Systemic Pandemic Risk Management

Terje Gjøsæter (terje.gjosater@uia.no)

Centre for Integrated Emergency Management, Univ. of Agder

UiA CIEM
Centre for Integrated Emergency Management

The challenge

Pandemics activate inter-dependent societal risks ("systemic risks")

Systemic risks are "the central challenge of the first half of the 21st century" (UNDRR 2019)

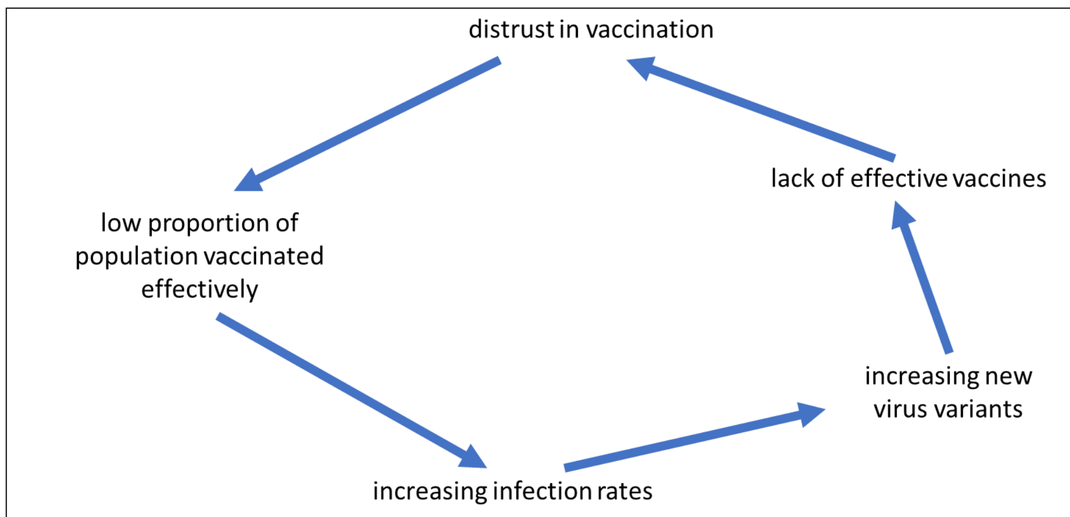
Crucial property of systemic risks

A major pandemic, such as COVID-19, triggers more than 200 risks across society

There are more than 600 interconnections between these risks

The interconnections results in more than 5 million nested vicious cycles

Unless mitigated, vicious cycles escalate the risks



Example of vicious cycle of risks

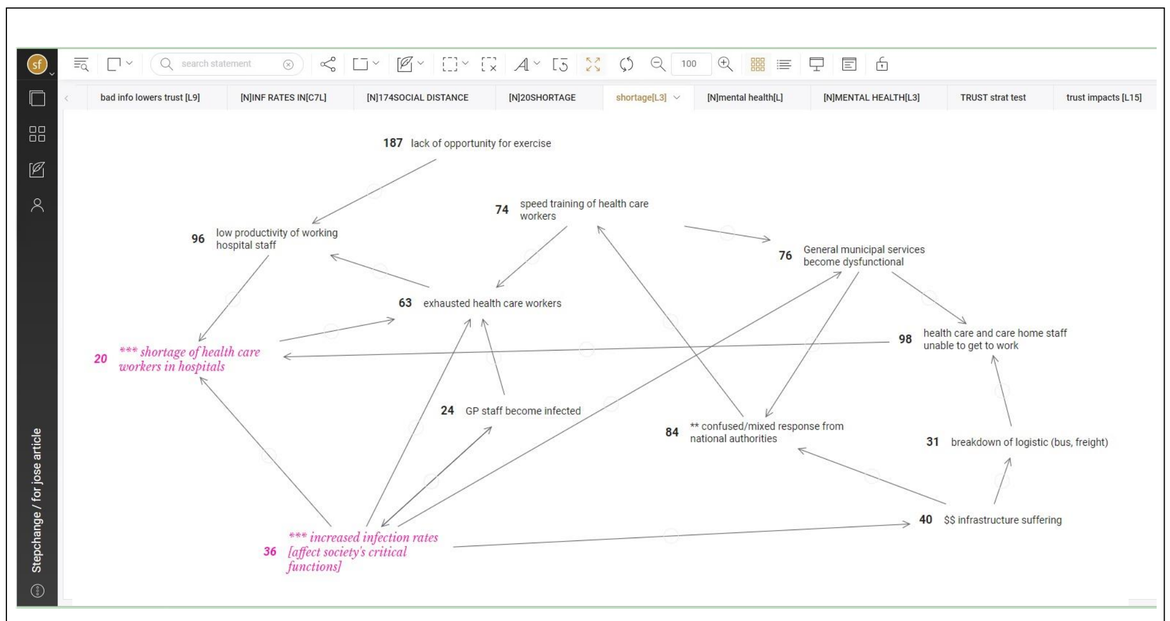
Method

Workshops with the Internet-based GSS *Strategyfinder*™ supporting facilitation and inter-workshop analysis for the design of impactful and practical mitigation strategies hitting the highest number of nested vicious cycles.

Participants: Carefully selected experts and power-brokers across relevant societal sectors.

Risk assessment and management stages:

1. Selection of experts for the group process, to ensure breadth and depth of knowledge and involve those with interest and power on the project
2. Elicitation and causal linking of risks
3. Identification of risk scenarios
4. Validation and enhancement of the systemic risk model
5. Development of portfolios of impactful and practical mitigation strategies
6. Assignment of responsibilities for the risk mitigation strategies



Example of risk scenario: Shortage of healthcare workers

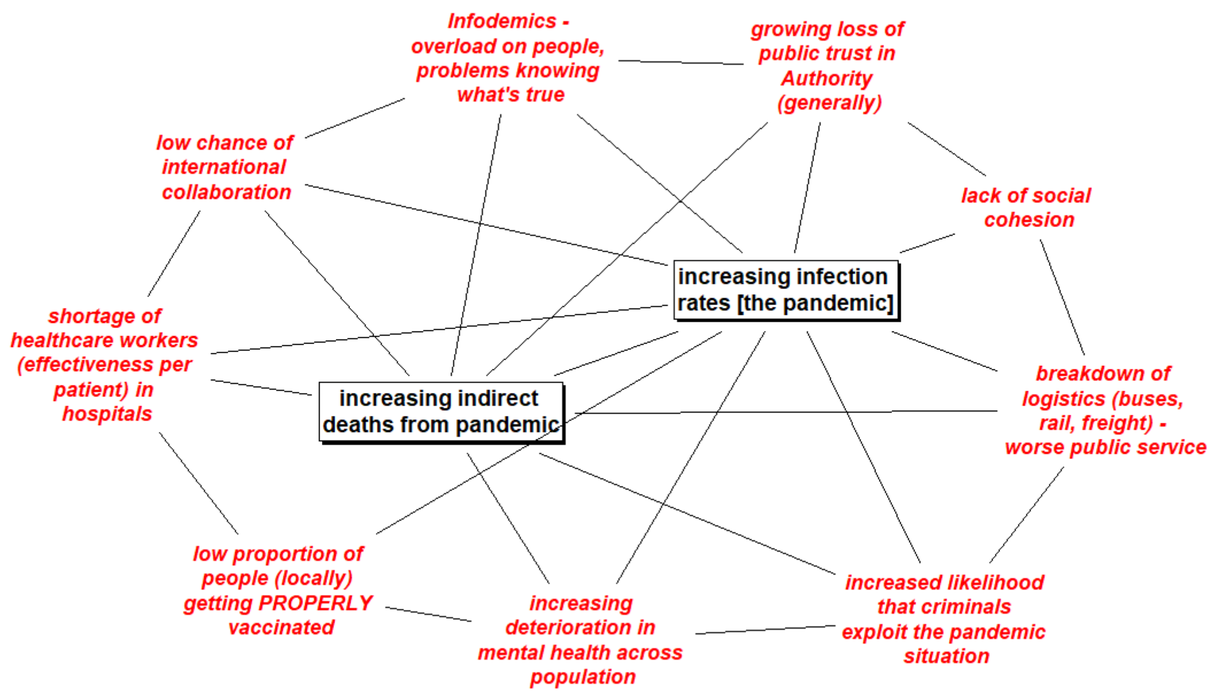
Shortage of Health Care Workers in Hospitals

Agreed Strategies, their Purpose, and Implementation Teams

Establish high-level infection protection (PPE) for healthcare and emergency workers
In order to: Directly avoid shortage of Health Care Workers in Hospitals, and Control local outbreaks in hospitals, and so Avoid having exhausted health care workers and so Reduce possibility of low productivity of working health care staff because of shortage of staff
Implementation Team: Chief physician at nursing home, Physician specialist in public health

Example of mitigation strategy

Risk scenarios with the highest impact on health



Effective pandemic mitigation requires mitigation strategies for <u>all</u> risk scenarios!

The project team

Ocean Infinity Stepchange AS, Kristiansand

The Kristiansand municipality

The Hospital of Southern Norway (Sørlandet Sykehus HF)

The Centre for Integrated Emergency Management, CIEM, University of Agder

KMC (the Center for Disaster Medicine and Traumatology in Linköping, Sweden)

CRIMEDIM (the Center for Research and Training in Disaster Medicine, Humanitarian Aid and Global Health, Universitá del Piemonte Orientale, Novara, Italy)

References

UNDRR (2019). Global Assessment Report on Disaster Risk Reduction 2019.

Gonzalez, J.J., et al: Elicitation, analysis and mitigation of systemic pandemic risks. Adrot, Anouck; Grace, Rob; Moore, Kathleen and Zobel, Christopher W., Editors. 18th International Conference on Information Systems for Crisis Response and Management. Blacksburg, Virginia: ISCRAM. (2021); pp. 581-596

Digital outpatient services: development of an intervention and a multicenter controlled trial

Heidi Holmen[1,2], Anna Hurrød[3], Christopher Ekholdt[1], Are M. Holm[1,4], Thomas K. Kilvær[5], Lotte S. Larsen[1], Saida A. M. Overgaard[1], Erik Fosse[1,4]

[1]Oslo University Hospital, [2]Oslo Metropolitan University, [3]Dignio Connected Care, [4]University of Oslo, [5]University hospital of North-Norway,

Background

The need for healthcare services is increasing, but the resources remain limited. Already prior to the pandemic, efforts were made to digitalize healthcare services to provide hospital services at home.

A digital healthcare service might improve the HCP's understanding of each individual patients needs. The digital healthcare services might also support the patients' understanding of their health challenges through individualized follow-up, thus supporting the individuals' health literacy.

Patient-reported outcome measures (PROM) are suitable for digital reporting, allowing patients to subjectively report their health, pain, symptoms, and other parameters of relevance. Such patient reports allow HCP to tailor patient care accordingly.

Aim

The aim of this study is to evaluate whether a digital outpatient service has a positive impact on health literacy, health-related quality-of-life, digital health literacy, satisfaction, and utilization of health service resources. Further, we aim to investigate possible care pathways that ensure the quality of care and efficiency for remote monitoring in outpatient care.

Developing the intervention

Dignio Connected Care delivers a multicomponent platform with a patient app MyDignio and healthcare personnel software DignioPrevent. MyDignio can be tailored to specific needs, and the use of PROMs, clinical measures and equipment can support self-management. Video-consultation and chat can further support the patient and facilitate contact, all according to the needs of the patient and resources in the healthcare service.

The aim of the intervention is to support patients in the active management of their own health. The intervention will facilitate how patients receive sufficient and understandable health information. It is also the aim to facilitate the patient's interaction with healthcare personnel, ensuring that patients feel they are understood and supported.

Our intervention is tailored for patients at the departments for lung disease, neurology, and chronic pain at Oslo University Hospital, and the cancer department at the University Hospital of North Norway.

Together with healthcare personnel and other stakeholders, we have drawn each individual departments' patient journey maps based on a service design thinking. This way, we have identified the potential for digital outpatient treatment and which patients can benefit most from this solution.

Study design

The study is a pragmatic, multicenter, non-randomized controlled trial with two study arms. Eligible patients are ≥ 18 years, and receive outpatient care at the neurology-, lung-, pain-, or cancer department.

Our a priori power calculation on the Health literacy questionnaire (HLQ) as primary outcome gives a total sample size of n=165 split into a 1:2 ratio. Thus, a minimum of 55 participants in the control group and 110 participants in the intervention group is required.

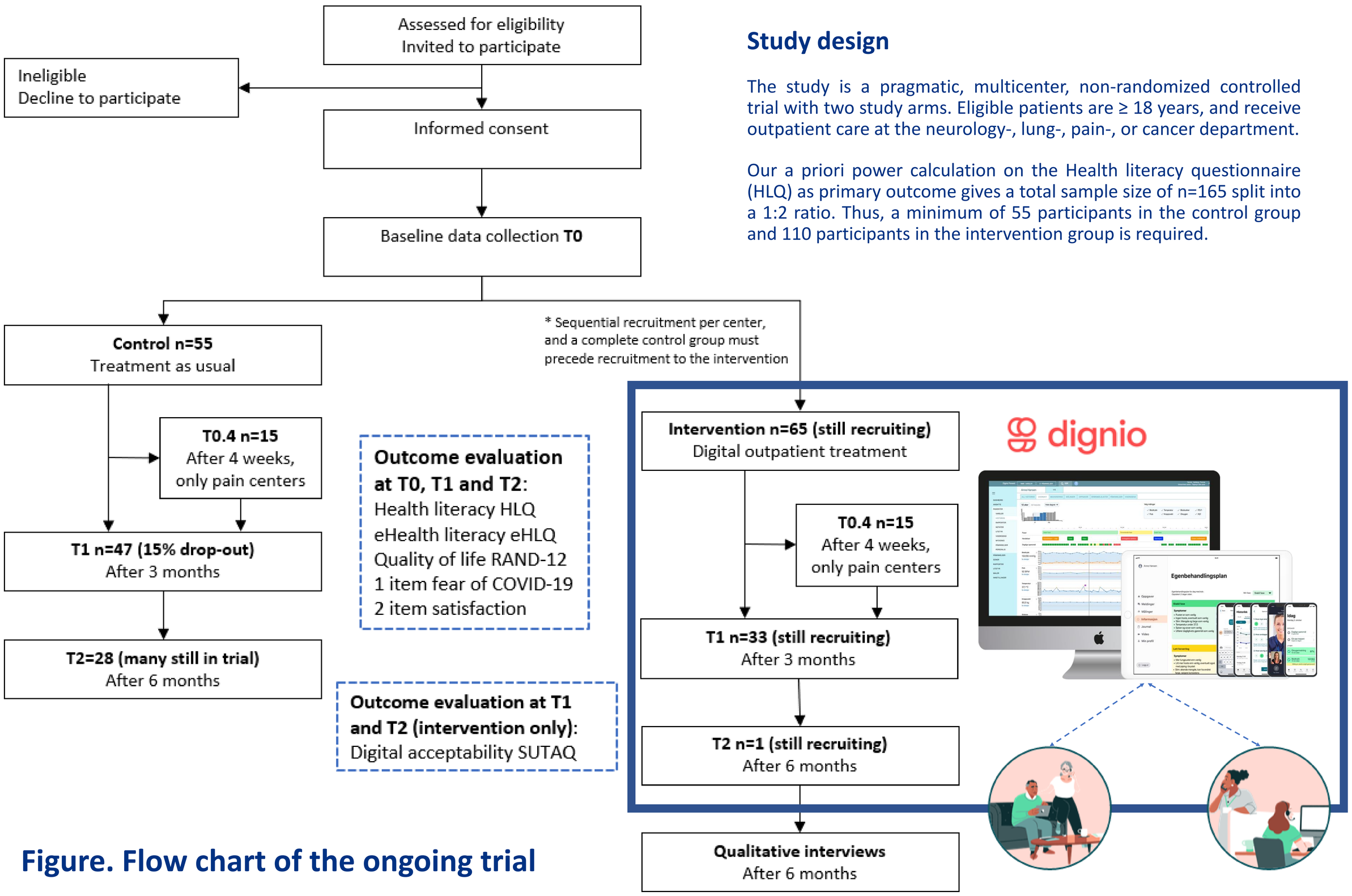


Figure. Flow chart of the ongoing trial

Corresponding author Heidi Holmen heidho@ous-hf.no

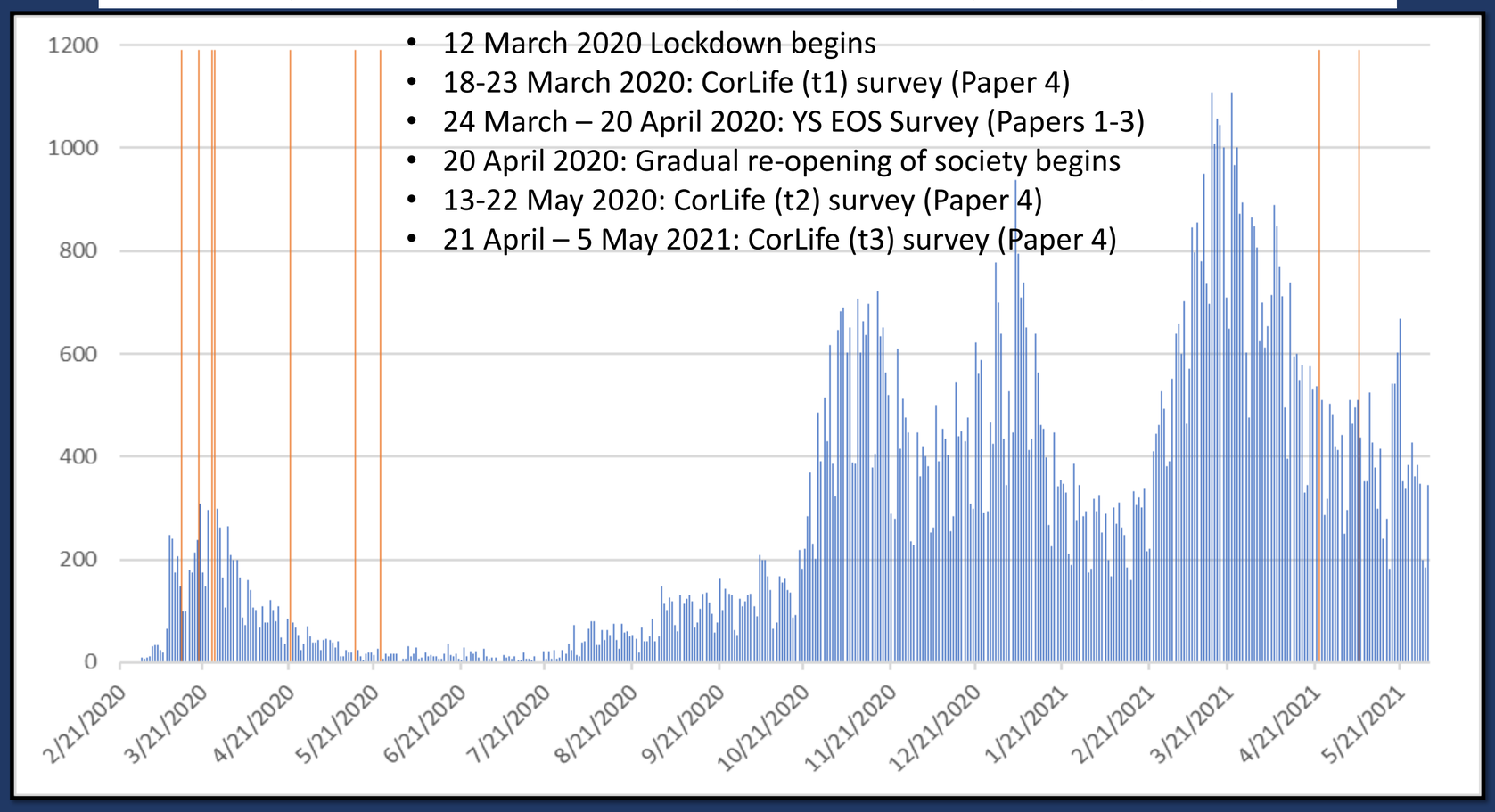
Early COVID-19 Wave in Norway: Social Inequality in Morbidity, Compliance to Non-Pharmaceutical Interventions and Labour Market Consequences (CorRisk).

Jessica Dimka, Centre for Research on Pandemics & Society

Background

- The impacts of pandemics are never just medical in nature. Among other factors, socioeconomic status (SES) plays an important role in the consequences of both the disease itself and control measures.
- The CorRisk project focused on how SES influenced adoption of recommended non-pharmaceutical interventions, and how the pandemic differentially impacted health, work, and life satisfaction based on SES.

Number of reported cases between 21 February 2020 and 31 May 2021 (NIPH/FHI).



Summary of Results

Paper 1

Mamelund et al. 2021. *Journal of Developing Societies 37(3):302-328*

- Except for using facemasks and less public transportation in a non-work context, all analyzed NPIs showed independent positive association with income.
- Policymakers should consider SES-related barriers to NPI use when developing recommendations.

NPI *n* = 3,002	Checked
Washed hands more (private)	2,806 (93.5)
Kept 1 m distance from others (private)	2,722 (90.7)
Used PPE, for example, masks (private)	217 (7.2)
Worked from home more (work)	1,587 (52.9)
Used less public transportation (private)	1,357 (45.2)
Used less public transportation (work)	700 (23.3)

Paper 2

Ingelsrud 2021. *Labour and Industry 31(4):387-404*

- Compared to full-time workers, self-employed and part-time employed were at higher risk of income loss and reduced hours.
- Results illustrate the economic risk inherent in non-standard employment relationships.

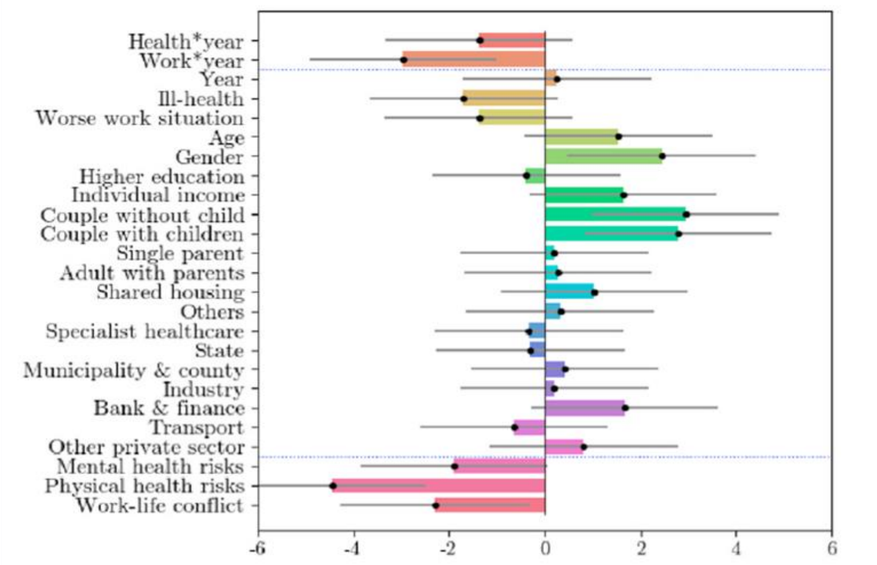
		Employment relationship			Working time		
	Total	Permanent[a]	Temporary	Self-employed	Full-time[a]	Voluntary part-time	Involuntary part-time
Unweighted N	2991	2743	139	98	2541	230	86
Directed to work from home	41%	41%	43%	28%*	45%	25%***	18%***
Reduction of working-time	18%	17%	25%*	37%***	16%	25%**	37%***
Temporary laid-off	13%	13%	12%	13%	12%	14%	31%***
Income-loss	12%	11%	19%**	40%***	10%	15%	30%***

[a]Reference category for chi-square test, ***p < 0.001, **p < 0.01, *p < 0.05

Paper 3

Bakkeli 2021. *SSM – Population Health 14:100804*

- People with poor health were more likely to experience worsened work situations during the pandemic.
- Health-related risks and work-life balance were central contributing factors to life satisfaction before the pandemic, while different types of household structure (e.g., access to family support) were among the most important predictors during the pandemic.
- Labour market interventions must address security and maintenance of work situations.

