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Contribution by

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Bundesministerium
Bildung, Wissenschaft
und Forschung

SORA

COVID-19 Prevalence

Media information, April 10, 2020

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Overview

Key data:

- n=1,544 (random sample for Austria)
- Test period: April 1–6, 2020

A detailed scientific study protocol will be published in April.

COVID-19 Prevalence

1 Objectives, client and consortium

The Austrian Ministry of Science launched this study to find out:

- How many people are infected with COVID-19 in Austria? (prevalence)

This is the first countrywide representative study on COVID-19 worldwide.

Commissioned by: Republic of Austria, represented by the Federal Ministry of Education, Science and Research (BMBWF).

Project consortium:

- SORA Institute for Social Research and Consulting (project lead, co-ordination, sample, data analysis), closely co-ordinated with:
- Institut für statistische Analysen Jaksch & Partner GmbH (hotline, sample management, telephone interviews)
- Medical University of Vienna (evaluation of PCR tests)
- Complexity Science Hub Vienna CSH (statistical-medical expertise)

Directly commissioned by the BMBWF:

- Austrian Red Cross and its national associations (carrying out PCR tests throughout Austria)

2 Key results

Estimate of period prevalence

Prevalence is the occurrence of a disease in relation to an entire population. This study makes it possible to estimate the prevalence of acute infections with COVID-19 (“Corona Virus”) among non-hospitalized people living in Austria for the period early April 2020.

The proportion of positively tested in the weighted sample is 0.33%.

This proportion represents about 28,500 people among the population.

Confidence interval (95%)

If a sample survey draws a conclusion on a population, the confidence interval must always be observed. For this study, the generally accepted principle was applied that results should be within the stated interval with 95% certainty.

Applying the Clopper-Pearson interval method, we find that the prevalence of COVID-19 in Austrian households is 95% likely to be between 0.12 and 0.76%.

In absolute terms: In addition to the patients in hospitals, there were between 10,200 and 67,400 people acutely infected with COVID-19 in the period April 1-6.

3 Study design

The study was divided into three steps: notification, on-site testing and post-test telephone survey.

Notification (Mar 31 – Apr 3)

- Households selected as part of the random sample were informed in advance of the study by letter and/or by telephone. Willingness to participate was determined.

Testing (Apr 1–6 with focus on Apr 4 and 5)

- Employees of the Austrian Red Cross carried out PCR tests (cobas® SARS-CoV-2) in the included municipalities as well as in drive-in test centers in seven federal states. 35% of the sample went to a drive-in station.
- Testing was carried out using a cotton swab. The swabs were then analyzed at the Clinical Institute of Laboratory Medicine at the Medical University of Vienna.

Telephone survey (after Apr 6)

- After April 6, the tested persons are contacted again by telephone to collect further information, e.g. on their state of health.
- The results of the follow-up survey will be published in April, together with a detailed study protocol.

Information on data protection

The test has been organised in accordance with the GDPR, the regulations of the Austrian market research institutions VMÖ/VdMI and the WHO guidelines. The implementing institutions are at no point able to assign a test result to any particular household/test subject.

The laboratory of the Medical University Vienna notifies the relevant authorities whenever a person tests positive. These authorities then contact the person immediately.

The only stored data is anonymized and kept for statistical analysis or provided for purposes of scientific research.

4 Sampling

Population

The study population consists of all people living in Austria (excluding those currently in hospital). The youngest person in the sample was not yet one year old, the oldest 94 years.

Gross sample

Design: Random selection of 249 municipalities and Viennese districts in Austria stratified in advance according to federal state and municipal size. Random selection of households within the communities and random selection of household member in the household.

Address data: (A) Public telephone directories, supplemented by (B) RLD (random last digit) procedure

Acceptance and refusal to participate: Only households with a confirmed willingness to participate were contacted by the Red Cross for a PCR test. The total refusal rate (address data A + B) is 23%, i.e. 77% of those contacted agreed, a relatively high level of willingness.

A total of 2,197 households declared their willingness to participate, including 654 who were contacted using the RLD procedure.

Net sample

n=1,544

- For n = 1,541 persons, both a correct PCR test and a valid questionnaire are available.
- During recruiting, n = 3 people indicated that they had recently tested positive.
  These were not tested again but included in the sample as having tested positive. This allows the sample to be corrected for systematic error.
- The net sample used for the calculations therefore contains n = 1,544 cases.

Distribution of federal states in the sample

The unweighted distribution according to federal state is as follows:

Burgenland	71	4.6%
Carinthia	29	1.9%
Lower Austria	326	21.1%
Upper Austria	255	16.5%
Salzburg	88	5.7%
Styria	277	17.9%
Tirol	99	6.4%
Vorarlberg	75	4.9%
Vienna	324	21.0%
	1544	100%

Weighting

The data were weighted according to:

- Household size
- Region
- Age
- Age x gender
- Age x region

5 Acknowledgements

On behalf of the project consortium and our staff, SORA would like to thank

- those contacted for participation in the study
- those agreeing to participate
- those tested for the study

We would also like to thank

- the staff at the Federal Ministry
- our partner institutions and their staff
- the team at SORA
- the staff and teams of the Austrian Red Cross
- the international and Austrian experts and colleagues who advised and helped us throughout this project

COVID-19 Simulation Model

Analysis of Epidemic Spread and Effectiveness of Countermeasures

Introduction and Aims

When it was clear that COVID-19 will become a global issue, the obvious questions was: What impact will the disease have on health care systems and what would the best countermeasures be to get a grip on it? While decision makers are still hesitant to accept results from (mathematical) computer models, these can be a very powerful tool for decision support for policy making in a wide range of areas[1].
Thus, we adopted our existing agent-based General Population Concept (GEPOC[2]) model in order to simulate the COVID-19 epidemic. The GEPOC model itself is a perfect example for a decision support tool, as it is already tested and proven in the health sector (e.g. assessment of re-hospitalization rates of psychiatric patients[3] and evaluation of MMR and Polio vaccination rates[4]).
The epidemic simulation extension to the model is based on an influenza simulation model[5] that was developed in the IFEDH[6] project. This model has already yielded new insights into the course of the annual influenza wave in cooperation with the Austrian health system.[7] The contact models used within are based on data of the POLYMOD study[8] works and contact models developed from the former.[9][10]

