Mathematical modeling and prediction of COVID-19 cases, hospitalisation (including intensive care and ventilation units) and deaths in the German states

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Summary

Aims

- The aim of this project is to develop a mechanistic mathematical model to predict COVID-19 infections including hospital bed occupancy, intensive care units (ICU), ventilation and death rates in the individual German federal states and to estimate non-pharmaceutical interventions (NPI, e.g. school closure) over time.
- The model will be used to predict the further course of infections (including hospital occupancy, ICU, ventilation, death rates) and to simulate various possible scenarios (e.g. lifting of lockdown).
- The model and the predictions will be adjusted with new data at regular intervals (every 2 weeks). New predictions for all federal states will be made available initially as a PDF report and in the medium term in web format. The website www.covid-simulator.com is intended as an online platform for the transmission of information and for the provision of an online simulator.

Results

- A modified infection model (Susceptible - Exposed - Infectious - Recovered - Death; SEIRD) has been developed and adapted to the respective situation of each federal state. The model shows an excellent descriptive characteristic of COVID-19 case numbers, occupancy of inpatient beds, intensive care beds (ventilated and non-ventilated), deaths and recoveries in all 16 German federal states.
- The influence of non-pharmaceutical interventions (NPI) on R(t) was investigated:
  - At the beginning of the infection the R(t) value in Germany lies on average at 2.78.
  - School closure, lockdown (on 23.03.2020) and a subsequent lockdown (on 01.04.2020) have a significant effect ($p<0.001$) on the reduction of R(t). Due to the close alignment of NPIs, it cannot be ruled out that the effect of another NPI is overlapped. The reproduction number R(t) decreases from the initial value of $R(t) = 2.78$ to $R(t) = 0.636$ on a national average on 01.04.2020.
  - Subsequently, in April, even slighter but statistically significant ($p<0.001$) changes of R(t) occurred. On 25.04.2020, 5 days after opening of shops (20.04.2020), state specific R(t) changes were observed.
  - On 06.05.2020 (two days after school reopening on 04.05.2020), there was a small increase of R(t) by 13% on average to 0.716. After 05.06.2020, there was a further increase of R(t) by approx. 51% from 0.716 to 1.08 on a national average with subsequent reduction of R(t) after 17.06.2020 by about 21% from 1.08 to 0.857.
  - On 12.07.2020, a new increase of R(t) by approx. 54% from 0.857 to 1.32 on average can be observed, followed by reduction of R(t) after 12.08.2020 by about 28% from 1.32 to 0.956 on a national average.

  - Following the relaxation of NPIs nationwide, a general increase in infections has been observed. The R(t) changes in June seem to depict emergence of the local "corona hotspots" in some federal states (e.g. North Rhine-Westphalia, Berlin, Brandenburg, Saxony-Anhalt) followed by containment of this local outbreaks. In the time period from July to August, however, the rising number of positively tested individuals among incoming travellers have also played an increasingly important role.
  - The current R(t) values are estimated at 0.956 on a national average and lie above 1.0 for 6 out of 16 federal states.

- Forecasts with different assumptions of R0 are presented for each federal state.
  - Assuming that the reproduction rate (R(t)) in the federal states adopts a value below 1, the bed capacity of the hospitals appears to be sufficient in all federal states.
  - If the reproduction number R(t) adopts a value around 1.2, a further increase in bed occupancy can be expected in the next six to twelve weeks in some federal states. If the R(t) value was to rise more sharply to, for example, 1.8, it would be expected that the increase would be expected earlier and steeper.
- The Robert Koch Institute (RKI) publishes regular updates on the current R0 figures in Germany and the federal states. The method of calculating the R0 number of the RKI differs significantly from our model approach. The RKI only considers new infections in the last 8 days, whereas our model considers the complete data set (extent and also other data, such as hospital stays, deceased, convalescence). Due to the short time period of the RKI data considered, their R0 value is more susceptible to changes and fluctuations in reporting and also sensitive in the range of small numbers of new infections. The R0 value of the RKI therefore fluctuates more over time compared to the R(t) value calculated by our model. Still by comparing the R0 values calculated by the RKI and our calculated R(t) values, a large agreement could be found over a long period of time (results on demand).

Changes in the document

Changes compared to the report of 27.08.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 09.09.2020. No further effect on R(t) was estimated. A further effect on the hospitalization rate was estimated (p-value < 0.001).

Changes compared to the report of 13.08.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 26.08.2020. A further effect on R(t) on 08.08 was estimated (p-value < 0.001).

Changes compared to the report of 30.07.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 12.08.2020. No further effect on R(t) was estimated.

Changes compared to the report of 16.07.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 29.07.2020.A further effect on R(t) on 08.07 was estimated (p-value < 0.001).

Changes compared to the report of 02.07.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 15.07.2020.

Changes compared to the report of 25.06.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 01.07.2020.

Changes compared to the report of 18.06.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 24.06.2020.

Changes compared to the report of 11.06.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 17.06.2020.

Changes compared to the report of 04.06.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 09.06.2020.

Changes compared to the report dated 28.05.2020

Compared to the last report, the database has been expanded and the model of new data has been estimated up to 03.06.2020.

Changes compared to the report dated 19.05.2020

The model was estimated with new data up to and including 26.05.2020.

Changes compared to the report dated 08.05.2020

To increase the model stability, some structural model optimizations were carried out. These allow a better estimation of changes in the R(t) number. The model was estimated with new data up to and including 17.05.2020.

Changes compared to the report dated 05.05.2020

Compared to the last report, the data basis has been expanded and the model of new data has been estimated up to and including 07.05.2020.

Changes compared to the report dated 24.04.2020

Compared to the last report, the database has been expanded. Inpatient hospital data from different federal states were collected and entered into the model. The new model was estimated with new data up to and including 04.05.2020.

Changes compared to the report dated 21.04.2020

The model structure of the hospital and intensive care beds was fundamentally changed. The lengths of stay of about 3000 hospitalized COVID-19 patients were calculated from existing billing data and integrated into the model. Furthermore, the mortality rates were transferred from this data and implemented in the model. In addition, the observed data of the convalesced patients were incorporated into the model. The new model was estimated with new data up to and including 23.04.2020. Due to the changed structure, some estimated model parameters have changed slightly.

Changes in comparison to the report from 15.04.2020

The model was updated with new data up to and including 20.04.2020. A German overview has been added to the report. The effect of the Easter holidays has been changed into a static effect, which starts on 02.04.2020 and is to be considered as “2nd stage of the contact ban”.

Changes compared to the report of 11.04.2020

The model was updated with new data up to and including 14.04.2020. Based on available data, the lengths of stay in hospital and ICU were adjusted and reduced for COVID patients (hospital 5-10 days, ICU 5 days). This was also necessary, as otherwise the hospital and ICU beds would be overestimated. Here, the data show a saturation. Easter holidays were detected as another effect on R0. Since the beginning of the holidays, R0 has decreased by a further ~35% and is now below 1 in all federal states (average 0.69). The other effect sizes remain unaffected by this.

Contents

1 Overview of the modeling

1.1 Question

Infections of humans with the SARS coronavirus-2 (the resulting disease is known as "COVID-19") are increasing rapidly in Germany and the world. This results in rising hospitalisation rates and also an increased occupancy of intensive care beds (ICU) as well as the use of ventilation capacities. In the course of the pandemic, various non-pharmaceutical interventions (NPI) were introduced (e.g. school closure) in order to delay the spread of the pandemic and not to exceed the stress limits of the health care system. Unfortunately, predicting the further course of infection, the workload of the health care system and the influence of NPIs on the course of the disease is a difficult task. This can only be achieved by mathematical modeling and simulation. Several epidemiological models already exist to predict the course of COVID-19. However, these are either not adapted to the German situation, but often to the USA or UK, or, if models exist for Germany, they do not take into account any characteristics specific to the federal states. Furthermore, to the best of our knowledge, effects of NPIs have only been assumed, but never estimated.

1.2 Objectives

- The aim of this project is to develop a mechanistic mathematical model to predict COVID-19 infections including hospital bed occupancy, intensive care units (ICU), ventilation and death rates in the individual German states and to estimate non-pharmaceutical interventions (NPI, e.g. school closure) over time.
- The model will be used to predict the further course of infections (including hospital occupancy, ICU, ventilation, death rates) and to simulate various possible scenarios (e.g. lifting of lockdown).
- The model and the predictions will be adjusted with new data at regular intervals (every 2 weeks). New predictions for all federal states will be made available initially as a PDF report and in the medium term in web format. The website www.covid-simulator.com is intended to be and online platform for the transmission of information and for the provision of an online simulator.

1.3 Target group

- The model is intended to help authorities, politicians and the health care system to better estimate the course of the current SARS coronavirus-2 pandemic in the short and medium term and to plan capacities. Furthermore, the influence of NPIs (e.g. lockdown) can be estimated by these groups of people, either justifying them or justifying their lifting.
- On the other hand, the model presented can be used to illustrate to the population the influence of interventions on the course of infection, thereby encouraging them to abide the NPIs.

1.4 Methods

- The following data sources serve as a basis:
  - Database Berliner Morgenpost: (www.morgenpost.de)
    - Data sources from the Morgenpost: Johns Hopkins University CSSE (international data from WHO, CDC (USA), ECDC (Europe), NHC, DXY (China) and reports from the German authorities (Robert Koch Institute and district and state health authorities)
  - MetaKIS: Documentation of anonymized billing data from more than 250 hospitals throughout Germany
  - Information from the Saarland and other health ministries
  - Results of literature search on intervention measures in the federal states
  - DIVI Intensive Care Register

- The modeling is done using the Non-Linear Mixed Effects (NLME) approach and is performed in the software NONMEM® (Version 7.4.3)
- Statistical analysis, graphical display and report generation were performed with R® (version 3.6.3) and R-Studio® (version 1.2.5033)
- An approved ethics application of the ethics committee of the medical association of the Saarland has been submitted
- A detailed description of the model structure and the parameterization will be available in the forthcoming publication

1.5 Model structure

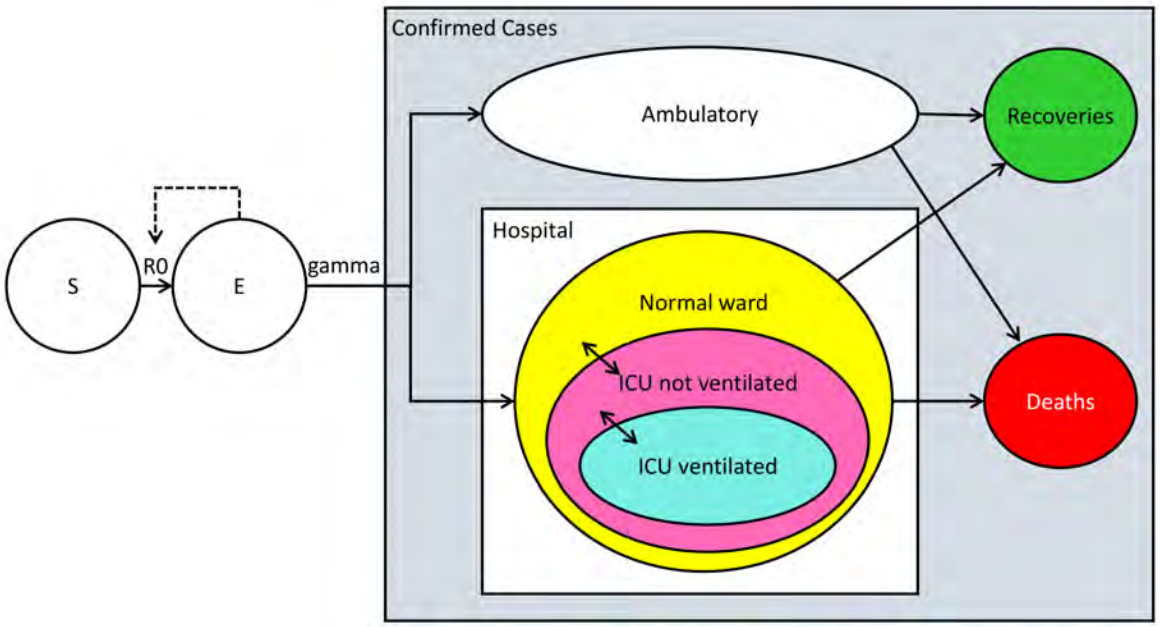
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected, can be infectious, but are not yet identified as infected, *Stage I:* Infected people, *Stage R:* Cured people.

The more advanced SEIR/D model describes more complex relationships. In addition to the stages S, E and R, a distinction is made for infected people between *stage C:* Infected people who remain outpatients, *stage CH:* Infected in hospital, *stage ICU:* Infected in intensive care unit and *stage ICU ventilated:* Infected people requiring mechanical ventilation. In addition, the model was extended to include *stage D:* Infected people who have died. Likewise to stage C, *stage R* was divided into *stage KH R:* patients recovered during the hospital stay, and *stage R:* people recovered outside the hospital.

People from *stage E* infect people from *stage S*. The factor *R0 or R(t) (basic reproduction number)* indicates how many people from stage S are infected on average by a single person from stage E. Infected people in stage E are only identified as infected after a certain time (*gamma*) and thus reach stage C (C: Cases = confirmed cases). Infected persons (C) can either be recovered on an outpatient basis (R) or admitted to hospital

as inpatients (KH). Inpatients can recover in hospital (KH R), die in hospital (D: Death) or be transferred to intensive care (ICU). Infected patients in intensive care units (ICU) can also recover (KH R), die (D) or require mechanical ventilation (ICU ventilated).

The model structure with the different stages and their transitions is shown in Fig.1. The given data (duration of hospitalization, percentage of patients, ventilation, etc.) are taken from hospital data of more than 3000 German COVID-19 patients from more than 250 hospitals, which were derived anonymously from the MetaKIS system.



	Distribution [%]		Ratio [%]	Duration [days]	ICU [% Duration]	Ventilation [% Duration]
Normal ward	80.1	recovered	84.5	12	-	-
		deceased	15.5	8.8	-	-
ICU not ventilated	5.0	recovered	79.6	19	34	-
		deceased	20.4	13	57	-
ICU ventilated	14.9	recovered	48.6	35	75	49
		deceased	51.4	13	88	76

Figure 1: SEIR/D Model - Model structure

1.6 Model results

1.6.1 Description of the data

Using the SEIR/D model developed in Section 1.5 Model Structure, the COVID-19 case numbers for infections, hospital bed occupancy (acute and cumulative hospital beds), ICU occupancy (acute and cumulative), recovery and deaths can be described in the Federal Republic of Germany and separately for each federal state.

Fig. 2 shows the model description of the case numbers (line) and the reported case numbers (dots) for each federal state over time for infection numbers (blue), recovery numbers (green), deaths (red), occupied hospital beds acute and cumulative (magenta), occupied ICU beds acute (yellow) and cumulative (orange), and number of ventilated intensive care patients (cyan).

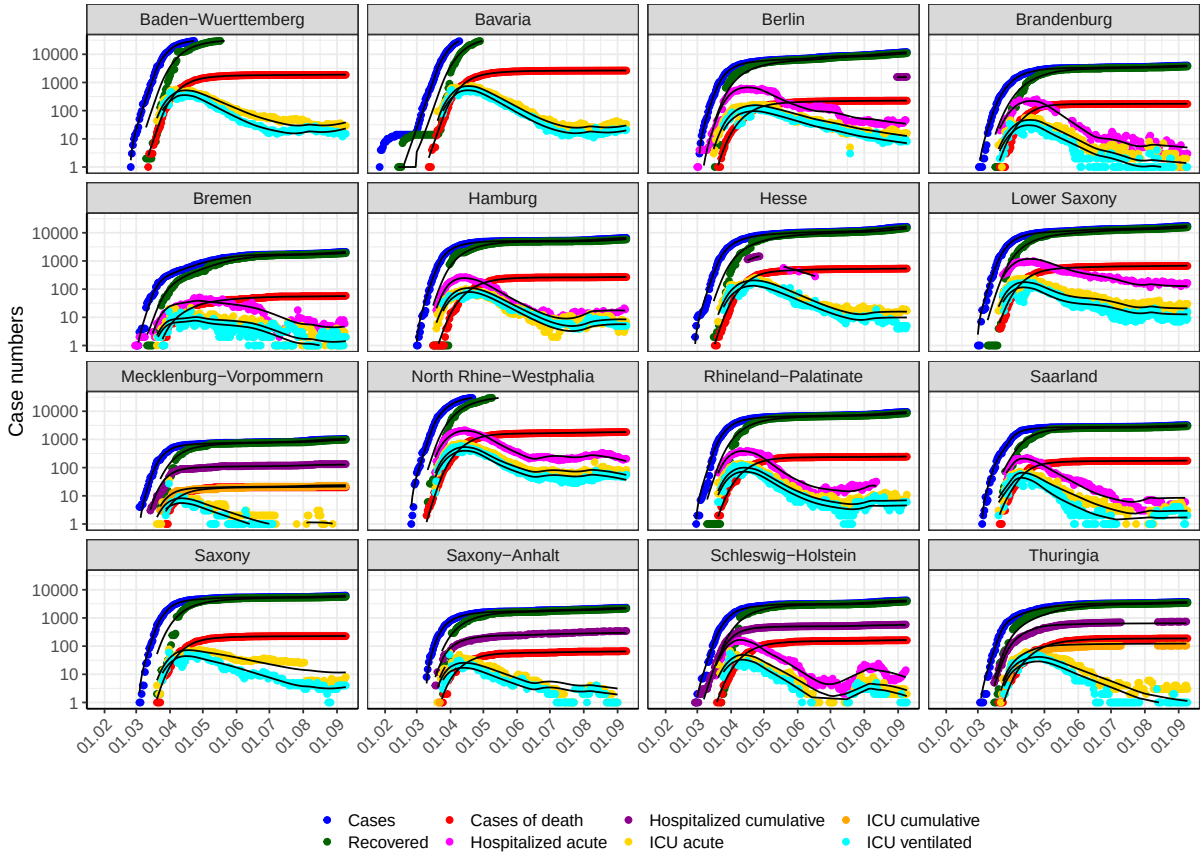


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

Fig. 3 and 4 show the model description of the infection numbers (line) and the reported infection numbers (points) for each state over time in linear (3) and semi-logarithmic (4) representation.

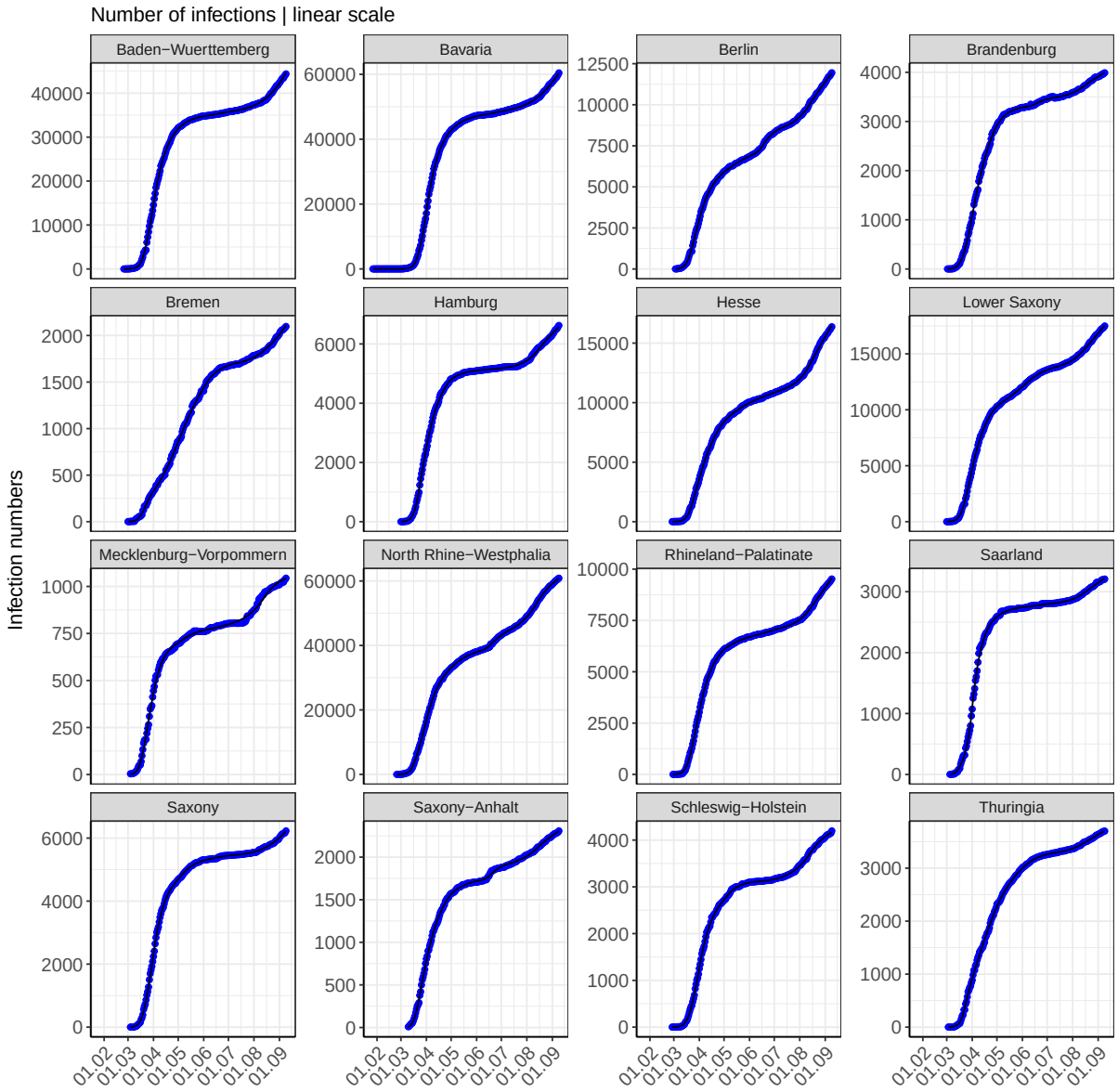


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

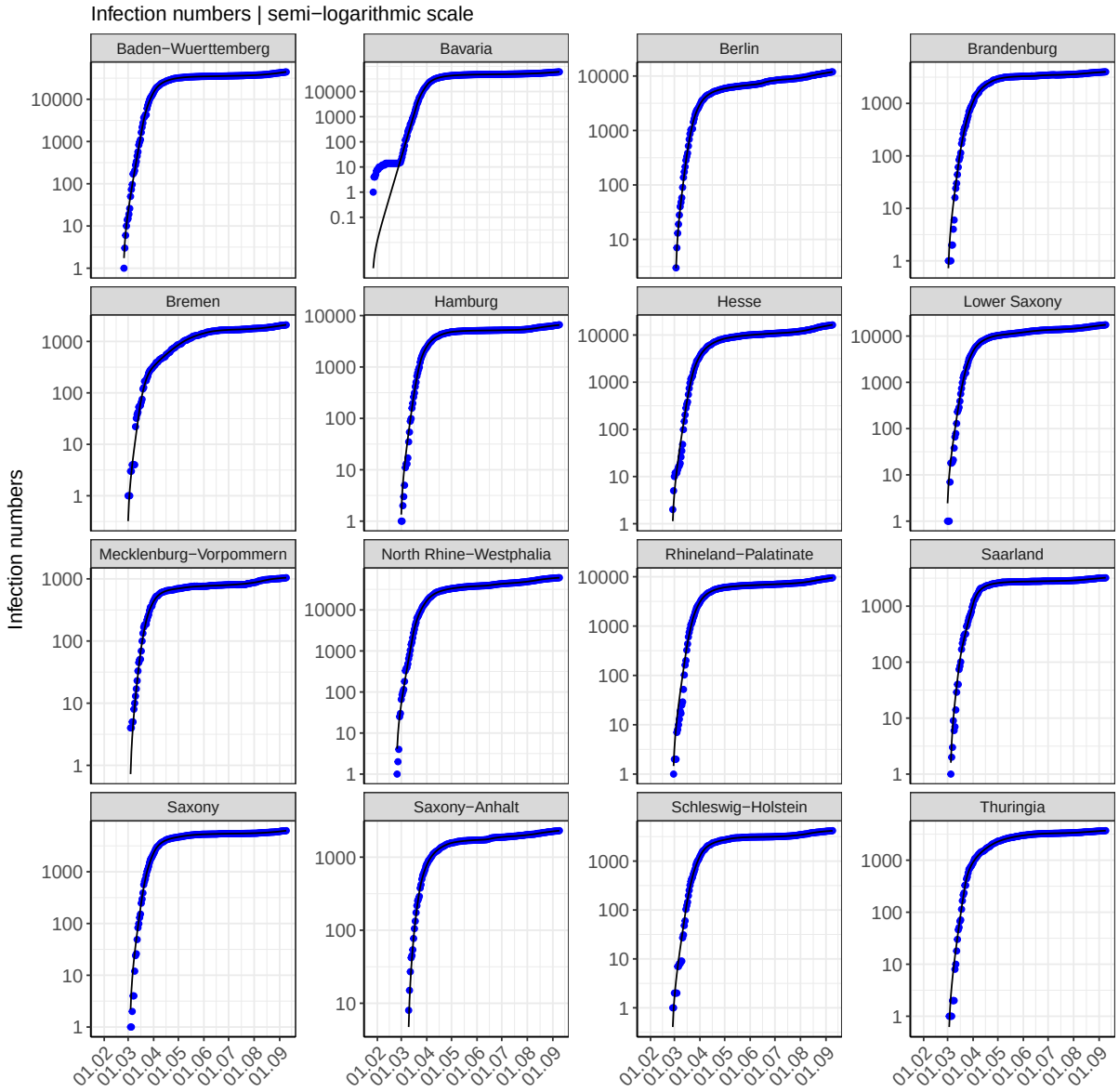


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

Fig. 5 shows the model description of the occupied beds and ventilated patients (line) and the reported occupancy of the hospital and ICU beds and ventilated patients (dots) for each federal state over time. The occupancy of the hospital and ICU beds is shown acutely and/or cumulatively.

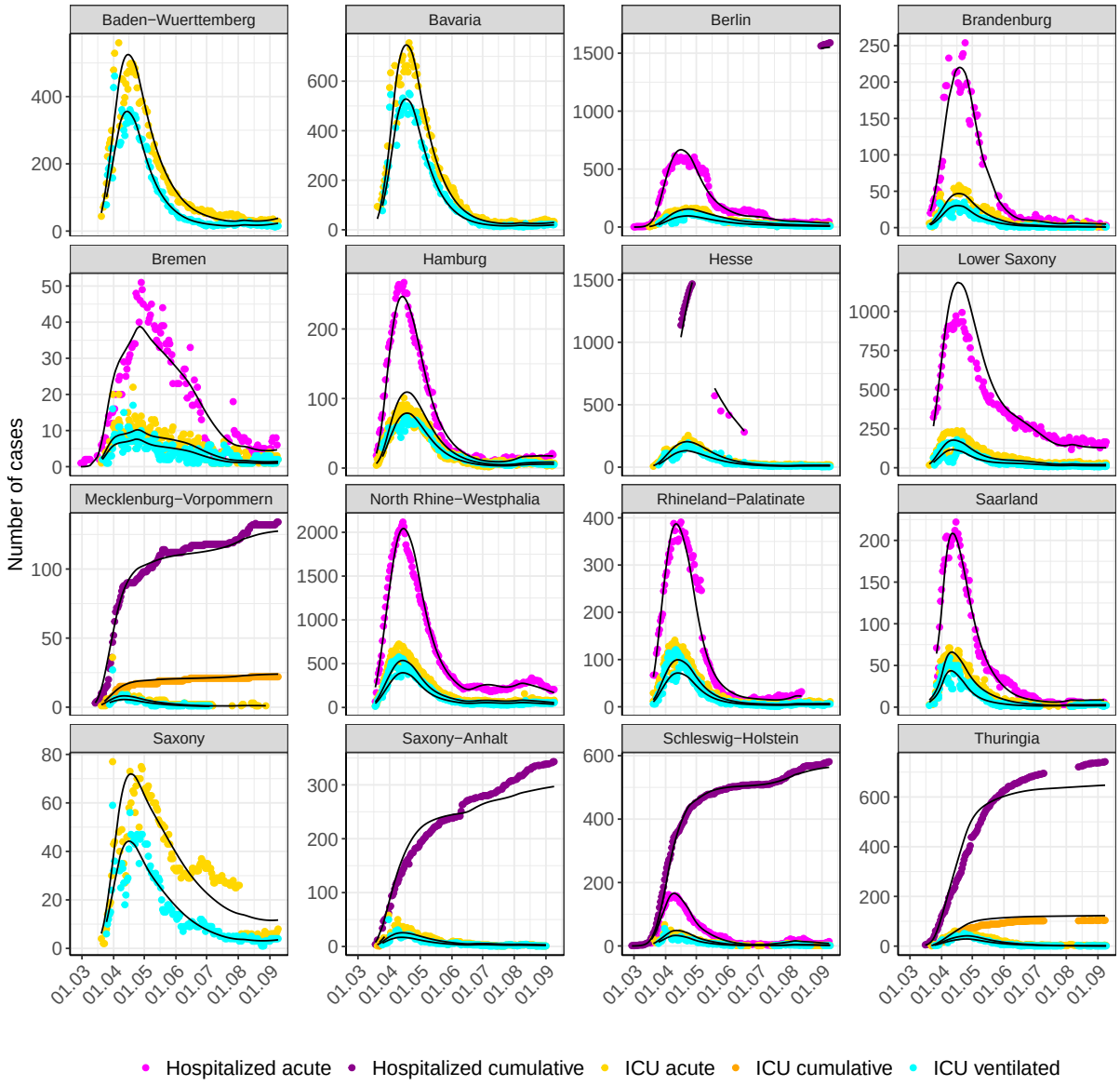


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

Fig. 6 shows the model description of the patients recovered from COVID-19 (line) as well as the reported cases of recovered patients (points) for each federal state over time.

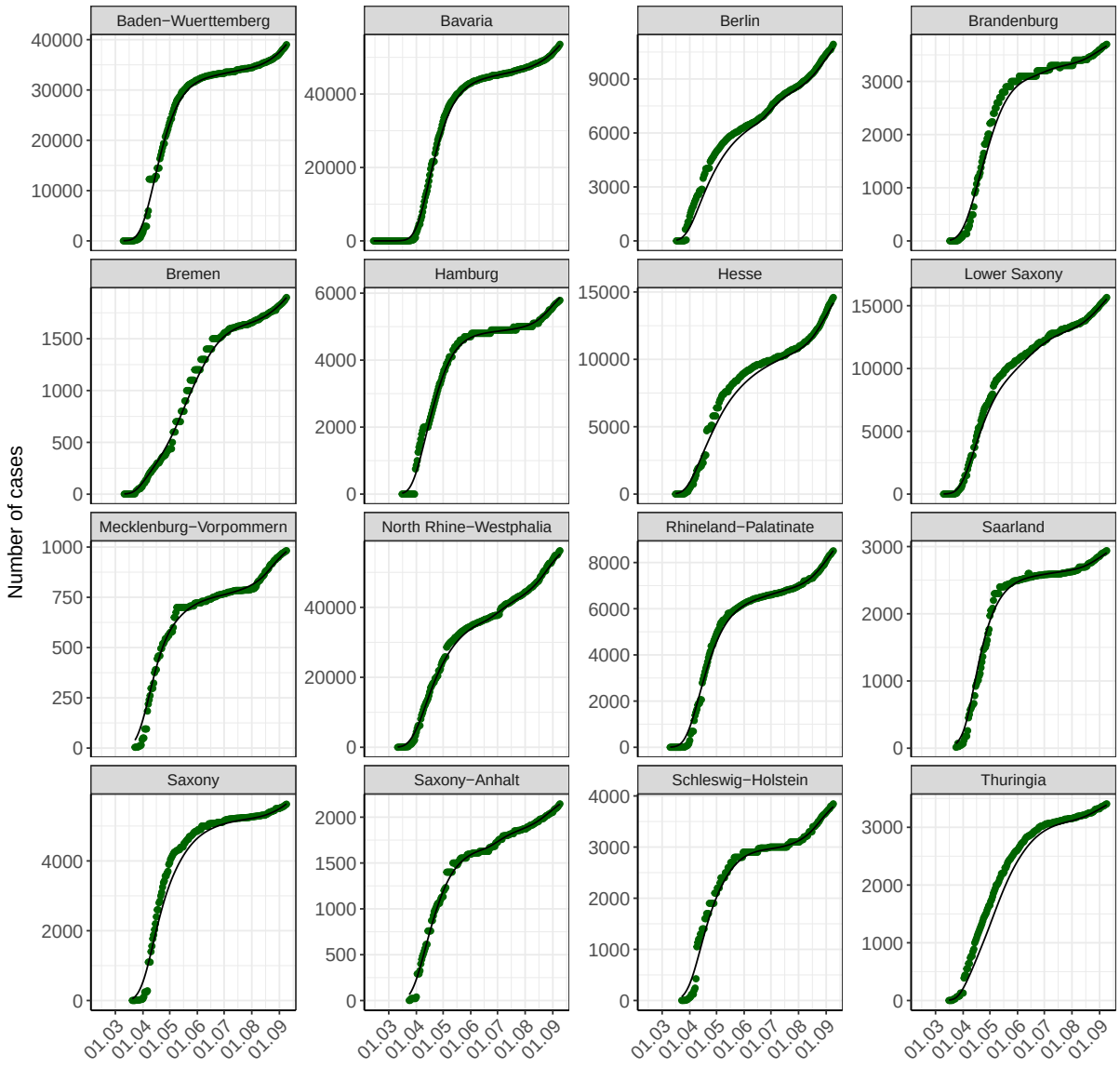


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

Fig. 7 shows the model description of the patients who died of COVID-19 (line) and the reported death numbers (points) for each state over time.

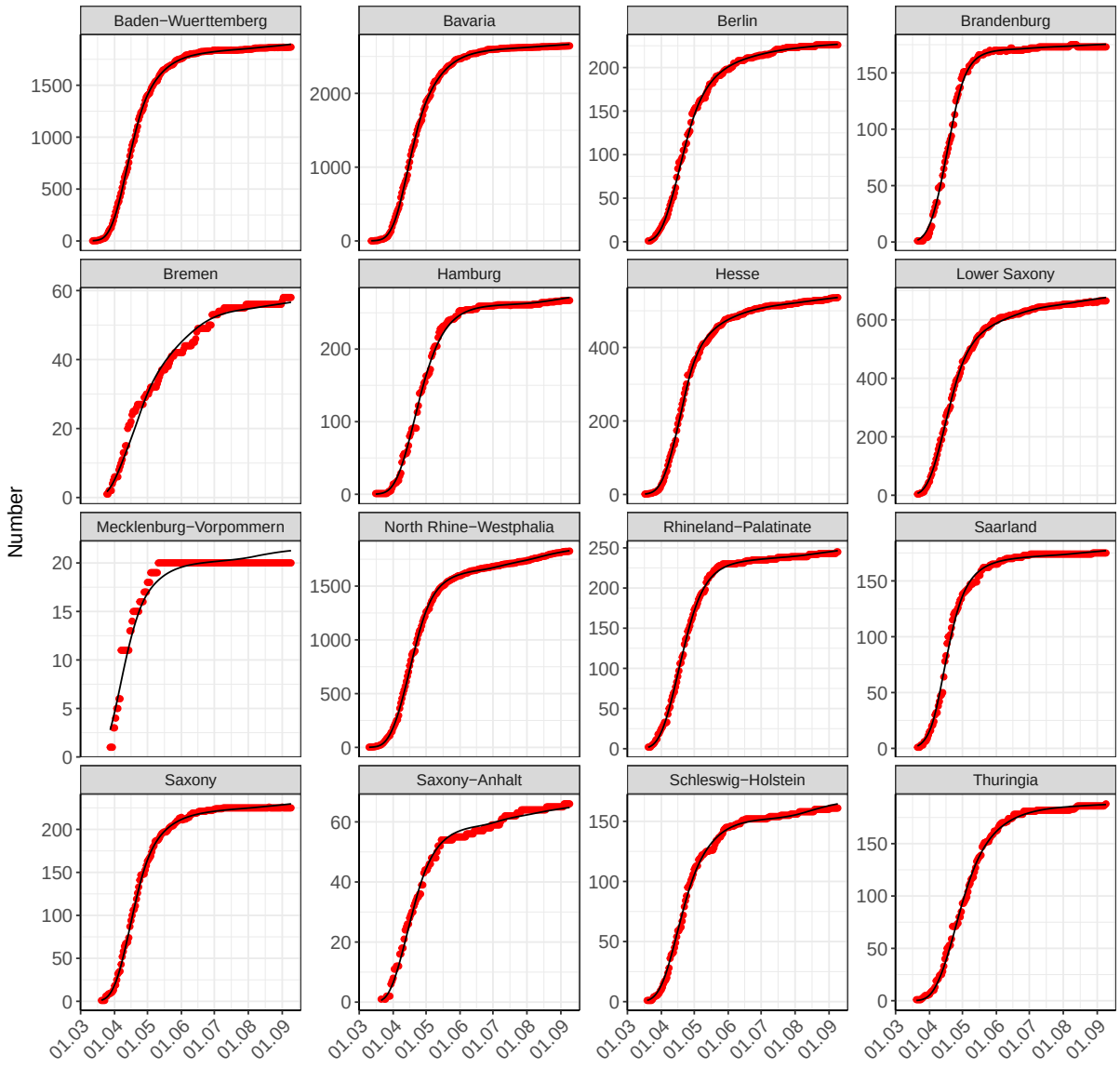


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

Fig. 8 shows a goodness-of-fit (GOF) plot, the graphical representation of the goodness-of-fit of the model. The values calculated by the model are plotted against the raw data. If the pairs of values were 100% identical, all data points would be located on the identity line. The points are distributed evenly around the identity line. This reflects the good descriptive performance of the model.

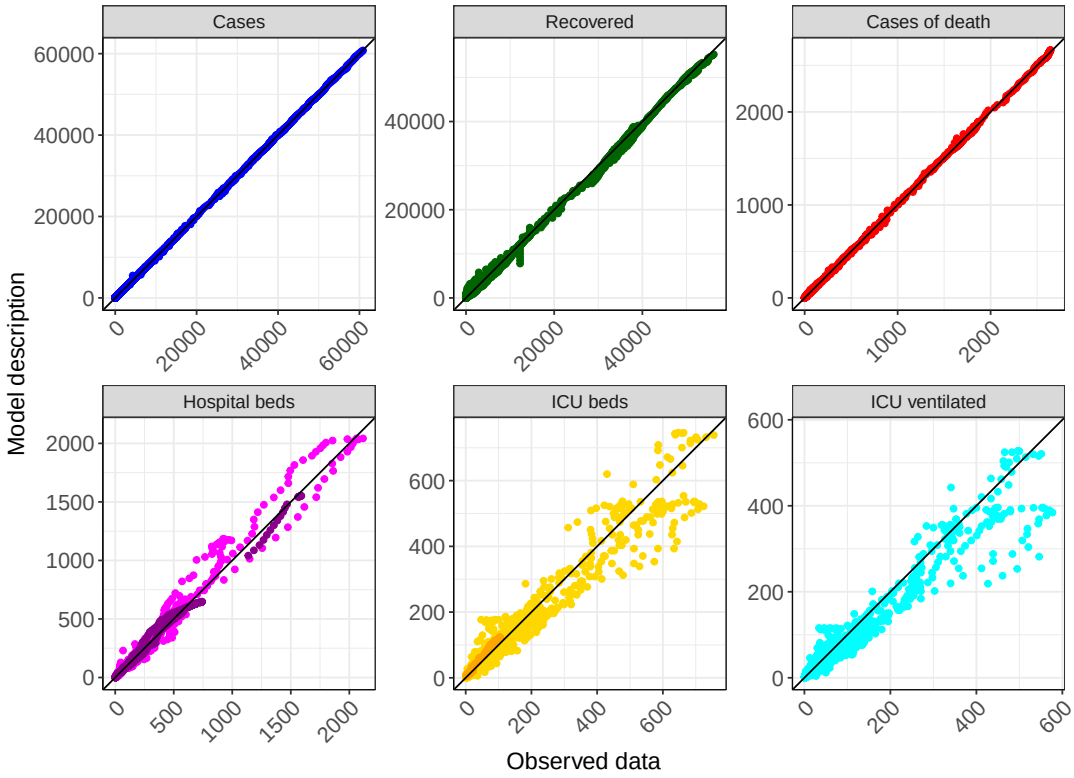


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

1.6.2 Influence of non-pharmaceutical interventions (NPI) and other structural changes

The influences of NPIs and other events were systematically investigated and incorporated into the model. Investigations of influencing factors on R(t) revealed the following statistically significant effects: school closure, lockdown, a "2nd stage" of the lockdown since 01.04.2020 and changes on 25.04.2020, 06.05.2020, 05.06.2020, 17.06.2020, 12.07.2020 and 12.08.2020. The effects vary slightly in each federal state (see Table 1, figures [9] and [10]), while the exact causes are not clear. It can be assumed that the geographical situation of the federal states ("rural" states vs. "urban" states, border region, mentality) as well as local policies play a role. Two days after the school reopening on 04.05.2020, the R(t) value increased by approx. 13% to 0.716 on a national average. In general, the safety measures taken appear to have been effective in keeping R(t) at a stable level below 1, with the exception of the federal states with known "corona hotspots". Since the beginning of the easing of the NPIs and especially since the beginning of the current holiday season (high incidence among incoming travellers) a new increase of the R(t) value has been observed. In addition, smaller local outbreaks are also playing an increasingly important role. The factors influencing R(t) are listed in detail below:

- School closures: Reduction of R(t) on average by approx. 31% from 2.78 to 1.92 (p-value < 0.001)
- Lockdown (on 23.03.2020): Further reduction of R(t) on average by approx. 43% from 1.92 to 1.1 (p-value < 0.001)
- "2nd stage" of the lockdown (on 01.04.2020): Further reduction R(t) on average by approx. 42% from 1.1 to 0.636 (p-value < 0.001)
- From 06.05.2020: A slight increase of R(t) by about 13% to 0.716 (p-value < 0.001).
- From 05.06.2020: A further increase of R(t) by approx. 51% from 0.716 to 1.08 (p-value < 0.001).
- From 17.06.2020: Reduction of R(t) by approx. 21% from 1.08 to 0.857 (p-value $<$ 0.001).
- From 12.07.2020: A new increase of R(t) by approx. 54% from 0.857 to 1.32 (p-value < 0.001).
- From 12.08.2020: Reduction of R(t) by approx. 28% from 1.32 to 0.956 (p-value $<$ 0.001).

Table 1 lists the R(t) values after the introduction of the individual NPIs for each federal state. The values for Germany may differ slightly in this table due to different calculation methods.

Table 1: R(t) value before and after the NPIs

Federal state	Initial value	School closures	Lockdown	From 01.04.	From 25.04.	From 06.05.	From 05.06.	From 17.06.	From 12.07.	From 12.08.
Baden-Wuerttemberg	2.78	1.72	1.31	0.58	0.56	0.60	1.23	0.97	1.33	1.24
Bavaria	2.78	2.77	1.52	0.57	0.57	0.66	1.04	1.04	1.28	1.20
Berlin	2.78	1.98	1.02	0.62	0.78	0.90	1.78	0.61	1.30	0.94
Brandenburg	2.78	1.91	1.39	0.78	0.44	0.53	1.78	0.65	1.34	0.92
Bremen	2.78	1.46	0.70	1.13	1.04	0.88	0.55	0.66	1.31	1.15
Hamburg	2.78	2.15	0.93	0.65	0.30	0.59	0.92	1.26	1.41	0.93
Hesse	2.78	2.09	1.08	0.77	0.61	0.85	0.91	0.97	1.37	0.97
Mecklenburg-Vorpommern	2.78	1.67	0.93	0.42	1.03	0.71	1.01	1.19	1.29	0.66
Lower Saxony	2.78	2.05	1.18	0.66	0.50	1.07	0.84	0.74	1.32	1.02
North Rhine-Westphalia	2.78	1.38	1.13	0.66	0.75	0.76	1.76	0.82	1.26	0.77
Rhineland-Palatinate	2.78	1.90	1.07	0.62	0.51	0.80	1.09	0.98	1.36	1.01
Saarland	2.78	1.51	1.83	0.41	0.52	0.59	1.23	0.97	1.38	1.00
Saxony	2.78	1.94	1.26	0.51	0.95	0.63	0.85	0.82	1.36	1.22
Saxony-Anhalt	2.78	2.00	0.94	0.69	0.47	0.69	2.04	0.63	1.27	0.88
Schleswig-Holstein	2.78	1.94	1.29	0.59	0.92	0.50	0.78	1.40	1.30	0.73
Thuringia	2.78	2.51	0.80	0.93	0.78	0.81	0.69	0.65	1.32	0.97
Germany	2.78	2.19	1.29	0.62	0.64	0.76	1.35	0.87	1.29	1.02

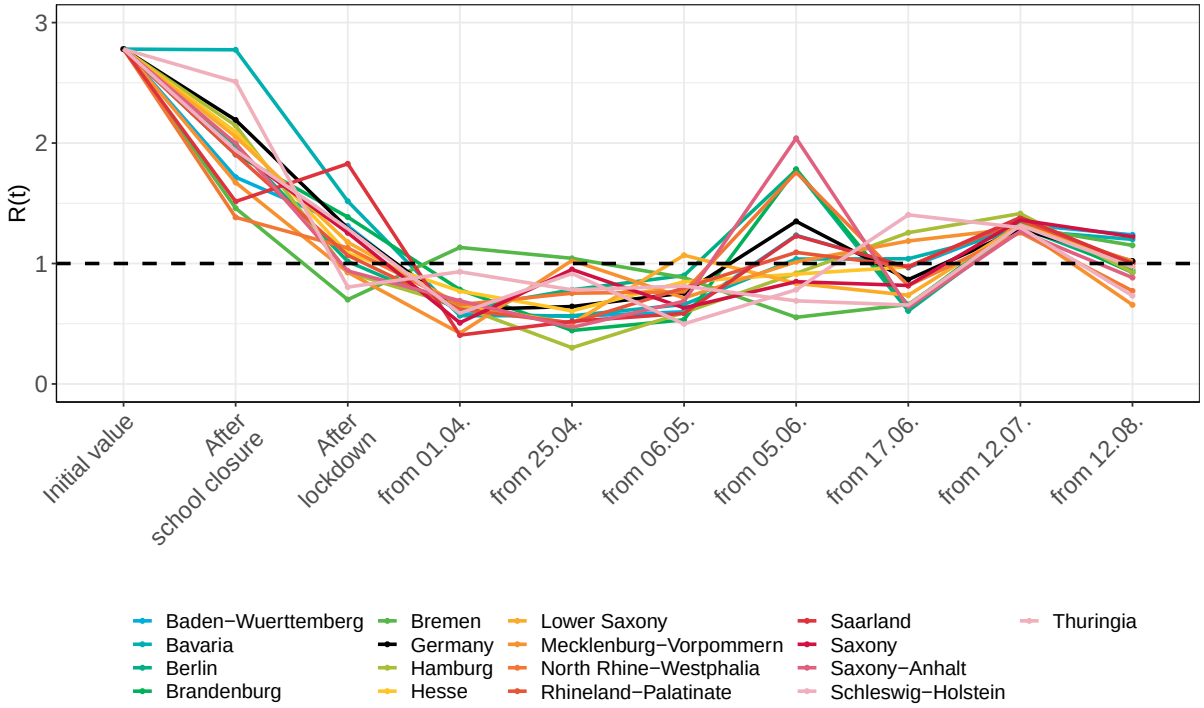


Figure 9: R(t) distribution before and after NPIs

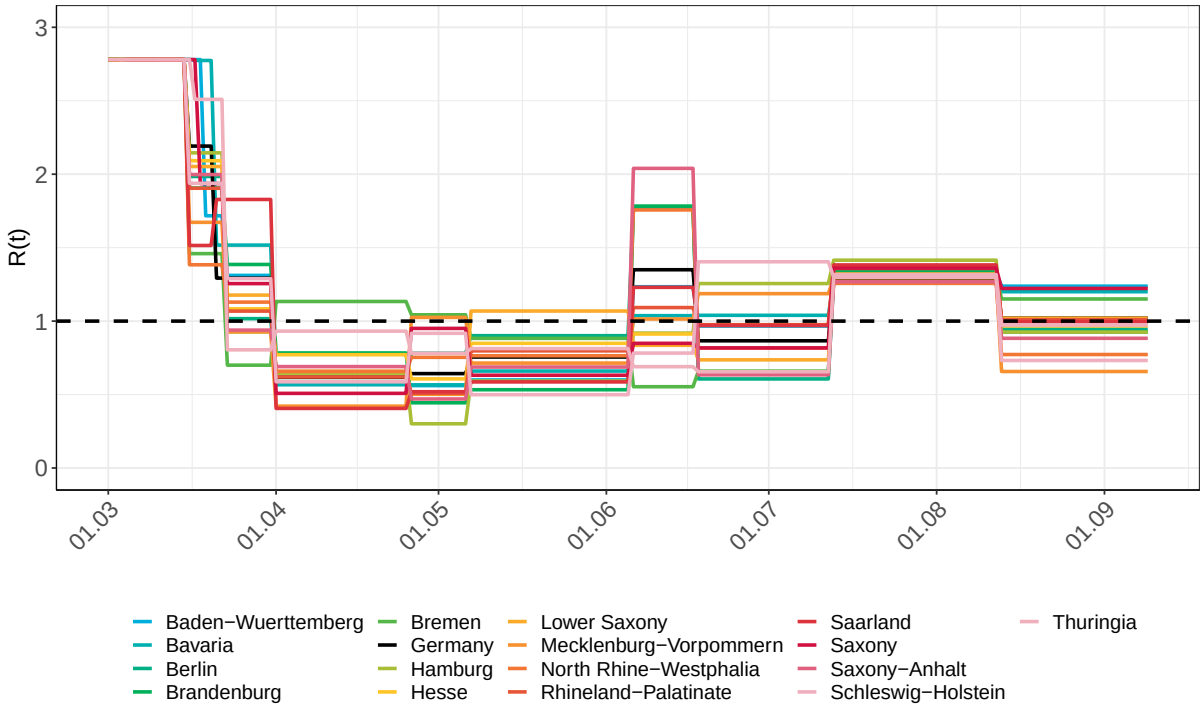


Figure 10: R(t) over time

2 Baden-Wuerttemberg

2.1 Model description

Fig. 11 depicts the results of the modeling (lines) compared to the observed data (points) for Baden-Wuerttemberg on a linear (A) and semi-logarithmic (B) scale.

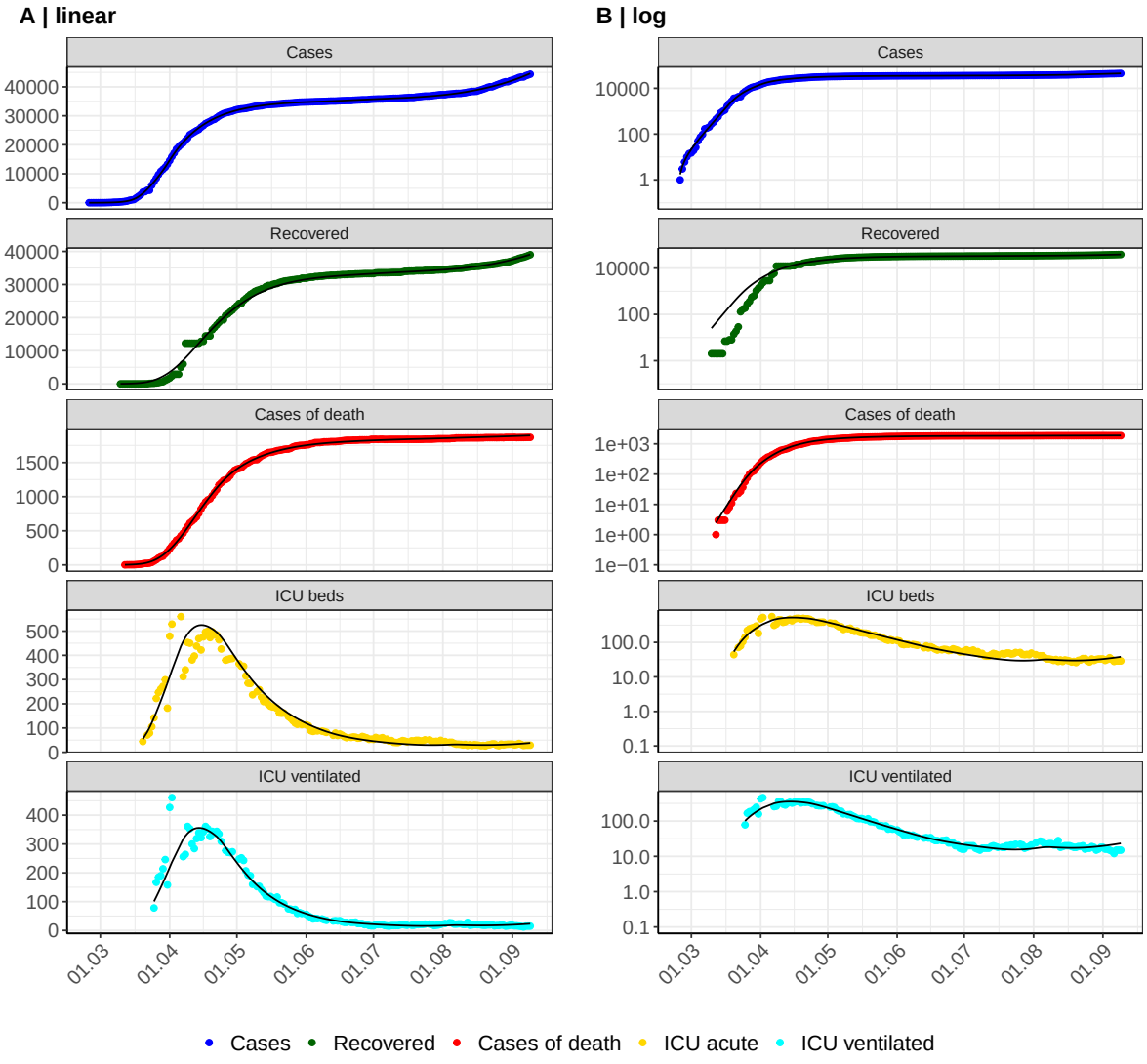


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

Fig. 12 shows the goodness-of-fit for Baden-Wuerttemberg. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

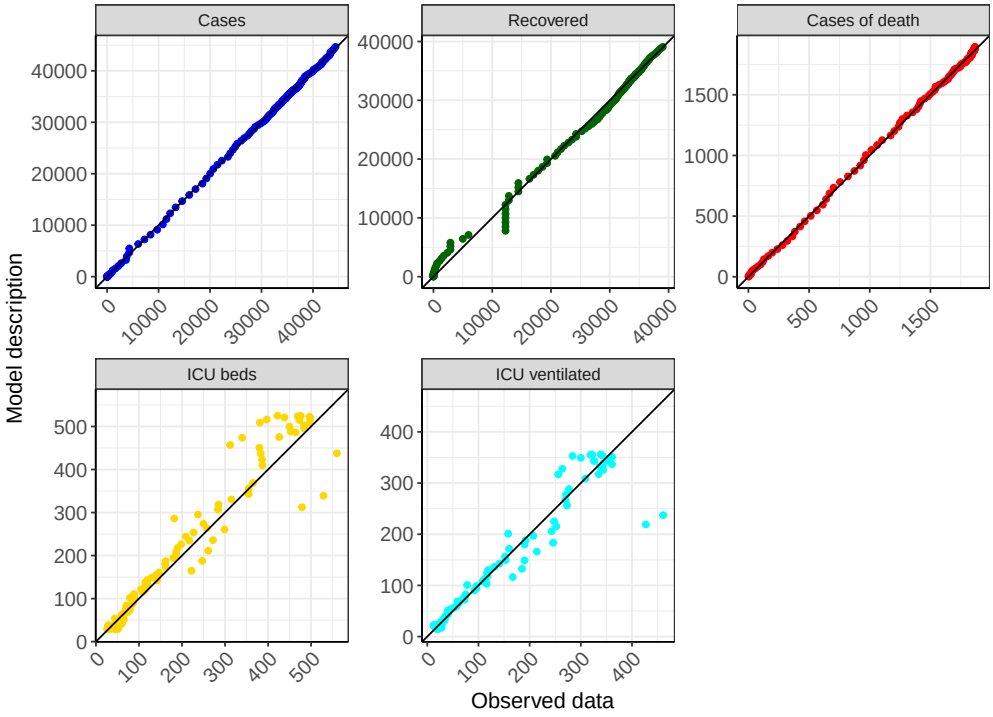


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

Fig. 13 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Baden-Wuerttemberg (red line) in comparison with the other federal states (grey lines).

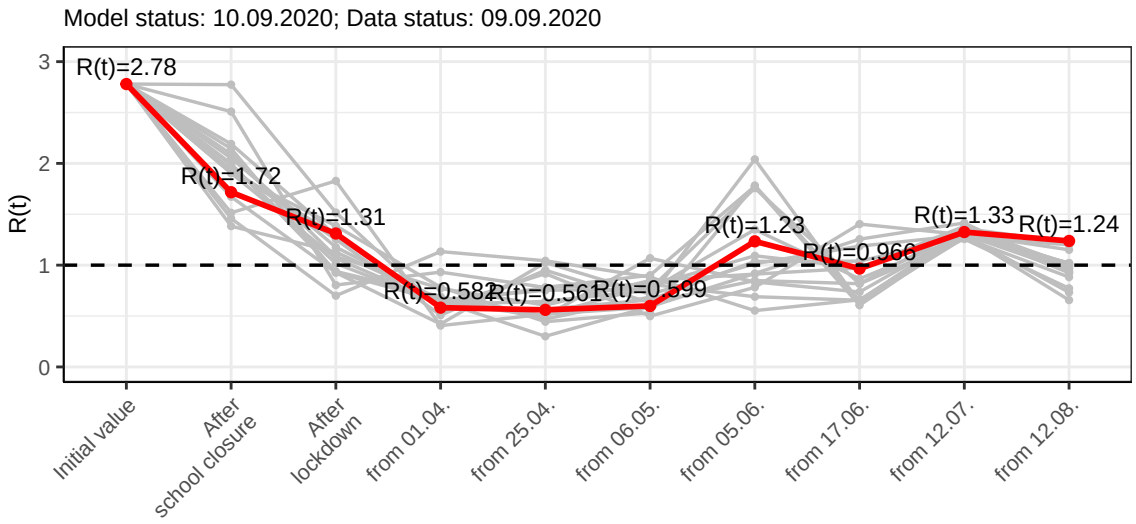


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

Fig. 14 shows the R(t) estimated value for Baden-Wuerttemberg (red line) over time in comparison with the other federal states (grey lines).

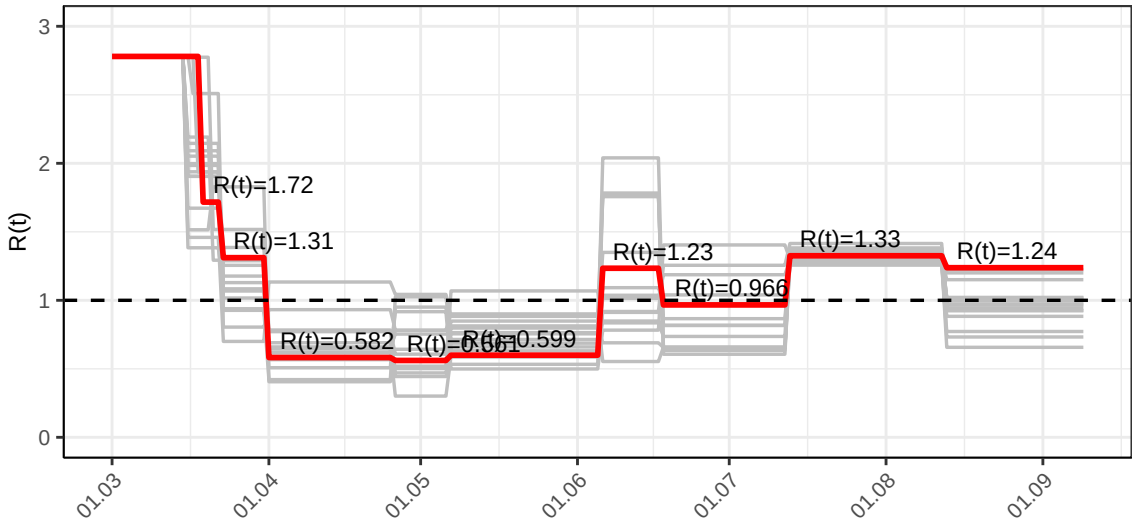


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

2.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.24)

Fig. 15 and 16 depict the the model predictions for the next 4 weeks for Baden-Wuerttemberg on a linear (15) and a semi-logarithmic (16) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

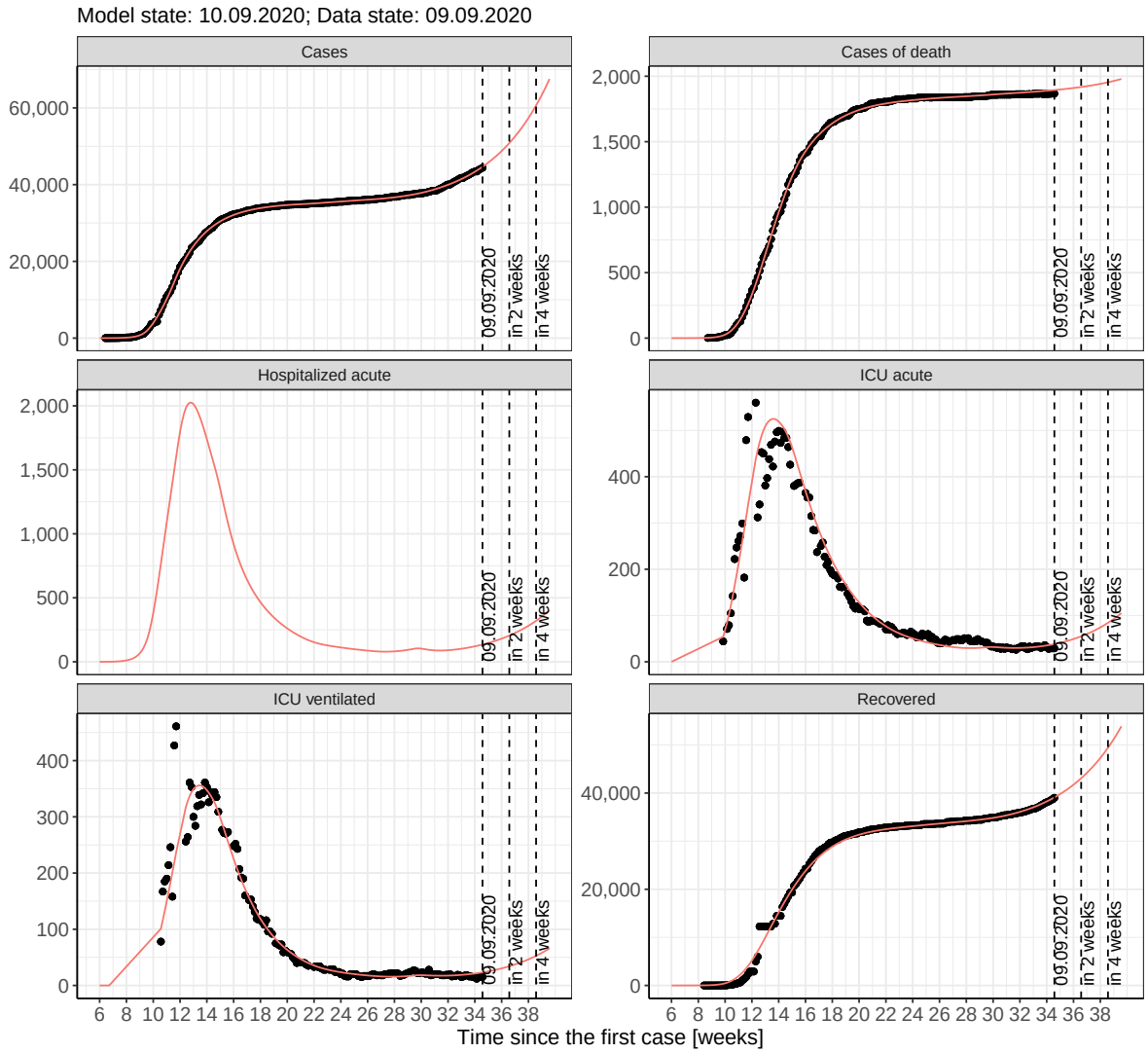


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

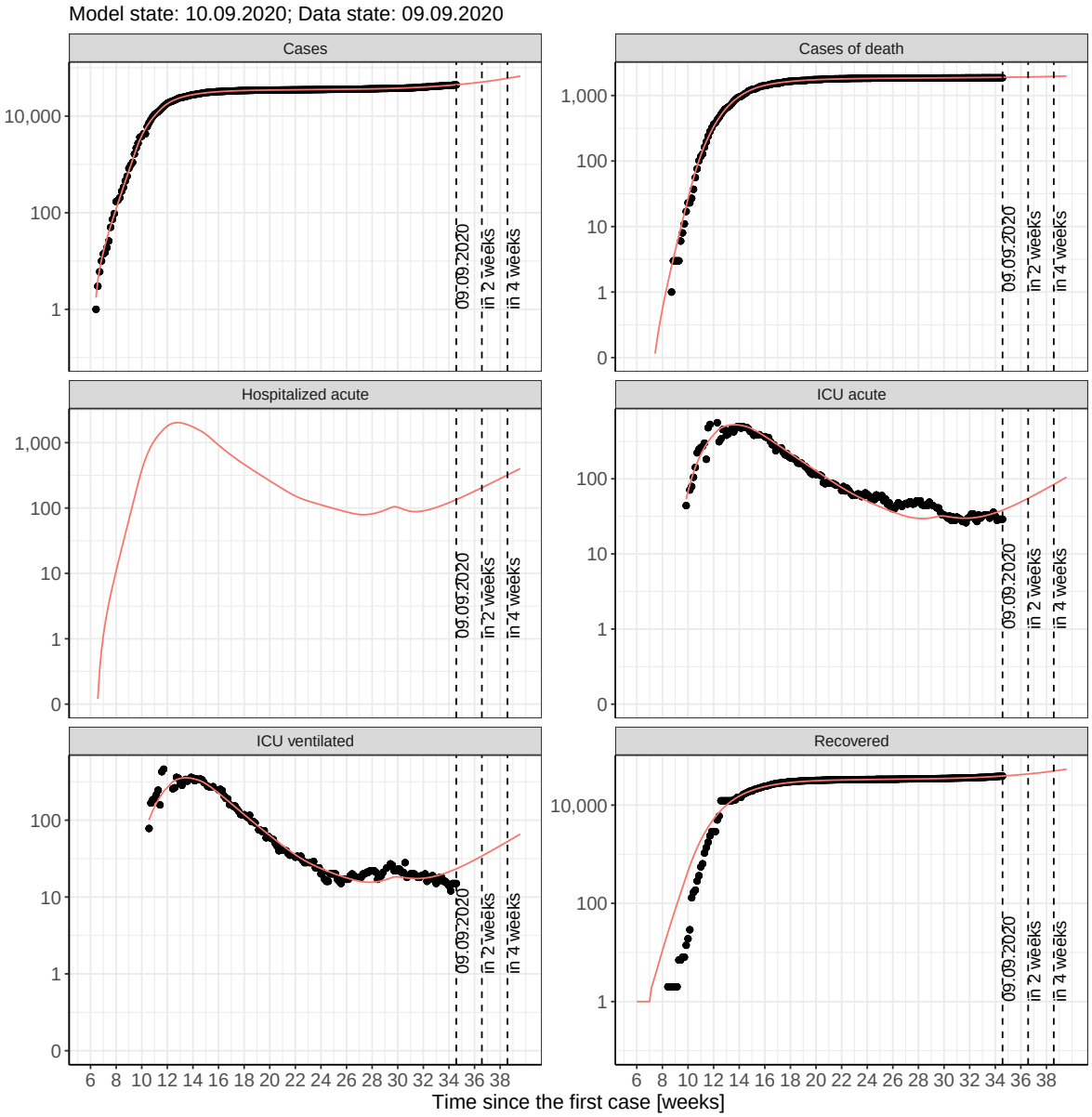


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 17 and 18 represent the model prediction for the next 4 weeks for Baden-Wuerttemberg on a linear (17) and a semi-logarithmic (18) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

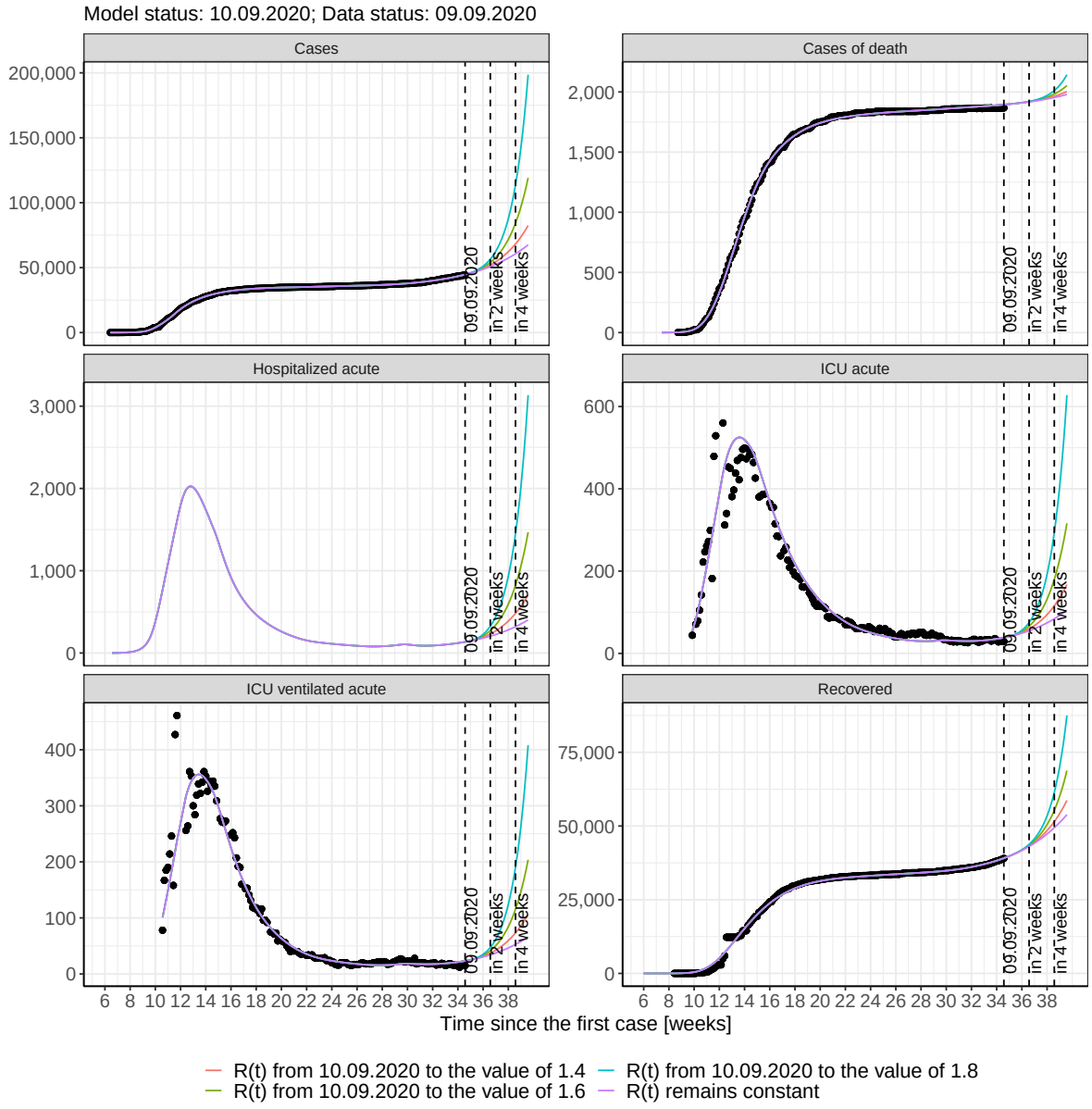


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

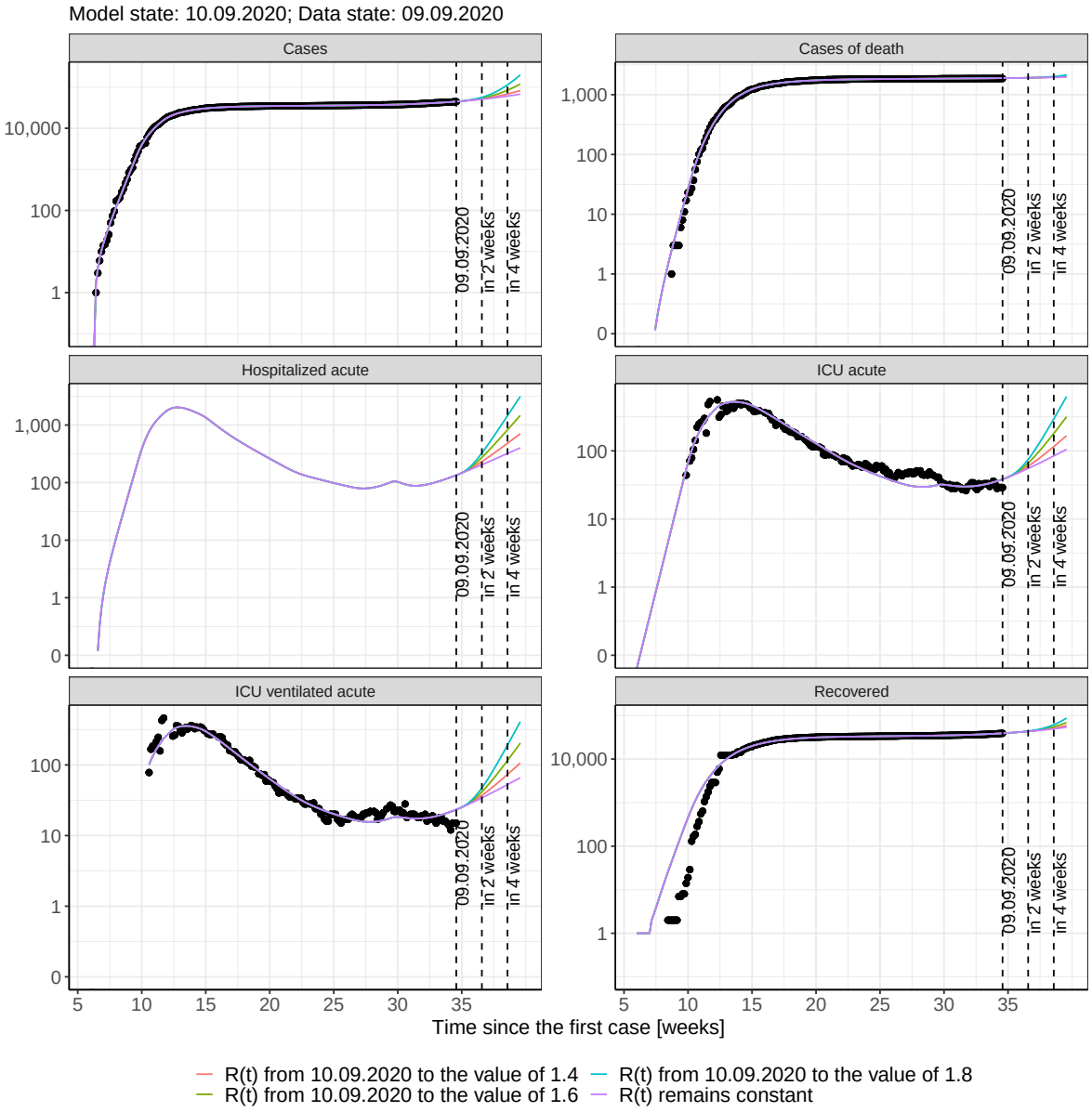


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 19 and 20 represent the model prediction for the next 16 weeks for Baden-Wuerttemberg on a linear (19) and a semi-logarithmic (20) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

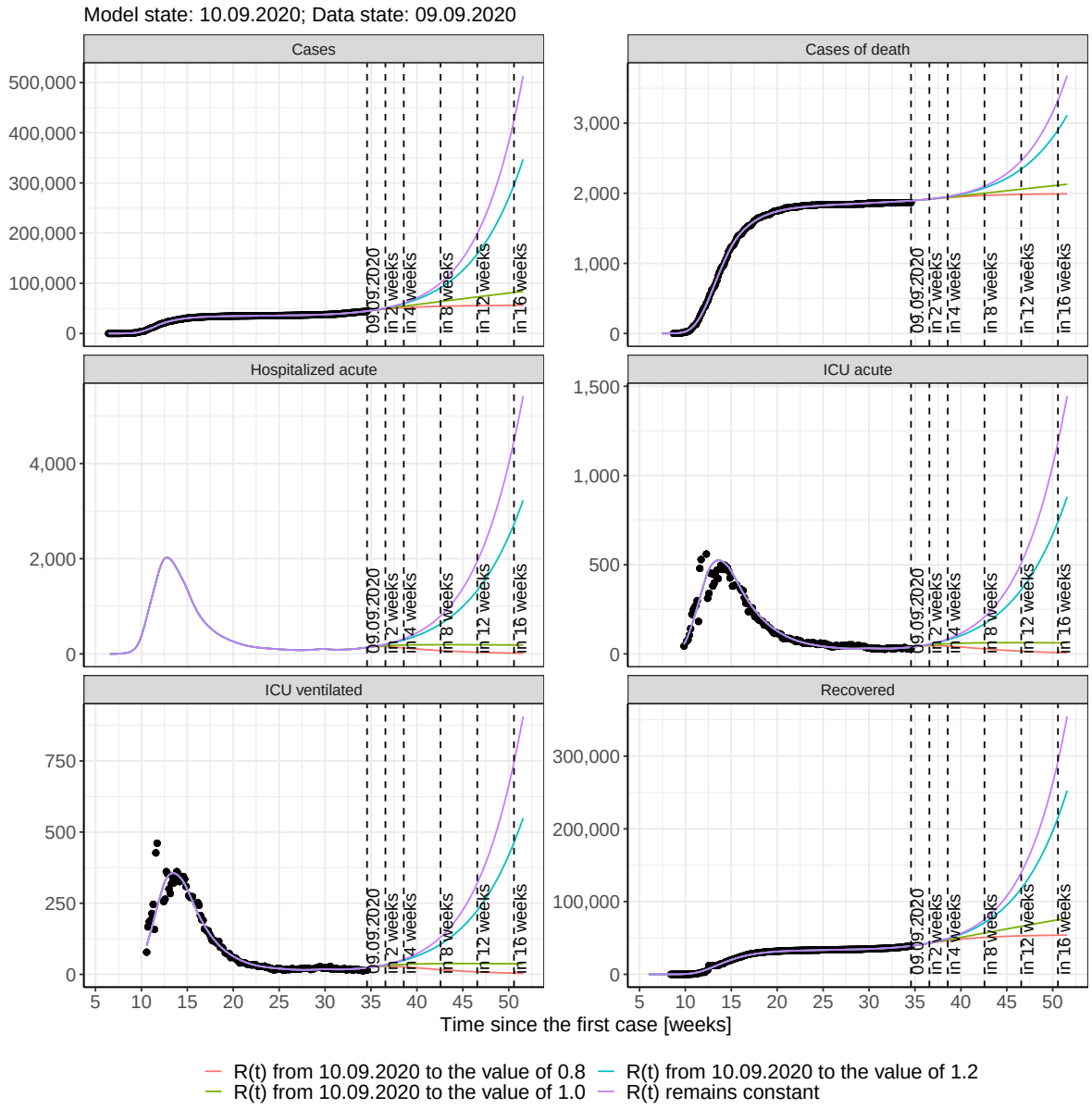


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

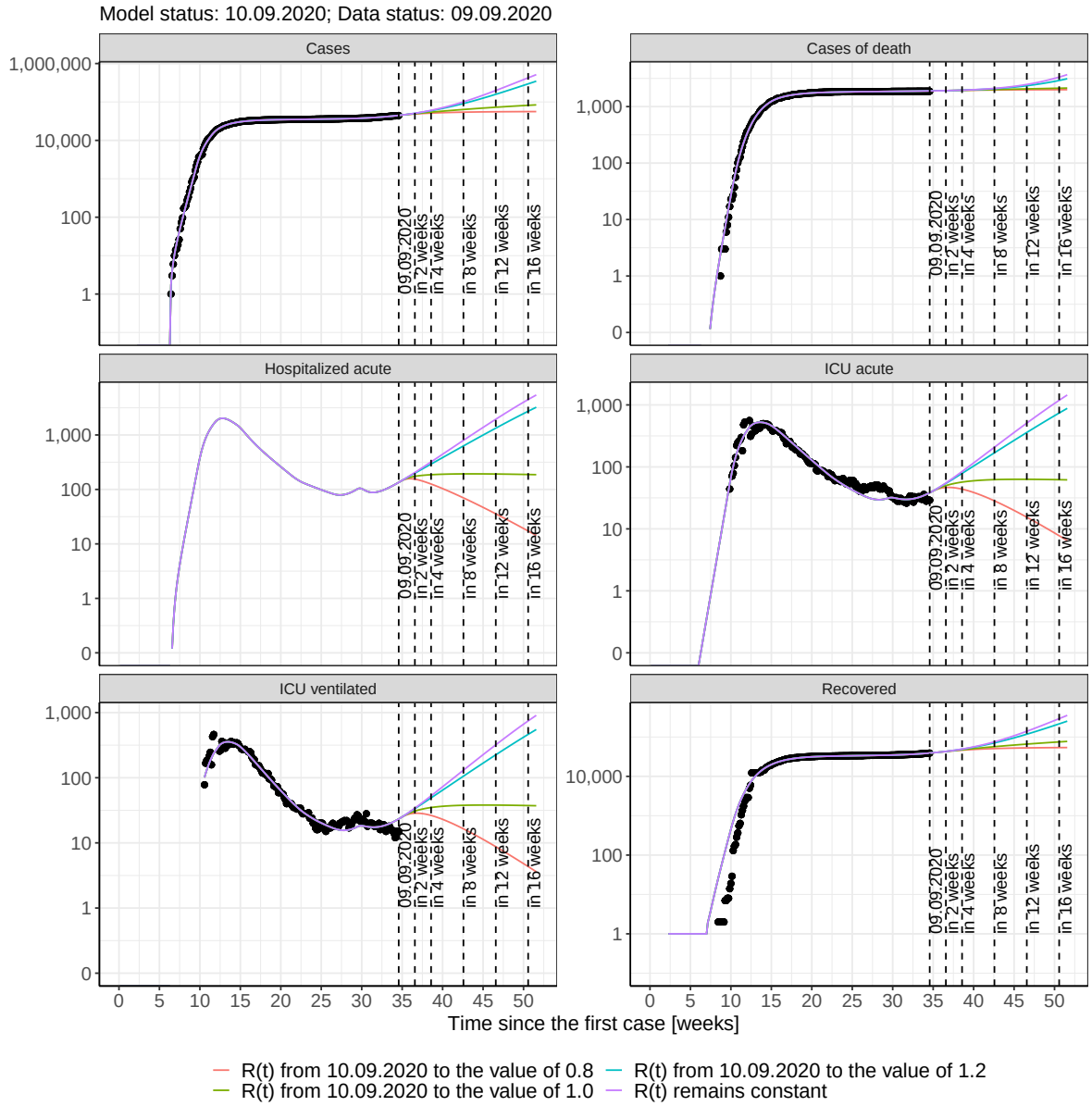


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 5) Model status from 10.09.2020; Data status: 09.09.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	45005	1896	39313	138	39	24
11.09.2020	45370	1897	39547	142	40	24
12.09.2020	45746	1899	39790	147	41	25
13.09.2020	46135	1900	40041	151	42	26
14.09.2020	46538	1902	40301	156	43	26
15.09.2020	46954	1903	40569	160	44	27
16.09.2020	47384	1905	40847	165	45	28
17.09.2020	47828	1907	41133	170	47	29
18.09.2020	48288	1908	41430	175	48	30
19.09.2020	48763	1910	41737	181	49	30
20.09.2020	49254	1912	42053	187	51	31
21.09.2020	49761	1914	42381	192	52	32
22.09.2020	50286	1916	42720	198	53	33
23.09.2020	50828	1918	43070	205	55	34
24.09.2020	51389	1920	43432	211	57	35
25.09.2020	51968	1922	43806	218	58	36
26.09.2020	52567	1924	44193	225	60	37
27.09.2020	53186	1926	44593	232	62	39
28.09.2020	53826	1929	45006	240	64	40
29.09.2020	54488	1931	45433	248	66	41
30.09.2020	55171	1934	45875	256	68	42
01.10.2020	55878	1936	46331	264	70	44
02.10.2020	56608	1939	46803	272	72	45
03.10.2020	57363	1942	47291	281	74	46
04.10.2020	58143	1945	47795	291	77	48
05.10.2020	58950	1948	48316	300	79	49
06.10.2020	59783	1951	48855	310	82	51
07.10.2020	60644	1954	49412	320	84	53

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	44994	1896	39312	138	39	24
11.09.2020	45326	1897	39547	142	40	24
12.09.2020	45648	1899	39789	146	41	25
13.09.2020	45961	1900	40037	149	42	26
14.09.2020	46265	1902	40292	152	43	26
15.09.2020	46560	1903	40552	154	43	27
16.09.2020	46847	1905	40817	156	44	27
17.09.2020	47125	1906	41086	157	45	27
18.09.2020	47396	1908	41358	157	45	28
19.09.2020	47659	1910	41632	157	45	28
20.09.2020	47914	1911	41907	157	46	28
21.09.2020	48162	1913	42183	157	46	28
22.09.2020	48403	1915	42460	156	46	28
23.09.2020	48637	1916	42735	154	47	29
24.09.2020	48864	1918	43010	153	47	29
25.09.2020	49085	1920	43283	151	47	29
26.09.2020	49299	1921	43553	150	47	29
27.09.2020	49507	1923	43821	148	47	28
28.09.2020	49709	1924	44086	146	46	28
29.09.2020	49906	1926	44348	144	46	28
30.09.2020	50097	1928	44606	142	46	28
01.10.2020	50282	1929	44860	139	46	28
02.10.2020	50462	1931	45110	137	46	28
03.10.2020	50637	1932	45355	135	45	27
04.10.2020	50807	1934	45596	133	45	27
05.10.2020	50972	1935	45833	130	45	27
06.10.2020	51132	1937	46065	128	44	27
07.10.2020	51287	1938	46292	126	44	26

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	44999	1896	39312	138	39	24
11.09.2020	45345	1897	39547	142	40	24
12.09.2020	45691	1899	39789	146	41	25
13.09.2020	46037	1900	40039	150	42	26
14.09.2020	46382	1902	40296	154	43	26
15.09.2020	46727	1903	40560	157	44	27
16.09.2020	47072	1905	40830	160	45	27
17.09.2020	47417	1906	41106	162	45	28
18.09.2020	47762	1908	41388	165	46	28
19.09.2020	48106	1910	41676	167	47	29
20.09.2020	48450	1912	41968	169	48	29
21.09.2020	48794	1913	42265	171	48	30
22.09.2020	49138	1915	42567	173	49	30
23.09.2020	49481	1917	42872	174	50	31
24.09.2020	49824	1919	43180	176	51	31
25.09.2020	50167	1921	43492	177	51	32
26.09.2020	50510	1922	43807	178	52	32
27.09.2020	50852	1924	44124	179	52	32
28.09.2020	51195	1926	44444	180	53	33
29.09.2020	51537	1928	44766	181	53	33
30.09.2020	51878	1930	45089	182	54	33
01.10.2020	52220	1932	45415	182	54	33
02.10.2020	52561	1934	45742	183	55	34
03.10.2020	52902	1936	46070	184	55	34
04.10.2020	53243	1938	46400	185	56	34
05.10.2020	53584	1940	46730	185	56	34
06.10.2020	53924	1942	47062	186	56	35
07.10.2020	54264	1944	47394	186	57	35

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	45004	1896	39312	138	39	24
11.09.2020	45366	1897	39547	142	40	24
12.09.2020	45737	1899	39790	147	41	25
13.09.2020	46119	1900	40041	151	42	26
14.09.2020	46512	1902	40300	155	43	26
15.09.2020	46915	1903	40567	160	44	27
16.09.2020	47330	1905	40844	164	45	28
17.09.2020	47757	1907	41129	169	46	29
18.09.2020	48196	1908	41423	174	48	29
19.09.2020	48647	1910	41726	178	49	30
20.09.2020	49111	1912	42039	183	50	31
21.09.2020	49588	1914	42361	189	51	32
22.09.2020	50079	1916	42693	194	53	33
23.09.2020	50583	1918	43035	199	54	34
24.09.2020	51102	1920	43388	205	56	34
25.09.2020	51635	1922	43750	210	57	35
26.09.2020	52182	1924	44124	216	59	36
27.09.2020	52746	1926	44508	222	60	37
28.09.2020	53325	1928	44904	228	62	38
29.09.2020	53921	1931	45311	235	63	39
30.09.2020	54533	1933	45731	241	65	41
01.10.2020	55162	1936	46162	248	67	42
02.10.2020	55809	1938	46605	255	69	43
03.10.2020	56474	1941	47062	262	71	44
04.10.2020	57158	1943	47531	269	72	45
05.10.2020	57861	1946	48014	277	74	46
06.10.2020	58583	1949	48510	284	77	48
07.10.2020	59326	1952	49021	292	79	49

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 21 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

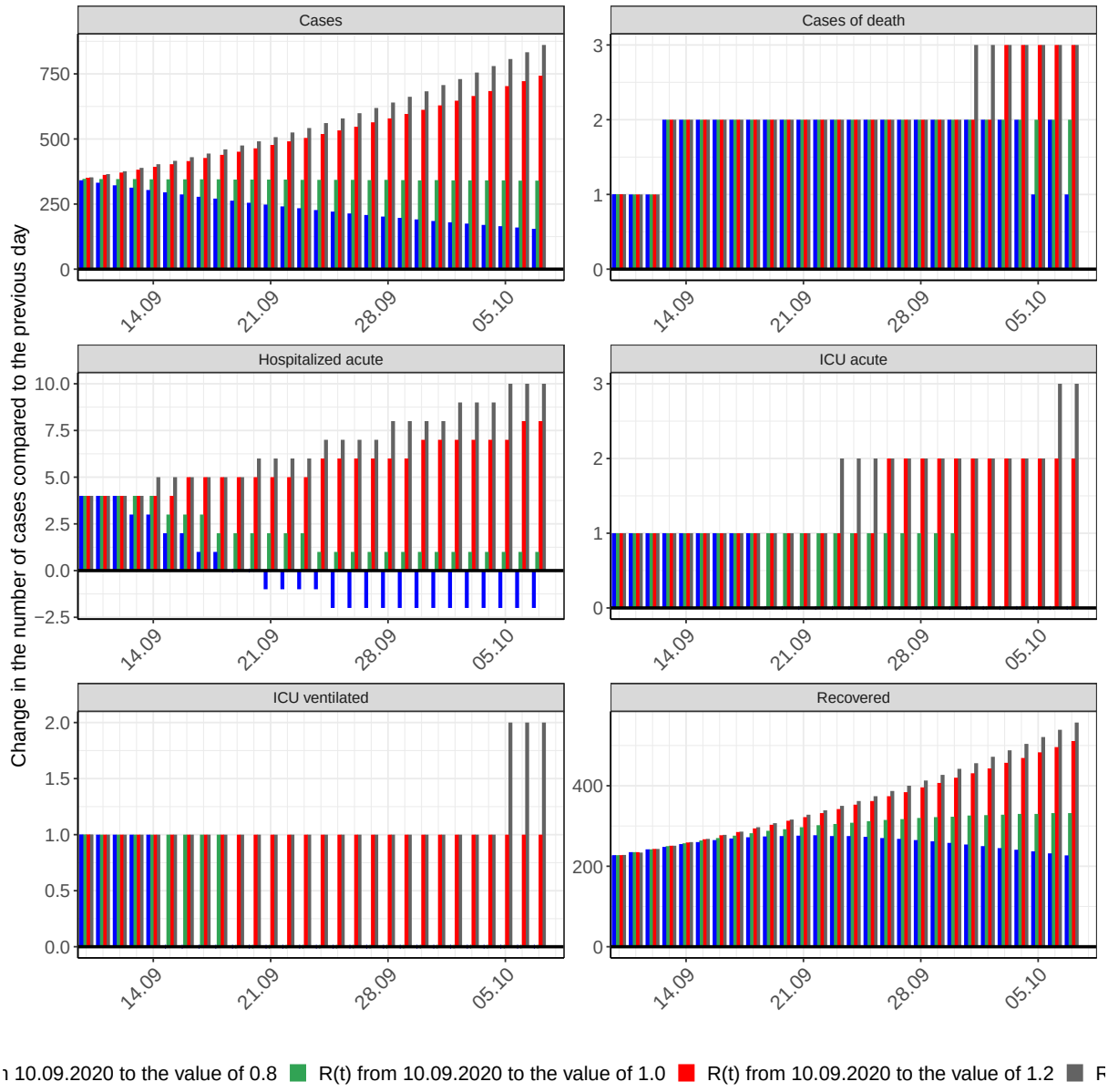


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

3 Bavaria

3.1 Model description

Fig. 22 depicts the results of the modeling (lines) compared to the observed data (points) for Bavaria on a linear (A) and semi-logarithmic (B) scale.

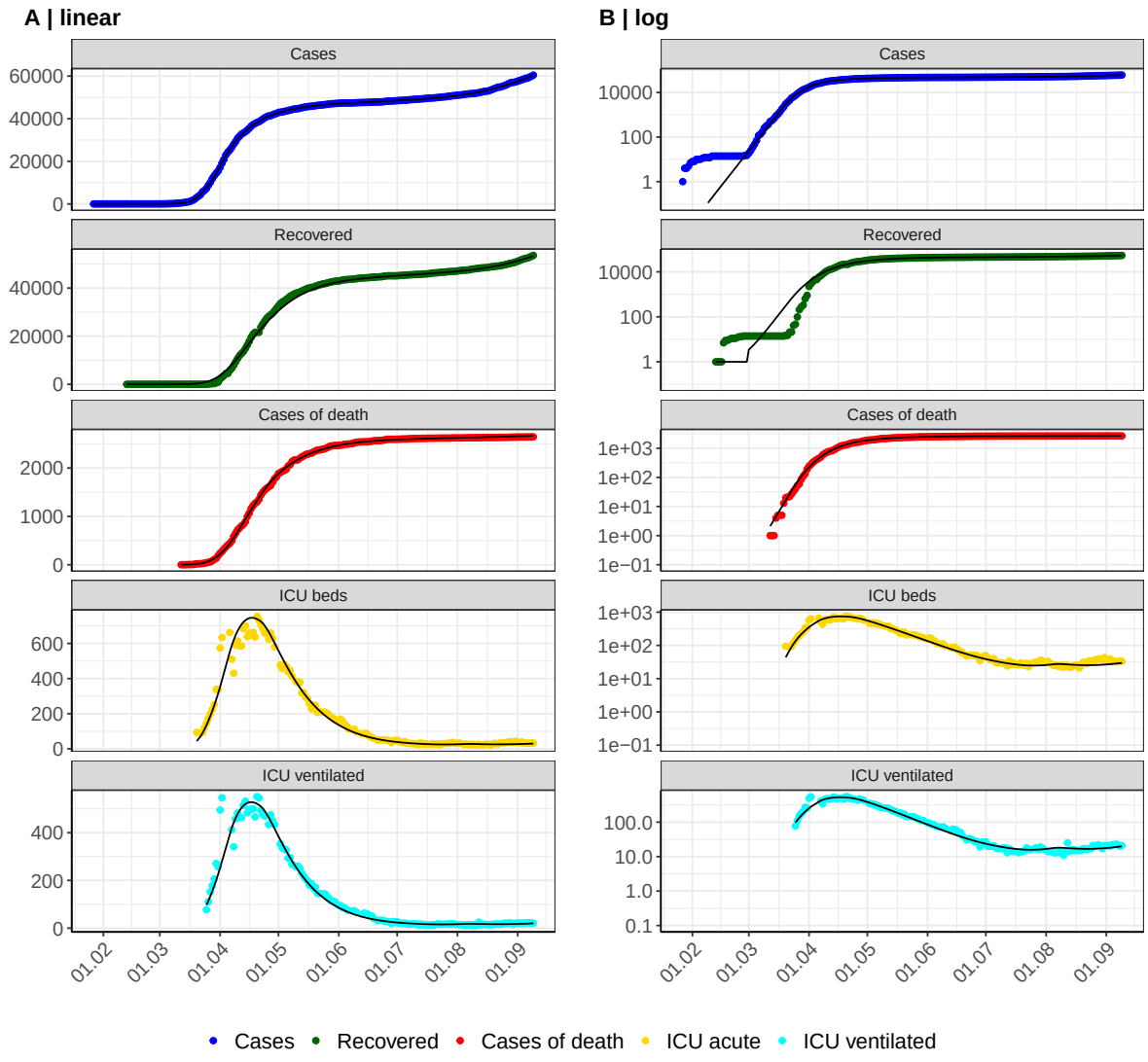


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

Fig. 23 shows the goodness-of-fit for Bavaria. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

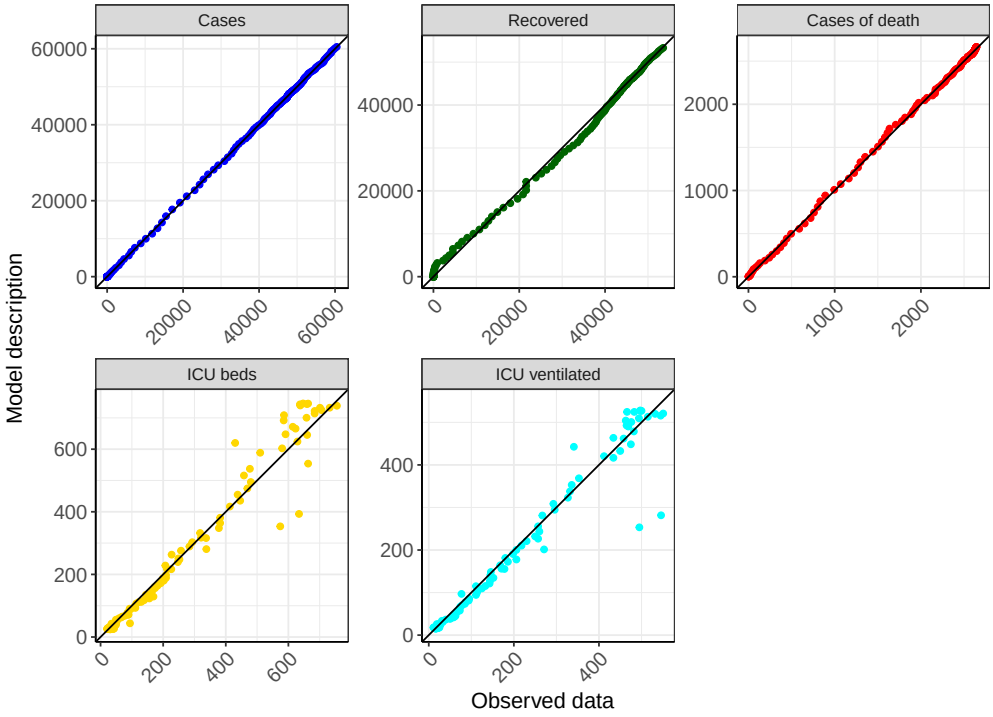


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

Fig. 24 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Bavaria (red line) in comparison with the other federal states (grey lines).

