORDINATE        object
 10  VALUE             float64
dtypes: float64(1), int64(1), object(9)
memory usage: 804.6+ MB
```

[32]:
```
data.drop(data.index[data['Type_of_decision'] == 'Total decisions'], inplace =␣
 ↪True)
data.drop(data.index[data['Charge_and_case'] == 'Total charges'], inplace = True)
data.drop(data.index[data['Charge_and_case'] == 'Total cases'], inplace = True)
data.drop(data.index[data['Offences'] == 'Total Criminal Code'], inplace = True)
```

```
data.drop(data.index[data['Offences'] == 'Criminal Code (without traffic)'],␣
 ↪inplace = True)
data.drop(data.index[data['Offences'] == 'Total offences'], inplace = True)
data.drop(data.index[data['VALUE'] == 0.0], inplace = True)
data.drop(data.index[data['Offences'] == 'Crimes against the person'], inplace =␣
 ↪True)
data.drop(data.index[data['Offences'] == 'Crimes against property'], inplace =␣
 ↪True)
data.drop(data.index[data['Offences'] == 'Administration of justice'], inplace =␣
 ↪True)
data.drop(data.index[data['Offences'] == 'Other federal statutes'], inplace =␣
 ↪True)
data.drop(data.index[data['Offences'] == 'Youth Criminal Justice Act'], inplace␣
 ↪= True)
data.drop(data.index[data['Sex_of_accused'] == 'Total, sex of accused'], inplace␣
 ↪= True)
data.drop(data.index[data['Age_of_accused'] == 'Total, age of accused'], inplace␣
 ↪= True)
data = data.dropna()
data = data.reset_index()
data = data.drop('index', axis = 1)
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 343045 entries, 0 to 343044
Data columns (total 11 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   REF_DATE          343045 non-null  int64
 1   GEO               343045 non-null  object
 2   DGUID             343045 non-null  object
 3   Offences          343045 non-null  object
 4   Age_of_accused    343045 non-null  object
 5   Sex_of_accused    343045 non-null  object
 6   Charge_and_case   343045 non-null  object
 7   Type_of_decision  343045 non-null  object
 8   VECTOR            343045 non-null  object
 9   COORDINATE        343045 non-null  object
 10  VALUE             343045 non-null  float64
dtypes: float64(1), int64(1), object(9)
memory usage: 28.8+ MB
```

3.4.2 Youth Detentions

[33]:
```
YD.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10766 entries, 0 to 10765
```

```
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   REF_DATE                 10766 non-null  int64
 1   GEO                      10766 non-null  object
 2   Admissions_and_releases  10766 non-null  object
 3   Correctional_services    10766 non-null  object
 4   Corrections              5755 non-null   float64
dtypes: float64(1), int64(1), object(3)
memory usage: 420.7+ KB
```

[34]:
```
YD.drop(YD.index[YD['Correctional_services'] == 'Total correctional services'],␣
 ↪inplace = True)
YD.drop(YD.index[YD['Correctional_services'] == 'Total community sentences'],␣
 ↪inplace = True)

YD = YD.reset_index()
YD = YD.drop('index', axis = 1)

YD.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9226 entries, 0 to 9225
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   REF_DATE                 9226 non-null   int64
 1   GEO                      9226 non-null   object
 2   Admissions_and_releases  9226 non-null   object
 3   Correctional_services    9226 non-null   object
 4   Corrections              4666 non-null   float64
dtypes: float64(1), int64(1), object(3)
memory usage: 360.5+ KB
```

[35]:
```
YD.Correctional_services.unique()
```

[35]:
```
array(['Pre-trial detention', 'Provincial director remand',
       'Secure custody', 'Custody and supervision (secure)',
       'Young Offenders Act (YOA) (secure)', 'Open custody',
       'Custody and supervision (open)',
       'Young Offenders Act (YOA) (open)',
       'Community Portion of Custody Supervision',
       'Intensive support and supervision',
       'Deferred custody and supervision', 'Supervised probation',
       'Other community sentences'], dtype=object)
```

4 Engineering (transforming) data

4.1 Drop Canada, and low population Provinces and Territories

displaying all 13 provinces and territories on graphs get messy. In addition the numbers of the Maritime provinces and the Territories are so low compared to the other provinces that their data is unreadable. Quebec will also be removed due to the severe lack of data provided by Quebec.

Also Canada population totals are listed in both the court cases and Population datasets currently. Since only the relevant provinces are needed Canada values will be removed.

Population Before

[36]:
```
pop
```

[36]:

	Geography	1997	1998	1999	2000	\
0	Canada	29,818,012	30,080,180	30,314,696	30,594,030	
1	Newfoundland and Labrador	553,115	542,479	534,498	529,574	
2	Prince Edward Island	135,931	135,635	136,025	136,289	
3	Nova Scotia	931,832	932,033	932,116	934,291	
4	New Brunswick	752,447	751,080	750,075	750,543	
5	Quebec	7,267,820	7,290,497	7,315,053	7,347,179	
6	Ontario	11,179,959	11,322,038	11,452,857	11,621,255	
7	Manitoba	1,135,846	1,136,177	1,140,502	1,145,873	
8	Saskatchewan	1,017,683	1,017,105	1,015,716	1,009,177	
9	Alberta	2,813,157	2,876,753	2,937,393	2,988,465	
10	British Columbia	3,931,056	3,977,912	4,002,433	4,033,319	
11	Yukon	31,659	31,320	30,602	30,382	
12	Northwest Territories 5	41,668	40,968	40,705	40,455	
13	Nunavut 5	25,839	26,183	26,721	27,228	

	2001	2002	2003	2004	2005	...	\
0	30,910,996	31,253,382	31,550,768	31,846,669	32,141,943	...	
1	523,235	520,228	518,813	517,940	515,358	...	
2	136,499	136,892	137,120	137,629	137,788	...	
3	932,909	934,177	935,800	938,783	937,991	...	
4	749,789	748,777	749,265	749,336	748,693	...	
5	7,383,844	7,428,016	7,471,775	7,520,262	7,567,307	...	
6	11,827,345	12,030,408	12,195,501	12,341,656	12,477,967	...	
7	1,149,684	1,154,737	1,160,863	1,170,347	1,177,285	...	
8	1,001,643	997,740	995,748	997,080	994,892	...	
9	3,041,238	3,108,360	3,169,049	3,223,490	3,296,271	...	
10	4,066,132	4,094,236	4,114,925	4,145,951	4,182,963	...	
11	30,124	30,142	30,573	31,401	31,862	...	
12	40,625	41,280	42,219	43,210	43,457	...	
13	27,929	28,389	29,117	29,584	30,109	...	

	2013	2014	2015	2016	2017	2018	\
0	34,958,216	35,323,533	35,611,271	35,970,303	36,398,013	36,898,431	

```
1       527,313     527,498     528,063     529,063     528,544     526,395
2       143,948     143,984     144,259     145,784     148,860     152,039
3       941,230     938,913     936,271     940,382     947,384     954,618
4       758,132     758,876     758,948     762,289     764,813     768,522
5     8,090,916   8,132,425   8,163,063   8,204,085   8,272,894   8,367,551
6    13,467,829  13,582,747  13,669,860  13,816,545  14,006,386  14,235,643
7     1,260,834   1,274,407   1,288,094   1,307,689   1,328,412   1,347,055
8     1,094,390   1,109,631   1,118,806   1,131,147   1,146,218   1,158,451
9     3,946,798   4,054,280   4,128,300   4,181,765   4,227,969   4,281,706
10    4,611,648   4,684,490   4,757,759   4,832,155   4,905,210   4,983,183
11       36,313      36,682      37,372      38,042      39,175      40,141
12       43,867      43,794      44,193      44,590      44,813      45,320
13       34,998      35,806      36,283      36,767      37,335      37,807

