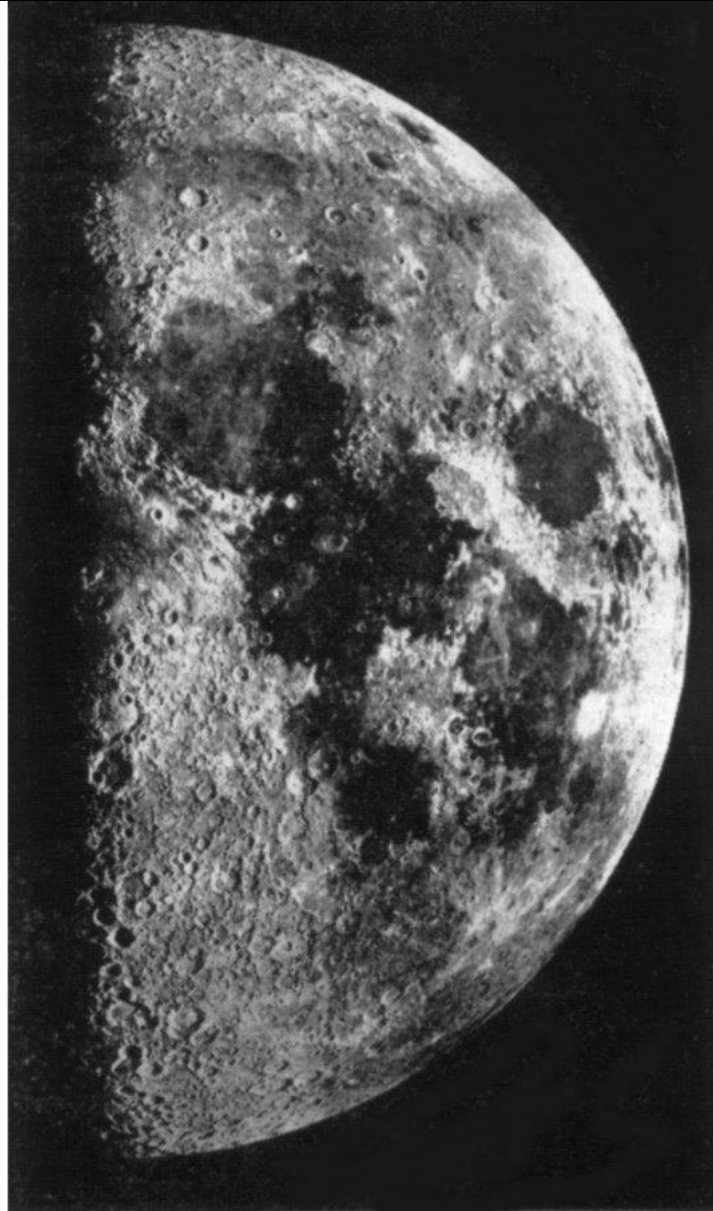
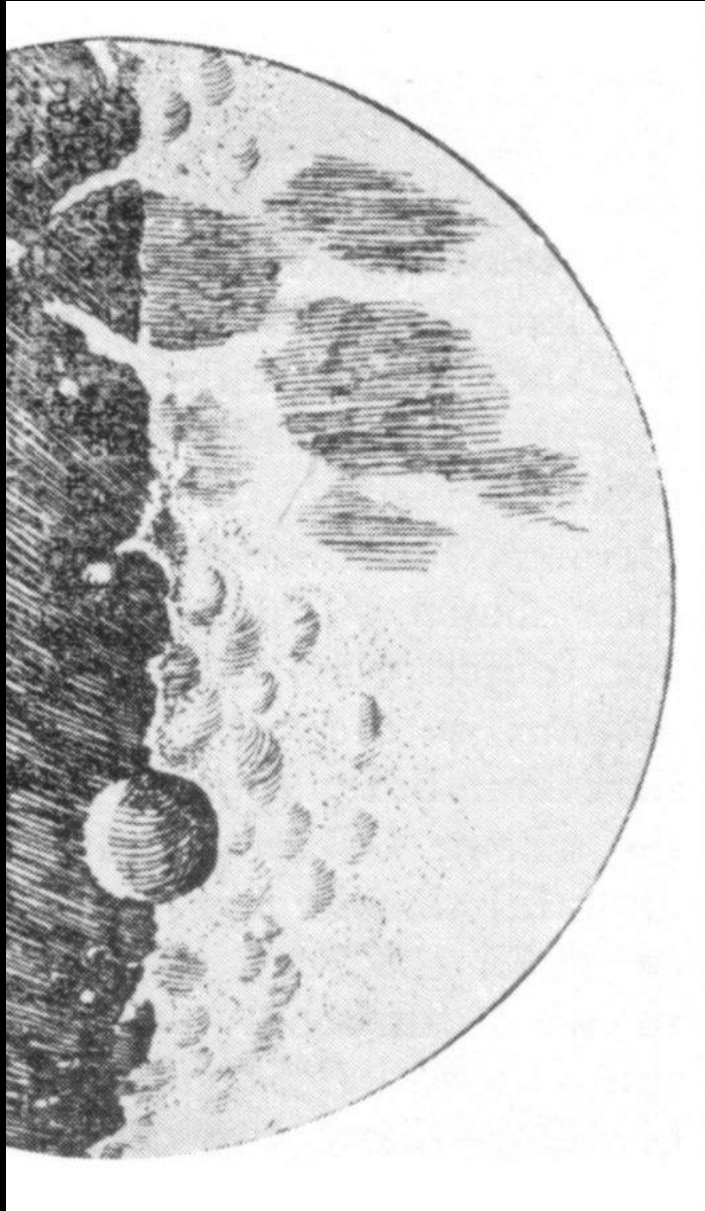


# Die Komplexität in der Wissenschaftskommunikation

IMST Fachdidaktiktag, 27.9.2022

Assoz. Prof. Priv.-Doz. Mag. Dr. Peter Klimek

Medical University of Vienna, Complexity Science Hub Vienna



# Brauchen wir Wissenschaft(skommunikation) überhaupt noch?



"Petabytes allow us to say: "Correlation is enough." We can stop looking for models. We can analyze the data without hypotheses about what it might show. We can throw the numbers into the biggest computing clusters the world has ever seen and let statistical algorithms find patterns where science cannot."

Chris Anderson. 2008. "The End of Theory: The Data Deluge Makes the Scientific Method Obsolete." *Wired Magazine*, June 27.

# 15 Social Challenges AI Could Help Solve



Forbes Technology Council

3.9.2019

- Wildlife conservation
- Clean Energy
- Epidemics and outbreaks
- Growing Cost Of Health Care
- Conflict
- Fact-Checking
- Disaster Awareness and Prediction
- Mental Illness
- Human Bias
- Global Hunger Crisis
- Bullying And Hate Speech
- Governance in Dense Urban Areas
- Universal Translation
- Enabling Better Education
- Agriculture

# 15 Social Challenges AI Could Help Solve



Forbes Technology Council

3. Sep.2019

- Wildlife conservation
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- Fact-Checking
- Mental Illness
- Global Hunger Crisis
- Governance in Dense Urban Areas
- Enabling Better Education

# Das Ende der Wissenschaft?

- Ein regelbasiertes maschinelles Lernverfahren „entdeckte“ folgende Korrelation in einem Datensatz von ~15000 Pneumonie Patienten:

*„Patienten mit Geschichte von Asthma haben niedrigeres Sterberisiko bei einer Pneumonie im Vergleich zur allgemeinen Bevölkerung“*

- Computer lernt Regel: „Asthma → Geringere Mortalität bei Pneumonie“
- Wie können wir diese Korrelation verstehen?

# Das Ende der Wissenschaft?

- *„Patienten mit Geschichte von Asthma haben niedrigeres Sterberisiko bei einer Pneumonie im Vergleich zur allgemeinen Bevölkerung“*
- Tatsächlicher Prozess: Patienten mit bekanntem Asthma wurden bei Einlieferung häufiger direkt auf Intensivstation gebracht → Korrelation ergibt sich aus erhöhter Vigilanz...
- ... aber stellen Sie sich vor, wir würden unsere Gesundheitsplanung auf solchen Korrelationen basieren!



Letter | Published: 29 August 2018

## Deep learning of aftershock patterns following large earthquakes

Phoebe M. R. DeVries , Fernanda Viégas, Martin Wattenberg & Brendan J. Meade

*Nature* **560**, 632–634(2018) | [Cite this article](#)

**20k** Accesses | **32** Citations | **1013** Altmetric | [Metrics](#)





Letter | Published: 2

## Deep learning following


Phoebe M. R. DeVrie

*Nature* 560, 632–633

20k Accesses | 32

Matters Arising | Published: 02 October 2019

## One neuron versus deep learning in aftershock prediction

Arnaud Mignan  & Marco Broccardo 

*Nature* 574, E1–E3(2019) | [Cite this article](#)

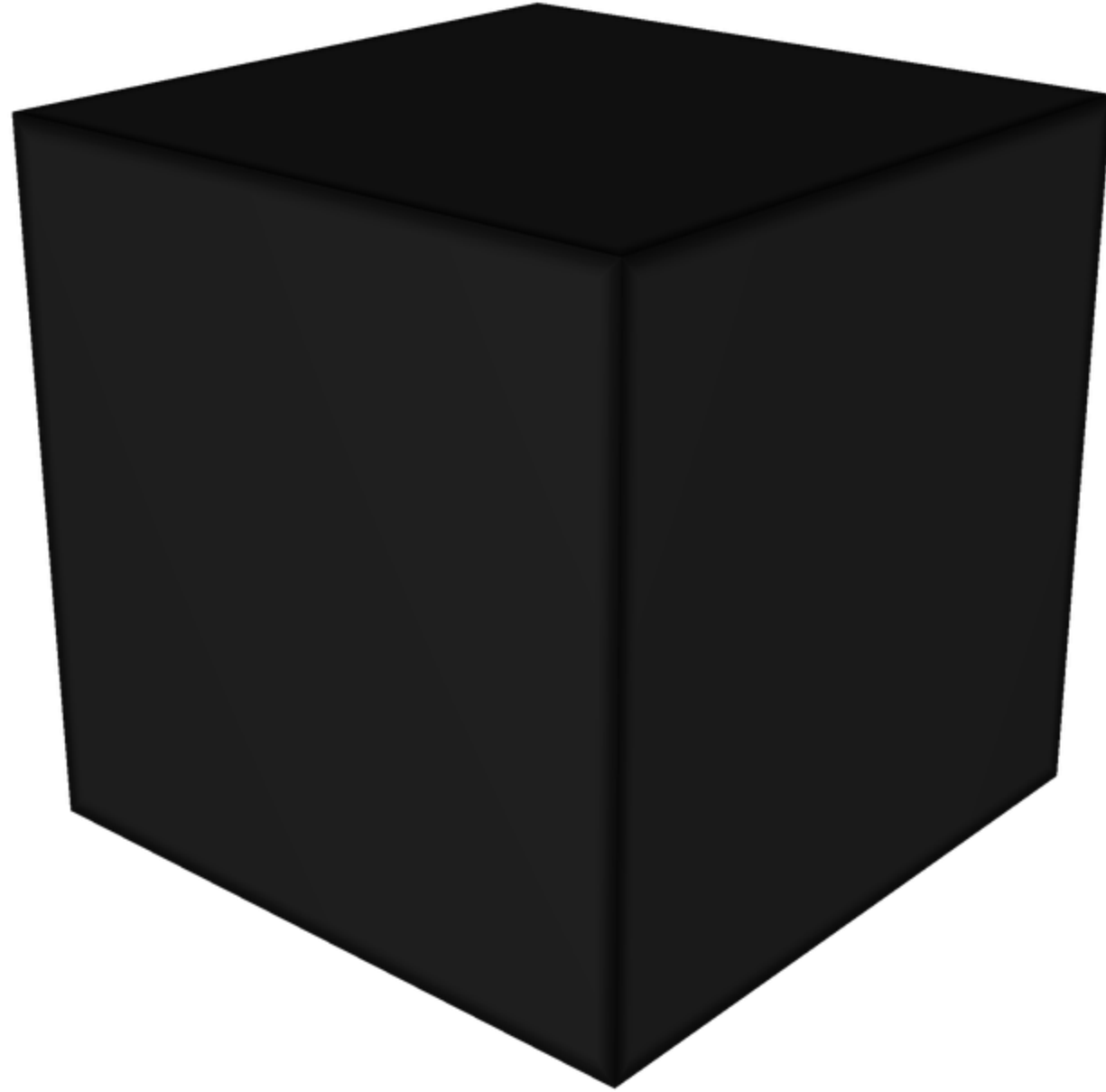
6970 Accesses | 2 Citations | 361 Altmetric | [Metrics](#)

“We further show that measured distance and mainshock average slip can be used instead of stress, yielding an improved AUC = 0.86, again with a simple logistic regression.”

WORLD  
ECONOMIC  
FORUM

## AI could help to make aftershocks





# Natürliche und künstliche Intelligenz

## Leicht für KI („AI-easy“)

### What Machine Learning Can Do

A simple way to think about supervised learning.

INPUT A	RESPONSE B	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Loan application	Will they repay the loan? (0 or 1)	Loan approvals
Ad plus user information	Will user click on ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	French sentence	Language translation
Sensors from hard disk, plane engine, etc.	Is it about to fail?	Preventive maintenance
Car camera and other sensors	Position of other cars	Self-driving cars

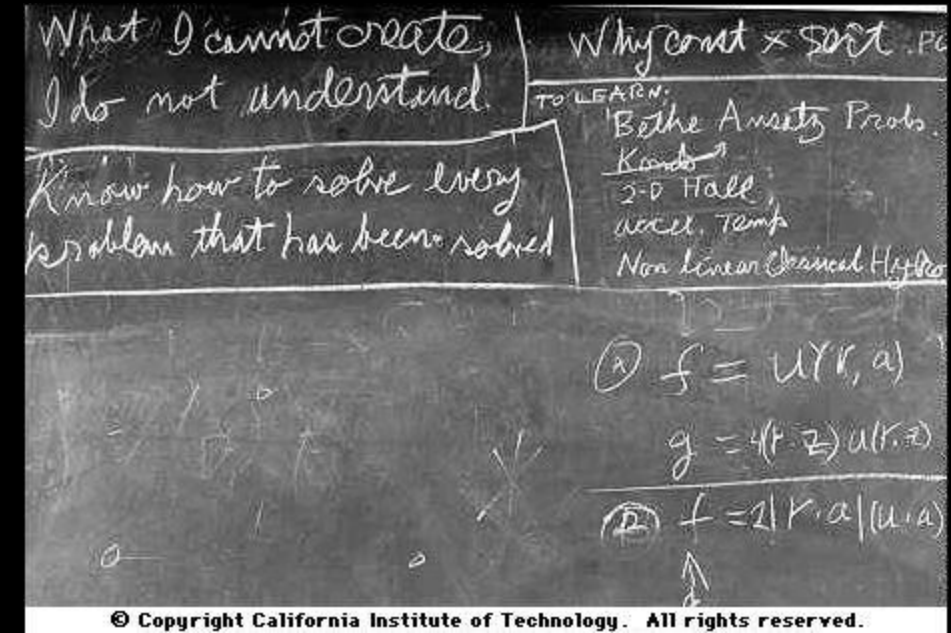
Andrew Ng, Harvard Business Review, Nov 9 2016

## Schwer für KI („AI-complete“)

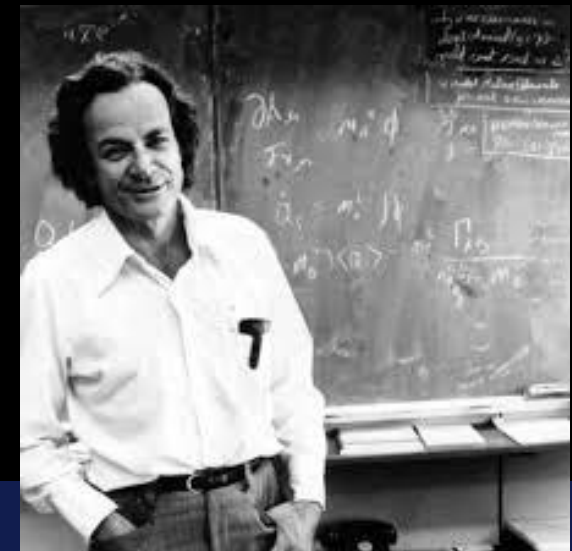
- Natural language understanding (e.g., KI schreibt Wikipedia Eintrag)
- Problemlösung
- Knowledge representation and reasoning
- Vision or image understanding

# What I cannot create, I do not understand.

- Kausales Verständnis von Vorgängen im System notwendig, um System vorhersagen zu können.
- Z.B. verstehen von Krankheitsursachen um Ansatzpunkte für Therapien zu finden
- System managen = **vorhersagen**, welche Konsequenzen bestimmte Eingriffe nach sich ziehen.

