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Public health research on Covid-19 in Switzerland

SSPH+/ETHZ Lecture Series "This Is Public Health“
March 2, 2022

Milo Puhan, MD, PhD, Prof. Epidemiology & Public Health, University of Zurich

President Foundation board, SSPH+

https://www.youtube.com/watch?v=qzx4ImG5Pes

https://www.youtube.com/watch?v=of5AY-e_nxU

Science to public

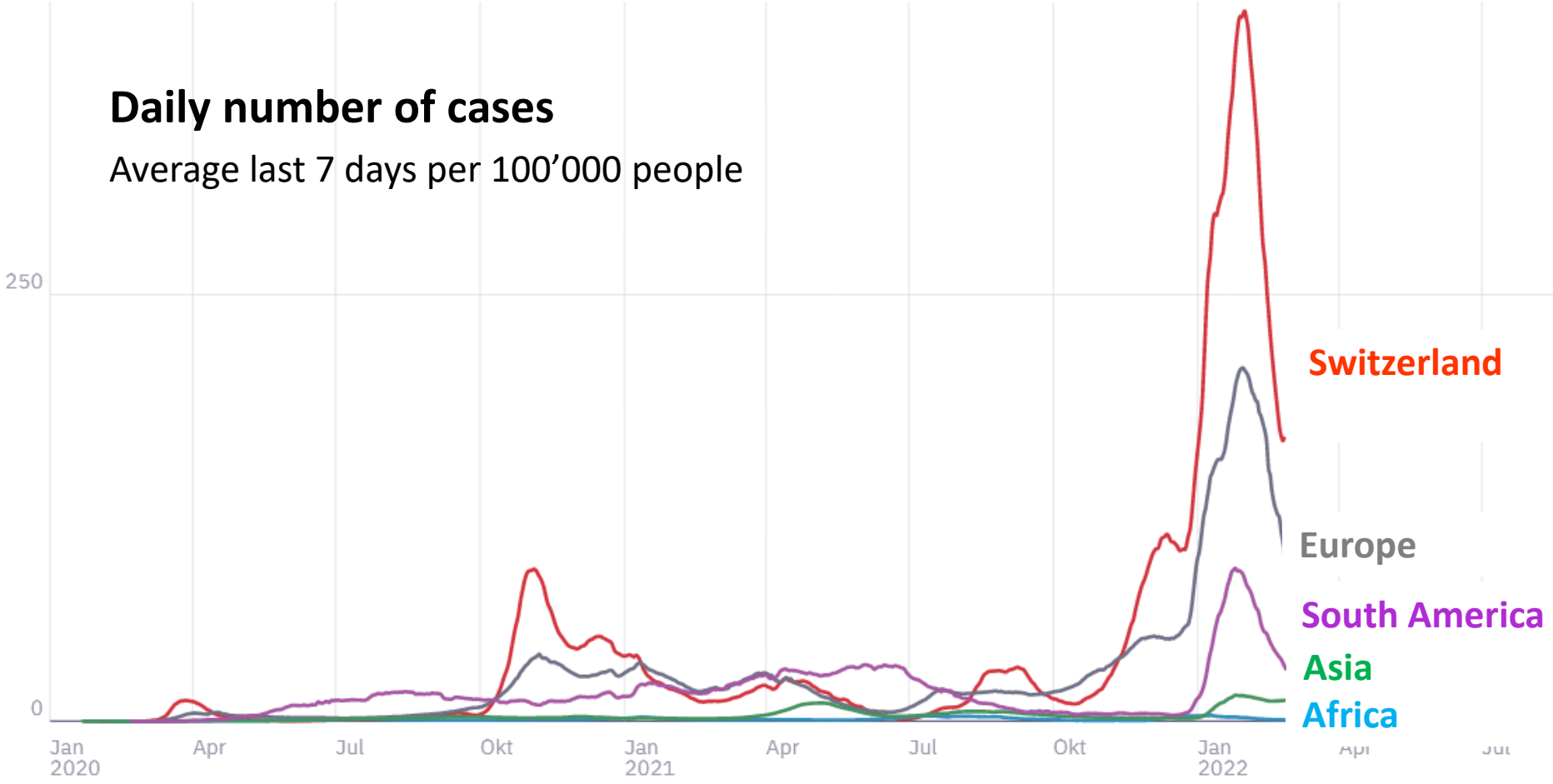
Science in a minute Youtube channel

https://www.youtube.com/channel/UC6esmpftoDxewev-1pT4ARg

https://www.youtube.com/watch?v=qzx4ImG5Pes

https://www.youtube.com/watch?v=of5AY-e_nxU

Challenges to judge the spread and impact of the pandemic



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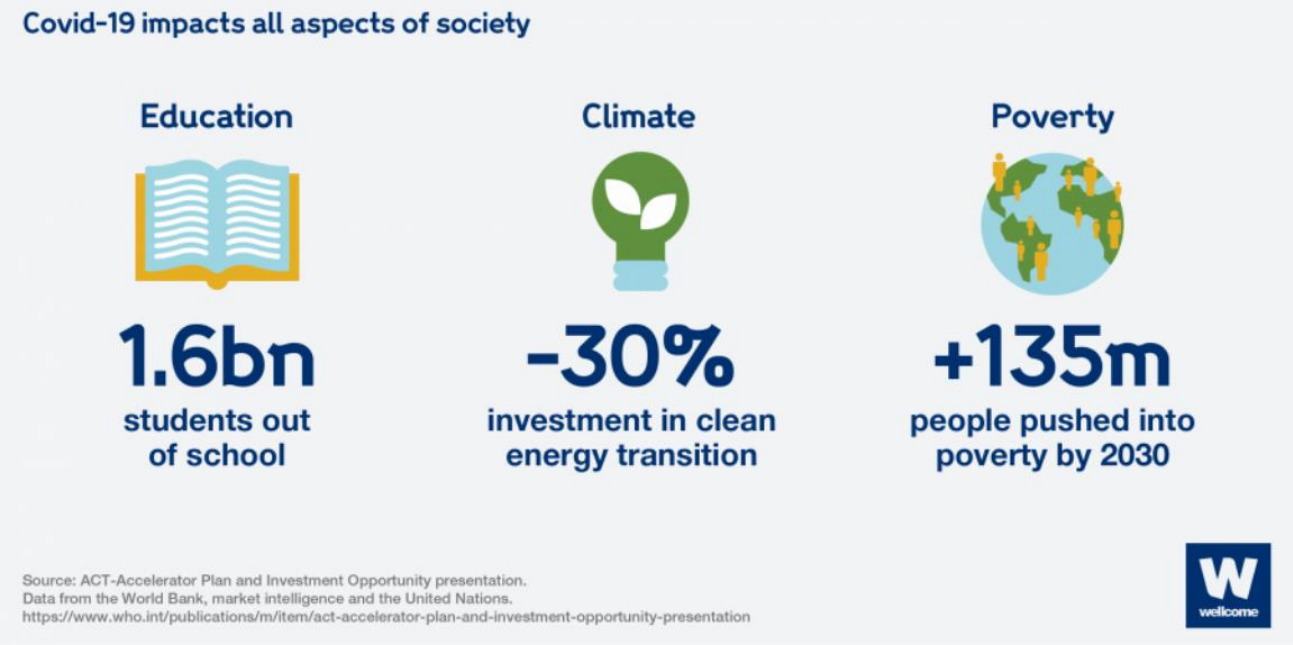
… nor to determine the impact of the pandemic



www.gavi.org

www.thelancet.com

https://bangkok.unesco.org

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Corona Immunitas is born: Data for decisions

"Determination of corona immunity in Switzerland brings clarity.

Clarity in this respect is the basis for goal-oriented political

decisions in connection with COVID-19."

www.corona-immunitas.ch

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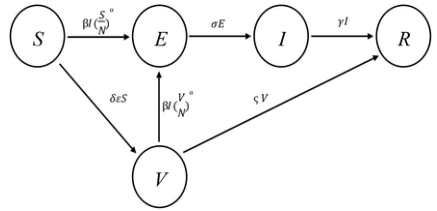
Science to policy – formally and informally

Federal level

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs DHA
Federal Office of Public Health FOPH



SWISS NATIONAL COVID-19 SCIENCE TASK FORCE

Cantonal level

C GDK S

Konferenz der kantonalen Gesundheits-direktorinnen und -direktoren
Conférence des directrices et directeurs cantonaux de la santé
Conferenza delle direttrici e dei direttori cantonali della sanità

International level

ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

World Health Organization

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Switzerland wide program to assess the spread and impact of the pandemic

14 participating universities and health organisations

50'000 study participants

40 studies throughout Switzerland

Financed through public private funding

SSPH+ initiates and coordinates the programme

For the health of society

www.corona-immunitas.ch

Science in a minute youtube channel

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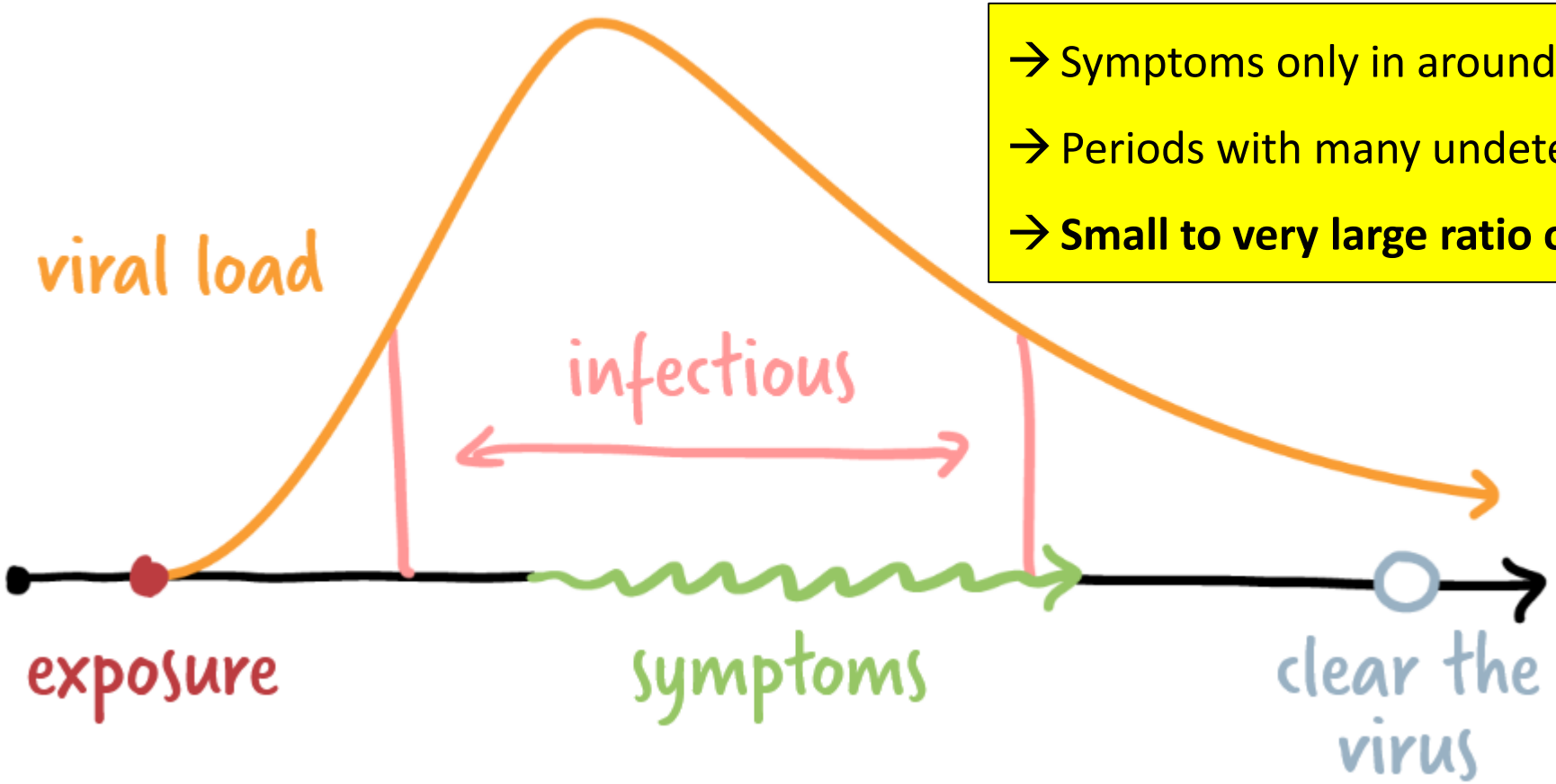
Why virus detection alone is not enough to determine the spread



