

NIPH - Division for health services: Impact case 4

Institution: NIPH
Administrative unit: Unit for Health service research - HTH
Title of case study: Beredt-C19 – the foundation and enablement of a system producing scientifically founded real time knowledge to handle the covid-19 pandemic
Period when the underpinning research was undertaken: April 2020-Dec 2023
Period when staff involved in the underpinning research were employed by the submitting institution: April 2020-Dec. 2023
Period when the impact occurred: April 2020-Dec 2023.

1. Summary of the impact

The research unit was responsible for establishing and daily operation of NIPHs Preparedness Registry (Beredt-C19). Beredt C19 played a crucial role in Norway's response to the pandemic through real time data driven decisions enabling targeted infectious disease measures. The legal basis was the Health Emergency Preparedness Act, which allows NIPH to collect extensive amounts of health/administrative data and link them at an individual level. The result was an innovative analytical platform giving real time knowledge of spread, causation and hospitalizations of covid-19, covid-19 vaccine coverage, effect and side effects. The research group enabled preparation of unstructured, real-time data, in addition to producing substantial amounts of knowledge and research. Beredt-C19 represents a unique, innovative and significant step forward using real time data both in and between crises.

2. Underpinning research

The urgent need for information for both the public and policy makers during the covid-19 pandemic implied that research and analysis had to be available for decisions-makers exceptionally fast. Preliminary results were shared with both the media and relevant policy makers before publication. The research was all carried out between April 2020, when the first data sources were included, up until December 2023.

The research insights were all related to the covid-19 pandemic, and their importance and relevance were characterized by the short period between preliminary results and decision-making, to implement or adjust measures and advice. Research on infection spread, hospitalization and health care use, vaccine uptake, side effects and vaccine effectiveness were all conducted simultaneously with the ongoing pandemic and Beredt C19 made real time evaluation of measures possible. Moreover, studies showing unintended effects of restrictions and infection prevention measures, such as use of health services due to mental health or changes in planned surgeries were also produced. A wide body of research explored differential effects according to migrant and social background. Complications, rehabilitation and post covid symptoms were also areas of research. The rapid research conducted, and the knowledge produced were policy relevant on a day-to-day basis for handling the pandemic.

The research unit's long-standing experience with analysing large data from health registries and other administrative data, combined with a broad range of scientific, analytical methods and legal insight, made it possible to develop an infrastructure to make data available for analytical purposes for the rest of the institute. A flexible infrastructure was developed to allow including new data sources as the knowledge need increased.

The data sources were administrative registries for administration and financing purposes, health registries etc (over 20 data sources were included, see [Emergency preparedness register for COVID-19 \(Beredt C19\) - NIPH \(fhi.no\)](#)). Due to the daily data flow from the majority of data sources, there was limited time for regular data quality assurance routines in each registry. To

produce research from unpolished data depend on skilled researchers, who can manage a vast quantitative of unstructured data and exploit them to answer research questions necessary to underpin decisions and information needs. To produce high quality research from the available data material at the fast pace that was necessary was challenging, but rapid knowledge production is crucial in a crisis. Beredt C19 has effectively demonstrated the valuable insights from real time surveillance and science in a health crisis, and was awarded a prize from the Norwegian Data Association [FHI vant Innsiktsprisen – Dataforeningen](#) (in Norwegian).

Essential project researchers from our research unit

- Anja Schou Lindman: Department director Health Service Research Unit, project leader for Beredt C19 (data processor according to GDPR, responsible for legal and technical operations)
- Kjetil Telle: Executive director for the Division of Health Services, Beredt C19 Research manager
- Jon Helgeland: Senior researcher
- Mari Grøslund: Junior researcher
- Karin Magnusson: Senior researcher, research leader for analytical team
- Anna Godøy: Senior researcher, research leader for analytical team
- Katrine Skyrud: Senior Researcher
- Vilde Bergstad Larsen: Junior researcher
- Torill Alise Rotevatn: Senior researcher
- Jonas Gjesvik: Junior researcher
- Sigurd Storehaug Arntzen: Junior researcher
- Lema Hussaini: Junior researcher
- Fredrik Methi: Junior researcher
- Bjørn Atle Reme: Senior researcher

The [Beredt C19](#) analytical resources included researchers from the whole of NIPH but was led and administrated from our unit. During the pandemic over 25 analytical teams with different analytical purposes were active, led by dedicated team leaders. Beredt C19 was the central data source for the covid-19 surveillance in Norway. Several impact cases from NIPH are based on Beredt C19.

