

DV1597 Assignment 2

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1 Introduction

This report contains statistical analysis regarding COVID-19. The analysis is based on information on daily COVID-19 cases and deaths, COVID-19 vaccinations, and hospital admission rates.

In part 1 of this report, 8 different questions are answered based on the analysis done. For part 2, three additional questions are investigated.

1.1 Datasets

For the analysis, 3 different datasets are used:

1. `COVID-19_daily_number_of_new_cases_and_deaths.csv`
Contains data on reported COVID-19 cases and deaths for 30 European countries during 2020-2022.
2. `COVID-19_vaccination.csv`
Contains data on COVID-19 vaccination for 30 European countries, including i.a. time, dose number, vaccine type.
3. `COVID-19_hospital_and_ICU_admission_rates.csv`
Contains data on hospital and ICU (Intensive Care Unit) occupancy and admission from 2020-2023 for 25 European countries.

All three datasets are provided by the *European Centre for Disease Prevention and Control* (ECDC).

1.2 Method

The analysis was done using `Python 3` in `Jupyter Notebook`. The results presented are based on the analysis performed in the notebook.

1.3 Data munging

A series of data munging steps were taken to ensure that our questions could be answered. For the three datasets, a `Time` column was added to enable analysis with respect to time/dates. For all datasets the column names were adjusted to be consistent.

Regarding dataset 1, some countries reported number of cases and deaths every day, while others reported less frequently, i.e. every other day or weekly. This was not adjusted, but it is important to be aware of. Columns that was not necessary for the anlysis were removed.

For dataset 2, NaN values in selected columns were replaced with 0. Some countries had reported vaccination data for local regions. Regional data was removed, since only data for the entire country is relevant for this analysis. Also, two vaccine target groups were added to the dataset (*Age<18* and *1_Age60+*). These target groups were already present for some countries, but not for others, and were essential to some of the analysis done. Furthermore, two columns were created, one containing all additional doses, and another containing all doses. For dataset 2, some columns were removed, either because that data

was not reported for all countries, or because it was not necessary for our analysis. We also replaced the country code in the dataset with the country name.

Dataset 3 was divided into 4 parts: *Daily hospital occupancy*, *Weekly new hospital admissions per 100k*, *Weekly new ICU admissions per 100k* and *Daily ICU occupancy*. *Daily hospital occupancy per 100k* and *Daily ICU occupancy per 100k* was calculated and stored.

Some countries reported both hospital occupancy daily and weekly new hospital admissions per 100k, while others only reported only one of them. We wanted to compare all countries according to the same metric. We retrieved the data from the countries that had data for both categories, and we performed a linear regression ($R^2=0.75$) to find a correlation between the two. Using the result we estimated *Weekly new hospital admissions per 100k* for four countries: Austria, Bulgaria, Lithuania and Romania.

2 Part 1

2.1 Reported cases per quarter 2020-2022

Which top 10 countries reported the most number of cases of COVID-19 in each quarter from 2020 to 2022? Are these numbers relatively high compared to the country's population? Is there any connection to their geographical locations?

To investigate this, dataset 1 was used. The dataset was grouped into 4 quarters per year 2020-2022, and the cases were summed up for each country. Additionally Cpm (*Cases Per Million people*) was calculated using the country's population. The data was sorted based on the total number of cases, and the countries outside of the top 10 were removed. The resulting tables for each quarters are found in appendix section 4.1 table 5 to table 16.

For Q1-Q4 in 2020, the most amount of cases were reported in countries with a large population, such as Spain, Italy, Germany and France. Also, looking at cases per million, relative to their total population these numbers were large. Although Germanys Cpm was lower than the other countries'. For 2020-Q4, Czechia had a substantially higher Cpm the other other countries. Continuing in 2021-Q1, Czechia still had a high Cpm, similar to its neighboring country Slovakia.

In 2021, France had the most total reported cases for each quarter, and also a relatively high number of cases per million people. Continuing the trend from 2020, Spain, Italy and Germany were always among the top 5 most reported cases. In 2021, Poland had more cases reported than in 2020. Furthermore, the Netherlands had a high number of cases per million people during 2021.

In 2022, the same four large countries France, Germany, Italy and Spain reported the most cases. Noticably, Portugal had a high Cpm for 2022-Q2, and Greece had a high Cpm for 2022-Q3.

Regarding the cases and the countries' geographical locations, there is no obvious pattern. The 4 countries with the most cases (France, Italy, Germany and Spain) are in the same general region and are all connected through France. Their location probably contributed to some spread of infection. One case were geographical location is likely to have had an impact is in 2021-Q2, where the neighboring countries Czechia and Slovakia both saw a spike in reported cases.

