COVID-19 and International Travellers in Canada

April 14, 2021

- COMP 8157 Advanced Database Topics
- Mini Project on Data Visualization

1 Purpose

Due to new travel restrictions by the government of Canada, many international students have to remain quarantined at the hotel resulting in a large amount of mental and financial burden. But at the same time, we can't blame the government as they are trying to stop the spread. So, in this project, I will try to find the pattern from visuals on how people's travel history is related to coronavirus spread while analyzing other features too.

2 Description

We will analyze different feature and understand the visuals by closely observing them 1. comparing genders 2. age group 3. provinces 4. transmission and travel history

2.1 Dataset:

- Name: COVID-19 Canada Open Data Working Group
- URL: https://github.com/ccodwg/Covid19Canada

2.1.1 Importing libraries and Reading data

[1]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings('ignore')
```

[2]:
```
df_cases=pd.read_csv("./covid_19_canada/cases_2020.csv")
df_mort=pd.read_csv("./covid_19_canada/mortality_2020.csv")

print("Shape of Cases:", df_cases.shape)
print("Shape of Mortality:", df_mort.shape)
```

```
Shape of Cases: (584448, 16)
Shape of Mortality: (15666, 12)
```

[3]:
```
df_cases.head()
```

[3]:
```
   case_id  provincial_case_id    age     sex       health_region province  \
0        1                   1  50-59    Male             Toronto  Ontario
1        2                   2  50-59  Female             Toronto  Ontario
2        3                   1  40-49    Male        Not Reported       BC
3        4                   3  20-29  Female   Middlesex-London  Ontario
4        5                   2  50-59  Female  Vancouver Coastal       BC

  country date_report report_week travel_yn travel_history_country  \
0  Canada  25-01-2020  19-01-2020         1                  China
1  Canada  27-01-2020  26-01-2020         1                  China
2  Canada  28-01-2020  26-01-2020         1                  China
3  Canada  31-01-2020  26-01-2020         1                  China
4  Canada  04-02-2020  02-02-2020         0                    NaN

  locally_acquired case_source additional_info additional_source  method_note
0              NaN         ON1           ON873             ON228          0.0
1              NaN         ON2             ON1             ON228          0.0
2              NaN         BC1             BC1             BC228          1.0
3              NaN         ON3           ON873             ON228          0.0
4    Close Contact         BC2             BC2             BC228          NaN
```

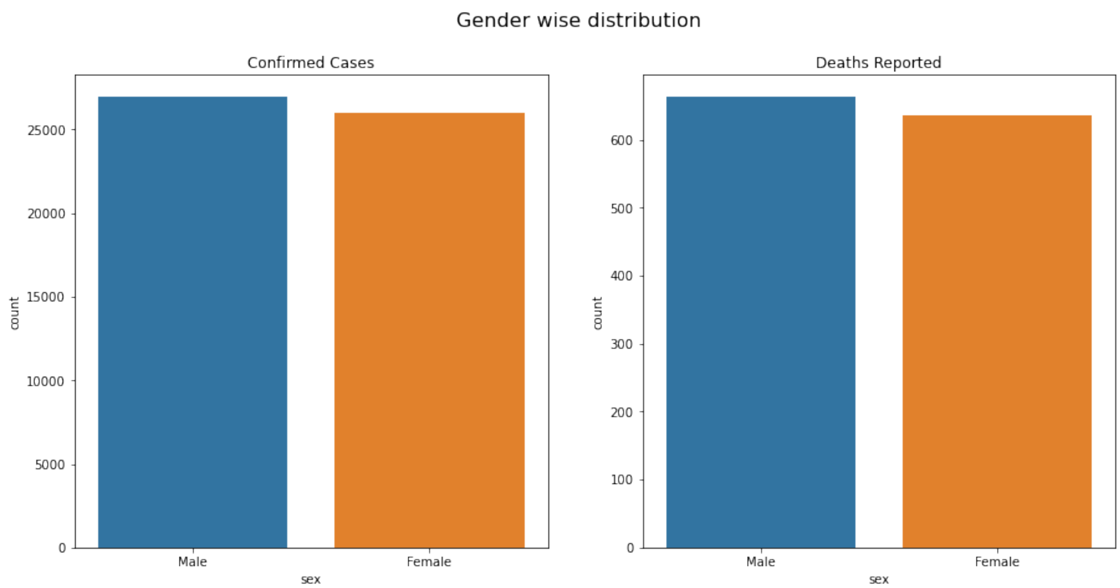
[4]:
```
df_mort.head()
```

[4]:
```
   death_id  province_death_id  case_id           age           sex  \
0         1                  1     60.0         80-89          Male
1         2                  1    477.0         70-79          Male
2         3                  2      NaN  Not Reported  Not Reported
3         4                  3      NaN  Not Reported  Not Reported
4         5                  4      NaN  Not Reported  Not Reported