Decision Support – Goals & Outcomes

The two primary goals of the simulation model are to 1) test different intervention and policy scenarios and 2) evaluate the amount of required resources (e.g. number of ventilators and ICU beds).
Due to the high quality of the simulation results a series of decision makers have commissioned simulation runs to answer various questions. Among those are (as of April 15, 2020):

- The Austrian Ministry of Health:
  - Weekly prognosis of case numbers for Austria (joint action with other research groups in Austria (Medical University Vienna, Gesundheit Österreich GmbH)
  - Identification of effective measures / Evaluation of effectiveness of measures
  - Effect of suspension of measures ("controlled restart")
- Wiener Krankenanstaltenverbund (Viennese Association of Hospitals) and Niederösterreichische Landesklinikenholding (on a regular basis):
  - Prognosis of case numbers
  - Planning of health care resources (hospital beds and ICUs)
- In parallel to commissioned simulation the model is constantly being expanded in order to widen the range of possible scenarios and increase the quality of results. It is also used for scientific investigations of crucial topics, such as the analysis of general mechanisms of the epidemic spread and that of local effects on it.

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[1] Š. Emrich, "Modeling Peace and Security: The Future of Computer-Supported Policy" in IPI Global Observatory, June 2017.

[2] M. Bicher, C. Urach, and N. Popper, "GEPOC ABM: A Generic Agent-Based Population Model for Austria," in Proceedings of the 2018 Winter Simulation Conference, Gothenburg, Sweden, 2018, pp. 2656–2667.

[3] G. Zauner, C. Urach, M. Bicher, N. Popper, and F. Endel, "Microscopic modelling of international (re-)hospitalisation effects in the CEPHOS-LINK setting," International Journal of Simulation and Process Modelling, vol. 3, no. 14, pp. 261–279, Jan. 2019, doi: 10.1504/IJSPM.2019.101012.

[4] https://www.sozialministerium.at/Themen/Gesundheit/Impfen/Masern---Elimination-und-Durchimpfungsraten/Durchimpfungsraten---Nationaler-Aktionsplan.html

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[7] F. Miksch et al., "New Insights on the Spread of Influenza Through Agent Based Modeling," Value in Health - The Journal of the International Society for Pharmacoeconomics and Outcomes Research, vol. 14, no. 7, Nov. 2011.

[8] J. Mossong et al., "POLYMOD social contact data," 2017.

[9] G. Schneckenreither and N. Popper, "Dynamic multiplex social network models on multiple time scales for simulating contact formation and patterns in epidemic spread," in Proceedings of the 2017 Winter Simulation Conference, Las Vegas, Nevada, 2017, pp. 4324–4335.

[10] F. Miksch, G. Zauner, N. Popper, and F. Breitenecker, "Agent-Based Population Models For Household Simulation," in Proceedings of the 7th EUROSIM Congress on Modelling and Simulation, Prague, Czech Republic, 2010, vol. Vol. 2 Full Papers (CD), pp. 567–572.

Simulation of the SARS-CoV-2 Epidemic in Vienna

Introduction and Aims

The SARS-CoV-2 virus has begun to spread in Austria, too. The attendant Covid-19 cases in Austria are rising at speed and are by now displaying endemic forms. This project aims to model and simulate the spread of SARS-CoV-2, the Covid-19 cases caused thereby and in particular the severe and critical cases that require medical care (hospital stays and/or intensive care units). Scenarios are computed in order to simulate strategies and their effects on the spread of the disease. The aim is on the one hand to locate effective interventions which will reduce the total number of cases, especially the peaks of cases (meaning the maximum value of cases that occur at the same time and require treatment). On the other hand, the required resources need to be estimated and strategies have to be developed in order to safeguard supply.

Scientific Background

The questions described above can only be answered with the aid of an individual agent-based simulation strategy, meaning that each person is considered as one small simulation model (digital twin) within a large model and over the course of time[1]. This is why our Covid-19 simulation model is an agent-based model, which is based on previous work in various projects. Its basis is an agent-based population model (GEPOC[2]) that was created in the context of the Comet K-project DEXHELPP[3] and has since been used as a foundation for a range of simulation questions from the health sector (for example for the assessment of re-hospitalization rates of psychiatric patients[4] and evaluation of MMR and Polio vaccination rates[5]). The model is a stochastic agent-based model and uses state-of-the-art methods in order to guarantee that results can be reproduced, validated and verified (see here, for example[6]).

The epidemic simulation extension to the model is based on an influence simulation model[7] that was developed in a pre-project IFEDH[8]. This model has already yielded new insights into the course of the annual influenza wave in cooperation with the Austrian health system.[9] The contact models are based on data of the POLYMOD study[10] works and contact models developed from the former.[11][12]

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1 F. Miksch, B. Jahn, K. J. Espinosa, J. Chhatwal, U. Siebert, and N. Popper, "Why should we apply ABM for decision analysis for infectious diseases?—An example for dengue interventions," PLoS ONE, vol. 14, no. 8, p. e0221564, Aug. 2019, doi: 10.1371/journal.pone.0221564.

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5 https://www.sozialministerium.at/Themen/Gesundheit/Impfen/Masern---Elimination-und-Durchimpfungsraten/Durchimpfungsraten---Nationaler-Aktionsplan.html
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7 F. Miksch, "Mathematische Modelle für neue Erkenntnisse über Epidemien mittels Herdenimmunität und Serotypenverschiebung," Dissertation, Inst. f. Analysis und Scientific Computing, Vienna University of Technology, Vienna, 2012.

8 N. Popper, I. Wilbacher, and F. Breitenecker, "IFEDH - solving health system problems using modelling and simulation," in Proceedings of the International Workshop on Innovative Simulation for Health Care 2012, Vienna, 2012, pp. 127–132.

