

DISPARITIES IN SECOND BOOSTER COVERAGES AND IMPACT ON COVID-19 CASES AND HOSPITAL ADMISSIONS DURING SUMMER 2022

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1. Context

As of the 24th of January 2022, a fourth dose of COVID-19 vaccine (or third dose after a primary vaccination with the *COVID-19 Vaccine Janssen*®) has been offered to specific groups of the Belgian population, starting with immunocompromised individuals.¹ On February 16, the Interministerial Conference (IMC) Public Health decided that those who had received a primary schedule with the *COVID-19 Vaccine Janssen*® could receive a second booster dose, at least three months after the first booster dose.²

From May 2022 onwards, nursing home residents and those aged 80 years and over in Flanders have been offered a second booster dose, while no active invitation process was implemented for these specific groups in the other Belgian regions.³

A second booster dose was proactively and systematically offered to immunocompromised people over 65 years of age, health care workers, and then to people aged 50-64 years nationwide from September 2022 onwards.⁴

Over the summer months of 2022 a moderate wave of COVID-19 infections primarily related to Omicron BA.5 occurred in all regions.

Because of variations in the second booster invitation process across regions, and across age groups within regions, here we assess the impact of the early second booster campaign on vaccination coverage across regions and provinces, as well as on the wave of COVID-19 cases and hospital admissions that occurred during the summer 2022.

2. Second booster coverages and impact on cases and hospital admissions

2.1. EARLY SECOND BOOSTER VACCINATION CAMPAIGN

Figure 1 shows the evolution of second booster coverage between June and August 2022, by region for the 80+ (solid line) and for the total population (dotted line). While a plateau of more than 60% coverage of the second booster for the 80+ population residing in Flanders was reached before July, the number of people who received a second booster and residing in other regions only starts to slowly increase from August onwards. However, focussing on the total population, coverage remains low (below 10%) in all regions until September.

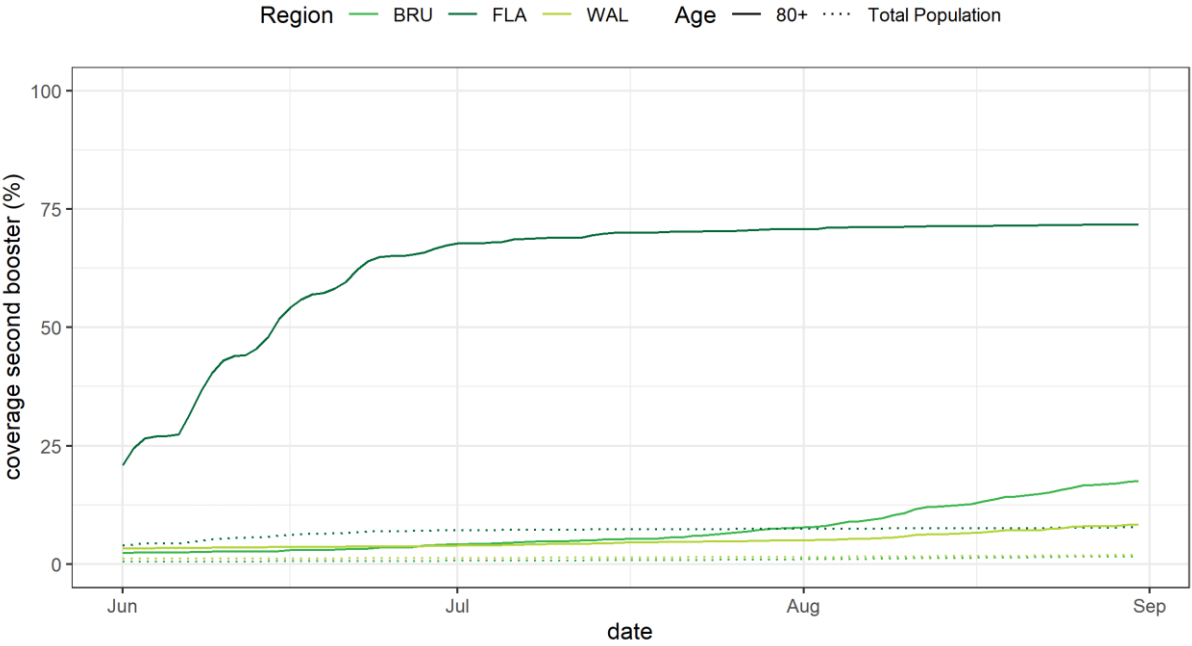
¹ <https://www.health.belgium.be/fr/news/cim-sante-publique-25>