       health_region province country date_death_report death_source  \
0  Vancouver Coastal       BC  Canada        08-03-2020          BC1
1     Simcoe Muskoka  Ontario  Canada        11-03-2020          ON1
2  Vancouver Coastal       BC  Canada        16-03-2020          BC2
3  Vancouver Coastal       BC  Canada        16-03-2020          BC2
4  Vancouver Coastal       BC  Canada        16-03-2020          BC2

  additional_info additional_source
0             BC1               NaN
1             ON1               NaN
2             BC1               NaN
3             BC1               NaN
4             BC1               NaN
```

3 Visualization:

3.1 Gender wise

[5]:
```
df_mort.sex.unique()

plt.figure(figsize=(15,7))
plt.suptitle("Gender wise distribution", fontsize=16)
plt.subplot(1,2,1)
plt.title("Confirmed Cases")
sns.countplot('sex', data=df_cases[df_cases.sex!='Not Reported'])

plt.subplot(1,2,2)
plt.title("Deaths Reported")
sns.countplot('sex', data=df_mort[df_mort.sex!='Not Reported'])

plt.show()
```



Observation: We can observe that number of males effected by coronavirus is more than female

3.2 Age wise

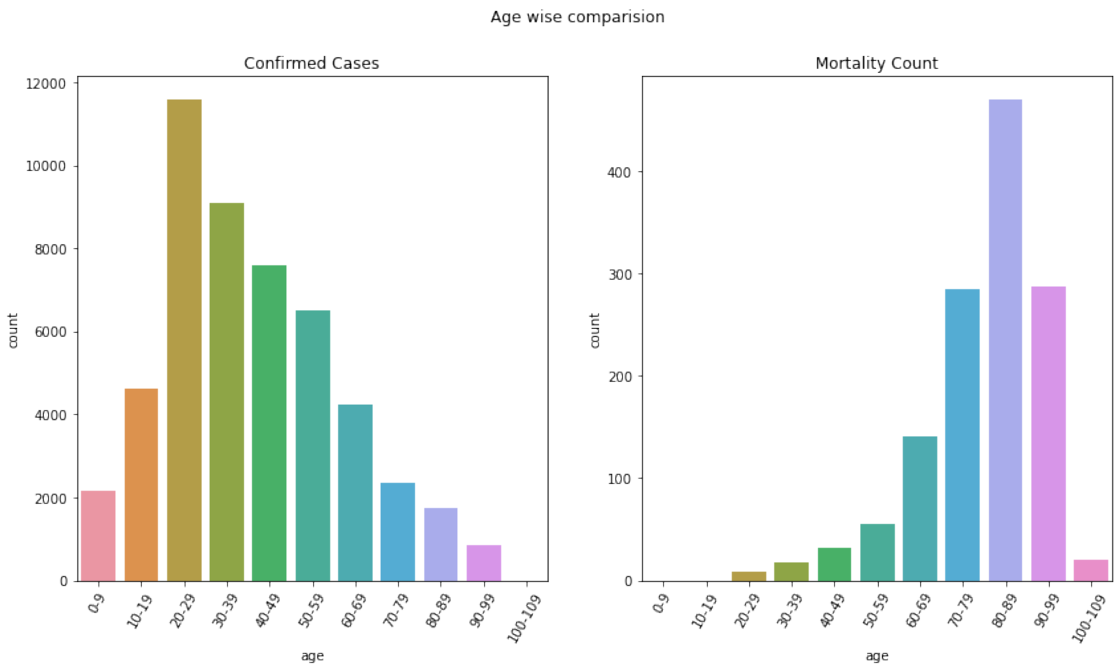
[6]:
```
# df_cases.age.unique()
```

[7]:
```
# Grouping different inputs to one like  >60 and 60+ is same as 60-69
df_cases.age[df_cases.age=='<18']='10-19'
df_cases.age[df_cases.age=='<1']='0-9'
df_cases.age[df_cases.age=='2']='0-9'
```