2.2 Visualisation of deaths and cases

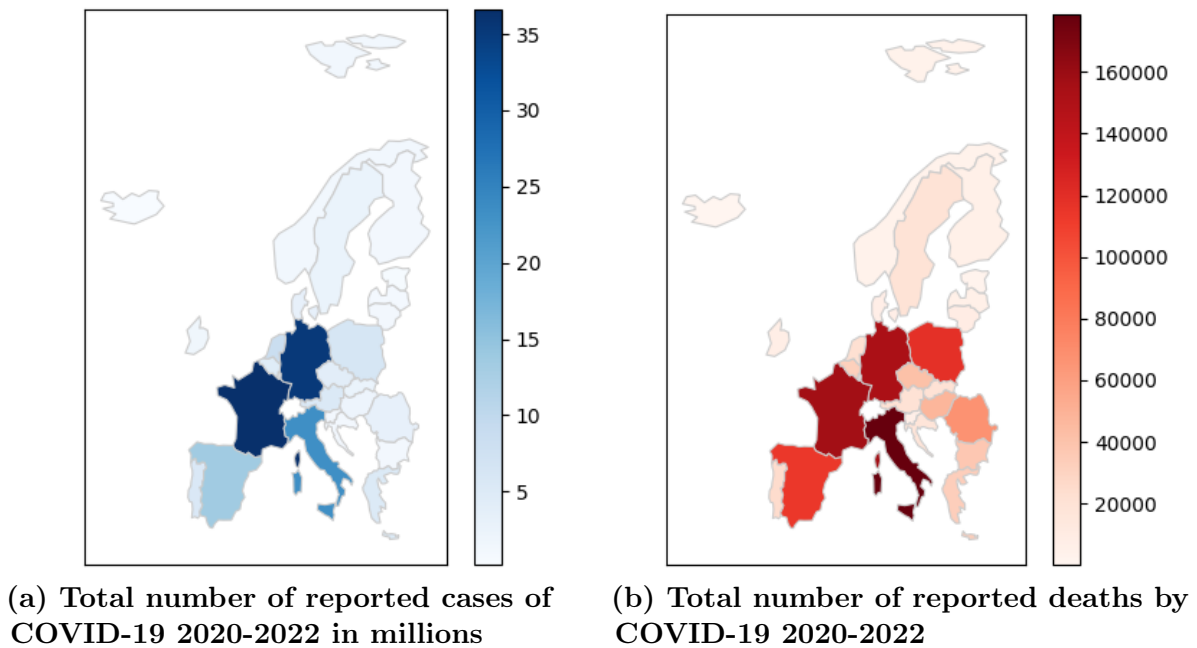
Visualize each country's total number of cases and deaths on a map in 2020, 2021 and 2022.

The map showing each country's number of cases can be found in figure 1a, and the map showing each country's total reported deaths is found in figure 1b. The maps were created by summing cases and deaths for each country, and drawing each country with a color based on these values.

The results showed in figure 1a is similar to what was found in section 2.1. The highest number of cases are reported for Germany and France, third is Italy and fourth is Spain.

The result in figure 1b does show some similarities to 1a. In general, the countries with the largest populations have the highest number of reported deaths by COVID-19. Italy is the country with the highest number of reported deaths, followed by France and Germany, and then Spain and Poland. It is not very surprising that the most populous European countries also have the highest number of reported deaths by COVID-19.

Figure 1: Number of cases (1a) and deaths (1b) of COVID-19 2020-2022



2.3 Most used vaccine brands in EU/EEA

What are the top 3 popular vaccine brands that have been used across the EU/EEA? Is it similar at the country level?

To answer this, the sum for each vaccine was calculated, and the unknown vaccine type (UNK) was removed. Then the vaccine types were sorted and the top 3 were selected. The vaccines were ranked based on the total number of doses that people received of a certain vaccine. The results are found in table 1. The 3 most popular vaccine types used in EU/EEA was COM (*Pfizer BioNTech - Comirnaty*), MOD (*Moderna - Spikevax*) and AZ (*AstraZeneca - Vaxzevria*).

Table 1: Top 3 vaccine brands used in EU/EEA

	Vaccine	TotalDoses
1	COM	1,131,043,535
2	MOD	270,588,618
3	AZ	137,341,608

Furthermore, we investigated what the top 3 vaccine brand was for each country. It was done similarly to finding the top 3 overall, but for each country. The results are found in appendix section 4.2 table 17.

On a country level COM was the most used vaccine for all countries except for Liechtenstein, where MOD was more common. The second and third most popular vaccine for each country was more varied. Both MOD and AZ was common. A few other vaccines appeared in the top 3 for some countries, among those were COMBA.4-5 (*Pfizer BioNTech – Comirnaty Original/Omicron BA.4/BA.5*), BECNBG (*Beijing CNBG - BBIBP-CorV*) and JANS (Janssen - Jcovden).

2.4 Target groups for the top 3 vaccine brands

Considering section 2.3, which target groups mainly received these vaccine brands in each country?

To answer this question, dataset 2 was used. The targetgroups ALL, 1_Age60+ and 1_Age<60 were removed, so that only smaller target groups were taken into consideration. Then the largest group for each of the top 3 vaccines were selected and stored in a table. For Germany and France not enough data is available to answer this question.

The results are found in appendix section 4.3 table 18. Regarding the overall most popular vaccine, COM, the target group age 25-49 was the one who received the most doses of this vaccine in all countries. This target group is the largest one included, and it is therefore an expected result. For MOD, target group 25-49 is the largest receiving group in all countries except for the Netherlands (age 60-69) and Slovenia (age 70-79). For AZ, the target group age 25-49 is still common, but for many countries, older target groups such as age 60-69 and age 70-79 received a larger portion of these doses. Also Liechtenstein seem to not have used AZ at all.

Overall, COM and MOD were most common for ages 25-49. While AZ was commonly used for people over the age of 60.

2.5 Country skepticism towards first vaccine dose

Which countries are the most skeptical towards the first dose of the COVID-19 vaccine? Do you think this matter have any impact on the hospitalization level?

