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Geneva, December 21, 2021

N/réf : PV/LK

SARS-CoV-2 genomic surveillance in Geneva: weekly update

Geneva Centre for
Emerging Viral Diseases

Division of Infectious
Diseases

Department of Medicine

Laboratory of virology

Division of Laboratory
Medicine

Diagnostic Department

The laboratory of virology of the Geneva University Hospitals as a sentinel site for the Geneva area

The number of tests (PCR and antigen tests) performed at the laboratory of virology of the Geneva University Hospitals represents around 20% of the total number of tests performed in the canton of Geneva during week 50 (7977/38230). **Roughly ¼ (28%) of the positive specimens collected in the Geneva area were processed at HUG (1203/4187) during week 50.** Tests performed at our outpatient testing center are either PCR-based or antigen-based. Most symptomatic patients are screened by RT-PCR and all positive antigen-based tests are confirmed by PCR, allowing screening for variants.

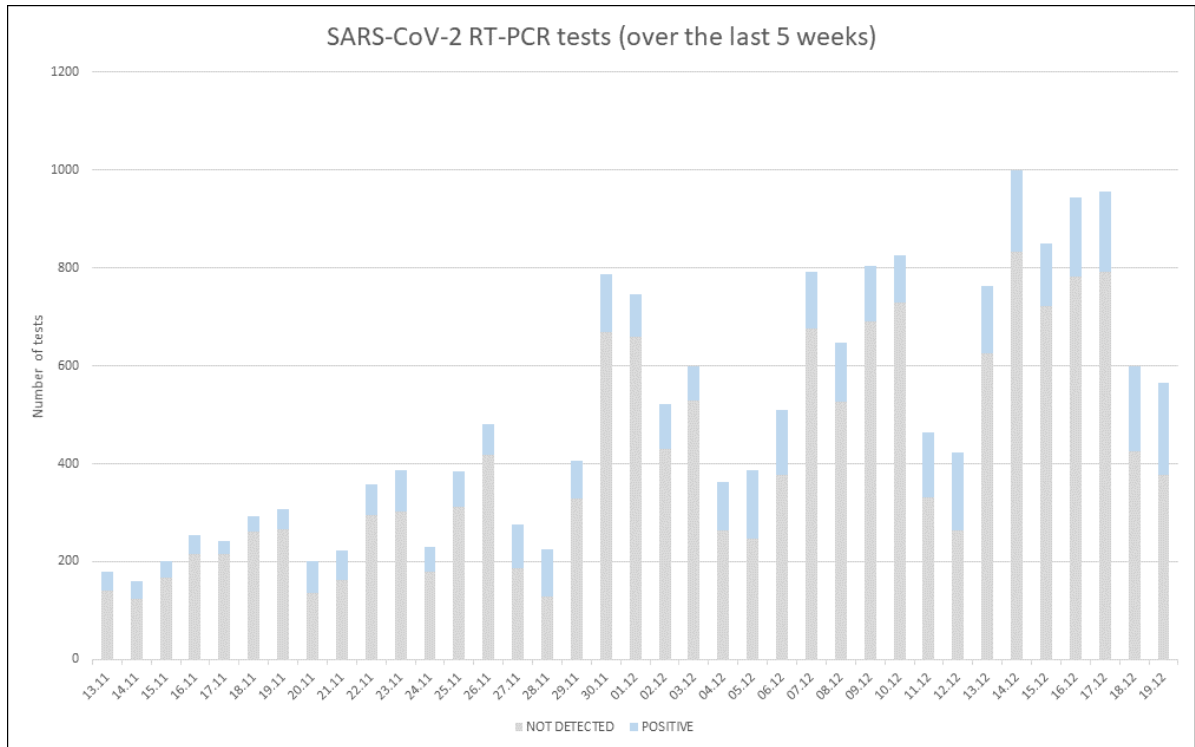
The number of positive tests in the canton and the total number of tests done during the surveilled week are derived from the website of the Direction Générale de la Santé in Geneva (available at <https://infocovid.smc.unige.ch/>), accessed December 21, at 10:00.

Methods and collaborations

Screening for the “S drop out” was implemented at HUG on SARS-CoV-2 positive specimens with Ct value < 32 tested for primary diagnostic in our laboratory on November 28. All positive specimen are tested for the S drop out since December 1, 2021.

