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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Report dated 16 July 2020
Model status of 16 July 2020
Data as of 15 July 2020

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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 (1-2 times per week). 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 (under construction) 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 the 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 09.05.2020 (five days after school reopening on 04.05.2020), there was a small increase of R(t) by 11.6% on average to 0.71. After 04.06.2020, there was a further increase of R(t) by approx. 58% from 0.71 to 1.12 in the national average with subsequent reduction of R(t) after 17.06.2020 by about 32% from 1.12 to 0.76.
  - 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.

  - The current R(t) values are estimated to be around 1 for all federal states. The R(t) values for Bavaria, Hessen, Rhineland-Palatinate and Schleswig-Holstein estimated to be slightly above 1.

- Forecasts with different assumptions of R0, including the lifting of intervention measures, are presented for each state.
  - Assuming that the reproductive rate R(t) in the federal states remains below 1, the hospital bed capacity appears to be sufficient in all federal states.
  - If the reproductive number increases immediately to R(t)=1.2, the maximum bed capacity can be expected to be reached within the next ten to twelve weeks in some federal states, with this time being earlier in federal states with a higher current R(t) value. If the R(t) value was to rise more sharply to, for example, 1.8, it would be expected that the maximum bed capacity would be reached much earlier.

- Many epidemiological models for COVID-19 are currently being published.
  - Our model differs in the ammount of the data avaliable and the modeling approach. To the best of our knowledge, we are the only ones to use all available data (COVID-19 cases, recovered, deceased, outpatients, ventilated and non-ventilated intensive care patients) from the individual German federal states. Furthermore, for the establishment of the hospital stay (incl. length of stay) and its outcome (survival, death), we were able to rely on a constantly expanding internal data set of more than 3000 completed COVID-19 patient cases in Germany. This allows a realistic representation of the inpatient and intensive care situation in German hospitals.
  - Our model can be successfully transferred to other countries (e.g. USA, France, Italy), where it also shows excellent descriptive properties (results on demand). This shows that the structure of our model is valid and generic. An application to other countries is possible without any problems if the corresponding data is available.

- 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 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 (1-2 times per week). 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 (under construction) 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

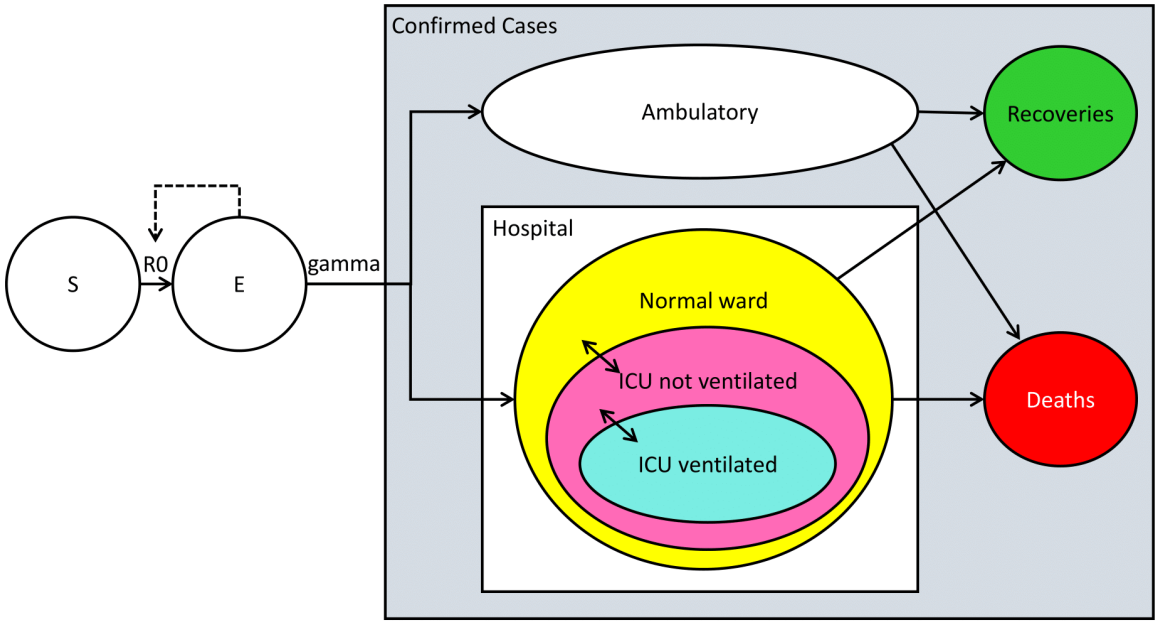
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected, 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).