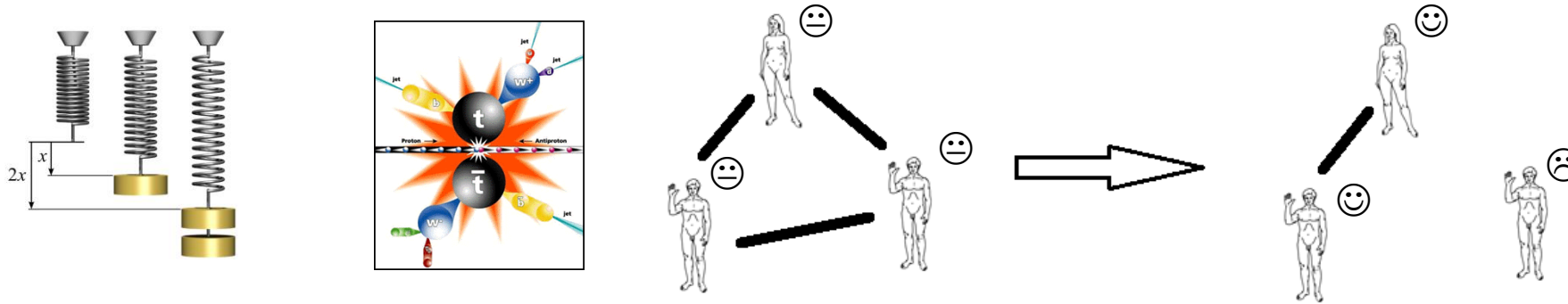


Richard Feynman, 1988



# Welche Systeme können wir gut vorhersagen?

- Sehr, sehr kleine ( $\sim 1-10$  Komponenten)



Haben eine Chance die richtigen Gesetze zu erraten (Physik, Soziologie, ...)!

- Sehr, sehr große ( $\sim 10^{28}$  Komponenten)



Statistische Gesetzmäßigkeiten greifen!

# Was sind Komplexe Systeme?

- Zu groß und vielschichtig um die einzelnen Gesetze alle richtig zu bekommen.
- Zu klein, dynamisch, und mit wechselseitigen Abhängigkeiten durchsetzt um sinnvoll Statistik betreiben zu können.
- Konsequenz:



"Ich weiß schon, meine Damen und Herren, das alles ist sehr kompliziert so wie diese Welt, in der wir leben und handeln, und die Gesellschaft, in der wir uns entfalten wollen. Haben wir daher den Mut, mehr als bisher auf diese Kompliziertheit hinzuweisen; zuzugeben, daß es perfekte Lösungen für alles und für jeden in einer pluralistischen Demokratie gar nicht geben kann."

Fred Sinowatz *Regierungserklärung 31. Mai 1983,*



# Was sind Komplexe Systeme?

- Komplexe Systeme bestehen aus vielen Komponenten
- Diese Komponenten haben bestimmte Eigenschaften und interagieren miteinander.
- Details sind wichtig! Wer interagiert wann mit wem unter welchen Bedingungen?
- Interaktionen können die Eigenschaften der Komponenten verändern
- Bestimmte Eigenschaften verändern Art und Weise der Interaktionen

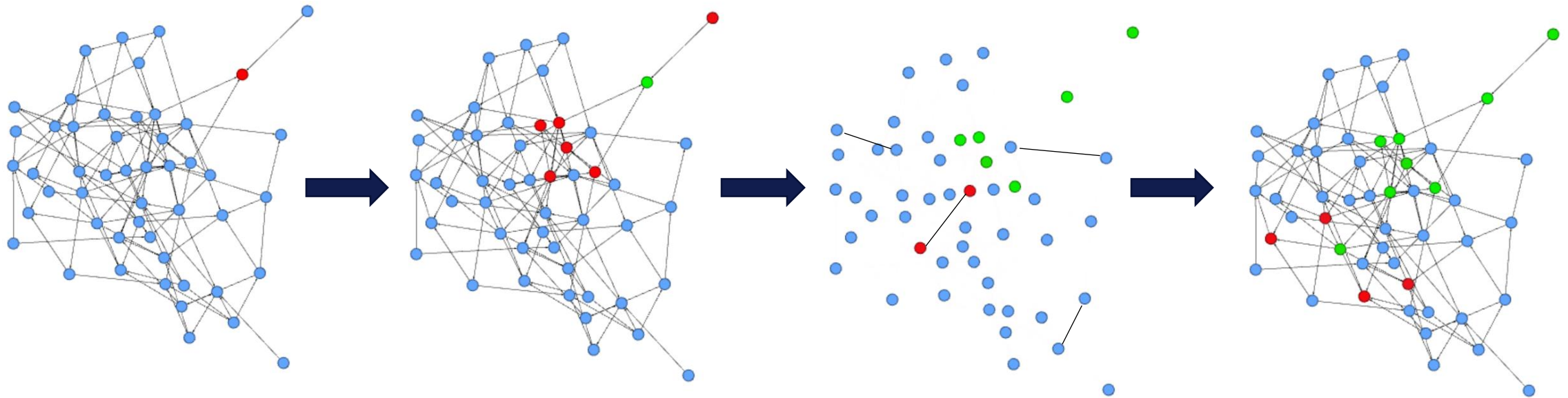
# Was sind Komplexe Systeme?

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- 
- Interaktionen können die Eigenschaften der Komponenten verändern.
  - Bestimmte Eigenschaften verändern Art und Weise der Interaktionen.
- 

*Diese Feedbacks machen Komplexe Systeme komplex!*

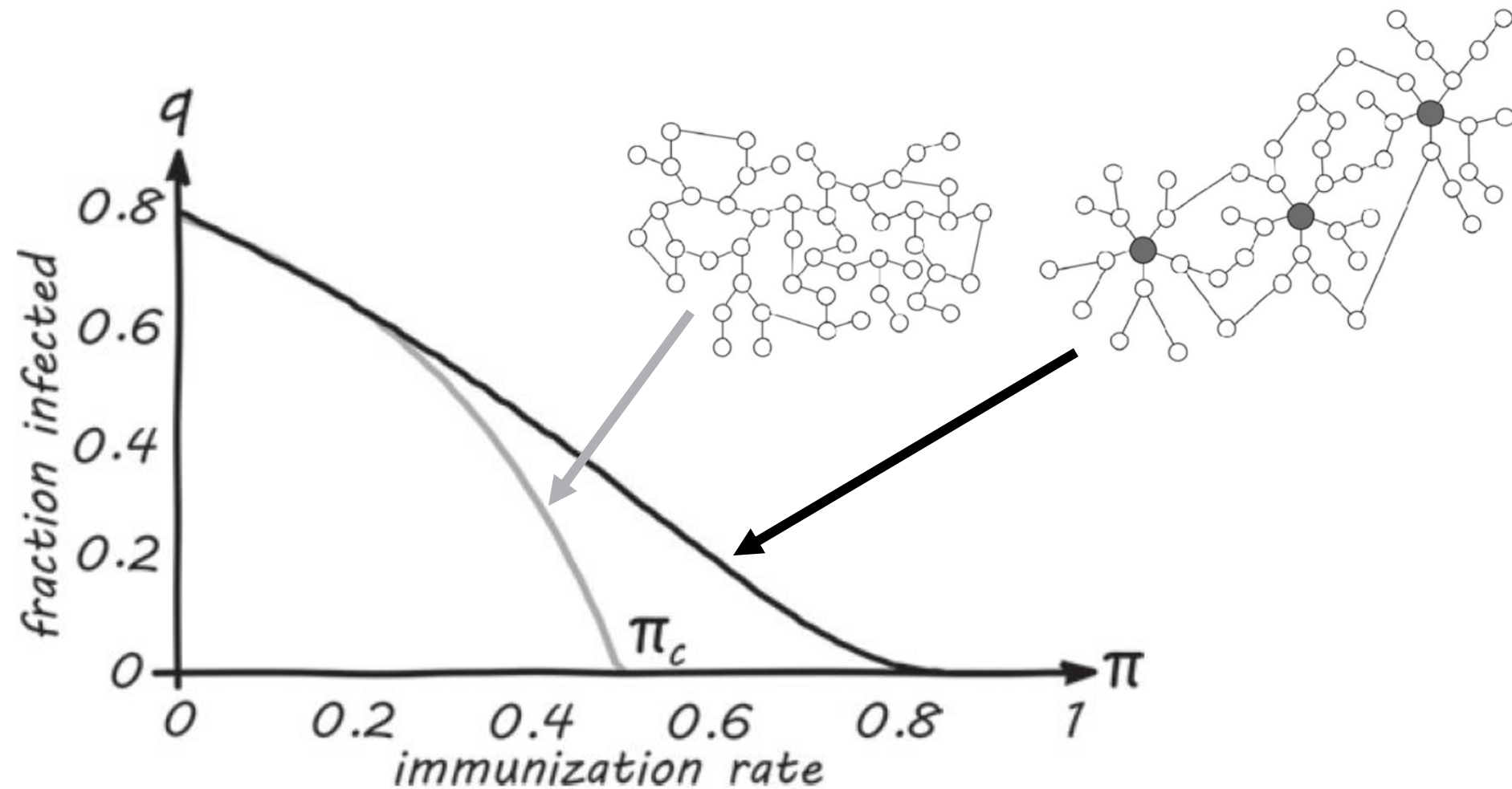
# Was sind Komplexe Systeme?



Form begets function begets form begets function

.....

# Networks matter.



- Was können COVID Modellierungen/Vorhersagen (nicht)?
- Wieso können solche Modellierungen/Vorhersagen trotzdem sinnvoll sein?

Please be aware of the [limitations](#) when interpreting the forecasts. We recommend to focus on the ensemble which would be expected to give the most reliable forecasts. The individual models that constitute the ensemble are shown for transparency but should not be taken on their own without fully acknowledging the limitations and engaging with the listed authors. These models have been contributed by independent teams who do not represent ECDC or the London School of Hygiene & Tropical Medicine.

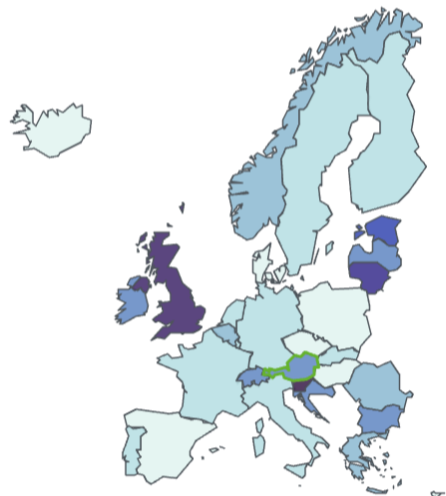
**Cases** | Deaths

Location

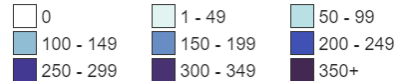
Forecasts are available for different locations. Select a country by clicking in the below map.

Current Location

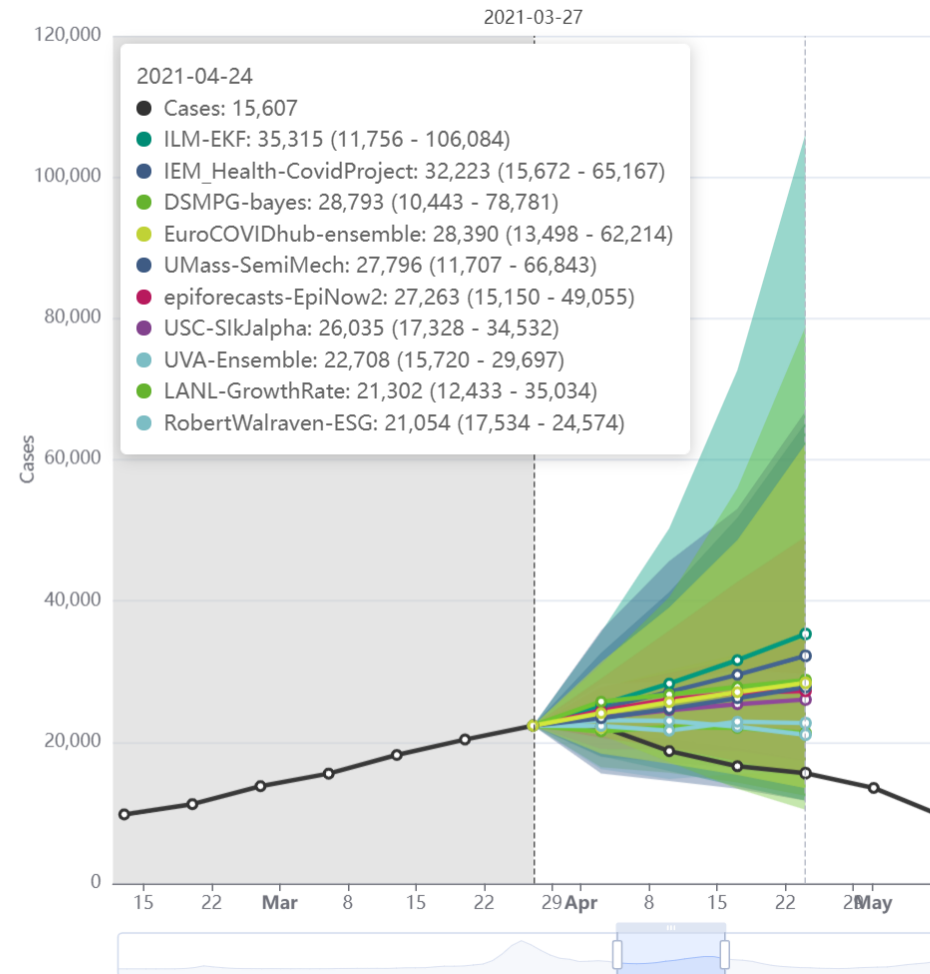
Austria



Cases / 100,000 inhabitants



Forecasts · Cases, Austria · issued on Mar 29, 2021



- DSMPG-bayes
- EuroCOVIDhub-ensemble
- IEM\_Health-CovidProject
- ILM-EKF
- Karlen-pypm
- LANL-GrowthRate
- MUNI-ARIMA
- RobertWalraven-ESG
- SDSC\_ISG-TrendModel
- UMass-SemiMech
- USC-SikJalpha
- UVA-Ensemble
- bisop-seirfilterlite
- epiforecasts-EpiExpert
- epiforecasts-EpiNow2



Please be aware of the [limitations](#) when interpreting the forecasts. We recommend to focus on the ensemble which would be expected to give the most reliable forecasts. The individual models that constitute the ensemble are shown for transparency but should not be taken on their own without fully acknowledging the limitations and engaging with the listed authors. These models have been contributed by independent teams who do not represent ECDC or the London School of Hygiene & Tropical Medicine.