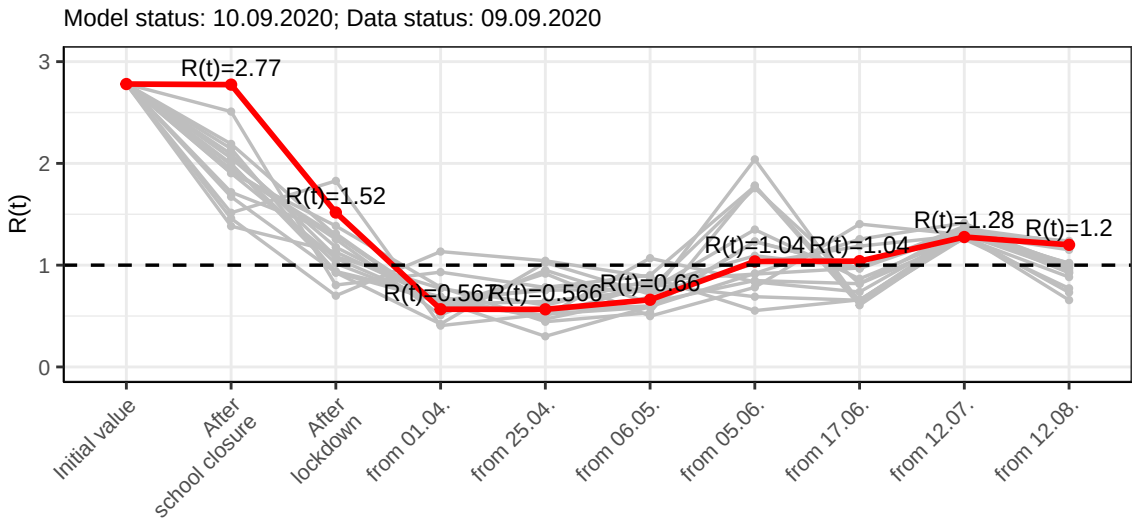


Figure 24: R(t) values before and after the NPIs for Bavaria

Fig. 25 shows the R(t) estimated value for Bavaria (red line) over time in comparison with the other federal states (grey lines).

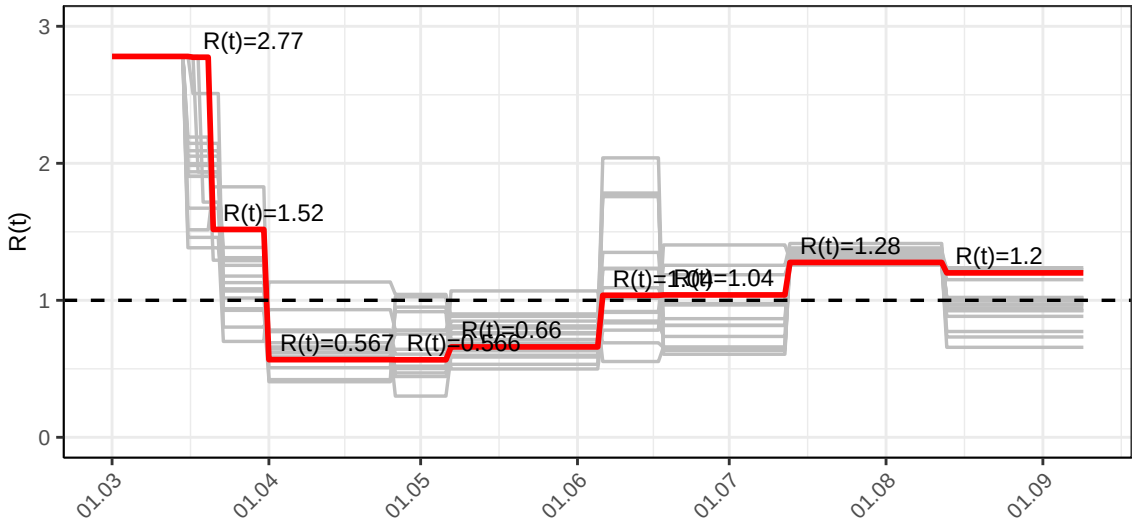


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

3.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.2)

Fig. 26 and 27 depict the the model predictions for the next 4 weeks for Bavaria on a linear (26) and a semi-logarithmic (27) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

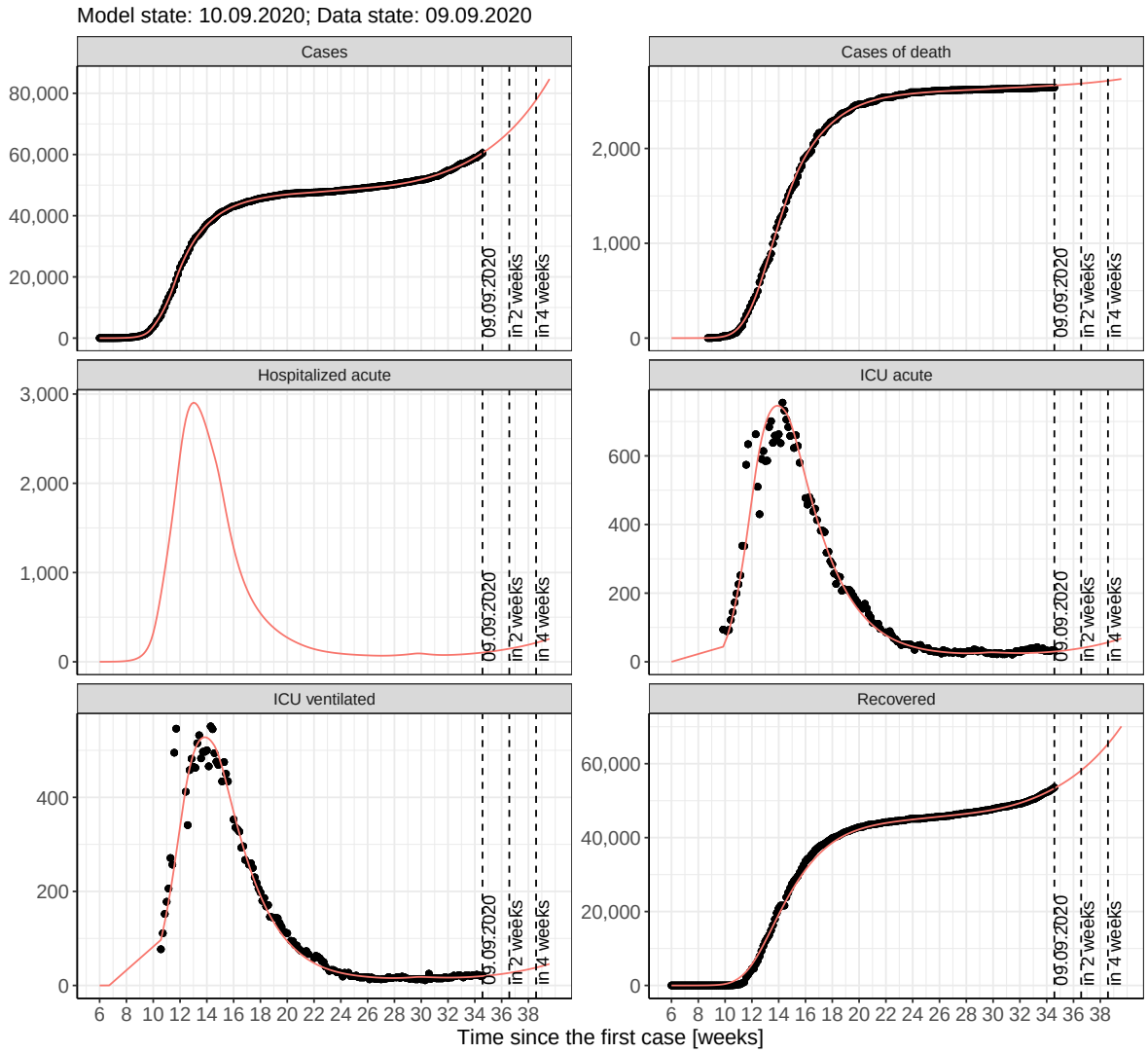


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

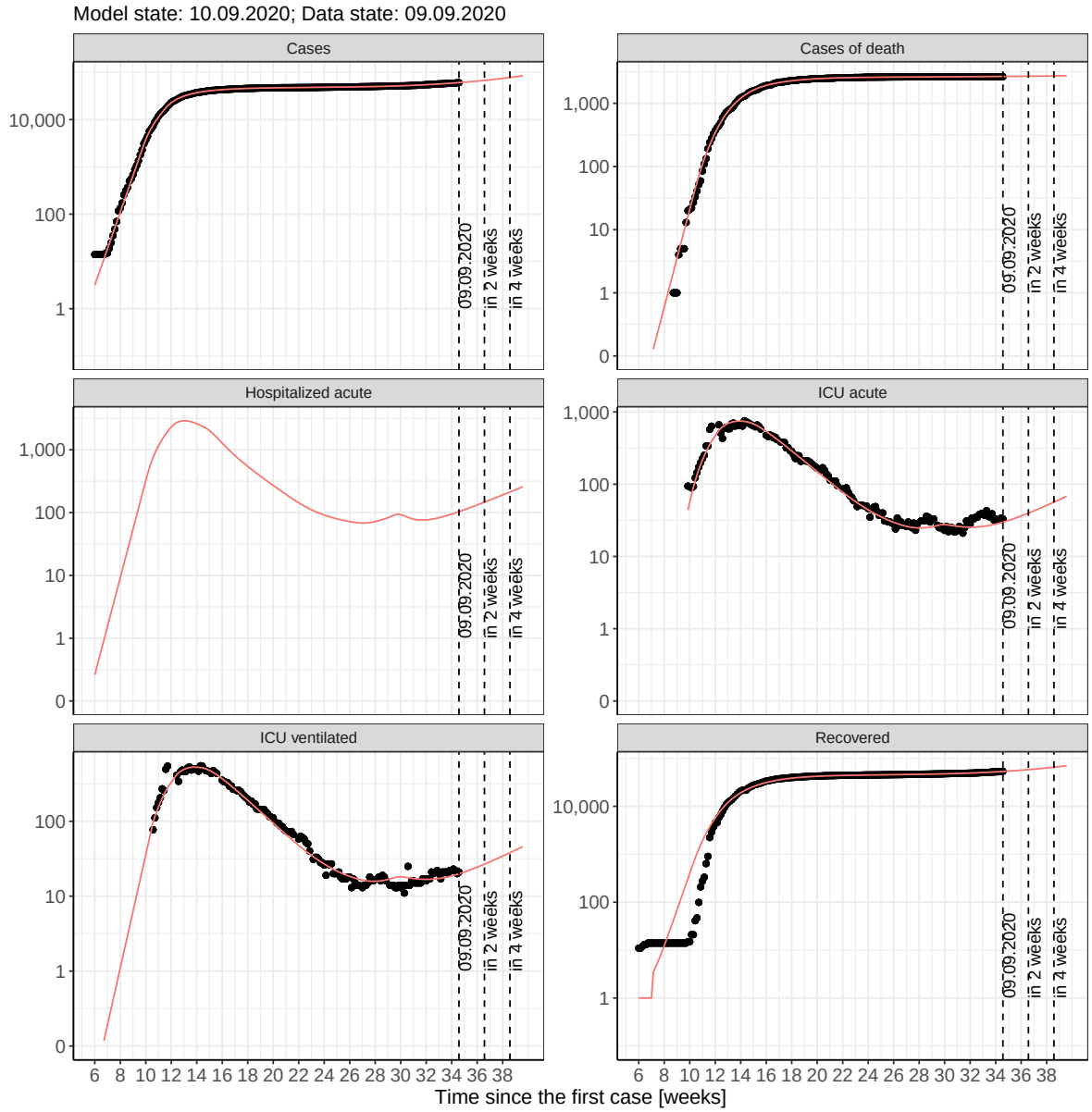


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 28 and 29 represent the model prediction for the next 4 weeks for Bavaria on a linear (28) and a semi-logarithmic (29) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

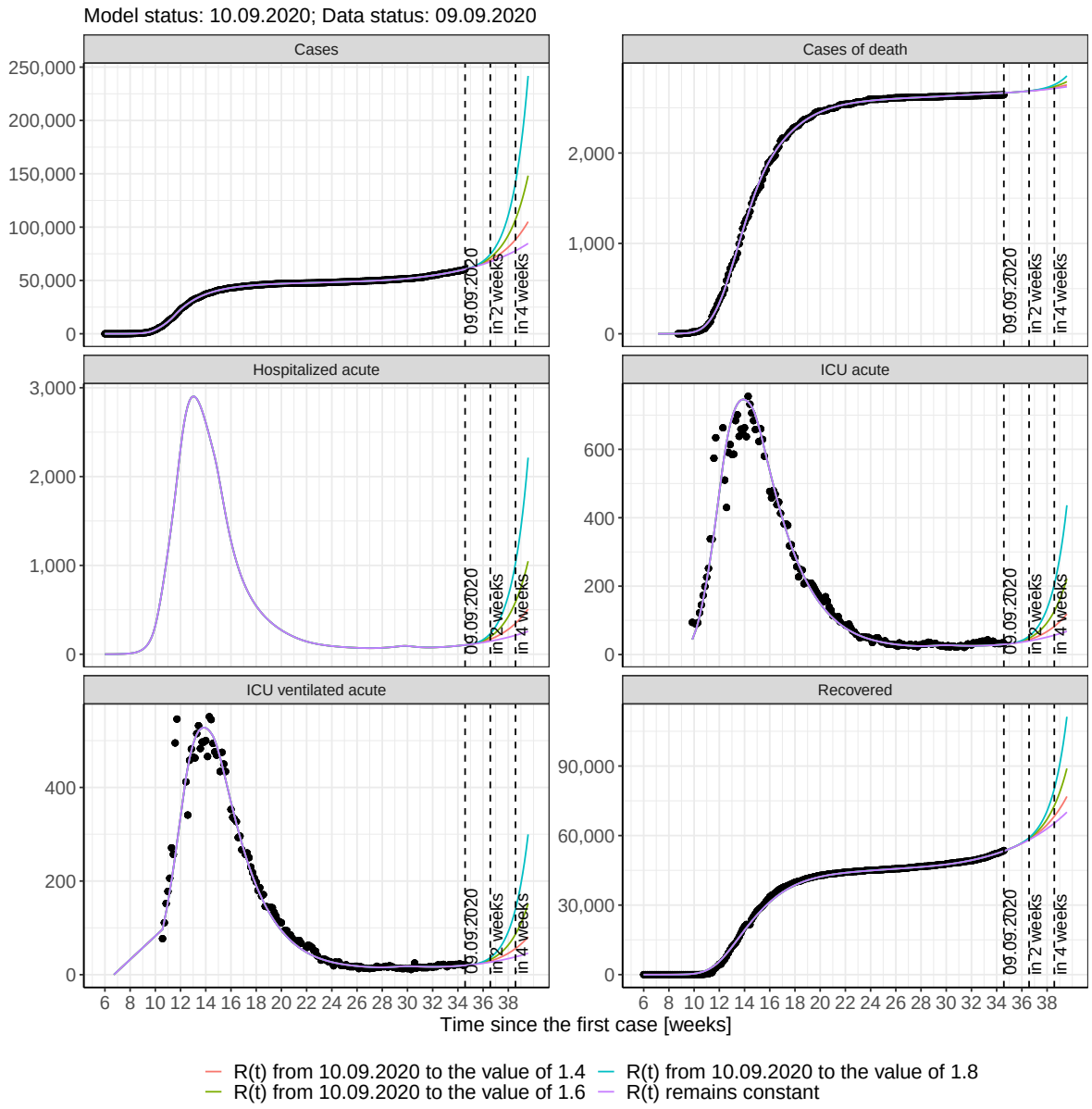


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

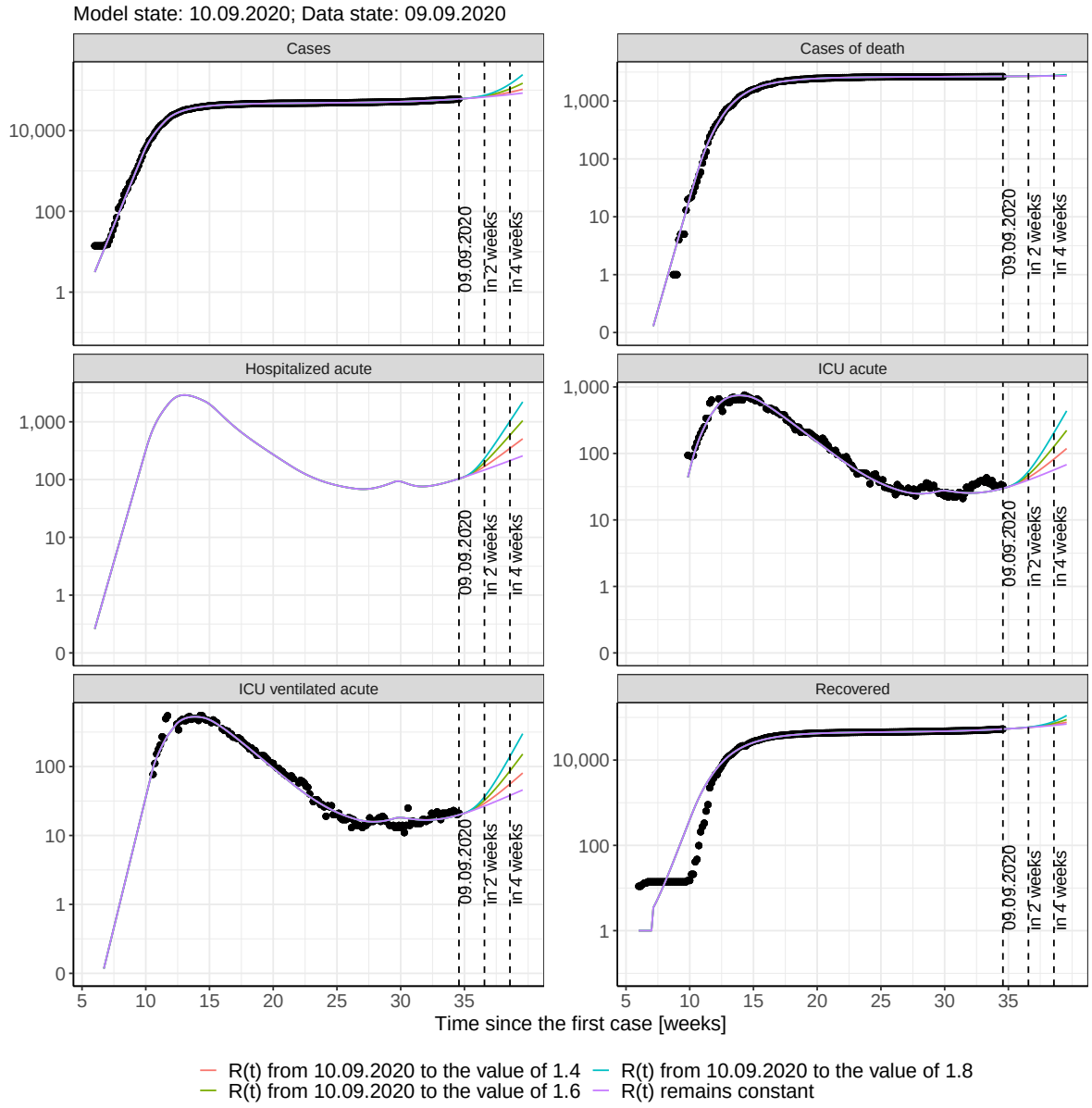


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 30 and 31 represent the model prediction for the next 16 weeks for Bavaria on a linear (30) and a semi-logarithmic (31) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

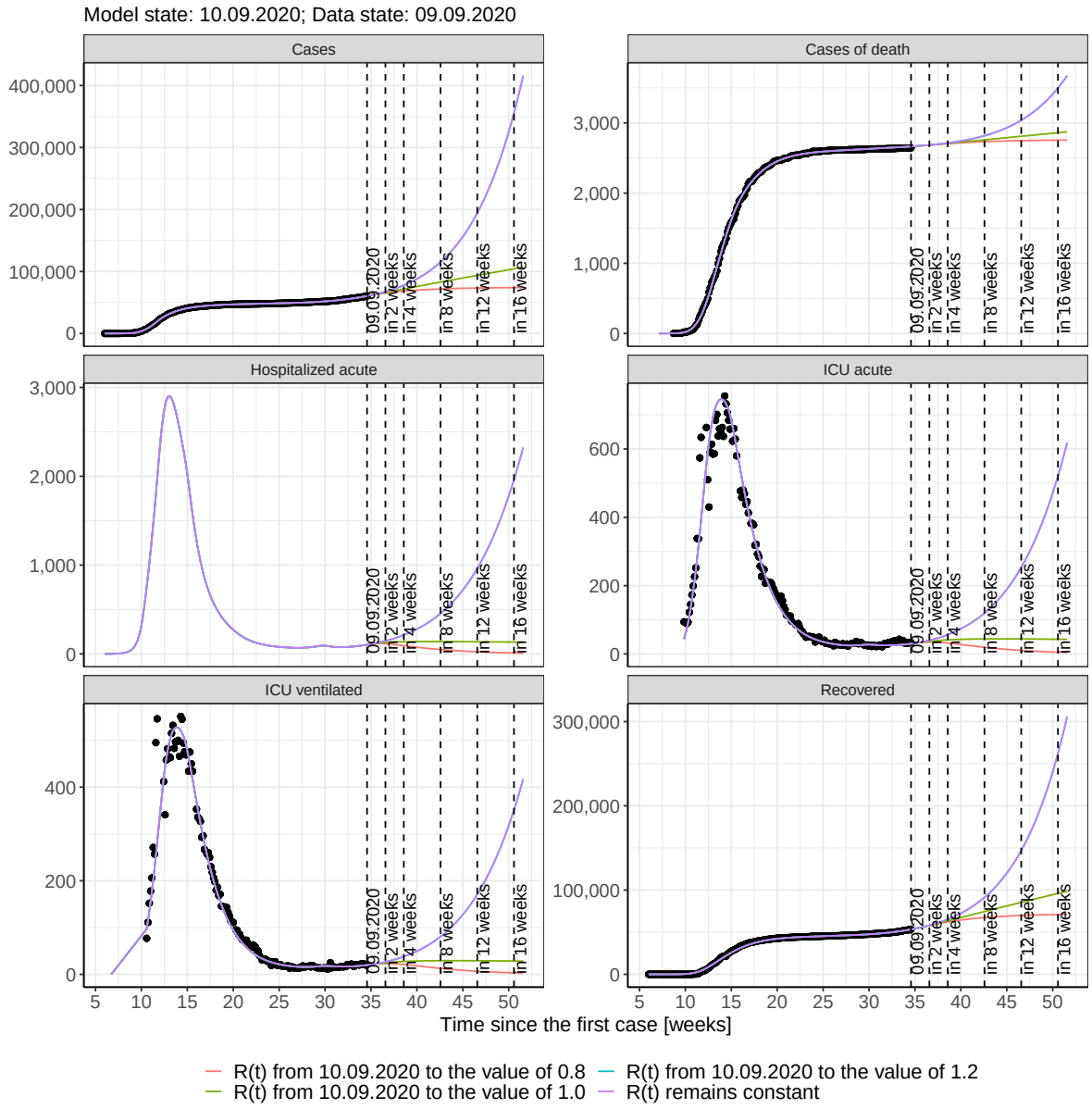


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

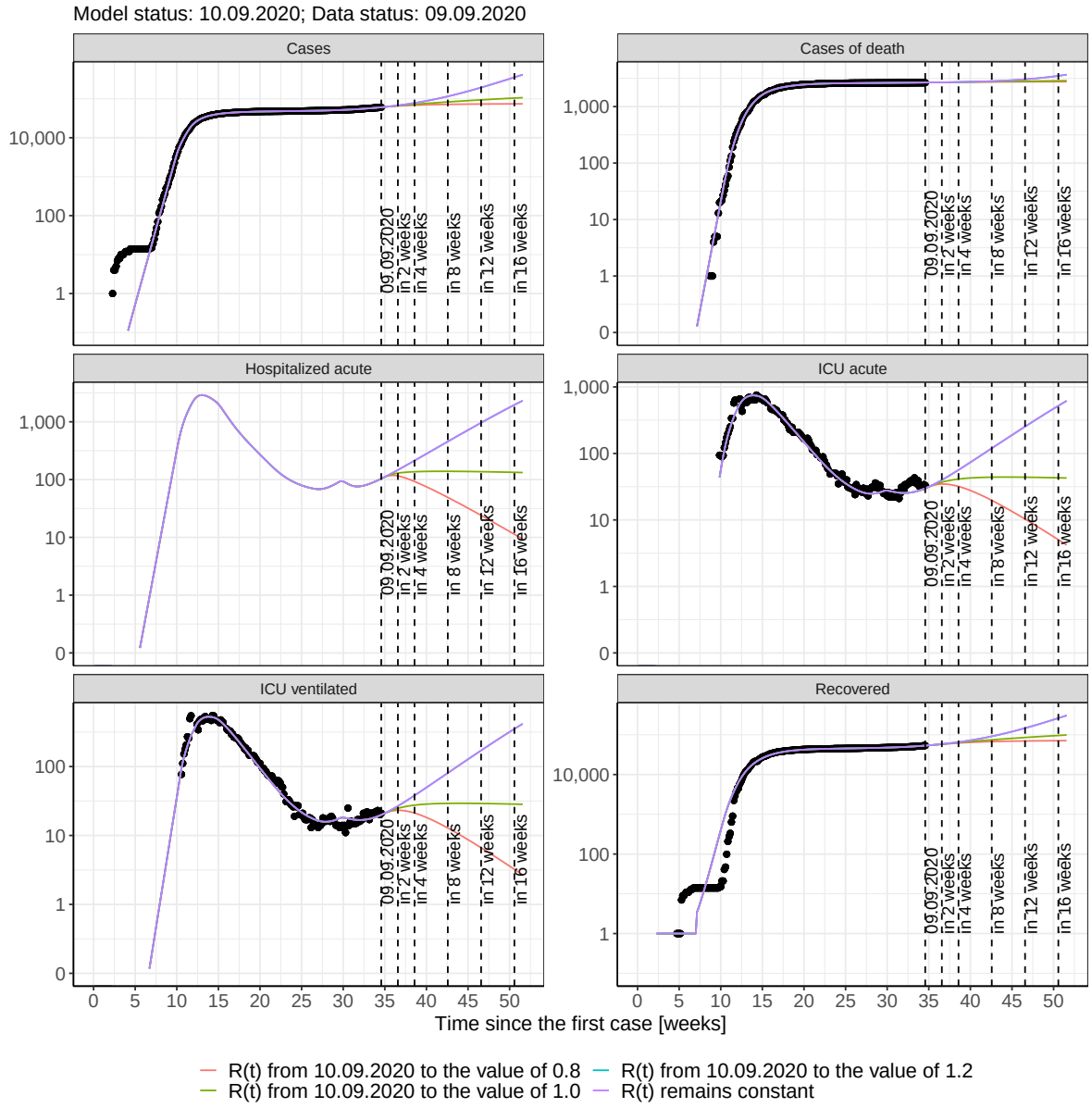


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 9) Model status from 10.09.2020; Data status: 09.09.2020.

Table 6: Bavaria - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60911	2666	53619	106	30	20
11.09.2020	61338	2668	53914	109	31	21
12.09.2020	61777	2669	54218	111	31	21
13.09.2020	62228	2670	54530	114	32	21
14.09.2020	62693	2672	54852	117	33	22
15.09.2020	63170	2673	55182	120	33	22
16.09.2020	63661	2674	55522	123	34	23
17.09.2020	64165	2676	55871	126	35	23
18.09.2020	64684	2677	56231	129	36	24
19.09.2020	65217	2679	56600	132	36	24
20.09.2020	65765	2680	56980	136	37	25
21.09.2020	66329	2682	57370	139	38	26
22.09.2020	66908	2684	57772	143	39	26
23.09.2020	67504	2685	58185	147	40	27
24.09.2020	68116	2687	58609	151	41	27
25.09.2020	68745	2689	59045	155	42	28
26.09.2020	69392	2691	59494	159	43	29
27.09.2020	70058	2693	59955	163	44	29
28.09.2020	70742	2694	60429	167	45	30
29.09.2020	71445	2696	60917	172	46	31
30.09.2020	72167	2698	61418	176	47	32
01.10.2020	72910	2701	61933	181	48	33
02.10.2020	73674	2703	62463	186	50	33
03.10.2020	74459	2705	63008	191	51	34
04.10.2020	75265	2707	63567	196	52	35
05.10.2020	76095	2709	64143	202	54	36
06.10.2020	76947	2712	64735	207	55	37
07.10.2020	77824	2714	65343	213	56	38

Table 7: Bavaria - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60899	2666	53619	106	30	20
11.09.2020	61291	2668	53914	108	31	21
12.09.2020	61672	2669	54216	111	31	21
13.09.2020	62042	2670	54526	113	32	21
14.09.2020	62401	2672	54842	115	32	22
15.09.2020	62750	2673	55164	116	33	22
16.09.2020	63089	2674	55490	117	33	22
17.09.2020	63418	2676	55820	118	34	22
18.09.2020	63738	2677	56152	118	34	23
19.09.2020	64048	2679	56486	118	34	23
20.09.2020	64350	2680	56821	118	34	23
21.09.2020	64643	2682	57157	117	35	23
22.09.2020	64928	2683	57491	117	35	23
23.09.2020	65204	2685	57824	116	35	23
24.09.2020	65472	2686	58155	114	35	23
25.09.2020	65733	2688	58483	113	35	23
26.09.2020	65986	2689	58809	112	35	23
27.09.2020	66232	2690	59130	110	34	23
28.09.2020	66471	2692	59448	109	34	23
29.09.2020	66703	2693	59761	107	34	23
30.09.2020	66928	2695	60069	105	34	23
01.10.2020	67147	2696	60372	104	34	22
02.10.2020	67360	2698	60670	102	33	22
03.10.2020	67566	2699	60962	100	33	22
04.10.2020	67767	2700	61249	98	33	22
05.10.2020	67961	2702	61531	96	33	22
06.10.2020	68151	2703	61806	94	32	21
07.10.2020	68334	2704	62075	93	32	21

Table 8: Bavaria - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60905	2666	53619	106	30	20
11.09.2020	61314	2668	53914	109	31	21
12.09.2020	61723	2669	54217	111	31	21
13.09.2020	62131	2670	54528	113	32	21
14.09.2020	62540	2672	54847	116	33	22
15.09.2020	62948	2673	55173	118	33	22
16.09.2020	63355	2674	55505	120	34	23
17.09.2020	63763	2676	55844	122	34	23
18.09.2020	64170	2677	56189	123	35	23
19.09.2020	64577	2679	56539	125	35	24
20.09.2020	64983	2680	56895	126	36	24
21.09.2020	65390	2682	57255	127	36	24
22.09.2020	65796	2683	57619	128	37	24
23.09.2020	66201	2685	57988	129	37	25
24.09.2020	66607	2686	58360	130	37	25
25.09.2020	67012	2688	58735	131	38	25
26.09.2020	67416	2690	59113	132	38	26
27.09.2020	67821	2691	59494	132	38	26
28.09.2020	68225	2693	59877	133	39	26
29.09.2020	68629	2695	60262	134	39	26
30.09.2020	69032	2696	60649	134	39	26
01.10.2020	69435	2698	61037	135	40	27
02.10.2020	69838	2700	61427	135	40	27
03.10.2020	70241	2701	61819	135	40	27
04.10.2020	70643	2703	62211	136	40	27
05.10.2020	71045	2705	62605	136	41	27
06.10.2020	71446	2707	62999	136	41	27
07.10.2020	71847	2708	63394	137	41	28

Table 9: Bavaria - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60911	2666	53619	106	30	20
11.09.2020	61338	2668	53914	109	31	21
12.09.2020	61777	2669	54218	111	31	21
13.09.2020	62228	2670	54530	114	32	21
14.09.2020	62693	2672	54852	117	33	22
15.09.2020	63170	2673	55182	120	33	22
16.09.2020	63660	2674	55522	123	34	23
17.09.2020	64165	2676	55871	126	35	23
18.09.2020	64683	2677	56230	129	36	24
19.09.2020	65216	2679	56600	132	36	24
20.09.2020	65764	2680	56980	136	37	25
21.09.2020	66328	2682	57370	139	38	26
22.09.2020	66907	2684	57772	143	39	26
23.09.2020	67503	2685	58184	147	40	27
24.09.2020	68115	2687	58609	150	41	27
25.09.2020	68744	2689	59045	154	42	28
26.09.2020	69391	2691	59494	159	43	29
27.09.2020	70056	2693	59955	163	44	29
28.09.2020	70740	2694	60429	167	45	30
29.09.2020	71443	2696	60916	172	46	31
30.09.2020	72165	2698	61417	176	47	32
01.10.2020	72908	2701	61933	181	48	33
02.10.2020	73671	2703	62462	186	50	33
03.10.2020	74456	2705	63007	191	51	34
04.10.2020	75262	2707	63566	196	52	35
05.10.2020	76091	2709	64142	202	54	36
06.10.2020	76944	2712	64733	207	55	37
07.10.2020	77820	2714	65341	213	56	38

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 32 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

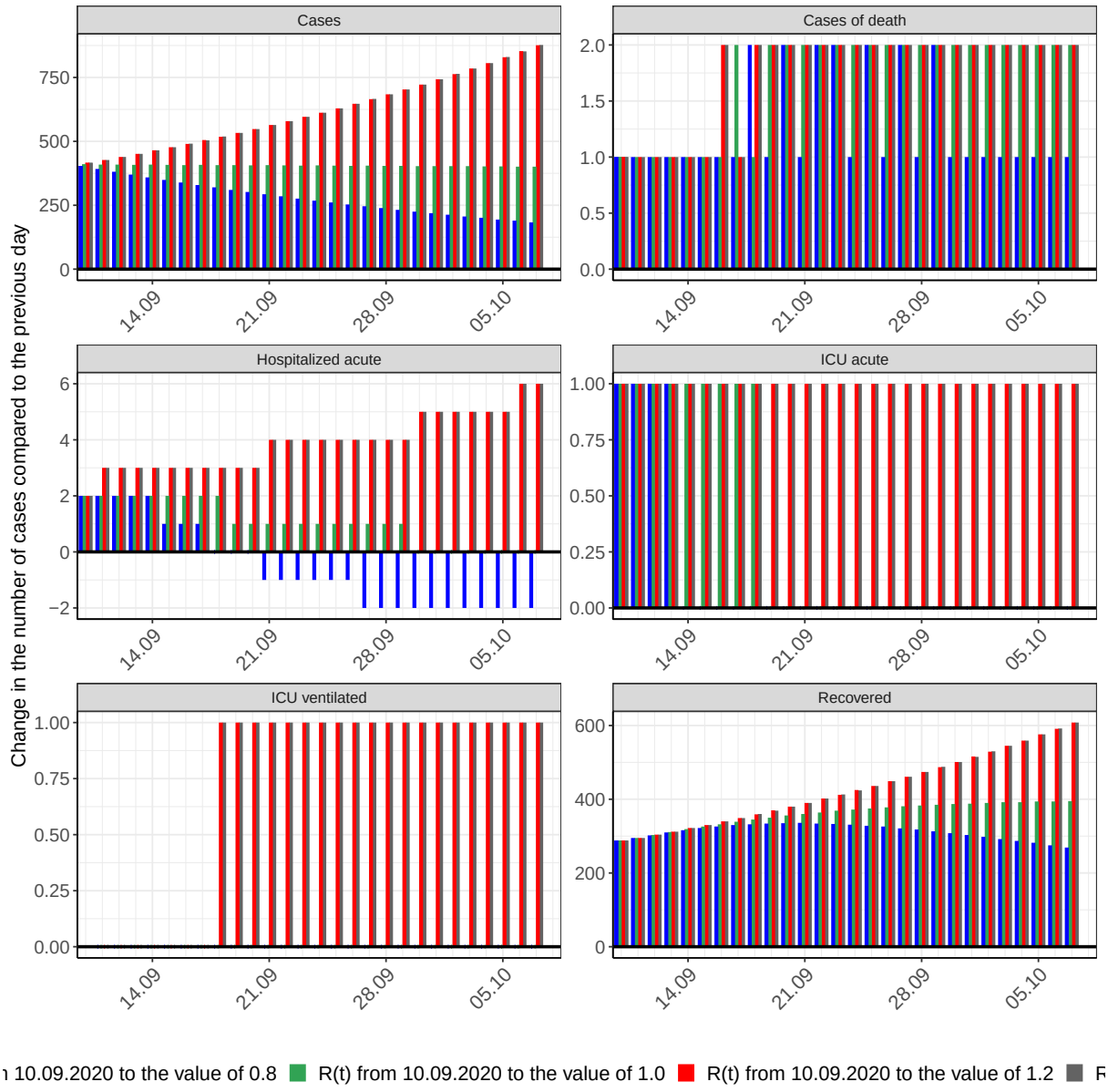


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

4 Berlin

4.1 Model description

Fig. 33 depicts the results of the modeling (lines) compared to the observed data (points) for Berlin on a linear (A) and semi-logarithmic (B) scale.

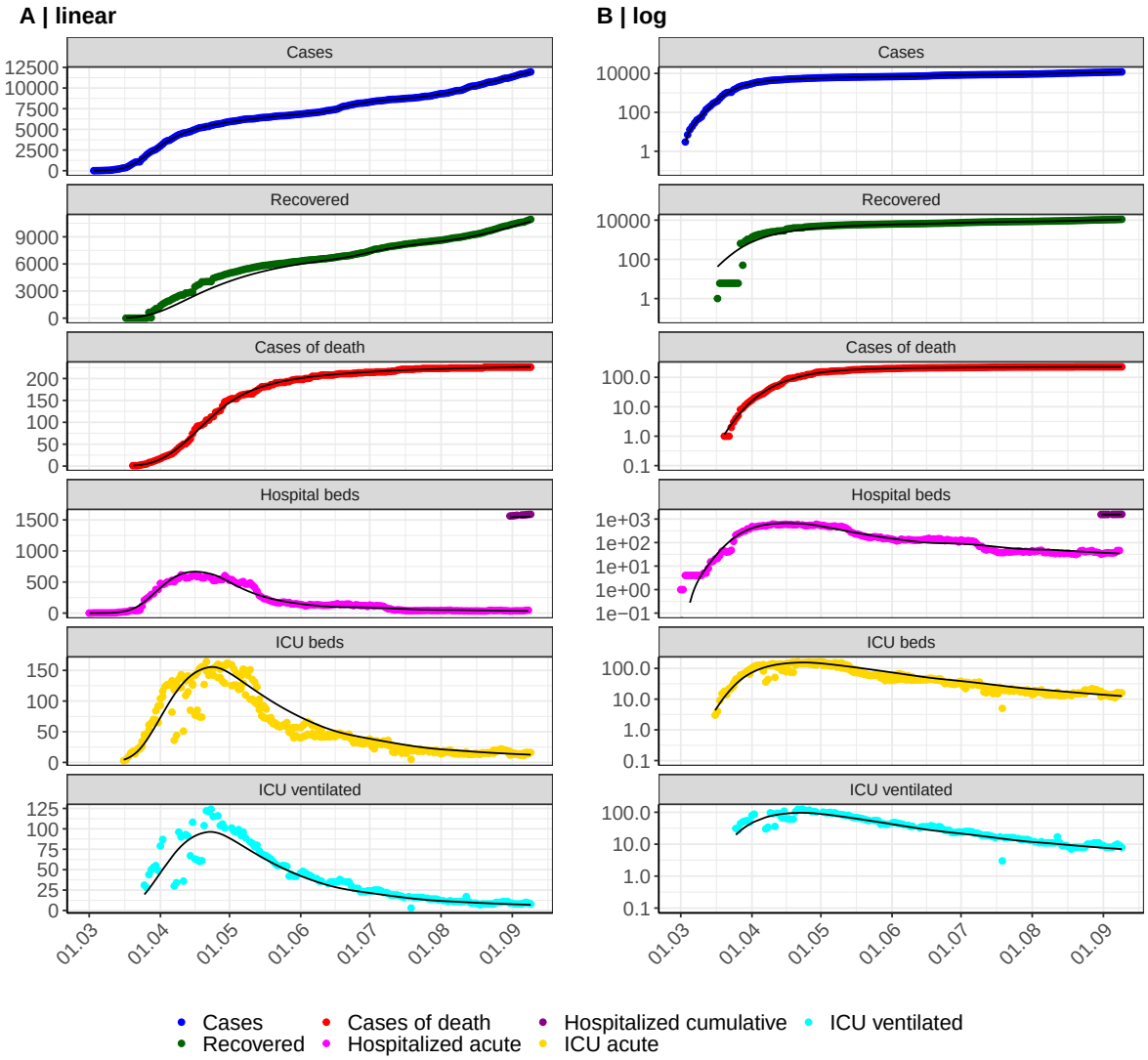


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

Fig. 34 shows the goodness-of-fit for Berlin. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

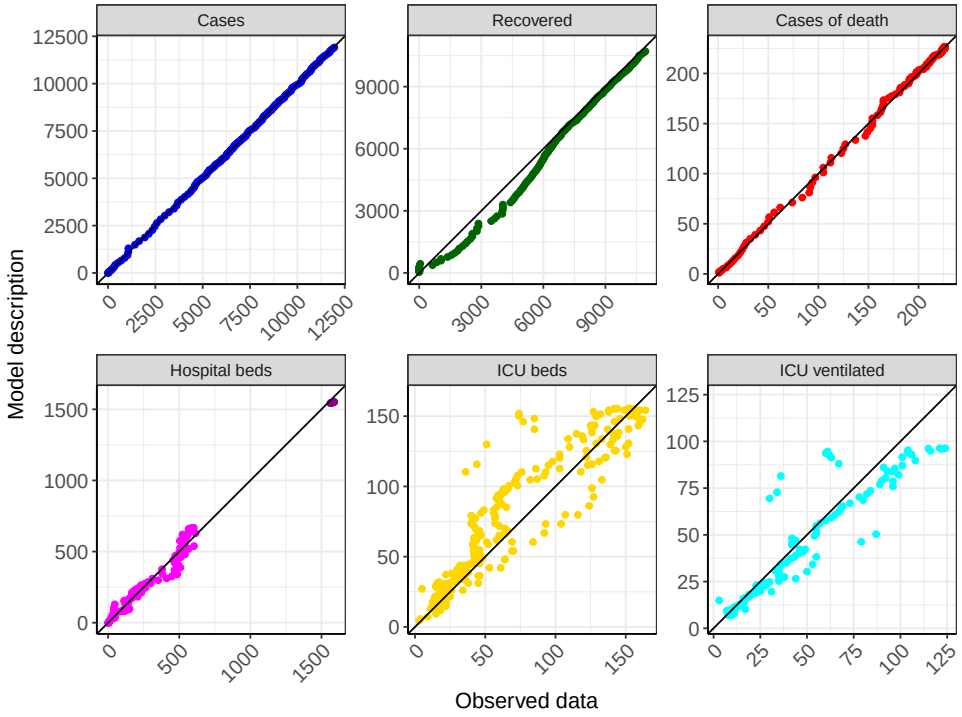


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

Fig. 35 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Berlin (red line) in comparison with the other federal states (grey lines).

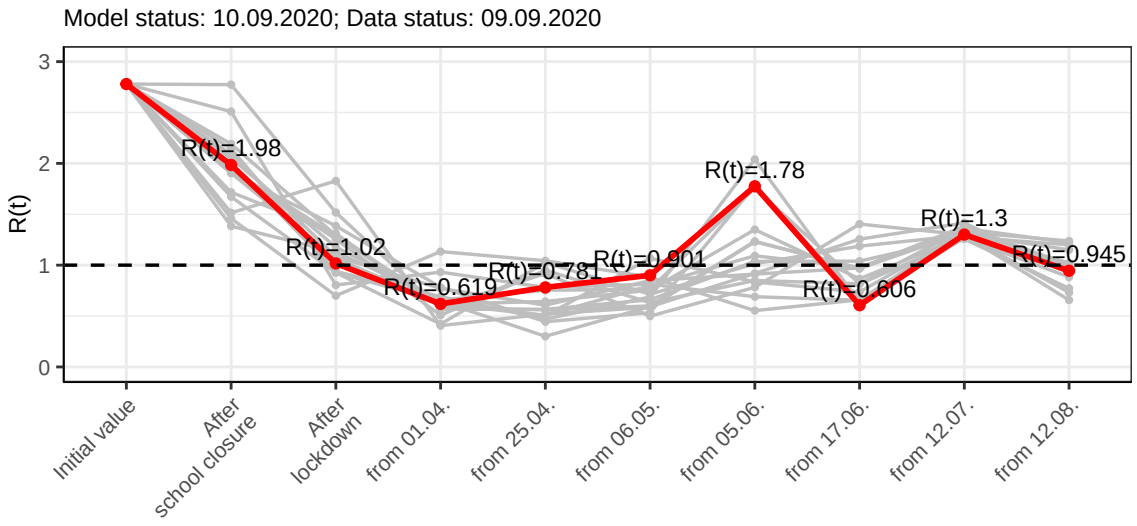


Figure 35: R(t) values before and after the NPIs for Berlin

Fig. 36 shows the R(t) estimated value for Berlin (red line) over time in comparison with the other federal states (grey lines).

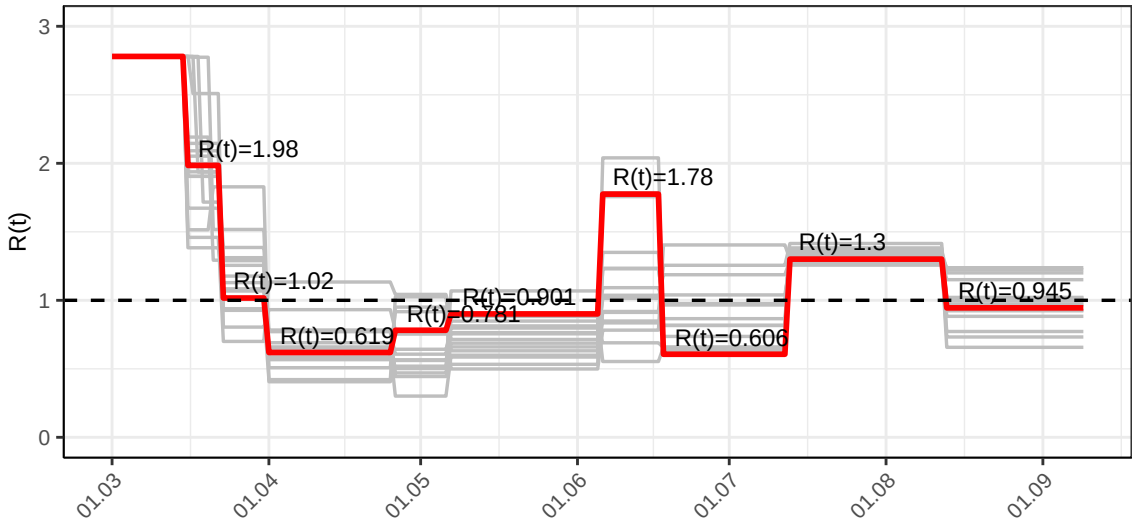


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.94)

Fig. 37 and 38 depict the the model predictions for the next 4 weeks for Berlin on a linear (37) and a semi-logarithmic (38) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

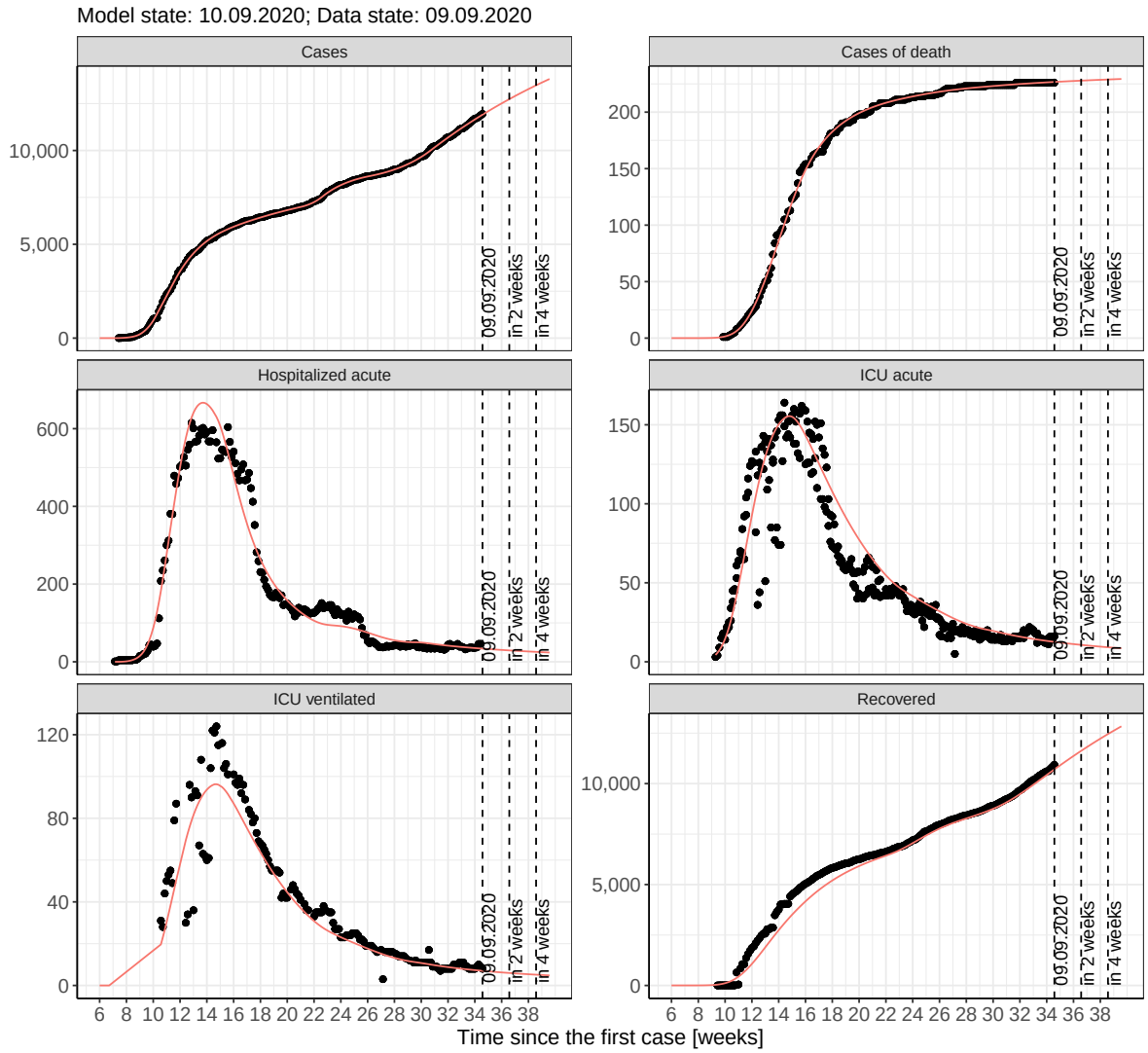


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

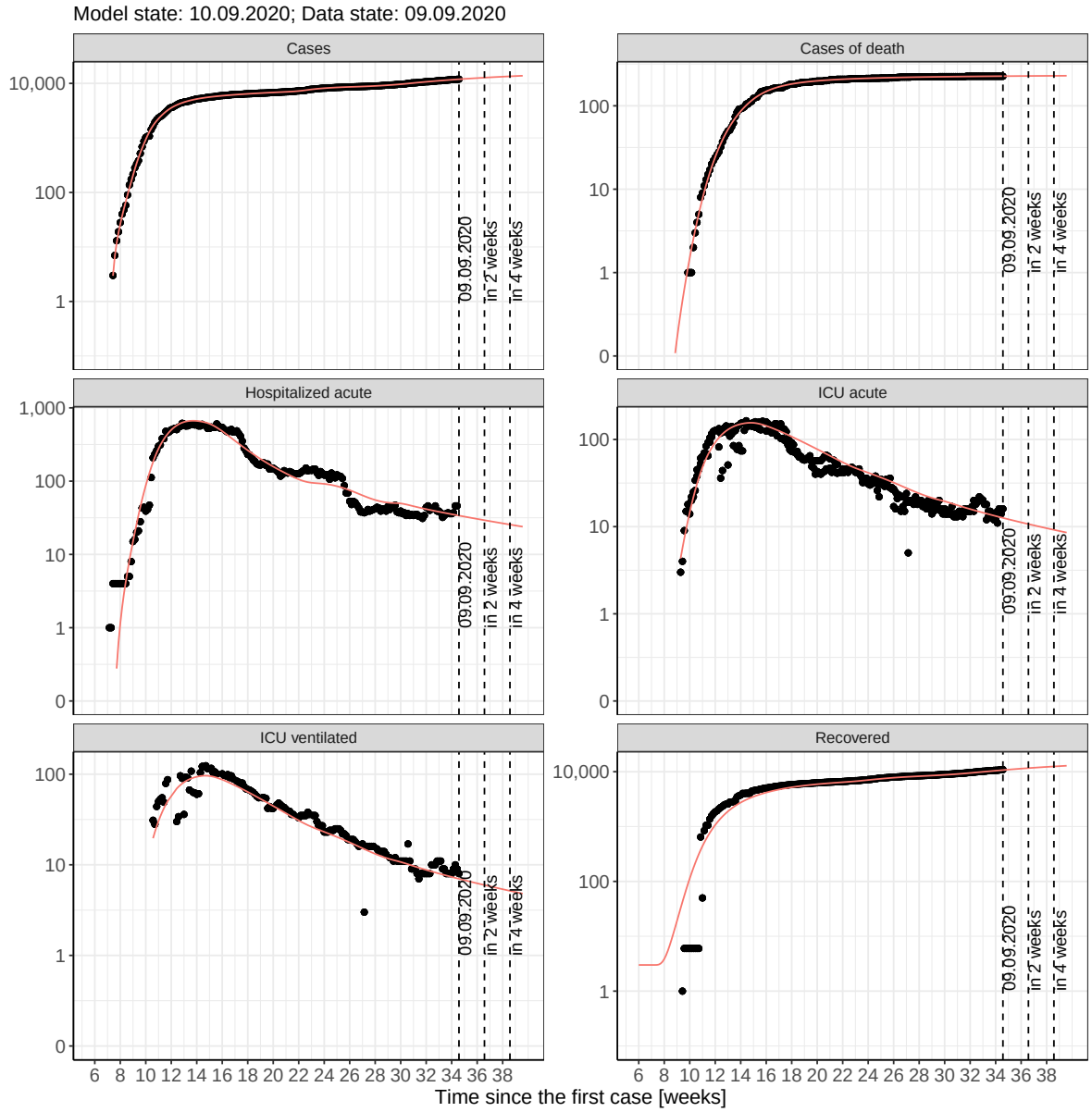


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 39 and 40 represent the model prediction for the next 4 weeks for Berlin on a linear (39) and a semi-logarithmic (40) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

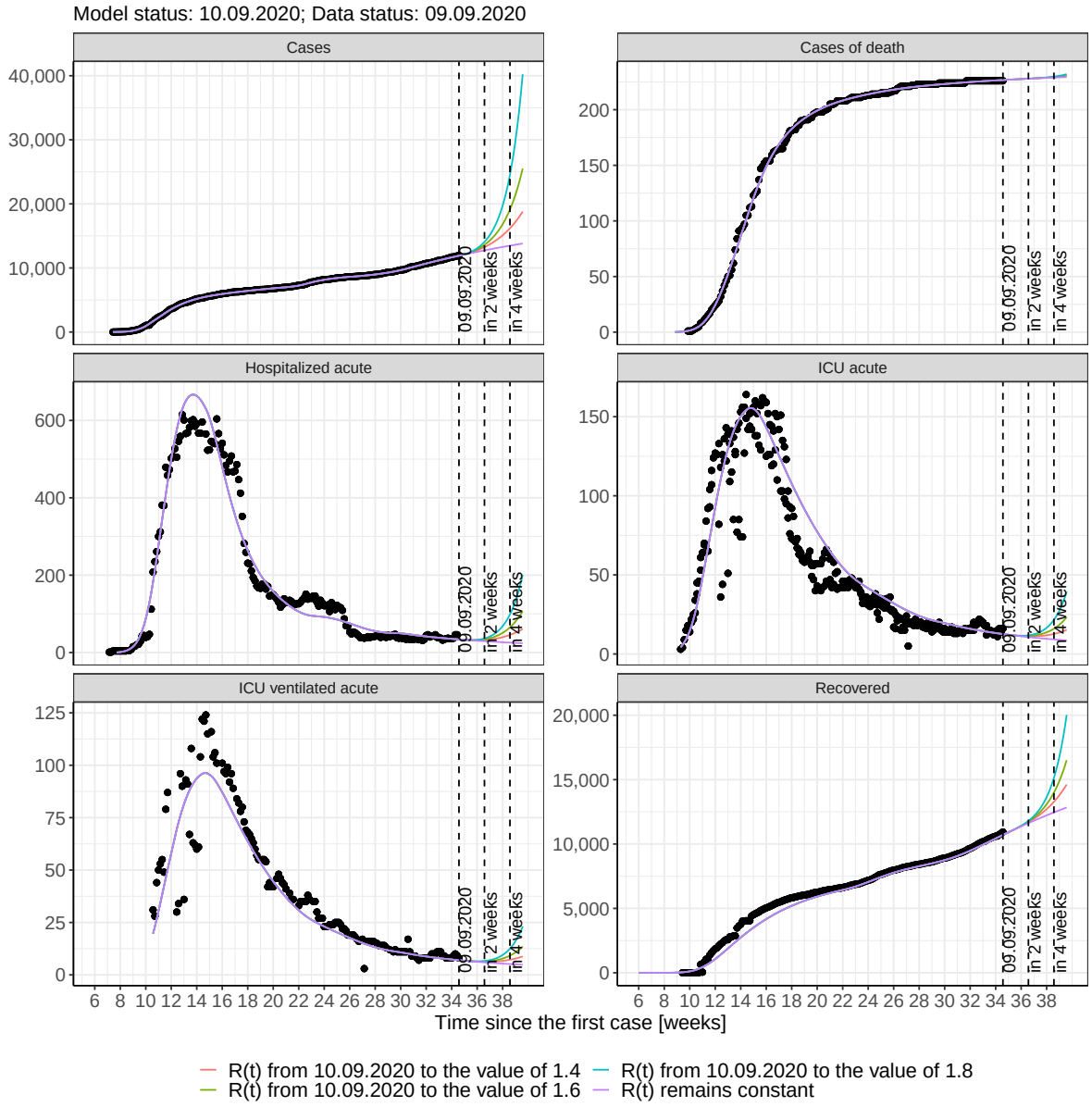


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

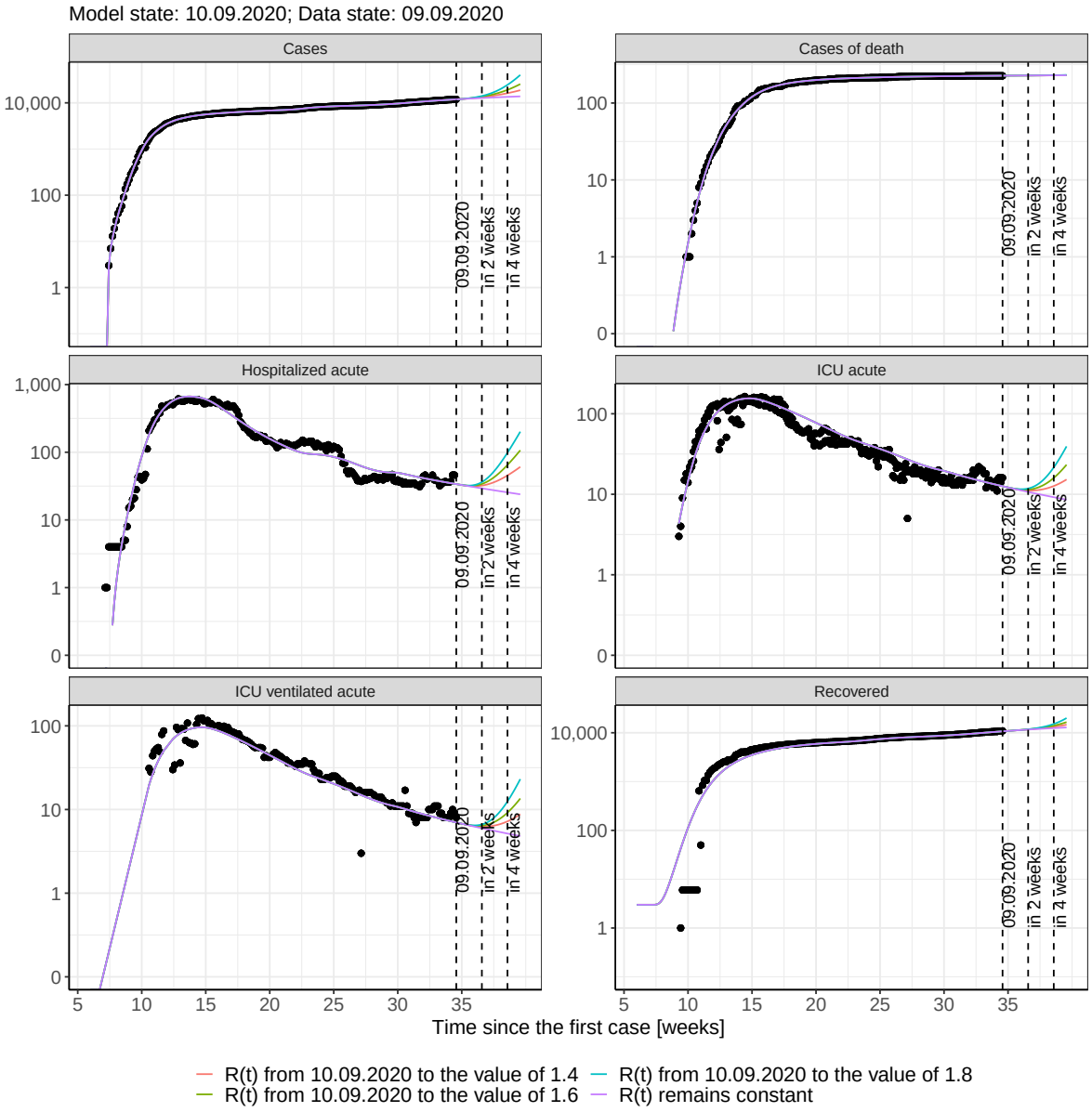


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 41 and 42 represent the model prediction for the next 16 weeks for Berlin on a linear (41) and a semi-logarithmic (42) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

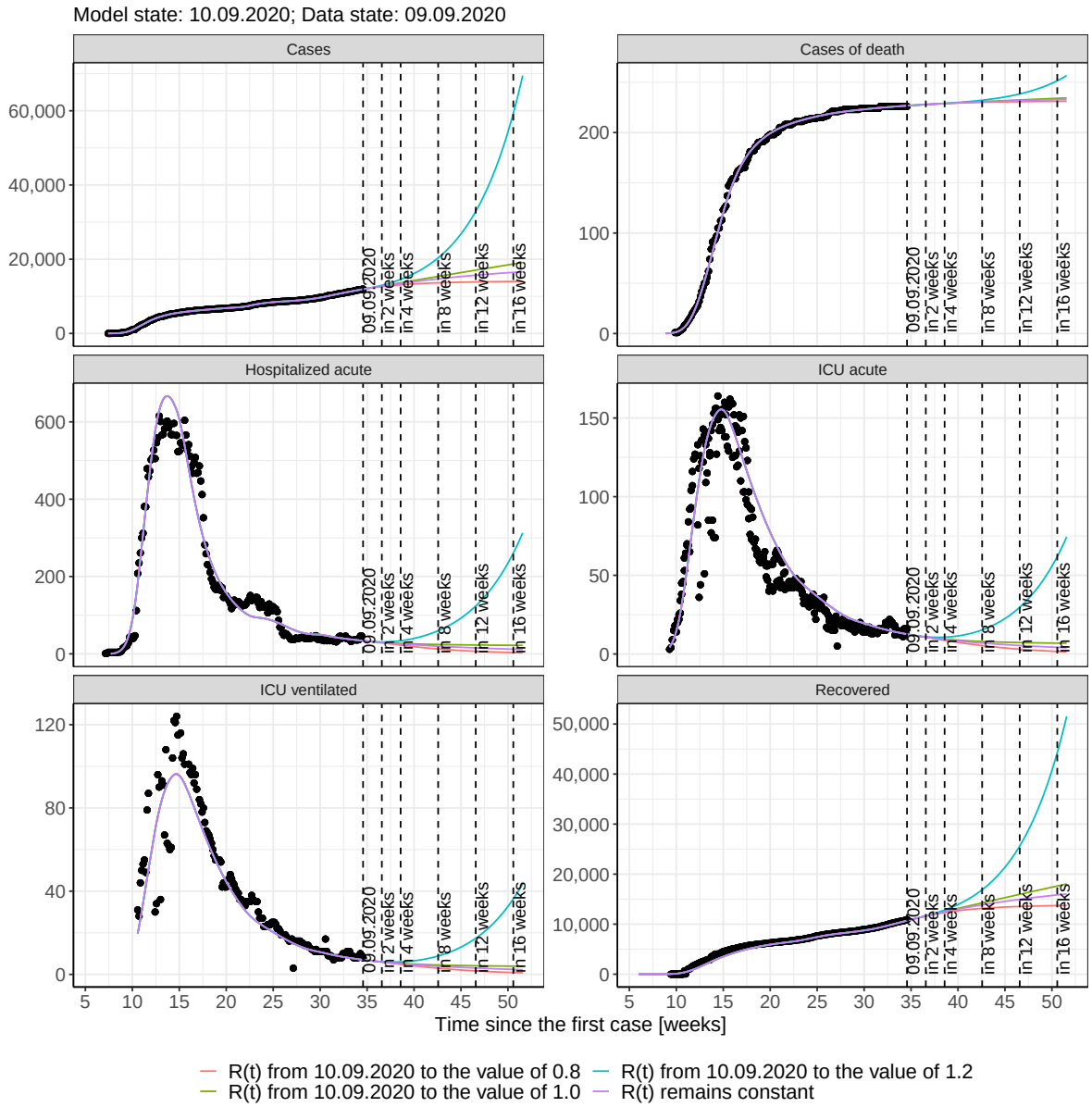


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

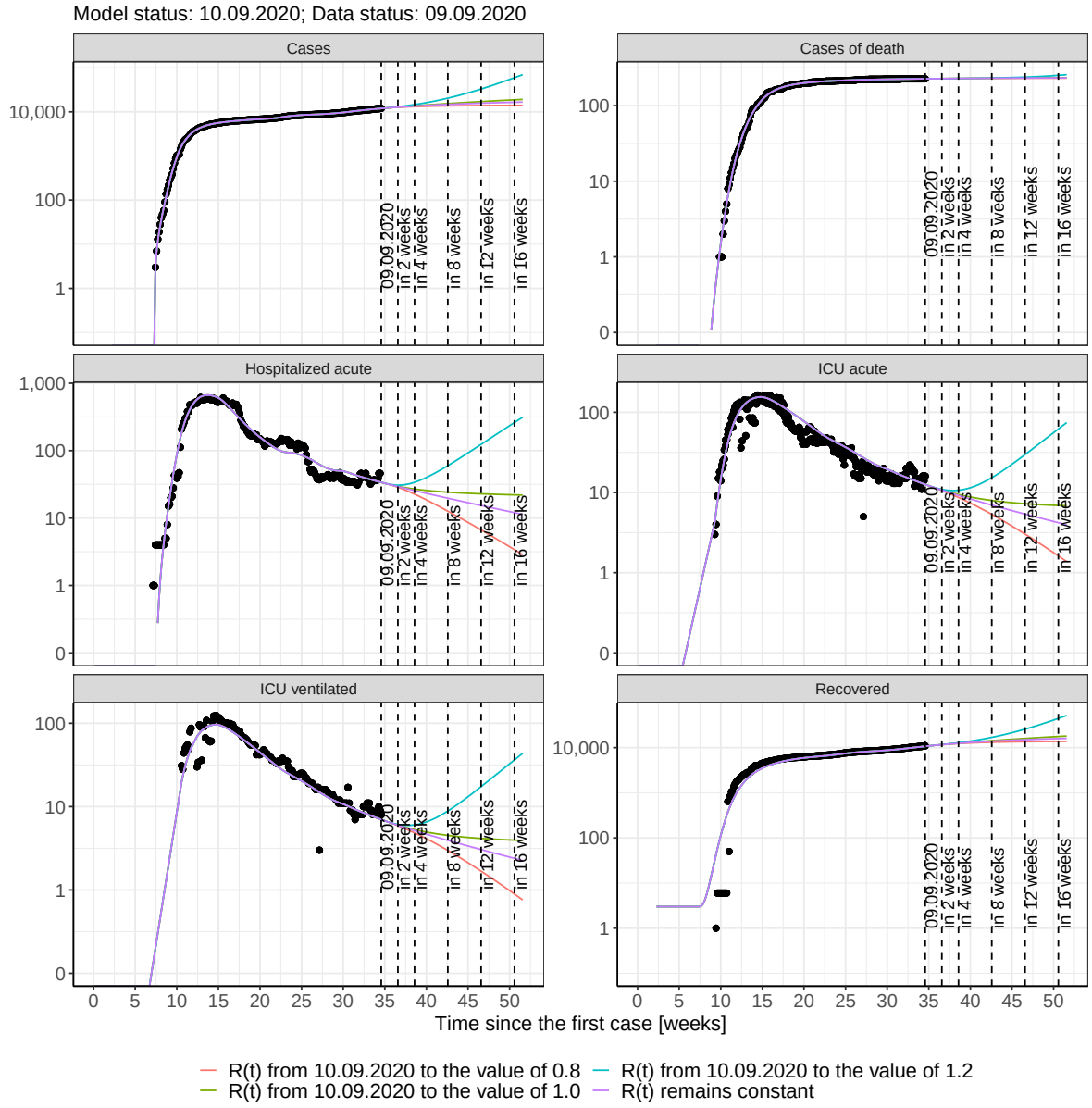


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 13) Model status from 10.09.2020; Data status: 09.09.2020.

Table 10: Berlin - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	11972	227	10771	34	12	7
11.09.2020	12034	227	10839	33	12	7
12.09.2020	12095	227	10906	33	12	7
13.09.2020	12156	227	10974	32	12	7
14.09.2020	12217	227	11040	32	12	7
15.09.2020	12277	227	11107	32	12	7
16.09.2020	12336	227	11173	31	12	6
17.09.2020	12395	227	11239	31	11	6
18.09.2020	12453	227	11304	31	11	6
19.09.2020	12511	228	11369	31	11	6
20.09.2020	12568	228	11433	30	11	6
21.09.2020	12625	228	11497	30	11	6
22.09.2020	12682	228	11560	30	11	6
23.09.2020	12738	228	11623	29	11	6
24.09.2020	12793	228	11686	29	11	6
25.09.2020	12848	228	11748	29	10	6
26.09.2020	12903	228	11809	28	10	6
27.09.2020	12957	228	11870	28	10	6
28.09.2020	13011	228	11931	28	10	6
29.09.2020	13064	228	11991	28	10	6
30.09.2020	13117	228	12051	27	10	6
01.10.2020	13169	228	12110	27	10	5
02.10.2020	13221	229	12168	27	10	5
03.10.2020	13273	229	12227	27	10	5
04.10.2020	13324	229	12284	26	9	5
05.10.2020	13374	229	12342	26	9	5
06.10.2020	13425	229	12399	26	9	5
07.10.2020	13474	229	12455	26	9	5

Table 11: Berlin - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	11972	227	10771	34	12	7
11.09.2020	12032	227	10839	33	12	7
12.09.2020	12090	227	10906	33	12	7
13.09.2020	12146	227	10973	32	12	7
14.09.2020	12201	227	11040	32	12	7
15.09.2020	12255	227	11106	32	12	7
16.09.2020	12307	227	11171	31	12	6
17.09.2020	12357	227	11236	31	11	6
18.09.2020	12406	227	11300	31	11	6
19.09.2020	12454	228	11363	30	11	6
20.09.2020	12500	228	11425	30	11	6
21.09.2020	12545	228	11486	29	11	6
22.09.2020	12589	228	11546	29	11	6
23.09.2020	12631	228	11605	29	11	6
24.09.2020	12672	228	11663	28	10	6
25.09.2020	12712	228	11720	28	10	6
26.09.2020	12751	228	11776	27	10	6
27.09.2020	12789	228	11831	27	10	6
28.09.2020	12825	228	11884	27	10	6
29.09.2020	12861	228	11937	26	10	5
30.09.2020	12896	228	11988	26	10	5
01.10.2020	12929	228	12038	25	9	5
02.10.2020	12962	229	12087	25	9	5
03.10.2020	12994	229	12135	24	9	5
04.10.2020	13024	229	12181	24	9	5
05.10.2020	13054	229	12227	23	9	5
06.10.2020	13083	229	12271	23	9	5
07.10.2020	13112	229	12315	23	9	5

Table 12: Berlin - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	11972	227	10771	34	12	7
11.09.2020	12035	227	10839	33	12	7
12.09.2020	12098	227	10906	33	12	7
13.09.2020	12160	227	10974	32	12	7
14.09.2020	12223	227	11041	32	12	7
15.09.2020	12285	227	11107	32	12	7
16.09.2020	12348	227	11174	32	12	6
17.09.2020	12410	227	11240	31	11	6
18.09.2020	12473	227	11305	31	11	6
19.09.2020	12535	228	11371	31	11	6
20.09.2020	12597	228	11436	30	11	6
21.09.2020	12660	228	11501	30	11	6
22.09.2020	12722	228	11566	30	11	6
23.09.2020	12784	228	11631	30	11	6
24.09.2020	12846	228	11695	29	11	6
25.09.2020	12909	228	11759	29	11	6
26.09.2020	12971	228	11823	29	10	6
27.09.2020	13033	228	11887	29	10	6
28.09.2020	13095	228	11951	28	10	6
29.09.2020	13157	228	12015	28	10	6
30.09.2020	13219	228	12078	28	10	6
01.10.2020	13281	228	12141	28	10	6
02.10.2020	13343	229	12205	28	10	6
03.10.2020	13405	229	12268	28	10	5
04.10.2020	13467	229	12331	27	10	5
05.10.2020	13529	229	12394	27	10	5
06.10.2020	13590	229	12457	27	10	5
07.10.2020	13652	229	12519	27	9	5

Table 13: Berlin - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	11973	227	10771	34	12	7
11.09.2020	12039	227	10839	33	12	7
12.09.2020	12106	227	10906	33	12	7
13.09.2020	12175	227	10974	32	12	7
14.09.2020	12246	227	11041	32	12	7
15.09.2020	12319	227	11109	32	12	7
16.09.2020	12394	227	11176	32	12	6
17.09.2020	12472	227	11244	31	11	6
18.09.2020	12551	227	11312	31	11	6
19.09.2020	12633	228	11380	31	11	6
20.09.2020	12717	228	11449	31	11	6
21.09.2020	12804	228	11519	31	11	6
22.09.2020	12893	228	11590	31	11	6
23.09.2020	12984	228	11661	31	11	6
24.09.2020	13078	228	11734	31	11	6
25.09.2020	13175	228	11807	31	11	6
26.09.2020	13274	228	11882	31	11	6
27.09.2020	13376	228	11959	31	11	6
28.09.2020	13482	228	12037	31	11	6
29.09.2020	13590	228	12116	31	11	6
30.09.2020	13701	228	12197	32	11	6
01.10.2020	13815	229	12280	32	11	6
02.10.2020	13933	229	12365	32	11	6
03.10.2020	14054	229	12452	32	11	6
04.10.2020	14178	229	12541	33	11	6
05.10.2020	14306	229	12632	33	11	6
06.10.2020	14437	229	12726	33	11	6
07.10.2020	14572	229	12822	34	11	6

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 43 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

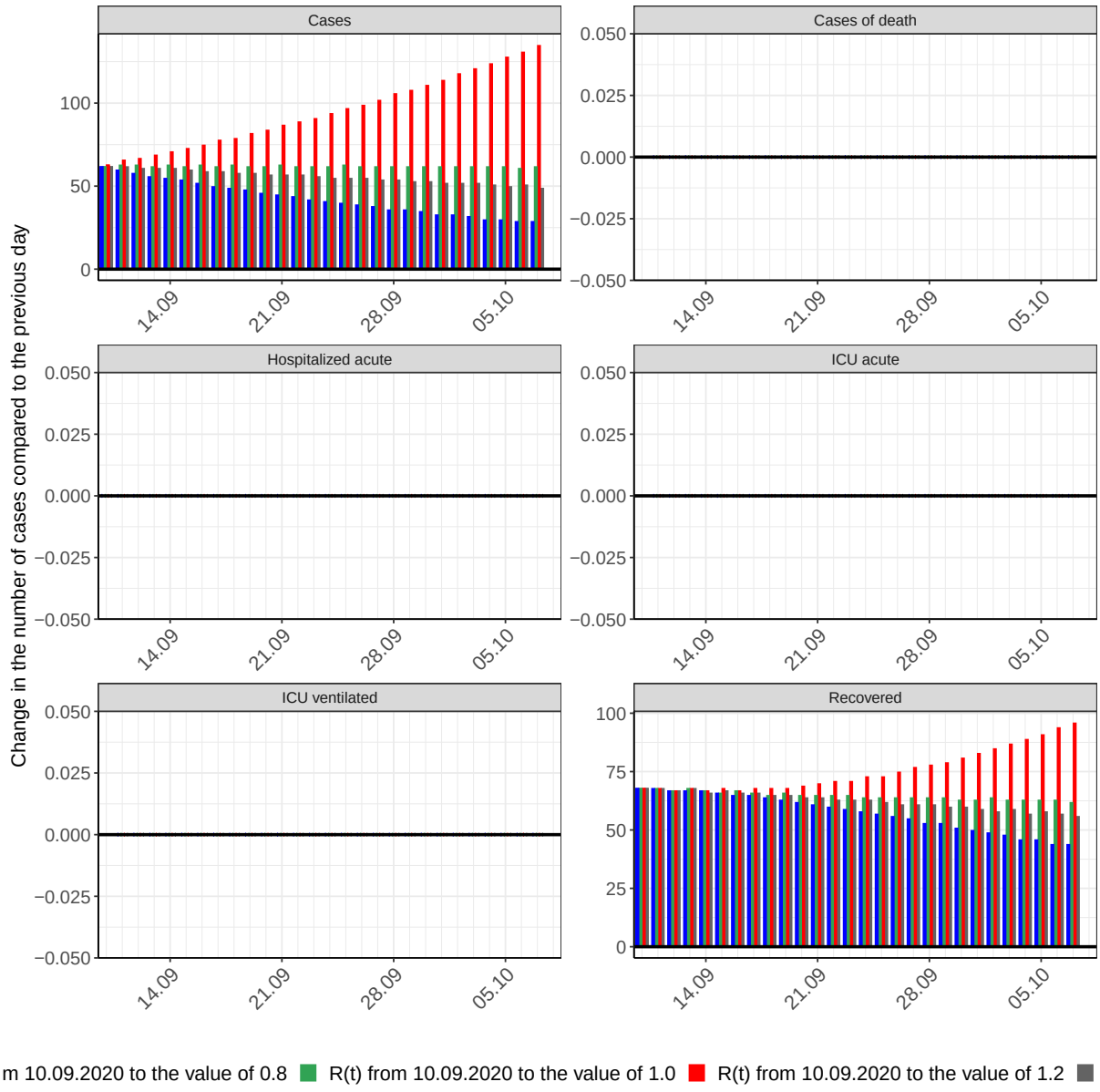


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

5 Brandenburg

5.1 Model description

Fig. 44 depicts the results of the modeling (lines) compared to the observed data (points) for Brandenburg on a linear (A) and semi-logarithmic (B) scale.

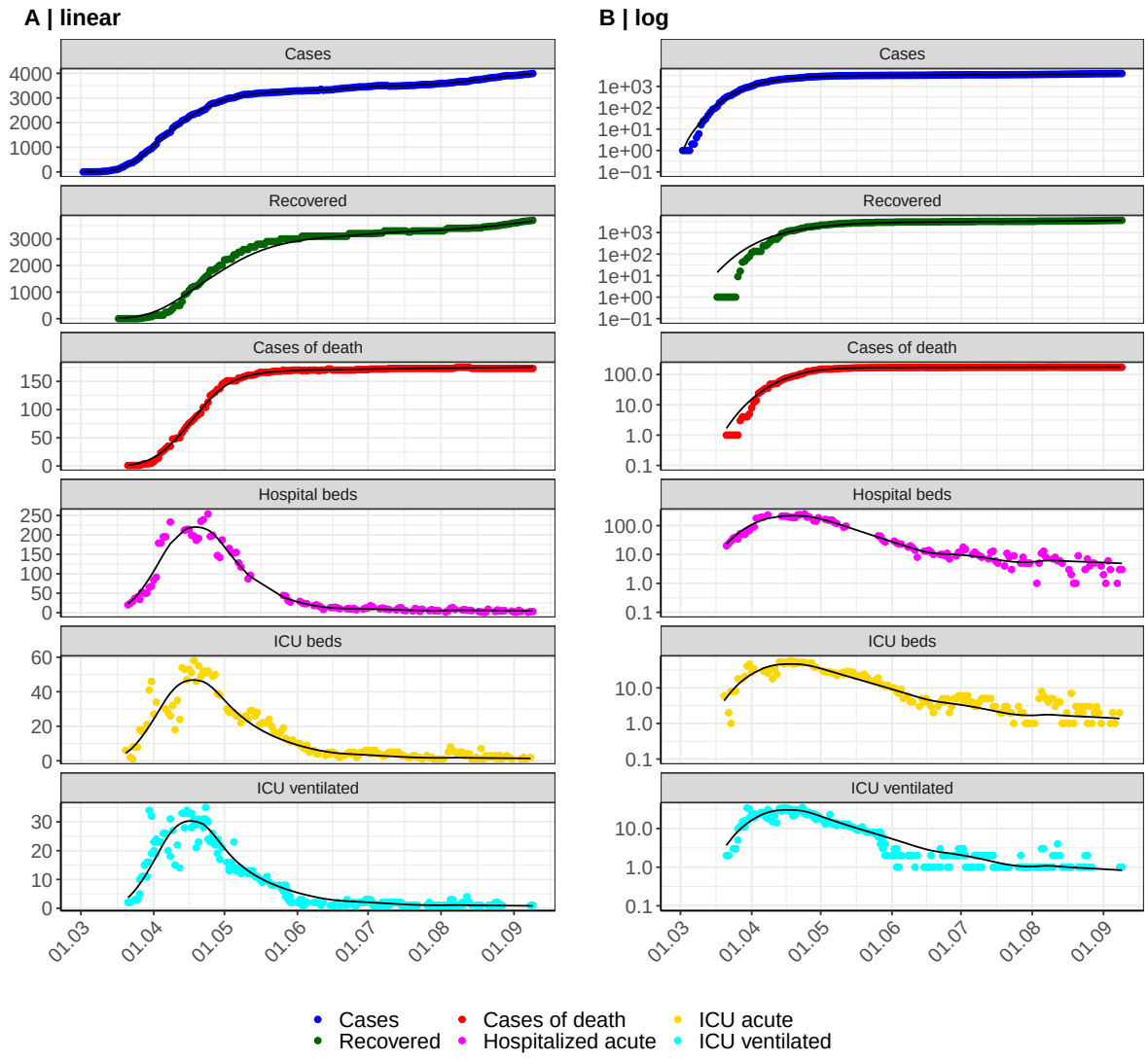


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

Fig. 45 shows the goodness-of-fit for Brandenburg. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

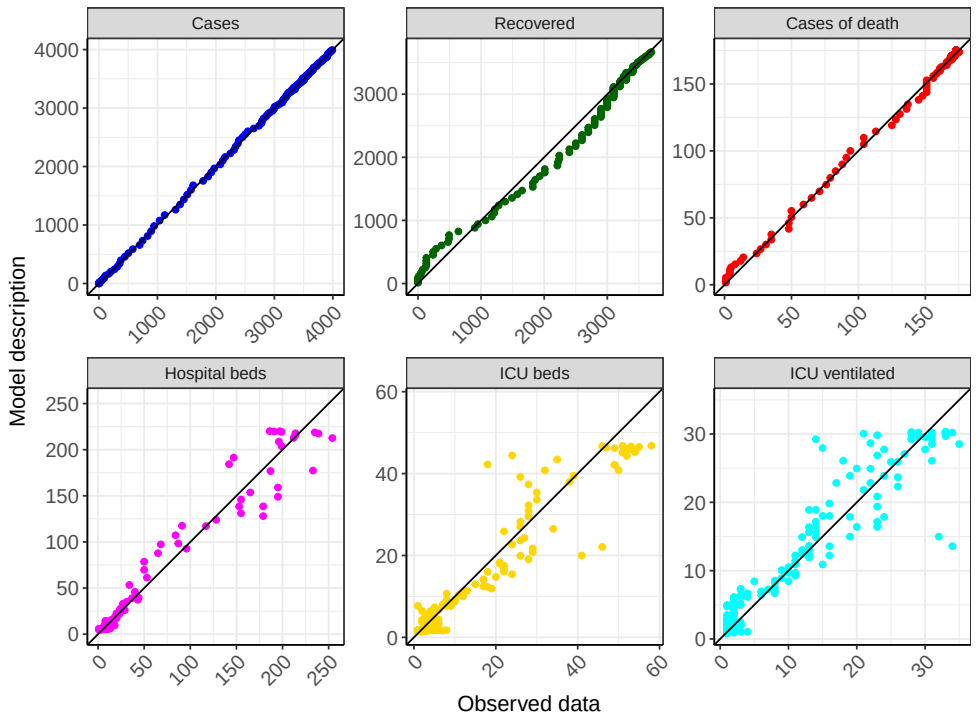


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

Fig. 46 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Brandenburg (red line) in comparison with the other federal states (grey lines).

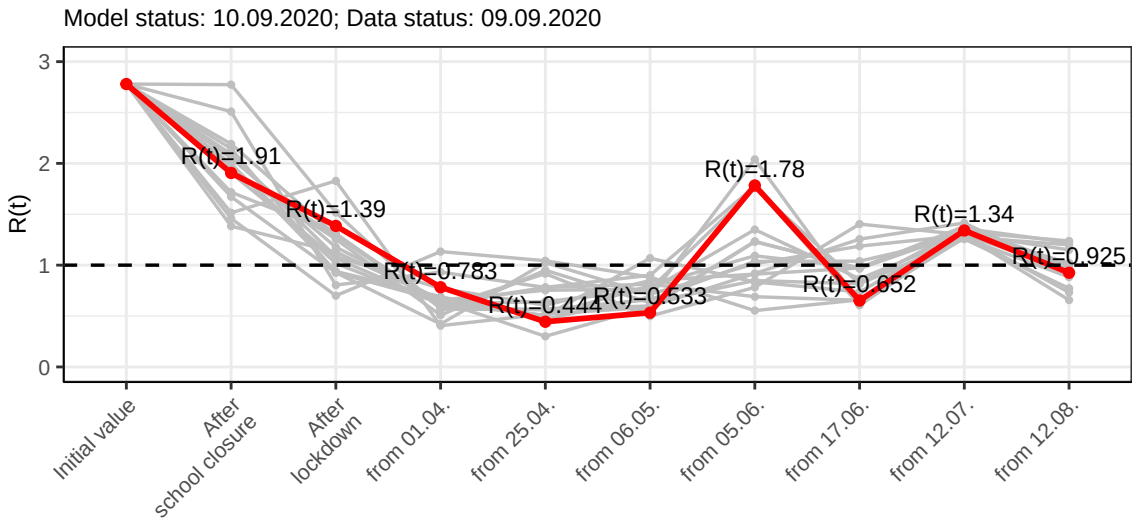


Figure 46: R(t) values before and after the NPIs for Brandenburg

Fig. 47 shows the R(t) estimated value for Brandenburg (red line) over time in comparison with the other federal states (grey lines).

