Genomic surveillance of SARS-CoV-2 in Belgium

Report of the National Reference Laboratory (UZ Leuven & KU Leuven)

Situation update – 28 of December 2021
(report 2021_61)

Executive summary

74,556 Belgian sequences of SARS-CoV-2 are now publicly available on GISAID; compared to last week's report, 1,487 sequences have been added.

672 sequences of positive SARS-CoV-2 samples collected between 13/12/2021 and 26/12/2021 have at this stage been analyzed in the context of baseline surveillance. For samples collected during the week of 20/12/2021, Omicron represented 28% of the strains analyzed.

To provide more updated information on the evolution of the Omicron variant, we follow-up on a daily basis the percentage of diagnostic PCRs harboring the S gene target failure. On 28/12/2021, SGTF was present among [67% - 74%] of the positive samples. During week 51, 100% of the samples presenting SGTF were further confirmed as Omicron.

As Omicron now represents the majority of the circulating strains, it is to be expected that the epidemiology will mainly be driven by this variant during the coming weeks.

Currently, 82% of the 65+ Belgian population has received a booster dosis.

Authors (National Reference Laboratory – UZ Leuven and KU Leuven):
Piet Maes, Tom Wenseleers, Guy Baele, Lize Cuypers, Simon Dellicour, Johan Van Weyenbergh, Els Keyaerts, Joren Raymenants, Barney Potter, Sunita Janssenswillen, Elke Wollants, Marc Van Ranst, Emmanuel André.

With the collaboration of the laboratories of UCL, ULB, UMons, UNamur, ULiège, UGent, UZA/UAntwerpen, Jessa ZH, AZ Delta, AZ Klina, IPG, AZ St Lucas Gent, OLVZ Aalst, Briant network, ZNA, AZ St Jan Brugge, UZ Brussel, LHUB-ULB, and UZ Leuven/KU Leuven; and Sciensano HealthData.

Previous reports can be downloaded using the following link:
https://www.uzleuven.be/nl/laboratoriumgeneeskunde/genomic-surveillance-sars-cov-2-belgium

Table of contents

1. Monitoring of VOCs in Belgium

While first identified on the 24th of November 2021 in Belgium, the BA.1 Variant of Concern (Omicon) has become the dominant lineage in Belgium one month after the first case was detected. This viral population replacement has happened at a very rapid pace, which cannot be fully captured by the baseline sequencing-based surveillance due to relatively long turn-around time (see Figure 1). This phenomenon is better captured by the evolution of the share of positive PCR results which present an S gene target failure (Figure 2). During week 51, 100% of SGTF samples were further confirmed as Omicron infections by a marker PCR or whole-genome sequencing (Figure 3).