Cases

Deaths

Forecasts · Cases, Austria · issued on Mar 29, 2021

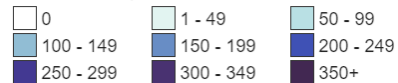
SOMMERPROGNOSE GECKO

# Bis zu 70.000 Neuinfektionen täglich

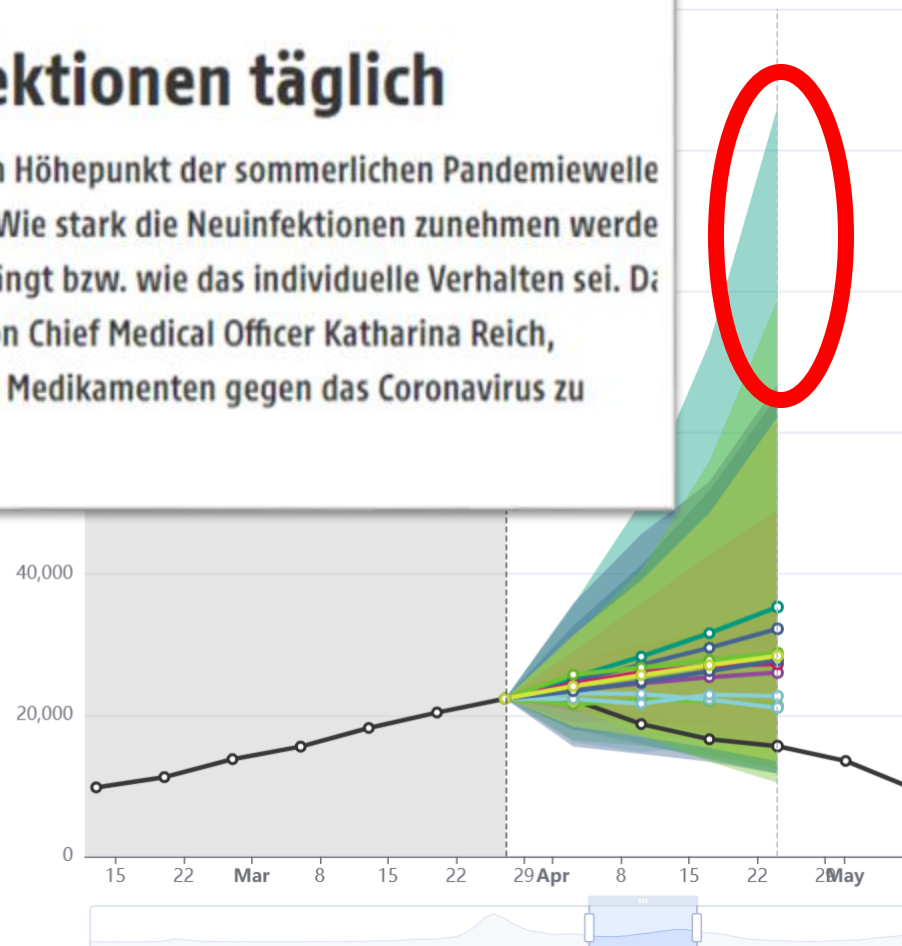
Das Beratungsgremium GECKO rechnet zum Höhepunkt der sommerlichen Pandemiewelle mit bis zu 70.000 Neuinfektionen pro Tag. Wie stark die Neuinfektionen zunehmen werde hänge davon ab, welche Maßnahmen verhängt bzw. wie das individuelle Verhalten sei. Das Gremium, geleitet im medizinischen Teil von Chief Medical Officer Katharina Reich, empfiehlt jedenfalls, die Verfügbarkeit von Medikamenten gegen das Coronavirus zu erleichtern.



Cases / 100,000 inhabitants



Leaflet



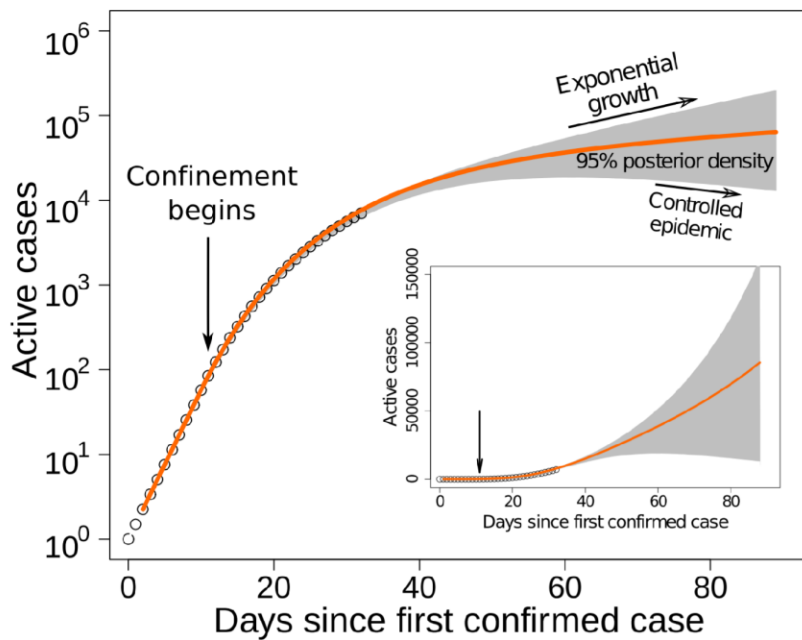
- DSMPG-bayes
- EuroCOVIDhub-ensemble
- IEM\_Health-CovidProject
- ILM-EKF
- Karlen-pypm
- LANL-GrowthRate
- MUNI-ARIMA
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- SDSC\_ISG-TrendModel
- UMass-SemiMech
- USC-SIKJalpha
- UVA-Ensemble
- bisop-seirfilterlite
- epiforecasts-EpiExpert
- epiforecasts-EpiNow2

# Wieso sind die Prognosen so ~~schlecht~~ unterschiedlich?

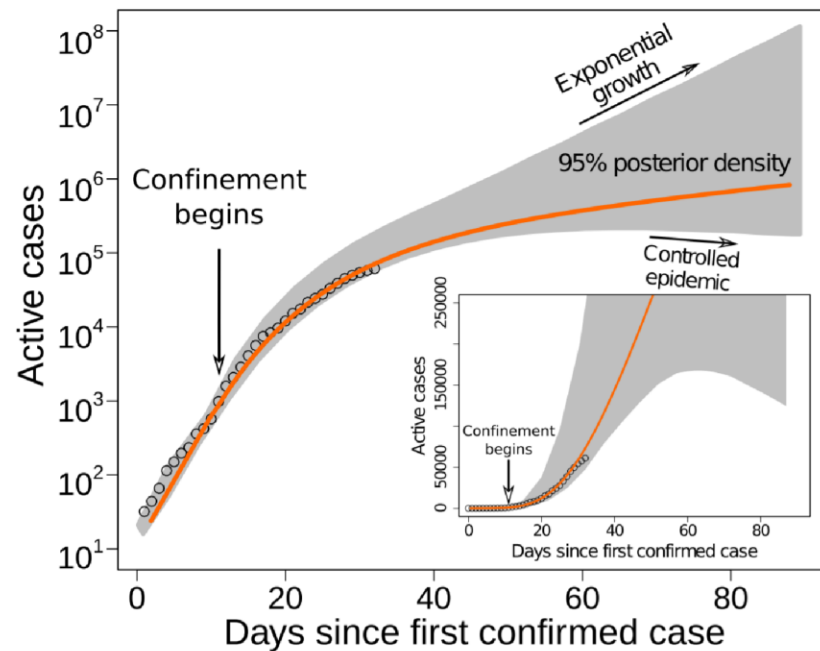
- Strukturelle Unsicherheit
- Modellsensitivität

# Modellsensitivität: Nicht einmal eine computergenerierte Pandemie lässt sich genau vorhersagen

Prognose einer simulierten Epidemie



Prognose einer tatsächlichen Epidemie



- W. C. Roda, M. B. Varughese, D. Han, and M. Y. Li, "Why is it difficult to accurately predict the covid-19 epidemic?," *Infectious Disease Modelling*, 2020.
- N. P. Jewell, J. A. Lewnard, and B. L. Jewell, "Predictive mathematical models of the covid-19 pandemic: Underlying principles and value of projections," *Jama*, vol. 323, no. 19, pp. 1893-1894, 2020
- I. Holmdahl and C. Buckee, "Wrong but useful—what covid-19 epidemiologic models can and cannot tell us," *New England Journal of Medicine*, 2020.
- Ioannidis, J. P., Cripps, S., & Tanner, M. A. (2020). Forecasting for COVID-19 has failed. *International journal of forecasting*.
- Taleb, Nassim Nicholas, Yaneer Bar-Yam, and Pasquale Cirillo. "On single point forecasts for fat-tailed variables." *International Journal of Forecasting* (2020).

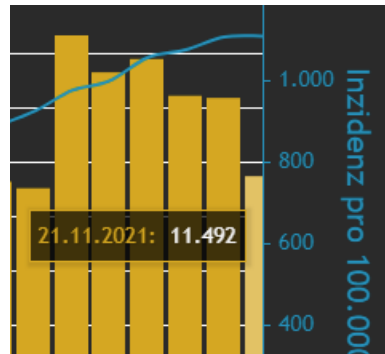
# Melderealität

Fallzuwachs	
Bundesland	Zuwachs
Burgenland	314
Carinthia	1269
Lower Austria	3113
Upper Austria	4786
Salzburg	1432
Styria	
Tyrol	
Vorarlberg	
Wien	
Gesamt	17149

EMS Stand 21.11., 20h:  
**17.149**

Fälle 2021-11-21	
	205
	440
	2.360
	3.252
	917
	1.281
	<b>11.305</b>

Morgenauswertung AGES, 22.11.:  
**11.305**

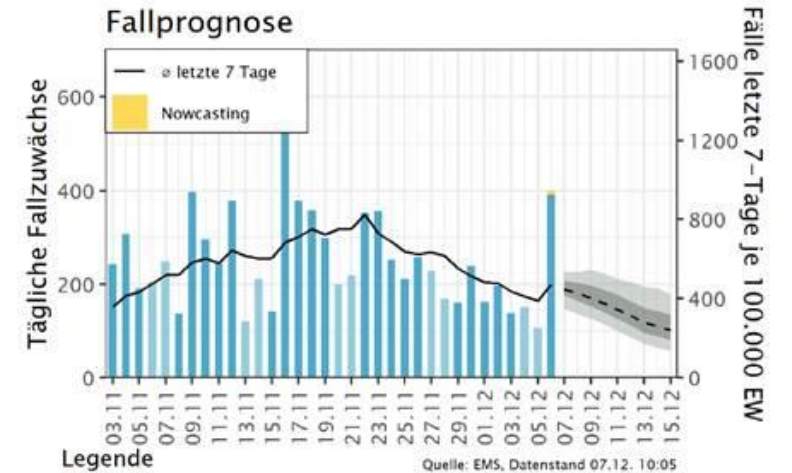


Dashboard, 22.11.:  
**11.492**

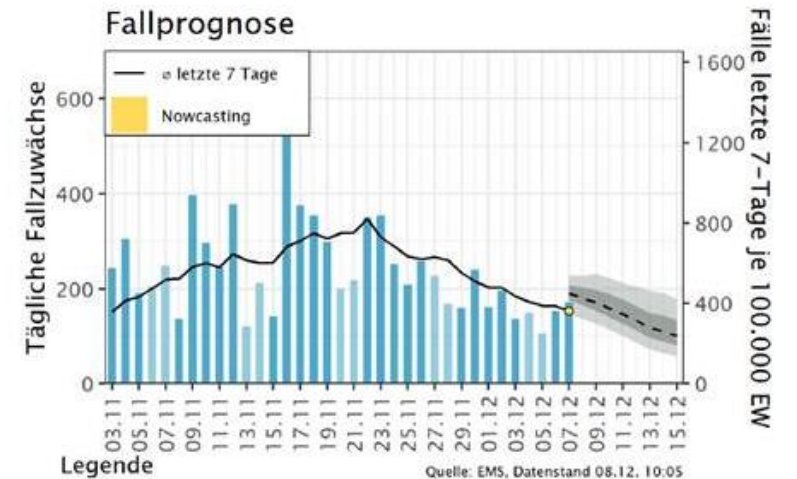
Datum:	22.11.2021	Summe
A	Gesamtsumme Testungen (PCR + Antigen)	107.187.151
A1		
A2		
A3		
A4		
A5	Veränderung absolut zu gestern	53.109
B	Gesamtzahl der bestätigten Fälle	1.070.419
B1	Veränderung absolut zu gestern	13.806

