Swiss TPH

What did you want to know about COVID-19?

Jürg Utzinger and Swiss TPH Team

Zoomlandia, 30 September, 2021

Outline of COVID-19 Health Issues

“COVID-19 anywhere is COVID-19 everywhere”

Agenda

Welcome and Introduction
The SARS-CoV-2 pandemic as a Driver of International Collaboration and Technology Development
Modelling analyses to support the COVID-19 response in Switzerland and beyond
How Can Systems Thinking Promote Social Protection during a Health Crisis?
Climate Change and COVID-19: What's the Connection?
Closing Remarks and Q&A

Claudia Daubenberger
Unit Head
Clinical Immunology

Andrew Shattock
Senior Scientist
Disease Modelling

Daniel Cobos
Project Leader
Health Systems Support

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Unit Head
Climate Change and Health

Daniel Paris
Head of Medicine

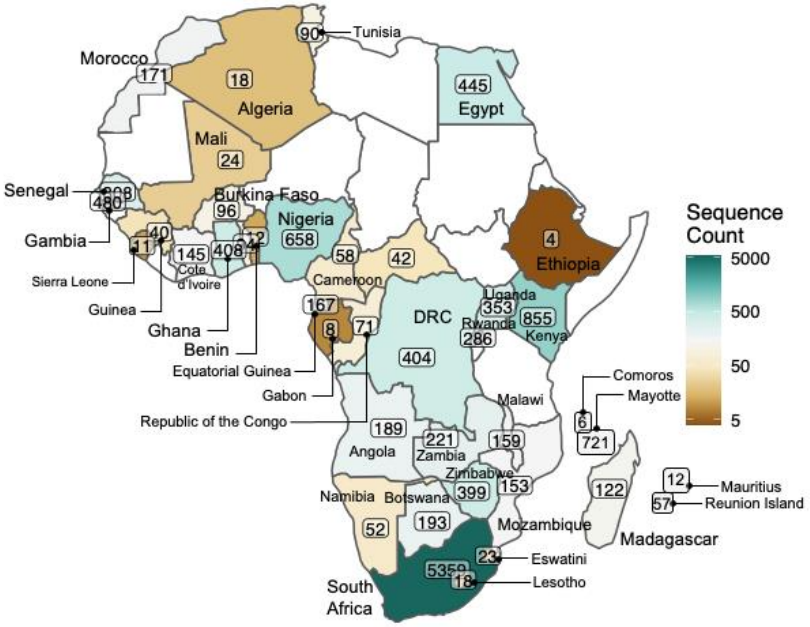
Swiss TPH

The SARS-CoV-2 pandemic as a driver of international collaboration and technology development

Claudia Daubenberger
Unit Head, Clinical Immunology

A year of genomic surveillance reveals how the SARS-CoV-2 pandemic unfolded in Africa

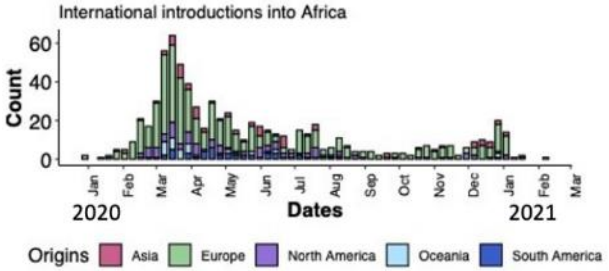
- A consortium of 302 researchers from 107 African and 30 partner institutions jointly analysed and described the genomic epidemiology using a dataset of 8746 genomes from 33 African countries and two overseas territories
- Together with our colleagues from the Ministry of Health we participated in this study with 167 whole Sars-CoV-2 genomes from Equatorial Guinea
- **Message: Africa must not be left behind in the global pandemic response, otherwise it could become a breeding ground for new variants.**

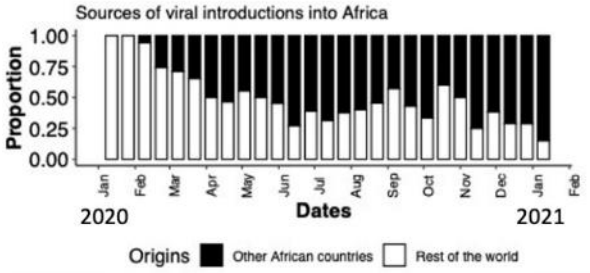


Taken from E. Wilkinson et al., Science 10.1126/science.abj4336 (2021)

A year of genomic surveillance reveals how the SARS-CoV-2 pandemic unfolded in Africa

- In the beginning of the pandemic (January – March 2020), the epidemics in most African countries were initiated by importations predominantly from Europe
- The number of introductions were reduced following the implementation of international travel restrictions / collapse of international travel
- As the pandemic progressed, population based transmission and resumed mobility led to the spread within the continent





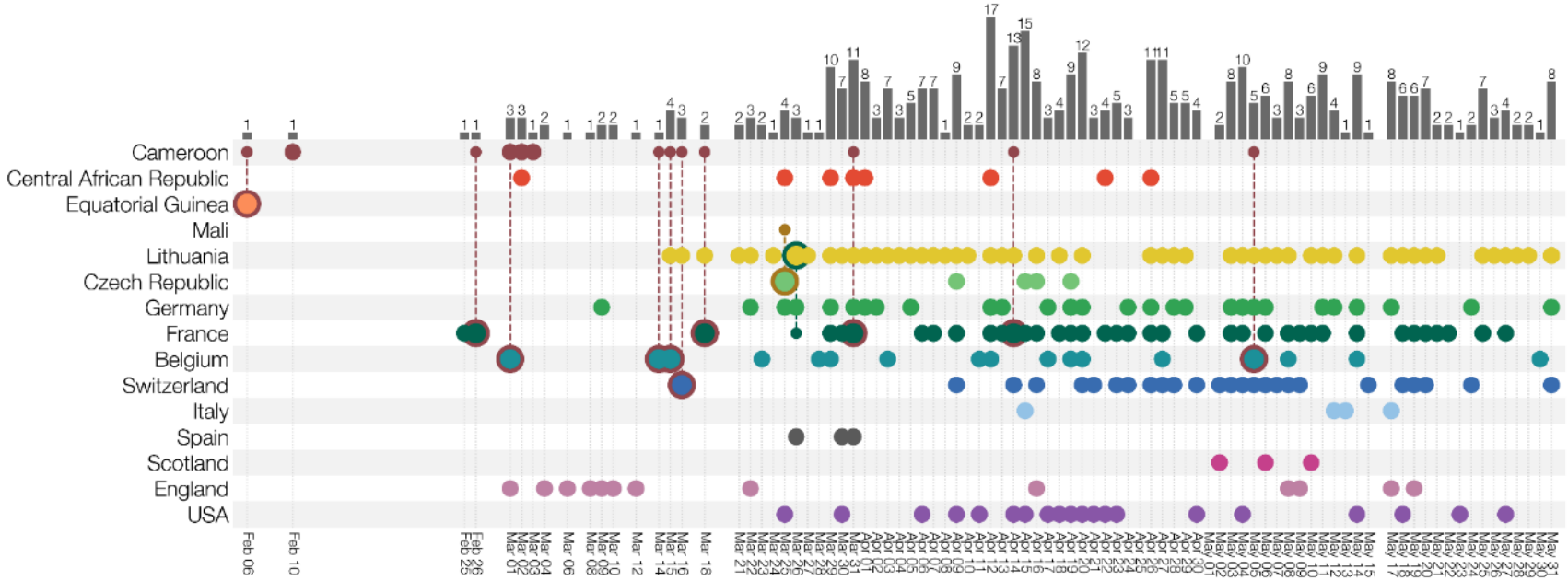
Taken from E. Wilkinson et al., Science 10.1126/science.abj4336 (2021)

The Emergence and Spread of the Beta variant in Africa

- The emergence and spread of many variants of concern and variants of interest were recorded
- The Beta variant (lineage B.1.351), first reported in South Africa, became the dominant variant across the continent within few weeks

Taken from E. Wilkinson et al., Science 10.1126/science.abj4336 (2021)

How the worrisome Variant B.1.620 of central African Origin was introduced to Europe by travel



Variant B1.620 is circulating widely in central Africa but has been undetected because of limited sequencing capacity. This highlights the risk posed by regional inequalities in genomic surveillance of the virus.