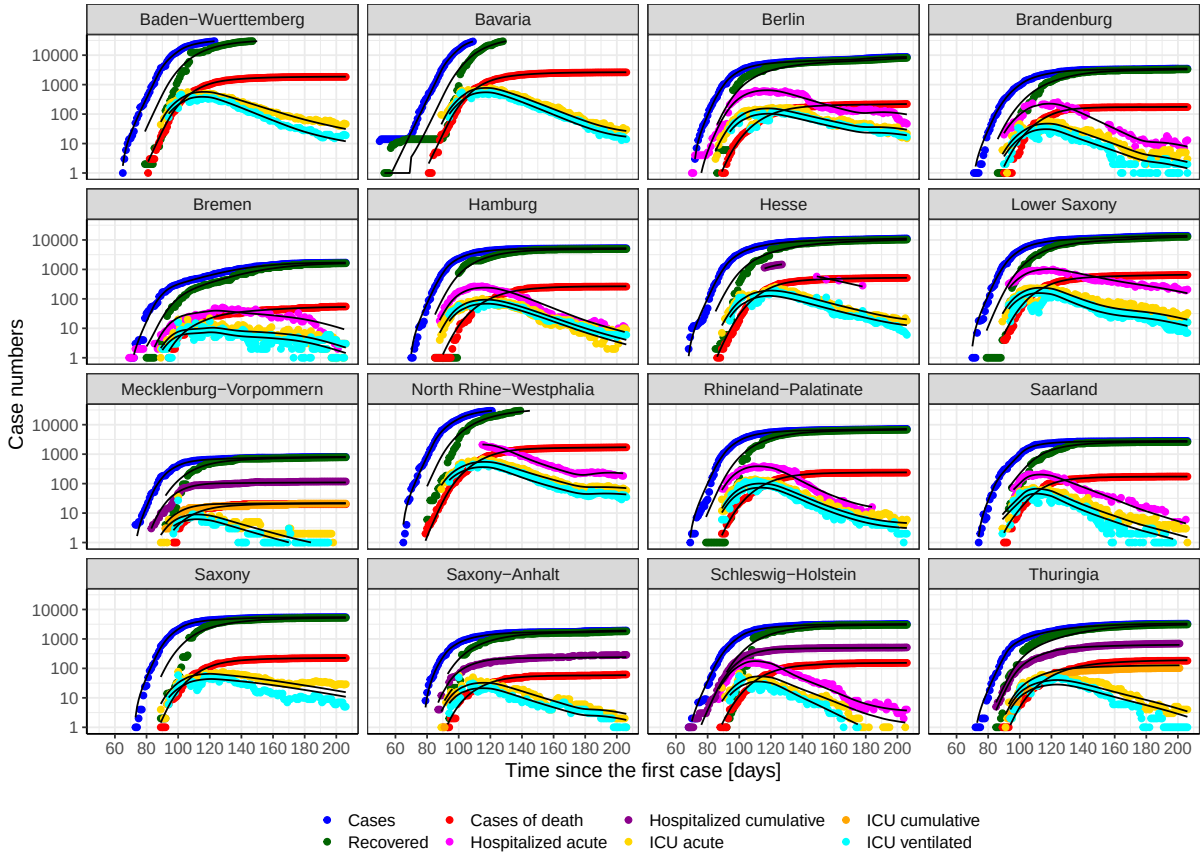


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

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.

