NIPH
Norwegian Institute of Public Health

Situational awareness and forecasting for Norway

FHI COVID-19 modelling team

Week 48, 1 December 2021

Main results:

From this week, we only calibrate to the hospital incidence data in the national changepoint model. We do this as the testing criteria have changed a lot this autumn and because the total number of tests performed is unknown due to the extended use of self-test kits and quick tests. We continue to correct the hospitalisation risks with the age profile of the test data, the increased severity of the alpha variant and decreased severity due to vaccination with 1, 2 or 3 doses of vaccine. We do not incorporate future vaccination doses in the three-week-ahead predictions. We are working on moving to use only hospital data also in the calibration of the other models. However, this needs further work as these models are more difficult estimation problems and thus require more data.

- **National epidemiological situation:**

  The most recent reproduction numbers:

Model	Median	5%	95%	Prob>1	period/day	More info
Changepoint	1.02	0.9	1.16	0.64	Since 2. Nov	Table 1
SMC	1.07	0.87	1.29	0.76	23 Nov	Fig. 4
EpiEstim	1.13	1.1	1.15		22 Nov	Table 10, Fig. 17

  The cumulative incidence since the start of the epidemic can be found in Table 2 together with an estimate of the fraction of infections that have been reported.

- **National forecasting:**

  One-week-ahead national forecasts from changepoint model:

Indicator	Median/Mean 95% PI	day	Info 2-3 weeks forecasts
Prevalence	9241/8902 (5073-15730)	7 Dec	Table 3
Daily incidence	2119/2022 (1108-3710)	7 Dec	Table 3
Hospital beds	224/222 (152-310)	7 Dec	Table 3
Ventilator beds	32/32 (19-48)	7 Dec	Table 3

  * Age-specific hospital prevalence predictions are provided in Figures 7 and 8.

- **Regional epidemiological situation:**

  The newest regional reproduction numbers for Oslo:

Model	Median	5%	95%	Prob>1	period/day	Info other counties
Changepoint*	-	-	-	-	-	-
SMC*	-	-	-	-	-	
EpiEstim	1.15	1.11	1.2		22 Nov	Table 10, Fig. 17

  *Regional changepoint and SMC models are not included this week due to technical issues.

- **Telenor mobility data and the number of foreign visitors:** The most recent mobility development is found in Figures 11 and 12 for the largest municipality in each county and for each county, respectively. Figure 13 shows the total number of roamers per day per county.

1 Estimated national reproduction numbers

Calibration of our national changepoint model to hospitalisation incidence data leads to the following estimates provided in table 1. Figure 2 shows the estimated daily number of COVID-19 patients admitted to hospital (1), with blue medians and interquantile bands, which are compared to the actual true data, provided in red. The uncertainty captures the uncertainty in the calibrated parameters in addition to the stochastic elements of our model and the variability of other model parameters.

Table 1: Calibration results

Reff	Period
2.48/2.47(1.97-2.92)	From Feb 17 to Mar 14
0.62/0.62(0.52-0.72)	From Mar 15 to Apr 19
0.77/0.76(0.28-1.19)	From Apr 20 to May 10
0.84/0.82(0.4-1.22)	From May 11 to Jun 30
0.9/0.88(0.16-1.6)	From Jul 01 to Jul 31
1.07/1.06(0.63-1.38)	From Aug 01 to Aug 31
0.98/0.99(0.76-1.24)	From Sep 01 to Sep 30
1.16/1.15(0.93-1.36)	From Oct 01 to Oct 25
1.23/1.23(0.85-1.58)	From Oct 26 to Nov 04
0.87/0.87(0.76-0.97)	From Nov 05 to Nov 30
1/1(0.9-1.09)	From Dec 01 to Jan 03
0.81/0.81(0.59-1.02)	From Jan 04 to Jan 21
0.75/0.74(0.45-1.02)	From Jan 22 to Feb 07
1.38/1.38(1.16-1.65)	From Feb 08 to Mar 01
1.06/1.06(0.96-1.18)	From Mar 02 to Mar 24
0.81/0.81(0.7-0.94)	From Mar 25 to Apr 12
0.84/0.83(0.66-0.97)	From Apr 13 to May 05
0.96/0.96(0.72-1.2)	From May 06 to May 26
0.86/0.86(0.66-1.08)	From May 27 to Jun 20
0.91/0.91(0.77-1.03)	From Jun 21 to Aug 04
1.2/1.2(1.04-1.36)	From Aug 05 to Aug 31
0.75/0.75(0.63-0.86)	From Sep 01 to Sep 24
1.1/1.1(1-1.18)	From Sep 25 to Nov 01
1.02/1.02(0.9-1.16)	From Nov 02

Median/Mean (95% credible intervals)

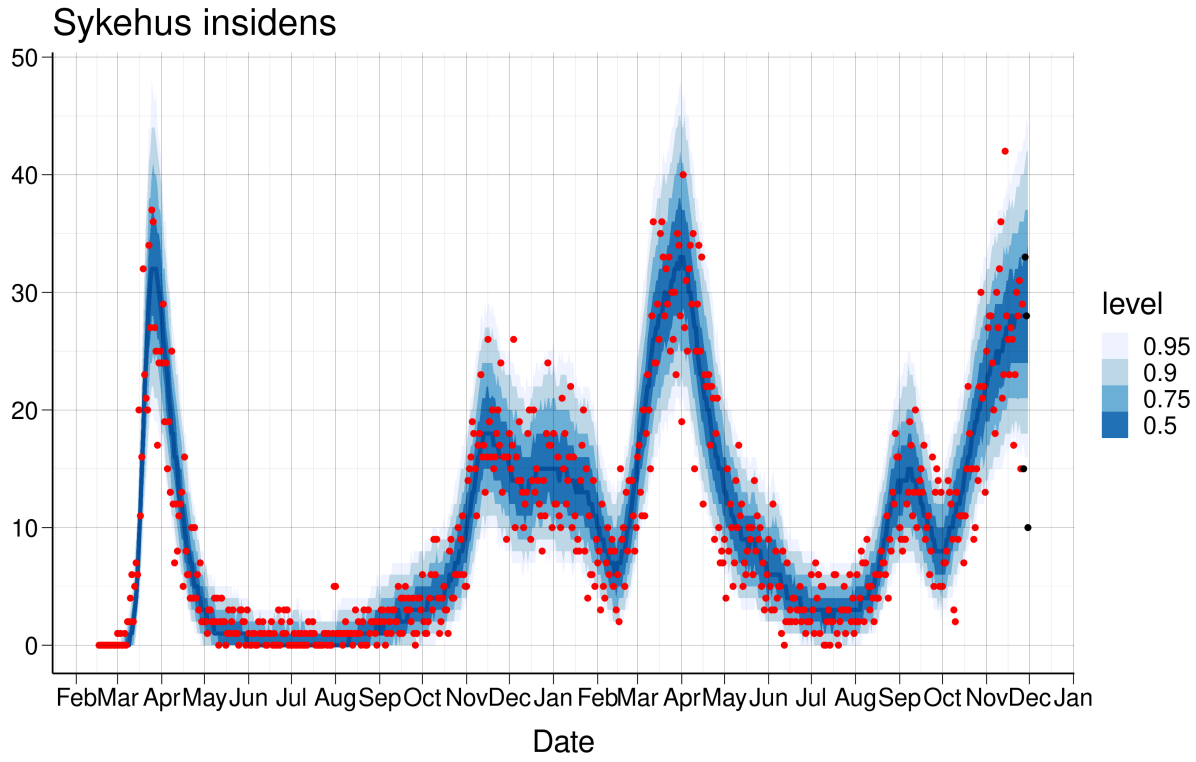
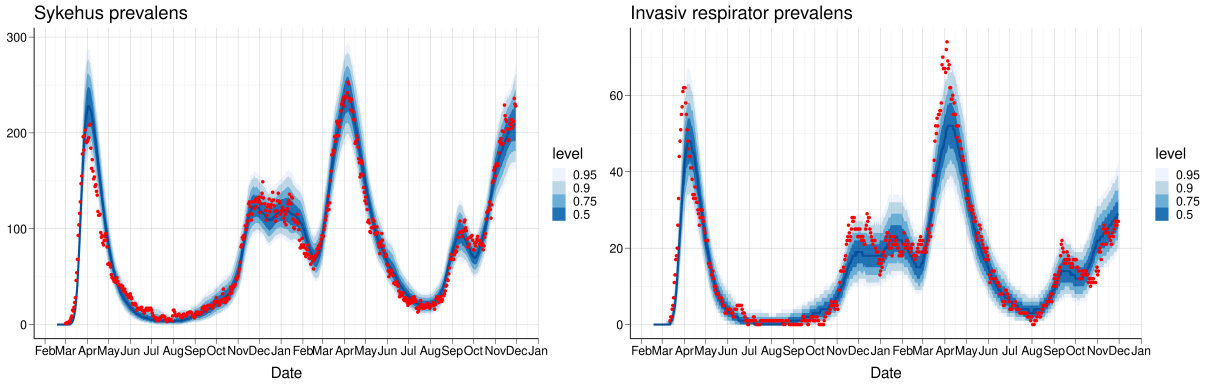


Figure 1: Hospital admissions

Figure 2: A comparison of true data (red) and predicted values (blue) for hospital admissions. The last four data points (black) are assumed to be affected by reporting delay. The uncertainty captures the uncertainty in the calibrated parameters, in addition to the stochastic elements of our model and the variability of other model parameters.