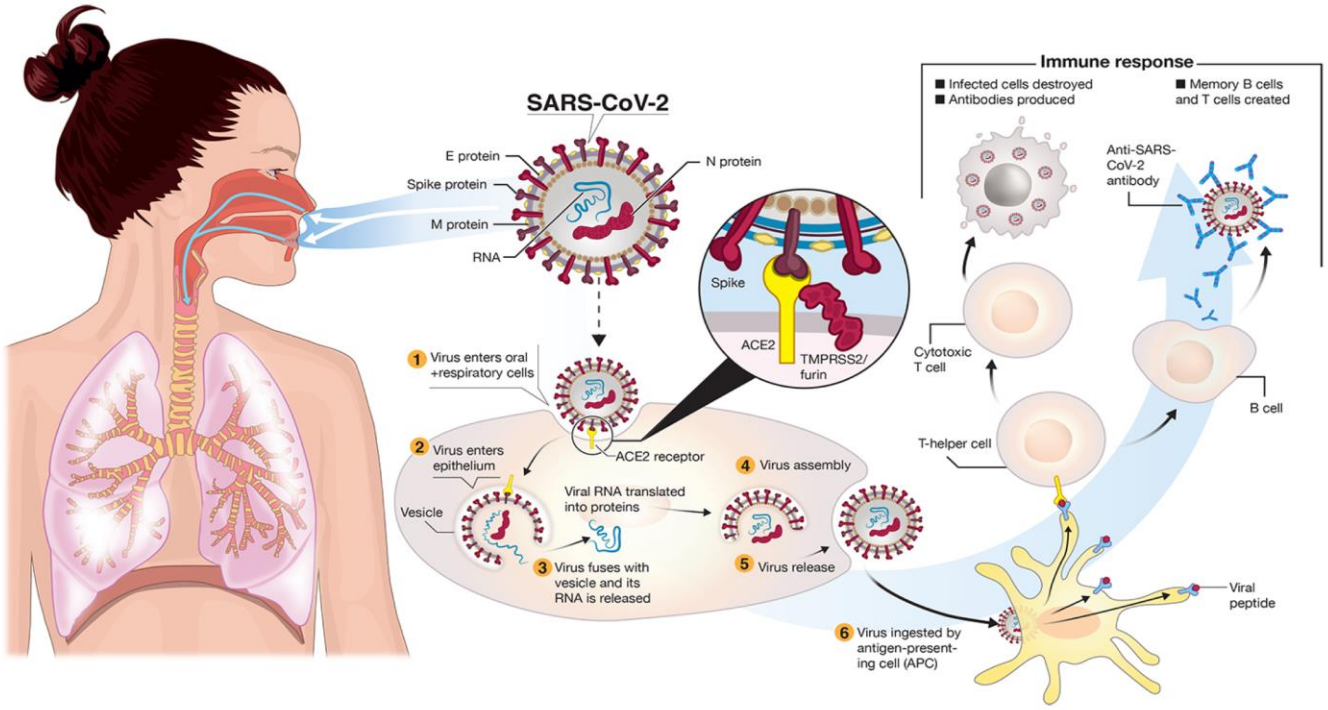
→ Symptoms only in around 50% and often mild

→ Periods with many undetected infections

→ **Small to very large ratio of diagnosed to all infections**

New York Times, Jan 24, 2022

Immune response as prove of infection



YouTube CH

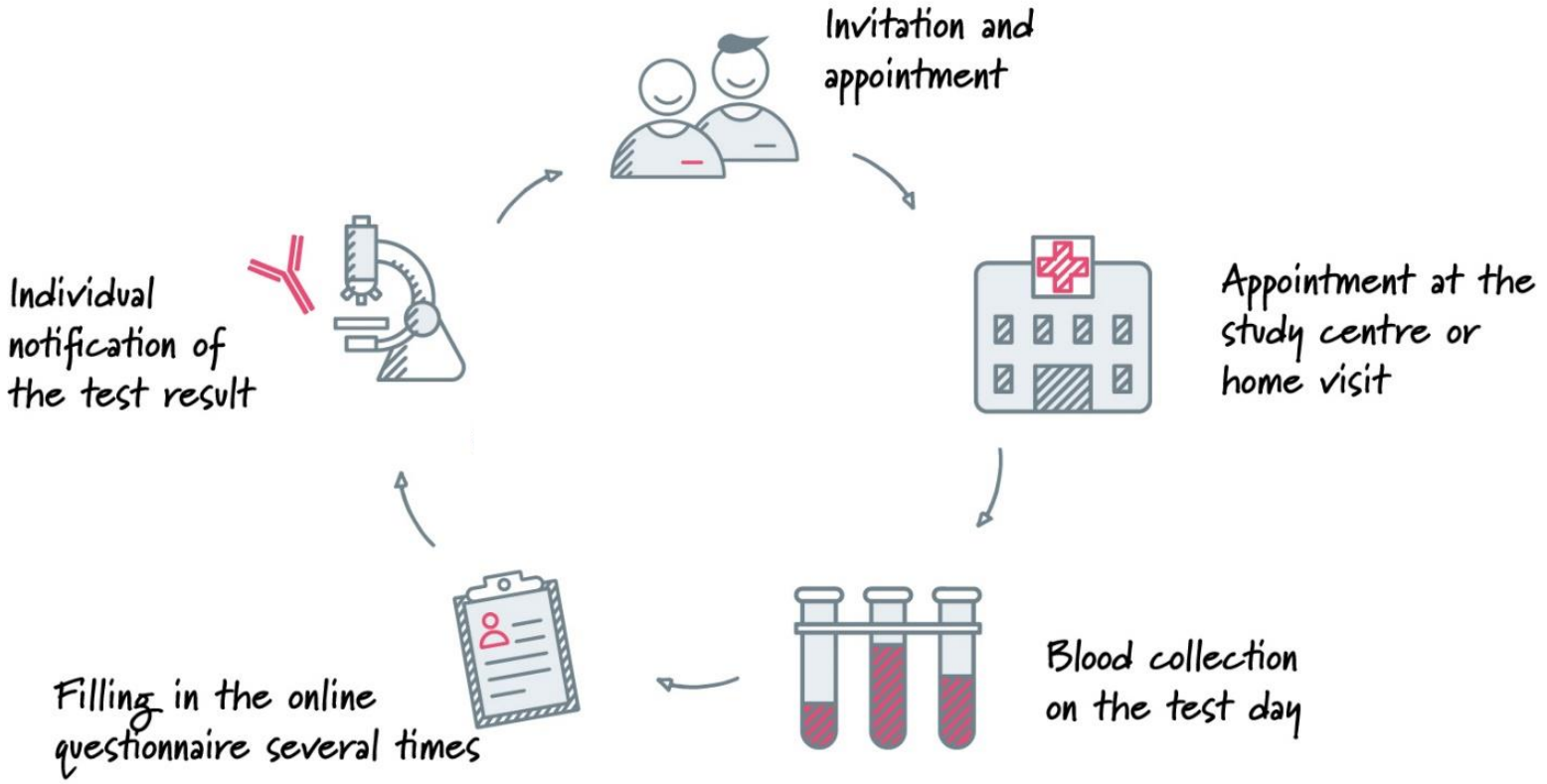
SCIENCE IN A MINUTE
SSPH+

Surveillance using serological (antibody) studies – main questions

- What proportion of a population has been infected by SARS-CoV-2?
- How many persons with SARS-CoV-2 infection illness have or little symptoms?
- Is an infection associated with immunity? Factors associated with (partial) immunity?
- How is the spread changing over time?

See also https://www.cdc.gov/coronavirus/2019-ncov/covid-data/serology-surveillance/index.html

Key principles: Core protocol, maximise synergisms



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Careful evaluation of antibody tests

Steps

1. Testing working group
2. Definition of 18 criteria
3. Public opening
4. Evaluation
5. Decision Executive Committee

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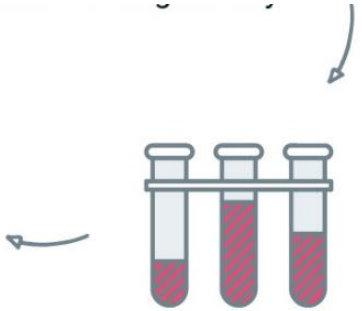
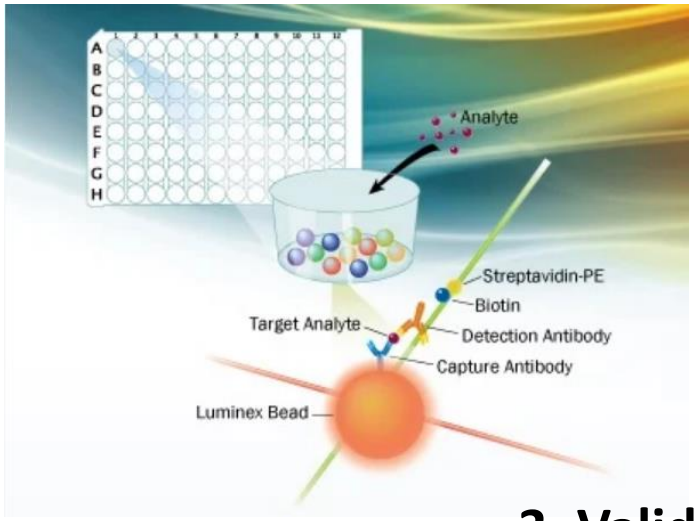
Test of CHUV scored and proved to be best for our purpose