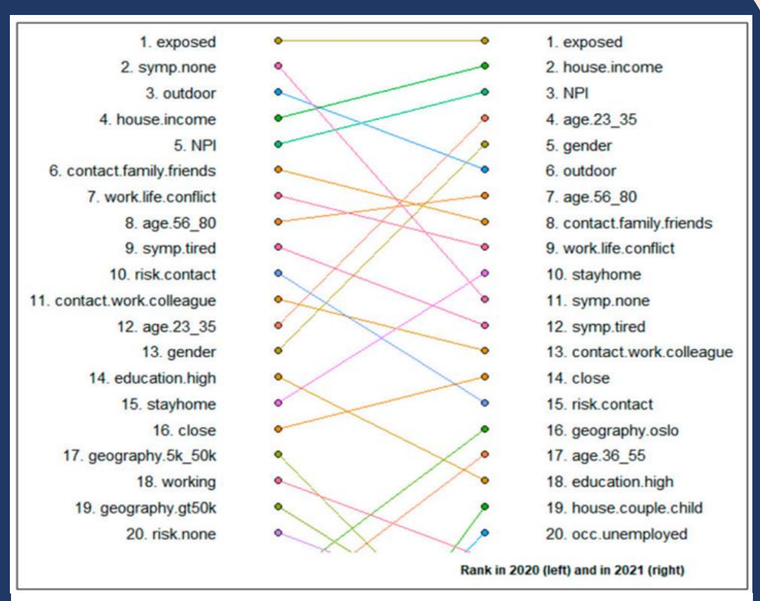


Life satisfaction predicted by health, work situation, and interaction with time. Controlled for SES, health risks, and work-life balance. Pooled data, n = 593

Paper 4

Bakkeli 2022. *Social Science Computer Review*, doi 10.1177/08944393211069622

- Machine learning models identified self-perceived exposure risk as the most influential predictor of depression symptoms.
- The importance of demographic and SES factors (gender, age, household type, and employment status) for psychological distress increased substantially in the later stage of the pandemic.
- Results suggest a simple and fast screening tool to identify people more likely to suffer from depression due to the pandemic.



Ranking of the 20 most important variables for predicting depression in 2020 and 2021

Implications

- The CorRisk project demonstrated the important role of SES, as well as other social and demographic variables, on the consequences of the COVID-19 pandemic in Norway.
- Careful consideration of these relationships when implementing future public health interventions will reduce social inequalities in disease burden and the negative social and economic effects of the pandemic.
- Although the project mainly focused on the first wave, results likely extend to and potentially are more pronounced in later periods. Additional work is ongoing.

The project was funded by a grant from the Research Council of Norway, grant no. 312716

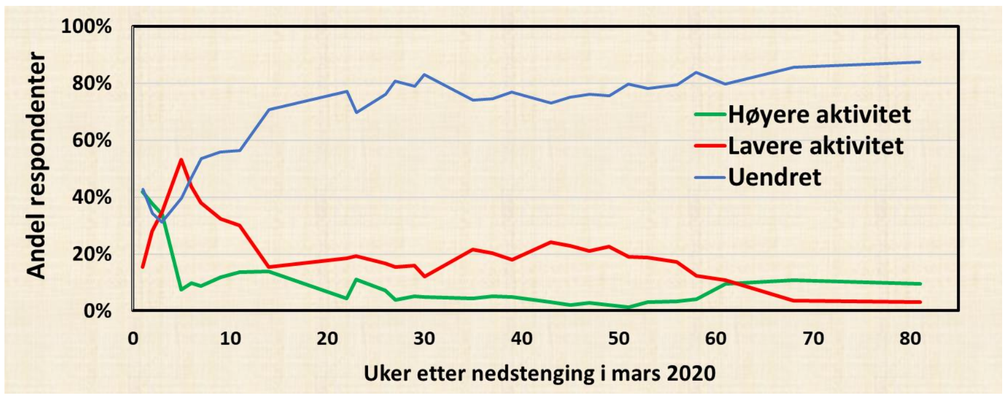
CONSIGN

Effekter av Covid-19 på nasjonal forsyningssikkerhet

Daniel R. Pinchasik & Inger Beate Hovi (TØI)

Innenriks utfordringer/effekter

- Endringer i etterspørsel:
  - Pandemiens start preget av usikkerhet
  - Relativt stabilt etterspørselsnivå i sum, men mye variasjon: Vinnere og tapere
  - Overføring B2B til B2C (f.eks. HORECA til dagligvarer)
  - Stor økning i netthandel, spesielt for hjemlevering
- Økt fremkommelighet for godstransport pga hjemmekontor, spesielt i by og rushtid
- Generelt lave marginer i transportbransjen, økt fare for konkurser
- Tilgang på sjåfører, mer utfordrende etter pandemien
- Økt ledetid på nye biler pga delemangel og utfordringer med transport

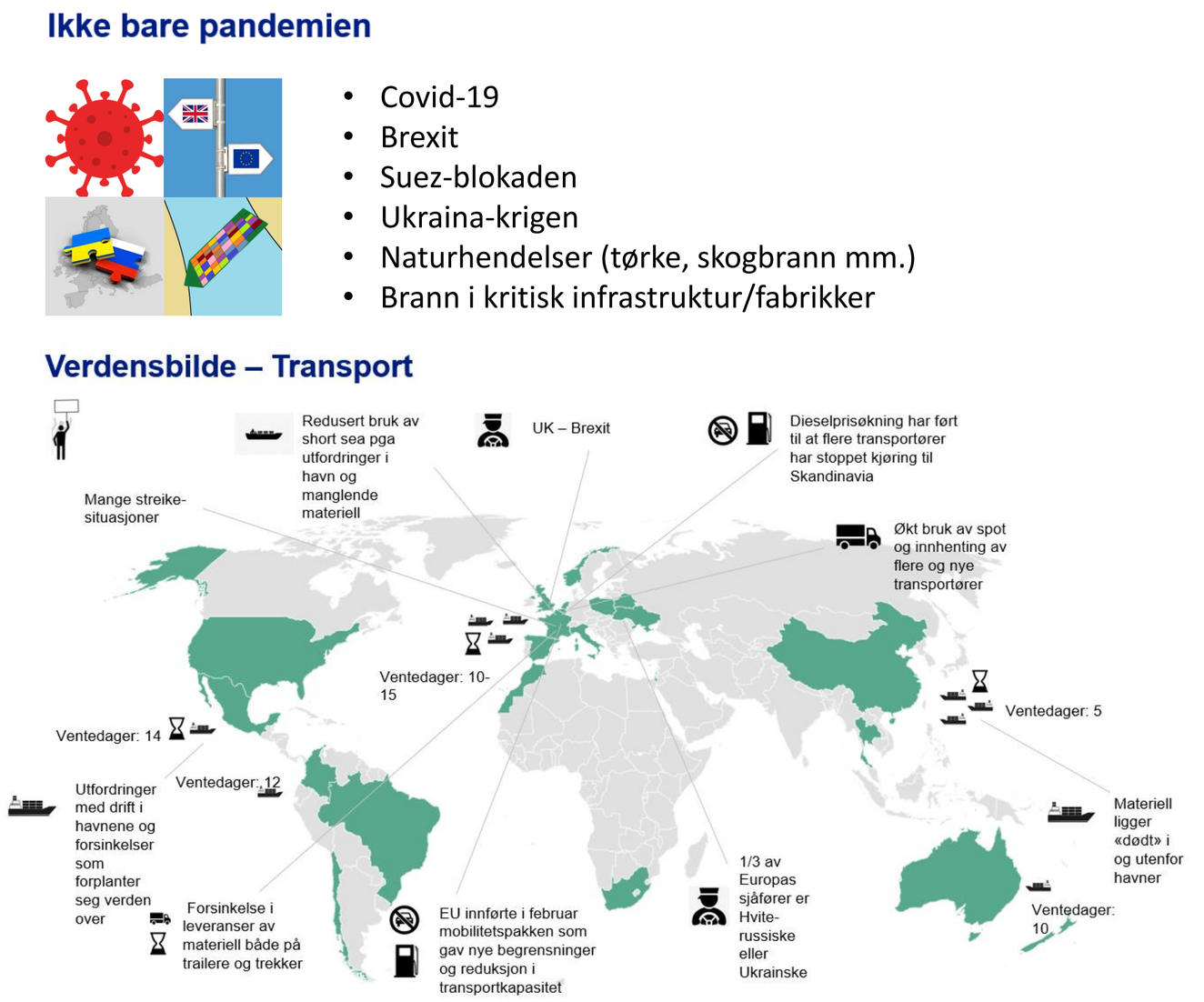


Andel respondenter i Norsk Lastebileier-Forbundet sine «korona-undersøkelser», som rapporterer om hhv høyere, lavere og uendret aktivitet ifm pandemien.

Utvikling i pakkevolumer (1000 sendinger). For de tre største samlastere i Norge.

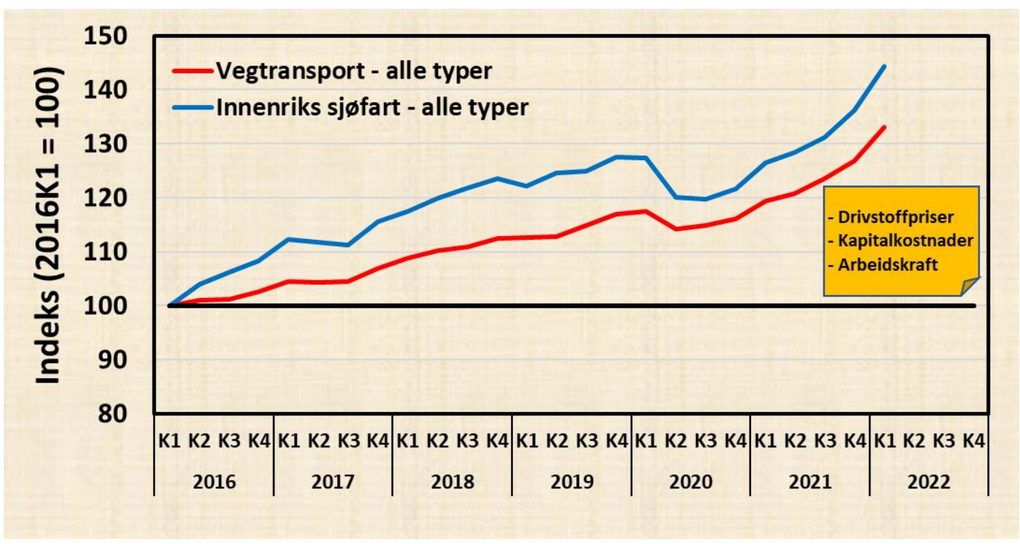
Utenriks utfordringer/effekter

- Økt etterspørsel etter ferdigvarer i hele vestlige verden
- Kapasitetsutfordringer for oversjøisk kontainerfrakt og flyfrakt, lange ventetider i havner
- Volatilitet og ekstrem økning i fraktrater (mest for import fra Asia/Kina)
  - Forsinkelser, usikkerhet, upålitelighet: Kommer varene? Når?
  - Ringvirkning til short-sea shipping-markedet i Europa/Norge
- Økte drivstoffpriser
- Mangel på arbeidskraft, sjåfører, utstrakt bruk av utenlandske sjåfører
- Mangel på viktige råvarer/innsatsvarer (f.eks. halvledere)

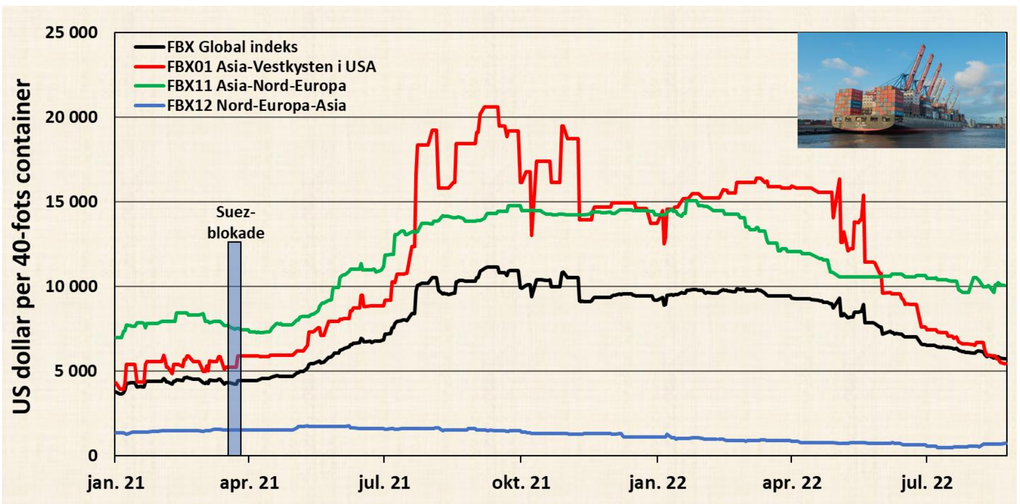


Læringseffekter og innsikter

- Beredskap
  - Få var forberedt på pandemi
  - Mange beredskapsplaner har fungert, men mer ad-hoc enn ønskelig
  - Pandemien har økt kompetansenivået på risikohåndtering
  - Økt lederfokus på operasjonell drift
  - Forsert overgang til nye og digitale løsninger
- Forsyningskjedenes sårbarhet øker ved bl.a.
  - Sentralisering av kritiske funksjoner
  - Konsentrasjon mht leverandører/produkter/markeder/transportoperatører
  - Just-in-time-baserte produksjonsopplegg
- Transportavtaler og forsyningssikkerhet
  - Kostnadsminimering i normalsituasjonen kan medføre stor usikkerhet ved avvik
  - Langsiktige fastprisavtaler er dyrere, men gir økt forutsigbarhet og sikkerhet
  - Store speditører og kunder med høy betalingsvillighet ble prioritert ved kapasitetsutfordringer på oversjøiske transporter
- Jernbanetransport Asia-Europa ble supplement under kapasitetsutfordringer på sjø/fly
- Passasjerfly omgjort til fraktfly når reiserestriksjonene ble innført
- Manglende standardisering i internasjonale transportdokumenter har medført ekstraarbeid. Standardisering utfordrende å løse i et globalt marked



Kostnadsutvikling vegtransport/innenriks sjøfart (2016K1=100). Basert på SSB-statistikk.



Daglig variasjon i fraktrater (40-fots containere). Global indeks og indekser for containerfrakt Asia-USAs vestkyst, Asia-Nord-Europa og vv. I US dollar. Kompilasjon basert på Freightos.com

The Social Gradient in Employment Loss during COVID-19

Annette Alstadsæter, Bernt Bratsberg, Simen Markussen, Oddbjørn Raaum and Knut Røed

Frischsenteret

Norges miljø- og biovitenskapelige universitet

Main research question

How did the employment responses to the economic crisis induced by COVID-19 differ across workers? Social gradient: Did the labor market crisis hit low skilled workers particularly hard?

Employment loss

Monthly administrative pay records for all Norwegian employees:
Measure of hours worked as wage rates are fixed.

Social gradient

Social position proxied by own earnings history (rank) and immigrant background (origin region).

Data

Administrative records for all Norwegian employees.
Samples: All wage earners in February.
In 2020 : COVID , In 2018: Comparison group (“counterfactual”)

Empirical strategy

Pre-COVID cohorts as ”counterfactual”.

Regression analysis: Test whether social gradients (own earnings rank, immigrant background) are particularly strong during COVID.

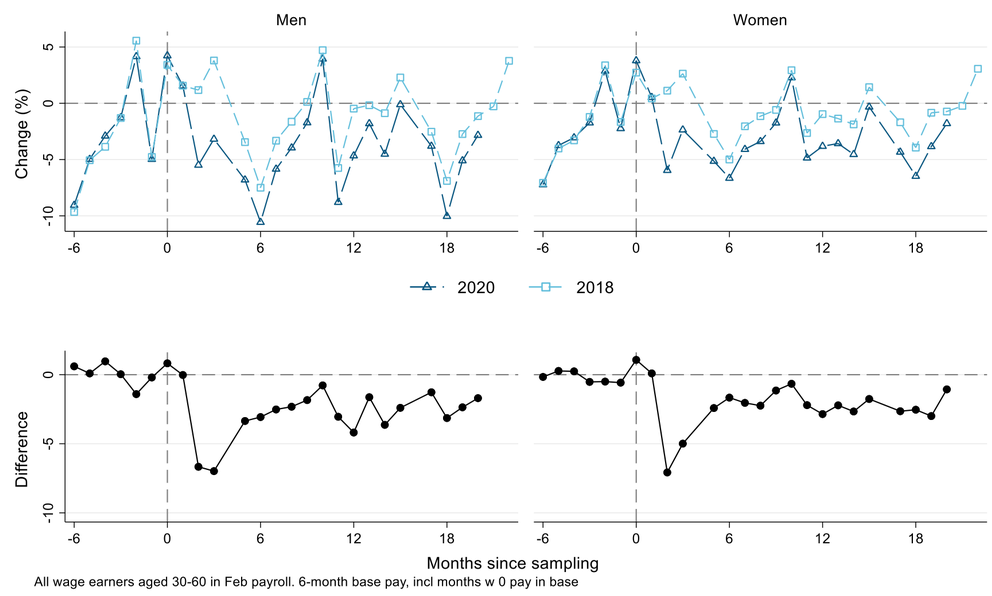
$$dW_i = Change\ in\ \ total\ pay$$
$$= \alpha + \beta Rank_i + \gamma Covid_i + \delta(Rank_i \cdot Covid_i) + f(Age)$$
$$+ \sum \theta_j ImmGroup_{ij} + \sum \eta_j (ImmGroup_{ij} \cdot Covid_i) + Controls + u_i,$$

Other analyses

Return to work by unemployed at the outset of the crisis
School to work transitions of youth.

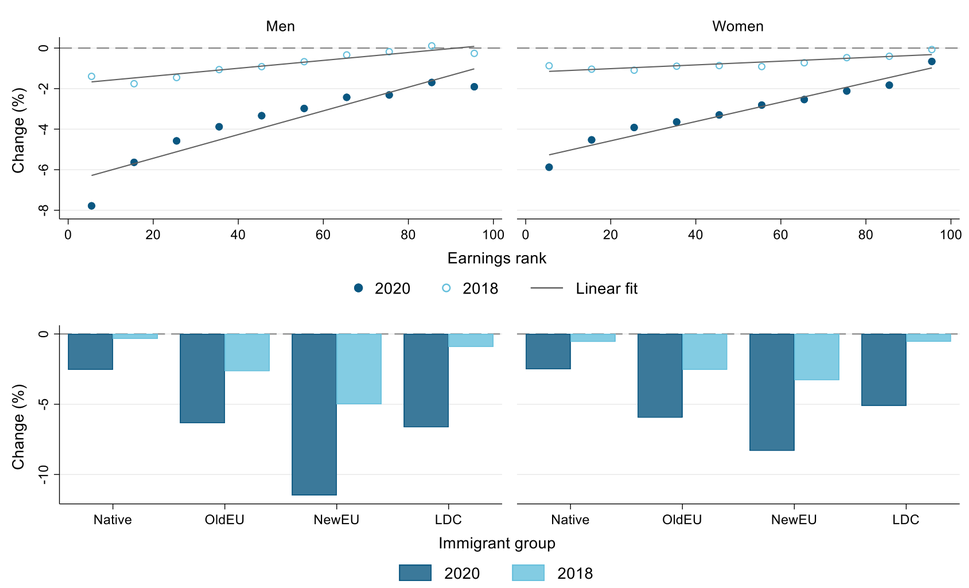
Results

Employment loss prime-aged workers by month



Change in monthly pay from 6-month base period ending February 2018 and 2020. Prime-aged workers (30-60).

Steeper social gradients in employment loss during COVID



Change in monthly pay between base and post periods, 2018 and 2020. Prime-aged workers (30-60)

Conclusions

With pre-crisis cohorts as controls, we use a difference-in-differences strategy to identify the effects of the crisis.

Total pay (hours worked) dropped by 8% the first two months after the initial lockdown, followed by a quick recovery, to , -2% by October 2021.

For prime-aged employees, we find monthly pay reductions in line with those for the whole economy. For senior wage earners and unemployed, the negative long-term employment effects were even larger.

We identify significant social gradients, as persons with low past earnings, immigrants, and youth with a disadvantaged family background experienced more adverse consequences of the crisis.

Project: The corona crisis and its economic consequences (316475)

Contact: oddbjorn.raaum@frisch.uio.no or simen.markussen@frisch.uio.no

Reference: Alstadsæter et al (2022), The Social Gradient in Employment Loss during COVID-19. Frischrapport 1/2022, www.frisch.uio.no (submitted)

COVID-19 Network Technology based Responsive Action

CONTRA
COvid19 Network Technology based Responsive Action
https://contra.uia.no

Forskningsrådet

Research Objectives

The CONTRA project (June 2020 – March 2022) aimed at developing an intuitive web-based tool that could support public health authorities - specifically in middle- and low-income countries - to allocate and distribute COVID-19 vaccines inside countries. The project's ambition was to **ensure the effectiveness, efficiency, equity and sustainability of COVID-19 vaccine distribution [1], specifically in the contexts of low- and middle-income countries** (**Figure 1**).

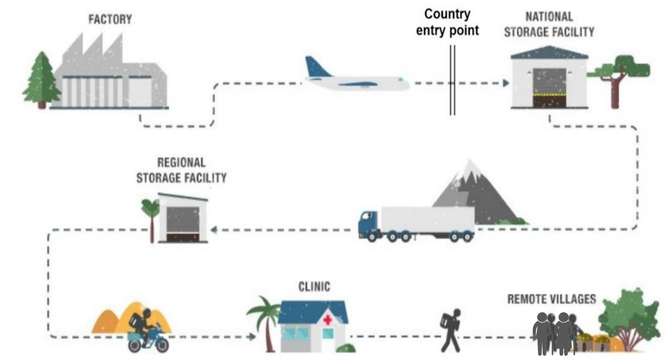


Figure 1 Schematic presentation of a typical vaccine distribution network in low-income countries

Methodology

The CONTRA project followed the **Systems Thinking** approach; i.e., a methodology to express the complex, interdependent, sociotechnical problems that managers and policy makers face **[2]**. Our research was divided into **five steps** (**Figure 2**) combining multiple qualitative and quantitative methods including semi-structured interviews, focus group workshops, supply chain (**SC**) mapping, mathematical modelling, scenario analysis and validation exercises.

Given the primary objective of CONTRA, we positioned decision makers of public health authorities and other stakeholders for the vaccine distribution problem at the centre of our efforts. **Multiple interviews and six workshops** were conducted with representatives from different organizations in Norway and abroad between Aug. 2020 and Mar. 2021. In close collaboration with practitioners, we first determined the scope of the vaccine SC system, and then mapped the actors of the system for Norway and Belgium, as examples (**step 1**). Thereafter, we identified critical decision-making criteria in the system and defined measurable key performance indicators (KPIs) to represent criteria in a mathematical model (**steps 2&3**). Finally, after designing a preliminary mockup system together with different experts, we developed the online CONTRA dashboard and tested it under several potential scenarios through group decision-making exercises (**steps 4&5**).