           2019        2020        2021        2022
0    37,422,946  38,000,056  38,153,211  38,654,738
1       524,131     522,465     519,693     522,875
2       155,916     160,417     162,596     167,680
3       965,553     979,175     985,776   1,007,049
4       774,035     782,199     785,819     800,243
5     8,466,531   8,574,270   8,587,179   8,653,184
6    14,467,552  14,729,324  14,795,883  15,007,816
7     1,364,667   1,379,735   1,383,638   1,393,179
8     1,169,397   1,179,939   1,180,314   1,186,308
9     4,344,454   4,415,700   4,438,772   4,500,917
10    5,066,120   5,150,616   5,185,990   5,286,528
11       40,932      42,017      42,586      43,249
12       45,137      45,363      45,629      45,607
13       38,521      38,836      39,336      40,103

[14 rows x 27 columns]
```

After

[37]:
```
pop = pop.drop(11, axis = 0)
pop = pop.drop(12, axis = 0)
pop = pop.drop(13, axis = 0)
pop = pop.drop(1, axis = 0)
pop = pop.drop(2, axis = 0)
pop = pop.drop(3, axis = 0)
pop = pop.drop(4, axis = 0)
pop = pop.drop(0, axis = 0)
pop = pop.drop(5, axis = 0)
pop = pop.reset_index()
pop = pop.drop('index', axis = 1)
pop
```

[37]:
```
           Geography        1997        1998        1999        2000  \
0            Ontario  11,179,959  11,322,038  11,452,857  11,621,255
1           Manitoba   1,135,846   1,136,177   1,140,502   1,145,873
2       Saskatchewan   1,017,683   1,017,105   1,015,716   1,009,177
3            Alberta   2,813,157   2,876,753   2,937,393   2,988,465
4  British Columbia   3,931,056   3,977,912   4,002,433   4,033,319

         2001        2002        2003        2004        2005  ...  \
0  11,827,345  12,030,408  12,195,501  12,341,656  12,477,967  ...
1   1,149,684   1,154,737   1,160,863   1,170,347   1,177,285  ...
2   1,001,643     997,740     995,748     997,080     994,892  ...
3   3,041,238   3,108,360   3,169,049   3,223,490   3,296,271  ...
4   4,066,132   4,094,236   4,114,925   4,145,951   4,182,963  ...

         2013        2014        2015        2016        2017        2018  \
0  13,467,829  13,582,747  13,669,860  13,816,545  14,006,386  14,235,643
1   1,260,834   1,274,407   1,288,094   1,307,689   1,328,412   1,347,055
2   1,094,390   1,109,631   1,118,806   1,131,147   1,146,218   1,158,451
3   3,946,798   4,054,280   4,128,300   4,181,765   4,227,969   4,281,706
4   4,611,648   4,684,490   4,757,759   4,832,155   4,905,210   4,983,183

         2019        2020        2021        2022
0  14,467,552  14,729,324  14,795,883  15,007,816
1   1,364,667   1,379,735   1,383,638   1,393,179
2   1,169,397   1,179,939   1,180,314   1,186,308
3   4,344,454   4,415,700   4,438,772   4,500,917
4   5,066,120   5,150,616   5,185,990   5,286,528

[5 rows x 27 columns]
```

Youth Detentions Before

[38]:
```
YD.head()
```

[38]:
```
   REF_DATE                      GEO Admissions_and_releases  \
0      1997  Provinces and territories        Youth admissions
1      1997  Provinces and territories        Youth admissions
2      1997  Provinces and territories        Youth admissions
3      1997  Provinces and territories        Youth admissions
4      1997  Provinces and territories        Youth admissions

                Correctional_services  Corrections
0                 Pre-trial detention      16010.0
1          Provincial director remand          NaN
2                      Secure custody       8019.0
3   Custody and supervision (secure)          NaN
4  Young Offenders Act (YOA) (secure)          NaN
```

[39]:
```
YD = YD[YD['GEO'] != 'Provinces and territories']
YD = YD[YD['GEO'] != 'Newfoundland and Labrador']
YD = YD[YD['GEO'] != 'Prince Edward Island']
YD = YD[YD['GEO'] != 'Quebec']
YD = YD[YD['GEO'] != 'New Brunswick']
YD = YD[YD['GEO'] != 'Ontario, Ministry of Children and Youth Services (MCYS)']
YD = YD[YD['GEO'] != 'Nova Scotia']
YD = YD[YD['GEO'] != 'Ontario, Ministry of Community Safety and Correctional␣
 ↪Services (MCSCS)']
YD = YD[YD['GEO'] != 'Northwest Territories including Nunavut']
YD = YD[YD['GEO'] != 'Northwest Territories']
YD = YD[YD['GEO'] != 'Yukon']
YD = YD[YD['GEO'] != 'Nunavut']

data = data.reset_index()
data = data.drop('index', axis = 1)
```

after

[40]:
```
YD.GEO.unique()
```

[40]:
```
array(['Ontario', 'Manitoba', 'Saskatchewan', 'Alberta',
       'British Columbia'], dtype=object)
```

[41]:
```
YD.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2840 entries, 156 to 9171
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   REF_DATE                 2840 non-null   int64
 1   GEO                      2840 non-null   object
 2   Admissions_and_releases  2840 non-null   object
 3   Correctional_services    2840 non-null   object
 4   Corrections              1612 non-null   float64
dtypes: float64(1), int64(1), object(3)
memory usage: 133.1+ KB
```

Court Cases before

[42]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 343045 entries, 0 to 343044
Data columns (total 11 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   REF_DATE          343045 non-null  int64
```

```
 1   GEO               343045 non-null  object
 2   DGUID             343045 non-null  object
 3   Offences          343045 non-null  object
 4   Age_of_accused    343045 non-null  object
 5   Sex_of_accused    343045 non-null  object
 6   Charge_and_case   343045 non-null  object
 7   Type_of_decision  343045 non-null  object
 8   VECTOR            343045 non-null  object
 9   COORDINATE        343045 non-null  object
 10  VALUE             343045 non-null  float64
dtypes: float64(1), int64(1), object(9)
memory usage: 28.8+ MB
```

[43]:
```
data.drop(data.index[data['GEO'] == 'Canada'], inplace = True)
data = data.reset_index()
data = data.drop('index', axis = 1)
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 277940 entries, 0 to 277939
Data columns (total 11 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   REF_DATE          277940 non-null  int64
 1   GEO               277940 non-null  object
 2   DGUID             277940 non-null  object
 3   Offences          277940 non-null  object
 4   Age_of_accused    277940 non-null  object
 5   Sex_of_accused    277940 non-null  object
 6   Charge_and_case   277940 non-null  object
 7   Type_of_decision  277940 non-null  object
 8   VECTOR            277940 non-null  object
 9   COORDINATE        277940 non-null  object
 10  VALUE             277940 non-null  float64
dtypes: float64(1), int64(1), object(9)
memory usage: 23.3+ MB
```

4.2 Percentage decisions

Now that the large dataset has been trimmed down a bit, the value for 'Type of decision' is a percentage out of 100. In order to be counted properly compared to other decisions each percentage based value needs to be divided by 100.

before

[44]:
```
data.head()
```

[44]:
```
   REF_DATE                          GEO        DGUID          Offences  \
0      1991  Newfoundland and Labrador  2016A000210  Attempted murder
```

```
1      1991  Newfoundland and Labrador  2016A000210           Robbery
2      1991  Newfoundland and Labrador  2016A000210           Robbery
3      1991  Newfoundland and Labrador  2016A000210           Robbery
4      1991  Newfoundland and Labrador  2016A000210           Robbery

    Age_of_accused Sex_of_accused        Charge_and_case     Type_of_decision  \
0  16 and 17 years          Males        Related charges  Stayed or withdrawn
1   12 to 15 years          Males  Multiple-charge cases               Guilty
2   12 to 15 years          Males  Multiple-charge cases   Percentage guilty
3   12 to 15 years          Males  Multiple-charge cases  Stayed or withdrawn
4  16 and 17 years          Males  Multiple-charge cases               Guilty

      VECTOR   COORDINATE  VALUE
0  v60186656  2.6.3.2.5.6    1.0
1  v60187188  2.7.2.2.4.3    1.0
2  v61284951  2.7.2.2.4.4   50.0
3  v60187190  2.7.2.2.4.6    1.0
4  v60187308  2.7.3.2.4.3    2.0
```

