

# 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]: '2021-08-18'
```

```
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_E
8786	2021-08-18T12:15:00+02:00	SACHSEN_ANHALT		42	4
8787	2021-08-18T12:15:00+02:00	NORDRHEIN_WESTFALEN		313	185
8788	2021-08-18T12:15:00+02:00	DEUTSCHLAND		1311	594

3 rows × 21 columns



## 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	BADEN_WUERTTEMBERG	31	35	39	
1	2020-03-20	HAMBURG	11	6	24	
2	2020-03-20	BREMEN	3	2	0	
3	2020-03-20	SACHSEN	20	3	44	
4	2020-03-20	BRANDENBURG	20	2	50	

5 rows × 21 columns

```
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: 8789 entries, 0 to 8788
Data columns (total 21 columns):
#   Column                                     Non-Null Count  Dtype
---  -
0   Datum                                     8789 non-null   datetime64[ns]
1   Bundesland                               8789 non-null   object
2   Anzahl_Meldebereiche_Erwachsene          8789 non-null   int64
3   Aktuelle_COVID_Faelle_Erwachsene_ITS     8789 non-null   int64
4   Belegte_Intensivbetten_Erwachsene        8789 non-null   int64
5   Freie_Intensivbetten_Erwachsene          8789 non-null   int64
6   7_Tage_Notfallreserve_Erwachsene         8789 non-null   int64
7   Freie_IV_Kapazitaeten_Gesamt             8789 non-null   int64
8   Freie_IV_Kapazitaeten_Davon_COVID        8789 non-null   int64
9   Betriebssituation_Regulaerer_Betrieb     8789 non-null   int64
10  Betriebssituation_Teilweise_Eingeschraenkt 8789 non-null   int64
11  Betriebssituation_Eingeschraenkt         8789 non-null   int64
12  Betriebssituation_Keine_Angabe           8789 non-null   int64
13  Stratum_17_Minus                         8789 non-null   int64
14  Stratum_18_Bis_29                        8789 non-null   int64
15  Stratum_30_Bis_39                        8789 non-null   int64
16  Stratum_40_Bis_49                        8789 non-null   int64
17  Stratum_50_Bis_59                        8789 non-null   int64
18  Stratum_60_Bis_69                        8789 non-null   int64
19  Stratum_70_Bis_79                        8789 non-null   int64
20  Stratum_80_Plus                          8789 non-null   int64
dtypes: datetime64[ns](1), int64(19), object(1)
memory usage: 1.4+ MB
```