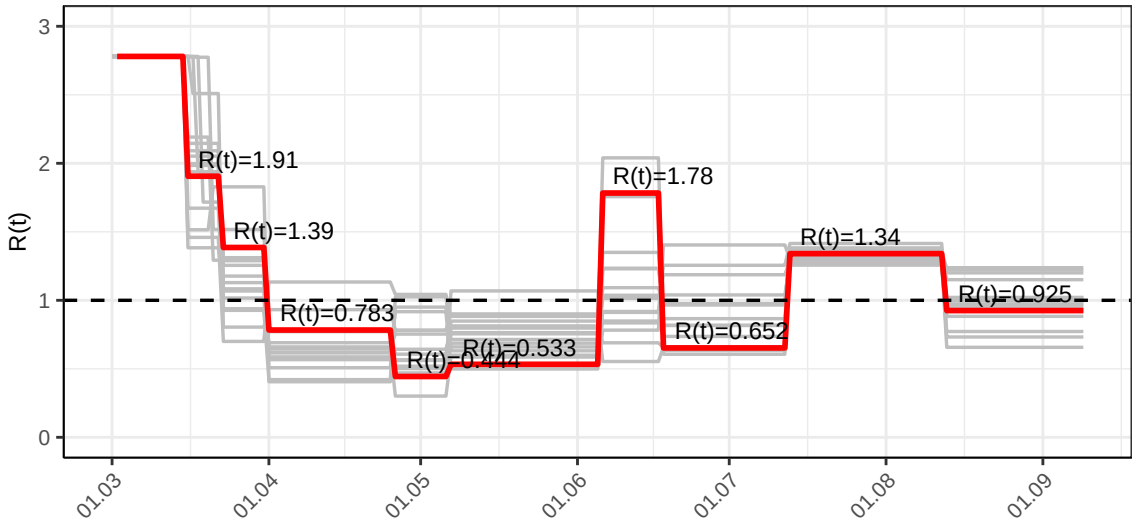


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

5.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.92)

Fig. 48 and 49 depict the the model predictions for the next 4 weeks for Brandenburg on a linear (48) and a semi-logarithmic (49) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

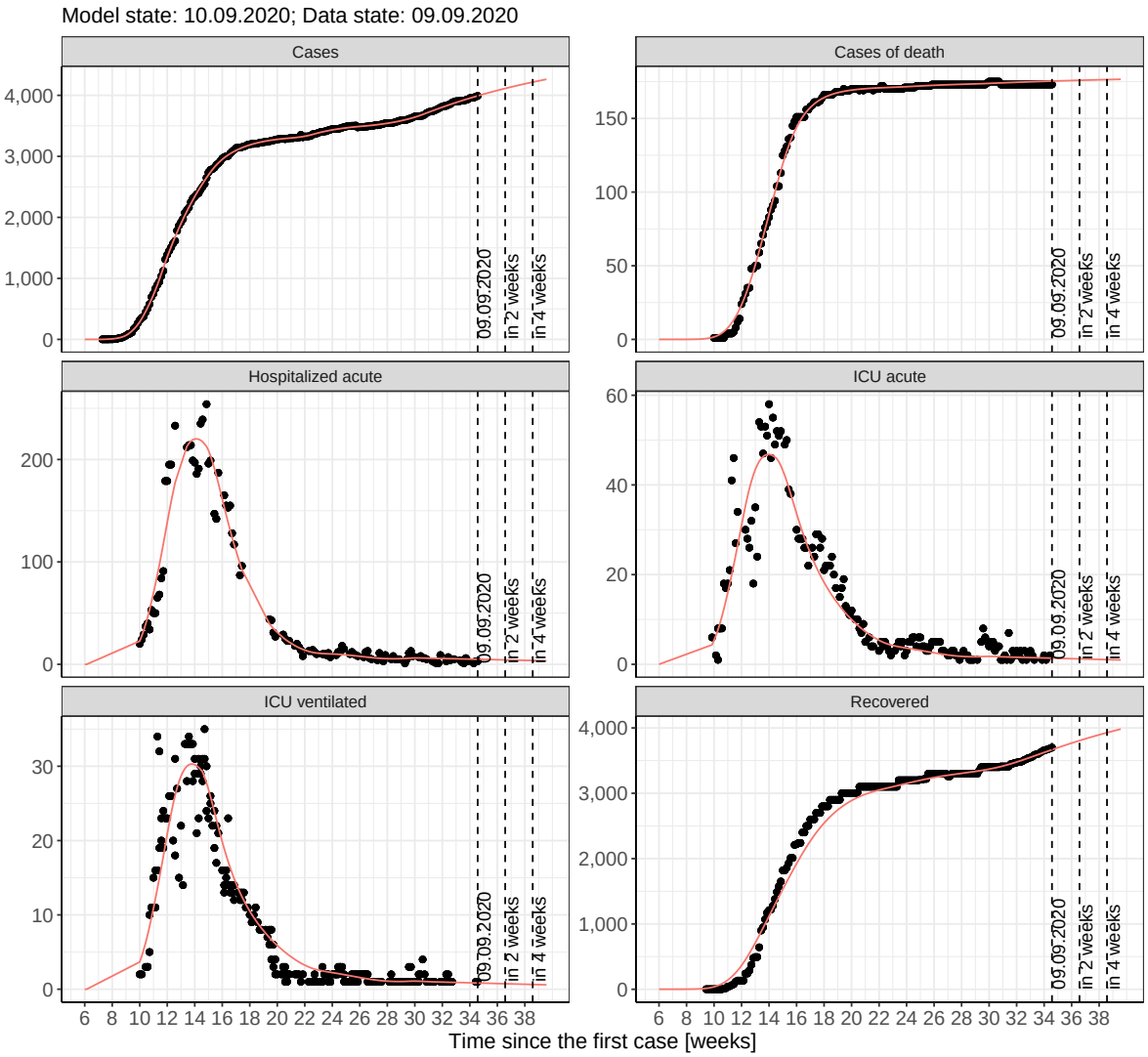


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

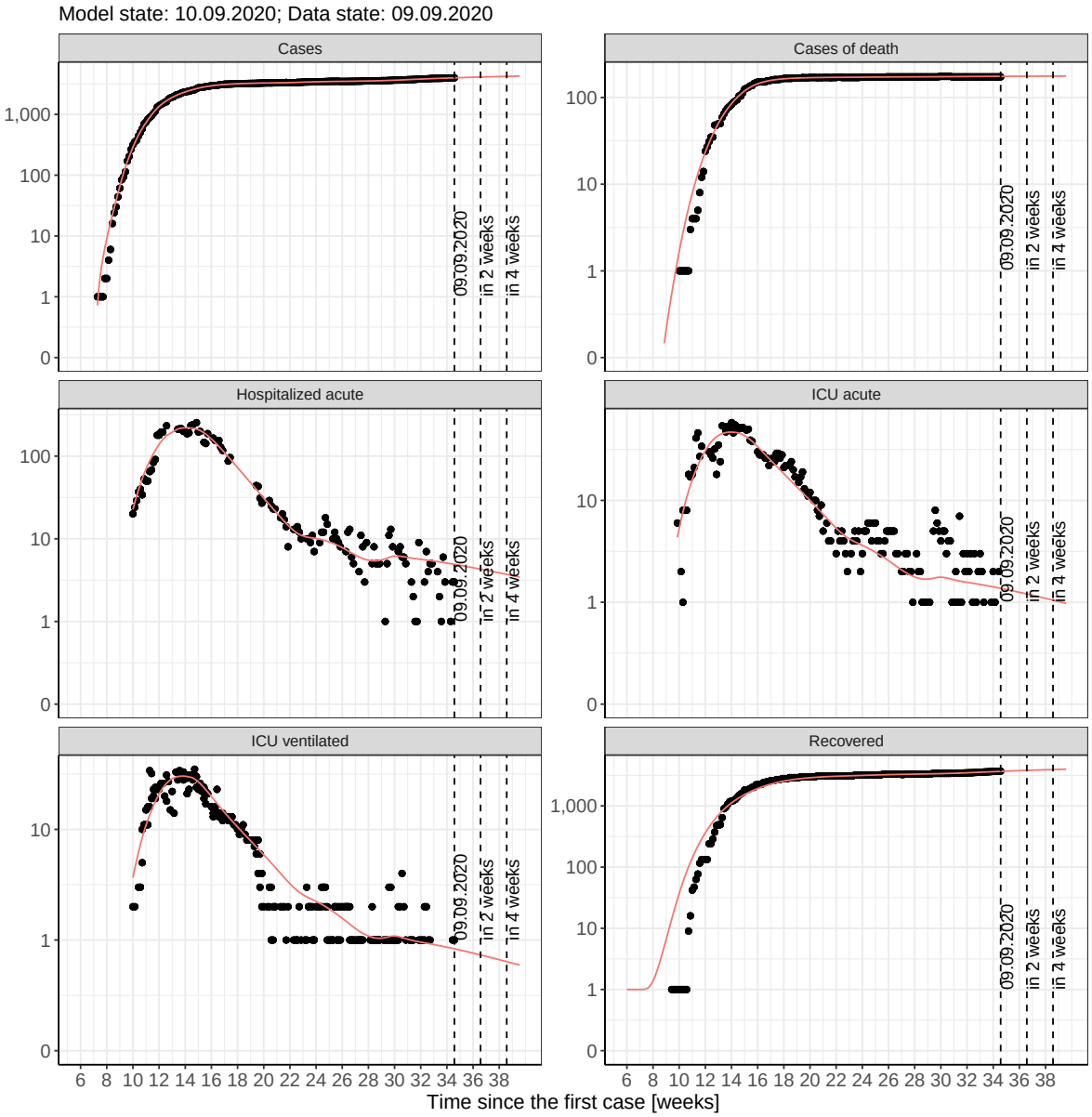


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 50 and 51 represent the model prediction for the next 4 weeks for Brandenburg on a linear (50) and a semi-logarithmic (51) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

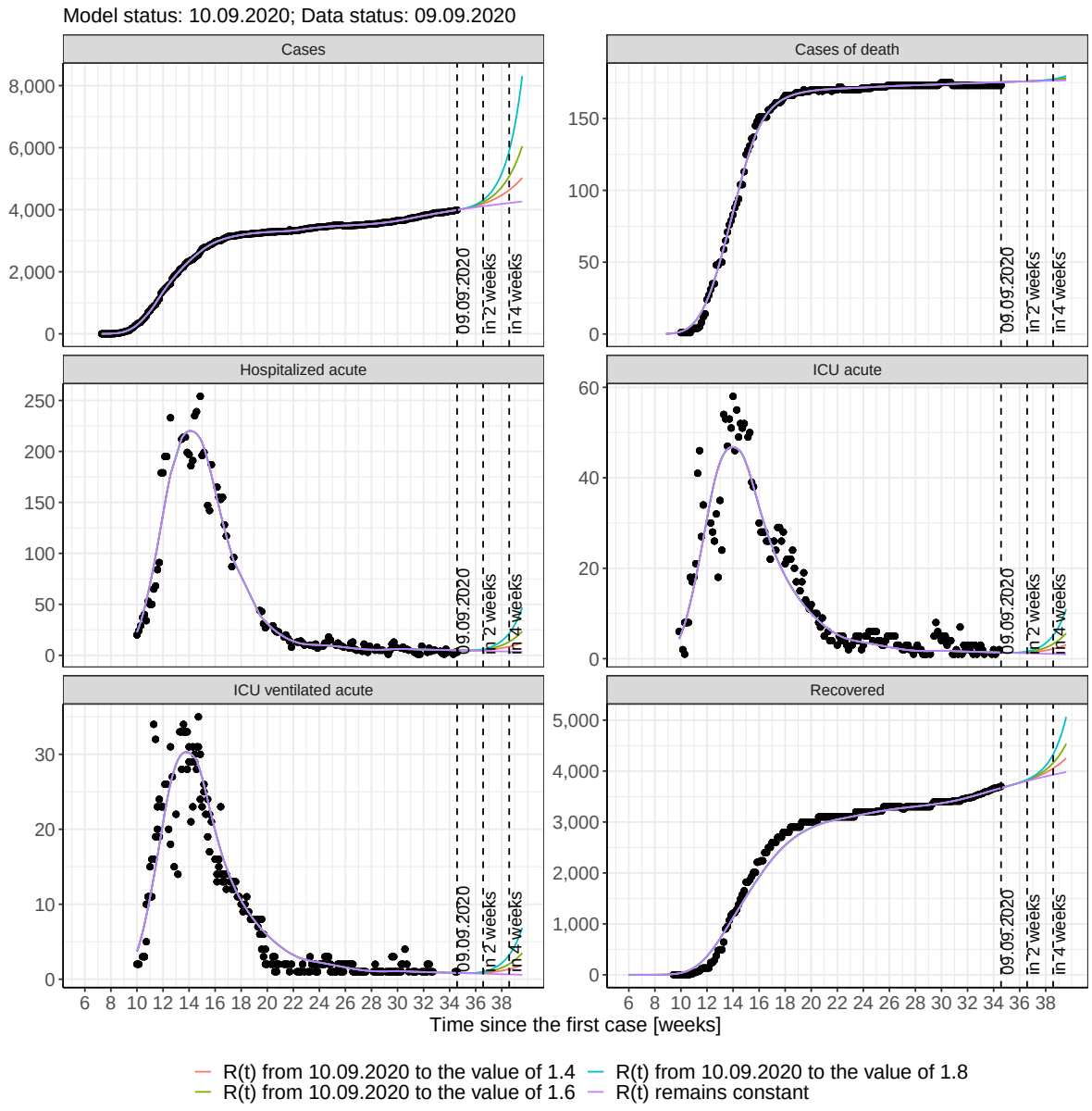


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

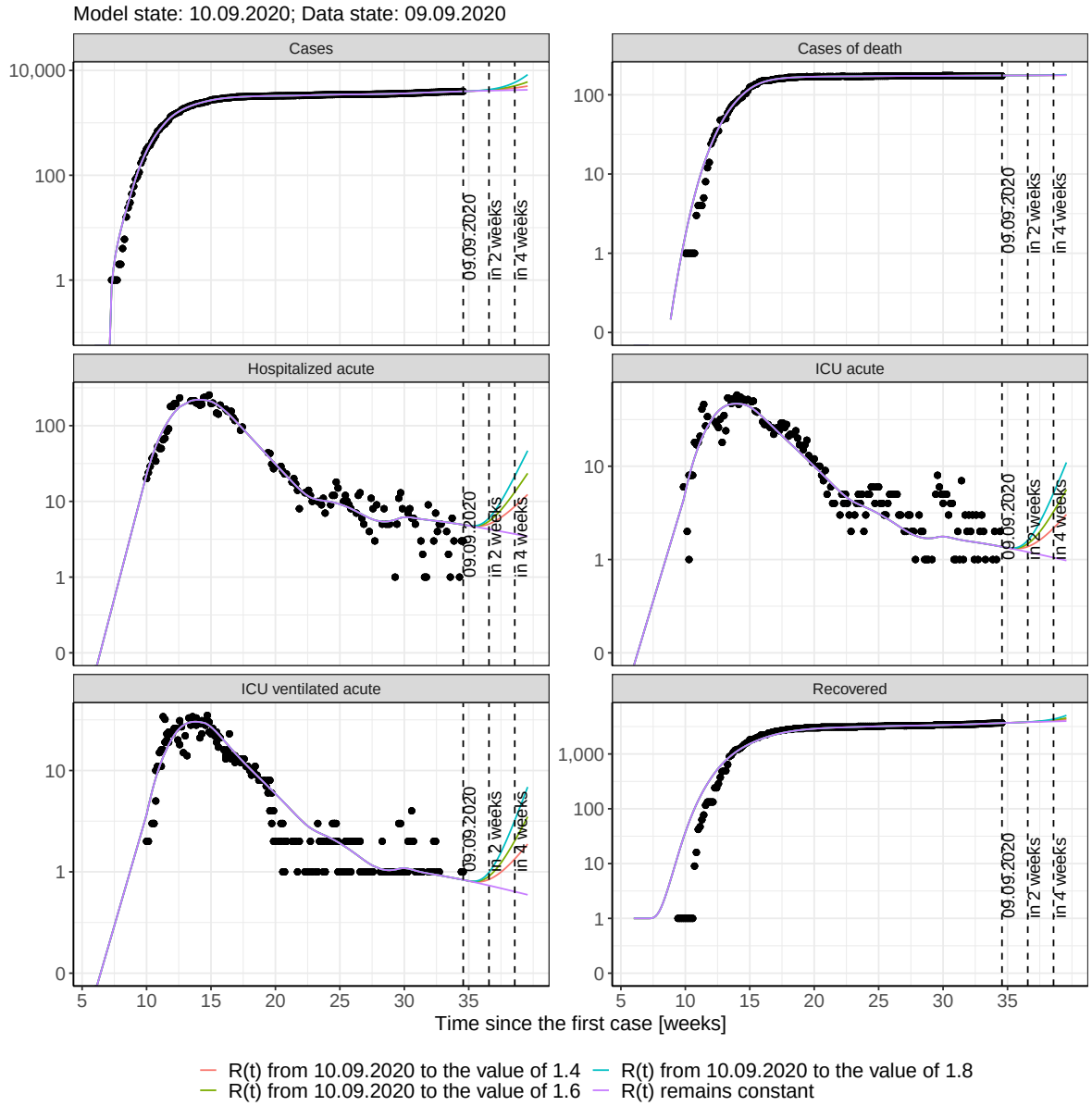


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 52 and 53 represent the model prediction for the next 16 weeks for Brandenburg on a linear (52) and a semi-logarithmic (53) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

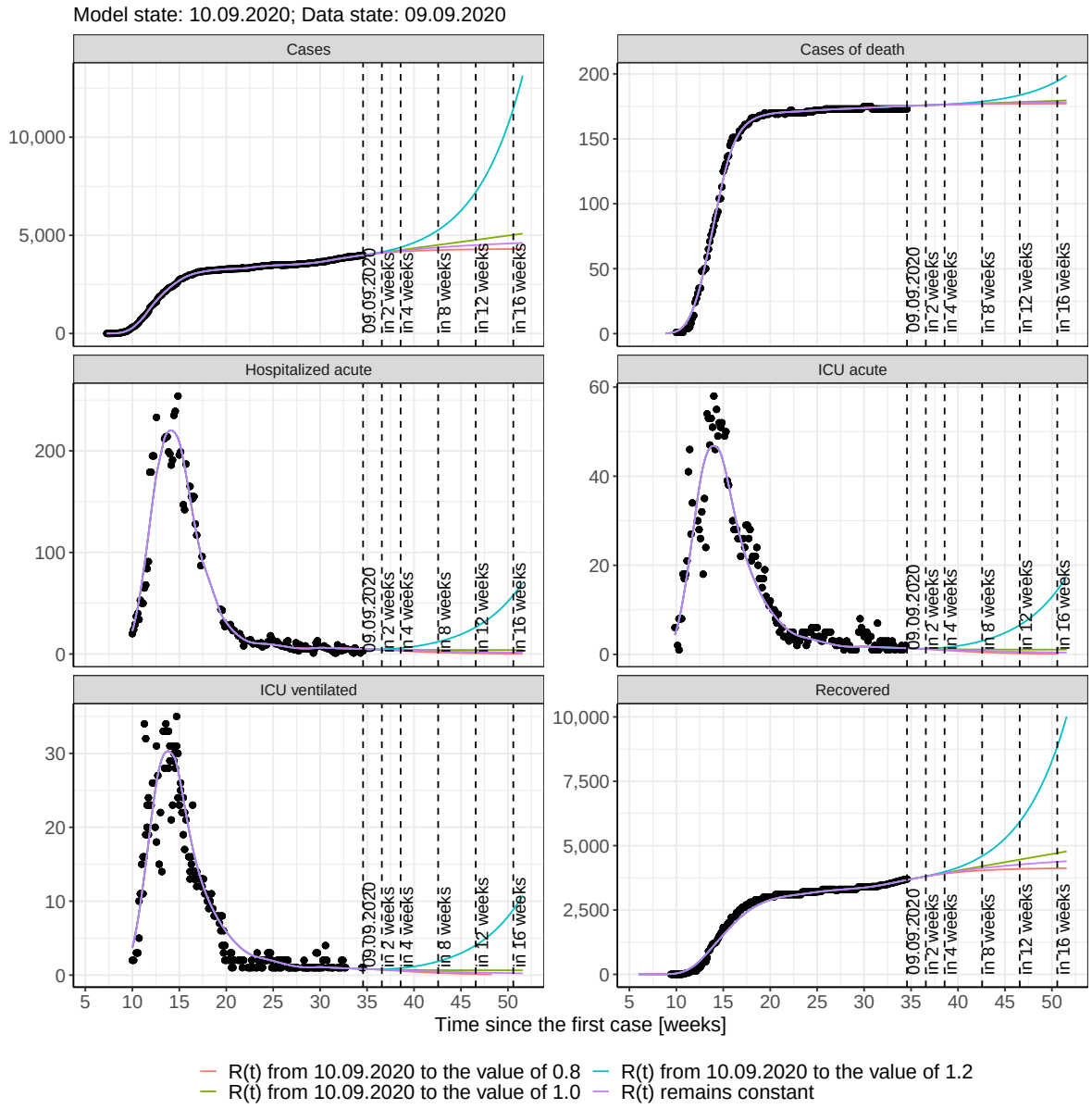


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

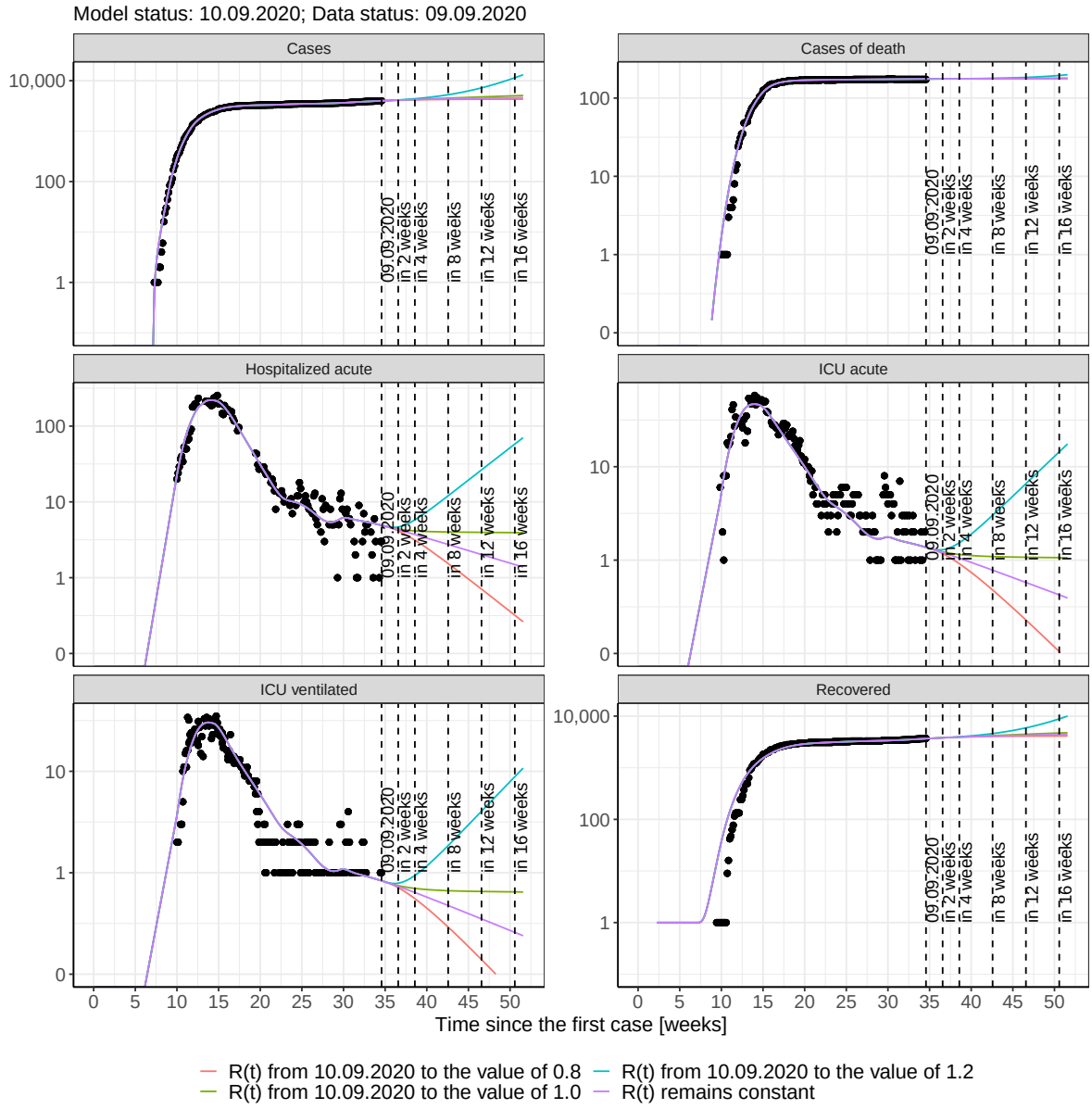


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 17) Model status from 10.09.2020; Data status: 09.09.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4001	175	3678	5	1	1
11.09.2020	4010	175	3688	5	1	1
12.09.2020	4019	175	3698	5	1	1
13.09.2020	4028	176	3709	5	1	1
14.09.2020	4037	176	3719	5	1	1
15.09.2020	4046	176	3729	5	1	1
16.09.2020	4055	176	3739	5	1	1
17.09.2020	4063	176	3749	5	1	1
18.09.2020	4072	176	3759	5	1	1
19.09.2020	4080	176	3768	4	1	1
20.09.2020	4088	176	3778	4	1	1
21.09.2020	4097	176	3788	4	1	1
22.09.2020	4105	176	3797	4	1	1
23.09.2020	4113	176	3806	4	1	1
24.09.2020	4121	176	3816	4	1	1
25.09.2020	4129	176	3825	4	1	1
26.09.2020	4136	176	3834	4	1	1
27.09.2020	4144	176	3843	4	1	1
28.09.2020	4152	176	3852	4	1	1
29.09.2020	4159	176	3861	4	1	1
30.09.2020	4167	176	3869	4	1	1
01.10.2020	4174	176	3878	4	1	1
02.10.2020	4182	176	3886	4	1	1
03.10.2020	4189	176	3895	4	1	1
04.10.2020	4196	176	3903	4	1	1
05.10.2020	4203	176	3912	4	1	1
06.10.2020	4210	176	3920	4	1	1
07.10.2020	4217	176	3928	4	1	1

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4001	175	3678	5	1	1
11.09.2020	4010	175	3688	5	1	1
12.09.2020	4018	175	3698	5	1	1
13.09.2020	4027	176	3709	5	1	1
14.09.2020	4035	176	3719	5	1	1
15.09.2020	4043	176	3729	5	1	1
16.09.2020	4051	176	3739	5	1	1
17.09.2020	4058	176	3748	5	1	1
18.09.2020	4066	176	3758	4	1	1
19.09.2020	4073	176	3768	4	1	1
20.09.2020	4080	176	3777	4	1	1
21.09.2020	4086	176	3786	4	1	1
22.09.2020	4093	176	3795	4	1	1
23.09.2020	4099	176	3804	4	1	1
24.09.2020	4105	176	3813	4	1	1
25.09.2020	4111	176	3821	4	1	1
26.09.2020	4117	176	3830	4	1	1
27.09.2020	4123	176	3838	4	1	1
28.09.2020	4128	176	3846	4	1	1
29.09.2020	4134	176	3854	4	1	1
30.09.2020	4139	176	3861	4	1	1
01.10.2020	4144	176	3869	4	1	1
02.10.2020	4149	176	3876	3	1	1
03.10.2020	4154	176	3883	3	1	1
04.10.2020	4158	176	3890	3	1	1
05.10.2020	4163	176	3897	3	1	1
06.10.2020	4167	176	3904	3	1	1
07.10.2020	4171	176	3910	3	1	1

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4001	175	3678	5	1	1
11.09.2020	4010	175	3688	5	1	1
12.09.2020	4020	175	3698	5	1	1
13.09.2020	4029	176	3709	5	1	1
14.09.2020	4038	176	3719	5	1	1
15.09.2020	4048	176	3729	5	1	1
16.09.2020	4057	176	3739	5	1	1
17.09.2020	4066	176	3749	5	1	1
18.09.2020	4076	176	3759	5	1	1
19.09.2020	4085	176	3769	5	1	1
20.09.2020	4094	176	3779	4	1	1
21.09.2020	4104	176	3788	4	1	1
22.09.2020	4113	176	3798	4	1	1
23.09.2020	4122	176	3808	4	1	1
24.09.2020	4132	176	3817	4	1	1
25.09.2020	4141	176	3827	4	1	1
26.09.2020	4150	176	3837	4	1	1
27.09.2020	4159	176	3846	4	1	1
28.09.2020	4169	176	3856	4	1	1
29.09.2020	4178	176	3865	4	1	1
30.09.2020	4187	176	3875	4	1	1
01.10.2020	4197	176	3884	4	1	1
02.10.2020	4206	176	3894	4	1	1
03.10.2020	4215	176	3903	4	1	1
04.10.2020	4224	176	3912	4	1	1
05.10.2020	4234	176	3922	4	1	1
06.10.2020	4243	176	3931	4	1	1
07.10.2020	4252	176	3941	4	1	1

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4001	175	3678	5	1	1
11.09.2020	4011	175	3688	5	1	1
12.09.2020	4021	175	3698	5	1	1
13.09.2020	4031	176	3709	5	1	1
14.09.2020	4042	176	3719	5	1	1
15.09.2020	4053	176	3729	5	1	1
16.09.2020	4064	176	3739	5	1	1
17.09.2020	4076	176	3750	5	1	1
18.09.2020	4087	176	3760	5	1	1
19.09.2020	4100	176	3770	5	1	1
20.09.2020	4112	176	3780	5	1	1
21.09.2020	4125	176	3791	5	1	1
22.09.2020	4138	176	3802	5	1	1
23.09.2020	4152	176	3812	5	1	1
24.09.2020	4166	176	3823	5	1	1
25.09.2020	4181	176	3834	5	1	1
26.09.2020	4196	176	3845	5	1	1
27.09.2020	4211	176	3857	5	1	1
28.09.2020	4227	176	3868	5	1	1
29.09.2020	4243	176	3880	5	1	1
30.09.2020	4260	176	3892	5	1	1
01.10.2020	4277	176	3905	5	1	1
02.10.2020	4294	176	3918	5	1	1
03.10.2020	4312	176	3930	5	1	1
04.10.2020	4331	176	3944	5	1	1
05.10.2020	4350	176	3957	6	1	1
06.10.2020	4370	176	3971	6	2	1
07.10.2020	4390	177	3986	6	2	1

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 54 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

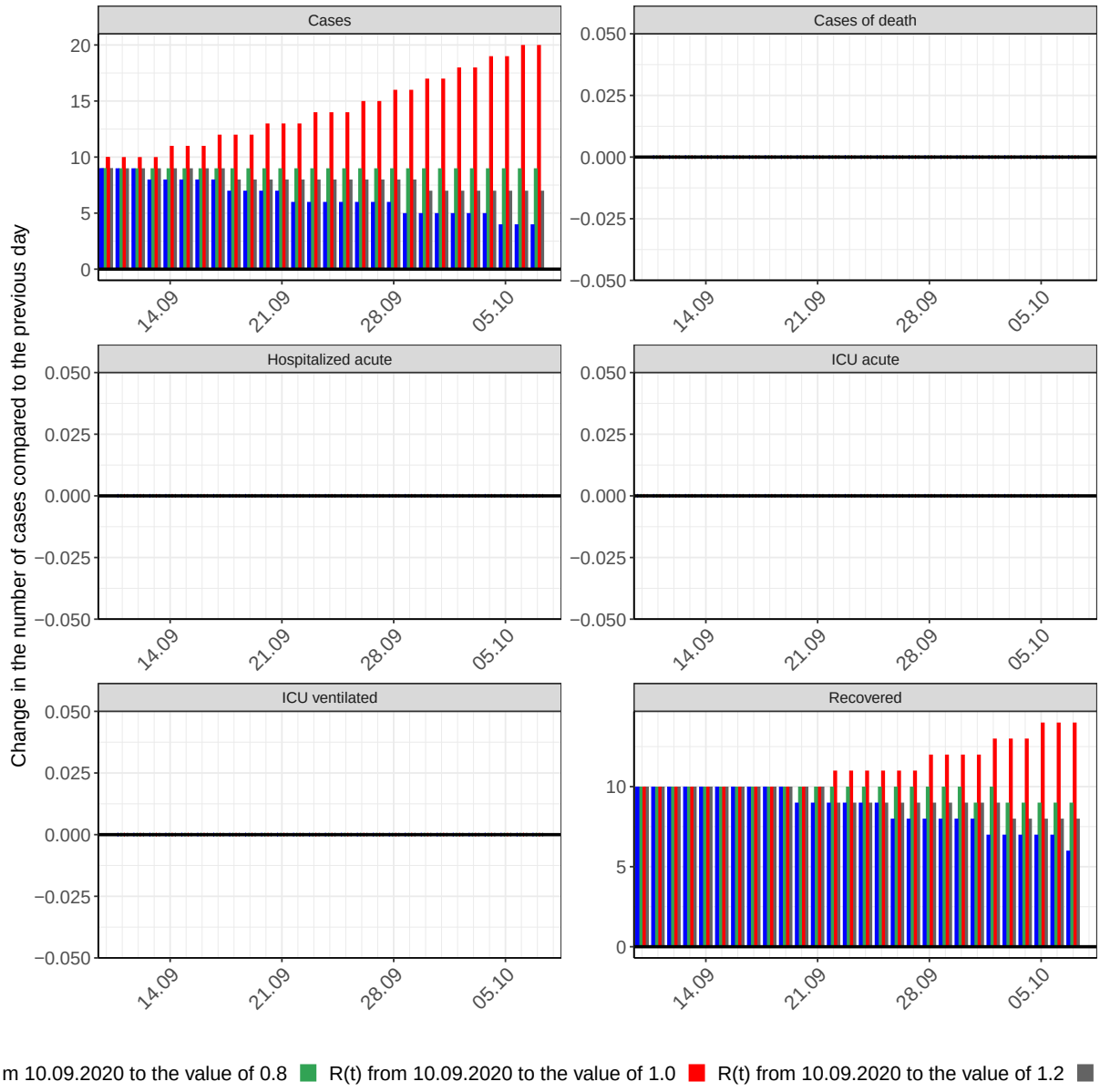


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

6 Bremen

6.1 Model description

Fig. 55 depicts the results of the modeling (lines) compared to the observed data (points) for Bremen on a linear (A) and semi-logarithmic (B) scale.

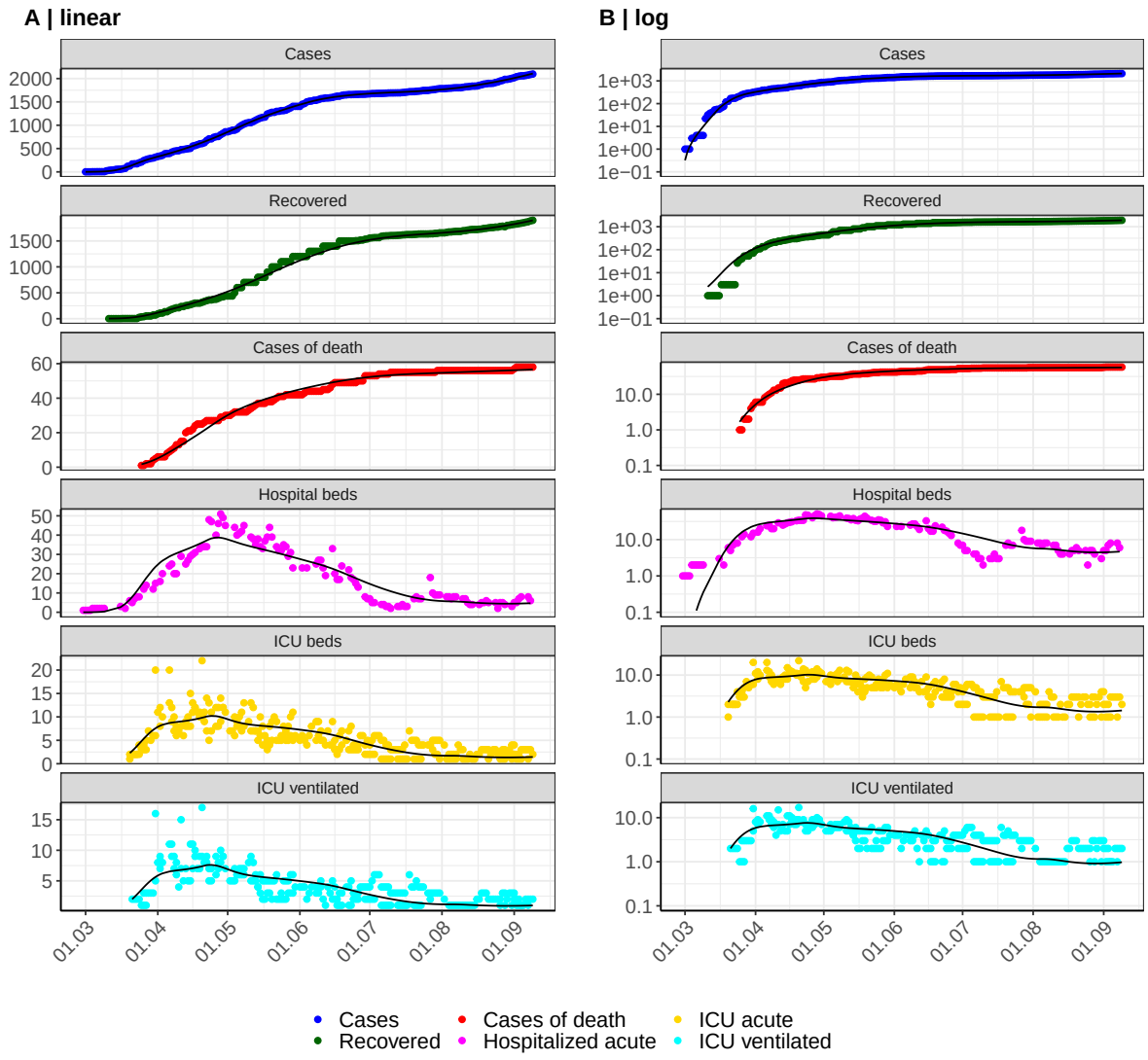


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

Fig. 56 shows the goodness-of-fit for Bremen. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

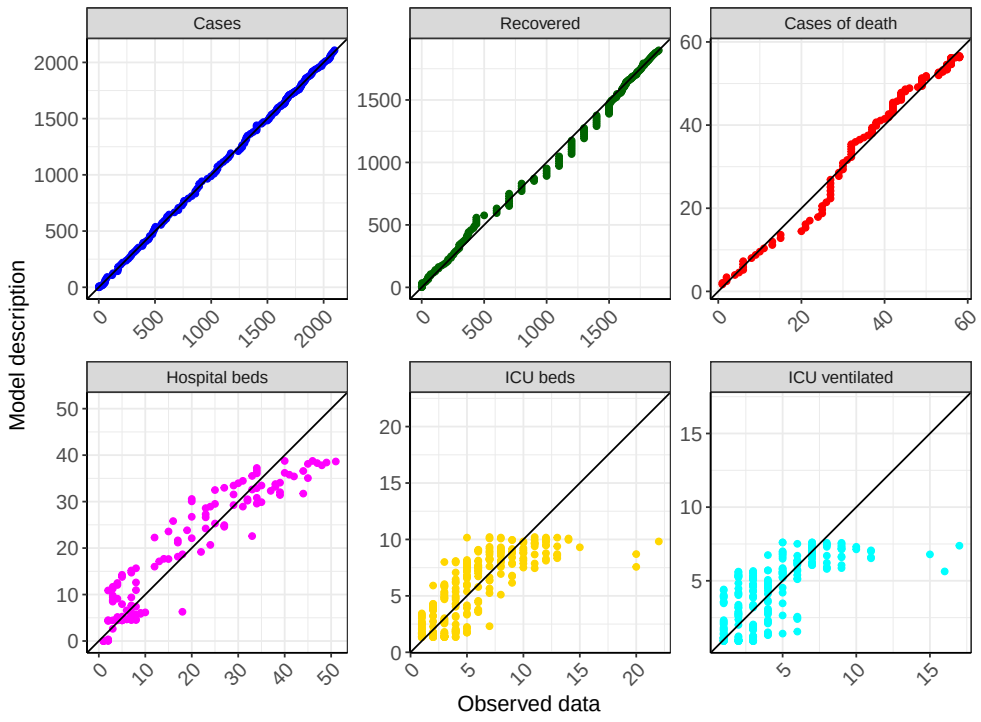


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

Fig. 57 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Bremen (red line) in comparison with the other federal states (grey lines).

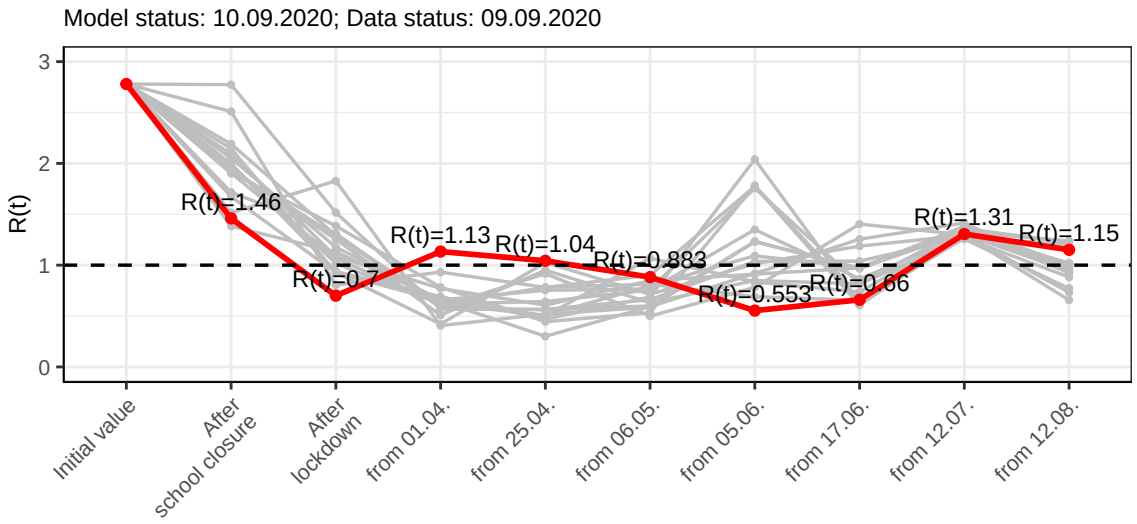


Figure 57: R(t) values before and after the NPIs for Bremen

Fig. 58 shows the R(t) estimated value for Bremen (red line) over time in comparison with the other federal states (grey lines).

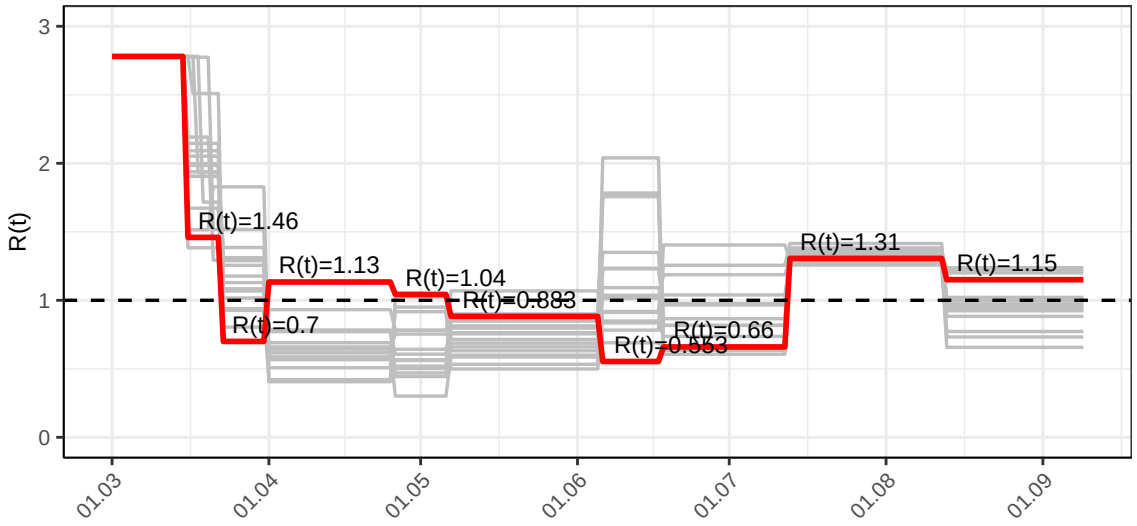


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

6.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.15)

Fig. 59 and 60 depict the the model predictions for the next 4 weeks for Bremen on a linear (59) and a semi-logarithmic (60) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

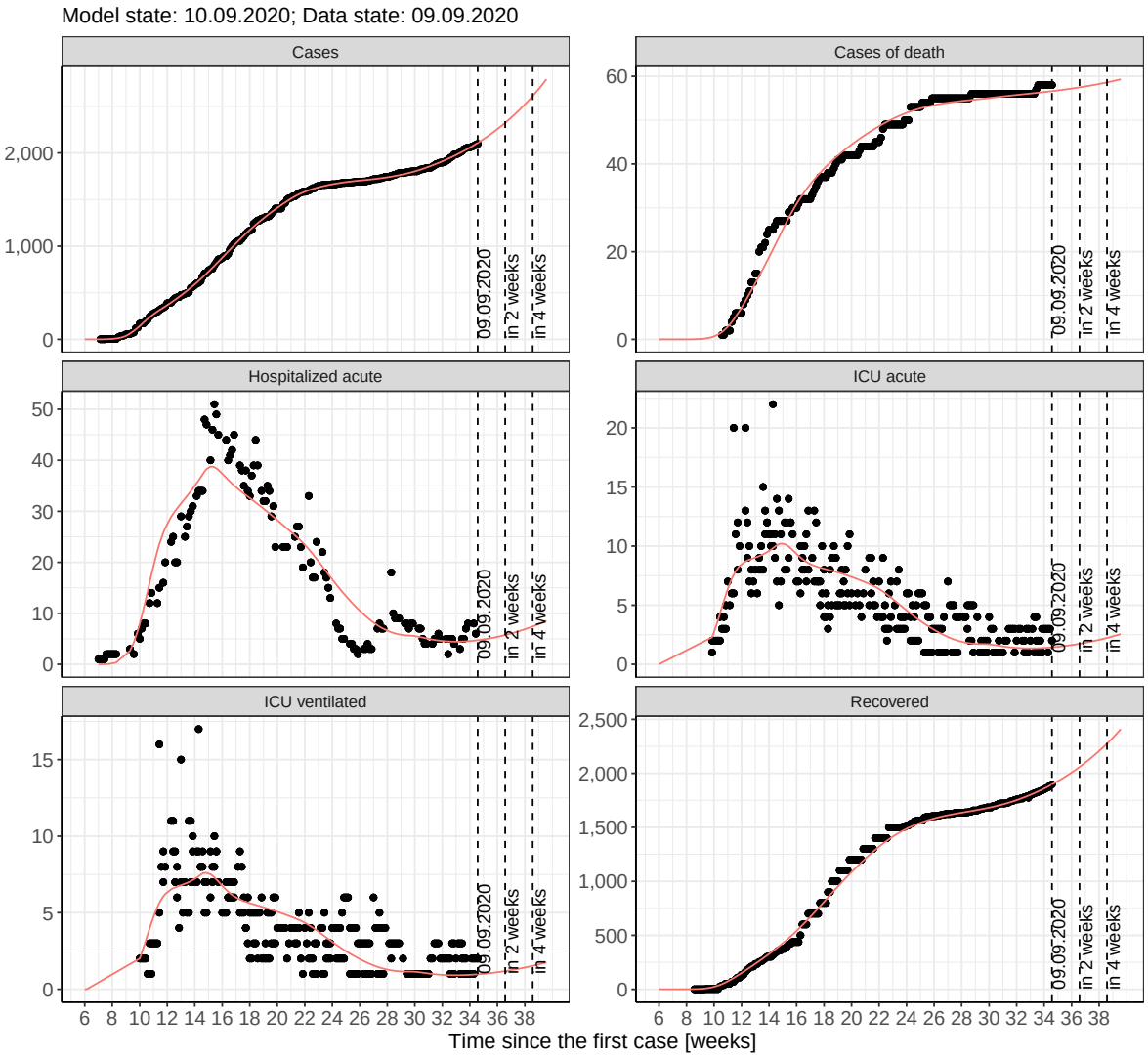


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

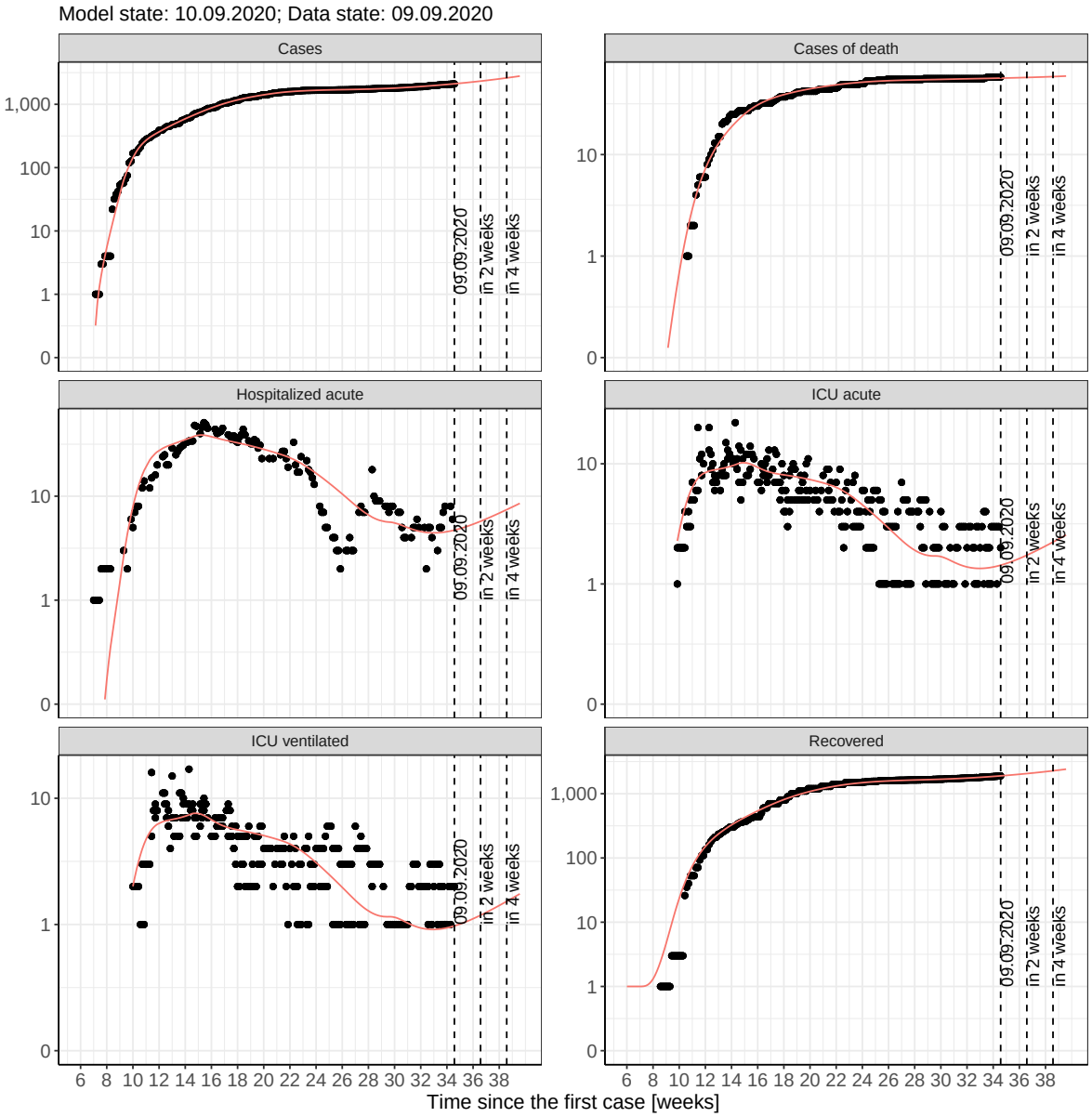


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 61 and 62 represent the model prediction for the next 4 weeks for Bremen on a linear (61) and a semi-logarithmic (62) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

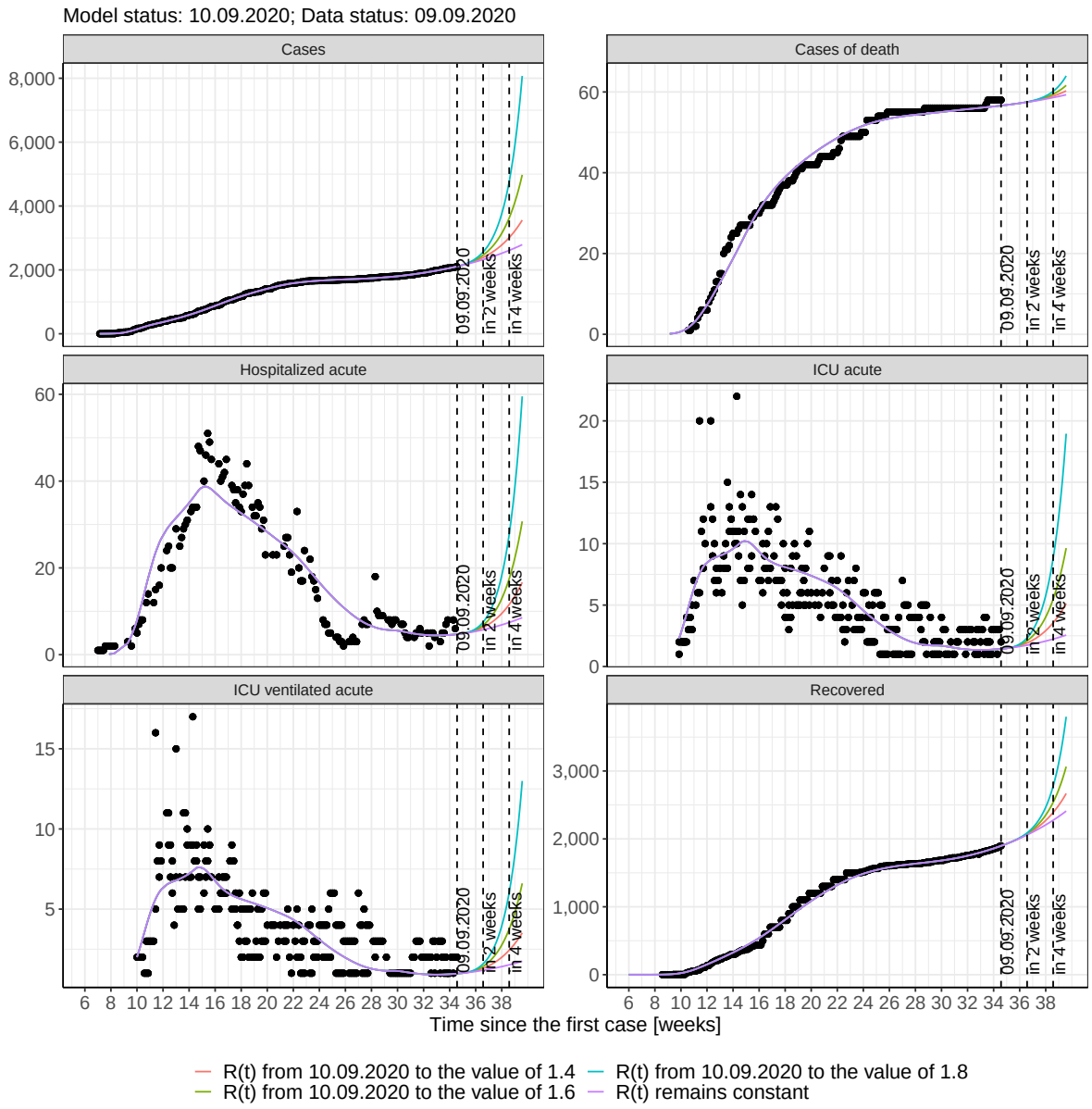


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

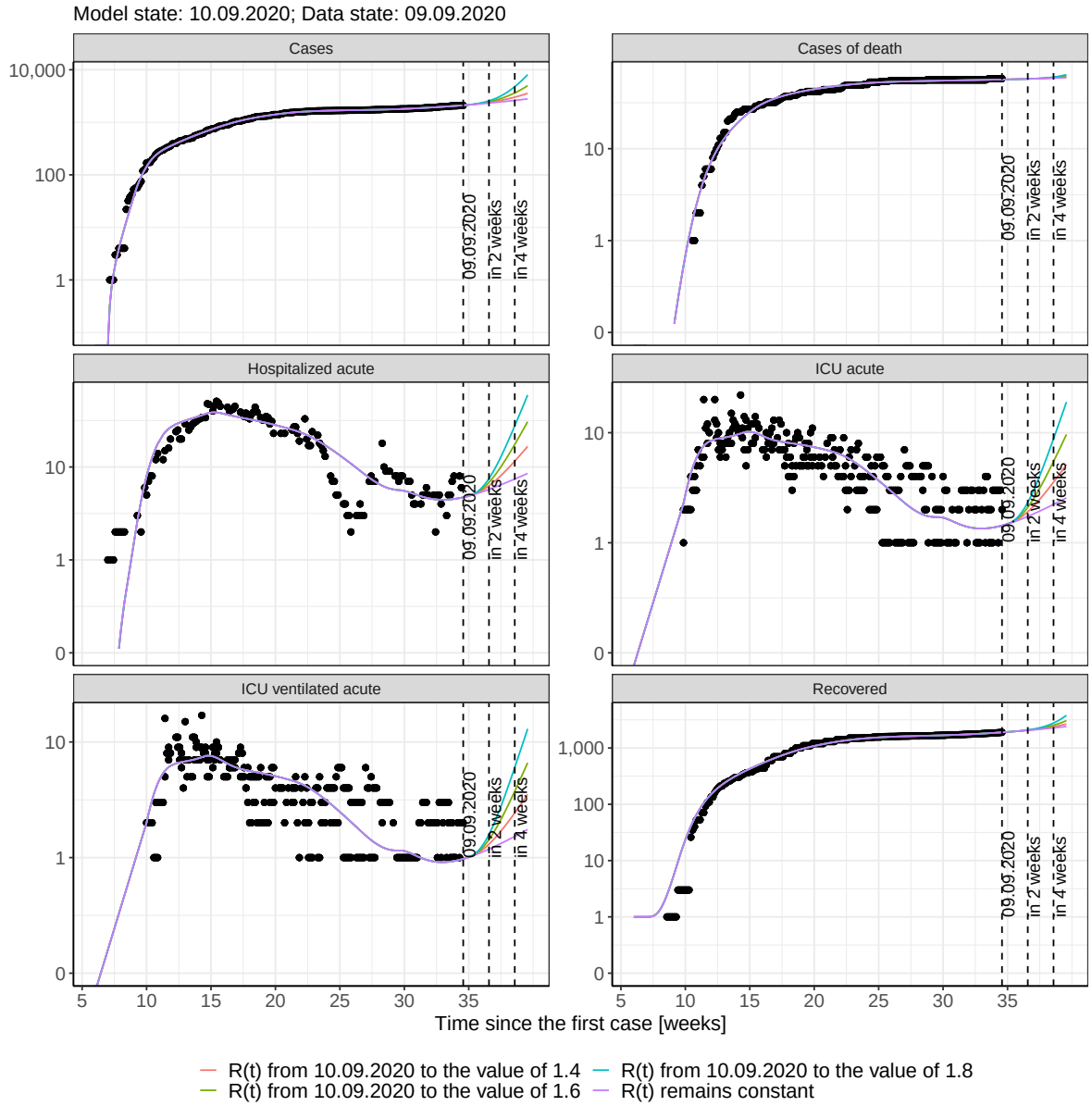


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 63 and 64 represent the model prediction for the next 16 weeks for Bremen on a linear (63) and a semi-logarithmic (64) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

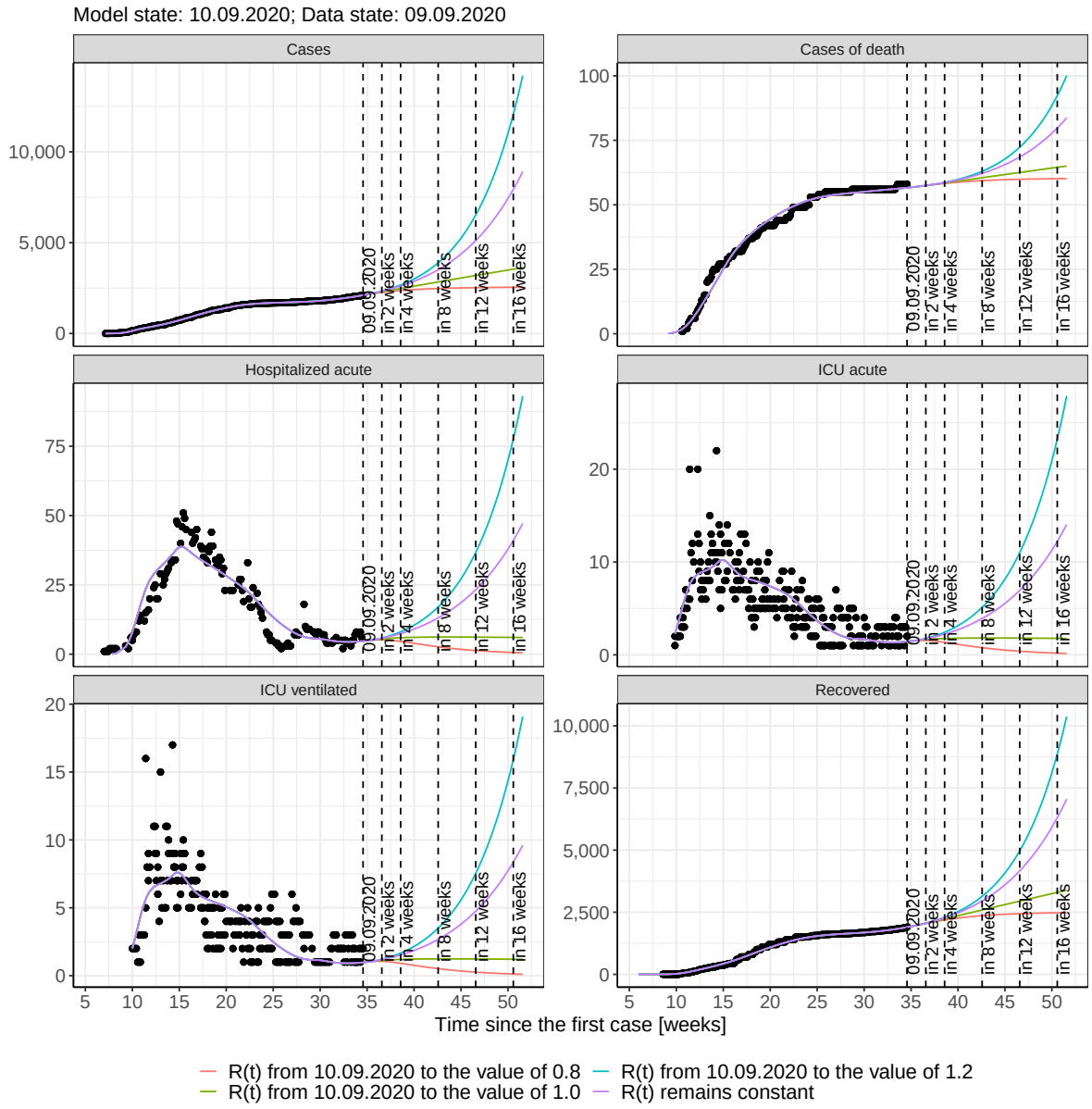


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

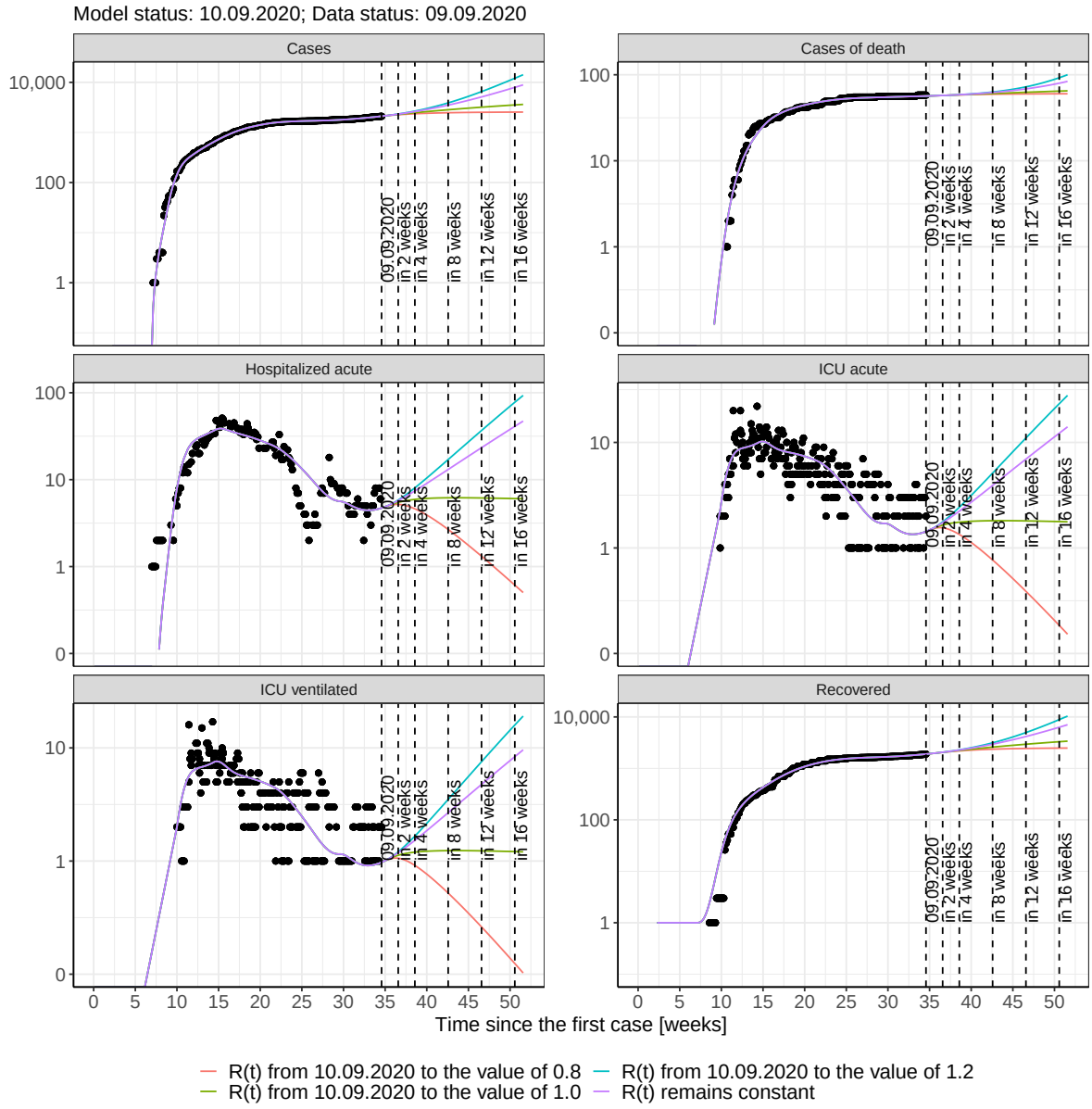


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 21) Model status from 10.09.2020; Data status: 09.09.2020.

Table 18: Bremen - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2122	57	1907	5	1	1
11.09.2020	2135	57	1917	5	1	1
12.09.2020	2149	57	1928	5	1	1
13.09.2020	2163	57	1938	5	1	1
14.09.2020	2178	57	1949	5	2	1
15.09.2020	2193	57	1960	5	2	1
16.09.2020	2208	57	1972	5	2	1
17.09.2020	2223	57	1984	5	2	1
18.09.2020	2239	57	1995	5	2	1
19.09.2020	2255	57	2008	5	2	1
20.09.2020	2272	57	2020	5	2	1
21.09.2020	2288	57	2032	6	2	1
22.09.2020	2306	57	2046	6	2	1
23.09.2020	2323	57	2059	6	2	1
24.09.2020	2341	58	2072	6	2	1
25.09.2020	2359	58	2086	6	2	1
26.09.2020	2378	58	2100	6	2	1
27.09.2020	2397	58	2114	6	2	1
28.09.2020	2416	58	2129	6	2	1
29.09.2020	2436	58	2144	6	2	1
30.09.2020	2457	58	2159	6	2	1
01.10.2020	2477	58	2175	7	2	1
02.10.2020	2498	58	2191	7	2	1
03.10.2020	2520	58	2207	7	2	1
04.10.2020	2542	58	2223	7	2	1
05.10.2020	2565	58	2240	7	2	1
06.10.2020	2588	59	2258	7	2	1
07.10.2020	2611	59	2275	7	2	2

Table 19: Bremen - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2121	57	1907	5	1	1
11.09.2020	2134	57	1917	5	1	1
12.09.2020	2146	57	1928	5	1	1
13.09.2020	2158	57	1938	5	1	1
14.09.2020	2170	57	1949	5	2	1
15.09.2020	2181	57	1960	5	2	1
16.09.2020	2192	57	1971	5	2	1
17.09.2020	2202	57	1982	5	2	1
18.09.2020	2213	57	1993	5	2	1
19.09.2020	2223	57	2004	5	2	1
20.09.2020	2232	57	2016	5	2	1
21.09.2020	2242	57	2027	5	2	1
22.09.2020	2251	57	2038	5	2	1
23.09.2020	2260	57	2049	5	2	1
24.09.2020	2269	58	2060	5	2	1
25.09.2020	2277	58	2070	5	2	1
26.09.2020	2285	58	2081	5	2	1
27.09.2020	2293	58	2091	5	2	1
28.09.2020	2301	58	2102	5	2	1
29.09.2020	2309	58	2112	5	1	1
30.09.2020	2316	58	2122	5	1	1
01.10.2020	2323	58	2132	5	1	1
02.10.2020	2330	58	2142	5	1	1
03.10.2020	2337	58	2151	5	1	1
04.10.2020	2343	58	2160	5	1	1
05.10.2020	2349	58	2170	5	1	1
06.10.2020	2356	58	2178	5	1	1
07.10.2020	2361	58	2187	5	1	1

Table 20: Bremen - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2121	57	1907	5	1	1
11.09.2020	2134	57	1917	5	1	1
12.09.2020	2148	57	1928	5	1	1
13.09.2020	2161	57	1938	5	1	1
14.09.2020	2174	57	1949	5	2	1
15.09.2020	2187	57	1960	5	2	1
16.09.2020	2200	57	1972	5	2	1
17.09.2020	2214	57	1983	5	2	1
18.09.2020	2227	57	1994	5	2	1
19.09.2020	2240	57	2006	5	2	1
20.09.2020	2253	57	2018	5	2	1
21.09.2020	2266	57	2030	5	2	1
22.09.2020	2279	57	2042	5	2	1
23.09.2020	2292	57	2054	5	2	1
24.09.2020	2306	58	2066	6	2	1
25.09.2020	2319	58	2078	6	2	1
26.09.2020	2332	58	2091	6	2	1
27.09.2020	2345	58	2103	6	2	1
28.09.2020	2358	58	2116	6	2	1
29.09.2020	2371	58	2128	6	2	1
30.09.2020	2384	58	2141	6	2	1
01.10.2020	2397	58	2154	6	2	1
02.10.2020	2410	58	2166	6	2	1
03.10.2020	2423	58	2179	6	2	1
04.10.2020	2436	58	2192	6	2	1
05.10.2020	2449	58	2204	6	2	1
06.10.2020	2462	58	2217	6	2	1
07.10.2020	2475	58	2230	6	2	1

Table 21: Bremen - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2122	57	1907	5	1	1
11.09.2020	2135	57	1917	5	1	1
12.09.2020	2150	57	1928	5	1	1
13.09.2020	2164	57	1938	5	1	1
14.09.2020	2179	57	1949	5	2	1
15.09.2020	2194	57	1961	5	2	1
16.09.2020	2210	57	1972	5	2	1
17.09.2020	2227	57	1984	5	2	1
18.09.2020	2243	57	1996	5	2	1
19.09.2020	2261	57	2008	5	2	1
20.09.2020	2278	57	2021	6	2	1
21.09.2020	2296	57	2034	6	2	1
22.09.2020	2315	57	2047	6	2	1
23.09.2020	2334	57	2060	6	2	1
24.09.2020	2354	58	2074	6	2	1
25.09.2020	2375	58	2088	6	2	1
26.09.2020	2396	58	2103	6	2	1
27.09.2020	2417	58	2118	6	2	1
28.09.2020	2439	58	2134	6	2	1
29.09.2020	2462	58	2150	7	2	1
30.09.2020	2486	58	2166	7	2	1
01.10.2020	2510	58	2183	7	2	1
02.10.2020	2534	58	2200	7	2	1
03.10.2020	2560	58	2218	7	2	2
04.10.2020	2586	58	2236	7	2	2
05.10.2020	2613	58	2254	8	2	2
06.10.2020	2641	59	2274	8	2	2
07.10.2020	2669	59	2293	8	2	2

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 65 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

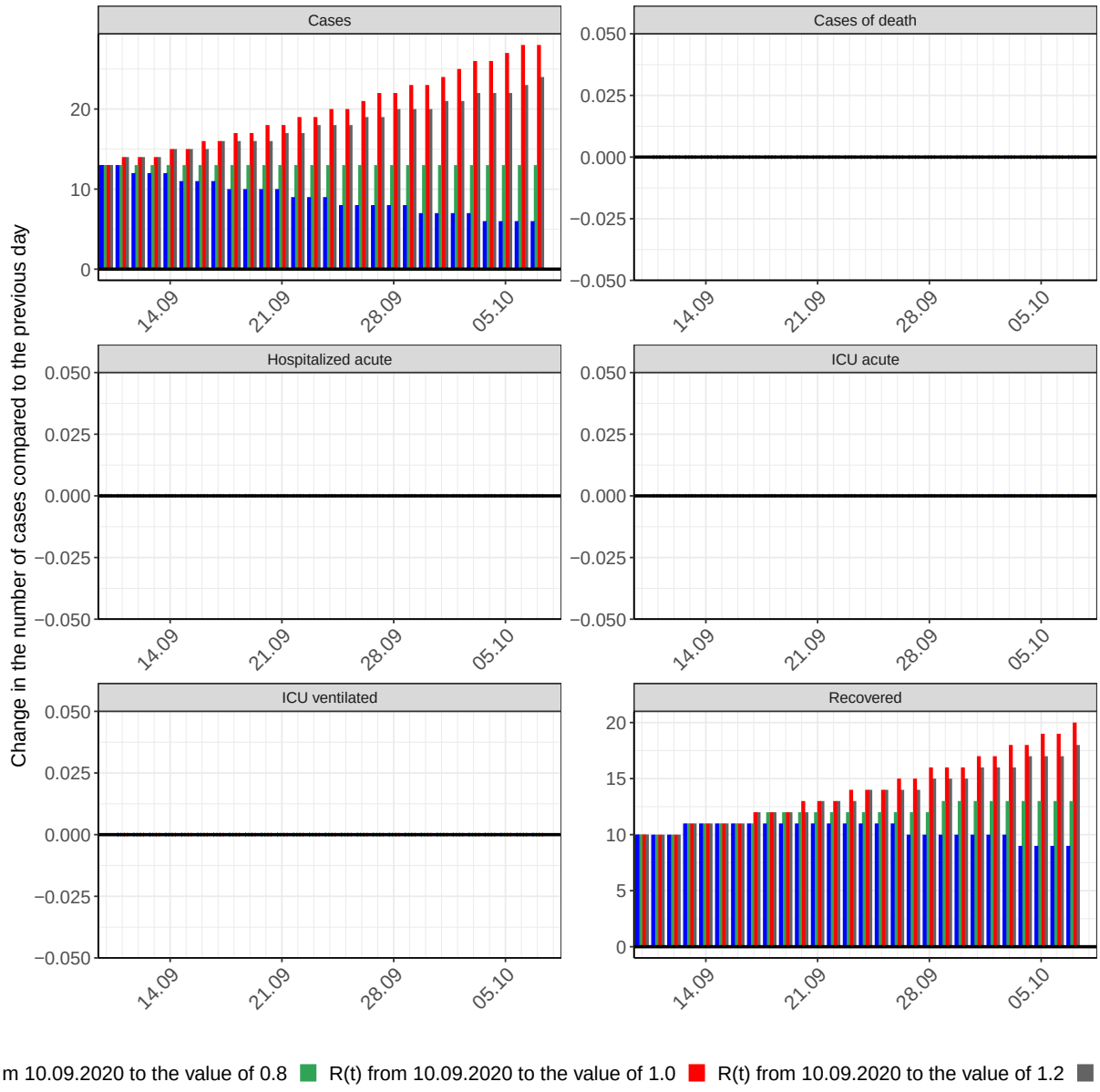


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

7 Hamburg

7.1 Model description

Fig. 66 depicts the results of the modeling (lines) compared to the observed data (points) for Hamburg on a linear (A) and semi-logarithmic (B) scale.

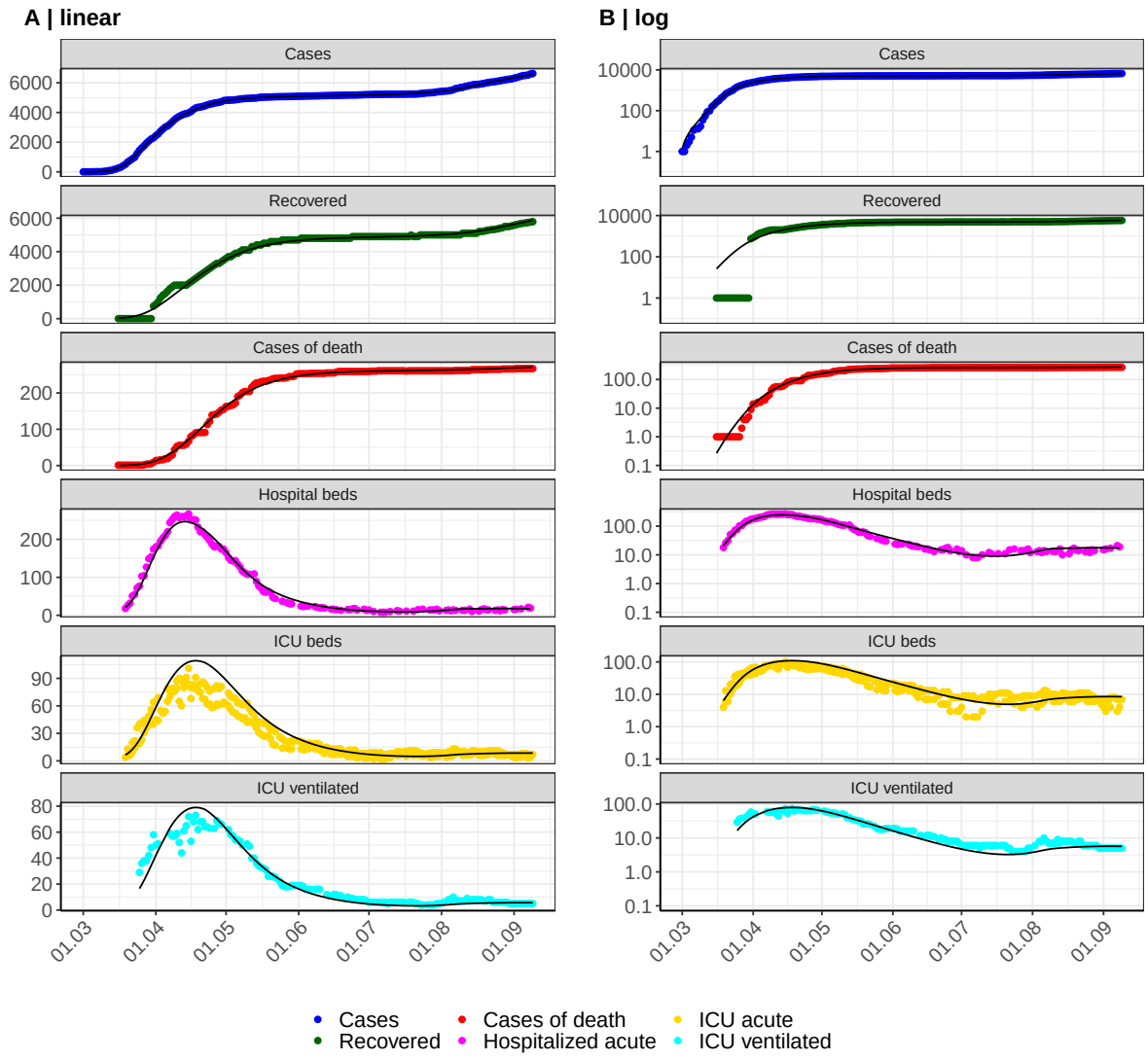


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

Fig. 67 shows the goodness-of-fit for Hamburg. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

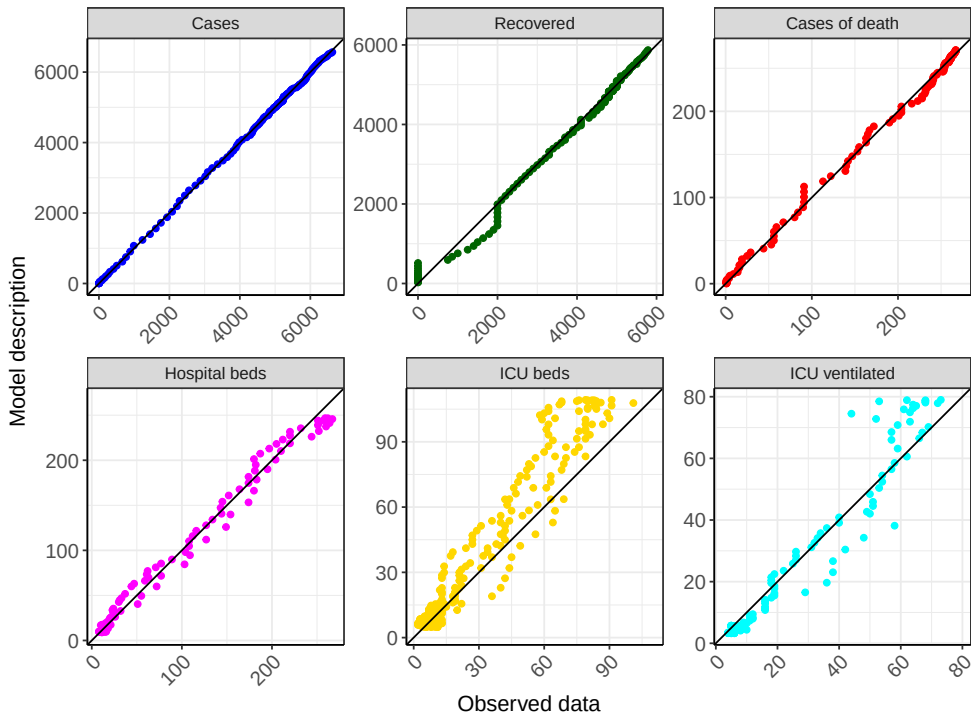


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

Fig. 68 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Hamburg (red line) in comparison with the other federal states (grey lines).

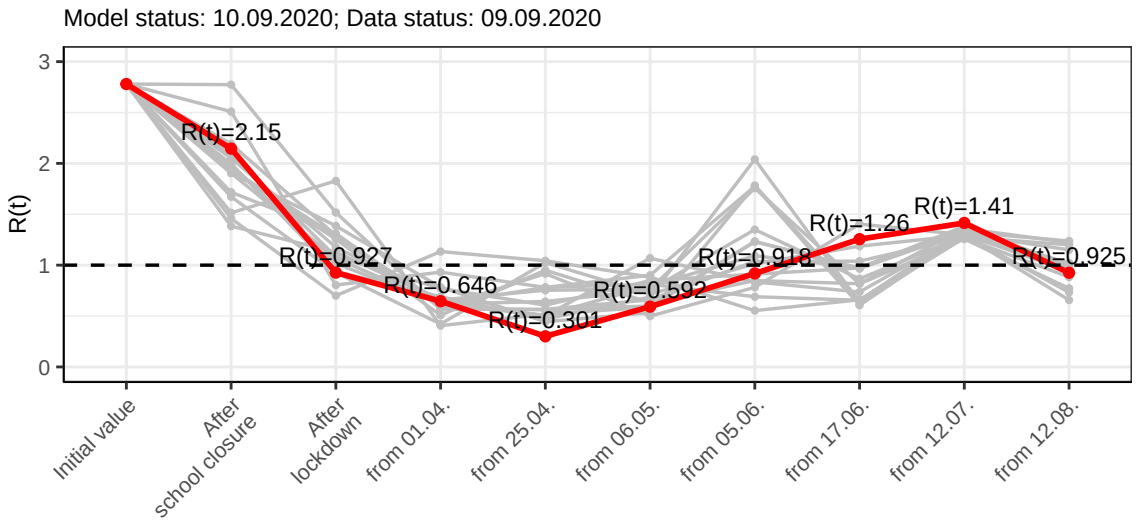


Figure 68: R(t) values before and after the NPIs for Hamburg

Fig. 69 shows the R(t) estimated value for Hamburg (red line) over time in comparison with the other federal states (grey lines).

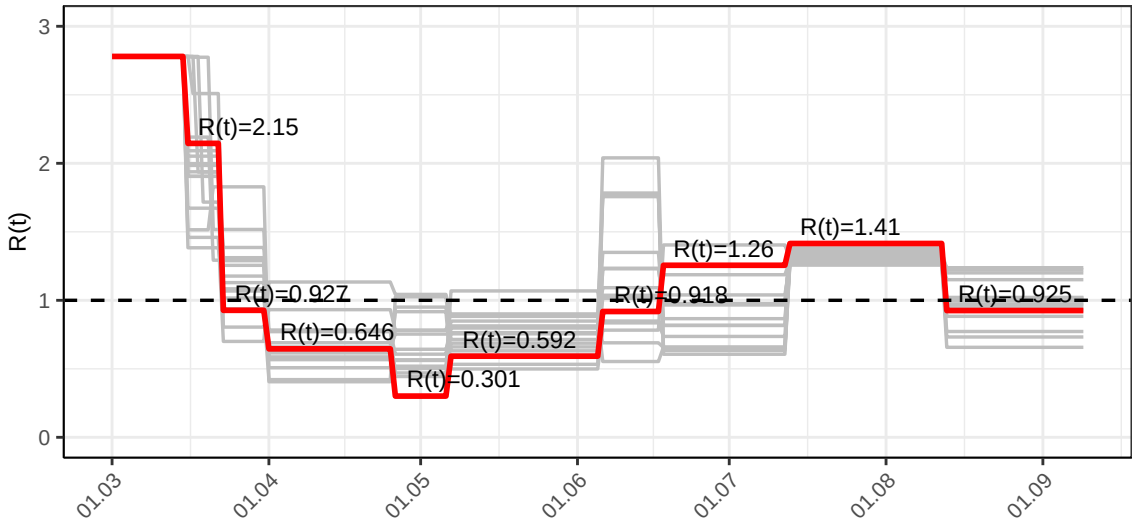


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

7.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.93)

Fig. 70 and 71 depict the the model predictions for the next 4 weeks for Hamburg on a linear (70) and a semi-logarithmic (71) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

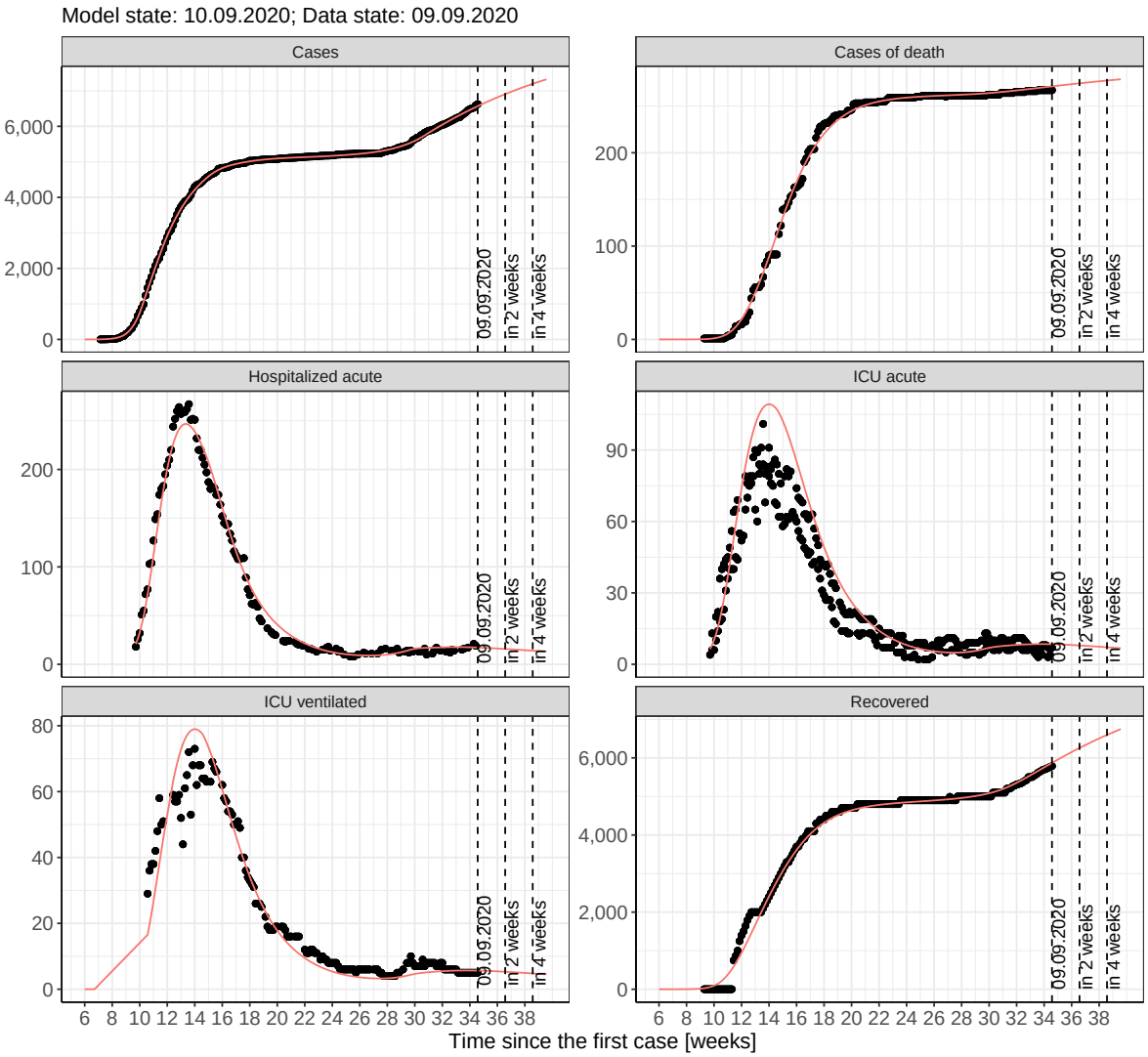


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

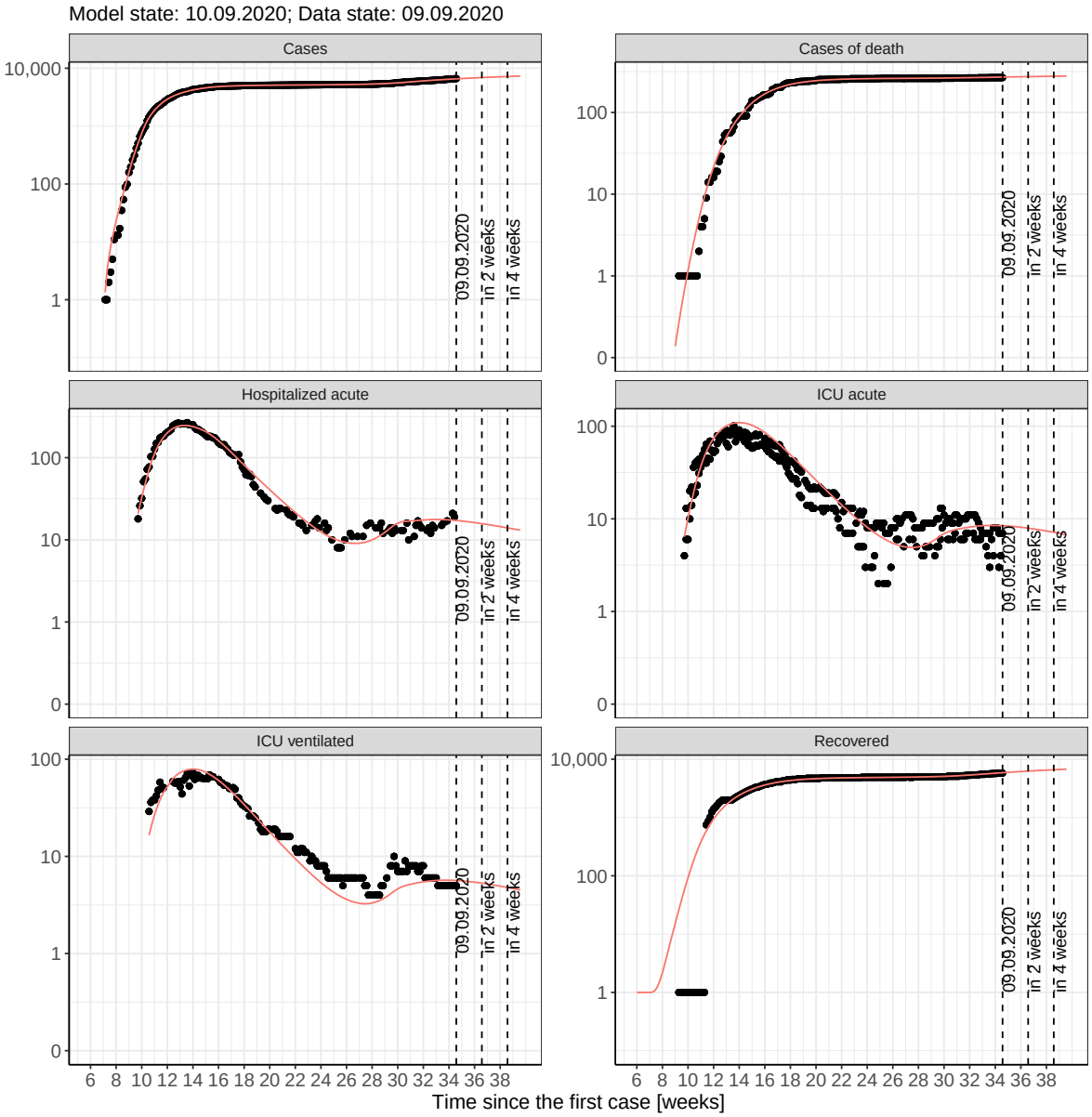


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 72 and 73 represent the model prediction for the next 4 weeks for Hamburg on a linear (72) and a semi-logarithmic (73) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

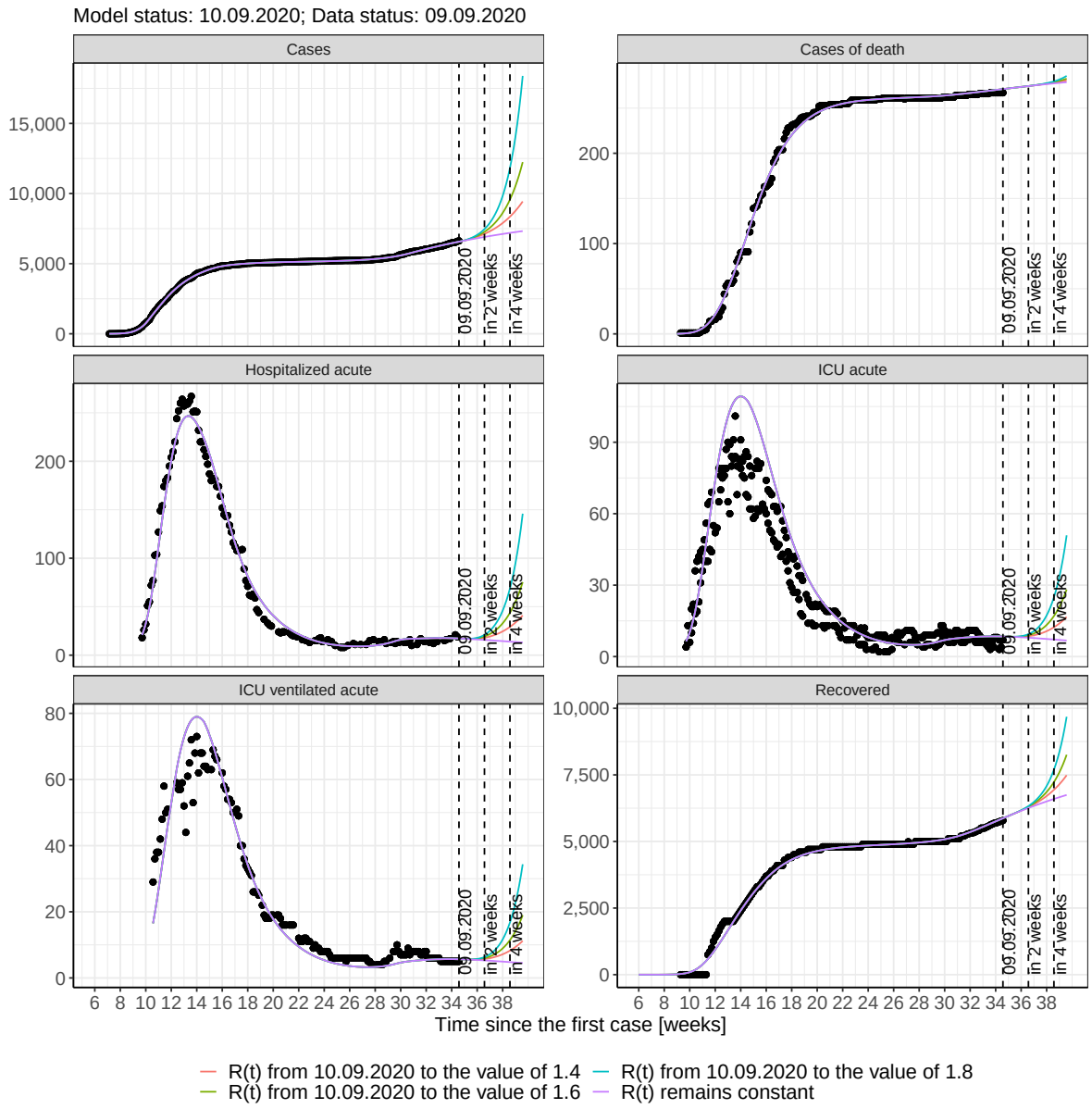


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

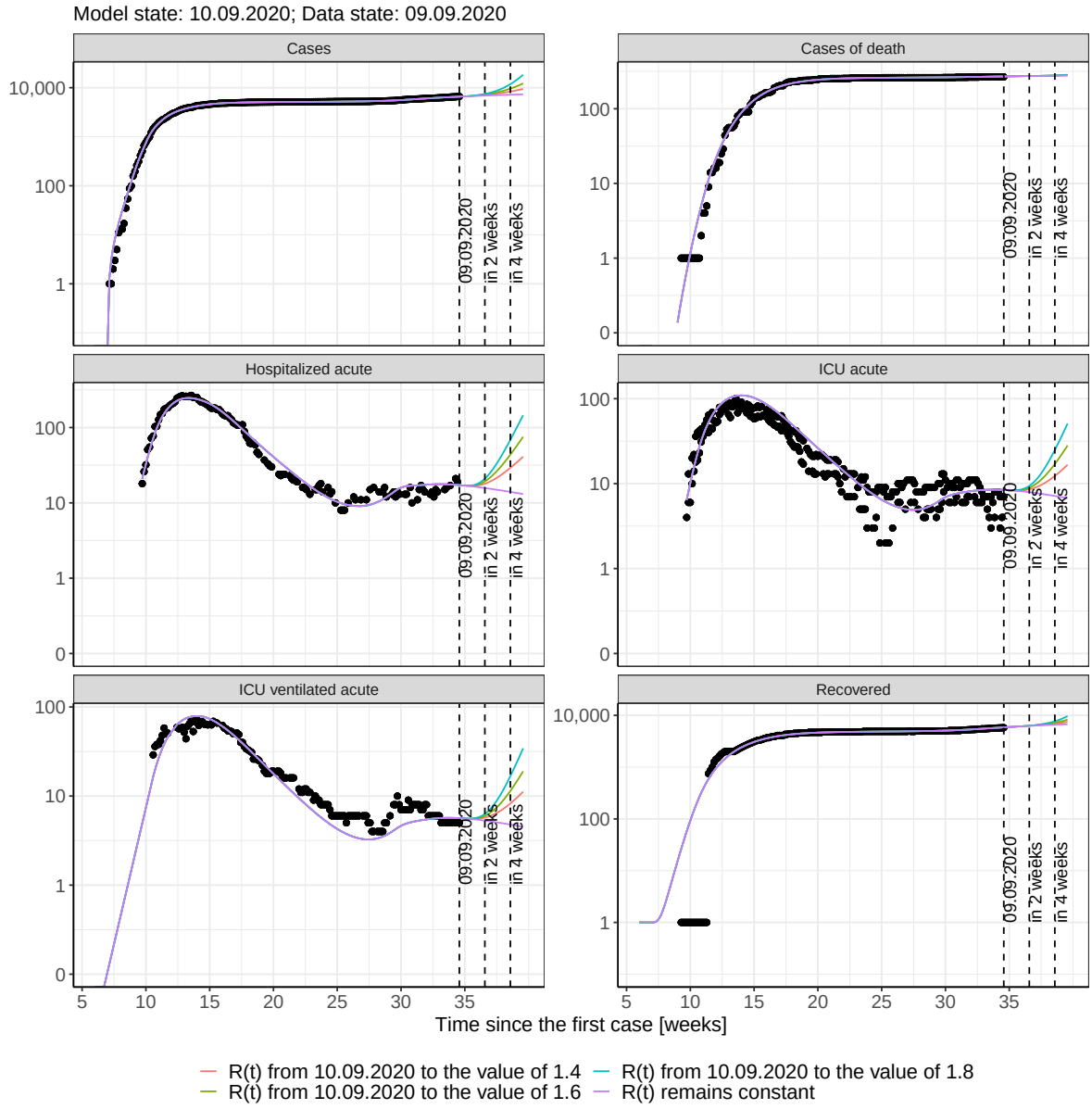


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 74 and 75 represent the model prediction for the next 16 weeks for Hamburg on a linear (74) and a semi-logarithmic (75) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

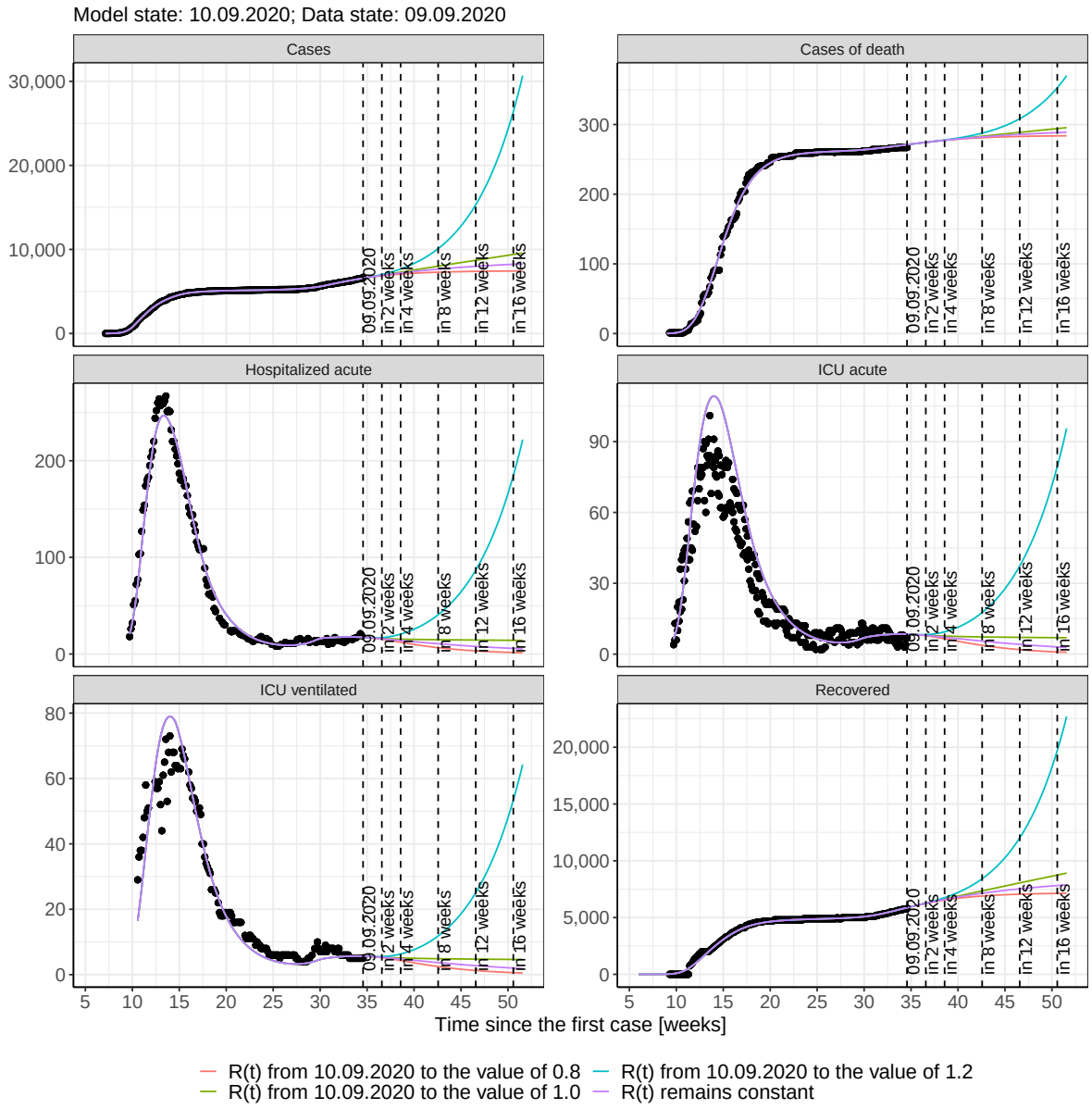


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

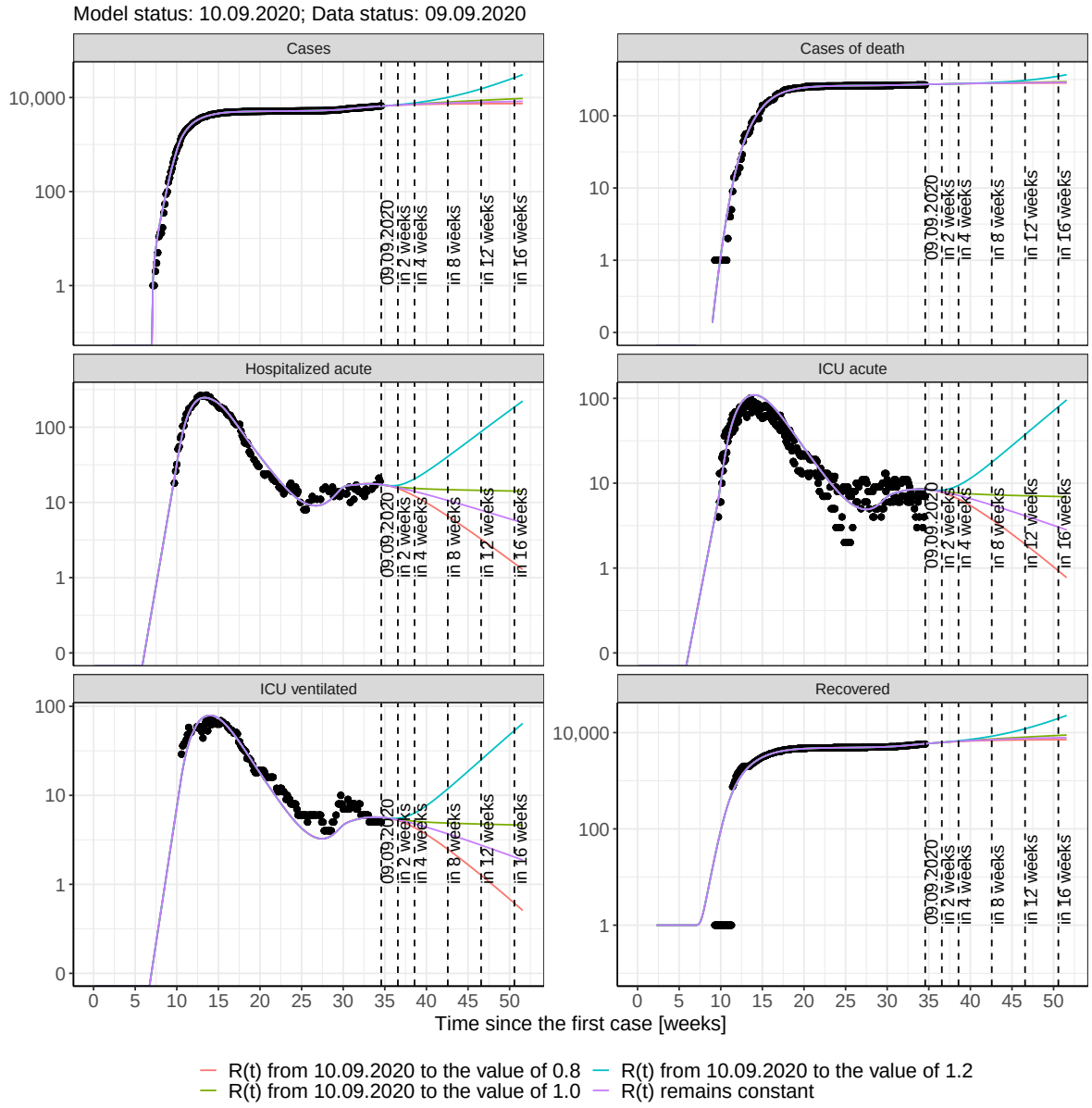


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 25) Model status from 10.09.2020; Data status: 09.09.2020.