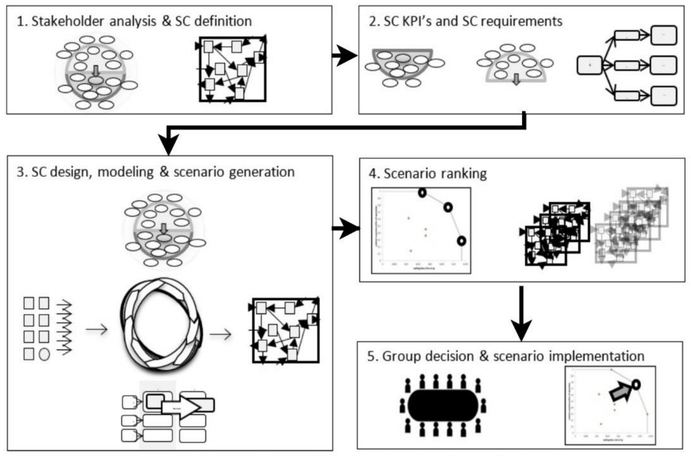


Figure 2 The research design of the CONTRA project based on Systems Thinking approach

Results

First, we found that the COVID-19 vaccine distribution inside countries could be investigated in **central vs. local allocation levels [3]**. The central problem (**generalizable to many contexts** in high-, middle- and low-income countries) deals with the distribution of vaccines from the central to the regional storage facilities of the country after receiving (and repacking) them at the main entry points, such as the airports **(Figure 3).**

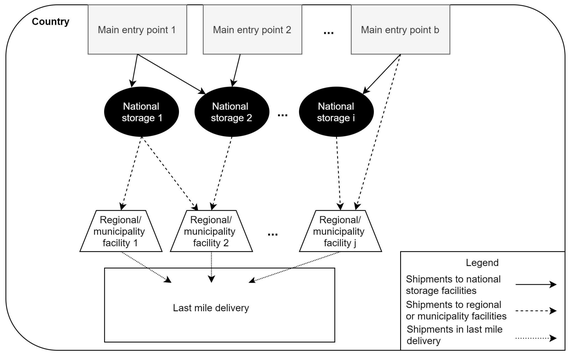


Figure 3 Schematic presentation of the central vaccine allocation problem

Second, we found that public health authorities often followed **five key objectives in COVID-19 vaccine allocation: vaccination as fast as possible, vaccinate as many as possible, vaccinate in line with priority** and other guidelines set by the coordination body in charge (for instance, the Institute of Public Health in Norway), **fair access, and public trust in vaccination.** However, we also found that there is a lack of intuitive decision support systems for allocating COVID-19 vaccines **[4]**.

Third, to support public health authorities to achieve the above-mentioned objectives, specifically fair access to vaccines, the CONTRA team developed a **novel mathematical model that could produce equitable allocation strategies within seconds [5]**. The model investigates equity through "**fair coverage level**", which is calculated based on the size and the importance of multiple regions and eligible population groups. The results of testing the model on actual COVID-19 datasets indicated its ability to support equitable vaccine allocation under different scenarios **(Figure 4).** The model also showed that vaccine hesitancy could impact the allocation equity.

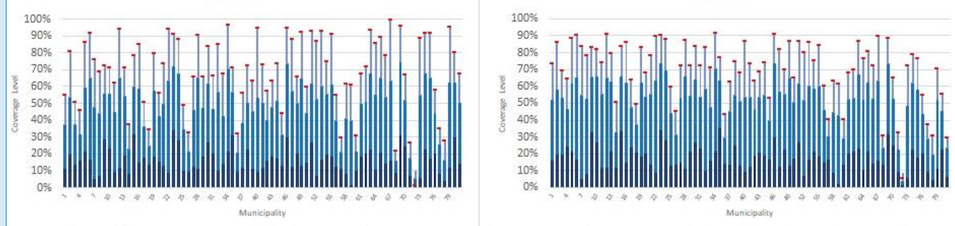


Figure 4 Two real word examples that show how the model achieved the desired equity level (red points) for a large network of municipalities

Fourth, the CONTRA team developed an **intuitive decision support system** (**Figure 5)** that incorporated the novel mathematical model into an online **user-friendly** dashboard to support COVID-19 vaccine allocation [6].

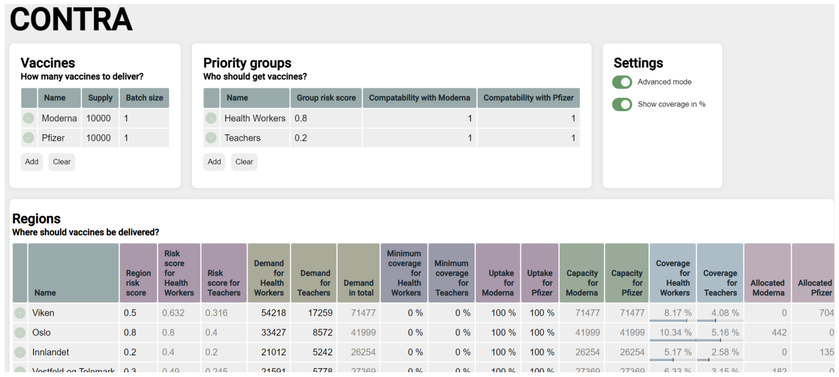


Figure 5 Screenshot of the CONTRA dashboard accessible on https://contra.agens.no

Multiple validation meetings were held with representatives of public health authorities worldwide **where the system was tested with different scenarios and datasets.** The validation outcome revealed that although vaccine allocation decision is indeed a complicated task, the system could provide **useful insights for decision-makers**, who often donot have sufficient time, resources and knowledge to incorporate sophisticated decision support tools **(Figure 6).**

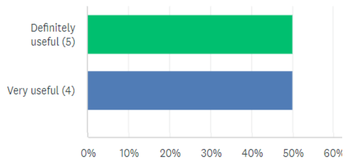


Figure 6 . Survey results: From 1 to 5, how useful the tool was in supporting you for allocating vaccines equitably?

Policy Implications

- Factors used for the prioritization of regions may result in significantly different vaccine allocation decisions and therefore, impact the equity.
- The limited capacity of facilities at municipality and regional levels can significantly hamper equity in the whole vaccination system.
- Intuitive analytical system that could incorporate several potential scenarios before or after presenting solution alternatives to public health authorities increases the quality of decisions for vaccine distribution.
- Vaccines hesitancy should be considered carefully when the objective of vaccine allocation to different regions is to ensure the equity.

Future Research

- Investigating the **last mile delivery for the COVID-19 vaccine distribution**, specifically in middle and low-income countries.
- **Connecting the central level problem to the last mile** delivery problem.
- Exploring **tradeoffs** between **equitable, inclusive and sustainable** vaccine distribution in pandemics and investigating the implications for decision-makers in public health authorities.
- Exploring the use of **machine learning algorithms** to predict the **hesitancy** rate for different vaccines in distinct age groups of target locations.
- Supporting the **assessment of local contextual characteristics** for the feasibility of equitable and effective COVID-19 vaccines roll out plans.

Key References

[1] Baharmand, H., & Phillips, R. O. (**2020**). Covid-19 vaksine: tiden er knapp for planlegging av effektiv distribusjon. forskning.no.

[2] Haines, S. (**2000**). The systems thinking approach to strategic planning and management. CRC Press.

[3] Baharmand, H., Balcik, B., Boey, L., Decouttere, C., Phillips, R., Saeed, N., & Vandaele, N. (**2021**). Toward a decision support system for COVID-19 vaccine allocation inside countries. Norsk IKT-konferanse for forskning og utdanning.

[4] Phillips, R. , Baharmand, H., Vandaele, N., Decouttere, C., & Boey, L. (**2022**) How can authorities support distributed improvisation during major crises? A study of decision bottlenecks arising during local COVID-19 vaccine roll-out. Journal of Cognitive Engineering and Decision Making.

[5] Balcik, B., Yucesoy, E., Akca, B., Karakaya, S., Gevsek, A. A., Baharmand, H., & Sgarbossa, F. (**2022**). A mathematical model for equitable in-country COVID-19 vaccine allocation. International Journal of Production Research.

Research Team

Assoc. Prof. Hossein Baharmand (Project manager) and **Prof. Naima Saeed** from the Centre for Integrated Emergency Management (CIEM), University of Agder, Norway, contributed to the conceptualization of the decision-making problem, prepared scenario development/analysis and conducted the validation exercises.

Prof. Burcu Balcik from the Ozyegin University, Turkey, led the parameterization and mathematical modelling of the vaccine SC system with four research assistant.

Prof. Nico Vandaele, **Dr. Catherine Decouttere**, and **Dr. Lise Boey** from the Access-To-Medicine (ATM) research centre at the KU Leuven, Belgium, determined parameters, variables and causal links between them in the vaccine SC system.

Dr. Ross Phillips and **Dr. Milch Vibeke** from the Institute of Transport Economics, Norway developed the actors map of the vaccine distribution system and identified its bottlenecks.

The knock-on effects of the COVID-19 pandemic on supply and availability of generic medicines in Ethiopia: a mixed methods study

Tsegaye Melaku*, Zeleke Mekonnen, Gudina Terefe, Mohammed Mecha, Christine Årdal, Marianne Jahre

Background

- The COVID-19 pandemic has exposed supply chain and logistics vulnerabilities.
- It has put a tremendous strain on supply and availability of essential medicines, especially in low and middle countries.
- This study aimed to explore the knock-on effects of COVID-19 on the availability and stock status of selected generic medicines, including those for chronic medicines and paracetamol, in Ethiopia.

Methods

- A mixed methods study conducted in health facilities (29) and public pharmaceutical supply agencies (2) located in seven zonal administrations (see diagram)
- Tools used:
  - Logistics System Assessment Tool (LSAT)
  - Logistic Indicators Assessment Tool (LIAT)
  - Inventory Management Assessment Tool (IMAT)
- Pharmaceutical products: Cardiovascular disease medicines (19), anti-diabetics (5), and paracetamol products (4)
- Product availability was assessed based on the World Health Organization's availability index.

Results

- The overall stockout situation in the study area has worsened during COVID-19 compared to pre-COVID-19 time. Medicine order fill rate experienced a negative trend throughout 2020 (Figure 1).
- None of the surveyed chronic disease basket medicines met the ideal availability benchmark of 80% in health facilities (Figure 2 for paracetamol).
- However, availability of paracetamol 500mg tablets, which is produced in Ethiopia, surprisingly remained consistently available during the pandemic (Figure 2). Whereas the child formulation (oral syrup) of paracetamol experienced high stockout levels (Figures 2 & 3).

Discussion and future perspectives

- Hospitals and supply agencies reported significant increases in medicine acquisition costs, suspected due to supply constraints, currency depreciation, and local political instability.
- Yet, the continued availability of paracetamol 500mg tablets indicates that local production of medicines may play an important role in securing predictable supplies during crises, particularly in low-income countries. The research team will further explore this relationship.

Acknowledgements

- Healthcare workers and managers participating in the study
- Research Council of Norway, Global Health and Vaccination Research Program (GLOBVAC)
- Jimma University, Ethiopia

* Tsegaye Melaku , Jimma University, tsegish.melaku@gmail.com

Figure 1: Overall order fill rate before and during COVID-19

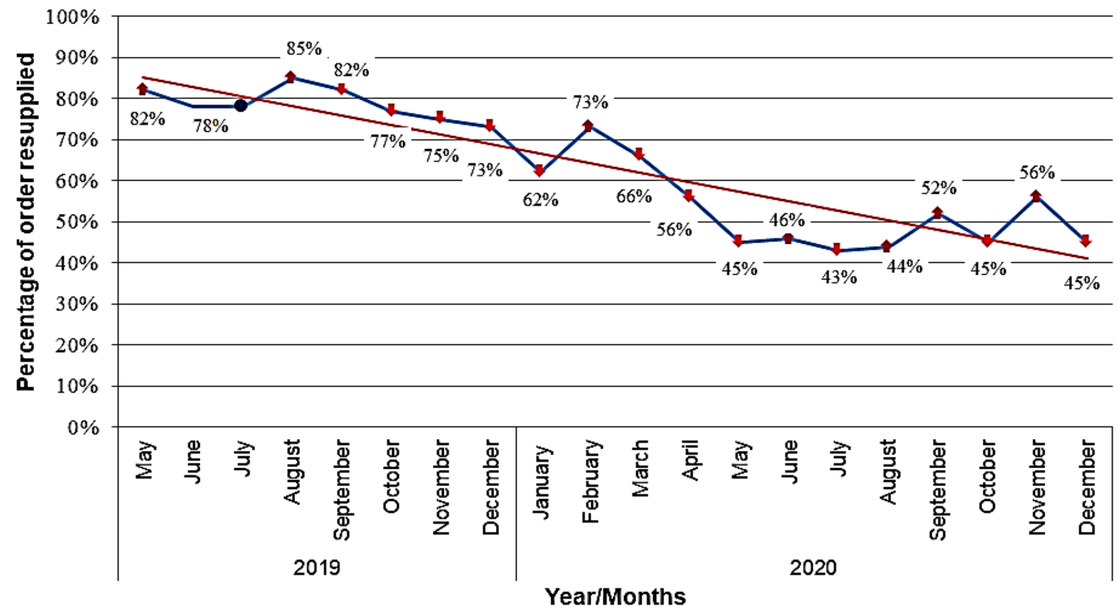


Figure 2: Average weeks of stock levels for two paracetamol products in comparison to maximum, minimum, and emergency-stock level thresholds

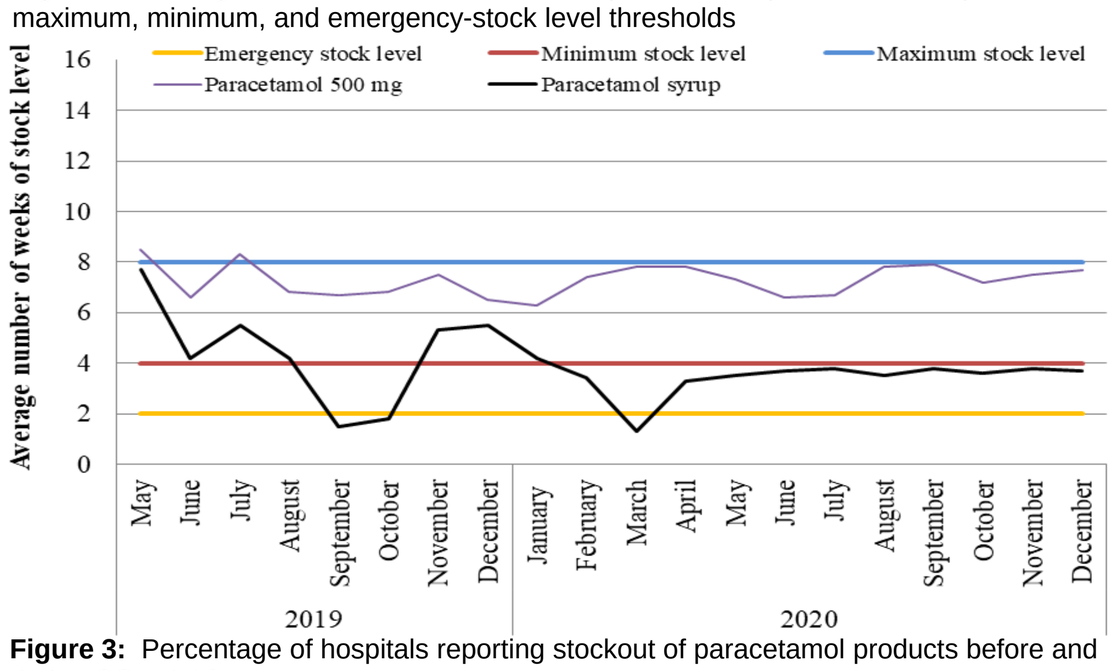
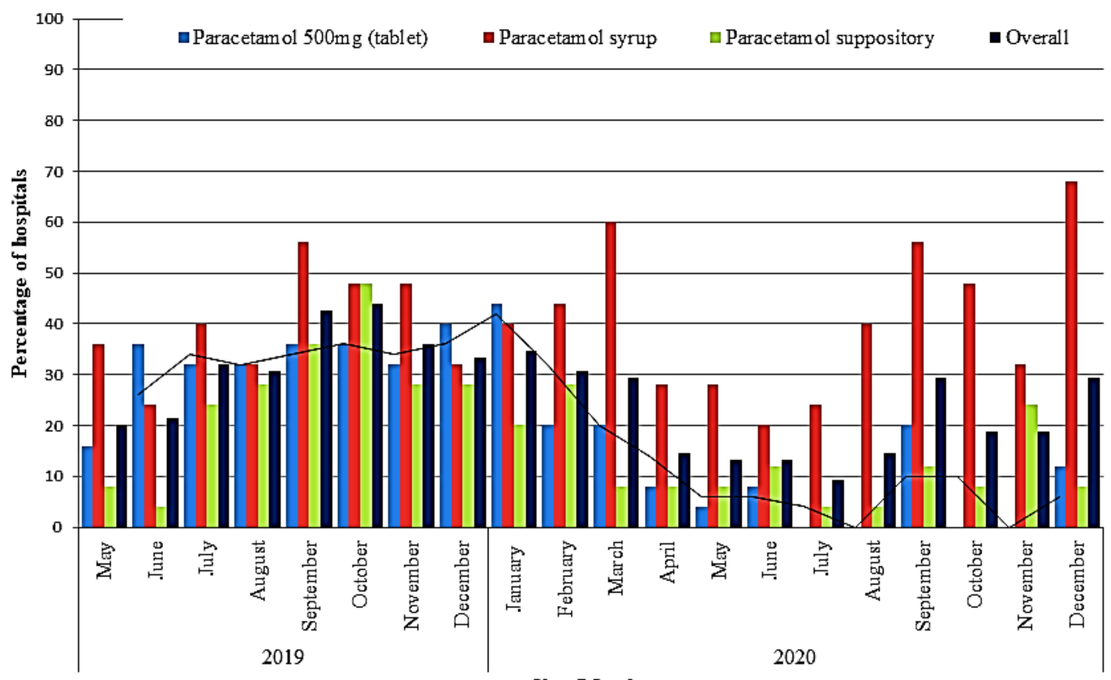


Figure 3: Percentage of hospitals reporting stockout of paracetamol products before and during COVID-19



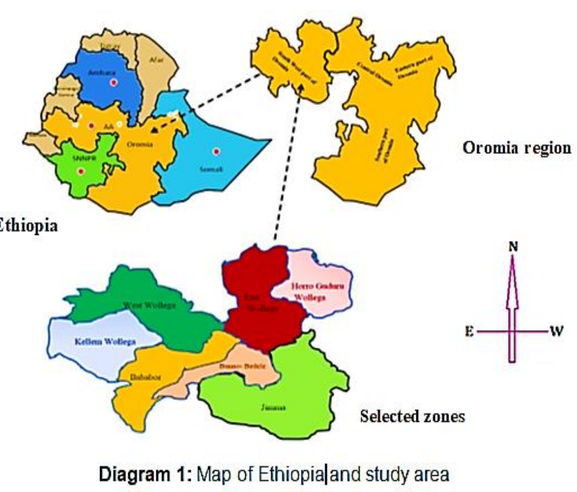


Diagram 1: Map of Ethiopia and study area

COVID-19 scenarios for Norway using an Individual-Based Model

Louis Yat Hin Chan[1], Francesco Di Ruscio[1], Jørgen Eriksson Midtbø[1], Gunnar Rø[1], FHI COVID-19 Modelling Team[1], Birgitte Freiesleben de Blasio[1,2,*]

1 Norwegian Institute of Public Health, Oslo, Norway. 2 University of Oslo, Oslo, Norway. * Birgitte.Freiesleben.DeBlasio@fhi.no

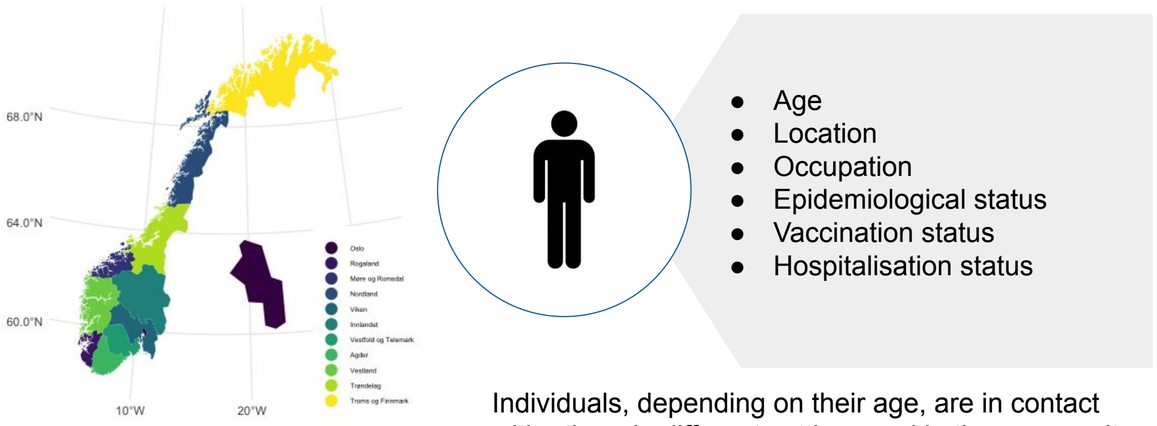
Introduction

Scenario modelling of COVID-19 has been crucial to evaluate and plan strategies for policy makers. The need of modelling potential epidemic trajectories under different interventions, such as locking down and reopening society, isolation and quarantine rules and distribution of vaccines, has been increasing throughout the pandemic. Understanding the impact of each strategy helps to allocate resources and take the right decisions to reduce the burden on the public health system. The impact of infection control measures is often impossible to assess through observational studies, for both practical and ethical reasons. Mathematical models thus represent an invaluable and unique resource to investigate "what-if" scenarios and support policy decision makers.

During the pandemic, scenario analyses have been performed using an Individual-Based Model (IBM) as an in-silico lab for Norway [1]. The model has been used in various phases of the pandemic. Here, as an example, the main focus is in the period during the spread of the Delta variant in late 2021, following the full reopening of the Norwegian society on September 25th [2]. The scenarios were used to compare hypothetical assumptions and assess the impact of interventions on hospital burden, in terms of daily admissions.

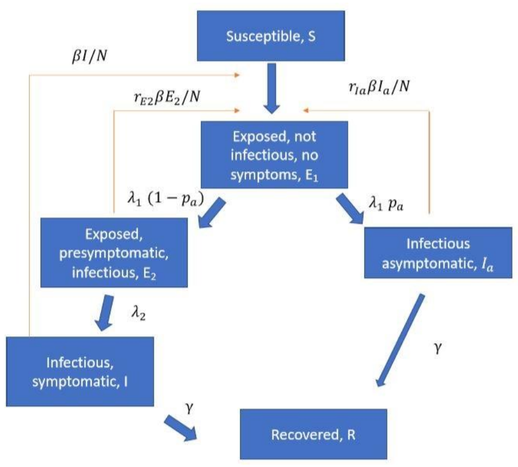
Methods

We developed a stochastic IBM reproducing the real socio-demography of Norway [1]. The model consists of approximately 5.4 million people distributed on a geolocated grid. Each person has a number of individual features.

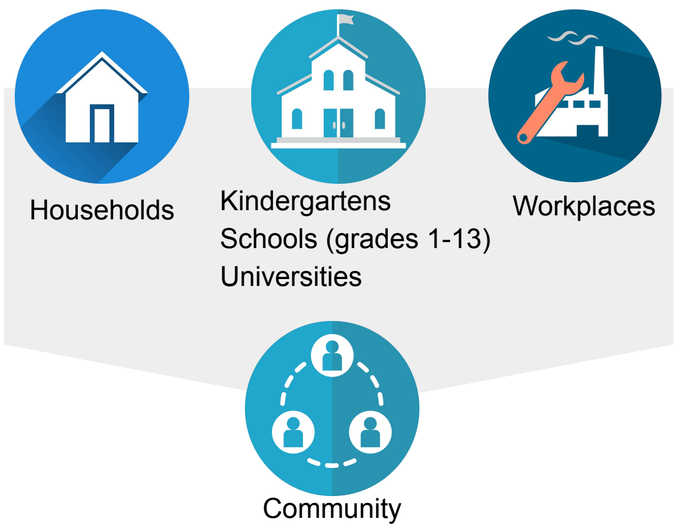


- Age
- Location
- Occupation
- Epidemiological status
- Vaccination status
- Hospitalisation status

The epidemiological model is based on a SEIR structure



Individuals, depending on their age, are in contact with others in different settings and in the community



Parameters and calibration

The parametrization of the IBM relies on several data sources that together enable modelling key features of the Norwegian society that play an important role in the spreading dynamics of SARS-CoV-2:

- Norwegian census data have been used to build a realistic household composition and demography of Norway.
- Human mobility patterns have been informed using mobile phone data from Telenor Norway, reporting the distribution of the radius of gyration by day and municipality.
- Vaccination status data from the Norwegian Immunisation Registry (SYSVAK) determines the distribution of vaccine doses to the population by age and municipality.
- Daily hospitalizations data by age have been used to parametrize the admissions of patients to hospitals and intensive care units.

The force of infection of SARS-CoV-2 and its changes over time, as a result of interventions or genetic variations, have been calibrated on Norwegian surveillance data, such as the incidence of hospital admissions and the fraction of cases by virus variants.