Morgenmeldung Ministerien, 22.11.:  
**13.806**

## Burge



## Burge



# Strukturelle Unsicherheit → Wir kennen das „richtige“ Modell nicht

## Effects of non-pharmaceutical interventions on COVID-19: A Tale of Three Models

Vincent Chin, John P.A. Ioannidis, Martin A. Tanner, Sally Cripps

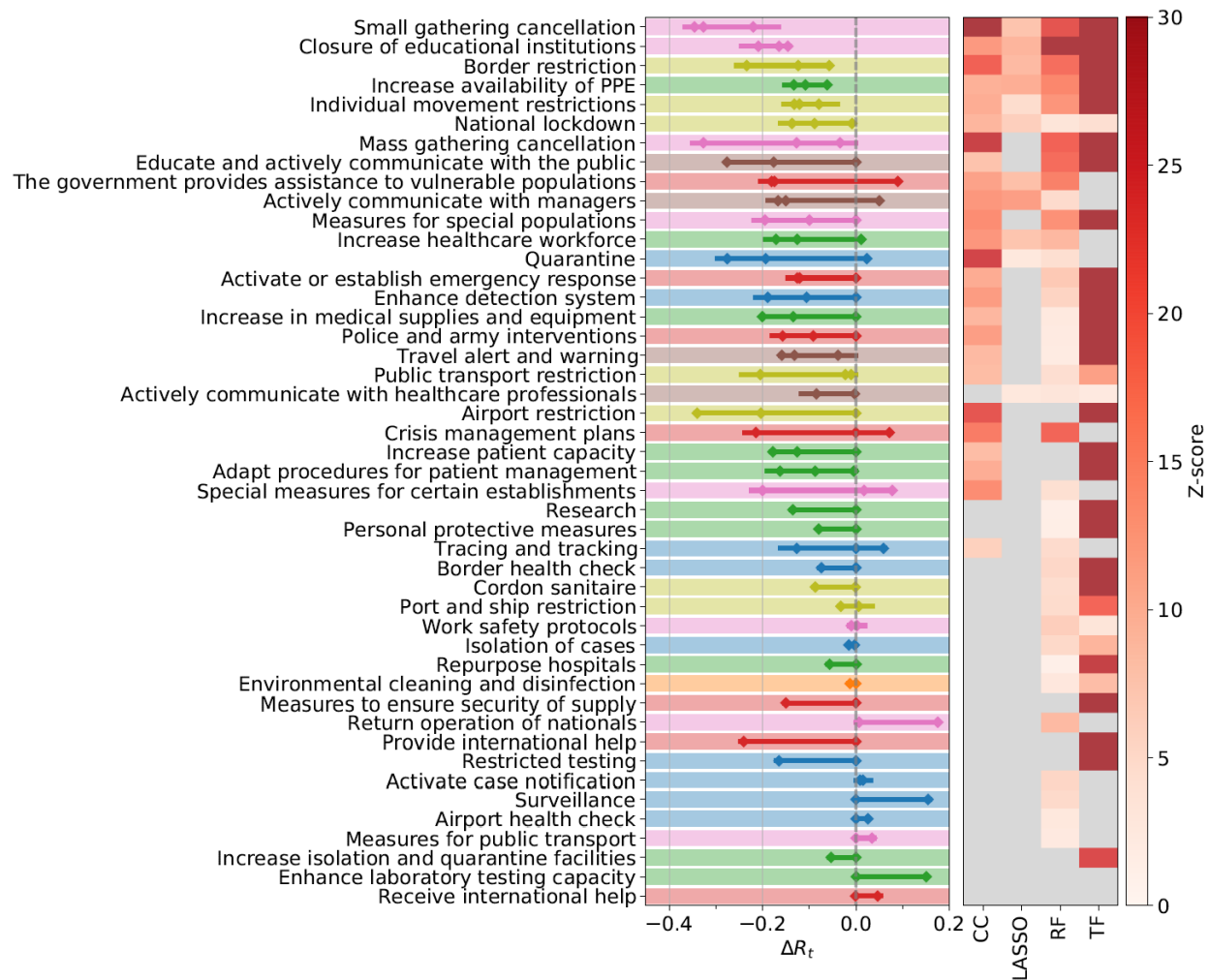
doi: <https://doi.org/10.1101/2020.07.22.20160341>

**Results** While model 1 found that lockdown was the most effective measure in the original 11 countries, model 2 showed that lockdown had little or no benefit as it was typically introduced at a point when the time-varying reproductive number was already very low. Model 3 found that the simple banning of public events was beneficial, while lockdown had no consistent impact. Based on Bayesian metrics, model 2 was better supported by the data than either model 1 or model 3 for both time horizons.

**Conclusions** Inferences on effects of NPIs are non-robust and highly sensitive to model specification. Claimed benefits of lockdown appear grossly exaggerated.



# Welle 1: Wirksamkeitsranking

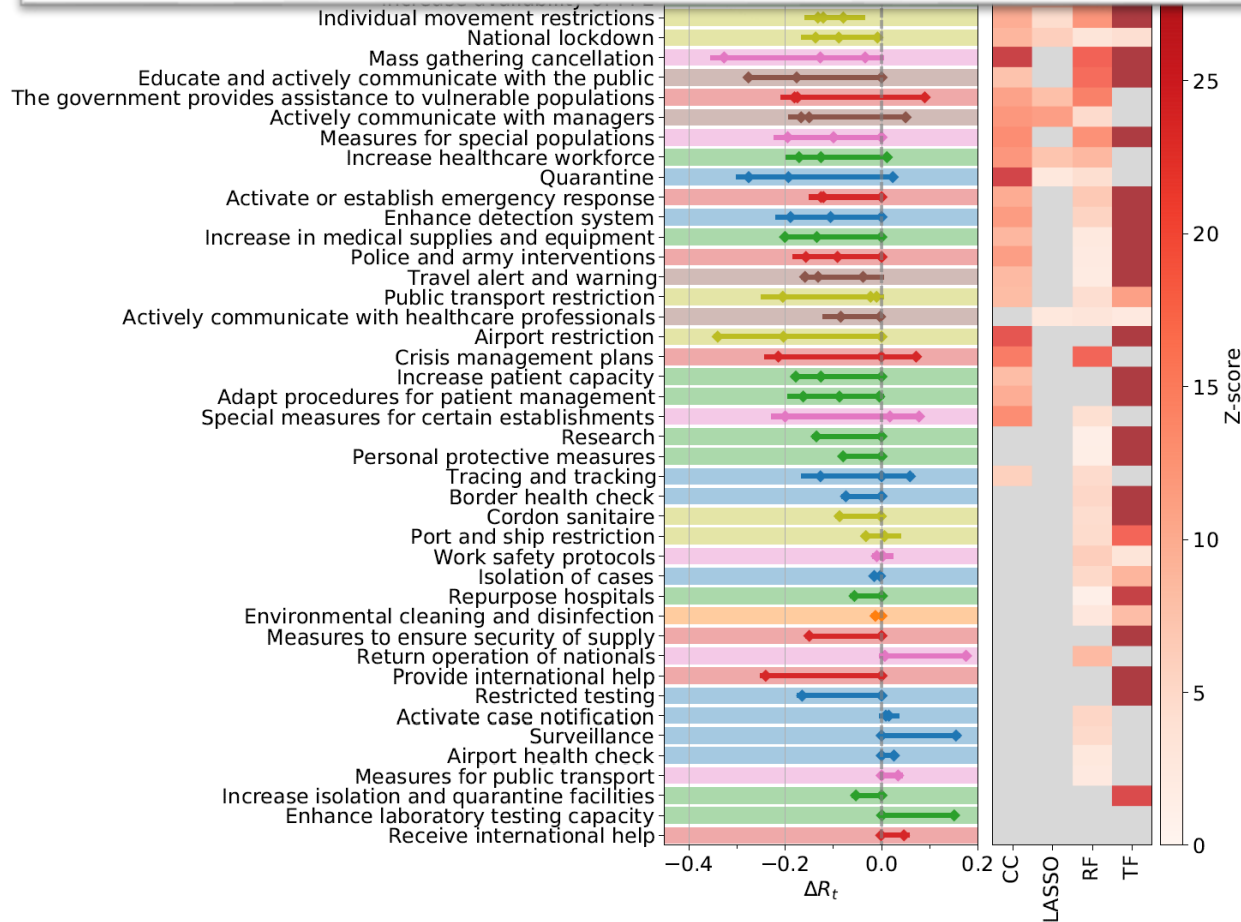


- Am effektivsten: social distancing an Orten wo Personen in kleineren Gruppen für längere Zeiträume zusammen kommen (Arbeitsplätze, Schulen, Restaurants, ...), Bewegungseinschränkungen, Stärkung des Gesundheitssystems
- Auch hocheffektiv: Risikokommunikation (Richtung Öffentlichkeit & stakeholders), wirtschaftliche Unterstützung



# Welle 1: Wirksamkeitsranking

## Small gathering cancellation

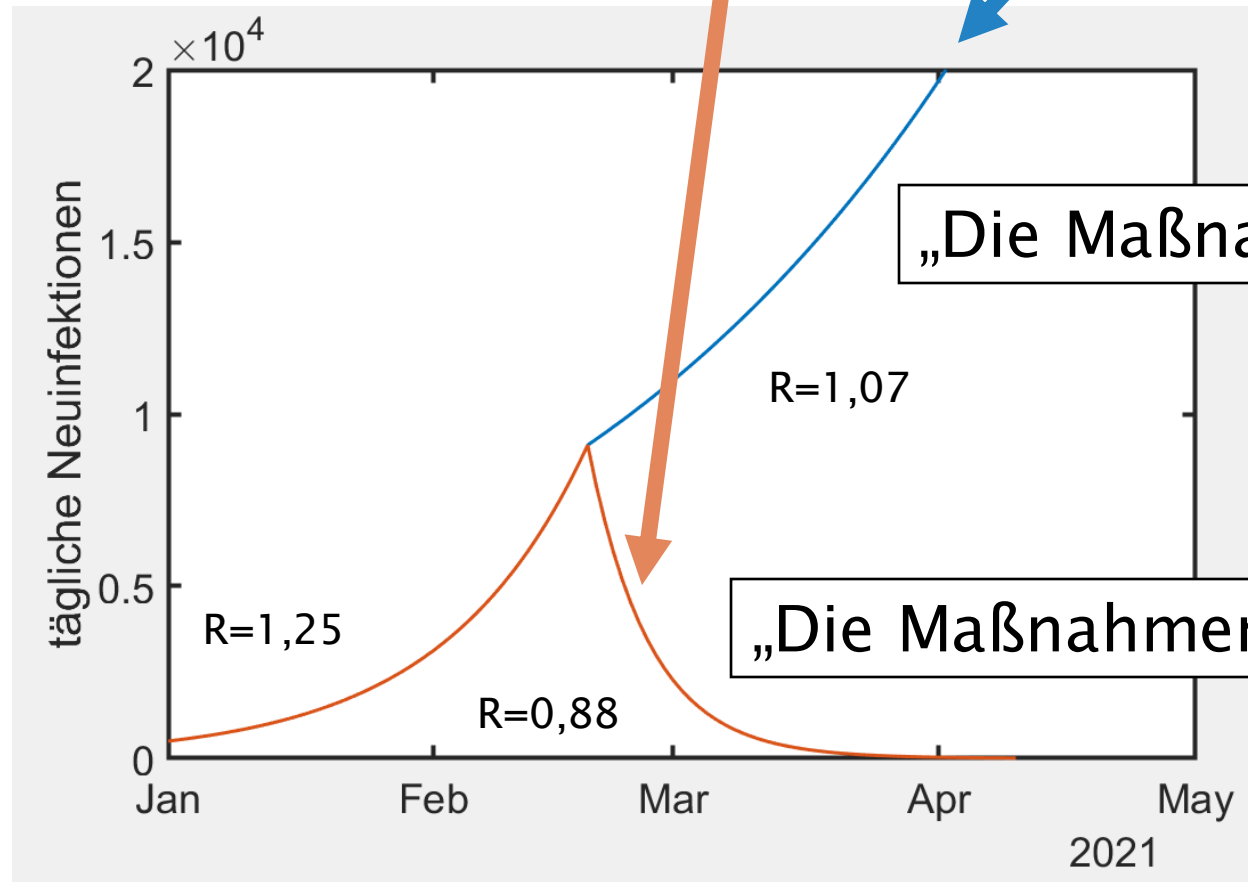


an Orten wo Personen in kleineren Gruppen für längere Zeiträume zusammen kommen (Arbeitsplätze, Schulen, Restaurants, ...),  
Bewegungseinschränkungen,  
Stärkung des Gesundheitssystems

- Auch hocheffektiv:  
Risikokommunikation (Richtung Öffentlichkeit & stakeholders),  
wirtschaftliche Unterstützung

# Strukturelle Unsicherheit

Small gathering cancellation



# Welle 2: Wirksamkeitsranking

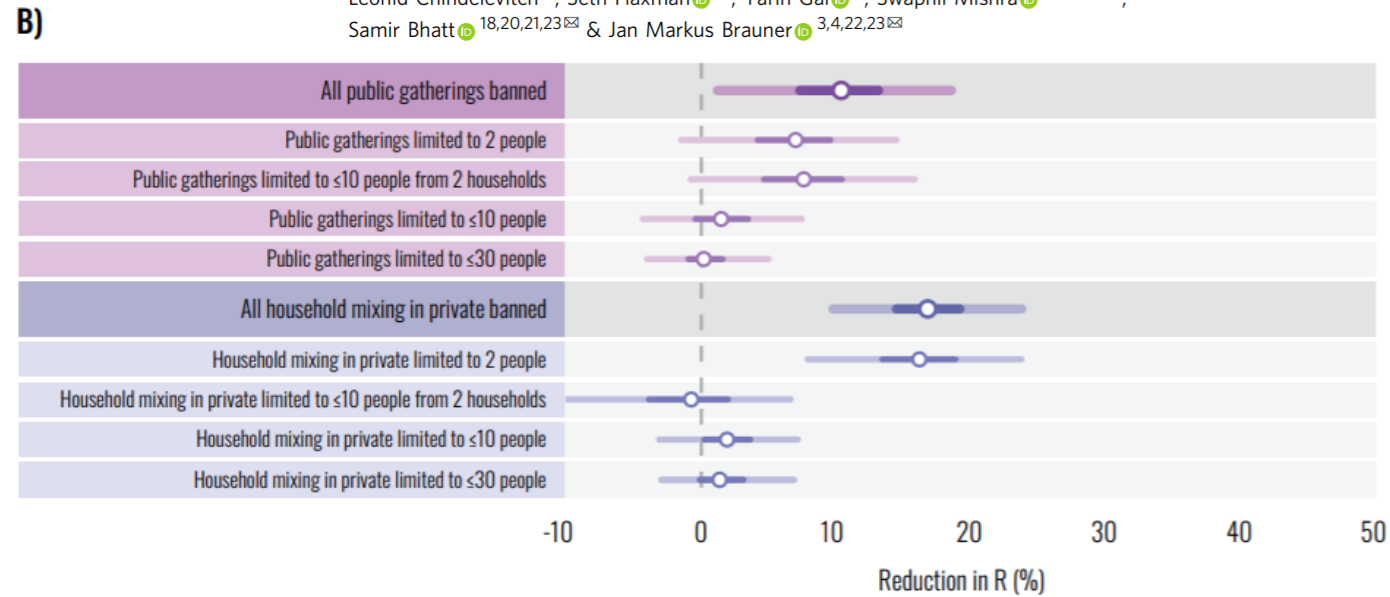
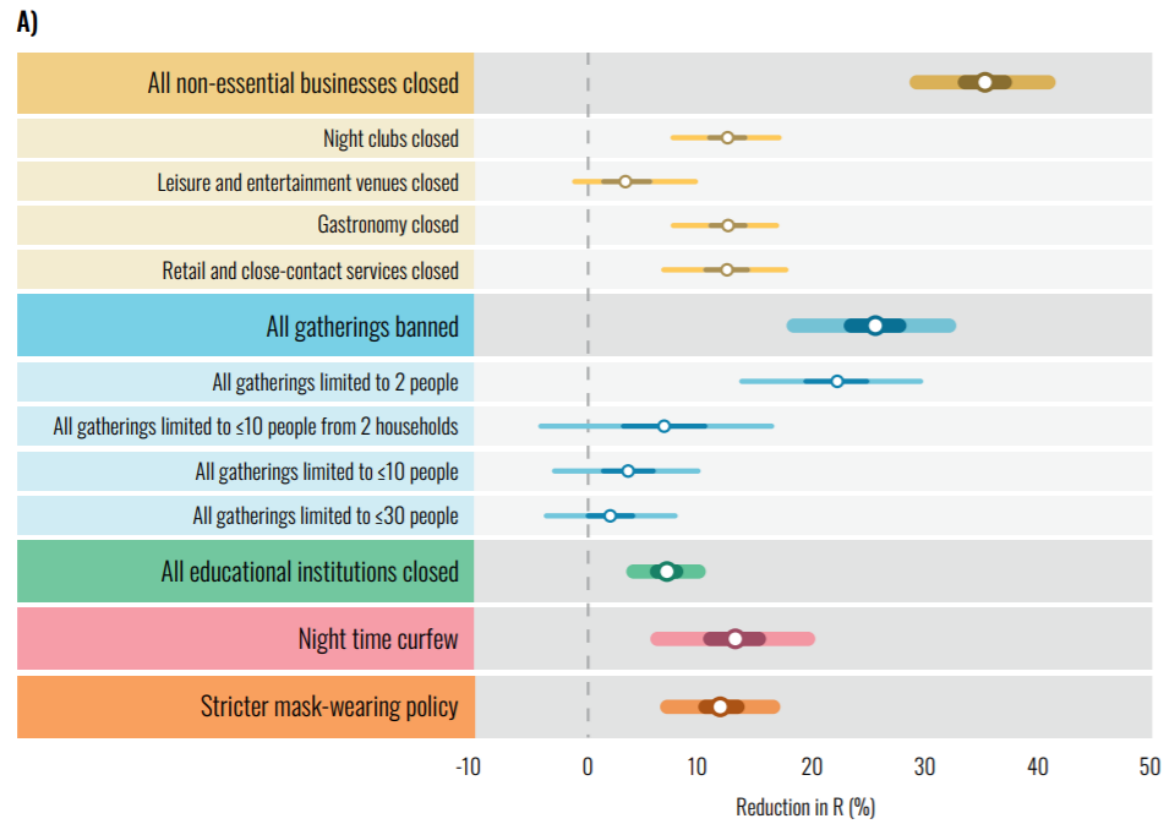
ARTICLE