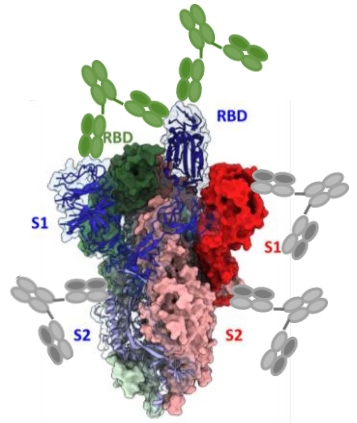


Blood collection on the test day

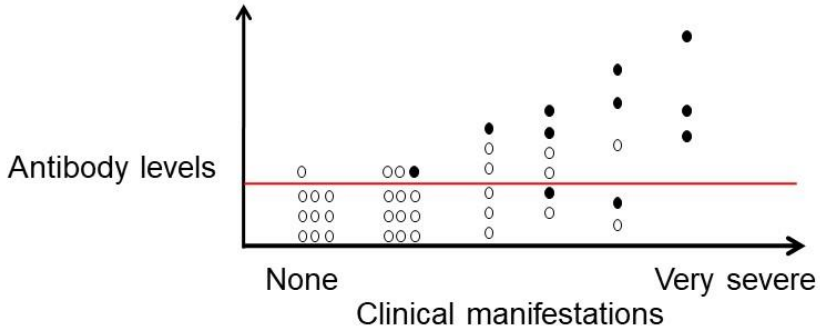
1. Well established Luminex technology



2. Trimeric spike protein

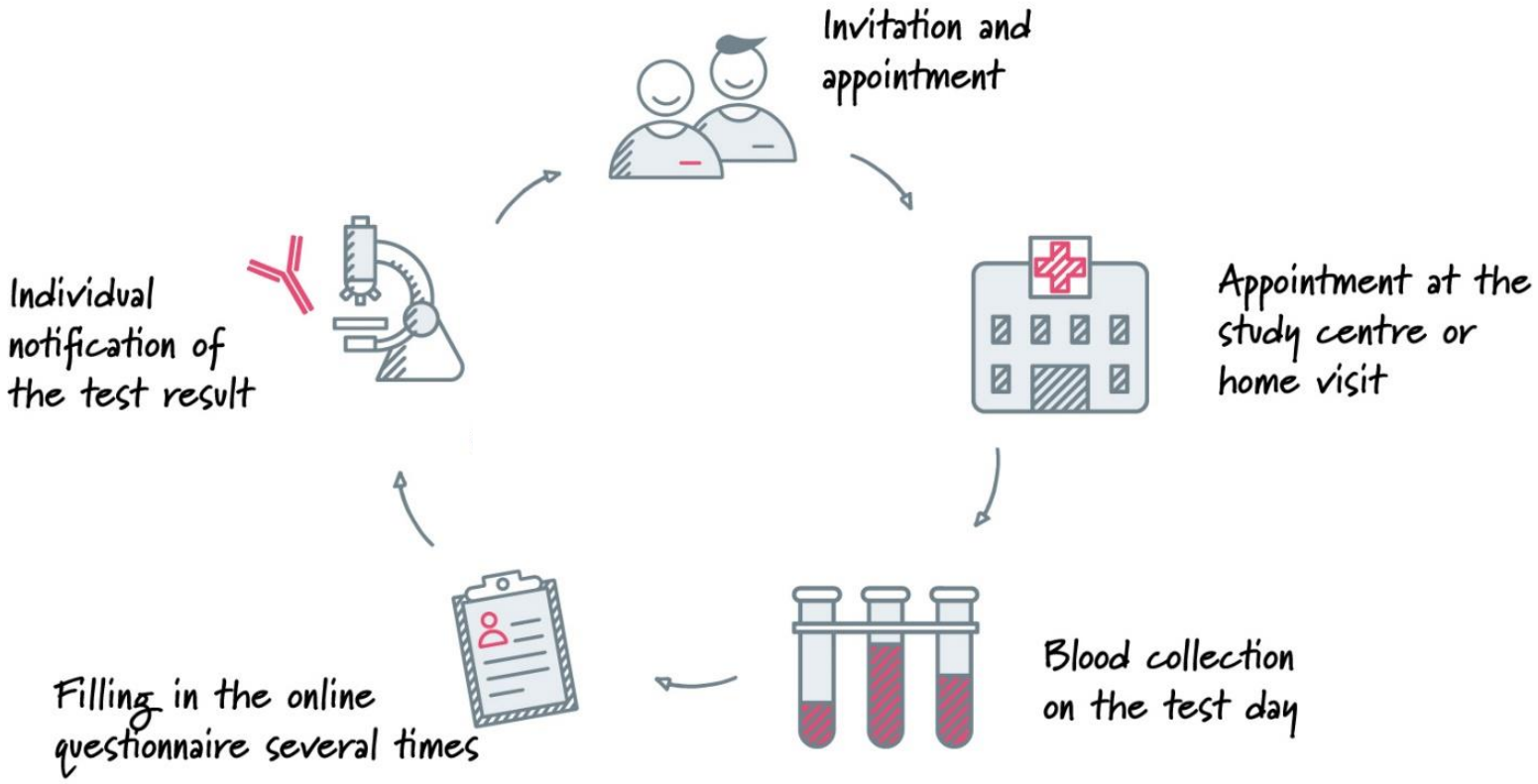


3. Validation in population sample



Fenwick et al. J Virology 2021 https://doi.org/10.1128/JVI.01828-20

Key principles: Core protocol, maximise synergisms and freedom to sites for additional studies



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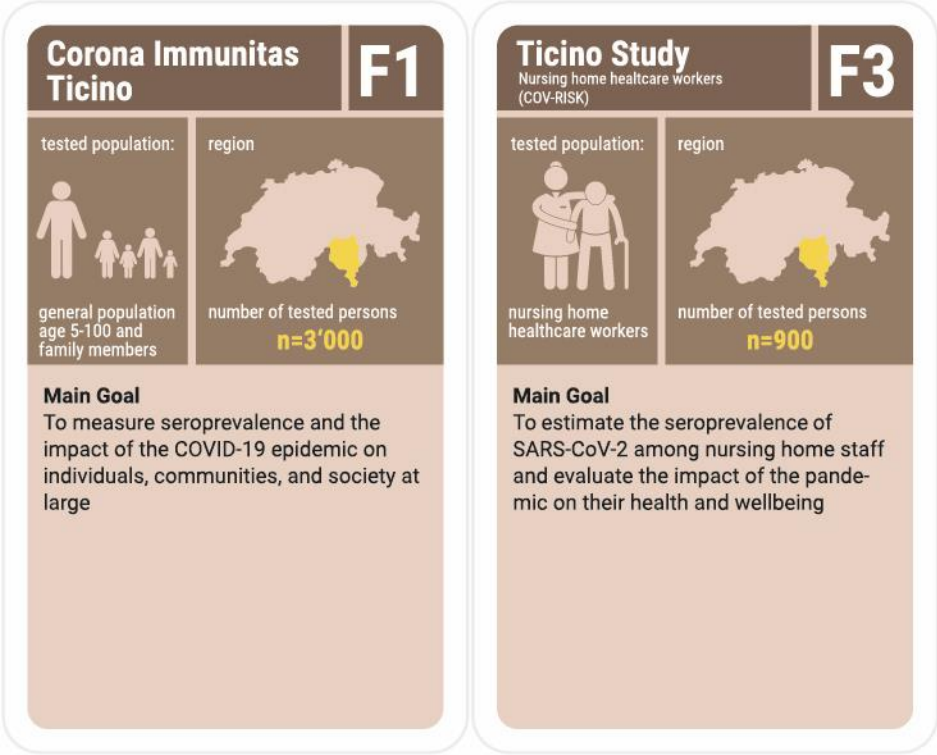
Example of Ticino: Additional focus on elderly and nursing homes



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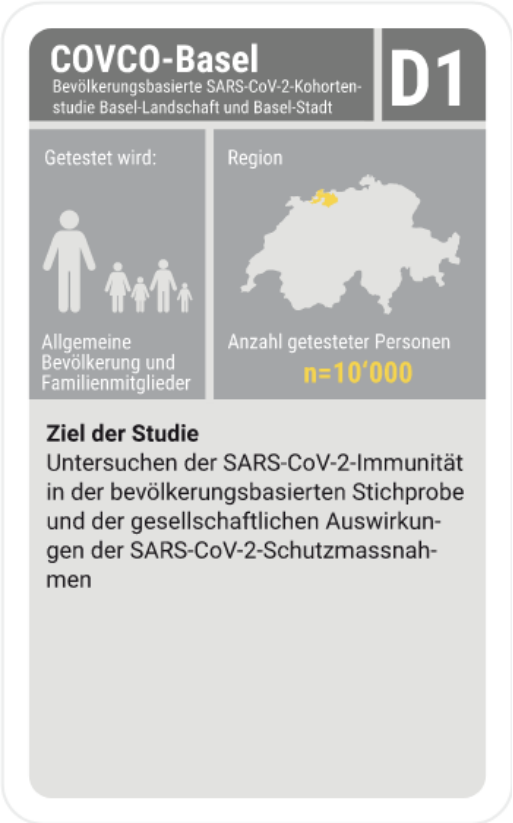
Example of Basel : Digital cohort and focus on mental health



https://www.swisstph.ch/en/projects/covcobasel/

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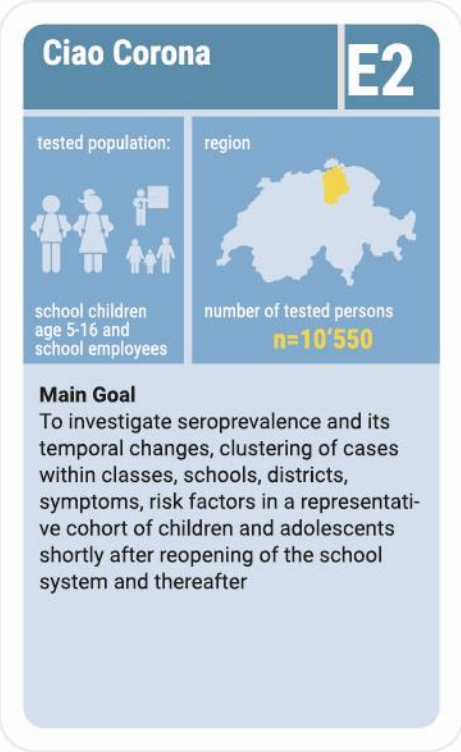
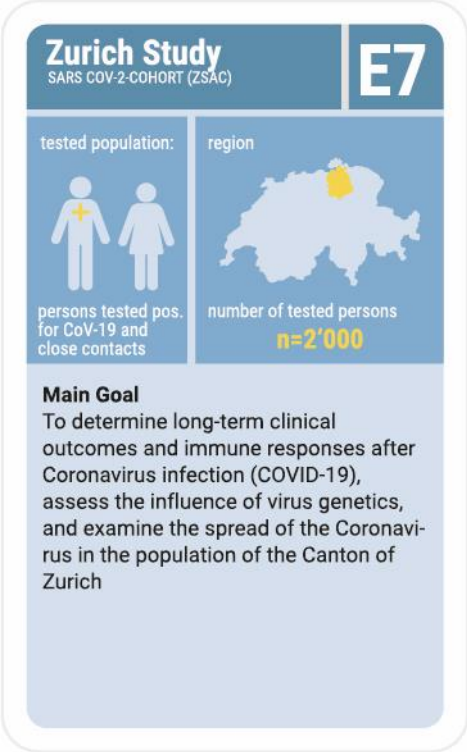
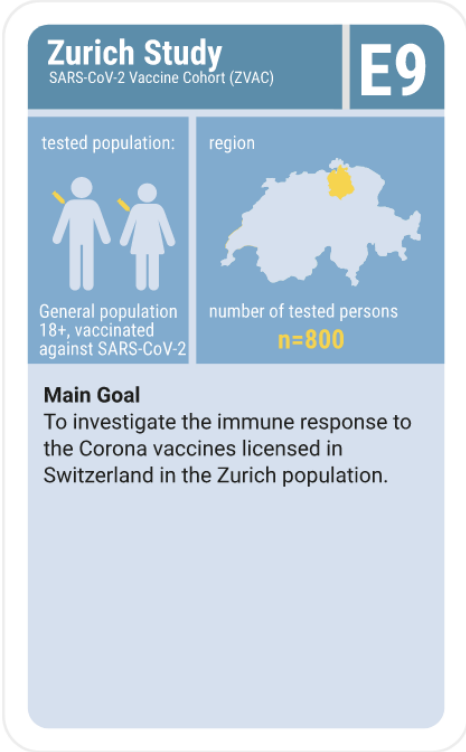
Example of Zurich: Cohort studies with children, infected and vaccinated persons







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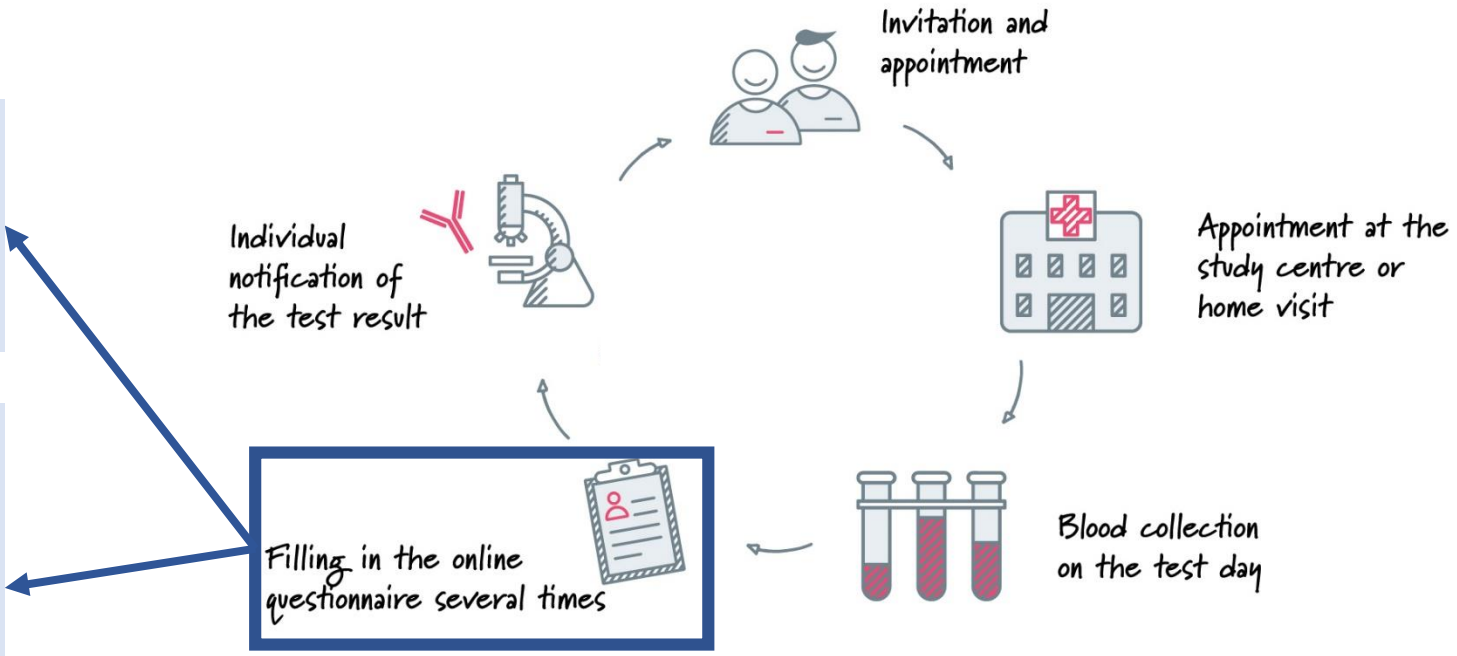
Corona Immunitas Digital Cohort – monitoring population behaviour during the pandemic

Weekly surveys (short):
- Onset of symptoms
- Covid-19 tests
- Adherence to preventive measures

Monthly surveys (more extensive):
- Perception of health, economic, societal risks
- Mental health, feelings of loneliness
- Use of SwissCovid app
- Vaccination/vaccine hesitancy