```
df_cases.age[df_cases.age=='<10']='0-9'
df_cases.age[df_cases.age=='61']='60-69'
df_cases.age[df_cases.age=='>60']='60-69'
df_cases.age[df_cases.age=='65-69']='60-69'
df_cases.age[df_cases.age=='>70']='70-79'

df_cases.age[df_cases.age=='50']='50-59'
df_cases.age[df_cases.age=='<20']='10-19'

df_cases.age[df_cases.age=='45-65']='40-49'
df_cases.age[df_cases.age=='>80']='80-89'
df_cases.age[df_cases.age=='80+']='80-89'
df_cases.age[df_cases.age=='>90']='90-99'
df_cases.age[df_cases.age=='90+']='90-99'
df_cases.age[df_cases.age=='45-65']='40-49'
df_cases.age[df_cases.age=='45-65']='40-49'



# df_cases.age.value_counts()
```

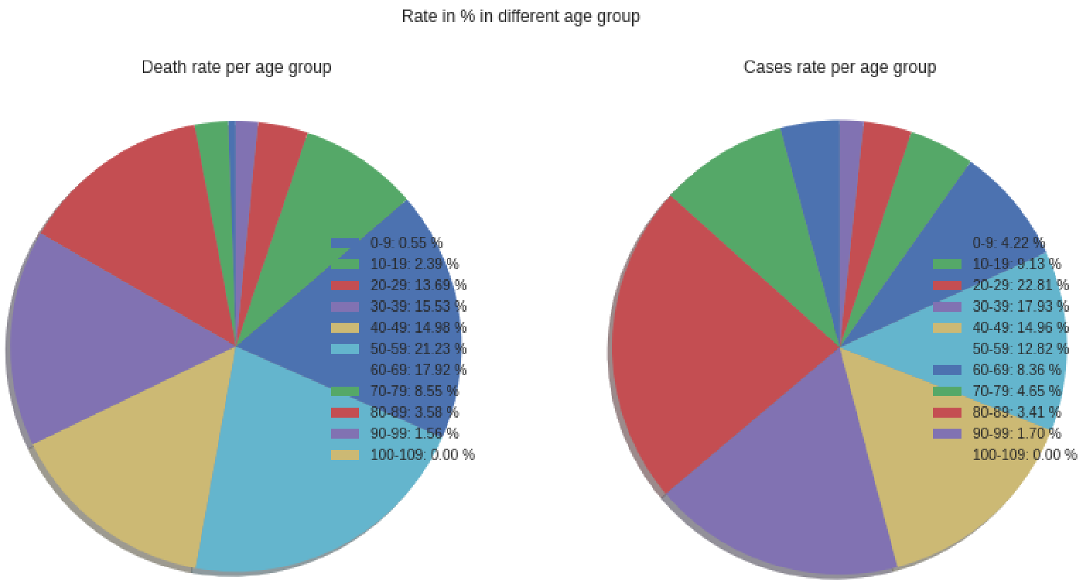
[8]:

```
order_age=['0-9','10-19','20-29','30-39','40-49','50-59','60-69','70-79','80-89','90-99','100-

plt.figure(figsize=(14,7))
plt.suptitle("Age wise comparision")

plt.subplot(1,2,1)
plt.title("Confirmed Cases")
sns.countplot('age', data=df_cases[df_cases.age!='Not Reported'],␣
↪order=order_age)
plt.xticks(rotation=60)