Check for updates

<https://doi.org/10.1038/s41467-021-26013-4> OPEN

## Understanding the effectiveness of government interventions against the resurgence of COVID-19 in Europe

Mrinank Sharma<sup>1,2,3,22</sup>, Sören Mindermann<sup>4,22</sup>, Charlie Rogers-Smith<sup>5</sup>, Gavin Leech<sup>6</sup>, Benedict Snodin<sup>3</sup>, Janvi Ahuja<sup>3,7</sup>, Jonas B. Sandbrink<sup>3,7</sup>, Joshua Teperowski Monrad<sup>3,8,9</sup>, George Altman<sup>10</sup>, Gurpreet Dhaliwal<sup>11,12</sup>, Lukas Finnveden<sup>3</sup>, Alexander John Norman<sup>13</sup>, Sebastian B. Oehm<sup>14,15</sup>, Julia Fabienne Sandkühler<sup>16</sup>, Laurence Aitchison<sup>6</sup>, Tomáš Gavenčák<sup>17</sup>, Thomas Mellan<sup>18</sup>, Jan Kulveit<sup>3</sup>, Leonid Chindelevitch<sup>18</sup>, Seth Flaxman<sup>19</sup>, Yarin Gal<sup>4</sup>, Swapnil Mishra<sup>18,20,23</sup>, Samir Bhatt<sup>18,20,21,23</sup> & Jan Markus Brauner<sup>3,4,22,23</sup>



# Welle 2: Wirksamkeitsranking

Maßnahmen wirken subadditiv, kannibalisieren sich gegenseitig: „1+1 = 1,5“

Check for updates

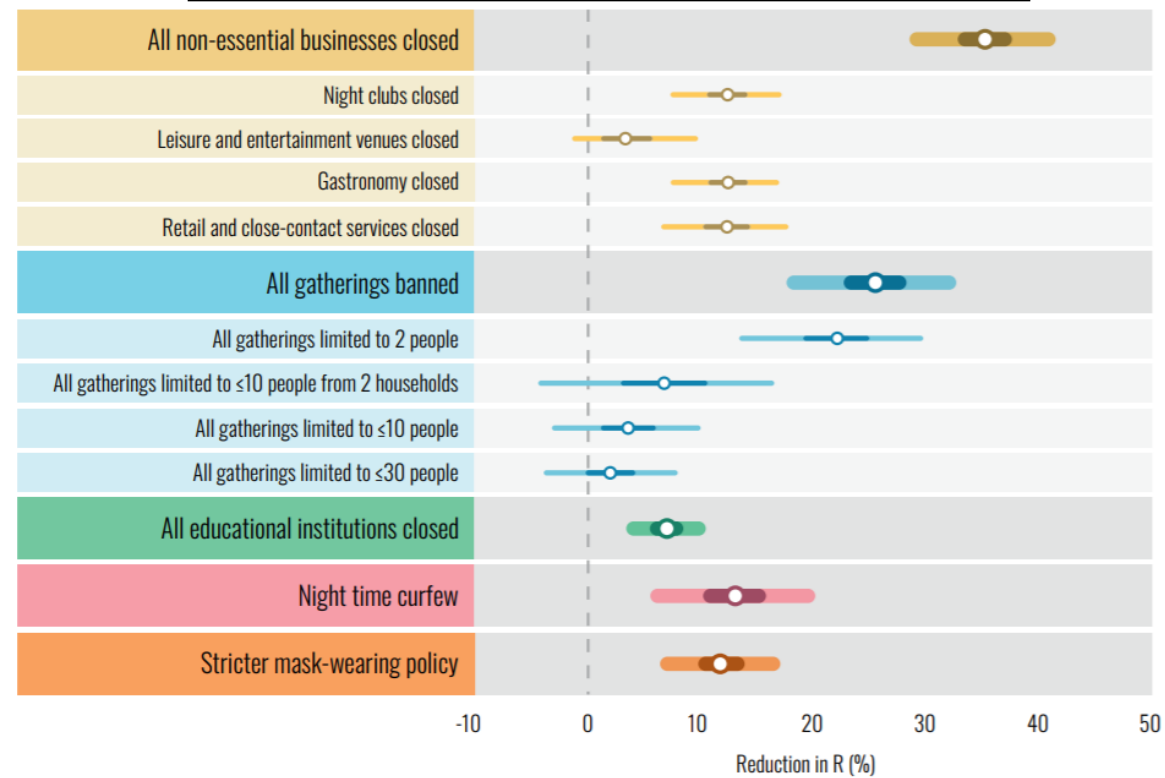
ARTICLE

<https://doi.org/10.1038/s41467-021-26013-4> OPEN

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A)



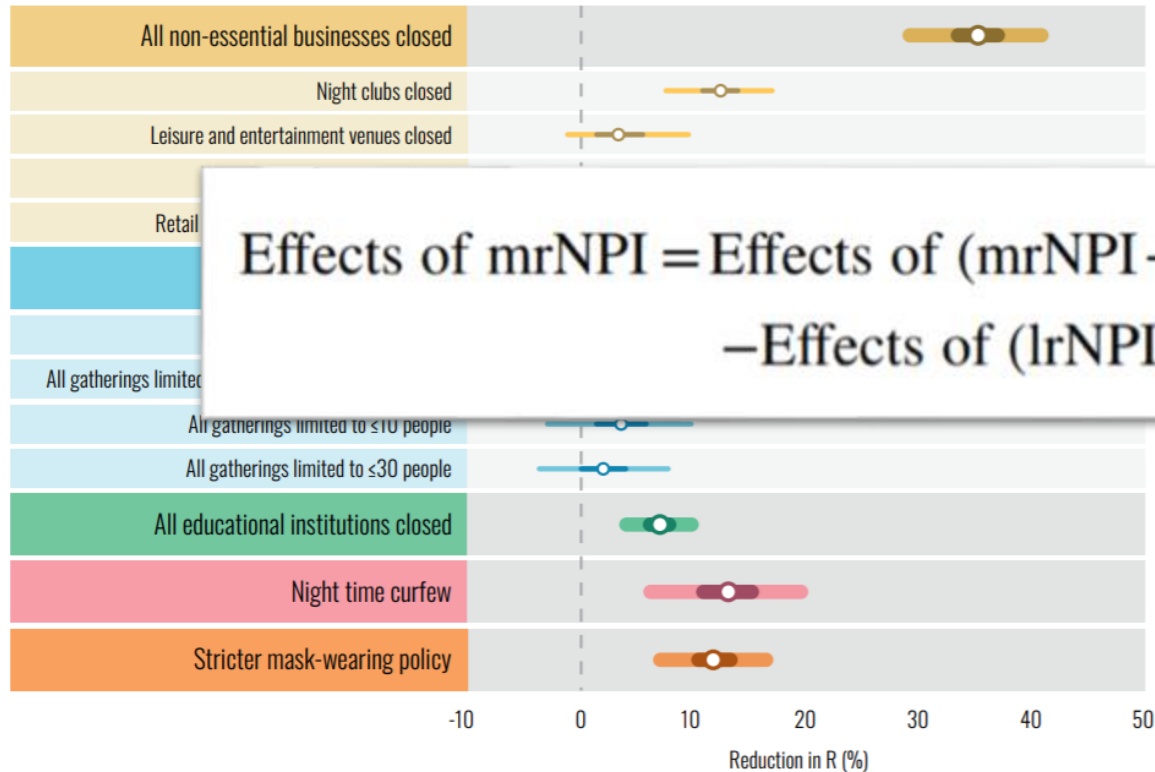
B)



# Welle 2: Wirksamkeitsranking

Maßnahmen wirken subadditiv, kannibalisieren sich gegenseitig: „1+1 = 1,5“

A)



$$\text{Effects of mrNPI} = \text{Effects of (mrNPI + lrNPI + epidemic dynamics)} - \text{Effects of (lrNPI + epidemic dynamics)}$$

## Assessing mandatory stay-at-home and business closure effects on the spread of COVID-19

Eran Bendavid<sup>1,2</sup> | Christopher Oh<sup>1</sup> | Jay Bhattacharya<sup>2</sup> | John P. A. Ioannidis<sup>1,3,4,5,6</sup>

<sup>1</sup>Department of Medicine, Stanford University, Stanford, CA, USA

<sup>2</sup>Center for Health Policy and the Center for Primary Care and Outcomes Research, Stanford University, Stanford, CA, USA

### Abstract

**Background and Aims:** The most restrictive nonpharmaceutical interventions (NPIs) for controlling the spread of COVID-19 are mandatory stay-at-home and business closures. Given the consequences of these policies, it is important to assess

effects on epidemic case growth of more restrictive and those of less-restrictive NPIs (lrNPIs).

COVID-19 case growth in relation to any NPI implementations of 10 countries: England, France, Germany, Iran, South Korea, Sweden and the United States. Using first-order effects, we isolate the effects of mrNPIs by subtracting the effects of lrNPIs and epidemic dynamics from all NPIs. We use case growth in South Korea, 2 countries that did not implement mandatory

stay-at-home and business closures, as comparison countries for the other 8 countries (16 total comparisons).

**Results:** Implementing any NPIs was associated with significant reductions in case growth in 9 out of 10 study countries, including South Korea and Sweden that implemented only lrNPIs (Spain had a nonsignificant effect). After subtracting the epidemic and lrNPI effects, we find no clear, significant beneficial effect of mrNPIs on case growth in any country. In France, for example, the effect of mrNPIs was +7% (95% CI: -5%-19%) when compared with Sweden and +13% (-12%-38%) when compared with South Korea (positive means pro-contagion). The 95% confidence intervals excluded 30% declines in all 16 comparisons and 15% declines in 11/16 comparisons.

**Conclusions:** While small benefits cannot be excluded, we do not find significant benefits on case growth of more restrictive NPIs. Similar reductions in case growth may be achievable with less-restrictive interventions.