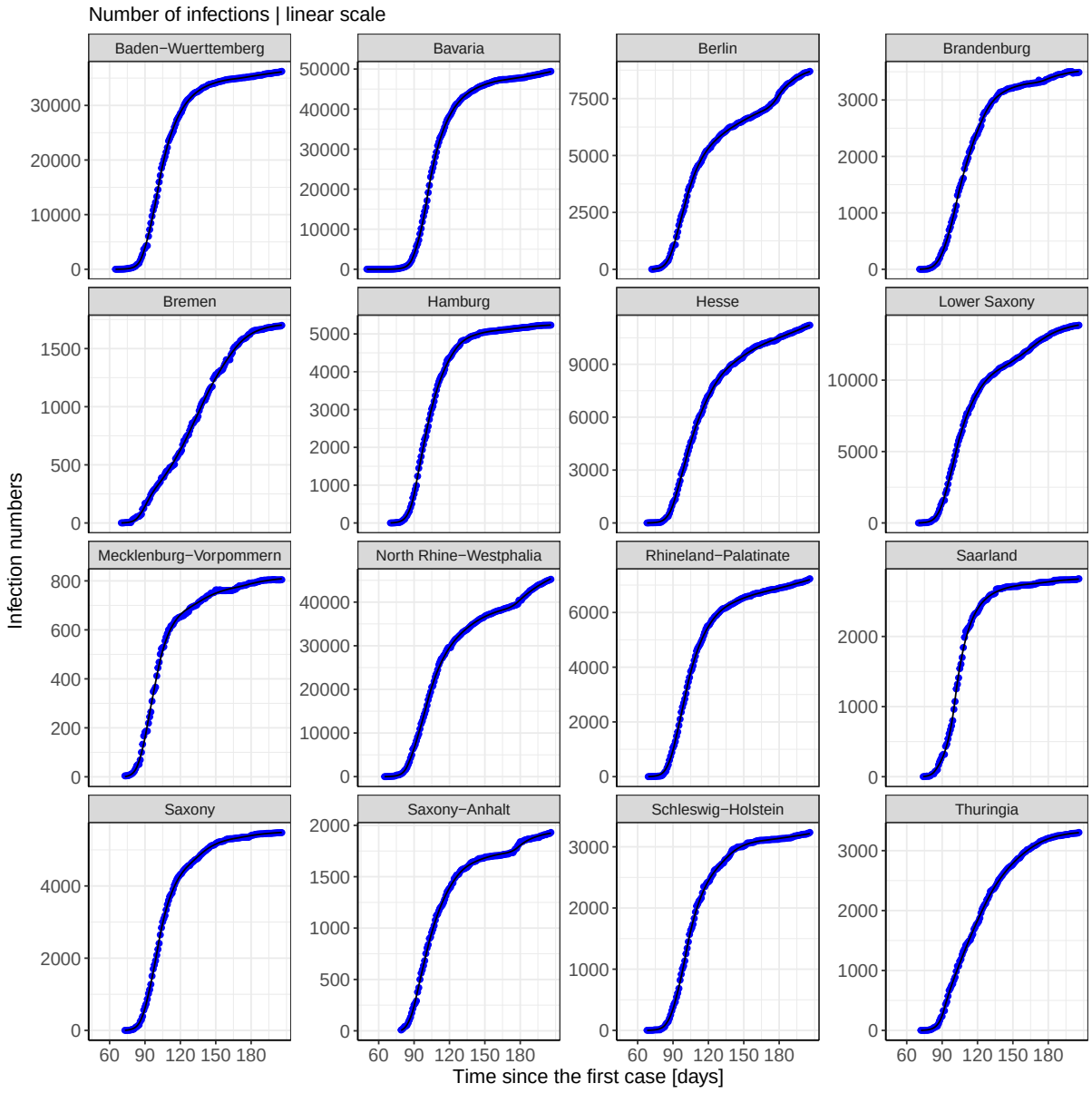


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

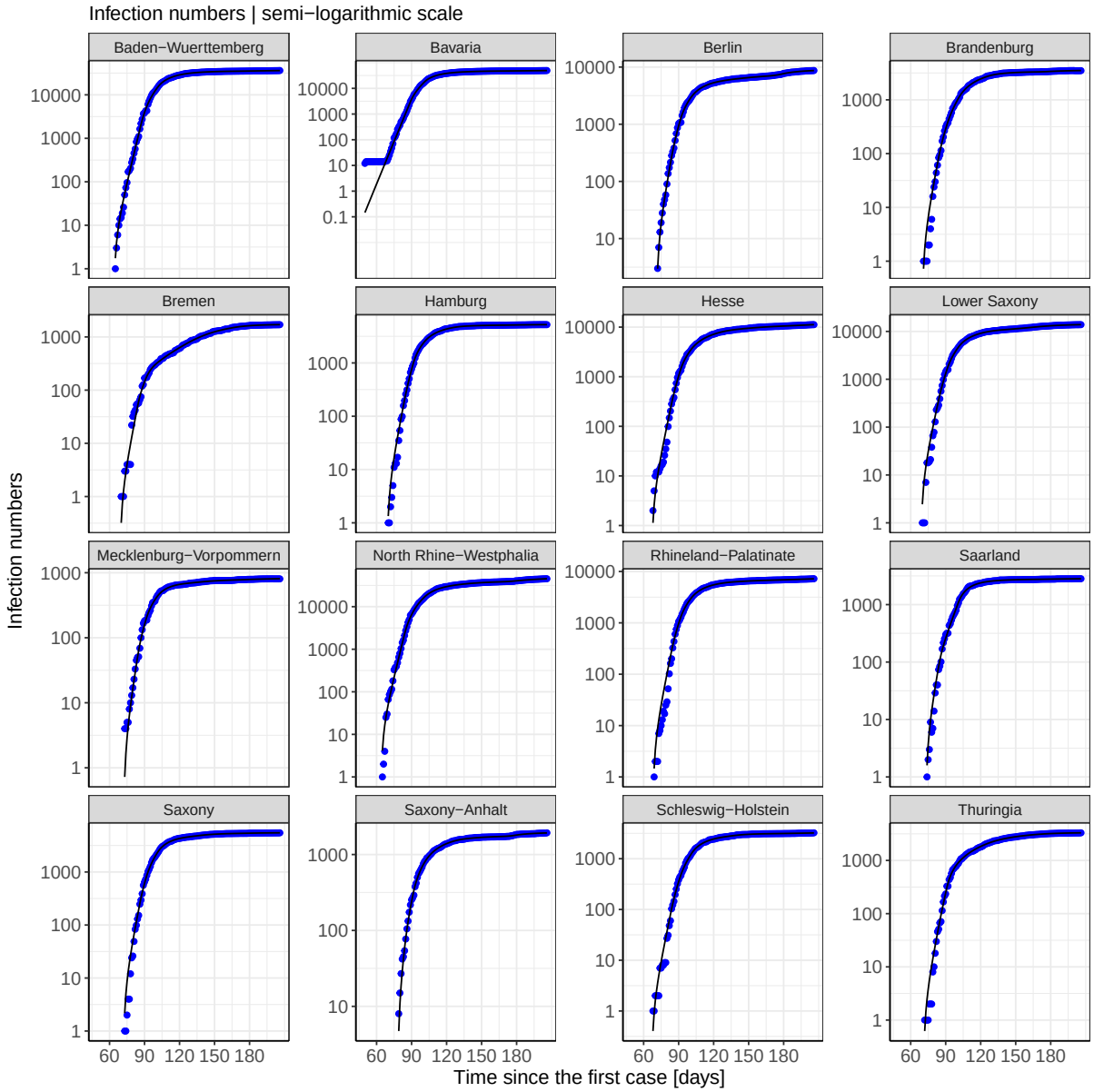


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

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.