In figure 3, we show how our national model fits the national hospital prevalence data (3a) and the daily number of patients receiving ventilator treatment (3b). Those data sources are not used to estimate the parameters, and can therefore be seen as a validation of the model assumptions.



(a) Hospital prevalence

(b) Ventilator prevalence

Figure 3: A comparison of true data (red) and predicted values (blue) for hospital and respirator prevalence. Prevalence data is based on NIPaR and may be different to the data from Helsedirektoratet.

1.1 National SMC-model: Estimated daily reproduction numbers

Figure 4 shows the SMC estimate of the 7-day-average daily reproduction number $R(t)$ from the start of the epidemic in Norway and until today. In the figure we plot the 95% credibility interval and quantiles of the estimated posterior distribution of $R(t)$.

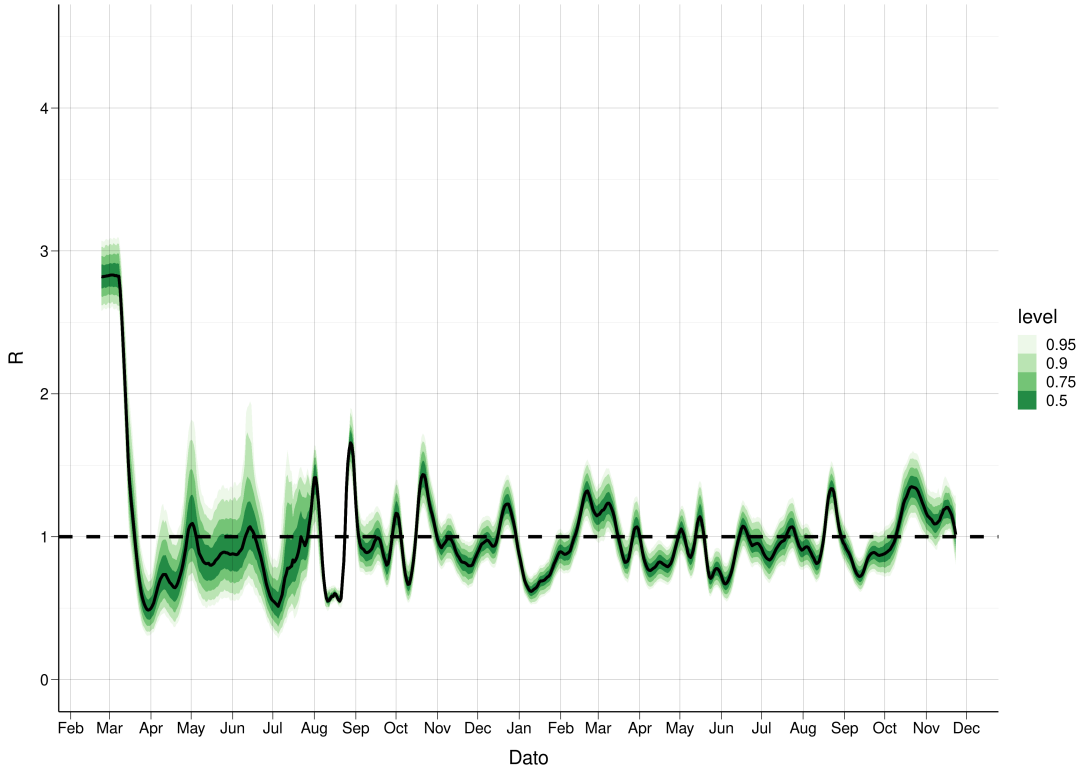


Figure 4: R(t) estimates using a Sequential Monte Carlo approach calibrated to hospitalisation incidence and test data. The large uncertainty during the last 7 days reflects the lack of available data due to the transmission delay, test delay, time between symptoms onset and hospitalisation. The green band shows the 95% posterior credibility interval. As we use test data only from 1 August, the credibility interval becomes more narrow thereafter.

2 National estimate of cumulative (total) number of infections

The national changepoint model estimates the total number of infections and the symptomatic cases that have occurred (Table 2).
Figure 5 shows the modelled expected daily incidence (blue) and the observed daily number of laboratory-confirmed cases (red). When simulating the laboratory-confirmed cases, we also model the detection probability for the infections (both symptomatic, presymptomatic and asymptomatic).

Table 2: Estimated cumulative number of infections, 2021-11-30

Region	Total	No. confirmed	Fraction reported	Min. fraction
Norway	397620 (364096; 426582)	267825	67%	63%

Fraction reported=Number confirmed/number predicted; Minimal fraction reported=number confirmed/upper CI

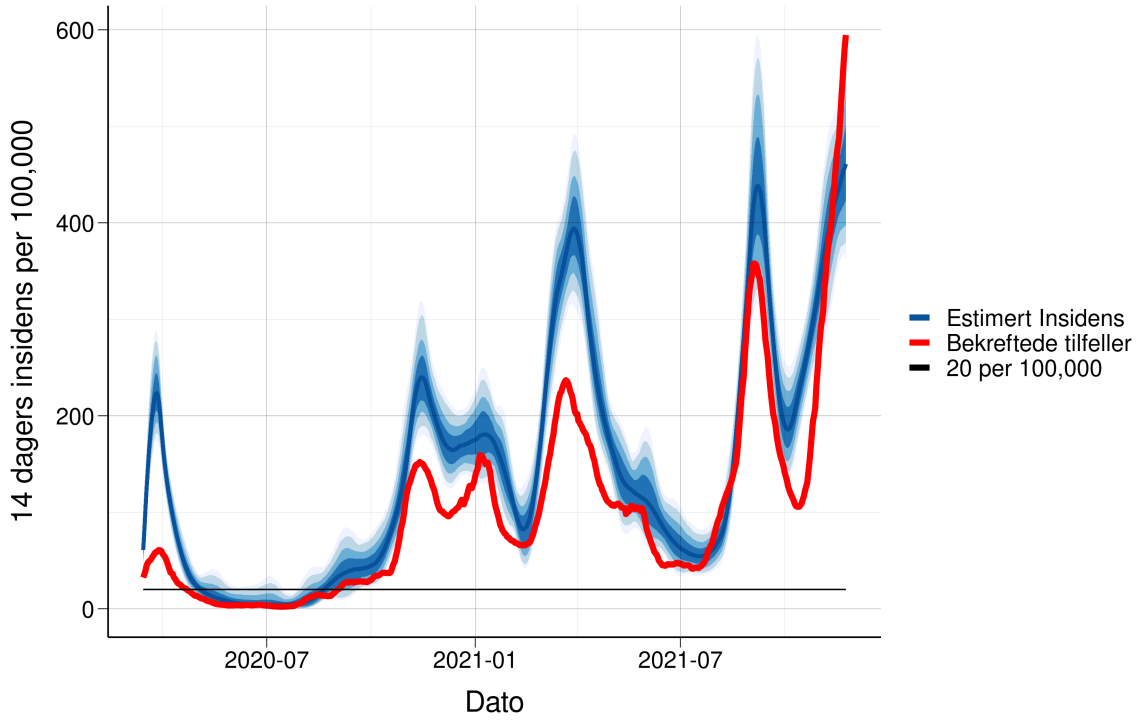


Figure 5: Number of laboratory-confirmed cases vs model-based estimated number of new infected individuals

3 National 3-week predictions: Prevalence, Incidence, Hospital beds and Ventilator beds

The national changepoint model estimates the prevalence and daily incidence of infected individuals (asymptomatic, presymptomatic and symptomatic) for the next three weeks, aggregated to the whole of Norway (table 3). In addition, the table shows projected national prevalence of hospitalised patients (hospital beds) and prevalence of patients receiving ventilator treatment (ventilator beds). The projected epidemic and healthcare burden are illustrated in figure 6.