### Correspondence

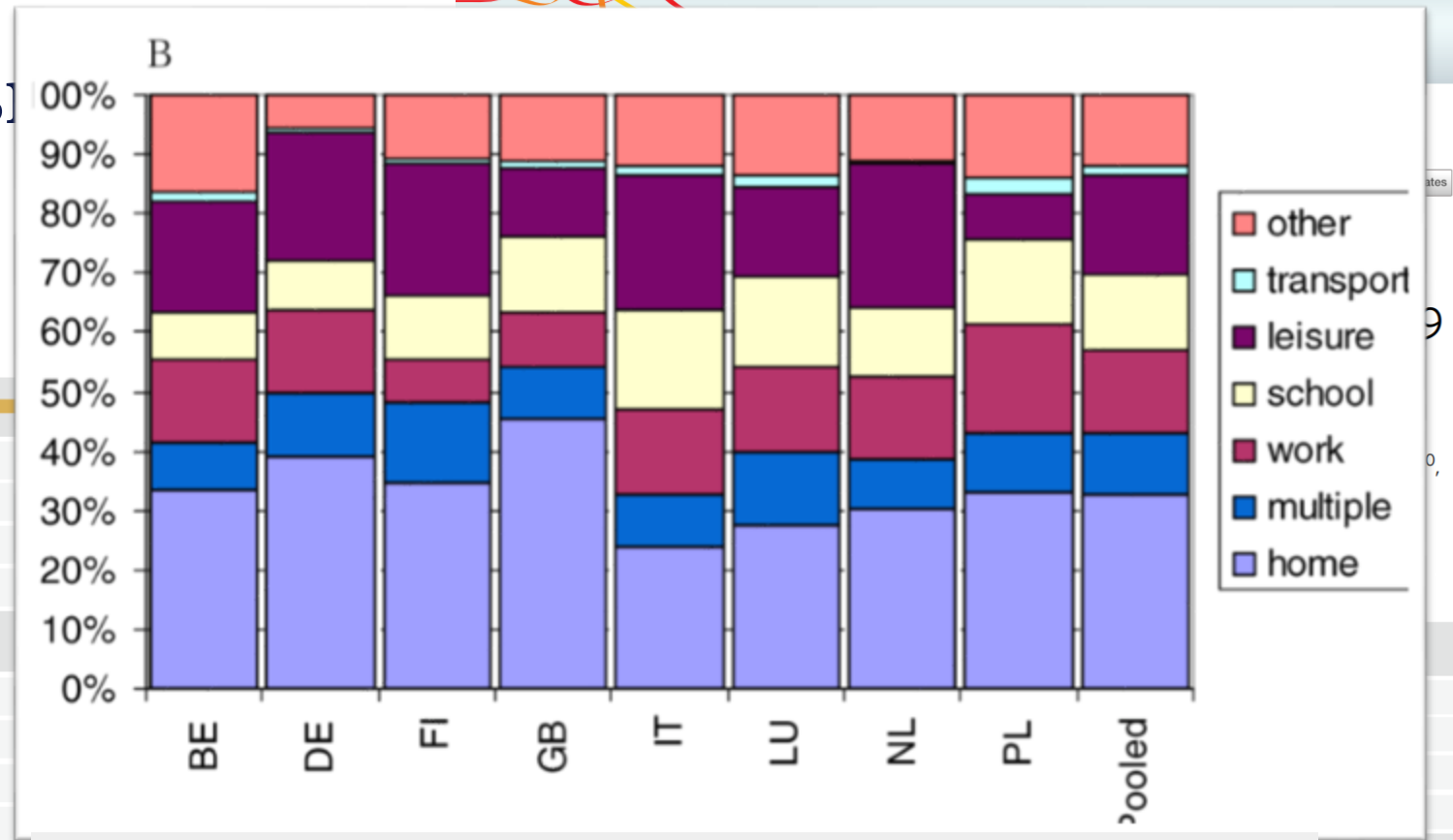
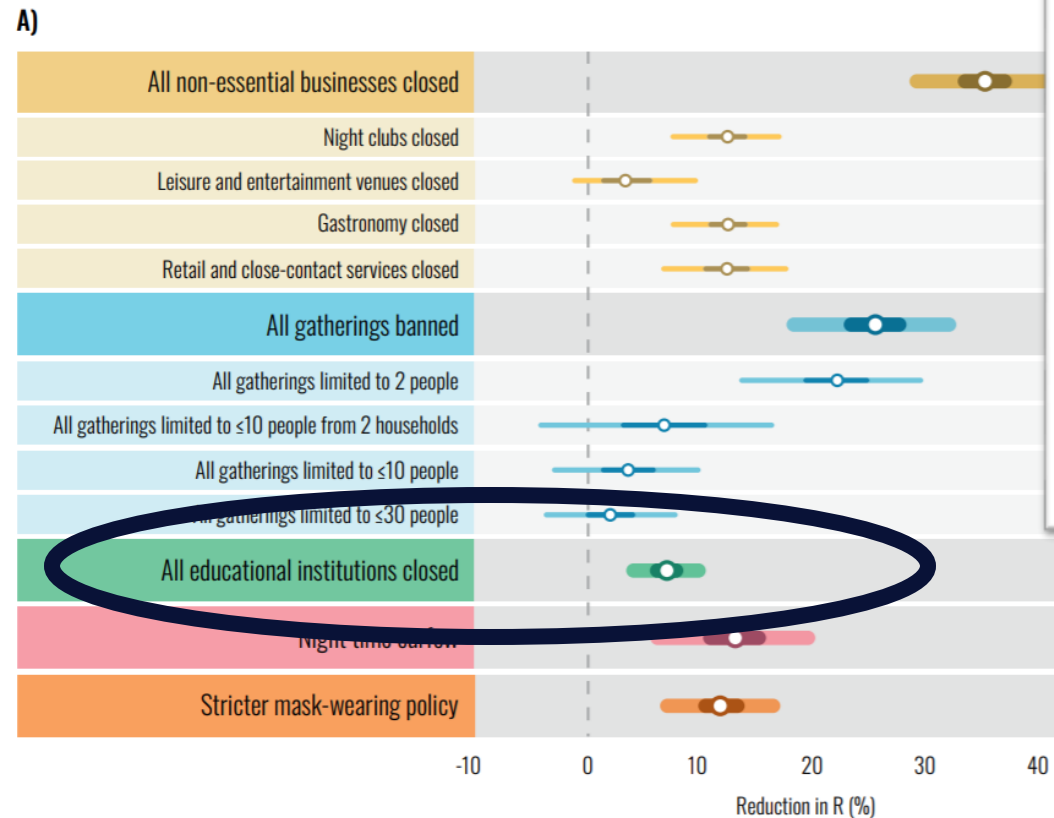
Eran Bendavid, Department of Medicine, Stanford University, Stanford CA 94305, USA.  
Email: ebd@stanford.edu

### FUNDING INFORMATION

The study was funded with support from the Stanford COVID-19 Seroprevalence Studies Fund.



# Welle 2: Wirksamkeits



## PLOS MEDICINE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

### Social Contacts and Mixing Patterns Relevant to the Spread of Infectious Diseases

Joël Mossong, Niel Hens, Mark Jit, Philippe Beutels, Kari Auranen, Rafael Mikolajczyk, Marco Massari, Stefania Salmaso, Gianpaolo Scalia Tomba, Jacco Wallinga, Janneke Heijne, Malgorzata Sadkowska-Todys, Magdalena Rosinska, W. John Edmunds

Published: March 25, 2008 • <https://doi.org/10.1371/journal.pmed.0050074>



# Agenten-basierte Simulation

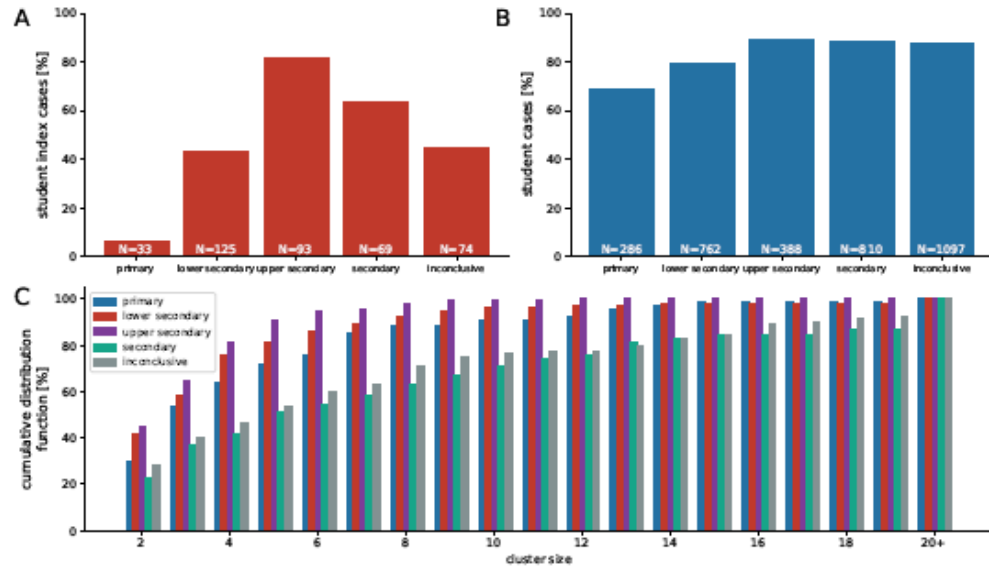


Figure 1: Cluster data for transmissions in schools. The ratio of A student-to-teacher source cases is lower in school types with young children (primary, lower secondary) and higher in school types with older children (upper secondary, secondary). The same trend is seen in the proportion of students in clusters B. C The cumulative distribution function of cluster sizes shows a majority of clusters consisting of only a handful of cases, whereas clusters with 20 or more cases still do occur, particularly in (upper) secondary schools. See Materials and Methods, section "Empirical observations of SARS-CoV-2 clusters in Austrian schools" for details on the identification of school types.

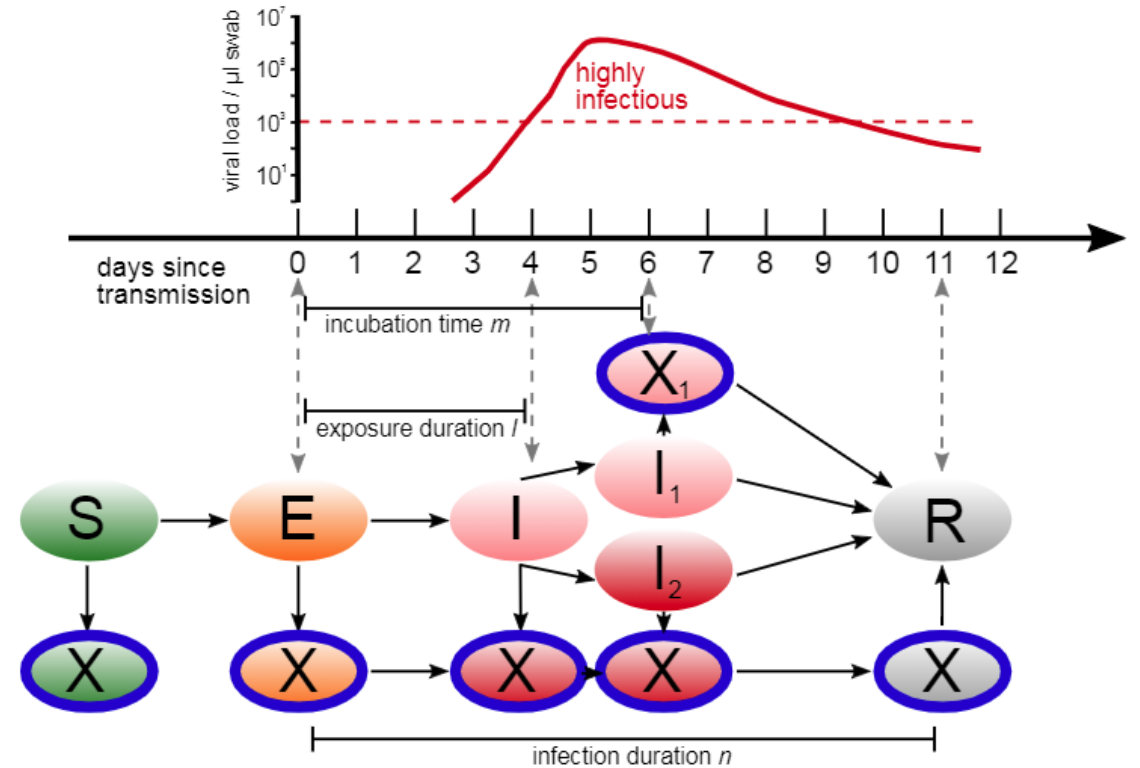
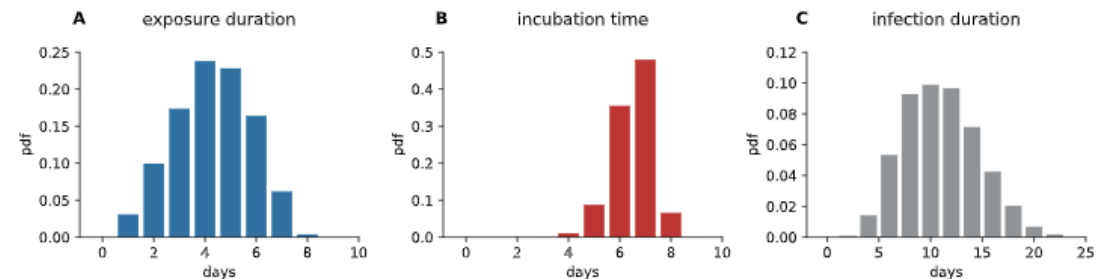
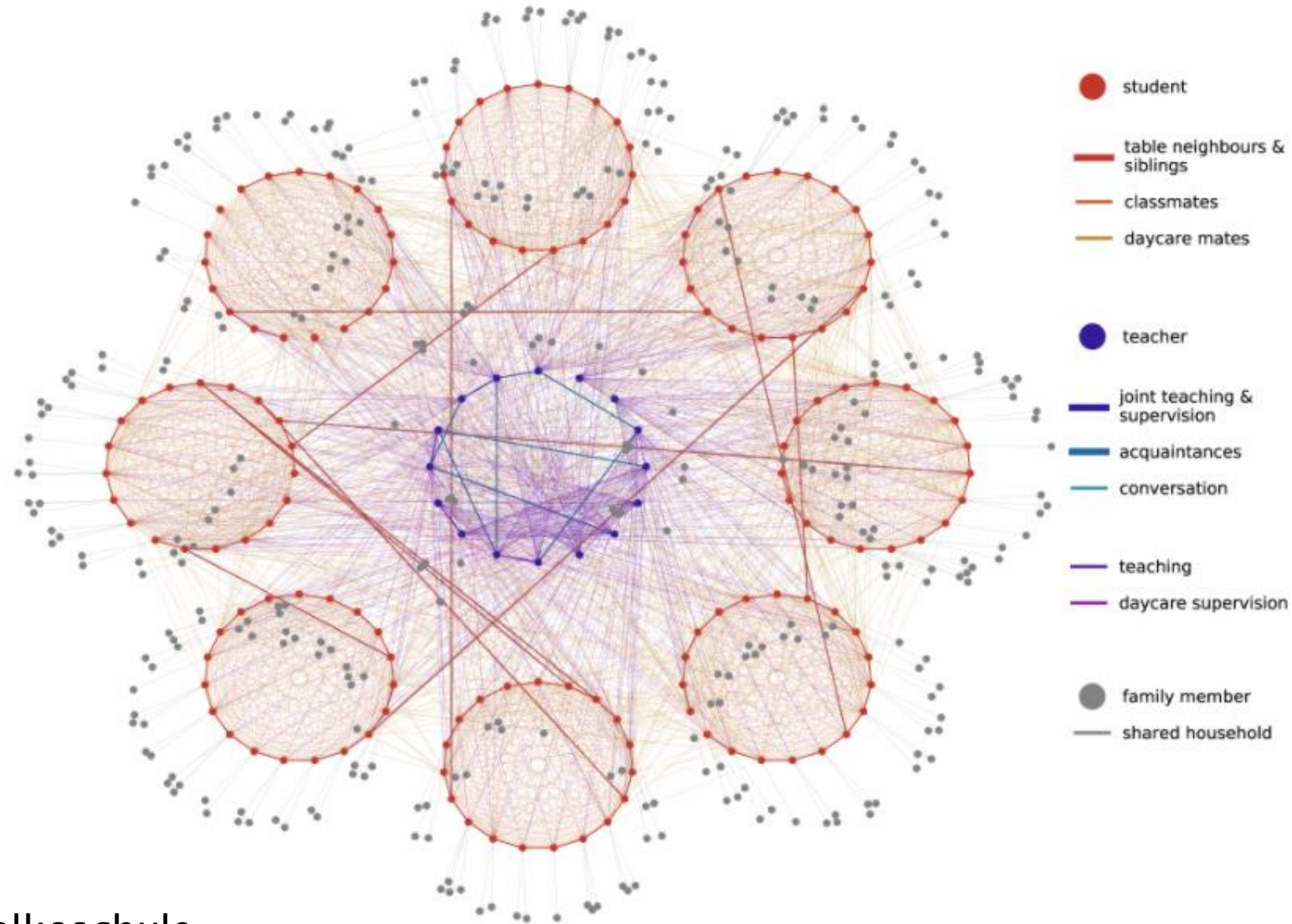


Fig. 5. Agents in the epidemiological model can be in the states (circles) susceptible (S), exposed (E), infectious (I), infectious without symptoms ( $I_1$ ), infectious with symptoms ( $I_2$ ) and recovered (R). Possible state transitions are shown by arrows. In each of these states, agents can also be quarantined (X), preventing them from interacting with other agents. Transitions between states follow the development of the viral load in the host.