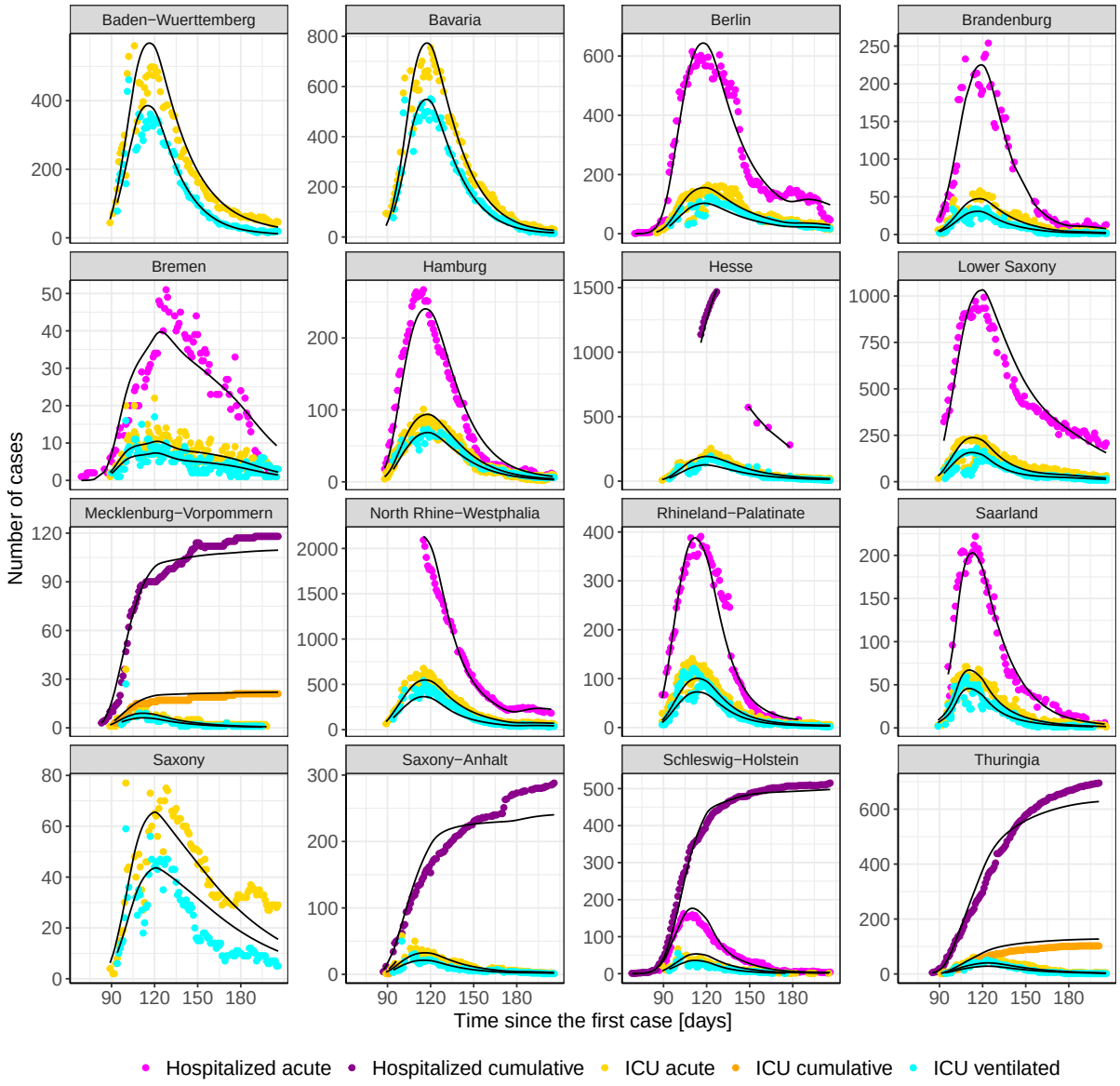


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

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.

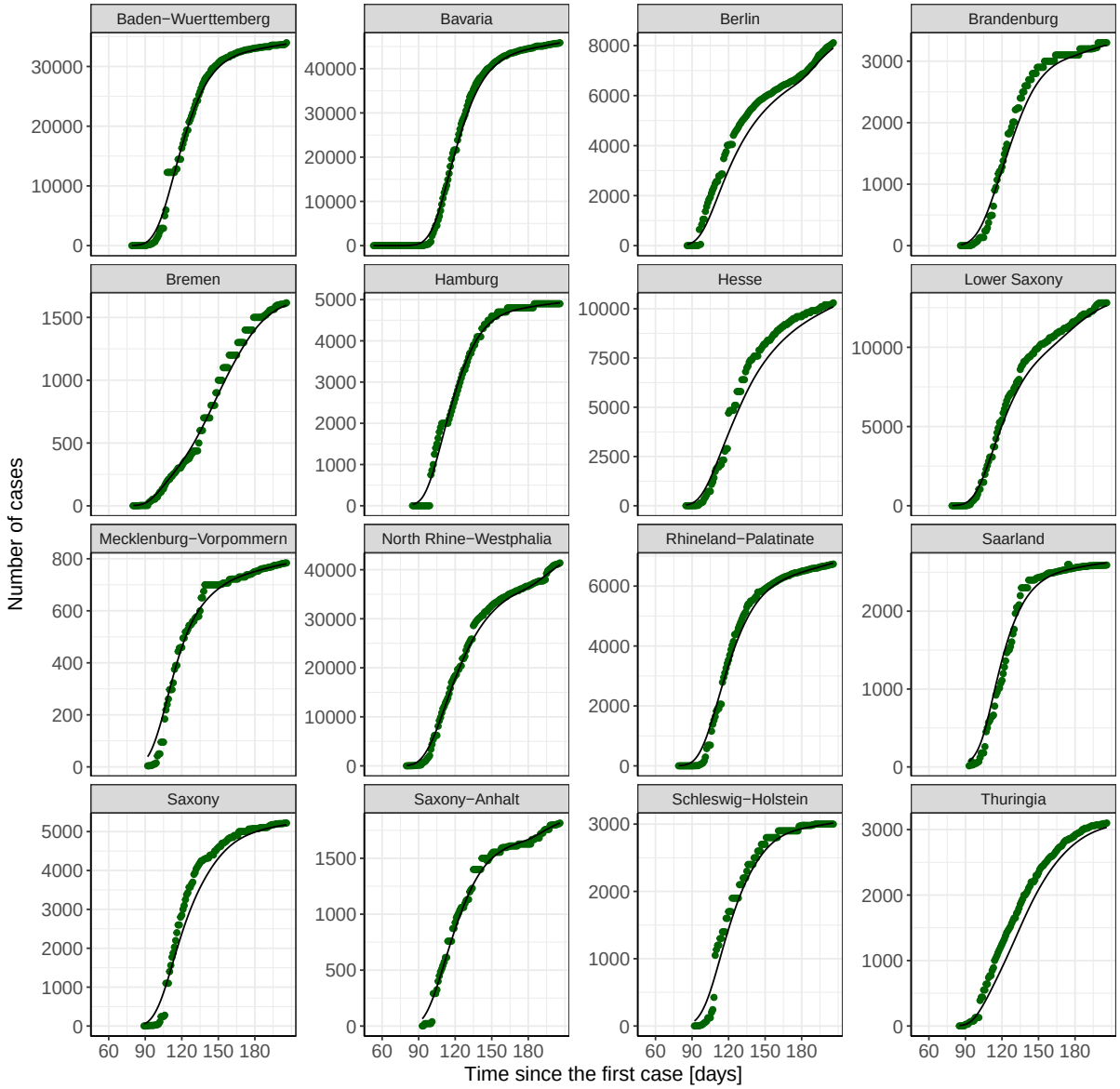


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

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.