Scenarios

The scenarios explore the effect of varying adherence to the isolation mandate and vaccine coverage, using the following assumptions:

- The fraction of symptomatic infected people staying at home for 5 days is either:
  - 0%, 20%, 50%, or 70%.
- Vaccination coverage of people aged 12 years or above is either:
  - Current (remained the same as October 2021), at least 90%, or the whole population.

In an open society, there was considerable uncertainty about the rate of transmission, parameterised by the basic reproduction number (R0). Here we show results with R0=6 [2]. The seasonal variation of transmissibility is selected to be 25%, representing the difference between the coldest and warmest time of the year.

Results

Hospital capacity has been a primary concern throughout the pandemic, and interventions have been aimed at avoiding overload. We show the modelled daily hospital admissions until the end of 2021.

Figure 1A shows that the scenario of 70% adherence of home isolation and 90% vaccination coverage is the finest as post-hoc in these simulations.

There is clear effect of pushing the vaccination coverage to a higher level to flatten the curve. Had we reached 100 percent vaccination coverage, there could be almost no admissions in Norway.

Figure 1B shows how poor adherence to home isolation policies could significantly increase hospital admissions. In the extreme scenario with no isolation, the hospitalizations could raise up to 200 per day in December 2021.

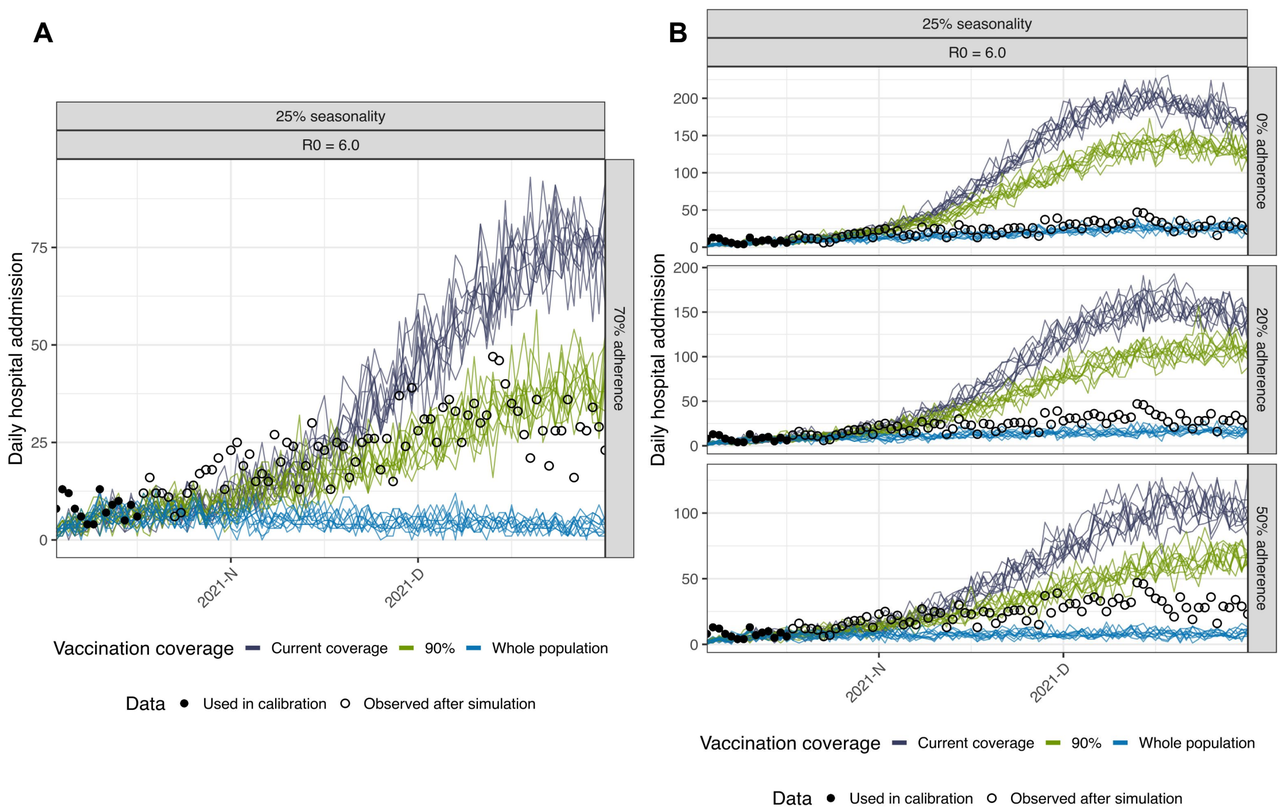


Figure 1: The number of daily hospital admissions given different adherence rates of the 5-day home isolation rule (A: 70% adherence; B: 0%, 20% or 50% adherence). Each scenario consists of 50 stochastic simulations. The vaccination coverage is represented by different color. The basic reproduction number and seasonal variation is assumed to be respectively 6 and 25%. Hospitalization data until 18th October 2021 were used to calibrate the model. Note that the emergence of Omicron variant from late 2022 was not considered in this simulation [2].

Discussion

By comparing different strategies under various possible assumptions, the scenario analysis demonstrates the importance of vaccination and responsible behavior such as isolation in case of symptoms in a crucial phase of the pandemic when no strict restrictions were imposed.

The simulations are surrounded by large uncertainties, such as vaccine efficacy, waning dynamics of natural and vaccine-derived protection or the number of individuals who have been infected in Norway. Moreover, it is impossible to anticipate changes in human behavior or genetic mutations. We therefore emphasise that the scenarios do not aim to predict the future development of the pandemic, but rather to compare epidemiological outcomes of hypothetical scenarios under stationary assumptions.

The collection of new data in Norway enable us to constantly improve the model and follow the development of the pandemic (e.g. the Omicron wave in the early 2022 [3]).

Acknowledgements

The project was funded by the Research Council of Norway "COVID-19 in Norway: A real-time analytical pipeline for preparedness, planning and response during the COVID-19 pandemic in Norway" grant number 312721. The mobility data was collected and provided by Telenor Norway.

References

1. Coronavirus modelling at the NIPH https://www.fhi.no/en/id/infectious-diseases/coronavirus/coronavirus-modelling-at-the-niph-fhi/
2. Long-term scenarios for Norway for the fall and winter 2021-2022 https://www.fhi.no/contentassets/e6b5660fc35740c8bb2a32bfe0cc45d1/vedlegg/nasjonale-og-regionale-rapporter/2021-10-28-long_term_scenarios_report_updated.pdf
3. Modelling scenarios for the SARS-CoV-2 Omicron VOC (B.1.1.529) in Norway, gradual reopening in February-March 2022 https://www.fhi.no/contentassets/e6b5660fc35740c8bb2a32bfe0cc45d1/vedlegg/nasjonale-og-regionale-rapporter/modelling-scenarios-for-the-sars-cov-2-omicron-voc-26.01.2022.pdf

Cohort study of COVID-19 Nested within an RCT of Patients with Community-Acquired Pneumonia (COVID-19-CAPNOR study). Sub-study on CAP biomarkers: Transcriptional and protein biomarker profiling in patients with COVID-19 or acute lower respiratory tract infections with alternate microbial aetiology

Dhanasekaran Sivakumaran[a], Sondre Serigstad[a,b], Christian Ritz[a,c], Siri T. Knoop[a,d], Elling Ulvestad[a,d], Harleen M.S. Grewal[a,b,d] and the CAPNOR study group.

[a] Department of Clinical Science, Bergen Integrated Diagnostic Stewardship cluster, University of Bergen, Bergen, Norway. [b] Emergency Care Clinic, Haukeland University Hospital, Bergen, Norway. [c] National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark. [d] Department of Microbiology, Haukeland University Hospital, Bergen, Norway.

COVID-19-CAPNOR study

We recruited patients (initiated on 25th September 2020) hospitalized for community-acquired pneumonia (CAP) at the Emergency Department (ED), Haukeland University Hospital (HUS), Bergen, into a pragmatic randomized controlled trial (RCT) [NCT04660084] to assess the impact of a comprehensive ultra-rapid, molecular diagnostic test (FilmArray® Pneumonia *plus*, Biomérieux) compared to the current standard of care on a broad range of outcomes. The proposed patient-centered, opportunity-driven COVID-19 nested cohort study will contribute to i) optimising sampling strategies; ii) optimizing patient management; iii) optimising virus detection and mapping of protein and transcriptional responses; iv) supporting capacity building, and infection control measures and best practice to protect health care workers.

To date, SARS-CoV-2 was identified in 17.4% of patients recruited in the RCT (74/425). A bacterial co-infection was detected in 42% of COVID-19 patients, with *H. influenzae* and *Staphylococcus aureus* being the most common bacteria detected in mixed infections. Despite the presence of a bacterial co-infection, 52.9% of COVID-19 patients with a bacterial co-infection were clinically deemed as not requiring treatment with an antibiotic. Mixed infections, representing respiratory pathobionts, can potentially (dependent on clinical presentations) be treated without antibiotics in a significant number of COVID-19 patients, thereby preventing antibiotic overuse/misuse.

COVID-19-CAP biomarker nested sub-study

To enable optimal care, prevent unnecessary antibiotic prescriptions, and maximize the use of hospital resources, a precise differential diagnosis between acute viral and bacterial illnesses is essential[1]. An integrated view of the host response to infections presents opportunities for developing precise and reliable molecular diagnostics[2]. In this nested sub-study, we aimed to investigate host transcriptional and protein profiles in patients with COVID-19 and acute lower respiratory infections with alternate microbial aetiology.

Methods

Whole blood RNA samples from patients with CAP due to pure bacterial aetiology (n=11), pure viral aetiology, other than COVID-19 (n=11) and COVID-19 (n=10), and plasma samples from patients with pure bacterial aetiology (n=49), pure viral aetiology (n=35), and pure COVID-19 (n=40) were selected and analysed using high throughput methods for transcriptional (Clariom™ S array) and protein profiling (Luminex® Multiplex Assay), respectively.

Results

Transcriptional analysis showed that 177 differentially expressed genes overlapped between the following comparisons: pure bacterial vs. pure viral and pure bacterial vs. pure COVID-19. Of these, 103 genes were down-regulated, and 74 were up-regulated in the pure bacterial group compared to pure viral and COVID-19 groups. Notably, no differentially expressed genes were identified between the pure viral and pure COVID-19 groups.

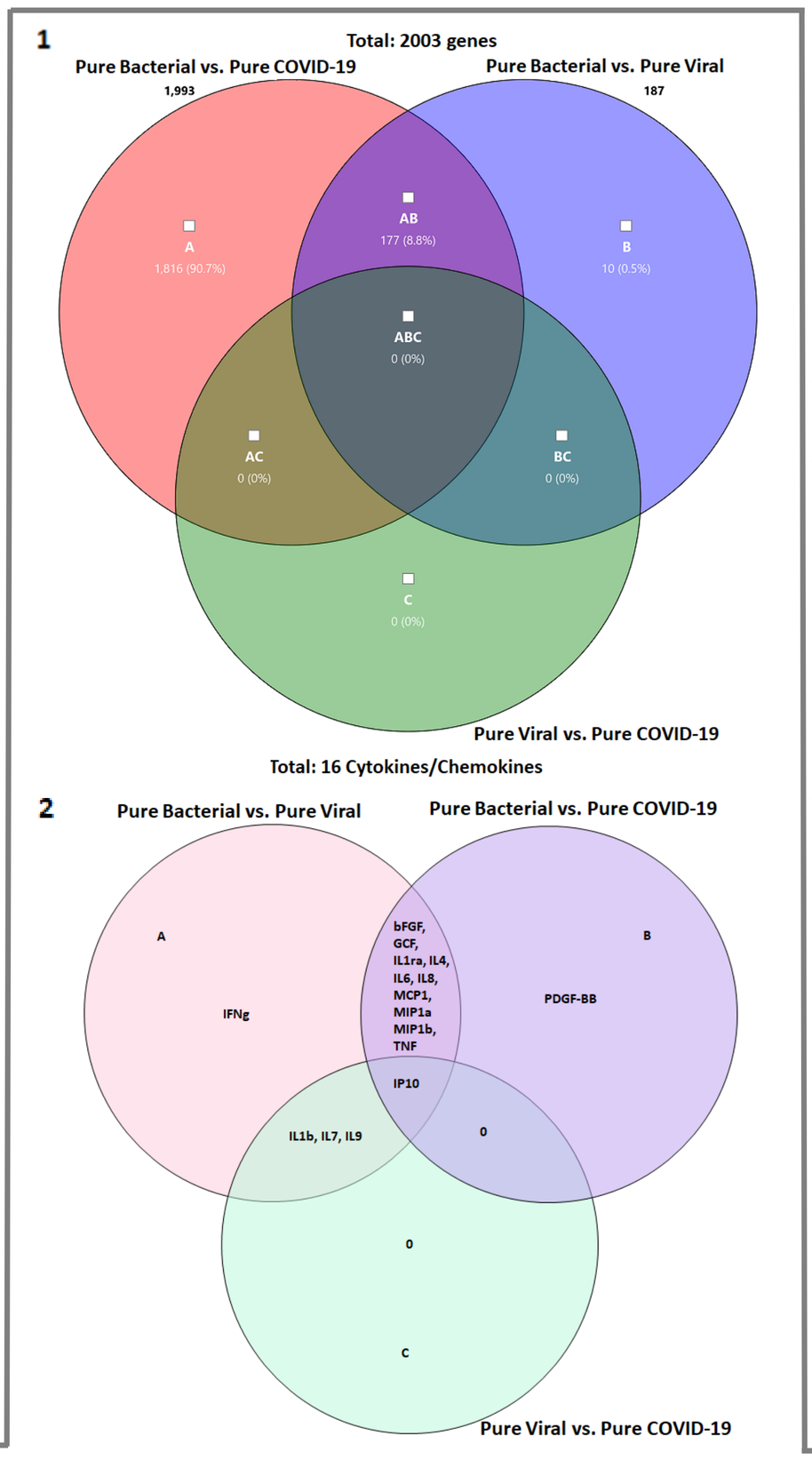


Figure 1: Venn diagram shows a total of 2003 genes that were differentially expressed between the 3 comparisons (A: Pure Bacterial vs. Pure COVID-19 [pink circle]; B: Pure Bacterial vs. Pure Viral [purple circle]; C: Pure Viral vs. Pure COVID-19 [green circle]).

Figure 2: Venn diagram shows a total of 16 cytokines/chemokines that were differentially expressed between the 3 comparisons (A: Pure Bacterial vs. Pure Viral [pink circle]; B: Pure Bacterial vs. Pure COVID-19 [purple circle]; C: Pure Viral vs. Pure COVID-19 [green circle]).

Protein biomarker profiling of patients with COVID-19 compared with those with acute respiratory tract infections with an alternate microbial aetiology (bacterial/viral) showed that the concentration of GCF, IL6 ($p<0.05$), IL8, MCP1 ($p<0.01$), bFGF, IL1ra, IL4, MIP1a, and MIP1b ($p<0.001$) was increased while, the concentration of IP10 and TNF ($p<0.01$) was decreased in patients with pure bacterial aetiology as compared with, those with viral aetiology (including COVID-19). Further, compared to patients with pure bacterial and other viral aetiology, the concentration of IL1b ($p<0.05$) and IP10 ($p<0.01$) was elevated in patients with COVID-19, whereas the concentration of IL7 ($p<0.01$) was decreased in patients with COVID-19. The concentration of IL9 ($p<0.01$) was decreased in the pure viral group compared to the other two groups.

Conclusions

The 177 differentially expressed genes between the viral, COVID-19, and bacterial groups are primarily involved in the SARS-CoV-2 signaling pathway map, type I interferon signaling, MAPK signaling, and endothelin pathways. Interestingly, the interferon γ-induced protein 10 (IP-10, also termed CXCL-10) was elevated in COVID-19 patients compared with patients with bacterial or viral CAP. IP10 has previously been shown to have a positive association with greater disease severity and adverse prognosis in COVID-19[3].

Funding

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References

1. Ravichandran S et al. EBioMedicine. 2021 May; 67:103352. doi: 10.1016/j.ebiom.2021.103352.
2. Lydon EC et al. Expert Rev Mol Diagn. 2018 Aug;18(8):723-738. doi: 10.1080/14737159.2018.1493378.
3. Manuela Rizzi et al. Dis Markers. 2022 Feb; 2022:3528312. doi: 10.1155/2022/3528312.

Dhanasekaran Sivakumaran
Department of Clinical Science (K2), University of Bergen, Norway
Email: Dhanasekaran.Sivakumaran@uib.no
Phone: +47 96693568
Website: https://www.uib.no/en/persons/ge.Sivakumaran

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TROND MOHN STIFTELSE

UNIVERSITAS BERGENSIS

HELSE BERGEN
Haukeland universitetssjukehus

PANDRISK

Perceived risk and precautions during a pandemic outbreak

AUTHORS: **Sebastian B. Bjørkheim & Bjørn Sætrevik**

UNIVERSITY OF BERGEN

Background:

Perceiving a situation as threatening and seeing public benefits of compliance may increase intention to comply with infection control measures (Bults et al., 2011; Jordan et al., 2020; Isler et al., 2020).

Design:

- 2x2 between group survey experiment
- We manipulated:
  - High risk vs low risk
  - Prosocial vs self-interested motivation
- Outcome variable = Intention to comply

Hypotheses:

H1: Main effect for "prosocial motivation"

H2: Main effect for "high risk"

H3: Interaction effect of "self-interested motivation" and "high risk"

- Preregistration: https://osf.io/ahfdn

Data Collection:

- N = 2.533 (from November 2020), representative for Norwegian adults
- Collected in November 2020 using the Norwegian Citizen Panel

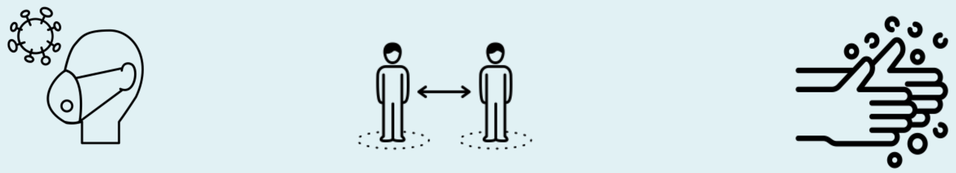
Results:

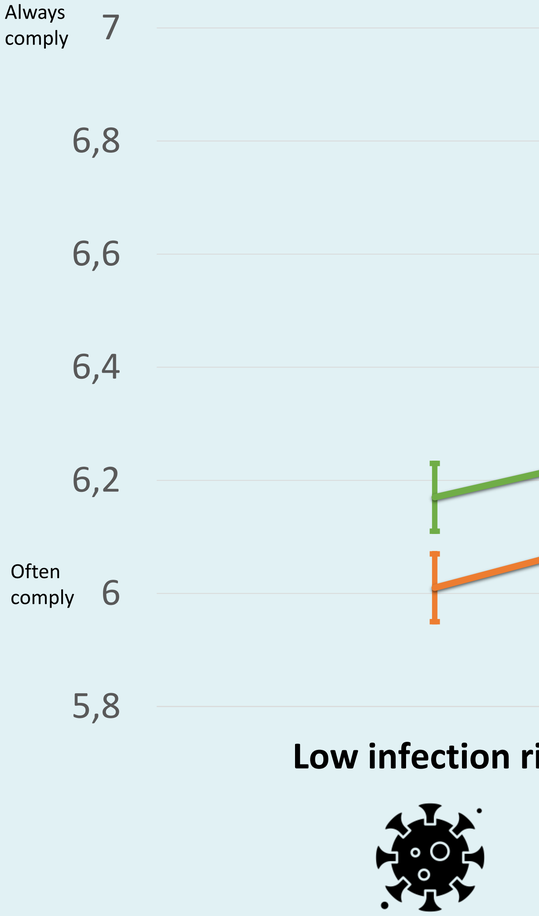
- H1: Main effect for "prosocial motivation" ($F(1, 2521) = 7.9$, $p < .01$, $r^2 = .003$)
- H2: Main effect for "high risk" $F(1, 2521) = 68.14$, $p < .001$, $r^2 = .026$)
- H3: No interaction effect of "self-interested motivation" and "high risk" ($F(1, 2521) = 1.01$, $p = .31$)

Implications for future outbreaks:

Health authorities may increase compliance by emphasizing the risk of infection and the importance of protecting others

Emphasizing high risk of infection and prosocial motivation for compliance increase intentions to comply with infection control measures





PrePrint

EU-COVID-19 – a multinational registry-based study with focus on risk and protective factors, clinical outcomes and mental health

Hedvig Nordeng, Elisabeth Pedersen, Eimir Hurley, Jing Zhao, Thi Hong Nhung Trinh, Angela Lupattelli

PharmacoEpidemiology and Drug Safety Research Group, University of Oslo, Norway

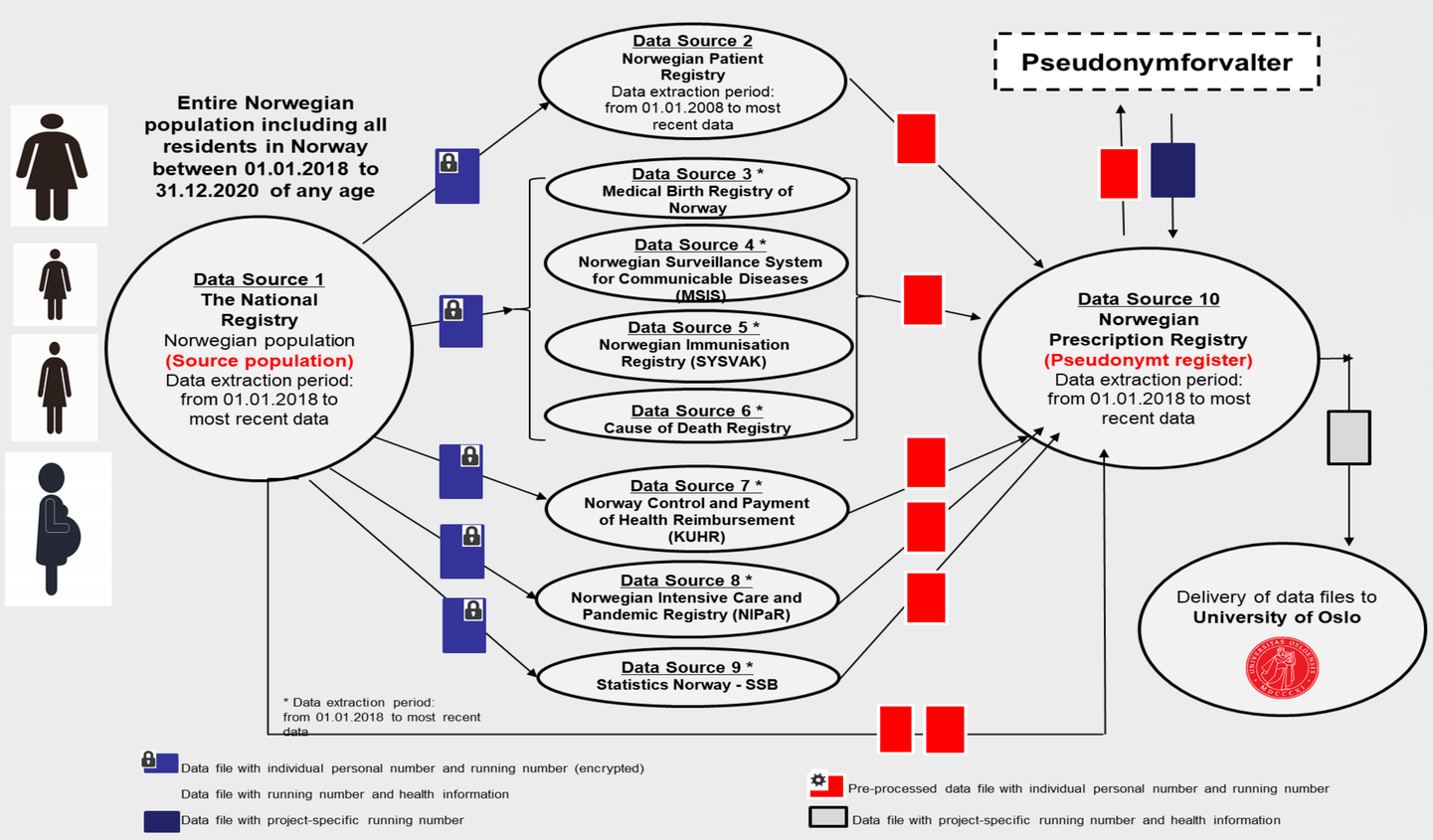
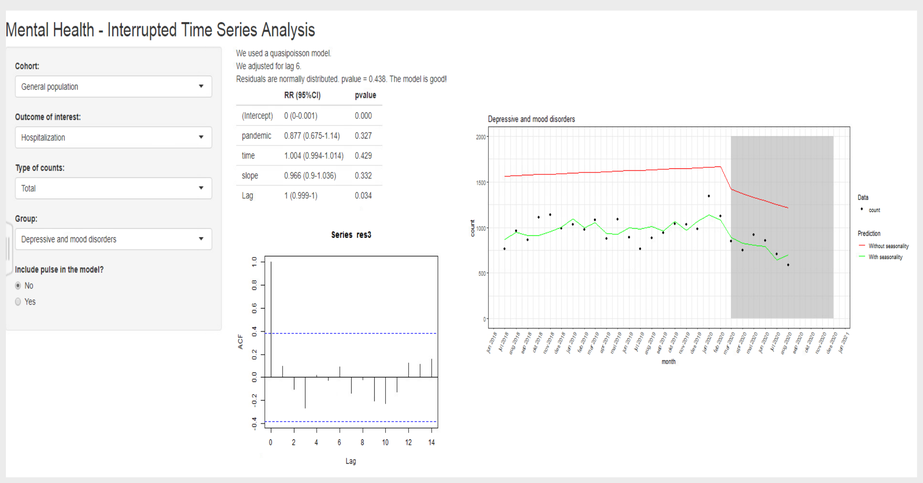


Figure: Ten national Norwegian data registries were linked in the EU-COVID-19 project

Major results

- A functional data analytical pipeline for Norwegian heath data for covid-19 studies established within the University of Oslo, Department of Pharmacy. This ensures a specific focus on medications.
- A Nordic COVID-19 Common Data Model extension developed in collaboration with colleagues from University of Copenhagen.
- More than 18,000 women completed their pregnancy during the first four months of the pandemic, whereof 31 had a positive COVID-19 test (5 in 2nd trimester and 26 in 3rd)
- Almost 124,000 children tested positive for COVID-19 during 2020/2021, and about 500 were hospitalized with a COVID-19 diagnosis. Post COVID Condition was diagnosed in 44 children and Multisystem Inflammatory Syndrome in 43.
- Software development: A ShinyApp for time trend drug utilization analyses developed and applied to the pandemic period



Lessons learned for future pandemics

Long data delivery lag time of > 1 year has been a major challenge. This major bottleneck needs to be improved to ensure preparedness for future pandemics.
Currently, this a major drawback for Norway's participation in international, multinational epidemiological studies.