Table 3: Estimated national prevalence, incidence, hospital beds and ventilator beds. Median/Mean (CI)

	1 week prediction (Dec 07)	2 week prediction (Dec 14)	3 week prediction (Dec 21)
Prevalence	9241/8902 (5073-15730)	9618/9028 (4494-18485)	10024/9100 (3921-21825)
Daily incidence	2119/2022 (1108-3710)	2206/2048 (990-4367)	2300/2078 (856-5184)
Hospital beds	224/222 (152-310)	231/227 (141-366)	238/227 (125-420)
Ventilator beds	32/32 (19-48)	33/33 (19-51)	35/34 (19-56)

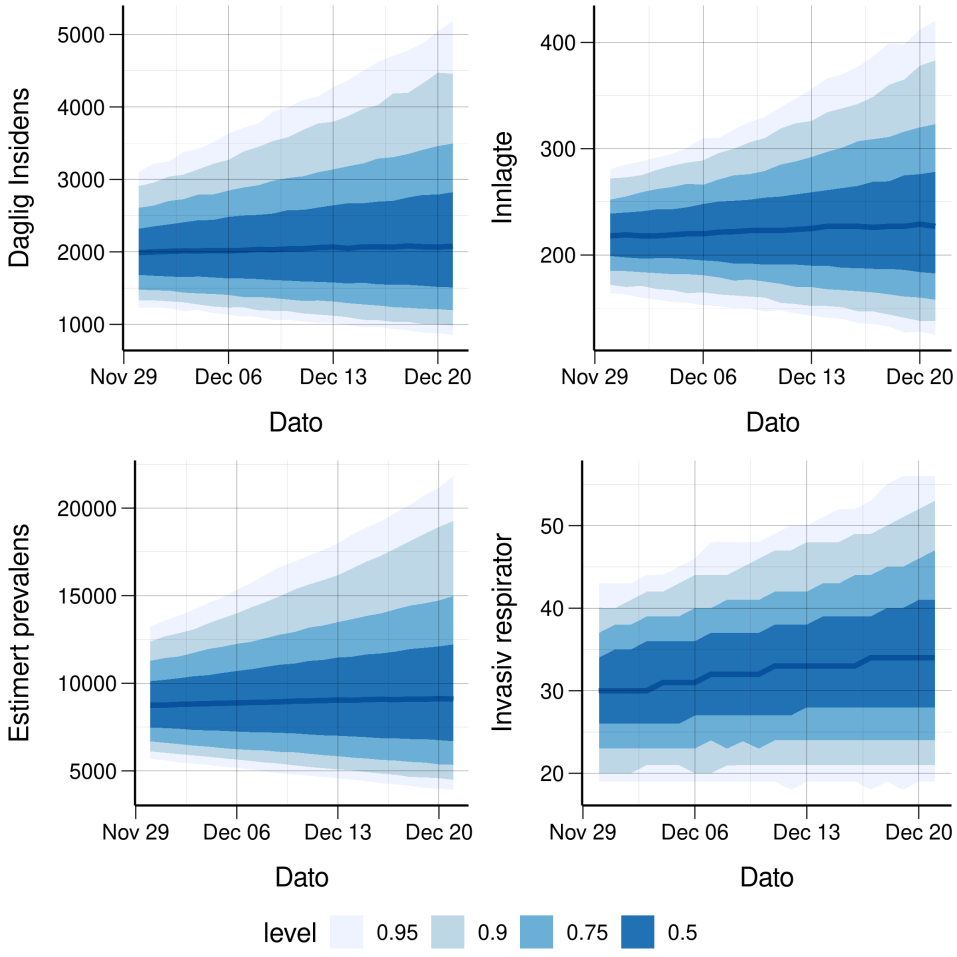


Figure 6: National 3 week predictions for incidence (top left), prevalence (bottom left), hospital beds (top right) and ventilator beds (bottom right)

3.1 Hospital and Ventilator prevalence by age

In Figures 7 and 8 we show the hospital prevalence by age group obtained from the simulations of the national model, including a 3 week forecast period. The real number of patients in each age group is also included (black dots). In the forecast period, we assume that the age distribution of the cases in hospital and respirator beds will remain the same as today. Specific values for these projections are shown in table 4.

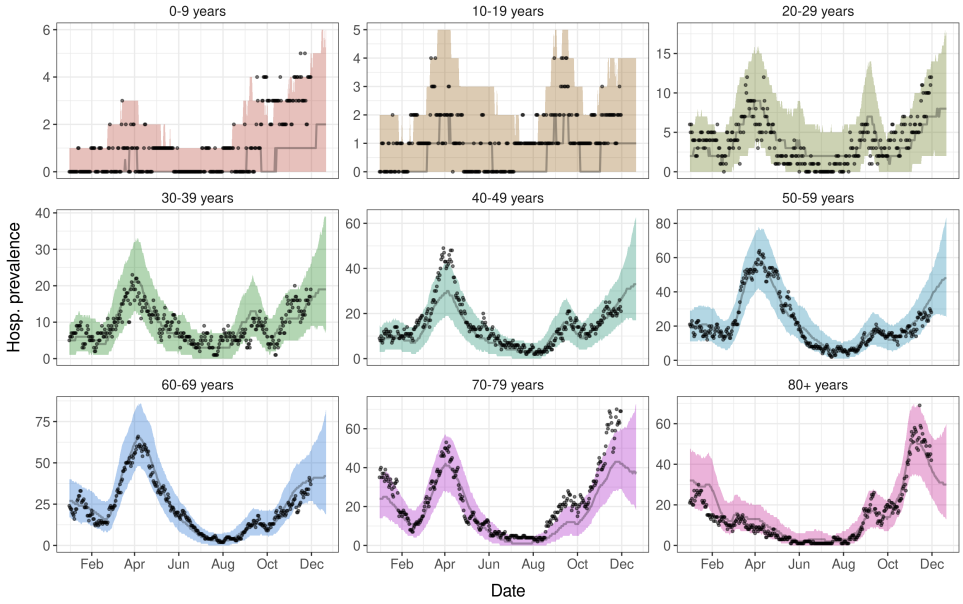


Figure 7: Simulated hospital prevalence by age group. Real data is shown as black dots

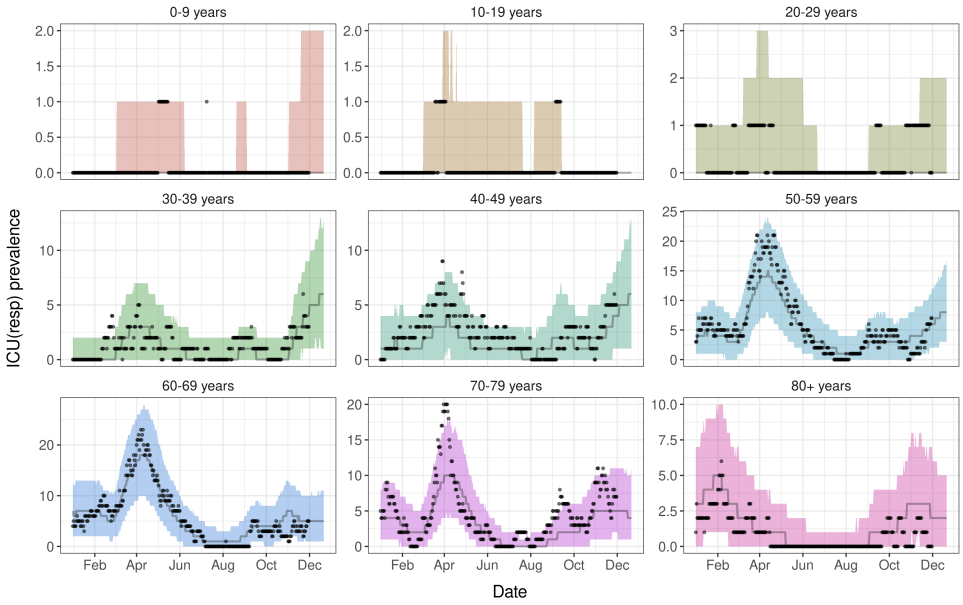


Figure 8: Simulated respirator prevalence by age group. Real data is shown as black dots

3.1 Hospital and Ventilator prevalence by age

Table 4: Hospital and Respirator prevalence per age group: 3 week prediction (2021-12-21). Mean and 95 perc. CI

Age group	Hosp	Resp
0-9 years	2 (0-6)	0 (0-2)
10-19 years	1 (0-4)	0 (0-0)
20-29 years	9 (2-18)	1 (0-2)
30-39 years	21 (9-41)	6 (1-13)
40-49 years	36 (17-63)	6 (2-13)
50-59 years	51 (26-88)	9 (3-16)
60-69 years	45 (20-84)	6 (1-12)
70-79 years	41 (19-75)	5 (1-11)
+80 years	32 (14-62)	2 (0-5)

4 14-day trend analysis of confirmed cases and hospitalisations by county

To estimate recent trends in hospitalisation and number of positive tests, we present results in table 5 based on a negative binomial regression where we account for weekend effects. We exclude the last three days to avoid problems of reporting delay and fit the model using data from 17 days to 3 days before the current date. We fit a separate trend model for confirmed cases and for hospital incidence. We only fit a trend model if there has been more than 5 cases or hospitalisations in the 14-day period.