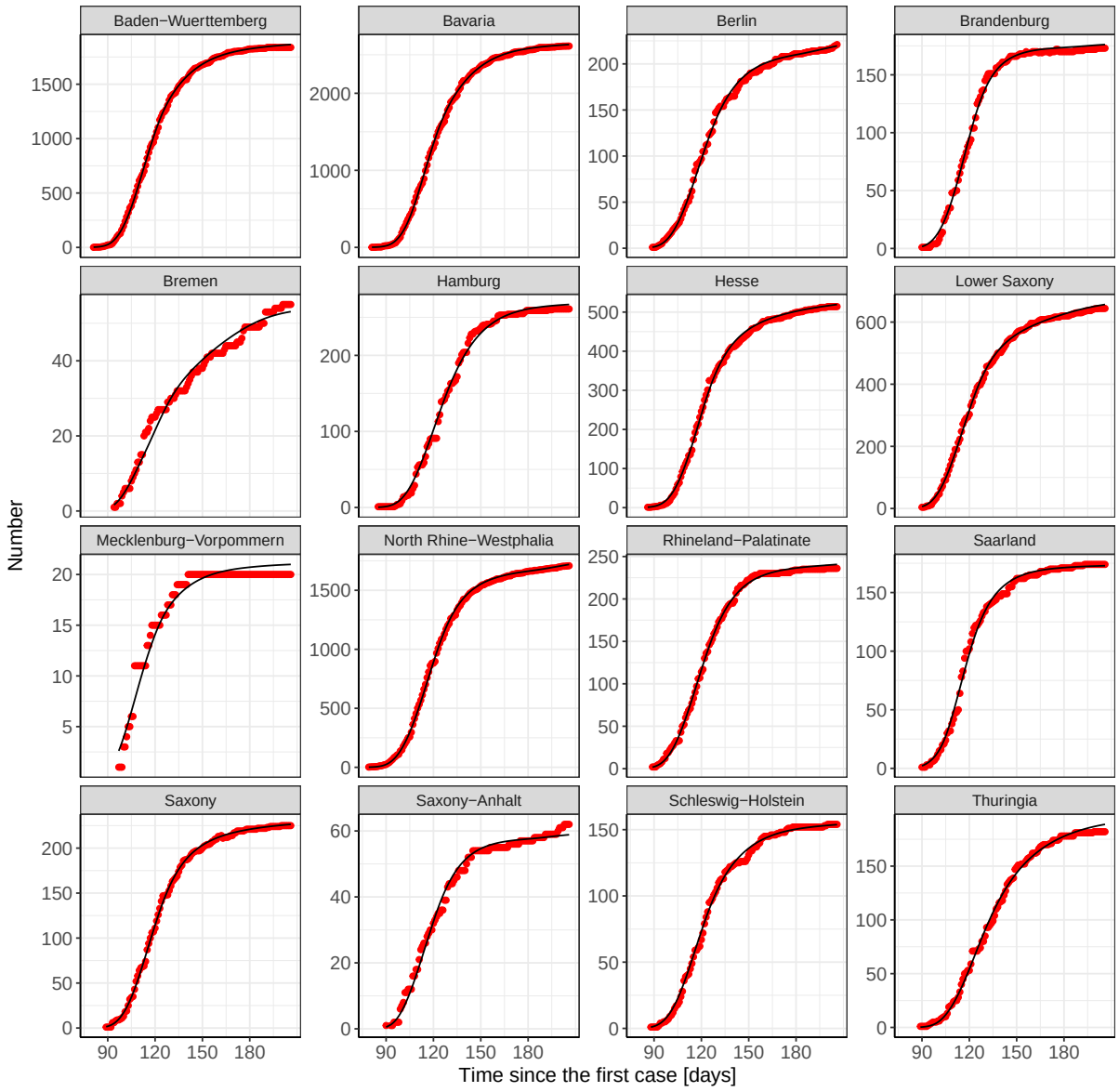


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

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.