Contact:

Professor Hedvig Nordeng, Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Universitetet i Oslo.
www.mn.uio.no/farmasi/english/research/groups/pharma-safe/

Dr. Angela Lupattelli, Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Universitetet i Oslo.
www.mn.uio.no/farmasi/english/research/groups/pharma-safe/

Cognitive impairments 6 and 12 months after ICU-admission in COVID-19 patients

Fjone KS[1,2], Buanes EA[3], Småstuen MC[1,2], Laake JH[1,4], Hofsø K[1,5,6]

1 Department of Research and Development, Division of Emergencies and Critical Care, Oslo University Hospital, Oslo **2** Department of Public Health, Oslo Metropolitan University, Oslo **3** Norwegian Intensive Care and Pandemic Registry, Haukeland University Hospital, Bergen **4** Department of Anaesthesia and Intensive Care Medicine, Division of Emergencies and Critical Care, Oslo **5** Lovisenberg Diaconal University College, Oslo **6** Department of Postoperative and Intensive Care Nursing Division of Emergencies and Critical Care, Oslo University Hospital, Oslo

Background

The most severely ill COVID-19 patients need intensive care treatment and often mechanical ventilation because of respiratory failure. It is well documented that severe illness treated in the intensive care unit (ICU) can lead to long lasting and complex symptoms. Among the most reported symptoms are cognitive impairments, such as memory loss and lack of concentration and approximately 25% of ICU-patients experience symptoms months after discharge.

Objectives

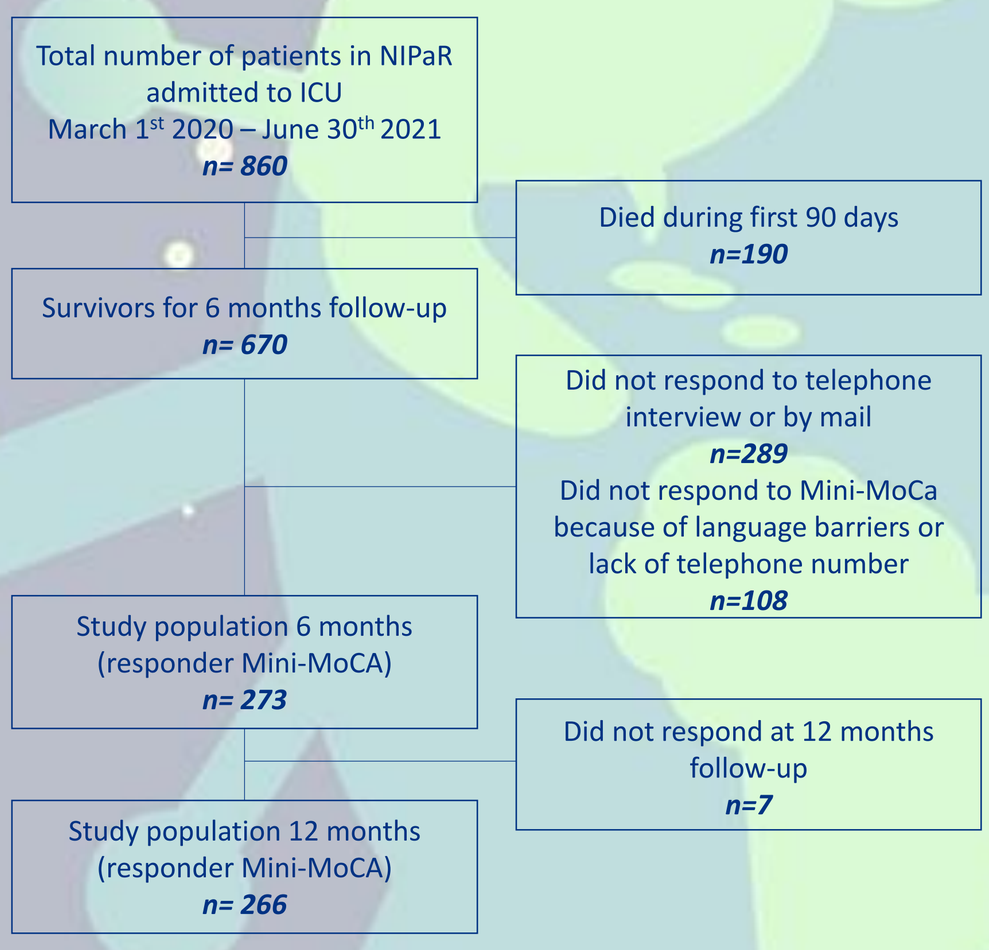
- Investigate the prevalence of cognitive impairments at 6 and 12 months after ICU-admission in adult COVID-19 survivors registered in the Norwegian Intensive Care and Pandemic Registry (NIPaR)
- Investigate predictive factors for cognitive impairments defined as a total score under 11 in Mini-MoCA

Methods

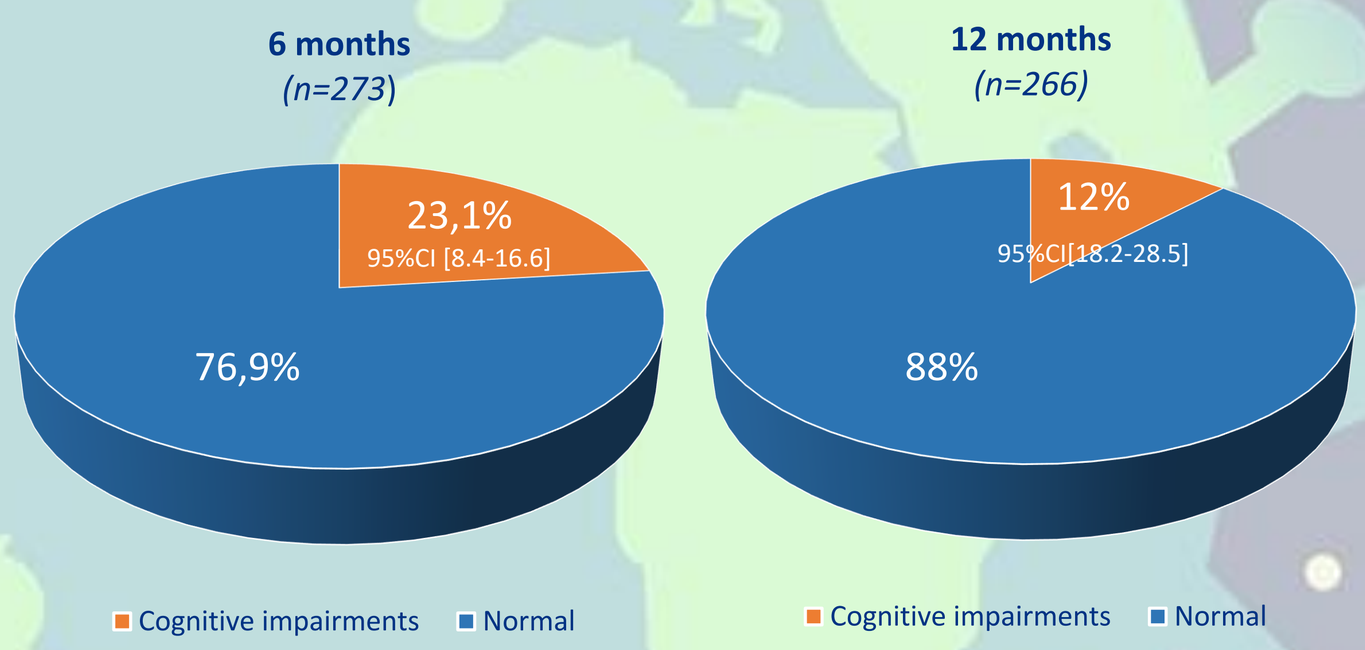
- Prospective observational study
- Data collected from NIPaR and telephone interview
- Statistical analyses: Logistic regression and binominal distribution approximation

Results

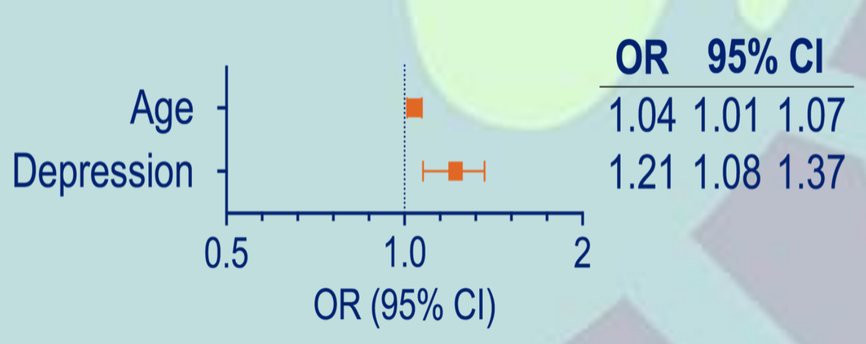
Flowchart



Prevalences of cognitive impairments



Predictive factors for having cognitive impairments at 6 months



Clinical characteristics of the study sample at time of ICU admission *(n=273)*	n	%	Median (range)
Age			57 (30-88)
Gender			
Female	81	29.7	
Male	192	70.3	
BMI (kg/m²)	193		29.1 (18.8-58.1)
Peripheral oxygen-saturation (%)	249		90 (11-100)
Respiration rate (per minute)	266		26 (8-78)
SAPS II score	273		31 (6-72)
ICU length of stay (days)	273		11.6 (0.5-75.1)
Received mechanical ventilation (respirator and/or NIV)	237	86.8	
Time on invasive mechanical ventilation (days)	216		8.3 (0.8-69.5)
Any risk factor			
Yes	200	73.3	
No	73	26.7	
Risk factors*			
Cardiovascular disease	106	38.8	
Obesity	67	24.5	
Asthma	48	17.6	
Diabetes Mellitus I or II	38	13.9	
Other	79	21.7	

*Some have more than one risk factor

Conclusion

There is a significant decrease in the prevalence of cognitive impairments from 6 to 12 months after ICU admission, indicating that cognitive impairments improve over time. Older age and having symptoms of depression were found to be predictive factors for having cognitive impairments at 6 months. Information about improvement over time is important both for the general public, general practitioners and rehabilitation services. Patients in this study have received various degrees of rehabilitation, but this was not found as a predictive factor for improvement. Future research should include baseline levels and more detailed information about length and type of rehabilitation.

Oslo University Hospital
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OSLOMET OSLO METROPOLITAN UNIVERSITY STORBYUNIVERSITETET

A Clinical Hygiene Ruler Based on Hyperspectral Imaging and Machine Learning: A Possible Solution for COVID-19 and Other Pathogen Detection

Arnoud Jochemsen[1], Juha Vahokoski[4], Julio Hernandez[2], Kristin Grave Isdahl Mohn[4], Lars Kristian Vognild[1], Na Liu[2], Nabil Belbachir[1]*, Rebecca Cox[3], Xuan Zhang[1]

[1]NORCE-Technology, Norway, [2]Norsk Elektro Optikk, Norway, [3]Universitet i Bergen, Norway,
[4]Haukeland Universitetssjukehus, Norway, *Email: nabe@norceresearch.no

Abstract

- Since the outbreak of the pandemic coronavirus disease, Polymerase Chain Reaction (PCR) test and antigen test have been applied to detect the existence of Corona virus. However, positive results in the PCR test or the antigen test do not necessarily mean virus being infectious, as dead virus or pieces of virus can trigger positive results in these two types of testing methods. This paper explores the possibility of applying hyperspectral imaging and machine learning in detecting infectious virus in the indoor environment. The method is based on measuring *virus infecting live cells*, and the infection status is recorded by a hyperspectral camera. A Partial Least Square - Discriminant Analysis (PLS-DA) model was trained to predict the infectiousness of the targeted virus within 48 hours. Our method shows the potential of *directly* detecting the infectiousness of virus and can be potentially applied in COVID-19 detection in complex situations for real infection.
- Keywords: hyperspectral imaging, HSI, Corona, covid-19, virus infectiousness detection, PLS-DA.

Introduction

- The pandemic since early 2020 has caused tremendous lost of human lives.
- Needs of virus detection in indoor environment: hospital rooms, airports, etc, so that its spreading and the risk of being infected by it can be reduced.
  - COVID19 virus can survive from several hours to a couple of days on different material surfaces [1], making it difficult to stop its spread.
- Current detection methods: PCR and antigen tests.
  - Dead virus or pieces of virus are not infectious but can trigger positive results.
  - Positive results do not mean infectiousness.
- Our method: on the basis of Hyperspectral imaging, measuring live cells being infected by virus.
  - Though labor-demanding and time-consuming, it worth the work and study.

Hyperspectral Imaging

- Theory:
  - when photons enter a certain object, some of them are reflected, some pass through, and the rest are absorbed.
  - Different chemical substances have their own absorption, reflection, and scattering characteristics at different wavelengths. These characteristics can be recorded by hyperspectral cameras in the form of hyperspectral images.
  - Study the chemical composition of the object by analyzing the spectral images.
- Various applications [2-4]
  - air quality monitoring
  - precision agriculture
  - food quality control
  - biomedical and clinical research
  - Surveillance
  - geological exploration
  - chemical detection.

Scenario

- Collect contaminants by ventilation systems.
- Centrifuge the contaminants to get virus.
- Infect cells by virus and incubate the cell-virus mixture.
- Measure the infection status by hyperspectral imaging.
- Read the hyperspectral images and predict the infectiousness of the virus.

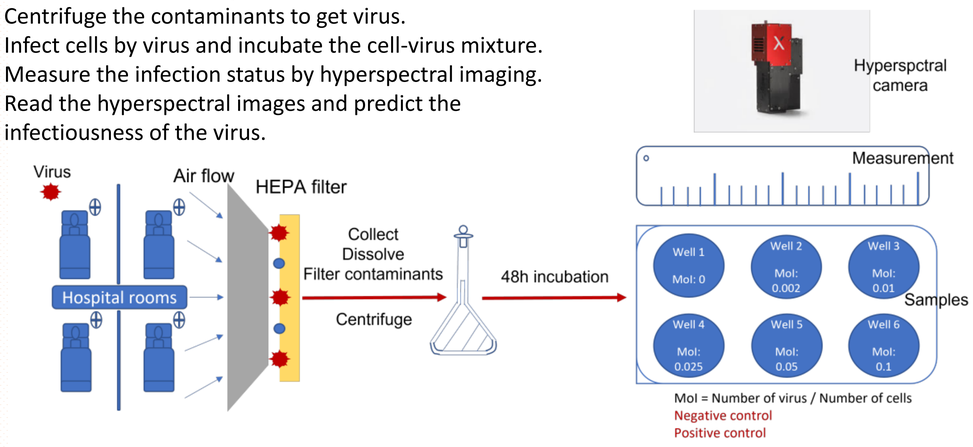


Figure 1: The scenario of monitoring the infectiousness of corona virus in hospital rooms

Sample Preparation and Hyperspectral measurement Steps

1. Cell propagation: MRC-5 cells are propagated in a 10cm cell culture dish, until there are enough cells for this experiment. In total, we prepare six replicate plates of samples. In each plate, each of the six wells contains 1.5ml growth medium with 1×10^6 MCR-5 cells.
2. Infecting cells with predefined number of infectious virus particles. The viral load is defined as the Multiplicity of Infection (MoI): MoI = Nunmber of virus/Number of cells. The MoI values in each well are shown in Fig. 1.
3. Incubating cell culture dishes for 48h at +33°C.
4. Recording SWIR spectra. To avoid fine condensation on the lid while recording SWIR spectra, the samples have been equilibrated to the room temperature before they were scanned with the hyperspectral system shown in Fig. 2.
5. Observing cell culture cytopathic effect (CPE) through the micro-scope and record the CPE results. The CPE results are shown in Table 1.
   - The CPE result can tell whether cells in a specific well have been infected or not at the time point of observation.
   - Binary: if CPE is observed in the sample, the result is “positive”, meaning cells are infected, otherwise, the result is “negative”, meaning cells are not visibly infected.
   - Early sings: means the observer is not sure about the CPE status, but some early signs of CPE is observed.
   - The CPE is used as the ground truth to guide the data analysis in the next section.

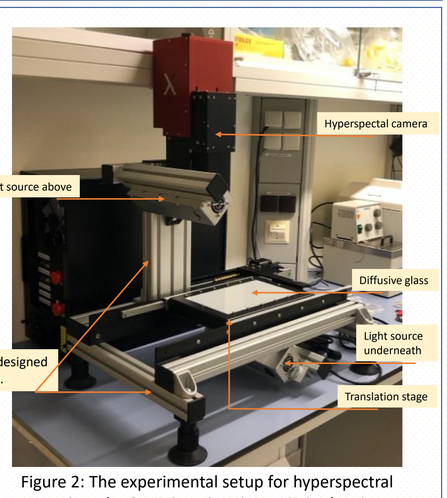


Figure 2: The experimental setup for hyperspectral scanning: the SWIR imaging rig at UiB in the virus laboratory

Table 1: The CPE results in each well of the five plates.

	Well-2	Well-3	Well-4	Well-5	Well-6
Plate-I	negative	negative	positive	positive	positive
Plate-II	negative	negative	positive	positive	positive
Plate-III	negative	negative	positive	positive	positive
Plate-IV	negative	early signs	positive	positive	positive
Plate-V	negative	negative	early signs	positive	positive

Orange samples - calibration samples
Yellow samples - validation samples
Black samples - testing samples

Dataset

- In total five hyperspectral images obtained.
- Fig. 3 shows one of the hyperspectral images in the false-color form.
- One pixel in the false-color image corresponds to a spectral curve as shown in Fig. 4.
  - 288 spectral channels
  - ranging from wavelength 953nm to 2515nm
- In the false-color image, the areas within wells, are the areas of interest.
- Each well sample is further segmented into 25 subsamples.
- Each subsample is represented by the mean spectra of the pixels in that subsample.
- In summary, we have obtained (one plate is excluded for potential technical issues):
  - 5 plates = 30 wells = 750 subsamples, in which, 125 subsamples from well-1’s are for negative control only.

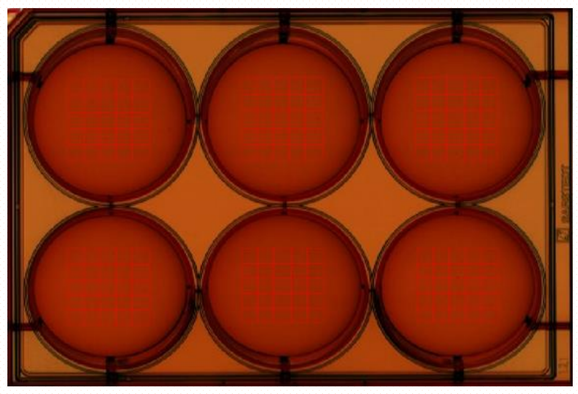


Figure 3: The hyperspectral image in the false-color form and the Partitioning of samples.

Figure 4: The spectra of one pixel

Data Analysis

- Goal: to build a Partial Least Square Discriminant Analysis (PLA-DA) model based on the data we obtained from experiment.
- Ground truth: the CPE results as shown in Table 1. The guide of the learning.
- Training group: randomly selected 2 plates.
  - Calibration group: well-2’s and well-6’s (the orange samples in Table 1). To train the PLS-DA model.
  - Validation group: well-3’s, well-4’s and well-5’s (the yellow samples in Table 1). To validate the PLS-DA model.
  - Spectral range: bands 12 to 277. (excluded the first 11 and last 11 bands to reduce noise)
- Testing group: samples except training samples (the black samples in Table 1). To test the PLS-DA model on samples it has never seen in training.

Analytical Results

- Training the model on calibration samples:
  - Number of components: 5
  - R^2 and Q^2 reached 0.96.
  - The model accounts for more than 95% of the variance in the Calibration samples, indicating a good model.
- Validation:
  - In total 100 subsamples, in which 25% were negative samples and 75% were positive samples.
  - The model classified all the samples into their correct classes. Precision, recall, and F-score of both positive and negative classes were 100%.
- Testing:
  - In total 375 subsamples, in which 40% were negative samples, and 60% were positive samples.
  - The model classified 360 samples correctly, while the rest 15 samples were negative samples being classified wrongly into positive class, resulting in false positive.
  - Precision of the negative class was 100%, while its recall was 90%.
  - Precision of the positive class was 93.8% with a recall of 100%.
  - The F-score for negative and positive classes were 94.7% and 96.8%, respectively
  - The model works well on the samples that it has never seen before, demonstrating its robustness.
- Test on Early signs samples:
  - Well-3 in Plate 5 and Well-4 in Plate 6 are labeled as “Early signs” in the CPE results table (Table 1).
  - “Early signs” means human eyes cannot tell for sure if it is CPE positive or negative in these samples.
  - We test the model on these samples to see how the model would tell about the infection status of these samples.
  - Model prediction:
    - Well-3 in Plate 5: CPE negative
    - Well-4 in Plate 6: CPE positive
  - Fact:
    - Well-3 in Plate 5: lower MoI.
    - Well-4 in Plate 6: relatively higher MoI.
    - all well-3’s in other plates: CPE negative, as shown in Table 1.
    - all well-4’s in other plates: CPE positive, as shown in Table 1.
  - Analysis:
    - The CPE results that were predicted by the model on the uncertain samples were consistent with the other plates where CPE results were certain in well-3 and well-5’s.
    - This shows that our model on the one hand can capture changes that human eyes cannot tell. Indeed, CPE is observed by human eyes, subtle changes that cause the change of the spectra may be easily neglected by human eyes, but our model is sensitive enough to detect the spectral changes and capture the subtle changes missed by human eyes.
    - On the other hand, the model is robust to noise. When there were signs that human eyes may consider as CPE, the model was able to tell the truth from noise.
    - This reveals the potential of the technology of applying hyperspectral imaging in detecting potential infection.
- The above results are from the model that was trained on the randomly selected plates IV and V. Indeed, the random selection process for training plates has been iterated, and similarly good performance were obtained by models that were built on other selections of calibration sets.