[45]:
```
data.loc[data['Type_of_decision'] == 'Percentage guilty', 'VALUE'] =␣
 ↪(data['VALUE'] / 100)
data.head()
```

[45]:
```
   REF_DATE                        GEO        DGUID          Offences  \
0      1991  Newfoundland and Labrador  2016A000210  Attempted murder
1      1991  Newfoundland and Labrador  2016A000210           Robbery
2      1991  Newfoundland and Labrador  2016A000210           Robbery
3      1991  Newfoundland and Labrador  2016A000210           Robbery
4      1991  Newfoundland and Labrador  2016A000210           Robbery

    Age_of_accused Sex_of_accused        Charge_and_case     Type_of_decision  \
0  16 and 17 years          Males        Related charges  Stayed or withdrawn
1   12 to 15 years          Males  Multiple-charge cases               Guilty
2   12 to 15 years          Males  Multiple-charge cases   Percentage guilty
3   12 to 15 years          Males  Multiple-charge cases  Stayed or withdrawn
4  16 and 17 years          Males  Multiple-charge cases               Guilty

      VECTOR   COORDINATE  VALUE
0  v60186656  2.6.3.2.5.6    1.0
1  v60187188  2.7.2.2.4.3    1.0
2  v61284951  2.7.2.2.4.4    0.5
3  v60187190  2.7.2.2.4.6    1.0
4  v60187308  2.7.3.2.4.3    2.0
```

4.3 Wide to Long data

The population dataset was given by Stats Canada in a wide format. It needs to be transformed into a new long format dataframe (popYear) in order to be more useful for graphing.

[46]:
```
popYear = pd.DataFrame()
popYear['Geography'] = []
popYear['Year'] = []
popYear['Population'] = []
```

[47]:
```
geo = pop['Geography']
tFrame = pop.drop('Geography', axis = 1)
count = 1997
for col in tFrame:
    row = 0
    while row < 5:
        popYear = popYear.append({'Geography' : geo[row], 'Year' : col,␣
 ↪'Population' : tFrame.loc[row][count]}, ignore_index = True)
#         print(geo[row], col, tFrame.loc[row][count])
        row += 1
    count += 1
    if count == 2022:
        break
popYear
```

[47]:

	Geography	Year	Population
0	Ontario	1997.0	11,179,959
1	Manitoba	1997.0	1,135,846
2	Saskatchewan	1997.0	1,017,683
3	Alberta	1997.0	2,813,157
4	British Columbia	1997.0	3,931,056
..	...	...	...
120	Ontario	2021.0	14,795,883
121	Manitoba	2021.0	1,383,638
122	Saskatchewan	2021.0	1,180,314
123	Alberta	2021.0	4,438,772
124	British Columbia	2021.0	5,185,990

[125 rows x 3 columns]

4.4 Convert 'Population' to a number datatype

Population is currently a string datatype. In order to be used by graphs, all the commas will need to be removed and then the column can be converted into a number datatype.

Before

[48]:
```
popYear
```

[48]:

	Geography	Year	Population
0	Ontario	1997.0	11,179,959
1	Manitoba	1997.0	1,135,846
2	Saskatchewan	1997.0	1,017,683

```
3              Alberta  1997.0   2,813,157
4    British Columbia   1997.0   3,931,056
..                 ...     ...         ...
120            Ontario  2021.0  14,795,883
121           Manitoba  2021.0   1,383,638
122       Saskatchewan  2021.0   1,180,314
123            Alberta  2021.0   4,438,772
124  British Columbia   2021.0   5,185,990

[125 rows x 3 columns]
```

After

[49]:
```
popYear = popYear.replace(',','', regex=True)
popYear['Population'] = pd.to_numeric(popYear['Population'])
popYear.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 125 entries, 0 to 124
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Geography   125 non-null    object
 1   Year        125 non-null    float64
 2   Population  125 non-null    int64
dtypes: float64(1), int64(1), object(1)
memory usage: 3.1+ KB
```

5 Creating specialized dataframes for graphs

5.1 Create a merge population table with PopYear and Youth Detentions

The first table to create (popMerge) is combining the population table with the Youth Detentions table while including only data relevant to the Western-most provinces (see 'Drop low population Provinces and Territories' section for why). Also duplicate columns will be deleted.

[50]:
```
popMerge = YD.merge(popYear, left_on = ['REF_DATE', 'GEO'], right_on = ['Year',␣
↪'Geography'], how = 'left')
popMerge.head()
```

[50]:
```
   REF_DATE      GEO Admissions_and_releases  \
0      1997  Ontario        Youth admissions
1      1997  Ontario        Youth admissions
2      1997  Ontario        Youth admissions
3      1997  Ontario        Youth admissions
4      1997  Ontario        Youth admissions

                Correctional_services  Corrections Geography    Year  \
```

```
0                 Pre-trial detention       4966.0   Ontario  1997.0
1          Provincial director remand          NaN   Ontario  1997.0
2                       Secure custody       3738.0   Ontario  1997.0
3    Custody and supervision (secure)          NaN   Ontario  1997.0
4  Young Offenders Act (YOA) (secure)          NaN   Ontario  1997.0

   Population
0    11179959
1    11179959
2    11179959
3    11179959
4    11179959
```

[51]:
```
popMerge = popMerge.dropna()
popMerge.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1612 entries, 0 to 2839
Data columns (total 8 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   REF_DATE                 1612 non-null   int64
 1   GEO                      1612 non-null   object
 2   Admissions_and_releases  1612 non-null   object
 3   Correctional_services    1612 non-null   object
 4   Corrections              1612 non-null   float64
 5   Geography                1612 non-null   object
 6   Year                     1612 non-null   float64
 7   Population               1612 non-null   int64
dtypes: float64(2), int64(2), object(4)
memory usage: 113.3+ KB
```

[52]:
```
popMerge = popMerge.drop('GEO', axis = 1)
popMerge = popMerge.drop('Year', axis = 1)
popMerge = popMerge.reset_index()
popMerge = popMerge.drop('index', axis = 1)
```

5.1.1 Remove releases

For this table's 'Admissions and releases' column, only admissions is needed, so releases will be removed and the column renamed appropriately.

[53]:
```
popMerge = popMerge[popMerge['Admissions_and_releases'] != 'Youth releases']
popMerge = popMerge.reset_index()
popMerge = popMerge.drop('index', axis = 1)
popMerge.rename(columns={'Admissions_and_releases': 'Admissions'}, inplace=True)
popMerge
```

[53]:
```
     REF_DATE        Admissions                     Correctional_services  \
0        1997  Youth admissions                       Pre-trial detention
1        1997  Youth admissions                            Secure custody
2        1997  Youth admissions                              Open custody
3        1997  Youth admissions                     Supervised probation
4        1997  Youth admissions                       Pre-trial detention
..        ...               ...                                       ...
826      2020  Youth admissions  Community Portion of Custody Supervision
827      2020  Youth admissions         Intensive support and supervision
828      2020  Youth admissions          Deferred custody and supervision
829      2020  Youth admissions                     Supervised probation
830      2020  Youth admissions                Other community sentences

     Corrections         Geography  Population
0         4966.0           Ontario    11179959
1         3738.0           Ontario    11179959
2         4219.0           Ontario    11179959
3        17699.0           Ontario    11179959
4         1789.0          Manitoba     1135846
..           ...               ...         ...
826         29.0  British Columbia     5150616
827         67.0  British Columbia     5150616
828         31.0  British Columbia     5150616
829        287.0  British Columbia     5150616
830        904.0  British Columbia     5150616

[831 rows x 6 columns]
```

5.1.2 Calculate Correctional services per 1000 population

The last thing to do for this dataset before creating graphs and exporting for excel use is to calculate how often youth corrections happen relative to population size. Multiplying by 1000 gives numbers closer to the single digits.