Table 22: Hamburg - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6593	271	5900	17	8	6
11.09.2020	6619	272	5928	17	8	6
12.09.2020	6644	272	5957	17	8	6
13.09.2020	6670	272	5985	17	8	6
14.09.2020	6694	272	6014	17	8	6
15.09.2020	6719	273	6042	17	8	6
16.09.2020	6743	273	6069	17	8	6
17.09.2020	6767	273	6097	16	8	5
18.09.2020	6791	273	6124	16	8	5
19.09.2020	6814	273	6151	16	8	5
20.09.2020	6838	274	6178	16	8	5
21.09.2020	6861	274	6205	16	8	5
22.09.2020	6883	274	6231	16	8	5
23.09.2020	6906	274	6257	16	8	5
24.09.2020	6928	275	6283	16	8	5
25.09.2020	6950	275	6308	15	8	5
26.09.2020	6972	275	6334	15	8	5
27.09.2020	6993	275	6359	15	8	5
28.09.2020	7015	276	6384	15	8	5
29.09.2020	7036	276	6408	15	8	5
30.09.2020	7056	276	6432	15	8	5
01.10.2020	7077	276	6456	15	8	5
02.10.2020	7097	276	6480	15	7	5
03.10.2020	7117	277	6504	14	7	5
04.10.2020	7137	277	6527	14	7	5
05.10.2020	7157	277	6550	14	7	5
06.10.2020	7176	277	6573	14	7	5
07.10.2020	7196	277	6595	14	7	5

Table 23: Hamburg - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6593	271	5900	17	8	6
11.09.2020	6618	272	5928	17	8	6
12.09.2020	6642	272	5957	17	8	6
13.09.2020	6666	272	5985	17	8	6
14.09.2020	6689	272	6013	17	8	6
15.09.2020	6711	273	6041	17	8	6
16.09.2020	6733	273	6069	16	8	5
17.09.2020	6754	273	6096	16	8	5
18.09.2020	6774	273	6123	16	8	5
19.09.2020	6794	273	6149	16	8	5
20.09.2020	6813	274	6175	16	8	5
21.09.2020	6832	274	6201	16	8	5
22.09.2020	6850	274	6226	16	8	5
23.09.2020	6868	274	6251	15	8	5
24.09.2020	6885	275	6275	15	8	5
25.09.2020	6902	275	6299	15	8	5
26.09.2020	6918	275	6322	15	8	5
27.09.2020	6934	275	6345	14	7	5
28.09.2020	6949	275	6367	14	7	5
29.09.2020	6964	276	6389	14	7	5
30.09.2020	6978	276	6411	14	7	5
01.10.2020	6992	276	6432	14	7	5
02.10.2020	7006	276	6452	13	7	5
03.10.2020	7019	276	6472	13	7	5
04.10.2020	7032	277	6492	13	7	5
05.10.2020	7044	277	6510	13	7	4
06.10.2020	7057	277	6529	12	7	4
07.10.2020	7068	277	6547	12	7	4

Table 24: Hamburg - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6593	271	5900	17	8	6
11.09.2020	6620	272	5928	17	8	6
12.09.2020	6646	272	5957	17	8	6
13.09.2020	6672	272	5985	17	8	6
14.09.2020	6698	272	6014	17	8	6
15.09.2020	6724	273	6042	17	8	6
16.09.2020	6750	273	6070	17	8	6
17.09.2020	6776	273	6097	16	8	5
18.09.2020	6802	273	6125	16	8	5
19.09.2020	6828	273	6152	16	8	5
20.09.2020	6854	274	6180	16	8	5
21.09.2020	6880	274	6207	16	8	5
22.09.2020	6906	274	6234	16	8	5
23.09.2020	6932	274	6261	16	8	5
24.09.2020	6958	275	6288	16	8	5
25.09.2020	6984	275	6315	16	8	5
26.09.2020	7010	275	6341	16	8	5
27.09.2020	7036	275	6368	16	8	5
28.09.2020	7061	276	6394	16	8	5
29.09.2020	7087	276	6421	16	8	5
30.09.2020	7113	276	6447	16	8	5
01.10.2020	7139	276	6474	16	8	5
02.10.2020	7165	276	6500	16	8	5
03.10.2020	7190	277	6526	16	8	5
04.10.2020	7216	277	6552	15	8	5
05.10.2020	7242	277	6578	15	8	5
06.10.2020	7268	277	6604	15	8	5
07.10.2020	7294	277	6630	15	8	5

Table 25: Hamburg - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6594	271	5900	17	8	6
11.09.2020	6621	272	5928	17	8	6
12.09.2020	6649	272	5957	17	8	6
13.09.2020	6678	272	5986	17	8	6
14.09.2020	6708	272	6014	17	8	6
15.09.2020	6738	273	6042	17	8	6
16.09.2020	6769	273	6071	17	8	6
17.09.2020	6802	273	6099	17	8	6
18.09.2020	6835	273	6128	17	8	6
19.09.2020	6869	273	6156	17	8	6
20.09.2020	6904	274	6185	17	8	6
21.09.2020	6940	274	6214	17	8	6
22.09.2020	6977	274	6244	17	8	6
23.09.2020	7015	274	6273	17	8	6
24.09.2020	7054	275	6304	17	8	6
25.09.2020	7095	275	6334	17	8	6
26.09.2020	7136	275	6365	17	8	6
27.09.2020	7179	275	6397	18	8	6
28.09.2020	7222	276	6429	18	8	6
29.09.2020	7268	276	6462	18	9	6
30.09.2020	7314	276	6496	18	9	6
01.10.2020	7362	276	6530	18	9	6
02.10.2020	7410	277	6565	19	9	6
03.10.2020	7461	277	6601	19	9	6
04.10.2020	7513	277	6637	19	9	6
05.10.2020	7566	277	6675	20	9	6
06.10.2020	7621	278	6714	20	9	6
07.10.2020	7677	278	6753	21	9	6

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 76 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

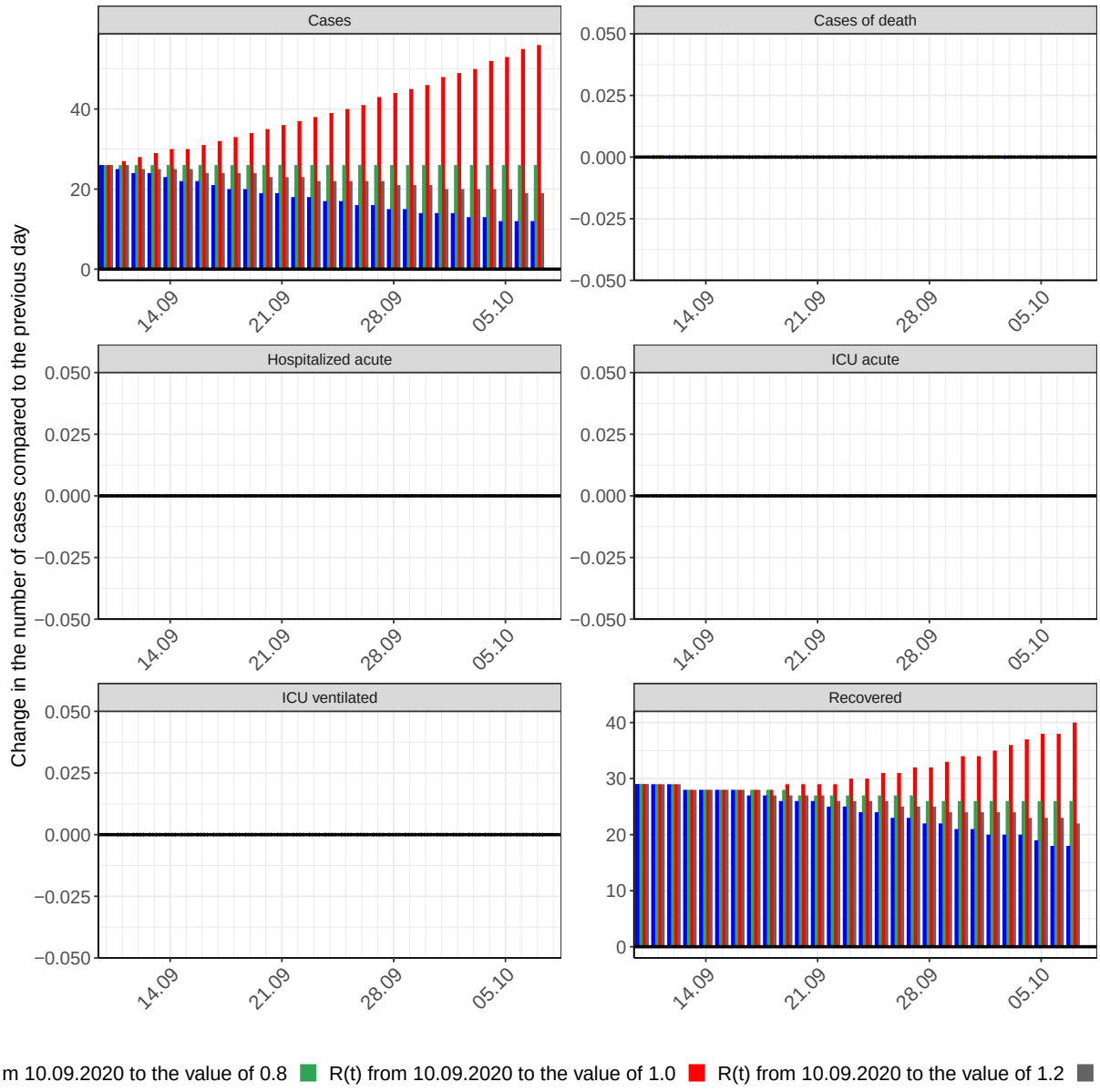


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

8 Hesse

8.1 Model description

Fig. 77 depicts the results of the modeling (lines) compared to the observed data (points) for Hesse on a linear (A) and semi-logarithmic (B) scale.

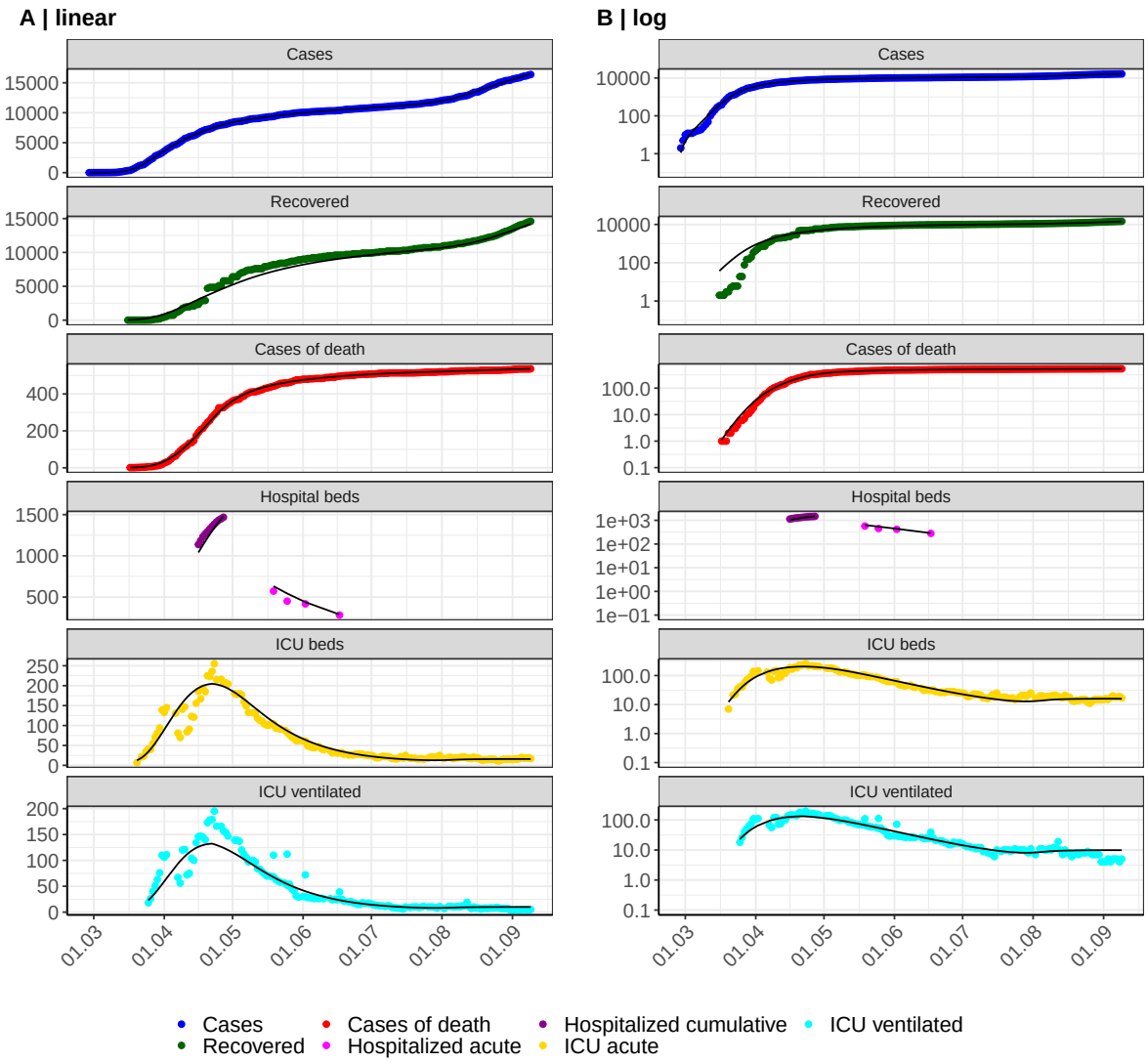


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

Fig. 78 shows the goodness-of-fit for Hesse. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

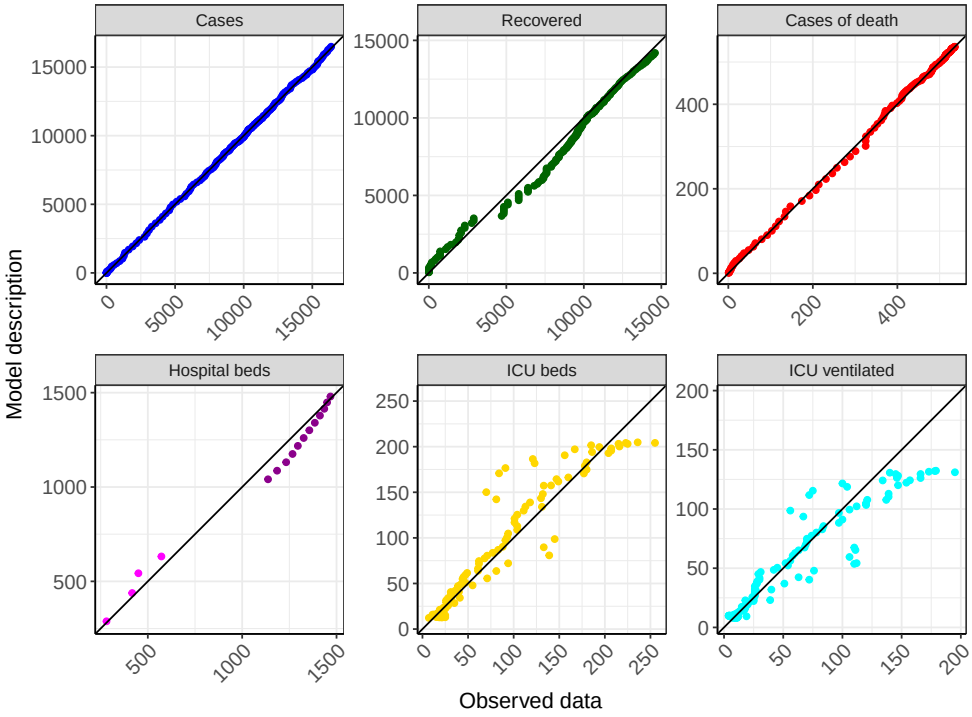


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

Fig. 79 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Hesse (red line) in comparison with the other federal states (grey lines).

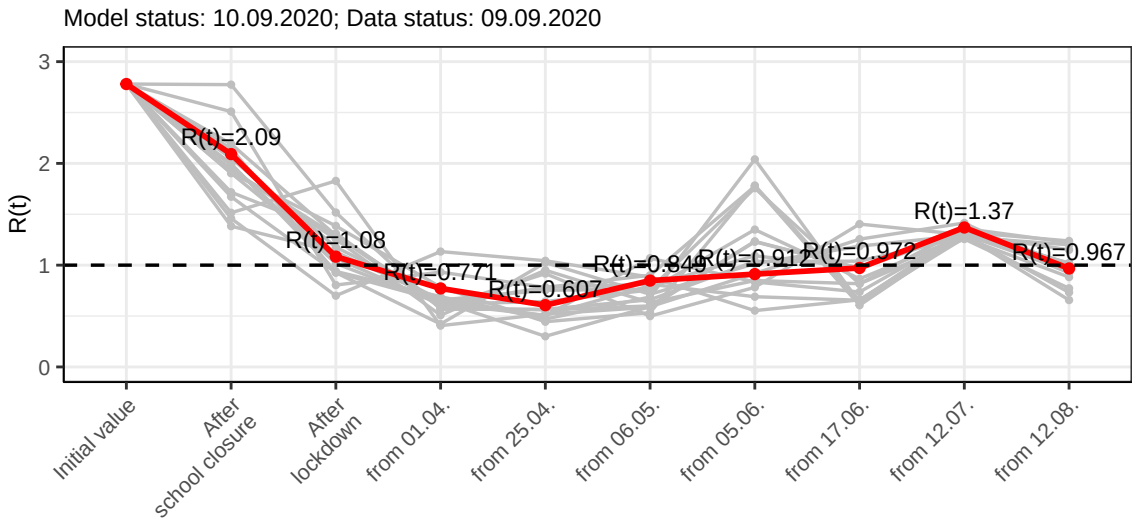


Figure 79: R(t) values before and after the NPIs for Hesse

Fig. 80 shows the R(t) estimated value for Hesse (red line) over time in comparison with the other federal states (grey lines).

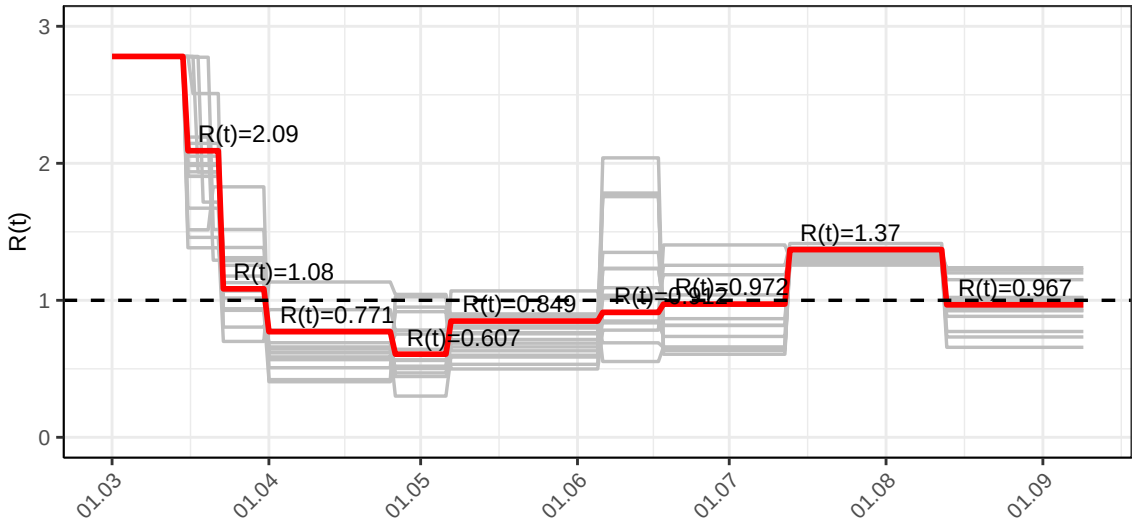


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

8.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.97)

Fig. 81 and 82 depict the the model predictions for the next 4 weeks for Hesse on a linear (81) and a semi-logarithmic (82) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

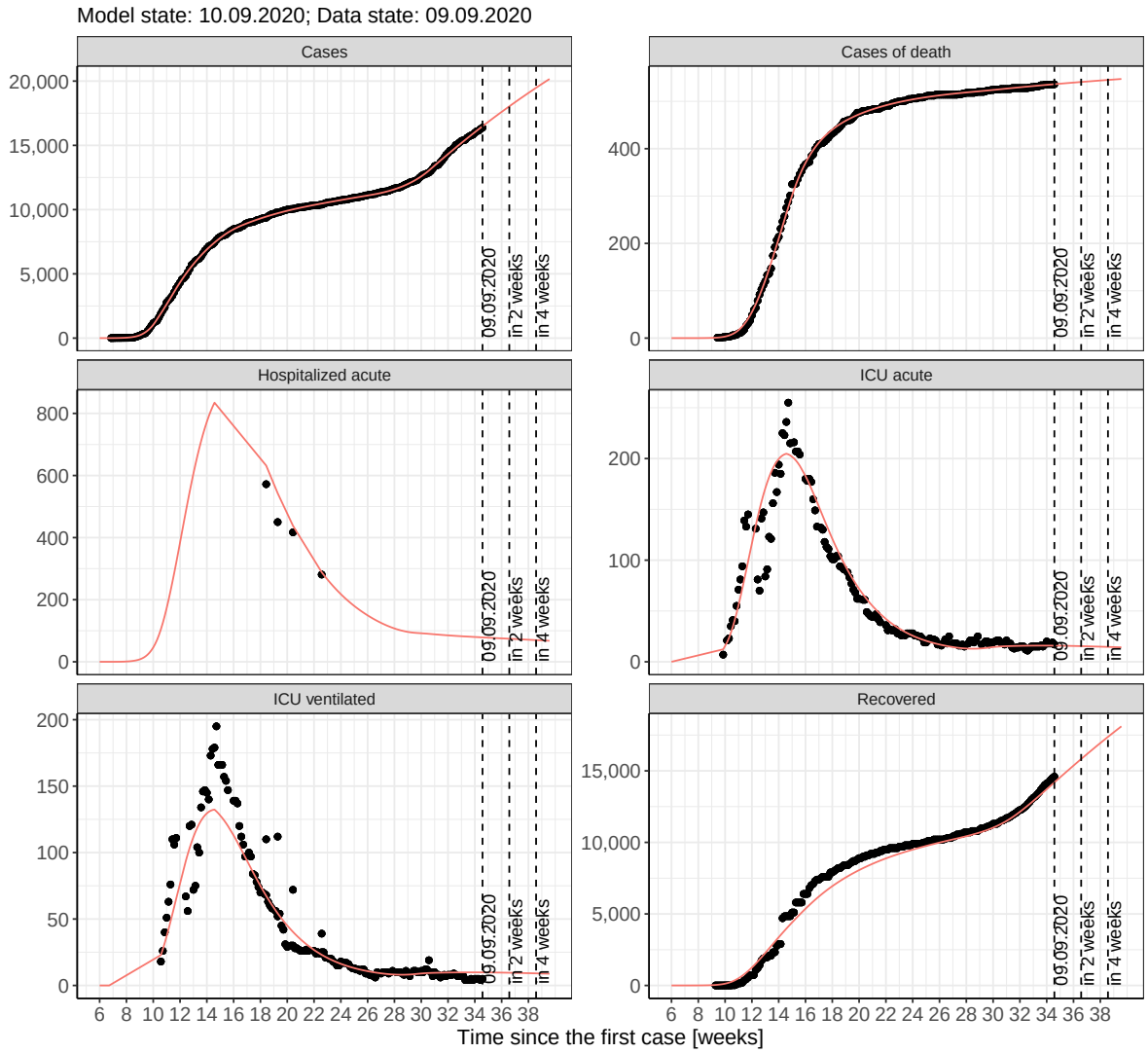


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

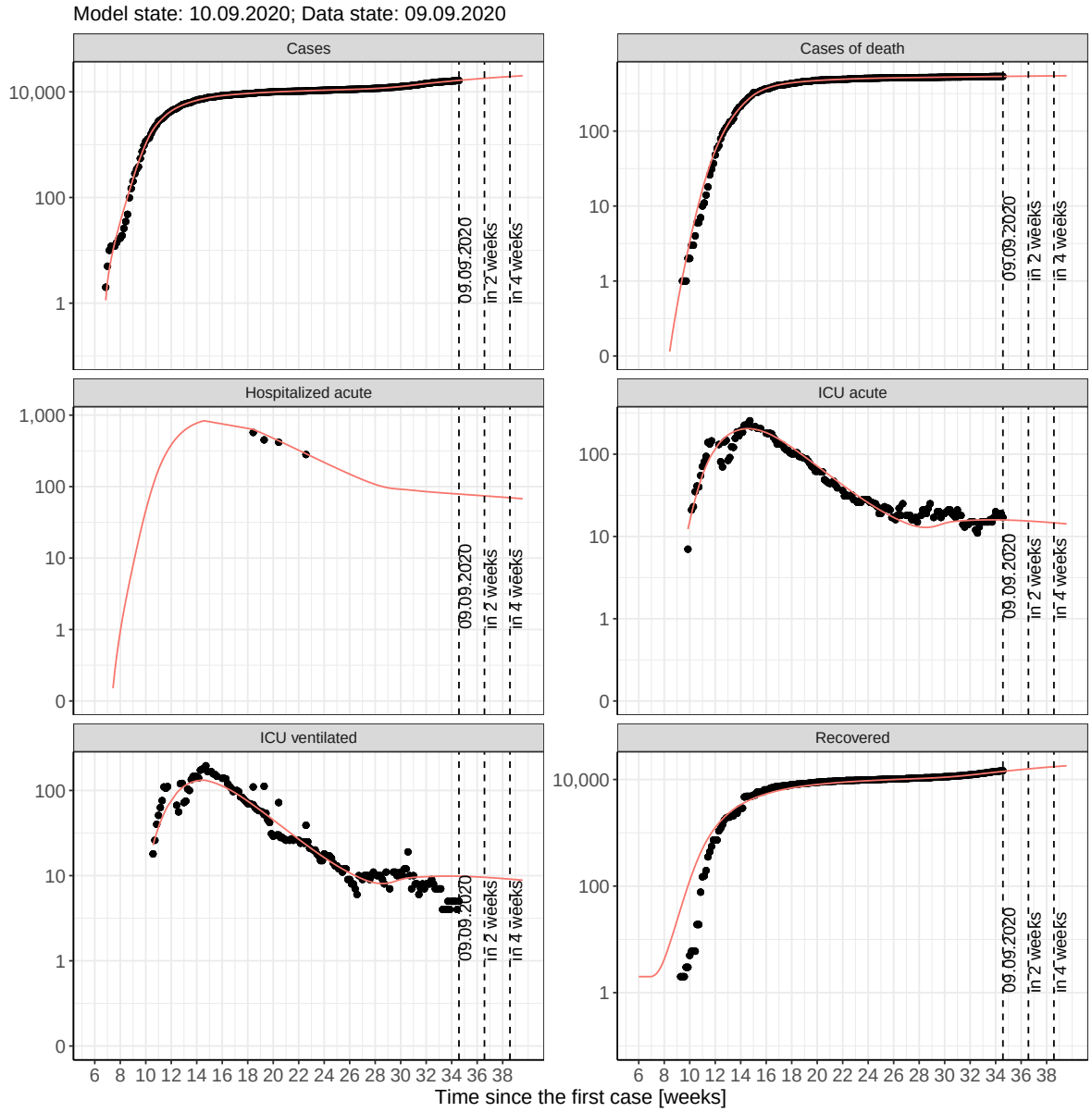


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 83 and 84 represent the model prediction for the next 4 weeks for Hesse on a linear (83) and a semi-logarithmic (84) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

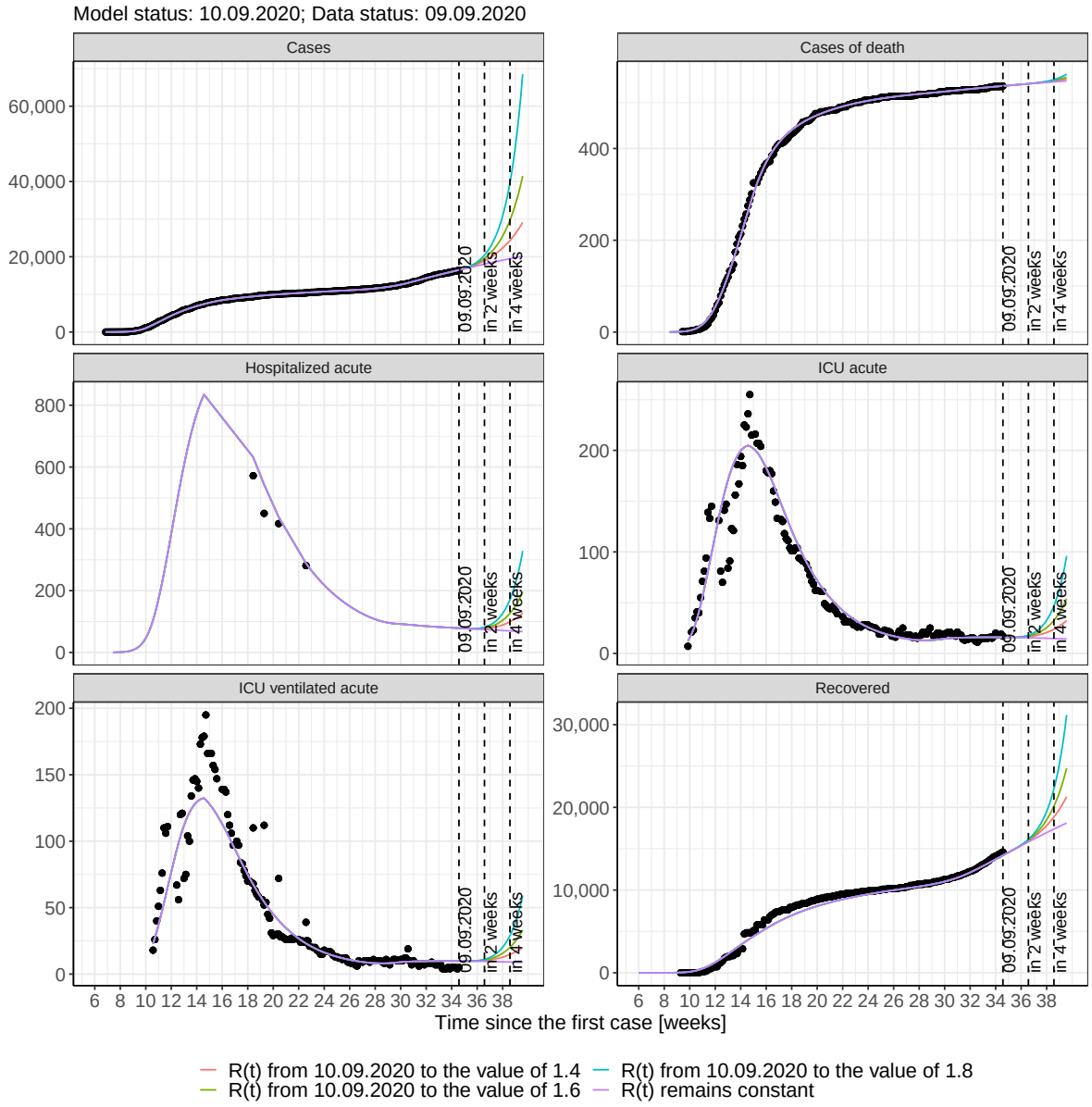


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

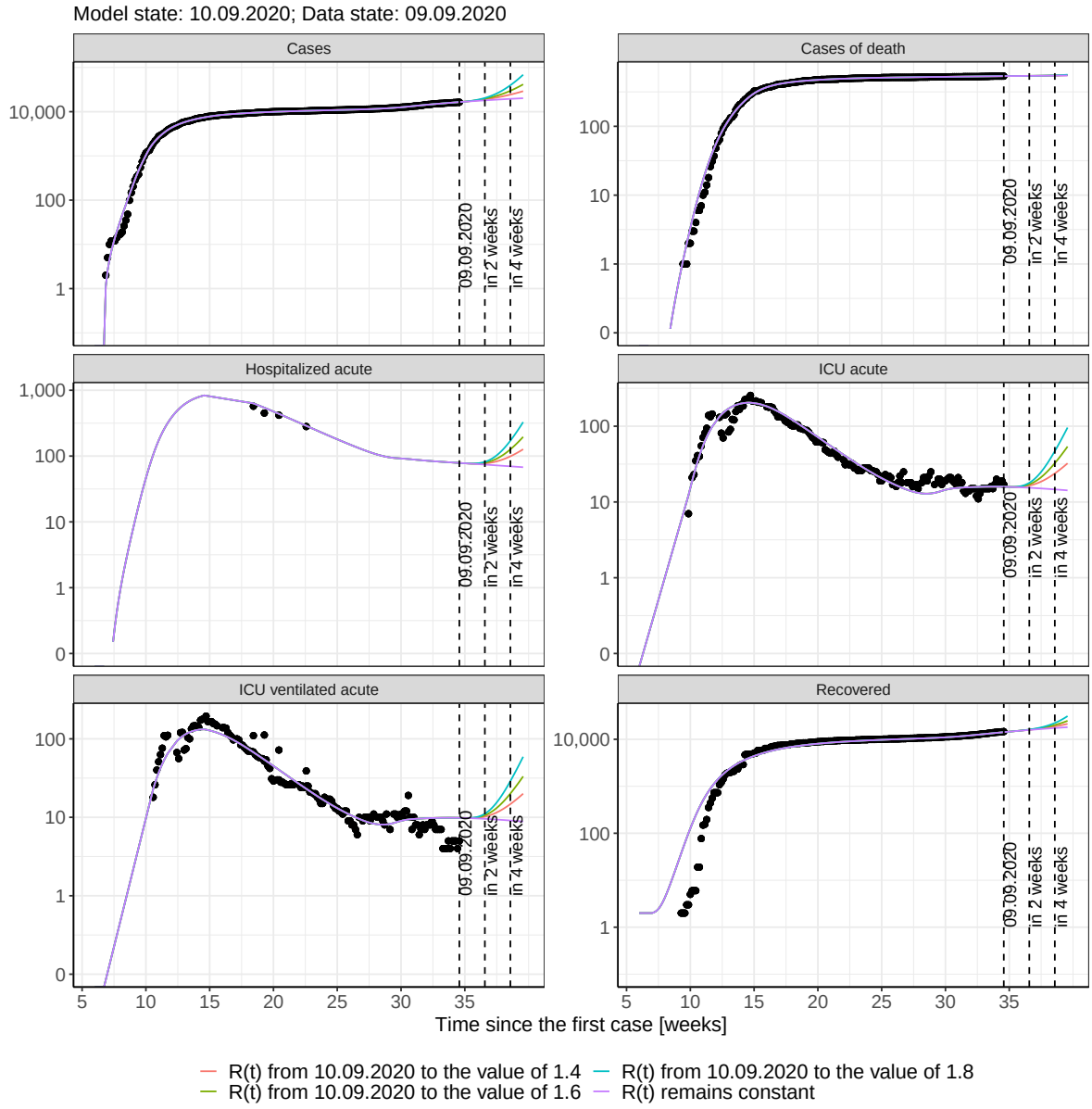


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 85 and 86 represent the model prediction for the next 16 weeks for Hesse on a linear (85) and a semi-logarithmic (86) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

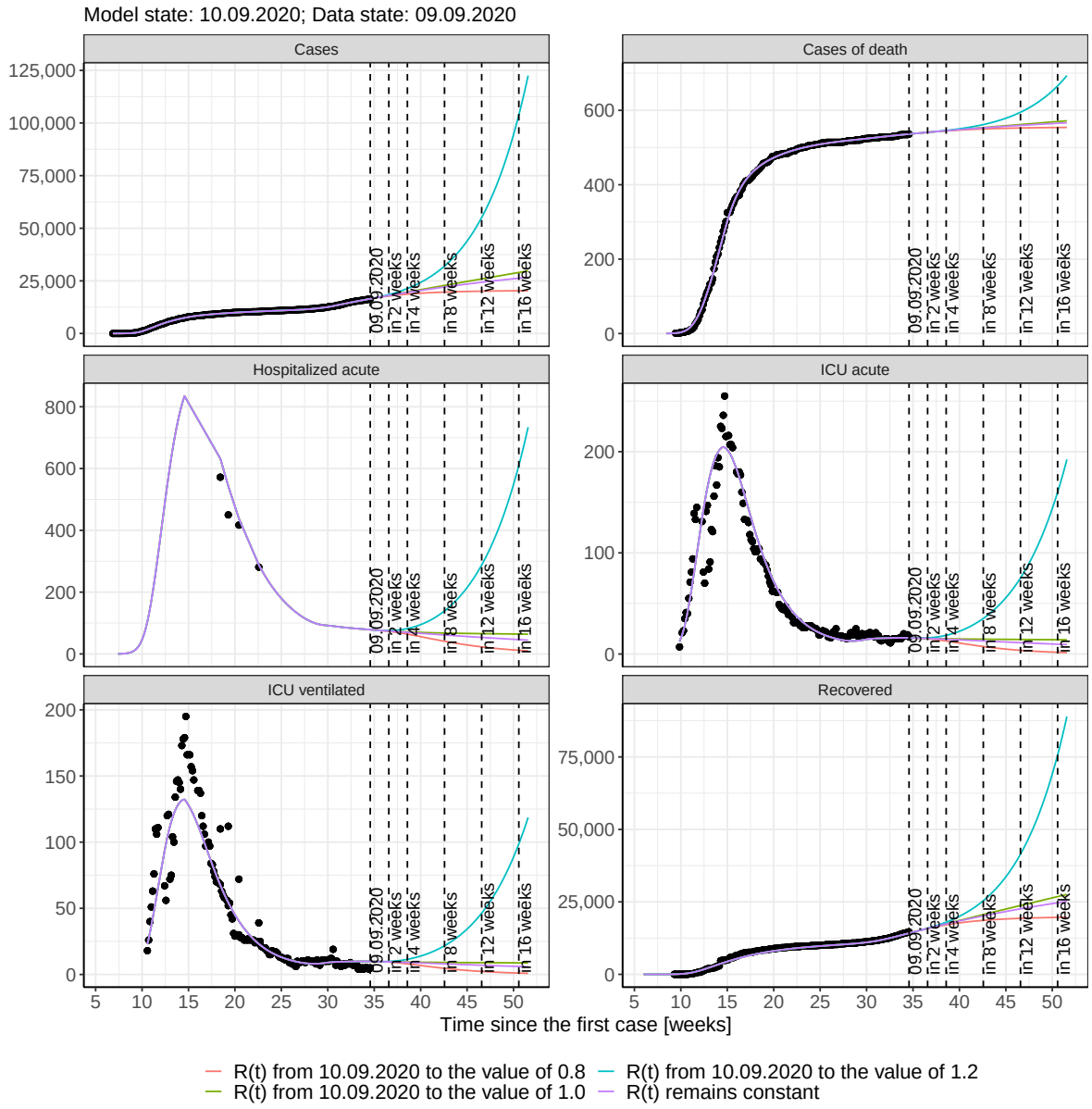


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

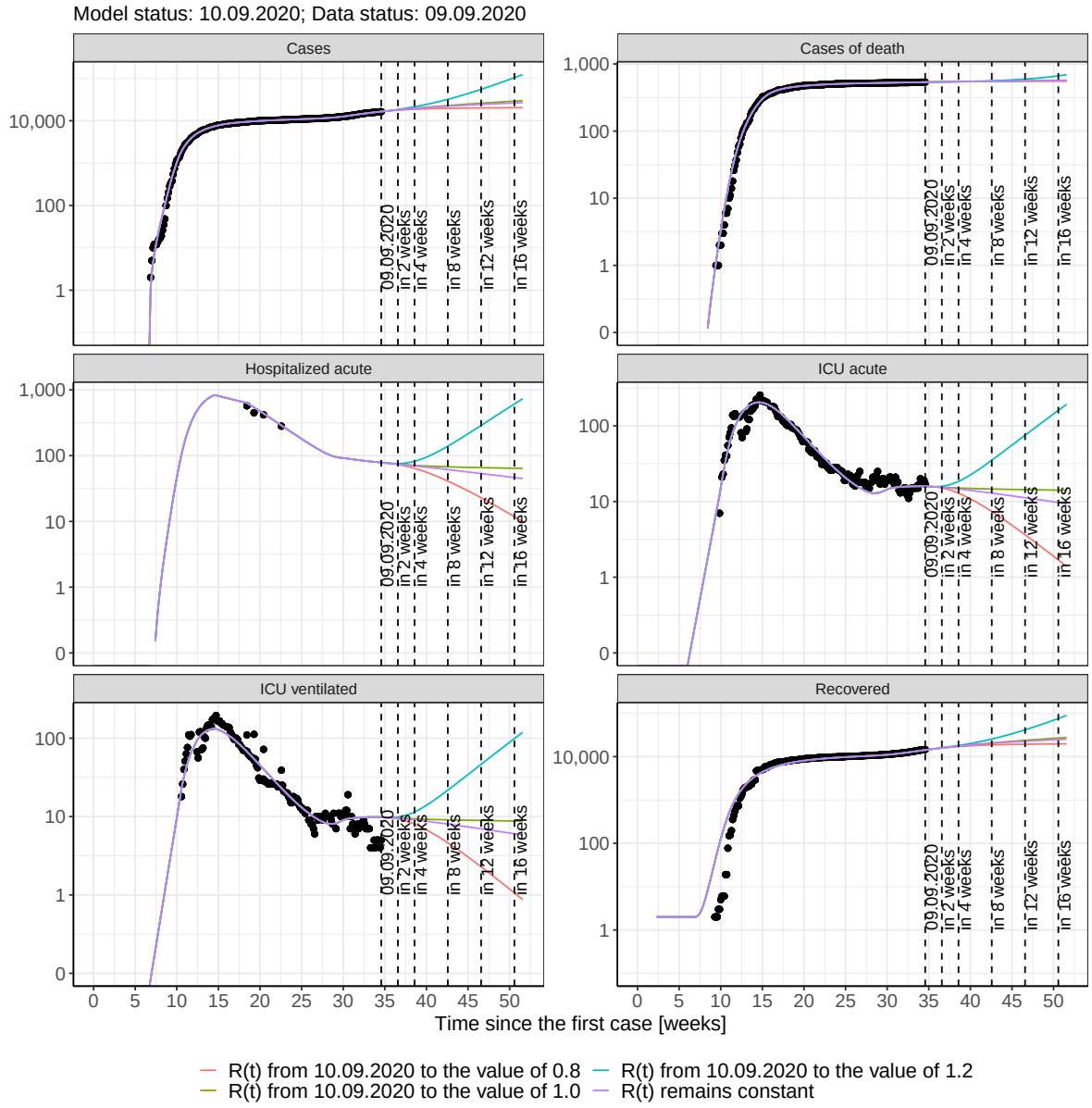


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 29) Model status from 10.09.2020; Data status: 09.09.2020.

Table 26: Hesse - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	16599	537	14309	78	16	10
11.09.2020	16713	537	14427	78	16	10
12.09.2020	16826	537	14546	78	16	10
13.09.2020	16939	538	14664	77	16	10
14.09.2020	17051	538	14781	77	16	10
15.09.2020	17163	538	14899	77	16	10
16.09.2020	17274	539	15016	76	16	10
17.09.2020	17384	539	15133	76	16	10
18.09.2020	17494	539	15250	76	16	10
19.09.2020	17603	540	15366	75	16	10
20.09.2020	17712	540	15481	75	16	10
21.09.2020	17820	540	15596	75	15	10
22.09.2020	17928	541	15711	75	15	10
23.09.2020	18035	541	15826	74	15	10
24.09.2020	18142	541	15939	74	15	10
25.09.2020	18248	542	16053	74	15	10
26.09.2020	18353	542	16166	73	15	9
27.09.2020	18458	542	16278	73	15	9
28.09.2020	18563	542	16390	73	15	9
29.09.2020	18667	543	16501	72	15	9
30.09.2020	18770	543	16612	72	15	9
01.10.2020	18873	543	16723	72	15	9
02.10.2020	18975	544	16832	71	15	9
03.10.2020	19077	544	16942	71	15	9
04.10.2020	19178	544	17050	71	15	9
05.10.2020	19279	545	17159	70	15	9
06.10.2020	19380	545	17266	70	15	9
07.10.2020	19479	545	17374	70	15	9

Table 27: Hesse - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	16598	537	14309	78	16	10
11.09.2020	16707	537	14427	78	16	10
12.09.2020	16814	537	14545	78	16	10
13.09.2020	16918	538	14663	77	16	10
14.09.2020	17019	538	14780	77	16	10
15.09.2020	17116	538	14897	77	16	10
16.09.2020	17212	539	15013	76	16	10
17.09.2020	17304	539	15127	76	16	10
18.09.2020	17394	539	15241	76	16	10
19.09.2020	17481	540	15353	75	15	10
20.09.2020	17566	540	15464	75	15	10
21.09.2020	17648	540	15573	74	15	9
22.09.2020	17728	541	15681	74	15	9
23.09.2020	17805	541	15787	73	15	9
24.09.2020	17881	541	15892	73	15	9
25.09.2020	17954	541	15994	72	15	9
26.09.2020	18025	542	16095	72	15	9
27.09.2020	18095	542	16193	71	15	9
28.09.2020	18162	542	16290	70	14	9
29.09.2020	18227	543	16385	70	14	9
30.09.2020	18290	543	16478	69	14	9
01.10.2020	18352	543	16569	68	14	9
02.10.2020	18412	543	16657	68	14	9
03.10.2020	18470	544	16744	67	14	8
04.10.2020	18527	544	16829	66	13	8
05.10.2020	18582	544	16912	66	13	8
06.10.2020	18635	545	16992	65	13	8
07.10.2020	18687	545	17071	64	13	8

Table 28: Hesse - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	16599	537	14309	78	16	10
11.09.2020	16714	537	14427	78	16	10
12.09.2020	16829	537	14546	78	16	10
13.09.2020	16943	538	14664	77	16	10
14.09.2020	17058	538	14782	77	16	10
15.09.2020	17172	538	14899	77	16	10
16.09.2020	17287	539	15017	76	16	10
17.09.2020	17401	539	15134	76	16	10
18.09.2020	17515	539	15251	76	16	10
19.09.2020	17630	540	15368	76	16	10
20.09.2020	17744	540	15485	75	16	10
21.09.2020	17858	540	15601	75	16	10
22.09.2020	17972	541	15718	75	16	10
23.09.2020	18086	541	15834	74	15	10
24.09.2020	18200	541	15950	74	15	10
25.09.2020	18314	542	16066	74	15	10
26.09.2020	18428	542	16181	74	15	10
27.09.2020	18542	542	16297	73	15	10
28.09.2020	18656	542	16412	73	15	10
29.09.2020	18770	543	16527	73	15	9
30.09.2020	18883	543	16642	73	15	9
01.10.2020	18997	543	16757	72	15	9
02.10.2020	19111	544	16872	72	15	9
03.10.2020	19224	544	16987	72	15	9
04.10.2020	19338	544	17102	72	15	9
05.10.2020	19451	545	17216	72	15	9
06.10.2020	19565	545	17331	71	15	9
07.10.2020	19678	545	17445	71	15	9

Table 29: Hesse - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	16601	537	14309	78	16	10
11.09.2020	16721	537	14427	78	16	10
12.09.2020	16844	537	14546	78	16	10
13.09.2020	16970	538	14664	77	16	10
14.09.2020	17100	538	14783	77	16	10
15.09.2020	17234	538	14902	77	16	10
16.09.2020	17372	539	15022	77	16	10
17.09.2020	17514	539	15142	76	16	10
18.09.2020	17660	539	15263	76	16	10
19.09.2020	17809	540	15385	76	16	10
20.09.2020	17963	540	15509	76	16	10
21.09.2020	18122	540	15634	76	16	10
22.09.2020	18285	541	15761	76	16	10
23.09.2020	18453	541	15890	76	16	10
24.09.2020	18625	541	16020	76	16	10
25.09.2020	18802	542	16154	76	16	10
26.09.2020	18985	542	16289	76	16	10
27.09.2020	19172	542	16428	76	16	10
28.09.2020	19365	543	16569	77	16	10
29.09.2020	19563	543	16713	77	17	10
30.09.2020	19767	543	16861	77	17	10
01.10.2020	19977	544	17011	78	17	11
02.10.2020	20193	544	17166	78	17	11
03.10.2020	20415	544	17324	79	17	11
04.10.2020	20643	545	17486	80	18	11
05.10.2020	20877	545	17652	80	18	11
06.10.2020	21119	546	17823	81	18	11
07.10.2020	21367	546	17997	82	18	11

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 87 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

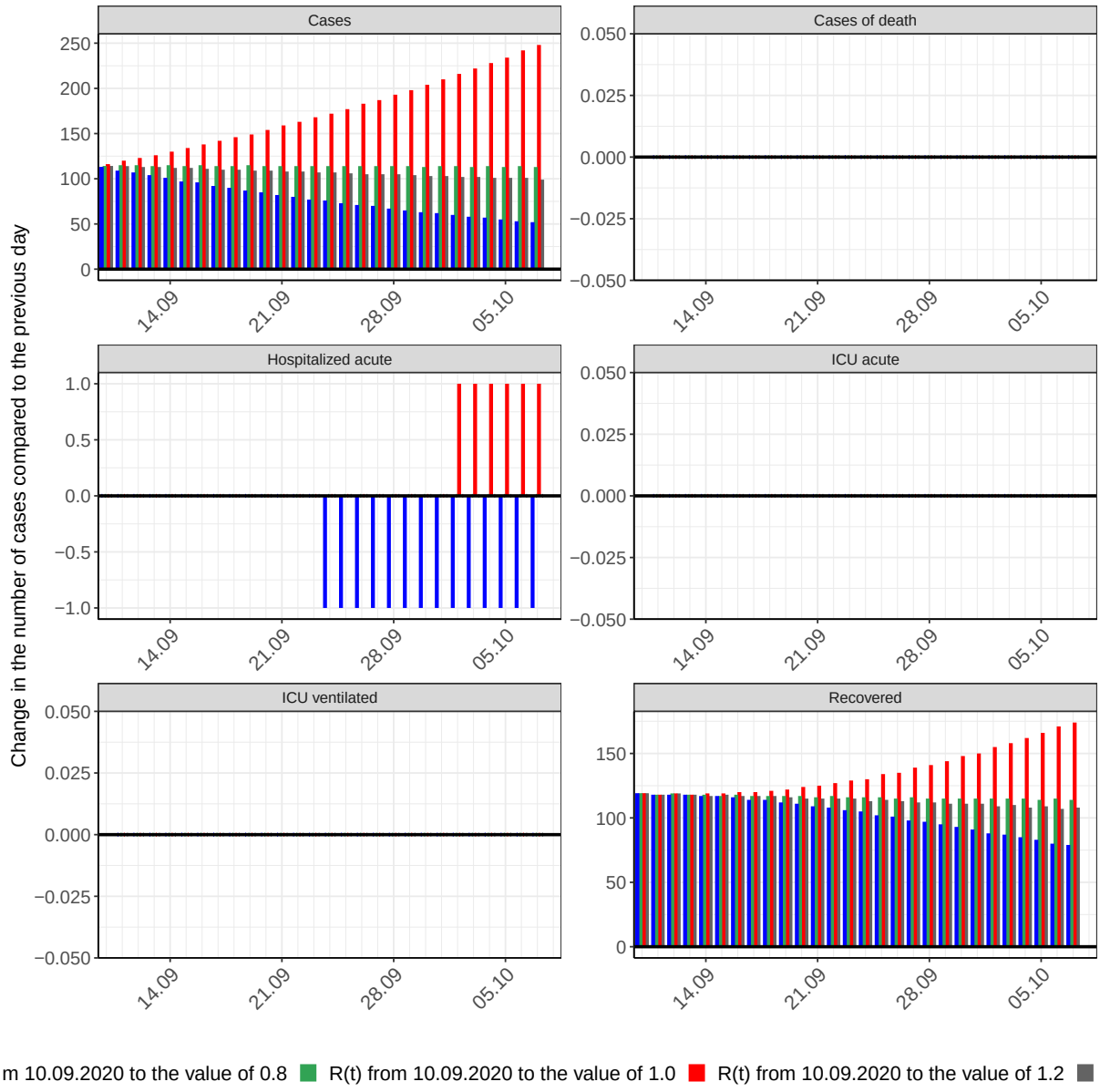


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

9 Mecklenburg-Vorpommern

9.1 Model description

Fig. 88 depicts the results of the modeling (lines) compared to the observed data (points) for Mecklenburg-Vorpommern on a linear (A) and semi-logarithmic (B) scale.

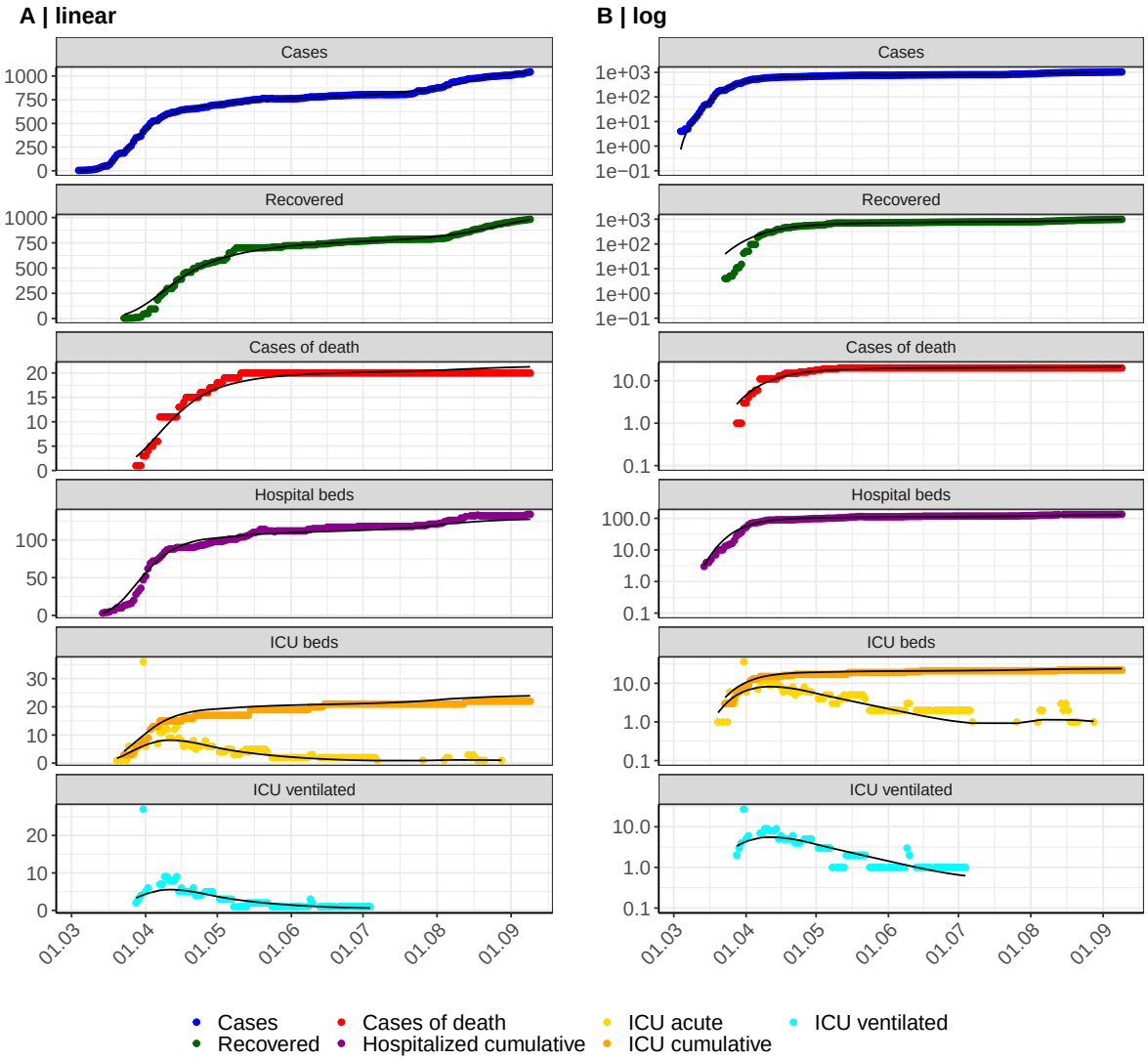


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

Fig. 89 shows the goodness-of-fit for Mecklenburg-Vorpommern. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

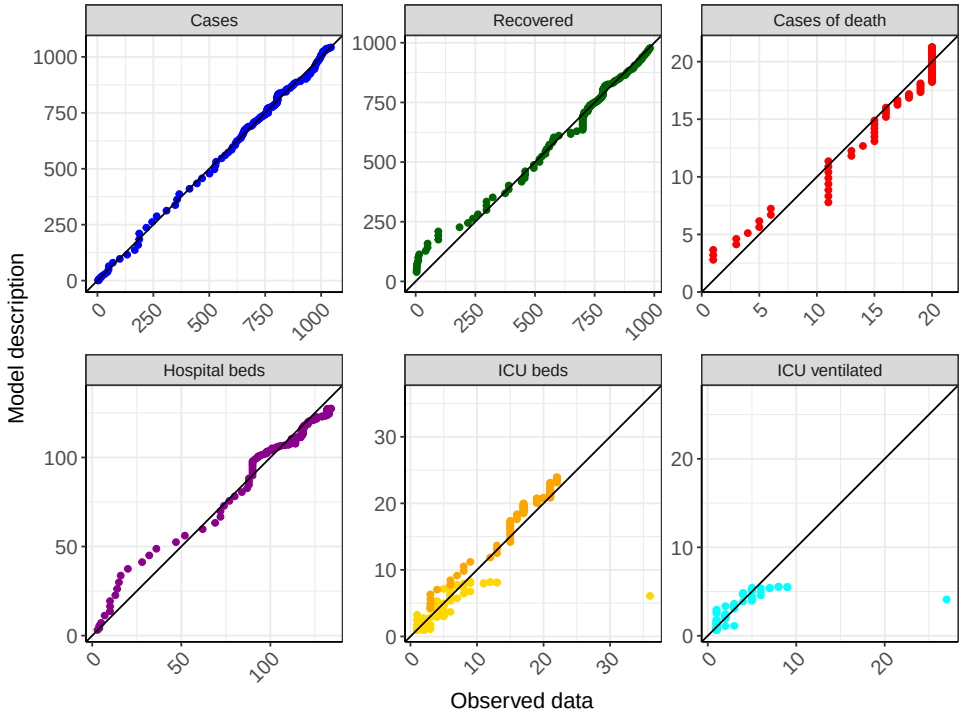


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

Fig. 90 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Mecklenburg-Vorpommern (red line) in comparison with the other federal states (grey lines).

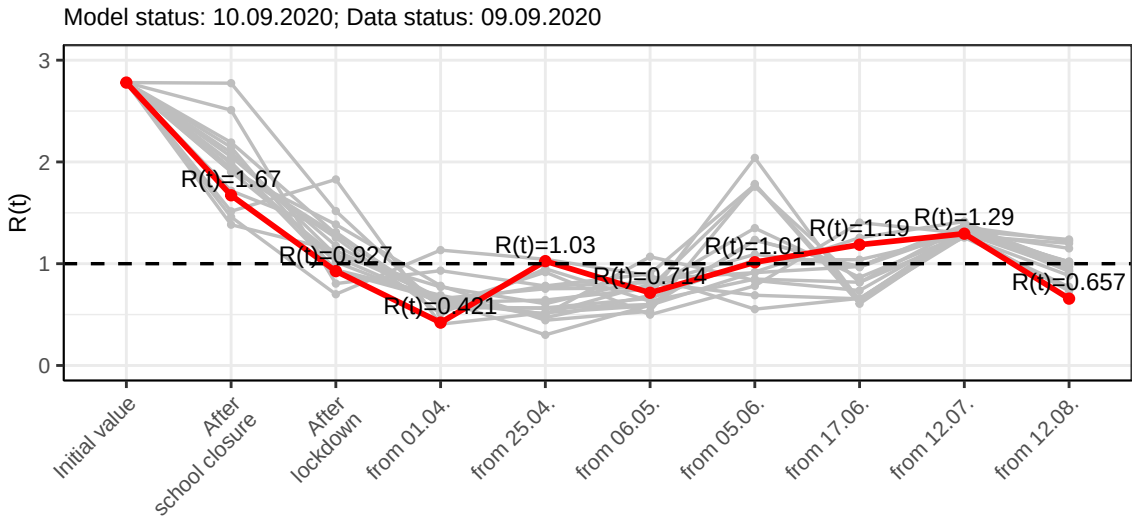


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

Fig. 91 shows the R(t) estimated value for Mecklenburg-Vorpommern (red line) over time in comparison with the other federal states (grey lines).

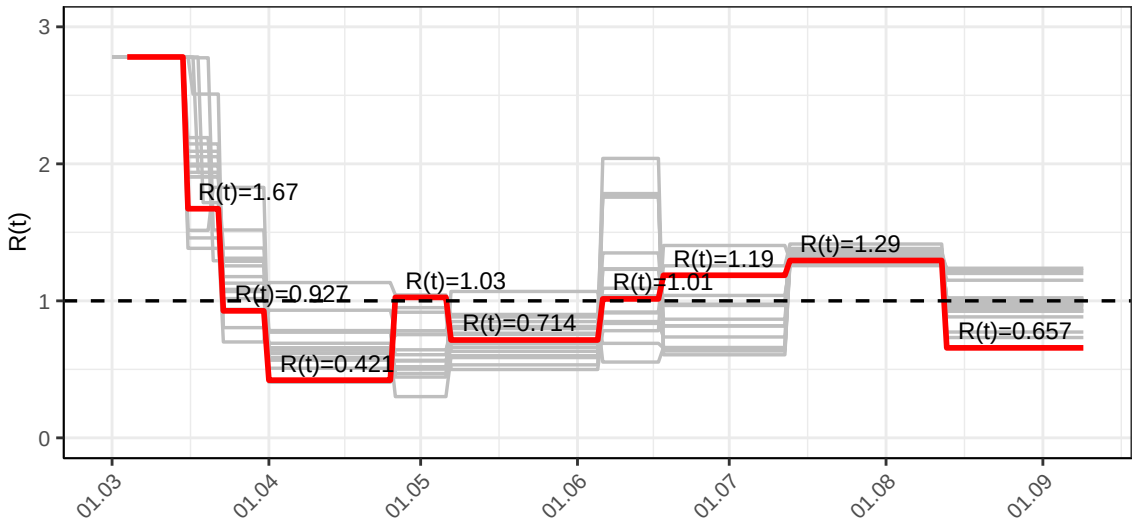


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

9.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.66)

Fig. 92 and 93 depict the the model predictions for the next 4 weeks for Mecklenburg-Vorpommern on a linear (92) and a semi-logarithmic (93) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

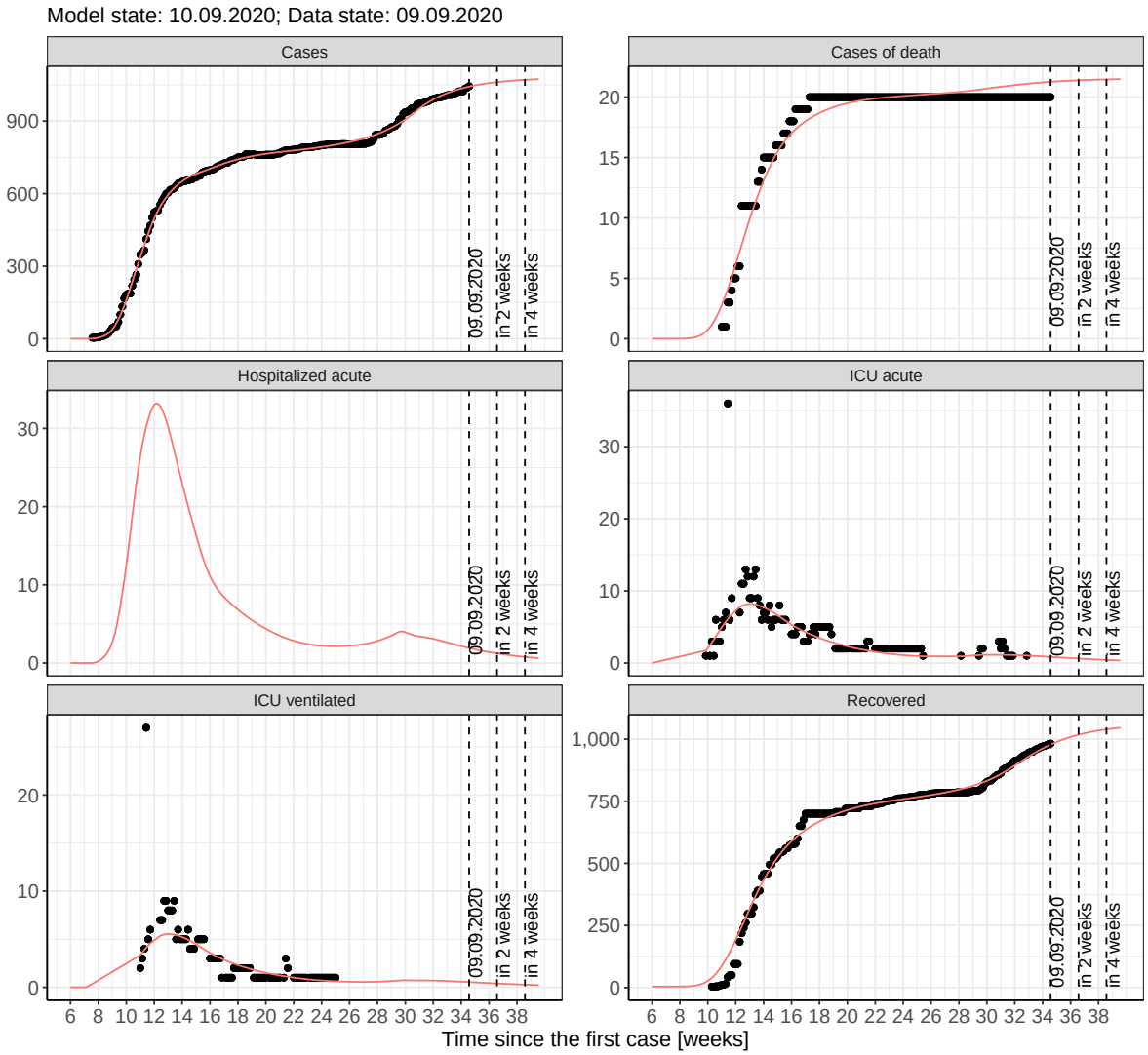


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

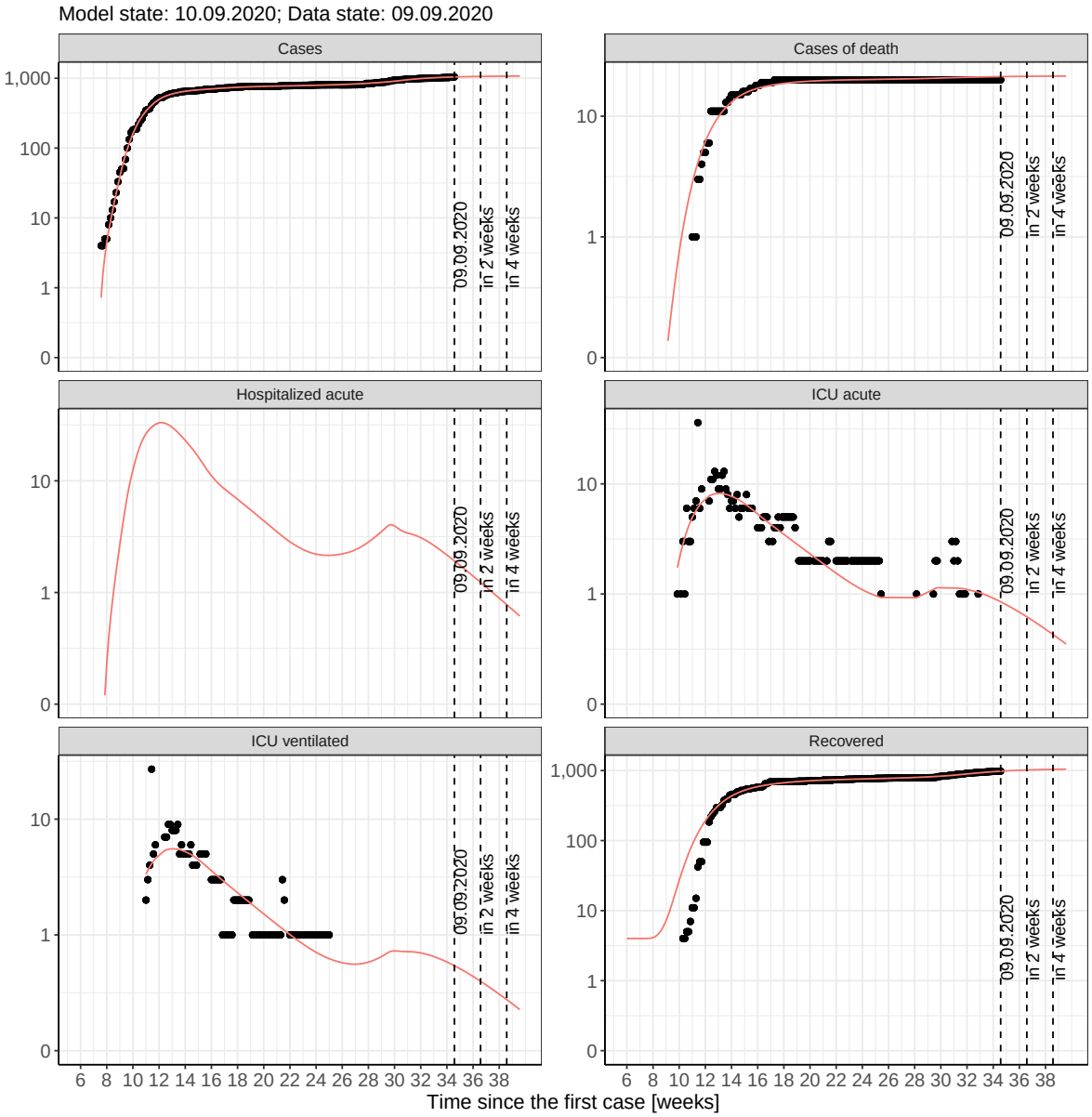


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 94 and 95 represent the model prediction for the next 4 weeks for Mecklenburg-Vorpommern on a linear (94) and a semi-logarithmic (95) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

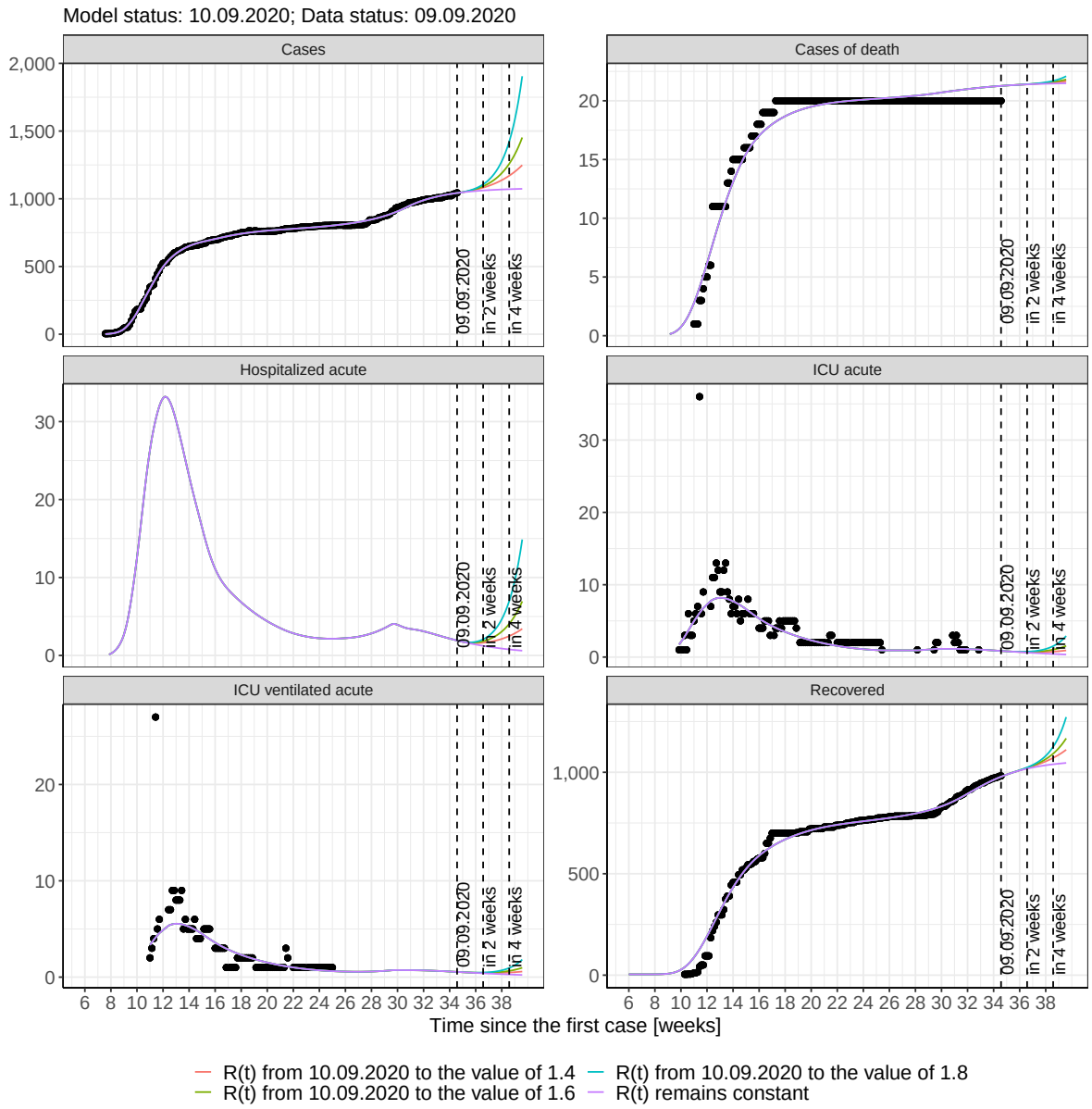


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

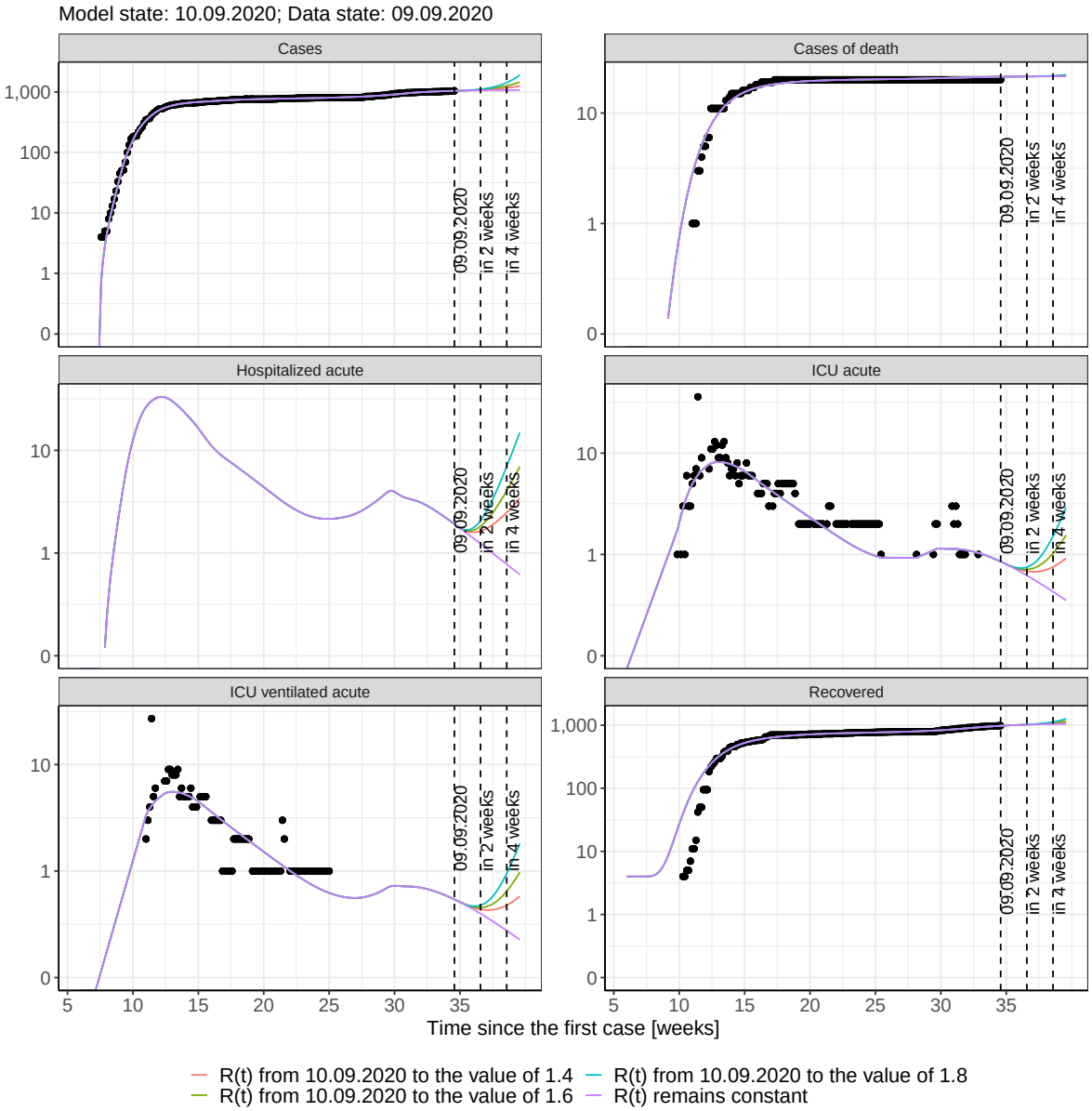


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 96 and 97 represent the model prediction for the next 16 weeks for Mecklenburg-Vorpommern on a linear (96) and a semi-logarithmic (97) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

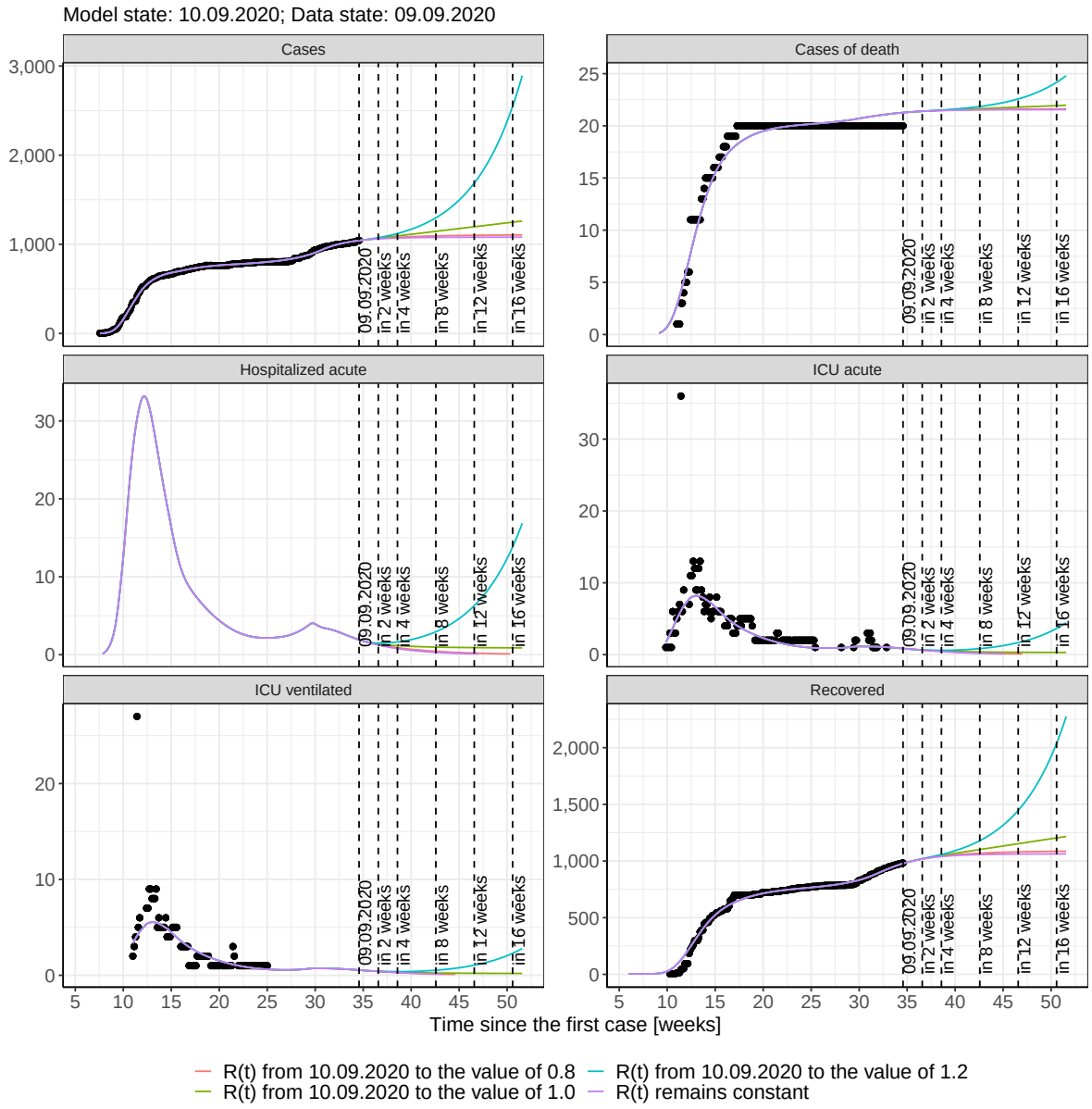


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

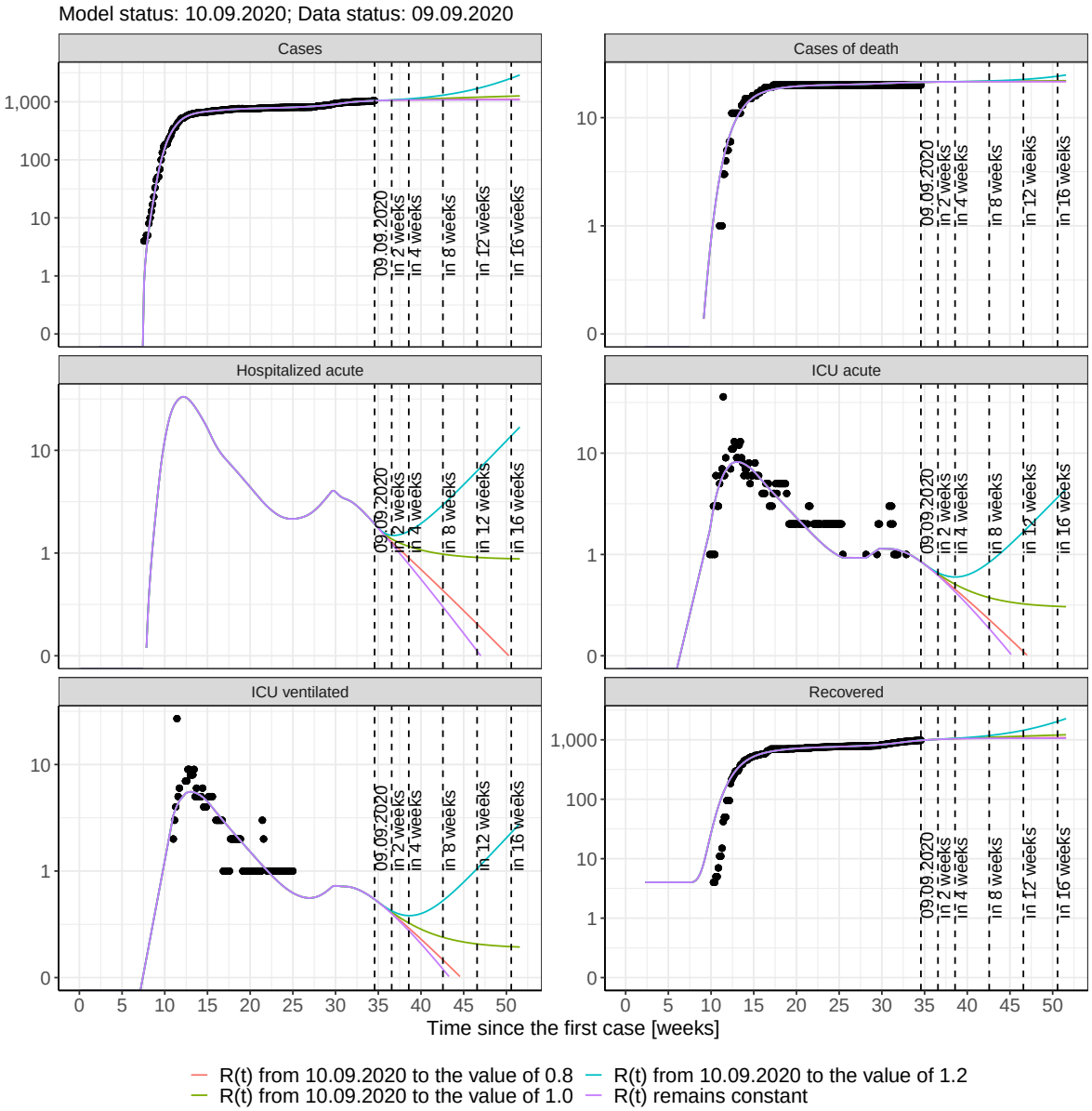


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 33) Model status from 10.09.2020; Data status: 09.09.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	1044	21	982	2	1	1
11.09.2020	1046	21	985	2	1	1
12.09.2020	1048	21	988	2	1	1
13.09.2020	1049	21	992	2	1	0
14.09.2020	1051	21	995	2	1	0
15.09.2020	1052	21	998	2	1	0
16.09.2020	1054	21	1001	2	1	0
17.09.2020	1055	21	1003	1	1	0
18.09.2020	1056	21	1006	1	1	0
19.09.2020	1057	21	1009	1	1	0
20.09.2020	1058	21	1011	1	1	0
21.09.2020	1059	21	1013	1	1	0
22.09.2020	1060	21	1016	1	1	0
23.09.2020	1061	21	1018	1	1	0
24.09.2020	1062	21	1020	1	1	0
25.09.2020	1063	21	1022	1	1	0
26.09.2020	1064	21	1024	1	1	0
27.09.2020	1065	21	1025	1	1	0
28.09.2020	1065	21	1027	1	1	0
29.09.2020	1066	21	1029	1	1	0
30.09.2020	1067	21	1030	1	1	0
01.10.2020	1067	21	1032	1	1	0
02.10.2020	1068	21	1033	1	0	0
03.10.2020	1069	21	1035	1	0	0
04.10.2020	1069	21	1036	1	0	0
05.10.2020	1070	21	1037	1	0	0
06.10.2020	1070	21	1038	1	0	0
07.10.2020	1071	21	1039	1	0	0

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	1044	21	982	2	1	1
11.09.2020	1046	21	985	2	1	1
12.09.2020	1048	21	988	2	1	1
13.09.2020	1050	21	992	2	1	1
14.09.2020	1051	21	995	2	1	0
15.09.2020	1053	21	998	2	1	0
16.09.2020	1054	21	1001	2	1	0
17.09.2020	1056	21	1004	2	1	0
18.09.2020	1057	21	1006	1	1	0
19.09.2020	1059	21	1009	1	1	0
20.09.2020	1060	21	1011	1	1	0
21.09.2020	1061	21	1014	1	1	0
22.09.2020	1063	21	1016	1	1	0
23.09.2020	1064	21	1018	1	1	0
24.09.2020	1065	21	1020	1	1	0
25.09.2020	1066	21	1022	1	1	0
26.09.2020	1067	21	1024	1	1	0
27.09.2020	1068	21	1026	1	1	0
28.09.2020	1070	21	1028	1	1	0
29.09.2020	1071	21	1030	1	1	0
30.09.2020	1072	21	1032	1	1	0
01.10.2020	1073	21	1034	1	1	0
02.10.2020	1074	21	1035	1	1	0
03.10.2020	1075	21	1037	1	0	0
04.10.2020	1076	21	1038	1	0	0
05.10.2020	1076	21	1040	1	0	0
06.10.2020	1077	21	1041	1	0	0
07.10.2020	1078	21	1042	1	0	0

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	1044	21	982	2	1	1
11.09.2020	1046	21	985	2	1	1
12.09.2020	1048	21	989	2	1	1
13.09.2020	1050	21	992	2	1	1
14.09.2020	1052	21	995	2	1	0
15.09.2020	1054	21	998	2	1	0
16.09.2020	1055	21	1001	2	1	0
17.09.2020	1057	21	1004	2	1	0
18.09.2020	1059	21	1006	2	1	0
19.09.2020	1061	21	1009	1	1	0
20.09.2020	1063	21	1012	1	1	0
21.09.2020	1065	21	1014	1	1	0
22.09.2020	1066	21	1016	1	1	0
23.09.2020	1068	21	1019	1	1	0
24.09.2020	1070	21	1021	1	1	0
25.09.2020	1072	21	1024	1	1	0
26.09.2020	1074	21	1026	1	1	0
27.09.2020	1076	21	1028	1	1	0
28.09.2020	1078	21	1030	1	1	0
29.09.2020	1079	21	1032	1	1	0
30.09.2020	1081	21	1034	1	1	0
01.10.2020	1083	21	1036	1	1	0
02.10.2020	1085	21	1038	1	1	0
03.10.2020	1087	21	1041	1	1	0
04.10.2020	1089	21	1043	1	1	0
05.10.2020	1090	21	1045	1	1	0
06.10.2020	1092	21	1047	1	1	0
07.10.2020	1094	21	1048	1	1	0

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	1044	21	982	2	1	1
11.09.2020	1046	21	985	2	1	1
12.09.2020	1048	21	989	2	1	1
13.09.2020	1050	21	992	2	1	1
14.09.2020	1052	21	995	2	1	0
15.09.2020	1055	21	998	2	1	0
16.09.2020	1057	21	1001	2	1	0
17.09.2020	1059	21	1004	2	1	0
18.09.2020	1062	21	1006	2	1	0
19.09.2020	1064	21	1009	2	1	0
20.09.2020	1066	21	1012	2	1	0
21.09.2020	1069	21	1015	2	1	0
22.09.2020	1072	21	1017	1	1	0
23.09.2020	1074	21	1020	1	1	0
24.09.2020	1077	21	1022	1	1	0
25.09.2020	1080	21	1025	1	1	0
26.09.2020	1083	21	1028	1	1	0
27.09.2020	1086	21	1030	1	1	0
28.09.2020	1089	21	1033	1	1	0
29.09.2020	1092	21	1035	2	1	0
30.09.2020	1096	21	1038	2	1	0
01.10.2020	1099	21	1041	2	1	0
02.10.2020	1102	21	1043	2	1	0
03.10.2020	1106	21	1046	2	1	0
04.10.2020	1110	21	1049	2	1	0
05.10.2020	1114	21	1052	2	1	0
06.10.2020	1118	22	1054	2	1	0
07.10.2020	1122	22	1057	2	1	0

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 98 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

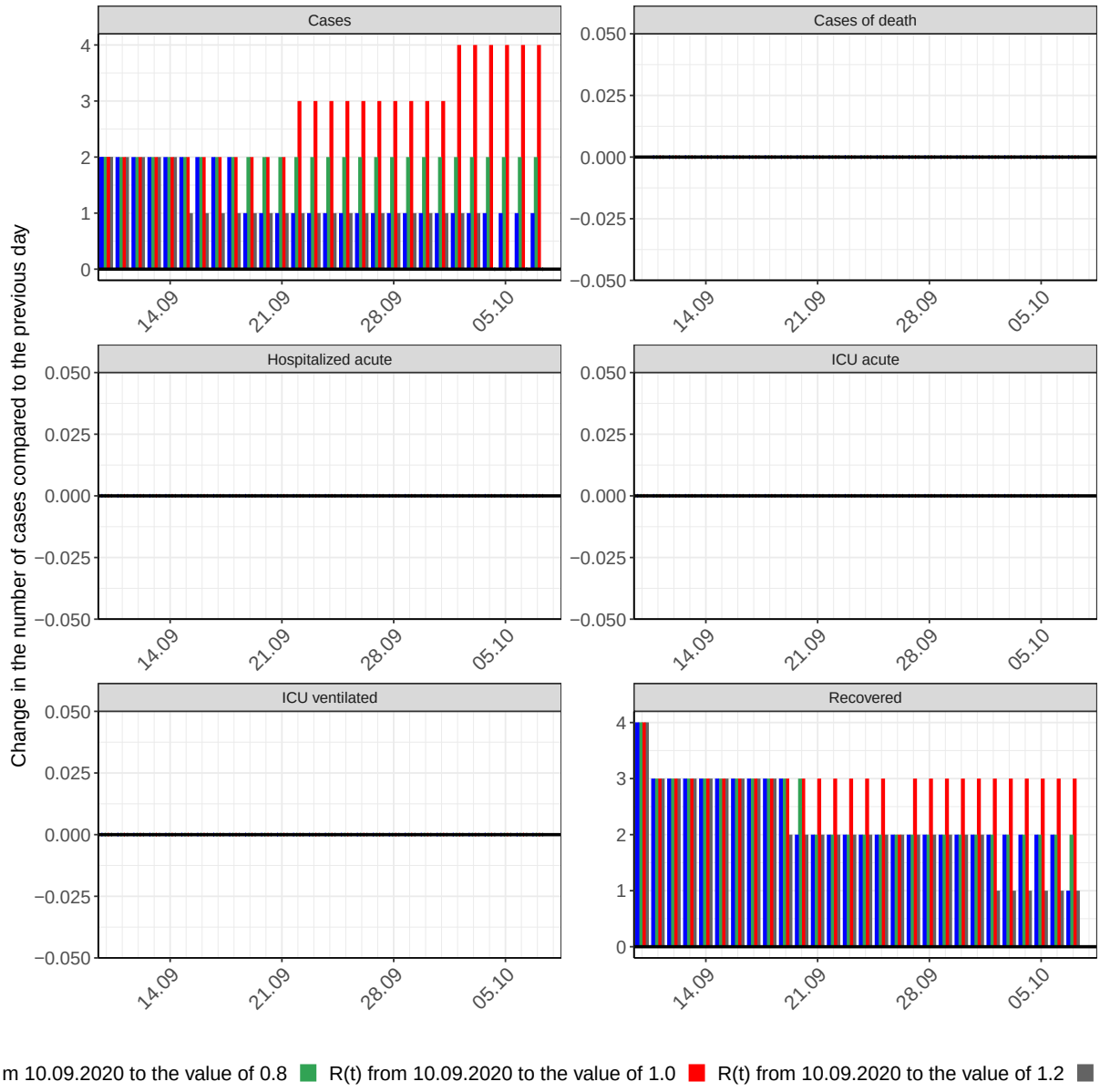


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

10 Lower Saxony

10.1 Model description

Fig. 99 depicts the results of the modeling (lines) compared to the observed data (points) for Lower Saxony on a linear (A) and semi-logarithmic (B) scale.