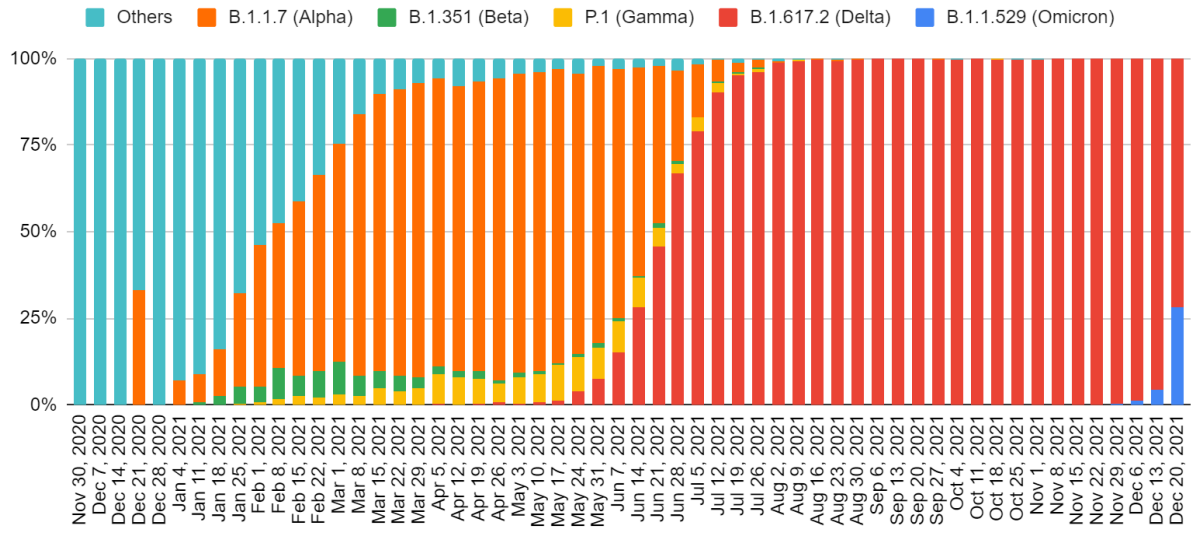

Figure 1: *Weekly evolution of the frequency of variants of concern reported by the baseline surveillance network using a whole genome sequencing (WGS) approach.*

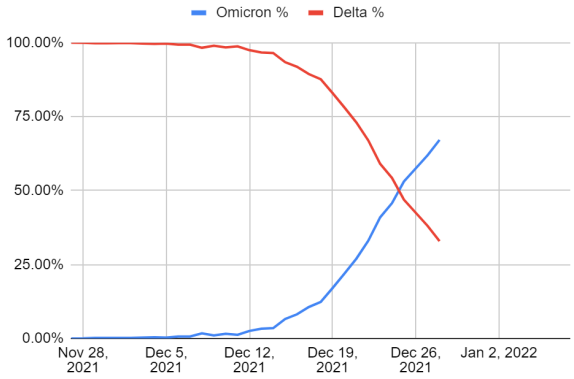

Figure 2: *Omicron (S dropout with Cq <25) and Delta rate over the past weeks in Belgium (data from the eight federal platform laboratories).*

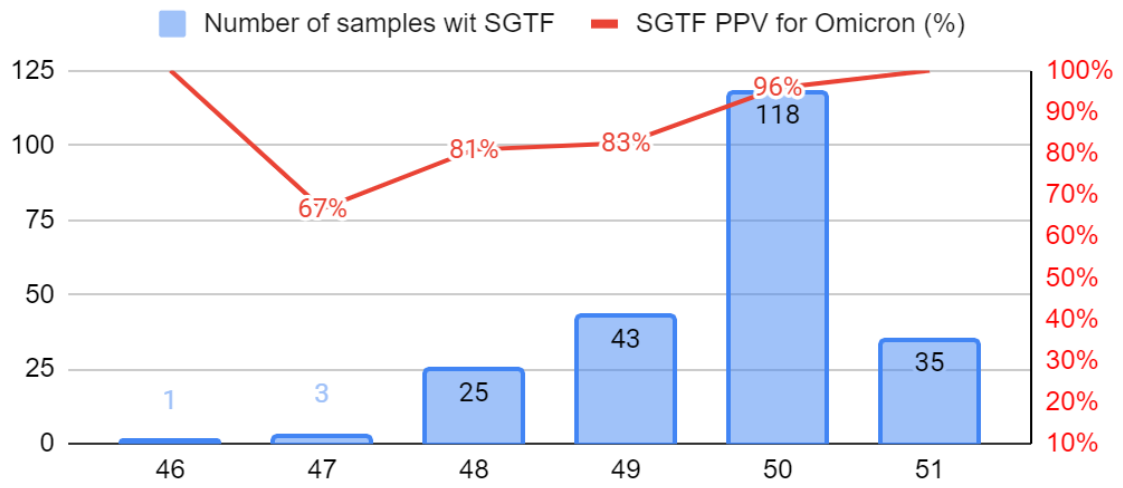

Figure 3: *Weekly evolution of the percentage of samples harboring SGTF that are confirmed as Omicron by sequencing. Data from the UZ Leuven/KU Leuven diagnostic laboratories, per epidemiological week.*