# Kontaktnetzwerke

- Schultypspezifische Kontaktnetzwerke
- Unterschiedliche Anzahl von Klassen, Schüler:innen, Lehrpläne, etc.
- Volksschule: Kontakte von Lehrkräften konzentrieren sich auf eine Klasse

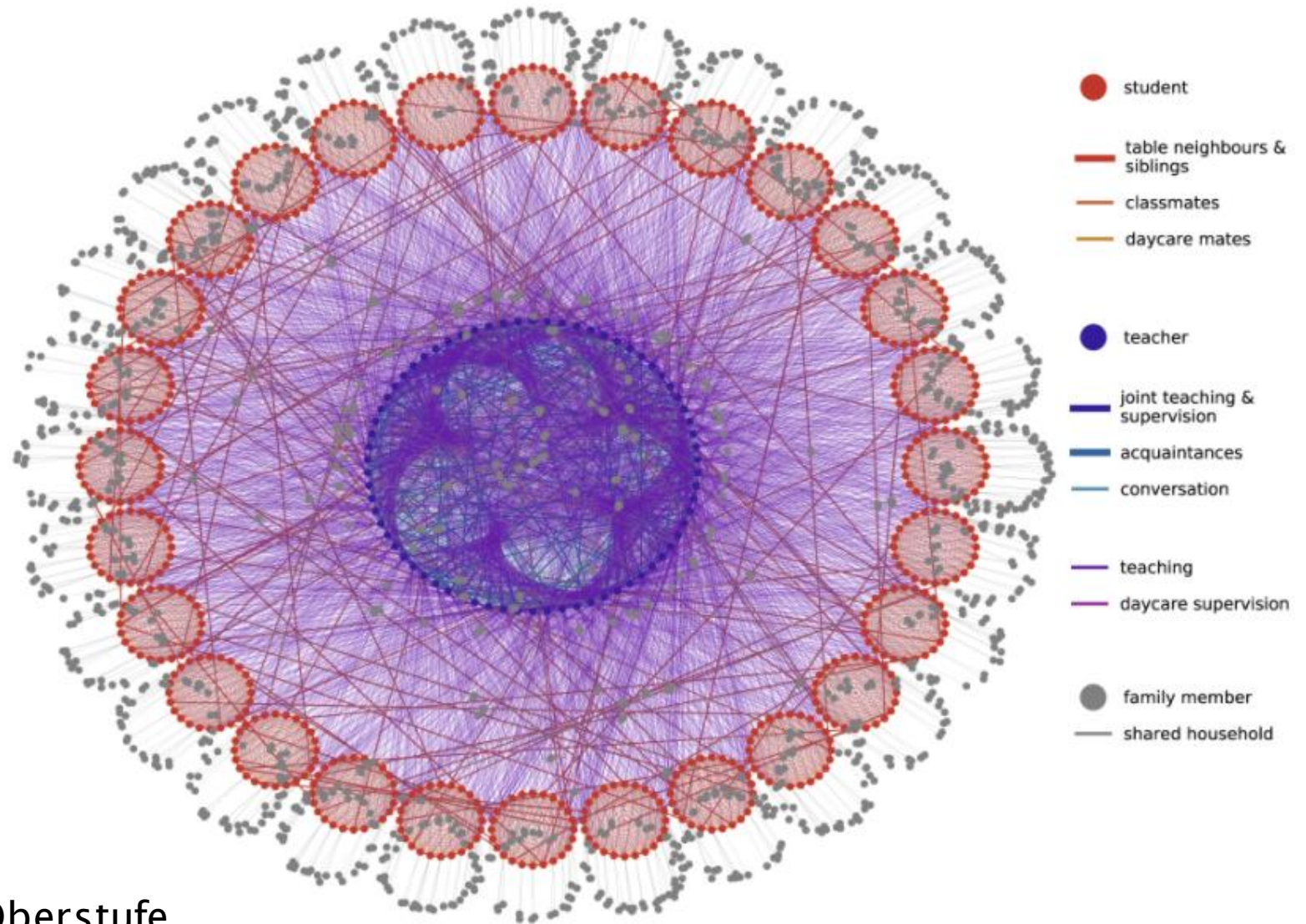


Volksschule



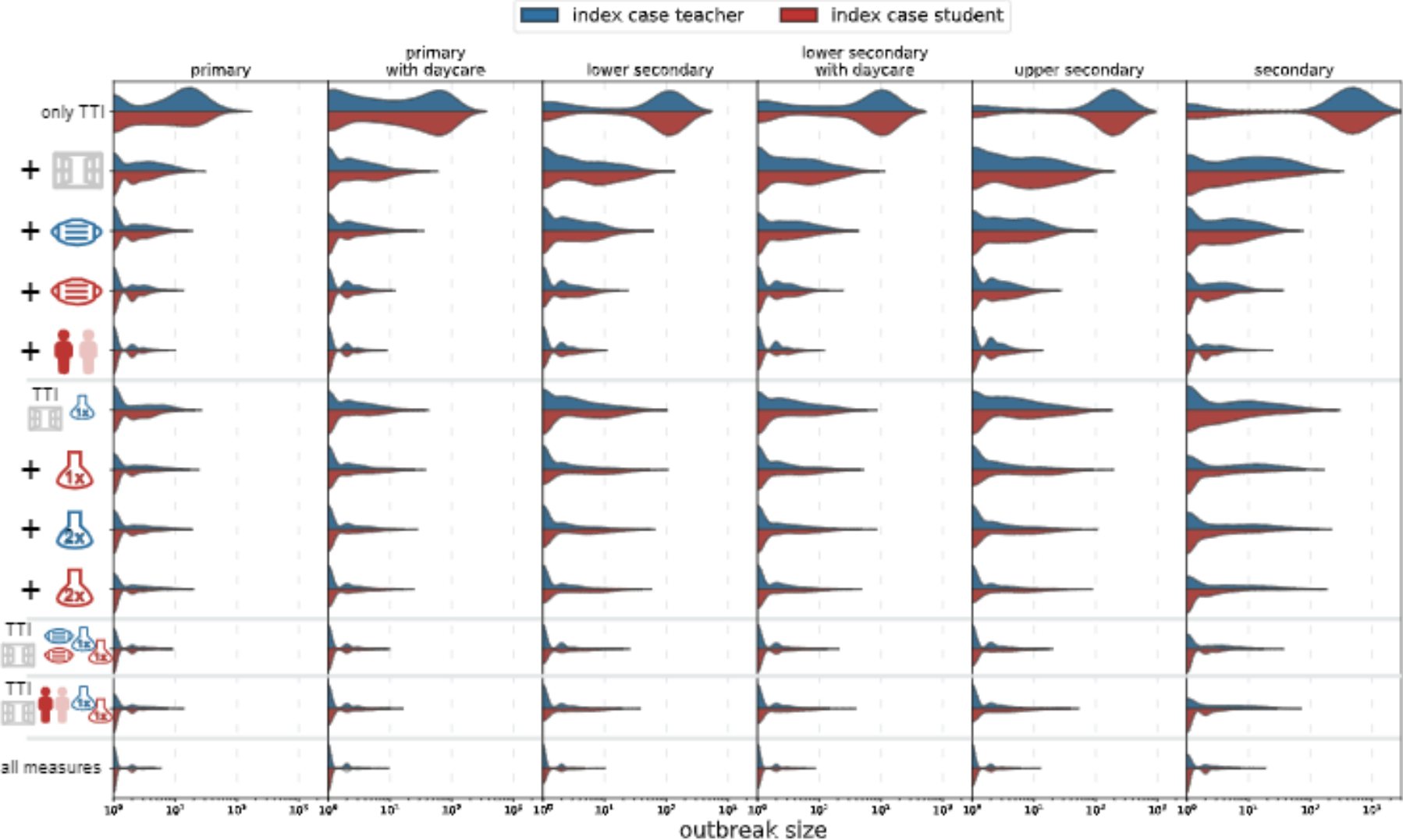
# Kontaktnetzwerke

- Schultypspezifische Kontaktnetzwerke
- Unterschiedliche Anzahl von Klassen, Schüler:innen, Lehrpläne, etc.
- Oberstufe: stärkere Durchmischung durch Lehrkräfte



Oberstufe

# Evaluierung von Maßnahmenbündel



K+ ABONNIEREN

CORONA

IMMO

JOBS



POLITIK INLAND

22.11.2021

## Offene Schulen im Lockdown: Faßmanns Empfehlungen

Bildungsminister Heinz Faßmann hat Montagmorgen seine Haltung zum Präsenzunterricht bekräftigt.



INNENPOLITIK

## Forscher: Strengere Corona-Maßnahmen für höhere Schulen

Von OÖN 21. Januar 2021 00:04 Uhr



Studie zu Wirkung von Schulmaßnahmen  
Bild: Alexander Schwarzl



CORONAVIRUS

## Klimek für Normalbetrieb an Schulen

Im kommenden Schuljahr wird es - anders als vergangenen Herbst - zunächst weder Test- noch Maskenpflicht geben. Für Komplexitätsforscher Peter Klimek ist das auch vertretbar. Man sollte sich auf die vulnerablen Gruppen konzentrieren.

30. August 2022, 7.47 Uhr

Teil

Strengere Sicherheitsmaßnahmen in den Schulen hätten nur einen überschaubaren Effekt, nachdem es in der breiten Gesellschaft fast nirgends mehr Maskenpflicht gibt und kaum noch getestet wird. „Man kann das einfach nicht trennen von dem, was sich in der Gesamtbevölkerung an Infektionsniveau abspielt.“

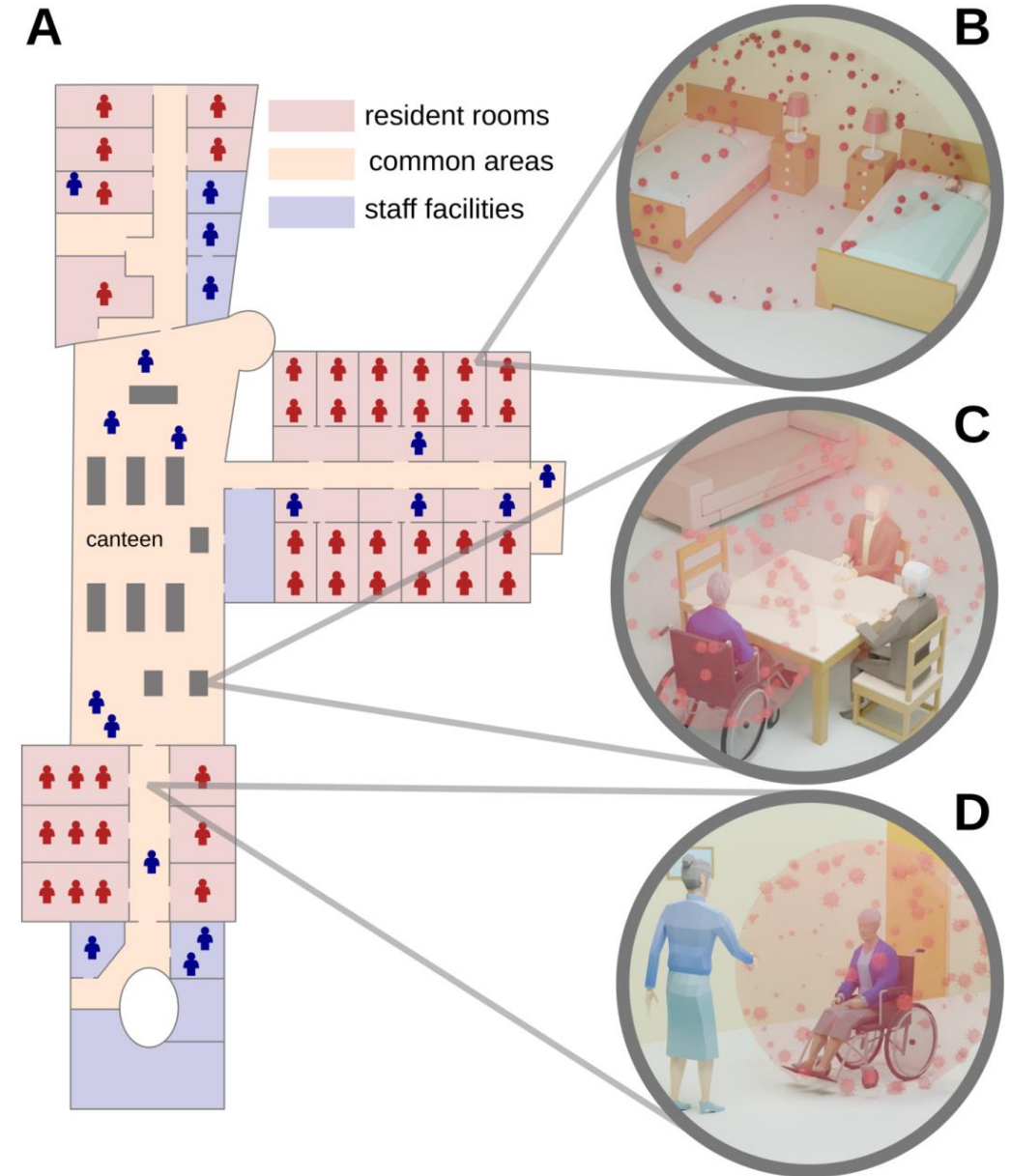
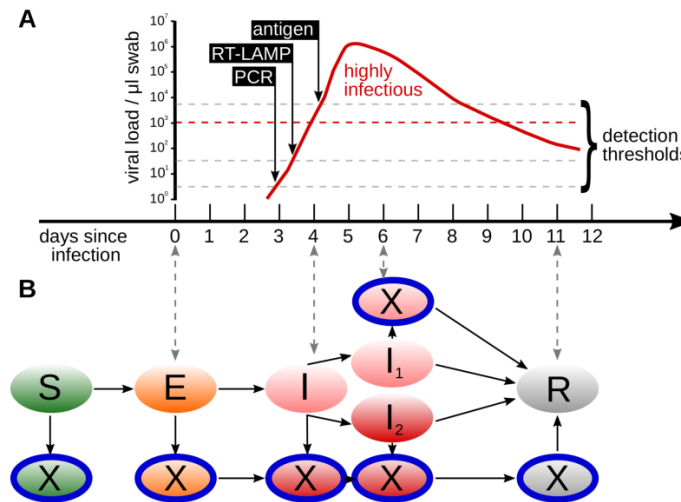
### Erwartet mehr Cluster

Es werde mehr Cluster an den Schulen geben als im vergangenen Schuljahr, erwartet Klimek, der am Complexity Science Hub (CSH) Vienna und der Medizin-Uni Wien forscht. Um diese zu reduzieren, müsste man allerdings angesichts der hohen Übertragbarkeit von Omikron einen unverhältnismäßig hohen Aufwand betreiben, so Klimek. „Seit Omikron ist Screening mit Testen nur noch mit sehr

