



From Epidemiological Evidence to Action Example Corona Pandemic

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Origin SARS-CoV-2



Zwei Coronaviren unter dem Mikroskop. Foto: Steve Patterson (Keystone)



Novel Human Virus? Pneumonia Cases Linked to Seafood Market in China Stir Concern

By Dennis Normile

The Washington Post

January 9, 2020

China Identifies New Strain of Coronavirus as Source of Pneumonia Outbreak

Source, Anthony Fauci CDC, shown at International on line CoVID-19 Conference, July 2020

Global Spread of COVID-19 – Dec. 31, 2019



Quelle: Drosten NDR Podcast Nr 35, 26..04.2020 (Originalstudien im Manuskript zum Podcast aufgeführt)



Global Spread of COVID-19 – July 5, 2020



Worldwide Situation Corona, Status, 1st May 2021

Cases: 152 Mio Deaths 3.2 Mio



Corona- Example India

- 19.5 Mio cases total (status 1. May 2021)
- 400'000 new infections/day
- Serosurvey January 2021: 24,1% positive
- Mild diseases in frist/second wave: population susceptible again
- Variant B.1.617 is newly present
- 1.6% of population vaccinated so far (Astra Zeneca and Covaxis)

Epidemiology and Monitoring

Confirmed SARS-CoV-2 cases, CH, Jun 20-Apr 21



Confirmed Deaths, COVID-19, Switzerland



Occupancy of beds, ICU, ZH, Nov 20-Feb 20

Weniger Covid-19-Patienten auf den Zürcher Intensivstationen

Anzahl Intensivbetten im Kanton, nach Status der Belegung



• Covid-19-Patienten • Andere Patienten • Freie zertifizierte Intensivbetten

Die Kapazität kann ausgebaut werden, bei nicht zertifizierten Intensivbetten ist aber unter Umständen die Betreuung schlechter.

Quelle: Gesundheitsdirektion des Kantons Zürich NZZ / nth.

Positivity of Coronatests, CH, Jun 20-Apr 21



SARS-CoV-2 Antibodies in CH Population



Quelle: Corona immunitas

Development R–Value, April 20 – April 21

Aktualisiert: 2. Mai; Datenstand: 1. Mai.



Grafik: lm/pvo • Quelle: ETH • Daten herunterladen

Corona monitoring in Sewage Treatment Plant, Zurich



Quelle. Website EAWAG, 1.5.2021

Corona-Variants, Switzerland, Status 1 May 2021

17'106 UK Variant

- 247 South African Variant
- 14 Brasilian Variant
- 24'937 Mutation N501Y
- 826 Mutation N501Y + E484K

42'726 total cases with relevant variant lineages

Mortality Risk of Sars-CoV-2 variant B.117

- Three studies in UK, one study in Denmark
- Hazard Ratio to die with UK variant within 28 days after PCR diagnosis is 60-70% higher than to die with wild type of SARS-CoV-2
- For 85yrs +: risk to die is 24% versus 16% with wild type of virus
- Risk for hospitalisation is 64% higher in B.117 variant
- -> Virus got more infectious and more dangerous



Corona – transmission pathways

- 40%-50% transmissions via droplets
- 40% transmissions via aerosols
- 10% transmissions via smear infection/contact infection
- -> Hygiene, social distancing, masks, good ventillation of rooms, outdoor activities, etc.

Corona Transmission in a bus in China, Jan 2020



Source: Tagesanzeiger, 8.9.2020, based on Jama Publication of September 2020

Corona-Outbreak, Superspreading event

- South Corea
- 29 yrs old celebrates end of Lockdown
- 5 Bars/Discos visited, asymptomatic
- 63 club goers infected + 21 relatives/family members
- Contact data of all party guests (n=1'500) were available but mostly faked/wrong

Ciao Corona Study Zürich, Sept 2020-Nov 2020



Die Universität Zürich hat bei 2'500 Zürcher Schulkindern getestet, ob sie sich mit Corona infiziert haben. (Bild: Corona Immunitas)

Ciao Corona Study, Zürich

- 2500 pupils tested for antibodies, 55 schools, 128 classes, 6-16 yr age
- Questionnaire, blood and saliva tests
- Results July 2020: 2.8% of pupils have antibodies
- Results Nov 2020: 7.8% of pupils have antibodies
- Clustering of positive pupils only in very few classes
- Next study cycle in spring 2021

Quelle: EBPI website, 1.5.2021

Clinics and Therapy



Ein Patient wird in die Notaufnahme der Covid-Klinik La Carità in Locarno geschoben, die sich vor dem Gebäude der Klinik befindet. Aufnahme vom 13. Mai 2020.