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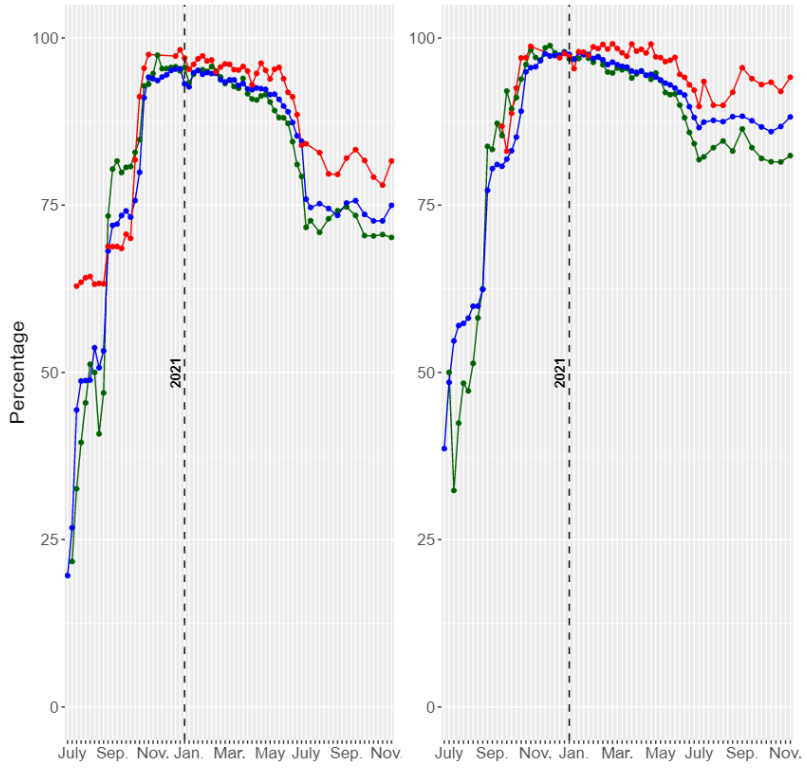
Prevention behaviour – assessed weekly in Ticino, Romandie and German-speaking cantons

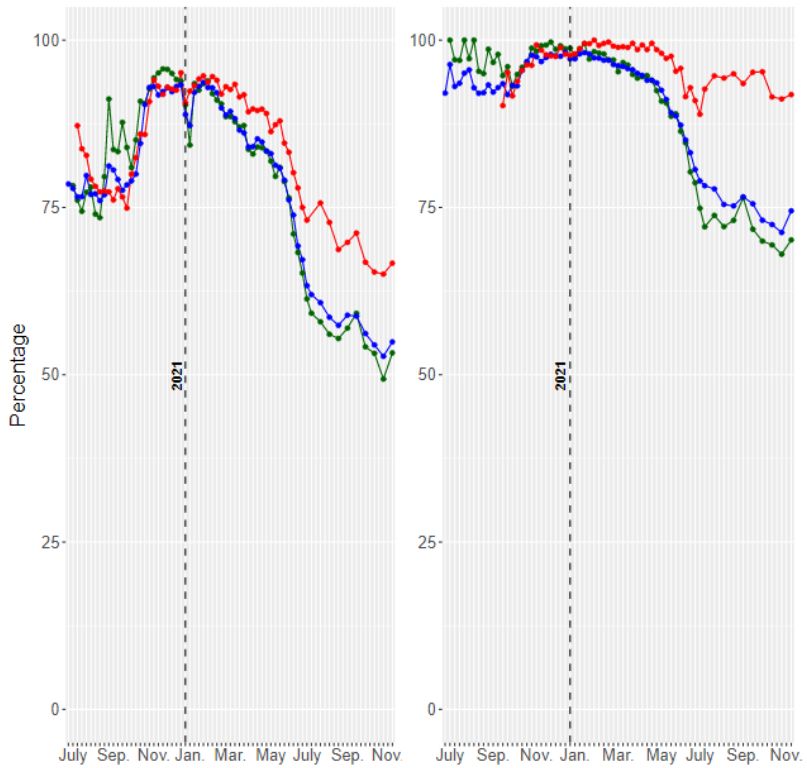
Mask wearing where required

20-64 year olds >65



Social distancing

20-65 year olds >65



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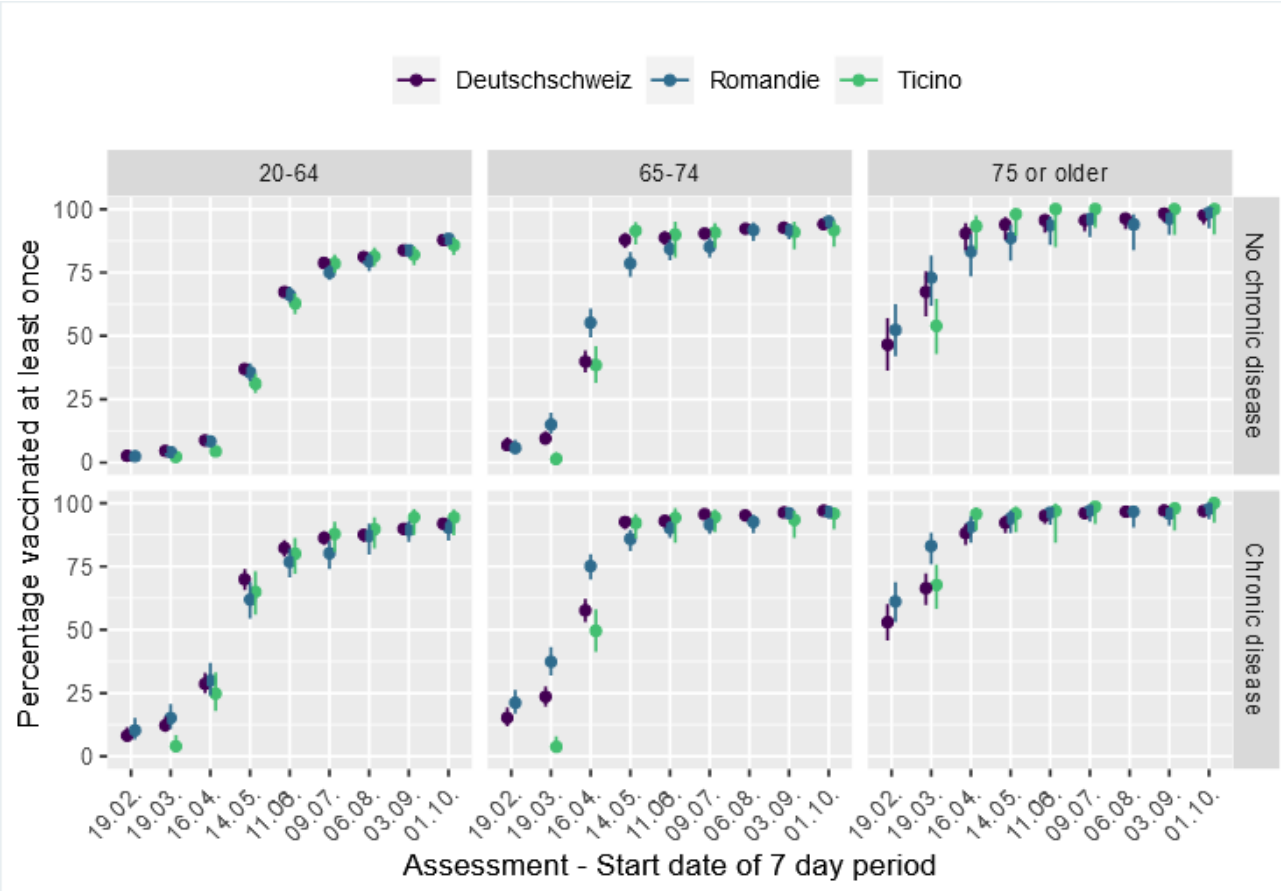
Corona Immunitas reports to inform vaccination campaign

Monthly vaccination report to FOPH and cantons

- Number of vaccines delivered to special groups
- Vaccine hesitancy
- etc



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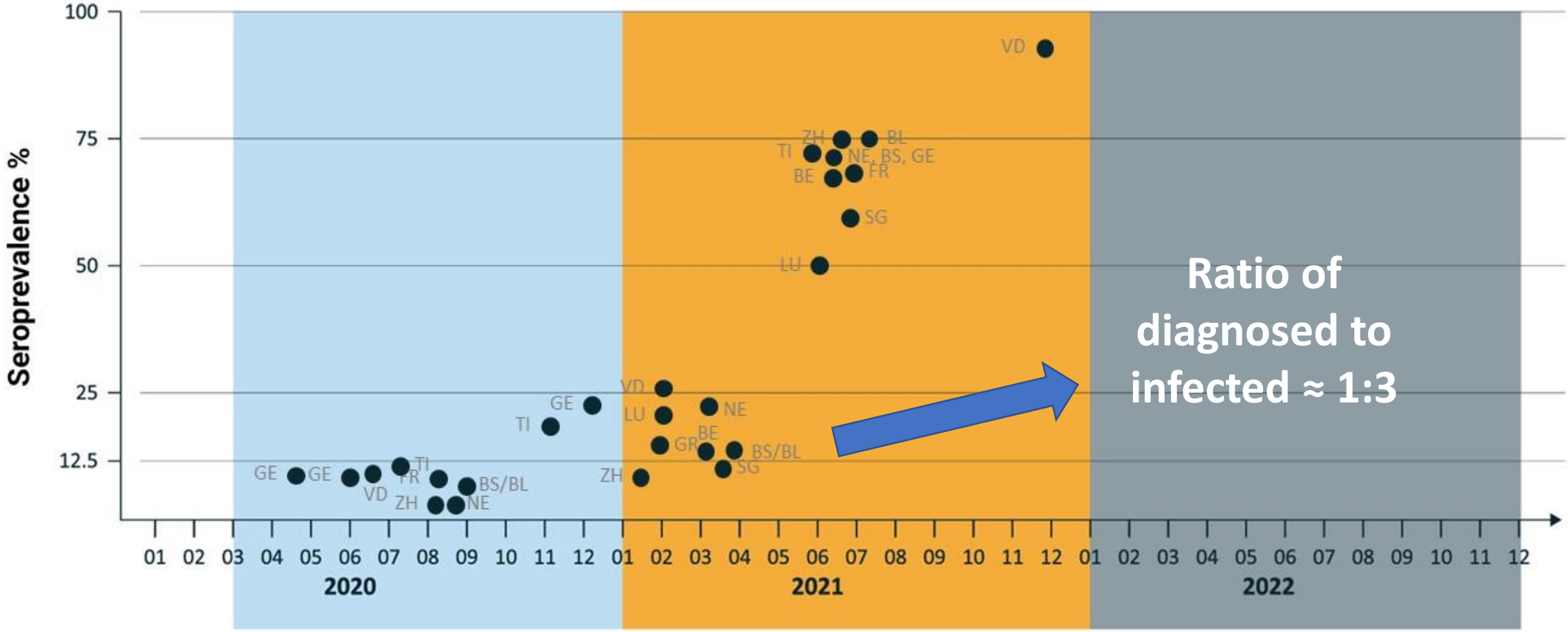
Increase in seroprevalence (% with antibodies) until 2021 in 20 to 64 year olds