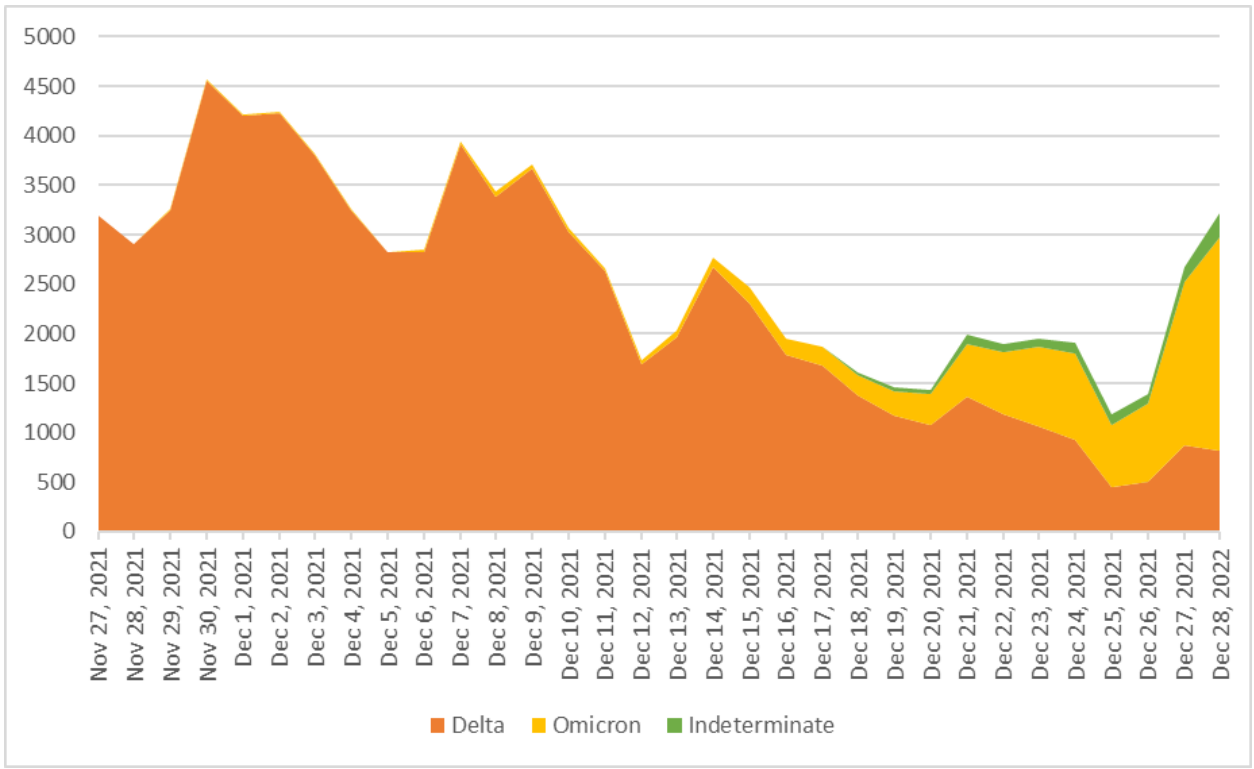

Figure 4: *Evolution of the number of positive PCR results and positive samples harboring SGTF in the federal platform laboratories. While the total number of positive samples tended to decrease until 21/12/2021, the underlying and increasing Omicron trend has now modified the overall epidemiology. Indeterminate samples are samples presenting an SGTG with a Cq higher than 25.*

2. Estimating the short-term impact of Omicron in Belgium

Current estimates of the effective reproduction number Re clearly show a growing number of infections in Brussels and Flemish Brabant, and to a lesser extent Walloon Brabant. The provinces of Antwerp and Liège are also again approaching a scenario of epidemic expansion, whereas the situation currently appears quite stable in the remaining provinces (Figure 5).