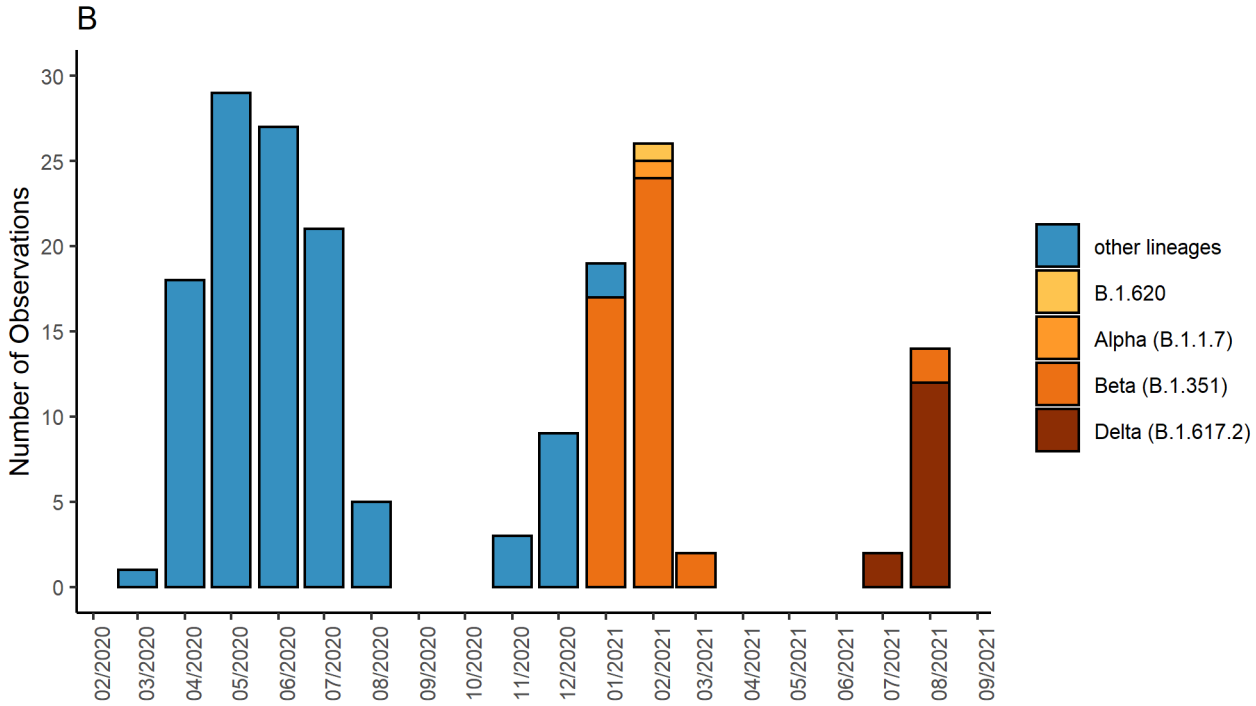
National Reference Laboratory for Sars-CoV-2 Surveillance

Entrance

Molecular Biology Section

Pictures: Courtesy of Elizabeth Nyakarungu, Baney, Equatorial Guinea

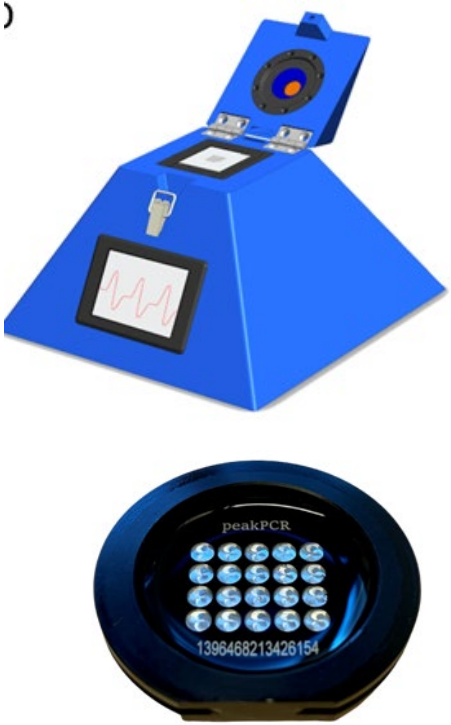
Waves of Sars-CoV-2 outbreaks in Equatorial Guinea are dominated by distinct virus variants



Hosch et al., unpublished

Point-of-care identification of Sars-CoV-2 Variants of Concern

- Our diagnostic assays detect the E484K and N501Y SNPs as well as a spike gene deletion (HV69/70) and can be run on standard laboratory equipment or on the portable rapid diagnostic technology platform peakPCR.
- The peakPCR platform completed sample analysis in 37 minutes, which is half of the time required to run the same assay on a standard RT-qPCR platform while retaining comparable efficiency, specificity and sensitivity.
- No significant difference in diagnostic performance between lyophilized reagents and standard commercially available RT-qPCR mixes were observed
- Further development of a PoC Sars-CoV-2 assay now focuses on sample preparation (replacing lab-based RNA extraction)



Taken from Bechtold et al., under revision in Analytical Chemistry

Acknowledgments

- **Sars-CoV-2 surveillance in EG:**
- His Excellency, Vice Minister of Health Mitoha Ondo'o Ayekaba
- Dr. Max Mpina, Elizabeth Nyakurungu,
- **MinION Sequencing/bioinformatics:** Tobias Schindler, Salome Hosch
- **Point-of-care PCR:** ETH Zürich/Diaxxo AG, Michele Gregorini, Philippe Bechtold & Amalia Ruiz Serrano
- **Sars-CoV-2 VOC RNA:** Laboratory Spiez, Denise Siegrist & Olivier Engler

Thanks You for your attention

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Modelling analyses to support the COVID-19 response in Switzerland and beyond

Andrew Shattock
Senior Scientist, Disease Modelling

This talk

Modelling analyses to support the COVID-19 response in Switzerland and beyond

- Early contributions: pan-Europe
- An individual-based model for Switzerland
- OpenCOVID: a setting-agnostic model

First wave in Europe:
spring & summer 2020

Second & third waves in Switzerland:
up to summer 2021

Beyond summer 2021

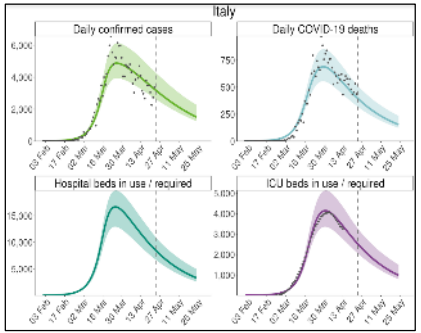
Early contributions: pan-Europe

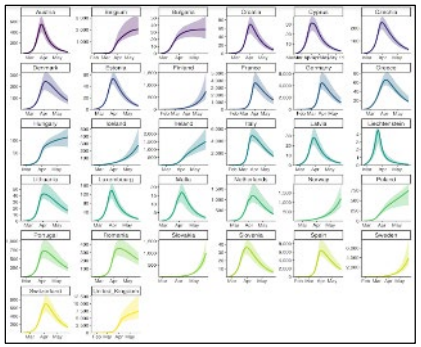
Q) How many cases, hospitalisations, deaths will occur?