[54]:
```
popMerge['Youth_corrections_per_1000_population'] = (popMerge['Corrections'] /␣
 ↪popMerge['Population']) * 1000
popMerge
```

[54]:
```
     REF_DATE        Admissions                     Correctional_services  \
0        1997  Youth admissions                       Pre-trial detention
1        1997  Youth admissions                            Secure custody
2        1997  Youth admissions                              Open custody
3        1997  Youth admissions                     Supervised probation
4        1997  Youth admissions                       Pre-trial detention
..        ...               ...                                       ...
826      2020  Youth admissions  Community Portion of Custody Supervision
827      2020  Youth admissions         Intensive support and supervision
```

```
828      2020  Youth admissions          Deferred custody and supervision
829      2020  Youth admissions                      Supervised probation
830      2020  Youth admissions                 Other community sentences

     Corrections         Geography  Population  \
0         4966.0           Ontario    11179959
1         3738.0           Ontario    11179959
2         4219.0           Ontario    11179959
3        17699.0           Ontario    11179959
4         1789.0          Manitoba     1135846
..           ...               ...         ...
826         29.0  British Columbia     5150616
827         67.0  British Columbia     5150616
828         31.0  British Columbia     5150616
829        287.0  British Columbia     5150616
830        904.0  British Columbia     5150616

     Youth_corrections_per_1000_population
0                                 0.444188
1                                 0.334348
2                                 0.377372
3                                 1.583101
4                                 1.575037
..                                     ...
826                               0.005630
827                               0.013008
828                               0.006019
829                               0.055721
830                               0.175513

[831 rows x 7 columns]
```

5.2 Create a Manitoba subset from the Court Cases dataset

[55]:
```
mbData = data.loc[data['GEO'] == 'Manitoba']
mbData = mbData.reset_index()
mbData = mbData.drop('index', axis = 1)
mbData.tail()
```

[55]:
```
       REF_DATE       GEO        DGUID                    Offences  \
23465      2019  Manitoba  2016A000246        Other drug offences
23466      2019  Manitoba  2016A000246        Other drug offences
23467      2019  Manitoba  2016A000246        Other drug offences
23468      2019  Manitoba  2016A000246        Other drug offences
23469      2019  Manitoba  2016A000246  Residual federal statutes

        Age_of_accused Sex_of_accused        Charge_and_case  \
```

```
23465  16 and 17 years    Sex unknown  Multiple-charge cases
23466  16 and 17 years    Sex unknown         Related charges
23467  16 and 17 years    Sex unknown         Related charges
23468  16 and 17 years    Sex unknown         Related charges
23469  16 and 17 years    Sex unknown         Related charges

          Type_of_decision     VECTOR    COORDINATE  VALUE
23465  Stayed or withdrawn  v60379760  8.38.3.5.4.6   2.00
23466               Guilty  v60379764  8.38.3.5.5.3   2.00
23467    Percentage guilty  v61314792  8.38.3.5.5.4   0.17
23468  Stayed or withdrawn  v60379766  8.38.3.5.5.6  10.00
23469  Stayed or withdrawn  v60381806  8.40.3.5.5.6   1.00
```

5.3 Create a mbData subset of the most recent year (2019/2020)

Something worth looking at is how the most recent year (2019/2020) compares to the average from this dataset (from 1991/1992 - 2019/2020).

[56]:
```
mb2019 = mbData.loc[mbData['REF_DATE'] == 2019]
mb2019 = mb2019.reset_index()
mb2019 = mb2019.drop('index', axis = 1)
mb2019.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 471 entries, 0 to 470
Data columns (total 11 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   REF_DATE          471 non-null    int64
 1   GEO               471 non-null    object
 2   DGUID             471 non-null    object
 3   Offences          471 non-null    object
 4   Age_of_accused    471 non-null    object
 5   Sex_of_accused    471 non-null    object
 6   Charge_and_case   471 non-null    object
 7   Type_of_decision  471 non-null    object
 8   VECTOR            471 non-null    object
 9   COORDINATE        471 non-null    object
 10  VALUE             471 non-null    float64
dtypes: float64(1), int64(1), object(9)
memory usage: 40.6+ KB
```

6 Exporting new datasets to csv and spreadsheet files

[57]:
```
popYear.to_csv(pwd + '/PopulationLong.csv')
```

[58]:
```
YD.to_csv(pwd + '/YouthDetentionsCleaned.csv')
```

[59]:
```
mbData.to_csv(pwd + '/ManitobaCourtCases.csv')
```

[60]:
```
mb2019.to_csv(pwd + '/ManitobaCourtCases2019.csv')
```

[61]:
```
data.to_csv(pwd + '/CourtCasesCleaned.csv')
```

[62]:
```
popMerge.to_csv(pwd + '/YouthCorrectionsPer1000Population.csv')
```

[63]:
```
writer = pd.ExcelWriter(pwd + '/YouthJusticeInManitoba.xlsx', engine =␣
 ↪'xlsxwriter')

data.to_excel(writer, sheet_name='Youth Court Cases Cleaned')
YD.to_excel(writer, sheet_name='YouthDetentionsCleaned')
popYear.to_excel(writer, sheet_name = 'Population Long')
mbData.to_excel(writer, sheet_name='Mb Youth Court Cases')
mb2019.to_excel(writer, sheet_name='Mb Youth Court Cases, 2019')
popMerge.to_excel(writer, sheet_name='Youth charges per 1000 Pop')

writer.save()
```