Conclusions

- This paper explored the possibility of applying hyperspectral imaging in detecting infectious virus in specious environment. Virus was added into cell culture for 48-hour incubation, after which, the infection status was recorded by a hyperspectral camera and stored in the form of hyperspectral images. A well-trained PLS-DA based analytical model can predict the infectiousness of the virus, hence tell if the environment is infection-risky or not. Compared to PCR test and antigen test, where positive result do not necessarily mean virus being infectious, our method is based on measuring live cells being infected by virus, thus the infectiousness of virus can be directly predicted. We believe this method opens a new avenue to infection detection and can be potentially applied in COVID19 detection in the indoor environment.

References

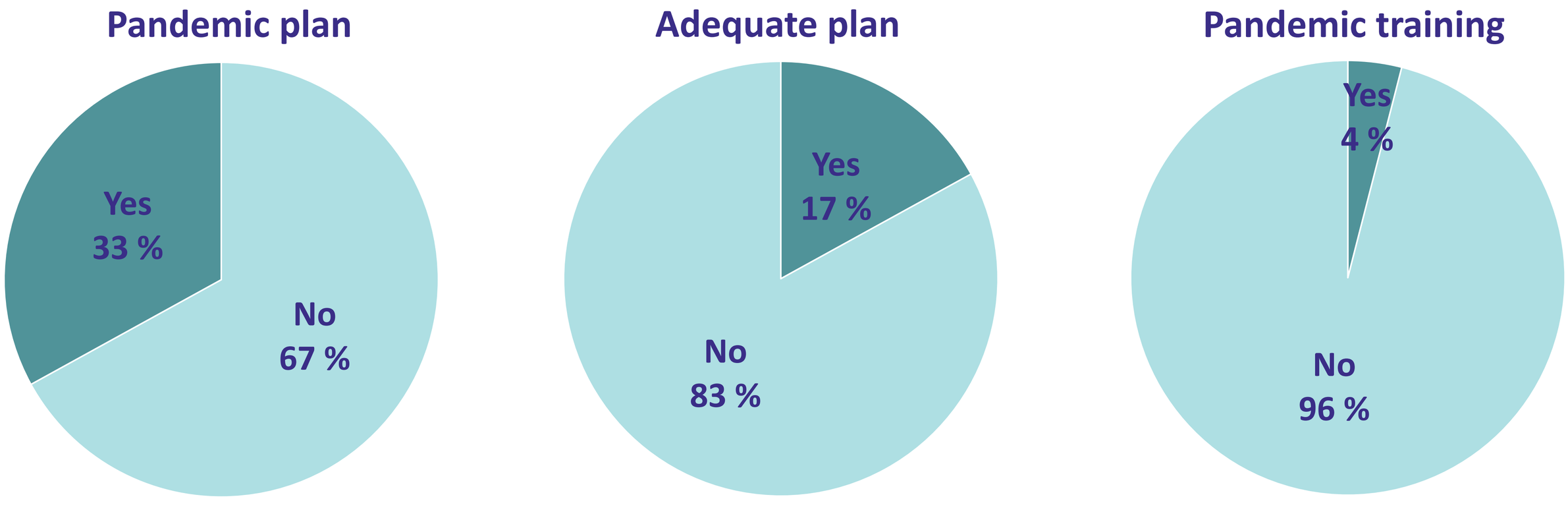
1. N. van Doremalen et al., “Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1,” the New England Journal of Medicine, March 2020.
2. Y. Lia, J. Wanga, Z. Huanga and X. Zhou, “Mapping Air Contaminant Concentrations Using Remote Sensing FTIR,” Journal of Environmental Science and Health 38, 2003.
3. M. Segal-Rosenheimer, Y. Dubowski, C. Jahn, K. Schäfer, G. Gerl and R. Linker, “Feasibility study of detection of hazardous airborne pollutants using passive open-path FTIR,” Advanced Environmental, Chemical, and Biological Sensing Technologies VII. Proceedings of the SPIE, Vol. 7673, 2010.
4. S. Roy, D. Perez-Guaita, S. Bowden, P. Heraud and B.R. Wood, “Spectroscopy goes Viral: Diagnosis of hepatitis B and C virus infection from human sera using ATR-FTIR spectroscopy,” Clinical Spectroscopy (2020).

Emergency primary care centres not prepared for the COVID-19 pandemic

NORCE
National Centre for Emergency Primary Health Care

Jonas Nordvik Dale
National Centre for Emergency Primary Health Care, NORCE, Norway

Fig.1 Pandemic plans in place at the emergency primary care (EPC) centers prior to the COVID-19 pandemic



Background

The emergency primary care (EPC) services are in the frontline of any pandemic

Knowledge about the EPC services' management of the COVID-19 outbreak can be used to:

i. Prepare for future outbreaks
ii. Improve patient management

The aims of the study were to identify:

i. Pandemic preparedness in EPC centres
ii. Management strategies in EPC centres during the COVID-19 outbreak

Method

Questions included in the data collection for the National Out-Of-Hours Services Registry

Topics:

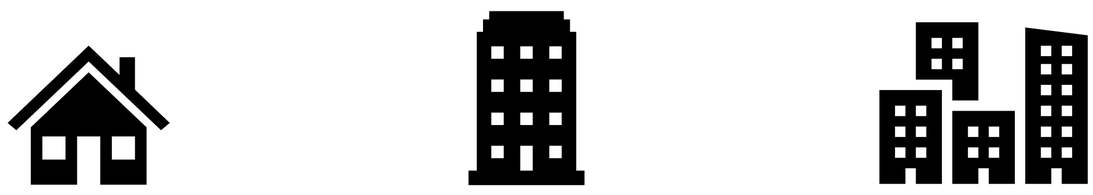
i. Pre-pandemic preparedness
ii. Access to personal protective equipment
iii. Organizational measures taken
iv. How staffing was organized during the onset of the pandemic

Results

100% respons rate, all 169 EPC centres in Norway covered

i. One of three EPC centres had pandemic plans (fig. 1)
ii. Nine of ten EPC centres had insufficient access to personal protective equipment
iii. Three of four EPC centres created airways clinics (fig. 2)
iv. Half of the EPC centres hired health care professionals from other disiplines

Fig.2 Creation and staffing of airway clinics by number of inhabitants covered by the EPC



	< 10.000	10.000 -100.000	> 100.000
Airway clinics created by the EPC	62%	85%	91%
Airway clinics staffed by non-EPC personnel	41%	66%	91%

Conclusion

The EPC services in Norway

- **lacked well-tested plans**
- **had insufficient supplies of personal protective equipment**

Most services adapted to the pandemic by

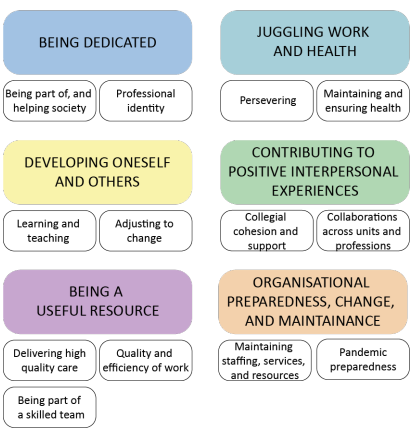
- **altering the ways they worked**
- **hiring health care professionals from other disciplines**

J. N. Dale[1], T. Morken[1], K. E. Eliassen[2], J. Blinkenberg[1], G. Rørtveit[2,3], S. Hunskaar[1,2], I. K. Rebnord[1,2], V. Baste[1]. Preparedness and management during the first phase of the COVID-19 outbreak - a survey among emergency primary care services in Norway. BMC Health Serv Res. 2022

[1]National Centre for Emergency Primary Health Care, NORCE Norwegian Research Centre, Bergen, Norway
[2]Department of Global Public Health and Primary Care, University of Bergen
[3] Research Unit for General Practice, NORCE Norwegian Research Centre, Bergen, Norway

NORCE Norwegian Research Centre AS
www.norceresearch.no

A healthy work environment buffers the adverse impact of working through crises



Stress responses and work environment in health personnel during the Covid-19 pandemic

Bondjers, K.[1], Stensland, SØ.[1,2], Lingaas, I.[1], Zwart, JA.[7,8], Rosseland, LA.[8], Atar, D.[6,8], Matre, D.[9], Wentzel-Larsen, T.[1], Wøien, H.[3,4], Dyb, G.[1,8]

Intro

Health personnel (HP) are a vital resource in crises response.

Yet, there is a lack of knowledge on how to increase organizational resilience, individual motivation, and efficiently safeguard the health and work environment of health personnel responding to long-term crises, such as the pandemic.

Methods

The study followed a in-vivo design, where N=2501 health personnel from four Norwegian hospitals (Oslo University Hospital, Akershus University Hospital, St. Olavs Hospital and The Arctic University Hospital of North Norway) participated in online surveys conducted at each of the four major waves of the covid-19 pandemic (April 2020 – January 2022). Health worker's work assignments, exposure, environment and health was studied across the four waves.

Results

At all four timepoints, a considerable portion of participants reported high levels of health problems (16-20% somatic symptoms (muscular, headaches and dizziness), 20% anxiety or depression, 12-17% burnout, 8 % PTSD). First wave infection of Covid-19 and having a close colleague, friend or family experience severe Covid-19 illness was associated with increased risk for mental health problems.

The study identified eight main work environment factors associated with better health (figure 1).

Working with severely ill covid-19 infected patients, at intensive and intermediary care units, was associated with more frequent experience of unfavourable working conditions.

In a qualitative study, participants described aspects of their day-to-day work in which they took pride. Six areas were identified (figure 2).

Conclusions

The Covid 19 pandemic has posed a heavy burden on health personnel, with prolonged pressing need for individual and organizational adjustment, adaption and learning. Organizational measures ensuring systematic building of individual and team competency, predictability of teams and tasks, safety and need-based support may pose key measures to build motivation, resiliency and sustainability and buffer the adverse effects of crises in the work force.

NORWEGIAN CENTRE FOR VIOLENCE AND TRAUMATIC STRESS STUDIES

Corresponding author: Dr Kristina Bondjers, kristina.bondjers@nkvts.no
Affiliations: [1]Norwegian centre for violence and traumatic stress studies, Disaster and migration, Oslo, Norway [2]Oslo University hospital, Research and Communication Unit for Musculoskeletal Health (FORMI), Oslo, Norway [3]Oslo university hospital, Division of emergencies and intensive care, Oslo, Norway [4]University of Oslo, Institute of Health and Society, Faculty of Medicine, Oslo, Norway [5]Norwegian Institute of Public Health, Reviews and health technology assessment, Oslo, Norway [6]Oslo University hospital, Dept. of Cardiology, Oslo, Norway [7]Oslo University Hospital, Division of Clinical Neuroscience, Oslo, Norway [8]University of Oslo, Institute of Clinical Medicine, Faculty of Medicine, Oslo, Norway, [9]STAMI - The National Institute of Occupational Health in Norway

Experiences and management strategies of **Norwegian GPs** during the **COVID-19** pandemic

PRESENTER:

Silje Rebekka Heltveit-Olsen, MD

s.r.heltveit-olsen@medisin.uio.no

BACKGROUND

General practitioners (GPs) are key health care providers in the municipalities. Our aim was to explore the experiences and management strategies of Norwegian GPs during the COVID-19 pandemic - over time, and in the context of a sudden organizational change.

METHODS

- Longitudinal interview study
- Two Zoom interviews, 2-4 months apart.
- 8 GPs, 5 re-interviewed, 13 interviews
- Geography, municipality size, COVID-19 spread.

RESULTS

- The fear of a pandemic required GPs to **balance several concerns**, such as continuity of care and their own professional efforts.
- Several GPs experienced **challenges in the collaboration with the municipality** and in relation to defining their own professional position.
- Guided by their medical association and collegial support, they found viable solutions and ended up with a feeling of having **adapted to a new normal**.

"We get the impression that there are many in the municipality who think that we are, in a way, demanding, a fly in the ointment, for wanting to get paid to do a job." (GP04)

"The biggest challenge is really to make sure that people are not infected when they are in the doctor's office or, the balancing act between being hysterical and being pragmatic." (GP02)

"We are getting used to living in a different situation. As long as we have some ideas about how to do things when it changes, that we have a plan to back us up. Then we cope really well with a little unpredictability." (GP04)

SCAN ME

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IMPLICATIONS

- Although our study demonstrates that the GPs adapted to the changing conditions, the current **municipal health care models are not ideal**.
- There is a need for **clarification of responsibilities** between GPs and the municipality to facilitate a more coordinated future pandemic response.

PARTICIPANTS

Participant characteristics (total n= 8)	Sex	Age (years)	Experience	Number of patients on GP list	Number of GPs in the office	Details
Interview 1 (n=8)	4 female, 4 male	31-56 (median 44)	≤ 5 years (n=1) 6-20 years (n=6) ≥ 21 years (n=1)	602-1400 (median 1000)	3-8 (median 6)	8 GPs 5 work in out-of-hours clinic* 5 work in COVID clinic* 6 work in municipal position*
Interview 2 (n=5)	2 female, 3 male	31-56 (median 44)	≤ 5 years (n=1) 6-20 years (n=3) ≥21 years (n=1)	950-1400 (median 1050)	3-8 (median 6)	5 general practitioners 3 work in out-of-hours clinic* 3 work in COVID clinic* 4 work in municipal position*

Research team:

Silje Rebekka Heltveit-Olsen, MD
Lene Lunde, RN
Anja Brænd, PhD
Ivan Spehar, PhD
Sigurd Høye, PhD
Ingmarie Skoglund, PhD
Pär-Daniel Sundvall, PhD
Prof. Jørund Straand
Guro H. Fossum, PhD
Prof. Mette Bech Risør

The Research Council of Norway

UNIVERSITY OF BERGEN Faculty of Medicine

UiT The Arctic University of Norway

UNIVERSITY OF GOTHENBURG

UiO : Avdeling for Allmennmedisin
Institutt for Helse og Samfunn, Universitet i Oslo

Vi må finne ut hva som virker – også under en pandemi

Når vi innfører smitteverntiltak under en pandemi, trenger vi kunnskap om effektene av tiltakene, slik at fordelene og ulempene kan veies mot hverandre.

Våren 2020 var alle treningssentre i Norge stengt på grunn av pandemien. Da sentrene ble stengt, fantes det ingen kunnskap om risikoen for å bli smittet av koronavirus på treningssenter.

Hva gjorde vi?

I TRAiN-studien ville vi finne ut om det var større risiko for å bli smittet dersom man trente på treningssenter enn om man ikke gjorde det.

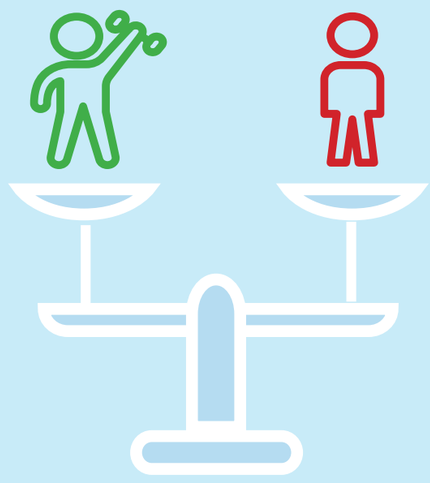
Studien ble utført av forskergruppen Klinisk effekt-forskning ved Universitetet i Oslo og Oslo universitetssyke-hus. Fem treningssentre i Oslo, fordelt på kjedene SATS, STOLT og Evo, deltok i studien.

3764 personer mellom 18 og 64 år uten underliggende sykdommer deltok i studien. 1896 deltakere ble trukket ut til å få tilgang til treningssenter i perioden 25. mai til 15. juni 2020, og 1868 deltakere fikk ikke trene på senter. Det ble iverksatt spesifikke hygienetiltak og avstandskrav på sentrene.

Alle deltakere skulle ta en koronatest hjemme 14 dager etter studiestart.

Hva fant vi ut?

Etter 14 dager var det ingen økt risiko for smitte med koronavirus hos de som fikk trene på treningssenter, sammenliknet med de som ikke fikk trene på senter. Det var ingen koronarelaterte sykehusinnleggelser i noen av gruppene etter 21 dager.



Resultatene viste:

Ingen økt risiko

Hvorfor er det viktig?

Denne studien er et eksempel på at det er mulig å gjøre randomiserte, kontrollerte utprøvinger av smitteverntiltak under en pandemi.

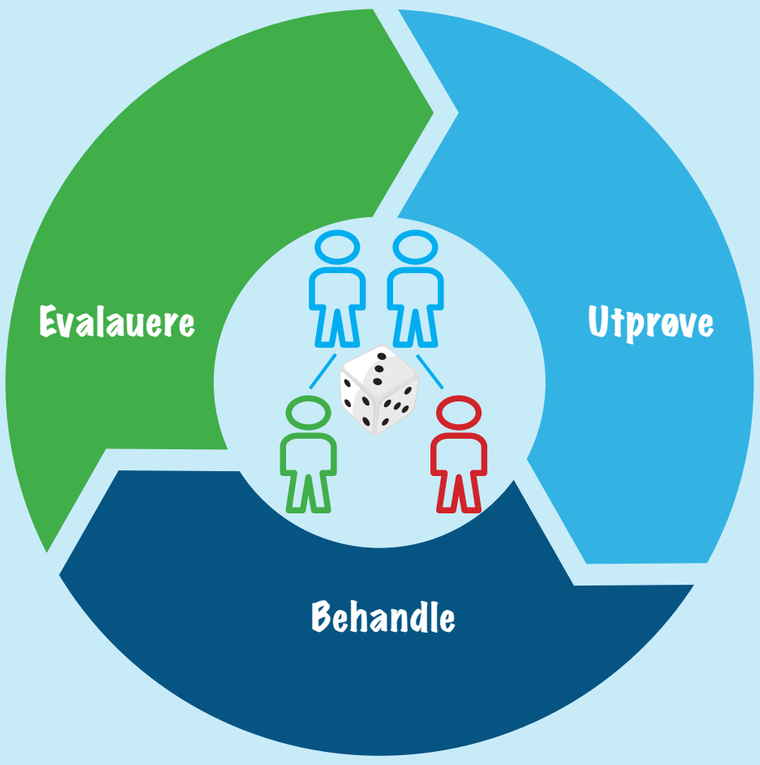
Hvis vi kontinuerlig tester ut og evaluerer effekten av ulike smitteverntiltak i et lærende helsesystem*, kan vi til enhver tid vite om fordelene veier opp for ulempene.

* Horwitz L I, Kuznetsova M, Jones S A. Creating a Learning Health System through Rapid-Cycle, Randomized Testing. N Engl J Med 2019; 381:1175-1179.

Vi trenger evidens før tiltak – alltid

Under koronapandemien ble det innført en rekke tiltak uten at vi undersøkte effekten av dem.

Når vi innfører tiltak overfor befolkningen, er det viktig at det gjøres basert på et solid evidensgrunnlag. Dette er vanlig innen forskning på legemidler og andre tiltak i helsetjenesten.



Vi trenger randomiserte studier, også på folkehelsetiltak.
Vi må vite hva som virker.

"Covid-19 transmission in fitness centers in Norway – a randomized trial", BMC Public Health, 2021. Forfattere: Lise M. Helsingen, Magnus Løberg, Erle Refsum et al.

UNIVERSITETET I OSLO

Oslo universitetssykehus

Drivers of public responses toward Coronavirus outbreak and implications of social dynamics (COSD)

Key researchers: Chunyan Xie (Norway) , Ove Oklevik (Norway), Richard P. Bagozzi (USA), Silvia Mari (Italy), Zhi Yang (China), Helene Maristuen (Norway)

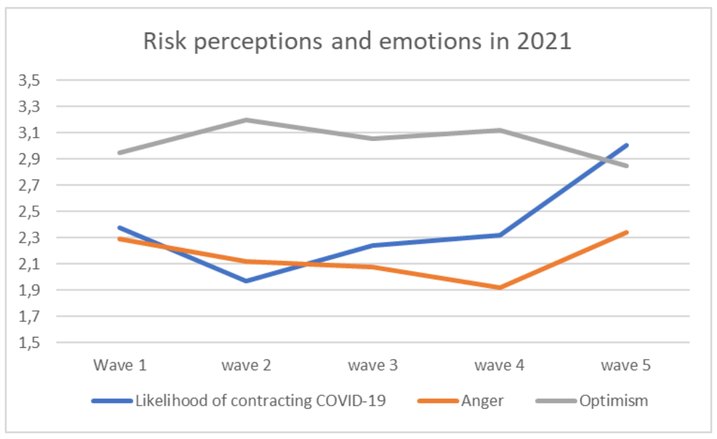
Background

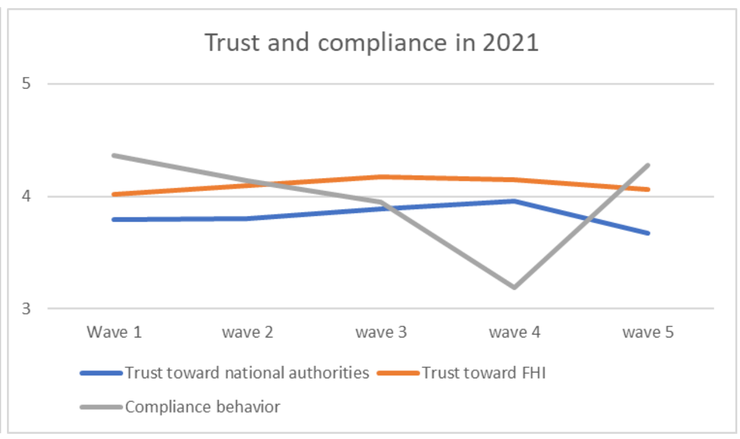
The background of this project is the global outbreak of COVID-19 in early 2020. Norway, China, Italy, and US are four countries that were at different stages of the pandemic at that time. The pandemic originated in China and then spread globally. The situation in Italy was the worst in Europe at that time. USA was seriously affected by the pandemic, and it is also one of the most important bases for vaccine research and development.

Given the long-term and widespread nature of the pandemic, there is a great need to carry out systematic studies on this pandemic, including longitudinal studies and cross-cultural experiments, which is rare in previous research on SARS and Ebola epidemics. This project includes two work packages (WP).

	Objectives	Results achieved	R&D tasks
WP1	To investigate how public responses toward the pandemic change over time in Norway.	Pre-studies provided tacit knowledge to integrate in a longitudinal survey. Main study provided insight on how public responses toward the pandemic changed overtime in Norway.	**Pre-studies** (1) Categorized countermeasures taken by the authorities in the period of Feb.-Aug. 2020. (2) Content-analyzed of media reports from a major national newspaper (Aftenposten) between March and Dec. 2020. (3) 18 interviews with representatives from authorities, business, and private persons in a local region of Western Norway (Fall 2020). **Main study** A multiple-wave (longitudinal) survey was conducted at multiple points of time in 2021.
WP2	To investigate public responses toward countermeasures taken by authorities, business, and individuals across cultures.	Pre-studies provided validated questionnaires for the main study. Main study generated insights on: - how and when the public reacted to countermeasures, - whether and how the public reacted differently across cultures.	**Pre-studies** (1) Tested questionnaires in Norway in winter 2020. (2) Further validated questionnaires in US in winter 2021. **Main study** Field-experiments were conducted in 5 countries (Norway, Italy, China, USA, and Kenya) with national representative samples in 2022.