Table 5: Trend analysis for the last 14 days

	Average daily increase last 14 days		Doubling Time (days)	
County	Hospitalisations	Cases	Hospitalisations	Cases
Agder	Not enough data	1.3 (-6.2, 9.4) %	Not enough data	54.2 (-10.8, 7.7)
Innlandet	Not enough data	-5.5 (-9.9, -0.9) %	Not enough data	-12.2 (-6.6, -72.8)
Møre og Romsdal	Not enough data	-7.3 (-11.6, -2.7) %	Not enough data	-9.2 (-5.6, -24.9)
Nordland	Not enough data	-1.7 (-5.1, 1.8) %	Not enough data	-40.5 (-13.2, 38.5)
Norge	-3.5 (-8.1, 1.4) %	-2.6 (-4.3, -0.9) %	-19.7 (-8.2, 50.4)	-26.4 (-15.9, -78.1)
Oslo	-10 (-18.3, -1.4) %	-3.6 (-5.8, -1.4) %	-6.6 (-3.4, -48.2)	-18.8 (-11.6, -48.8)
Rogaland	Not enough data	-4.3 (-7.9, -0.7) %	Not enough data	-15.7 (-8.5, -99.2)
Troms og Finnmark	8 (-10.4, 32.9) %	2.4 (-1.7, 6.6) %	9 (-6.3, 2.4)	29.6 (-40.2, 10.8)
Trøndelag	Not enough data	-2.5 (-6.7, 1.9) %	Not enough data	-27.7 (-10, 36.1)
Vestfold og Telemark	Not enough data	-6.3 (-10.6, -1.8) %	Not enough data	-10.7 (-6.2, -38)
Vestland	Not enough data	0.2 (-2.7, 3.2) %	Not enough data	310.3 (-25.5, 21.9)
Viken	-1.2 (-9.5, 7.9) %	-2.4 (-4.8, 0.2) %	-58.4 (-6.9, 9.2)	-29 (-14, 368.6)

5 Mobility

Number of trips out from each municipality during each day is based on Telenor mobility data. The reference level is set to 100 on March 2nd 2020 for all the figures in this section, and we plot the seven-day, moving average of the daily mobility. Figure 9 shows an overview of the mobility since March 2020 for the largest municipalities in each county, and Figure 10 shows the total mobility out from all municipalities in each county, including Oslo. Figure 11 and 12, zooms in on mobility from August 16 2021, for municipalities and counties, respectively.

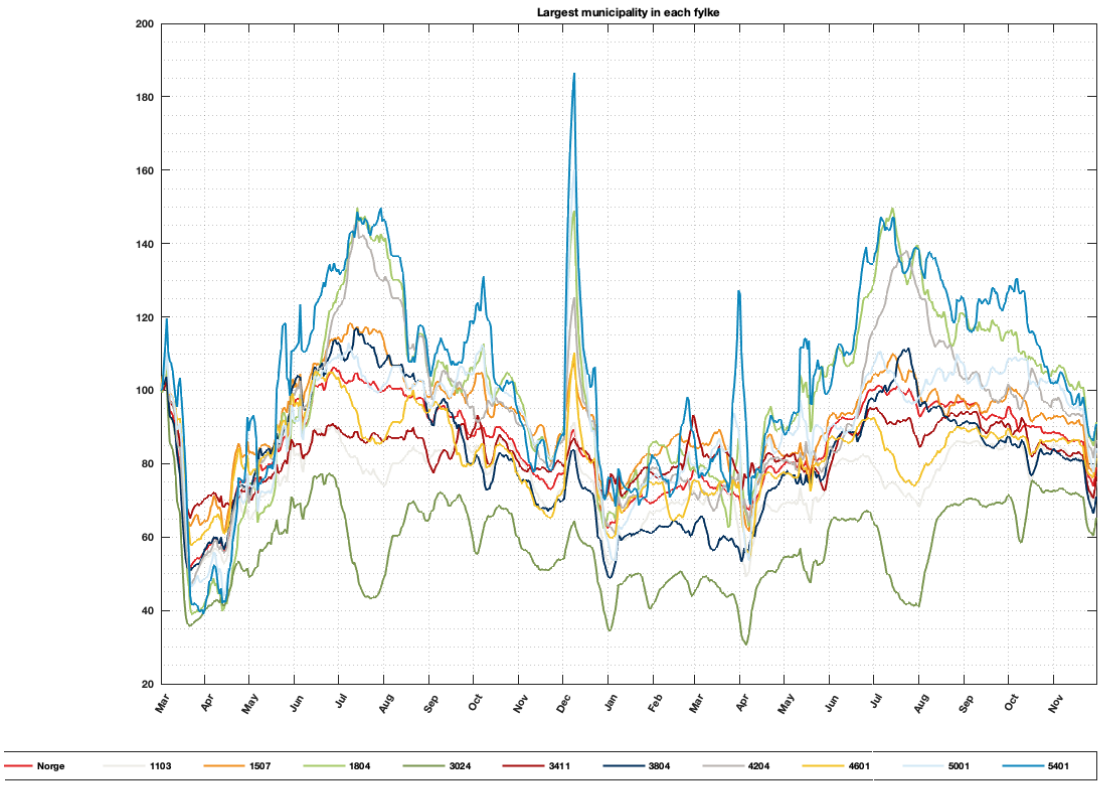


Figure 9: Mobility for selected municipalities since March 2020: Nationally (Norge), Stavanger (1103), Ålesund (1507), Bodø (1804), Bærum (3024), Ringsaker (3411), Sandefjord (3804), Kristiansand (4204), Bergen (4601), Trondheim (5001), Tromsø (5401).

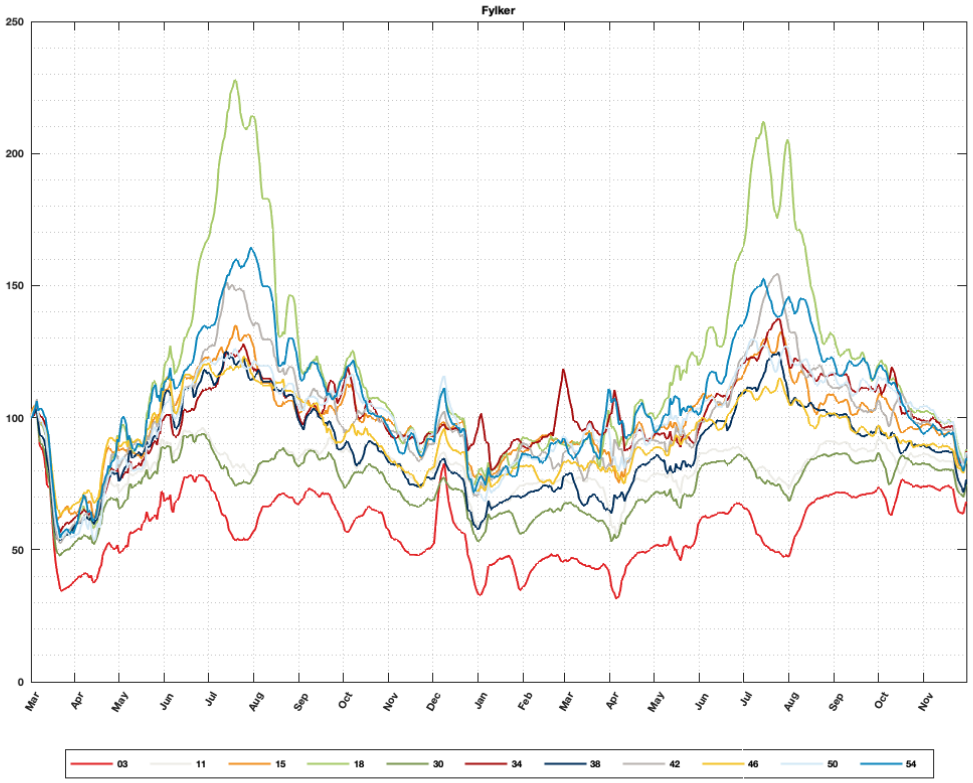


Figure 10: Mobility for fylker since March 2020: Oslo (03), Rogaland (11), Møre og Romsdal (15), Nordland (18), Viken (30), Innlandet (34), Vestfold og Telemark (38), Agder (42), Vestland (46), Trøndelag (50), Troms og Finmark (54).