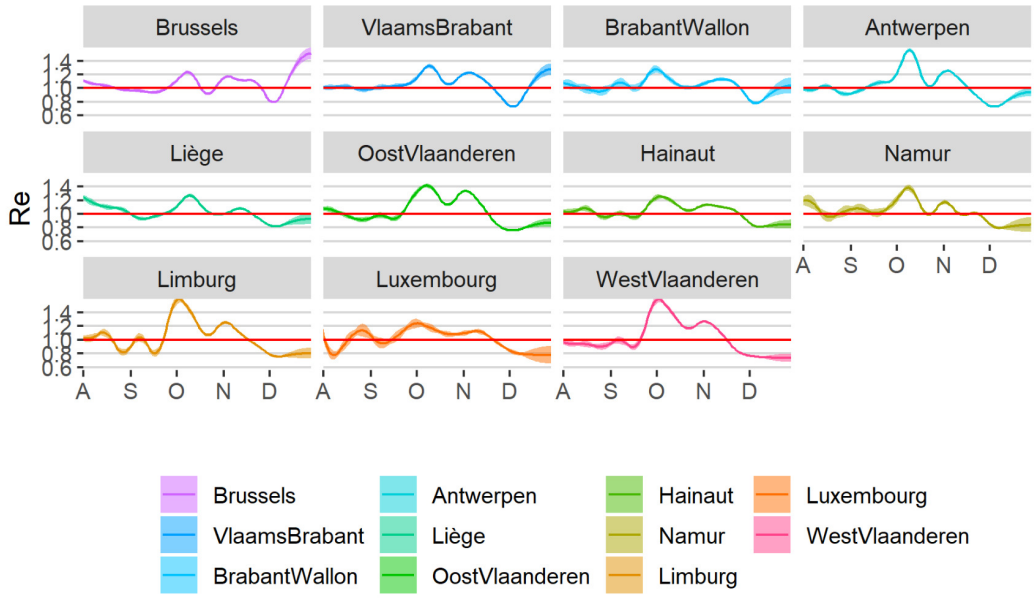

Figure 5: *Re values per province/region (taking into account testing intensity) at the moment of infection.*

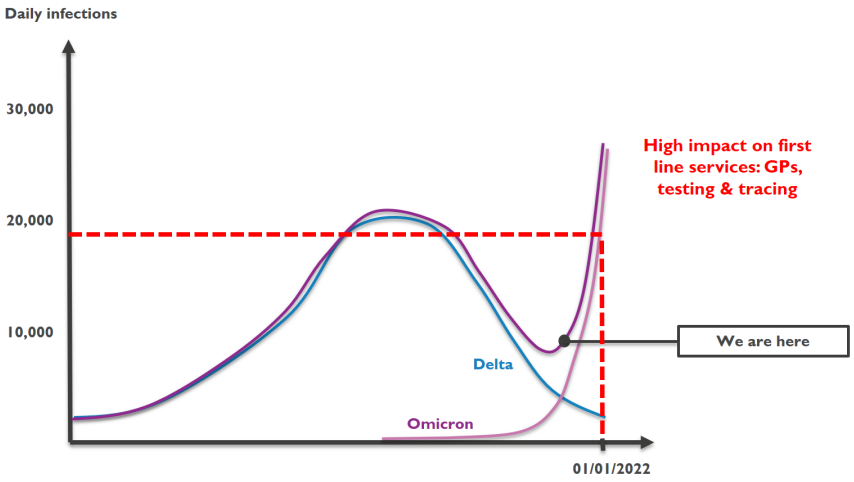

Figure 6: *Foreseen evolution of the number of infections in Belgium. The Omicron wave, which is causing the increasing trend in number of infections (see Figure 4) is expected to have a high impact on first line health services from early January onward.*

The past week has seen new data concerning the severity of Omicron infections (WHO Collaborating Centre for Infectious Disease Modelling, MRC Centre for Global Infectious Disease Analysis, Jameel Institute, Imperial College London.). For Omicron infections in England, research suggests Omicron cases are 15% less likely to attend hospital, and 40% less likely to be hospitalised for a night or more, compared to Delta. This must be balanced against the increased transmissibility of Omicron over Delta. Hence, at a population level, large numbers of infections could still lead to large numbers of hospitalisations. In other words, given the high transmissibility of the Omicron virus, there remains the potential for health services to face increasing demand if Omicron cases continue to grow at the rate that has been seen in recent weeks (Figure 6) (https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-50-Severity-Omicron/).