plt.subplot(1,2,2)
plt.title("Mortality Count")
sns.countplot('age', data=df_mort[df_mort.age!='Not Reported'], order=order_age)
plt.xticks(rotation=60)

plt.show()
```




```
[9]: death_count = []
for age in order_age:
    death_count.append(df_mort[df_cases.age==age].shape[0])
death_sum = sum(death_count)

case_count = []
for age in order_age:
    case_count.append(df_cases[df_cases.age==age].shape[0])
case_sum = sum(case_count)

plt.style.use('seaborn')

fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(14,7))
fig.suptitle("Rate in % in different age group")

ax1.pie(death_count, shadow=True, startangle=90)
ax1.axis('equal')
ax1.set_title('Death rate per age group')
ax1.legend(loc = 'right', labels=['%s: %1.2f %%' % (l, s*100.0/death_sum ) for␣
↪l, s in zip(order_age, death_count)])

ax2.pie(case_count, shadow=True, startangle=90)
ax2.axis('equal')
ax2.set_title('Cases rate per age group')
```

```
ax2.legend(loc = 'right', labels=['%s: %1.2f %%' % (l, s*100.0/case_sum ) for␣
↪l, s in zip(order_age, case_count)])

plt.show()
```



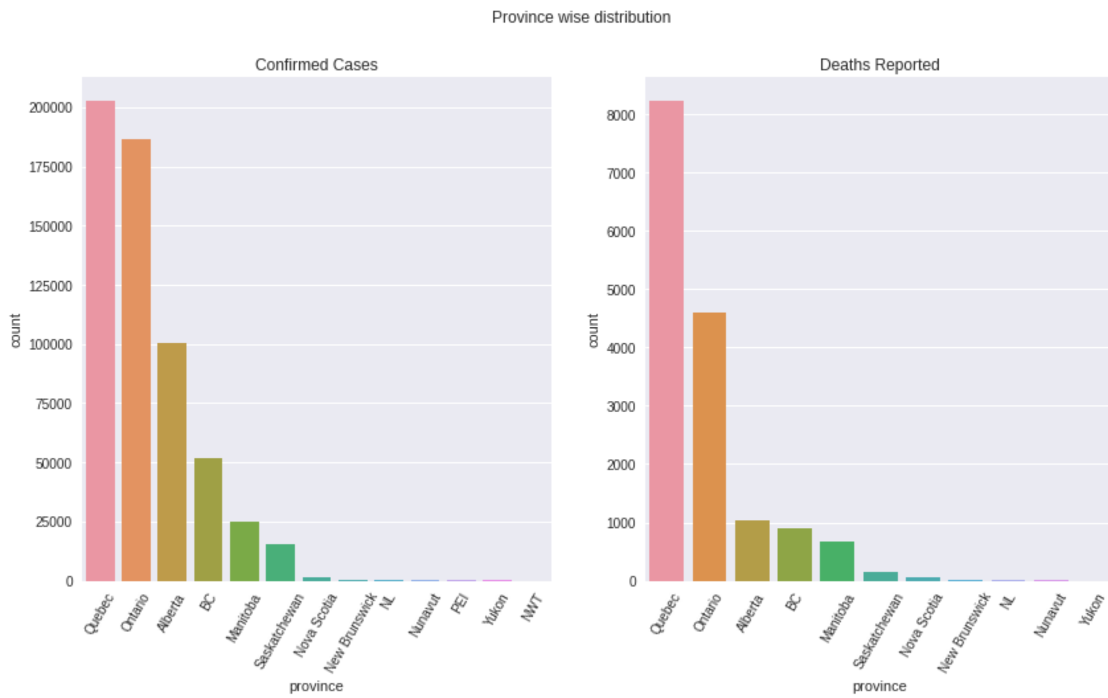
Observation: - The covid infection rate is heighest in 20-29 and 30-39 age group but death rate is low - But the death rate is heighest in 50-59 and 60-69 age group

- Thus we can saysPatients in the age group 20-39, also observed to have better immunity toward COVID-19. But its fatal for patients above 50.

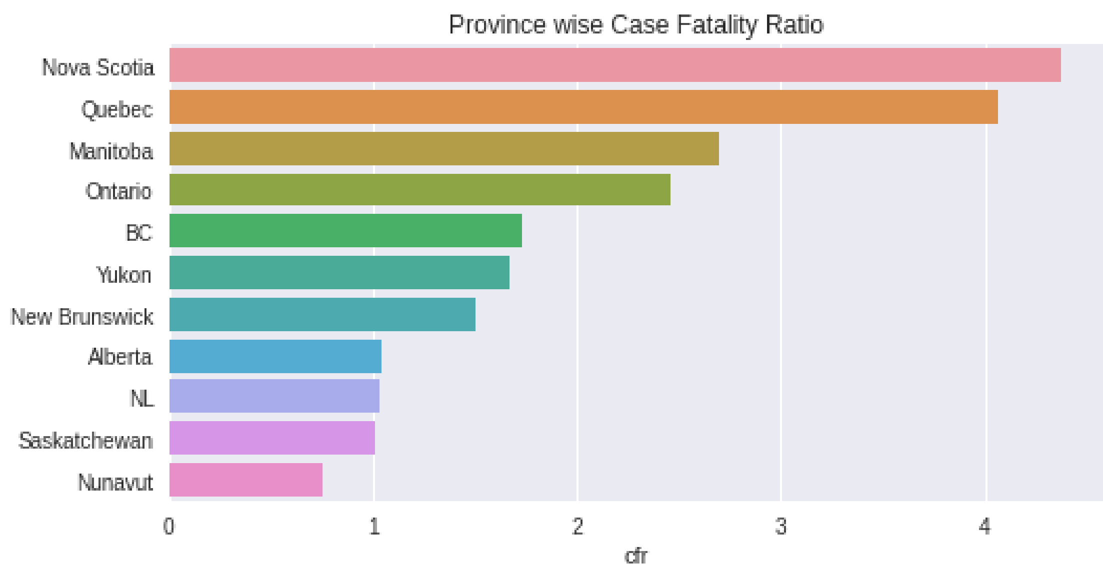
3.3 Province wise Analysis

[10]:
```
order_mort=df_mort.province.value_counts().index
order_conf=df_cases[df_cases.province!='Repatriated'].province.value_counts().
↪index
plt.figure(figsize=(14,7))
plt.suptitle("Province wise distribution")
plt.style.use('seaborn')
plt.subplot(1,2,1)
plt.title("Confirmed Cases")
sns.countplot('province', data=df_cases[df_cases.province!='Repatriated'],␣
↪order=order_conf)
plt.xticks(rotation=60)

