

# Intensive Care in Germany

## Data Source

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

## Setup

```
In [57]: # standard library  
import datetime  
import math
```

```
In [58]: # third party  
import numpy as np  
import pandas as pd  
import matplotlib.pyplot as plt  
import requests
```

## Date this Notebook was run

```
In [59]: today = datetime.datetime.today().strftime('%Y-%m-%d')  
today
```

```
Out[59]: '2021-08-21'
```

```
In [60]: # style like ggplot in R  
plt.style.use('ggplot')
```

```
In [61]: # 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 [62]: timeline_data = "https://diviexchange.blob.core.windows.net/%24web/bundesland-zeitreihe.csv"
```

```
In [63]: timeline_df = pd.read_csv(timeline_data)
```

```
In [64]: timeline_df.tail(3)
```

```
Out[64]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachse
8837	2021-08-21T12:15:00+02:00	HAMBURG	24	39	4
8838	2021-08-21T12:15:00+02:00	NIEDERSACHSEN	119	36	13
8839	2021-08-21T12:15:00+02:00	DEUTSCHLAND	1310	676	185

3 rows × 21 columns



## Rename Columns

### Convert datatype of date column

```
In [65]: timeline_df["Datum"] = timeline_df["Datum"].str[:10]
         timeline_df.head()
```

```
Out[65]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachse
0	2020-03-20	NORDRHEIN_WESTFALEN	55	35	8
1	2020-03-20	RHEINLAND_PFALZ	15	14	4
2	2020-03-20	HESSEN	19	7	2
3	2020-03-20	BAYERN	45	61	7
4	2020-03-20	MECKLENBURG_VORPOMMERN	10	1	1

5 rows × 21 columns

```
In [66]: timeline_df.iloc[ : , [0]] = timeline_df.iloc[ : , [0]].apply(pd.to_datetime)
```

```
In [67]: timeline_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8840 entries, 0 to 8839
Data columns (total 21 columns):
#   Column                                     Non-Null Count  Dtype
---  -
0   Datum                                     8840 non-null   datetime64[ns]
1   Bundesland                               8840 non-null   object
2   Anzahl_Meldebereiche_Erwachsene          8840 non-null   int64
3   Aktuelle_COVID_Faelle_Erwachsene_ITS     8840 non-null   int64
4   Belegte_Intensivbetten_Erwachsene         8840 non-null   int64
5   Freie_Intensivbetten_Erwachsene           8840 non-null   int64
6   7_Tage_Notfallreserve_Erwachsene          8840 non-null   int64
7   Freie_IV_Kapazitaeten_Gesamt              8840 non-null   int64
8   Freie_IV_Kapazitaeten_Davon_COVID         8840 non-null   int64
9   Betriebssituation_Regulaerer_Betrieb      8840 non-null   int64
10  Betriebssituation_Teilweise_Eingeschraenkt 8840 non-null   int64
11  Betriebssituation_Eingeschraenkt          8840 non-null   int64
12  Betriebssituation_Keine_Angabe            8840 non-null   int64
13  Stratum_17_Minus                          8840 non-null   int64
14  Stratum_18_Bis_29                         8840 non-null   int64
15  Stratum_30_Bis_39                         8840 non-null   int64
16  Stratum_40_Bis_49                         8840 non-null   int64
17  Stratum_50_Bis_59                         8840 non-null   int64
18  Stratum_60_Bis_69                         8840 non-null   int64
19  Stratum_70_Bis_79                         8840 non-null   int64
20  Stratum_80_Plus                           8840 non-null   int64
dtypes: datetime64[ns](1), int64(19), object(1)
memory usage: 1.4+ MB
```

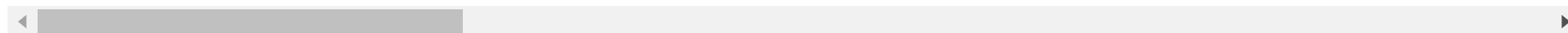
```
In [68]: federal_level = timeline_df[timeline_df.Bundesland=='DEUTSCHLAND']
federal_level.tail(3)
```

```
Out[68]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Intensivbetten_Erwachsene
<b>8805</b>	2021-08-19	DEUTSCHLAND	1310	616	18946	
<b>8822</b>	2021-08-20	DEUTSCHLAND	1309	646	18970	

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Inte
8839	2021-08-21	DEUTSCHLAND	1310	676	18562	

3 rows × 21 columns



## Used Beds (Adults)

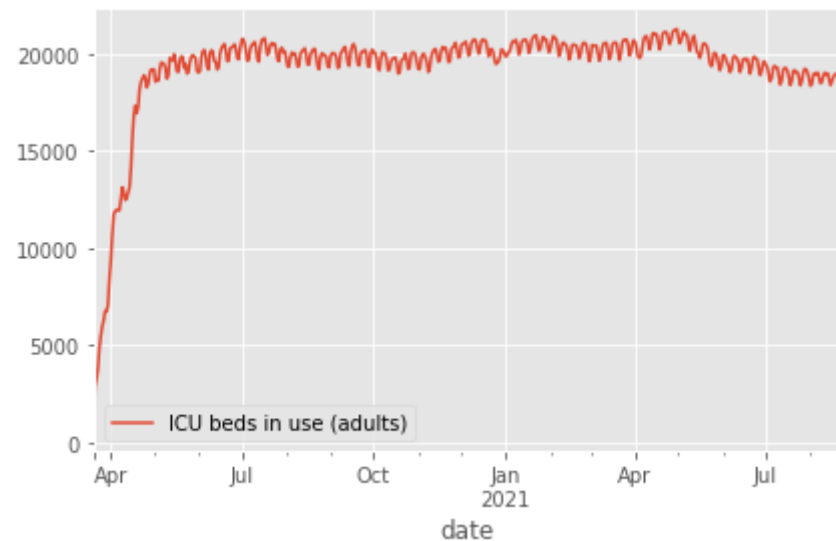
```
In [69]: used_beds = federal_level.loc[ : , ['Datum', 'Belegte_Intensivbetten_Erwachsene']]
used_beds.columns = ['date', 'ICU beds in use (adults)']
used_beds.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 520 entries, 16 to 8839
Data columns (total 2 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   date                                  520 non-null    datetime64[ns]
1   ICU beds in use (adults)             520 non-null    int64
dtypes: datetime64[ns](1), int64(1)
memory usage: 12.2 KB
```