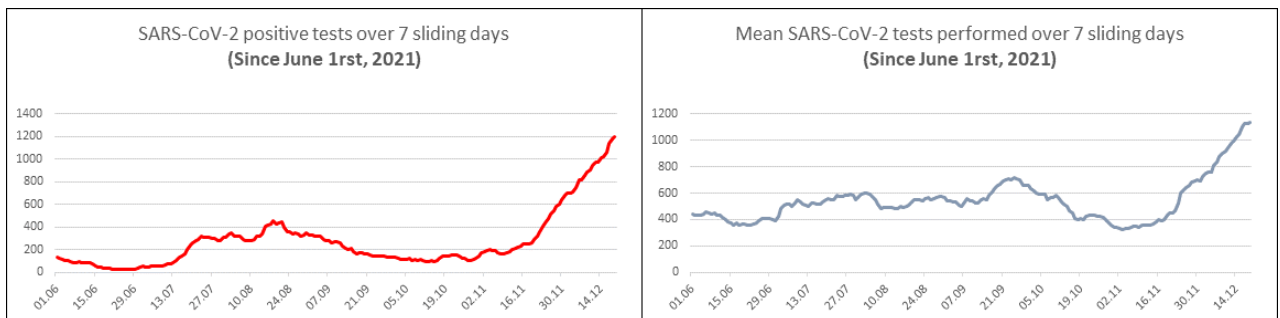
WGS is carried out in close collaboration with the Health 2030 Genome Center in Geneva and Philippe Le Mercier from the Swiss Institute of Bioinformatics. Since March 1, 2021, the sequencing has been done within the Swiss national SARS-CoV-2 genomic and variants surveillance program. Specimens collected at HUG with a Ct value ≤ 32 are sequenced. In some instances, sequencing can be done on specimens sent by other laboratories in Switzerland within the surveillance program or by request of the cantonal physician team. Phylogenetic analysis data are produced by Nextstrain, in collaboration with Richard Neher’s group at the University of Basel. In addition, partial Sanger sequencing may be done by our laboratory. Geographic distribution, transmission advantage estimates and detailed number of available sequences over time in the canton of Geneva is available on the covSPECTRUM platform, run by Tanja Stadler’s group at ETH Zurich.

These reports are produced in collaboration with the Geneva Cantonal Physician team, which provides information on epidemiological links and post-vaccination infections (see below).



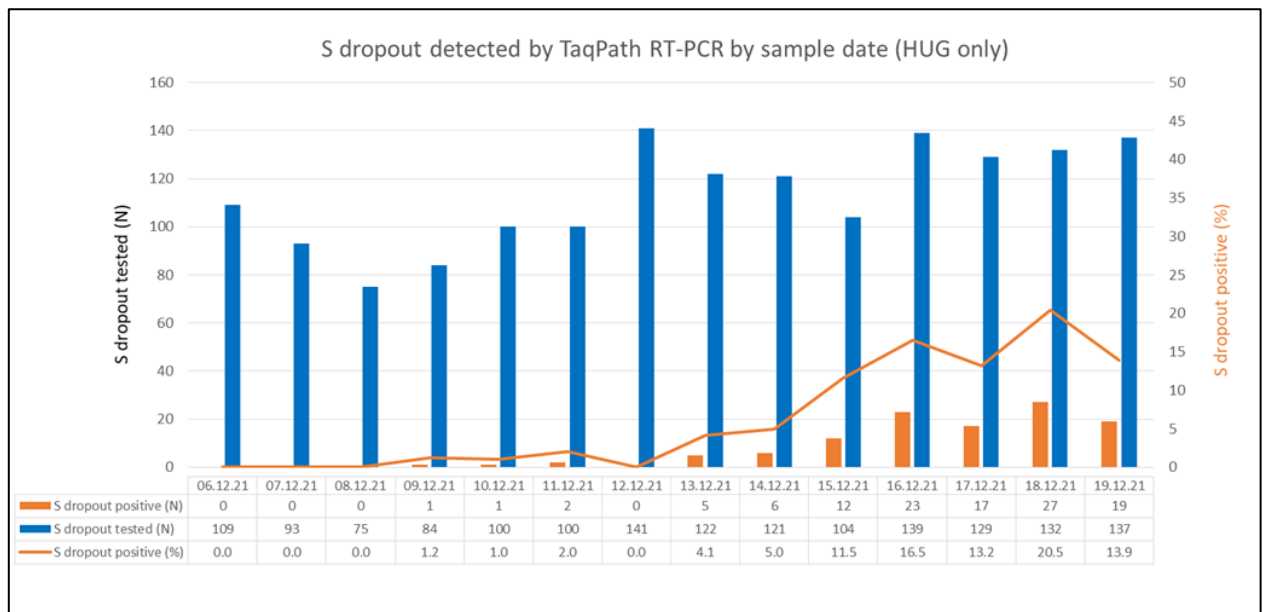
During week 50, the **absolute number of positive SARS-CoV-2 tests continued to increase**, while the mean positivity rate over 7 sliding days increasing in parallel to reach more than 16%.