² <https://www.health.belgium.be/fr/news/cim-sante-publique-27>

³ The German-speaking Community is also responsible for the implementation of its vaccination campaigns against COVID-19. For the purpose of this analysis which relies on aggregated numbers of vaccinations, cases, tests, and hospital admissions at the regional or provincial level the data from the German-speaking Community have been pooled together with Wallonia or Liège province. Detailed vaccination numbers for the German-speaking Community are available in opendata (<https://epistat.sciensano.be/covid/>).

⁴ <https://www.health.belgium.be/fr/news/cim-sante-publique-33>

Figure 1: Evolution of the second booster vaccination coverage by region for 80+ (solid line) and total population (dotted line), June-September 2022, Belgium.



Another way to estimate the proportion of the population protected against COVID-19 by vaccination at a given time point is to calculate the percentage of the population that has completed its primary vaccination schedule or received any booster dose since less than a given time period (e.g., 90 days). **Table 1** compares the second booster coverages reached as of July 1, 2022 with the percentages of the population that received a dose of vaccine within 90 days prior July 1. It can be seen that these two values are very similar across the three regions and for both the 80+ and the total population. The second booster coverages are generally slightly higher due to booster doses that were administered earlier in the year (e.g. to immunocompromised). But in the context of the present analysis on the impact of a recent vaccination on the evolution of new COVID-19 cases and hospital admissions, we show here that both indicators are equivalent.

Table 1: Vaccination coverages (%) of 2nd booster and of the last dose received within 90 days by region as of July 1, 2022 for 80+ and for the total population.

Region	80+ population		Total population	
	2nd booster	Last dose within 90d	2nd booster	Last dose within 90d
Brussels	4.2	3.3	0.7	1.7
Flanders	67.7	62.2	7.2	5.0
Wallonia	3.9	1.5	1.3	0.8

2.2. IMPACT OF VACCINATION COVERAGE ON CASES AND HOSPITALISATIONS

2.2.1. Regional level

Figure 2 shows the evolution of second booster vaccination coverage from June to September 2022 as well as the evolution of the 7-day incidence of new COVID-19 cases, the test positivity rate and the 7-day incidence of hospital admissions (due to COVID-19 infection, i.e., excluding hospitalised patients identified through systematic screening) for elderly people. Of note, due to data availability, hospital admissions data are shown for the 75+ population.

The seventh wave of COVID-19 started in Belgium on May 30, 2022. At that time, similar low incidences and positivity ratio can be detected in all three regions. However, when the new COVID-19 infections followed by hospital admissions increase, the curves corresponding to the situation in Flanders remain at lower levels compared to the other regions.

For hospital admissions, the impact appears to be somewhat smaller, but a number of additional considerations must be taken into account:

- Due to data availability the age group selected for hospital admissions (75+) does not exactly match the targeted group invited to receive a second booster dose in Flanders (80+).
- It is well documented that waning of vaccine effectiveness against infection occurs faster compared to more severe outcomes.⁵ Therefore, it is expected that in the short term, a recent booster campaign in a given subgroup of a population will have a larger impact on the cases than on the hospital admissions in that subgroup.
- The geographical distribution of hospital admissions is made based on the postal code of the hospital not the postal code of the hospitalised individual, which has an impact when patients residing in one region are hospitalised in another region.
- Due to a cyber-attack that targeted some hospitals in the province of Luxembourg, the data are not exhaustive for the period considered and the numbers for the Walloon region are therefore slightly underestimated.

For cases (and positivity rates) the increase clearly appears to be smaller in Flanders compared to other regions. However the early second booster vaccination campaign did not completely avoid a wave in the 80+ subgroup. About 44% of the new COVID-19 cases in the 80+ subgroup over the month of July in Flanders were not yet protected by a second booster, this is a slight overrepresentation given that only 32% had not yet received a second booster in the same subgroup on July 1. Altogether, this indicates that a recent booster reduces but does not completely avoids infection.