9 F. Miksch et al., "New Insights on the Spread of Influenza Through Agent Based Modeling," Value in Health - The Journal of the International Society for Pharmacoeconomics and Outcomes Research, vol. 14, no. 7, Nov. 2011.

10 J. Mossong et al., "POLYMOD social contact data," 2017.

11 G. Schneckenreither and N. Popper, "Dynamic multiplex social network models on multiple time scales for simulating contact formation and patterns in epidemic spread," in Proceedings of the 2017 Winter Simulation Conference, Las Vegas, Nevada, 2017, pp. 4324–4335.

12 F. Miksch, G. Zauner, N. Popper, and F. Breitenecker, "Agent-Based Population Models For Household Simulation," in Proceedings of the 7th EUROSIM Congress on Modelling and Simulation, Prague, Czech Republic, 2010, vol. Vol. 2 Full Papers (CD), pp. 567–572.

Methods

An agent-based simulation model for the course of the epidemic in Vienna is expanded and developed on the basis of the GEPOC model[13] that was developed in the Dexhelpp project. This is a population model using statistic representatives for the population of Vienna using the following parameters:

- age
- gender
- place of residence (GPS coordinates, sampled on the basis of registration districts)

Every real person is therefore represented in this model by a virtual image, i.e., a digital twin (called an 'agent' in simulation language). This representative can be followed over the entire timeline. The concept of the digital twin creates absolute freedom to the modeller to evaluate different (prognosis) scenarios in this virtual Vienna. The population is therefore followed, for example, in steps of single days in the basic population model and undergoes processes of death, birth and migration in order to enable a forecast calculation for the population (population status and structure). Find more information on the technical model structure here[1].
The attendant distributions are here taken from data from Statistik Austria[14] and the Global Human Settlement Project[15]. The population model was extended for the Covid19 simulation by providing each digital twin with contact networks which define individual contacts/relationships. Furthermore, the course of the disease is implemented to depict the various stadia of the course of the disease as well as changes to behaviour and the course of treatment due to measures taken.

A city like Vienna has other contact conditions from the rest of Austria: public transport, shopping centres, etc. facilitate many more coincidental contacts and the spatial proximity within a household of two people is less decisive for contact than in rural areas. The model is adapted to these conditions by providing for precisely specified places for human-to-human contacts, such as human-school-human or human-workplace-human networks. Prognoses regarding the spread of the disease are thereby more closely modelled to reality, and it is possible to evaluate scenarios like the closure of schools. Depending on age, gender, income and geographic location of the household they belong to, each virtual person visits different places where contact processes take place per day.

The following location types are currently contained in the model:

- households
- schools (separated into students <14 and >=14 years old)
- workplaces
- leisure time

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[13] F. Miksch, G. Zauner, N. Popper, and F. Breitenecker, "Agent-Based Population Models For Household Simulation," in Proceedings of the 7th EUROSIM Congress on Modelling and Simulation, Prague, Czech Republic, 2010, vol. Vol. 2 Full Papers (CD), pp. 567–572.

[14] www.statistik.at
[15] https://ghsl.jrc.ec.europa.eu/

This results in the creation of dynamic contact networks: there are people with whom a person is in contact regularly, such as in the household, at work or other changing contacts with clients or during leisure time. The number and structure of contacts is changed accordingly, when measures are put in place (quarantine measures, closures, changes of behaviour). Parameters include the contact rates from the POLYMOD study (EU project SP22-CT-2004-502084). Very young as well as older people have, for example, clearly fewer contact partners on average than do persons in their twenties and thirties. The same is true for the contact number per day, which also varies by age.
Further locations to be modelled more precisely as next steps are

- childcare institutions
- care institutions for elderly
- large-scale events.

Figure 1: Left: contact network of a single person; Right: contacts (yellow) sampled therefrom for a simulated day

Each contact with an infectious person infected with SARS-CoV-2 by a healthy person is attached to a likelihood of infection (Figure 2). Another decisive factor for the spread of SARS-CoV-2 is, next to contact networks, also the course of the illness as well as the behaviour of the person resulting from that. The model part for the COVID-19 cases therefore gives great significance to the basic patient path, i.e., the series of events that occur in the course of the disease. This requires that disease parameters (sources and assumptions, see appendix 1) are continuously updated with insights and data from published research.
In addition, the measures put in place and the resultant changes of behaviour per person need to be depicted for each point in time. The course of the disease depicted in the model is shown in Figure 3. This includes events that are immediately connected to the course of the disease and that are depicted in a pre-defined order.