We start by defining what skepticism is in this report. We will look at how many people over 18 years of age took the first dose of COVID-19 and compare it to the country's total population. The reason for us to not include target groups under the age of 18 is because not all countries attempted to vaccinate children, and therefore a low amount of vaccinated people under the age of 18 is not necessarily an indication of skepticism towards the vaccine.

We define the level of skepticism for the first dose for a country as

$$\text{Skepticism} = 1 - (\text{FirstDose}/\text{Population})$$

Where *FirstDose* is the number of adults who has taken the first dose, and *Population* is the country's total population. Skepticism was calculated for each country, and the countries were sorted from most to least skeptical. The result for all 30 countries is found in appendix section 4.4 table 19. The 5 most skeptical countries are listed in table 2. According to our metric on skepticism, the five countries with the highest number of vaccine-skepticism is Bulgaria, Romania, Slovakia, Poland and Croatia.

We do believe that vaccine skepticism does have an impact on hospitalization level. A country with a population with a higher percentage of vaccinated adults should experience a lower hospitalization level. This is because when vaccinated people get infected, the symptoms should generally be milder than if they were not vaccinated.

Table 2: Skepticism towards COVID-19 vaccine (Top 5 countries)

	Country	FirstDose	Population	Skepticism
1	Bulgaria	2077742	6951482	0.7
2	Romania	7917501	19328838	0.59
3	Slovakia	2704559	5457873	0.5
4	Poland	20848103	37958138	0.45
5	Croatia	2282163	4058165	0.44

2.6 First dose COVID-19 vaccine recieved per country for population under 18

Rank all EU/EEA countries based on their vaccinated population under age 18 for the first dose of the COVID-19 vaccine. Which countries have the most and least vaccinated people under age 18 in regards to their total populations?

For this question we summarize the all first doses of vaccines for people under 18 for every country. We also calculate $\text{Proportion} = \text{FirstDose}/\text{Population}$, where *FirstDose* is the number of vaccinated people under 18 years of age. *Proportion* is used to see which countries have the most and least vaccinated people under age 18 with regards to their total population. Table 3 shows the top 5 and bottom 5 countries with regards to the number of vaccinated people under age 18. The full table is found in appendix section 4.5 table 20.

To see which countries who have the most and least vaccinated population under age 18 with regards to the total population we look at the highest and lowest *Proportion*-values. From this we can conclude that Iceland, Spain and Portugal are the countries with the highest amount of first doses for people under 18. Meanwhile Bulgaria, Croatia and Romania are the three countries with the least number of vaccinated people under age 18 with regards to total population.

Table 3: People under 18 who recieved the first dose of COVID-19 vaccination for each country

	Country	Population	FirstDose	Proportion
1	Spain	47332614	4859297	0.103
2	France	67320216	4608158	0.068
3	Germany	83166711	4563350	0.055
4	Italy	59641488	4332328	0.073
5	Poland	37958138	1784079	0.047
...				
26	Malta	514564	39184	0.076
27	Cyprus	888005	37794	0.043
28	Croatia	4058165	35087	0.009
29	Bulgaria	6951482	28612	0.004
30	Liechtenstein	38747	1664	0.043

2.7 EU/EEA countries vaccine coverage for 60+ population

Which countries have the oldest vaccinated population for the second dose of the COVID-19 vaccine in regards to their total population?

To answer this question we look at the target group for adults over the age of 60. For this age group we summarize the number of second doses for each country. Then we calculate $Proportion = SecondDose / Population$. Where $SecondDose$ is the number of second doses taken for 60+ population, and $Population$ is the total population for the country.

The top 5 countries are found in table 4. The full results can be seen in appendix section 4.6 table 21. According to this metric, the five countries with the oldest vaccinated population for the second dose of the COVID-19 vaccine with regards to their total population is Finland, Portugal, Italy, Germany and Denmark.

Table 4: 60+ population vaccinated with a second dose of COVID-19 vaccine (top 5)

	Country	Population	SecondDose	Proportion
1	Finland	5525292	1539025	0.279
2	Portugal	10295909	2850385	0.277
3	Italy	59641488	16207428	0.272
4	Germany	83166711	22007037	0.265
5	Denmark	5822763	1523615	0.262

2.8 COVID-19 impact on healthcare

Which countries' health care was most affected by the coronavirus pandemic in 2020 compared to others? How are these statistics in 2022?

To determine the effect the COVID-19 pandemic had on the healthcare for countries in 2020, we look at the weekly new hospital admissions per 100k. We calculated the mean value of this metric for each country in 2020. We also plotted this metric over 2020, which can be seen in figure 2. The 7 countries with the highest mean value are highlighted in the figure, while the remaining countries are gray. From the figure we can see that there was an increased pressure on hospitals in march and april, and also towards the last three