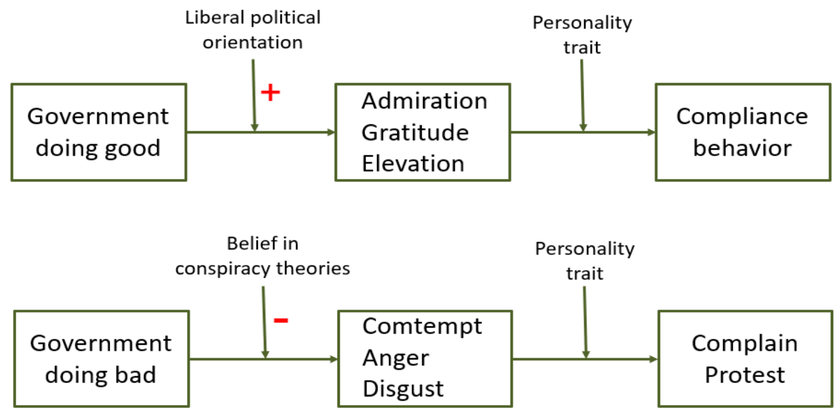
Results: The main study in WP1, a multiple-wave survey, provides insight on how people's responses toward the pandemic has changed over time in Norway. For instance, how their risk perception, emotional reactions such as anger and optimism, trust towards government agencies, and compliance behavior changed at different stages of the pandemic. Such a multiple-wave survey design is superior to traditional survey, as it allows us to track people's reactions over time and to investigate possible causal relationships among different variables.





Results: In the main study of WP2 (cross-cultural experiments), we compared people's responses towards government-, business-, and individuals' actions during a pandemic across different cultural contexts. We also examined people's propensity to take new vaccines.

Responses of the public towards the government actions in times of crisis (Norway)



Publication objectives have been achieved by submitting four scientific articles to highly ranked international journals: one has been published in British Journal of Social Psychology and three are under review.

Disseminations of research results to different stakeholders through multiple channels: through publishing two newspaper chronicles in regional press (Haugesunds Avis and Firda) and one blog post in Blog-TourNord, through social media platforms: a Facebook page (COSD-prosjektet) and a project web page organized by HVL, and through workshop for practitioners from the travel and tourism sector, and guest lectures to national and international university audience.

Impact and implications

- Our research findings add to knowledge advancement in the fields of health psychology and social psychology and developing new knowledge related to preparedness for future pandemics.
- We have carried out a systematic investigation on public responses toward the pandemic and countermeasures taken by applying a longitudinal survey approach and cross-cultural experimental investigation. Such research methods have not been applied in previous epidemic research.
- Our research results help policymakers to understand and predict public reactions toward their policies during a pandemic. It has also important implications for industries that have been heavily impacted by the pandemic like the travel and tourism industry.
- Our cross-cultural comparison of public reactions during a pandemic situation provides valuable insights that advise broad cooperation of the global society during future pandemics.

Western Norway University of Applied Sciences

THE UNIVERSITY OF MICHIGAN 1817

HUNAN UNIVERSITY

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

Forskningsrådet

UNIVERSITETET I OSLO

THE SMARTPHONE PANDEMIC

Antoine de Bengy Puyvallée & Katerini T. Storeng

About the project

AIM To study the political and societal implications of the use of smartphone technologies and big data in public health authorities' responses to the Covid-19 pandemic

METHODS Document review and qualitative case studies conducted between 2020 and 2022 in Sierra Leone, Myanmar, Japan, Taiwan, the United Kingdom, and Norway

TEAM Anthropologists, international relations scholars, and political philosophers from 7 countries

Digital contact tracing

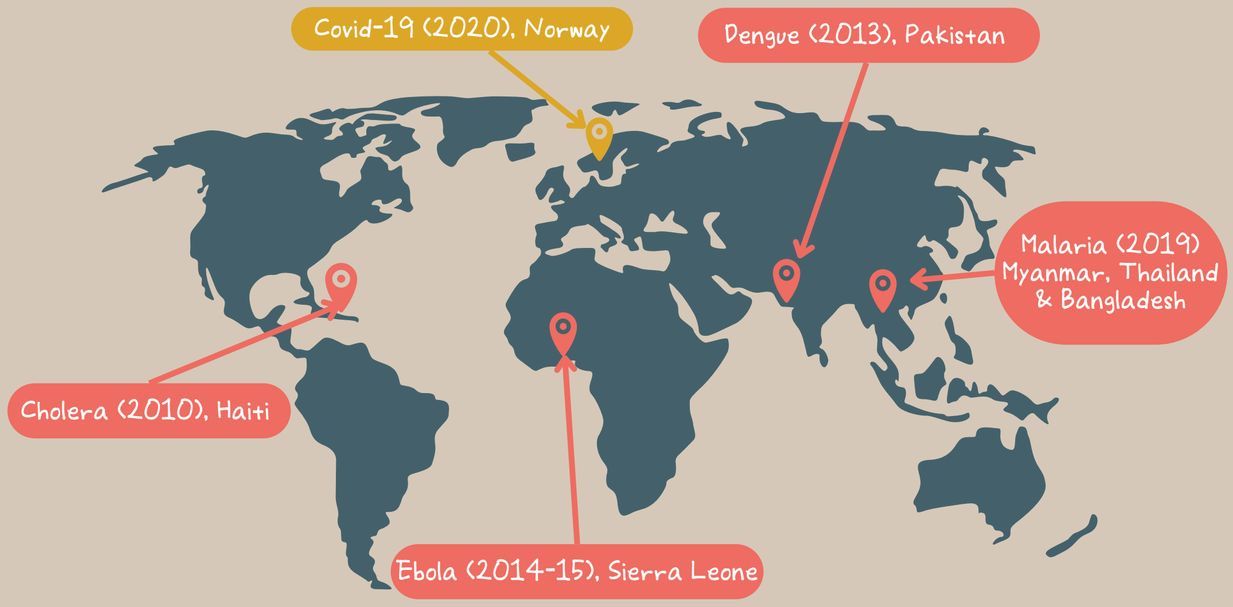
- Experimental solution developed at the start of the Covid-19 pandemic based on theoretical evidence of effectiveness from mathematical models
- Heated debate around privacy and digital surveillance issues
- Joint Google-Apple exposure notification system developed using Bluetooth and decentralized storage integrated in government apps, with T&C dictated by the companies
- Effectiveness evaluations rarely integrated and limited evidence about its public health value as a complement to 'manual' contact tracing or its value for users - privacy safeguards prevent scrutiny of data

Download the app to "get back our everyday life and freedom"

Erna Solberg, 16 April 2020

Smartphone mobility data

- Since 2010, telecom and tech companies have partnered with scientists to model the spread of diseases by using aggregated location data generated by mobile phones operators and apps
- Initially part 'Big Data for Social Good' Corporate Social Responsibility schemes in low-income countries facing epidemics
- Adopted in the first days of the Covid-19 pandemic in Norway and other rich countries and became an important tool for policy makers to have projections about the spread of the virus and measure the effectiveness of mobility restrictions



Modelling disease spread with big data - an historic overview

Take-aways about smartphone-based technologies in the pandemic response

#1 Experimentation

Adopted by public health authorities based on experimentation and limited theoretical evidence

Need for rigorous evaluation of effectiveness and discussion of political consequences

#2 Partnerships

Ushered in new forms of partnerships between 'Big Tech' and telecoms corporations and public health authorities

Need for transparency and regulation

#3 Market interests

Mobility data monitized, e.g. for traffic control, public security and epidemic forecasting

Solidified the market dominance of Big Tech companies and normalized their role in the highly profitable health market

Need for scrutiny of private-sector incursion in healthcare and health data markets

Key references

"The Smartphone Pandemic: How Big Tech and public health authorities partner in the digital response to Covid-19" *Global Public Health*, 2021

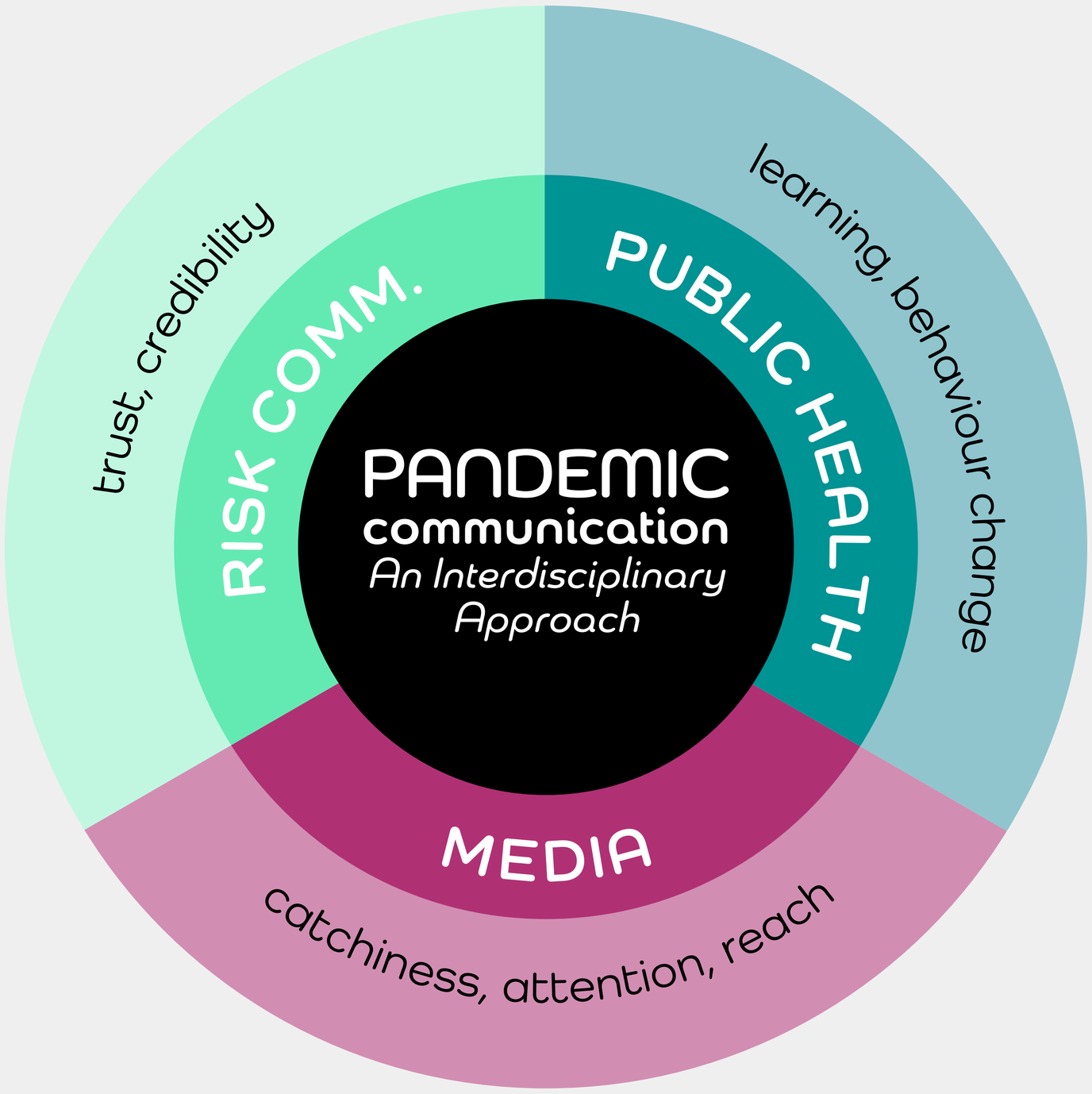
"'The Big Digital Contact Tracing Experiment" *Global Policy*, 2021

Global Health 2.0? Digital technologies, disruption, and power, *Global Health Watch 6*, 2022

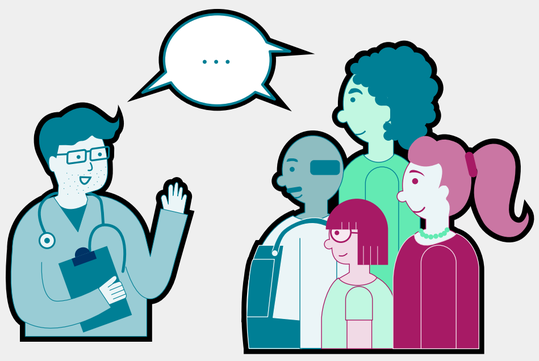
Digital Technology and the Political Determinants of Health Inequities, *Global Policy* Special Issue, 2021

COVCOM

Fighting a Pandemic Through Translating Science

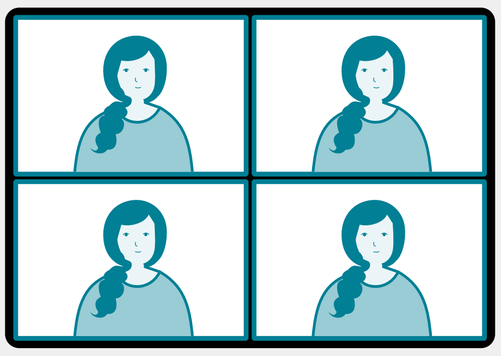


Results & Take Home Messages for Future Public Health Crises:



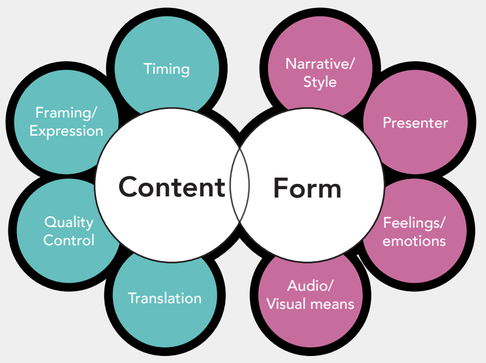
1. Dialogue is Key

Interviews with experts identified 36 (!) topics deemed important to communicate. Interviews with the public found that they wanted other information than the experts focused on.



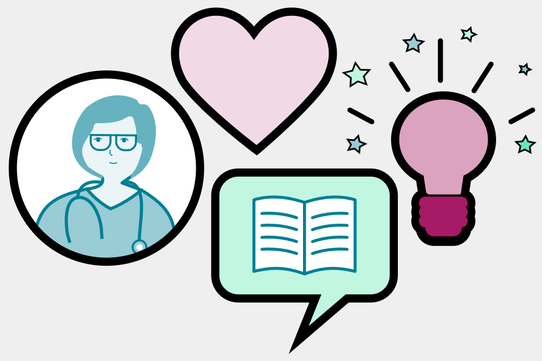
2. Getting people to choose information

Authorities' pandemic videos lack in creativity – accompanied by a limited public reach.



3. Content vs Form

While health experts focus on what to say, professional communicators focus on how to say it. Both are important to ensure broad outreach of quality information.



4. 'TENK'

Characteristics of effective communication: Trust + Emotions + Narratives + Creativity (TENK). Quality information from a trusted source is not sufficient in itself.

ABOUT THE PROJECT

The primary objective of the study is to use video to develop effective, evidence-based modes of communication for translating complex, but important health messages about pandemics to both the general population and decision-makers. The study uses COVID-19 as a case to learn and prepare society for also handling the next pandemic. COVCOM is funded and supported by:

TROND MOHN FOUNDATION

Universitetet i Stavanger

SHARE Centre for Resilience in Healthcare
University of Stavanger

MENTAL MODELS

The project combines qualitative, creative and quantitative methods (RCTs), using a mental models approach to science communication:

1. Identify what people need to know.
2. Identify what they already know, and how they make decisions.
3. Create the communication.
4. Test its effectiveness.

SCAN ME!

covcom.org

Research Team: Jo Røislien, Siri Wiig, Kolbjørn Kallesten Brønnick, Ionica Smeets, Henriette Thune, Jane O'Hara, Siv Hilde Berg, Marie Therese Shortt, Daniel Adrian Lungu

Contact: jo.roislien@uis.no

Fighting the COVID-19 pandemic with enhanced risk communication: Messages, compliance and vulnerability during the COVID-19 outbreak

Arora, S; Scharffscher, K.S. et. al. (2022)

INTRODUCTION

The pandemic went from being a health crisis to becoming a societal crisis.

In the first phase of the pandemic, much of the risk communication was about conveying different degrees of uncertainty and unpredictability.

While the five study countries appeared different at the outset of the pandemic, they grew surprisingly similar in how they handled the pandemic.

OBJECTIVES

Uncover the correlation between risk communication and social vulnerability during the COVID-19 outbreak through a comparative study of Norway, Sweden, Switzerland, Germany and the United Kingdom.

Translate this knowledge into internationally aligned, evidence-based, and culturally sensitive risk communication strategies.

METHODS

Survey with a representative sample of the population in five study countries (a total of 4,206 respondents)

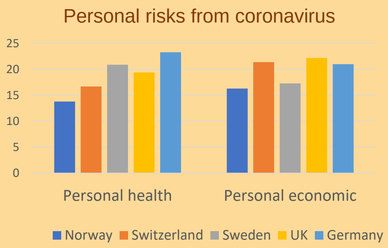
Mapping of national pandemic risk communication and Interviews with authority representatives s in each of the countries.

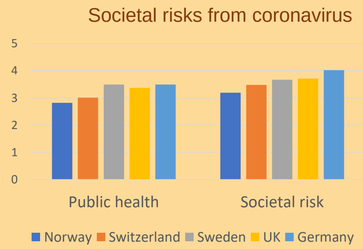
Focus group interviews in Norway & Sweden

KEY FINDINGS

Risk communication in all five countries had a short-term focus primarily on health-related risks. There was a significant lack of attention to the diversity of the population in terms of pre-pandemic vulnerabilities. An exception was the UK, where authorities quickly applied varied types of messaging to reach different parts of the population

People were worried about much more than getting sick. They had a need to understand how the COVID-19 pandemic created risks not only linked to health but also to economic, social and societal aspects of their life





There were significant variations across the five study countries in terms of perceived personal health risks, as well as economic and social risks. Comparatively, German people reported the highest level or risk perception whereas Norwegian people reported the lowest level of risk perception

In all five countries, women had a significantly higher risk perception, as did persons with pre-existing illnesses and/or psycho-social challenges

We found clear links between risk perception and protective behaviour, although with national variations. In Germany, the less worried people were about the economy (both personal and societal), the more likely they were to take protective behaviour, whereas no impact of this kind was found in the United Kingdom.

RECOMMENDATIONS

In risk communication during a crisis, attention must be given to existing vulnerabilities in the population beyond those directly affected by the crisis at hand (meaning health during a pandemic)

Authorities should also be **careful about introducing guidelines that 'break up' or change social routines** and social patterns. These have an important inherent value that must be recognized - not least in a crisis

What is 'rational' and 'irrational' in a crisis? **Emotion-based reactions are not necessarily irrational**

Social factors may influence people's ability to comply more than the understanding of the risk. Two-way communication is therefore important from the start of the crisis

Uncertainty and unpredictability are trademarks of a societal crisis: Relate to it consciously and communicate it to the public (because it forms part of key decision-making processes)

Be vocal on issues upholding **hope** and a way out of the crisis (economic, social, societal).

Personal health risks (3 items, α = 0.88)
Percentage chance: get COVID, hospitalised due to COVID, die from COVID
Public health risks (3 items, α = 0.82)
Risk more people fall ill, or die, than elsewhere; health services overstretched
Personal economic risks (3 items, α = 0.81)
Percentage chance: worse financial situation; you, or family, lose job
Societal risks (economic and social) (6 items, α = 0.80)
Risk of: deep econ. crisis, national debt increase, hard on small businesses, loss of trust in public authorities, lack of community/solidarity, children missing school

SCAN ME

Cellular immune responses against SARS-CoV-2

Hassen Kared[1,2], Amin Alirezaylavasani[1,2], Siri Mjaaland[3] and Ludvig Munthe[1,2]

[1]KG Jebsen Centre for B cell malignancy, Institute of Clinical medicine, University of Oslo. [2]Department of Immunology, Oslo University Hospital, Oslo, Norway

[3]Division of Infection Control, Norwegian Institute of Public Health, Oslo

Highlights - The RCN research grant allowed us:

- to start COVID-19 work when no other funds were available – and functioned as vital **seed funds**
- to establish regional and National networks and
- to secure the first Norwegian grant from the international coalition for preparedness against pandemics and for vaccine development, CEPI (The **Coalition for Epidemic Preparedness Innovations**). The CEPI grant was 3.1M USD and allowed us to establish research on **vaccine** efficacy and safety, with focus on i**mmunosuppressed** patient groups with highest risk of severe disease and mortality from COVID-19
- to recruit an international scientist (Hassen Kared) that has been first-author on 3 of the papers and on several papers that are accepted or to be submitted.
- To find **KEY RESULTS** - to define vaccine safety, severe adverse effects, mortality, breakthrough infections and COVID-19 in healthy and in immunosuppressed patients (Lancet Rheumatol, Am J Transplant, Arthritis Rheumatol, J Neurol Neurosurg Psychiatry, Nature Communications and several submitted)
- to define that 2 vaccine doses were not sufficient for immunosuppressed patients. 4 vaccine doses were not sufficient for many immunosuppressed, transplanted (5th doses are now being administered.)
- to define the mechanism of **severe adverse effects** towards the ChAdOx AstraZeneca Vaccine that caused the life threatening VITT syndrome (vaccine induced thrombosis and thrombocytopenia), N Engl J Med, Eur Heart J.
- to deliver a **knowledge base** that aided management of the pandemic for the Norwegian Corona Vaccination Program at NIPH, the Norwegian Medicines Agency and the Department of Health.
- to provide a series of articles have been published in the best journals and several that are in submission.

Defining immunity towards SASRS-CoV-2

A number of cells are necessary for the defence against SAR-CoV-2, **Figure 1**. We measured immune responses in infected patients (from mild to severe COVID-19) and in vaccinated patients.

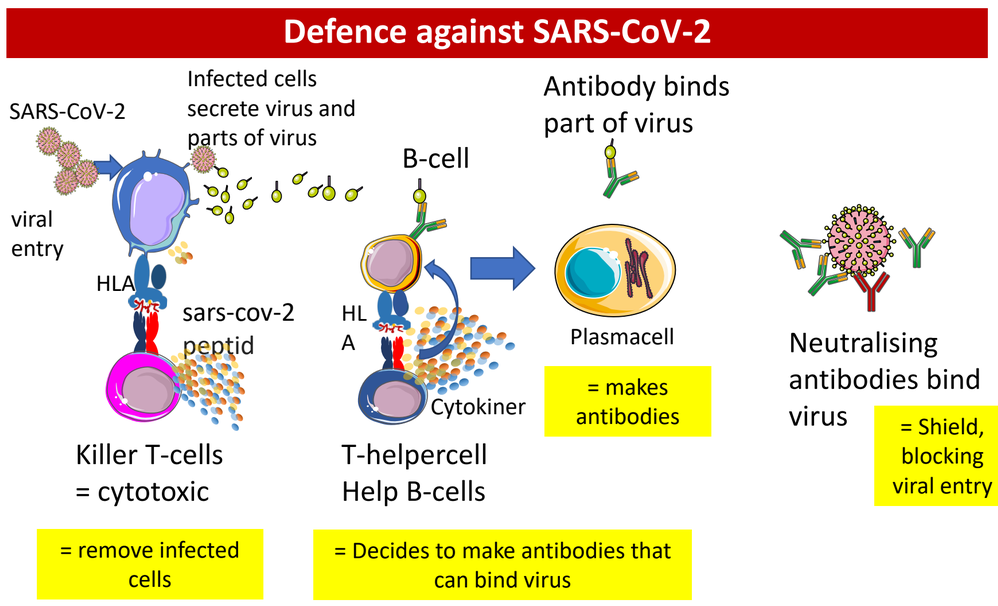


Figure 1. Components of the immune response to SARS-CoV-2

Defining adverse effects after vaccination

We classified patients in terms of adverse effects of vaccines and found a good safety profile in immunosuppressed patients for 2nd, 3rd and-4th vaccinations with mRNA vaccines (Lancet Rheumatol, Am J Transplant, Arthritis Rheumatol, J Neurol Neurosurg Psychiatry, and submitted).

After finding that AstraZeneca vaccine had lethal adverse effects (N Eng J Med) where some patients developed massive thromboses in large veins, including in the brain and consumptive thrombocytopenia. We defined the pathogenetic mechanisms, **Figure 2** and Eur Heart J.