2. References to the research (indicative maximum of six references)

Our research group's contribution:

1. **Magnusson, K., Kristoffersen, D.T., Dell'Isola, A.** et al. Post-covid medical complaints following infection with SARS-CoV-2 Omicron vs Delta variants/*Nature Communications/2022/*<https://doi.org/10.1038/s41467-022-35240-2> / <https://www.nature.com/articles/s41467-022-35240-2>
2. **Katrine Skyrud, Kjetil Telle, Karin Magnusson.** Impacts of mild and severe COVID-19 on sick leave/*International Journal of Epidemiology/2021/* <https://doi.org/10.1093/ije/dyab182> / <https://academic.oup.com/ije/article/50/5/1745/6359516?login=false>
3. Silje Jørgensen, Karin Nygård, Oliver Kacelinik and **Kjetil Telle.** Secondary Attack Rates for Omicron and Delta Variants of SARS-CoV-2 in Norwegian Households/*JAMA/2022/* [doi:10.1001/jama.2022.3780](https://doi.org/10.1001/jama.2022.3780) / <https://jamanetwork.com/journals/jama/fullarticle/2789920>
4. **A Rotevatn, Vilde Bergstad Larsen, Tone Bjordal Johansen, Elisabeth Astrup, Pål Surén, Margrethe Greve-Isdahl and Kjetil Elias Telle.** Transmission of SARS-CoV-2 in Norwegian schools during academic year 2020-21: population wide, register based cohort study/*BMJ Medicine/2022/* [doi: 10.1136/bmjmed-2021-000026](https://doi.org/10.1136/bmjmed-2021-000026) / <https://bmjmedicine.bmj.com/content/1/1/e000026.abstract>
5. **Karin Magnusson, Katrine Damgaard Skyrud, Pål Suren, Margrethe Greve-Isdahl, Ketil Størdal, Doris Tove Kristoffersen, Kjetil Telle.** Health care use for 6 months after COVID-19 in 700.000 children and adolescents: a pre-post register-based cohort study /*BMJ/2021/*

<https://doi.org/10.1136/bmj-2021-066809> / <https://www.bmj.com/content/376/bmj-2021-066809>

6. **Fredrik Methi, Kjetil Telle, Karin Magnusson.** COVID-19 among bartenders and waiters before and after pub lockdown. *Occupational and Environmental Medicine*/2022/ DOI: [10.1136/oemed-2021-107502](https://doi.org/10.1136/oemed-2021-107502)/<https://oem.bmj.com/content/79/1/46/>

4. Details of the impact

A health emergency has the potential to be followed by an information emergency. Nevertheless, the availability of extensive data, a flexible infrastructure, and the body of research and analyses conducted within Beredt-C19 ensured that the swiftly evolving knowledge requirements could be addressed through the development of the registry and research efforts. New knowledge was continuously communicated to decision makers, media and the public through NIPHs surveillance team - weekly reports, risk assessments, modelling reports etc. Beredt-C19 contributed to decisions and advice being data driven and helped shed light on potential risks or benefits of the continuously changing measures, and also target interventions towards the population with the highest risk.

The weekly reports were expanded as knowledge production increased. Risk assessments were regularly published during the pandemic and a vital part of the data behind them was the ongoing analysis from Beredt-C19. Research on the Omicron variant, later published in Jørgensen et al (2022), was for example essential in the risk assessment of December, 2021, which formed an important knowledge base in measures put in place with the arrival of Omicron.

In Norway several immigrant groups had higher risk for infection and hospitalizations, and this knowledge and statistic was important to communicate. However, as stated in the report of the Norwegian Korona commission (NOU 2022:5), the fear of stigmatizing migrants through targeted interventions was stronger in the public administration than in the migrant groups and organizations themselves. Moreover, municipalities responsible for local measures, informed the commission that it was first when data and statistics from NIPH documented that the migrants were more severely hit of the pandemic, that it became legitimate to aim interventions specifically at this group. Indseth and Lindman (2021) writes more extensively on this topic ([COVID-19 among immigrants in Norway, assessment of measures, and experiences from the field, report 1, chapter 4](#)).

One example is regarding infection rates in certain professions and following infection prevention measures. The 4th of November, preliminary results of infection rates for a range of professions were published, showing particularly high rates for bartenders and waiters. The results were also distributed in Norwegian media, including VG, one of the main newspapers in Norway. Infection prevention measures ('skjenkestopp') were in place already 7th of November, with restrictions in serving of alcohol (<https://www.stortinget.no/no/Saker-og-publikasjoner/Publikasjoner/Referater/Stortinget/2020-2021/refs-202021-11-05?all=true>). In addition, real-time data in Beredt C19 allowed simultaneously evaluation of measures, and on the 5th of February, new results were made available, showing a decline in infection rates for these professions.