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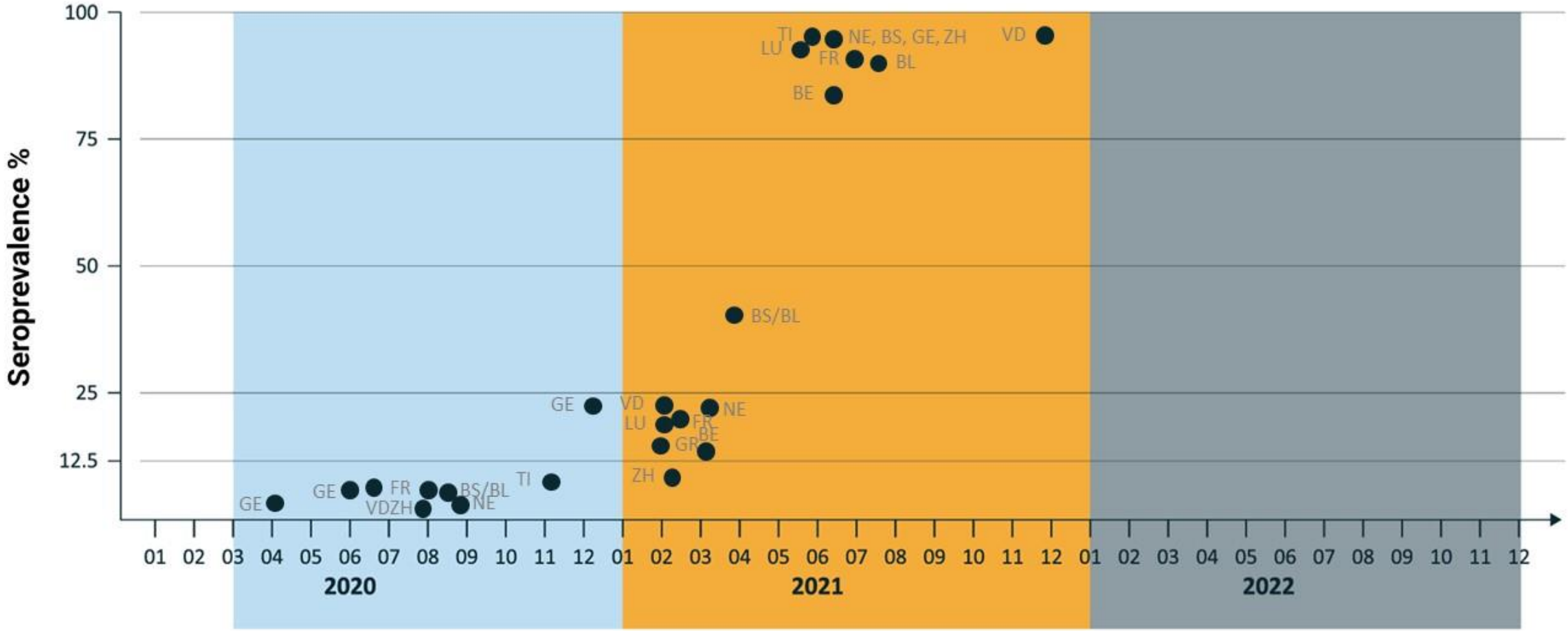
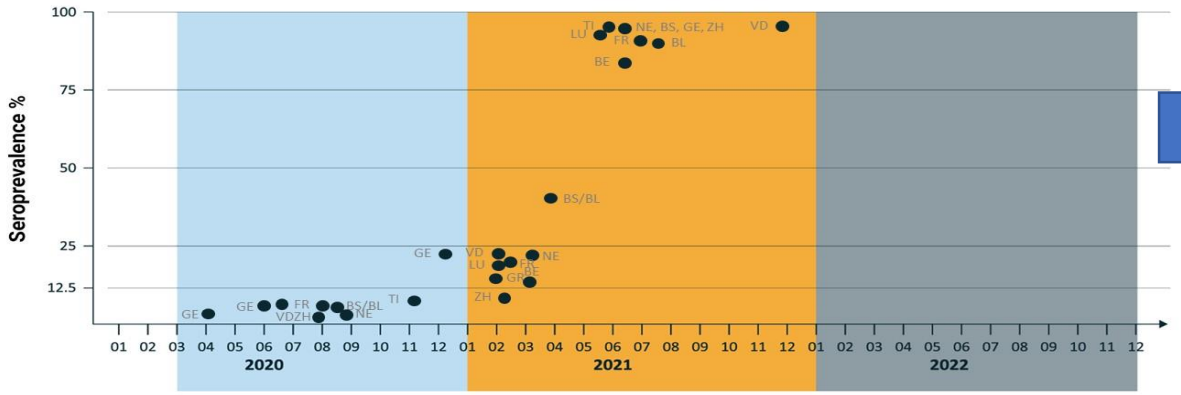
Even more impressive in 65+ old persons



Why such an Omicron wave despite the very high seroprevalence?



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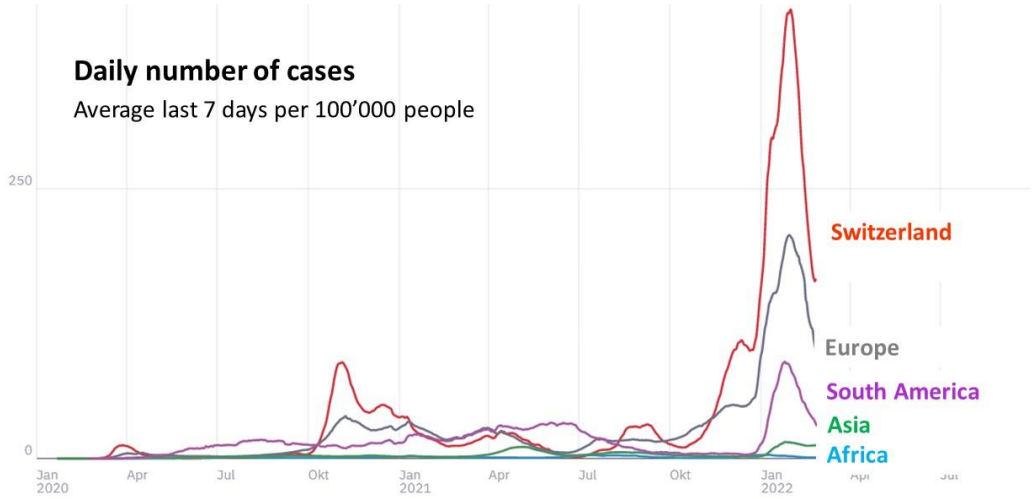

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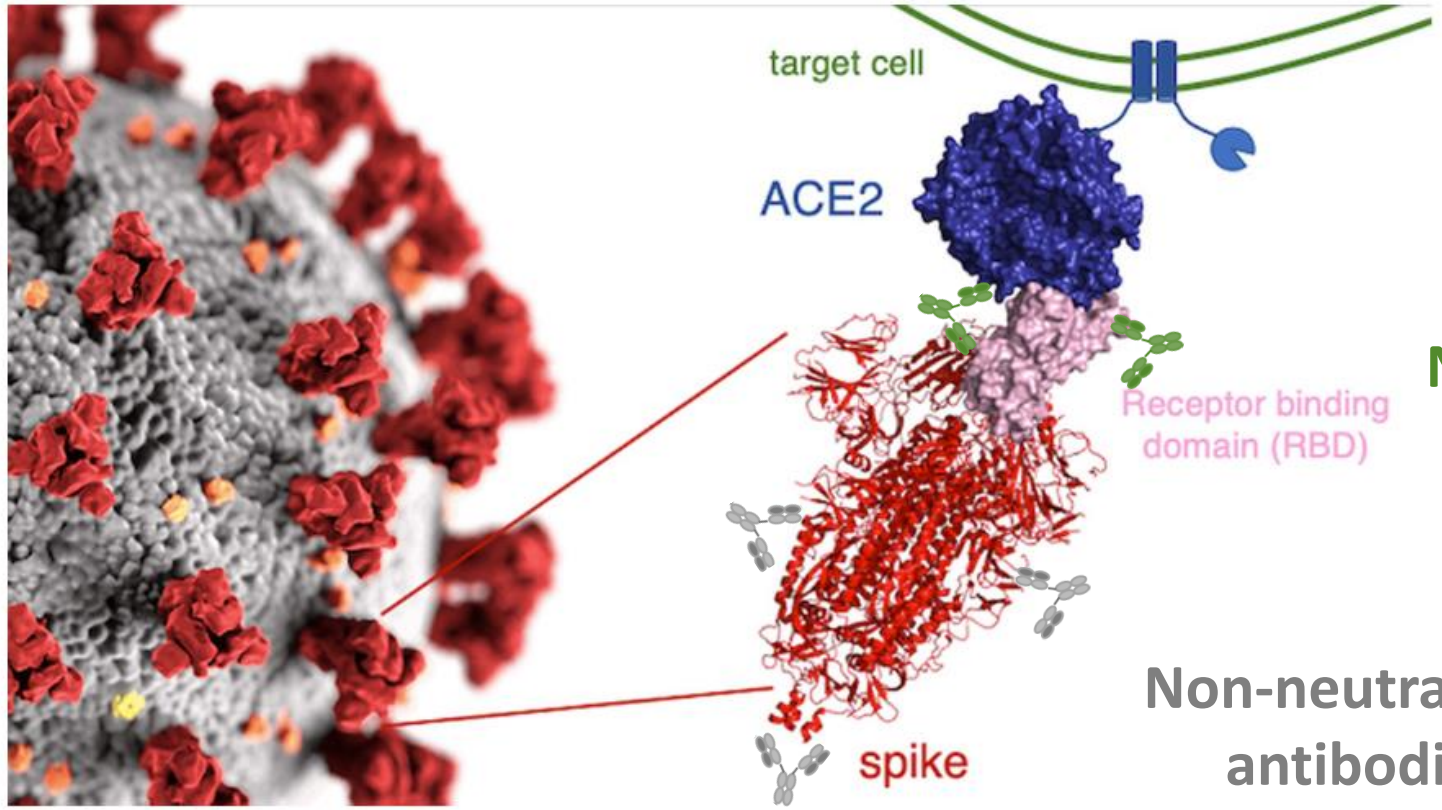
Seroprevalence can mean different levels of protection



Neutralizing antibodies

Non-neutralizing antibodies

Neutralizing activity vaccinated and unvaccinated participants

% of individuals with neutralizing activity

N	Vaccine	Wild type	α	δ
208	Yes	95%	90%	81%

N	Vaccine	Wild type	α	δ
83	No	25%	13%	10%

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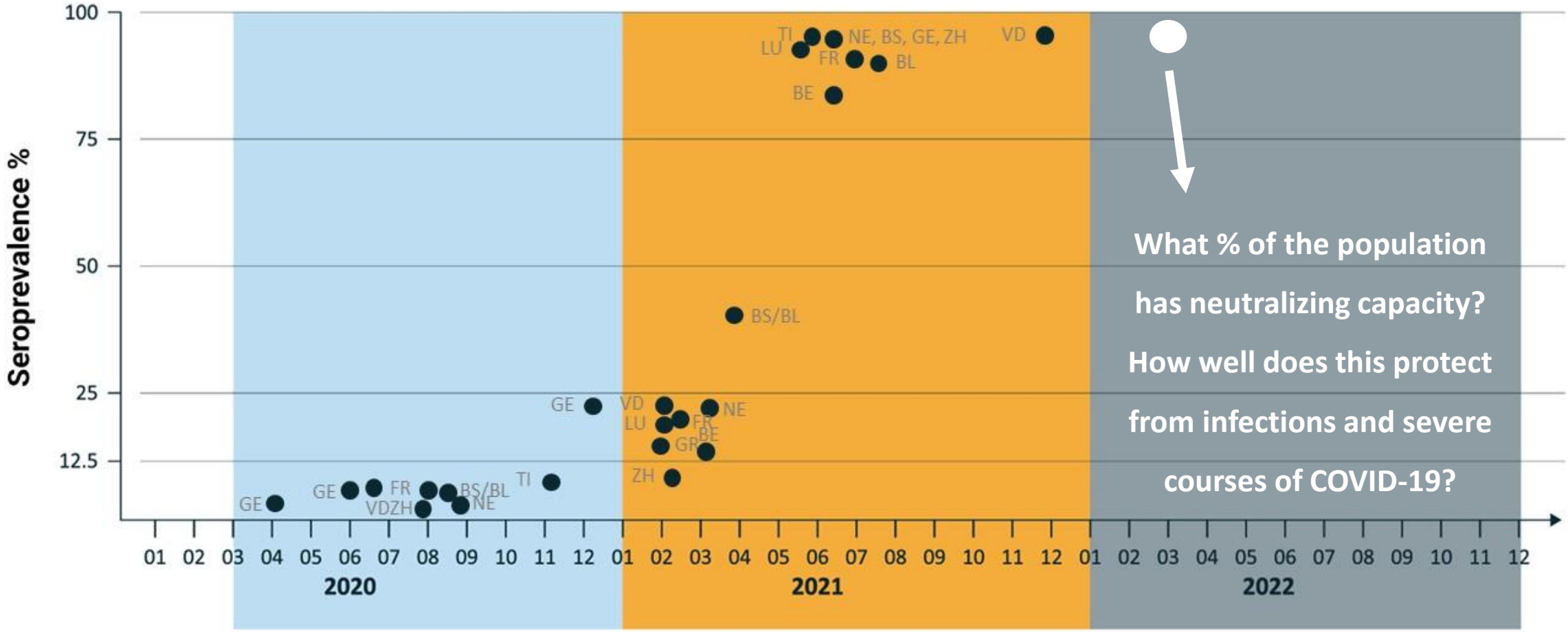
Round 5 of Corona Immunitas right after Omicron wave