Q) What has been / will be the impact of interventions?

Q) When can we relax these measures?

- Developed a dynamic population-based transmission model
- Modelling impact of NPIs, testing, and contact tracing
- Calibrated to all EU member states + Switzerland at the national level



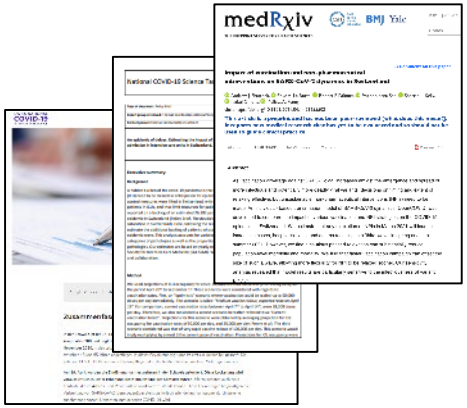


An individual-based model for Switzerland

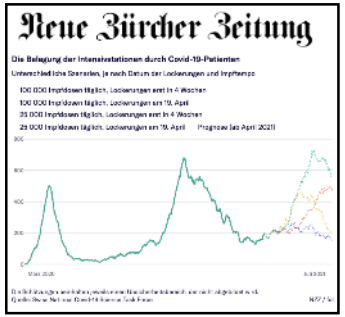
Q) What impact can we expect from interventions?

Q) Can NPIs be relaxed with a given vaccine coverage?

Q) What will be the impact of recently-emerged viral variants?



- Developed an individual-based model calibrated to Switzerland at the cantonal and national level
- Model is open source and uses publicly available data, funded by BRCCH
- Used extensively to provide quantitative evidence for decision making: FDHA, FOPH, and others via Swiss COVID-19 Science Taskforce
- Outputs reported by national media



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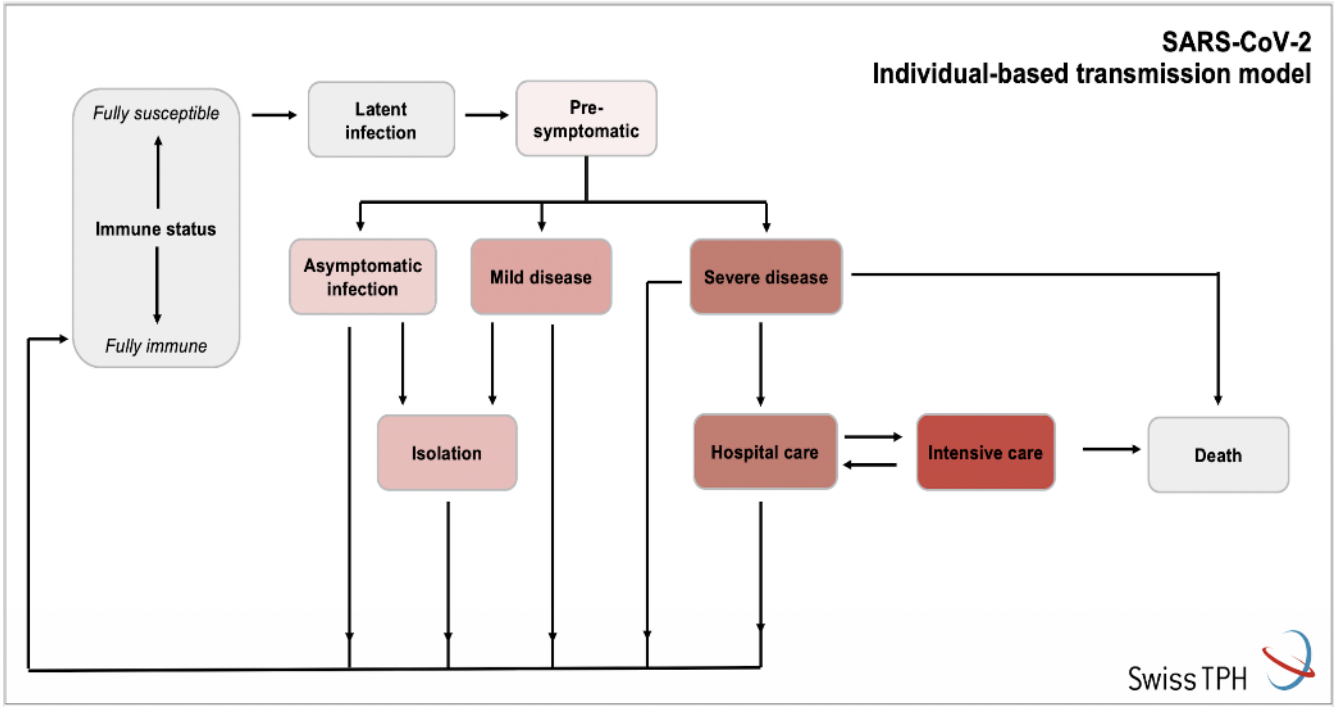
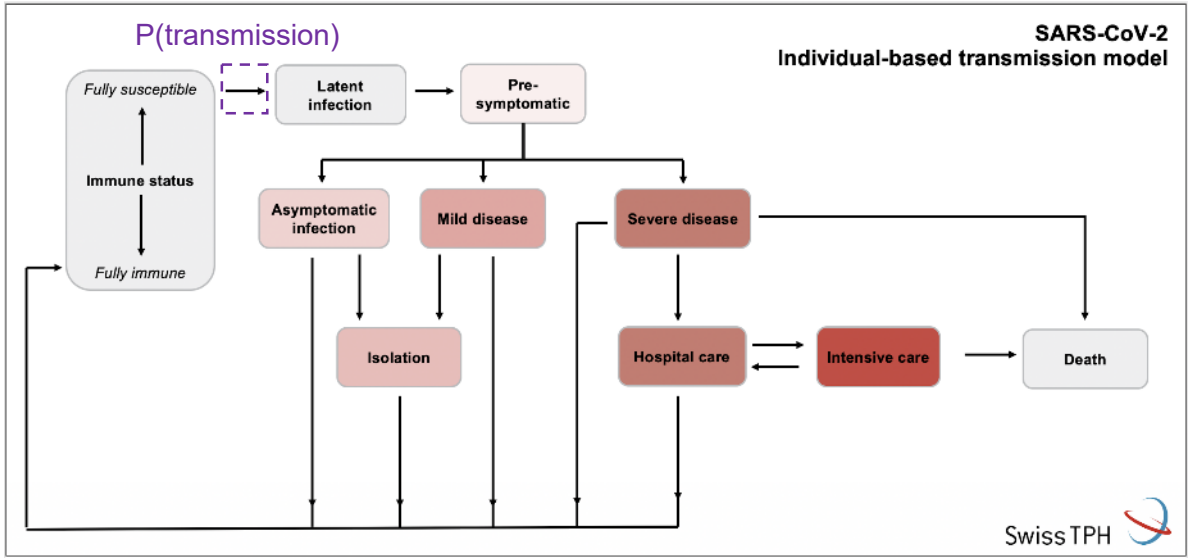
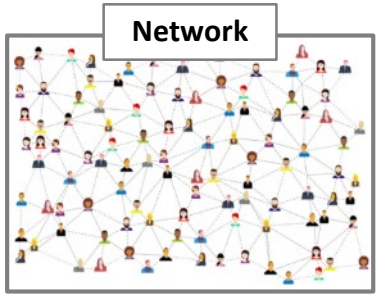
BRC CH Botnar Research Centre for Child Health

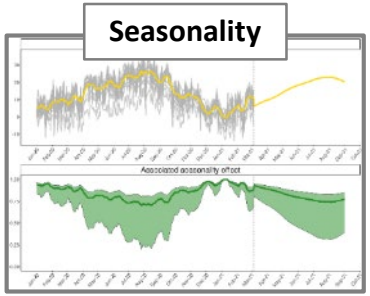
An individual-based model for Switzerland