Figure 2: Weekly new hospital admissions per 100k 2020

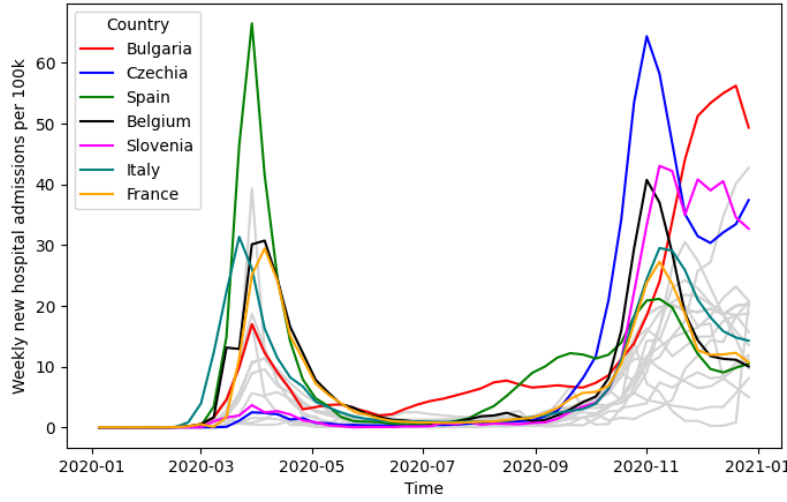
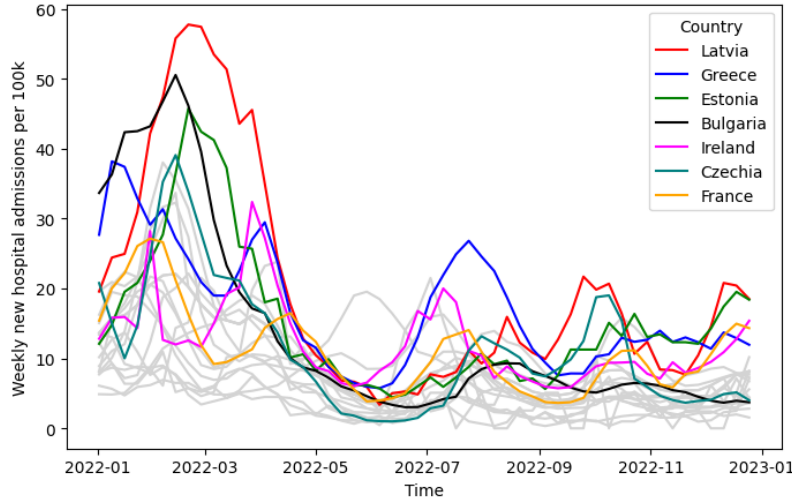


Figure 3: Weekly new hospital admissions per 100k 2022



months of the year. Lithuania was excluded from figure 2, since data was only available at the end of the year.

The countries whose healthcare was most affected by the pandemic according to new hospital admissions per 100k in 2020 were Bulgaria, Czechia, Spain, Belgium, Slovenia, Italy and France.

To compare these values to 2022, we performed the same procedure for 2022 as we did for 2020. The resulting graph can be seen in figure 3. For 2022, the health care was the most affected by the COVID-19 pandemic during the first three months of the year. The seven countries with the highest mean value for weekly new hospital admissions per 100k in 2022 were Latvia, Greece, Estonia, Bulgaria, Ireland, Czechia and France.

Comparing 2020 to 2022, the three countries Bulgaria, Czechia and France were all in the top seven countries with the regard to the highest effect on health care.

3 Part 2

3.1 COVID-19 lethality on a country level

Which countries had the highest level of lethality, comparing the number of cases per million to the number of deaths per million.

This is a question that is worth exploring because the relationship between cases and deaths is not an obvious one. More cases is likely to lead to more deaths, but a person's likelihood to survive a COVID-19 infection can also depend on what country that person lives in. Two important factors could be the country's healthcare and the vaccination coverage in the country.

In order to determine which countries had the highest level of lethality we investigated the first dataset. First we summed up the total cases and total deaths separately for each country, and then plotted those sums per million population. A scatter plot of this can be seen in figure 4 with each country represented by a differently colored dot.

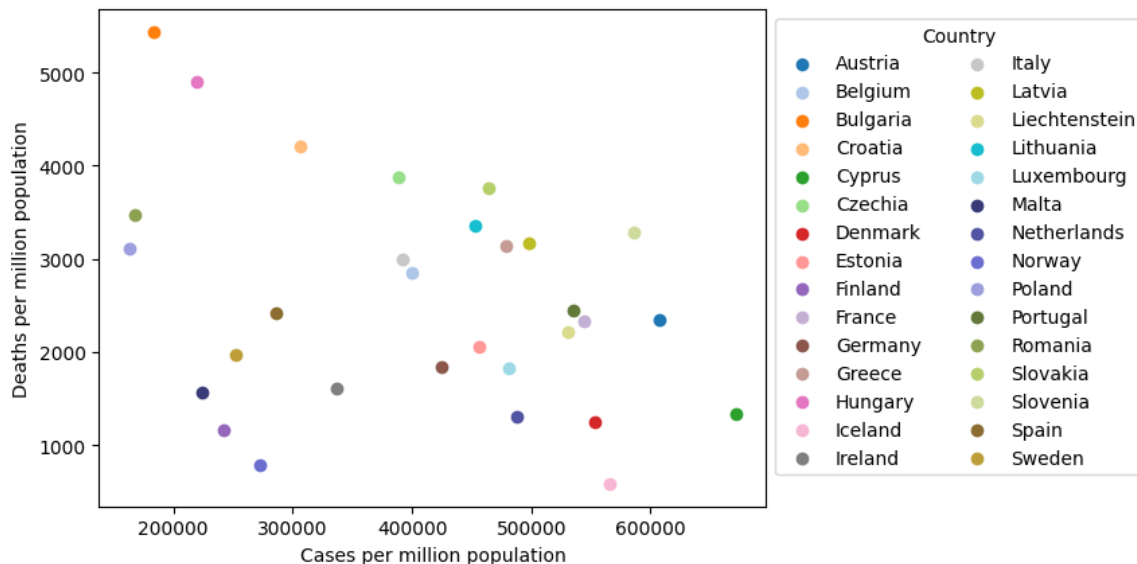


Figure 4: Cases and Deaths per million population

An interesting takeaway from the plot on figure 4 is that Bulgaria has the most deaths per million population while still being in the lower end of cases per million. There could be a correlation between this and the fact that the population of Bulgaria were found to be the most skeptical towards the vaccine in section 2.5 earlier in this report.