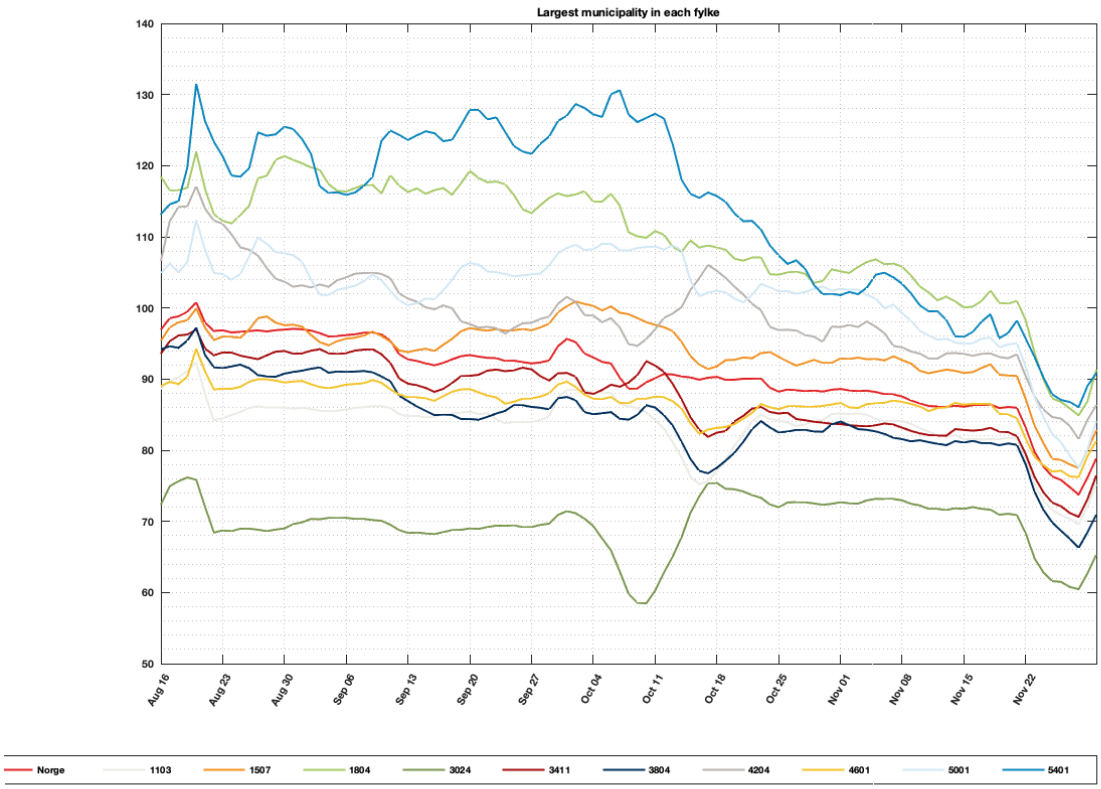


Figure 11: Zoom: Mobility from August 16, 2021 and onwards: Nationally (Norge), Stavanger (1103), Ålesund (1507), Bodø (1804), Bærum (3024), Ringsaker (3411), Sandefjord (3804), Kristiansand (4204), Bergen (4601), Trondheim (5001), Tromsø (5401).

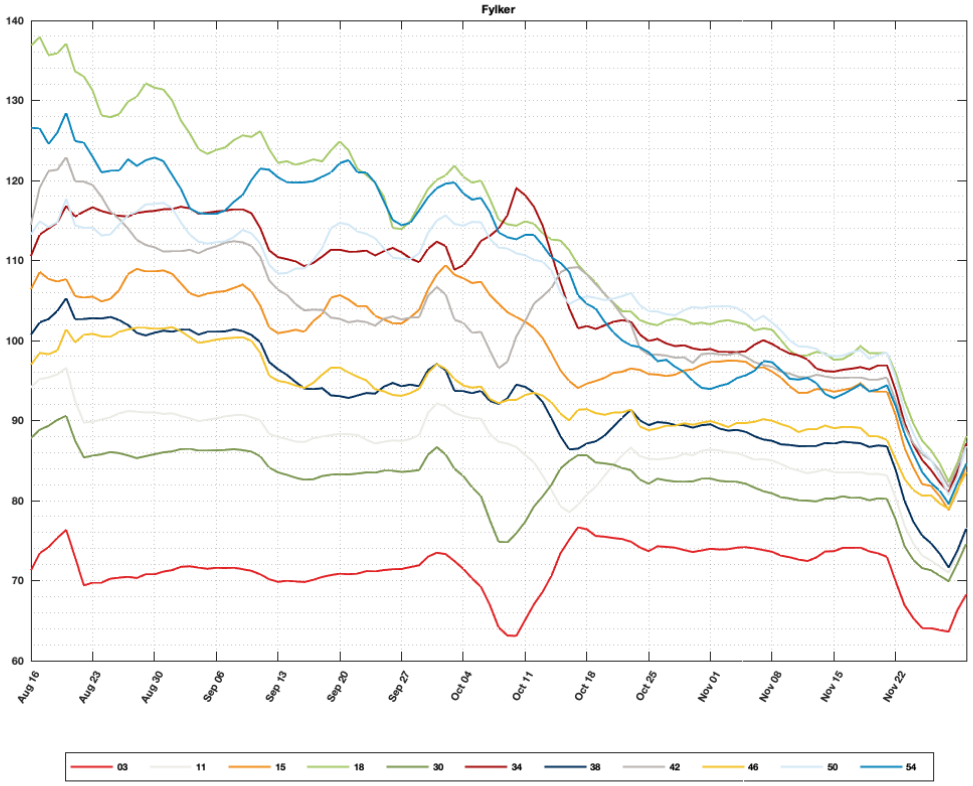


Figure 12: Zoom: Mobility from August 16, 2021 and onwards, per fylker: Oslo (03), Rogaland (11), Møre og Romsdal (15), Nordland (18), Viken (30), Innlandet (34), Vestfold og Telemark (38), Agder (42), Vestland (46), Trøndelag (50), Troms og Finnmark (54).

	45	46	47	48	49
Norge	88.6	87.5	86.1	83.2	76.2
Stavanger	85.2	84.1	81.5	78.7	72.1
Ålesund	92.9	92.7	90.9	87.2	80.0
Bodø	105.1	105.8	100.0	98.3	86.9
Bærum	72.7	72.9	71.7	68.3	62.7
Ringsaker	83.7	83.2	82.8	79.4	73.1
Sandefjord	84.0	81.5	81.1	78.0	68.5
Kristiansand	97.3	94.5	93.5	90.4	84.3
Bergen	86.7	86.8	86.4	81.6	79.1
Trondheim	102.7	99.2	94.9	91.8	80.1
Tromsø	101.8	103.4	95.9	95.7	89.0

Table 6: Municipalities

	45	46	47	48	49
Oslo	74.0	73.6	73.7	69.9	66.3
Rogaland	86.3	85.0	83.6	80.3	73.4
Møre og Romsdal	97.3	96.1	93.6	90.6	81.2
Nordland	102.0	101.4	97.6	95.9	84.7
Viken	82.8	80.9	80.2	77.6	72.2
Innlandet	98.9	99.6	96.1	93.7	83.7
Vestfold og Telemark	89.5	87.5	87.1	83.8	73.8
Agder	98.4	96.7	95.3	92.4	84.3
Vestlandet	89.9	90.0	89.0	85.1	81.4
Trøndelag	104.2	102.2	98.0	95.3	83.0
Troms og Finnmark	93.9	97.3	92.8	91.8	82.2

Table 7: Counties

Weekly mobility for Norway and selected municipalities is displayed in Table 6 and mobility for counties is displayed in Table 7. The percentages in the tables are to be interpreted towards the reference level of 100 for week 10 in March 2020. The color-coding encodes the following: 'Green' monotonic decrease in mobility, 'Yellow' almost monotonic decrease or flat mobility trend, 'Red' increasing mobility.

5.1 Foreign roamers on Telenor's network in Norway

An analysis of foreign roamers in Norway from January 2020 has been carried out, to better understand the potential virus importation. In Figure 13 the total number of roamers per day per county are displayed.

Figure 14 shows the levels of roamers from the following countries: Poland, Lithuania, Sweden, Netherlands, Denmark, Latvia, Germany, Spain, Finland and the rest of the world. These levels represent the total number of foreign, visiting roamers from each of the countries per day in Norway, since July 5 2021.

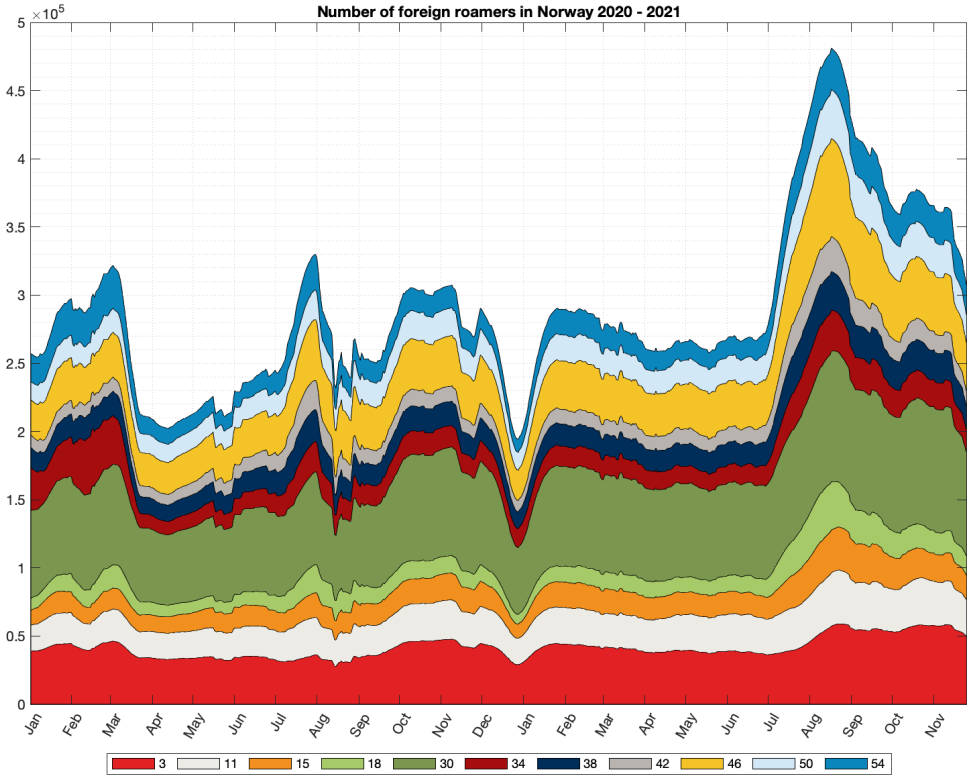


Figure 13: The total number of foreign roamers in Norway broken down on different fylker: Oslo (3), Rogaland (11), Møre og Romsdal (15), Nordland (18), Viken (30), Innlandet (34), Vestfold og Telemark (38), Agder (42), Vestland (46), Trøndelag (50), Troms og Finnmark (54).