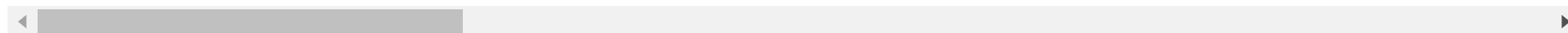
```
In [12]: federal_level = timeline_df[timeline_df.Bundesland=='DEUTSCHLAND']
federal_level.tail(3)
```

```
Out[12]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Intensivbetten_Erwachsene
<b>8754</b>	2021-08-16	DEUTSCHLAND	1311	541	18591	
<b>8771</b>	2021-08-17	DEUTSCHLAND	1310	571	18805	

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Inte
8788	2021-08-18	DEUTSCHLAND	1311	594		18923

3 rows × 21 columns



## Used Beds (Adults)

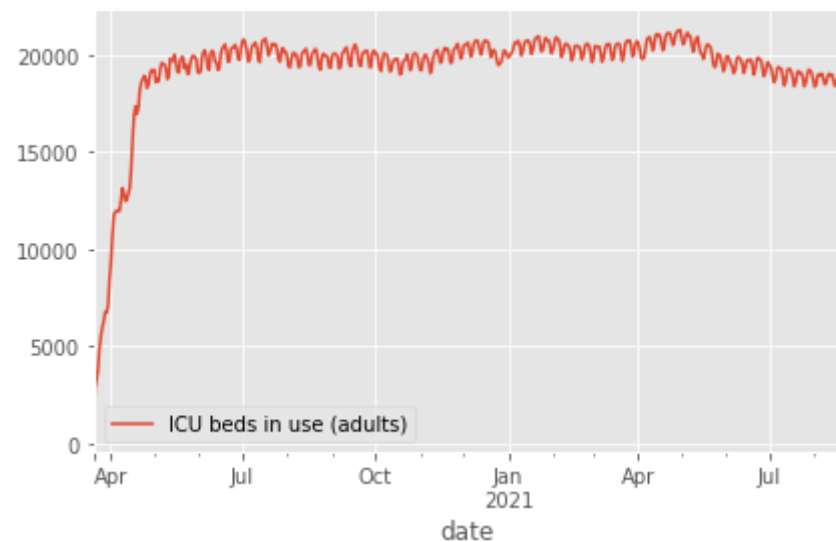
```
In [13]: used_beds = federal_level.loc[ : , ['Datum', 'Belegte_Intensivbetten_Erwachsene']]
used_beds.columns = ['date', 'ICU beds in use (adults)']
used_beds.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 517 entries, 16 to 8788
Data columns (total 2 columns):
#   Column                Non-Null Count  Dtype
---  -
0   date                  517 non-null   datetime64[ns]
1   ICU beds in use (adults) 517 non-null   int64
dtypes: datetime64[ns](1), int64(1)
memory usage: 12.1 KB
```

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

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

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



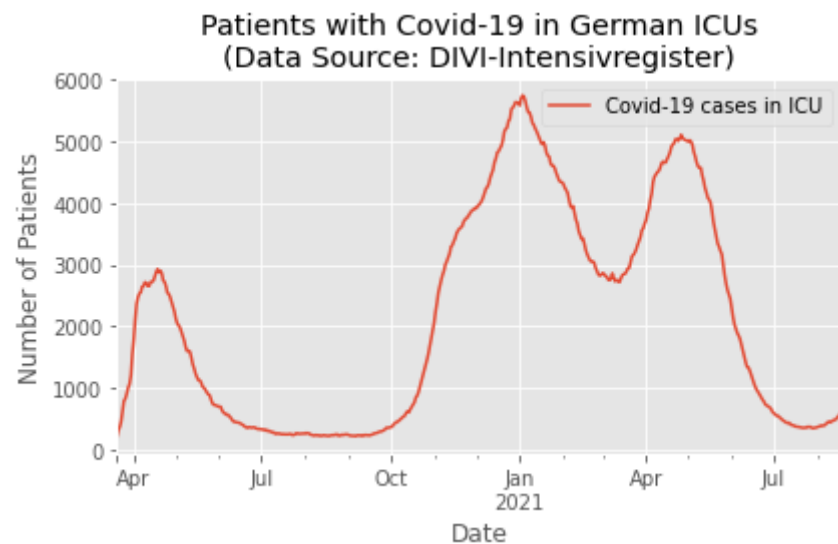
## Covid-19 patients in ICU

```
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: 517 entries, 2020-03-20 to 2021-08-18
Data columns (total 1 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Covid-19 cases in ICU  517 non-null   int64
dtypes: int64(1)
memory usage: 8.1 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

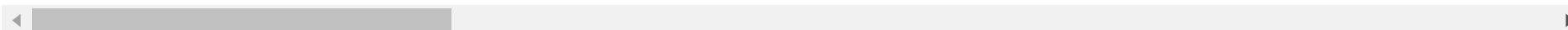
NRW ist the state in Germany with the highest number of inhabitants.

```
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
<b>8769</b>	2021-08-17	NORDRHEIN_WESTFALEN	313	172	4549
<b>8787</b>	2021-08-18	NORDRHEIN_WESTFALEN	313	185	4591

2 rows × 21 columns

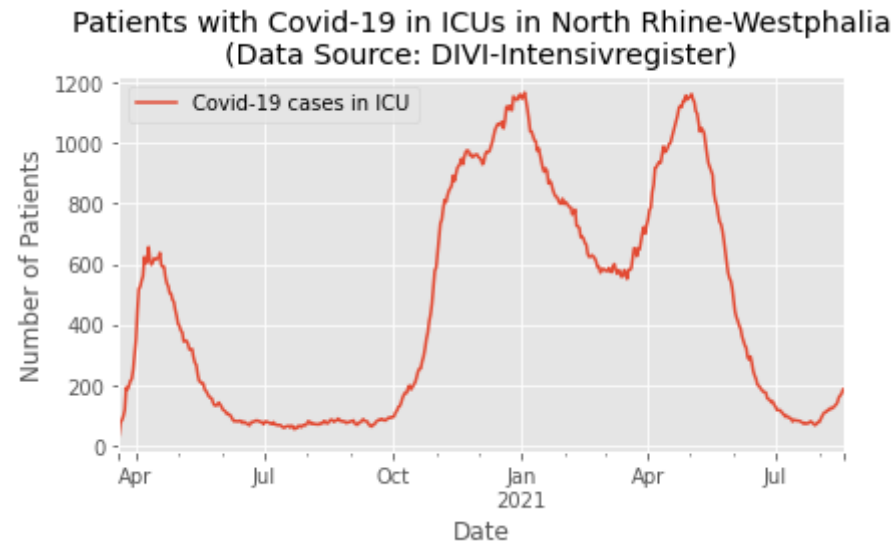