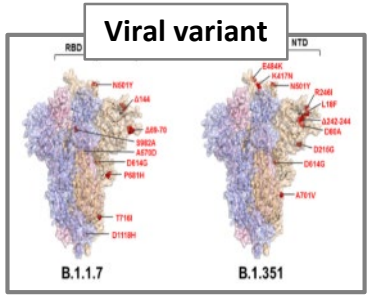


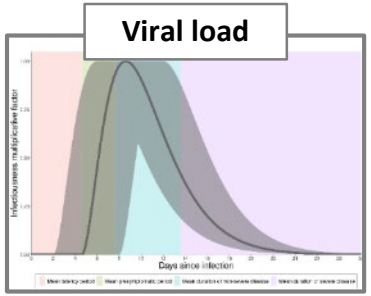
An individual-based model for Switzerland

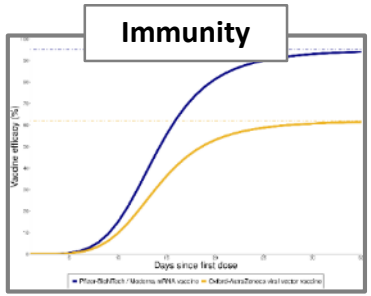






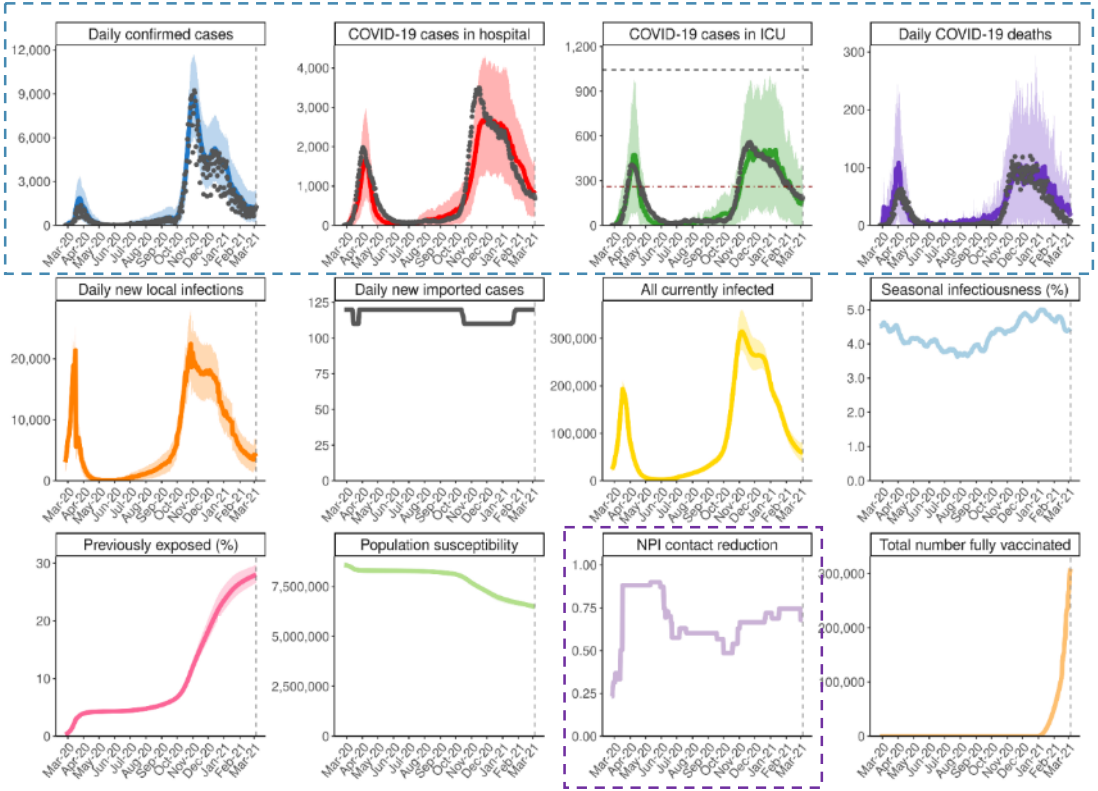






An individual-based model for Switzerland

Effect of NPIs is assumed proportion to the Oxford Containment and Health Index

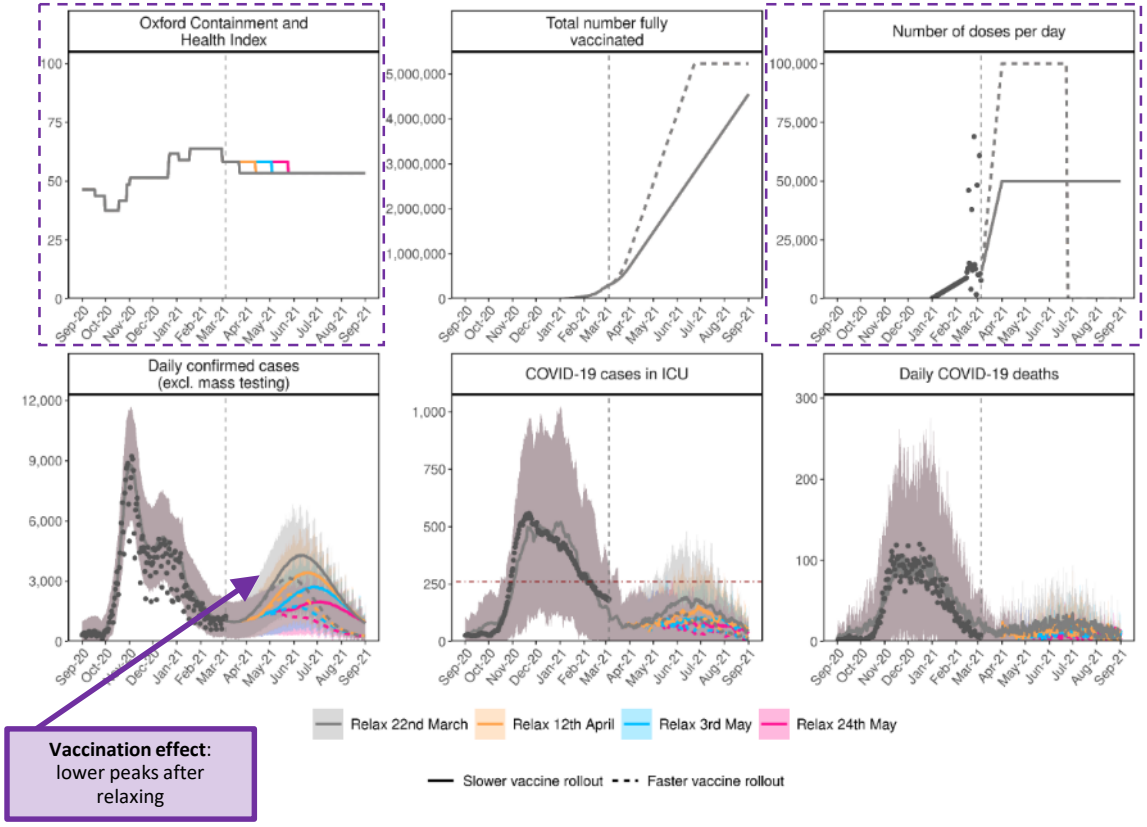


Data we align to

NPIs reduce effective contacts

An individual-based model for Switzerland

The health gain of **delaying openings** as we **scale up vaccination**



Vaccination effect: lower peaks after relaxing

Approx. 5 percentage points on the OCHI

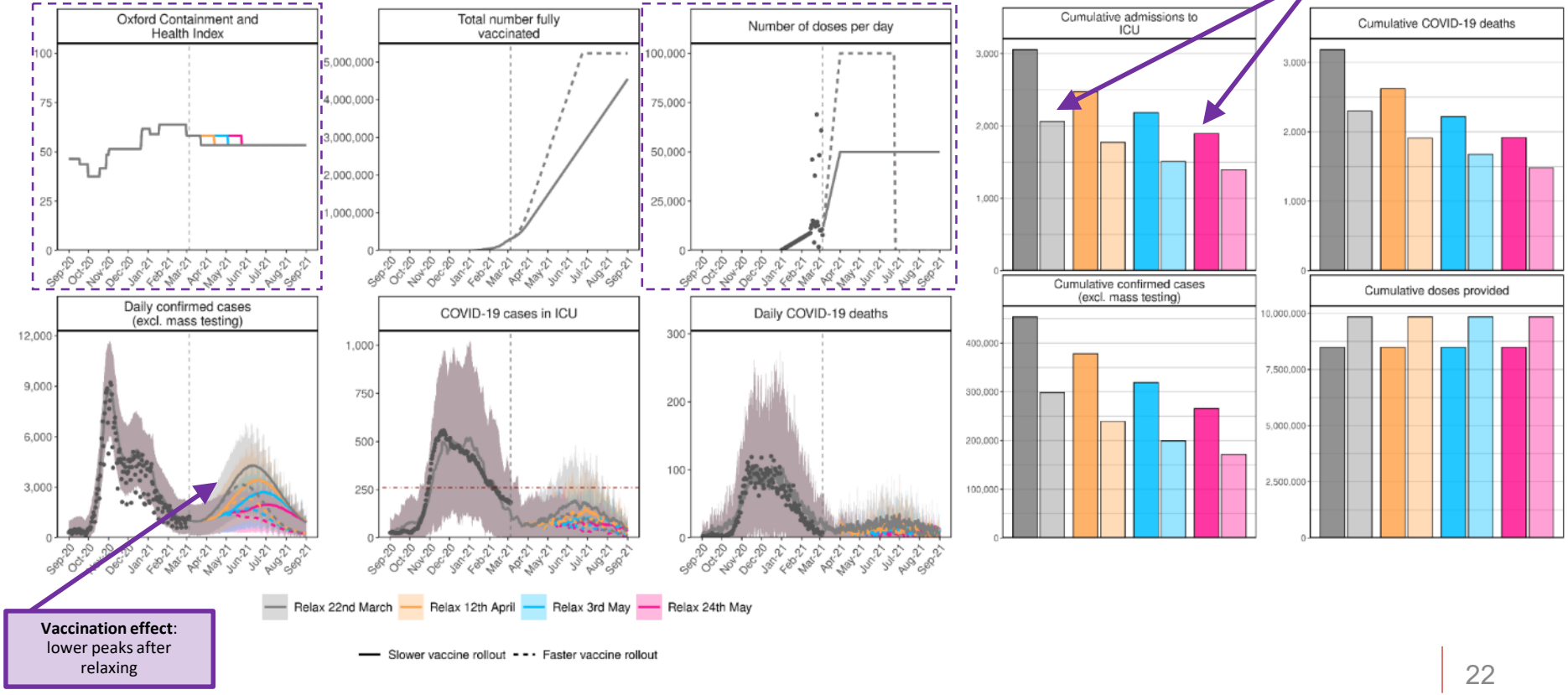
Öffnungen

- **Private Veranstaltungen im Innenbereich**: max. 10 Personen
- **Professionelle Veranstaltungen Kultur, Freizeit und Sport**: mit Maske und Abstand, nur sitzend, Konsumation nur im Aussenbereich (s.u.), maximale Anzahl Zuschauende drinnen und (höhere Zahl) draussen und nur max. 1/3 Kapazität.
- **Sport und Kultur innen für Erwachsene:** analog Regelung Oktober 2020 (15 Personen pro Gruppe, kein Körperkontakt, kein Wettkampf; Abstand und Maske oder grosser Raum, Verbot Chormusik)
- **Bildung vor Ort innen:** Erleichterungen für Volkshochschulen, Kurse von privaten Anbietern (z.B. Pro Senectute), max. 15 Personen
- **Restaurants Aussenbereich**: mit Bedienung, nur sitzend, 4-er Tische, Abstand zwischen den Tischen, Kontakterhebung etc.
- **Läden**: Anpassung Kapazitätsbeschränkungen

An individual-based model for Switzerland

The health gain of **delaying openings** as we **scale up vaccination**

Vaccination effect:
Gains achieved from fast vaccination similar to gains from 2-3 month delayed openings



Vaccination effect:
lower peaks after relaxing

OpenCOVID: a setting-agnostic model

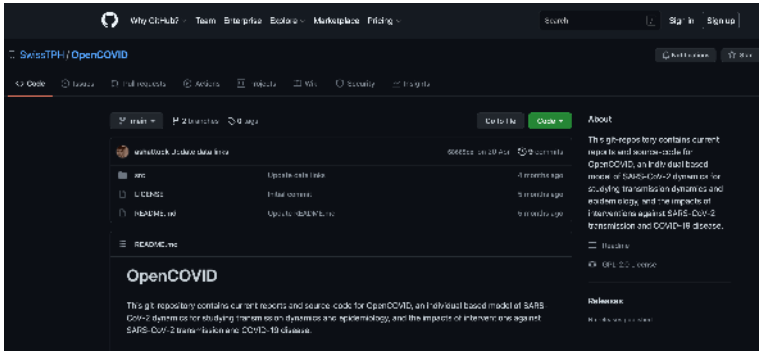
Q) What variant properties are likely to hinder epidemic control?

- *e.g. increased infectiousness, immuno-escaping*

Q) How does this vary for different settings?

- *e.g. vaccine coverage, seroprevalence, waning immunity*