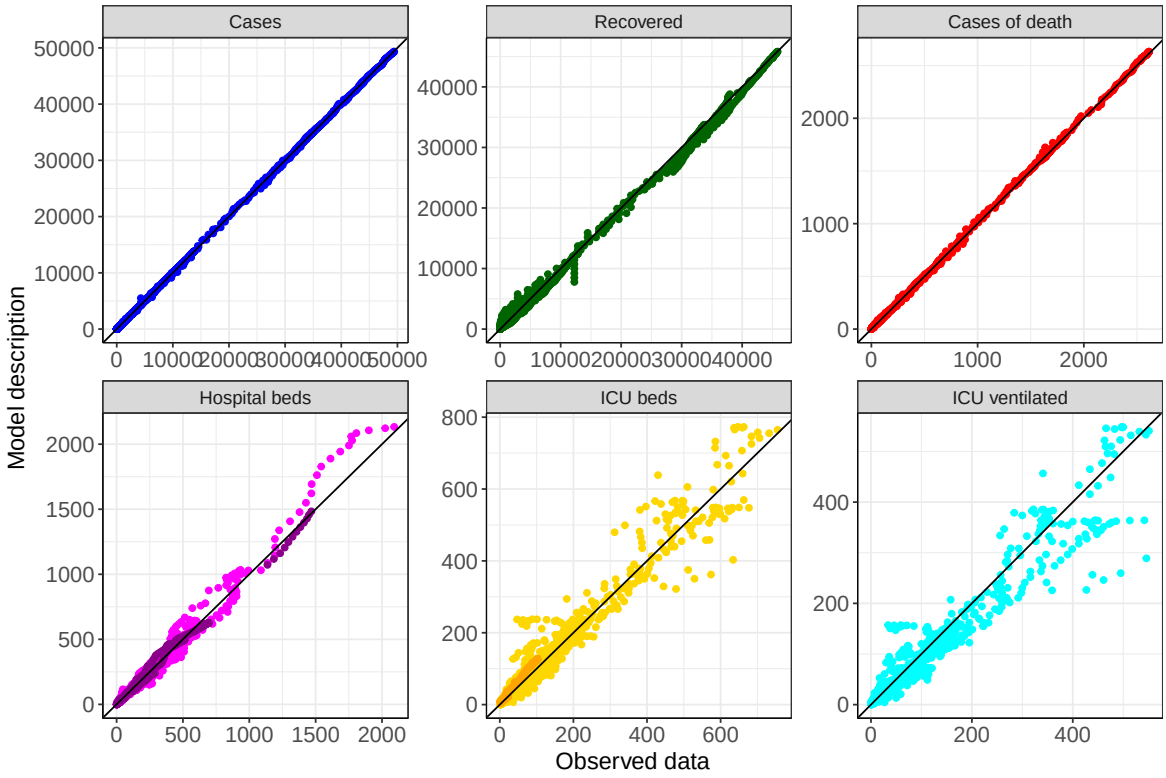


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

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, 09.05.2020 and 29.05.2020. 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. Five days after the school reopening on 04.05.2020, the R(t) value increased by approx. 11.6% to 0.71 on a national average. In general, the safety measures taken appear to be effective in keeping R(t) at a stable level below 1, with the exception of the federal states with known "corona hotspots". 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 0.64 (p-value < 0.001)
- From 09.05.2020: A slight increase of R(t) by about 11% to 0.71 (p-value < 0.001).
- From 04.06.2020: A further increase of R(t) by approx. 58% from 0.71 to 1.12 (p-value < 0.001).
- From 17.06.2020: Reduction of R(t) by approx. 32% from 1.12 to 0.76 (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 09.05.	From 04.06.	From 17.06.
Baden-Wuerttemberg	2.78	1.69	1.32	0.58	0.57	0.61	1.19	0.93
Bavaria	2.78	2.76	1.52	0.56	0.59	0.65	0.99	1.09
Berlin	2.78	1.98	1.02	0.62	0.80	0.90	1.74	0.61
Brandenburg	2.78	1.91	1.39	0.78	0.45	0.56	1.68	0.69
Bremen	2.78	1.46	0.69	1.14	1.01	0.87	0.61	0.55
Hamburg	2.78	2.15	0.92	0.65	0.34	0.62	1.25	0.80
Hesse	2.78	2.09	1.08	0.77	0.65	0.86	0.85	1.04
Mecklenburg-Vorpommern	2.78	1.67	0.93	0.42	0.97	0.73	1.15	0.74
Lower Saxony	2.78	2.04	1.18	0.65	0.59	1.09	0.85	0.69
North Rhine-Westphalia	2.78	1.40	1.12	0.66	0.76	0.76	1.72	0.84
Rhineland-Palatinate	2.78	1.91	1.07	0.62	0.56	0.81	1.01	1.05
Saarland	2.78	1.53	1.82	0.41	0.50	0.62	1.30	0.76
Saxony	2.78	1.95	1.25	0.51	0.90	0.60	0.97	0.73
Saxony-Anhalt	2.78	1.99	0.94	0.69	0.49	0.70	1.98	0.56
Schleswig-Holstein	2.78	1.95	1.28	0.59	0.83	0.50	1.01	1.06
Thuringia	2.78	2.50	0.81	0.93	0.79	0.81	0.72	0.62
Germany	2.78	2.27	1.27	0.63	0.64	0.77	1.32	0.86