5.1 Foreign roamers on Telenor's network in Norway

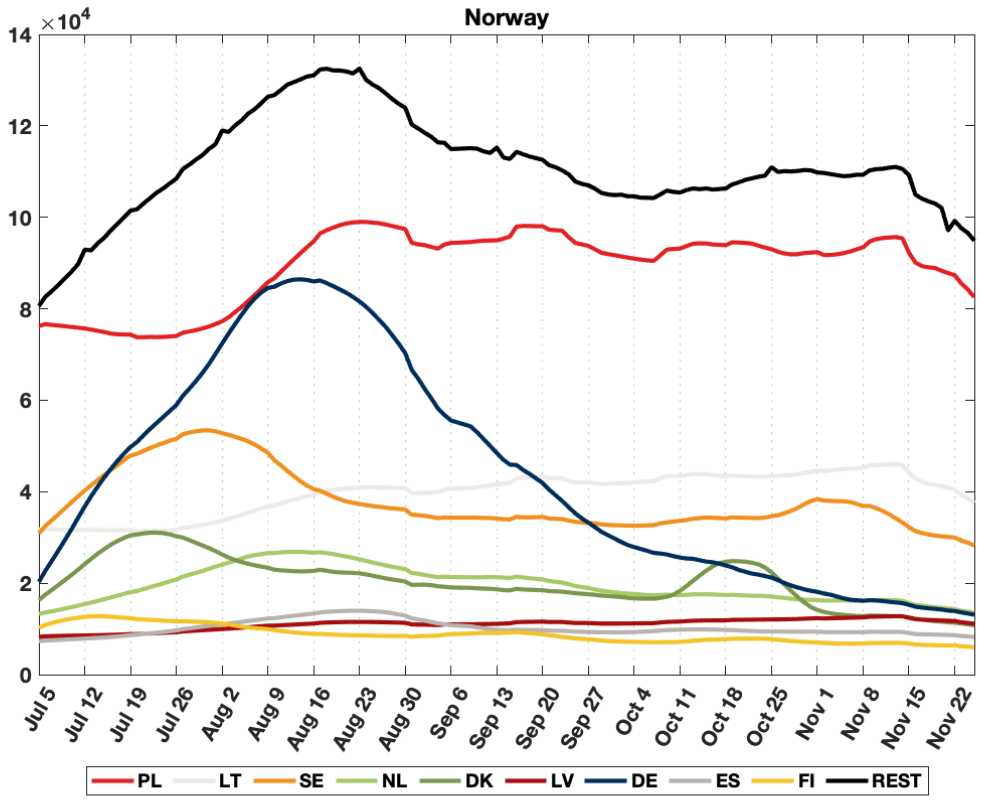
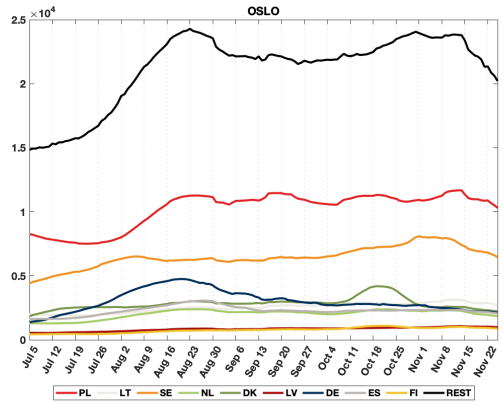
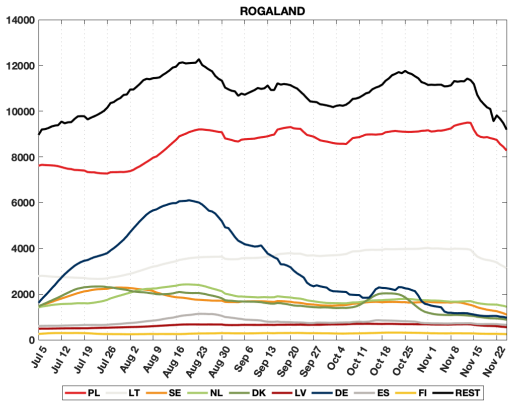
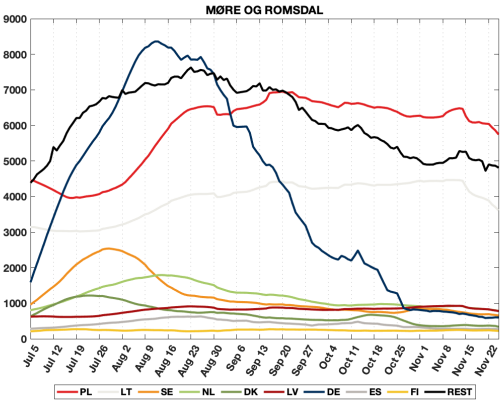


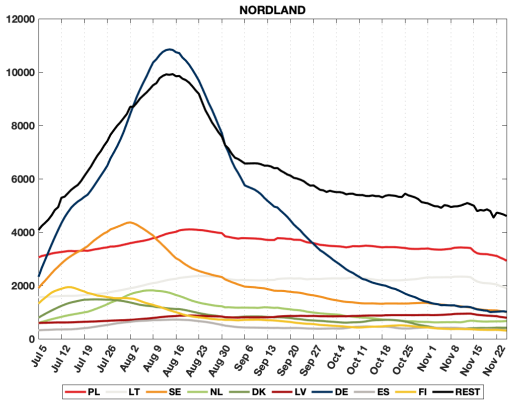
Figure 14: National overview of total number of foreign, visiting roamers from Poland, Lithuania, Sweden, Netherlands, Denmark, Latvia, Germany, Spain, Finland and the rest of the world.

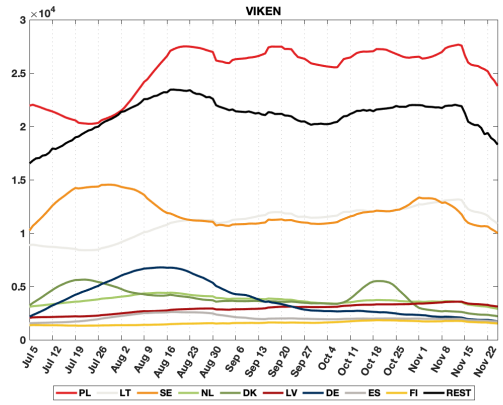
5.2 Foreign roamers per county (fylke) in Norway