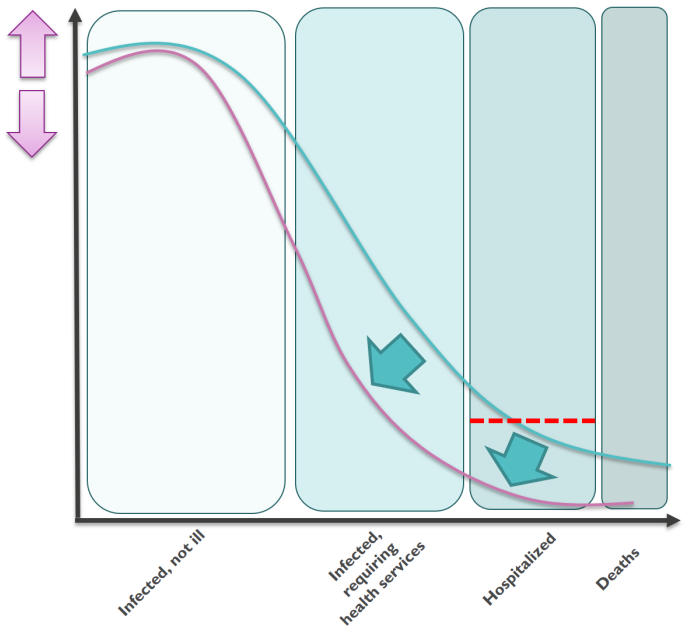

Figure 7: *Possible scenarios associated with a lower effective severity. A lower effective severity results from a higher immune status of a society and/or the eventual lower virulence of a variant (green arrows). In the initial scenario (green), the "acceptable" circulation of the virus is defined by the maximal hospital occupancy. In a "low severity" scenario, this limit will only be reached with a very high level of viral circulation, implying a non-manageable workload on individualized prevention strategies (in first instance early testing & tracing) and a very high number of people requiring self-isolation. The progressive evolutions towards such scenarios require a paradigm shift with regard to the dominant prevention strategies, and evolve towards general/structural measures (ventilation, air filtration, vaccination, disease surveillance), complemented by targeted mitigation strategies (novel antiviral treatments, masks). We are currently in an intermediate stage, which requires a mix of the "old" and "new" paradigms and leads to the current tensions in the society. While Omicron may, as long as it will be dominant, push towards a lower severity scenario, this situation may be transient if it is not associated with a consolidation of the structural measures mentioned above.*

3. Impact of Omicron on testing strategy

Beyond the foreseen impact of Omicron on the testing capacity, there has been some anecdotal evidence and pre-print manuscripts (source) suggesting that nasopharyngeal swabs lead to a decreased sensitivity of both PCR and rapid antigen tests compared to samples such as breath, saliva or oropharyngeal swabs.

Also, considering a possible shorter generation time for Omicron compared to previous variants, the impact of prolonged "time-to-lab result" and "time-to-isolate" indicators, typically observed when the system is getting closer to its maximal capacity, will be more deleterious than they were in previous waves.

Awaiting consolidated evidence, we recommend taking these elements into consideration when revising testing strategies and prioritizations.

4. Current status with regard to Omicron in the world

As of 28 December 2021, 89 countries shared 61,567 Omicron genome sequences on GISAID. This variant has now spread at an unprecedented speed in all regions of the world (Figure 8).