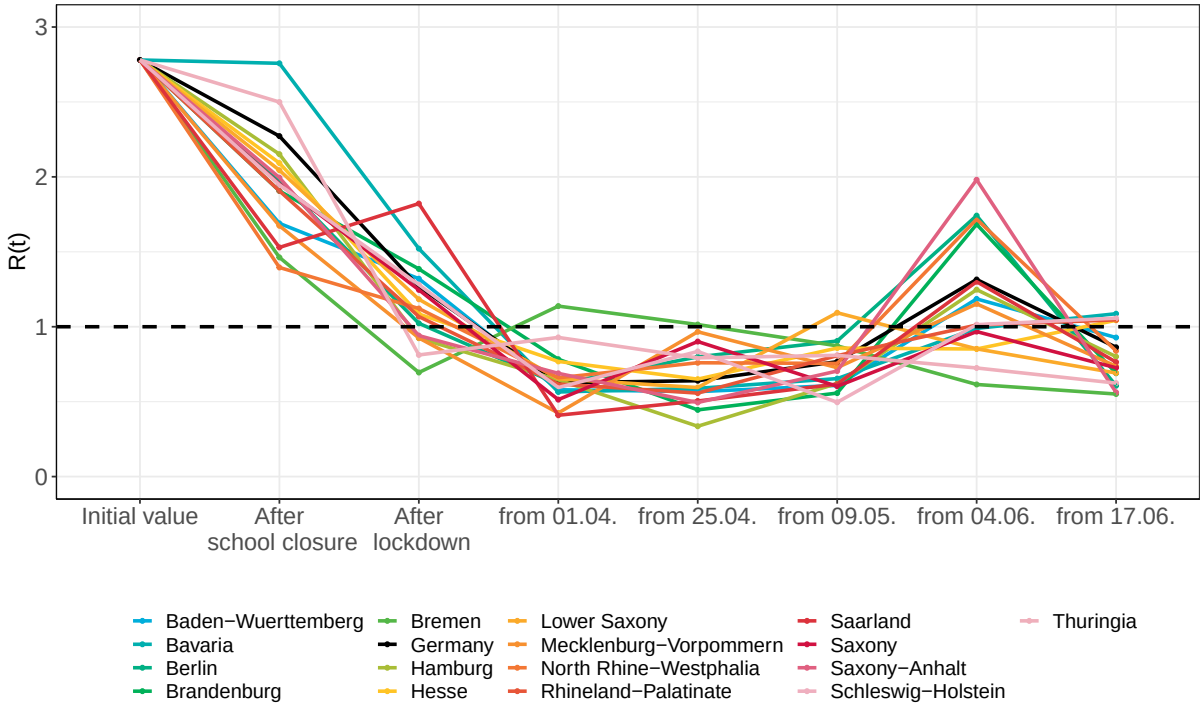


Figure 9: R(t) distribution before and after NPIs

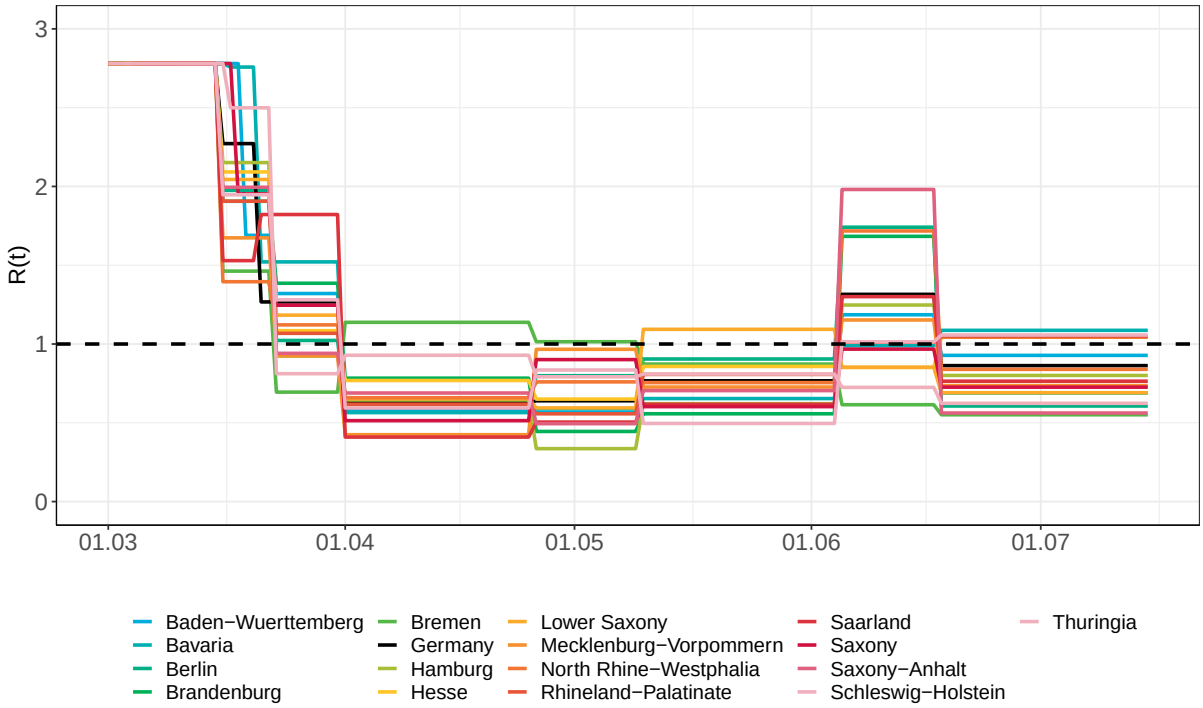


Figure 10: R(t) over time

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.