3.2 ICU admissions compared to vaccine skepticism

Did countries with high skepticism and low vaccination coverage experience a higher daily ICU occupancy per 100k people?

This question is important to explore in order to evaluate the effects of vaccination. The point of vaccinating is to protect individuals from infection, but also to take some pressure away from hospitals and intensive care units. By looking at this we will see what effect vaccination level has on ICU:s in particular.

To be able to explore this question we have to use both the second and the third dataset. We use the second dataset to calculate the skepticism the same way as we did in section 2.5. We then use the third dataset to calculate the median of the Daily ICU occupancy per 100k for each country the same way as we did for the Daily Hospital occupancy in section 2.8 for the years 2021 and 2022, we didn't look at the year 2020 because the vaccine had not been released yet and is therefore not affected by the levels of skepticism. We chose to use the Daily ICU occupancy per 100k instead of the weekly because all of the top 3 most skeptical countries used that as a measurement and they are very relevant. The plot for the year 2020 can be seen on figure 5 and the plot for 2021 can be seen on figure 6.

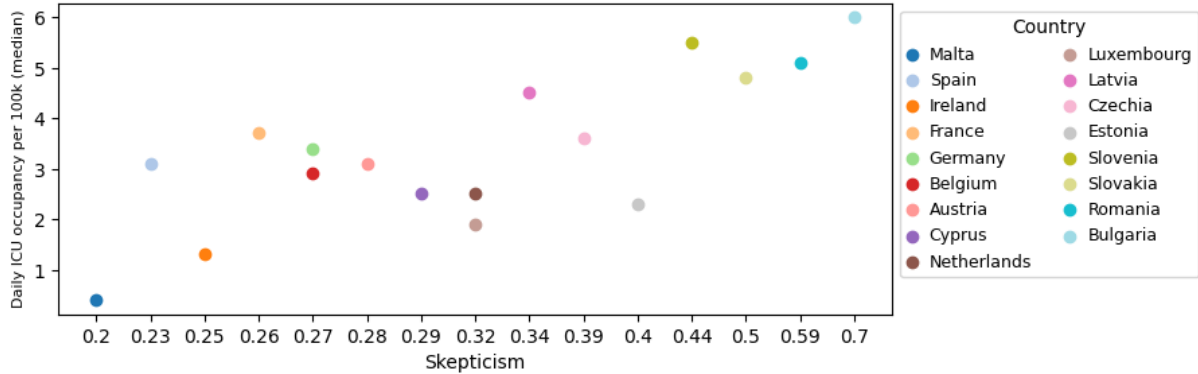


Figure 5: Daily ICU occupancy per 100k (median) 2021 vs Skepticism towards vaccine

The vaccine started rolling out at the end of 2020 and in 2021 we see a pattern of countries with higher levels of skepticism also tend to have a higher median of daily ICU occupancy per 100k. Two interesting takeaways are that Bulgaria is in the top right of figure 5 with the highest skepticism along with the highest median of daily ICU occupancy per 100k, and Malta in the opposite corner with the lowest skepticism in the plot and also the lowest median.

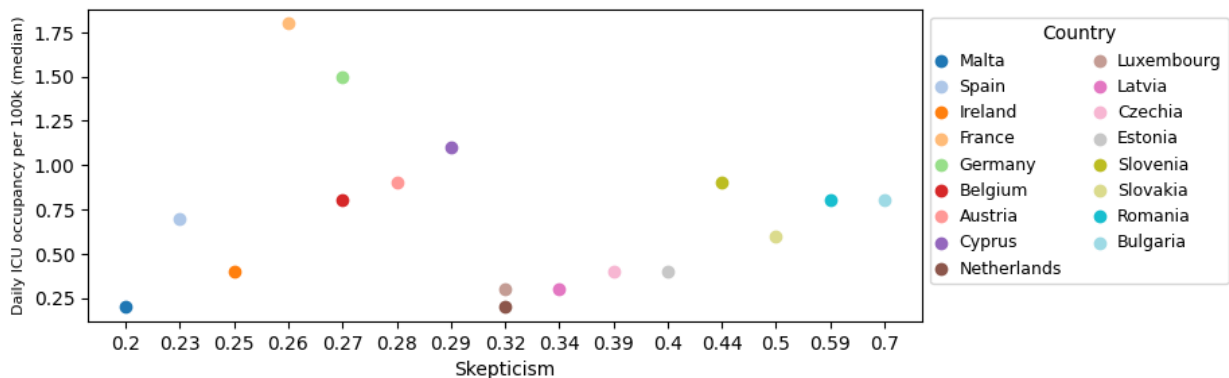


Figure 6: Daily ICU occupancy per 100k (median) 2022 vs Skepticism towards vaccine

Figure 6 show us that in the year 2022 the correlation between high levels of skepticism and a higher median of daily ICU occupancy per 100k has disappeared. In 2022 the ICU

occupancy is also much lower for all of the countries compared to the year before, showing us that the worst part of the pandemic seem to be over.