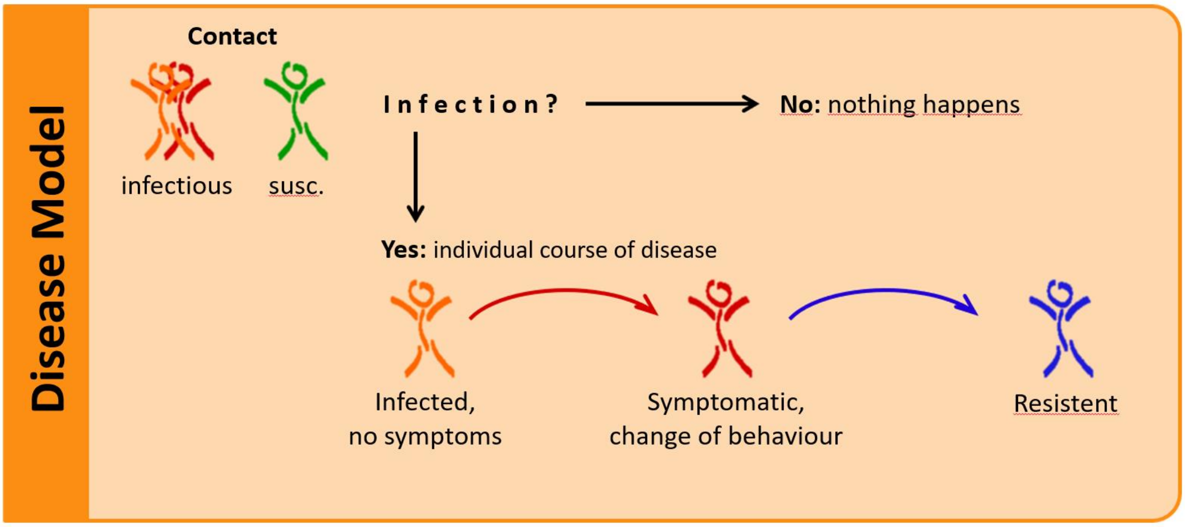

Figure 2: Potentially infectious contact

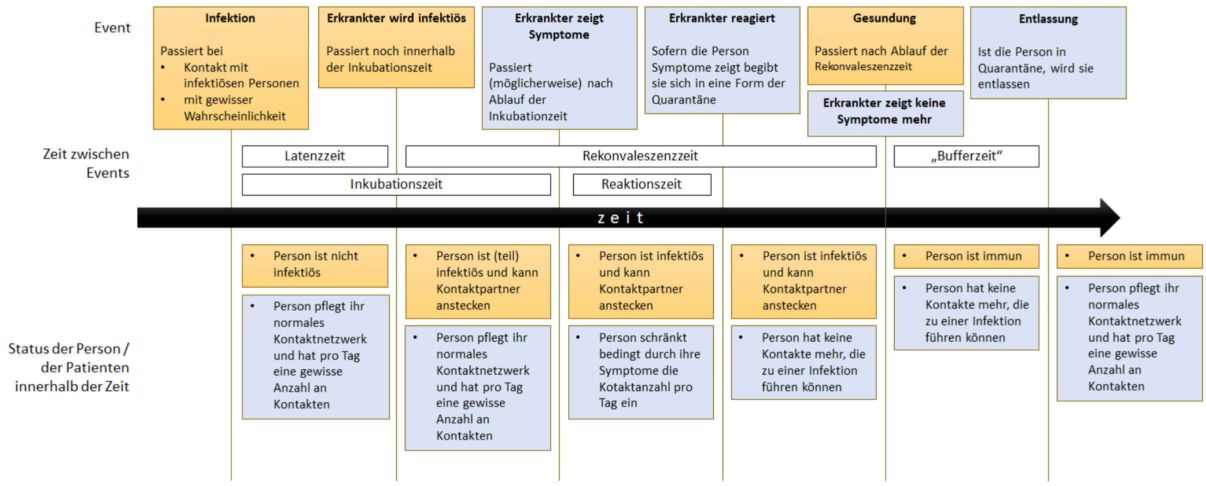

Figure 3: The sequence of events immediately related to the disease currently depicted in the model. Fields with an blue background are actively recognized by the patient or their environment, fields with an orange background are not.

The model also differentiates between 'mild', 'severe' and 'critical' cases in order to be able to evaluate the required resources. The age-dependent distribution of severity is taken from the case number study from China[16] and computed on the Austrian population structure. It is further planned to expand the model with selected chronic diseases in order to be able to simulate particular measures for at-risk patients.

[16] Novel Coronavirus Pneumonia Emergency Response Epidemiology Teamexternal icon. [The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) in China]. Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(2):145–151. DOI:10.3760/cma.j.issn.0254-6450.2020.02.003.

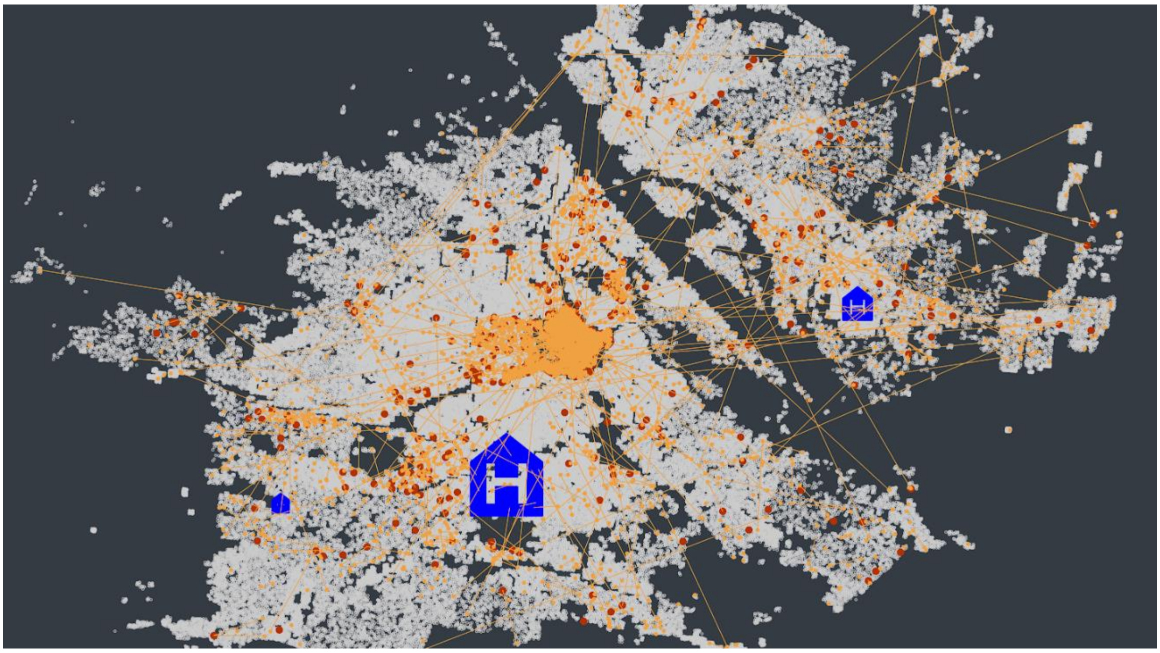

Figure 4: Schematic depiction of the simulation results for a particular point in time in Vienna

A lead time calculation is used in order to be able to depict the startpoint of the simulation as realistically as possible. According to official information, there were fifty confirmed cases in Vienna on 11 March 2020. The simulation starts a model run with a lower number of infected persons (5). These originally infected persons infect further persons in their contact networks. As soon as fifty persons with symptoms are counted in this model run, we stop the lead time calculation. After that, we can adopt all persons infected in the lead time calculations together with the information on the latency and incubation periods that have already passed into the start population for the real simulation.

