Intensive Care in Germany

Data Source

[DIVI-Intensivregister](#) monitors the ICU capacities of 1,300 hospitals in Germany.

Setup

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

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

Date this Notebook was run

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

```
Out[3]:  '2021-10-21'
```

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

```python
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

```python
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
9874	2021-10-21T12:15:00+02:00	SAARLAND	16	20	353
9875	2021-10-21T12:15:00+02:00	BERLIN	53	96	967
9876	2021-10-21T12:15:00+02:00	DEUTSCHLAND	1312	1526	19445

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_Erwachsen
0	2020-03-20	SACHSEN	20	3	4
1	2020-03-20	BADEN_WUERTTEMBERG	31	35	3
2	2020-03-20	MECKLENBURG_VORPOMMERN	10	1	
3	2020-03-20	NIEDERSACHSEN	25	17	4
4	2020-03-20	NORDRHEIN_WESTFALEN	55	35	8

```
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: 9877 entries, 0 to 9876
Data columns (total 13 columns):
 #   Column                                   Non-Null Count  Dtype
---  ------                                   --------------  -----
 0   Datum                                    9877 non-null   datetime64[ns]
 1   Bundesland                               9877 non-null   object
 2   Anzahl_Meldebereiche_Erwachsene          9877 non-null   int64
 3   Aktuelle_COVID_Faelle_Erwachsene_ITS     9877 non-null   int64
 4   Belegte_Intensivbetten_Erwachsene        9877 non-null   int64
 5   Freie_Intensivbetten_Erwachsene          9877 non-null   int64
 6   7_Tage_Notfallreserve_Erwachsene         9877 non-null   int64
 7   Freie_IV_Kapazitaeten_Gesamt             9877 non-null   int64
 8   Freie_IV_Kapazitaeten_Davon_COVID        9877 non-null   int64
 9   Betriebssituation_Regulaerer_Betrieb     9877 non-null   int64
 10  Betriebssituation_Teilweise_Eingeschraenkt 9877 non-null int64
 11  Betriebssituation_Eingeschraenkt         9877 non-null   int64
 12  Betriebssituation_Keine_Angabe           9877 non-null   int64
dtypes: datetime64[ns](1), int64(11), object(1)
memory usage: 1003.3+ 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
9842	2021-10-19	DEUTSCHLAND	1311	1467	19234	
9859	2021-10-20	DEUTSCHLAND	1312	1472	19340	
9876	2021-10-21	DEUTSCHLAND	1312	1526	19445	

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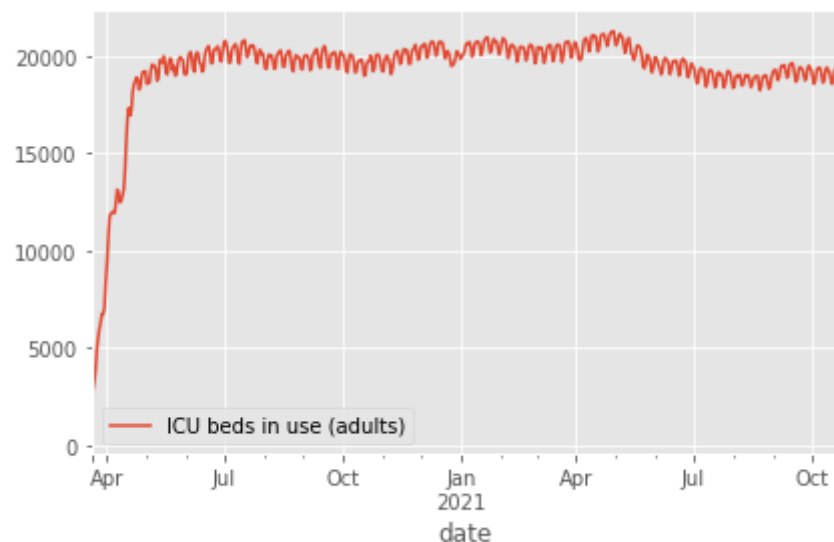
```
<class 'pandas.core.frame.DataFrame'>
```

```
Int64Index: 581 entries, 16 to 9876
Data columns (total 2 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   date                   581 non-null    datetime64[ns]
 1   ICU beds in use (adults)  581 non-null    int64
dtypes: datetime64[ns](1), int64(1)
memory usage: 13.6 KB
```

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

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

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

Covid-19 patients in ICU

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

In [17]:
```python
icu.columns = ['date', 'Covid-19 cases in ICU']
icu.set_index('date', inplace=True)
icu.info()
```
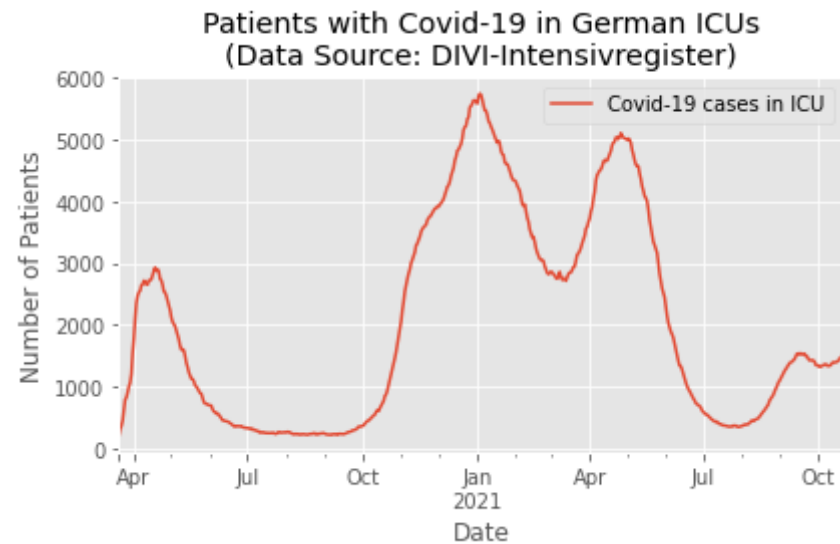
```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 581 entries, 2020-03-20 to 2021-10-21
```