An example of the flexibility of the system was demonstrated when there an urgent need for knowledge on cross-border virus spread through travels to Norway. New data on border crossings was included in Beredt C19 17th of March, 2021. Just a few days later, 23rd of March, preliminary results were published showing that imported infections mainly arrived from Africa and Asia. Based on these results, NIPH came with updated advice on quarantine measures, and this was followed by new regulations from the government 26th of March. See the following link for background on the intervention from the government.

<https://www.regjeringen.no/no/tema/Koronasituasjonen/begrunnelser-for-endringer-i-covid-19-forskriften/begrunnelse-for-endringer-28.-april-2021-i-covid-19-forskriften-5-om-oppholdssted-for-innreisekarantene/id2862154/>

There are some examples where a direct link between the knowledge produced, and the policy impact is evident. 11th of march, the vaccine from Astra Zeneca were put on hold due to reports of adverse events with high mortality, VITT. Together with Danish researchers, researchers in Beredt C19 reported an increased incidence of blood clots post-vaccination, as found in cases of VITT, which led to the NIPH recommending excluding vector vector vaccines from the vaccination program in April 2021, implemented as policy from May 2021.

The Beredt C19 was a large-scale project, which included making sure legal restrictions were met, such as DPIA, data collection and data collection infrastructure, infrastructure for access, access control and data analysis, in addition to researcher teams for analyzing the data and conducting research. Researchers all across NIPH were involved in conducting research and analysis in this project, and the methodological competencies in our research unit were essential for the development of both the infrastructure and the research made. In total, more than 150 researchers contributed to the research output, and organization of this structure was thus a major task.

5. Sources to corroborate the impact (indicative maximum of ten references)

Surveillance examples

- Weekly reports from NIPH: <https://www.fhi.no/publ/statusrapporter/luftveisinfeksjoner/#alle-ukerapporter-2020-2023>
- Risk assessments from NIPH: <https://www.fhi.no/publ/2020/covid-19-epidemien-risikovurdering/>
- Covid-19 modelling reports: <https://www.fhi.no/ss/korona/koronavirus/koronavirus-modellering/>

Migration health examples

- Indseth, T., Elgersma, I. H., Strand, B. H., Telle, K. E., Labberton, A. S., Arnesen, T. M., ... & Godøy, A. A. (2021). Covid-19 blant personer født utenfor Norge, justert for yrke, trangboddhet, medisinsk risikogruppe, utdanning og inntekt. Rapport Folkehelseinstituttet 2021.
- Indseth, T., Kjøllesdal, M. K. R., Jacobsen, C. C., Nygård, K. M., & Godøy, A. A. (2020). Covid-19 i Oslo etter fødeland: Personer testet, bekreftet smittet og relaterte innleggelser. Rapport Folkehelseinstituttet 2021.
- Expert group report. Immigrant Population During the COVID-19 Pandemic Infection, Vaccine, and Consequences for Integration Oslo, June 23, 2021. Report from an expert group
- Myndighetenes håndtering av koronapandemien – del 2. Rapport fra Koronakommisjonen. NOU 2022:5, s.407

Occupational risk

- Fredrik Methi, Kjetil Telle , Karin Magnusson. COVID-19 among bartenders and waiters before and after pub lockdown. Occupational and Environmental Medicine 2021. Doi: [10.1136/oemed-2021-107502](https://doi.org/10.1136/oemed-2021-107502)
- Magnusson Karin, Nygård Karin, Methi Fredrik, Vold Line, Telle Kjetil. Occupational risk of COVID-19 in the first versus second epidemic wave in Norway, 2020. *Euro Surveill.* 2021;26(40):pii=2001875. <https://doi.org/10.2807/1560-7917.ES.2021.26.40.2001875>

Astra Zeneca example

- Pottegård A, Lund LC, Karlstad Ø, Dahl J, Andersen M, Hallas J, Lidegaard Ø, Tapia G, Gulseth HL, Ruiz PL, Watle SV, Mikkelsen AP, Pedersen L, Sørensen HT, Thomsen RW, Hviid A. Arterial events, venous thromboembolism, thrombocytopenia, and bleeding after vaccination with Oxford-AstraZeneca ChAdOx1-S in Denmark and Norway: population based cohort study. *BMJ.* 2021 May 5;373:n1114. doi: 10.1136/bmj.n1114. PMID: 33952445; PMCID: PMC8097496.