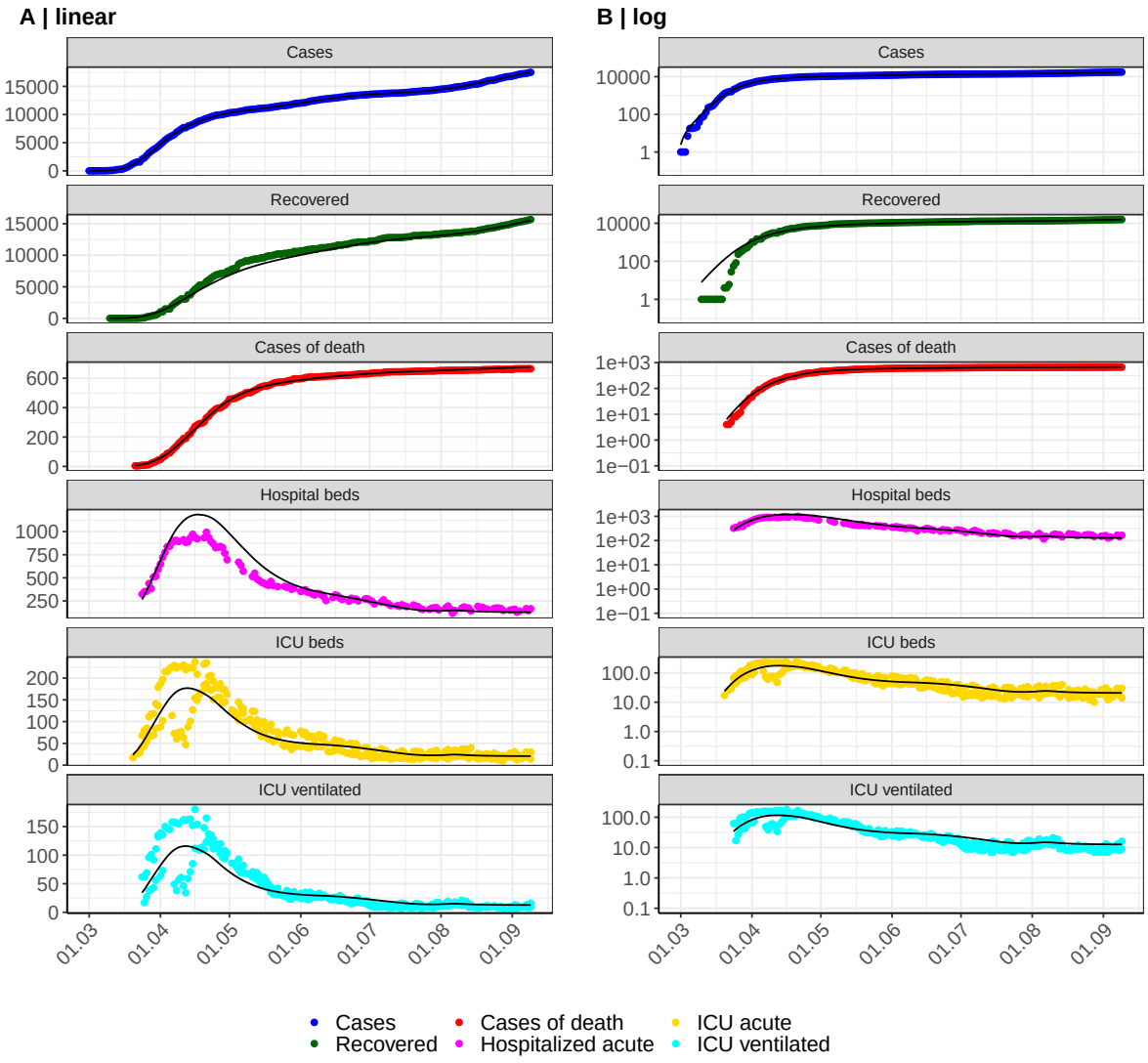


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

Fig. 100 shows the goodness-of-fit for Lower Saxony. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

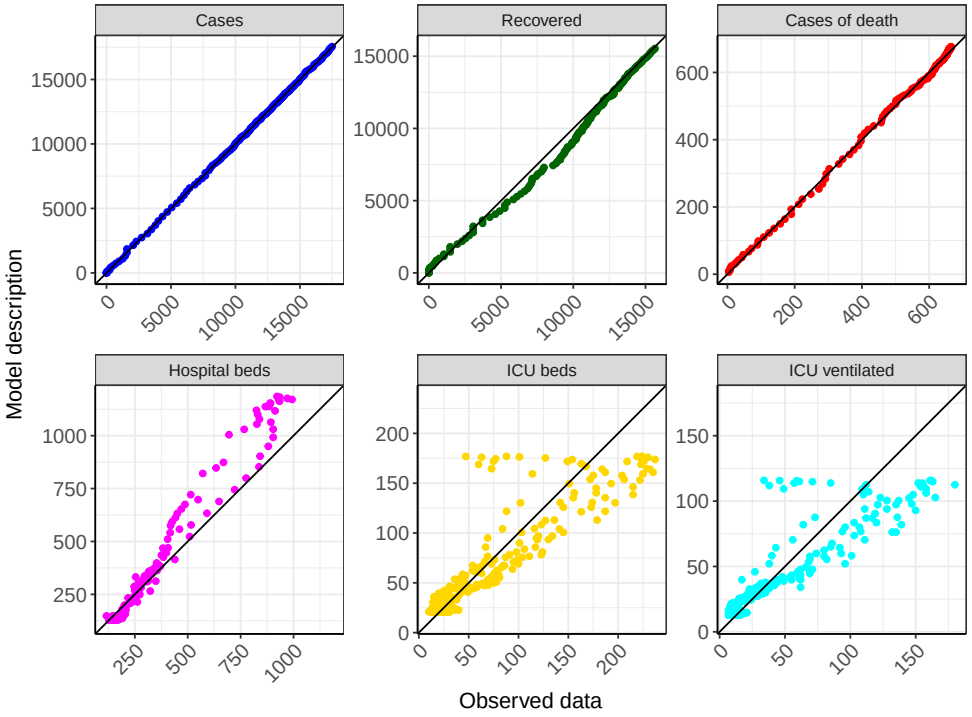


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

Fig. 101 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Lower Saxony (red line) in comparison with the other federal states (grey lines).

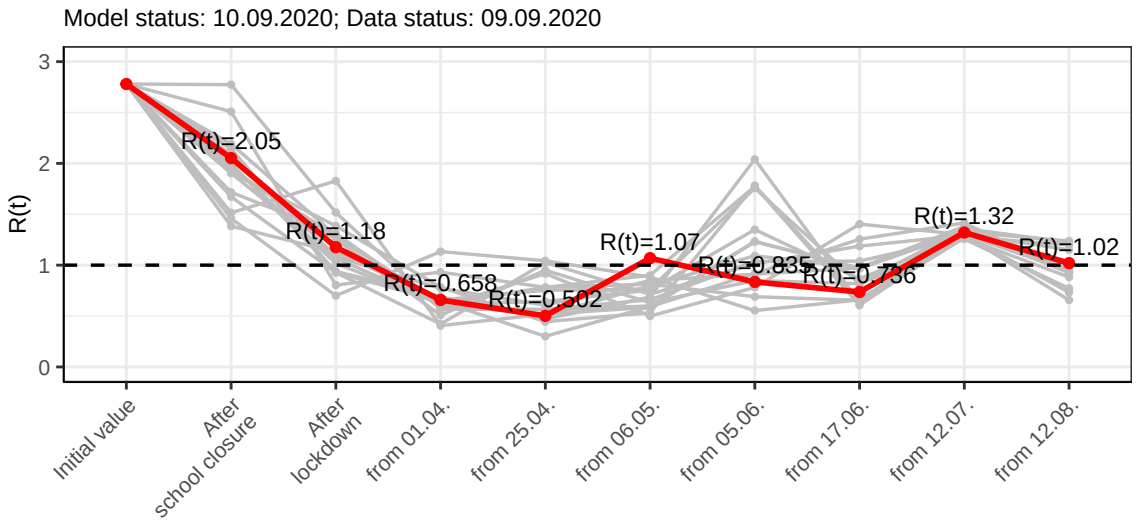


Figure 101: R(t) values before and after the NPIs for Lower Saxony

Fig. 102 shows the R(t) estimated value for Lower Saxony (red line) over time in comparison with the other federal states (grey lines).

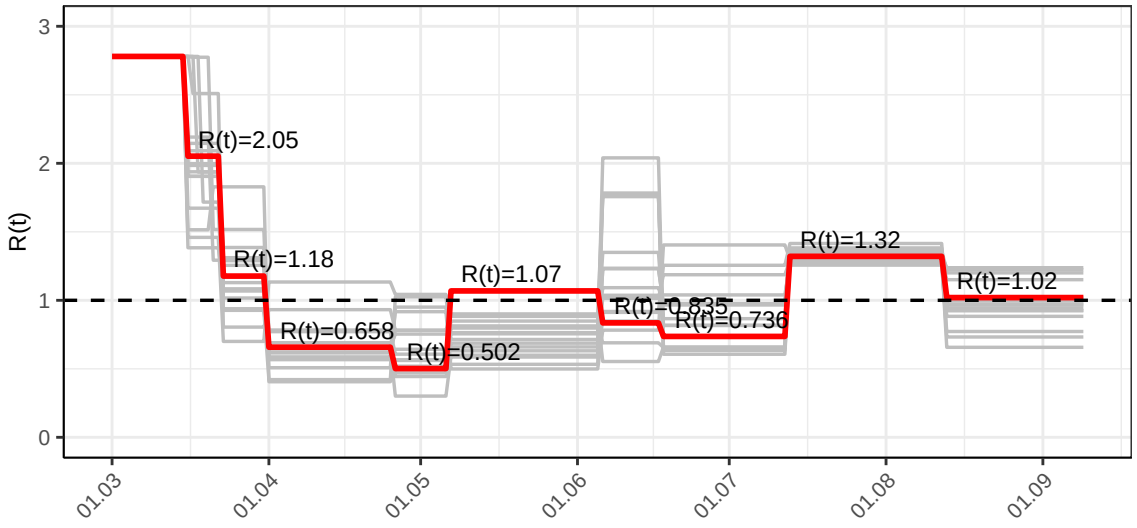


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

10.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.02)

Fig. 103 and 104 depict the the model predictions for the next 4 weeks for Lower Saxony on a linear (103) and a semi-logarithmic (104) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

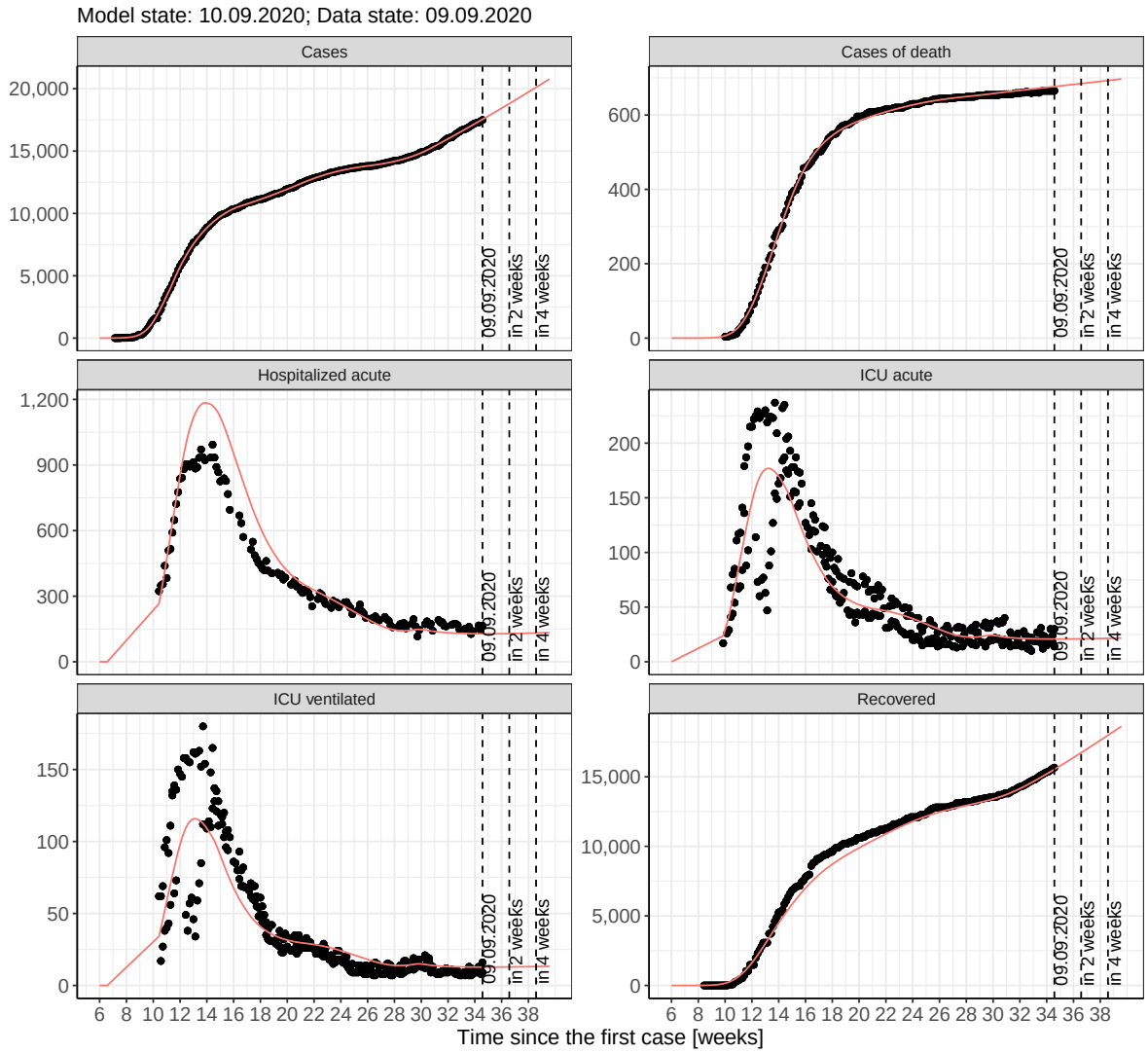


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

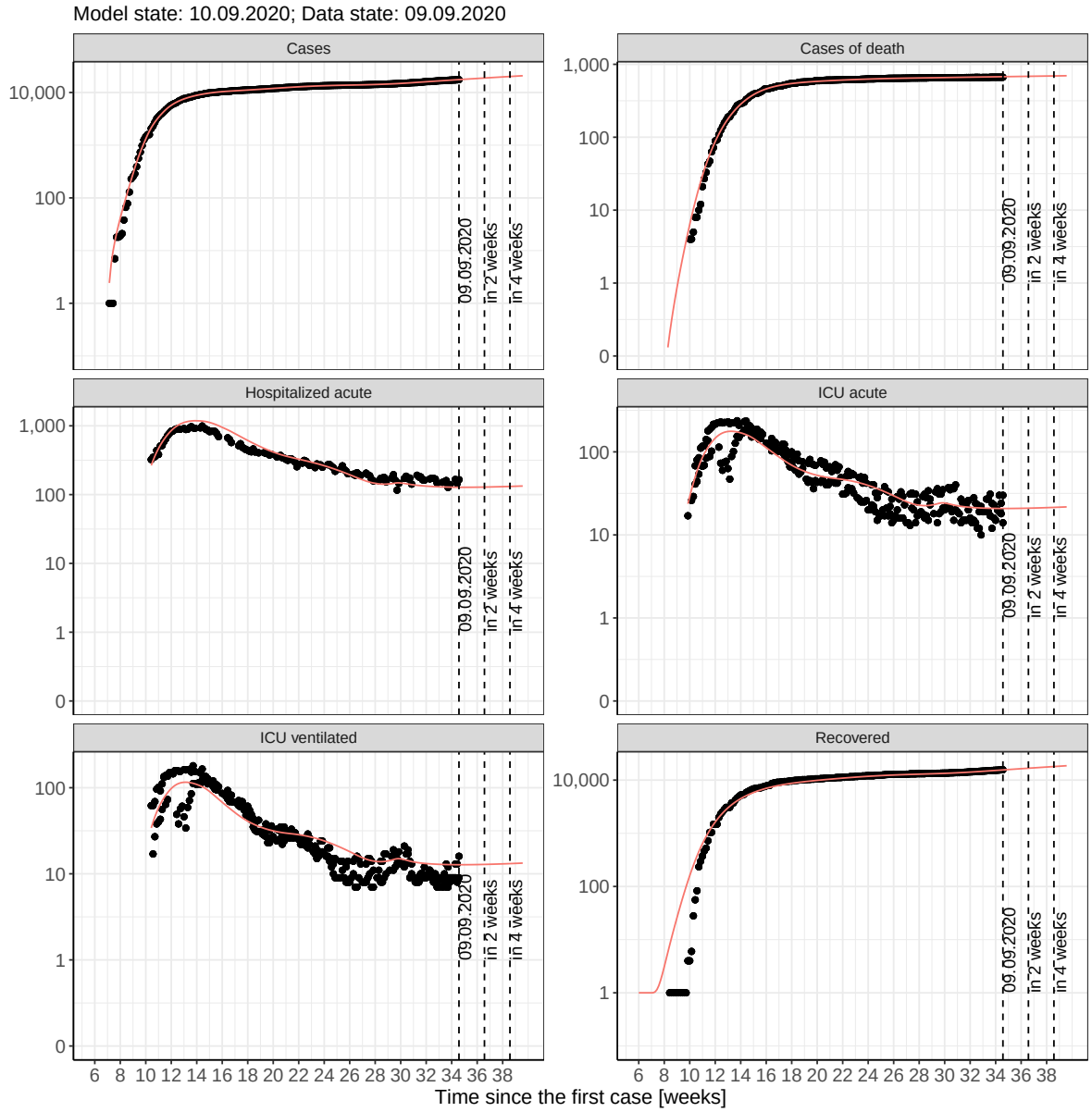


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 105 and 106 represent the model prediction for the next 4 weeks for Lower Saxony on a linear (105) and a semi-logarithmic (106) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

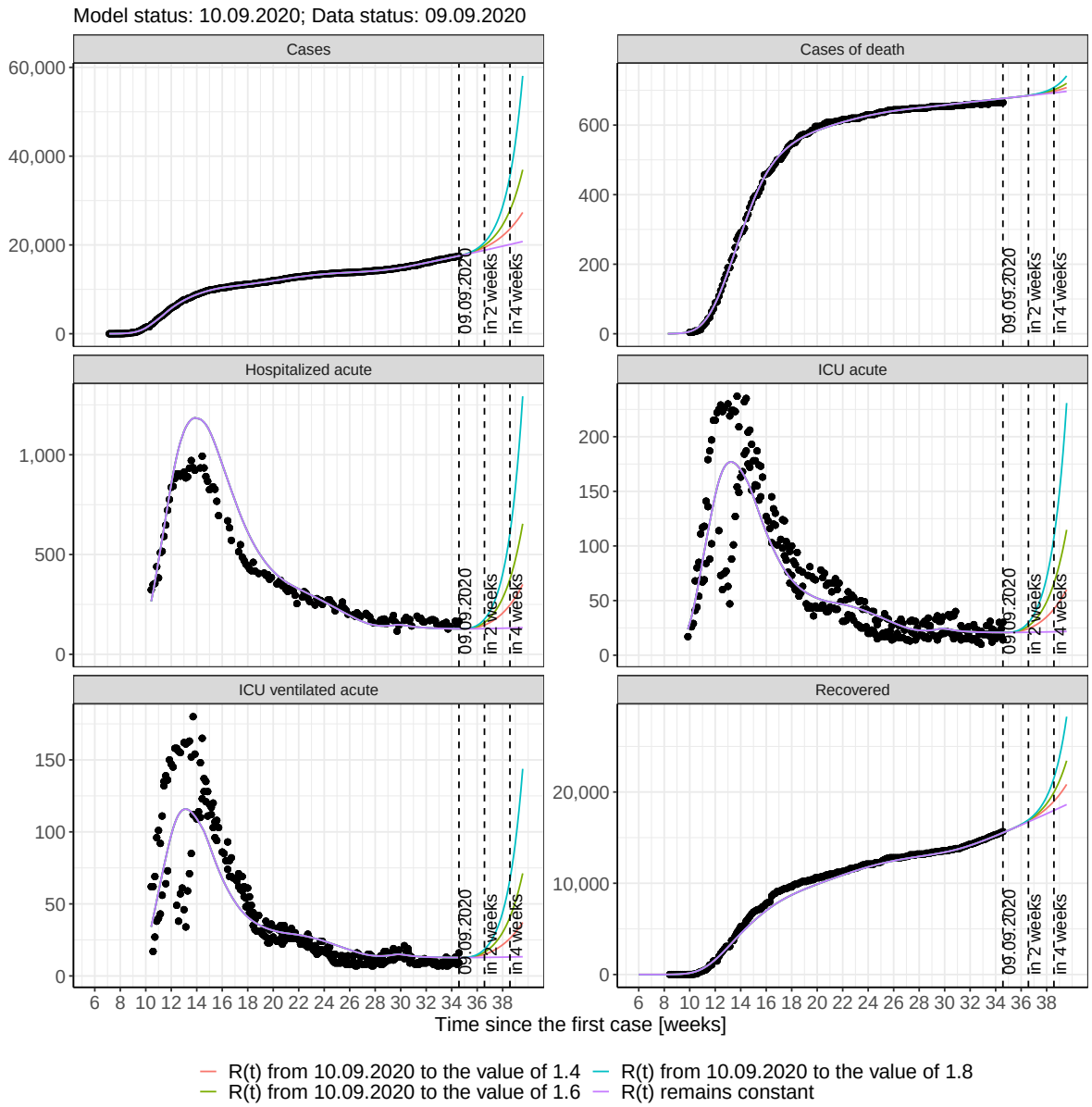


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

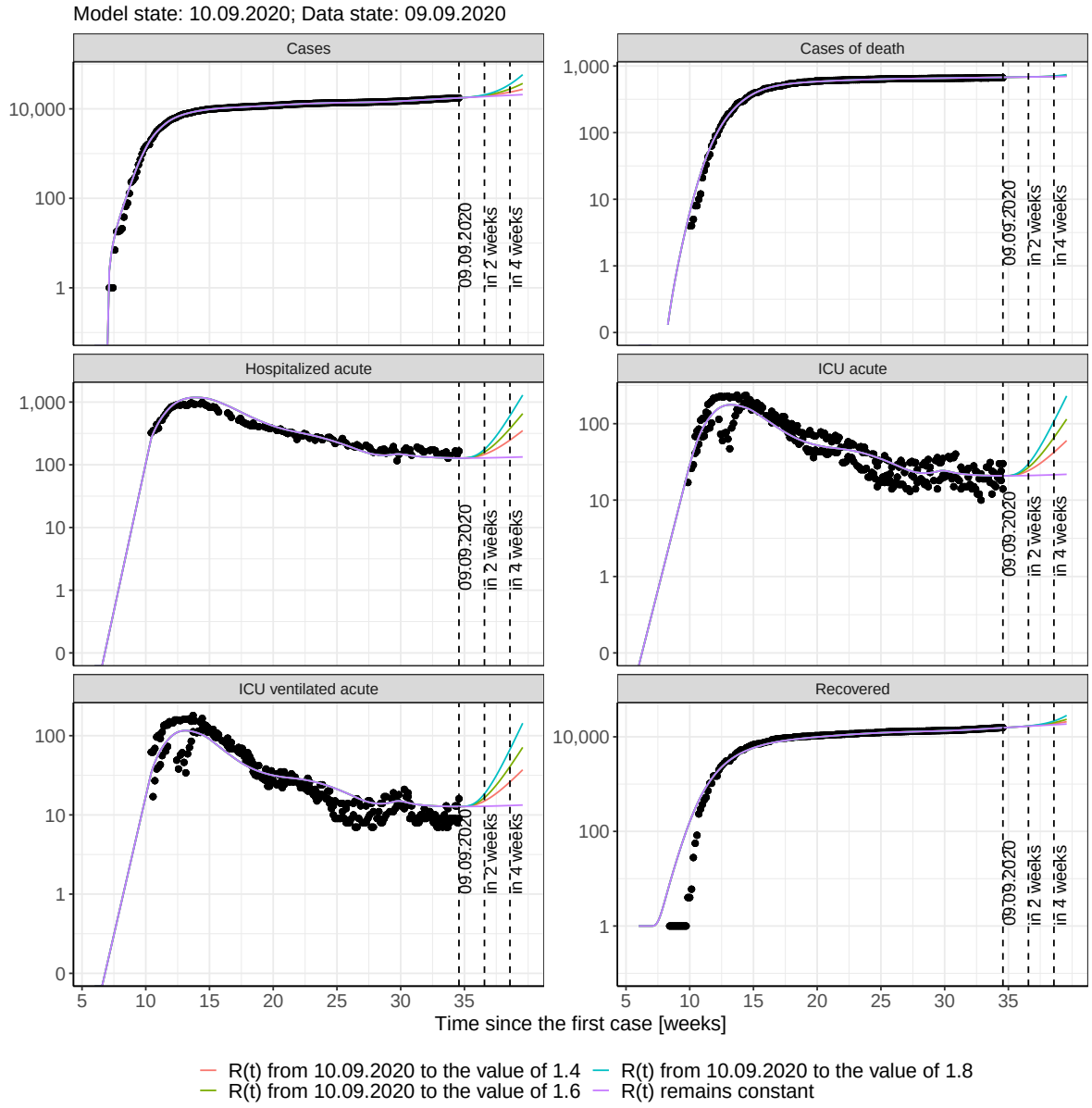


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 107 and 108 represent the model prediction for the next 16 weeks for Lower Saxony on a linear (107) and a semi-logarithmic (108) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

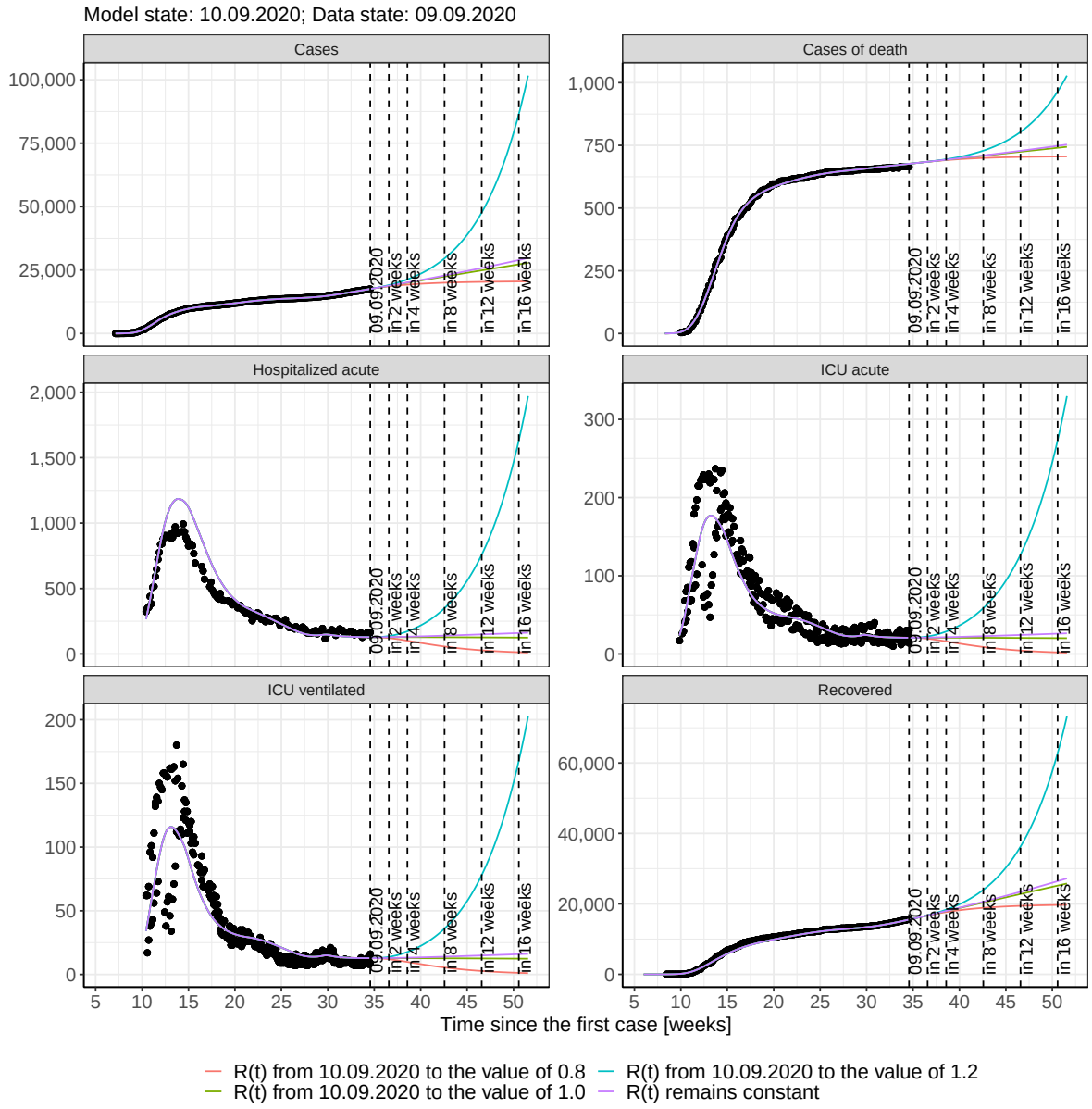


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

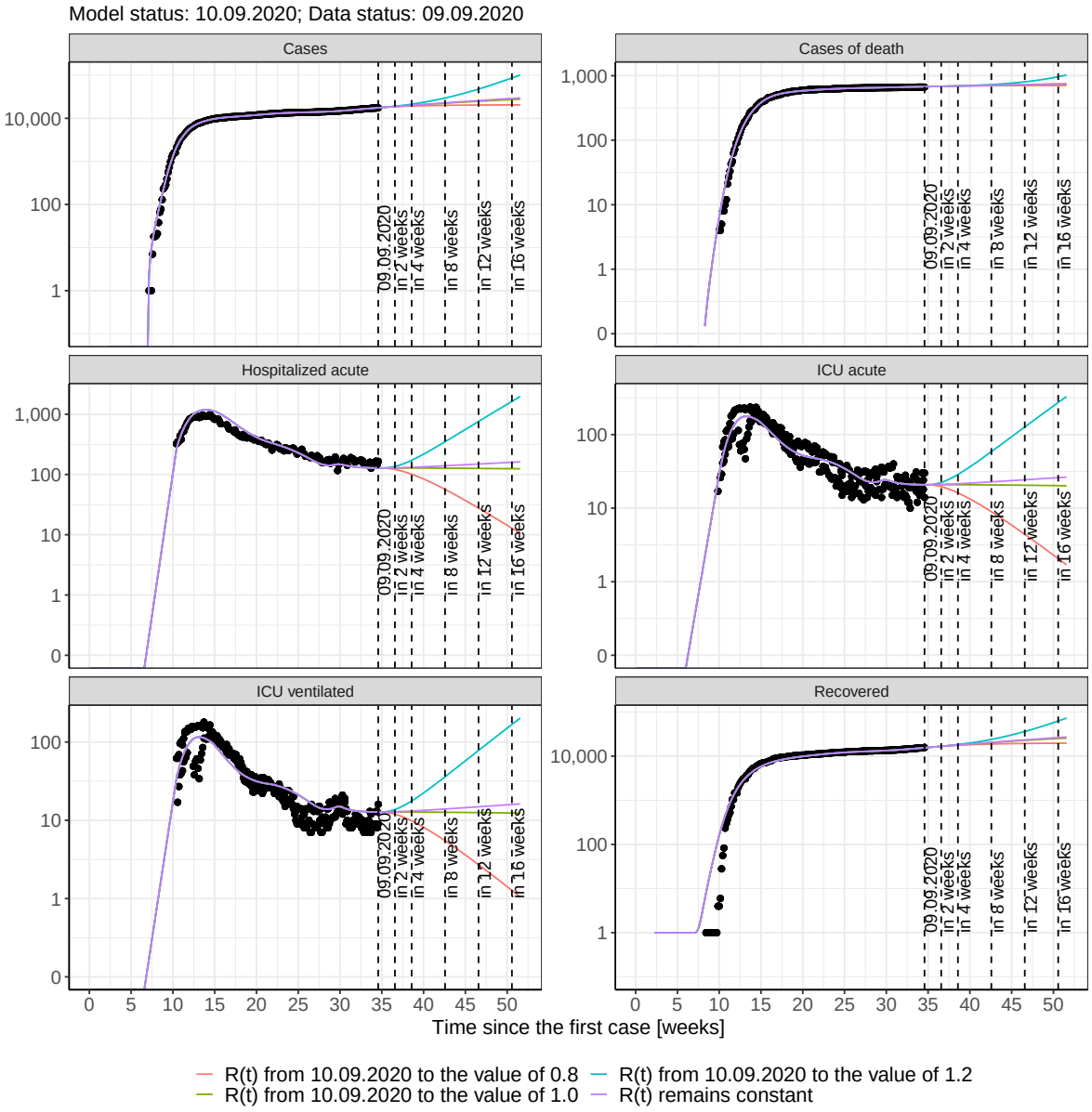


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 37) Model status from 10.09.2020; Data status: 09.09.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	17629	677	15616	128	21	13
11.09.2020	17718	678	15700	128	21	13
12.09.2020	17807	678	15784	128	21	13
13.09.2020	17896	679	15869	128	21	13
14.09.2020	17986	679	15954	128	21	13
15.09.2020	18076	680	16039	128	21	13
16.09.2020	18166	680	16125	128	21	13
17.09.2020	18256	681	16211	128	21	13
18.09.2020	18346	682	16297	128	21	13
19.09.2020	18437	682	16383	128	21	13
20.09.2020	18528	683	16470	128	21	13
21.09.2020	18619	683	16557	128	21	13
22.09.2020	18710	684	16644	129	21	13
23.09.2020	18802	685	16732	129	21	13
24.09.2020	18894	685	16820	129	21	13
25.09.2020	18986	686	16908	129	21	13
26.09.2020	19078	686	16996	129	21	13
27.09.2020	19171	687	17085	129	21	13
28.09.2020	19263	687	17173	130	21	13
29.09.2020	19356	688	17262	130	21	13
30.09.2020	19450	689	17352	130	21	13
01.10.2020	19543	689	17441	130	21	13
02.10.2020	19637	690	17531	130	21	13
03.10.2020	19731	690	17621	131	21	13
04.10.2020	19825	691	17711	131	21	13
05.10.2020	19919	692	17801	131	21	13
06.10.2020	20014	692	17892	131	21	13
07.10.2020	20108	693	17983	132	21	13

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	17627	677	15616	128	21	13
11.09.2020	17712	678	15700	128	21	13
12.09.2020	17795	678	15784	128	21	13
13.09.2020	17875	679	15868	128	21	13
14.09.2020	17953	679	15953	127	21	13
15.09.2020	18028	680	16037	127	21	13
16.09.2020	18102	680	16121	127	21	13
17.09.2020	18173	681	16205	126	21	13
18.09.2020	18242	682	16288	126	20	12
19.09.2020	18309	682	16371	125	20	12
20.09.2020	18375	683	16453	124	20	12
21.09.2020	18438	683	16534	123	20	12
22.09.2020	18500	684	16614	122	20	12
23.09.2020	18560	684	16693	121	20	12
24.09.2020	18619	685	16772	120	19	12
25.09.2020	18675	685	16849	119	19	12
26.09.2020	18730	686	16924	118	19	12
27.09.2020	18784	686	16999	117	19	11
28.09.2020	18836	687	17072	115	19	11
29.09.2020	18886	687	17144	114	18	11
30.09.2020	18935	688	17215	112	18	11
01.10.2020	18983	688	17284	111	18	11
02.10.2020	19029	689	17352	109	17	11
03.10.2020	19074	689	17418	108	17	11
04.10.2020	19118	690	17483	106	17	10
05.10.2020	19160	690	17547	104	17	10
06.10.2020	19201	691	17609	103	16	10
07.10.2020	19241	691	17669	101	16	10

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	17629	677	15616	128	21	13
11.09.2020	17717	678	15700	128	21	13
12.09.2020	17806	678	15784	128	21	13
13.09.2020	17894	679	15869	128	21	13
14.09.2020	17983	679	15954	128	21	13
15.09.2020	18071	680	16039	128	21	13
16.09.2020	18159	680	16124	128	21	13
17.09.2020	18248	681	16210	128	21	13
18.09.2020	18336	682	16296	128	21	13
19.09.2020	18424	682	16382	128	21	13
20.09.2020	18513	683	16468	128	21	13
21.09.2020	18601	683	16555	128	21	13
22.09.2020	18689	684	16641	128	21	13
23.09.2020	18777	684	16728	128	21	13
24.09.2020	18865	685	16815	128	21	13
25.09.2020	18953	686	16902	128	21	13
26.09.2020	19042	686	16989	128	21	13
27.09.2020	19130	687	17076	128	21	13
28.09.2020	19218	687	17163	128	21	13
29.09.2020	19306	688	17250	128	21	13
30.09.2020	19394	689	17337	128	21	13
01.10.2020	19481	689	17425	128	21	13
02.10.2020	19569	690	17512	128	21	13
03.10.2020	19657	690	17599	128	21	13
04.10.2020	19745	691	17687	128	21	13
05.10.2020	19833	691	17774	128	21	13
06.10.2020	19921	692	17861	128	21	13
07.10.2020	20008	693	17949	128	21	13

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	17630	677	15616	128	21	13
11.09.2020	17722	678	15700	128	21	13
12.09.2020	17817	678	15784	128	21	13
13.09.2020	17915	679	15869	128	21	13
14.09.2020	18016	679	15955	128	21	13
15.09.2020	18119	680	16041	129	21	13
16.09.2020	18226	680	16128	129	21	13
17.09.2020	18335	681	16216	130	21	13
18.09.2020	18448	682	16305	130	21	13
19.09.2020	18563	682	16395	131	21	13
20.09.2020	18682	683	16486	132	22	13
21.09.2020	18805	683	16579	133	22	13
22.09.2020	18931	684	16673	135	22	14
23.09.2020	19060	685	16770	136	22	14
24.09.2020	19194	685	16868	138	23	14
25.09.2020	19331	686	16967	140	23	14
26.09.2020	19472	687	17069	141	23	14
27.09.2020	19617	687	17173	143	24	15
28.09.2020	19766	688	17280	146	24	15
29.09.2020	19919	689	17389	148	24	15
30.09.2020	20077	689	17500	151	25	15
01.10.2020	20240	690	17614	153	25	16
02.10.2020	20406	691	17731	156	26	16
03.10.2020	20578	691	17851	159	26	16
04.10.2020	20755	692	17974	162	27	17
05.10.2020	20936	693	18100	165	28	17
06.10.2020	21123	694	18229	169	28	17
07.10.2020	21315	695	18361	172	29	18

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 109 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

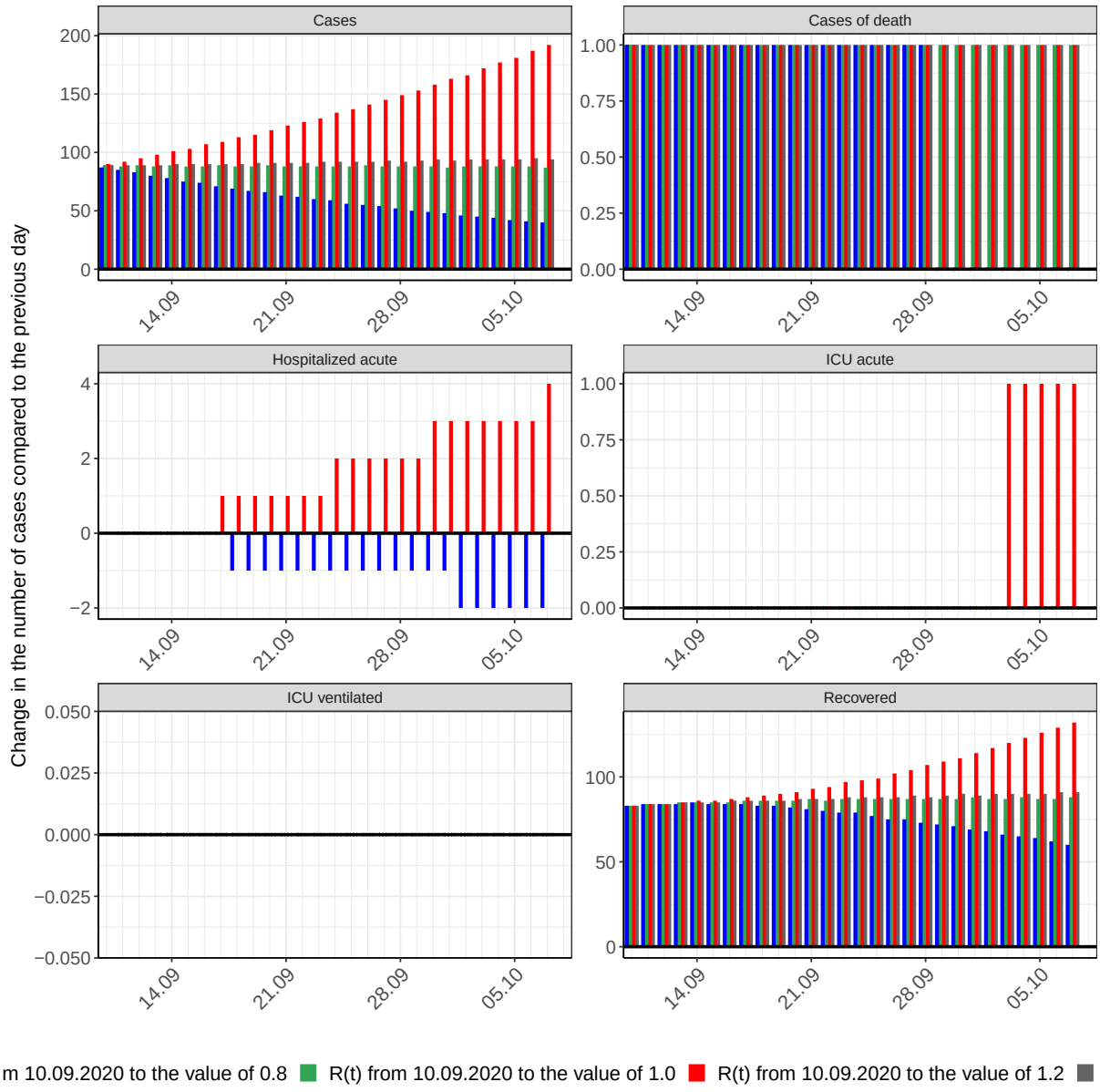


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

11 North Rhine-Westphalia

11.1 Model description

Fig. 110 depicts the results of the modeling (lines) compared to the observed data (points) for North Rhine-Westphalia on a linear (A) and semi-logarithmic (B) scale.

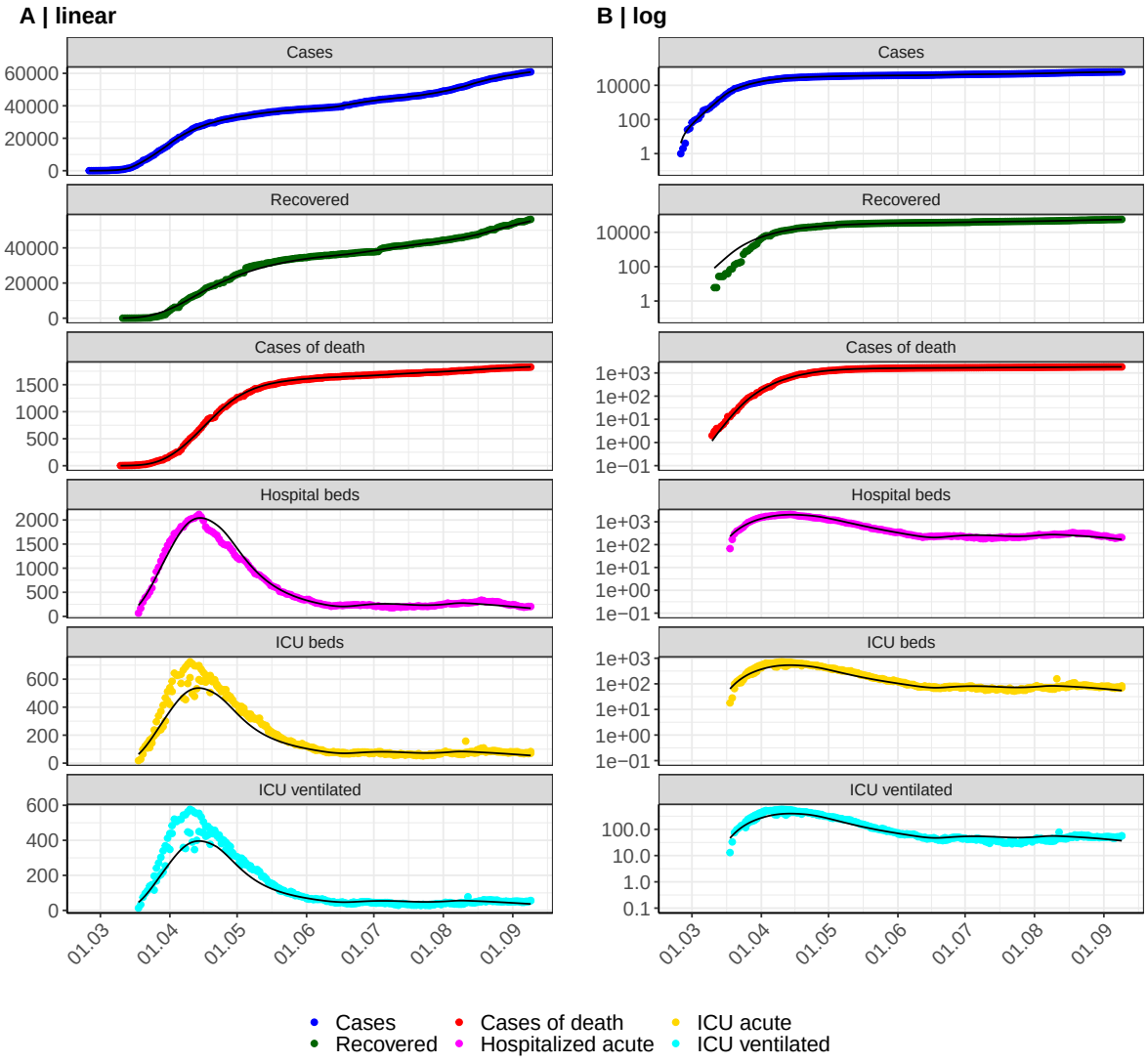


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

Fig. 111 shows the goodness-of-fit for North Rhine-Westphalia. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

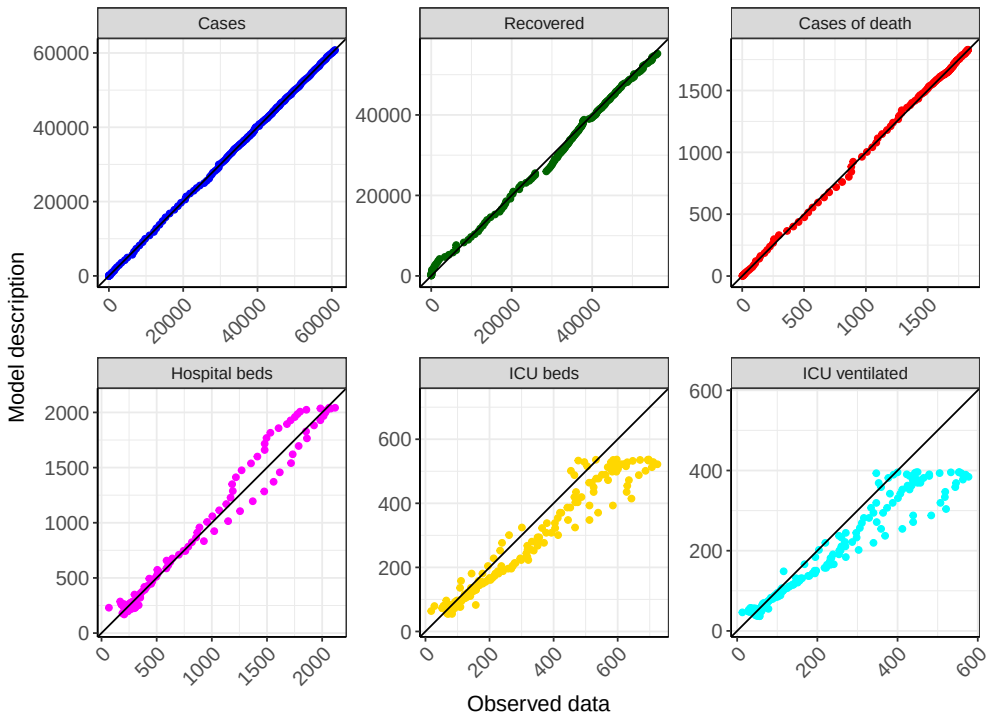


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

Fig. 112 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for North Rhine-Westphalia (red line) in comparison with the other federal states (grey lines).

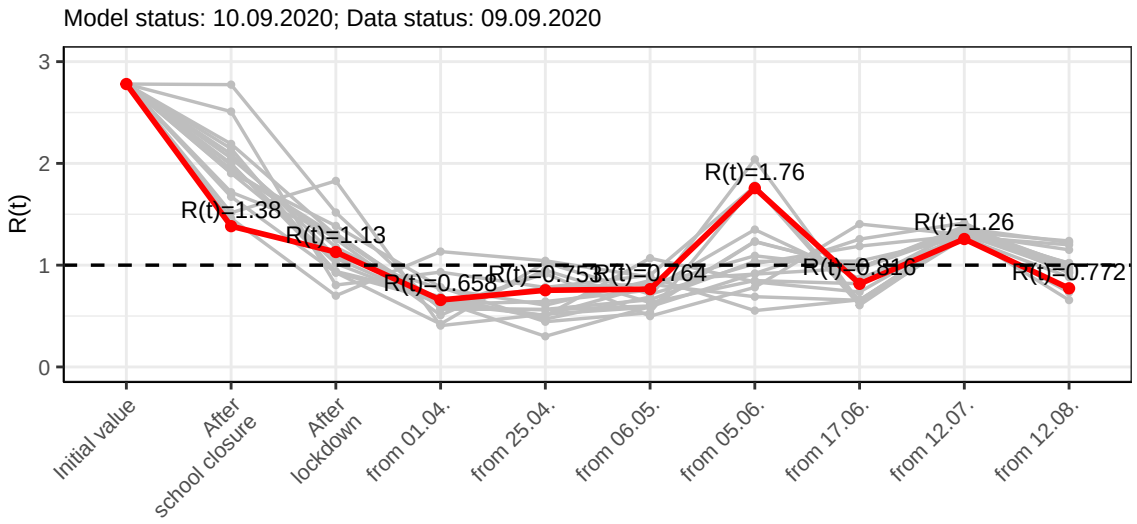


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

Fig. 113 shows the R(t) estimated value for North Rhine-Westphalia (red line) over time in comparison with the other federal states (grey lines).

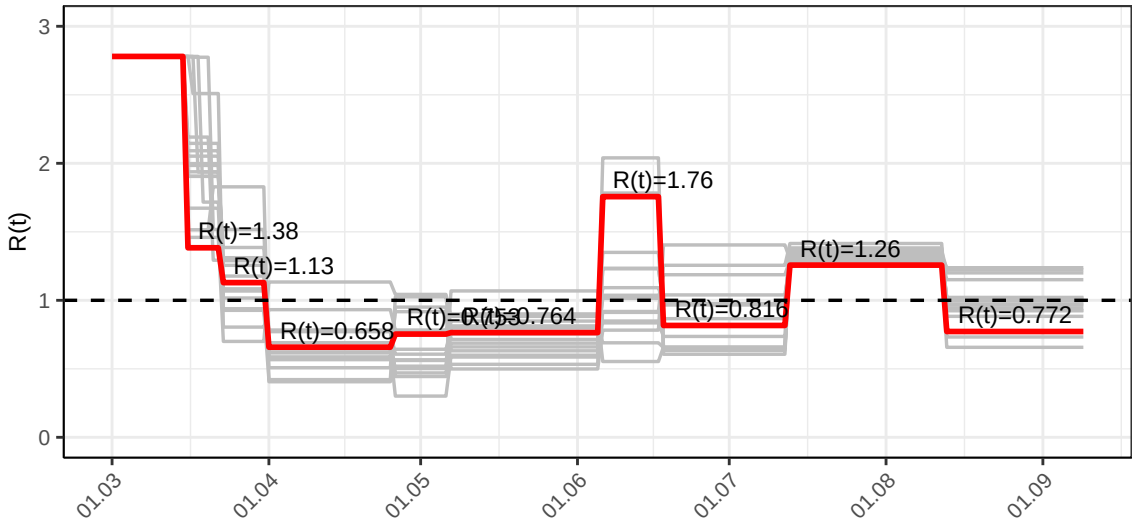


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.77)

Fig. 114 and 115 depict the the model predictions for the next 4 weeks for North Rhine-Westphalia on a linear (114) and a semi-logarithmic (115) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

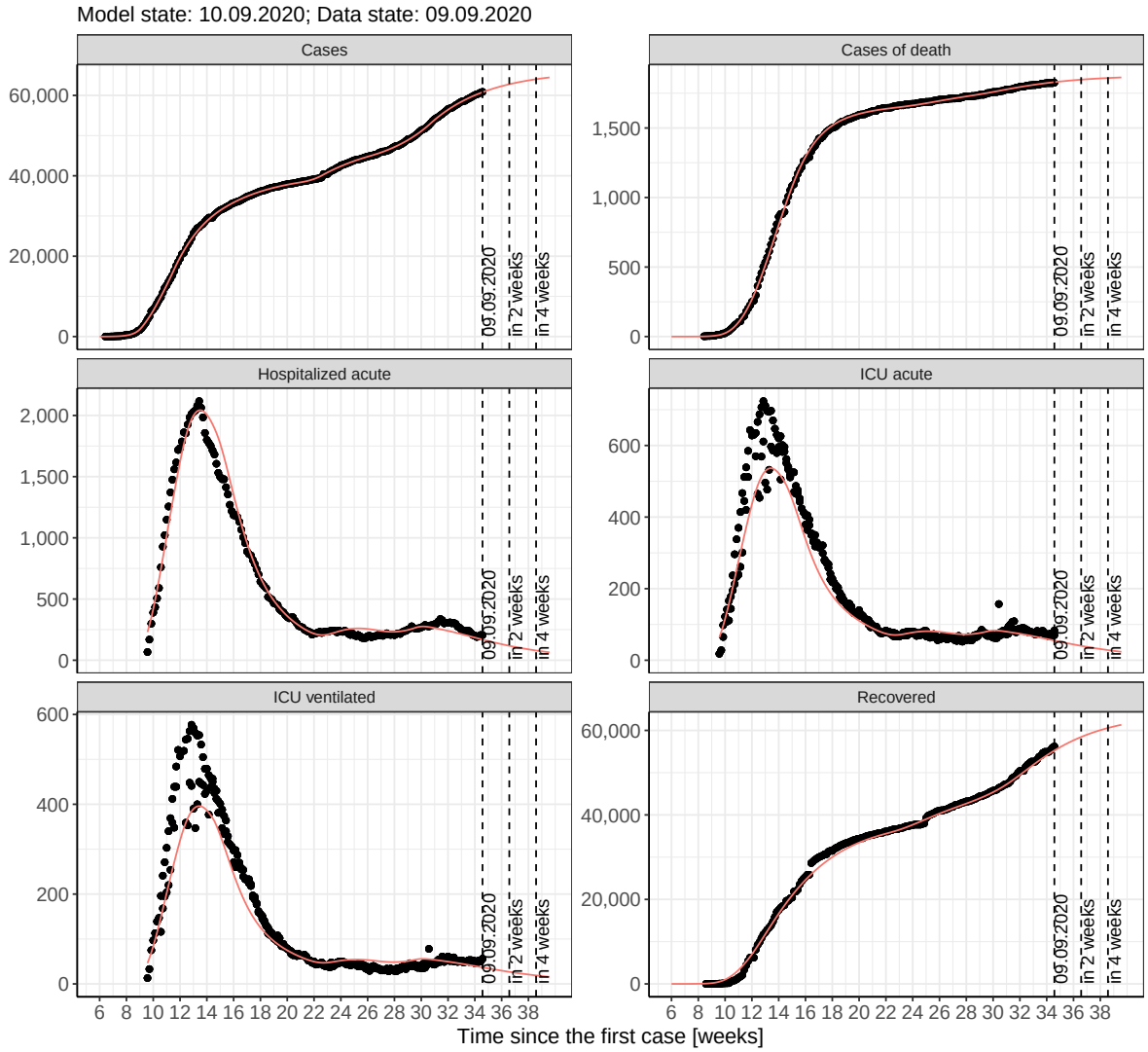


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

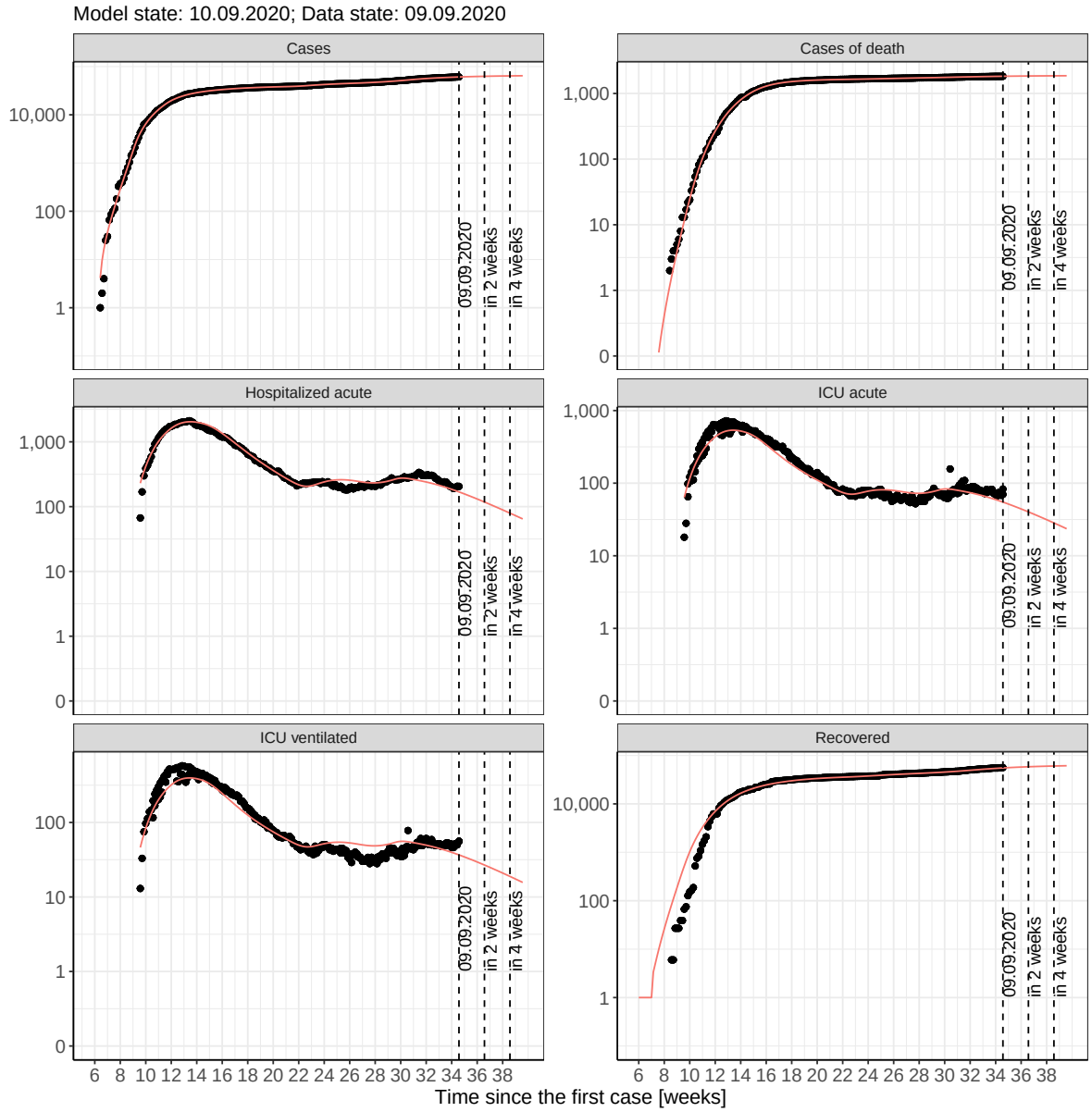


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 116 and 117 represent the model prediction for the next 4 weeks for North Rhine-Westphalia on a linear (116) and a semi-logarithmic (117) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

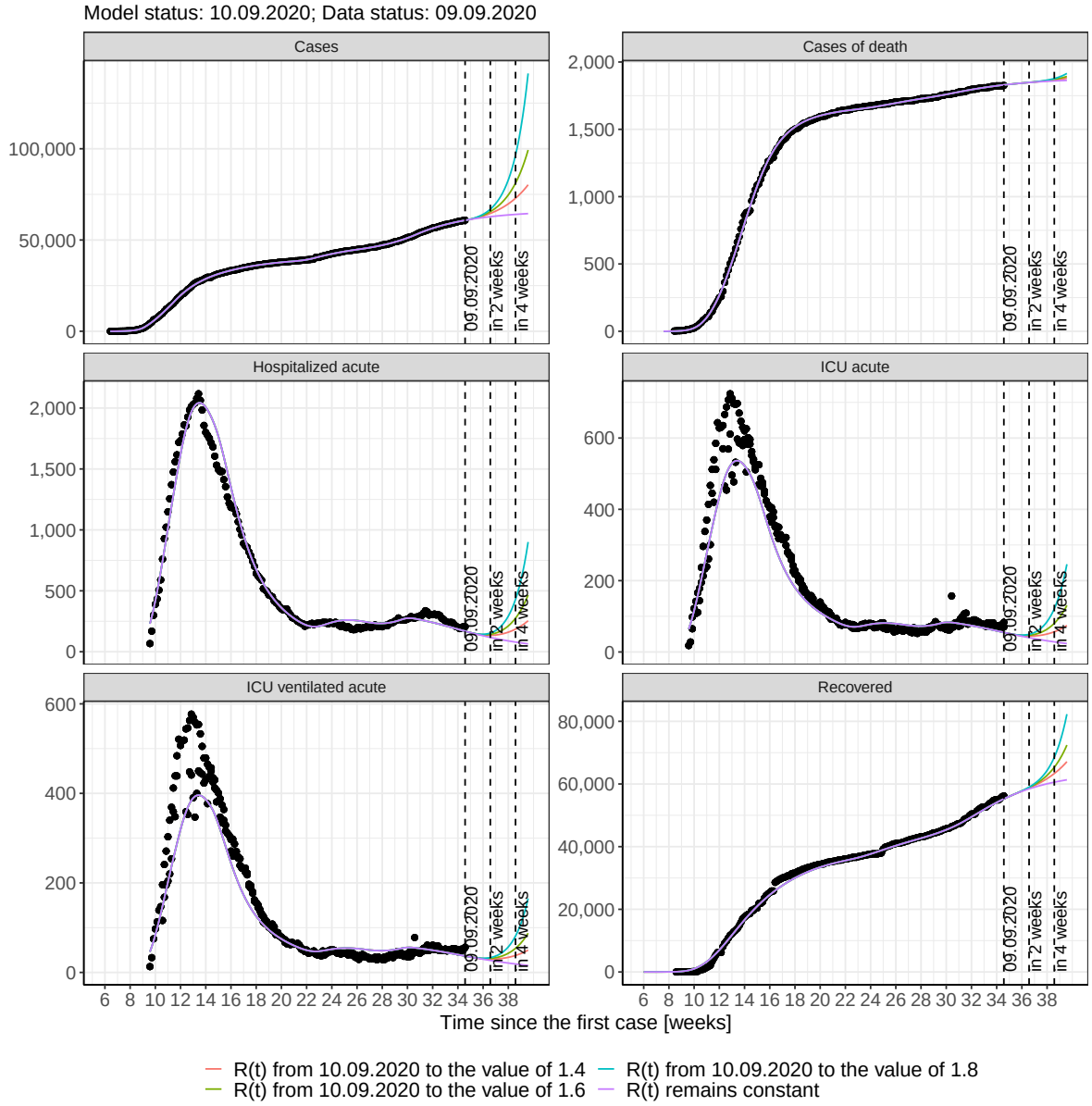


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

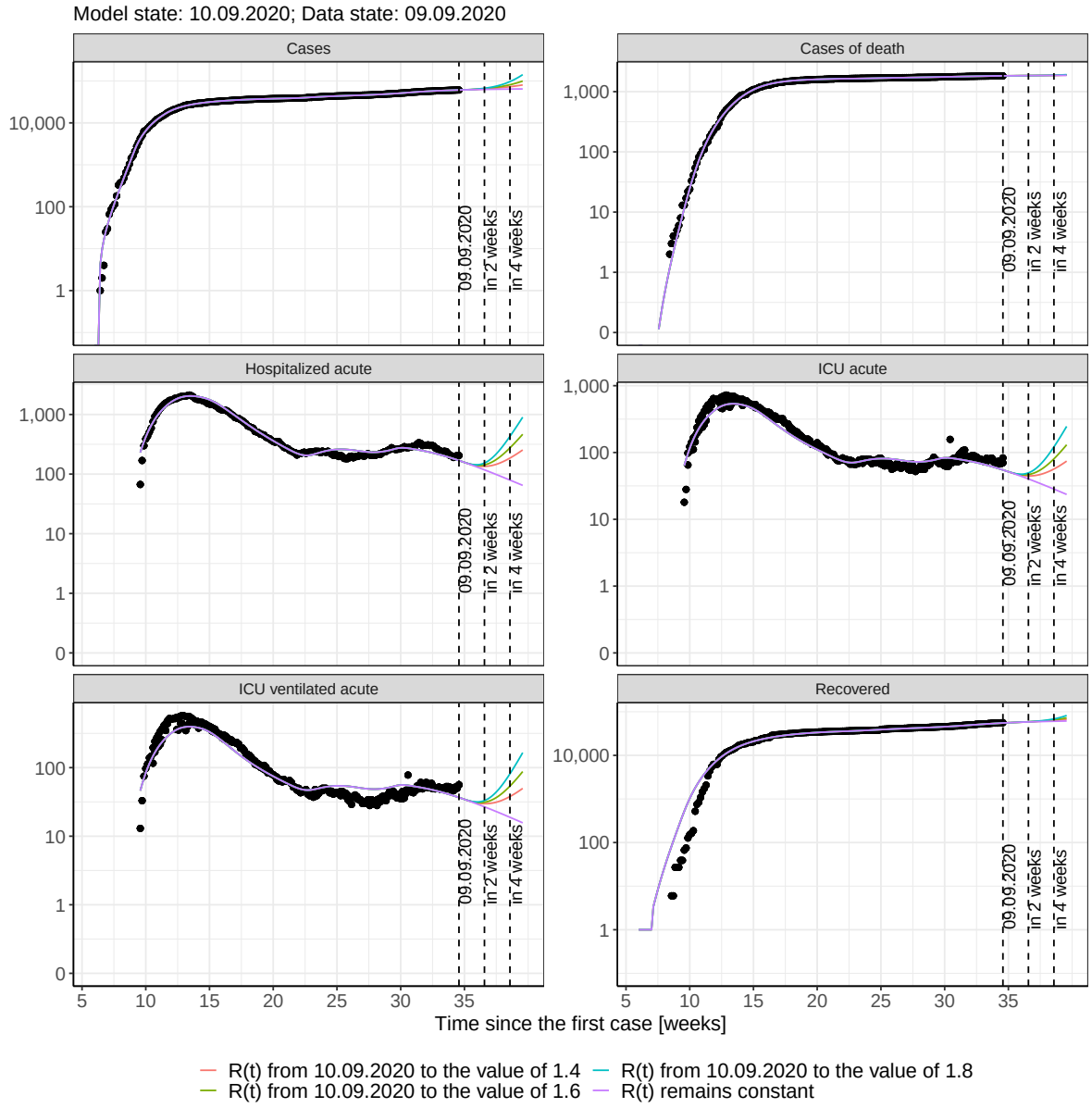


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 118 and 119 represent the model prediction for the next 16 weeks for North Rhine-Westphalia on a linear (118) and a semi-logarithmic (119) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

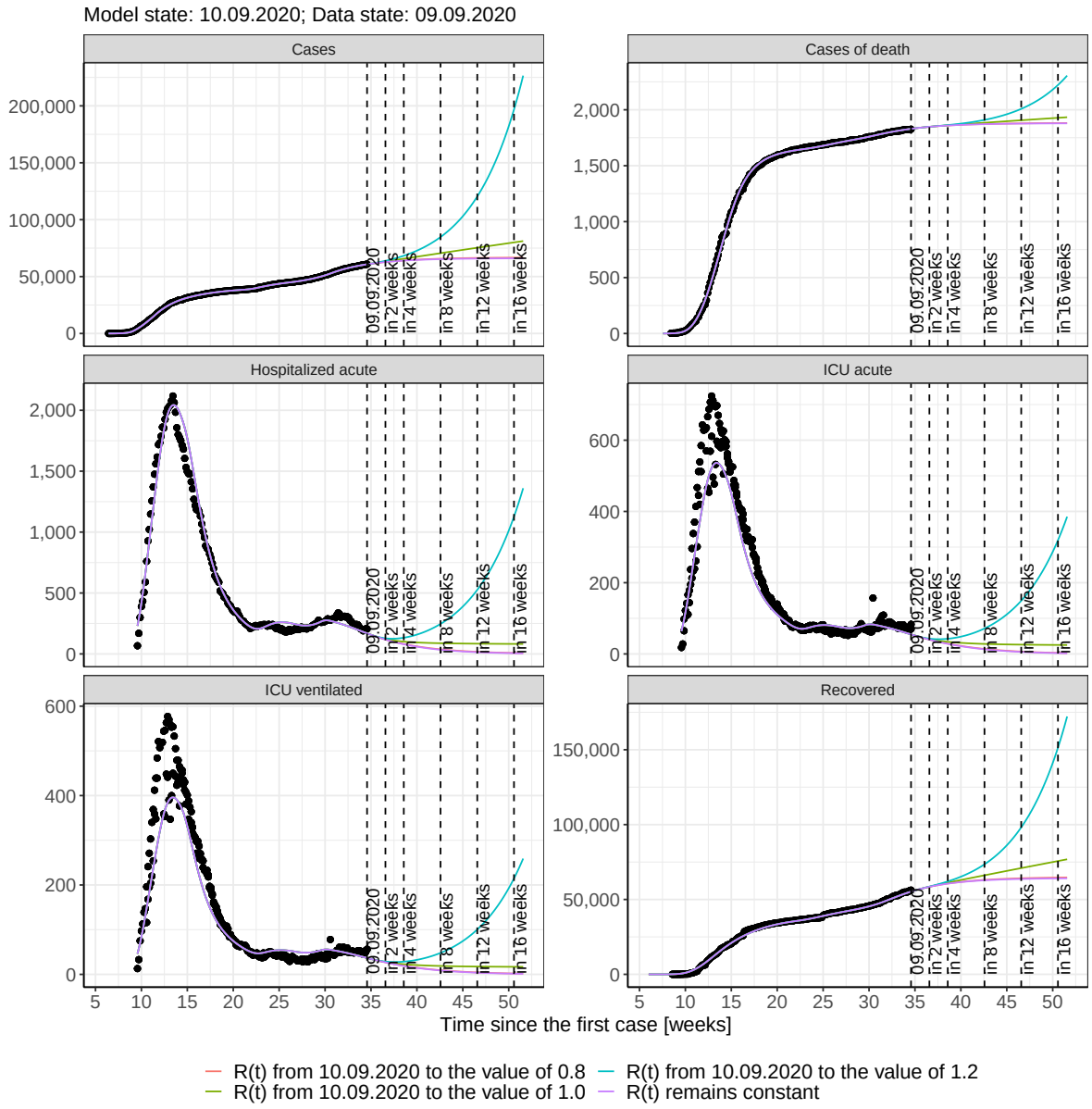


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

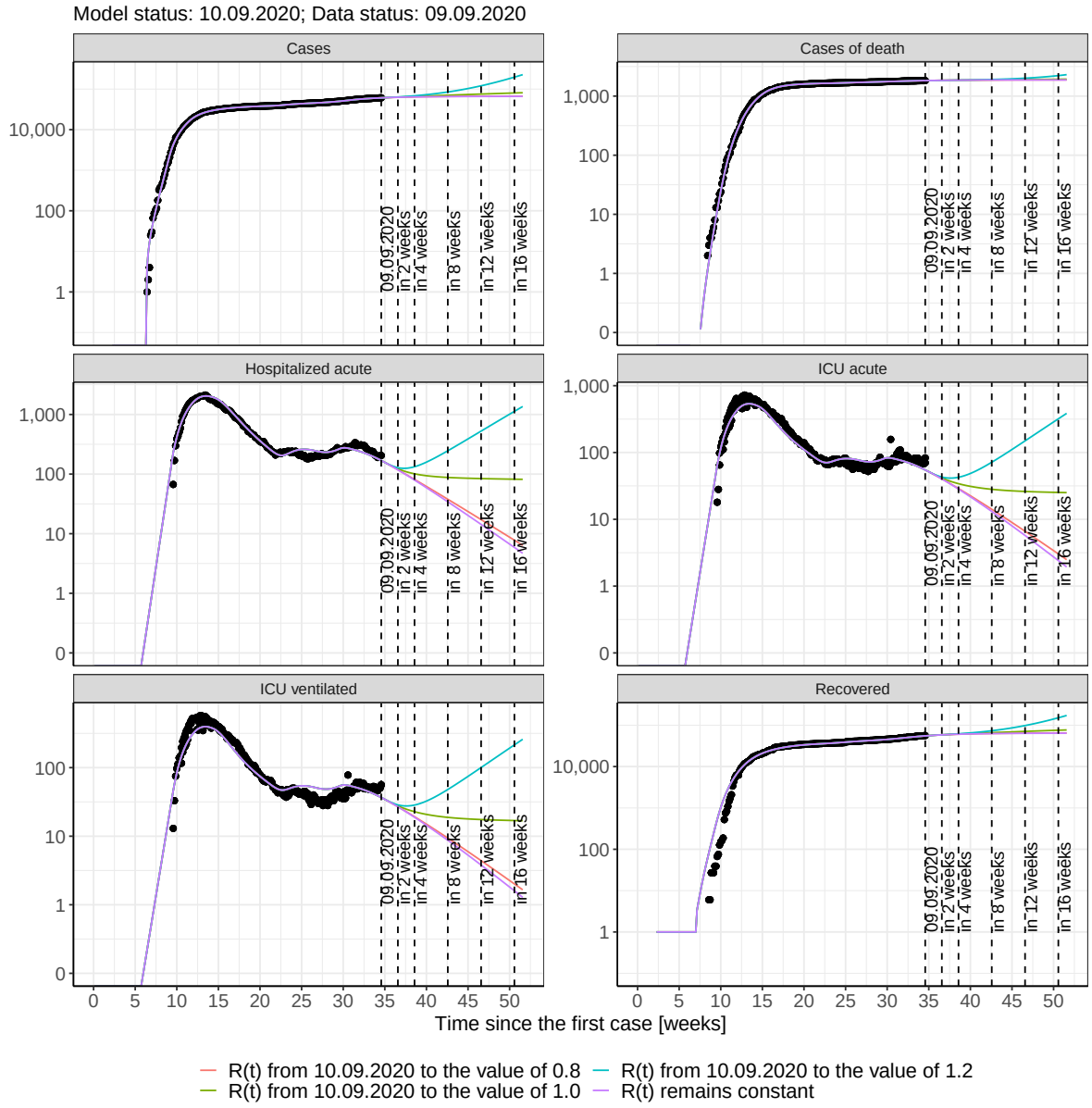


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 41) Model status from 10.09.2020; Data status: 09.09.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60961	1831	55505	165	54	36
11.09.2020	61130	1833	55769	161	53	35
12.09.2020	61293	1834	56028	157	52	34
13.09.2020	61450	1836	56279	153	50	34
14.09.2020	61603	1837	56524	149	49	33
15.09.2020	61751	1838	56763	146	48	32
16.09.2020	61894	1840	56995	142	47	32
17.09.2020	62032	1841	57220	138	46	31
18.09.2020	62166	1842	57440	135	45	30
19.09.2020	62295	1843	57653	131	44	29
20.09.2020	62421	1844	57860	128	43	29
21.09.2020	62542	1846	58061	124	42	28
22.09.2020	62659	1847	58257	121	41	27
23.09.2020	62773	1848	58446	118	40	27
24.09.2020	62883	1849	58630	115	39	26
25.09.2020	62989	1850	58809	112	38	26
26.09.2020	63092	1851	58982	108	37	25
27.09.2020	63192	1852	59150	106	36	24
28.09.2020	63288	1852	59313	103	36	24
29.09.2020	63381	1853	59471	100	35	23
30.09.2020	63471	1854	59624	97	34	23
01.10.2020	63559	1855	59773	94	33	22
02.10.2020	63643	1856	59917	92	32	21
03.10.2020	63725	1857	60056	89	31	21
04.10.2020	63804	1857	60191	87	31	20
05.10.2020	63880	1858	60322	84	30	20
06.10.2020	63954	1859	60449	82	29	19
07.10.2020	64026	1859	60572	79	28	19

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60961	1831	55505	165	54	36
11.09.2020	61131	1833	55770	161	53	35
12.09.2020	61296	1834	56028	157	52	34
13.09.2020	61456	1836	56279	153	50	34
14.09.2020	61611	1837	56524	149	49	33
15.09.2020	61762	1838	56763	146	48	32
16.09.2020	61909	1840	56996	142	47	32
17.09.2020	62051	1841	57222	138	46	31
18.09.2020	62189	1842	57442	135	45	30
19.09.2020	62324	1843	57656	131	44	30
20.09.2020	62454	1844	57864	128	43	29
21.09.2020	62581	1846	58067	125	42	28
22.09.2020	62705	1847	58264	122	41	28
23.09.2020	62824	1848	58455	118	40	27
24.09.2020	62941	1849	58642	115	39	26
25.09.2020	63054	1850	58823	112	39	26
26.09.2020	63163	1851	58999	109	38	25
27.09.2020	63270	1852	59169	106	37	25
28.09.2020	63374	1852	59336	104	36	24
29.09.2020	63474	1853	59497	101	35	23
30.09.2020	63572	1854	59654	98	34	23
01.10.2020	63667	1855	59807	96	33	22
02.10.2020	63759	1856	59955	93	33	22
03.10.2020	63849	1857	60099	91	32	21
04.10.2020	63936	1857	60239	88	31	21
05.10.2020	64020	1858	60375	86	30	20
06.10.2020	64103	1859	60507	84	30	20
07.10.2020	64182	1860	60635	81	29	19

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60964	1831	55505	165	54	36
11.09.2020	61141	1833	55770	161	53	35
12.09.2020	61318	1834	56028	157	52	34
13.09.2020	61494	1836	56280	153	50	34
14.09.2020	61671	1837	56526	150	49	33
15.09.2020	61848	1838	56767	146	48	32
16.09.2020	62024	1840	57002	143	47	32
17.09.2020	62201	1841	57232	139	46	31
18.09.2020	62377	1842	57458	136	46	30
19.09.2020	62553	1843	57679	133	45	30
20.09.2020	62729	1844	57896	130	44	29
21.09.2020	62905	1846	58110	128	43	29
22.09.2020	63081	1847	58320	125	42	28
23.09.2020	63257	1848	58527	123	41	28
24.09.2020	63433	1849	58731	120	41	27
25.09.2020	63608	1850	58932	118	40	27
26.09.2020	63784	1851	59131	116	39	26
27.09.2020	63960	1852	59327	114	39	26
28.09.2020	64135	1853	59522	113	38	26
29.09.2020	64310	1854	59715	111	38	25
30.09.2020	64485	1855	59906	110	37	25
01.10.2020	64661	1856	60095	108	37	24
02.10.2020	64836	1857	60284	107	36	24
03.10.2020	65011	1858	60470	105	36	24
04.10.2020	65185	1858	60656	104	35	24
05.10.2020	65360	1859	60841	103	35	23
06.10.2020	65535	1860	61024	102	35	23
07.10.2020	65709	1861	61207	101	34	23

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	60966	1831	55505	165	54	36
11.09.2020	61151	1833	55770	161	53	35
12.09.2020	61341	1834	56028	157	52	34
13.09.2020	61536	1836	56281	153	51	34
14.09.2020	61737	1837	56528	150	49	33
15.09.2020	61944	1838	56771	146	49	32
16.09.2020	62156	1840	57009	143	48	32
17.09.2020	62374	1841	57244	140	47	31
18.09.2020	62599	1842	57476	138	46	31
19.09.2020	62830	1843	57705	135	45	30
20.09.2020	63068	1844	57933	133	45	30
21.09.2020	63312	1846	58160	131	44	29
22.09.2020	63563	1847	58386	129	43	29
23.09.2020	63821	1848	58612	128	43	29
24.09.2020	64087	1849	58838	127	42	28
25.09.2020	64360	1850	59066	126	42	28
26.09.2020	64641	1851	59296	125	42	28
27.09.2020	64930	1852	59527	125	42	28
28.09.2020	65227	1853	59762	125	41	28
29.09.2020	65532	1854	59999	125	41	28
30.09.2020	65846	1856	60239	125	41	28
01.10.2020	66169	1857	60484	126	41	28
02.10.2020	66502	1858	60732	126	41	28
03.10.2020	66843	1859	60986	127	42	28
04.10.2020	67194	1860	61244	128	42	28
05.10.2020	67556	1861	61508	130	42	28
06.10.2020	67927	1862	61777	131	42	28
07.10.2020	68309	1863	62052	133	43	28

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 120 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

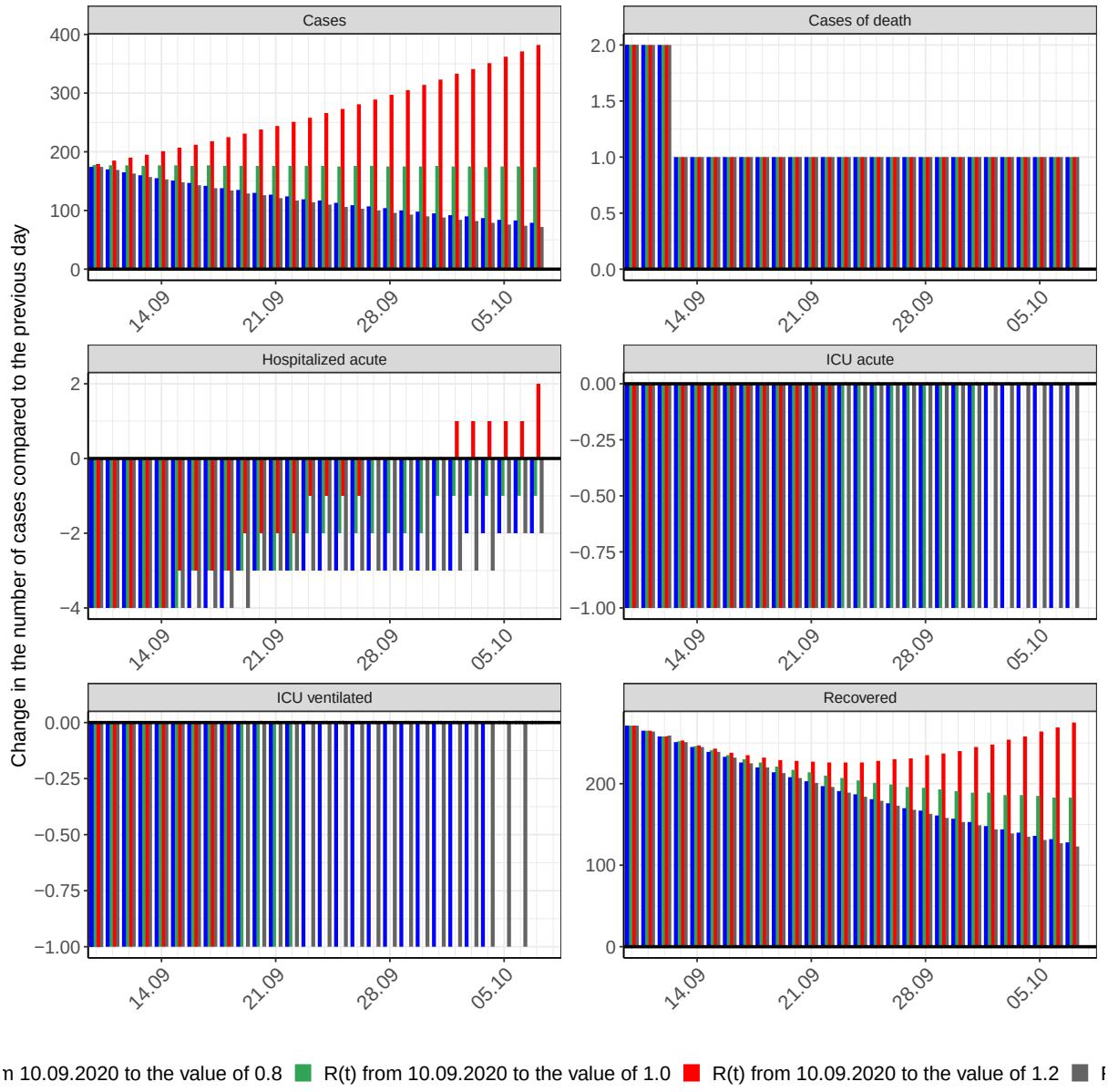


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

12 Rhineland-Palatinate

12.1 Model description

Fig. 121 depicts the results of the modeling (lines) compared to the observed data (points) for Rhineland-Palatinate on a linear (A) and semi-logarithmic (B) scale.

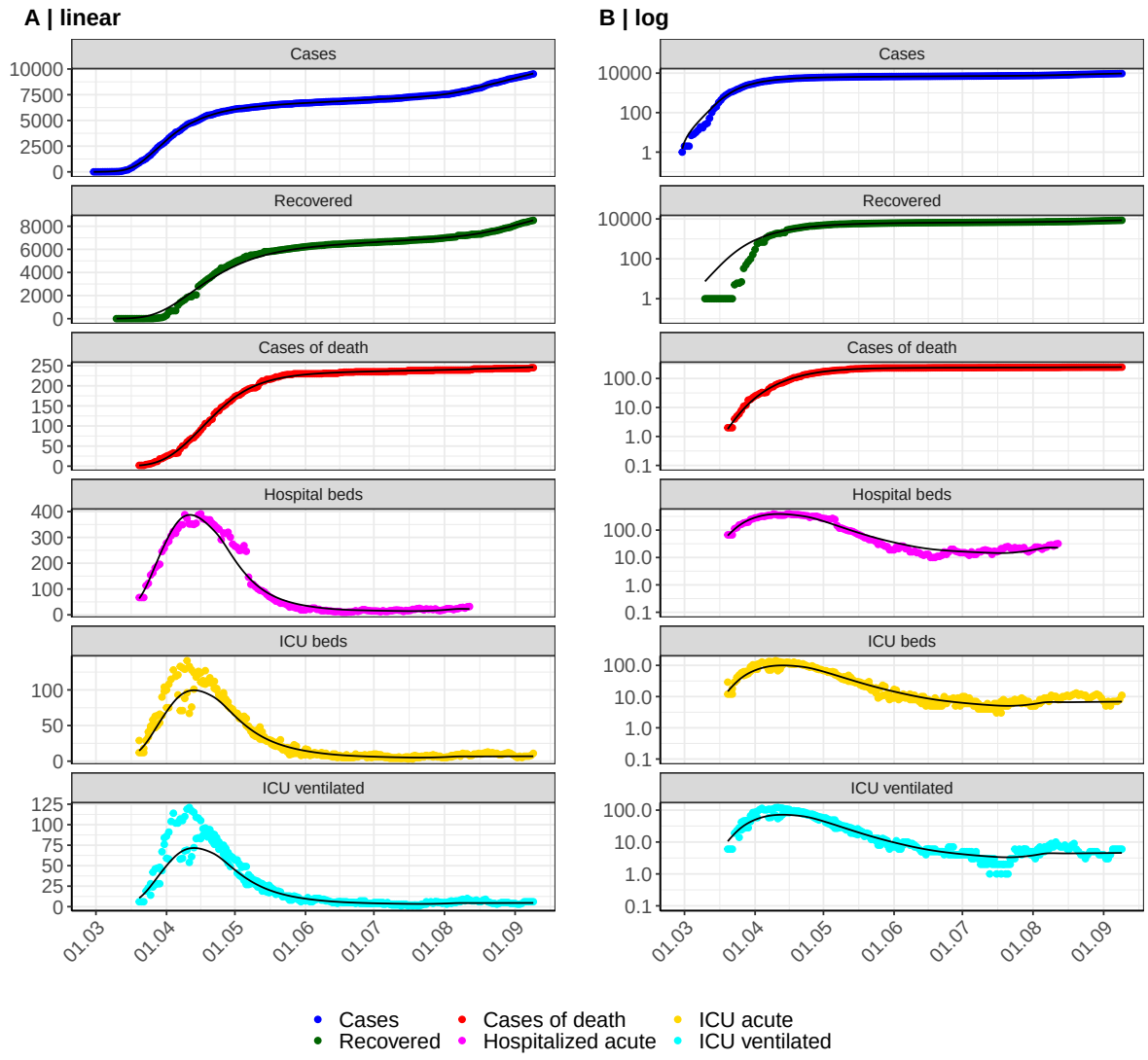


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

Fig. 122 shows the goodness-of-fit for Rhineland-Palatinate. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

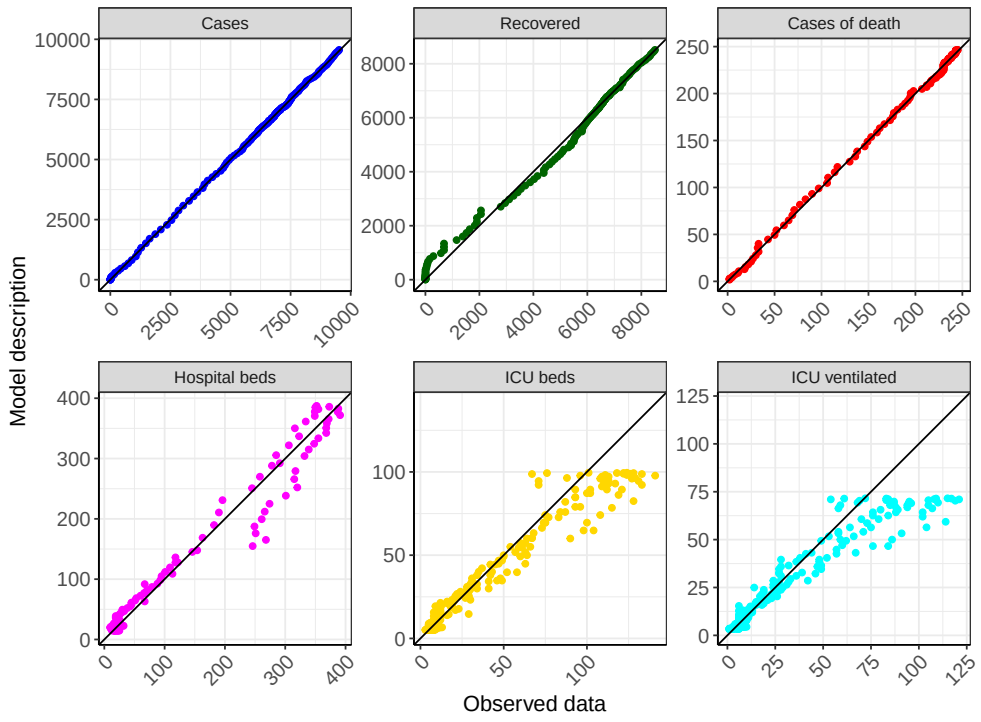


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

Fig. 123 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Rhineland-Palatinate (red line) in comparison with the other federal states (grey lines).

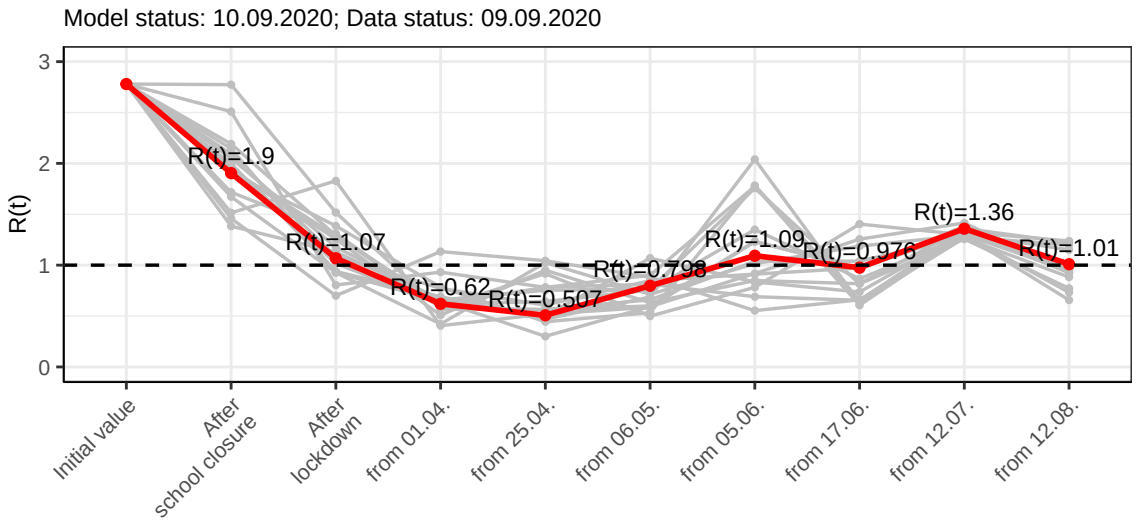


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

Fig. 124 shows the R(t) estimated value for Rhineland-Palatinate (red line) over time in comparison with the other federal states (grey lines).