Scenarios

The individual model versions are used to test different intervention and policy scenarios. As time is of the essence, calculations are continuously being conducted while particular model parts are being expanded in parallel. This widens the range of possible scenarios and increases the quality of the results with each model and data update. The following scenarios are planned:

- Course of the epidemic and confidence intervals if the policies currently in place are maintained
- Calculation of severe cases which require hospital care (resource estimates)
- Cancelling large-scale events
- School closures
- Childcare institution closures
- Increased home office work
- Various quarantine measures

It is an important aim of the calculations to test which measures are able to flatten the epidemic curve so that sufficient resources (beds, etc.) are available and to establish how many are required in the worst case.

The current status of the patient path was already parametrized partly with published data on COVID-19, but is continuously fine-tuned with further expert feedback/input/data. The flexible model structure is able to expand and focus individual areas almost at will, where that serves the precision of the model forecasts. For example, the model is currently fed with non-symptomatic patients, as these have other behavioural patterns than symptomatic patients and therefore have a different effect on the spread of infection. The severity of the disease by age, gender will have to be modelled additionally with other risk factors for the purpose of resource research.

Appendix 1

The following parameters and values are currently (13 March 2020) being used in the model:

Parameter	Application	Value	Sources
Probability of infection	Probability that a contact between an infected and a susceptible person leads to infection	Depends on the contact network in use (~5.8%)	Calibrated to a base reproduction rate R0 of 3.0 (estimate WHO, ARGES)
Incubation period	See figure 1	Beta distribution: 5.1 Median between 2 and 14 days	Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. Ann Intern Med. 2020; [Epub ahead of print 10 March 2020]. doi: https://doi.org/10.7326/M20-0504 // CDC
Latency period	See figure 1	Incubation period minus 1 day	estimate
Symptom – quarantine delay		3.43 day median Weibull distribution (Parameter 4.29; 1.65)	Hellewell, J., Abbott, S., Gimma, A., Bosse, N. I., Jarvis, C. I., Russell, T. W., … van Zandvoort, K. (2020). Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. The Lancet Global Health. https://doi.org/10.1016/s2214-109x(20)30074-7
Reconva-lescence period	See figure 1	between 7 and 21 days (beta distribution)	World Health Organization (2020). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19).
Reaction time	See figure 1	Weibull distribution, between 2.02 and 5.23 days, median 3.43	Hellewell, J., Abbott, S., Gimma, A., Bosse, N. I., Jarvis, C. I., Russell, T. W., … van Zandvoort, K. (2020). Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. The Lancet Global Health. https://doi.org/10.1016/s2214-109x(20)30074-7
'Buffer period'	See figure 1	currently 0 days	
Infectious period		10 days	Woelfel, R., Corman, V. M.,

from onset of symptoms			Guggemos, W., Seilmaier, M., Zange, S., Mueller, M. A., Niemeyer, D., Vollmar, P., Rothe, C., Hoelscher, M., Bleicker, T., Bruenink, S., Schneider, J., Ehmann, R., Zwirglmaier, K., Drosten, C., & Wendtner, C. (2020). Clinical presentation and virological assessment of hospitalized cases of coronavirus disease 2019 in a travel-associated transmission cluster. Cold Spring Harbor Laboratory. https://doi.org/10.1101/2020.03.05.20030502
Households	Household communities	1,2,3,4,5,6+ households each with number of children, adults and pensioners	Statistik Austria (2009)
Unemployed		10.4%	Website Stadt Wien
Schools	School sizes	Truncated normal distribution	Data Statistik Austria 2017
Workplaces	Distribution of the sizes of workplaces		Statistik Austria Workplace survey 2009
Contact partners per day per location	Average number of contacts per day	Each depending on location, gamma distribution	POLYMOD Studie (EU-Projekt SP22-CT-2004-502084) J. Mossong a. o., „Social contacts and mixing patterns relevant to the spread of infectious diseases“, PLoS medicine, Vol. 5, no. 3, 2008. R. A. Hill and R. I. Dunbar, 'Social network size in humans', Human nature, Vol. 14, no. 1, p. 53–72, 2003.
Severe + critical cases	Proportion of cases requiring hospitalization	Age distribution, recalculation of Chinese cases	Novel Coronavirus Pneumonia Emergency Response Epidemiology Teamexternal icon. [The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) in China]. Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(2):145–151. DOI:10.3760/cma.j.issn.0254-6450.2020.02.003.
Duration of hospitaliza-tion	Period hospitalized cases remain in hospital	Median 10 days (IQR 7.0 – 14.0)	Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., … Peng, Z. (2020). Clinical Characteristics of

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			138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. JAMA. https://doi.org/10.1001/jama.2020.1585
General death, birth, immigration, emigration rates	Demographic values used in the basic population model	Dependence on age and gender	Statistik Austria
Regional population distribution	Population distribution on the basis of data on Viennese registration districts and informations from the Global Human Settlement map	Dependence on age and gender	Statistik Austria, Global Human Settlement Project
Infected persons at start date (11 March 2020)	Infected persons at start date of simulation	50 known cases with symptoms (list); 140 already infected persons who display no symptoms (by simulation)	Case number list of the Federal Ministry + Calibration

Corona Related Activities and Projects of the Austrian Government and Government-Funded Institutions

Below you will find information and links to activities and projects of Austrian institutions. We are happy to help you to contact the respective institutions in order to identify projects and activities that are of interest within the framework of CSTD. Please note that not all institutions provide up-to-date project lists; in this case we might recommend a direct inquiry on your part, as this will also enable the institutions to make a targeted selection of relevant projects.