Figure 2: Vaccination coverages (top left), 7-day incidence of new cases (top right), positivity rate (bottom left) and 7-day incidence of hospital admissions (bottom right) by region, in 80+ (solid line) or 75+ (dashed line) age groups.

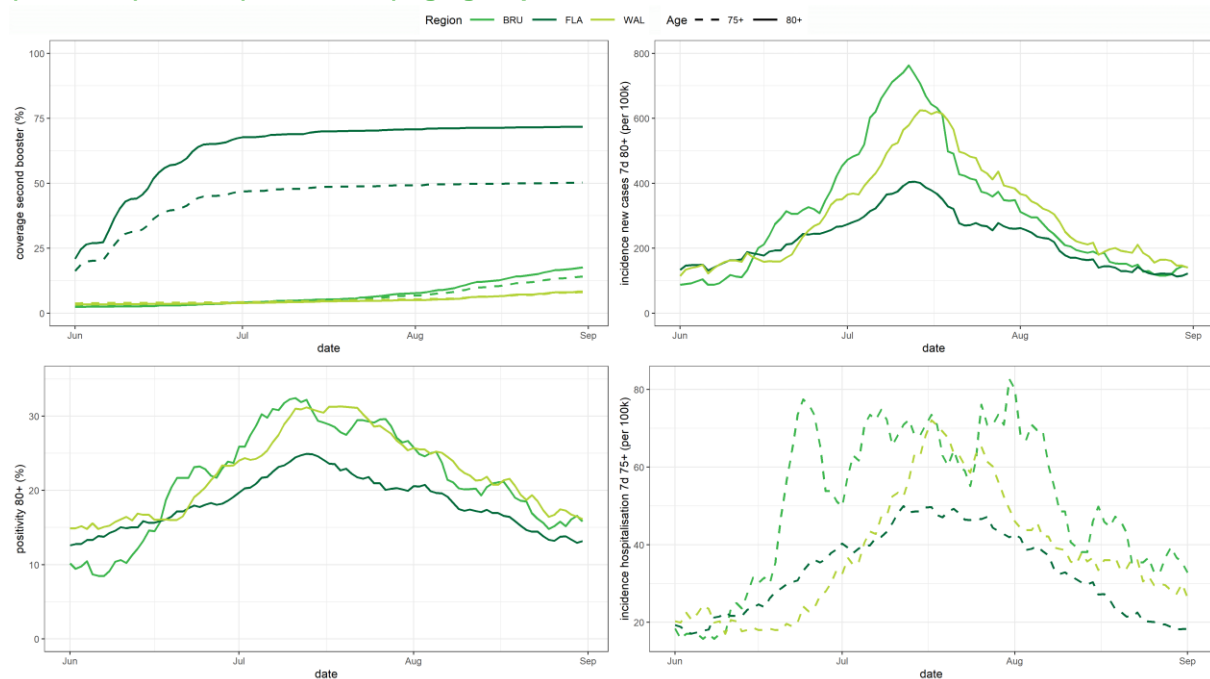
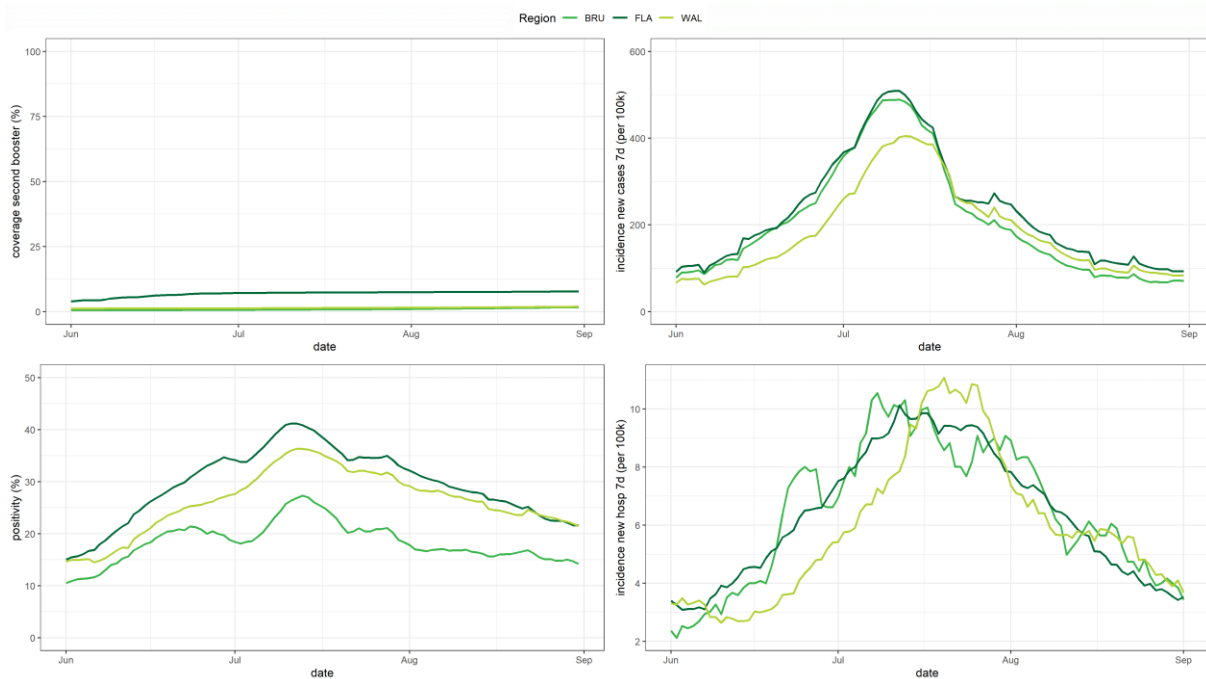