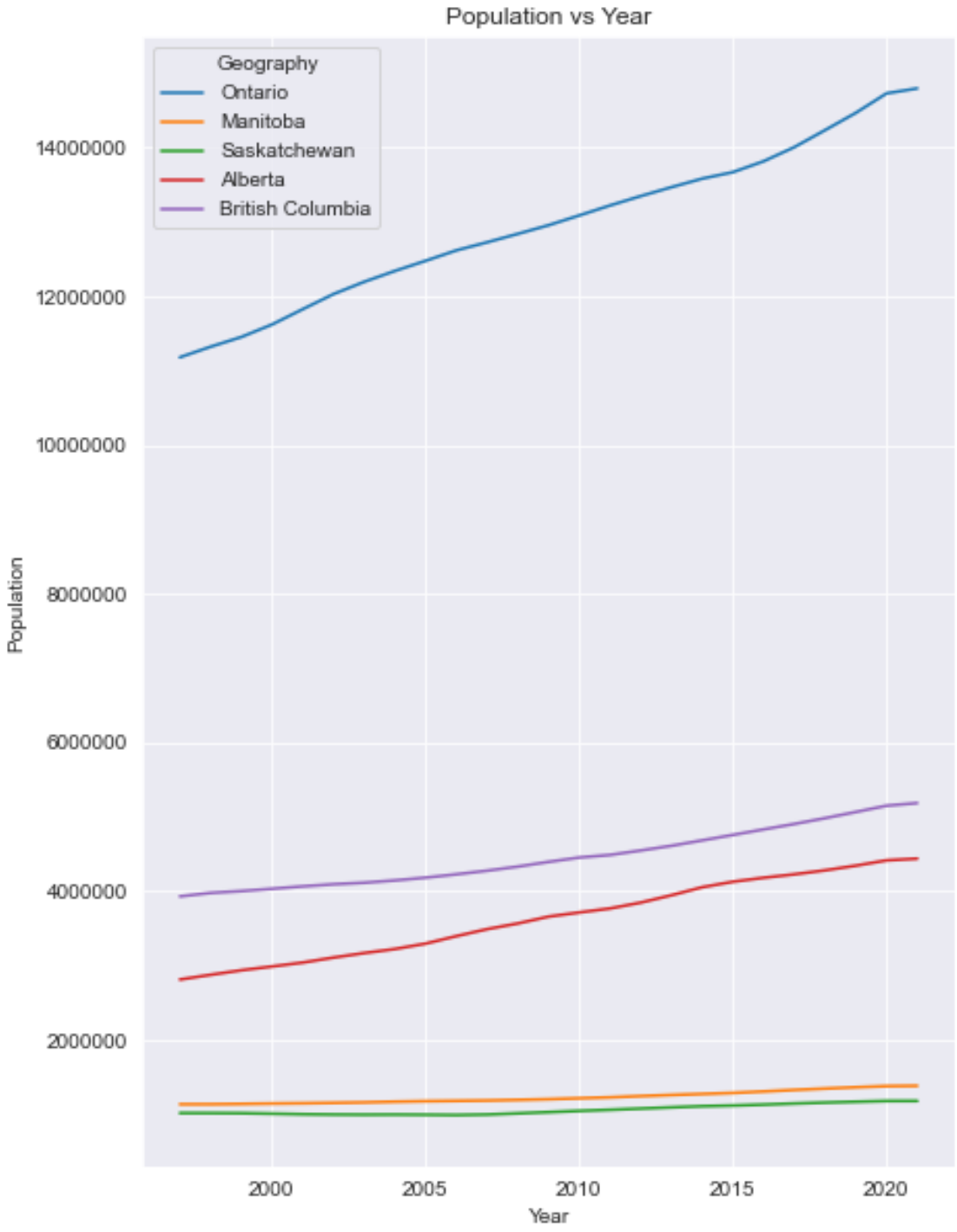
7 Graphs

Cleaning the data is usually what takes most of the time. Now that the data has been cleaned, graphs can be made to look at many different aspects of the data.

7.1 Population VS Year

First in the data is a view of population growth over the past from 1991/1992 - 2019/2020. Ontario, Alberta, and BC are growing at faster rates than Manitoba and Saskatchewan.

[64]:
```
sns.set_style('darkgrid')
fig, ax = plt.subplots()
fig.set_size_inches(7, 10)
plt.ticklabel_format(style='plain', axis='y')
sns.lineplot(data = popYear, x = 'Year', y = 'Population', hue = "Geography").
 ↪set(title = 'Population vs Year')
fig.savefig(pwd + '/PopVYear.png')
```

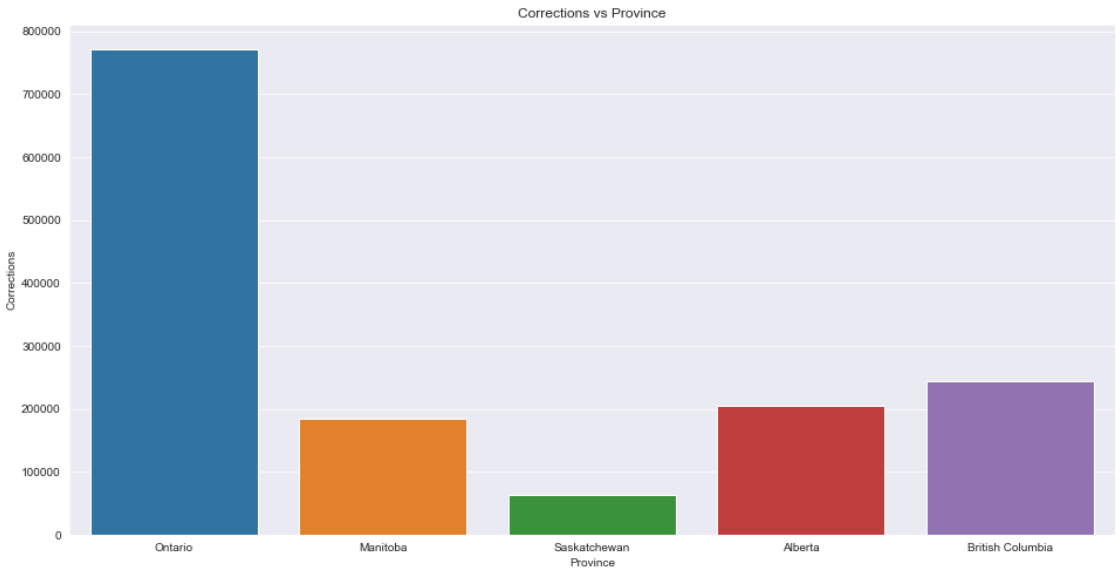


7.2 Corrections vs Province

Next is total Corrections over the same time period. Ontario is clearly much higher. Since Ontario is also a higher population it is clear that the ratio of corrections to population will be worth

looking into.

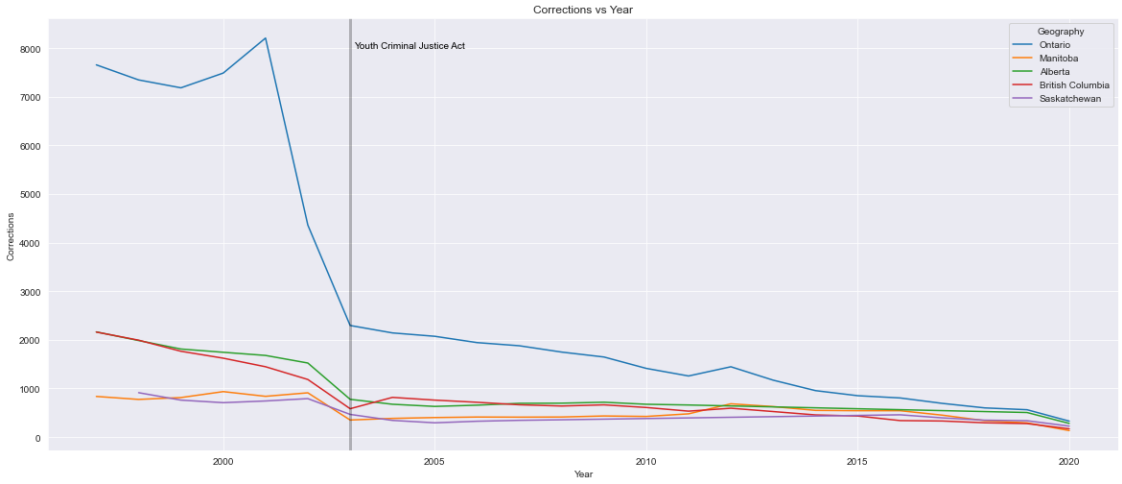
[65]:
```
fig, ax = plt.subplots()
fig.set_size_inches(16, 8)
plt.ticklabel_format(style='plain', axis='y')
sns.barplot(x = 'GEO', y = 'Corrections', data = YD, estimator = np.sum, ci =␣
 ↪None).set(title = 'Corrections vs Province')
ax.set(xlabel='Province')
fig.savefig(pwd + '/CorrectionsVProvince.png')
```



7.3 Corrections VS Year

Looking at a timeline of corrections by province, there is a large drop in all provinces, especially Ontario, with the introduction of the Youth Criminal Justice Act. Most provinces see a steady decline in corrections over time.