Q) What will the response need to look like in such situations?



- Extended, generalized version of the individual-based model for Switzerland
- Identifying key vaccine-variant trade offs, applicable to a wide range of settings
- Latest version soon to be made publicly available

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FNSNF
Swiss National Science Foundation

BRC CH Botnar Research Centre for Child Health

Thank you for your attention

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Melissa Penny

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- Swiss Federal Office of Public Health

FNSNF Swiss National Science Foundation

University of Basel

BRC CH Botnar Research Centre for Child Health

sciCORE Center for scientific computing

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How Can Systems Thinking Promote Social Protection during a Health Crisis?

Daniel Cobos, Project Leader

We need to acknowledge complexity

COVID pandemic disrupting social protection systems

Calls to helplines

Online searches

370 mil.

Children depend on school meals

Social protection systems impacting the COVID19 pandemic

Fear of deportation and stigmatization

We need to acknowledge complexity

These are "wicked" or complex problems

"A class of social problems which are **ill-formulated**, where the information is **confusing**, where there are many clients and decision makers with **conflicting values**, and where the **ramifications** in the whole system are thoroughly confusing"

Buchanan et al. 1992

Expert driven, single focus and top-down approaches are not very useful

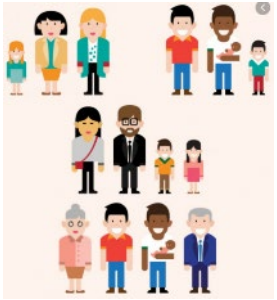
We need to acknowledge complexity

These are “wicked” or complex problems

1. Multiple stakeholders involved with divergent views, assumptions and values
2. Unintended consequences difficult to predict
3. Solutions dependent on mental models

Multiple stakeholders

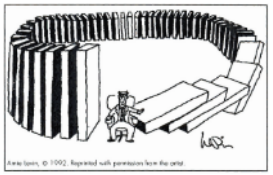
The importance of understanding mindsets



In order to lessen resistance to change we need to map out:

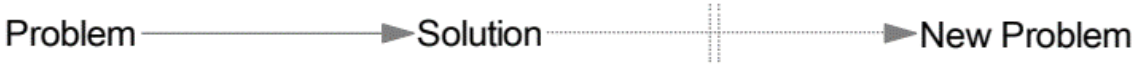
- Personal drivers
- Organisational or institutional drivers
- Political drivers

Unintended consequences

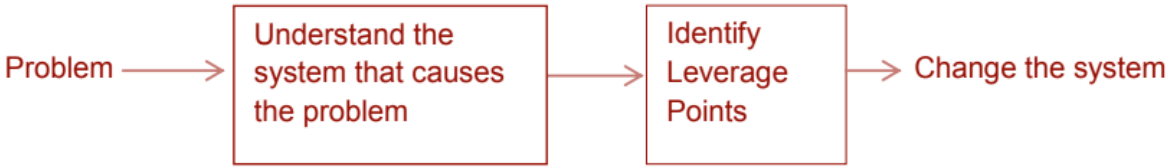


Problem framing versus problem solving

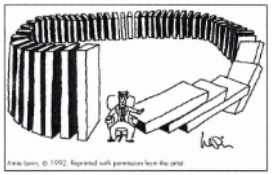
Usual approach



Systems thinking approach



Unintended consequences



Problem framing versus problem solving

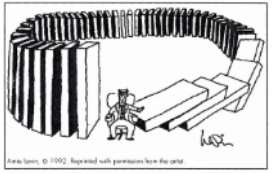
Missed opportunities in responding to violence against women and girls

Women experiencing violence are not detected in the health care system

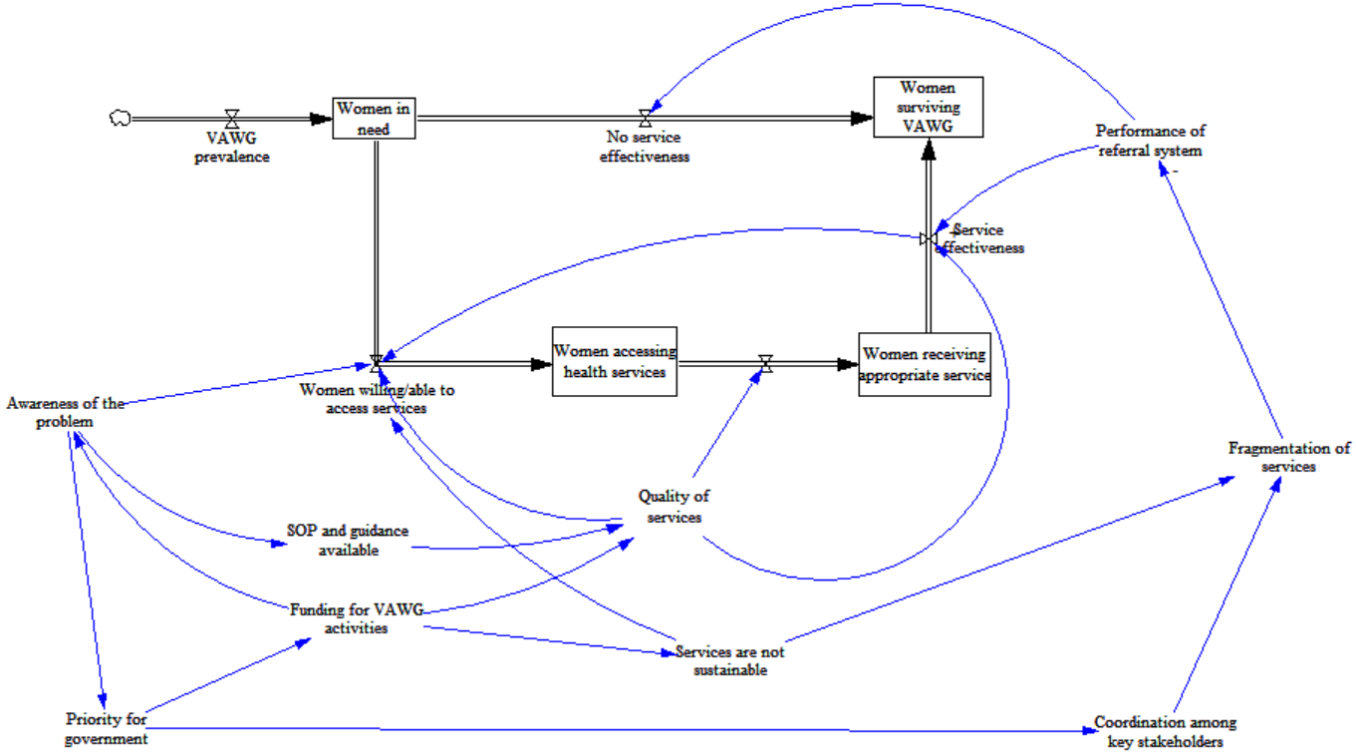
→

Develop a protocol for health professionals

Unintended consequences

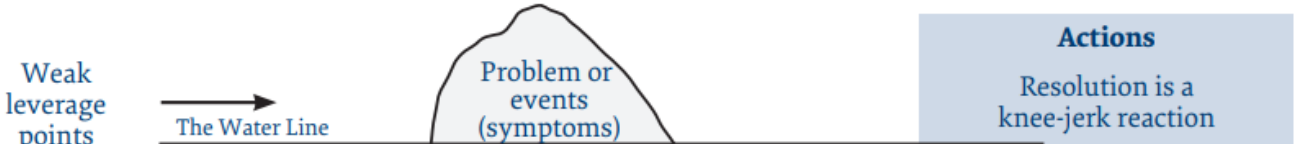


Problem framing versus problem solving



Solution dependent on mental models

The iceberg model…



Hassan et al. 2020

To sum up

Systems thinking can…

- ✓ Provide a broader perspective on situations and problems
- ✓ Allows you to see “below the tip of the iceberg”
- ✓ Predict unintended consequences and understand underlying patterns and mental models

It is a discipline to be “less wrong”

Final message

We need a paradigm shift to create more cohesive, inclusive and equal societies

- ✓ Working together
- ✓ Understanding root causes and limiting unintended consequences – not enough to reduce complex problems to single figures in mathematical models
- ✓ Agile and strategic decision making

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Climate Change and COVID-19: What's the Connection?

Guéladio, Cissé
Unit Head, Climate Change and Health

This Presentation

1. What are the major planetary challenges?
2. What are the connections between COVID-19 and Climate Change?
3. What have been the responses to COVID-19?
4. What lessons are taken from the responses to COVID-19 that could be helpful for future Climate Action?

The most important risks to the planet?

- Natural habitat destruction
- **Climate crisis**
- Loss of Biodiversity
- Drowning in waste
- Water crisis
- Food crisis

International Journal of *Environmental Research and Public Health*

MDPI

Review

Transdisciplinary Research Priorities for Human and Planetary Health in the Context of the 2030 Agenda for Sustainable Development

Kristie L. Ebi [1,*], Frances Harris [2], Giles B. Sioen [3,4], Chadia Wannous [5], Assaf Anyamba [6], Peng Bi [7], Melanie Boeckmann [8], Kathryn Bowen [9,10,11], Guéladio Cissé [12,13], Purnamita Dasgupta [14], Gabriel O. Dida [15,16], Alexandros Gasparatos [17], Franz Gatzweiler [18], Firouzeh Javadi [19], Sakiko Kanbara [20], Brama Kone [21,22], Bruce Maycock [23], Andy Morse [24], Takahiro Murakami [19], Adetoun Mustapha [25], Montira Pongsiri [26], Gerardo Suzán [27], Chiho Watanabe [4] and Anthony Capon [28]

… diseases, deaths, pandemics **Planetary Health!!!**

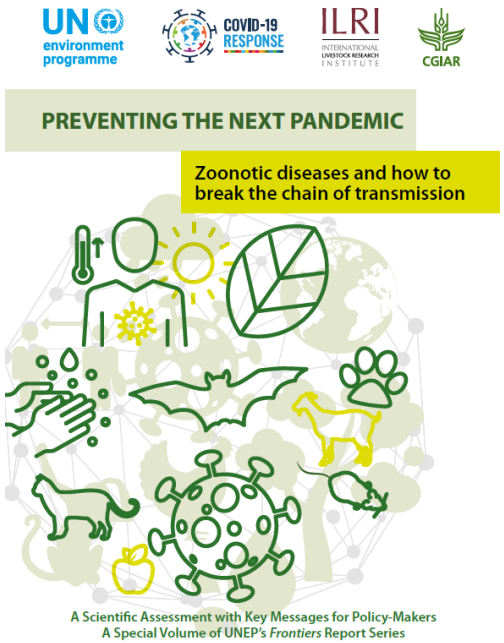
… **human health impacts** from **disruptions of Earth's natural systems**

… **pandemics (COVID-19)** **Climate change**

(Source: Systems Change Alliance; Ebi et al 2021

Climate change and COVID-19 interlinkages?