National level

The Federal Government is investing € 23 million to give an additional boost to research into a vaccine and effective drugs/therapies against COVID-19; € 21 million of this will come from BMDW (Federal Ministry of Digal and Economic Affairs) and BMK (Federal Ministry of Climate Action, Environment, energy, Mobility, Innovation and Technology)funds through a call for proposals by the FFG, and a further € 2 million from BMBWF funds for the medical universities in order to be able to implement clinical studies together with the companies.

FFG (The Austrian Research Promotion Agency):

- FFG- Emergency Call

Due to the current outbreak of the corona virus Sars-CoV-2, the BMDW (Federal Ministry of Digal and Economic Affairs) and BMK (Federal Ministry of Climate Action, Environment, energy, Mobility, Innovation and Technology) are providing 21 million euros (see above-note: Of a total of 23 million euros from the emergency measure; the BMBWF (Austrian Federal Ministry of Education, Science and Research) is providing 2 million euros via service agreements with the universities via the FFG). The FFG is handling the emergency call in an accelerated procedure. It should be possible to implement the planned projects quickly (development period of 12 months or less). The deadline for the submission of projects was 8 April 2020 (for short-term decisions) and is 11 May 2020 (for additional applications and funding decisions). The FFG guarantees a speedy evaluation for both submission deadlines.

https://www.ffg.at/ausschreibung/emergencycall-covid-19

- FFG small project initiative -SME and start-up support for research and development

This funding supports "smaller" research and development projects of SMEs and start-ups, which are carried out alone or in cooperation and which result in commercially exploitable products, processes or services. Funding is available for project costs up to a maximum of 60% (max. total costs € 150,000) in the form of grants. Submissions can be made continuously; there are no restrictions on the topic.

https://www.ffg.at/programm/kleinprojekt

FWF (The Austrian Science Fund):

The Austrian Science Fund FWF is trying to mitigate the effects of the corona crisis for researchers by offering fast and flexible services in its various programmes. At the same time, acute funding is intended to provide rapid impetus for new research projects to investigate existential crises.

Flexible solutions for researchers and applicants

Changed regulations currently apply in the areas of submissions, terms, reimbursement of costs and in the event of travel cancellations.

Acute funding for corona-relevant research projects (submissions from 6 April onwards)

The FWF's new "Acute Care Grant SARS-CoV-2" now provides a "fast-track track" for those applications that deal with research on humanitarian crises such as epidemics and pandemics. In selected FWF programmes, these applications are given preferential treatment and sent for review so that a rapid funding decision can be made within a few weeks. The goal is to initiate further scientifically high-quality projects at research institutions throughout Austria as quickly as possible, thereby expanding capacities and structures that will help to overcome current and possible future humanitarian crises.

https://www.fwf.ac.at/de/news-presse/news/nachricht/nid/20200326-2500/

https://www.fwf.ac.at/de/forschungsfoerderung/fwf-programme/akutfoerderung-sars-cov-2/

To further strengthen the international exchange of knowledge in basic research on COVID-19, funding agencies from **Austria, Germany, Luxembourg, Poland, Switzerland, Slovenia and the Czech Republic** are working closely together.
An international network is being established for this purpose. Both bi- and trilateral projects can be submitted under:
https://www.fwf.ac.at/fileadmin/files/Dokumente/Antragstellung/Akutfoerderung_SARS-CoV-2/FWF-urgent-funding_Joint-Projects.pdf

Every week, FWF's scilog (https://scilog.fwf.ac.at/en/) presents a selected project supported by the FWF. The project presentations offer insight into scientific issues and communicate current findings from basic research. The variety of disciplines is presented as well as the funding opportunities offered by the Austrian Science Fund.

ISTA (The Institute of Science and Technology Austria):

The Institute of Science and Technology Austria (IST Austria) is initiating an interdisciplinary project with the help of Citizen Science for the collection and application of data.
https://cokonet.pages.ist.ac.at/collective-diary/

Covid-19 and Sepsis

Expansion of acib GmbH Project 94.091
Partners: acib GmbH, TU Graz Institute of Computational Biotechnology, CNA Diagnostics GmbH
Authored by: Prof. Dr. Christoph W. Sensen, Graz University of Technology, Institute of Computational Biotechnology, Petersgasse 14, 8010 Graz, email: csensen@tugraz.at, phone +43 664 60873 4090

Studies released by Chinese researches have shown that patients with severe cases of Covid-19 infection all eventually suffered from sepsis and that the Covid-19 fatalities were all linked to sepsis as well (see figure 1). We have developed an early test for human sepsis, based on markers produced by the body in response to the onset of sepsis (Grabuschnig *et al.*, 2020), which can be used to detect sepsis cases two days earlier than current methods allow. The test, which is currently undergoing a FDA 510k clinical trial in the United States, **is PCR-based (like the current Covid-19 assays), can be performed in 3-4 hours and shows an accuracy of more than 90% from two days before the first clinical signs to two days after the diagnosis can be made with traditional methods** (Ullrich *et al.*, 2020).

We believe that using this assay on patients being at risk of hospitalization could allow a "**personalized medicine**" approach to the stratification of patients in the future (identification of those who are at risk of being hospitalized *vs.* those that are not). This means that patients at risk of developing the severe form of Covid-19 could be treated with antibiotics up to two days earlier, hopefully leading to a better outcome for these patients in general. Decisions of which individuals need to be treated in intensive care could potentially be based in part on their disease state, rather than just age (as reported from countries such as Spain right now).

We are interested in collaborating with hospitals, which can provide plasma samples from Covid-19 patients (after the pandemic is over, right now only biobanking is needed) and the anonymized patient outcome data with the goal create an extension to our current sepsis research program (acib 94.091). The goal is to collaborate on the development of a tool for the early detection of the switch from the initial viral infection to sepsis, which can be used in future pandemics. Aside from pandemics, this is also a general issue, for example, information provided by the Robert Koch Institute on the Influenza related deaths in Germany from 2001-2018 shows that in some years more than 25,000 deaths can be related to influenza in Germany. While these data never got the same media attention that Covid-19 currently has, they show that there is an ongoing need for earlier and more personalized detection and treatment of viral and bacterial infections.