Christoph Ruckstuhl / NZZ

Corona – Damage of organs

- Lungs
- Heart
- Neurological system
- Kidneys
- Brain
- Clotting and vascular system
 - Endothelium inflamed in many vessels

Loss of smelling and tasting in COVID-19

- 6/10 Corona patients suffer from lost of smell and taste
- In 15% persisting problems for many weeks (60% more than 6 Mo)
- Virus enters mucosal cells in nose
- Therapy: smelling-training , 2x/day, each 20 seconds à 4 "odours"

Long COVID Study Zürich

- Cohort study , 413 Corona positive patients
- Resultats: 25% are not completely recovered 6-8 months after infection
- Frequent complaints: Fatigue, breathing problems, Depression

→ Create clinics for Long COVID patients (low-threshold)

COVID-19 Treatment (April 2021)

Promising

- Dexamethason
- Anticoagulantia
- Convalescent Plasma
- Monoclonal antibodies
- Budesonid
- Tocilizumab, Colchicin
- Lipopeptide Nose spray
- etc.

Not effective

- Hydroxychloroquine
- Lopinavir/Ritonavir
- Cytokine- inhibitors
- Unclear
- Remdesivir



Donald Trump verlässt das Walter-Reed-Militärkrankenhaus und schwört seither auf das Antikörper-Mittel von Regeneron. Er ^{Quelle: Drc} ^{Quelle: Drc} ^{(Originalsti} ^{(Originalsti} ^{Foto: Evan Vucci (Keystone/AP)}



Die Herstellung der Antikörperbehandlung wird mithilfe des Schweizer Pharmariesen beschleunigt, trotzdem wird es noch dauern, bis das Mittel überall verfügbar ist.

Foto: Regeneron

Monoclonal Antibodies – for prevention

- Clinical test Reg-CoV (mixture of 2 antibodies)
- Used as passive vaccination, RCT, n=400, houshold contacts of COVID-19 Patienten
- 23/237 got Covid-19 in placbo group
- 10/173 got Covid-19 in Reg-CoV group
- Emergency admission received in USA for 2 products

Inhaled Budesonide as Covid-19 treatment

- Asthma patients do have less severe COVID-19 disease
- Study Oxford University, UK, RCT, 143 Covid-19 patients
- 50% with budesoside spray in first 7 days after symptomes
- 50% no asthma spray
- Results: in Budesonide group 1/70 needed urgent medical care; in control group 10/70 → protection 91% of Budesonide against severe course of Covid-19

Diagnostics und Testing



Ob diese Person auch wirklich Kontakt mit dem Coronavirus hatte, lässt sich auch mit einem Antikörpertest nicht genau ermitteln.

A

Welcher Test macht wann Sinn?

Mit der PCR-Methode lassen sich über einen sehr langen Zeitraum zuverlässig Viren nachweisen. Der Antigen-Test hat ein kürzeres Zeitfenster. Und der Antikörpertest braucht fast zwei Wochen nach Symptombeginn, um eine überstandene Covid-19-Infektion anzuzeigen.



Corona self testing - Benefits or Harms ?

- Comparison of AG selftests with goldstandard PCR test
- Study Charité Berlin: 83% sensitivity and 99% specificity of self test in persons with COVID-19
- Study Austria: 40% sensitivity in asymptomatic cases
- Study Lausanne, CH: 70% sensitivity in symptomatic cases and 33% sensitivity in asymptomatic cases
- → self-tests are a supplementary measure in Swiss COVID test strategy
- → CAVE: feeling of *"*false security" if test is negative

Vaccination

Corona Impfstoffe



COIVD-19 vaccine types and examples

RNA Vaccines (mRNA)

Biontech Pfizer / Moderna

Astra Zenca, Johnson/Johnson, Sputnik V

Vector Vaccines (Adenovirus)

Protein based Vaccines (virus-part)
Novovax

Inactivated vaccines
 (attenuated virus)

Sinovac

Quelle: Drosten NDR Podcast Nr 75, 10..02.2021 (Originalstudien im Manuskript zum Podcast aufgeführt)

Abo Impfdaten aus Israel und Grossbritannien

Der Zauber hat begonnen

The Magic has begun !

Efficacy of Pfizer/BioNTech Vaccine

Efficacy data from Israel Israel (real world situation)

- Protects from Infection
- Protects from asympt. infection
- Protects from sympt. infection
- Protects from hospitalisation
- Protects from severe disease

92% (CI 88-96%)

- 90% (CI 83-94%)
- 94% (CI 87-98%)
- 87% (CI 55-100%)
- 92% (CI 75-100%)

Effect of national Corona Vaccine Program in Israel, December 2020 - February 2021



 14 Tage nach dem Start der Impfkampagne
 7 Tage nachdem die ersten Personen die zweite Dosis erhielten

Spitaleintritte





Quelle: Rossman H et al, preprint February 2021

Side effects of mRNA Corona-Vaccines

Pfizer/BioNTech

Moderna

9/10 7/10 pain at injection site 7/10 5/10 Fatigue 6/10 4/10 Headache 4/10 2/10 shivering 2/10 1/10 Fever

- Allergic reactions 1/100'000 – see also Penicillin 1/5'000

RNA vaccines and anaphylactic shock

- CDC analysis USA, 1.89 Mio. Biontech vaccinations
- 175 severe incidents, where of 21x anaphylactic shock
- Frequency anaphylactic Shock: 11/1 Mio.
 - 81% had pre-existing allergies
 - Average start of side effects: 13 min after vaccination
 - 20/21 cases well recovered (1 unknown)

> 15 min of surveillance after vaccination and good anamnesis regarding allergies

Quelle: Drosten NDR Podcast Nr 71, 13.01.2021 (Originalstudien im Manuskript zum Podcast aufgeführt)

Astra Zeneca Vaccine – Efficacy and safety

- Dec 2020 data from phase III studies, n= 17'100, from 3 countries
- Protection against COVID-19 disease 70%, 3 months after vaccination
- No hospitalisations in vaccinated group
- Protection of mild disease in South African variant: 21%
- 175 "adverse serious events"; new reports about venous brain thrombosis and thrombocytopenia, mainly in young women
 - → change of indication in many countries (only >60yrs old persons vaccinated with AZ in Germany, France, etc.)