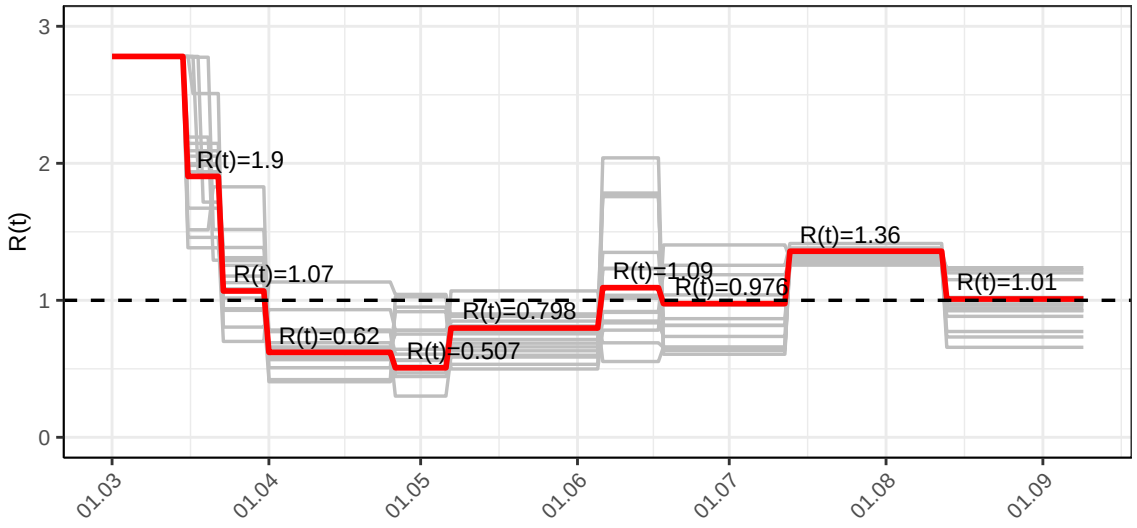


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

12.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.01)

Fig. 125 and 126 depict the the model predictions for the next 4 weeks for Rhineland-Palatinate on a linear (125) and a semi-logarithmic (126) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

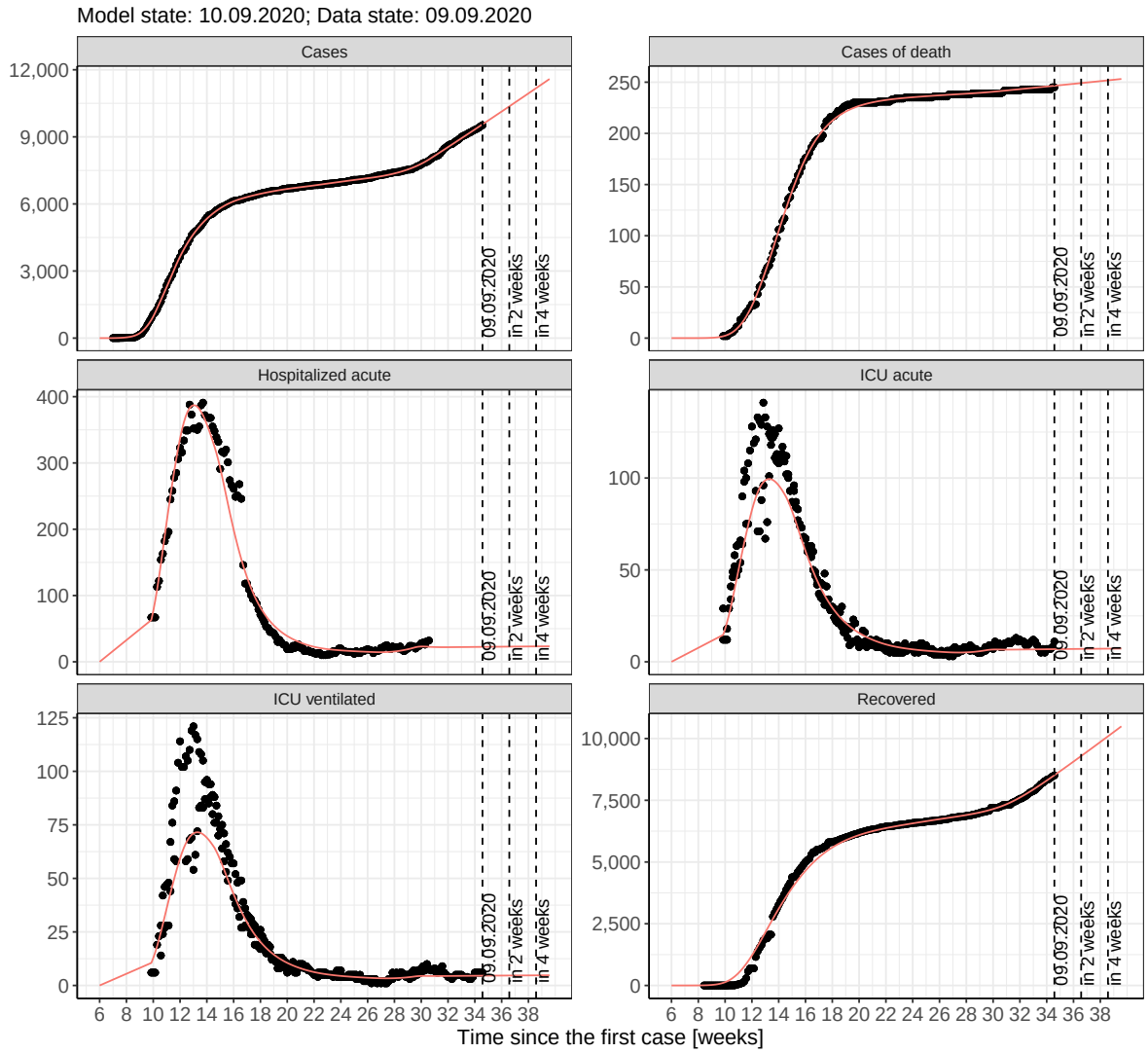


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

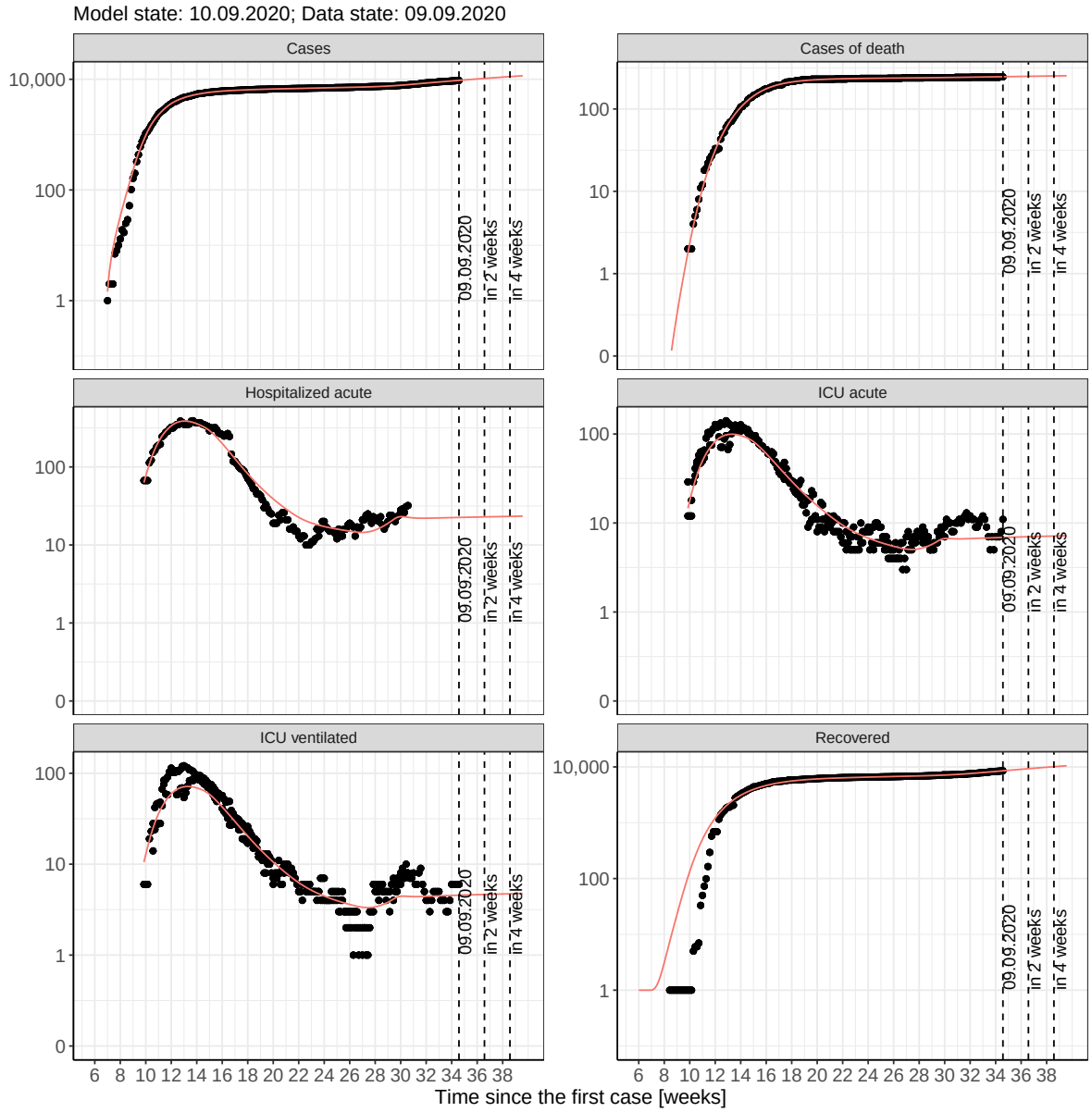


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 127 and 128 represent the model prediction for the next 4 weeks for Rhineland-Palatinate on a linear (127) and a semi-logarithmic (128) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

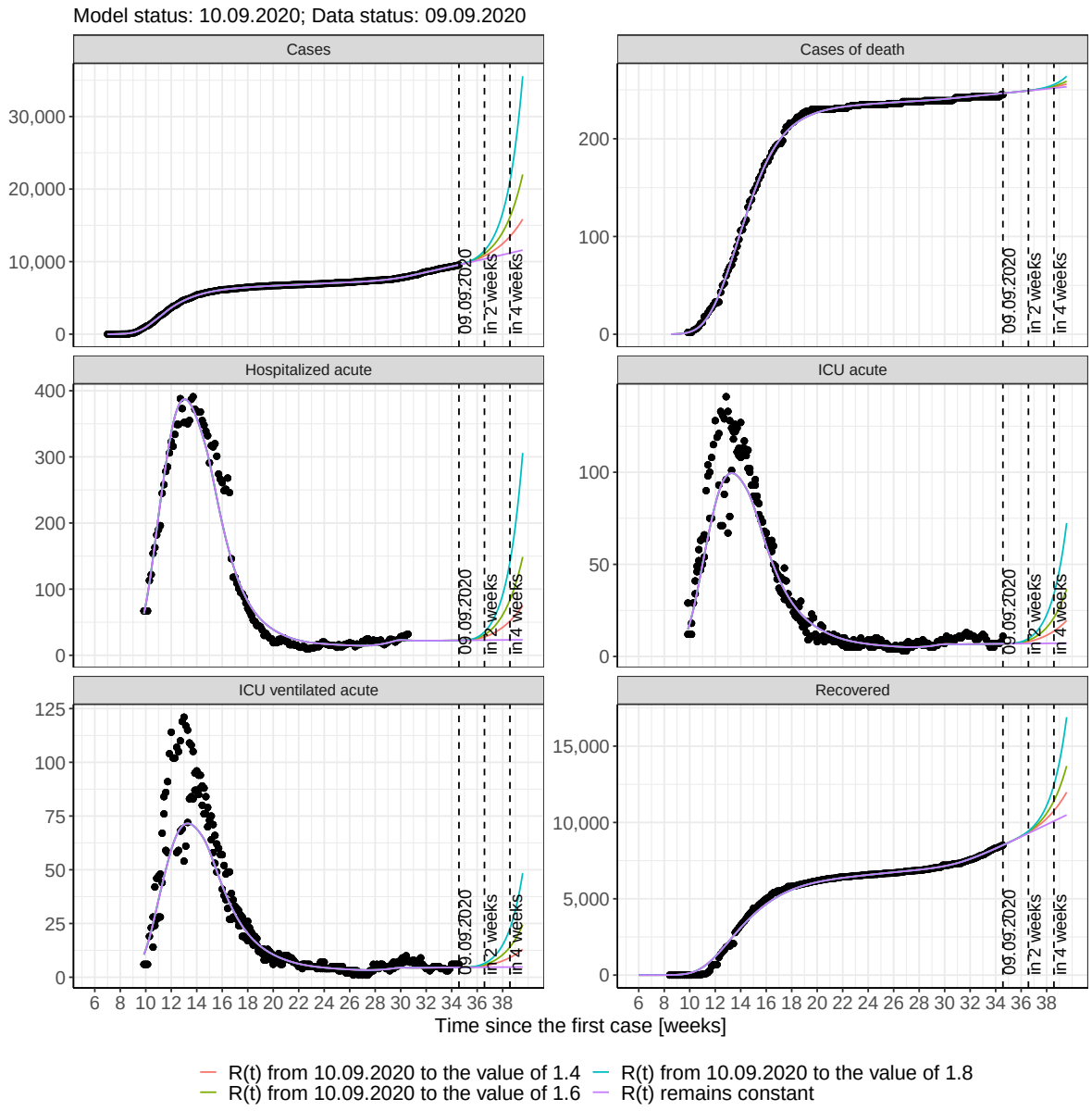


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

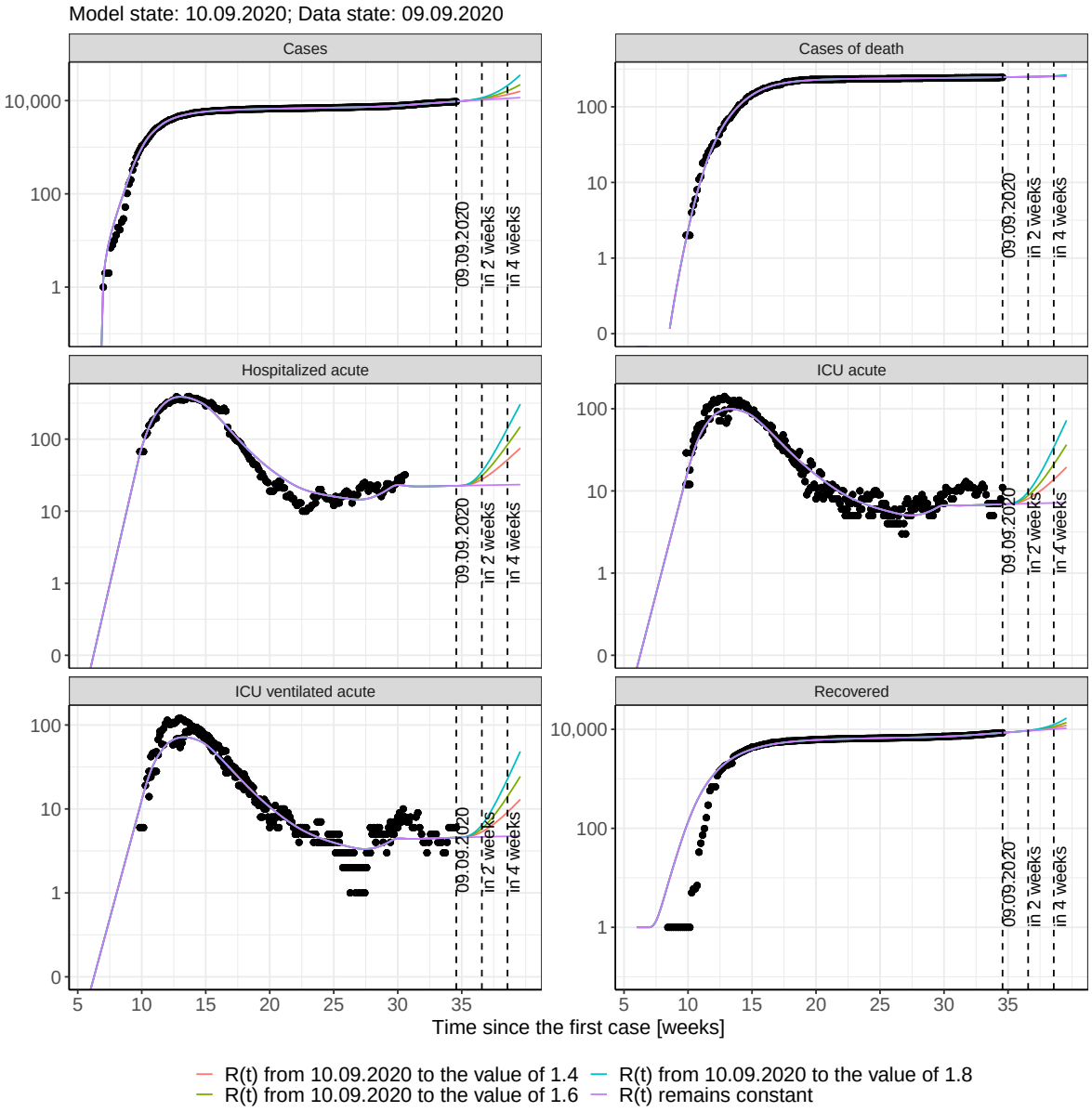


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 129 and 130 represent the model prediction for the next 16 weeks for Rhineland-Palatinate on a linear (129) and a semi-logarithmic (130) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

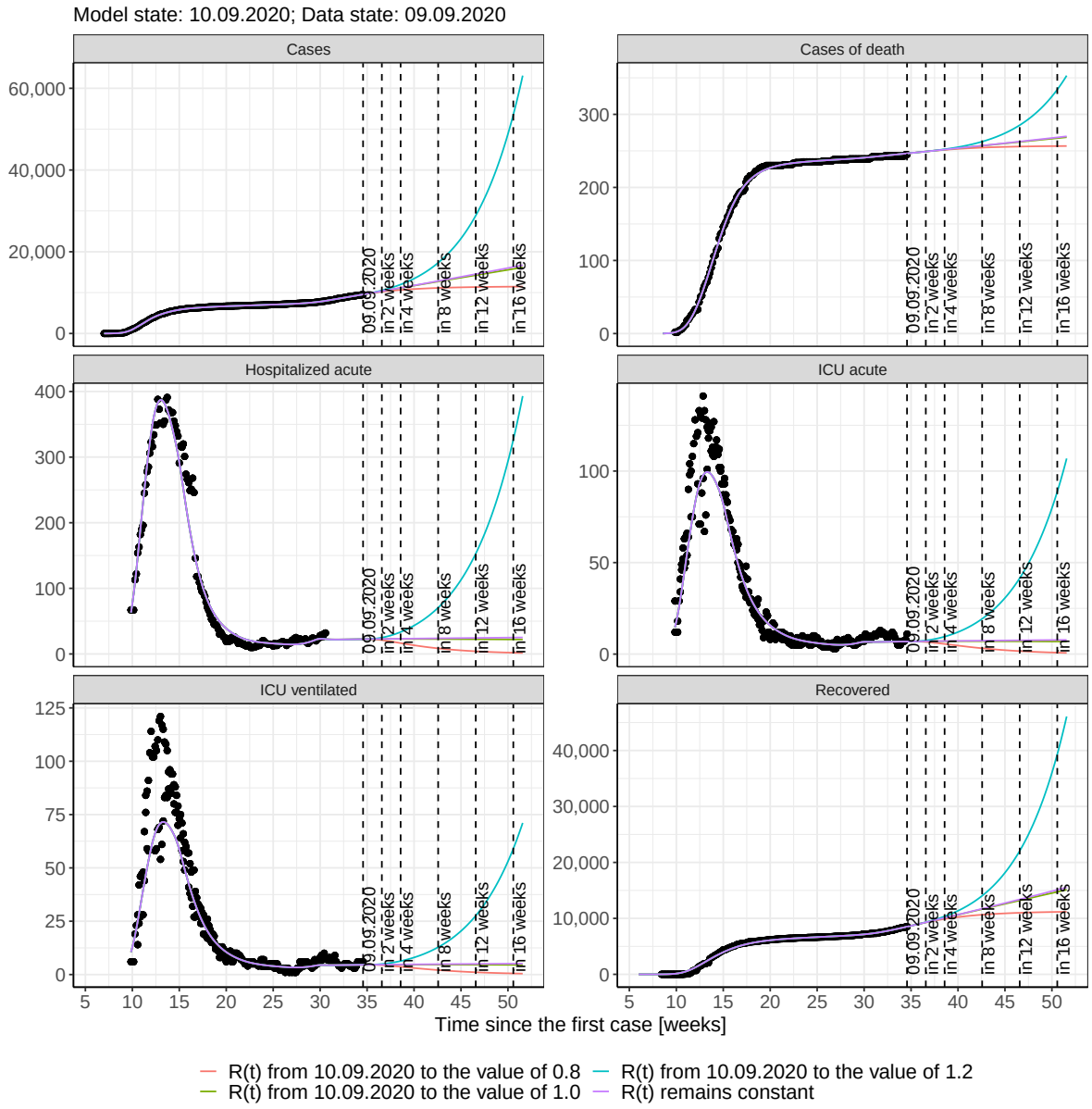


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

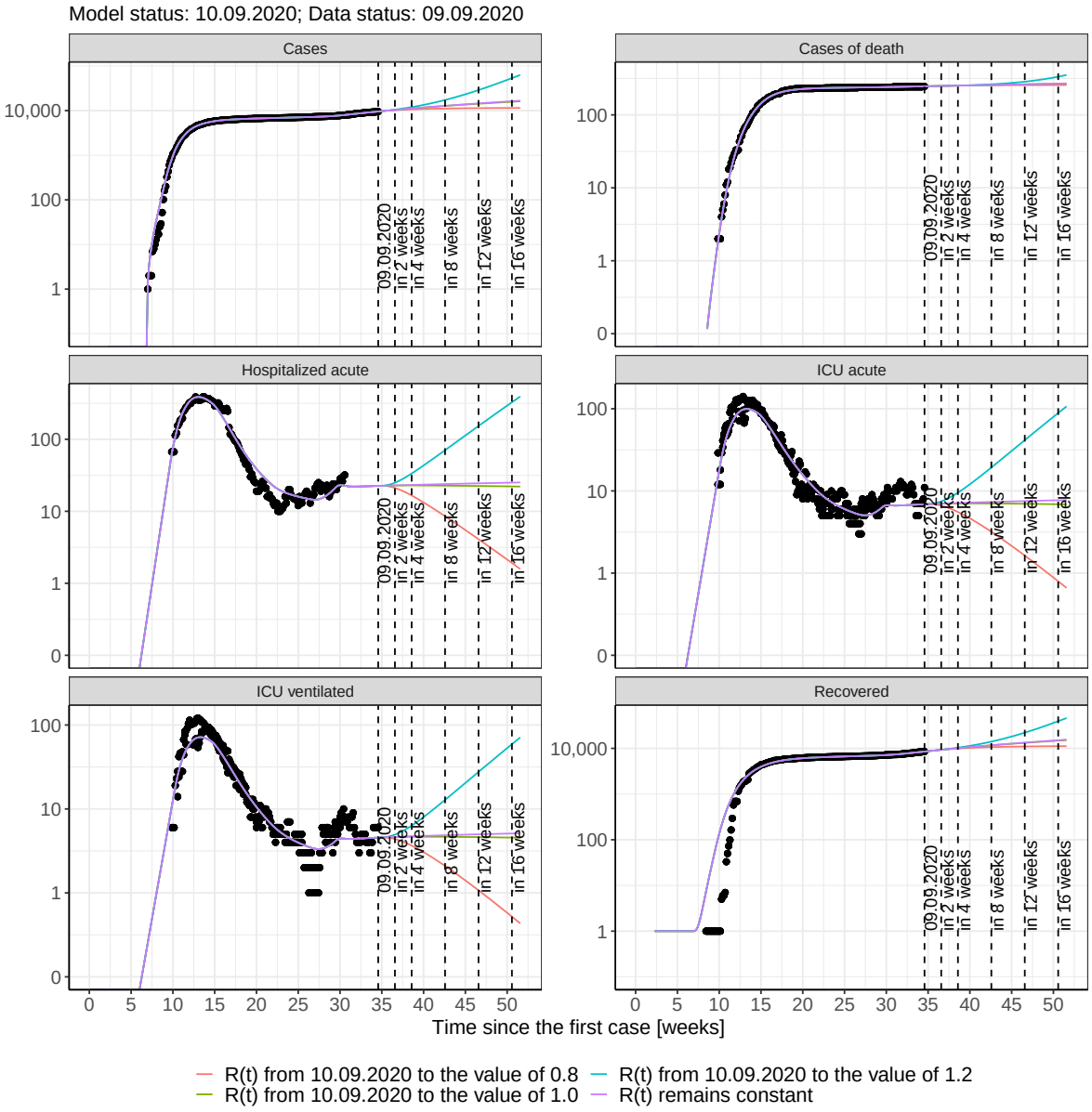


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 45) Model status from 10.09.2020; Data status: 09.09.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	9617	247	8568	23	7	5
11.09.2020	9674	247	8623	23	7	5
12.09.2020	9732	247	8678	23	7	5
13.09.2020	9789	247	8733	23	7	5
14.09.2020	9846	247	8788	23	7	5
15.09.2020	9903	248	8844	23	7	5
16.09.2020	9960	248	8899	23	7	5
17.09.2020	10018	248	8955	23	7	5
18.09.2020	10075	248	9011	23	7	5
19.09.2020	10133	248	9067	23	7	5
20.09.2020	10190	249	9123	23	7	5
21.09.2020	10248	249	9179	23	7	5
22.09.2020	10306	249	9236	23	7	5
23.09.2020	10363	249	9292	23	7	5
24.09.2020	10421	249	9348	23	7	5
25.09.2020	10479	250	9405	23	7	5
26.09.2020	10537	250	9462	23	7	5
27.09.2020	10595	250	9519	23	7	5
28.09.2020	10653	250	9575	23	7	5
29.09.2020	10711	250	9632	23	7	5
30.09.2020	10769	250	9689	23	7	5
01.10.2020	10827	251	9746	23	7	5
02.10.2020	10885	251	9803	23	7	5
03.10.2020	10943	251	9861	23	7	5
04.10.2020	11002	251	9918	23	7	5
05.10.2020	11060	251	9975	23	7	5
06.10.2020	11119	252	10033	23	7	5
07.10.2020	11177	252	10090	23	7	5

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	9616	247	8568	23	7	5
11.09.2020	9671	247	8623	23	7	5
12.09.2020	9724	247	8678	23	7	5
13.09.2020	9776	247	8733	23	7	5
14.09.2020	9826	247	8788	23	7	5
15.09.2020	9874	248	8843	22	7	5
16.09.2020	9921	248	8897	22	7	5
17.09.2020	9967	248	8952	22	7	5
18.09.2020	10012	248	9006	22	7	5
19.09.2020	10055	248	9059	22	7	5
20.09.2020	10097	249	9112	22	7	4
21.09.2020	10138	249	9165	22	7	4
22.09.2020	10178	249	9217	21	7	4
23.09.2020	10216	249	9268	21	7	4
24.09.2020	10254	249	9318	21	7	4
25.09.2020	10290	249	9368	21	6	4
26.09.2020	10326	250	9417	20	6	4
27.09.2020	10360	250	9465	20	6	4
28.09.2020	10394	250	9512	20	6	4
29.09.2020	10426	250	9558	19	6	4
30.09.2020	10458	250	9604	19	6	4
01.10.2020	10488	250	9648	19	6	4
02.10.2020	10518	251	9691	18	6	4
03.10.2020	10547	251	9734	18	6	4
04.10.2020	10575	251	9775	18	6	4
05.10.2020	10602	251	9816	17	6	4
06.10.2020	10629	251	9856	17	6	4
07.10.2020	10654	251	9894	17	6	4

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	9617	247	8568	23	7	5
11.09.2020	9674	247	8623	23	7	5
12.09.2020	9731	247	8678	23	7	5
13.09.2020	9788	247	8733	23	7	5
14.09.2020	9845	247	8788	23	7	5
15.09.2020	9902	248	8844	23	7	5
16.09.2020	9959	248	8899	23	7	5
17.09.2020	10015	248	8955	23	7	5
18.09.2020	10072	248	9011	23	7	5
19.09.2020	10129	248	9067	23	7	5
20.09.2020	10186	249	9123	23	7	5
21.09.2020	10243	249	9179	23	7	5
22.09.2020	10299	249	9235	23	7	5
23.09.2020	10356	249	9291	23	7	5
24.09.2020	10413	249	9347	23	7	5
25.09.2020	10469	250	9403	23	7	5
26.09.2020	10526	250	9460	23	7	5
27.09.2020	10583	250	9516	23	7	5
28.09.2020	10639	250	9572	23	7	5
29.09.2020	10696	250	9628	23	7	5
30.09.2020	10752	250	9685	23	7	5
01.10.2020	10809	251	9741	23	7	5
02.10.2020	10865	251	9798	23	7	5
03.10.2020	10922	251	9854	23	7	5
04.10.2020	10978	251	9910	23	7	5
05.10.2020	11035	251	9967	23	7	5
06.10.2020	11091	252	10023	23	7	5
07.10.2020	11147	252	10080	23	7	5

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	9618	247	8568	23	7	5
11.09.2020	9678	247	8623	23	7	5
12.09.2020	9739	247	8678	23	7	5
13.09.2020	9802	247	8733	23	7	5
14.09.2020	9866	247	8789	23	7	5
15.09.2020	9933	248	8845	23	7	5
16.09.2020	10001	248	8902	23	7	5
17.09.2020	10072	248	8959	23	7	5
18.09.2020	10144	248	9016	23	7	5
19.09.2020	10218	248	9075	24	7	5
20.09.2020	10295	249	9134	24	7	5
21.09.2020	10374	249	9195	24	7	5
22.09.2020	10455	249	9256	25	7	5
23.09.2020	10538	249	9318	25	7	5
24.09.2020	10624	249	9382	25	8	5
25.09.2020	10712	250	9447	26	8	5
26.09.2020	10803	250	9513	26	8	5
27.09.2020	10896	250	9581	27	8	5
28.09.2020	10992	250	9650	27	8	5
29.09.2020	11090	250	9720	28	8	5
30.09.2020	11192	251	9793	28	8	6
01.10.2020	11296	251	9867	29	8	6
02.10.2020	11403	251	9943	30	9	6
03.10.2020	11514	251	10021	30	9	6
04.10.2020	11627	252	10101	31	9	6
05.10.2020	11744	252	10183	32	9	6
06.10.2020	11864	252	10267	33	9	6
07.10.2020	11987	252	10353	33	10	6

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 131 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

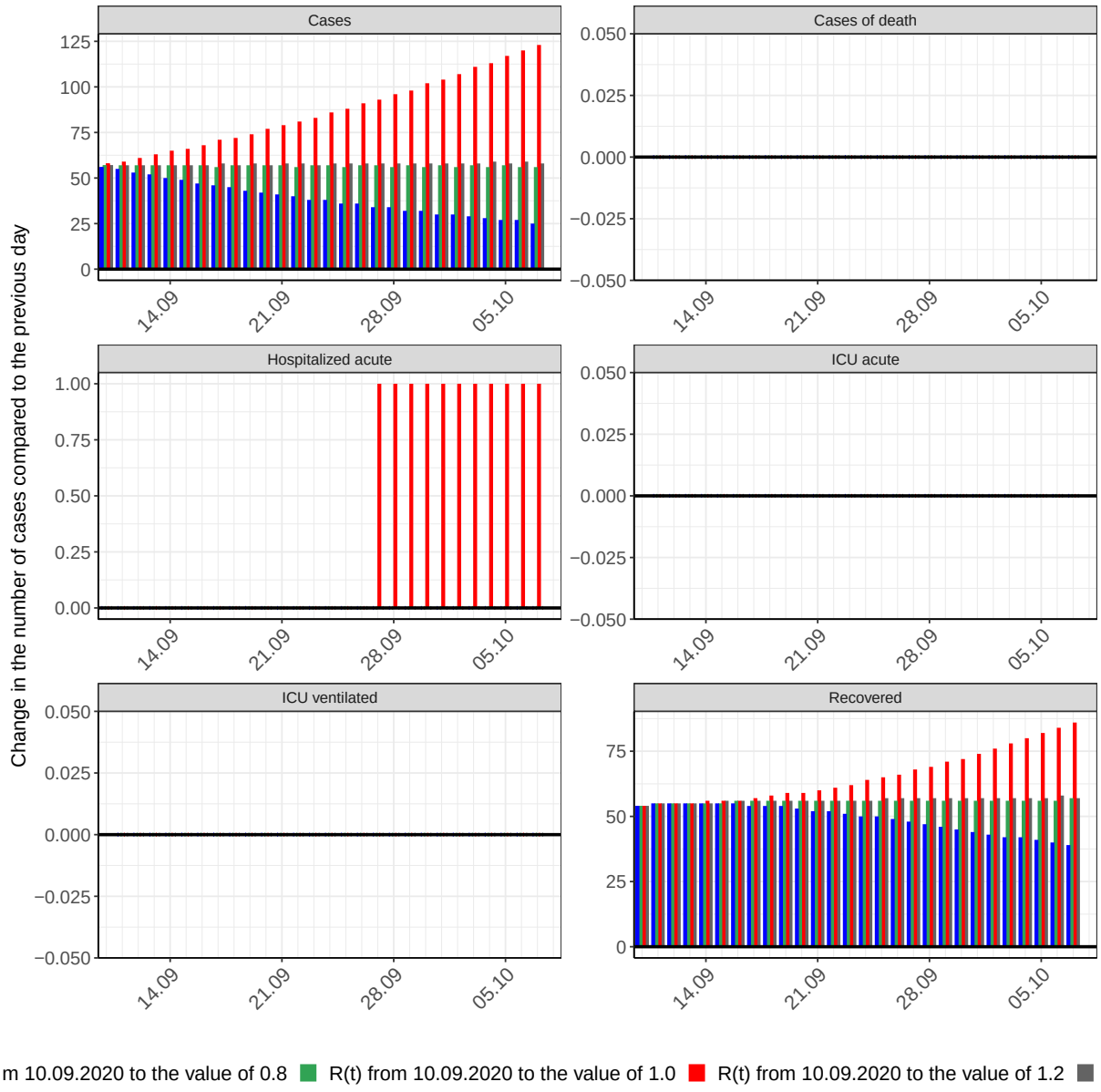


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

13 Saarland

13.1 Model description

Fig. 132 depicts the results of the modeling (lines) compared to the observed data (points) for Saarland on a linear (A) and semi-logarithmic (B) scale.

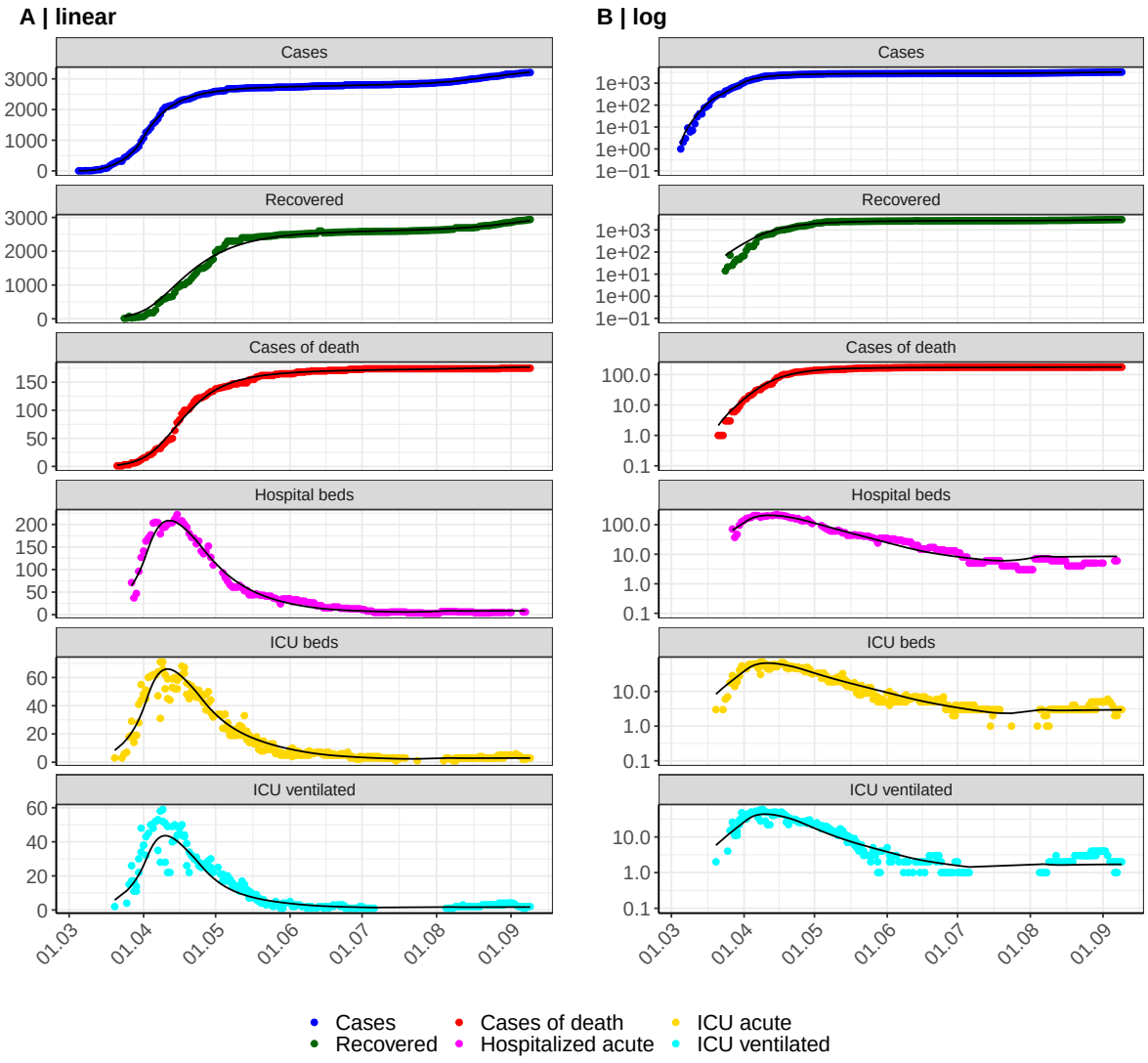


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

Fig. 133 shows the goodness-of-fit for Saarland. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

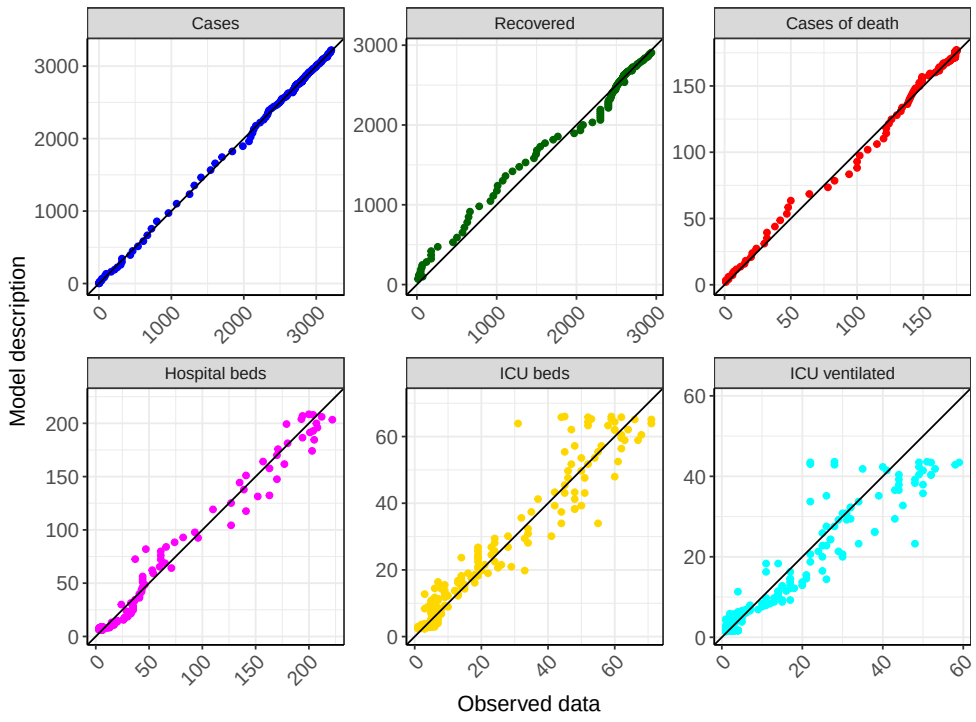


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

Fig. 134 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Saarland (red line) in comparison with the other federal states (grey lines).

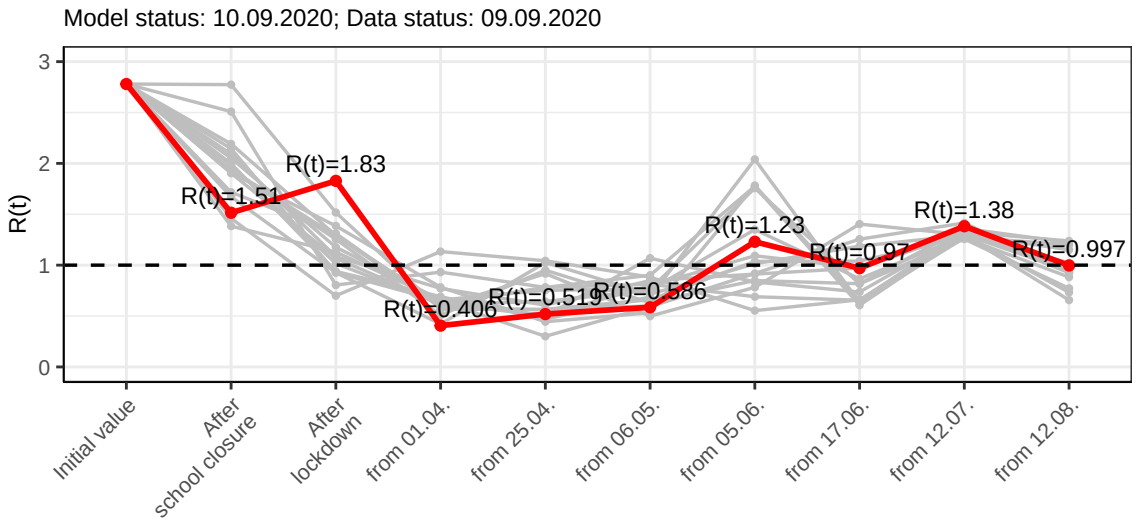


Figure 134: R(t) values before and after the NPIs for Saarland

Fig. 135 shows the R(t) estimated value for Saarland (red line) over time in comparison with the other federal states (grey lines).

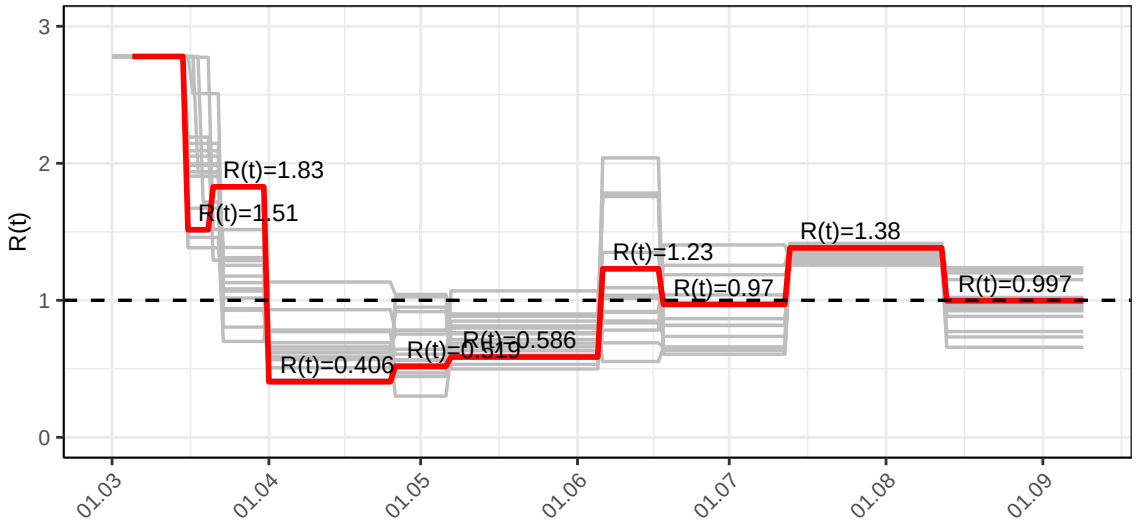


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

13.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1)

Fig. 136 and 137 depict the the model predictions for the next 4 weeks for Saarland on a linear (136) and a semi-logarithmic (137) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

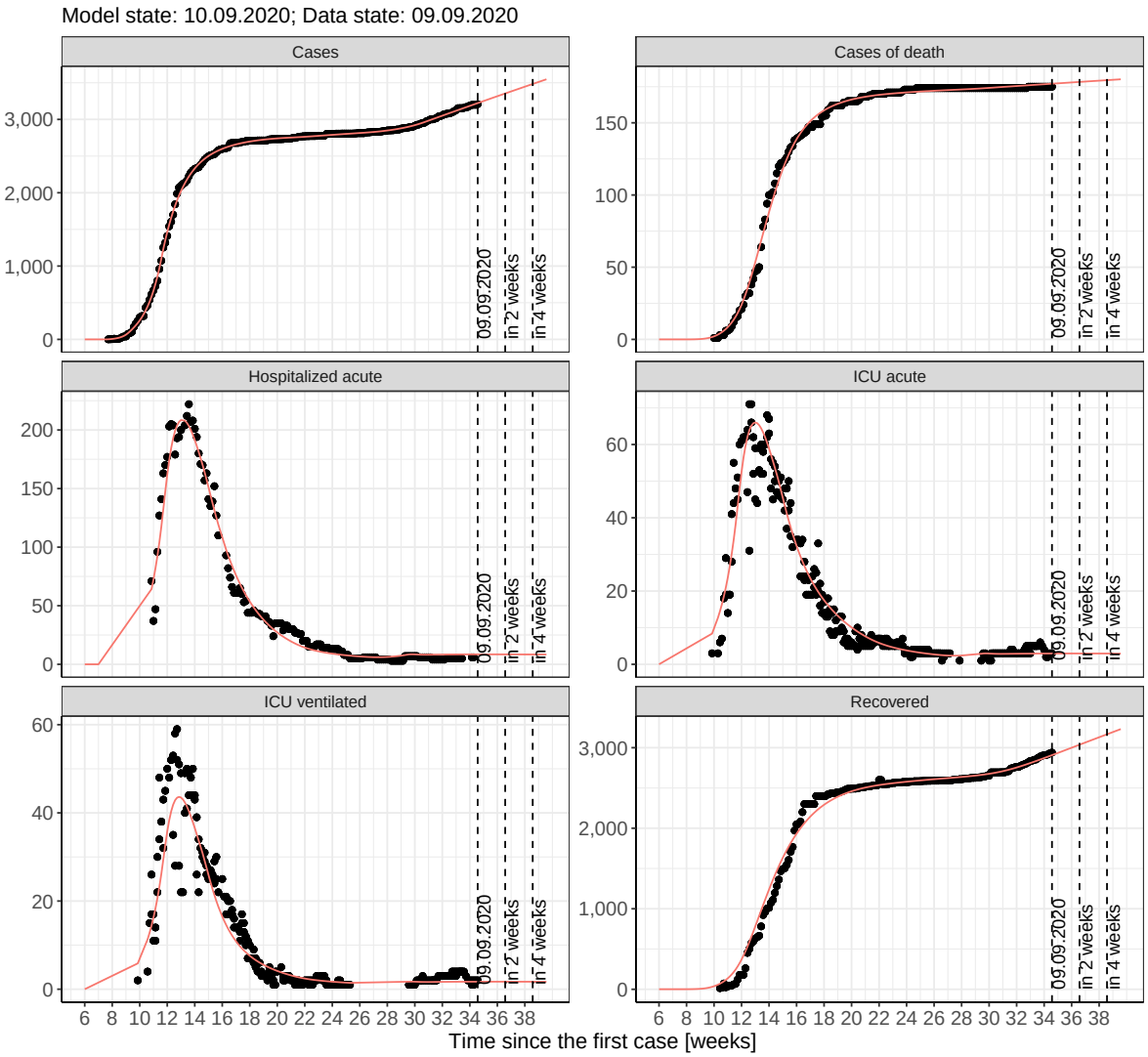


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

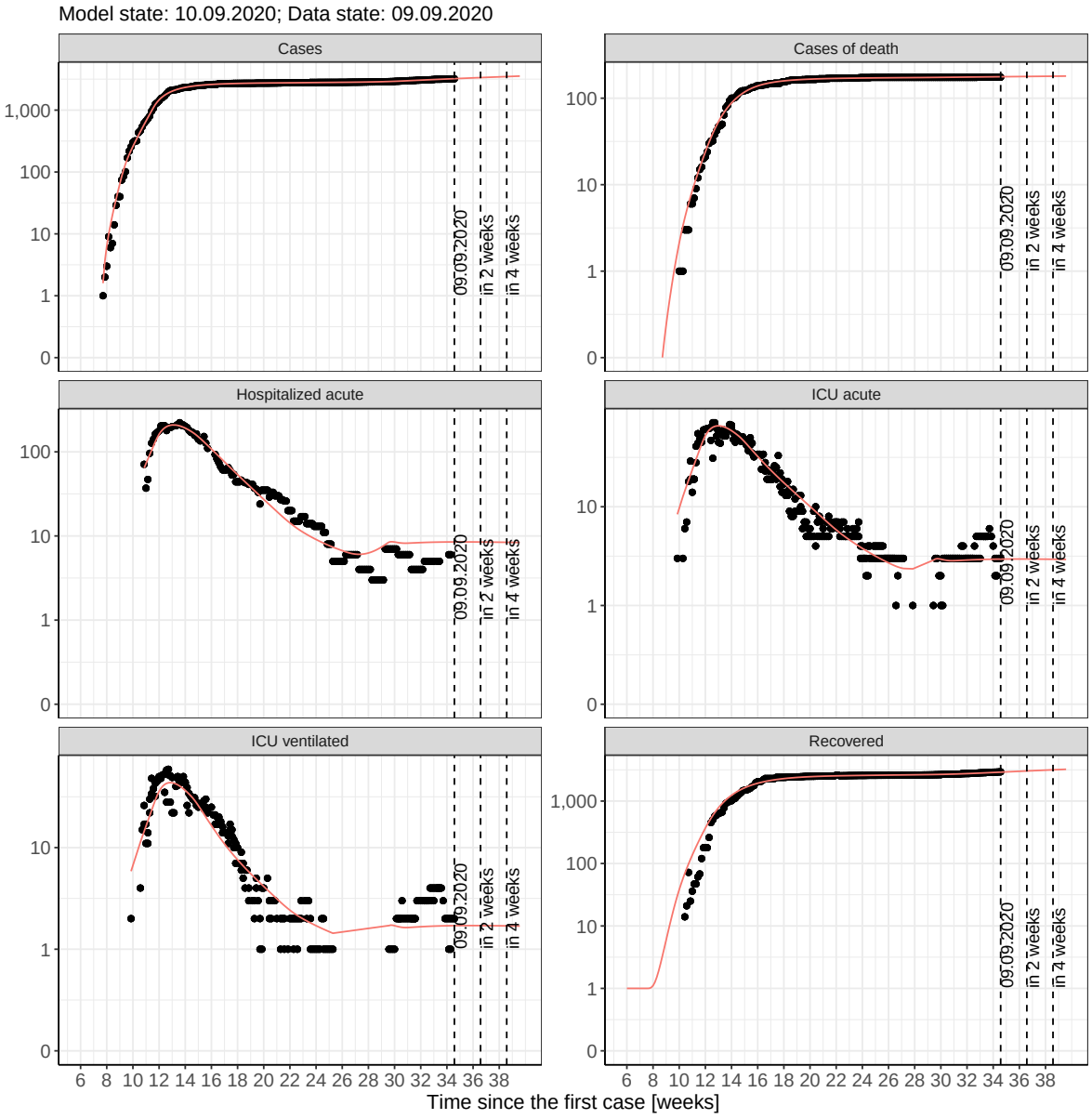


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 138 and 139 represent the model prediction for the next 4 weeks for Saarland on a linear (138) and a semi-logarithmic (139) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

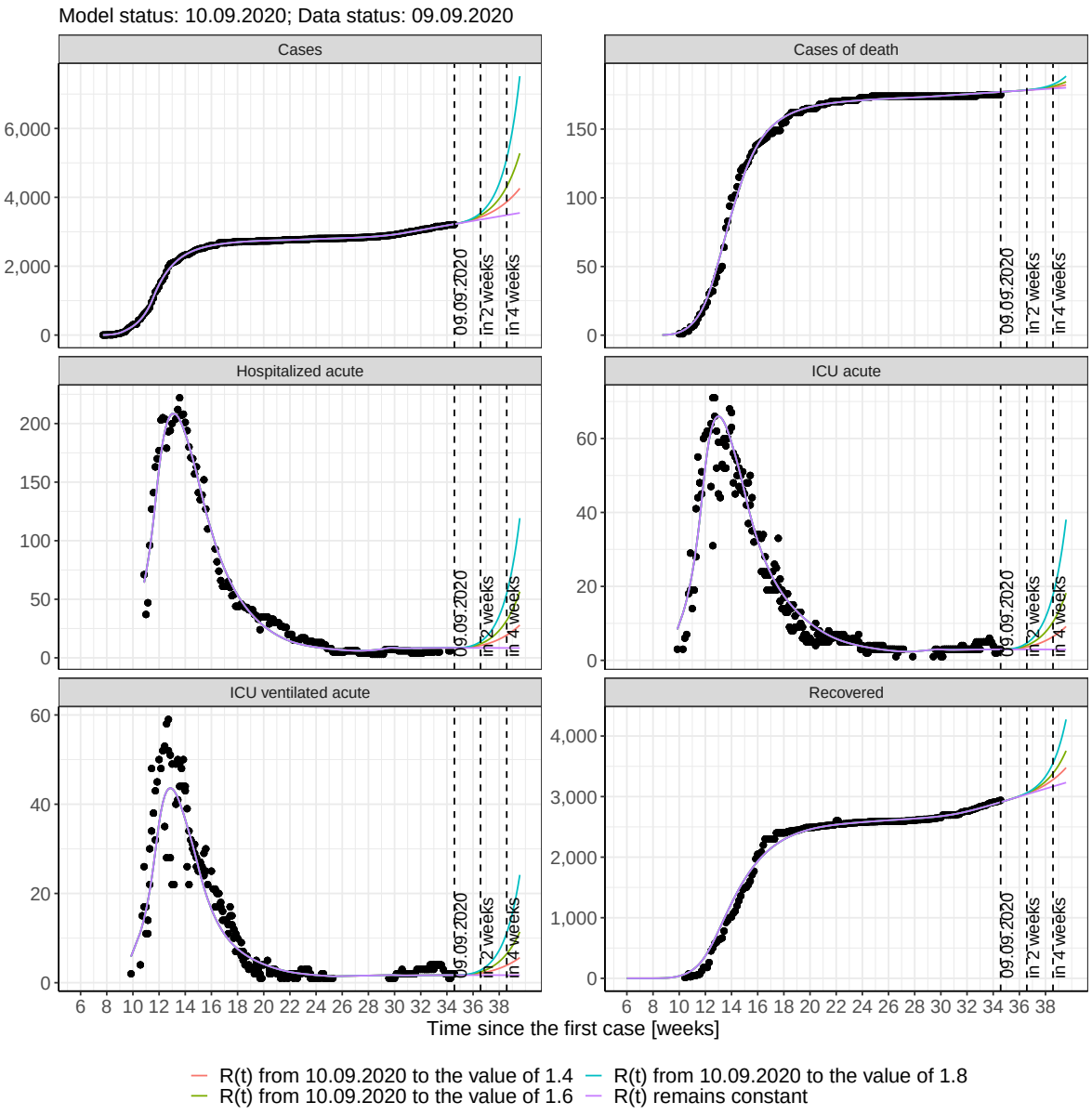


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

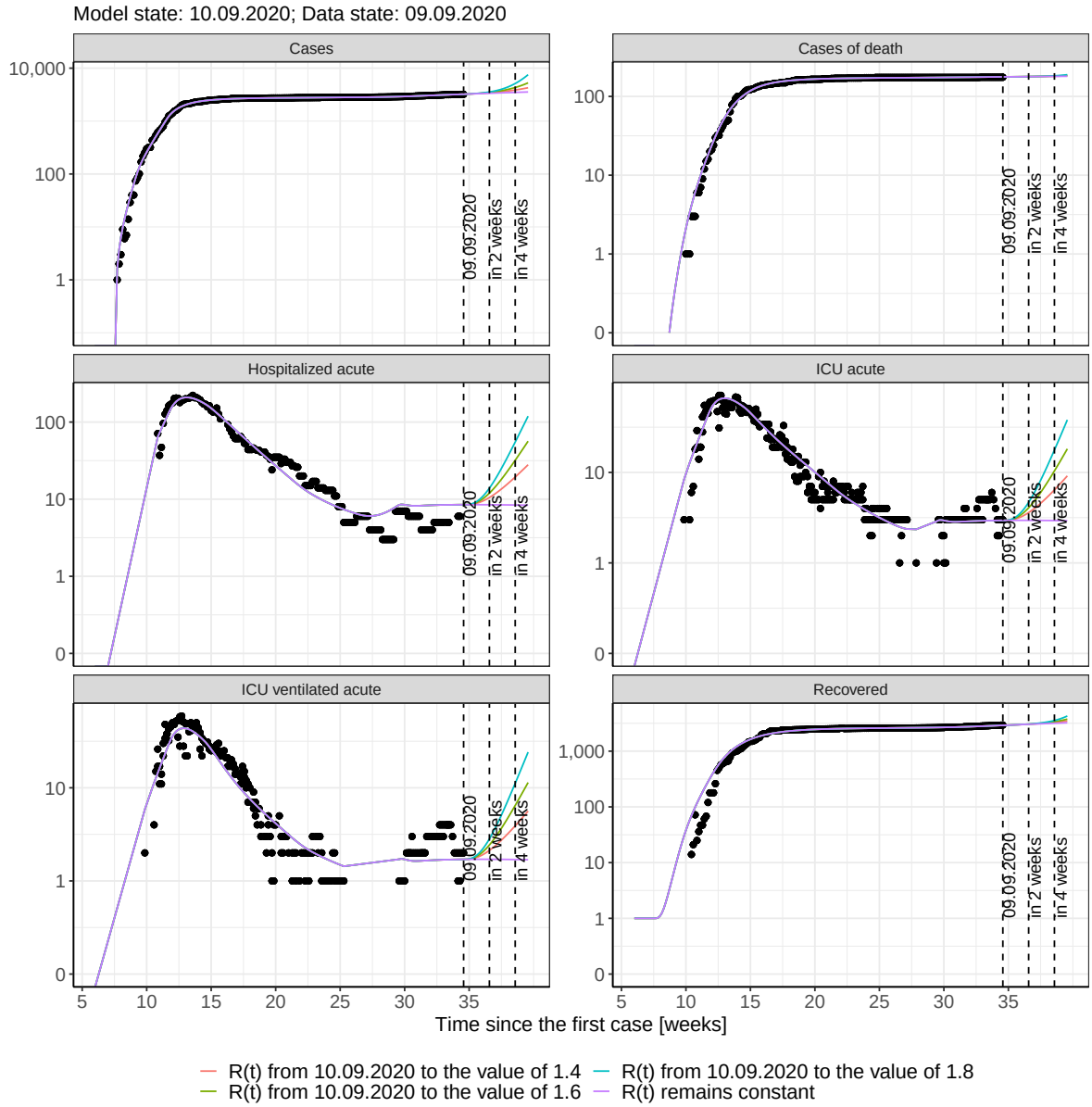


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 140 and 141 represent the model prediction for the next 16 weeks for Saarland on a linear (140) and a semi-logarithmic (141) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

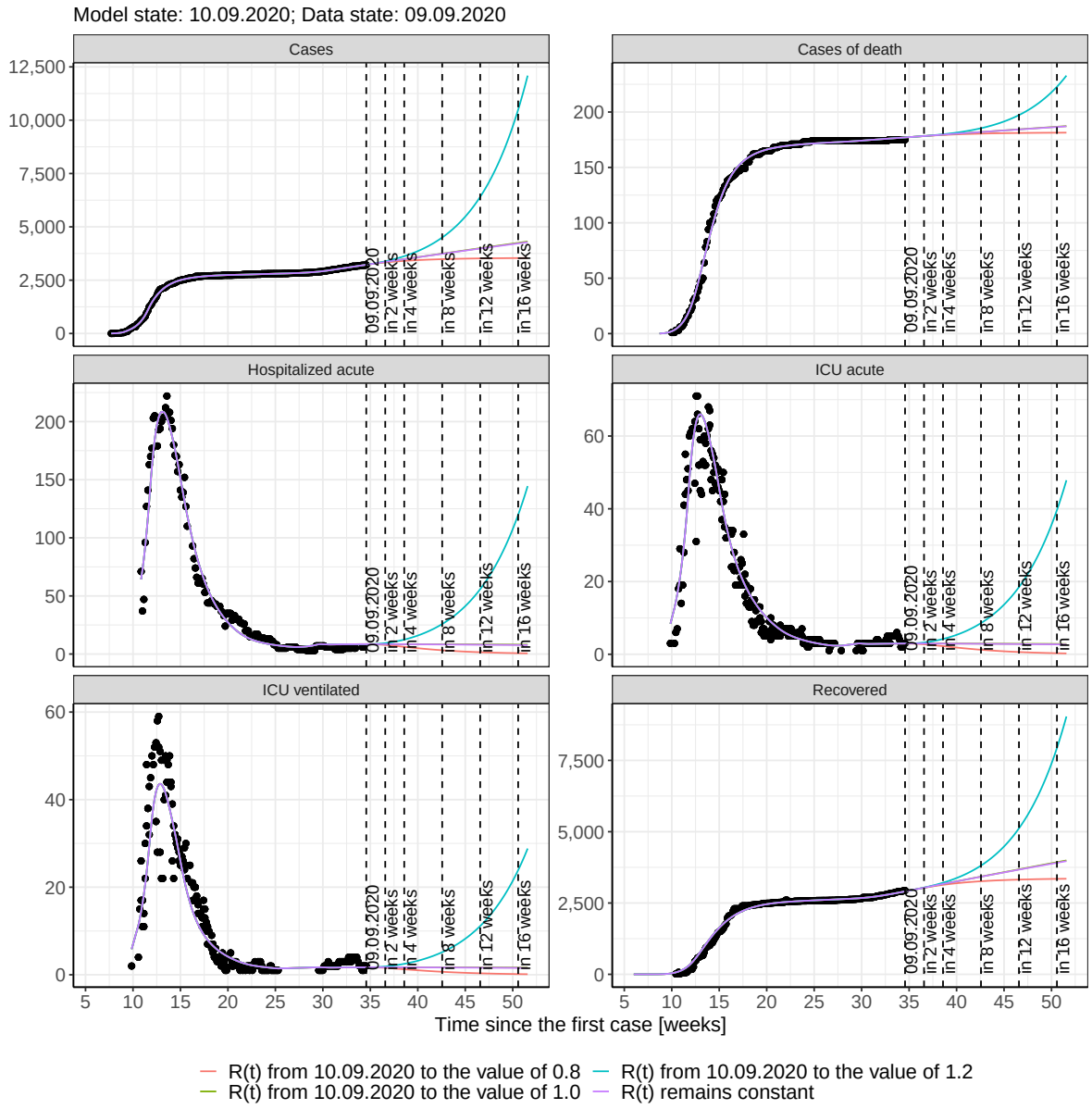


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

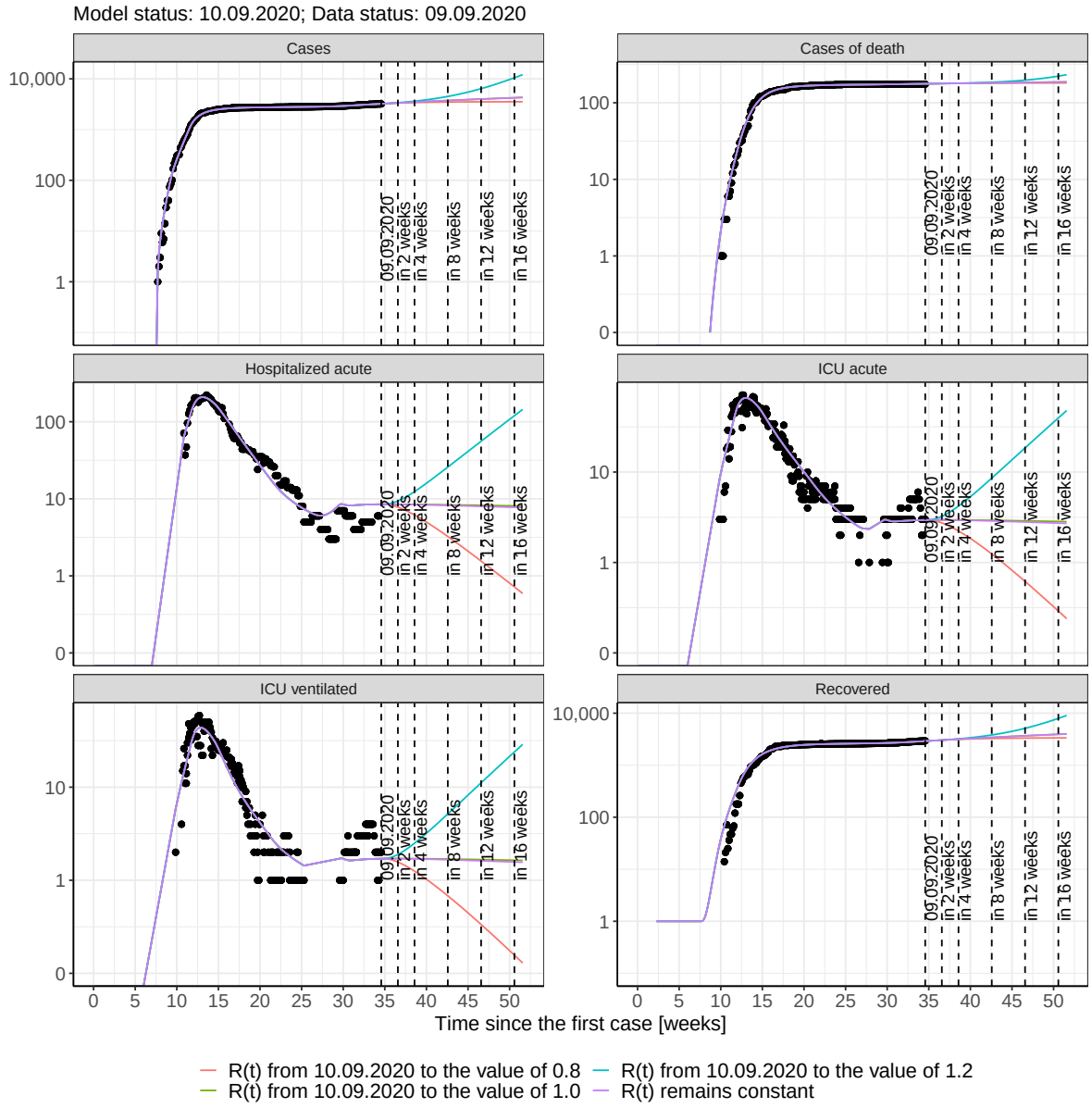


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 49) Model status from 10.09.2020; Data status: 09.09.2020.

Table 46: Saarland - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3232	177	2917	8	3	2
11.09.2020	3241	177	2926	8	3	2
12.09.2020	3250	177	2935	8	3	2
13.09.2020	3260	177	2944	8	3	2
14.09.2020	3269	178	2953	8	3	2
15.09.2020	3279	178	2963	8	3	2
16.09.2020	3288	178	2972	8	3	2
17.09.2020	3298	178	2981	8	3	2
18.09.2020	3307	178	2990	8	3	2
19.09.2020	3316	178	3000	8	3	2
20.09.2020	3326	178	3009	8	3	2
21.09.2020	3335	178	3018	8	3	2
22.09.2020	3344	178	3028	8	3	2
23.09.2020	3354	178	3037	8	3	2
24.09.2020	3363	178	3046	8	3	2
25.09.2020	3372	178	3056	8	3	2
26.09.2020	3381	179	3065	8	3	2
27.09.2020	3391	179	3074	8	3	2
28.09.2020	3400	179	3083	8	3	2
29.09.2020	3409	179	3093	8	3	2
30.09.2020	3418	179	3102	8	3	2
01.10.2020	3428	179	3111	8	3	2
02.10.2020	3437	179	3120	8	3	2
03.10.2020	3446	179	3130	8	3	2
04.10.2020	3455	179	3139	8	3	2
05.10.2020	3465	179	3148	8	3	2
06.10.2020	3474	179	3157	8	3	2
07.10.2020	3483	180	3167	8	3	2

Table 47: Saarland - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3232	177	2917	8	3	2
11.09.2020	3241	177	2926	8	3	2
12.09.2020	3249	177	2935	8	3	2
13.09.2020	3258	177	2944	8	3	2
14.09.2020	3266	178	2953	8	3	2
15.09.2020	3274	178	2962	8	3	2
16.09.2020	3282	178	2972	8	3	2
17.09.2020	3290	178	2981	8	3	2
18.09.2020	3297	178	2990	8	3	2
19.09.2020	3304	178	2999	8	3	2
20.09.2020	3311	178	3007	8	3	2
21.09.2020	3318	178	3016	8	3	2
22.09.2020	3324	178	3025	8	3	2
23.09.2020	3331	178	3033	8	3	2
24.09.2020	3337	178	3042	8	3	2
25.09.2020	3343	178	3050	8	3	2
26.09.2020	3349	179	3058	7	3	2
27.09.2020	3355	179	3066	7	3	1
28.09.2020	3360	179	3074	7	3	1
29.09.2020	3366	179	3082	7	3	1
30.09.2020	3371	179	3089	7	2	1
01.10.2020	3376	179	3096	7	2	1
02.10.2020	3381	179	3104	7	2	1
03.10.2020	3386	179	3111	7	2	1
04.10.2020	3390	179	3118	7	2	1
05.10.2020	3395	179	3124	6	2	1
06.10.2020	3399	179	3131	6	2	1
07.10.2020	3403	179	3137	6	2	1

Table 48: Saarland - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3232	177	2917	8	3	2
11.09.2020	3241	177	2926	8	3	2
12.09.2020	3251	177	2935	8	3	2
13.09.2020	3260	177	2944	8	3	2
14.09.2020	3269	178	2953	8	3	2
15.09.2020	3279	178	2963	8	3	2
16.09.2020	3288	178	2972	8	3	2
17.09.2020	3298	178	2981	8	3	2
18.09.2020	3307	178	2990	8	3	2
19.09.2020	3316	178	3000	8	3	2
20.09.2020	3326	178	3009	8	3	2
21.09.2020	3335	178	3018	8	3	2
22.09.2020	3345	178	3028	8	3	2
23.09.2020	3354	178	3037	8	3	2
24.09.2020	3363	178	3046	8	3	2
25.09.2020	3373	178	3056	8	3	2
26.09.2020	3382	179	3065	8	3	2
27.09.2020	3391	179	3074	8	3	2
28.09.2020	3401	179	3084	8	3	2
29.09.2020	3410	179	3093	8	3	2
30.09.2020	3420	179	3102	8	3	2
01.10.2020	3429	179	3112	8	3	2
02.10.2020	3438	179	3121	8	3	2
03.10.2020	3448	179	3130	8	3	2
04.10.2020	3457	179	3139	8	3	2
05.10.2020	3466	179	3149	8	3	2
06.10.2020	3476	179	3158	8	3	2
07.10.2020	3485	180	3167	8	3	2

Table 49: Saarland - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3232	177	2917	8	3	2
11.09.2020	3242	177	2926	8	3	2
12.09.2020	3252	177	2935	9	3	2
13.09.2020	3262	177	2944	9	3	2
14.09.2020	3273	178	2954	9	3	2
15.09.2020	3284	178	2963	9	3	2
16.09.2020	3295	178	2972	9	3	2
17.09.2020	3307	178	2982	9	3	2
18.09.2020	3319	178	2992	9	3	2
19.09.2020	3331	178	3001	9	3	2
20.09.2020	3344	178	3011	9	3	2
21.09.2020	3357	178	3021	9	3	2
22.09.2020	3370	178	3031	9	3	2
23.09.2020	3384	178	3042	9	3	2
24.09.2020	3398	178	3052	10	3	2
25.09.2020	3413	179	3063	10	3	2
26.09.2020	3428	179	3074	10	3	2
27.09.2020	3443	179	3085	10	3	2
28.09.2020	3459	179	3096	10	4	2
29.09.2020	3475	179	3108	10	4	2
30.09.2020	3492	179	3120	11	4	2
01.10.2020	3509	179	3132	11	4	2
02.10.2020	3527	179	3144	11	4	2
03.10.2020	3545	179	3157	11	4	2
04.10.2020	3564	180	3170	12	4	2
05.10.2020	3583	180	3184	12	4	2
06.10.2020	3603	180	3198	12	4	2
07.10.2020	3624	180	3212	12	4	2

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 142 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

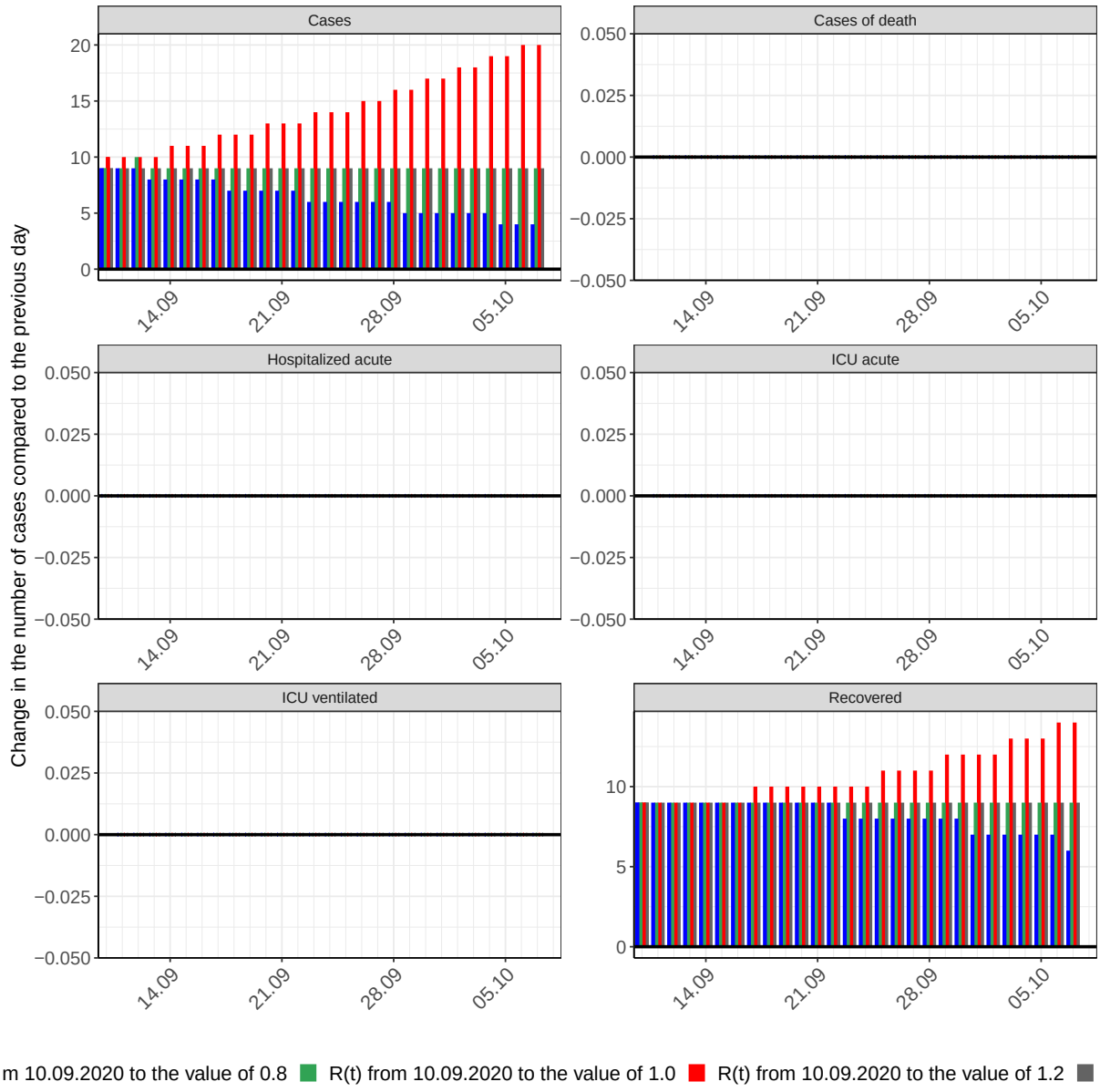


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

14 Saxony

14.1 Model description

Fig. 143 depicts the results of the modeling (lines) compared to the observed data (points) for Saxony on a linear (A) and semi-logarithmic (B) scale.

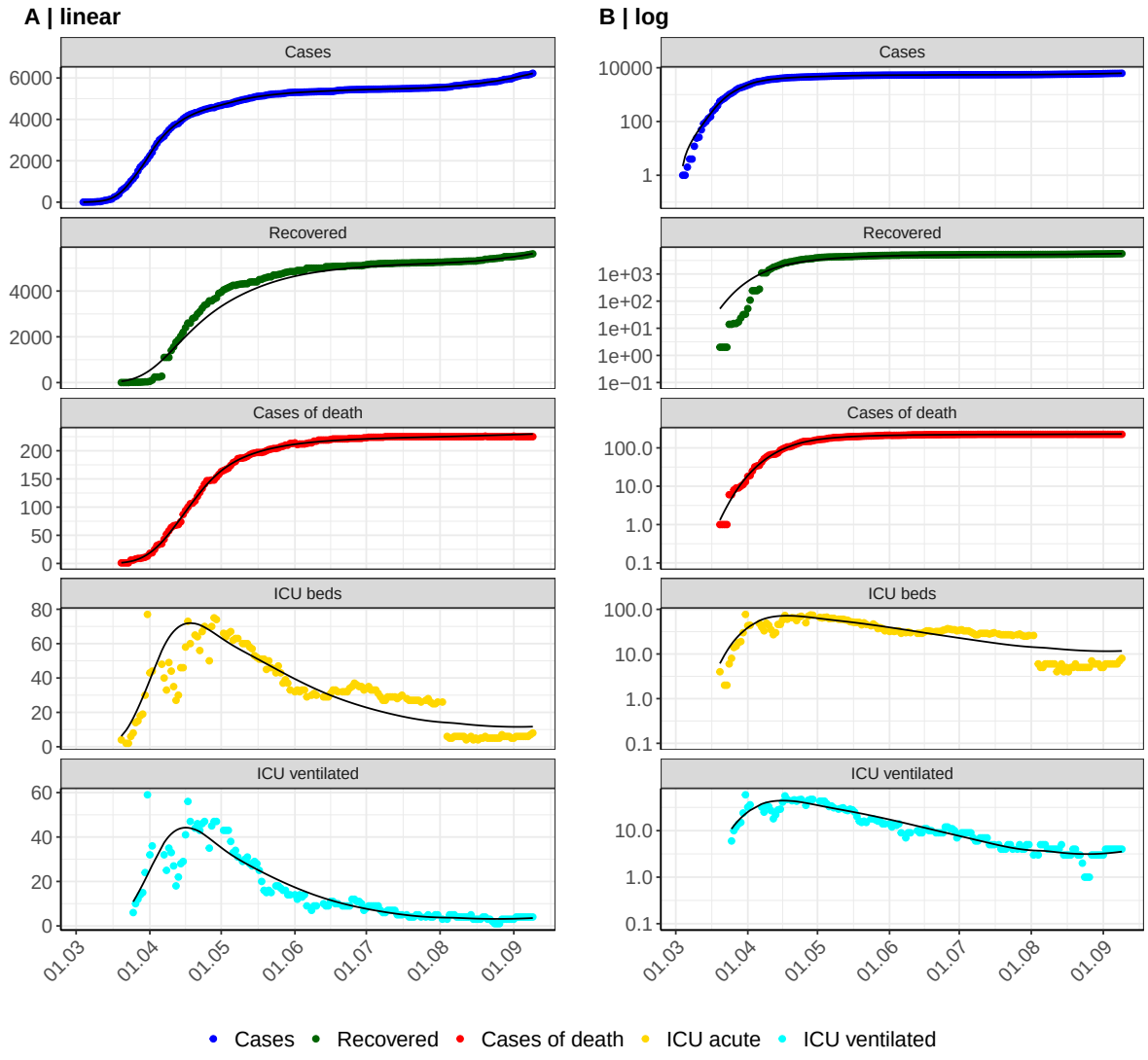


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

Fig. 144 shows the goodness-of-fit for Saxony. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

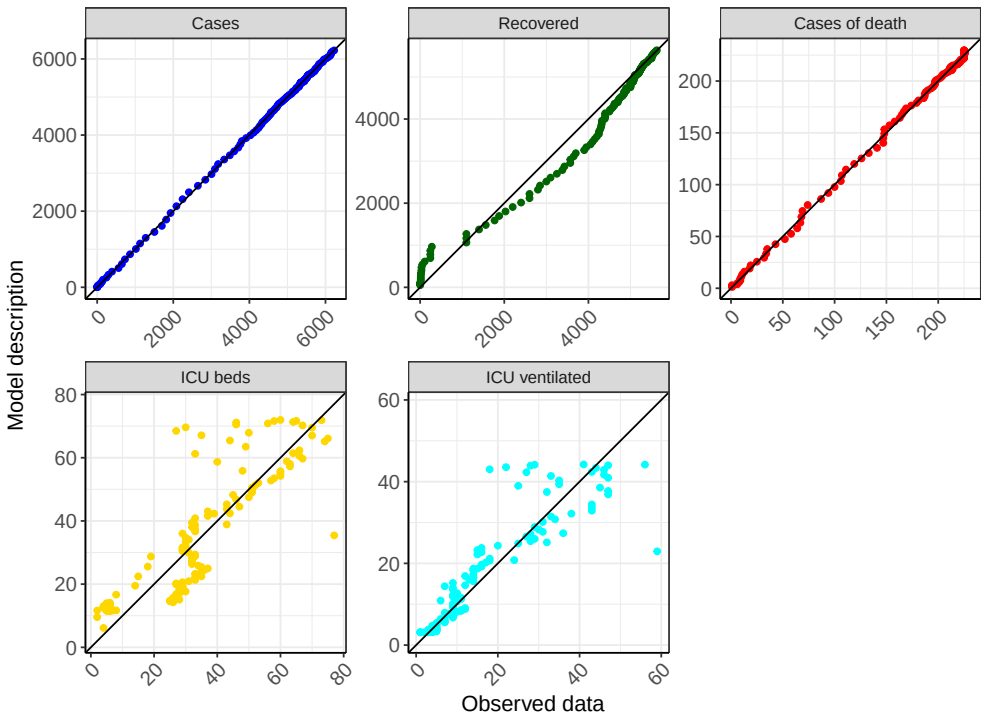


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

Fig. 145 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Saxony (red line) in comparison with the other federal states (grey lines).

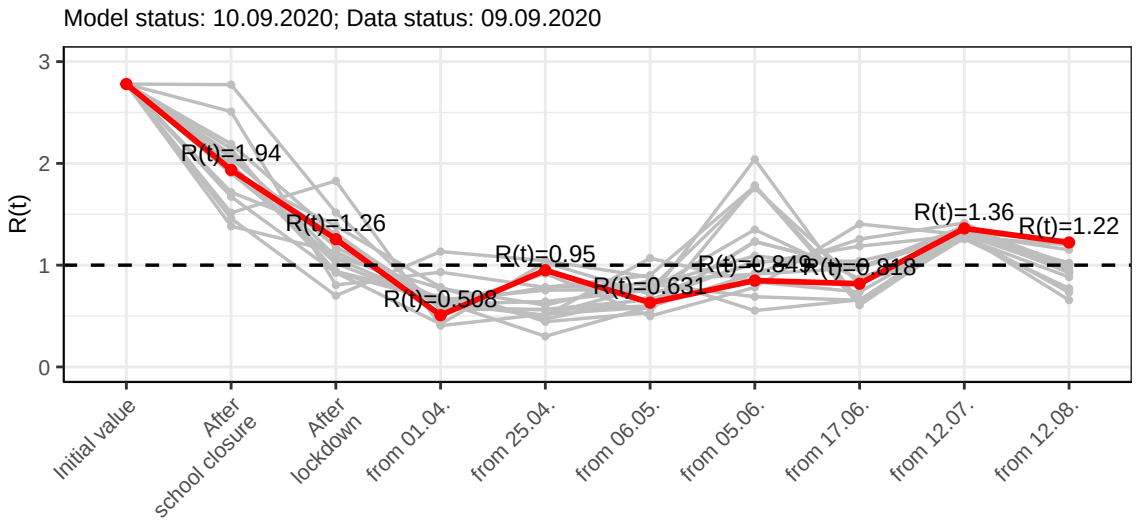


Figure 145: R(t) values before and after the NPIs for Saxony

Fig. 146 shows the R(t) estimated value for Saxony (red line) over time in comparison with the other federal states (grey lines).