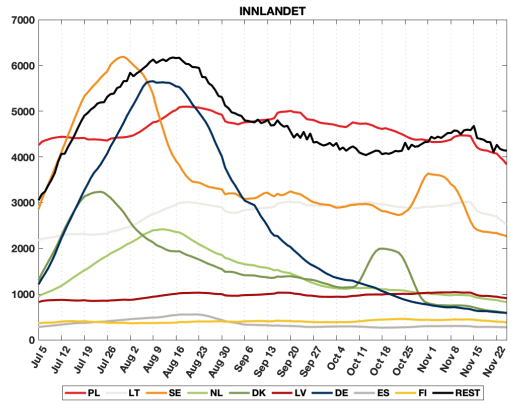




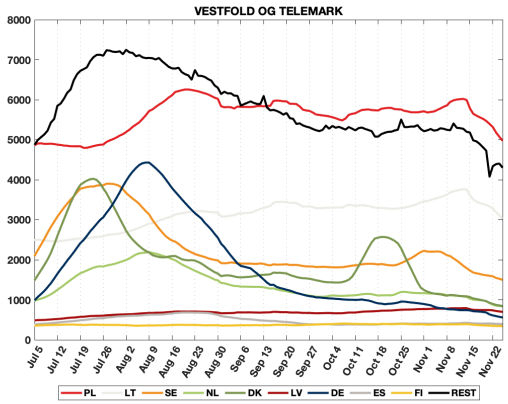


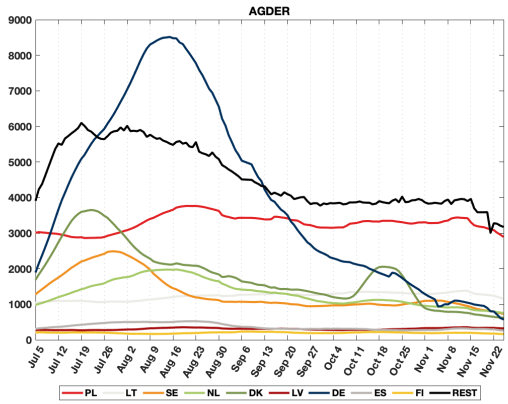


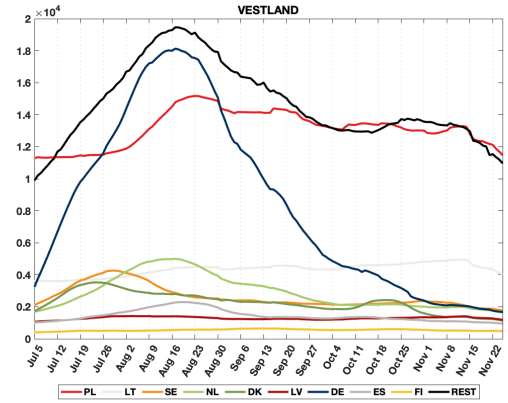


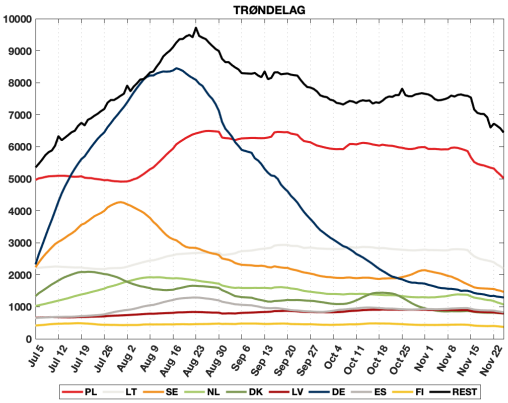


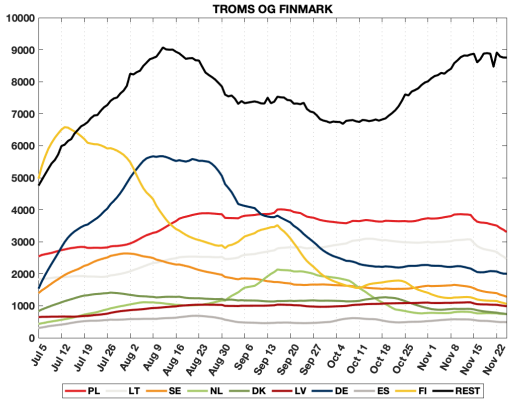
5.2 *Foreign roamers per county (fylke) in Norway*











6 Estimated parameters

Table 8: Estimated parameters

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	Period
R0s	1.737	2.298	2.482	2.472	2.658	3.057	Until March 14
R1s	0.417	0.585	0.623	0.622	0.658	0.792	From 15 March to 19 April
R2s	0.019	0.594	0.77	0.756	0.922	1.424	From 20 April to 10 May
R3s	0.078	0.678	0.841	0.823	0.96	1.445	From 11 May to 30 June
R4s	0.029	0.597	0.896	0.876	1.151	1.976	From 01 July to 31 July
R5s	0.452	0.946	1.073	1.056	1.186	1.55	From 01 August to 31 August
R6s	0.609	0.906	0.982	0.989	1.074	1.384	From 01 September to 30 September
R7s	0.861	1.076	1.158	1.152	1.228	1.514	From 01 October to 25 October
R8s	0.572	1.091	1.226	1.226	1.369	1.897	From 26 October to 04 November
R9s	0.667	0.836	0.874	0.873	0.909	1.042	From 05 November to 30 November
R10s	0.856	0.963	0.997	0.997	1.032	1.148	From 01 December to 03 January
R11s	0.418	0.734	0.808	0.812	0.899	1.096	From 04 January to 21 January
R12s	0.387	0.63	0.748	0.742	0.849	1.227	From 22 January to 07 February
R13s	0.985	1.296	1.376	1.384	1.472	1.741	From 08 February to 01 March
R14s	0.9	1.026	1.06	1.063	1.098	1.239	From 02 March to 24 March
R15s	0.641	0.769	0.813	0.813	0.852	1.033	From 25 March to 12 April
R16s	0.559	0.77	0.843	0.834	0.898	1.038	From 13 April to 05 May
R17s	0.611	0.856	0.959	0.958	1.061	1.352	From 06 May to 26 May
R18s	0.518	0.786	0.861	0.862	0.937	1.167	From 27 May to 20 June
R19s	0.696	0.86	0.909	0.906	0.952	1.095	From 21 June to 04 August
R20s	0.915	1.14	1.199	1.199	1.261	1.415	From 05 August to 31 August
R21s	0.589	0.704	0.746	0.745	0.786	0.952	From 01 September to 24 September
R22s	0.935	1.064	1.097	1.096	1.13	1.218	From 25 September to 01 November
R23s	0.869	0.982	1.022	1.024	1.067	1.26	From 02 November
AMPs	1.004	1.468	1.822	1.874	2.219	3.666	-

Table 9: Assumptions

Assumptions	Mean	Distribution	Reference
Mobile Mobility Data			
Telenor coverage	48%		https://ekomstatistikken.nkom.no/
Data updated	August 29		
Data used in the predictions	August 27th	Fixed	Corrected to preserve population
Model parameters			
Exposed period ($1/\lambda_1$)	2 days	Exponential	changed from Feretti et al 2020
Pre-symptomatic period ($1/\lambda_2$)	2 days	Exponential	Feretti et al 2020
Symptomatic infectious period ($1/\gamma$)	3 days	Exponential	changed from Feretti et al 2020
Asymptomatic, infectious period ($1/\gamma$)	3 days	Exponential	changed from Feretti et al 2020
Infectiousness asympt. (r_{I_a})	0.1	Fixed	Feretti et al 2020
Infectiousness presymp (r_{E_2})	1.3	Fixed	guided by Feretti et al 2020
Prob. asymptomatic infection (p_a)	0.4		Feretti et al 2020
Healthcare			
Fraction asymptomatic infections	40%	Fixed	Mizumoto et al 2020 20% for the old population, Diamond Princess
% symptomatic and asymptomatic infections requiring hospitalization: 0-9 years 10 - 19 years 20 - 29 years 30 - 39 years 40 - 49 years 50 - 59 years 60 - 69 years 70 - 79 years 80+ years	 0.1% 0.1% 0.5% 1.1% 1.4% 2.9% 5.8% 9.3% 22.3%	Fixed	Saljie et al 2020 corrected for: % of elderly living in elderly homes in Norway (last two age groups) and corrected for presence among positive tested since May 1.
Probability that an admission has been reported on Monday From Sunday From Saturday From Friday From Thursday	 32% 49% 68% 86%	Fixed	Estimated from "Beredskapsregistret BeredtC19"
Probability that an admission has been reported From one day before From two days before From three days before From four days before	 53% 77% 82% 91%	Fixed	Estimated from "Beredskapsregistret BeredtC19"
Probability that a positive laboratory test has been reported From one day before From two days before From three days before From four days before	 6.7% 59% 90% 97%	Fixed	Estimated from MSIS
Probability that a negative laboratory test has been reported From one day before From two days before From three days before From four days before	 16% 74% 92% 98%	Fixed	Estimated from MSIS

Supplementary analysis: EpiEstim estimation of reproduction number based on laboratory-confirmed cases

To complement the results of the metapopulation model, we present estimates of the temporal evolution of the reproduction number in Norway based on an analysis of laboratory-confirmed cases. The primary purpose of this analysis is to provide a more comprehensive perspective on the epidemic situation, taking into account several data sources.

Table 10: Estimated reproduction numbers 7 days ago

Location	Reff
National	1.13(1.1 - 1.15)
Oslo	1.16(1.12 - 1.2)
Rogaland	1.12(1.04 - 1.19)
Møre og Romsdal	1.06(0.97 - 1.17)
Nordland	0.91(0.82 - 1.01)
Viken	1.15(1.12 - 1.18)
Innlandet	1.24(1.14 - 1.35)
Vestfold og Telemark	1.25(1.17 - 1.33)
Agder	1.24(1.14 - 1.35)
Vestland	1.1(1.04 - 1.16)
Trøndelag	0.94(0.89 - 1)
Troms og Finnmark	0.79(0.73 - 0.85)