Effect of Pfizer/BioNTech vaccine in Sars-CoV-2 variants



Quelle: Liu Y et al. Neutralizing activity of BNT162b2-elicit serum. N Eng J Med 2021; 384,15

Duration of antibody protection against Covid-19

- Study Wuhan, published in Lancet
- Household survey, (n=9'500 infected persons from 3'600 housholds)
- Immunoglobulines tested 3 x in Apr 20, June 20 and Dec 20
- IGG: 100% ->97,5% -> 91%
- IGM: 13% ->3.9% ->1.5%
- IGA: 15.8% ->10% -> 3.5%

Protection of mucosa is getting lost over time \rightarrow Booster vaccination

Corona Vaccination CH, Status 1 May 2021

- 2'630'000 Doses vaccinated
- 936'000 Fully vaccinated (2x; 10.8% of population)
- 778'000 Partially vaccinated (1x; 9% of population)

38.5 Mio doses ordered

Public Health Reaction



Im Bild: Daniel Koch, Alain Berset und das neue Coronavirus.

Mask protection against SARS-CoV-2

- WHO review shows reduction of transmission risk up to 80%
- Masks protect environment and those wearing the mask
- US: Cities with mandatory use of face masks have lower case numbers
- DE: case study of Jena shows clear effect of wearing masks
 - ⇒ Masks protect, they should be combined with other hygiene measures



Der Test mit einer Stoffmaske: Auf dem Bild ganz links sieht man, dass der abgebildete Bereich vor der Maske nur 5 Zentimeter misst. Die Tröpfchen werden stark abgebremst und der grösste Teil zurückgehalten. Fotos: PD **Neues Coronavirus**

Aktualisiert am 9.10.2020



Wichtiger denn je: Anstieg der Infektionszahlen stoppen.



Abstand halten.

Maske tragen, wenn Abstandhalten nicht möglich ist. Gründlich Hände waschen.

Public Health Measures Switzerland

Die Schweiz lockert die Massnahmen ab 1. März

Der Oxford-Stringency-Index zeigt, wie hart die Einschränkungen in der Schweiz sind



Quelle: Universität Oxford



Monitoring criteria of Federal council, 4/2021

Am 14. April will der Bundesrat anhand von fünf Richtwerten entscheiden, ob Öffnungsschritte erfolgen können. Aktualisiert: 12. April 2021

Kriterium	Aktuell	Richtwert
14-Tages-Inzidenz	304	< 230 ¹
O IPS-Belegung Covid-19	201	< 250
R-Wert	1.14	<1
Hospitalisierungen (7-TgØ)	60	< 54.4 ¹
Todesfälle (7-TgØ)	11	< 7.3 ¹

1) Darf nicht höher sein als beim letzten Öffnungsschritt am 22. März 2021.



Ein neuerlicher landesweiter Lockdown soll vermieden werden. Foto: Reto Schlatter (Keystone)

Pandemic Defense - The Swiss Cheese Model



Source Marcel Tanner, Speech at FFHS on 20.April 2021

Tension fields – Corona Control

- Solidarity vs individual freedom
- Effectiveness vs efficacy of measures
- Cost-benefit analysis of all measures
- Economy vs health
- Silo thinking vs holistic reasoning
- Public Health ethics
- One solution fits all?

Herdimmunity as strategy ?



Pandlar in Takio: Dia Maskan- und Abstandereraln aufzuhahan und dar Enidamia fraian Lauf zu lassan, ist kaine Ontion 👘

Yuichi Yamazaki / Getty

Herdimmunity as strategy - the problems

- Duration of immunity after infection is still unclear
- Only limited signs of effective cross-immunity of SARS-CoV-2
- It takes many years to reach herdimmunity
- Much effort needed to protect the persons at risk
- Many deaths to be expected when pandemic takes it's own course
- Danger of setting damage to HC system; long term effects of covid
- Big societal and economic consequences

Source: Task Force Bund Covid-19, 15. September 2020 Policy Brief

How the pandemic might play out in 2021 and beyond

- Nature article, August 2020, predictions of various experts
- Covid-19 is here to stay
- Infections continue to spread at slow burn
- Intermittent lockdowns are the "new normal"
- Approved vaccine offers some protection, but distribution is slow
- Future depends on lots of unknown factors (such as duration of immunity, seasonality, etc.)
- We have no precedent. We are in a pandemic.





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