```
In [70]: used_beds.set_index('date', inplace=True)
```

```
In [71]: used_beds.plot()
```

```
Out[71]: <AxesSubplot:xlabel='date'>
```



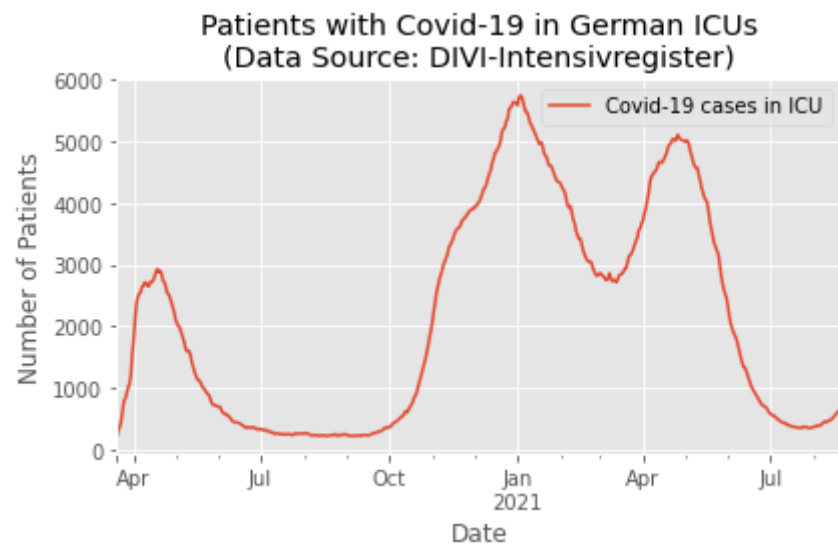
## Covid-19 patients in ICU

```
In [72]: icu = federal_level.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
```

```
In [73]: icu.columns = ['date', 'Covid-19 cases in ICU']
icu.set_index('date', inplace=True)
icu.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 520 entries, 2020-03-20 to 2021-08-21
Data columns (total 1 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Covid-19 cases in ICU  520 non-null   int64
dtypes: int64(1)
memory usage: 8.1 KB
```

```
In [74]: icu_cases = icu.plot(
        title='Patients with Covid-19 in German ICUs\n(Data Source: DIVI-Intensivregister)',
        xlabel='Date',
        ylabel='Number of Patients')
```



```
In [75]: fig = icu_cases.get_figure()
fig.savefig('img/covid-19-patients-in-icu-germany.png')
```

## Situation in North Rhine-Westphalia

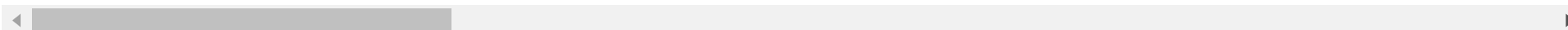
NRW ist the state in Germany with the highest number of inhabitants.

```
In [76]: nrw = timeline_df[timeline_df.Bundesland=='NORDRHEIN_WESTFALEN']
nrw.tail(2)
```

```
Out[76]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene
8806	2021-08-20	NORDRHEIN_WESTFALEN	313	203	4601
8823	2021-08-21	NORDRHEIN_WESTFALEN	313	215	4527