plt.subplot(1,2,2)
plt.title("Deaths Reported")
```

```
sns.countplot('province', data=df_mort, order=order_mort)
plt.xticks(rotation=60)

plt.show()
```



[11]:
```
pr_mort=pd.DataFrame(df_mort.province.value_counts())
pr_mort.rename(columns={"province":"deaths"}, inplace=True)
pr_mort["cases"]=0
pr_mort["cfr"]=0
for pr in pr_mort.index:
    pr_mort.cases[pr_mort.index==pr]=df_cases.province.value_counts()[pr]
pr_mort.cfr=round(pr_mort.deaths*100/pr_mort.cases,2)
pr_mort.sort_values(by='cfr', ascending=False, inplace=True)

plt.figure(figsize=(8,4))
plt.title("Province wise Case Fatality Ratio")
sns.barplot(y=pr_mort.index, x='cfr', data=pr_mort, orient='h')
plt.show()
```

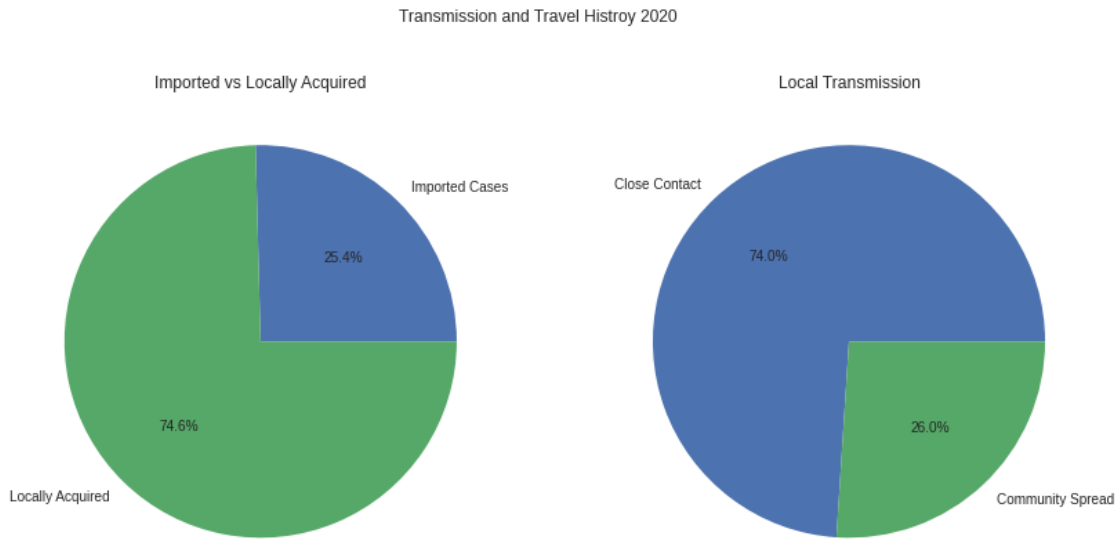


Observations:

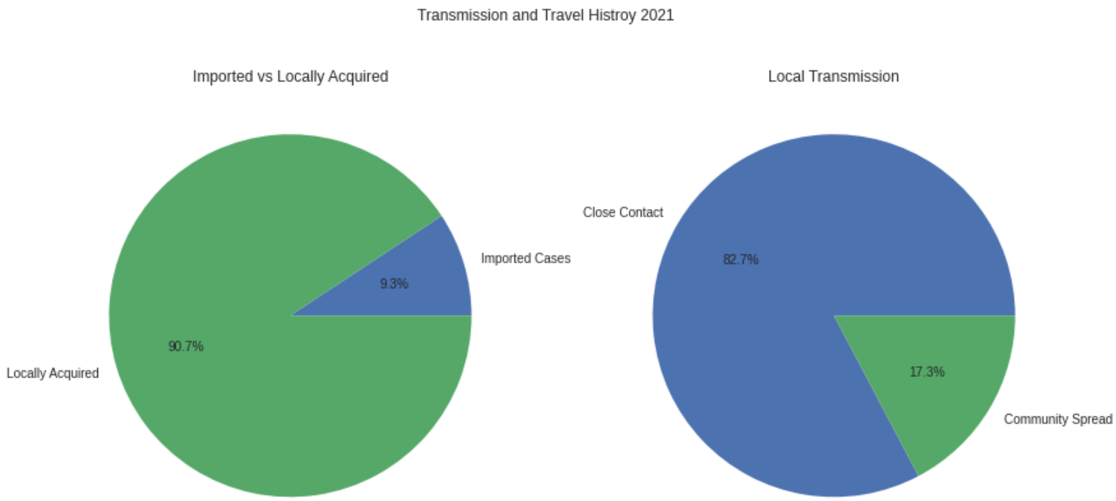
- Most of cases are in the Ontario and Quebec
- Case fatality rate in Ontario and BC is above 3% and other provinces have fatality rate under 2%.

3.4 Transmission and international arrivals

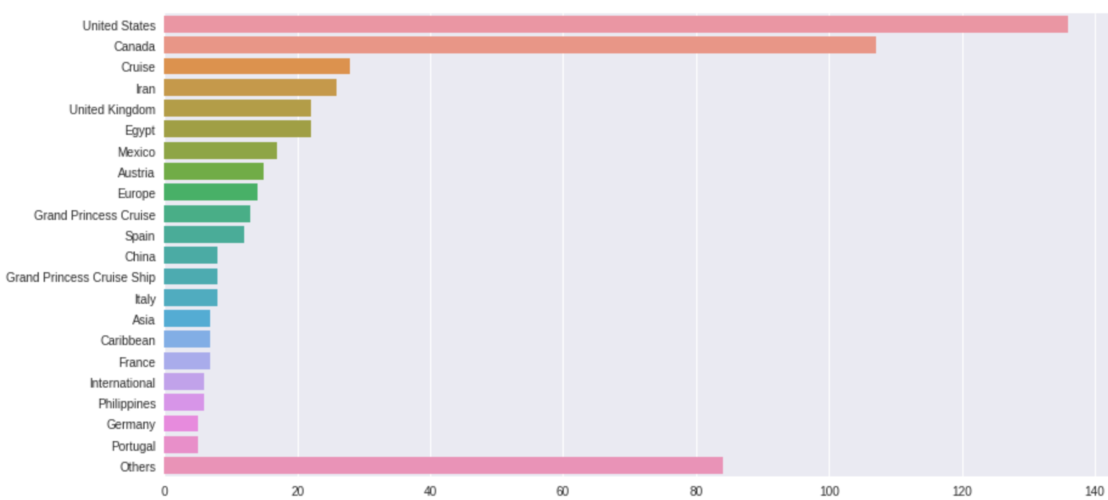
[12]:
```
plt.figure(figsize=(14,7))
plt.suptitle("Transmission and Travel Histroy 2020")