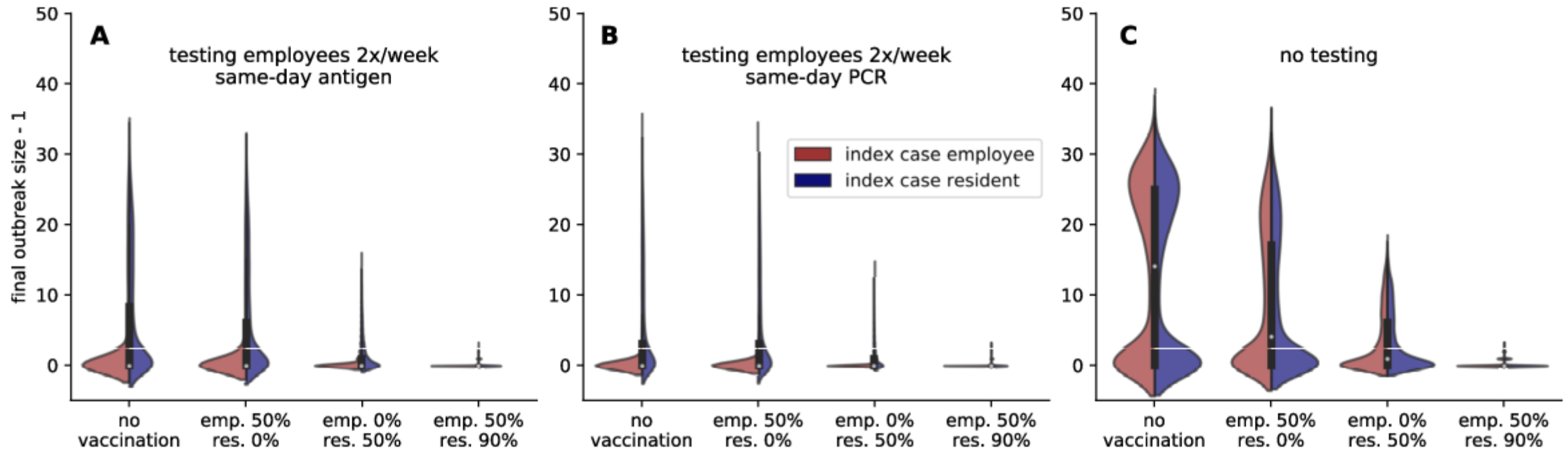


# Altersheime

- Kollaboration mit Caritas (NÖ/Wien), Thomas Wochele-Thoma
- Modell kalibriert zu Ausbrüchen in deren Heimen im Herbst 2020
- Simulation unterschiedlicher Screening Strategien, die in weiterer Folge auch umgesetzt wurden

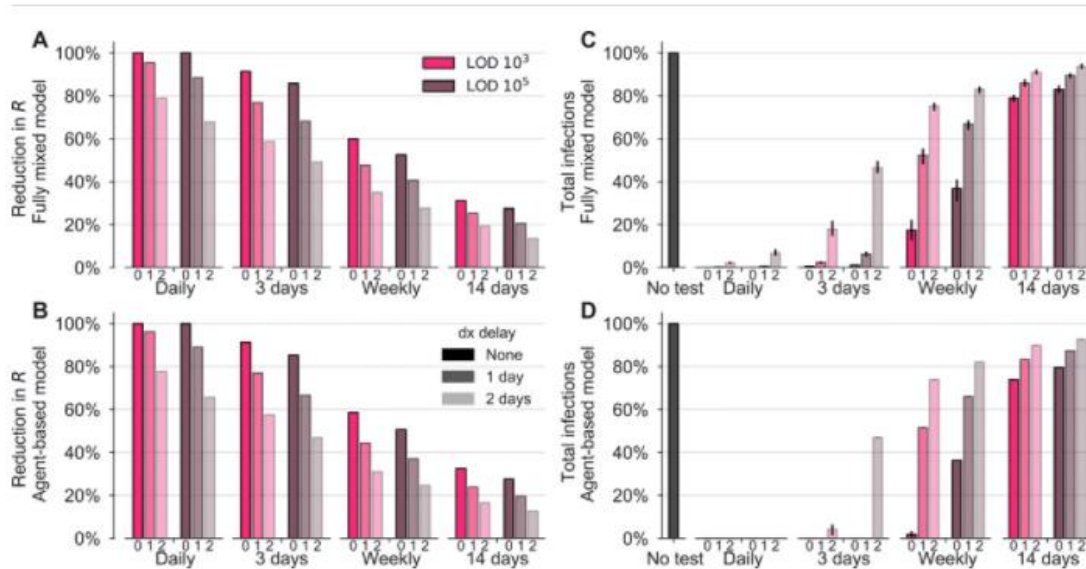


# Altersheime



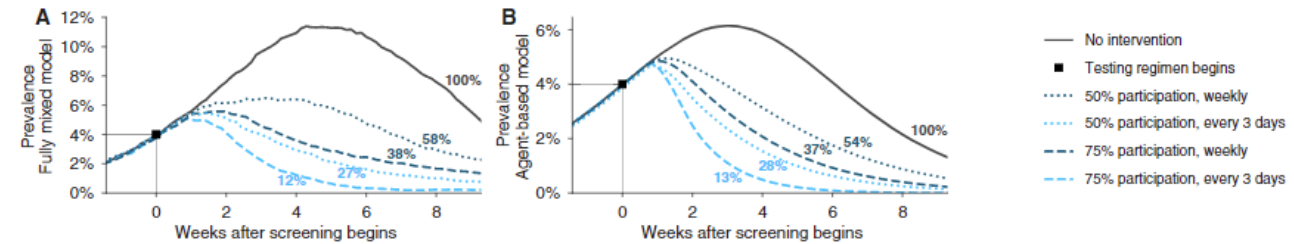
# Was bringt/brachte die Testerei?

full compliance:



**FIG. 5** Delays in reporting decrease the epidemiological impact of testing-driven isolation. The effectiveness of population screening programs is markedly diminished by delays in reporting in both the fully mixed compartmental model (top row) and agent-based model (bottom row). (A and B) The impact of testing every day, 3 days, weekly, or biweekly on the reproductive number  $R$ , calculated as  $100 \times (R_0 - R)/R_0$ , is shown for LODs  $10^3$  and  $10^5$  and delays of 0, 1, or 2 days (small text below the axis). Values of  $R$  were estimated from 50 independent simulations of dynamics (see Materials and Methods). (C and D) Relative to no testing (gray bars), repeated population screening suppresses the total number of infections in both models when testing every day or every 3 days, but delayed results lead to only partial mitigation of total cases, even for testing every day or 3 days. Error bars indicate inner 95% quantiles of 50 independent simulations each.

partial compliance:



**FIG. 6. Repeated population screening suppresses an ongoing epidemic.** Widespread testing and isolation of infected individuals drive prevalence downward for both (A) the fully mixed compartmental model and (B) the agent-based model. Time series of prevalence, measured as the total number of infectious individuals, are shown for no intervention (solid) and population screening scenarios (various dashed lines; see legend) for individual stochastic simulations. Screening began only when prevalence reached 4% (box), and time series are shifted such that testing begins at  $t = 0$ . Scenarios show the impact of a test with LOD  $10^5$ , no delay in results, and with 10% of samples assumed to be incorrectly collected (and therefore negative) to reflect decreased sensitivity incurred at sample collection in a mass testing scenario. Annotations show total number of post-intervention infections, as a percentage of the no-intervention scenario, labeled as 100% (see fig. S8 for identical simulations using a test with LOD  $10^6$ ).

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RESEARCH ARTICLE | CORONAVIRUS



## Test sensitivity is secondary to frequency and turn-around time for COVID-19 screening

DANIEL B. LARREMORE, BRYAN WILDER, EVAN LESTER, SORAYA SHEHATA, JAMES M. BURKE, JAMES A. HAY, MILIND TAMBE, MICHAEL J. MINA, AND ROY PARKER. [Authors Info & Affiliations](#)

SCIENCE ADVANCES • 1 Jan 2021 • Vol 7, Issue 1 • DOI: 10.1126/sciadv.abd5393

## EXPERTEN

# Massentests sind "billiger und sinnvoller" als ein dritter Lockdown

Die an diesem Wochenende in Österreich beginnenden Massentests sollten kein Einmal-Event sein, sondern wiederholt werden, allerdings nicht unbedingt bundesweit, sondern in Regionen mit hoher Infektionszahl.

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## OMIKRON-DYNAMIK

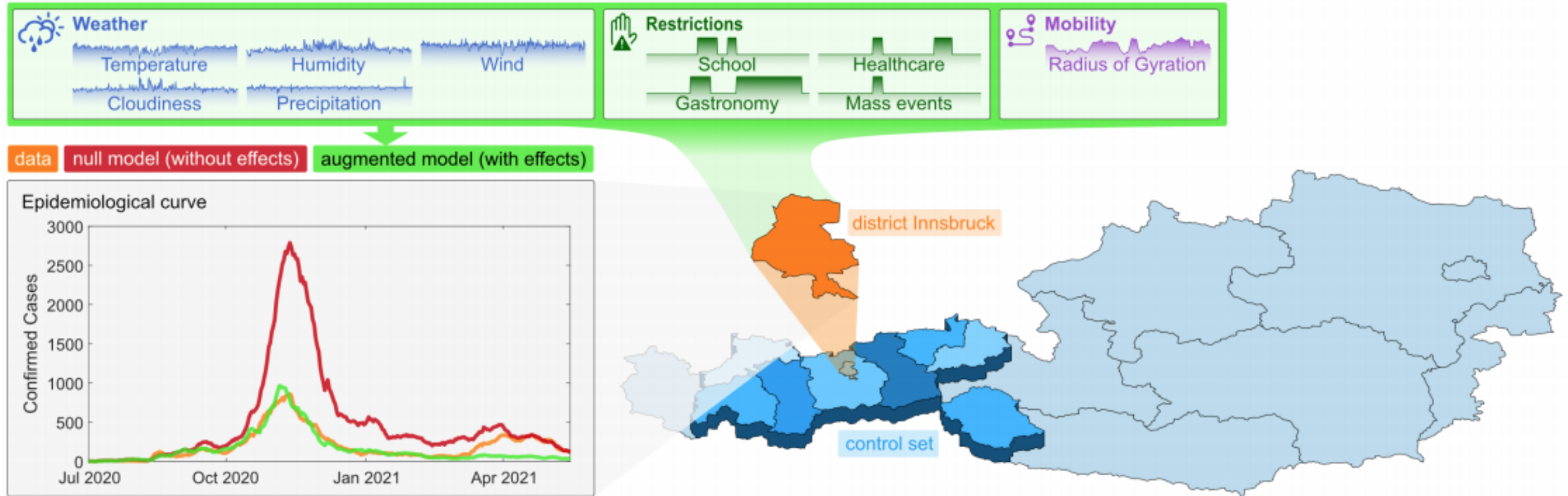
## "Tests nur für die, die sie wirklich brauchen"

- Omikron erfordert eine angepasste Teststrategie, denn um - wie bisher - so viel wie möglich zu testen, fehlen die Kapazitäten.

vom 11.01.2022, 16:06 Uhr | Update: 11.01.2022, 16:20 Uhr

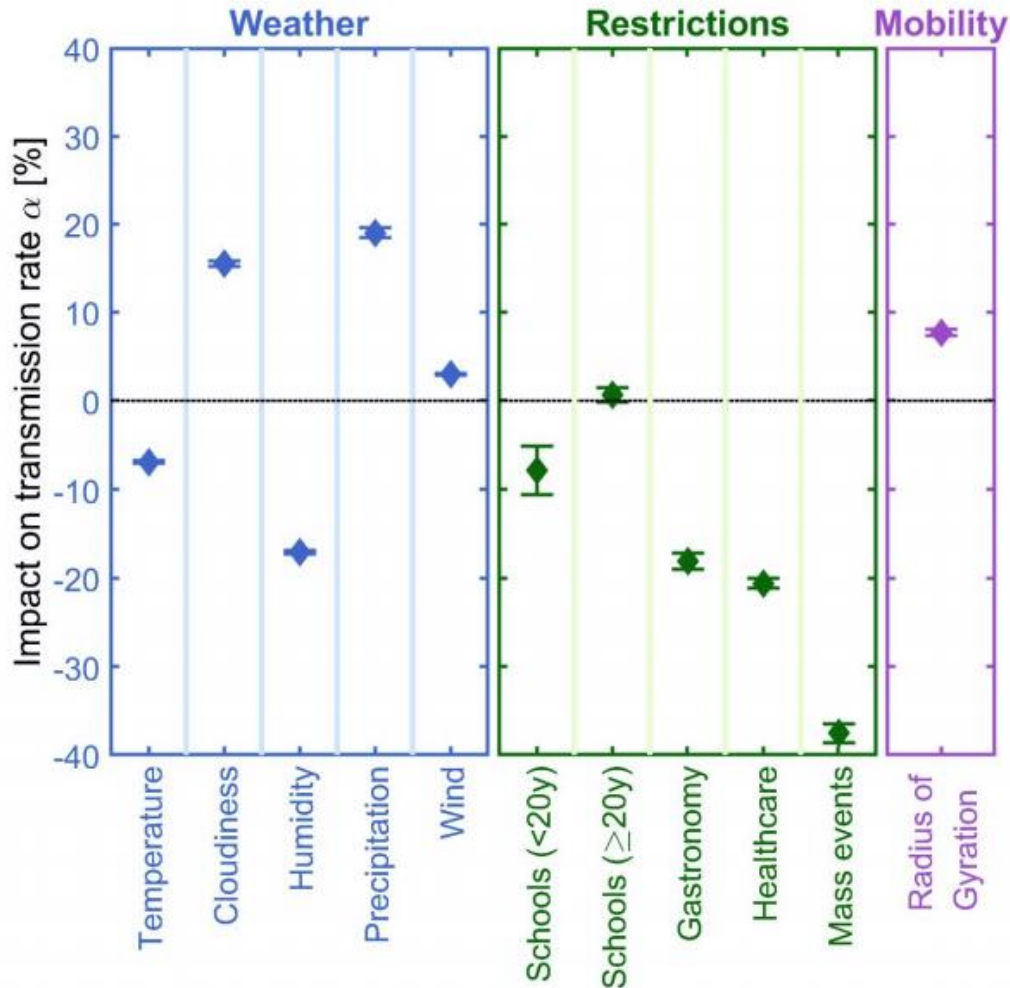


# Maßnahmen oder Zufall?





# Maßnahmen oder Zufall?




	re-fit of the model: explained variation [%]	SD [%]	re-run of the model: explained variation [%]	SD [%]
no dropout	60.3	2.7	60.3	2.7
weather dropout	45.9	3.0	44.5	3.0
restrictions dropout	25.9	14.3	12.4	3.6
mobility dropout	60.3	2.8	58.7	2.9

<https://doi.org/10.1371/journal.pcbi.1009973.t003>

- ) 60% der beobachteten Unterschiede in den Infektionskurven können durch eine Kombination dieser Faktoren erklärt werden.
- ) 15% der Unterschiede können mit meteorologischen Faktoren erklärt werden
- ) 35%-45% durch Maßnahmen.



## Will COVID-19 be evidence-based medicine's nemesis?

Trisha Greenhalgh 

Published: June 30, 2020 • <https://doi.org/10.1371/journal.pmed.1003266>

In a complex system, the question driving scientific inquiry is not “what is the effect size and is it statistically significant once other variables have been controlled for?” but “does this intervention contribute, along with other factors, to a desirable outcome?”. Multiple interventions might each contribute to an overall beneficial effect through heterogeneous effects on disparate causal pathways, even though none would have a statistically significant impact on any predefined variable [11]. To illuminate such influences, we need to apply research designs that foreground dynamic interactions and emergence. These include in-depth, mixed-method case studies (primary research) and narrative reviews (secondary research) that tease out interconnections and highlight generative causality across the system [16, 17].

Danke für die Aufmerksamkeit!