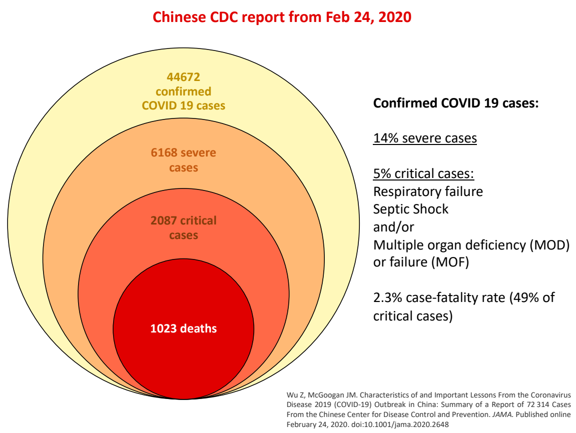


Figure 1: Cause of Covid-19 deaths in China

Estimated Influenza-attributable deaths (Excess mortality during the Influenza epidemic) as well as laboratory confirmed cases; additionally, the identified virus types and subtypes as well as the predominant B lineages (Yamagata or Victoria) are shown.

Influenza-associated deaths			Overview of identified Influenza virus (sub)types [%]		
Season	**Excess estimation (conservative)**	**Confirmed by laboratory tests**	**A(H3N2)**	**A(H1N1)**	**B**
2001/02	0	8	46.6	0.1	53
2002/03	8.000	17	86	0	14
2003/04	0	6	99	0	1 (Yamagata)
2004/05	11.700	13	54	26	20 (Victoria)
2005/06	0	5	20	10	70 (Victoria)
2006/07	200	8	85	14	1 (Yamagata/Victoria)
2007/08	900	7	1	51	48 (Yamagata)
2008/09	18.800	10	72	6	21 (Victoria)
2009/10	0	258	0	100	0
2010/11	0	165	1	62	37 (Victoria)
2011/12	2.400	14	75	1	24 (Victoria)
2012/13	20.700	196	31	34	35 (Yamagata)
2013/14	0	23	61	30	9 (Yamagata)
2014/15	21.300	274	62	15	23 (Yamagata)
2015/16	0	237	2	43	55 (Victoria)
2016/17	22.900	722	93	1	6 (Yamagata)
2017/18	25.100	1.674	4	28	69 (Yamagata)
2018/19	Not yet available	954	49	51	0

Taken from annual report of the Robert-Koch-Institute; https://influenza.rki.de/Saisonberichte/2018.pdf (retrieved March 31, 2020)

Figure 2: Influenza-related deaths in Germany

An Important Initiative on COVID has also been initiated by the
Research Data Alliance:

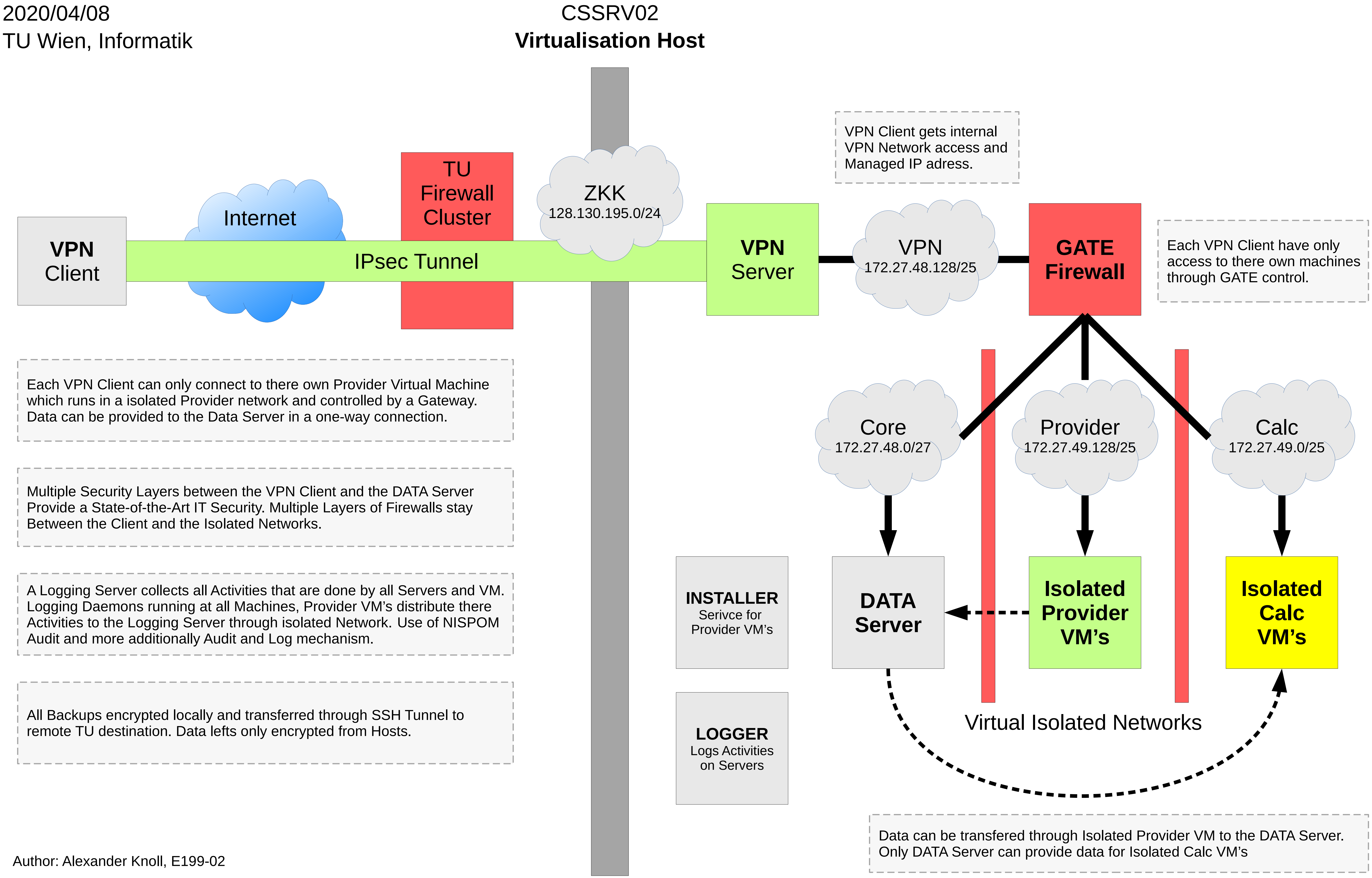
https://www.rd-alliance.org/groups/rda-covid19