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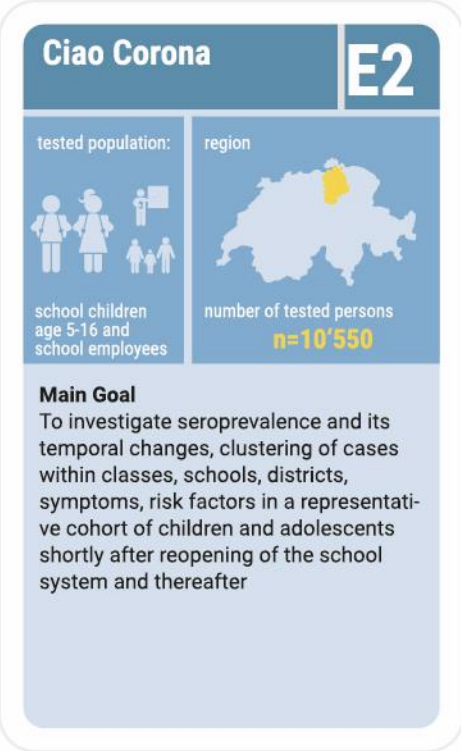
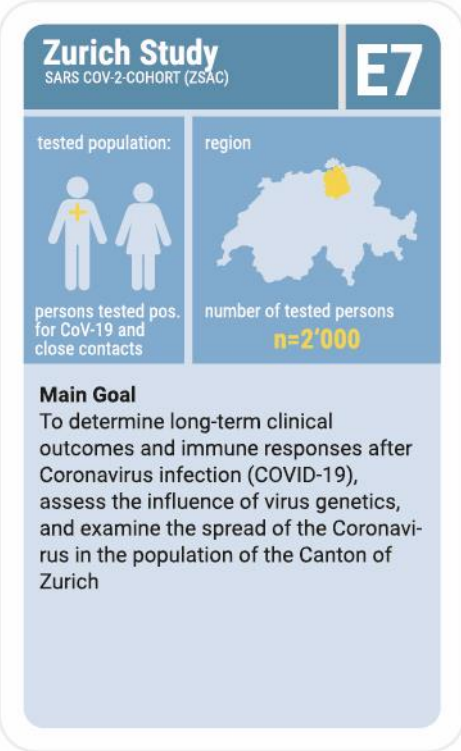
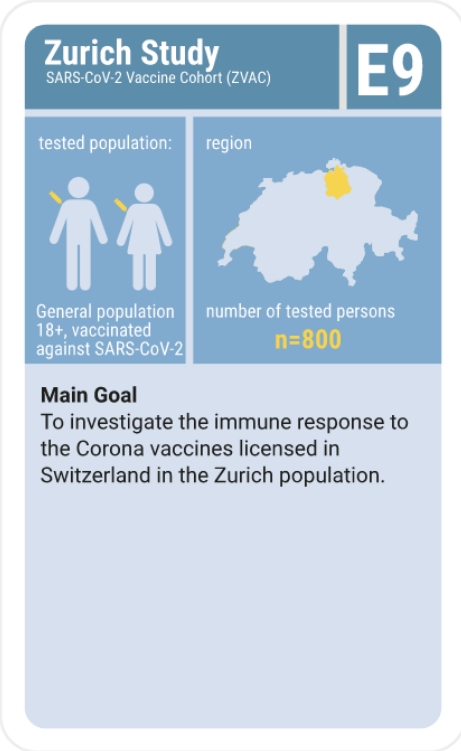
Zurich cohort studies with children, infected and vaccinated persons







Corona-Zentrum der Universität Zürich

Zentrum
für Reisemedizin
der Universität Zürich

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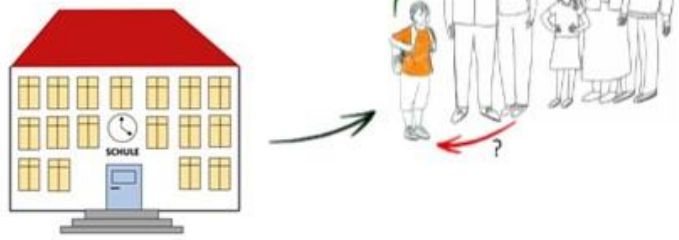
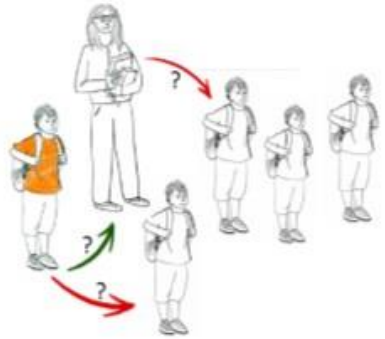
Ciao Corona – school based prospective cohort study

2-10 schools from each district





1/3 each from lower, middle and upper level

55 schools
275 classes,
2500 children

Ulyte et al. Int J Public Health 2020; doi.org/10.1007/s00038-020-01495-z

Main questions

- Seroprevalence over time
- Persistence of antibodies
- Clustering of infections within classes and schools
- Physical and mental health over time

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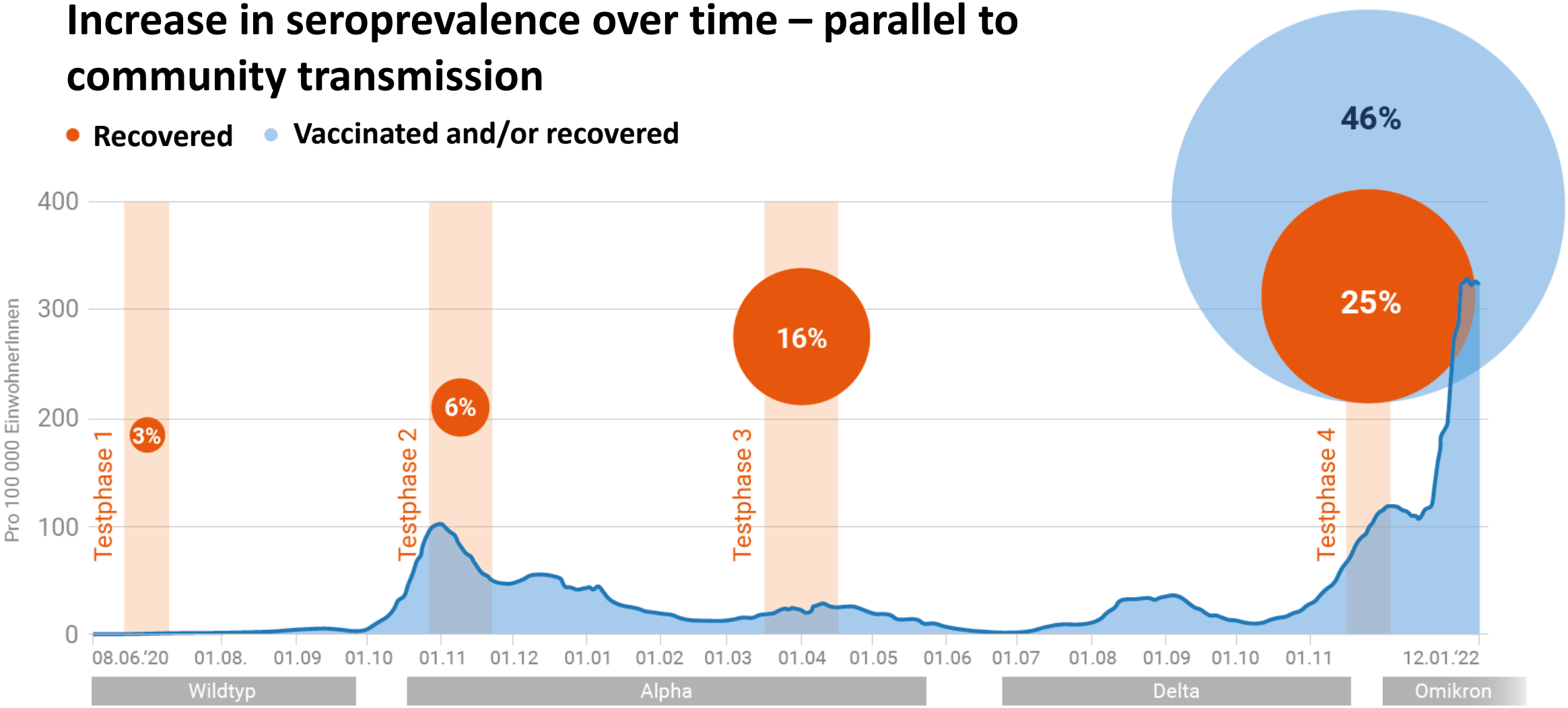
Increase in seroprevalence over time – parallel to community transmission



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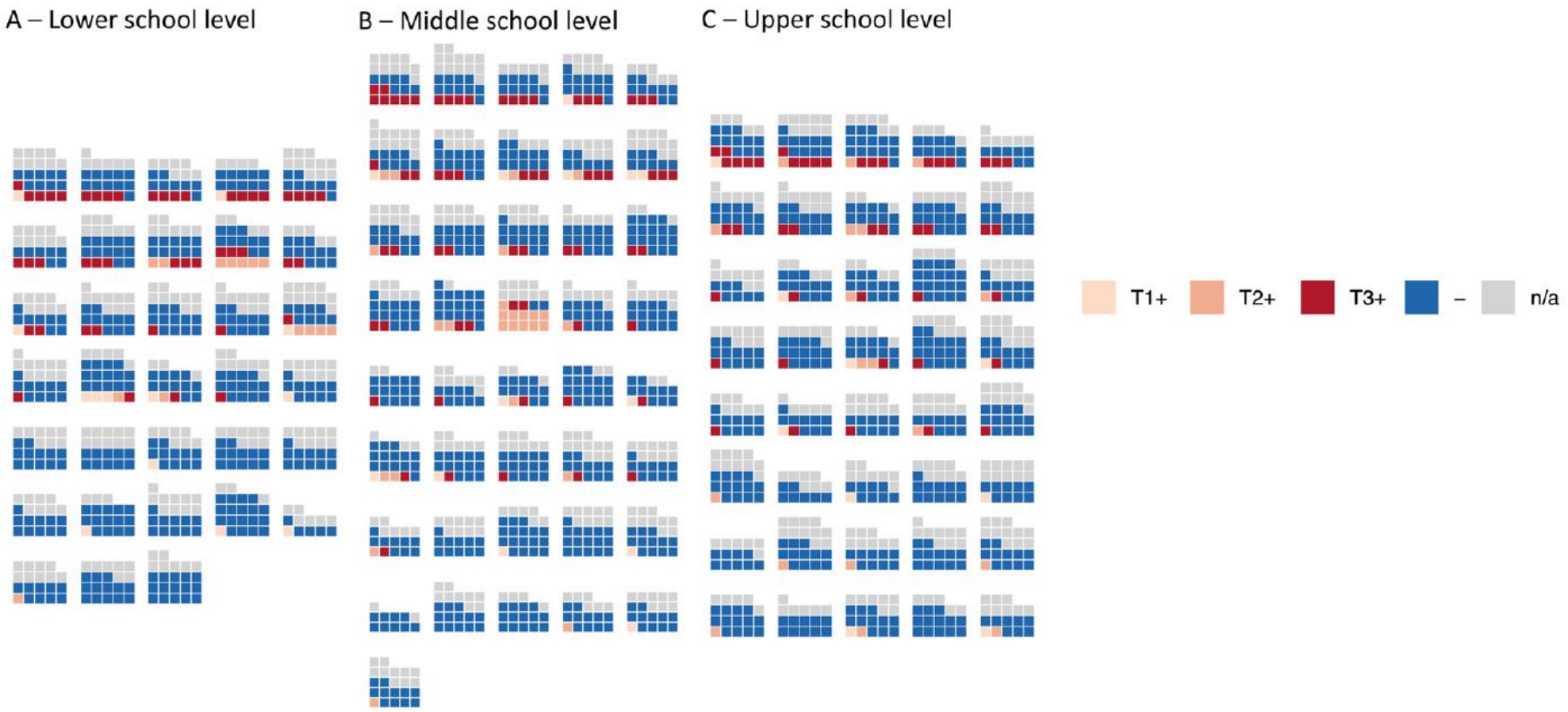
Limited clustering of infections within classes



Ulyte et al BMJ 2021, https://www.bmj.com/content/372/bmj.n616; Ulyte et al SMW 2021, https://doi.org/10.4414/smw.2021.w30092

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Zurich Coronavirus Cohort Study (ZSAC)

Zurich Study SARS COV-2-COHORT (ZSAC) **E7**

tested population: persons tested pos. for CoV-19 and close contacts

region

number of tested persons n=2'000

Main Goal
To determine long-term clinical outcomes and immune responses after Coronavirus infection (COVID-19), assess the influence of virus genetics, and examine the spread of the Coronavirus in the population of the Canton of Zurich