```
In [21]: icu_nrw = nrw.loc[:, ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_nrw.columns = ['date', 'Covid-19 cases in ICU']
```

```
icu_nrw.set_index('date', inplace=True)
icu_nrw.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 517 entries, 2020-03-20 to 2021-08-18
Data columns (total 1 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Covid-19 cases in ICU  517 non-null   int64
dtypes: int64(1)
memory usage: 8.1 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

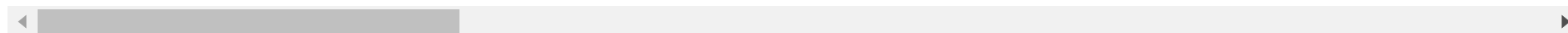
```
In [23]: rlp = timeline_df[timeline_df.Bundesland=='RHEINLAND_PFALZ']
          rlp.tail(2)
```

```
Out[23]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
8760	2021-08-17	RHEINLAND_PFALZ	77	27		795

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
8777	2021-08-18	RHEINLAND_PFALZ	77	26		789

2 rows × 21 columns

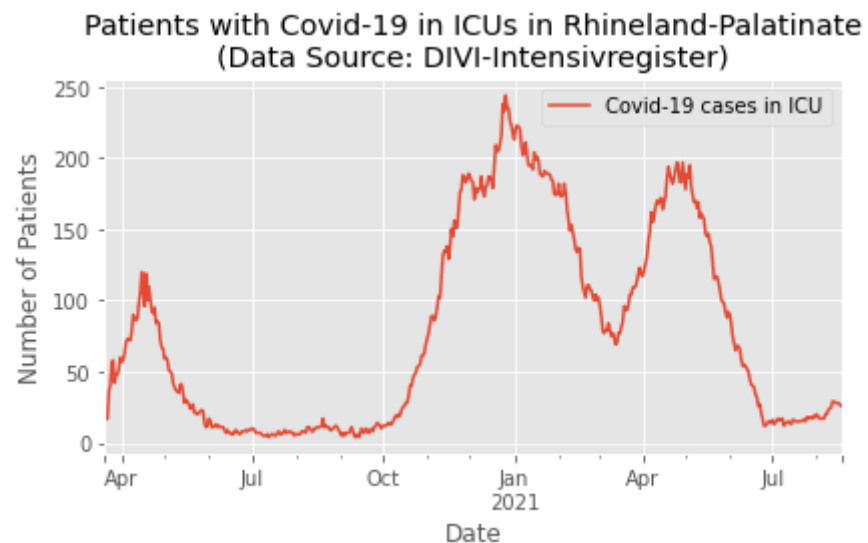


```
In [24]: icu_rlp = rlp.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_rlp.columns = ['date', 'Covid-19 cases in ICU']
icu_rlp.set_index('date', inplace=True)
icu_rlp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 517 entries, 2020-03-20 to 2021-08-18
Data columns (total 1 columns):
#   Column          Non-Null Count  Dtype
---  -
0   Covid-19 cases in ICU  517 non-null    int64
dtypes: int64(1)
memory usage: 8.1 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]: saxonias = timeline_df[timeline_df.Bundesland=='SACHSEN']
saxonias.tail(2)
```

```
Out[26]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Intensivbetten_Erwachsene
8759	2021-08-17	SACHSEN	78	23	1177	
8775	2021-08-18	SACHSEN	78	21	1192	

2 rows × 7 columns

```
In [27]: icu_saxonia = saxonias.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: 517 entries, 2020-03-20 to 2021-08-18
```

Data columns (total 1 columns):

#	Column	Non-Null Count	Dtype
0	Covid-19 cases in ICU	517 non-null	int64

dtypes: int64(1)  
memory usage: 8.1 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')
```