Figure 3 shows the same indicators as in **Figure 2** but for the total population. Interestingly we see here that with low second booster coverages (<10%) in all three regions, the curves for the other indicators remain higher or at similar levels in Flanders compared to the other regions.

⁵ Ssentongo, P., Ssentongo, A.E., Voleti, N. et al. SARS-CoV-2 vaccine effectiveness against infection, symptomatic and severe COVID-19: a systematic review and meta-analysis. BMC Infect Dis 22, 439 (2022).

Figure 3: Vaccination coverages (top left), 7-day incidence of new cases (top right), positivity rate (bottom left) and 7-day incidence of hospital admissions (bottom right) by region for the total population.



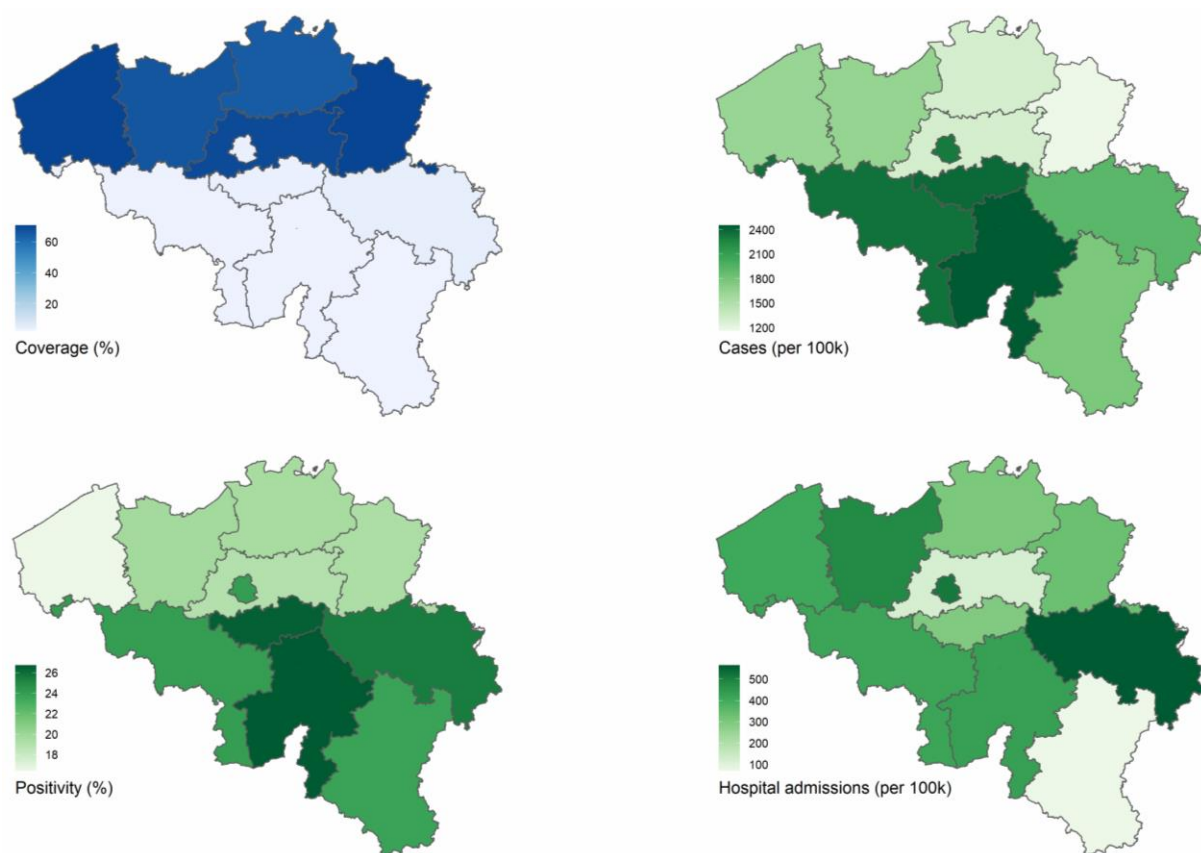
2.2.2. Provincial level

Finally, a similar analysis was performed at the provincial level. The maps below (**Figure 4**) show the second booster vaccination coverages in 80+ as of July 1, 2022, the total number of new cases per 100k inhabitants and positivity rate in 80+ over the month of July, and the total number of hospital admissions (due to COVID-19) in 75+ during July at the provincial level.⁶ Consistent with the results obtained at regional level, a clear split appears in the vaccine coverage reached in the Flemish provinces compared to Walloon and Brussels provinces. A similar pattern also appears for the incidence of COVID-19 cases and the positivity rate, for which lower levels are detected in the Flemish provinces. Based on the data aggregated at the provincial level, it was estimated (using a Poisson regression) that the implementation of the vaccination campaign in 80+ divided the total number of cases over the month of July in that subgroup by a factor 1.39 (95% confidence interval: 1.33-1.45), taking into account disparities in number of tests performed and the subgroups population sizes.

The impact appears less clear for the hospital admissions. The caveats described in the previous section still apply here, making a direct comparison at the provincial level less straightforward.