Reported cases

↓

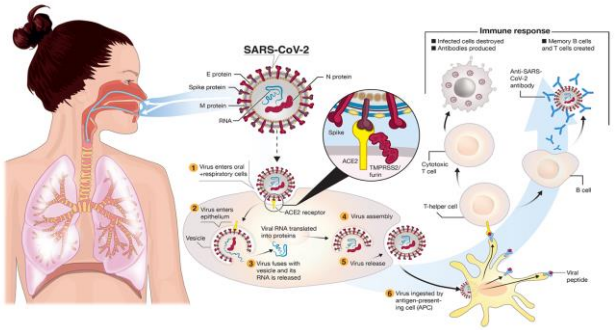
Kanton Zürich Gesundheitsdirektion

Random sampling and invitation

↓

N=446, 03-07 2020
N=1106, 08-12 2020

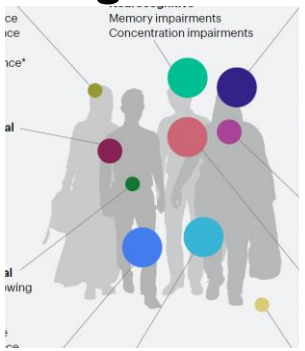
Development immune reaction



Isolation & Quarantine

Evaluation Contact tracing and Swiss Covid App

Long COVID



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Study design ZSAC

Reported cases → Kanton Zürich Gesundheitsdirektion → Random sampling

1552 participants

- 446 participants from 1st wave (February-August 2020)
- 1106 participants from August 2020 to January 2021

Blood sampling

Questionnaires

Study registration → https://doi.org/10.1186/ISRCTN14990068

First Long Covid results → https://doi.org/10.1371/journal.pone.0254523

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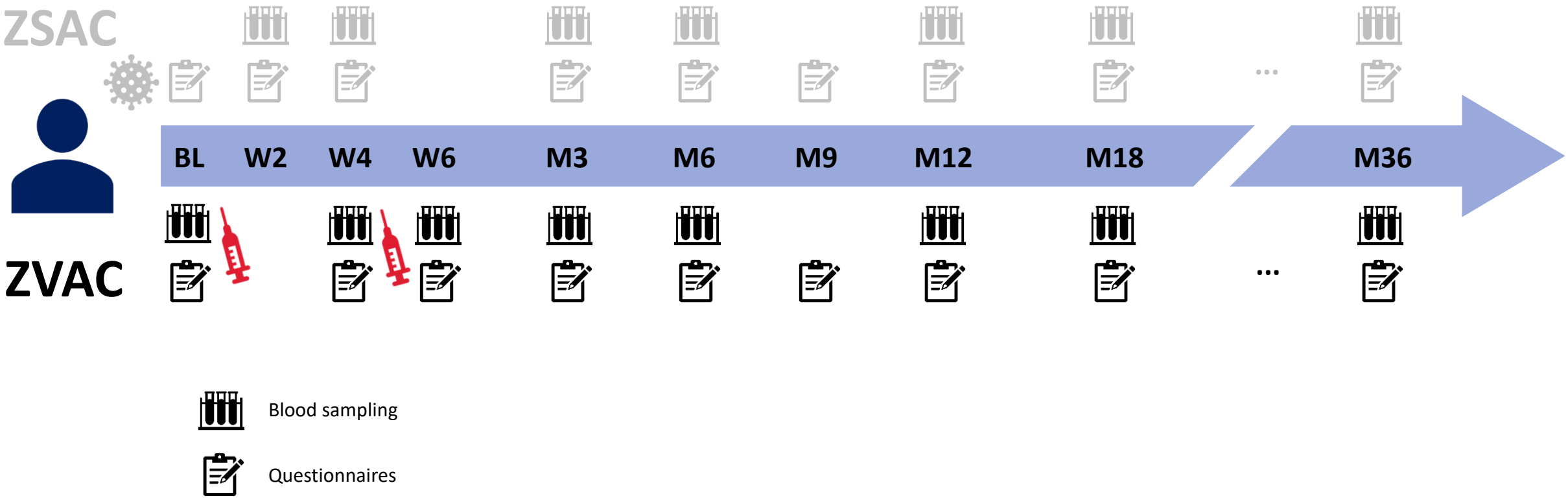
Twin study ZVAC



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Study design ZVAC

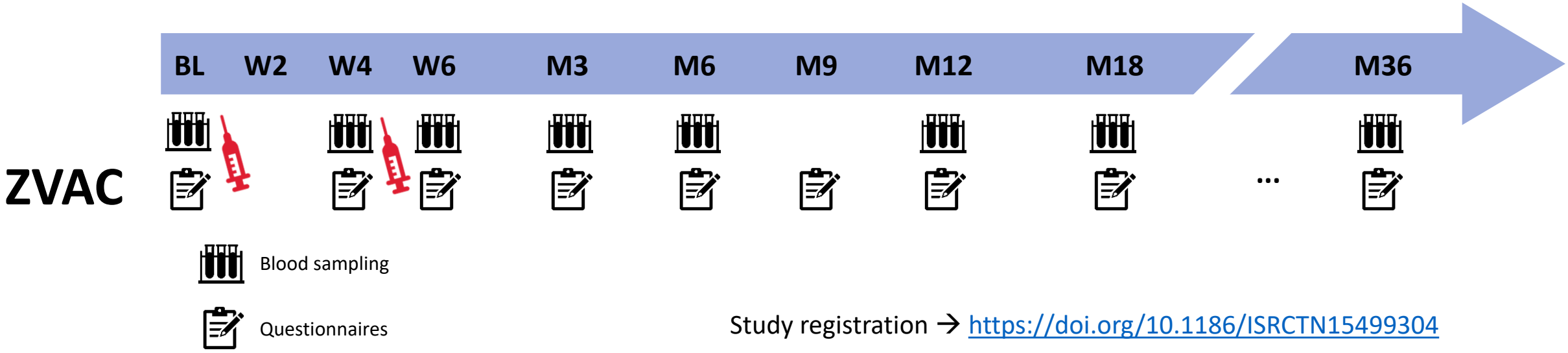
Registered for vaccination at

Zurich Corona Center

Random sampling →

575 participants

- Each 200 per vaccine (Moderna, Pfizer, J&J)
- Each 100 per age group 18-64 and 65+



Study registration → https://doi.org/10.1186/ISRCTN15499304

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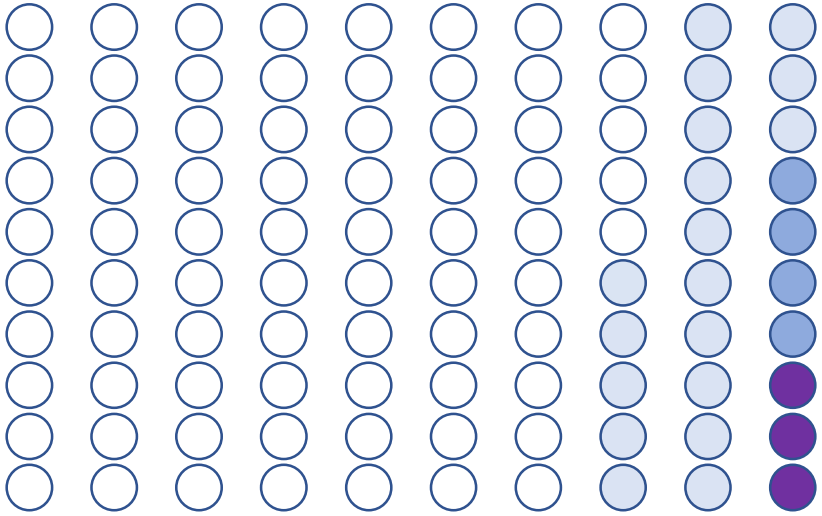
Long Covid – Recent results

Point de presse Feb 8, 2022: https://www.youtube.com/watch?v=bljdqpPF1Fg

Per 100 persons with an infection



- Mild impairment of health status
- Moderate impairment of health status
- Severe impairment of health status

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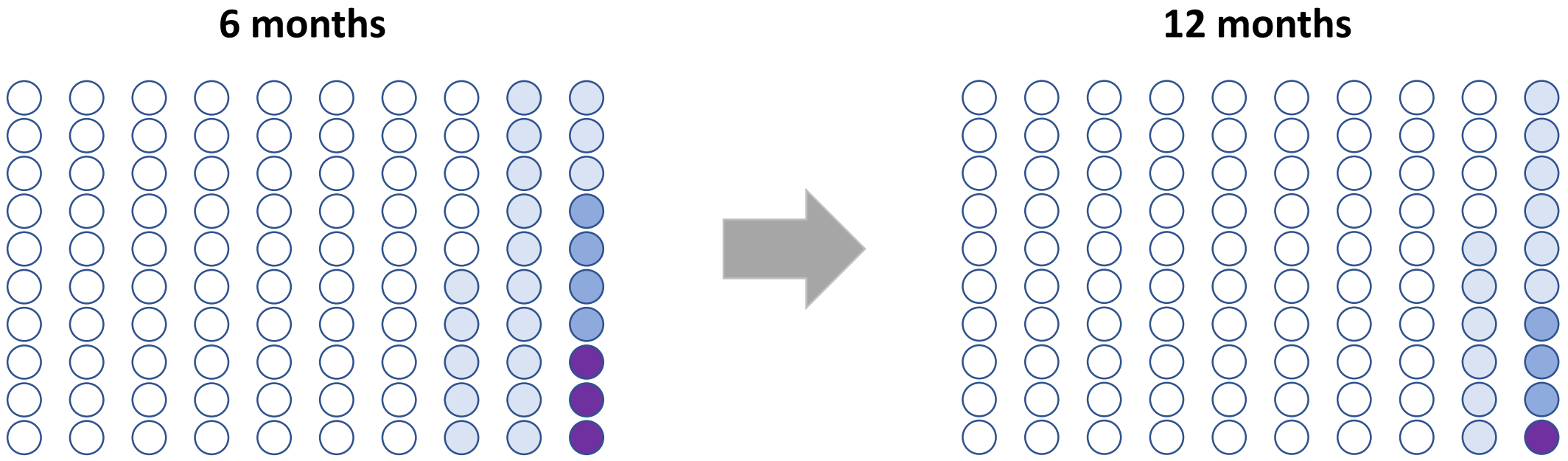
9 out of 25 persons affected by Long Covid recover within a year, 16 not or only partly



Per 100 persons with an infection

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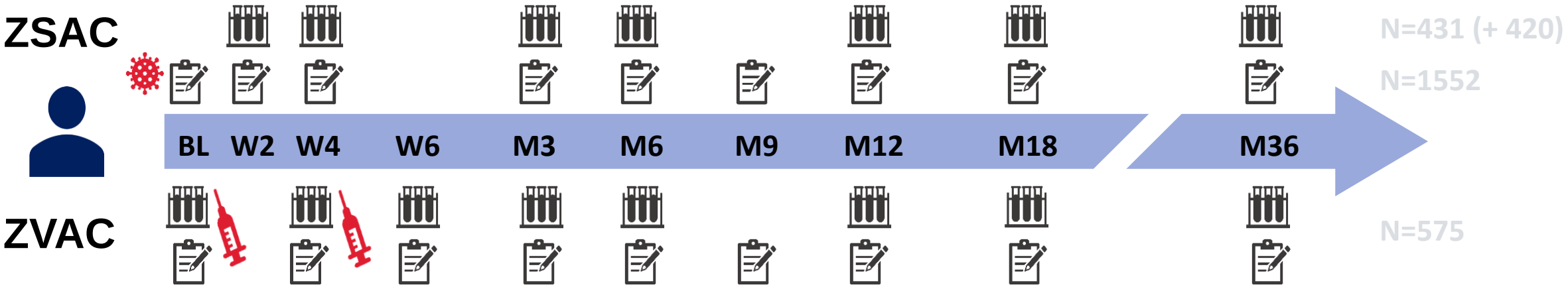
Immune response and infections over time after infection, vaccination and combinations thereof