plt.subplot(1,2,1)
plt.title("Imported vs Locally Acquired")
label=["Imported Cases", 'Locally Acquired']
x=[df_cases.travel_yn.value_counts()['1'],df_cases.travel_yn.
 ↪value_counts()['0']]
plt.pie(x, labels=label, autopct='%1.1f%%')

plt.subplot(1,2,2)
plt.title("Local Transmission")
x=[df_cases.locally_acquired.value_counts().sum()-df_cases.locally_acquired.
 ↪value_counts()['Community'],
   df_cases.locally_acquired.value_counts()['Community']]
labels=["Close Contact", "Community Spread"]
plt.pie(x,labels=labels,autopct='%1.1f%%')

plt.show()
```



[13]:
```
df_cases_2021=pd.read_csv("./covid_19_canada/cases_2021.csv")

plt.figure(figsize=(14,7))
plt.suptitle("Transmission and Travel Histroy 2021")

plt.subplot(1,2,1)
plt.title("Imported vs Locally Acquired")
label=["Imported Cases", 'Locally Acquired']
x=[df_cases_2021.travel_yn.value_counts()['1'],df_cases_2021.travel_yn.
 ↪value_counts()['0']]
plt.pie(x, labels=label, autopct='%1.1f%%')

plt.subplot(1,2,2)
plt.title("Local Transmission")
x=[df_cases_2021.locally_acquired.value_counts().sum()-df_cases_2021.
 ↪locally_acquired.value_counts()['Community'],
   df_cases_2021.locally_acquired.value_counts()['Community']]
labels=["Close Contact", "Community Spread"]
plt.pie(x,labels=labels,autopct='%1.1f%%')

plt.show()
```



[14]:
```
imported=df_cases[df_cases.travel_history_country!='Not Reported'].
↪travel_history_country.value_counts()
plt.figure(figsize=(14,7))
x=list(imported[imported>3])
y=list(imported[imported>3].index)

# Others with less than 4 cases
x.append(imported[imported<4].sum())
y.append("Others")
sns.barplot(x, y, orient='h')
plt.show()
```



Observations:

- We see interesting pattern here, in 2020 around 25.4% cases were from international travellers while in 2021 its 9.3%.
- Majorit of local cases (74% in 2020, 84% in 2021) are due to close contanct and few are due to community transfers.
- Also the most of case in international patients are from United States with land border.
- The current restrictions with hotel quarantine only applies to air travellers but its not for people travelling through land border.
- So as per above observation I think government should lessen the restrictions for international students travelling via airlines.
- The current data might so different pattern which I was not able to show here because dataset for 2021 doesnot mention the country of travellers, it only specifies traveller as "international"