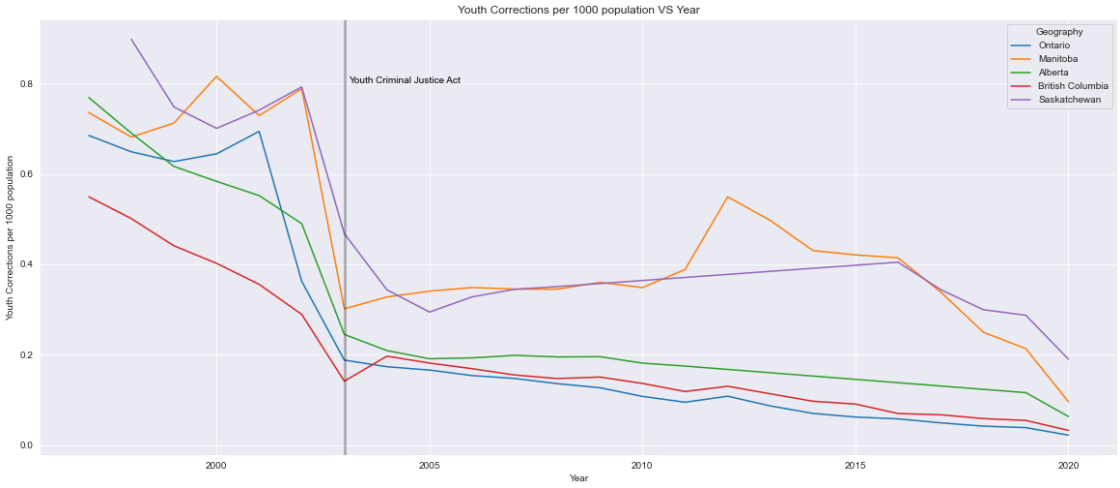
[66]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 8.27)
g = sns.lineplot(data = popMerge, x = 'REF_DATE', y = 'Corrections', hue =␣
 ↪'Geography', ci = None)
g.set(title = 'Corrections vs Year', xlabel='Year')
g.axvline(2003, color = 'black', lw = 3, alpha = 0.25)
plt.text(2003 + 0.1, 8000, "Youth Criminal Justice Act",␣
 ↪horizontalalignment='left', size='medium', color='black')
fig.savefig(pwd + '/CorrectionsVYear.png')
```



7.4 Youth Corrections per 1000 Population VS Year

Looking at youth corrections per capita (1000 population) vs Year, it appears that the trend is also a generally declining youth crime rate. The major exceptions are Manitoba and Saskatchewan who saw steadily increasing levels after the drop-off of the Youth Criminal Justice act. This upward trend continues until 2016. It is worth noting that Saskatchewan does not have data between 2006 and 2016, so it is possible that Saskatchewan also had elevated crime rates during this interval.

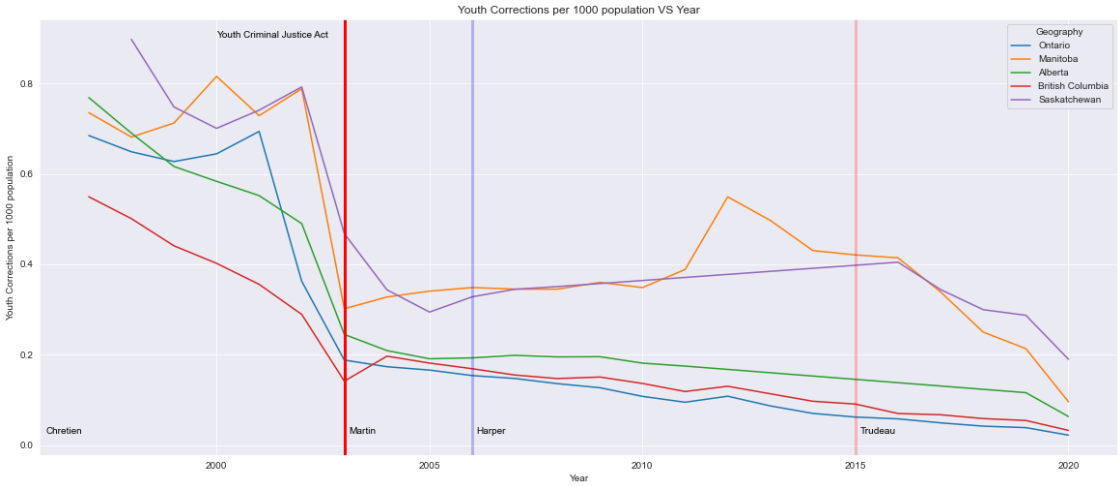
[67]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 8.27)
g = sns.lineplot(data = popMerge, x = 'REF_DATE', y =␣
 ↪'Youth_corrections_per_1000_population', hue = "Geography", ci = None)
g.axvline(2003, color = 'black', lw = 3, alpha = 0.25)
plt.text(2003 + 0.1, 0.8, "Youth Criminal Justice Act",␣
 ↪horizontalalignment='left', size='medium', color='black')
g.set(xlabel = 'Year', ylabel = 'Youth Corrections per 1000 population', title =␣
 ↪'Youth Corrections per 1000 population VS Year')
fig.savefig(pwd + '/CorrectionsPerCapitaVYear.png')
```



7.5 Youth Corrections per 1000 Population VS Year With Notations

Adding in major political changes and legislation can also help to understand what's going on during this timeline. Once again the Youth Criminal Justice act correlates to a reduction in corrections. Looking at the declines over the graph it is also fairly clear that the largest drops in corrections per capita happened during the Chretien and Trudeau administrations.