2 rows × 21 columns

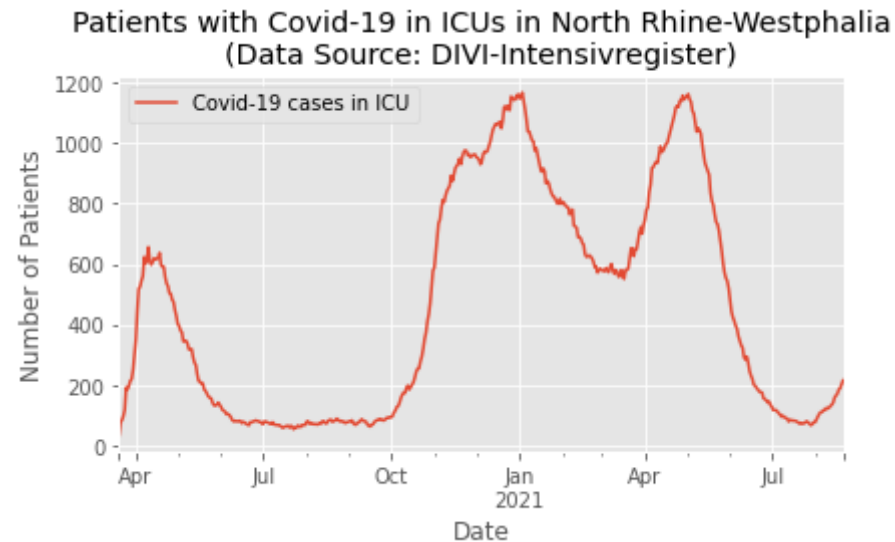


```
In [77]: icu_nrw = nrw.loc[:, ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_nrw.columns = ['date', 'Covid-19 cases in ICU']
```

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

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 520 entries, 2020-03-20 to 2021-08-21
Data columns (total 1 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Covid-19 cases in ICU  520 non-null   int64
dtypes: int64(1)
memory usage: 8.1 KB
```

```
In [78]: 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

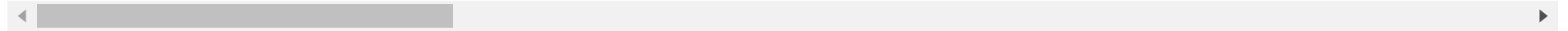
```
In [79]: rlp = timeline_df[timeline_df.Bundesland=='RHEINLAND_PFALZ']
        rlp.tail(2)
```

```
Out[79]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
8807	2021-08-20	RHEINLAND_PFALZ	77	29		777

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_
8824	2021-08-21	RHEINLAND_PFALZ	77	29		767

2 rows × 21 columns

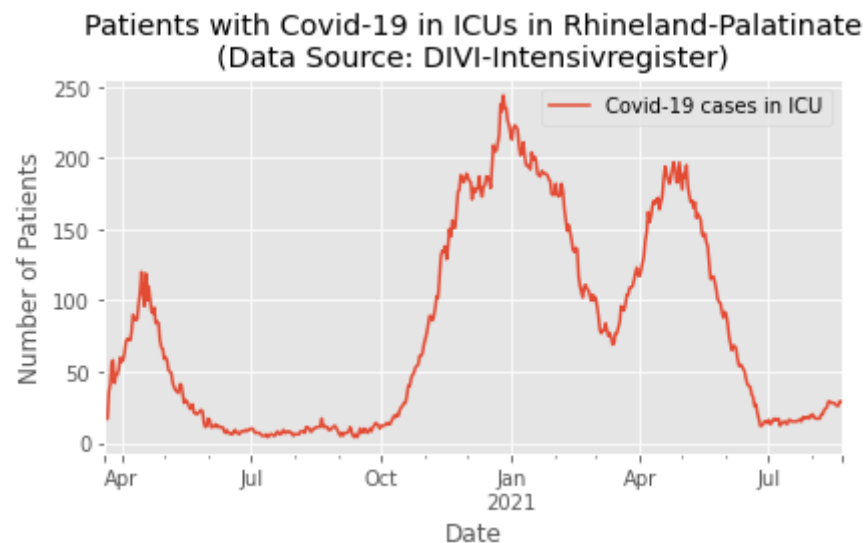


```
In [80]: icu_rlp = rlp.loc[ : , ['Datum', 'Aktuelle_COVID_Faelle_Erwachsene_ITS']]
icu_rlp.columns = ['date', 'Covid-19 cases in ICU']
icu_rlp.set_index('date', inplace=True)
icu_rlp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 520 entries, 2020-03-20 to 2021-08-21
Data columns (total 1 columns):
#   Column          Non-Null Count  Dtype
---  -
0   Covid-19 cases in ICU  520 non-null    int64
dtypes: int64(1)
memory usage: 8.1 KB
```

```
In [81]: 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 [82]: saxonias = timeline_df[timeline_df.Bundesland=='SACHSEN']
saxonias.tail(2)
```

```
Out[82]:
```

	Datum	Bundesland	Anzahl_Meldebereiche_Erwachsene	Aktuelle_COVID_Faelle_Erwachsene_ITS	Belegte_Intensivbetten_Erwachsene	Freie_Intensivbetten_Erwachsene
8819	2021-08-20	SACHSEN	77	19	1166	
8836	2021-08-21	SACHSEN	77	17	1178	

2 rows × 7 columns

```
In [83]: 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: 520 entries, 2020-03-20 to 2021-08-21
```

Data columns (total 1 columns):

#	Column	Non-Null Count	Dtype
0	Covid-19 cases in ICU	520 non-null	int64

dtypes: int64(1)  
memory usage: 8.1 KB

```
In [84]: 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')
```