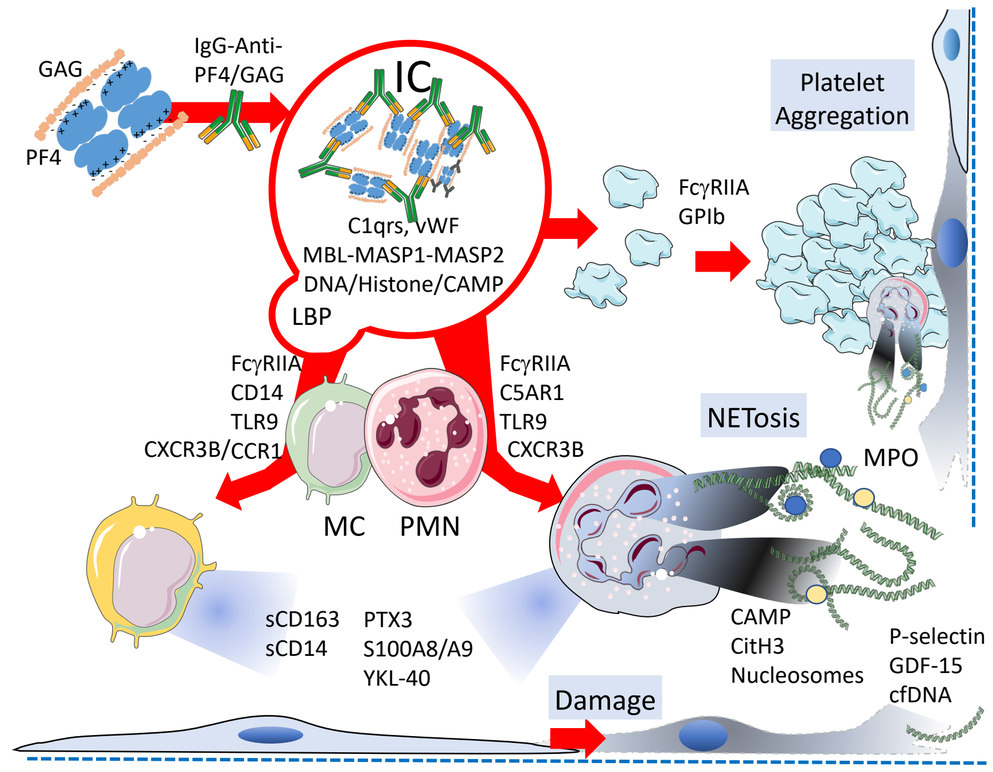


Figure 2. The disastrous cascade that causes AstraZeneca vaccine induced thrombosis and thrombocytopenia, Eur Heart J 2021.

SARS-CoV-2: Biobanking blood immune cells and clinical cohorts

Figure 3. Katrine Persgård Lund and Amin Alirezaylavasani prepare blood and freeze cells at the Dept of Immunology

At OUS, we have biobanked living cells in liquid nitrogen from >3500 patients and from >2500 longitudinally (3-5 time points, **Figure 3**. We have collected cells from many departments and from 4 main hospitals (OUS, Ahus, Diakonhjemmet, Kalnes) as well as other partner hospitals. This is already one of the largest biobanks for viable immune cells in Norway.

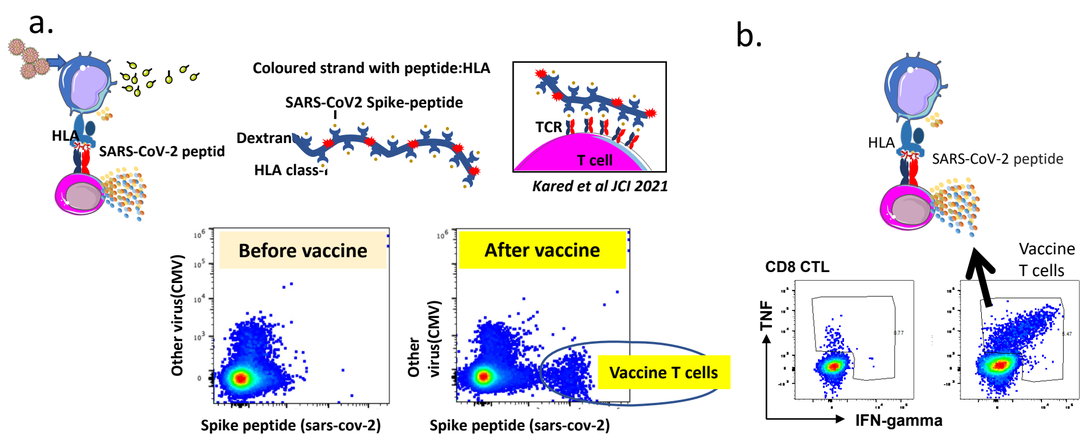


Figure 3. a. Identifying SARS-CoV-2 specific T cells. B. Measuring activation of T cells in response to viral peptides

Measuring immune responses towards SARS-CoV-2

We have developed world leading technologies to identify specific T and B cell responses in patient samples towards SARS-CoV-2 and control virus, specificity and function **Figure 4** as well as deep immune profiling/phenotyping. This has allowed us to describe immune responses elicited by vaccination as well as immune responses that occur in COVID-19 patients and after recovery, in convalescents. We identify immune responses to the wild type SARS-CoV-2 as well as variants of concern (Omicron), Nature Communications and submitted.

Conclusions

Developed technologies for in-depth study of immunity to SARS-CoV-2. Results triggered change the vaccination program in Norway for the benefit of the patients with the highest risk of severe disease and death. The mortality has been reduced by a factor of 5-10 in the highest risk groups. The pandemic is far from over for patients with highest risk - continued followup is mandatory.

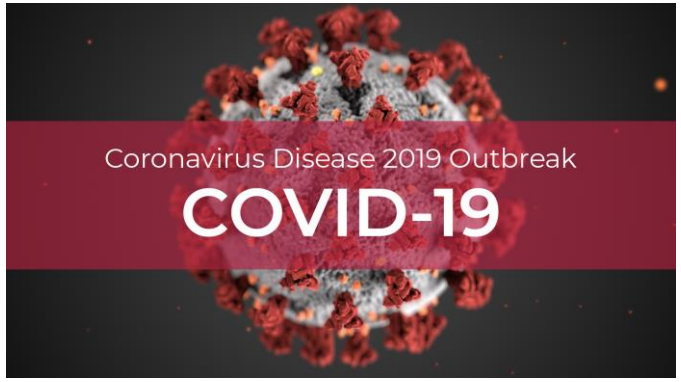
The coronavirus crisis: Development of capabilities on measuring and managing its effects in the Norwegian food, service and seafood export industries

Nhat Quang Le, BI, Bergen, Sasha Fedorikin, Indiana University, Indianapolis, Antonios Stamatogiannakis, IE Business School, Madrid, Margaret E Hillestad, AgriAnalyse, Oslo, Sterenn Lucas, Institute Agro, Rennes, Alexander Jakubanecs, Høgskolen på Vestlandet, Bergen, Margrethe Aanesen, SNF, Bergen, Keita Abe, SNF

CONSUMER BEHAVIOUR IN TIMES OF A PANDEMIC

Consumer behaviour depends on;

Economic variables Marketing efforts Social influences



Prices
Substitute prices
Income
Season

Discounts
Flyers
Disposals

Fear! May lead to:
-Hedonic consumption
-More domestic produce
-More traditional food

What has happened to the consumption of meat and fish products?

Panel survey KANTAR
In 2020 - 895 participants (43% female, mean age – 52 years old).
In 2021 – 269 (also participated in 2020) (42% female, mean age - 57 years old)

Product-related variables: product evaluation, product involvement, usage frequency

Corona-related variables: financial and health threat triggered by the pandemic, scope of the crisis, negative effect on shopping activities, health involvement

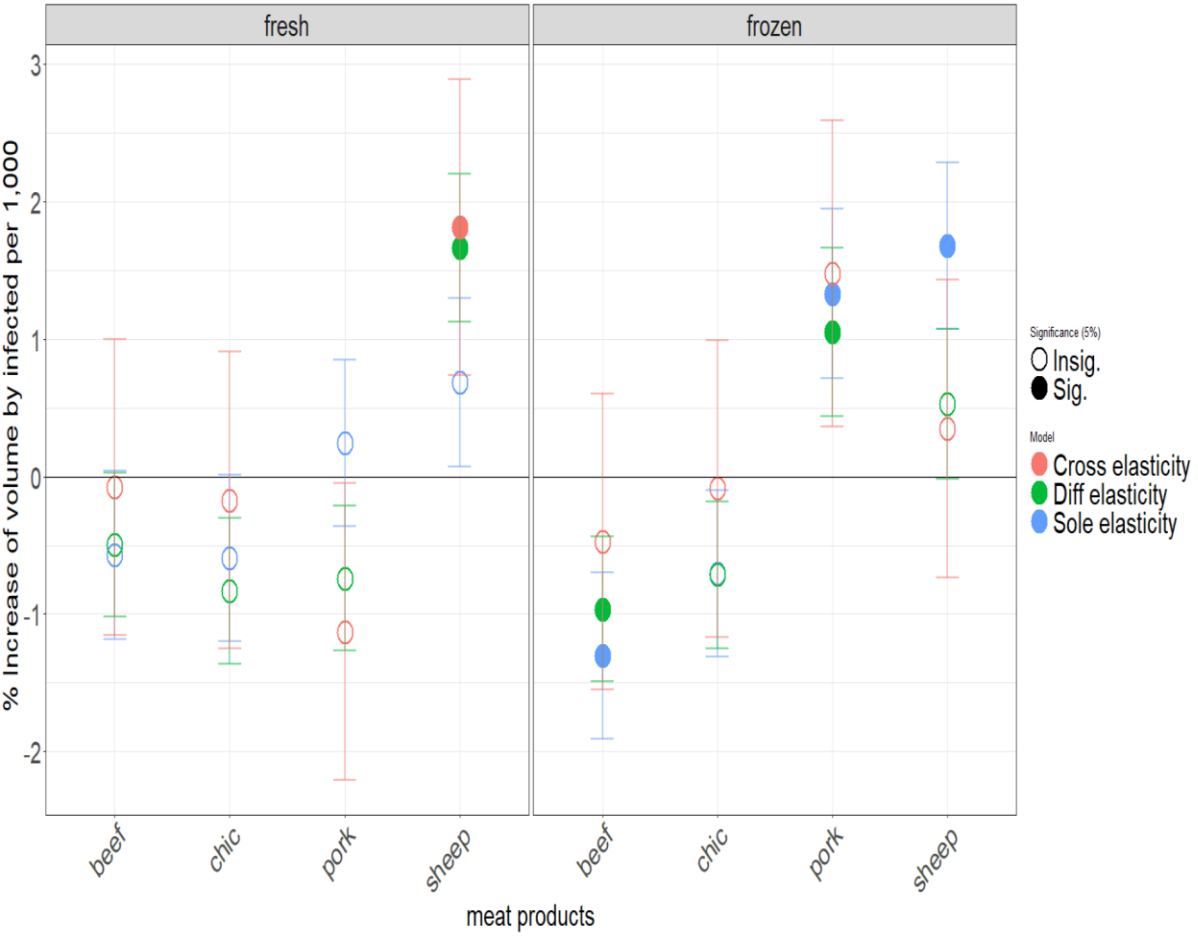
DV=WTP for beef, pork and chicken

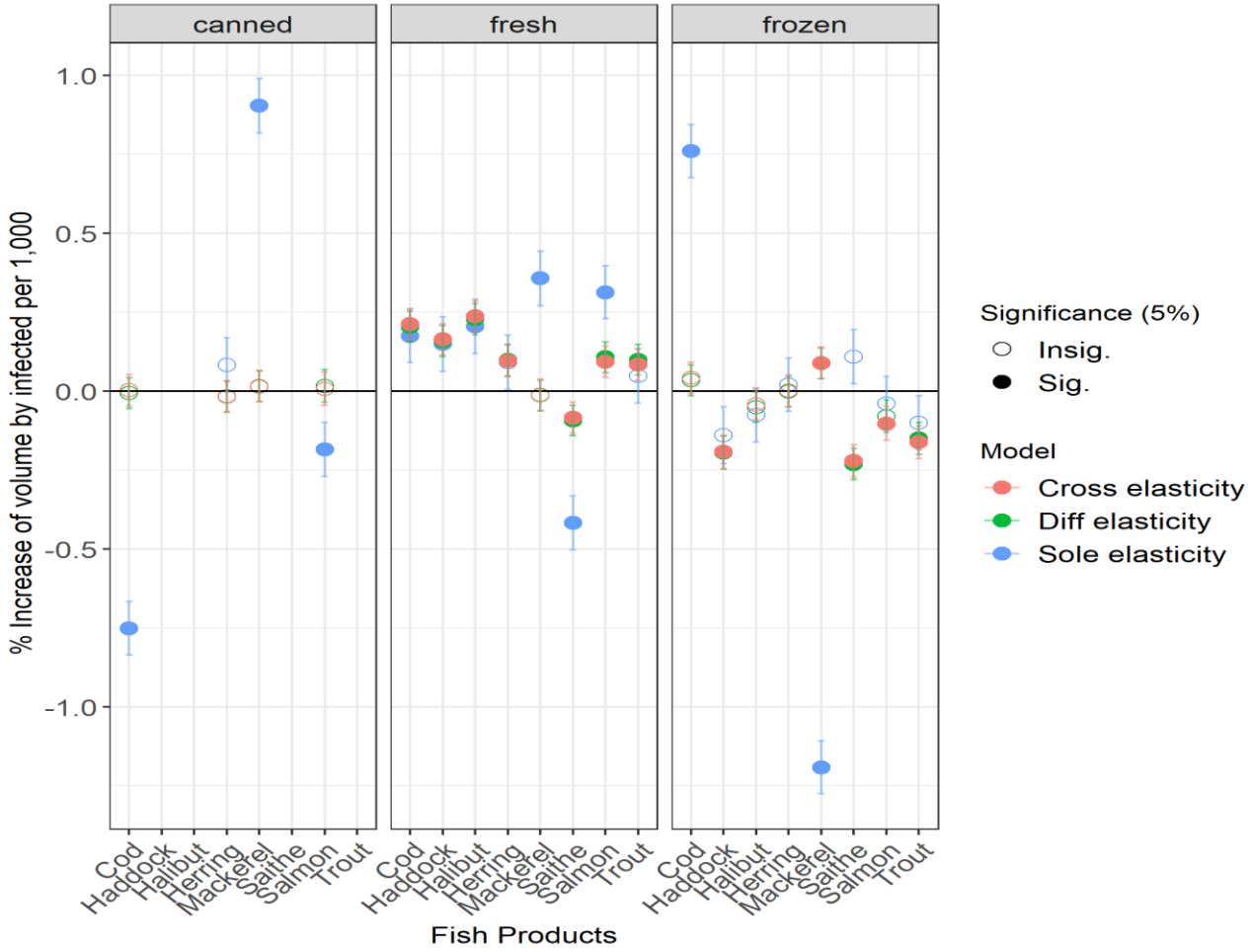
Aggregate data on purchases

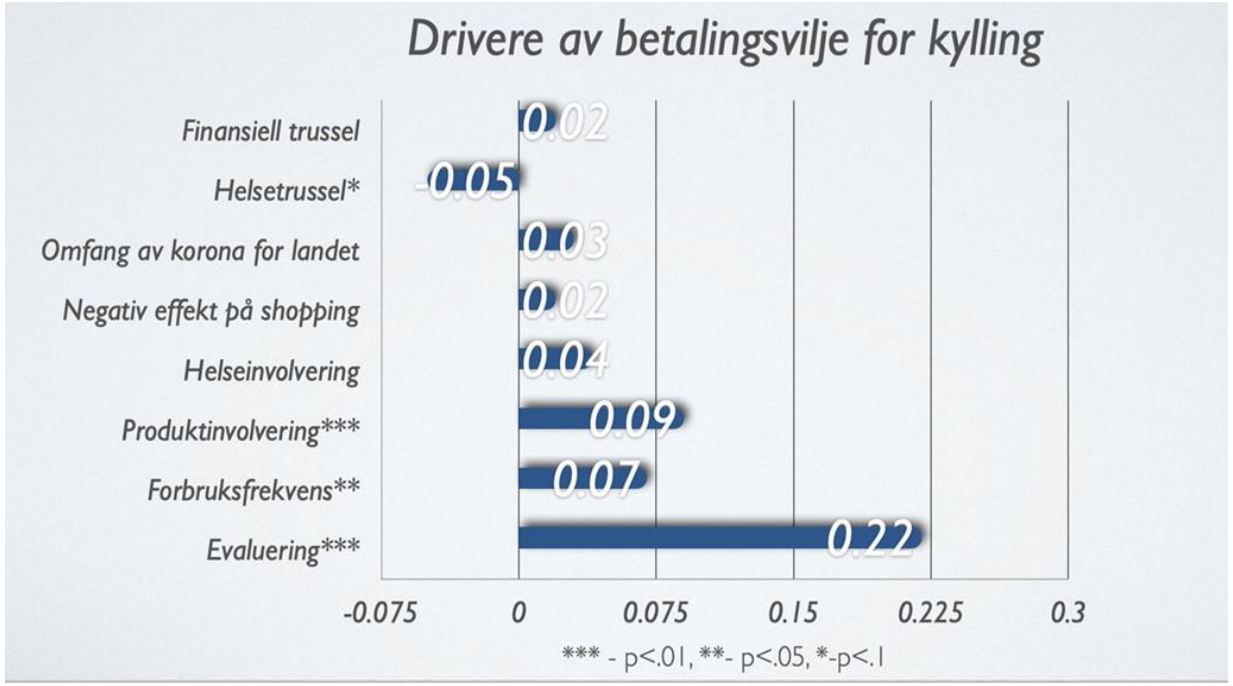
Weekly/monthly data from NielsenIQ on actual purchases of Various meat and fish products, both fresh, frozen and canned, in the period 01.01.2020 – 28.02.2021.

This is what the data says:

Changes in consumption of meat and fish during the first year of the pandemic



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Helsetrussel*
Omfang av korona for landet
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Forbruksfrekvens**
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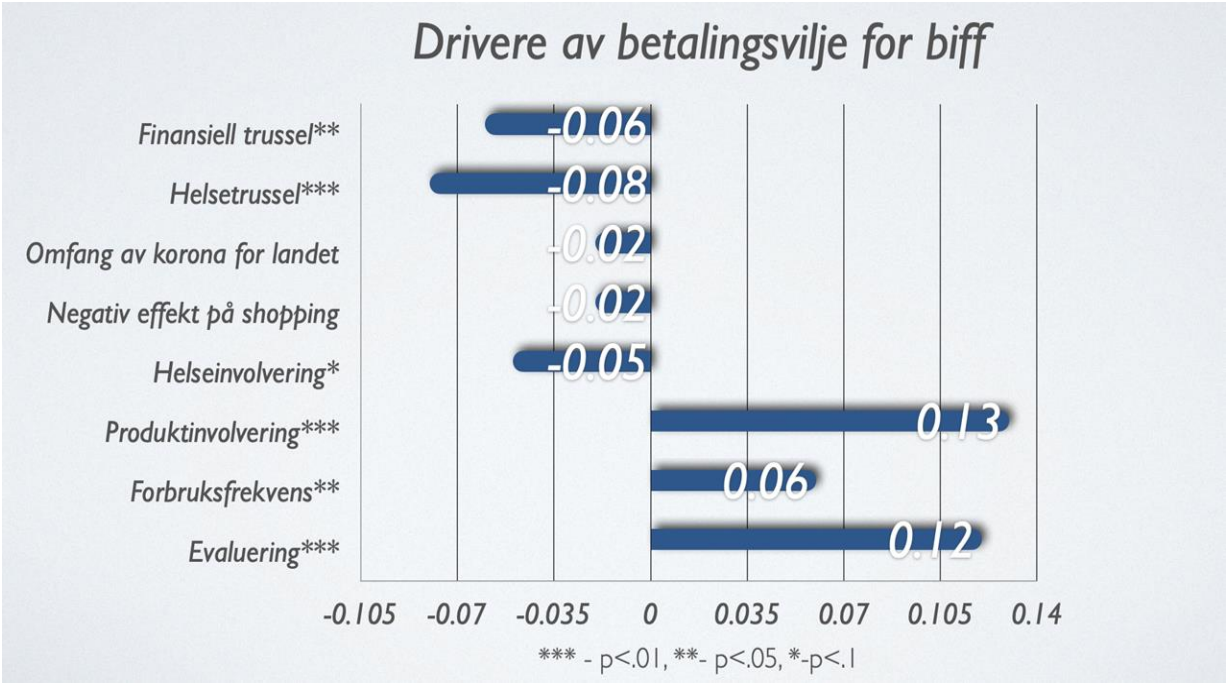
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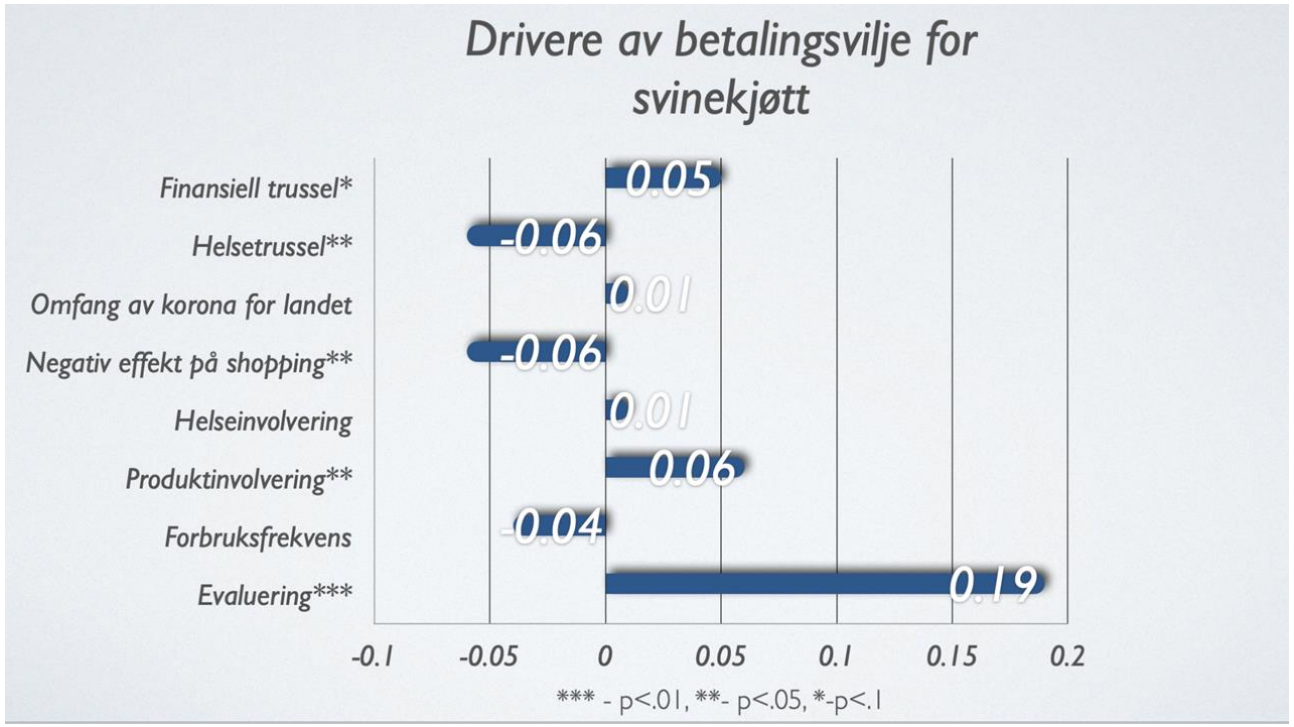
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Negativ effekt på shopping**
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Produktinvolvering**
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*** - p<.01, **- p<.05, *-p<.1

CONCLUSIONS

MEAT

- In Norway only lamb and frozen pork increases as the pandemic becomes more intense➡ a Christmas-effect??

- The corona pandemic generally affects willingness-to-pay (WTP) for meat products negatively

- In 2020, particularly health threat related to the pandemic has negative effects on WTP across the meat types
- In 2021 some of the effects of the pandemic persisted, i.e. the negative effect of the financial threat on WTP for chicken

FISH

- In Norway consumption of most fresh fish increases as the pandemic becomes more intense, but saithe decreases

- Abroad, the perception of seafood safety during the pandemic is a significant driver of WTP
- Perceptions of financial (health) threat has a negative effect on WTP in Italy and France, but positive in Germany for Norwegian salmon and cod

* **Note that fish is less sensitive to the pandemic than meat.**