- Vast amount of research on climate change
- Climate change … a problem for the entire planet
- Limited information on COVID-19
- COVID-19…. a pandemic, rapidly expanded planet
- They are both:
  - Huge in scale, with high death tolls
  - Important “shocks”, public “bads”
- The have both:
  - suffered from delayed, insufficient or mistaken actions
  - highest impacts on the most vulnerable people



(Source: Fuentes et al 2020, UNEP 2020, The Lancet 2021)

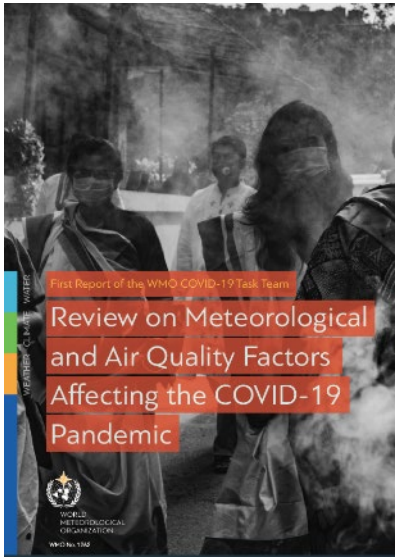
Climate change and COVID-19 interlinkages?

- "… the virus survives longer under cold, dry and low ultraviolet radiation conditions"

No evidence of a direct connection between climate change and the emergence or transmission of COVID-19 disease

- Key anthropogenic drivers : agricultural intensification, increased demand for animal protein, conversion of land and **climate change**
- Strong link between air pollution and higher rates of COVID-19-related deaths

Climate role on COVID-19 emergence: indirect, through major planetary disruptions affecting **human-animal-environmental health**



(Source: WMO 2021; UNEP 2020)

Responses to COVID-19 ?

- Health authorities slow to recognize the gravity
- At least 150 millions diagnosed with COVID-19 (as of May 2021), hundred of thousands died
- Governments forced to strict lockdowns and massive financial investments
- Governments had, by August 2020, put in place short-term recovery measures estimated to cost at least US$11.8tn or 8.7% of global GDP (World Bank, 2020)
- On average, government debt ratio to GDP would rise by almost 20 % by end-2022 for the OECD countries

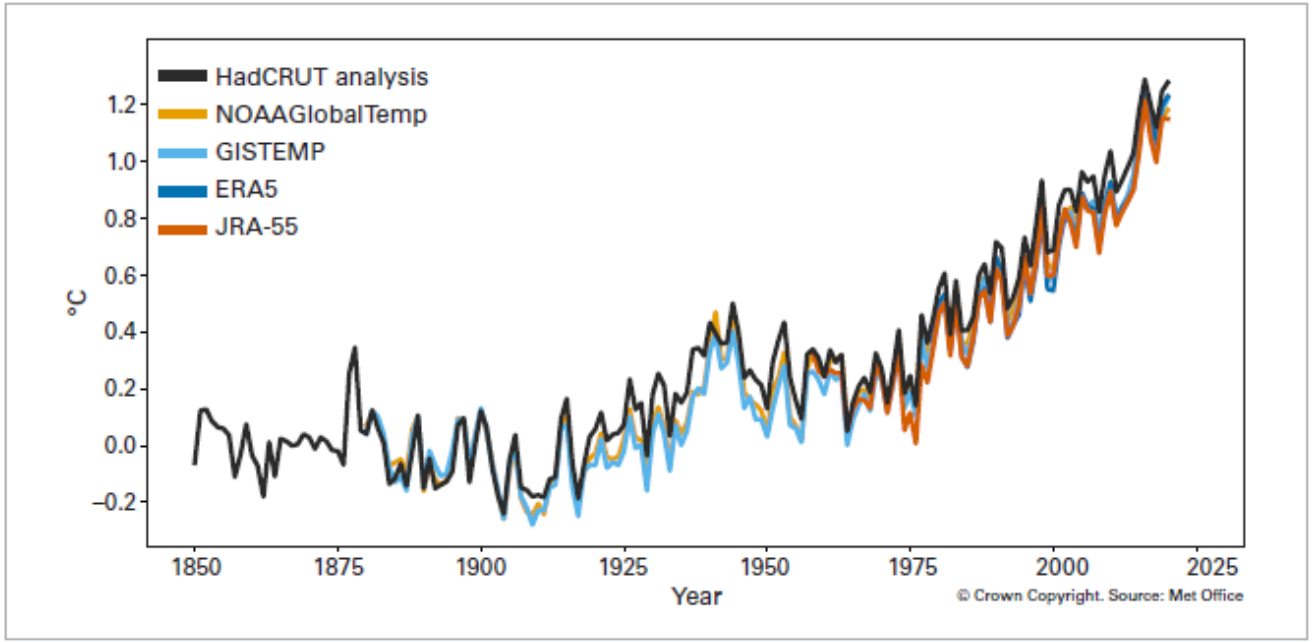
(Source: Swiss TPH 2021, OECD 2020, WMO 2021)

Responses to COVID-19, … and climate change ?

- Global carbon dioxide emissions dropped about 7% in 2020
- At end of restrictions and lockdowns, emissions returned to their normal climb
- 2011-2020: the warmest decade on record (WMO). The six warmest years have all been since 2015
- In 2020, the average global temperature is already about 1.2° C warmer than the preindustrial times
- There is at least a one in five chance of exceeding 1.5° C by 2024

(Source: WMO 2021

Responses to COVID-19, … and climate change ?



Global annual mean temperature difference from pre-industrial conditions (1850–1900) for five global temperature data sets

(Source: WMO 2021

Lessons from Responses to COVID-19?

- Increased belief in science in general (vaccines)
- Infectious diseases (COVID-19): **effects immediate** and hitting directly
- Climate change: slow motion, effects **less visible**, less concentrated
- Overlapping impacts : the two crises to be **tackled concurrently**
- UNFCC, National Determined Contributions (NDCs) COP26, to step forward with enhanced commitments, **COVID-19 and climate crisis in tandem**

(Source: Swiss TPH, The Lancet Planetary Health 2021

Lessons from Responses to COVID-19?