Similarly, at our **outpatient symptomatic testing center, the mean positivity rate continued to increase and reached 35% on average.**



Screening for the “S drop out” as a proxy for the Omicron B.1.1.529 variant

1. Screening for the “S drop out” as a proxy for the Omicron B.1.1.529 variant among SARS-COV-2 positive samples collected from patients tested for primary diagnosis in our laboratory.



We use the Taqpath RT-PCR assay on SARS-CoV-2 positive samples with Ct value < 32 to detect the so called “S gene dropout” (the S gene PCR target is not amplified, while the two other targets are detected). This constellation currently indicates the presence of the Omicron variant with a high probability. Whole genome sequencing performed on SARS-CoV-2 positive samples allows for definitive confirmation. The daily evolution of the proportion of the “S gene dropout” among SARS-CoV-2 samples tested with the Taqpath assay is displayed in the graph above. Samples included mainly come from people screened at our outpatient testing center, and to a lesser extent from patients in emergency departments (adult and pediatric), hospitalized patients, as well as from healthcare workers. Samples sent from other laboratories to test for S gene dropout at the request of the Cantonal Physician Team are here excluded.

The proportion of the samples carrying the “S drop out” and therefore suspected as Omicron specimens progressively increased over the week, to reach up to 20% of the number of specimen tested at the end of week 50. This corresponds to 109 cases positive for the “S Drop out”.

Of note, the mean percentage of SARS-CoV-2 PCR positive samples tested for S gene dropout (Ct value < 32) was 90% (range: 85-97%) during week 50.

Three specimens were collected from hospitalized patients during week 50, all suffering from mild disease. Please refer to the report regarding COVID-19 hospitalizations at HUG during week 50 for more details.

2. S drop out screening performed at the request of the cantonal physician team, in specimen tested outside of our laboratory for primary diagnosis and/or collected in non-Geneva residents

An additional 30 specimens, sent to our laboratory for S Drop out screening at the request of the cantonal physician team because of epidemiological link have been tested positive.

Epidemiological data (provided by the cantonal physician team)

Community transmission of Omicron has been confirmed during week 50 since not all cases were related to imported cases or family members of imported cases.

The Cantonal physician team continued to identify actively transmission chains and was able to identify several important clusters of “S-drop out” cases during week 50. This included two clusters in primary schools in Geneva:

- One cluster was linked to a family member of an index case who had a close contact abroad with a symptomatic traveler from South Africa (reported in previous report).

- However, no such link could be identified in the second school. Of note, the two schools are located in the same neighborhood in Geneva.

Another important cluster of “S-drop out” cases during week 50 was due to a social gathering of 25 people, in which all participants tested positive for SARS-CoV-2 (7 “S-drop out” cases identified, other results pending).

Several other clusters, smaller in size have been identified in different workplaces, sometimes in relation with an imported case. These clusters then led to other cases in the community.

However, an increasing number of cases couldn't be linked to the initial identified imported cases or to the newly identified local clusters. These cases indicate community transmission. Given the rapid transmission of Omicron, they have the potential to lead to important clusters as what was observed during week 50.

Because of the current situation of delayed testing due to saturated testing capacities in Geneva, and the fact that investigations are time consuming, the follow up of each transmission chain is not sustainable any more.

Update on B.1.1.529: the Omicron variant

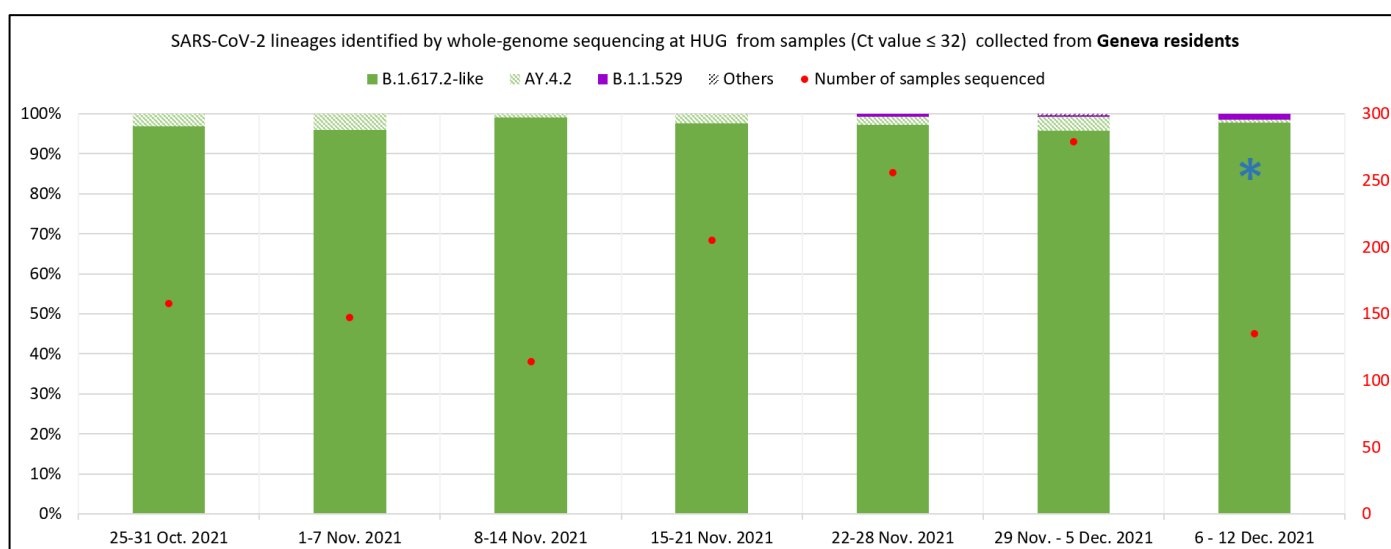
Omicron is progressively replacing Delta in countries where it is circulating, as it does here in the Geneva area, with a doubling time of 2 to 3 days, because of a growth advantage due to both increased transmissibility and to immune escape.