https://www.rd-alliance.org/data-together-covid-19-appeal-and-actions-0

Future Operations - Schemata for COV19 secured data collection

2020/04/08

TU Wien, Informatik



Author: Alexander Knoll, E199-02

Press release: 12.233-073/20

COVID-19 prevalence study: maximum 0.15% of Austrian population infected with SARS-CoV-2

Vienna, 2020-05-04 – In the period from 21 to 24 April 2020, a maximum of 0.15% or up to 10 823 persons in Austrian private households were infected with the coronavirus. This is the result of the nationwide COVID-19 prevalence study conducted by Statistics Austria on behalf of the Ministry of Science (BMBWF) and in cooperation with the Austrian Red Cross (ÖRK) and the Medical University of Vienna.

Up to 10 823 people infected with SARS-CoV-2

With a sample size of 2 800 persons aged 16 years and over living in private households, usable PCR samples were taken from 1 432 persons by means of mouth-nose-throat swabs. One of them tested positive for the coronavirus SARS-CoV-2. Although this result leads to a wide range of variation in the extrapolation, it allows conclusions to be drawn about an upper limit of SARS-CoV-2 infected persons: In the period from 21 to 24 April 2020, a maximum of 0.15% of the persons living in Austria were infected with SARS-CoV-2, which corresponds to 10 823 persons.

Higher prevalence of 0.75% in risk areas

In communities with a relatively large number of known coronavirus infected persons, the prevalence of 0.75% is significantly higher than average, but still low in absolute numbers. This was the result of an experimental study on SARS-CoV-2 antibody tests, which was carried out with a sample size of 540 persons aged 16 and over living in private households. A total of 269 persons in six federal states and nine districts underwent a multipart SARS-CoV-2 test on 25 April 2020. This consisted of a swab of the respiratory tract to check whether a current infection existed by means of PCR analysis, a rapid antibody test and a blood sample for antibody testing in the laboratory.

According to experimental study, 4.71% of people in risk communities have SARS-CoV-2 antibodies

According to extrapolation, 4.71% of the persons in the 27 communities with a relatively high number of known coronavirus infections had SARS-CoV-2 antibodies (mean value of the 95% confidence interval; see methodological information) on the cut-off date of the study on 25 April 2020. This means that an average of 1 884 persons in these communities had a past infection. Whether this leads to sustained immunity to the coronavirus cannot be answered with certainty at the current state of knowledge.

Fear of financial problems; for at-risk group, fear of infection is the main concern

The corona pandemic and its social and economic consequences have an impact on the fears of the Austrian resident population. When asked about possible consequences, 10% of the respondents in the COVID-19 prevalence study stated that they were afraid of financial problems, followed by the fear of infecting themselves (7%) and losing someone in the family due to COVID-19 disease (6%). The fourth most common fear is that there will be an increase in conflicts in the family or in the relationship (5%).

The consequences that are most frequently feared differ according to the current situation of the respondents: Among families with pre-school age children (born in 2015 or later), the most common concern is financial problems (19%) and the second most common concern is an increase in conflicts (14%). Persons who belong to a risk group due to pre-existing health problems, on the other hand, are most often afraid that they themselves will fall seriously ill with coronavirus and that they will have to stay in hospital for this reason (12%), which was seen as a less likely consequence in all other groups (2%).

Persons with critical pre-existing conditions feel much worse psychologically

Slightly less than two thirds (64%) of the total Austrian population aged 16 and over living in private households reported a rather good mental well-being, i.e. they felt good spirits, peace or relaxation at least most of the time. Looking only at people with pre-school age children, 58% still reported good well-being. Among the persons with critical pre-existing conditions, who are thus classified as a risk group, only about one third (33%) stated that their mental well-being was good.

Measures to contain the pandemic largely considered appropriate

The overwhelming majority of respondents considered the measures taken to contain the pandemic to be adequate. 98% felt that quarantine in crisis areas was appropriate, and 97% each judged keeping a distance, the ban on events and the wearing of a face mask to be appropriate. On the other hand, 44% of those questioned considered the measure of leaving the house only in exceptional cases to be inappropriate – especially for people with pre-school age children (56%).

Detailed explanations (in German only) can be found in the handout and the presentation for the press conference on 4 May 2020. Information on the survey procedure is available on the websites for the COVID-19 prevalence study and the experimental SARS-CoV-2 antibody test study.

Information on methods, definitions: The **COVID-19 prevalence study** tested 1 432 persons aged 16 and over living in private households. The results are subject to a 95% confidence interval, i.e. with a probability of 95%, those infected with SARS-CoV-2 are at most 10 823 persons or 0.15% of the total population aged 16 and over living in private households.
In the **experimental study on SARS-CoV-2 antibody tests**, 269 persons aged 16 and over were tested in 27 risk communities in private households. The results are also subject to a 95% confidence interval, i.e. with a probability of 95%, the number of persons with SARS-CoV-2 antibodies amounts between a minimum value of 543 persons or 1.36% and a maximum value of 3 189 persons or 7.97% of the total population aged 16 and over in private households.

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