```
Data columns (total 1 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   Covid-19 cases in ICU  581 non-null    int64
dtypes: int64(1)
memory usage: 9.1 KB
```

In [18]:
```python
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]:
```python
fig = icu_cases.get_figure()
fig.savefig('img/covid-19-patients-in-icu-germany.png')
```
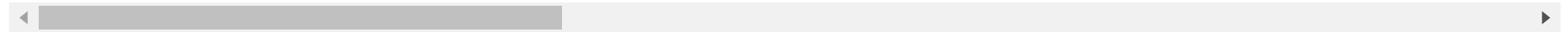
Situation in North Rhine-Westphalia

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

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

Out[20]:

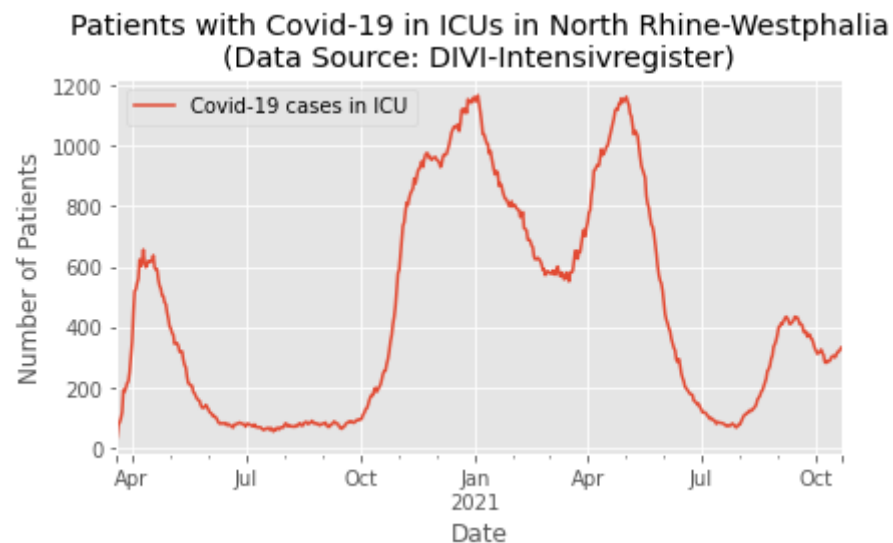| Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene
9847	2021-10-20	NORDRHEIN_WESTFALEN	315	323	4693
9864	2021-10-21	NORDRHEIN_WESTFALEN	315	331	4702

```python
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: 581 entries, 2020-03-20 to 2021-10-21
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  581 non-null    int64
dtypes: int64(1)
memory usage: 9.1 KB
```

```python
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')
```

Patients with Covid-19 in ICUs in North Rhine-Westphalia
(Data Source: DIVI-Intensivregister)

Situation in Rhineland-Palatinate

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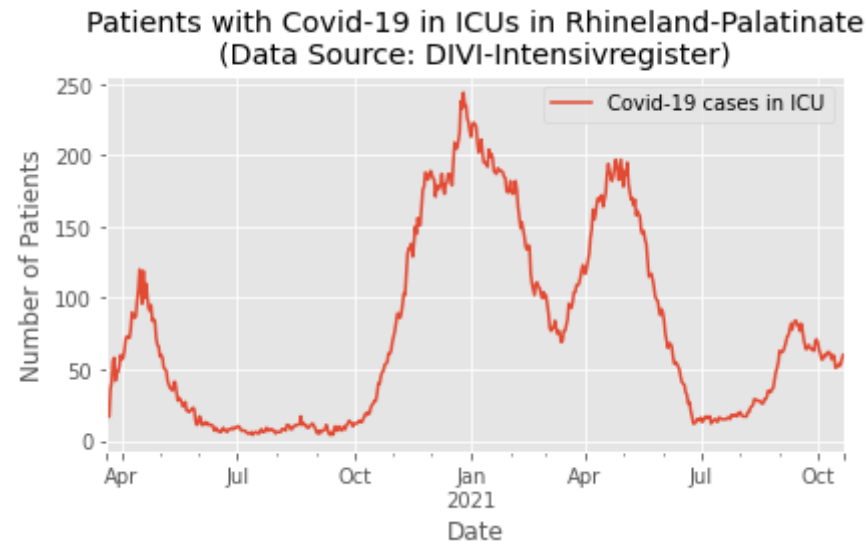
Out[23]:

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
9856	2021-10-20	RHEINLAND_PFALZ	77	57	789	
9873	2021-10-21	RHEINLAND_PFALZ	77	60	815	

```
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: 581 entries, 2020-03-20 to 2021-10-21
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  581 non-null    int64
```

```
dtypes: int64(1)
memory usage: 9.1 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
9843	2021-10-20	SACHSEN	79	119	1168	
9860	2021-10-21	SACHSEN	79	116	1170	

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: 581 entries, 2020-03-20 to 2021-10-21
Data columns (total 1 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Covid-19 cases in ICU  581 non-null    int64
dtypes: int64(1)
memory usage: 9.1 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')
```