⁶ The month of July was selected here given that the second booster coverage of the 80+ population in Flanders has already reached a plateau at the beginning of the month while the second booster vaccination has not really started yet in the other regions for the same subgroup. The peak of the wave also occurs mid-July.

Figure 4: Maps of vaccination coverages in 80+ (top left), total number of cases in 80+ (top right), positivity rate in 80+ (bottom left), and total number of hospital admissions in 75+ (bottom right) by province for the month of July 2022.⁷



3. Conclusions

In this report, we assessed the impact of disparities in second booster vaccination coverage across regions and age groups on COVID-19-related infections and hospital admissions during the summer 2022.⁸ Among the population residing in Flanders, where the 80+ population was invited to receive a second booster dose before July 2022, resulting in a second booster coverage of more than 60% early July 2022 in that subgroup, fewer COVID-19 cases and, to a lower extent, fewer hospital admissions occurred in the 80+ population during summer 2022 compared to other regions. In the total population, where regional differences in vaccination coverage were much smaller, the same tendency to lowered numbers of cases and hospital admissions in Flanders compared to other regions is not seen. It should be emphasized that this analysis does not, by itself, allow to establish a causal link between the early vaccination campaign of a population subgroup and a total number of cases or hospital admissions. Nevertheless, it suggests that a timely booster vaccination campaign in a given population subgroup can help to reduce the burden of a wave in that subgroup.

⁷ The apparent very low number of cases in the province of Luxembourg is due to a cyber-attack that targeted several hospitals making the data incomplete for that province.

⁸ Only the original versions of the Comirnaty and Spikevax vaccines were used as second booster doses before September, therefore the present results are only about the impact of the original versions of the vaccines, and not the bivalent ones.