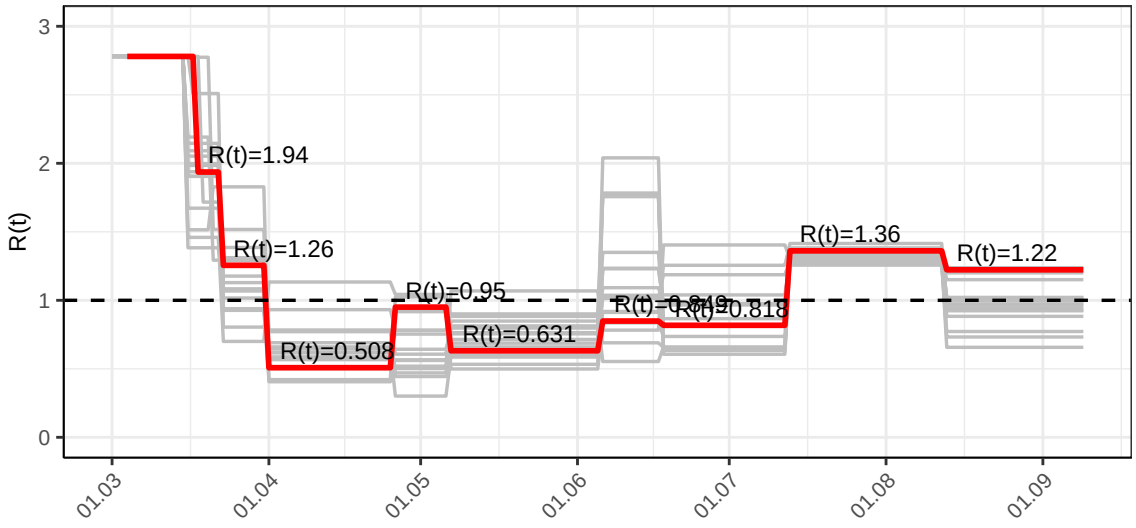


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

14.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.22)

Fig. 147 and 148 depict the the model predictions for the next 4 weeks for Saxony on a linear (147) and a semi-logarithmic (148) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

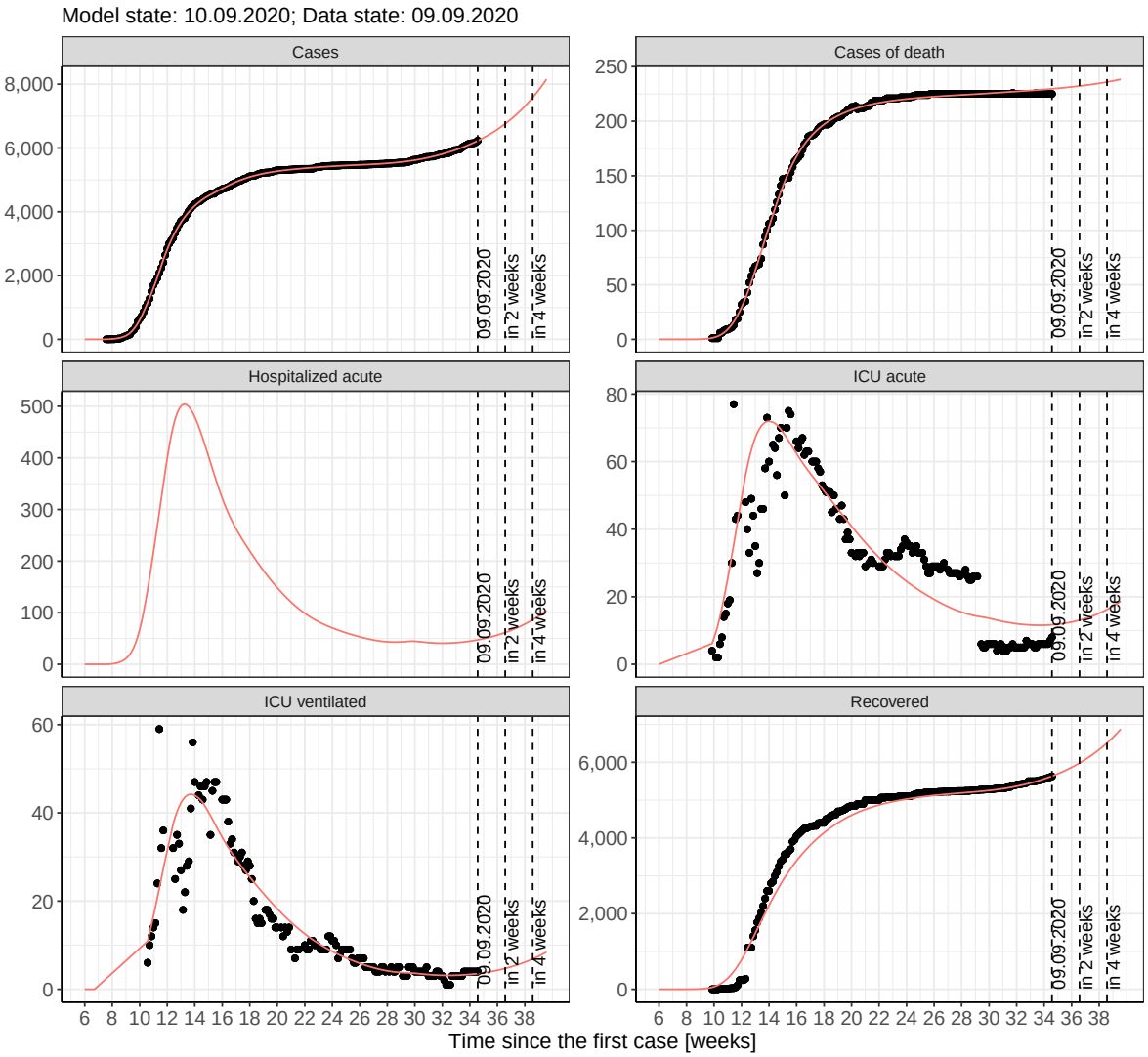


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

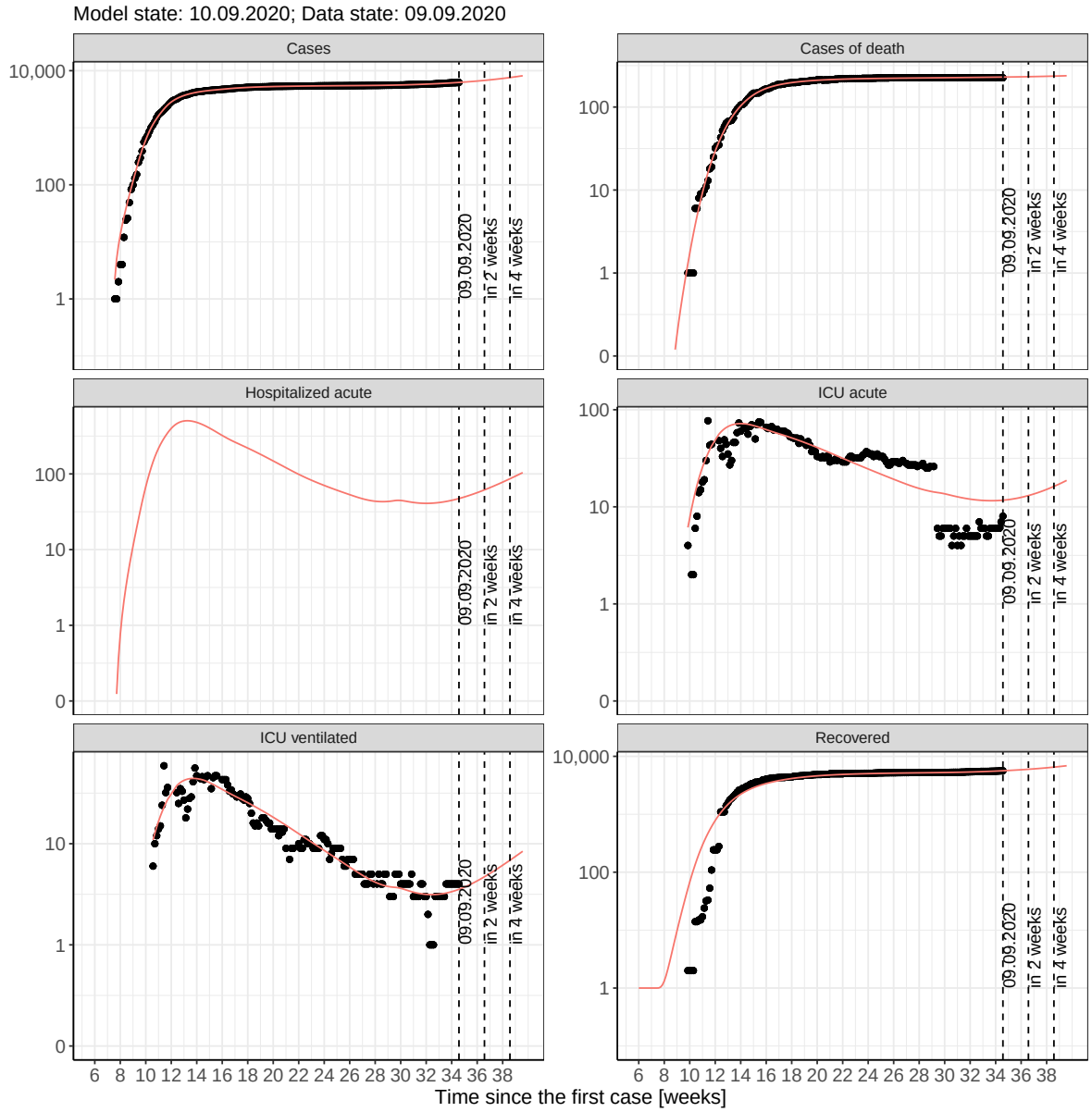


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 149 and 150 represent the model prediction for the next 4 weeks for Saxony on a linear (149) and a semi-logarithmic (150) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

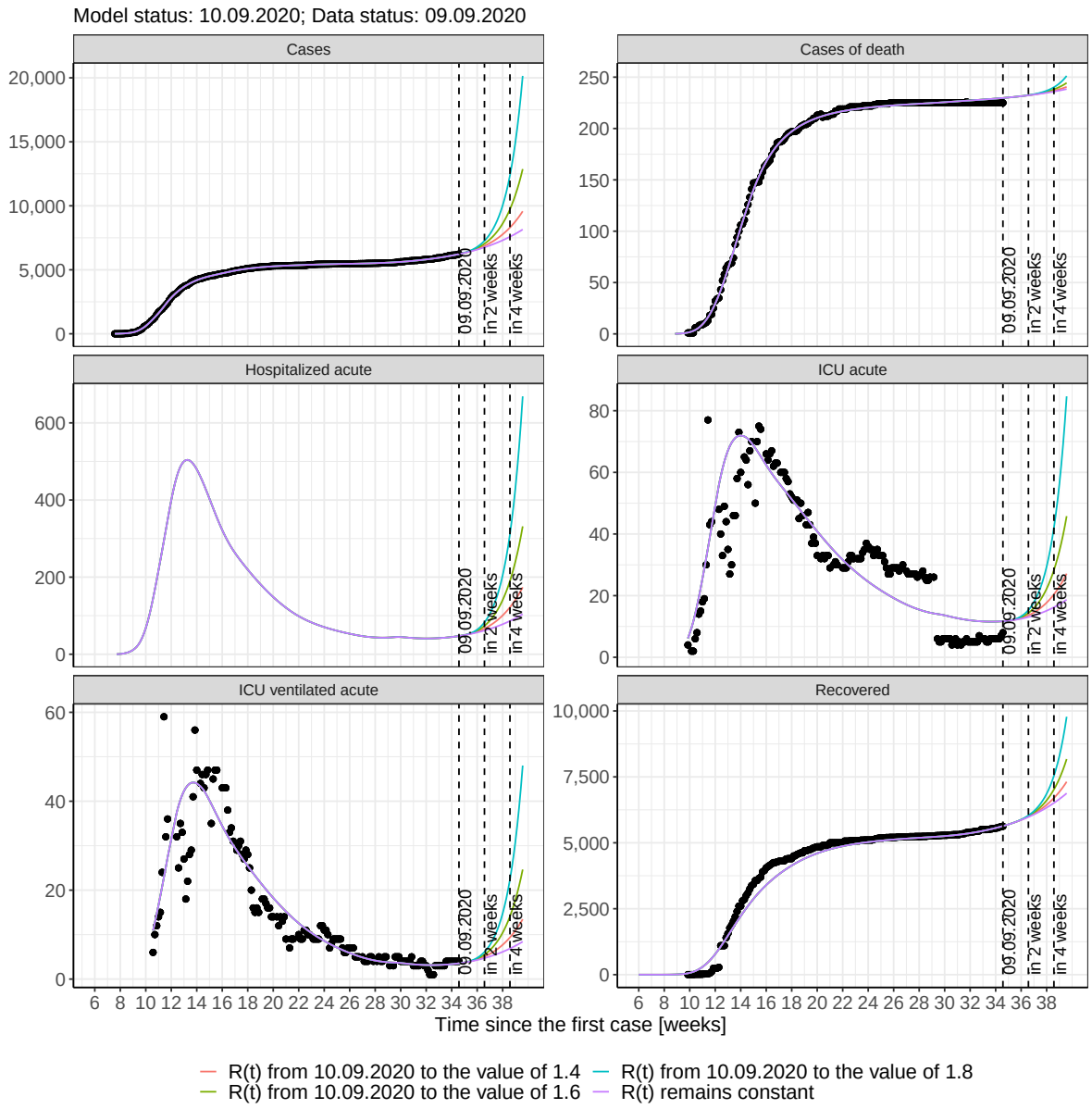


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

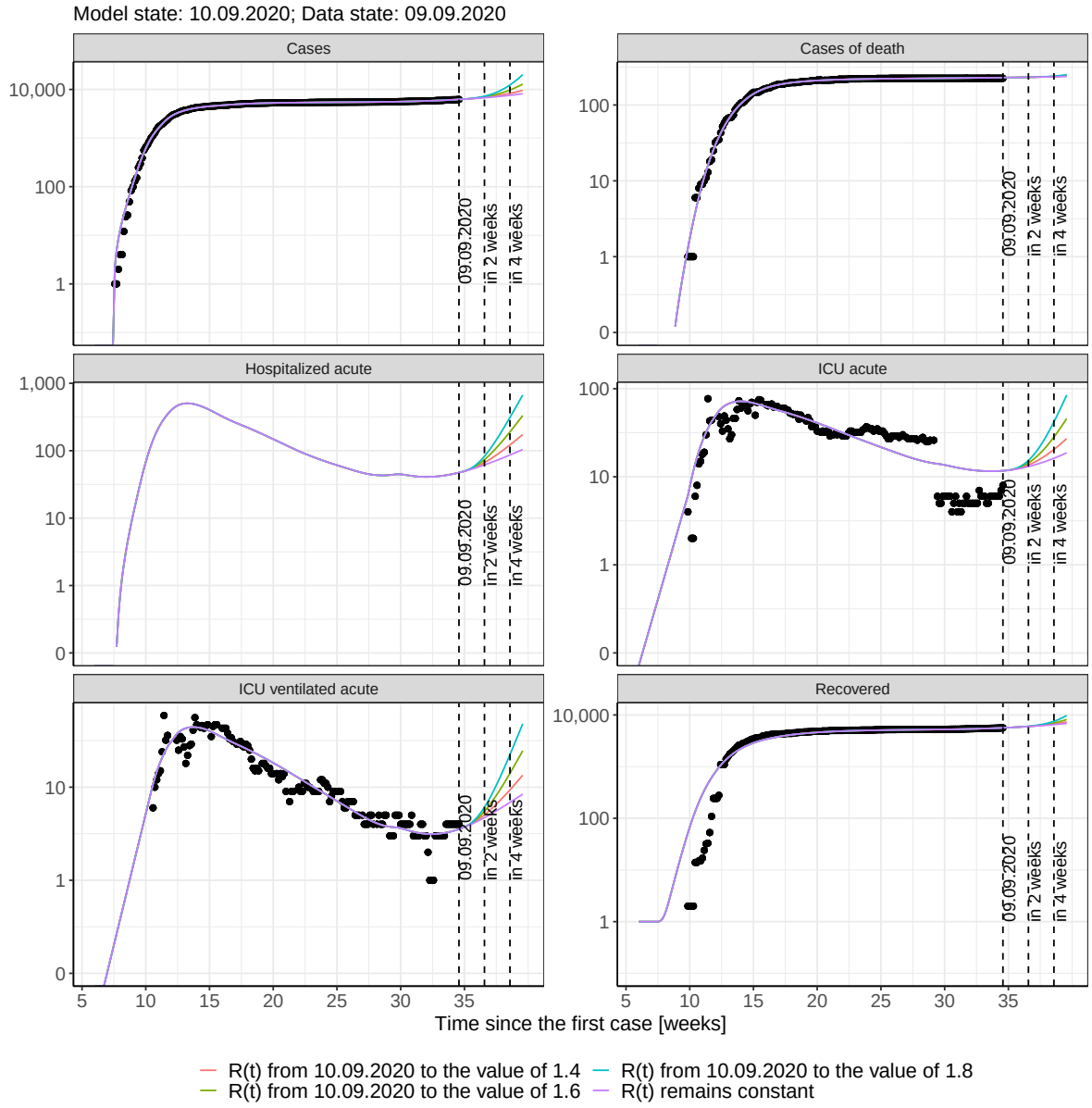


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 151 and 152 represent the model prediction for the next 16 weeks for Saxony on a linear (151) and a semi-logarithmic (152) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

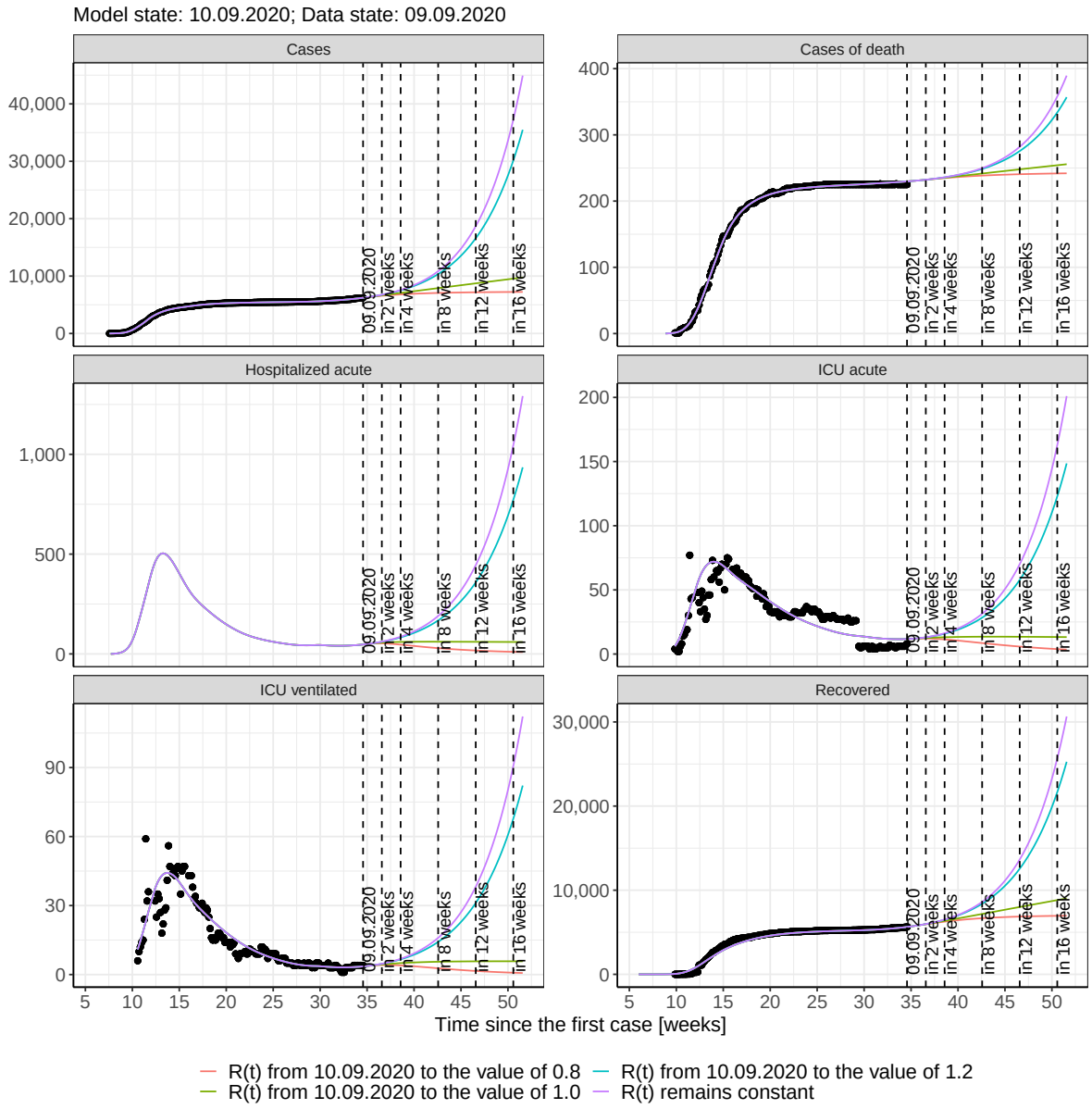


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

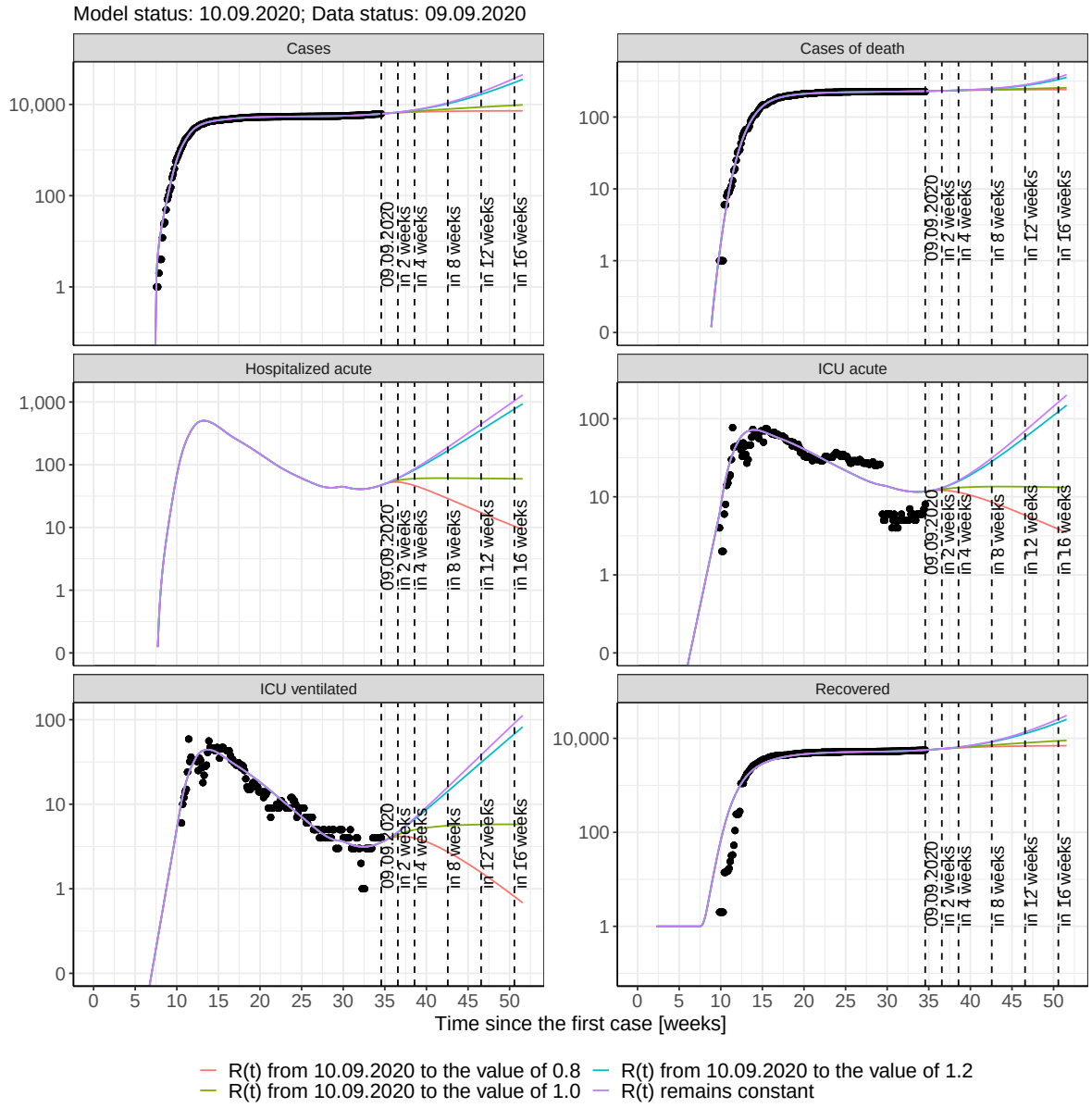


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 53) Model status from 10.09.2020; Data status: 09.09.2020.

Table 50: Saxony - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6255	230	5655	48	12	4
11.09.2020	6287	230	5675	49	12	4
12.09.2020	6320	230	5696	50	12	4
13.09.2020	6353	230	5718	50	12	4
14.09.2020	6388	231	5741	51	12	4
15.09.2020	6424	231	5764	52	12	4
16.09.2020	6461	231	5788	53	12	4
17.09.2020	6499	231	5813	54	12	4
18.09.2020	6539	231	5838	55	12	4
19.09.2020	6580	231	5865	57	13	4
20.09.2020	6622	232	5892	58	13	4
21.09.2020	6665	232	5920	59	13	4
22.09.2020	6710	232	5949	60	13	5
23.09.2020	6756	232	5979	62	13	5
24.09.2020	6804	232	6010	63	13	5
25.09.2020	6853	233	6041	64	13	5
26.09.2020	6904	233	6074	66	14	5
27.09.2020	6956	233	6108	67	14	5
28.09.2020	7010	233	6143	69	14	5
29.09.2020	7066	234	6179	71	14	5
30.09.2020	7123	234	6216	72	14	6
01.10.2020	7183	234	6254	74	15	6
02.10.2020	7244	234	6293	76	15	6
03.10.2020	7307	235	6334	78	15	6
04.10.2020	7373	235	6376	80	15	6
05.10.2020	7440	235	6419	82	16	6
06.10.2020	7510	236	6464	84	16	7
07.10.2020	7581	236	6510	86	16	7

Table 51: Saxony - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6254	230	5655	48	12	4
11.09.2020	6283	230	5675	49	12	4
12.09.2020	6311	230	5696	50	12	4
13.09.2020	6339	230	5718	50	12	4
14.09.2020	6365	231	5740	51	12	4
15.09.2020	6391	231	5763	51	12	4
16.09.2020	6416	231	5786	52	12	4
17.09.2020	6440	231	5809	52	12	4
18.09.2020	6464	231	5833	53	12	4
19.09.2020	6487	231	5856	53	12	4
20.09.2020	6509	232	5880	53	12	4
21.09.2020	6531	232	5904	53	12	4
22.09.2020	6552	232	5928	53	12	4
23.09.2020	6572	232	5952	53	12	4
24.09.2020	6592	232	5976	53	12	4
25.09.2020	6612	233	5999	53	12	4
26.09.2020	6630	233	6023	52	12	4
27.09.2020	6649	233	6046	52	12	4
28.09.2020	6666	233	6069	52	12	4
29.09.2020	6684	233	6092	51	12	4
30.09.2020	6700	234	6114	51	12	4
01.10.2020	6717	234	6136	50	12	4
02.10.2020	6732	234	6158	50	12	4
03.10.2020	6748	234	6180	49	12	4
04.10.2020	6763	234	6201	48	12	4
05.10.2020	6777	234	6222	48	12	4
06.10.2020	6791	235	6242	47	11	4
07.10.2020	6805	235	6262	47	11	4

Table 52: Saxony - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6255	230	5655	48	12	4
11.09.2020	6285	230	5675	49	12	4
12.09.2020	6315	230	5696	50	12	4
13.09.2020	6345	230	5718	50	12	4
14.09.2020	6375	231	5741	51	12	4
15.09.2020	6406	231	5764	52	12	4
16.09.2020	6436	231	5787	53	12	4
17.09.2020	6466	231	5811	53	12	4
18.09.2020	6496	231	5835	54	12	4
19.09.2020	6526	231	5860	54	12	4
20.09.2020	6556	232	5885	55	12	4
21.09.2020	6586	232	5911	56	12	4
22.09.2020	6616	232	5937	56	12	4
23.09.2020	6646	232	5963	57	13	4
24.09.2020	6676	232	5990	57	13	4
25.09.2020	6707	233	6017	57	13	4
26.09.2020	6737	233	6044	58	13	5
27.09.2020	6767	233	6072	58	13	5
28.09.2020	6797	233	6099	58	13	5
29.09.2020	6827	233	6127	59	13	5
30.09.2020	6857	234	6155	59	13	5
01.10.2020	6887	234	6183	59	13	5
02.10.2020	6917	234	6211	59	13	5
03.10.2020	6947	234	6240	60	13	5
04.10.2020	6977	235	6268	60	13	5
05.10.2020	7007	235	6297	60	13	5
06.10.2020	7037	235	6326	60	13	5
07.10.2020	7067	235	6354	60	13	5

Table 53: Saxony - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	6255	230	5655	48	12	4
11.09.2020	6287	230	5675	49	12	4
12.09.2020	6319	230	5696	50	12	4
13.09.2020	6352	230	5718	50	12	4
14.09.2020	6387	231	5741	51	12	4
15.09.2020	6422	231	5764	52	12	4
16.09.2020	6458	231	5788	53	12	4
17.09.2020	6496	231	5813	54	12	4
18.09.2020	6534	231	5838	55	12	4
19.09.2020	6574	231	5864	56	12	4
20.09.2020	6614	232	5891	57	13	4
21.09.2020	6656	232	5919	59	13	4
22.09.2020	6699	232	5948	60	13	5
23.09.2020	6743	232	5977	61	13	5
24.09.2020	6789	232	6007	62	13	5
25.09.2020	6836	233	6038	64	13	5
26.09.2020	6884	233	6071	65	13	5
27.09.2020	6933	233	6104	66	14	5
28.09.2020	6984	233	6138	68	14	5
29.09.2020	7037	234	6173	69	14	5
30.09.2020	7090	234	6208	71	14	6
01.10.2020	7146	234	6246	72	14	6
02.10.2020	7203	234	6284	74	15	6
03.10.2020	7262	235	6323	76	15	6
04.10.2020	7322	235	6363	77	15	6
05.10.2020	7384	235	6405	79	15	6
06.10.2020	7448	236	6447	81	16	6
07.10.2020	7514	236	6491	83	16	7

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 153 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

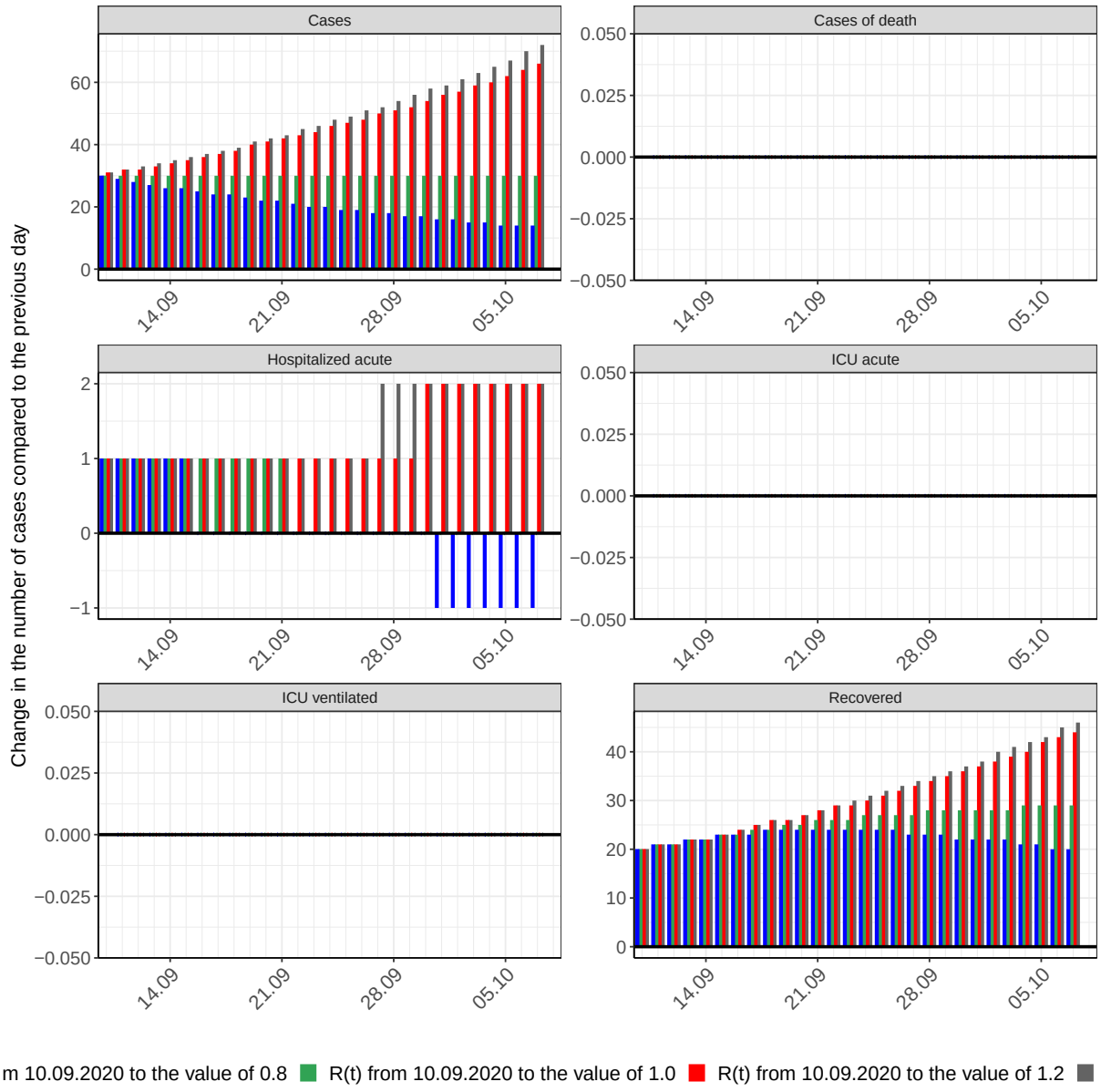


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

15 Saxony-Anhalt

15.1 Model description

Fig. 154 depicts the results of the modeling (lines) compared to the observed data (points) for Saxony-Anhalt on a linear (A) and semi-logarithmic (B) scale.

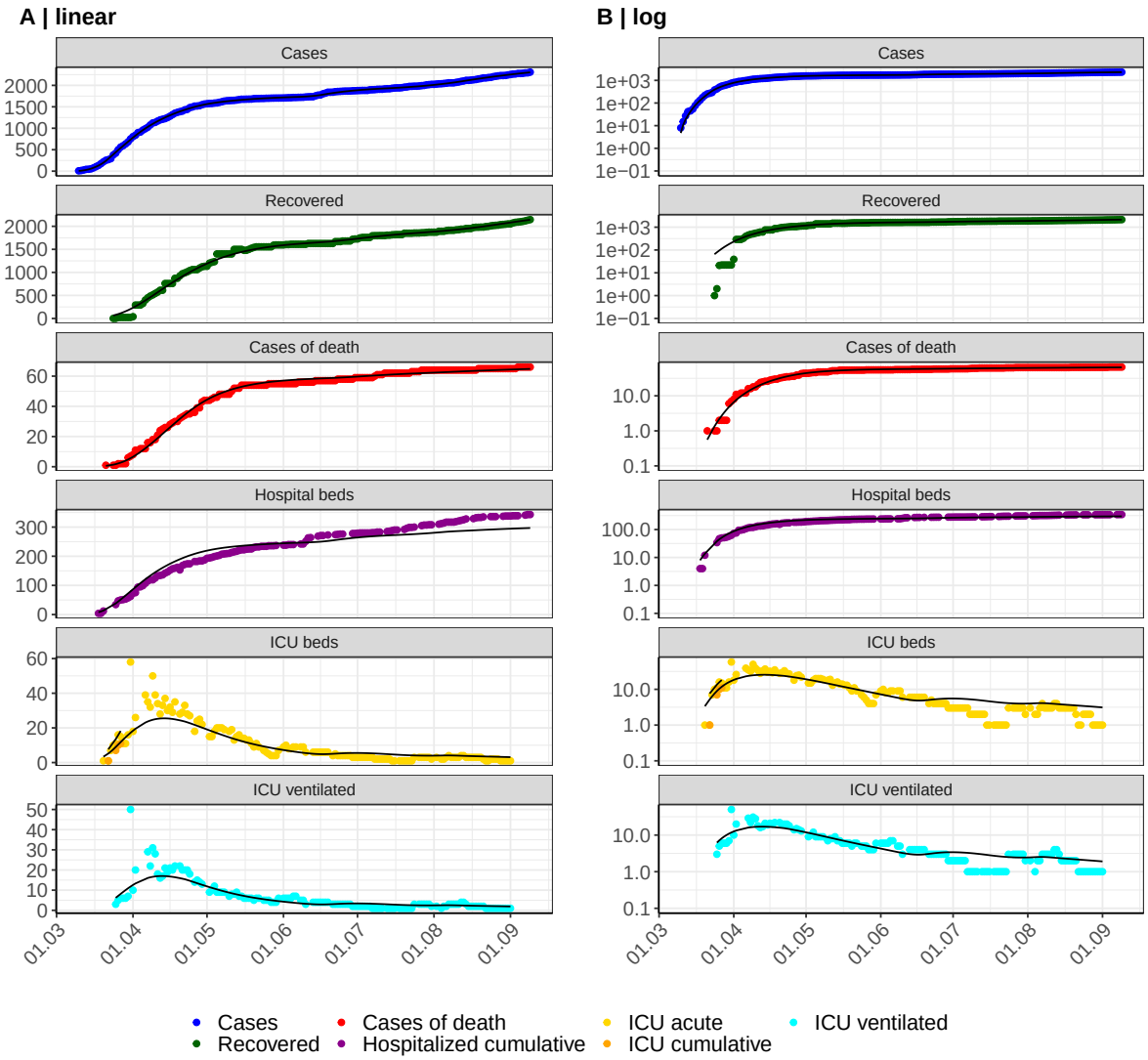


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

Fig. 155 shows the goodness-of-fit for Saxony-Anhalt. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

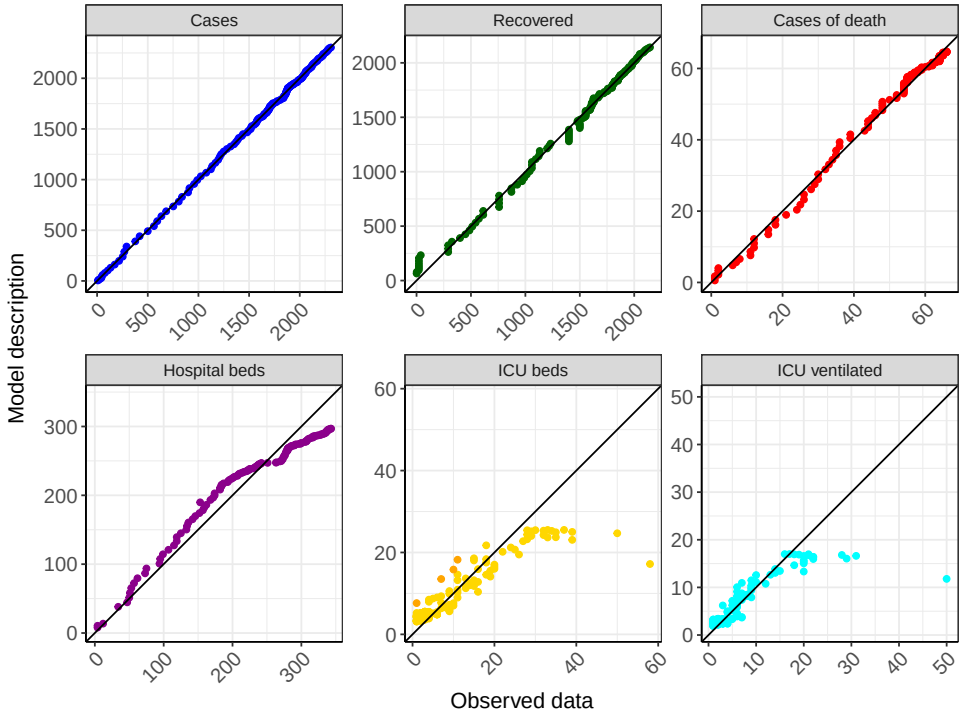


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

Fig. 156 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Saxony-Anhalt (red line) in comparison with the other federal states (grey lines).

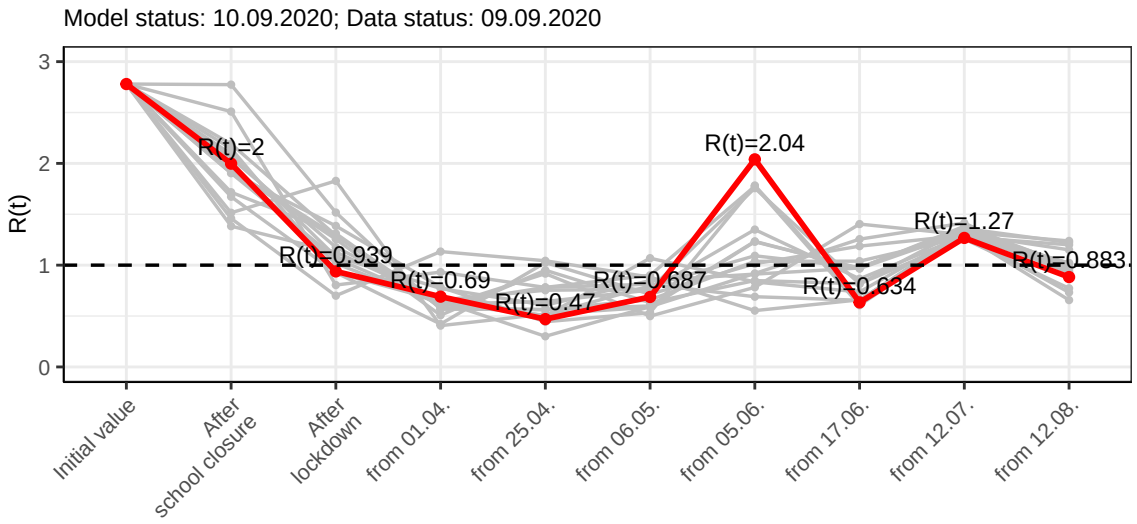


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

Fig. 157 shows the R(t) estimated value for Saxony-Anhalt (red line) over time in comparison with the other federal states (grey lines).

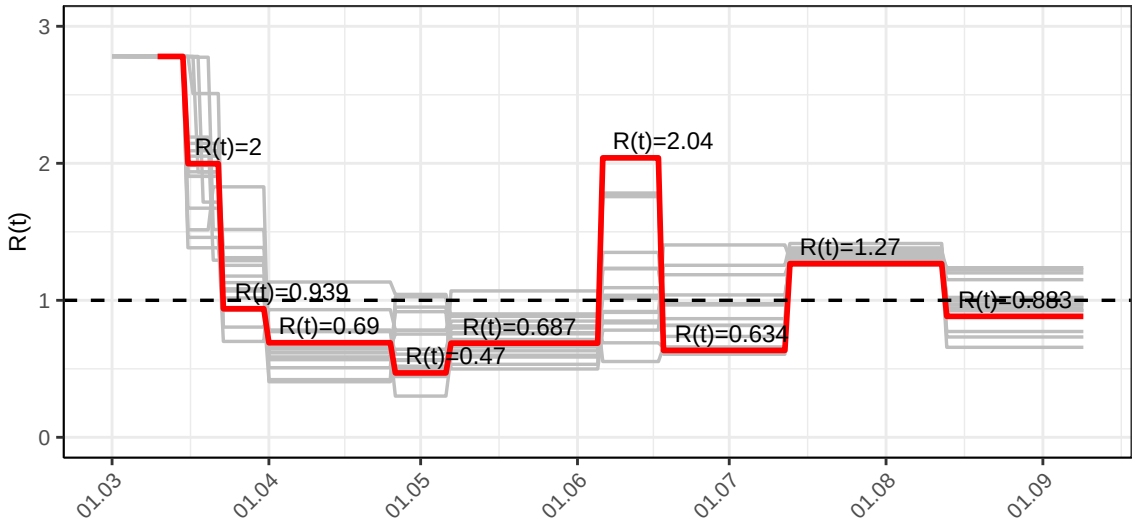


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.88)

Fig. 158 and 159 depict the the model predictions for the next 4 weeks for Saxony-Anhalt on a linear (158) and a semi-logarithmic (159) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

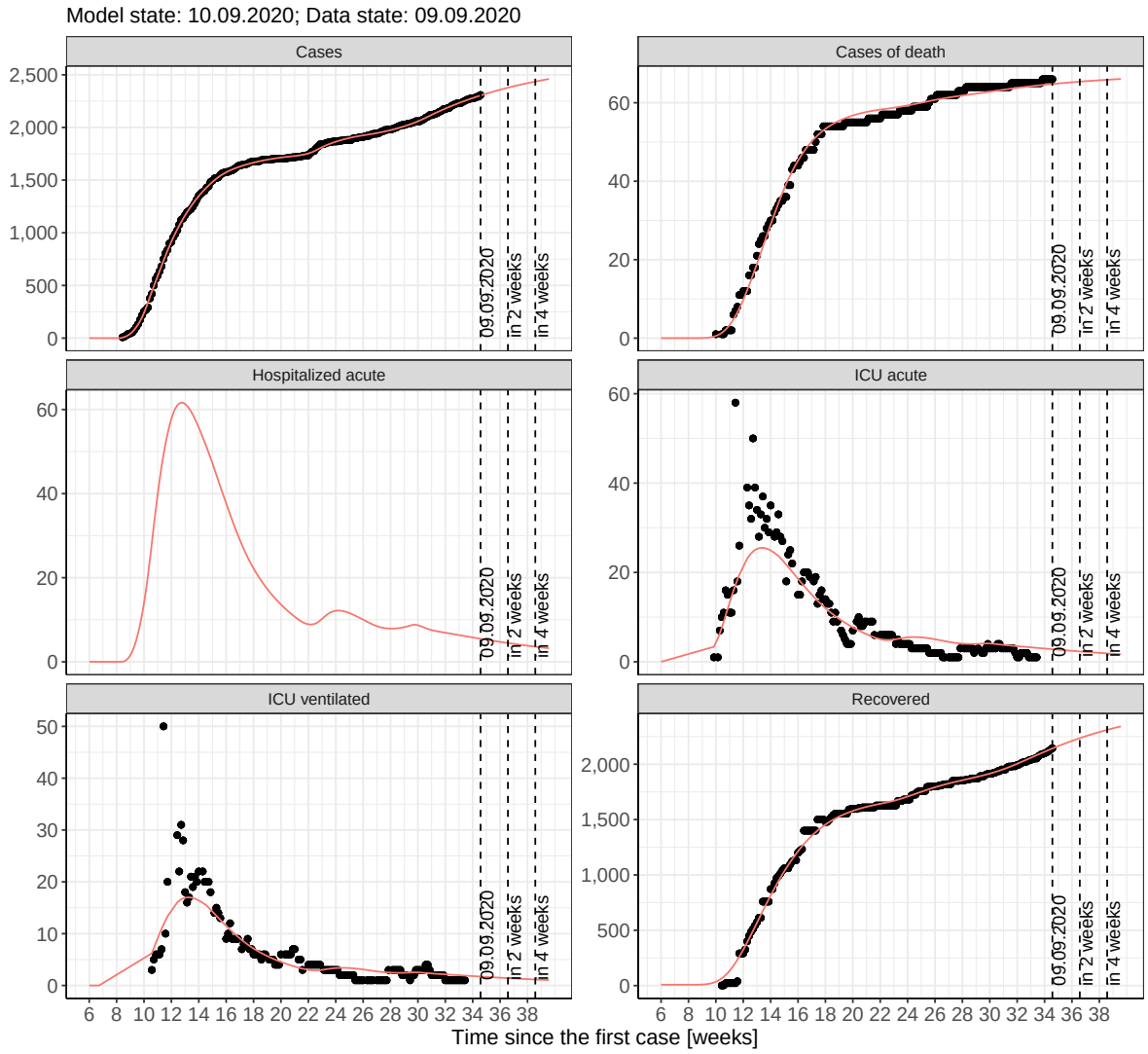


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

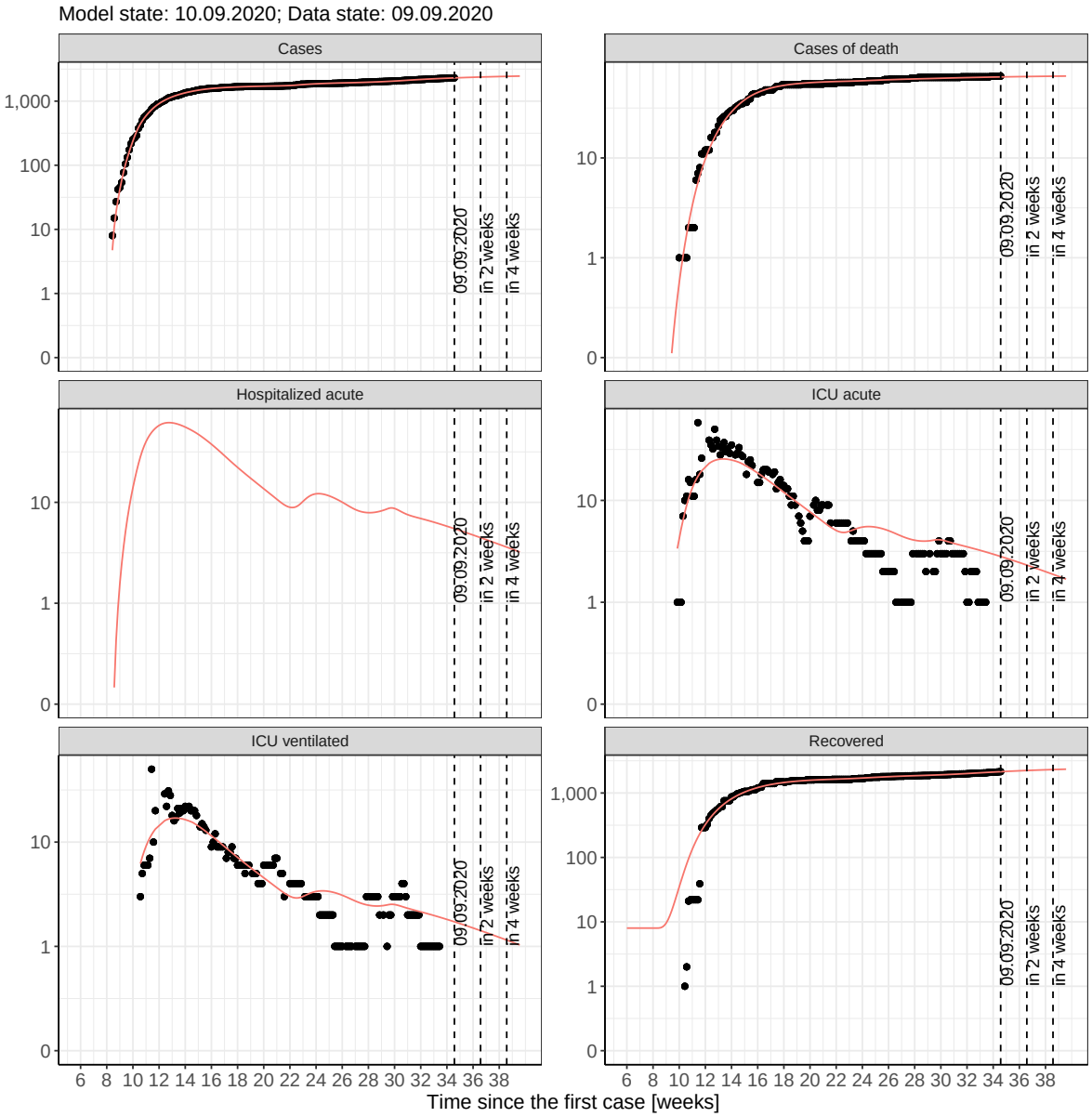


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 160 and 161 represent the model prediction for the next 4 weeks for Saxony-Anhalt on a linear (160) and a semi-logarithmic (161) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

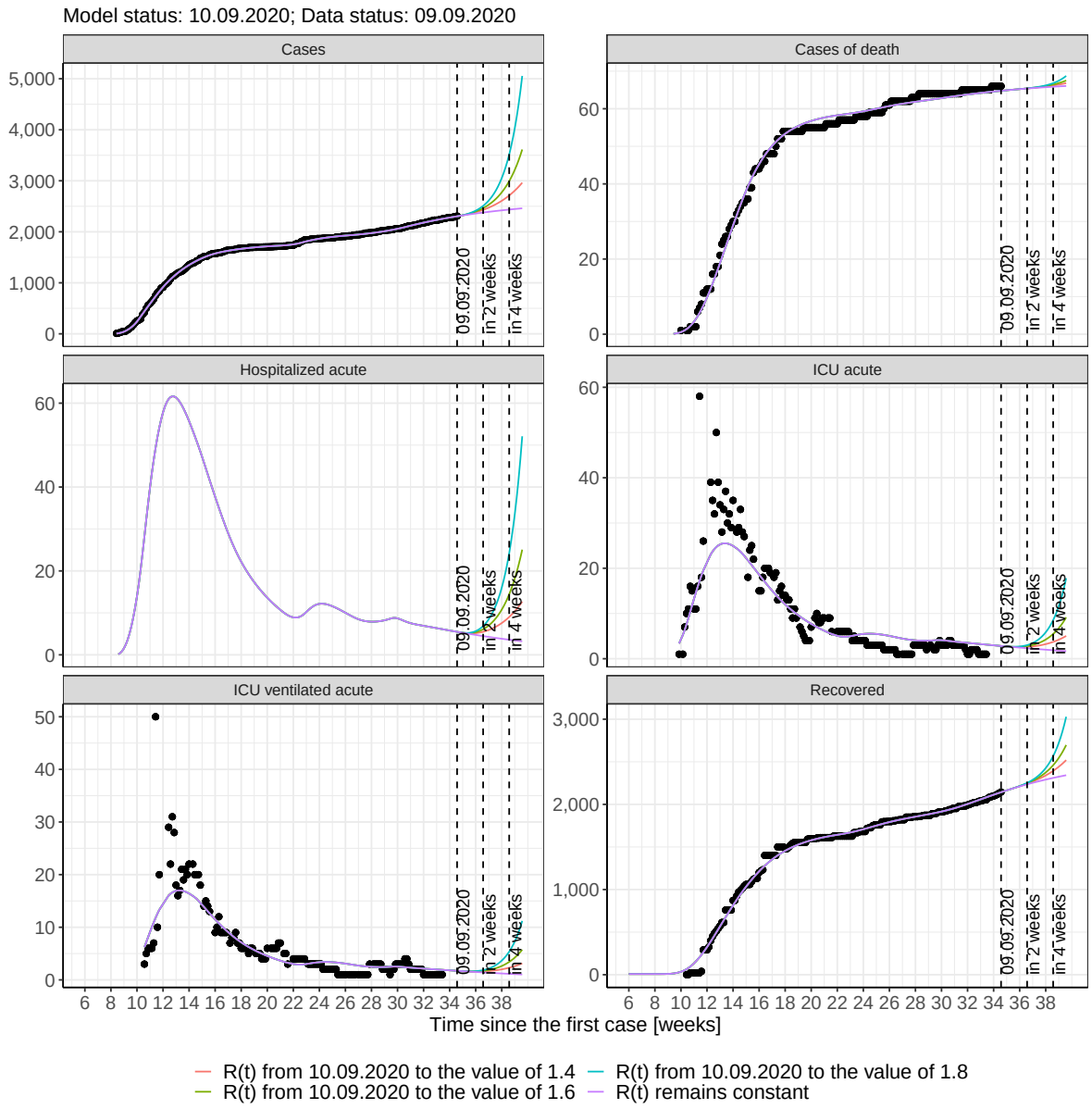


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

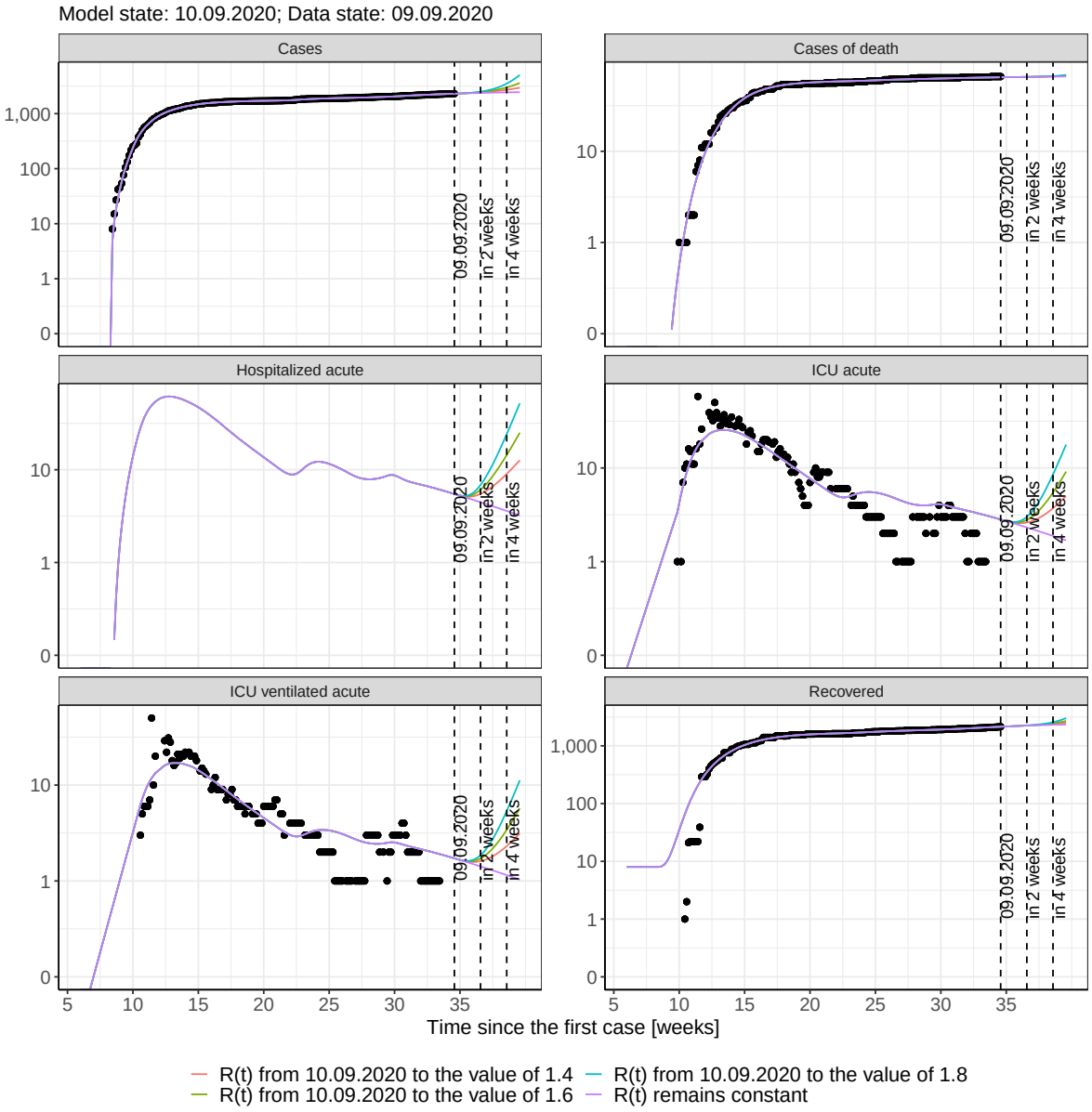


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 162 and 163 represent the model prediction for the next 16 weeks for Saxony-Anhalt on a linear (162) and a semi-logarithmic (163) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

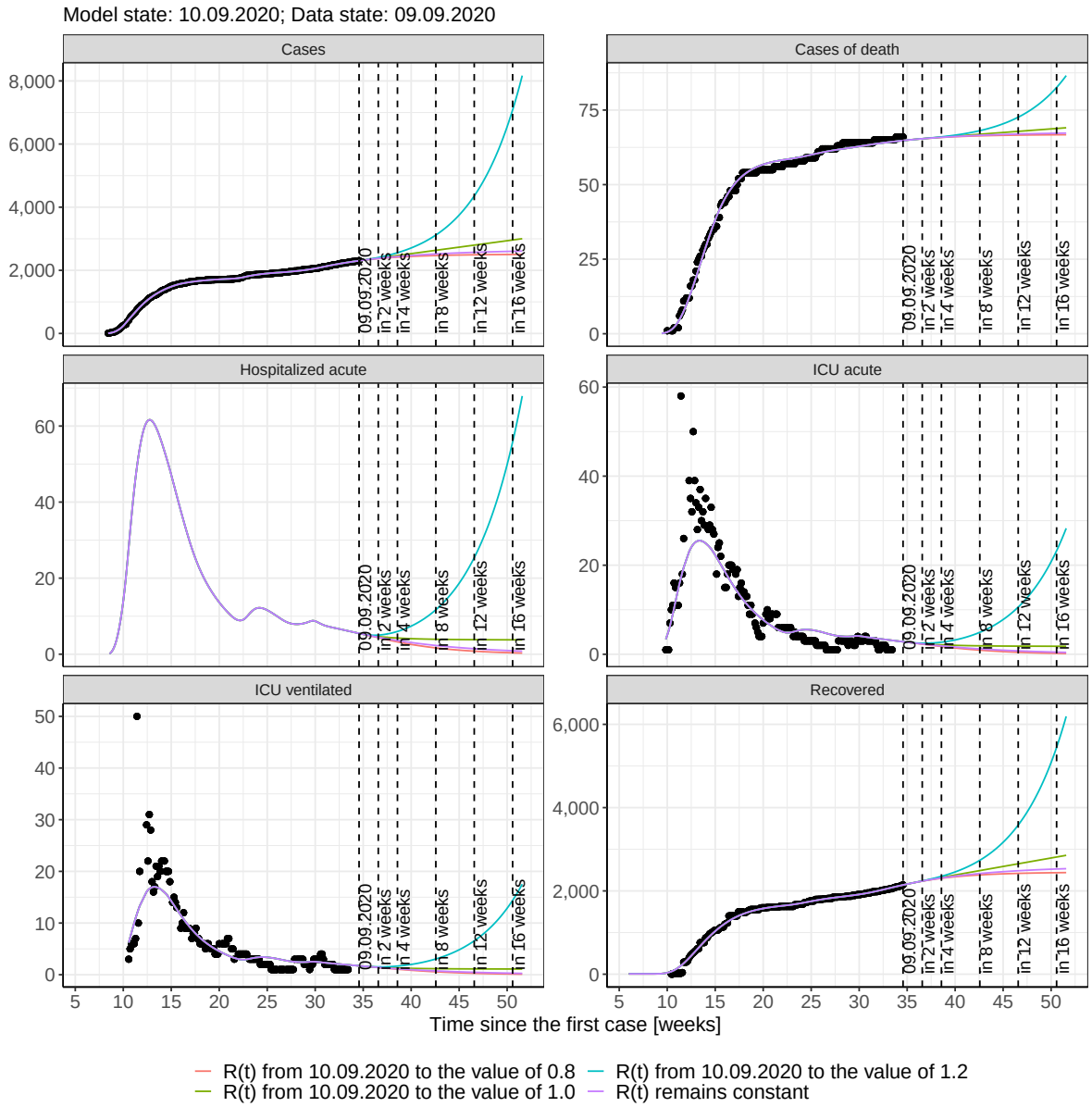


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

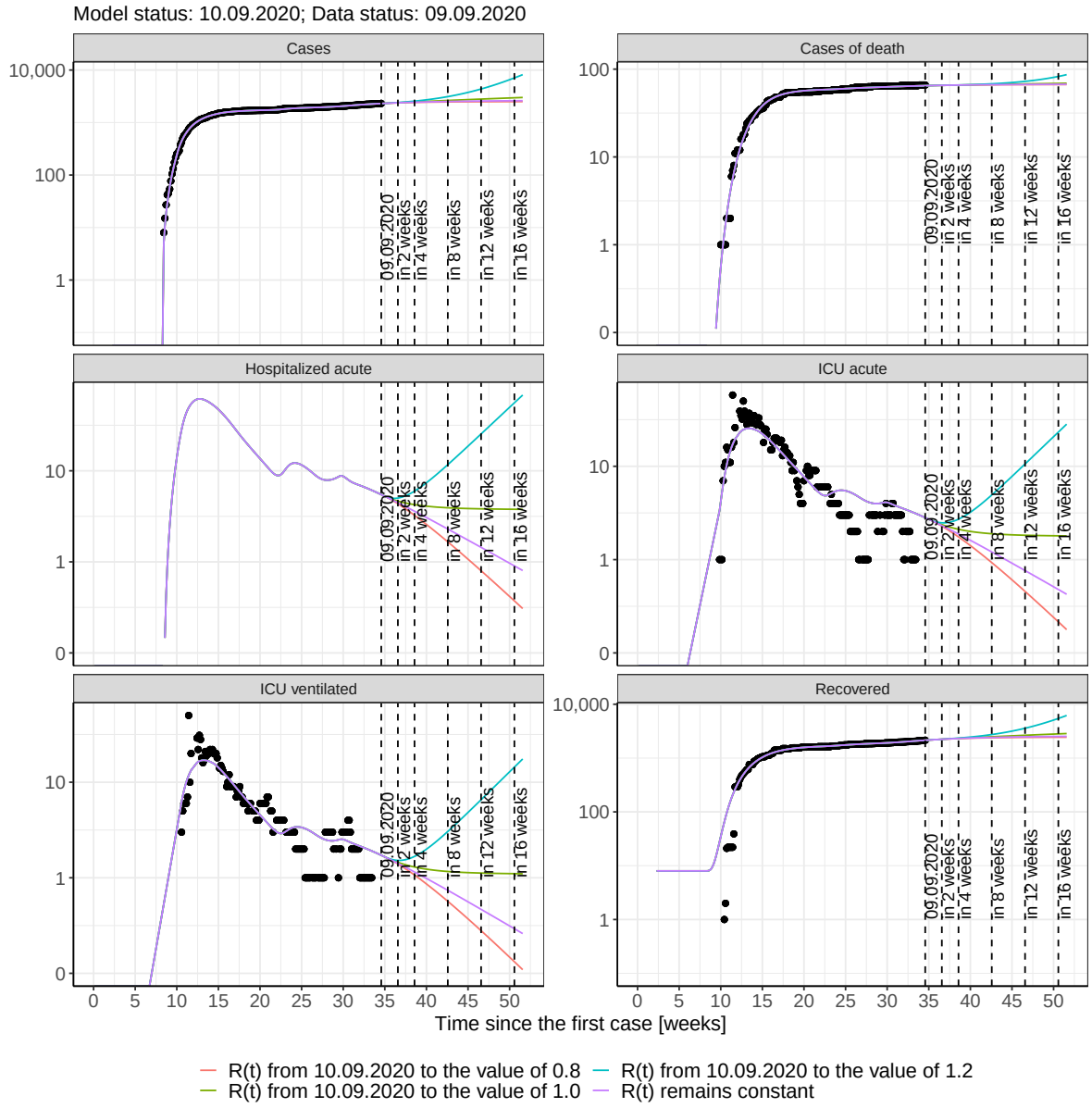


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 57) Model status from 10.09.2020; Data status: 09.09.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2310	65	2150	5	3	2
11.09.2020	2315	65	2157	5	3	2
12.09.2020	2321	65	2164	5	3	2
13.09.2020	2327	65	2171	5	3	2
14.09.2020	2332	65	2178	5	3	2
15.09.2020	2338	65	2185	5	3	2
16.09.2020	2343	65	2191	5	3	2
17.09.2020	2348	65	2198	5	3	2
18.09.2020	2353	65	2204	5	2	2
19.09.2020	2358	65	2211	5	2	2
20.09.2020	2363	65	2217	5	2	1
21.09.2020	2368	65	2223	5	2	1
22.09.2020	2373	65	2229	5	2	1
23.09.2020	2378	65	2235	4	2	1
24.09.2020	2382	65	2241	4	2	1
25.09.2020	2387	65	2247	4	2	1
26.09.2020	2391	65	2253	4	2	1
27.09.2020	2396	66	2259	4	2	1
28.09.2020	2400	66	2264	4	2	1
29.09.2020	2404	66	2270	4	2	1
30.09.2020	2408	66	2275	4	2	1
01.10.2020	2412	66	2280	4	2	1
02.10.2020	2417	66	2286	4	2	1
03.10.2020	2420	66	2291	4	2	1
04.10.2020	2424	66	2296	4	2	1
05.10.2020	2428	66	2301	4	2	1
06.10.2020	2432	66	2306	4	2	1
07.10.2020	2436	66	2311	4	2	1

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2310	65	2150	5	3	2
11.09.2020	2315	65	2157	5	3	2
12.09.2020	2321	65	2164	5	3	2
13.09.2020	2326	65	2171	5	3	2
14.09.2020	2331	65	2178	5	3	2
15.09.2020	2336	65	2184	5	3	2
16.09.2020	2341	65	2191	5	3	2
17.09.2020	2346	65	2198	5	3	2
18.09.2020	2351	65	2204	5	2	2
19.09.2020	2355	65	2210	5	2	1
20.09.2020	2360	65	2217	5	2	1
21.09.2020	2364	65	2223	5	2	1
22.09.2020	2368	65	2229	4	2	1
23.09.2020	2372	65	2234	4	2	1
24.09.2020	2376	65	2240	4	2	1
25.09.2020	2380	65	2246	4	2	1
26.09.2020	2383	65	2251	4	2	1
27.09.2020	2387	66	2257	4	2	1
28.09.2020	2390	66	2262	4	2	1
29.09.2020	2394	66	2267	4	2	1
30.09.2020	2397	66	2272	4	2	1
01.10.2020	2400	66	2277	4	2	1
02.10.2020	2403	66	2282	4	2	1
03.10.2020	2406	66	2286	4	2	1
04.10.2020	2409	66	2291	3	2	1
05.10.2020	2412	66	2295	3	2	1
06.10.2020	2415	66	2299	3	2	1
07.10.2020	2418	66	2304	3	2	1

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2310	65	2150	5	3	2
11.09.2020	2316	65	2157	5	3	2
12.09.2020	2322	65	2164	5	3	2
13.09.2020	2327	65	2171	5	3	2
14.09.2020	2333	65	2178	5	3	2
15.09.2020	2339	65	2185	5	3	2
16.09.2020	2345	65	2191	5	3	2
17.09.2020	2351	65	2198	5	3	2
18.09.2020	2357	65	2205	5	3	2
19.09.2020	2363	65	2211	5	2	2
20.09.2020	2369	65	2218	5	2	1
21.09.2020	2375	65	2224	5	2	1
22.09.2020	2381	65	2230	5	2	1
23.09.2020	2386	65	2237	5	2	1
24.09.2020	2392	65	2243	5	2	1
25.09.2020	2398	65	2249	5	2	1
26.09.2020	2404	66	2256	5	2	1
27.09.2020	2410	66	2262	5	2	1
28.09.2020	2416	66	2268	4	2	1
29.09.2020	2422	66	2274	4	2	1
30.09.2020	2428	66	2280	4	2	1
01.10.2020	2434	66	2286	4	2	1
02.10.2020	2440	66	2292	4	2	1
03.10.2020	2446	66	2298	4	2	1
04.10.2020	2451	66	2304	4	2	1
05.10.2020	2457	66	2311	4	2	1
06.10.2020	2463	66	2317	4	2	1
07.10.2020	2469	66	2323	4	2	1

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	2310	65	2150	5	3	2
11.09.2020	2316	65	2157	5	3	2
12.09.2020	2322	65	2164	5	3	2
13.09.2020	2329	65	2171	5	3	2
14.09.2020	2336	65	2178	5	3	2
15.09.2020	2342	65	2185	5	3	2
16.09.2020	2350	65	2192	5	3	2
17.09.2020	2357	65	2198	5	3	2
18.09.2020	2364	65	2205	5	3	2
19.09.2020	2372	65	2212	5	3	2
20.09.2020	2380	65	2219	5	3	2
21.09.2020	2388	65	2226	5	2	2
22.09.2020	2397	65	2233	5	2	2
23.09.2020	2406	65	2240	5	2	2
24.09.2020	2414	65	2247	5	2	2
25.09.2020	2424	65	2254	5	2	2
26.09.2020	2433	66	2261	5	2	2
27.09.2020	2443	66	2268	5	2	2
28.09.2020	2453	66	2276	5	2	2
29.09.2020	2463	66	2284	5	3	2
30.09.2020	2474	66	2291	5	3	2
01.10.2020	2485	66	2299	5	3	2
02.10.2020	2496	66	2307	6	3	2
03.10.2020	2507	66	2316	6	3	2
04.10.2020	2519	66	2324	6	3	2
05.10.2020	2532	66	2333	6	3	2
06.10.2020	2544	66	2342	6	3	2
07.10.2020	2557	66	2351	6	3	2

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 164 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

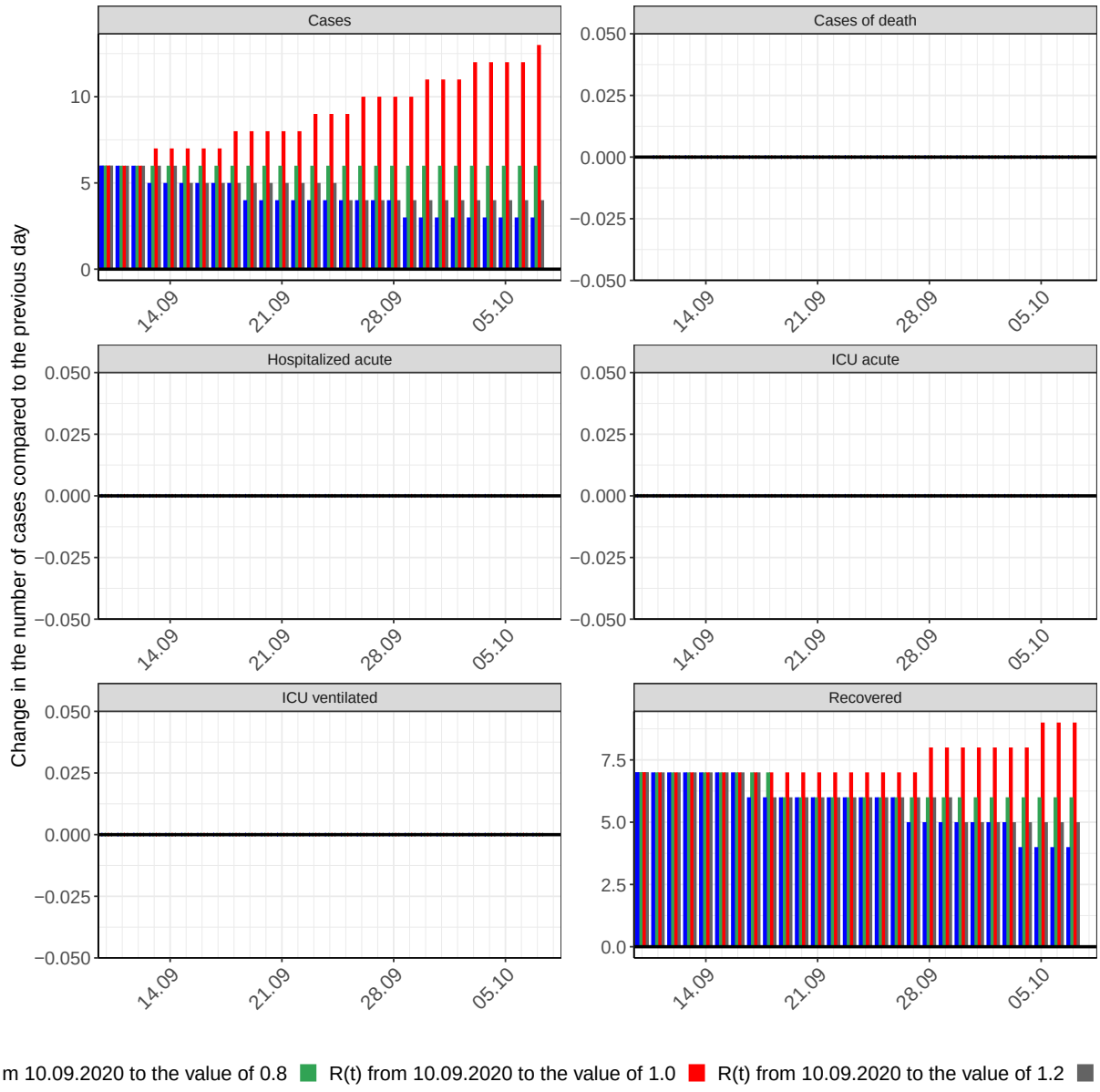


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

16 Schleswig-Holstein

16.1 Model description

Fig. 165 depicts the results of the modeling (lines) compared to the observed data (points) for Schleswig-Holstein on a linear (A) and semi-logarithmic (B) scale.

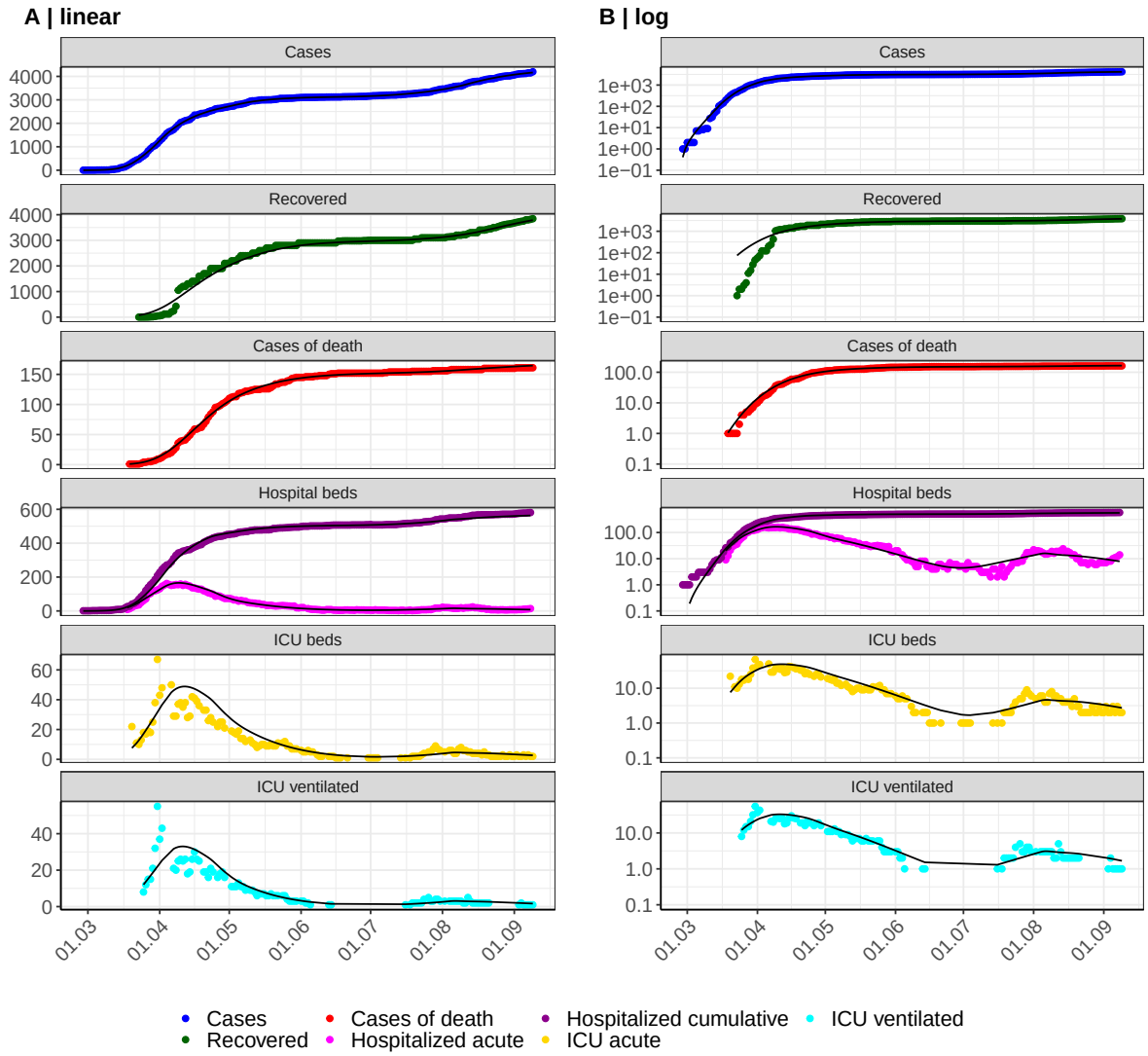


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

Fig. 166 shows the goodness-of-fit for Schleswig-Holstein. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

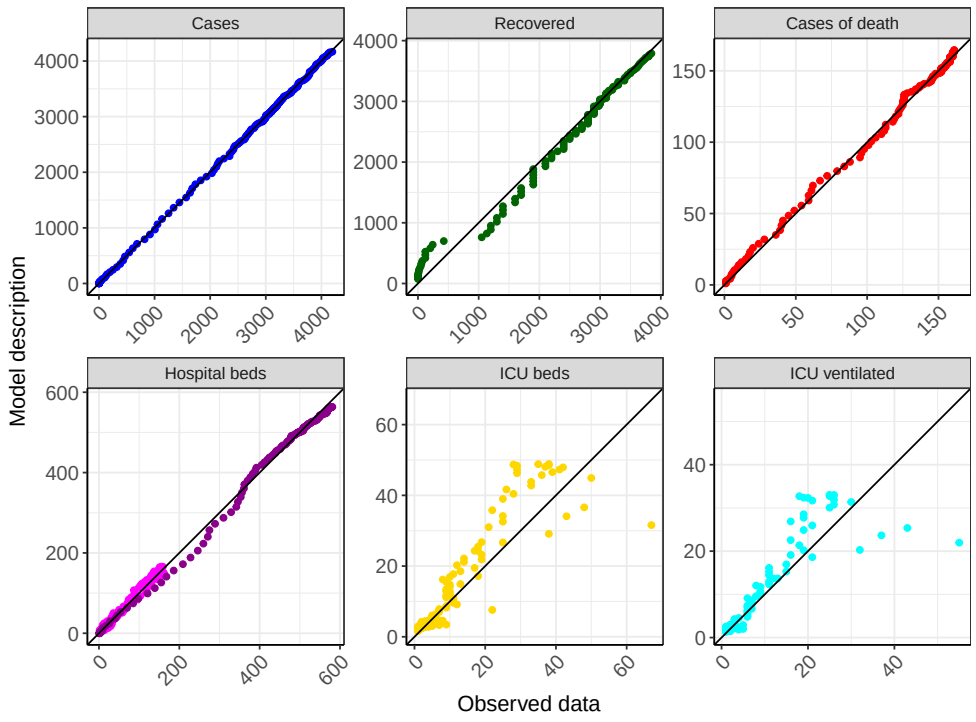


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

Fig. 167 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Schleswig-Holstein (red line) in comparison with the other federal states (grey lines).

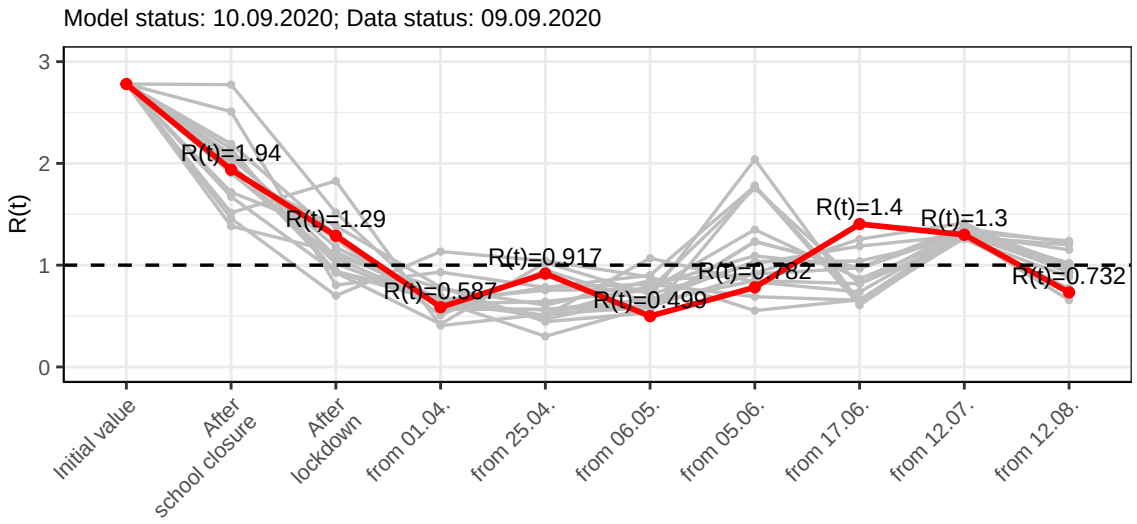


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

Fig. 168 shows the R(t) estimated value for Schleswig-Holstein (red line) over time in comparison with the other federal states (grey lines).

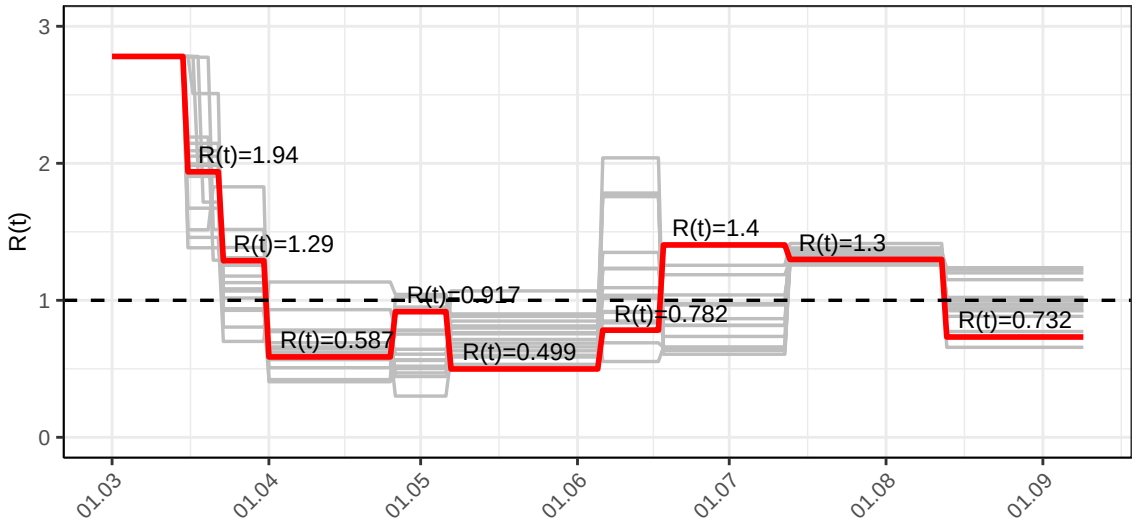


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

16.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.73)

Fig. 169 and 170 depict the the model predictions for the next 4 weeks for Schleswig-Holstein on a linear (169) and a semi-logarithmic (170) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

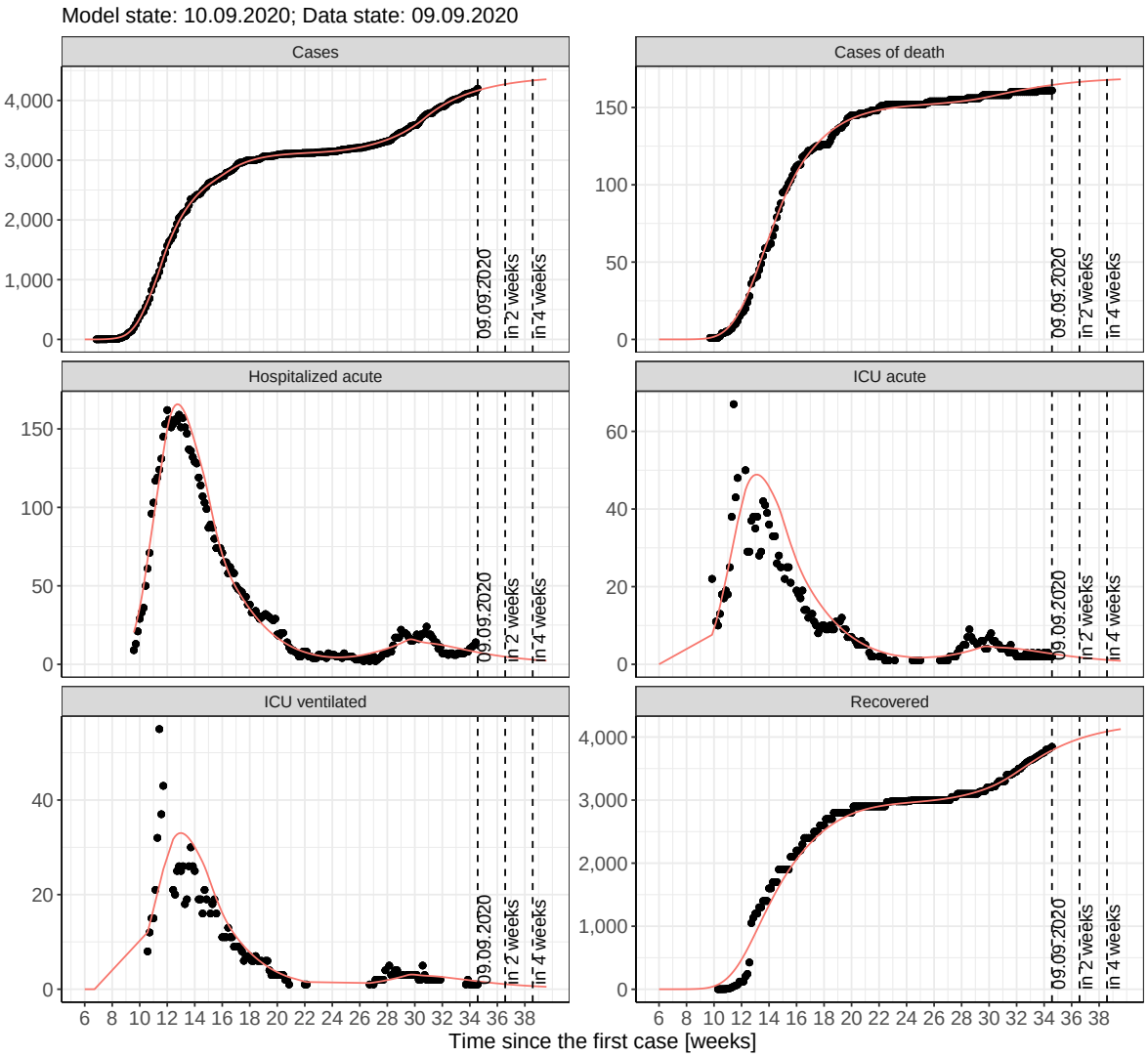


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

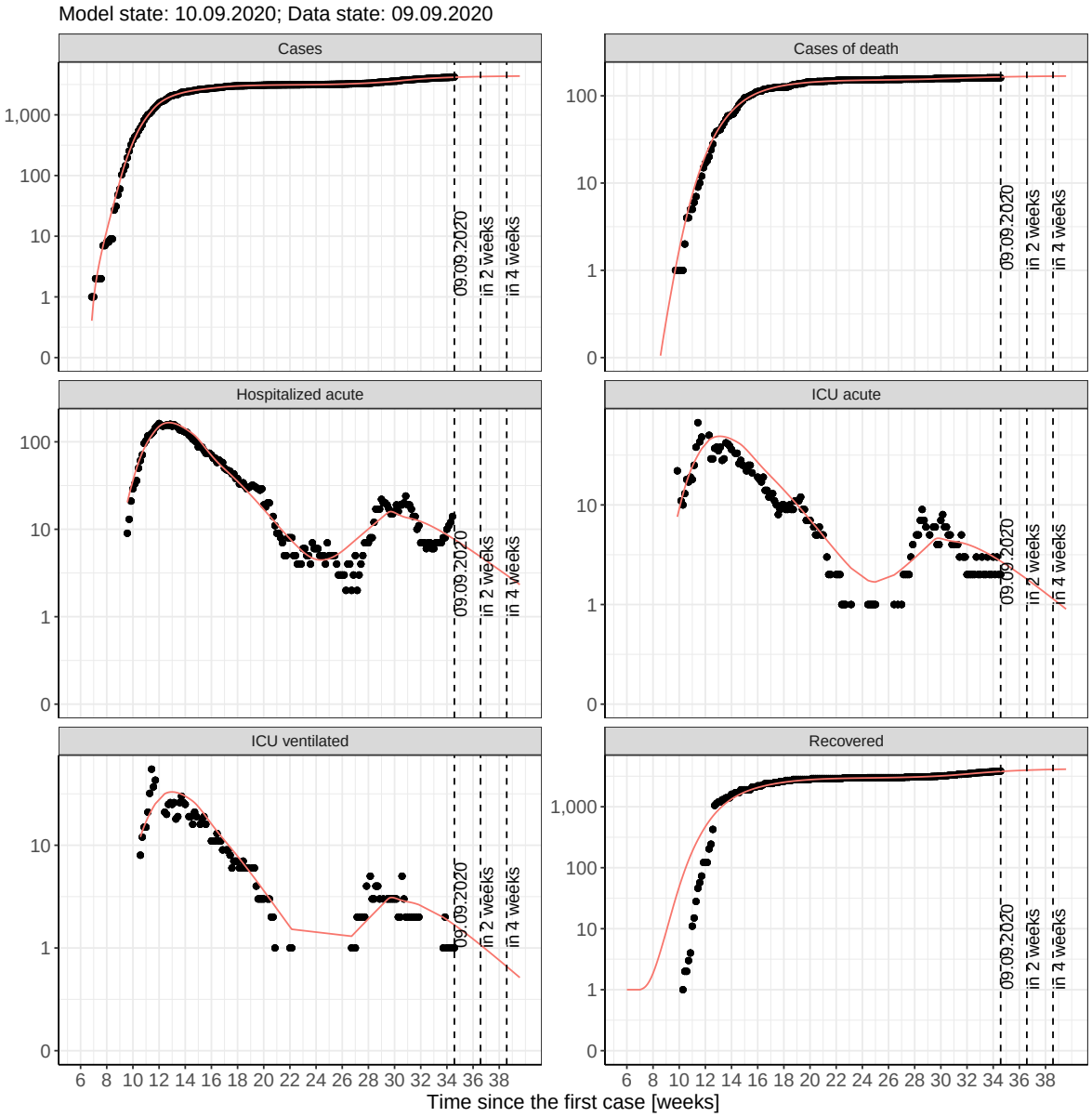


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 171 and 172 represent the model prediction for the next 4 weeks for Schleswig-Holstein on a linear (171) and a semi-logarithmic (172) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

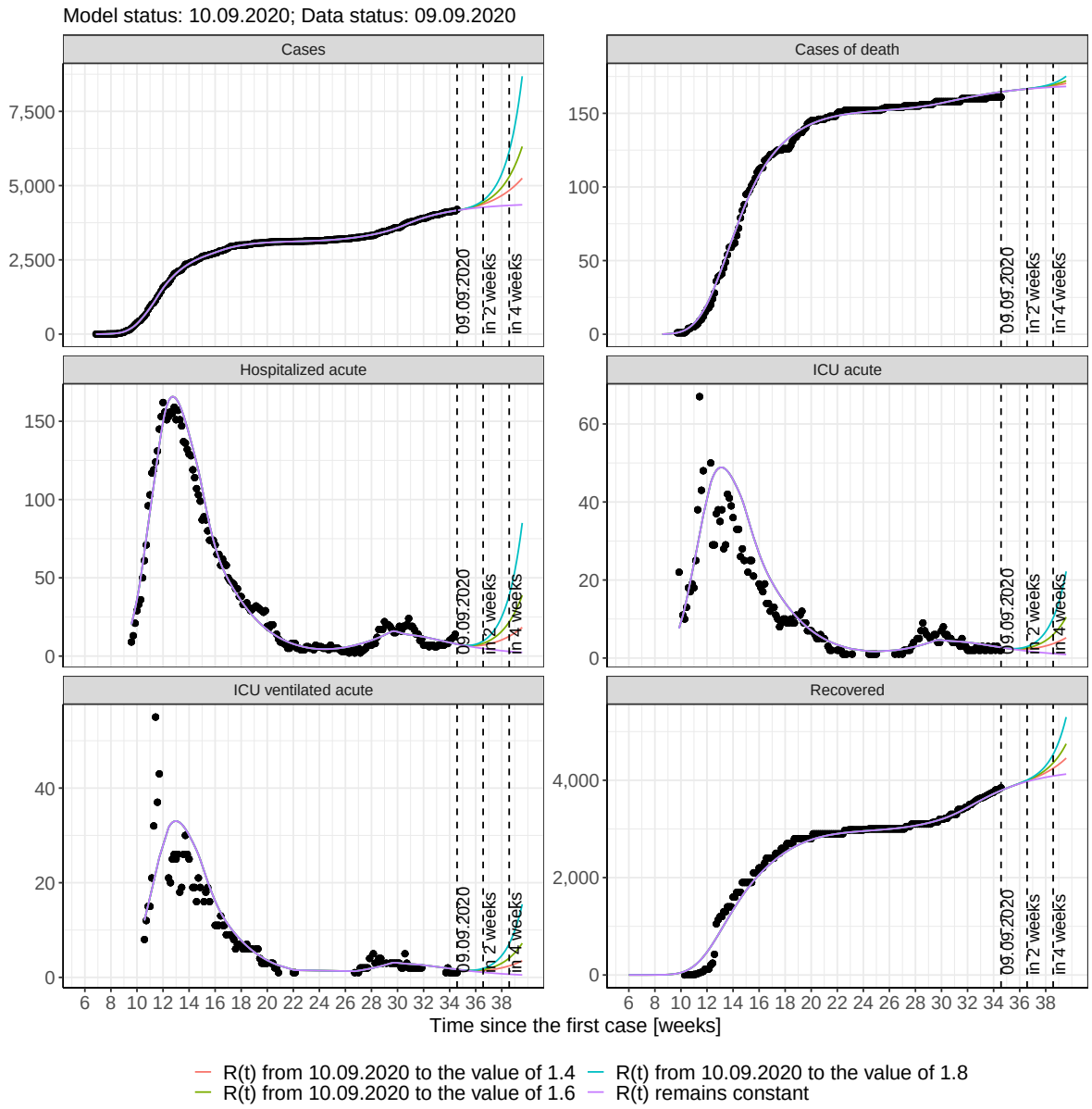


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

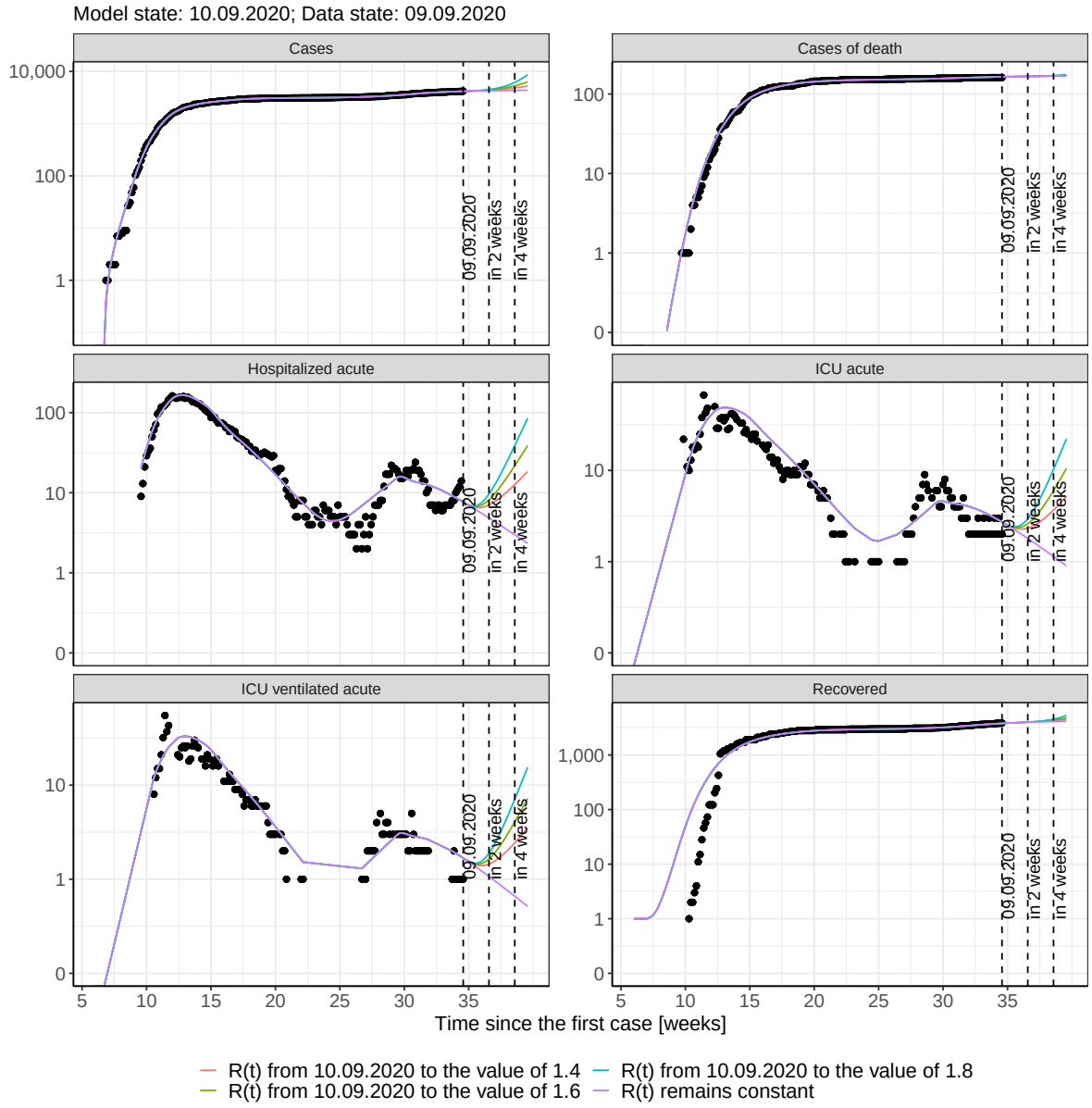


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 173 and 174 represent the model prediction for the next 16 weeks for Schleswig-Holstein on a linear (173) and a semi-logarithmic (174) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

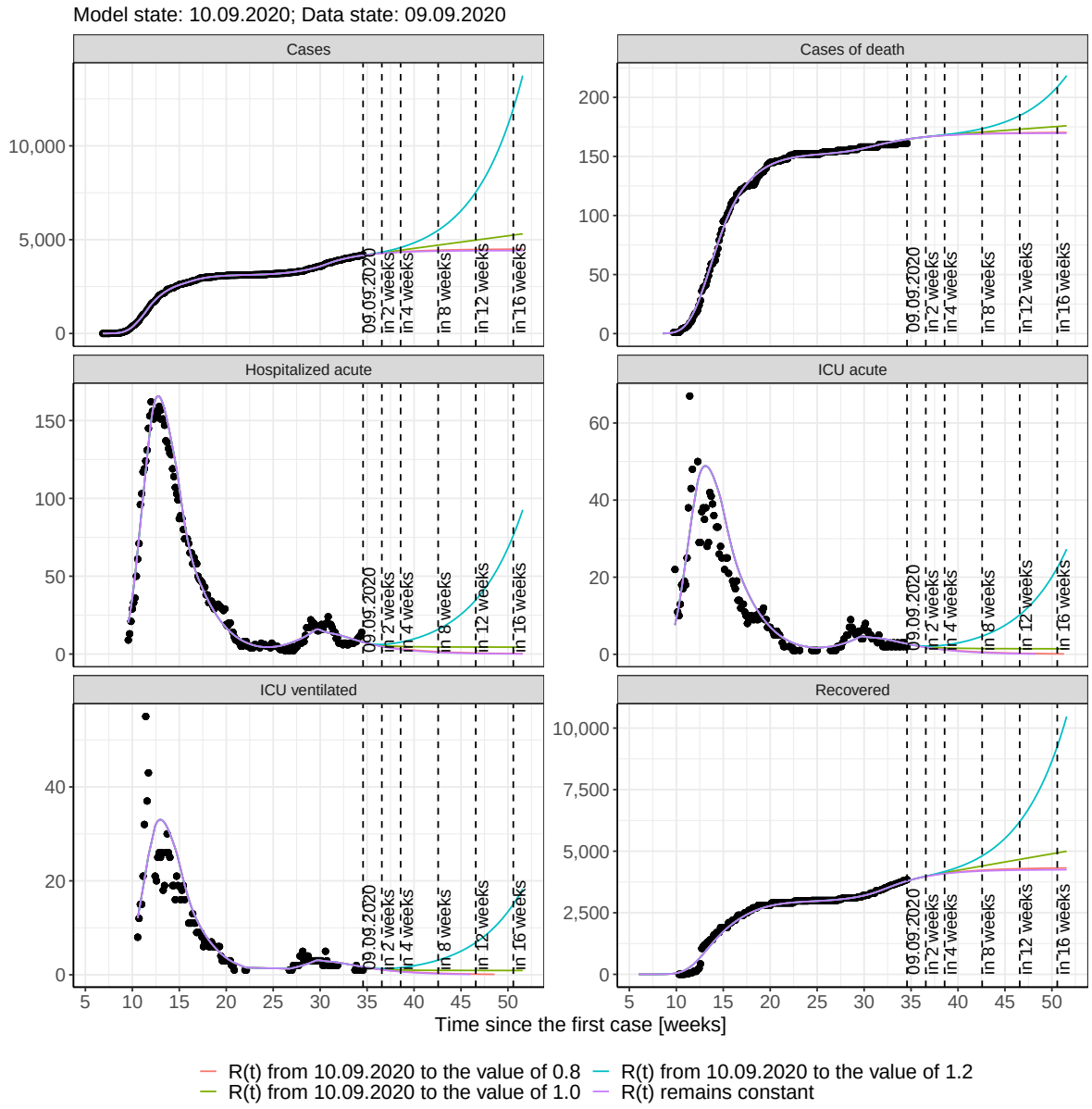


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

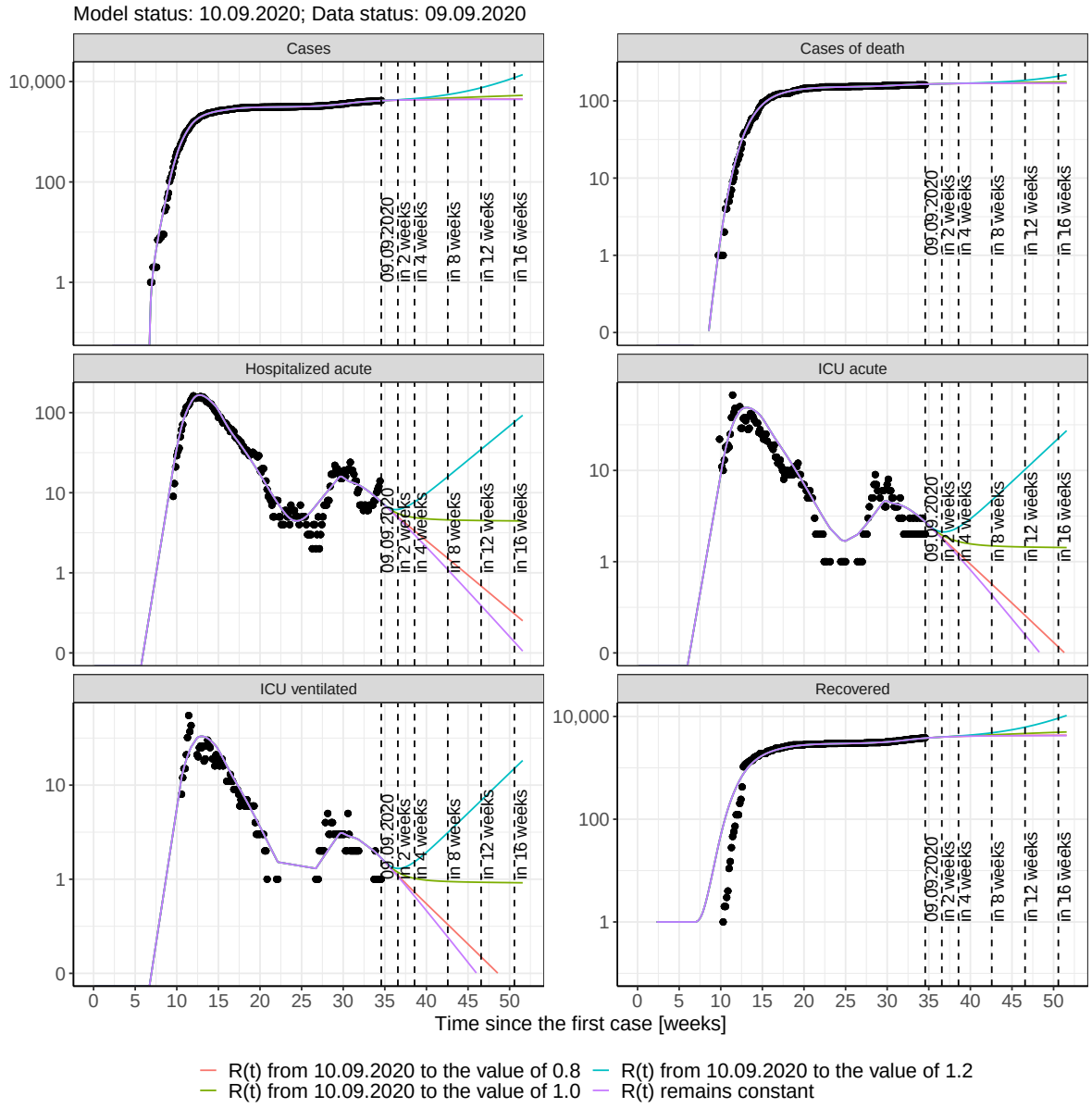


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 61) Model status from 10.09.2020; Data status: 09.09.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4176	165	3805	7	3	2
11.09.2020	4185	165	3821	7	3	2
12.09.2020	4194	165	3836	7	3	2
13.09.2020	4202	165	3851	7	2	1
14.09.2020	4211	165	3865	7	2	1
15.09.2020	4219	166	3879	6	2	1
16.09.2020	4226	166	3892	6	2	1
17.09.2020	4234	166	3905	6	2	1
18.09.2020	4240	166	3917	6	2	1
19.09.2020	4247	166	3929	6	2	1
20.09.2020	4254	166	3941	5	2	1
21.09.2020	4260	166	3952	5	2	1
22.09.2020	4266	166	3963	5	2	1
23.09.2020	4272	167	3974	5	2	1
24.09.2020	4278	167	3984	5	2	1
25.09.2020	4283	167	3994	5	2	1
26.09.2020	4288	167	4003	4	2	1
27.09.2020	4293	167	4012	4	2	1
28.09.2020	4298	167	4021	4	2	1
29.09.2020	4302	167	4030	4	1	1
30.09.2020	4307	167	4038	4	1	1
01.10.2020	4311	167	4046	4	1	1
02.10.2020	4315	167	4054	4	1	1
03.10.2020	4319	168	4061	3	1	1
04.10.2020	4323	168	4068	3	1	1
05.10.2020	4327	168	4075	3	1	1
06.10.2020	4330	168	4081	3	1	1
07.10.2020	4334	168	4088	3	1	1

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4176	165	3805	7	3	2
11.09.2020	4185	165	3821	7	3	2
12.09.2020	4194	165	3836	7	3	2
13.09.2020	4203	165	3851	7	2	1
14.09.2020	4212	165	3865	7	2	1
15.09.2020	4220	166	3879	6	2	1
16.09.2020	4228	166	3892	6	2	1
17.09.2020	4236	166	3905	6	2	1
18.09.2020	4244	166	3918	6	2	1
19.09.2020	4251	166	3930	6	2	1
20.09.2020	4258	166	3942	5	2	1
21.09.2020	4265	166	3953	5	2	1
22.09.2020	4272	166	3964	5	2	1
23.09.2020	4279	167	3975	5	2	1
24.09.2020	4285	167	3985	5	2	1
25.09.2020	4291	167	3996	5	2	1
26.09.2020	4297	167	4005	5	2	1
27.09.2020	4303	167	4015	4	2	1
28.09.2020	4309	167	4024	4	2	1
29.09.2020	4315	167	4033	4	2	1
30.09.2020	4320	167	4042	4	2	1
01.10.2020	4325	167	4050	4	1	1
02.10.2020	4330	167	4058	4	1	1
03.10.2020	4335	168	4066	4	1	1
04.10.2020	4340	168	4074	4	1	1
05.10.2020	4345	168	4082	4	1	1
06.10.2020	4349	168	4089	3	1	1
07.10.2020	4354	168	4096	3	1	1

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4176	165	3805	7	3	2
11.09.2020	4186	165	3821	7	3	2
12.09.2020	4196	165	3836	7	3	2
13.09.2020	4205	165	3851	7	2	1
14.09.2020	4215	165	3865	7	2	1
15.09.2020	4225	166	3879	6	2	1
16.09.2020	4234	166	3892	6	2	1
17.09.2020	4244	166	3906	6	2	1
18.09.2020	4254	166	3918	6	2	1
19.09.2020	4264	166	3931	6	2	1
20.09.2020	4273	166	3943	6	2	1
21.09.2020	4283	166	3955	6	2	1
22.09.2020	4293	166	3967	6	2	1
23.09.2020	4303	167	3979	6	2	1
24.09.2020	4312	167	3990	5	2	1
25.09.2020	4322	167	4002	5	2	1
26.09.2020	4332	167	4013	5	2	1
27.09.2020	4342	167	4024	5	2	1
28.09.2020	4351	167	4034	5	2	1
29.09.2020	4361	167	4045	5	2	1
30.09.2020	4371	167	4056	5	2	1
01.10.2020	4380	167	4066	5	2	1
02.10.2020	4390	168	4077	5	2	1
03.10.2020	4400	168	4087	5	2	1
04.10.2020	4409	168	4097	5	2	1
05.10.2020	4419	168	4107	5	2	1
06.10.2020	4429	168	4117	5	2	1
07.10.2020	4438	168	4128	5	2	1

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	4176	165	3805	7	3	2
11.09.2020	4186	165	3821	7	3	2
12.09.2020	4197	165	3836	7	3	2
13.09.2020	4208	165	3851	7	2	1
14.09.2020	4219	165	3865	7	2	1
15.09.2020	4230	166	3879	7	2	1
16.09.2020	4242	166	3893	6	2	1
17.09.2020	4254	166	3906	6	2	1
18.09.2020	4266	166	3919	6	2	1
19.09.2020	4279	166	3932	6	2	1
20.09.2020	4292	166	3945	6	2	1
21.09.2020	4306	166	3958	6	2	1
22.09.2020	4320	166	3971	6	2	1
23.09.2020	4334	167	3984	6	2	1
24.09.2020	4348	167	3996	6	2	1
25.09.2020	4364	167	4009	6	2	1
26.09.2020	4379	167	4022	6	2	1
27.09.2020	4395	167	4035	6	2	1
28.09.2020	4412	167	4048	6	2	1
29.09.2020	4429	167	4061	7	2	1
30.09.2020	4446	167	4074	7	2	1
01.10.2020	4464	168	4088	7	2	1
02.10.2020	4482	168	4101	7	2	1
03.10.2020	4501	168	4115	7	2	1
04.10.2020	4521	168	4130	7	2	1
05.10.2020	4541	168	4144	7	2	1
06.10.2020	4562	168	4159	7	2	2
07.10.2020	4583	168	4174	8	2	2

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 175 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

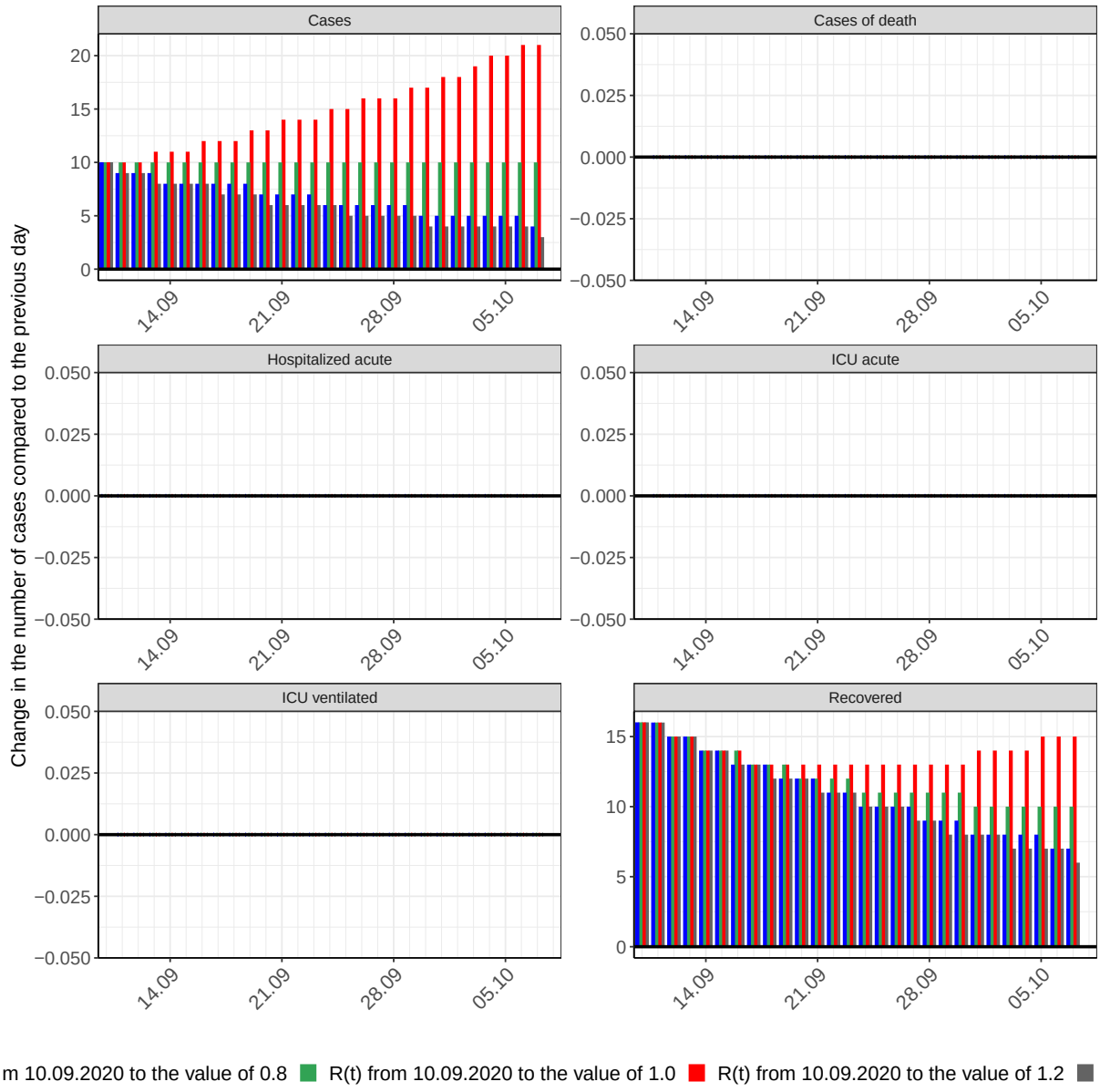


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

17 Thuringia

17.1 Model description

Fig. 176 depicts the results of the modeling (lines) compared to the observed data (points) for Thuringia on a linear (A) and semi-logarithmic (B) scale.