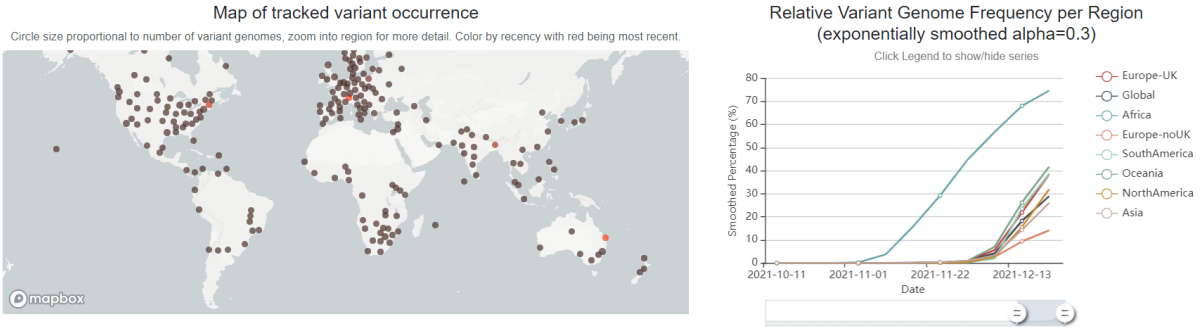

Figure 8: *Countries reporting confirmed Omicron infections (source: GISAID)*

The pace of viral population replacement is consistently faster for Omicron than what has been observed with previous variants of concern. The average growth rate advantage of Omicron over Delta is currently estimated at 0.27 per day [0.22-0.32] per day in Belgium and lower when combining with data of the UK and Denmark who seem to progressively reach a "plateau" (Figure 9).

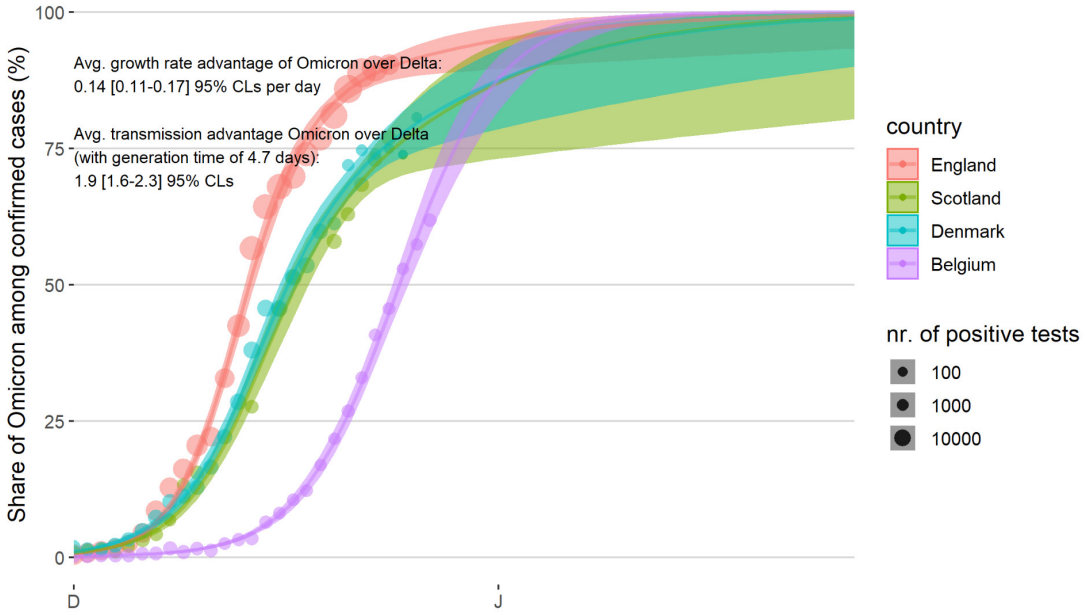

Figure 9: *Logistic regression model shows the rapid rise in the share of Omicron infections among newly diagnosed infections inferred from variant-specific PCR data (for Denmark) or S dropout (SGTF) PCR test data (other countries shown). The model used allows for overdispersion via the inclusion of an observation-level random effect.*