[68]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 8.27)
g = sns.lineplot(data = popMerge, x = 'REF_DATE', y =␣
 ↪'Youth_corrections_per_1000_population', hue = "Geography", ci = None)
g.set(xlabel = 'Year', ylabel = 'Youth Corrections per 1000 population', title =␣
 ↪'Youth Corrections per 1000 population VS Year')
g.axvline(2003, color = 'red', lw = 3, alpha = 1)
g.axvline(2006, color = 'blue', lw = 3, alpha = 0.25)
g.axvline(2015, color = 'red', lw = 3, alpha = 0.25)
plt.text(1996, 0.025, "Chretien", horizontalalignment='left', size='medium',␣
 ↪color='black')
plt.text(2003 + 0.1, 0.025, "Martin", horizontalalignment='left', size='medium',␣
 ↪color='black')
plt.text(2006 + 0.1, 0.025, "Harper", horizontalalignment='left', size='medium',␣
 ↪color='black')
plt.text(2015 + 0.1, 0.025, "Trudeau", horizontalalignment='left',␣
 ↪size='medium', color='black')
plt.text(2003 - 3, 0.9, "Youth Criminal Justice Act",␣
 ↪horizontalalignment='left', size='medium', color='black')
fig.savefig(pwd + '/CorrectionsPerCapitaVYearN.png')
```



7.6 Corrections per capita VS Year spread across Correction type VS Province

The last category to look at in this particular dataset is the type of Correctional services being administered. For this we will use a large facet grid to compare all 5 provinces to each other. Looking at this graph it is clear that Manitoba tends to have a higher ratio of 'pre-trial detentions' and 'other community sentances' than other provinces.

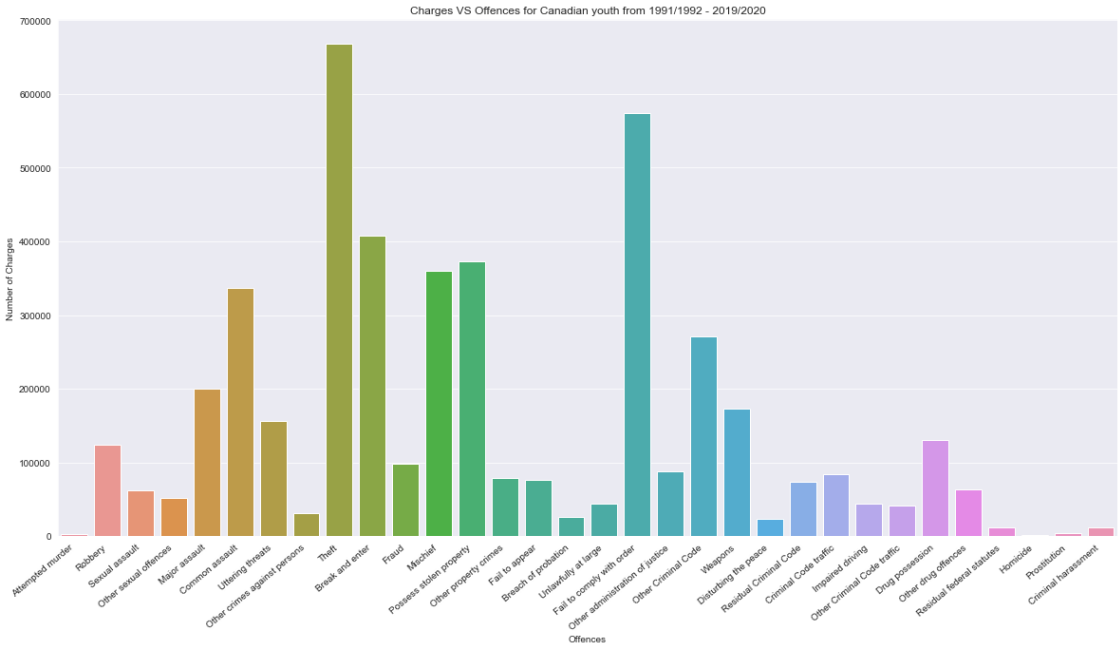
[69]:
```
sns.set_style('darkgrid')
grid = sns.FacetGrid(popMerge, col = 'Geography', row = 'Correctional_services',␣
 ↪hue = 'Geography')
grid.map(sns.lineplot, 'REF_DATE', 'Youth_corrections_per_1000_population')
grid.set(xlabel = 'Year', ylabel = 'Youth Corrections per 1000 population',␣
 ↪title = 'test')
grid.set_titles(col_template='{col_name}', row_template='{row_name}')
fig.savefig(pwd + '/CorrectionsPerCapitaYearProvince.png')
```


Pre-trial detention | Ontario
Pre-trial detention | Manitoba
Pre-trial detention | Alberta
Pre-trial detention | British Columbia
Pre-trial detention | Saskatchewan
Secure custody | Ontario
Secure custody | Manitoba
Secure custody | Alberta
Secure custody | British Columbia
Secure custody | Saskatchewan
Open custody | Ontario
Open custody | Manitoba
Open custody | Alberta
Open custody | British Columbia
Open custody | Saskatchewan
Supervised probation | Ontario
Supervised probation | Manitoba
Supervised probation | Alberta
Supervised probation | British Columbia
Supervised probation | Saskatchewan
Custody and supervision (secure) | Ontario
Custody and supervision (secure) | Manitoba
Custody and supervision (secure) | Alberta
Custody and supervision (secure) | British Columbia
Custody and supervision (secure) | Saskatchewan
Young Offenders Act (YOA) (secure) | Ontario
Young Offenders Act (YOA) (secure) | Manitoba
Young Offenders Act (YOA) (secure) | Alberta
Young Offenders Act (YOA) (secure) | British Columbia
Young Offenders Act (YOA) (secure) | Saskatchewan
Custody and supervision (open) | Ontario
Custody and supervision (open) | Manitoba
Custody and supervision (open) | Alberta
Custody and supervision (open) | British Columbia
Custody and supervision (open) | Saskatchewan
Young Offenders Act (YOA) (open) | Ontario
Young Offenders Act (YOA) (open) | Manitoba
Young Offenders Act (YOA) (open) | Alberta
Young Offenders Act (YOA) (open) | British Columbia
Young Offenders Act (YOA) (open) | Saskatchewan
Community Portion of Custody Supervision | Ontario
Community Portion of Custody Supervision | Manitoba
Community Portion of Custody Supervision | Alberta
Community Portion of Custody Supervision | British Columbia
Community Portion of Custody Supervision | Saskatchewan
Intensive support and supervision | Ontario
Intensive support and supervision | Manitoba
Intensive support and supervision | Alberta
Intensive support and supervision | British Columbia
Intensive support and supervision | Saskatchewan
Deferred custody and supervision | Ontario
Deferred custody and supervision | Manitoba
Deferred custody and supervision | Alberta
Deferred custody and supervision | British Columbia
Deferred custody and supervision | Saskatchewan
Other community sentences | Ontario
Other community sentences | Manitoba
Other community sentences | Alberta
Other community sentences | British Columbia
Other community sentences | Saskatchewan
Provincial director remand | Ontario
Provincial director remand | Manitoba
Provincial director remand | Alberta
Provincial director remand | British Columbia
Provincial director remand | Saskatchewan
Youth Convictions per 1000 population
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2000
2005
2010
2015
2020
Year

7.7 Charges VS Offences for Canadian youth from 1991/1992 - 2019/2020

Next is looking at total youth charges laid by offence throughout Canada for the dataset (from 1991/1992 to 2019/2020)

[70]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 10)
plt.ticklabel_format(style='plain', axis='y')
sns.barplot(x = 'Offences', y = 'VALUE', data = data, estimator = np.sum, ci =␣
↪None).set(title = 'Charges VS Offences for Canadian youth from 1991/1992 -␣
↪2019/2020', ylabel = 'Number of Charges')
ax.set_xticklabels(ax.get_xticklabels(), rotation=40, ha="right")
fig.savefig(pwd + '/ChargesVOffencesC.png')
```



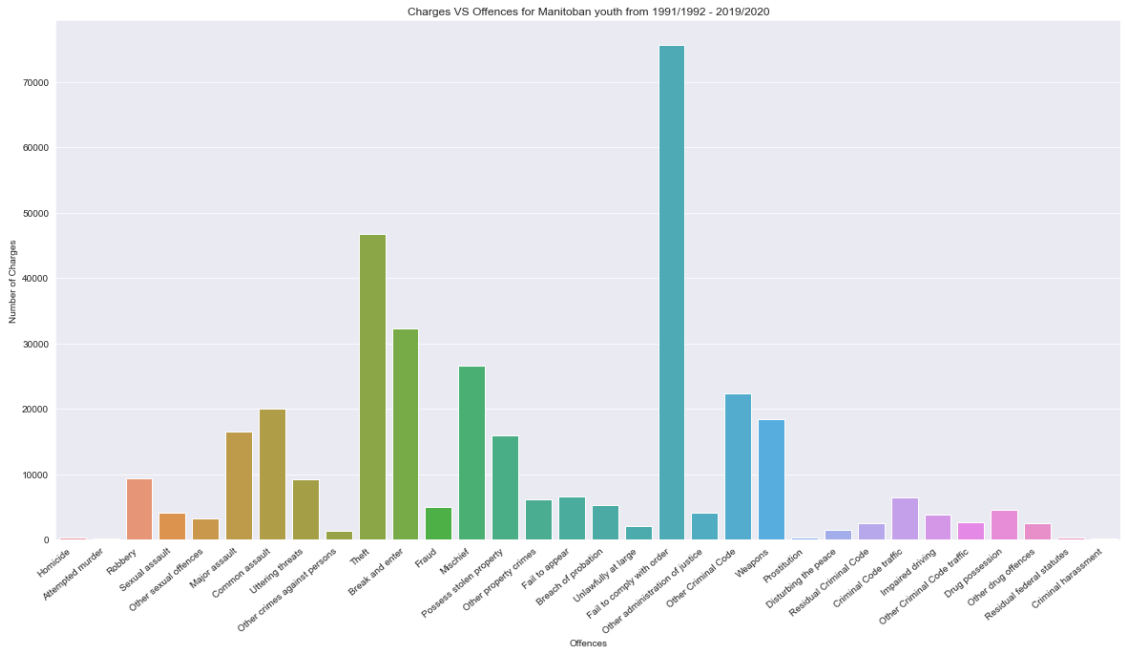
Theft and Failure to comply have the highest counts.

7.8 Charges VS Offences for Manitoban youth from 1991/1992 - 2019/2020

Next is to see how Manitoba compares to the national averages.