This variant continues to evolve, and already 3 sub-lineages have been described. One sub-lineage doesn't carry the deletion leading to the “S Drop out” feature, and has only rarely been identified, at very small numbers in the UK and South-Africa, and not in Switzerland to this date.

Preliminary data from the UK seems to show that Omicron-related COVID-19 is as severe as Delta-related disease, with no signal supporting a difference in the intrinsic virulence of Omicron compared to Delta.

The risk of reinfection has been showed to be at least 3 times higher with Omicron than with other variants, and primo-vaccination with only 2 vaccine doses offer small protection over time against infection due to this variant. This immune escape is partially restored after the booster dose, at least for a short period of time. Real-life epidemiological data are pending.

SARS-CoV-2 lineages identified by whole-genome sequencing at HUG from samples (Ct value ≤ 32) collected from Geneva residents



Results of WGS of 1286 sequences submitted to GISAID between October 18 and December 5, 2021.

* Partial data for week 49 (December 6 to December 12), as sequencing is still ongoing. Numbers will be updated in the next report.

Omicron sequences are detected since week 47, at a proportion progressively increasing over time. More results are awaited for week 49, due to the intrinsic delay of sequencing.

Delta or one of its sub-lineage were still the most frequently identified variants collected over the last 2 months.

Post-vaccination infections in the canton of Geneva

Post-vaccination infection is defined here as a positive SARS-CoV-2 test occurring more than 14 days after the second vaccine dose. This surveillance is done in collaboration with the Direction Générale de la Santé (DGS) of Geneva. Data are collected by the DGS of Geneva during contact tracing calls after having obtained informed consent from SARS-CoV-2 positive patients. The list of patients with post-vaccination infections is sent weekly to HUG virology laboratory, which makes an effort to retrieve initial diagnostic samples in order to ensure sequencing, as recommended by FOPH.

Among the 4304 new COVID-19 cases reported by the Direction Générale de la Santé in Geneva over week 50, almost a third 1337 (31%) have been identified as post-vaccination infections. Because those numbers also rely on the acceptance of the infected to share their vaccination status with the cantonal physician team during contact tracing, this number may be underestimated.

Of note, the incidence is largely higher (more than 7 times) in non-vaccinated patients, which represented more than 2/3 of infected patients in the Canton during week 50.

Preliminary data compiled by the cantonal physician team on the first 102 Geneva residents positive for the “S Drop out”, showed that 63 of the 91 cases (69%) for whom vaccination status is available received 2 doses of vaccine. Most of them were vaccinated more than 3 months before infection. This can be explained by the relatively high proportion of vaccinated people in the canton (> 80% among adults) and by the ability of Omicron to escape previously acquired immunity.

Conclusions

- The **absolute number of positive tests** collected at our institution **continued to increase over week 50**. The **high increase in the positivity rate** despite the increase in the absolute number of cases reflects the saturation of the testing capacities in the Canton.
- The absolute number and the proportion of SARS-CoV-2 positive samples carrying the “S Drop out” and therefore suspected as **Omicron specimens** progressively increased over week 50, to **reach up to 20%**. The delayed sequencing data confirms the progressive increase in the proportion of Omicron.
- The cantonal physician team confirmed **community transmission of Omicron** during week 50 in the Geneva area. Large clusters were identified in schools or secondary to large private events.
- Three Omicron samples were collected from patients hospitalized at HUG, all suffering from mild disease. Please refer to the report regarding COVID-19 hospitalizations at HUG during week 50 for more details.

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Pauline Brindel for the Geneva Cantonal Physician team.