- COVID-19 highlighted how vulnerable are all countries in an interconnected world, **even richest countries like Switzerland*** Martina Ragettli (Lessons learned from COVID-19 for the climate crisis)
- Climate crisis: major threat to the capacity for a good pandemic response (need **One Health**)* Jakob Zinsstag (“One Heath” and climate change)
- Rapid and radical action is possible and humans can handle together a global crisis, **global cooperation**, **health systems** strengthening* Daniel Cobos (System thinking to face dual threats: acknowledging complexity)
- Global community: to move beyond sector-specific crisis reactions

(Source: Swiss TPH, UNEP 2020)

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Closing Remarks and Q&A

Jürg Utzinger, Director
Daniel Paris, Head of Medicine

Summary

Immunology

Global Ecology

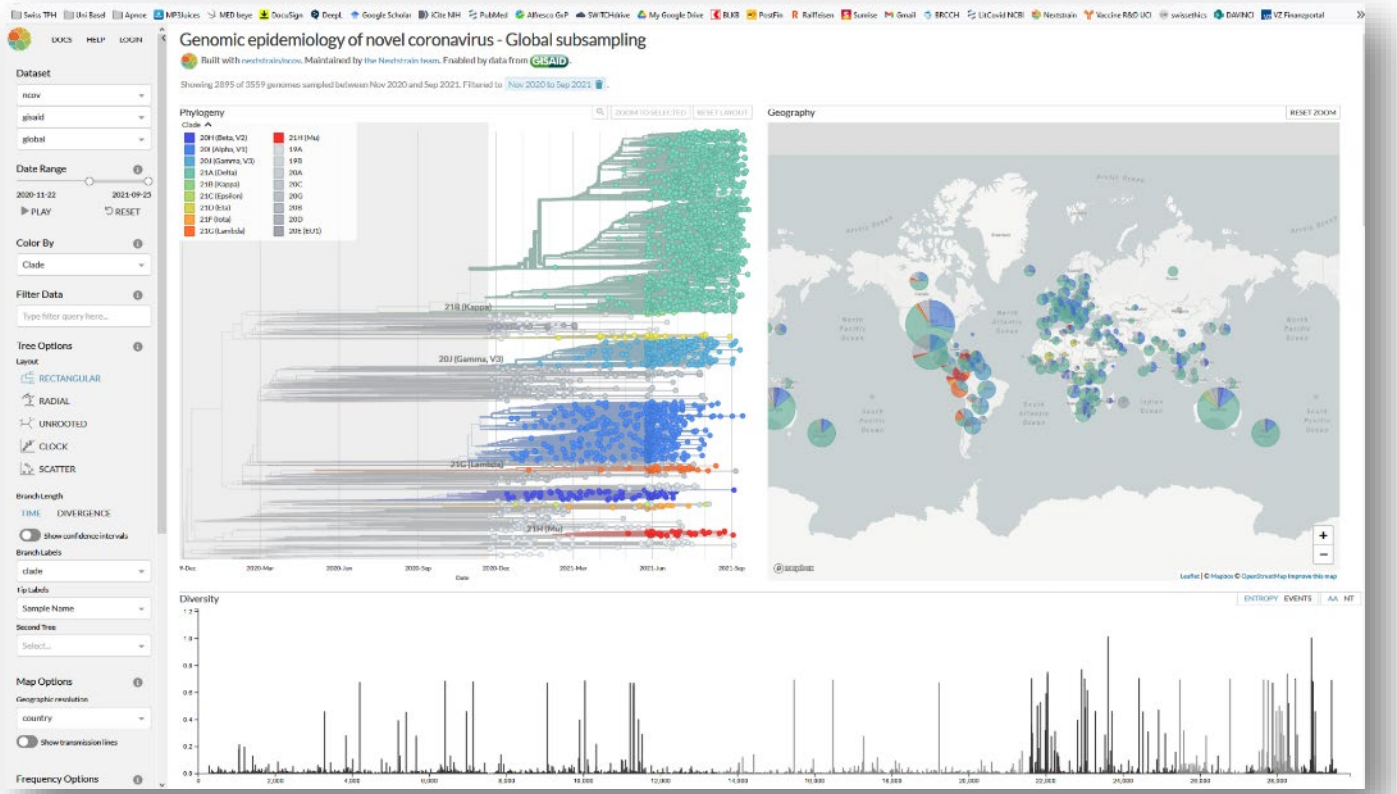
Epidemiological Trends and Models

Health Systems Support

Vaccines

COVID-19 Lessons Learned

COVID Variants Update



Nextstrain.org
Accessed 30 Sept 2021

What have we learned during the COVID-19 pandemic?

- Variants and vaccine development
- …

Support to COVID-19 efforts around the globe

Collaboration is key

It is in all of our interests that multiple institutions, share knowledge on the epidemiology and control of the disease. Collaborative activities have widespread benefits for individuals around the globe.

Some of our activities include:

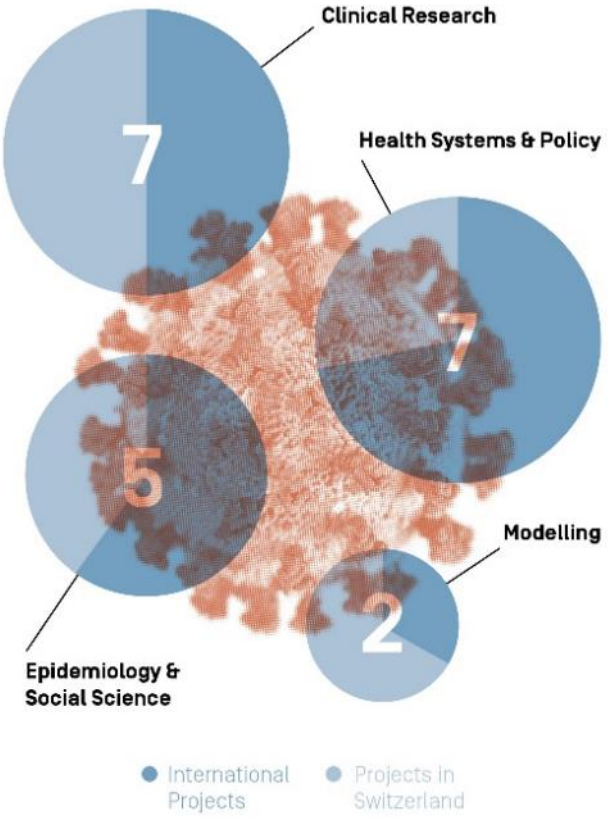
- **Supporting University of Basel Hospital** with our doctors when patient load is high
- **Providing guidance to governments and evidence-based advisory services -** From clinical research to policy advice
- **Improving diagnostics of COVID-19 in Eritrean refugee camps**
- **SARS-CoV-2 and vaccine modelling in Switzerland**
- **Evaluating long-term effects of the pandemic** on people's health and well-being

Support to COVID-19 efforts around the globe

21 Projects, 30 Countries

In 2020, Swiss TPH was involved in more than 20 projects related to COVID-19 in 30 different countries on topics such as clinical research, epidemiology and modelling.

Throughout all of the projects, we work along our value chain from innovation and validation to application.



Projects around the globe

Albania The Health for All Project (HAP) supported chronic care patients as well as those with COVID-19. The project also provided funding to the UN Development Programme to procure ventilators.

Chad The Support Project for the Health Districts in Chad (PADS) assisted with training health workers and the dissemination of communication tools to inform the local community about COVID-19.

Ethiopia The Jigjiga One Health Initiative (JOHI) laboratory at the Jigjiga University became the first COVID-19 diagnostic lab in the Somali Regional State of Ethiopia, contributing to pandemic control in Ethiopia.

Kosovo The Accessible Quality Healthcare project provided behavioural change communication support, as well as proactively countered false and misleading information.

Projects around the globe

Moldova The Healthy Life Project provided personal protective equipment to health and community workers, and evidence-based guidance via phone consultations.

Tajikistan The Enhancing Primary Healthcare Project supported with the procurement of personal protective equipment and trained health workers.

Tanzania SDC supported the Health Promotion and Systems Strengthening project (HPSS) with building up and operating a national call centre to provide COVID-19 information.

Ukraine The Medical Education Development Project launched an online course on topics such as newborn support and infection control in outpatient practice during the pandemic.

Swiss TPH

Thank you for your attention

Jürg Utzinger

Director, Swiss TPH

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