

## A real-time covid-19 modelling pipeline for Norway

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In early 2020, the Norwegian Institute of Public Health (NIPH) formed a covid-19 modelling team. The team is a collaboration between the modelling unit at NIPH, University of Oslo, Norwegian Computing Centre and Telenor. The aim is to provide situational awareness, forecasting and intervention modelling to assist the Norwegian health authorities with response and preparedness planning as the covid-19 epidemics unfolds.

Our models unique feature is the focus on regional disease dynamics, centred on a stochastic municipal-level metapopulation model for estimation of the epidemiological situation<sup>1,2,3</sup>, and an individual-based model<sup>4</sup> (IBM) to study effects of interventions, including vaccination. The models are informed with a real-time data infrastructure of merged individual-level registry data and mobile phone mobility data. The geographically specific approach is highly relevant because of the large differences in the local disease burden observed in Norway, where, in particular, the capital Oslo and the surrounding region have experienced sustained, high infection levels. The models also support the Norwegian covid-19 strategy, which is based locally.

In my talk, I will give an overview of the modelling pipeline. I will discuss our analyses, comparing the short-term predictions of the regional model with that of a national model in various stages of the epidemic with use of coverage and energy-score metrics. We have adopted an ensemble modelling approach to study the effects of the vaccine rollout and exploration of vaccination strategies. This implies that we run in parallel the IBM and a deterministic, simplified version of the metapopulation model<sup>5</sup>. Lastly, I will talk about our experience with this approach and how we have dealt with forecasting the effect of the Norwegian vaccination program given the highly uncertain epidemiological situation.

1. The Norwegian Institute of Public Health: Situational awareness and forecasting for Norway FHI COVID-19 modelling team Week 7, 24 February 2021 <https://www.fhi.no/contentassets/e6b5660fc35740c8bb2a32bfe0cc45d1/vedlegg/nasjonale-og-regionale-rapporter/2021.02.24-national-and-regional-corona-report-engelsk.pdf>
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3. S. Engebretsen, GØ Isaksson Rø, K Engø-Monsen, A Diz-Lois Palomares, AB Kristoffersen, F Di Rusico, R White, M. Storvik, G Grøneng, J Eriksson Midtbø, KL Stenerud, BF de Blasio, A Frigessi: Spatial modelling of the early-phase of the covid-19 epidemic in Norway (in prep)
4. F. Di Ruscio, G Guzzetta, JV Bjørnholt, TM Leegaard, AE Fossum Moen, S Merler, BF de Blasio: Quantifying the transmission dynamics of MRSA in the community and health care setting in a low-prevalence country *PNAS* 116(29), 14599-14605 (2019)
5. The Norwegian Institute of Public Health: Folkehelseinstituttets foreløpige anbefalinger om vaksinasjon mot covid-19 og om prioritering av covid-19 vaksiner, ver 2 15 December 2020 <https://www.fhi.no/contentassets/d07db6f2c8f74fa586e2d2a4ab24dfdf/2020-12-v2-anbefalinger-og-prioriteringer-2-utgave-korrigert-forside.pdf>