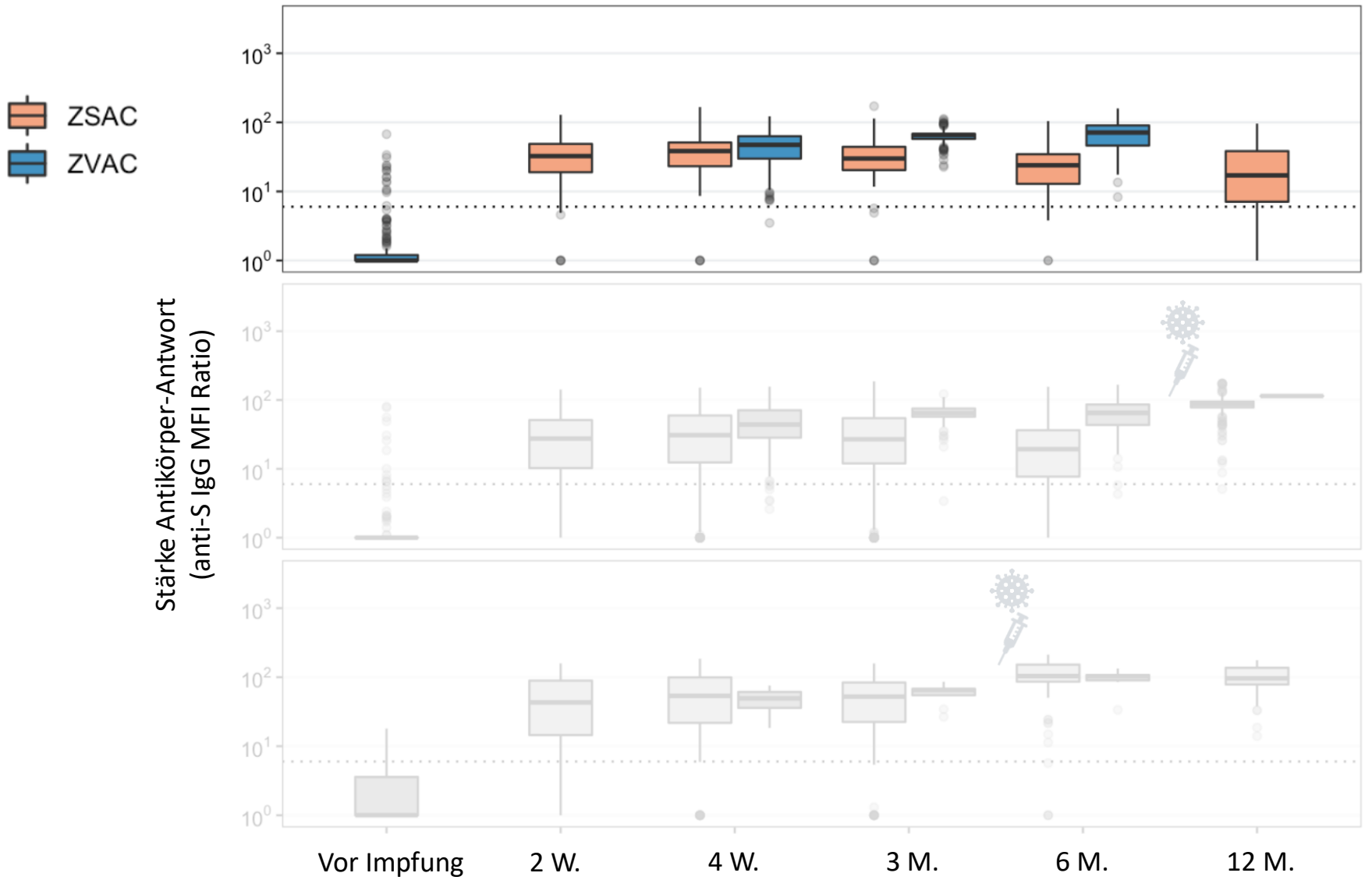
Blutplasma, PBMCs

Elektronische Fragebogen

→

- **Course of antibodies**
- **Neutralisation**
- **Cellular response (T and B cells)**

Course of anti-S IgG antibodies after infection and vaccination

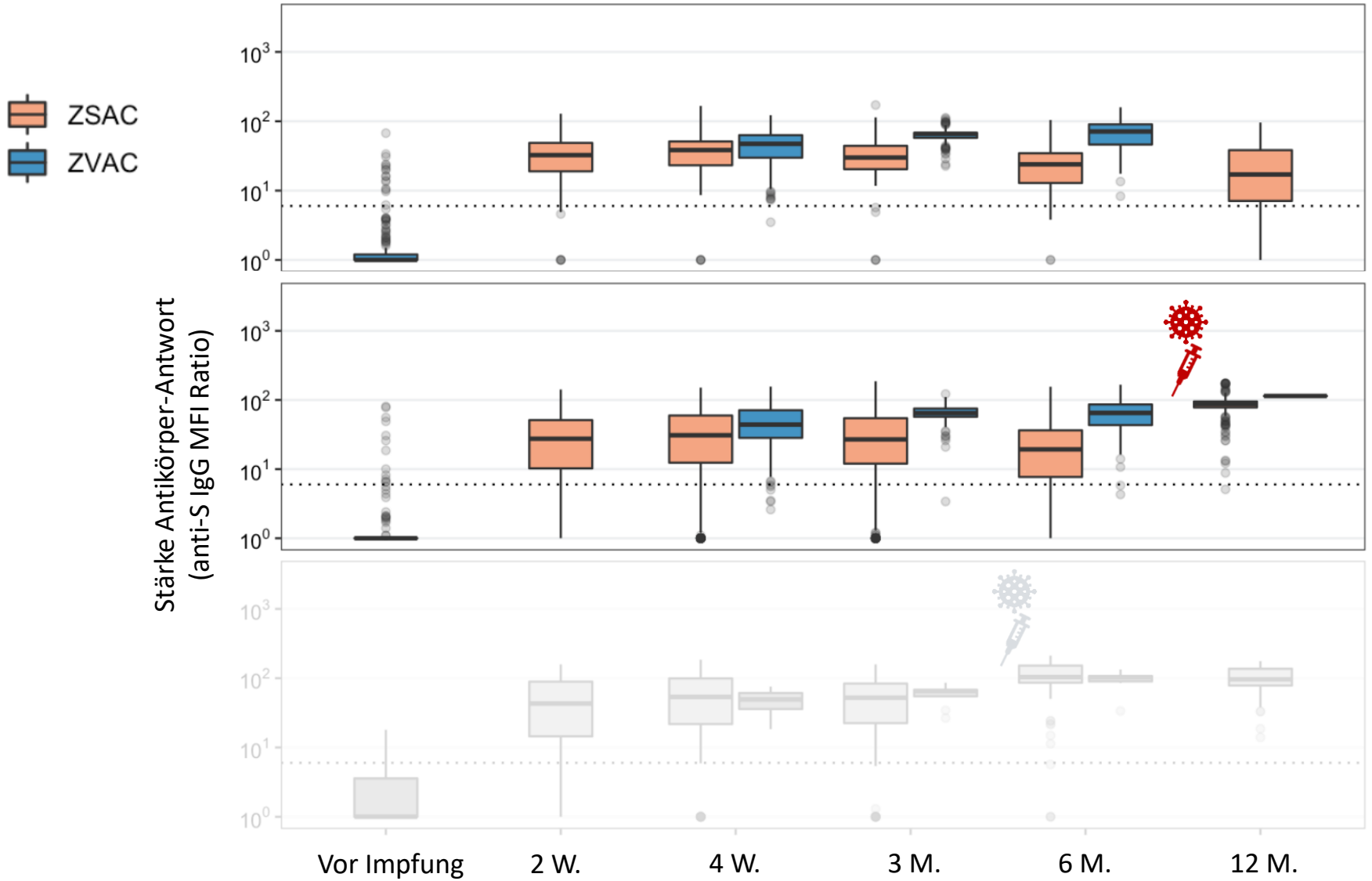


Natural course without additional infection or vaccination

Impfung/Infektion
vor 12 Monaten

Impfung/Infektion
vor 6 Monaten

Course of anti-S IgG antibodies after infection and vaccination

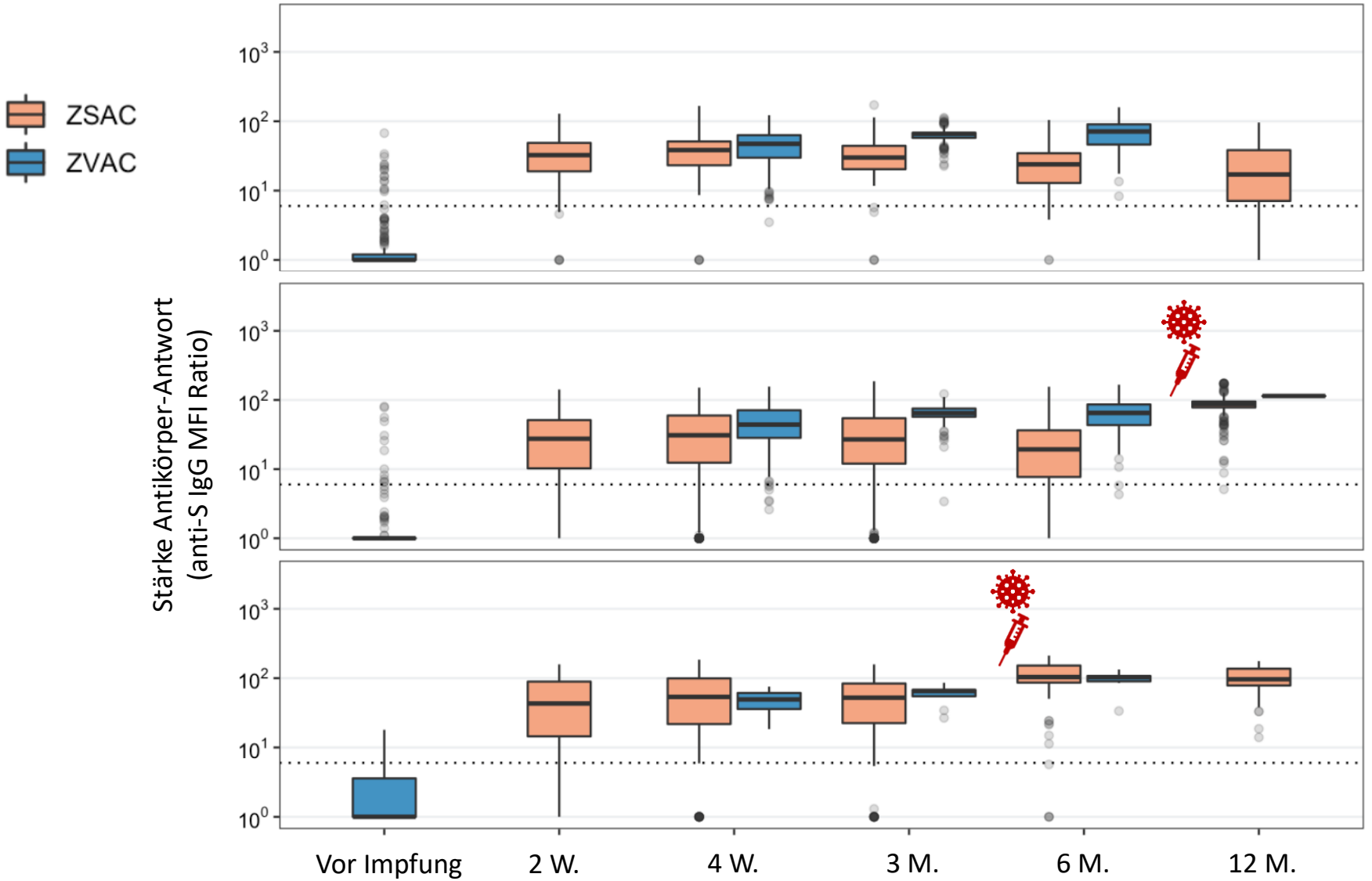


Natural course without additional infection or vaccination

Infection or vaccination before 12 months

Impfung/Infektion vor 6 Monaten

Course of anti-S IgG antibodies after infection and vaccination



Natural course without additional infection or vaccination

Infection or vaccination before 12 months

Infection or vaccination before 6 months

Potential of ZSAC & ZVAC

- ZSAC & ZVAC among very few prospective population based cohort studies of persons with PCR+ or vaccination
- Combination as twin cohorts unique, any real world combinations of infections and vaccination can be assessed
- Clinical outcomes: (re-) infections, patient reported outcomes, health care use, up tp 36 months

Upcoming analyses

- Investigation of risk factors for long covid and for unfavorable course and influence of vaccinations
- «Omicron and Long Covid» (together with Corona Immunitas)
- Detailed comparison of immune response after vaccination and infection (incl. neutralization).
- Association of immune status with (re)infections (also new variants) and other clinical outcomes
- Collaboration in international consortia (Global Burden of Disease (IHME), PRECIOUS (UK) und CoVICIS (EU)

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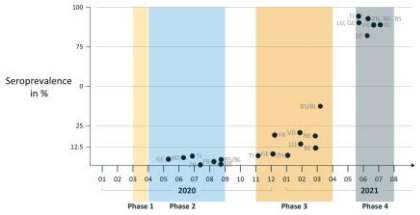
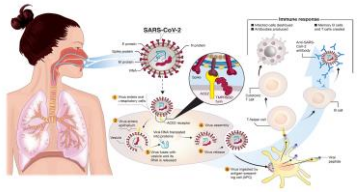
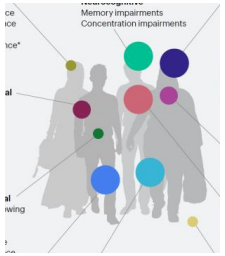
CORONA IMMUNITAS
POWERED BY SSPH+

Pandemic offers many opportunies

- First time in history to study a virus with potential for pandemic so comprehensively







- Brings together many disciplines

- Corona Immunitas greatly strenghted research collaboration across country!