3.3 Vaccination rate for the first dose of COVID-19 vaccine

Which countries were the fastest and slowest at vaccinating their population with the first dose?

The purpose of this question is partly to explore how quickly a country can vaccinate its population. It is also interesting to see how the vaccination speed is related to the final count on vaccinated people.

To see which countries vaccinated their population first we look at the second dataset. From there we take the cumulative sum of the 'FirstDose' column divided by the country's total population, that way we can plot how big the share of vaccinated people is for each country over time. We do this in figure 7. For improved visibility, only 12 countries are shown with a color, the rest are gray in the background. The countries were selected to show as much dispersity as possible.

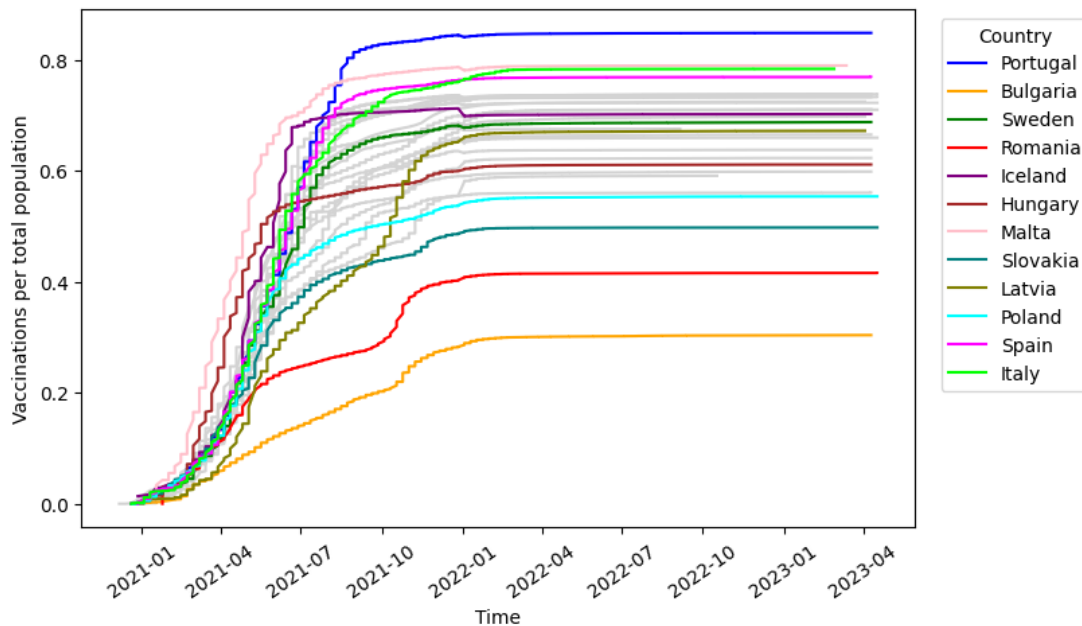


Figure 7: Part of population vaccinated with the first COVID-19 dose for countries

We see in figure 7 that general vaccination starts in early 2021 and that the amount of people getting vaccinated slows down at the end of summer. The graph also shows that almost all people who took the first dose did so during 2021. In general countries that reached a high vaccination coverage also were relatively quick at vaccinating.

One interesting country is Hungary, which was one of the faster countries to vaccinate in the beginning, but stagnated quickly once roughly 50 percent of the population was vaccinated. Another country that stands out is Latvia, that had a slow vaccination pace, but still vaccinated a fairly large part of the population.

4 Appendix

4.1 Top 10 countries for most reported COVID-19 cases for each quarter 2020-2022

CPM = Cases per million

Table 5: 2020 Q1

	COUNTRY	CASES	CPM
1	Spain	167645	3542
2	Italy	105792	1774
3	Germany	74061	891
4	France	52128	774
5	Belgium	16977	1473
6	Netherlands	12449	715
7	Austria	7312	821
8	Portugal	7251	704
9	Norway	5107	951
10	Sweden	4834	468

Table 6: 2020 Q2

	COUNTRY	CASES	CPM
1	Italy	134786	2260
2	Germany	120893	1454
3	France	112673	1674
4	Spain	93346	1972
5	Sweden	63033	6103
6	Belgium	45007	3906
7	Netherlands	37598	2160
8	Portugal	35673	3465
9	Poland	32082	845
10	Romania	24725	1279

Table 7: 2020 Q3

	COUNTRY	CASES	CPM
1	Spain	575532	12159
2	France	398734	5923
3	Romania	100602	5205
4	Germany	98995	1190
5	Italy	74283	1245
6	Netherlands	70530	4052
7	Belgium	63834	5540
8	Czechia	58799	5498
9	Poland	57121	1505
10	Portugal	34439	3345

Table 8: 2020 Q4

	COUNTRY	CASES	CPM
1	France	2056890	30554
2	Italy	1792305	30051
3	Germany	1460483	17561
4	Poland	1203364	31702
5	Spain	1180775	24946
6	Netherlands	674961	38774
7	Czechia	662653	61965
8	Belgium	524222	45496
9	Romania	504691	26111
10	Sweden	360917	34947

