COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)

Geneva, Switzerland

Contribution by

Austria

to the CSTD call for information sharing on initiatives against COVID-19

DISCLAIMER: The views presented here are the contributors’ and do not necessarily reflect the views and position of the United Nations or the United Nations Conference on Trade and Development
COVID-19 Prevalence

Media information, April 10, 2020

- Günther Ogris, Managing Partner and Scientific Director, SORA Institut
- Christoph Hofinger, Managing Partner and Scientific Director, SORA Institut

Contact for international media:
SORA Institut: Günther Ogris, go@sora.at; Christoph Hofinger, ch@sora.at
Overview

COVID-19 Prevalence .................................................................................................................. 3
1 Objectives, client and consortium .......................................................................................... 3
2 Key results ............................................................................................................................... 4
3 Study design ............................................................................................................................ 5
4 Sampling .................................................................................................................................. 6
5 Acknowledgements ................................................................................................................... 8

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:

<table>
<thead>
<tr>
<th>State</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>71</td>
<td>4.6%</td>
</tr>
<tr>
<td>Carinthia</td>
<td>29</td>
<td>1.9%</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>326</td>
<td>21.1%</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>255</td>
<td>16.5%</td>
</tr>
<tr>
<td>Salzburg</td>
<td>88</td>
<td>5.7%</td>
</tr>
<tr>
<td>Styria</td>
<td>277</td>
<td>17.9%</td>
</tr>
<tr>
<td>Tirol</td>
<td>99</td>
<td>6.4%</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>75</td>
<td>4.9%</td>
</tr>
<tr>
<td>Vienna</td>
<td>324</td>
<td>21.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1544</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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 be 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. Thus, we adopted our existing agent-based General Population Concept (GEPOC) 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 and evaluation of MMR and Polio vaccination rates).

The epidemic simulation extension to the model is based on an influenza simulation model that was developed in the IFEDH project. This model has already yielded new insights into the course of the annual influenza wave in cooperation with the Austrian health system. The contact models used within are based on data of the POLYMOD study works and contact models developed from the former.

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.
Contact

Niki Popper
dwh – simulation services & technical solutions
Neustiftgasse 57-59
A-1070, Vienna
Austria

Tel.: +43 1 526 5 526
E-Mail: office@dwh.at
Internet: www.dwh.at

References

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.\(^11,12\)

---

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

---


\(^{14}\) 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.

![Total contact network of person X](image1)

![Contacts of person X on day Y](image2)

*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 predefined order.
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\(^\text{16}\) 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.

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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Application</th>
<th>Value</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of infection</td>
<td>Probability that a contact between an infected and a susceptible person leads to infection</td>
<td>Depends on the contact network in use (~5.8%)</td>
<td>Calibrated to a base reproduction rate R0 of 3.0 (estimate WHO, ARGES)</td>
</tr>
<tr>
<td>Latency period</td>
<td>See figure 1</td>
<td>Incubation period minus 1 day</td>
<td>estimate</td>
</tr>
<tr>
<td>‘Buffer period’</td>
<td>See figure 1</td>
<td>currently 0 days</td>
<td></td>
</tr>
<tr>
<td>Infectious period</td>
<td></td>
<td>10 days</td>
<td>Woelfel, R., Corman, V. M.,</td>
</tr>
</tbody>
</table>

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 | 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)

Severe + critical cases | Proportion of cases requiring hospitalization | Age distribution, recalculation of Chinese cases | Novel Coronavirus Pneumonia Emergency Response Epidemiology Teamexternal icon.

<table>
<thead>
<tr>
<th>General death, birth, immigration, emigration rates</th>
<th>Demographic values used in the basic population model</th>
<th>Dependence on age and gender</th>
<th>Statistik Austria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional population distribution</td>
<td>Population distribution on the basis of data on Viennese registration districts and informations from the Global Human Settlement map</td>
<td>Dependence on age and gender</td>
<td>Statistik Austria, Global Human Settlement Project</td>
</tr>
<tr>
<td>Infected persons at start date (11 March 2020)</td>
<td>Infected persons at start date of simulation</td>
<td>50 known cases with symptoms (list); 140 already infected persons who display no symptoms (by simulation)</td>
<td>Case number list of the Federal Ministry + Calibration</td>
</tr>
</tbody>
</table>

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 Digital 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 Digital 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/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:

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
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

Each VPN Client can only connect to their own Provider Virtual Machine which runs in an isolated Provider network and controlled by a Gateway. Data can be provided to the Data Server in a one-way connection.

Multiple Security Layers between the VPN Client and the DATA Server provide a State-of-the-Art IT Security. Multiple Layers of Firewalls stay between the Client and the Isolated Networks.

A Logging Server collects all Activities that are done by all Servers and VM. Logging Daemons running at all Machines, Provider VM's distribute their Activities to the Logging Server through isolated Network. Use of NISPOM Audits and more additionally Audit and Log mechanism.

All Backups encrypted locally and transferred through SSH Tunnel to remote TU destination. Data lefts only encrypted from Hosts.

Data can be transferred through isolated Provider VM to the DATA Server. Only DATA Server can provide data for Isolated Calc VM's.