[71]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 10)
plt.ticklabel_format(style='plain', axis='y')
```

```
sns.barplot(x = 'Offences', y = 'VALUE', data = mbData, estimator = np.sum, ci =␣
↪None).set(title = 'Charges VS Offences for Manitoban youth from 1991/1992 -␣
↪2019/2020', ylabel = 'Number of Charges')
ax.set_xticklabels(ax.get_xticklabels(), rotation=40, ha="right")
fig.savefig(pwd + '/ChargesVOffencesM.png')
```



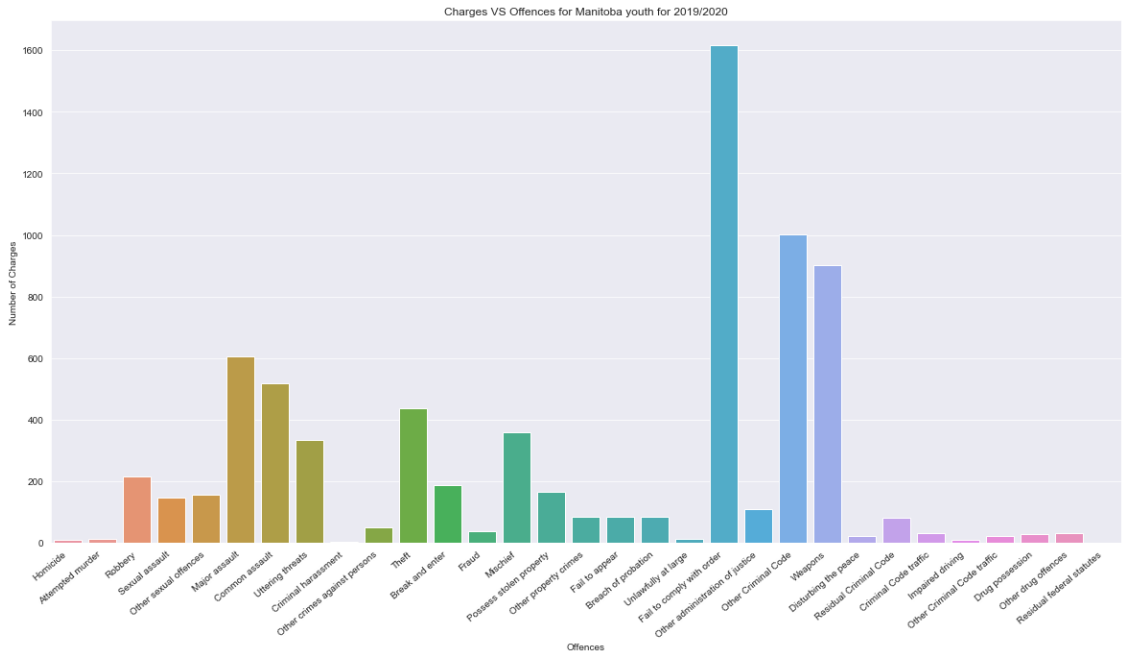
Looking at Manitoba it seems there is a lower level of Theft charges than the national average, but higher levels of Major assault, Sexual assault, Other sexual offences, and Failure to comply with order.

note: For this year, all 'Sex of accused' values were not collected. So it is not valuable to map it to Sexual assault, or other sexual offences charges.

7.9 Charges VS Offences for Manitoba youth for 2019/2020

Next is to compare how the most recent 2019/2020 year compares to Manitoba's average since 1991/1992.

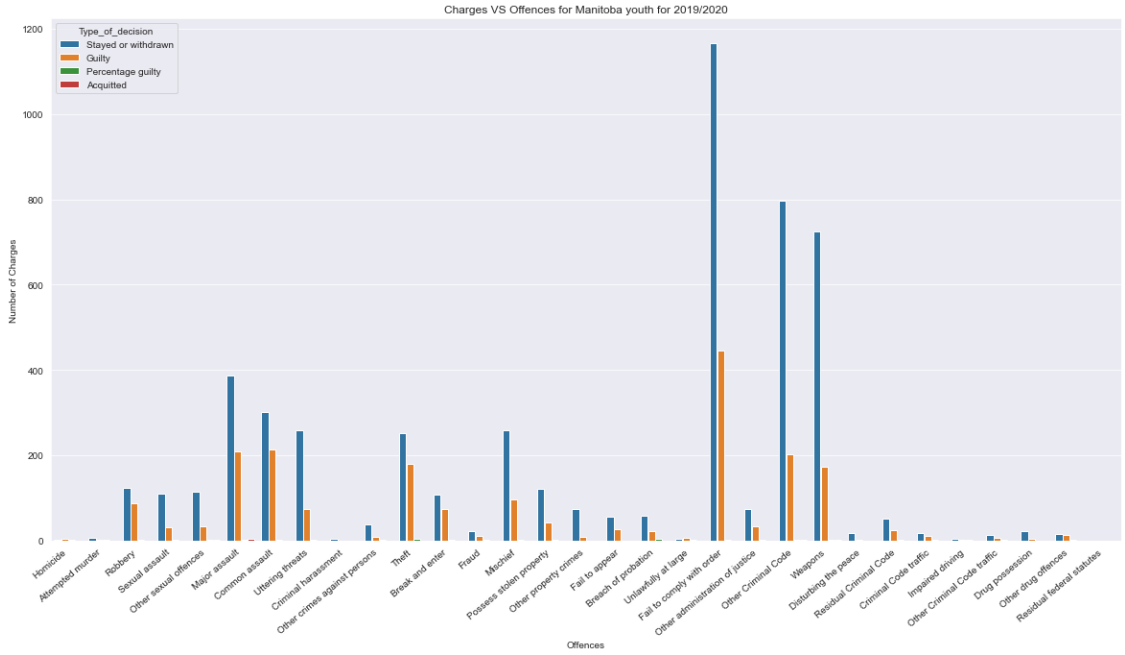
[72]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 10)
plt.ticklabel_format(style='plain', axis='y')
sns.barplot(x = 'Offences', y = 'VALUE', data = mb2019, estimator = np.sum, ci =␣
↪None).set(title = 'Charges VS Offences for Manitoba youth for 2019/2020',␣
↪ylabel = 'Number of Charges')
ax.set_xticklabels(ax.get_xticklabels(), rotation=40, ha="right")
fig.savefig(pwd + '/ChargesVOffencesM2019.png')
```



In this particular year there is a startlingly high number of Major assault charges and Failure to comply charges. Splitting these up by type of decision might help to understand why.

7.10 Charges VS Offences for Manitoba youth for 2019/2020

[73]:
```
fig, ax = plt.subplots()
fig.set_size_inches(20, 10)
plt.ticklabel_format(style='plain', axis='y')
sns.barplot(x = 'Offences', y = 'VALUE', data = mb2019, estimator = np.sum, hue␣
↪= 'Type_of_decision', ci = None).set(title = 'Charges VS Offences for Manitoba␣
↪youth for 2019/2020', ylabel = 'Number of Charges')
ax.set_xticklabels(ax.get_xticklabels(), rotation=40, ha="right")
fig.savefig(pwd + '/ChargesVOffencesM2019Hue.png')
```



Worth noting are how many Fail to comply charges, Weapons charges, and Other criminal code charges resulted in Stays or withdrawals. It might be worth having the province funding programs that target the reduction of Failure to comply and weapons charges amongst youth.

Finally worth noting is how an extremely small number of charges have resulted in acquittals. It would be worth looking into why this is the case since a stay remains on your record.

8 Sources

Canada Population info - Statistics Canada https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000

Youth admissions to correctional services - Government of Canada Open Data Portal https://open.canada.ca/data/en/dataset/c70a73e6-e42d-4e2a-91e3-6c0d41568952

https://open.canada.ca/data/en/dataset/1df8b66e-b773-425e-9551-62eba71bab28