Table 9: 2021 Q1

	COUNTRY	CASES	CPM
1	France	2023998	30065
2	Italy	1476278	24753
3	Spain	1325289	27999
4	Germany	1085469	13052
5	Poland	1026839	27052
6	Czechia	811691	75902
7	Netherlands	476152	27353
8	Slovakia	425349	77933
9	Portugal	406514	39483
10	Sweden	358264	34690

Table 10: 2021 Q2

	COUNTRY	CASES	CPM
1	France	1130878	16798
2	Germany	888207	10680
3	Italy	676465	11342
4	Poland	558195	14706
5	Spain	535698	11318
6	Netherlands	412910	23720
7	Sweden	277488	26869
8	Belgium	193903	16828
9	Greece	158767	14812
10	Hungary	155695	15937

Table 11: 2021 Q3

	COUNTRY	CASES	CPM
1	France	1238131	18392
2	Spain	1114164	23539
3	Germany	514274	6184
4	Italy	412446	6915
5	Netherlands	318118	18275
6	Greece	233311	21767
7	Portugal	198724	19301
8	Belgium	159581	13850
9	Romania	152876	7909
10	Ireland	117596	23688

Table 12: 2021 Q4

	COUNTRY	CASES	CPM
1	France	2959368	43960
2	Germany	2952749	35504
3	Spain	1838335	38839
4	Italy	1453328	24368
5	Poland	1201144	31644
6	Netherlands	1128856	64849
7	Belgium	885792	76875
8	Czechia	787729	73661
9	Romania	575223	29760
10	Slovakia	569192	104288

Table 13: 2022 Q1

	COUNTRY	CASES	CPM
1	France	15642043	232353
2	Germany	14337869	172399
3	Italy	8516671	142798
4	Spain	4762082	100609
5	Netherlands	4727250	271563
6	Austria	2599732	292070
7	Portugal	2336007	226887
8	Denmark	2194911	376954
9	Greece	1819576	169759
10	Poland	1770193	46635

Table 14: 2022 Q2

	COUNTRY	CASES	CPM
1	Germany	6830657	82132
2	France	5474911	81326
3	Italy	3880757	65068
4	Portugal	1427465	138644
5	Spain	1175098	24826
6	Greece	646073	60276
7	Austria	586570	65899
8	Belgium	388325	33702
9	Netherlands	325309	18688
10	Finland	230771	41766

Table 15: 2022 Q3

	COUNTRY	CASES	CPM
1	Germany	5058149	60819
2	France	4307356	63983
3	Italy	3944167	66131
4	Greece	1243690	116031
5	Spain	731828	15461
6	Austria	682264	76650
7	Romania	318611	16484
8	Portugal	304946	29618
9	Belgium	296782	25757
10	Netherlands	246712	14173

Table 16: 2022 Q4

	COUNTRY	CASES	CPM
1	Germany	1865884	22435
2	France	1215517	18056
3	Italy	892402	14963
4	Austria	261399	29367
5	Greece	215008	20059
6	Spain	65031	1374
7	Netherlands	63860	3669
8	Belgium	55667	4831
9	Hungary	47371	4849
10	Czechia	44148	4128

4.2 Top 3 vaccine brands used for each country

Table 17: Top 3 vaccine brands used for each country

Country	Top 1	Top 2	Top 3
Austria	COM	MOD	AZ
Belgium	COM	MOD	COMBA.1
Bulgaria	COM	MOD	AZ
Croatia	COM	AZ	MOD
Cyprus	COM	AZ	MOD
Czechia	COM	MOD	AZ
Denmark	COM	MOD	COMBA.4-5
Estonia	COM	AZ	MOD
Finland	COM	MOD	AZ
France	COM	MOD	AZ
Germany	-	-	-
Greece	COM	MOD	AZ
Hungary	COM	BECNBG	SPU
Iceland	COM	AZ	MOD
Ireland	COM	MOD	AZ
Italy	COM	MOD	AZ
Latvia	COM	MOD	AZ
Liechtenstein	MOD	COM	MODBA.1
Lithuania	COM	AZ	MOD
Luxembourg	COM	MOD	AZ
Malta	COM	MOD	AZ
Netherlands	COM	MOD	AZ
Norway	COM	MOD	COMBA.4-5
Poland	COM	AZ	MOD
Portugal	COM	MOD	AZ
Romania	COM	JANSS	MOD
Slovakia	COM	AZ	MOD
Slovenia	COM	AZ	MOD
Spain	COM	MOD	AZ
Sweden	COM	MOD	AZ

4.3 Target groups for the three most popular vaccines

Table 18: Top 3 vaccine brands target groups

Country	COM	MOD	AZ
Austria	Age25_49	Age25_49	Age25_49
Belgium	Age25_49	Age25_49	Age50_59
Bulgaria	Age25_49	Age25_49	Age25_49
Croatia	Age25_49	Age25_49	Age70_79
Cyprus	Age25_49	Age25_49	Age25_49
Czechia	Age25_49	Age25_49	Age70_79
Denmark	Age25_49	Age25_49	HCW
Estonia	Age25_49	Age25_49	Age60_69
Finland	Age25_49	Age25_49	Age60_69
France	-	-	-
Germany	-	-	-
Greece	Age25_49	Age25_49	Age60_69
Hungary	Age25_49	Age25_49	Age25_49
Iceland	Age25_49	Age25_49	Age60_69
Ireland	Age25_49	Age25_49	Age60_69
Italy	Age25_49	Age25_49	Age70_79
Latvia	Age25_49	Age25_49	Age70_79
Liechtenstein	Age25_49	Age25_49	-
Lithuania	Age25_49	Age25_49	Age25_49
Luxembourg	Age25_49	Age25_49	Age25_49
Malta	Age25_49	Age25_49	Age25_49
Netherlands	Age25_49	Age60_69	Age60_69
Norway	Age25_49	Age25_49	HCW
Poland	Age25_49	Age25_49	Age60_69
Portugal	Age25_49	Age25_49	Age60_69
Romania	Age25_49	Age25_49	Age25_49
Slovakia	Age25_49	Age25_49	Age25_49
Slovenia	Age25_49	Age70_79	Age25_49
Spain	Age25_49	Age25_49	Age60_69
Sweden	Age25_49	Age25_49	Age70_79