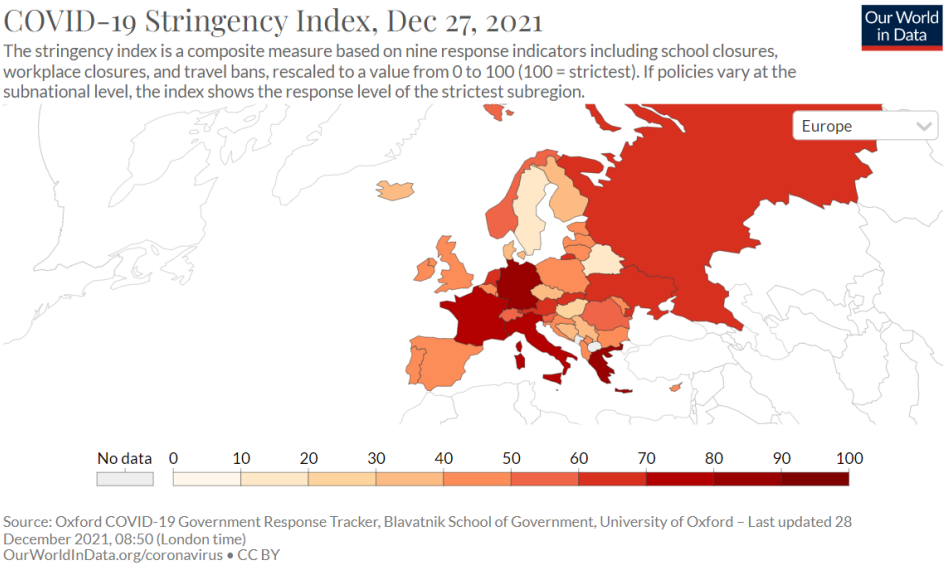

Figure 10: *Current stringency index for European countries. The current stringency index for Belgium is comparable to the UK and higher compared to Denmark. These two countries, which are also at a more advanced stage in terms of Omicron spread, can therefore be considered by Belgium as reliable indicators of the upcoming epidemiological evolution in Belgium. (source)*

Importantly, the UK and Denmark have surged ahead in administering booster doses (Figure 11) in order to mitigate the impact of Omicron infections.

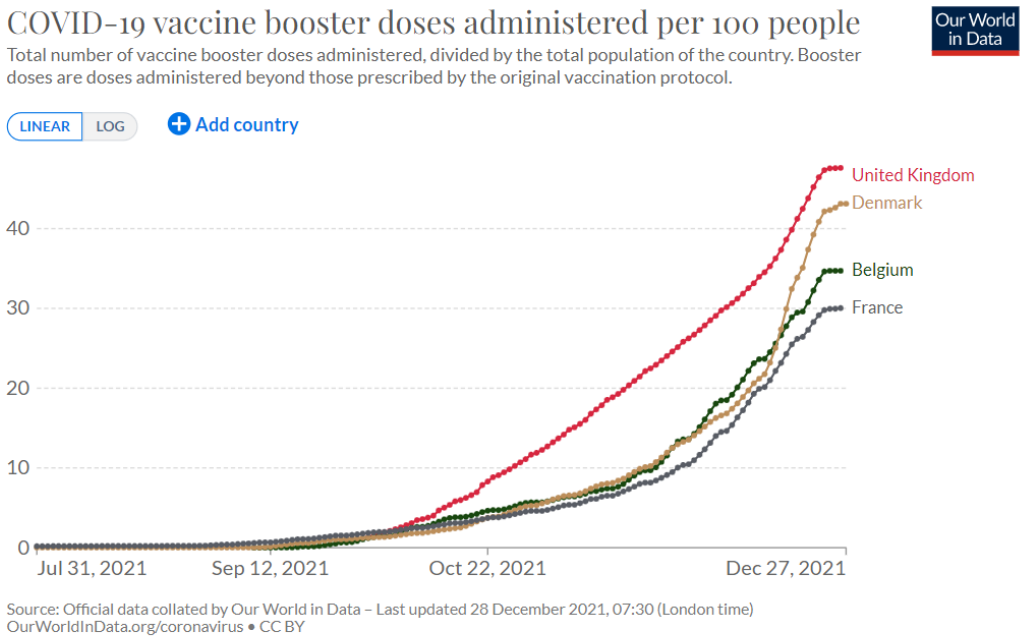

Figure 11: *Booster doses administered per 100 people in Belgium, France, the United Kingdom and Denmark (source)*

Until today, Denmark reported 210 hospital admissions among the nearly 40.000 patients diagnosed with Omicron infection. None of these patients are currently in ICU. This represents 0,5% of all diagnosed infections and is lower compared to what has been observed during the Delta wave (1%). These encouraging signals still need to be interpreted with caution, as the Omicron wave is still relatively recent in this country (Omicron has become dominant on 17/12/2021) and therefore these indicators may still evolve (source).