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=qzx4IImG5Pes

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

Daily number of cases
Average last 7 days per 100’000 people
... nor to determine the impact of the pandemic
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.”
Science to policy – formally and informally

Federal level

Cantonal level

International level

- Schweizerische Eidgenossenschaft
- Confédération suisse
- Confederazione Svizzera
- Confederaziun svizra

Swiss Confederation

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

COVID-19

SCIENCE TASK FORCE

CONFRÈRE DES DIRECTRICES ET DIRECTEURS CANTONAUX DE LA SANTÉ

CONFERENZA DELLE DIRETRICI E DEI DIRETTORI CANTONALI DELLA SANITÀ
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 finding
SSP+ initiates and coordinates the programme
For the health of society

www.corona-immunitas.ch

Science in a minute youtube channel
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
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?

Key principles: Core protocol, maximise synergisms

- Invitation and appointment
- Appointment at the study centre or home visit
- Blood collection on the test day
- Filling in the online questionnaire several times
- Individual notification of the test result
Careful evaluation of antibody tests

Steps
1. Testing working group
2. Definition of 18 criteria
3. Public opening
4. Evaluation
5. Decision Executive Committee
Test of CHUV scored and proved to be best for our purpose

1. Well established Luminex technology

2. Trimeric spike protein

3. Validation in population sample

Key principles: Core protocol, maximise synergisms and freedom to sites for additional studies
Example of Ticino: Additional focus on elderly and nursing homes
Example of Basel: Digital cohort and focus on mental health

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

**Ciao Corona**
- **Main Goal**: To investigate seroprevalence and its temporal changes, clustering of cases within classes, schools, districts, symptoms, risk factors in a representative cohort of children and adolescents shortly after reopening of the school system and thereafter.
- **tested population**: school children age 5-16 and school employees
- **number of tested persons**: ≈15,550

**Zurich Study SARS-COV-2 Cohort (ZSCC)**
- **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.
- **tested population**: persons tested pos. for Covid-19 and close contacts
- **number of tested persons**: ≈2,000

**Zurich Study SARS-COV-2 Vaccine Cohort (ZVAC)**
- **Main Goal**: To investigate the immune response to the Corona vaccines licensed in Switzerland in the Zurich population.
- **General population**: 16+, vaccinated against SARS-COV-2
- **number of tested persons**: ≈800
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
Prevention behaviour – assessed weekly in Ticino, Romandie and German-speaking cantons

- Mask wearing where required
- Social distancing

20-64 year olds  >65

20-65 year olds  >65
Corona Immunitas reports to inform vaccination campaign

Monthly vaccination report to FOPH and cantons
- Number of vaccines delivered to special groups
- Vaccine hesitancy
- etc
Increase in seroprevalence (% with antibodies) until 2021 in 20 to 64 year olds

Ratio of diagnosed to infected ≈ 1:3
Even more impressive in 65+ old persons
Why such an Omicron wave despite the very high seroprevalence?
Seroprevalence can mean different levels of protection

Neutralizing antibodies

Non-neutralizing antibodies
Neutralizing activity vaccinated and unvaccinated participants

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Round 5 of Corona Immunitas right after Omicron wave

What % of the population has neutralizing capacity?
How well does this protect from infections and severe courses of COVID-19?
Zurich cohort studies with children, infected and vaccinated persons

Ciao Corona
- **tested population:** school children age 5-16 and school employees
- **number of tested persons:** n=10,550

**Main Goal**
To investigate seroprevalence and its temporal changes, clustering of cases within classes, schools, districts, symptoms, risk factors in a representative cohort of children and adolescents shortly after reopening of the school system and thereafter.

Zurich Study SARS-CoV-2 Cohort (ZSCC)
- **tested population:** persons tested positive for Covid-19 and close contacts
- **number of tested persons:** n=2,900

**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.

Zurich Study SARS-CoV-2 Vaccine Cohort (ZVAC)
- **tested population:** general population 18+, vaccinated against SARS-CoV-2
- **number of tested persons:** n=880

**Main Goal**
To investigate the immune response to the Corona vaccines licensed in Switzerland in the Zurich population.
Ciao Corona – school based prospective cohort study

55 schools
275 classes,
2500 children

2-10 schools from each district

1/3 each from lower, middle and upper level

Main questions

• Seroprevalence over time
• Persistence of antibodies
• Clustering of infections within classes and schools
• Physical and mental health over time
Increase in seroprevalence over time – parallel to community transmission

- Recovered
- Vaccinated and/or recovered

Pro 100,000 EinwohnerInnen

Testphase 1: 3%
Testphase 2: 6%
Testphase 3: 16%
Testphase 4: 25%

Wildtyp
Alpha
Delta
Omicron
Limited clustering of infections within classes

A – Lower school level

B – Middle school level

C – Upper school level

Zurich Coronavirus Cohort Study (ZSAC)

**Reported cases**

- Random sampling and invitation
  - N=446, 03-07 2020
  - N=1106, 08-12 2020

**Development immune reaction**

- Evaluation Contact tracing and Swiss Covid App

**Isolation & Quarantine**

**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.

**Tested population:**
- People tested positive for SARS-CoV-2 and close contacts
- Number of tested persons: n=2'000
Study design ZSAC

1552 participants
- 446 participants from 1st wave (February-August 2020)
- 1106 participants from August 2020 to January 2021

Reported cases → Random sampling

Random sampling

Blood sampling

Questionnaires

Study registration → https://doi.org/10.1186/ISRCTN14990068
First Long Covid results → https://doi.org/10.1371/journal.pone.0254523
Twin study ZVAC

Blood sampling
Questionnaires
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+

ZVAC

BL  W2  W4  W6  M3  M6  M9  M12  M18  M36

Blood sampling

Questionnaires

Study registration → https://doi.org/10.1186/ISRCTN15499304
Long Covid – Recent results

Point de presse Feb 8, 2022: [https://www.youtube.com/watch?v=bljdqPF1Fg](https://www.youtube.com/watch?v=bljdqPF1Fg)

**Per 100 persons with an infection**

- Mild impairment of health status
- Moderate impairment of health status
- Severe impairment of health status
9 out of 25 persons affected by Long Covid recover within a year, 16 not or only partly.
Immune response and infections over time after infection, vaccination and combinations thereof

ZSAC

ZVAC

Blutplasma, PBMCs
Elektronische Fragebogen

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

N=431 (+ 420)
N=1552
N=575
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

Vor Impfung 2 W. 4 W. 3 M. 6 M. 12 M.
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 to 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))
Pandemic offers many opportunities

- First time in history to study a virus with potential for pandemic so comprehensively
- Brings together many disciplines
- Corona Immunitas greatly strengthened research collaboration across country!