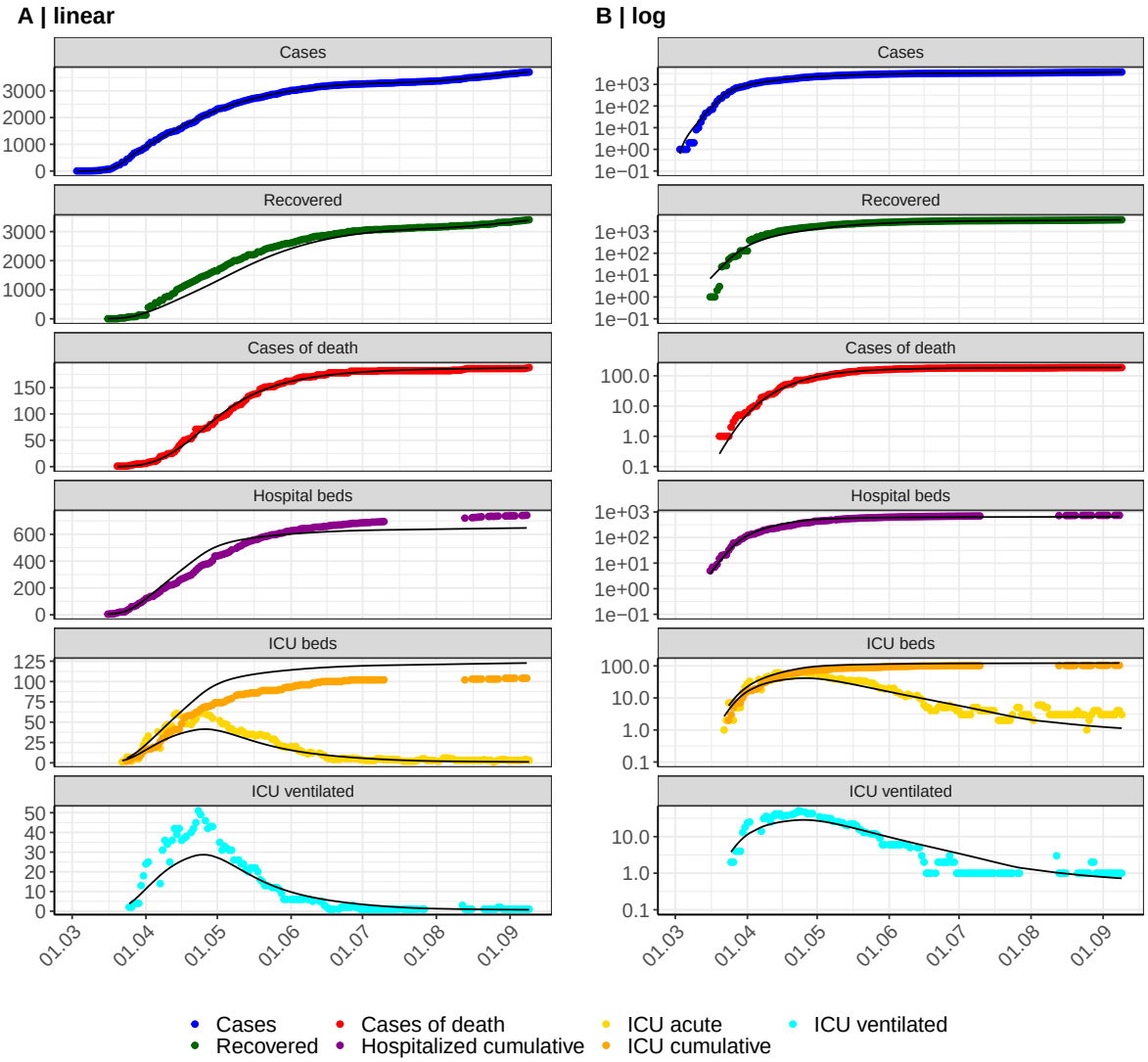


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

Fig. 177 shows the goodness-of-fit for Thuringia. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

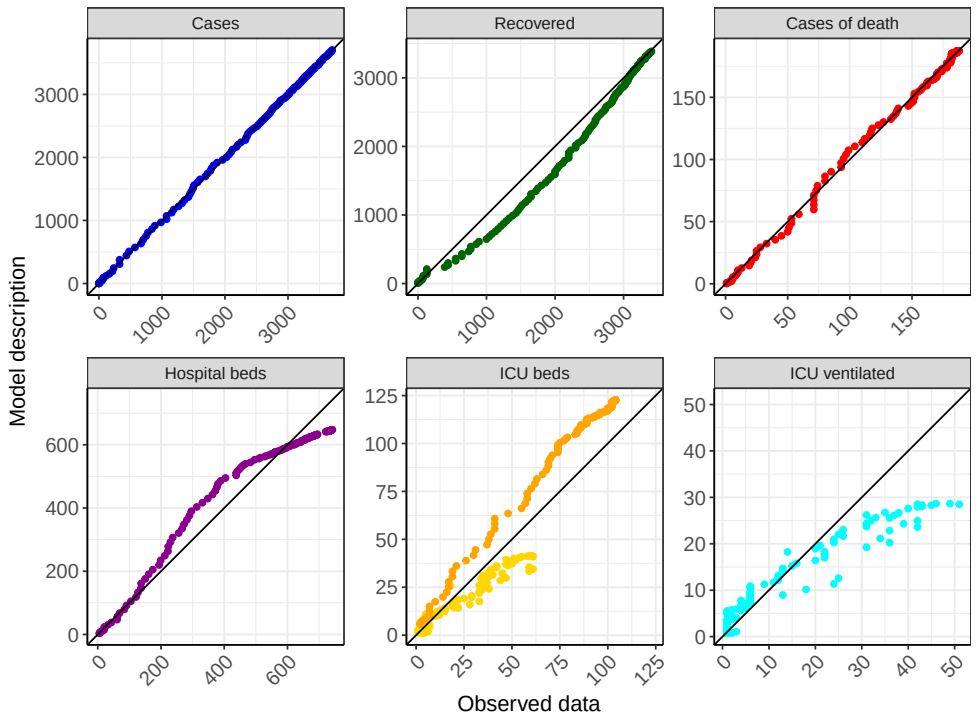


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

Fig. 178 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Thuringia (red line) in comparison with the other federal states (grey lines).

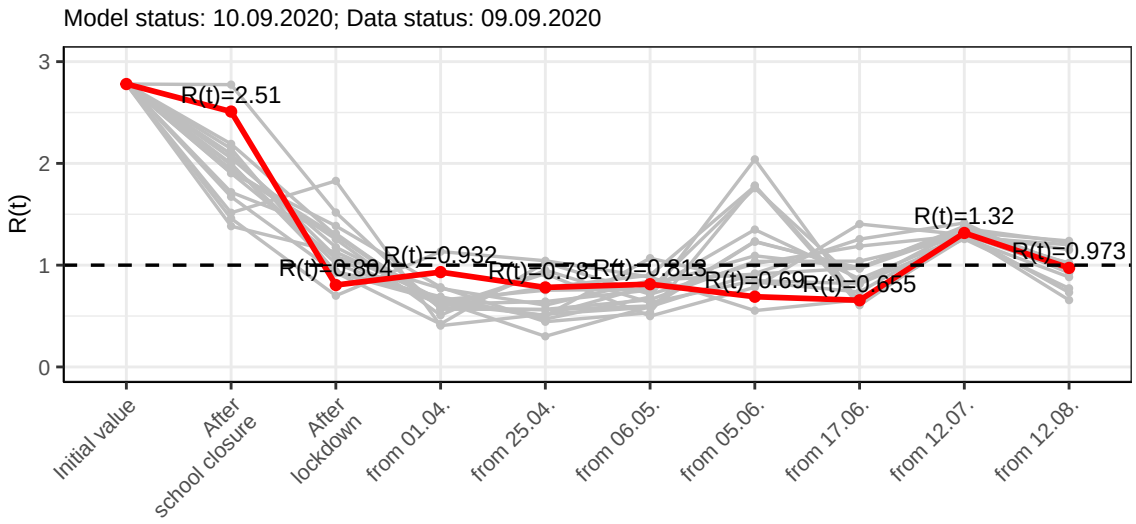


Figure 178: R(t) values before and after the NPIs for Thuringia

Fig. 179 shows the R(t) estimated value for Thuringia (red line) over time in comparison with the other federal states (grey lines).

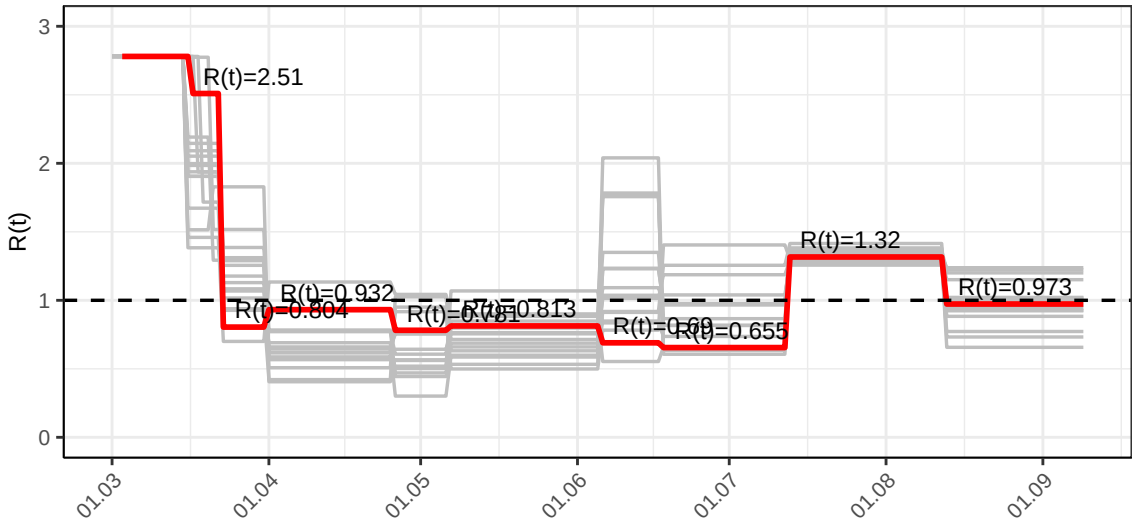


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

17.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.97)

Fig. 180 and 181 depict the the model predictions for the next 4 weeks for Thuringia on a linear (180) and a semi-logarithmic (181) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

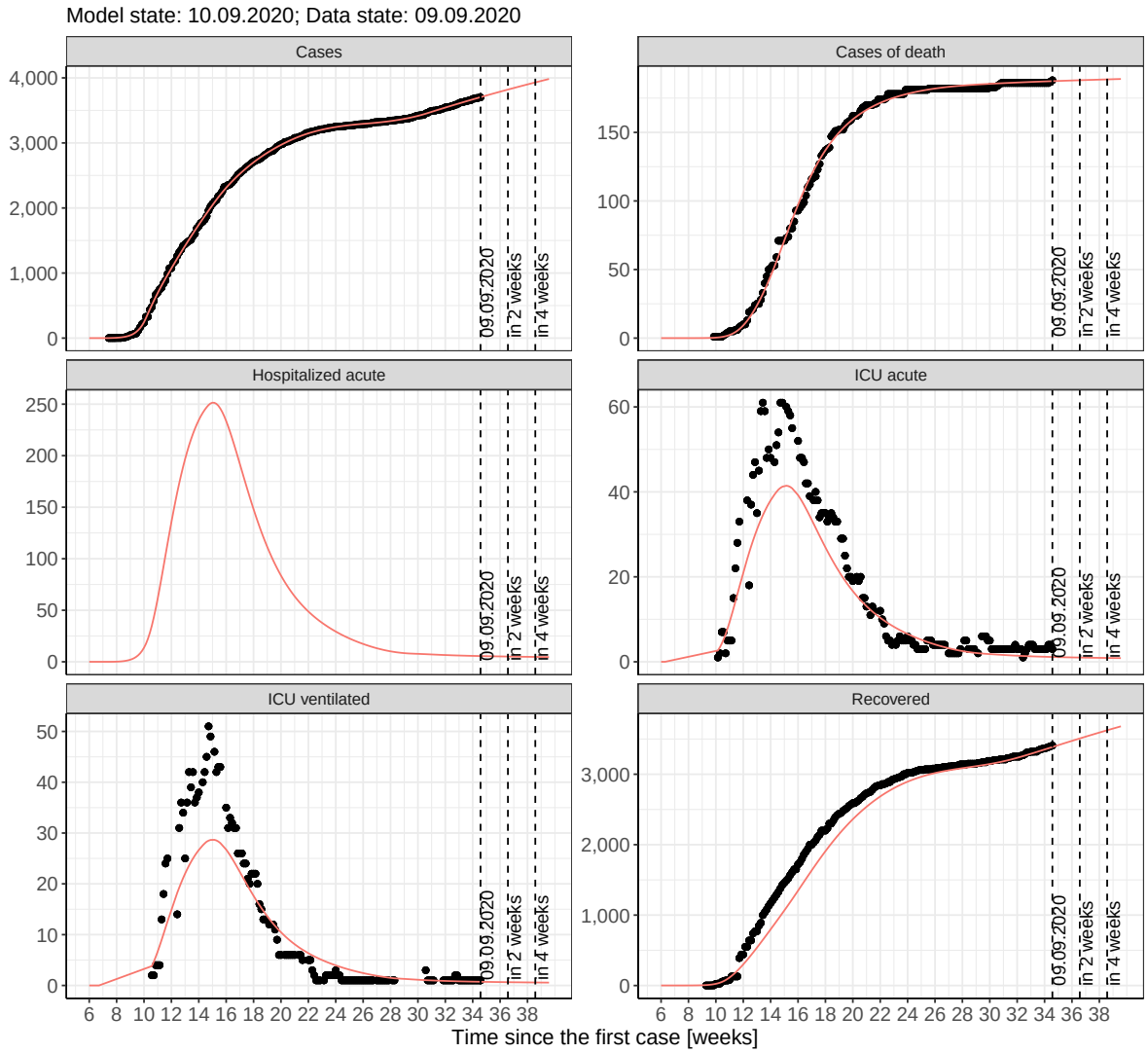


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

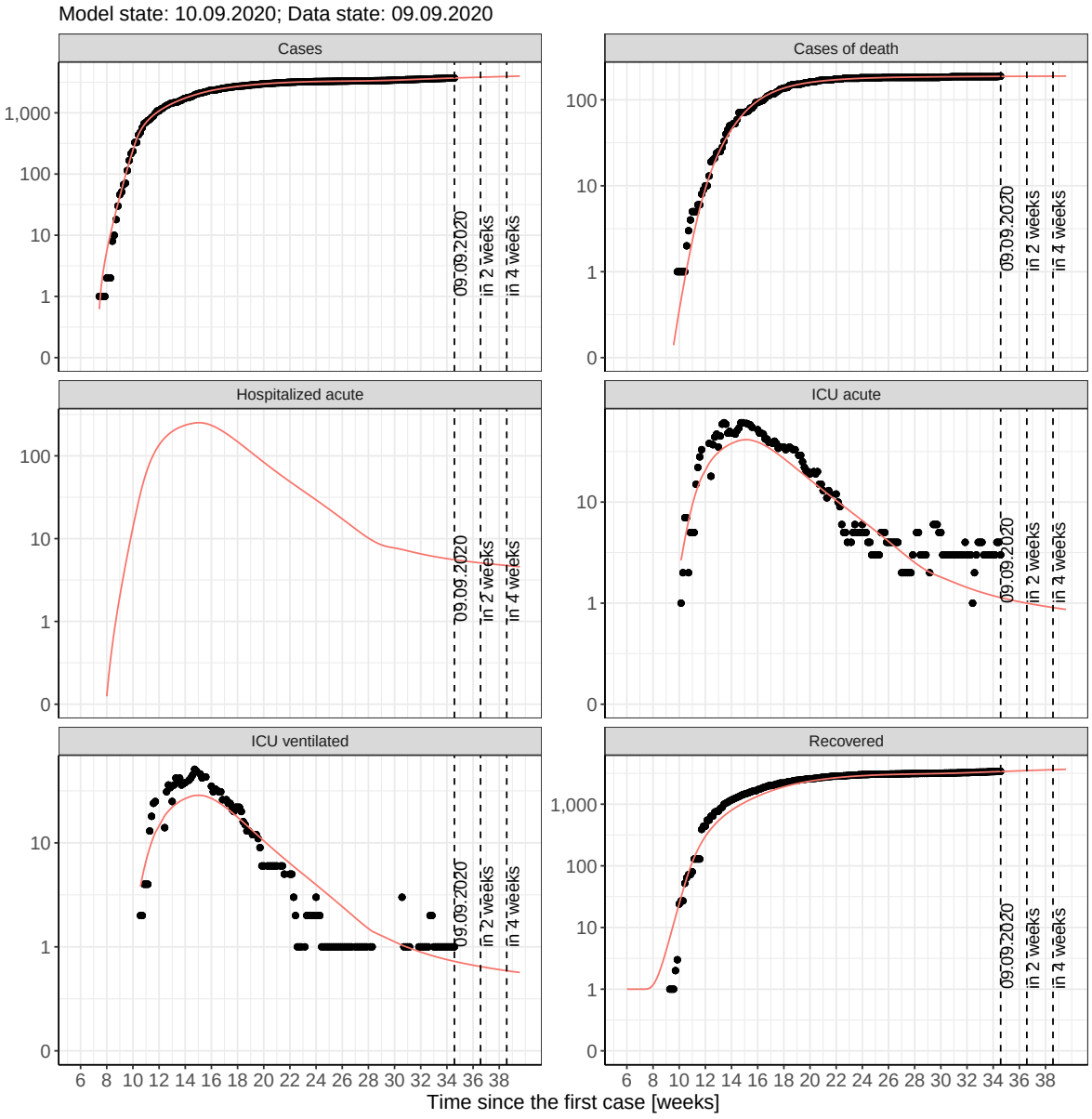


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 182 and 183 represent the model prediction for the next 4 weeks for Thuringia on a linear (182) and a semi-logarithmic (183) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

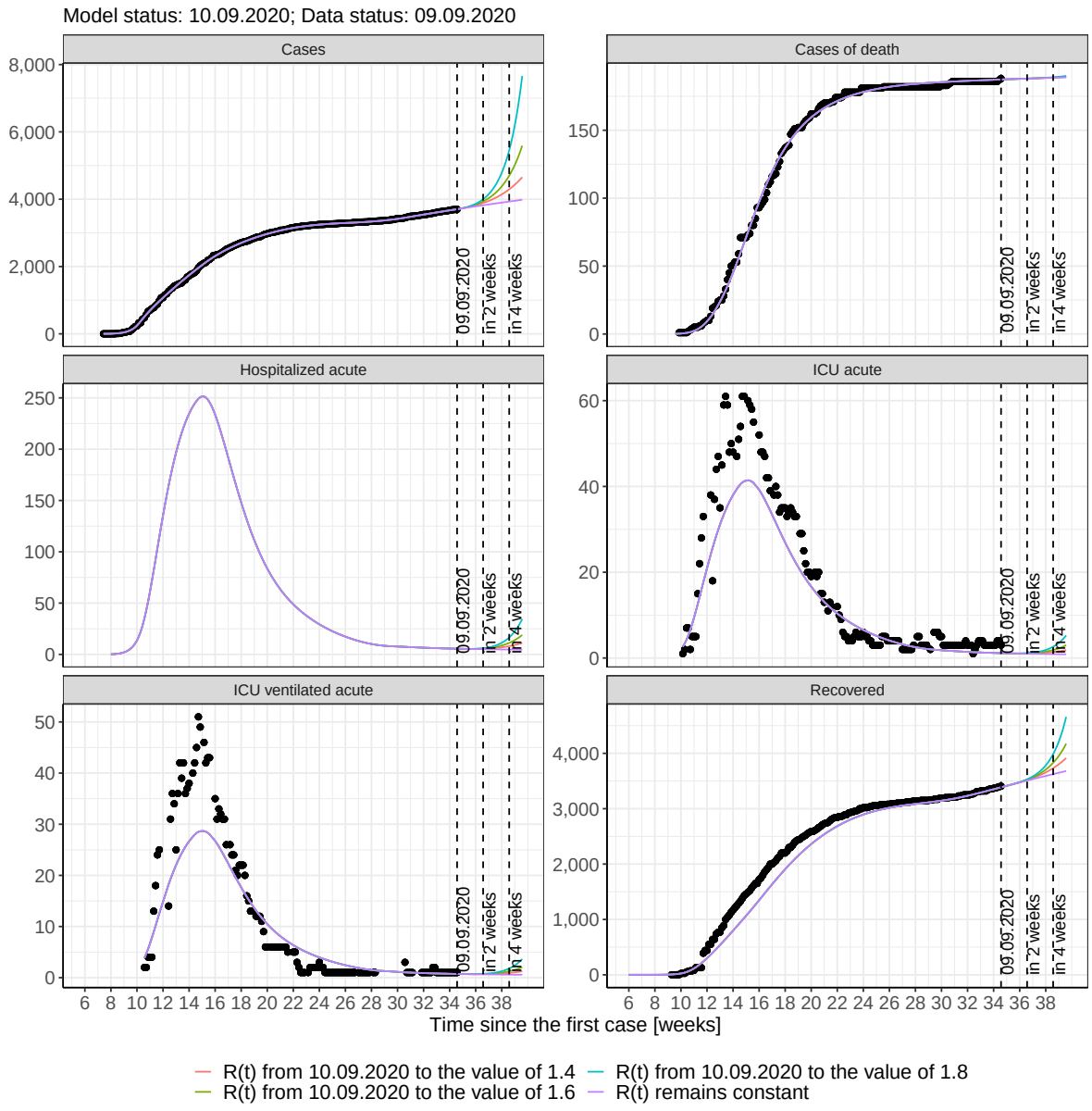


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

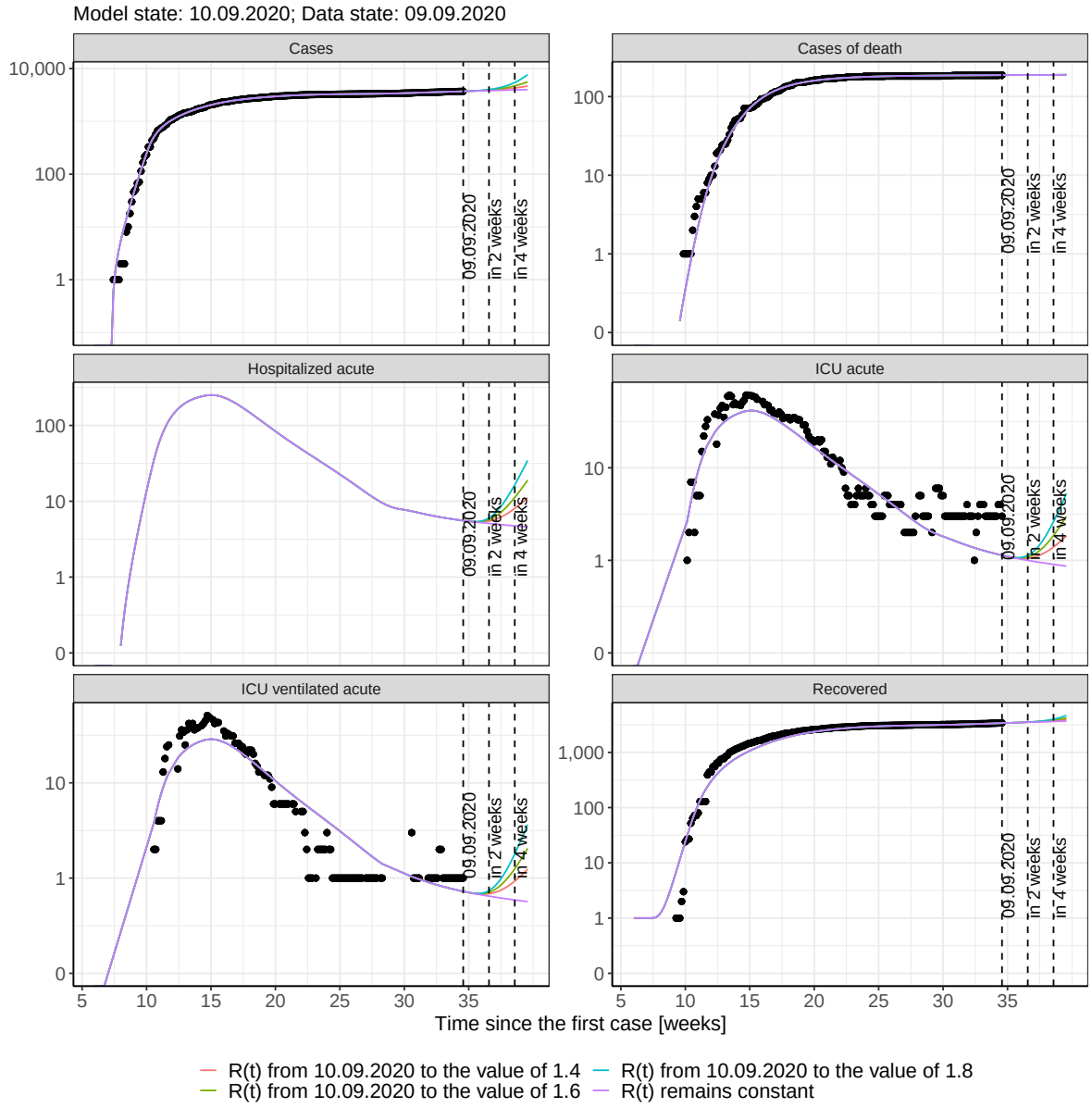


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 184 and 185 represent the model prediction for the next 16 weeks for Thuringia on a linear (184) and a semi-logarithmic (185) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

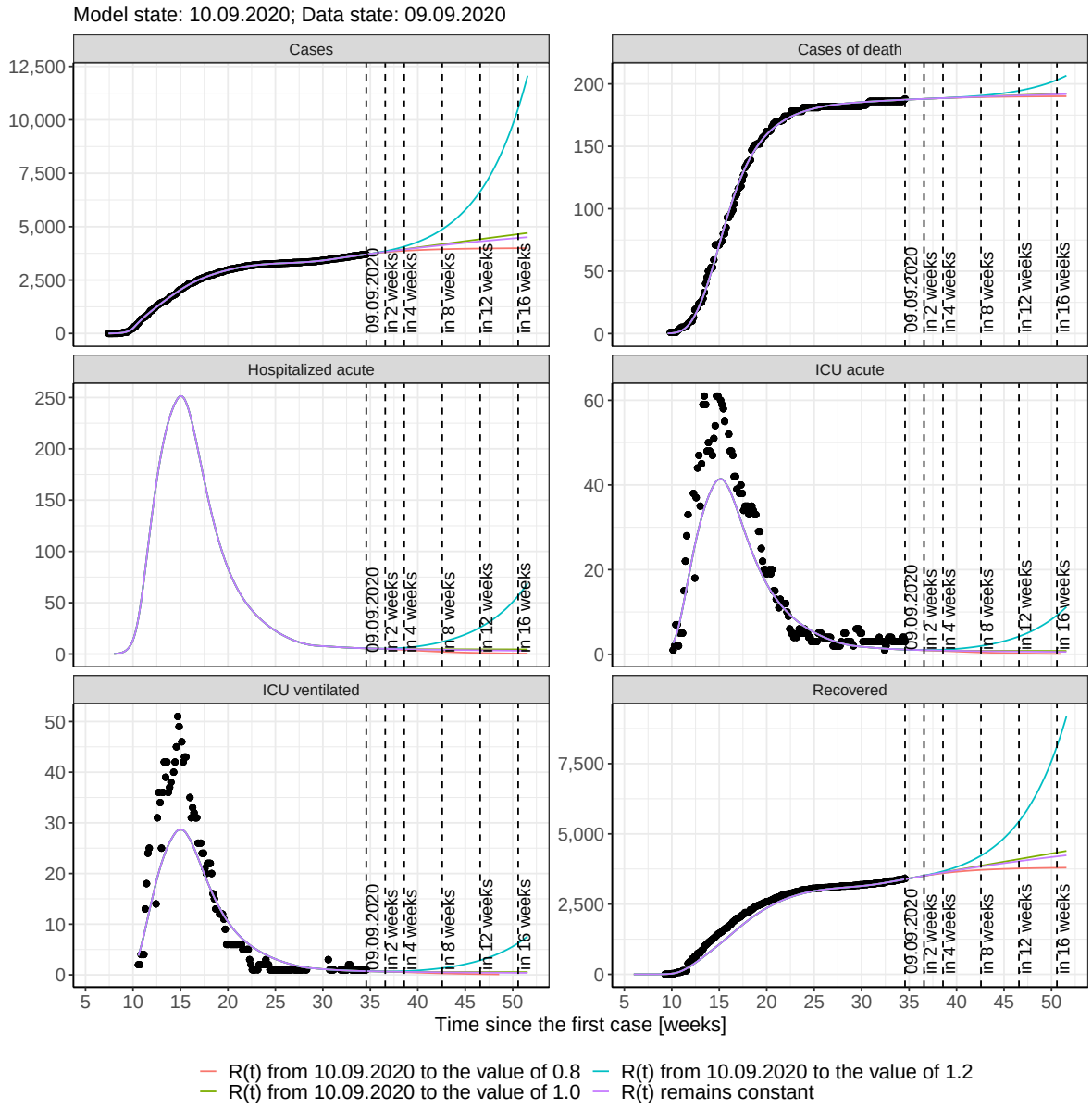


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

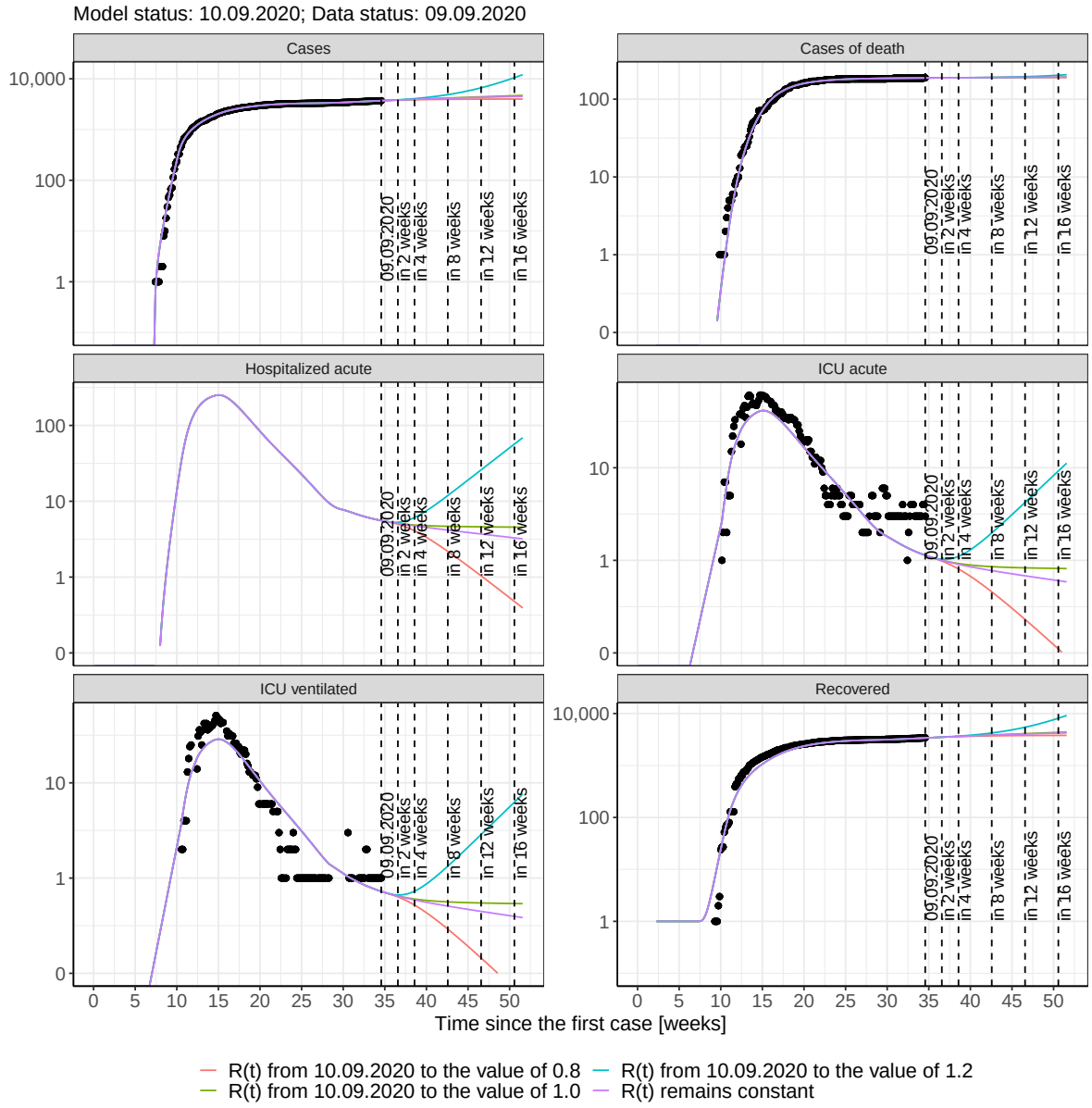


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 65) Model status from 10.09.2020; Data status: 09.09.2020.

Table 62: Thuringia - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3712	187	3395	6	1	1
11.09.2020	3721	187	3404	5	1	1
12.09.2020	3729	188	3413	5	1	1
13.09.2020	3738	188	3422	5	1	1
14.09.2020	3746	188	3430	5	1	1
15.09.2020	3754	188	3439	5	1	1
16.09.2020	3763	188	3448	5	1	1
17.09.2020	3771	188	3456	5	1	1
18.09.2020	3779	188	3465	5	1	1
19.09.2020	3788	188	3474	5	1	1
20.09.2020	3796	188	3482	5	1	1
21.09.2020	3804	188	3491	5	1	1
22.09.2020	3812	188	3500	5	1	1
23.09.2020	3820	188	3508	5	1	1
24.09.2020	3828	188	3517	5	1	1
25.09.2020	3836	188	3525	5	1	1
26.09.2020	3844	188	3534	5	1	1
27.09.2020	3852	188	3542	5	1	1
28.09.2020	3860	188	3550	5	1	1
29.09.2020	3868	188	3559	5	1	1
30.09.2020	3876	188	3567	5	1	1
01.10.2020	3884	188	3575	5	1	1
02.10.2020	3892	188	3584	5	1	1
03.10.2020	3899	188	3592	5	1	1
04.10.2020	3907	189	3600	5	1	1
05.10.2020	3915	189	3608	5	1	1
06.10.2020	3922	189	3616	5	1	1
07.10.2020	3930	189	3624	5	1	1

Table 63: Thuringia - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3712	187	3395	6	1	1
11.09.2020	3720	187	3404	5	1	1
12.09.2020	3728	188	3413	5	1	1
13.09.2020	3736	188	3422	5	1	1
14.09.2020	3743	188	3430	5	1	1
15.09.2020	3751	188	3439	5	1	1
16.09.2020	3758	188	3448	5	1	1
17.09.2020	3765	188	3456	5	1	1
18.09.2020	3772	188	3464	5	1	1
19.09.2020	3778	188	3473	5	1	1
20.09.2020	3784	188	3481	5	1	1
21.09.2020	3790	188	3489	5	1	1
22.09.2020	3796	188	3497	5	1	1
23.09.2020	3802	188	3505	5	1	1
24.09.2020	3808	188	3513	5	1	1
25.09.2020	3813	188	3520	5	1	1
26.09.2020	3819	188	3528	5	1	1
27.09.2020	3824	188	3535	5	1	1
28.09.2020	3829	188	3543	5	1	1
29.09.2020	3834	188	3550	5	1	1
30.09.2020	3839	188	3557	5	1	1
01.10.2020	3843	188	3563	4	1	1
02.10.2020	3848	188	3570	4	1	1
03.10.2020	3852	188	3576	4	1	1
04.10.2020	3856	188	3583	4	1	1
05.10.2020	3860	189	3589	4	1	1
06.10.2020	3864	189	3595	4	1	1
07.10.2020	3868	189	3601	4	1	1

Table 64: Thuringia - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3712	187	3395	6	1	1
11.09.2020	3721	187	3404	5	1	1
12.09.2020	3729	188	3413	5	1	1
13.09.2020	3738	188	3422	5	1	1
14.09.2020	3746	188	3430	5	1	1
15.09.2020	3755	188	3439	5	1	1
16.09.2020	3764	188	3448	5	1	1
17.09.2020	3772	188	3456	5	1	1
18.09.2020	3781	188	3465	5	1	1
19.09.2020	3789	188	3474	5	1	1
20.09.2020	3798	188	3483	5	1	1
21.09.2020	3806	188	3491	5	1	1
22.09.2020	3815	188	3500	5	1	1
23.09.2020	3823	188	3509	5	1	1
24.09.2020	3832	188	3517	5	1	1
25.09.2020	3840	188	3526	5	1	1
26.09.2020	3849	188	3534	5	1	1
27.09.2020	3857	188	3543	5	1	1
28.09.2020	3866	188	3552	5	1	1
29.09.2020	3874	188	3560	5	1	1
30.09.2020	3883	188	3569	5	1	1
01.10.2020	3892	188	3577	5	1	1
02.10.2020	3900	188	3586	5	1	1
03.10.2020	3908	188	3594	5	1	1
04.10.2020	3917	189	3603	5	1	1
05.10.2020	3926	189	3612	5	1	1
06.10.2020	3934	189	3620	5	1	1
07.10.2020	3943	189	3629	5	1	1

Table 65: Thuringia - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	3712	187	3395	6	1	1
11.09.2020	3721	187	3404	5	1	1
12.09.2020	3730	188	3413	5	1	1
13.09.2020	3740	188	3422	5	1	1
14.09.2020	3750	188	3430	5	1	1
15.09.2020	3760	188	3439	5	1	1
16.09.2020	3770	188	3448	5	1	1
17.09.2020	3780	188	3457	5	1	1
18.09.2020	3791	188	3466	5	1	1
19.09.2020	3803	188	3475	5	1	1
20.09.2020	3814	188	3484	5	1	1
21.09.2020	3826	188	3494	5	1	1
22.09.2020	3838	188	3503	5	1	1
23.09.2020	3851	188	3513	5	1	1
24.09.2020	3864	188	3522	5	1	1
25.09.2020	3877	188	3532	5	1	1
26.09.2020	3891	188	3542	5	1	1
27.09.2020	3905	188	3553	5	1	1
28.09.2020	3919	188	3563	5	1	1
29.09.2020	3934	188	3574	5	1	1
30.09.2020	3949	188	3585	6	1	1
01.10.2020	3965	188	3596	6	1	1
02.10.2020	3981	188	3608	6	1	1
03.10.2020	3998	188	3620	6	1	1
04.10.2020	4015	189	3632	6	1	1
05.10.2020	4033	189	3644	6	1	1
06.10.2020	4051	189	3657	6	1	1
07.10.2020	4069	189	3670	6	1	1

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 186 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

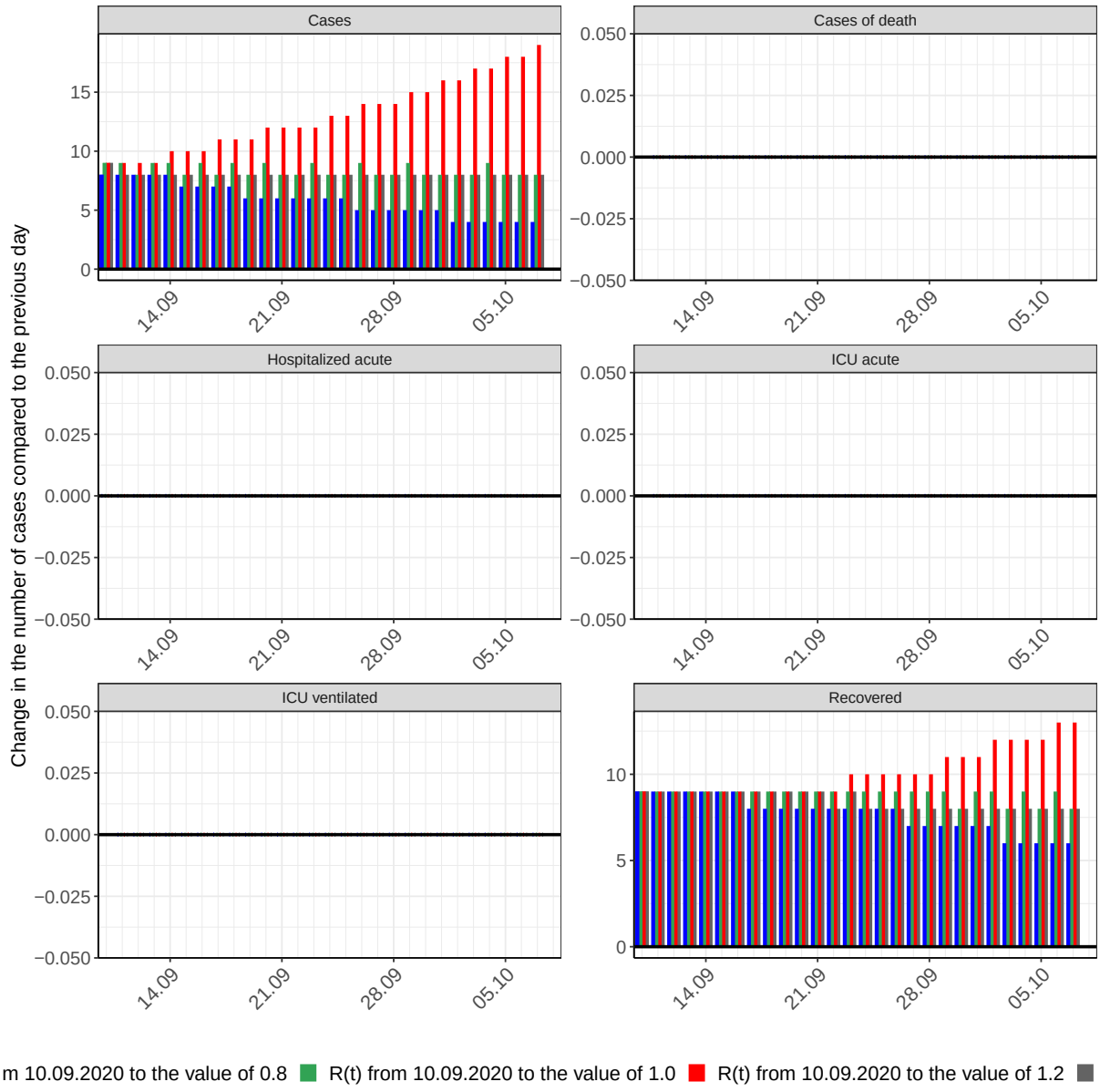


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

18 Germany

18.1 Model description

Fig. 187 depicts the results of the modeling (lines) compared to the observed data (points) for Germany on a linear (A) and semi-logarithmic (B) scale.

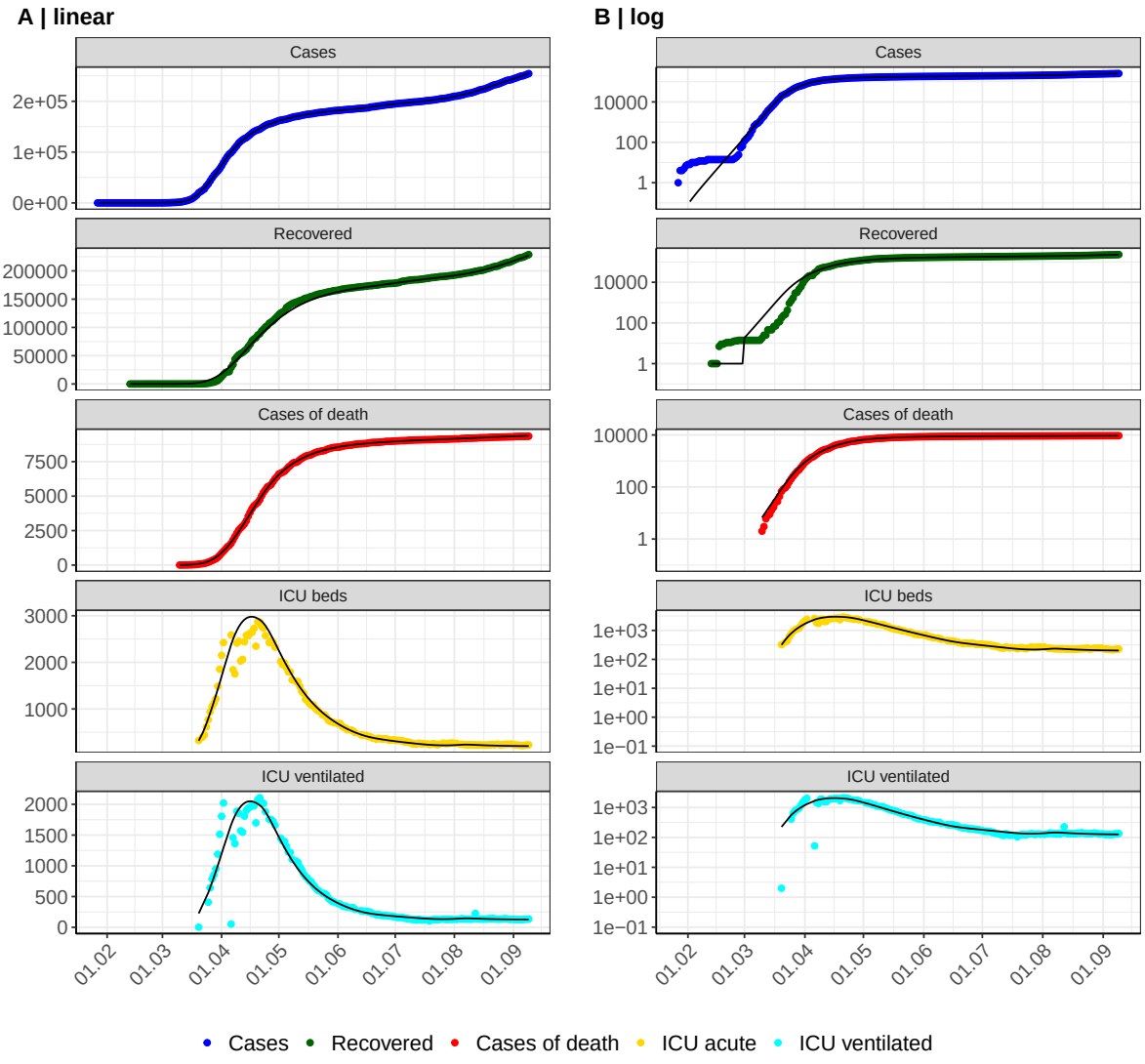


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

Fig. 188 shows the goodness-of-fit for Germany. The values calculated by the model are plotted against the observed data. If the model fit is good, the points scatter randomly along the lines of identity.

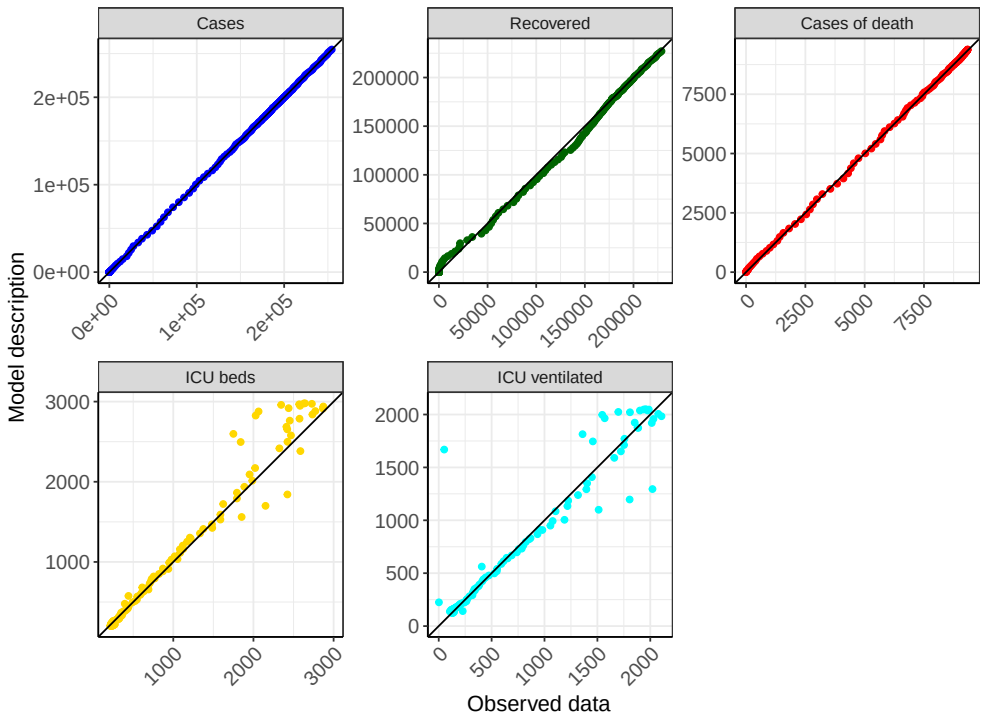


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

Fig. 189 shows the influence of non-pharmaceutical interventions (NPI) on R(t) for Germany (red line) in comparison with the other federal states (grey lines).

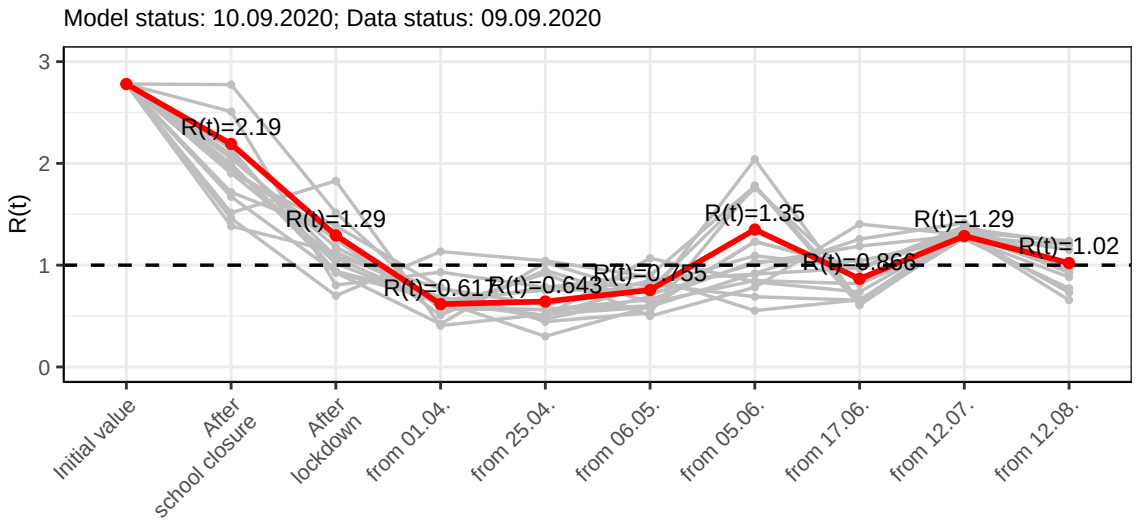


Figure 189: R(t) values before and after the NPIs for Germany

Fig. 190 shows the R(t) estimated value for Germany (red line) over time in comparison with the other federal states (grey lines).

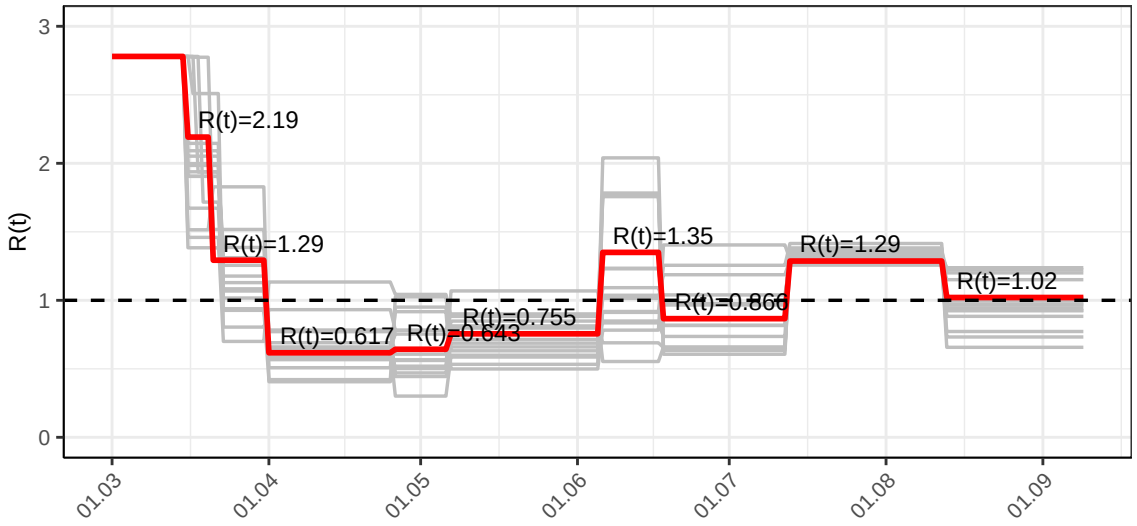


Figure 190: R(t) values over time for Germany

18.2 Model predictions

18.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.02)

Fig. 191 and 192 depict the the model predictions for the next 4 weeks for Germany on a linear (191) and a semi-logarithmic (192) scale. The modeling was carried out under the assumption that the R(t) estimated value would remain the same.

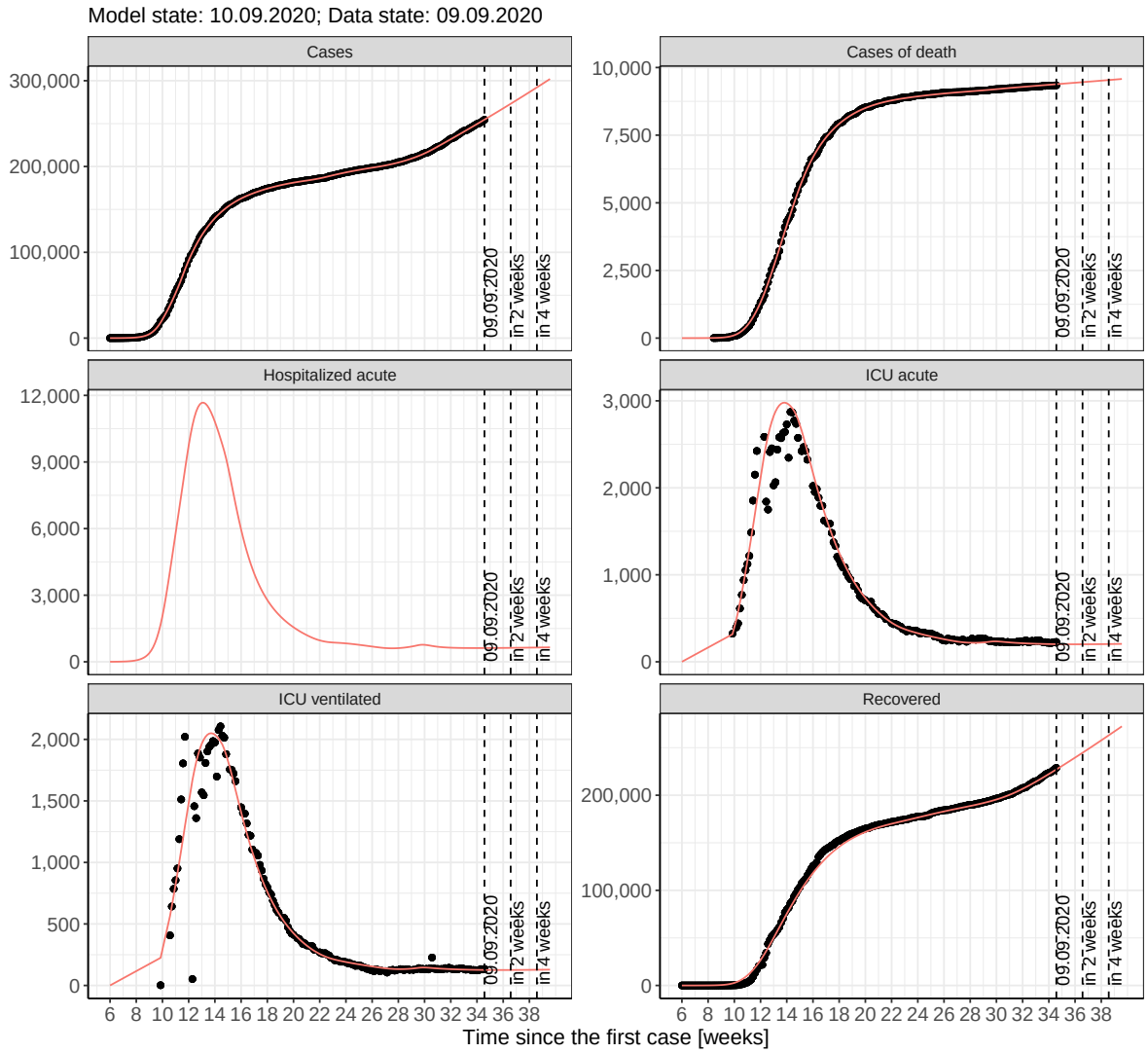


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

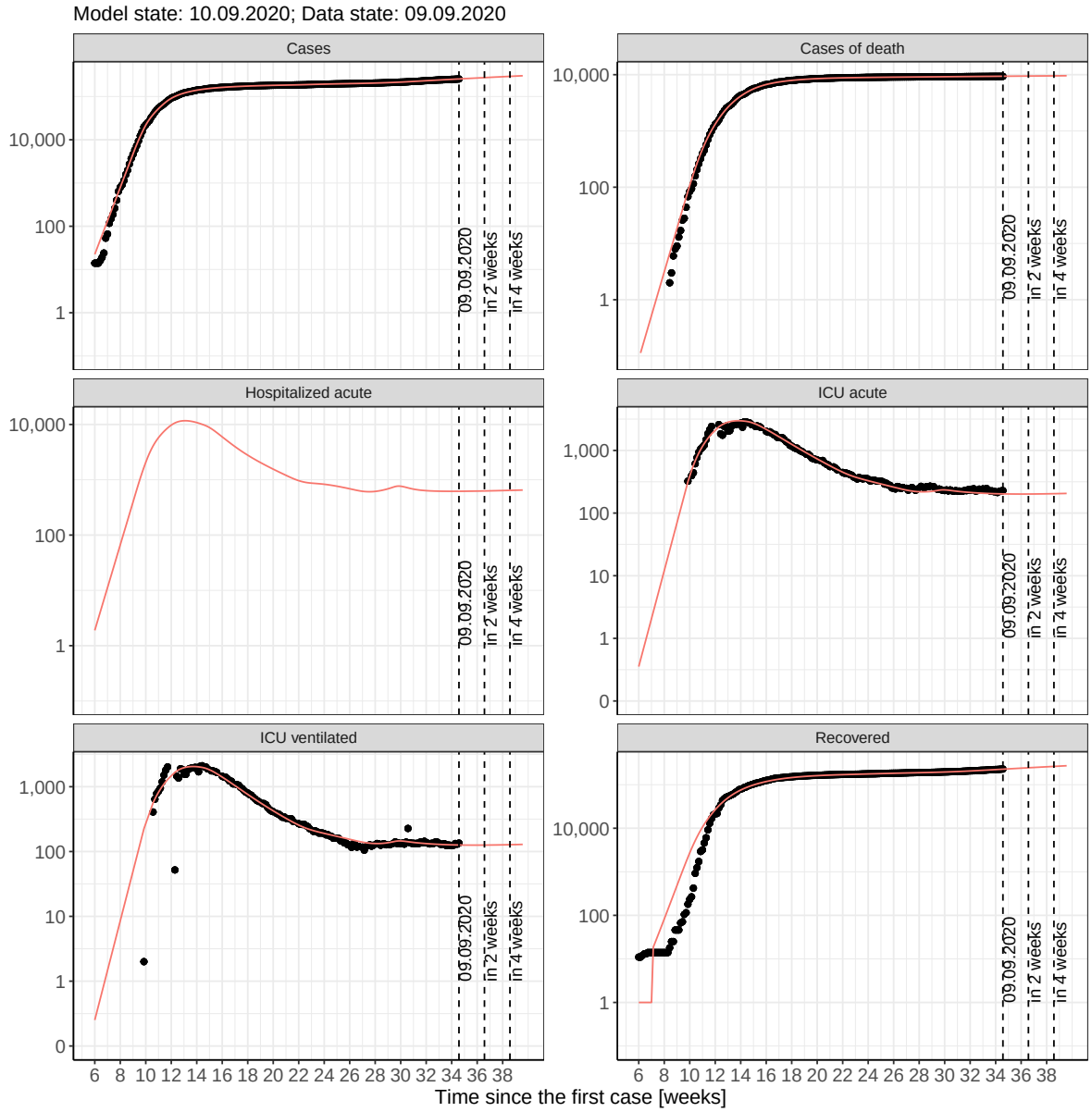


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 10.09.2020

Fig. 193 and 194 represent the model prediction for the next 4 weeks for Germany on a linear (193) and a semi-logarithmic (194) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 10.09.2020 were tested.

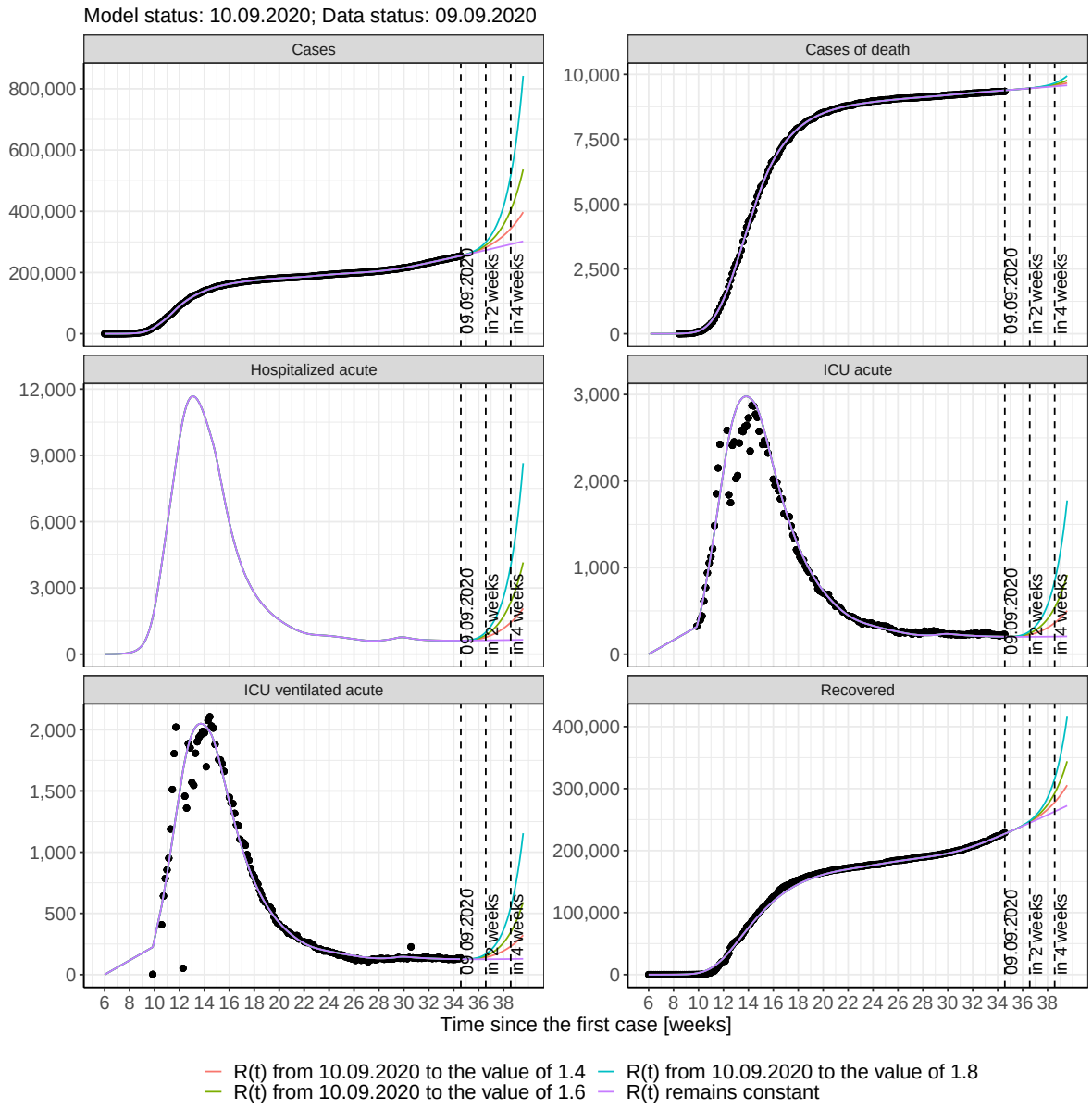


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

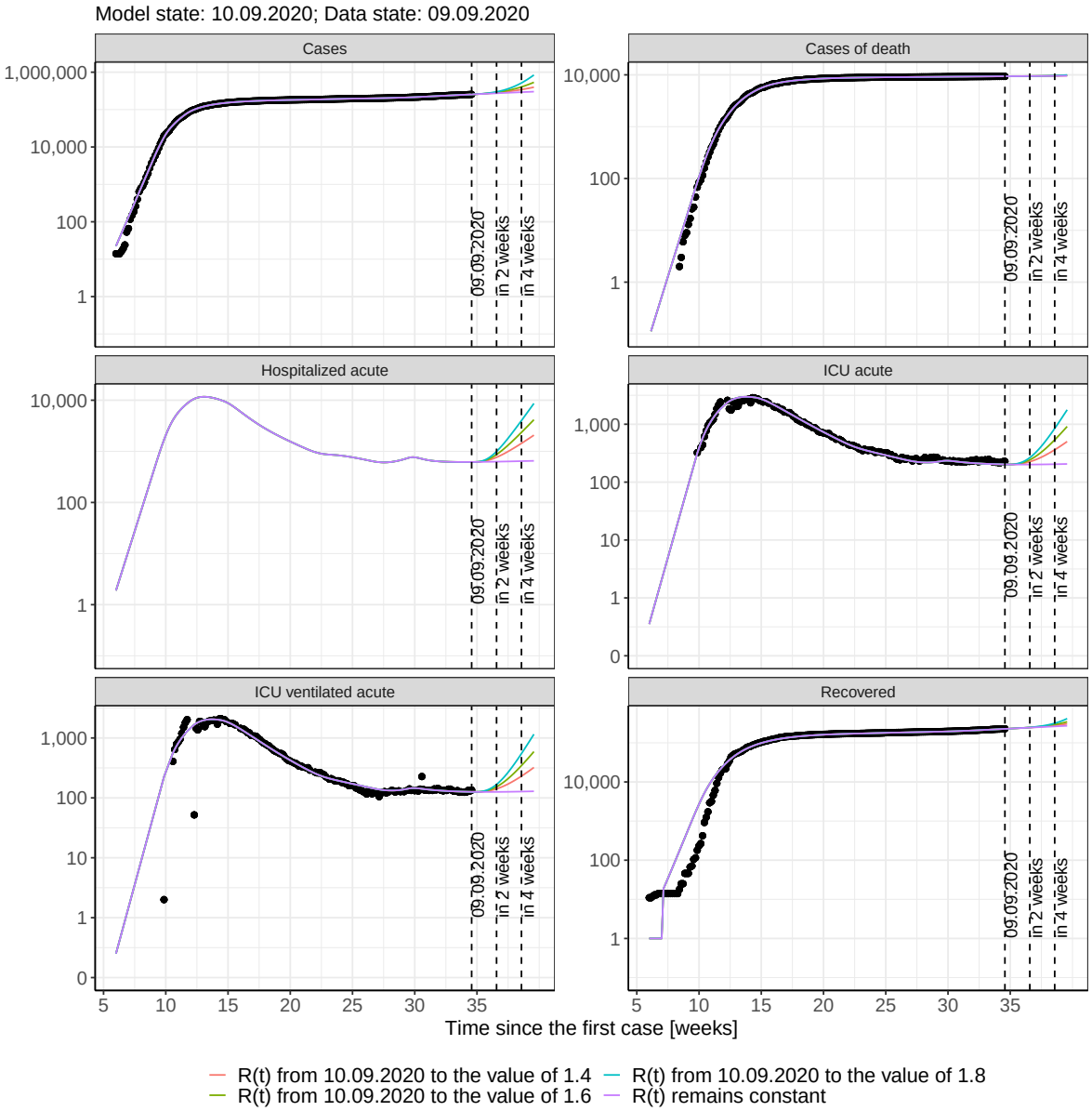


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 10.09.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 195 and 196 represent the model prediction for the next 16 weeks for Germany on a linear (195) and a semi-logarithmic (196) scale. In this simulation different scenarios of the possible course from the 10.09.2020 were tested.

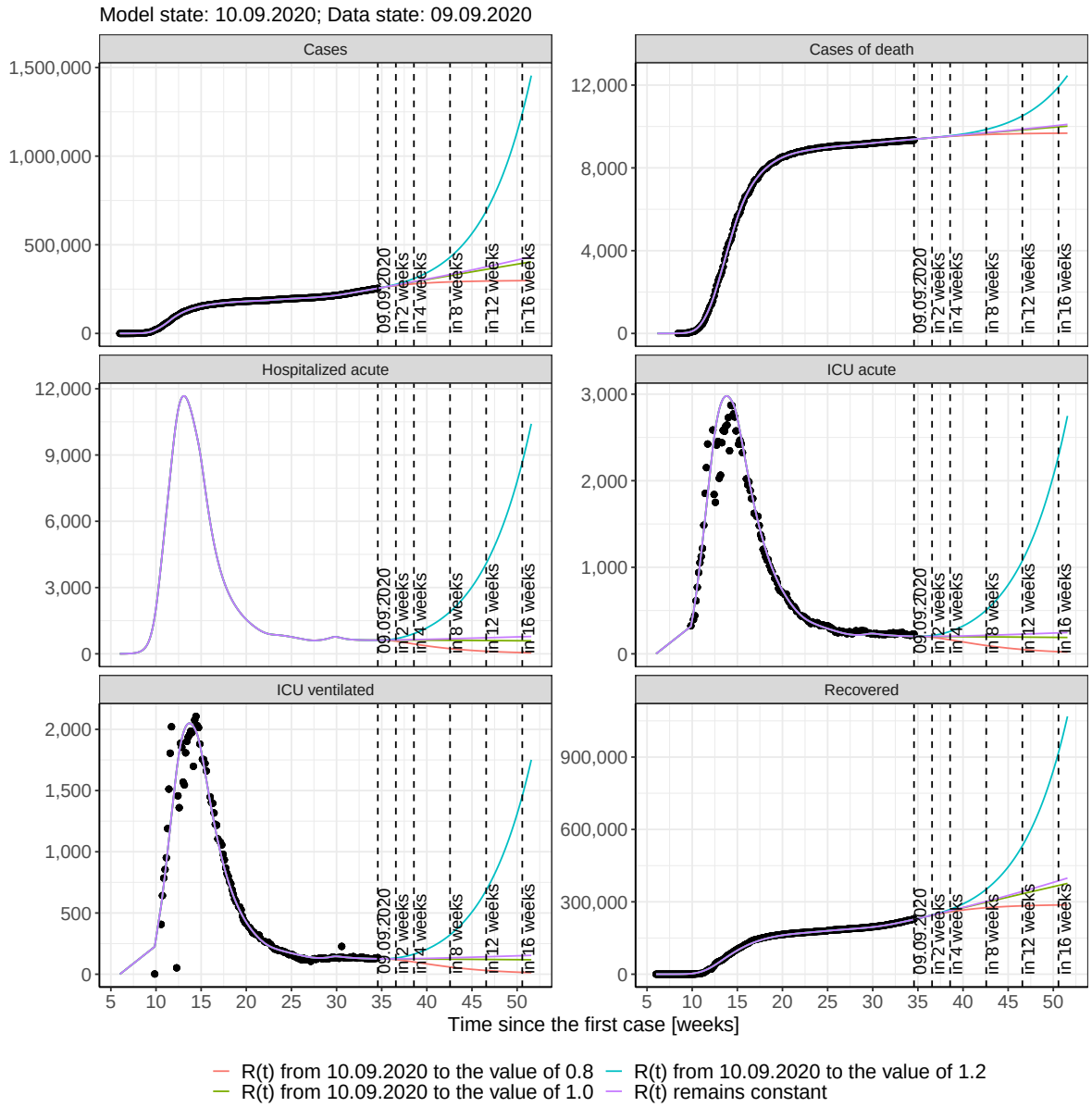


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 10.09.2020. Points: reported case numbers; lines: model prediction.

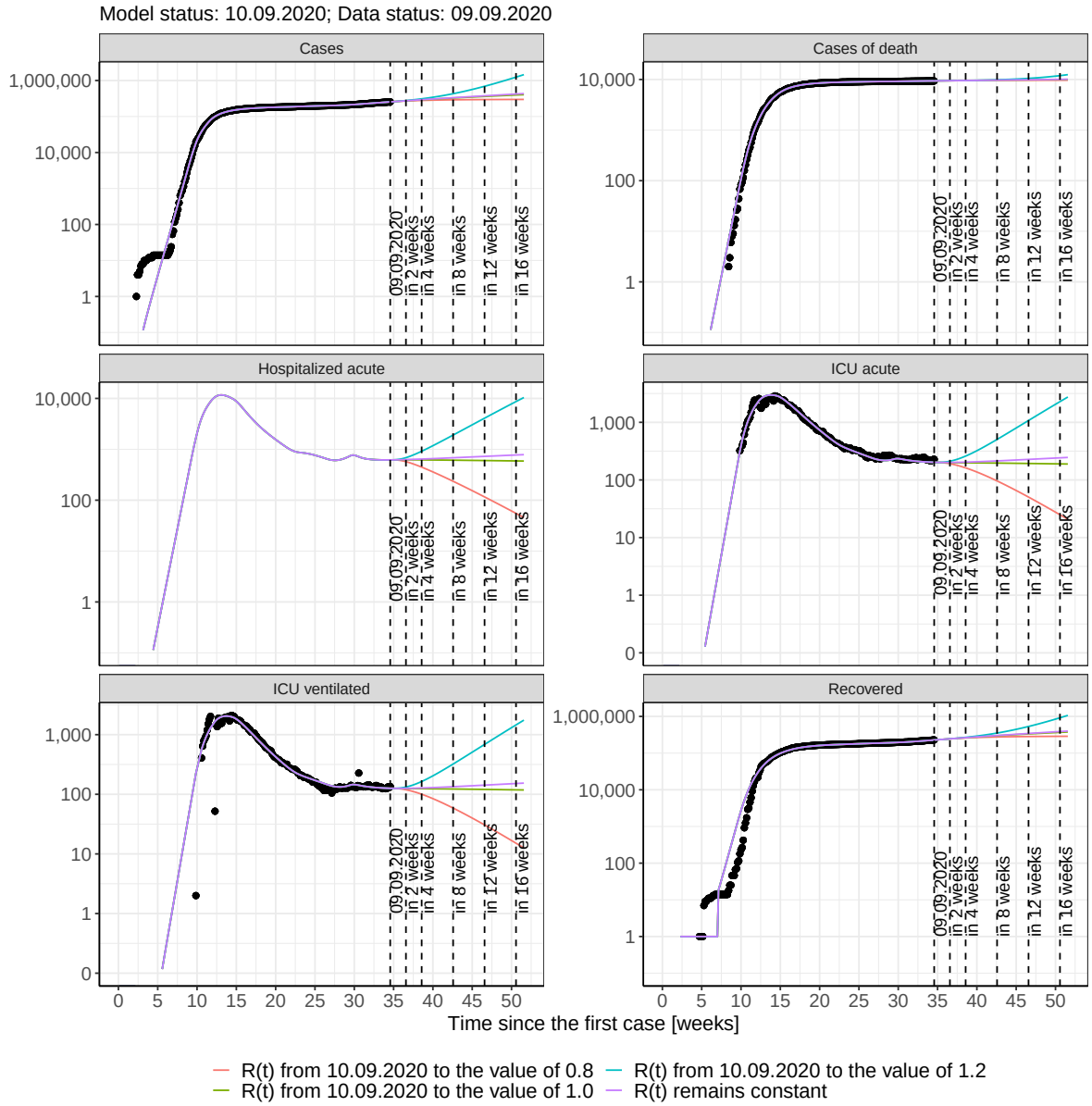


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 10.09.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 10.09.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 10.09.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 10.09.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 10.09.2020 (Tab. 69) Model status from 10.09.2020; Data status: 09.09.2020.

Table 66: Germany - R(t) remains unchanged after the 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	255930	9389	228310	619	202	126
11.09.2020	257230	9394	229540	620	202	126
12.09.2020	258530	9400	230770	620	202	126
13.09.2020	259840	9405	232010	621	202	126
14.09.2020	261150	9411	233260	621	201	126
15.09.2020	262470	9416	234510	622	201	126
16.09.2020	263780	9422	235760	622	201	126
17.09.2020	265100	9427	237020	623	201	126
18.09.2020	266430	9432	238280	624	201	126
19.09.2020	267750	9438	239550	625	201	126
20.09.2020	269080	9443	240820	625	201	126
21.09.2020	270420	9449	242100	626	201	126
22.09.2020	271750	9454	243380	627	201	126
23.09.2020	273090	9460	244660	628	201	126
24.09.2020	274440	9465	245950	629	201	126
25.09.2020	275780	9470	247240	630	202	126
26.09.2020	277130	9476	248530	631	202	126
27.09.2020	278490	9481	249830	632	202	126
28.09.2020	279840	9487	251130	633	202	126
29.09.2020	281200	9492	252440	634	202	126
30.09.2020	282560	9498	253750	635	202	126
01.10.2020	283930	9503	255060	636	202	127
02.10.2020	285300	9509	256380	637	203	127
03.10.2020	286670	9514	257700	638	203	127
04.10.2020	288050	9520	259020	639	203	127
05.10.2020	289430	9526	260340	641	203	127
06.10.2020	290810	9531	261670	642	204	127
07.10.2020	292200	9537	263010	643	204	127

Table 67: Germany - R(t) takes on the value of 0.8 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	255910	9389	228310	619	202	126
11.09.2020	257150	9394	229540	620	202	126
12.09.2020	258360	9400	230770	619	202	126
13.09.2020	259530	9405	232000	619	201	126
14.09.2020	260660	9411	233240	618	201	125
15.09.2020	261770	9416	234480	615	200	125
16.09.2020	262840	9421	235710	613	200	124
17.09.2020	263890	9427	236930	609	199	124
18.09.2020	264900	9432	238150	604	198	123
19.09.2020	265890	9438	239360	599	197	123
20.09.2020	266840	9443	240560	593	196	122
21.09.2020	267770	9448	241750	587	194	121
22.09.2020	268670	9453	242920	579	193	120
23.09.2020	269550	9458	244080	572	191	119
24.09.2020	270400	9464	245230	564	190	118
25.09.2020	271230	9469	246350	556	188	117
26.09.2020	272030	9474	247460	547	186	116
27.09.2020	272810	9479	248550	538	184	115
28.09.2020	273570	9483	249620	529	182	113
29.09.2020	274310	9488	250660	520	180	112
30.09.2020	275030	9493	251690	511	178	111
01.10.2020	275720	9498	252700	502	176	109
02.10.2020	276400	9502	253690	492	174	108
03.10.2020	277050	9507	254650	483	171	106
04.10.2020	277690	9511	255600	474	169	105
05.10.2020	278310	9516	256520	464	167	103
06.10.2020	278910	9520	257420	455	164	102
07.10.2020	279500	9524	258300	446	162	100

Table 68: Germany - R(t) takes on the value of 1.0 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	255930	9389	228310	619	202	126
11.09.2020	257220	9394	229540	620	202	126
12.09.2020	258520	9400	230770	620	202	126
13.09.2020	259810	9405	232010	620	202	126
14.09.2020	261100	9411	233250	621	201	126
15.09.2020	262400	9416	234500	621	201	126
16.09.2020	263690	9422	235750	621	201	125
17.09.2020	264980	9427	237010	622	201	125
18.09.2020	266270	9432	238270	622	201	125
19.09.2020	267560	9438	239530	622	201	125
20.09.2020	268850	9443	240800	622	201	125
21.09.2020	270140	9449	242060	622	201	125
22.09.2020	271430	9454	243330	622	200	125
23.09.2020	272720	9459	244600	622	200	125
24.09.2020	274010	9465	245870	622	200	125
25.09.2020	275290	9470	247150	622	200	125
26.09.2020	276580	9476	248420	622	200	125
27.09.2020	277860	9481	249700	622	200	125
28.09.2020	279150	9486	250970	622	200	125
29.09.2020	280430	9492	252250	621	200	125
30.09.2020	281720	9497	253530	621	200	125
01.10.2020	283000	9503	254810	621	199	125
02.10.2020	284280	9508	256080	621	199	125
03.10.2020	285560	9514	257360	620	199	124
04.10.2020	286840	9519	258640	620	199	124
05.10.2020	288120	9524	259920	620	199	124
06.10.2020	289400	9530	261200	620	199	124
07.10.2020	290680	9535	262480	619	199	124

Table 69: Germany - R(t) takes on the value of 1.2 after 10.09.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
10.09.2020	255950	9389	228310	619	202	126
11.09.2020	257300	9394	229540	620	202	126
12.09.2020	258690	9400	230770	621	202	126
13.09.2020	260120	9405	232020	622	202	126
14.09.2020	261590	9411	233270	624	202	126
15.09.2020	263100	9416	234530	627	202	126
16.09.2020	264660	9422	235810	631	203	127
17.09.2020	266260	9427	237100	636	203	127
18.09.2020	267900	9432	238400	642	204	128
19.09.2020	269590	9438	239720	649	205	128
20.09.2020	271330	9444	241060	656	206	129
21.09.2020	273120	9449	242430	665	208	130
22.09.2020	274960	9455	243810	675	210	131
23.09.2020	276850	9461	245220	685	211	132
24.09.2020	278800	9466	246660	696	213	134
25.09.2020	280800	9472	248130	709	216	135
26.09.2020	282860	9478	249630	722	218	137
27.09.2020	284970	9484	251160	735	221	139
28.09.2020	287150	9490	252720	750	224	140
29.09.2020	289390	9497	254320	765	227	143
30.09.2020	291690	9503	255960	781	230	145
01.10.2020	294060	9510	257640	798	234	147
02.10.2020	296490	9516	259360	816	237	149
03.10.2020	298990	9523	261130	834	241	152
04.10.2020	301570	9530	262940	854	246	155
05.10.2020	304210	9537	264790	874	250	158
06.10.2020	306930	9544	266700	894	255	161
07.10.2020	309730	9552	268650	916	260	164

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 10.09.2020

Fig. 197 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values. If no bars are shown on the plot it means that the number of cases has not changed compared to the previous day.

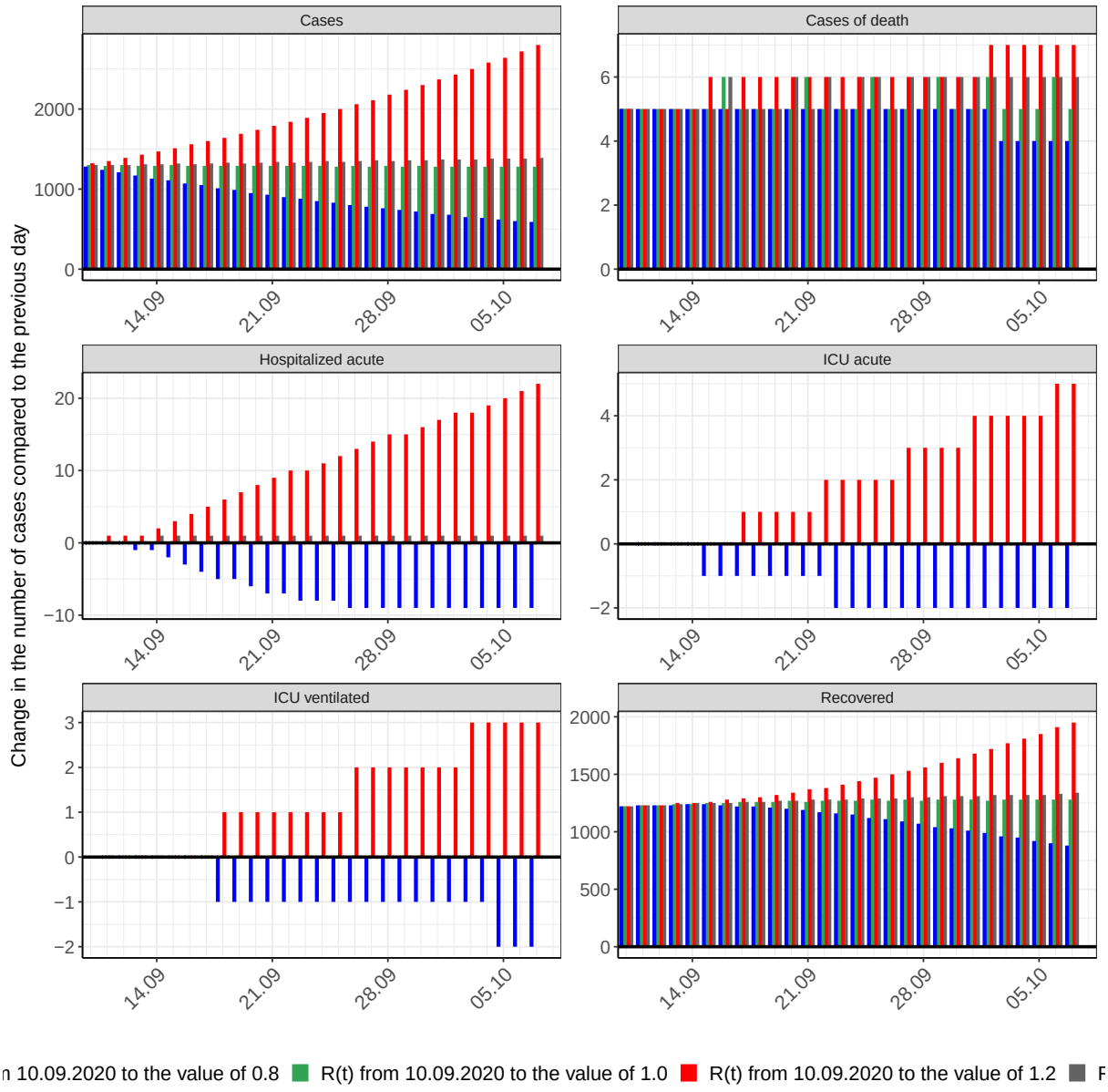


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany