Intensive Care in Germany

Data Source

DIVI-Intensivregister monitors the ICU capacities of 1,300 hospitals in Germany.

Setup

In [1]:
```
# standard library
import datetime
import math
```

In [2]:
```
# third party
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import requests
```

Date this Notebook was run

In [3]:
```
today = datetime.datetime.today().strftime('%Y-%m-%d')
today
```

Out[3]:
```
'2021-06-23'
```

In [4]:
```
# style like ggplot in R
plt.style.use('ggplot')
```

In [5]:
```
# Avoid cutting off part of the axis labels, see:
# https://stackoverflow.com/questions/6774086/why-is-my-xlabel-cut-off-in-my-matplotlib-plot
plt.rcParams.update({'figure.autolayout': True})
```

Get Data

In [6]:
```
timeline_data = "https://diviexchange.blob.core.windows.net/%24web/bundesland-zeitreihe.csv"
```

In [7]:
```
timeline_df = pd.read_csv(timeline_data)
```

In [8]:
```
timeline_df.tail(3)
```

Out[8]:

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene
7817	2021-06-22T12:15:00+02:00	SAARLAND	17	8	378
7818	2021-06-22T12:15:00+02:00	HAMBURG	23	27	457
7819	2021-06-22T12:15:00+02:00	DEUTSCHLAND	1323	845	19739

Rename Columns

Convert datatype of date column

In [9]:
```
timeline_df["Datum"] = timeline_df["Datum"].str[:10]
timeline_df.head()
```

Out[9]:

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Fr
0	2020-03-20	BAYERN	45	61	77	
1	2020-03-20	BADEN_WUERTTEMBERG	31	35	39	
2	2020-03-20	NORDRHEIN_WESTFALEN	55	35	86	
3	2020-03-20	HESSEN	19	7	18	
4	2020-03-20	BRANDENBURG	20	2	50	

In [10]:
```
timeline_df.iloc[ : , [0]] = timeline_df.iloc[ : , [0]].apply(pd.to_datetime)
```

In [11]:
```
timeline_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7820 entries, 0 to 7819
Data columns (total 13 columns):
 #   Column                                  Non-Null Count  Dtype
---  ------                                  --------------  -----
 0   Datum                                   7820 non-null   datetime64[ns]
 1   Bundesland                              7820 non-null   object
 2   Anzahl_Meldebereiche_Erwachsene         7820 non-null   int64
 3   Aktuelle_COVID_Faelle_Erwachsene_ITS    7820 non-null   int64
 4   Belegte_Intensivbetten_Erwachsene       7820 non-null   int64
 5   Freie_Intensivbetten_Erwachsene         7820 non-null   int64
 6   7_Tage_Notfallreserve_Erwachsene        7820 non-null   int64
 7   Freie_IV_Kapazitaeten_Gesamt            7820 non-null   int64
 8   Freie_IV_Kapazitaeten_Davon_COVID       7820 non-null   int64
 9   Betriebssituation_Regulaerer_Betrieb    7820 non-null   int64
 10  Betriebssituation_Teilweise_Eingeschraenkt  7820 non-null  int64
 11  Betriebssituation_Eingeschraenkt        7820 non-null   int64
 12  Betriebssituation_Keine_Angabe          7820 non-null   int64
dtypes: datetime64[ns](1), int64(11), object(1)
memory usage: 794.3+ KB
```

In [12]:
```
federal_level = timeline_df[timeline_df.Bundesland=='DEUTSCHLAND']
federal_level.tail(3)
```

Out[12]:

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Inte
7785	2021-06-20	DEUTSCHLAND	1325	927	18967	
7802	2021-06-21	DEUTSCHLAND	1323	885	19270	
7819	2021-06-22	DEUTSCHLAND	1323	845	19739	

Used Beds (Adults)

In [13]:
```
used_beds = federal_level.loc[ : , ['Datum', 'Belegte_Intensivbetten_Erwachsene']]
used_beds.columns = ['date', 'ICU beds in use (adults)']
used_beds.info()
```

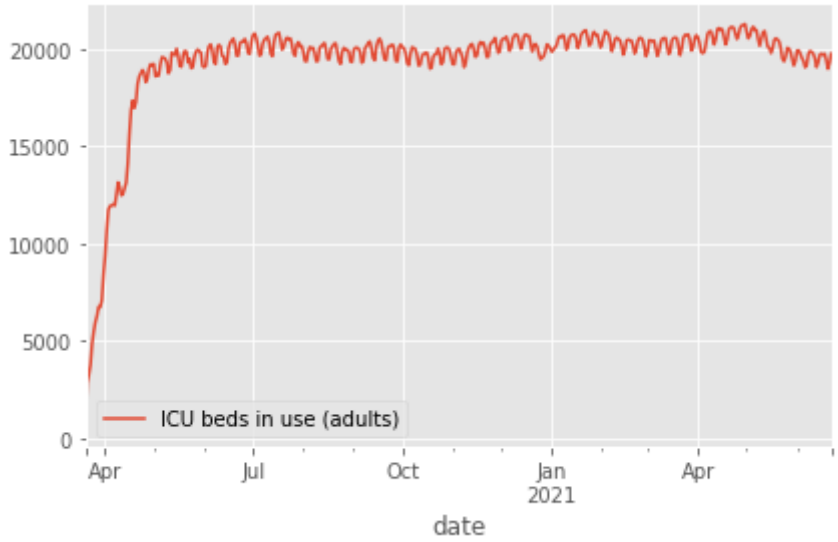
```
<class 'pandas.core.frame.DataFrame'>
```

```
Int64Index: 460 entries, 16 to 7819
Data columns (total 2 columns):
 #   Column                    Non-Null Count  Dtype         
---  ------                    --------------  -----         
 0   date                      460 non-null    datetime64[ns]
 1   ICU beds in use (adults)  460 non-null    int64         
dtypes: datetime64[ns](1), int64(1)
memory usage: 10.8 KB
```

In [14]:
```
used_beds.set_index('date', inplace=True)
```

In [15]:
```
used_beds.plot()
```

Out[15]:
```
<AxesSubplot:xlabel='date'>
```



Covid-19 patients in ICU

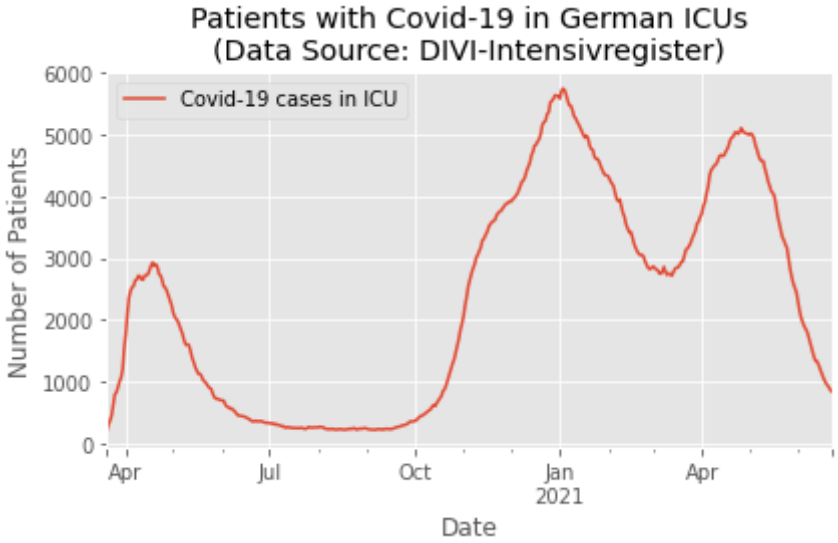
In [16]:
```
icu = federal_level.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
```

In [17]:
```
icu.columns = ['date', 'Covid-19 cases in ICU']
icu.set_index('date', inplace=True)
icu.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 460 entries, 2020-03-20 to 2021-06-22
```

```
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  460 non-null    int64
dtypes: int64(1)
memory usage: 7.2 KB
```

In [18]:
```
icu_cases = icu.plot(
    title='Patients with Covid-19 in German ICUs\n(Data Source: DIVI-Intensivregister)',
xlabel='Date',
ylabel='Number of Patients')
```



In [19]:
```
fig = icu_cases.get_figure()
fig.savefig('img/covid-19-patients-in-icu-germany.png')
```

Situation in North Rhine-Westphalia

NRW ist the state in Germany with the highest number of inhabitants.

In [20]:
```
nrw = timeline_df[timeline_df.Bundesland=='NORDRHEIN_WESTFALEN']
nrw.tail(2)
```

Out[20]:

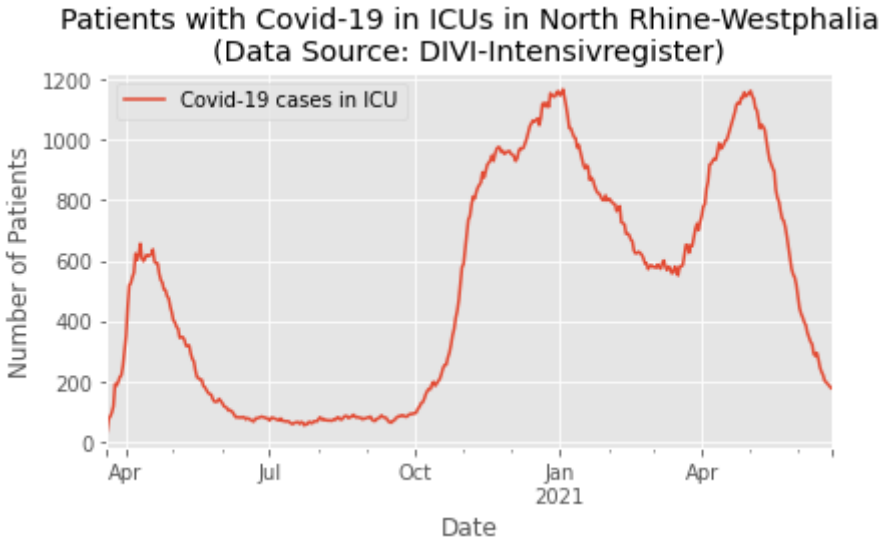
	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene
7788	2021-06-21	NORDRHEIN_WESTFALEN	318	186	4799
7804	2021-06-22	NORDRHEIN_WESTFALEN	318	178	4884

In [21]:
```
icu_nrw = nrw.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_nrw.columns = ['date', 'Covid-19 cases in ICU']
icu_nrw.set_index('date', inplace=True)
icu_nrw.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 460 entries, 2020-03-20 to 2021-06-22
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  460 non-null    int64
dtypes: int64(1)
memory usage: 7.2 KB
```

In [22]:
```
icu_cases_nrw = icu_nrw.plot(
    title='Patients with Covid-19 in ICUs in North Rhine-Westphalia\n(Data Source: DIVI-Intensivregister)',
xlabel='Date',
ylabel='Number of Patients')
```



Situation in Rhineland-Palatinate

In [23]:
```
rlp = timeline_df[timeline_df.Bundesland=='RHEINLAND_PFALZ']
rlp.tail(2)
```

Out[23]:

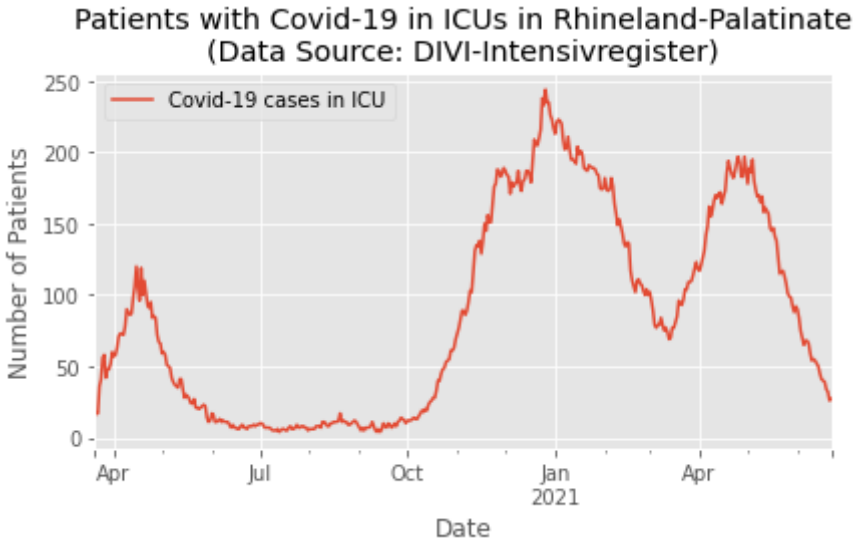
	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
7797	2021-06-21	RHEINLAND_PFALZ	77	26	780	
7814	2021-06-22	RHEINLAND_PFALZ	77	27	788	

In [24]:
```
icu_rlp = rlp.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_rlp.columns = ['date', 'Covid-19 cases in ICU']
icu_rlp.set_index('date', inplace=True)
icu_rlp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 460 entries, 2020-03-20 to 2021-06-22
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  460 non-null    int64
```

```
dtypes: int64(1)
memory usage: 7.2 KB
```

In [25]:
```
icu_cases_rlp = icu_rlp.plot(
    title='Patients with Covid-19 in ICUs in Rhineland-Palatinate\n(Data Source: DIVI-Intensivregister)',
xlabel='Date',
ylabel='Number of Patients')
```



Situation in Saxony

Saxonia had high case numbers during the pandemic.

In [26]:
```
saxonia = timeline_df[timeline_df.Bundesland=='SACHSEN']
saxonia.tail(2)
```

Out[26]:

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Intensiv
7795	2021-06-21	SACHSEN	79	77	1186	
7812	2021-06-22	SACHSEN	79	70	1216	

In [27]:
```
icu_saxonia = saxonia.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
```

```
icu_saxonia.columns = ['date', 'Covid-19 cases in ICU']
icu_saxonia.set_index('date', inplace=True)
icu_saxonia.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 460 entries, 2020-03-20 to 2021-06-22
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  460 non-null    int64
dtypes: int64(1)
memory usage: 7.2 KB
```

In [28]:
```
icu_cases_saxonia = icu_saxonia.plot(
    title='Patients with Covid-19 in ICUs in Saxonia\n(Data Source: DIVI-Intensivregister)',
xlabel='Date',
ylabel='Number of Patients')
```