4.4 Skepticism towards COVID-19 vaccine

Table 19: Skepticism towards COVID-19 vaccine

	Country	FirstDose	Population	Skepticism
1	Bulgaria	2077742	6951482	0.7
2	Romania	7917501	19328838	0.59
3	Slovakia	2704559	5457873	0.5
4	Poland	20848103	37958138	0.45
5	Croatia	2282163	4058165	0.44
6	Slovenia	1180783	2095861	0.44
7	Estonia	796997	1328976	0.4
8	Hungary	5921482	9769526	0.39
9	Czechia	6551506	10693939	0.39
10	Liechtenstein	25061	38747	0.35
11	Latvia	1260259	1907675	0.34
12	Lithuania	1866004	2794090	0.33
13	Netherlands	11880218	17407585	0.32
14	Luxembourg	425605	626108	0.32
15	Greece	7432619	10718565	0.31
16	Sweden	7186399	10327589	0.3
17	Cyprus	631315	888005	0.29
18	Austria	6373935	8901064	0.28
19	Belgium	8392294	11522440	0.27
20	Iceland	264176	364134	0.27
21	Germany	60303524	83166711	0.27
22	Norway	3998658	5367580	0.26
23	France	50061462	67320216	0.26
24	Finland	4093801	5525292	0.26
25	Denmark	4302704	5822763	0.26
26	Ireland	3707839	4964440	0.25
27	Spain	36465567	47332614	0.23
28	Italy	46246677	59641488	0.22
29	Malta	411329	514564	0.2
30	Portugal	8781013	10295909	0.15

4.5 Total first doses for population under age of 18

Table 20: People under 18 who recieved the first dose of COVID-19 vaccination for each country

	Country	Population	FirstDose	Proportion
1	Spain	47332614	4859297	0.103
2	France	67320216	4608158	0.068
3	Germany	83166711	4563350	0.055
4	Italy	59641488	4332328	0.073
5	Poland	37958138	1784079	0.047
6	Portugal	10295909	1003285	0.097
7	Netherlands	17407585	895339	0.051
8	Belgium	11522440	861956	0.075
9	Austria	8901064	525642	0.059
10	Greece	10718565	483328	0.045
11	Denmark	5822763	473881	0.081
12	Finland	5525292	453284	0.082
13	Hungary	9769526	436896	0.045
14	Czechia	10693939	420374	0.039
15	Ireland	4964440	400424	0.081
16	Norway	5367580	348257	0.065
17	Sweden	10327589	283547	0.027
18	Romania	19328838	270224	0.014
19	Slovakia	5457873	134575	0.025
20	Lithuania	2794090	90253	0.032
21	Latvia	1907675	84003	0.044
22	Estonia	1328976	44474	0.033
23	Slovenia	2095861	43805	0.021
24	Luxembourg	626108	43653	0.07
25	Iceland	364134	43091	0.118
26	Malta	514564	39184	0.076
27	Cyprus	888005	37794	0.043
28	Croatia	4058165	35087	0.009
29	Bulgaria	6951482	28612	0.004
30	Liechtenstein	38747	1664	0.043

4.6 60+ population vaccinated with a second dose of COVID-19 vaccine

Table 21: 60+ population vaccinated with a second dose of COVID-19 vaccine

	Country	Population	SecondDose	Proportion
1	Finland	5525292	1539025	0.279
2	Portugal	10295909	2850385	0.277
3	Italy	59641488	16207428	0.272
4	Germany	83166711	22007037	0.265
5	Denmark	5822763	1523615	0.262
6	Greece	10718565	2696484	0.252
7	Belgium	11522440	2840014	0.246
8	France	67320216	16532224	0.246
9	Spain	47332614	11572556	0.244
10	Malta	514564	124544	0.242
11	Sweden	10327589	2458642	0.238
12	Netherlands	17407585	4133560	0.237
13	Austria	8901064	2073507	0.233
14	Norway	5367580	1243274	0.232
15	Liechtenstein	38747	8650	0.223
16	Ireland	4964440	1075574	0.217
17	Czechia	10693939	2294873	0.215
18	Hungary	9769526	2087585	0.214
19	Croatia	4058165	863342	0.213
20	Estonia	1328976	279137	0.21
21	Slovenia	2095861	433060	0.207
22	Iceland	364134	74529	0.205
23	Cyprus	888005	182011	0.205
24	Lithuania	2794090	554864	0.199
25	Poland	37958138	7135297	0.188
26	Luxembourg	626108	112864	0.18
27	Latvia	1907675	333247	0.175
28	Slovakia	5457873	877487	0.161
29	Romania	19328838	1969930	0.102
30	Bulgaria	6951482	679023	0.098