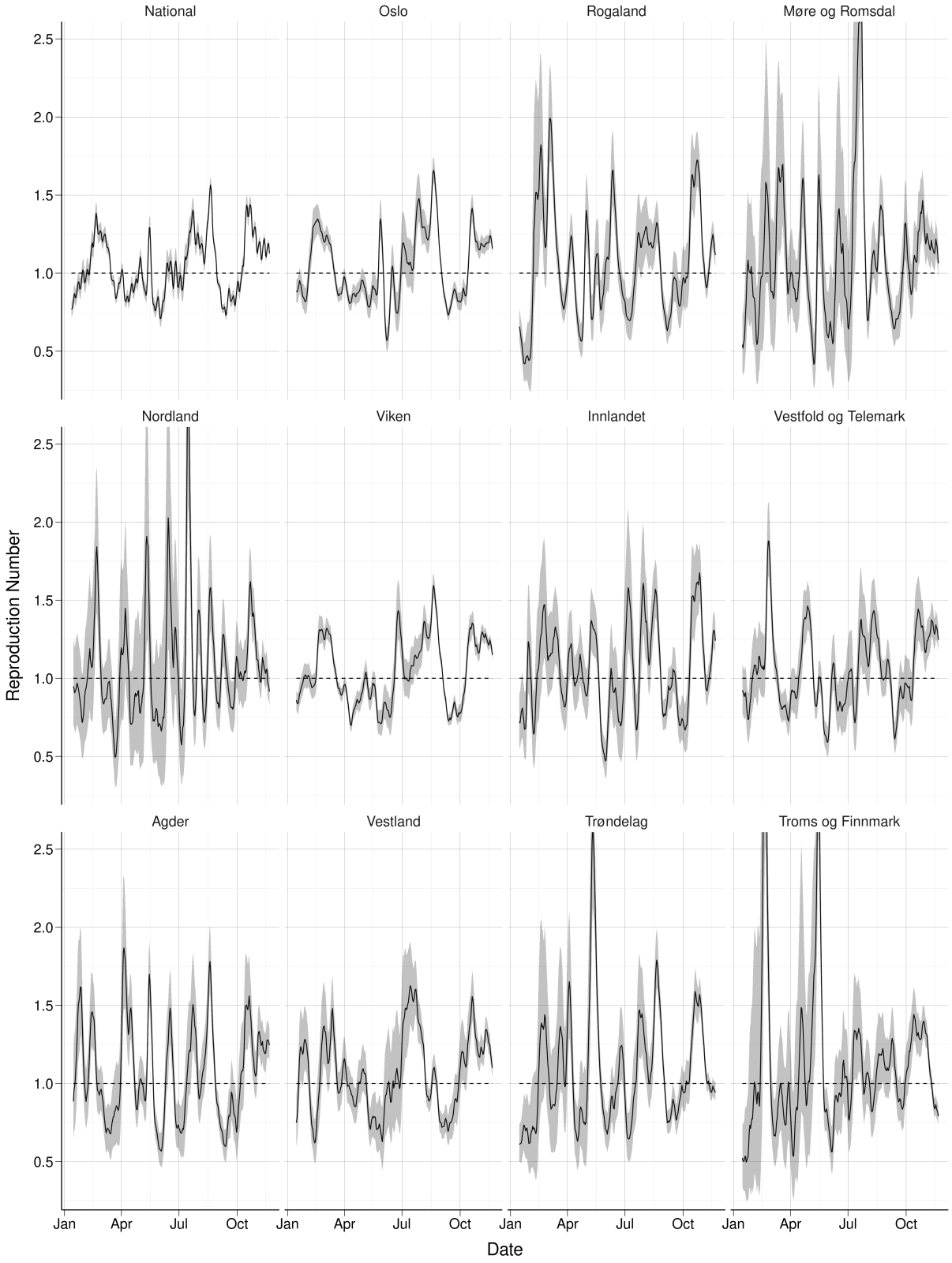


Figure 17: Reproduction number estimated using the R package EpiEstim.

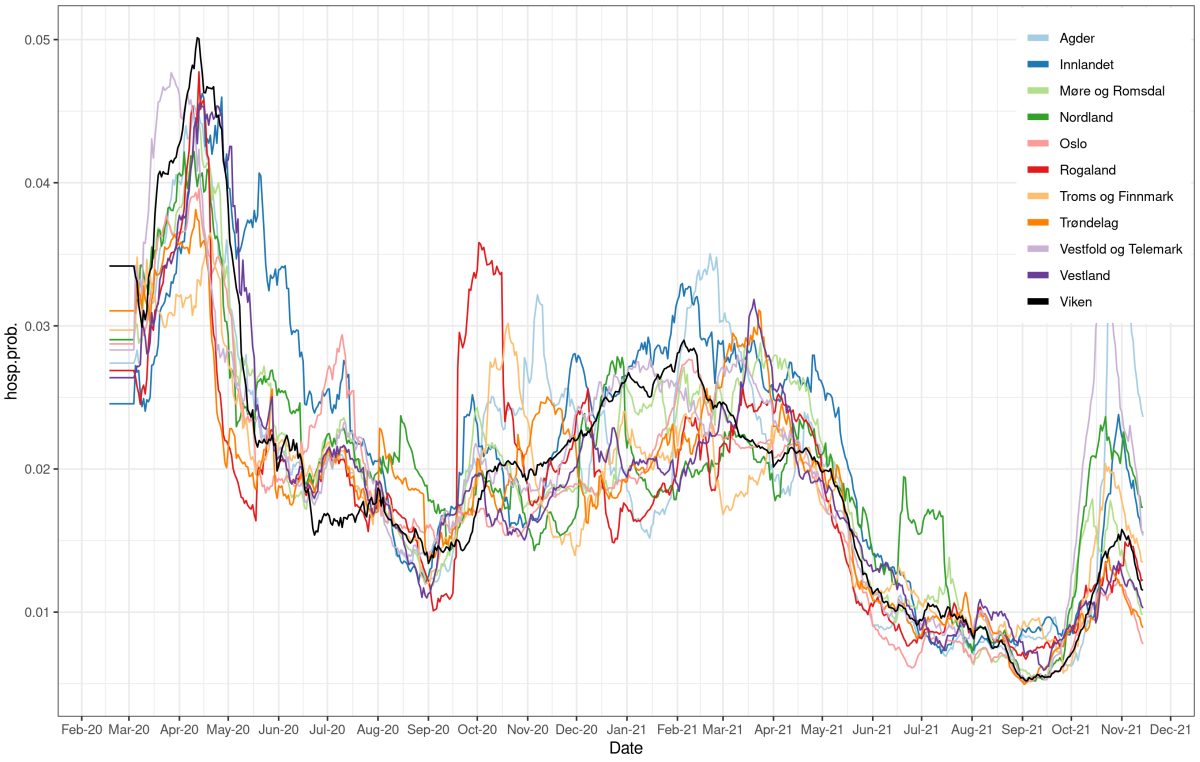


Figure 18: Regional hospitalisation probabilities per infection. The estimates are based on Salje et al., and regional data on the age distribution in the test data and the empirical case-hospitalisation rates.

Models and materials:

This report presents results based on a mathematical infectious disease model describing the geographical spread of COVID-19 in Norway. We use a metapopulation model for situational awareness and short-term forecasting and an individual-based model for long-term predictions. This report does not contain the long-term prediction results. Reproduction numbers of the metapopulation model are estimated in two ways: SMC-ABC is used to estimate a step-function in the transmissibility through prespecified changepoints, and SMC is used to estimate a daily varying reproduction number. We also provide estimates based on EpiEstim and a simple trend analysis. The models are described in previous reports and will not be explained here.

The metapopulation model takes daily varying Telenor mobility data as input. We also provide plots of the recent mobility for situational awareness.

How you should interpret the results: 3-week-ahead predictions and long-term scenarios
We provide both 3-week-ahead predictions and long-term scenarios. These are simulations of the disease spread into the future, under specific assumptions.

In the 3-week-ahead predictions, we assume that all parameters are as today, and simulate disease spread 3-weeks-ahead in time. Hence, these predictions are conditional on the current situation, and specifically on the most recently estimated reproduction number. The 3-week-ahead predictions thus do not take into account changes in transmissibility that are not yet captured by the available data, for example due to the delay between transmission and hospitalisation. Hence one of the conditions for the predictions to be valid is that the intervention policies do not change significantly in the next weeks. Hence, it does not make sense to evaluate or use the predictions if there are big changes in factors like

- new interventions
- relaxation of interventions
- a combination of new interventions and relaxations
- a significant change in vaccination coverage
- new variants with new properties
- a significant change in the contact behaviour of individuals.

As these factors are not likely to stay constant in the long-term future, we do not produce predictions for longer than three weeks ahead in time. Hence, our 3-week-ahead predictions are predictions of what may happen in the future, if there were no significant changes in the assumptions.

In addition to the short-term predictions, we also produce different long-term scenarios. Scenarios are not predictions of how we think the future pandemic will evolve. The scenarios are based on different hypothetical assumptions, and hence cannot be validated against what we later actually observe in the data. They are not meant to be, and hence should not be interpreted as, what we believe to be the most probable future outcome.

The purpose of the scenarios is manifold. Scenarios can contribute to situational awareness, and as information in decision making and future preparedness planning. Scenarios can be used to provide a better understanding of possible future disease spread, under specific assumptions. The assumptions of the scenarios may also sometimes be unrealistic. For example, scenarios can contribute in understanding the current situation, should we not change intervention policies in the future. This does however not mean that we believe that the intervention policies will stay constant. Scenarios can also be used to compare different intervention strategies, like comparing different vaccination strategies.

In this report, the term patient in ventilator treatment includes only those patients that require either invasive mechanical ventilation or ECMO (Extracorporeal membrane oxygenation).

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