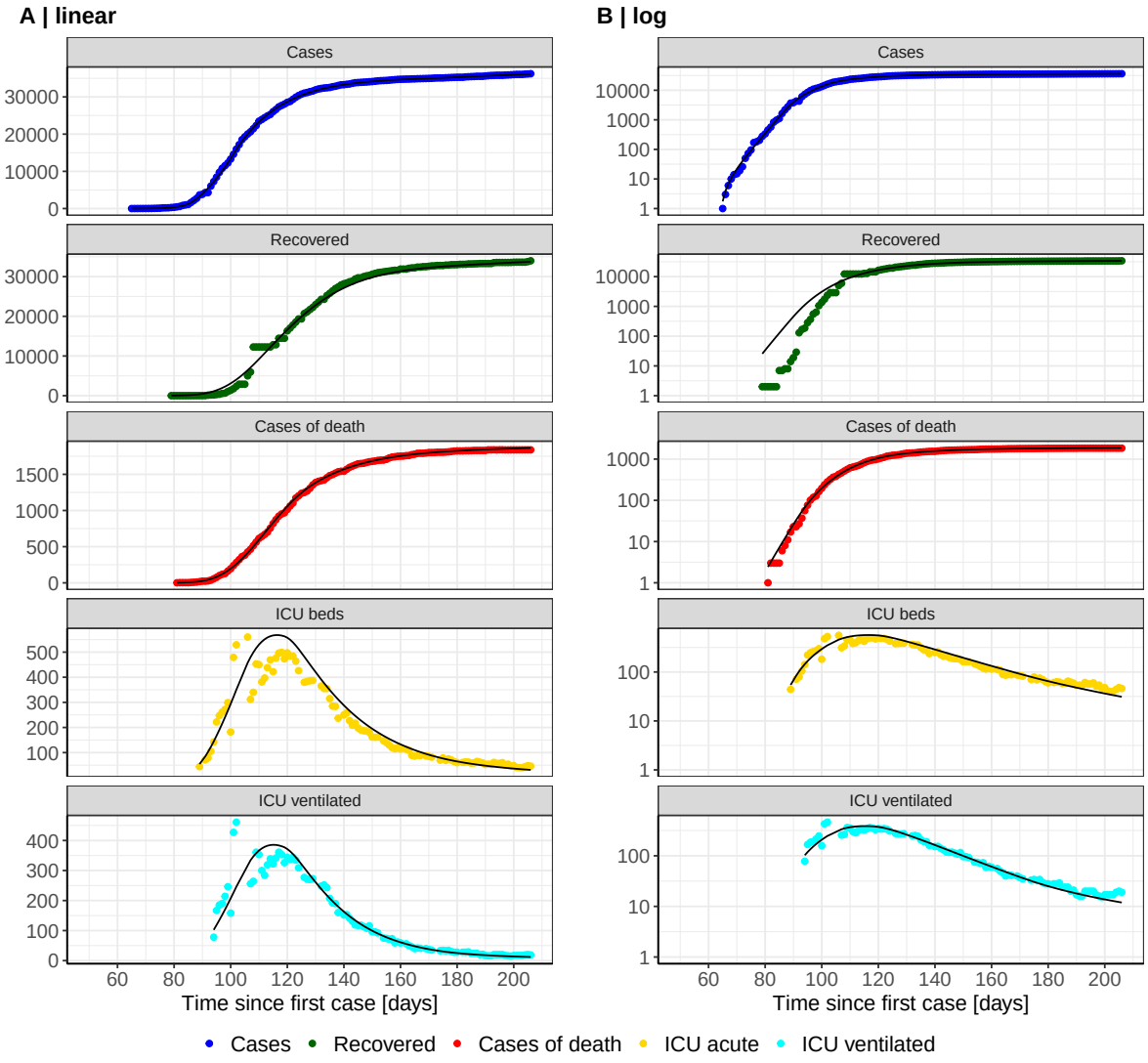


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

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.

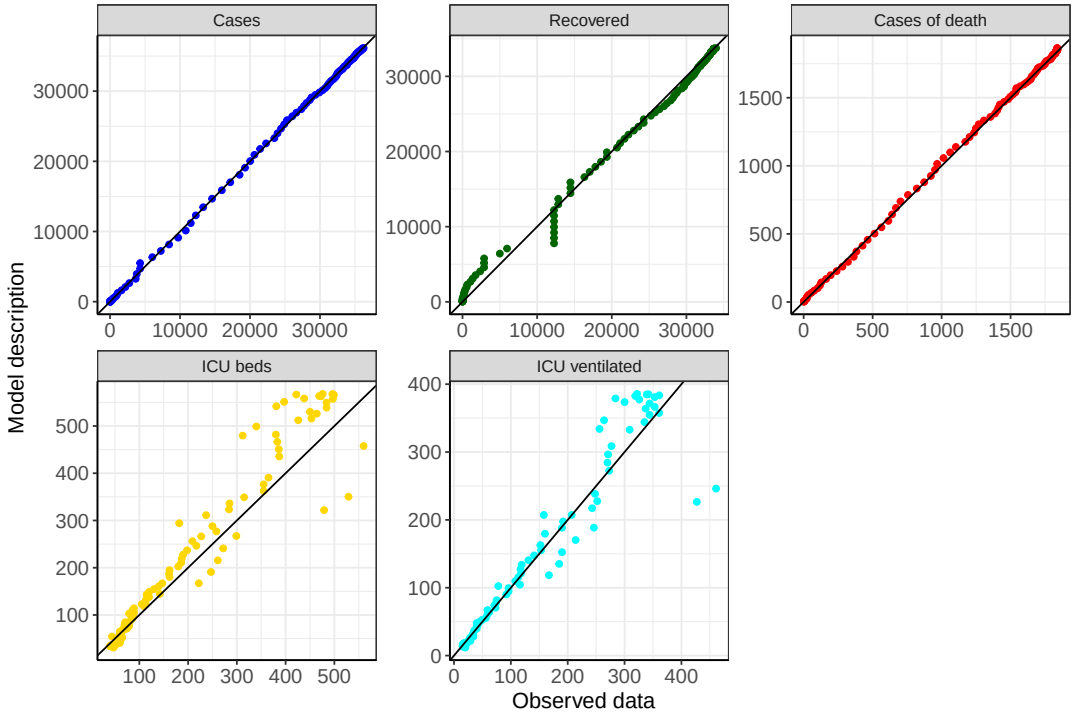


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

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).

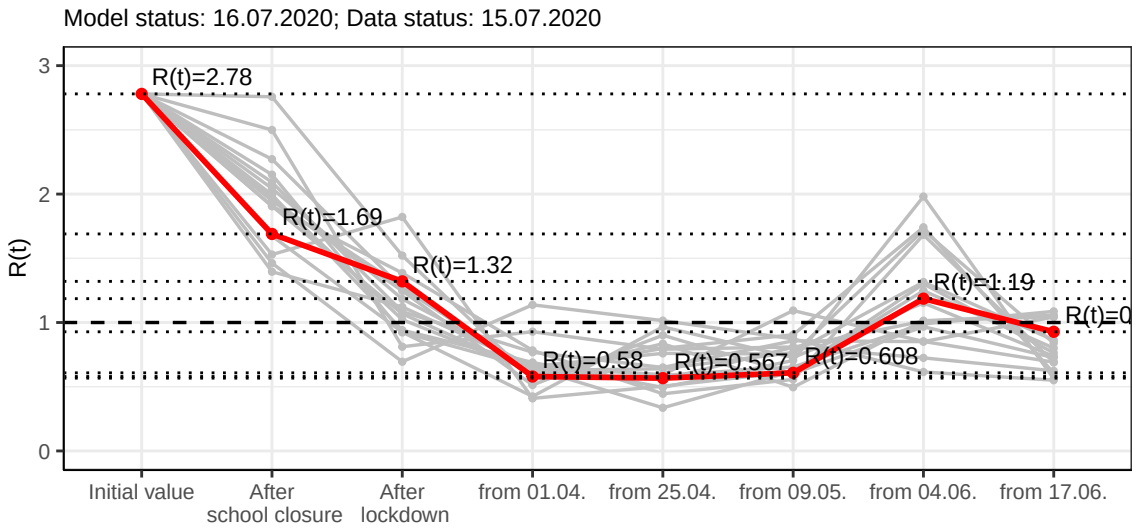


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

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

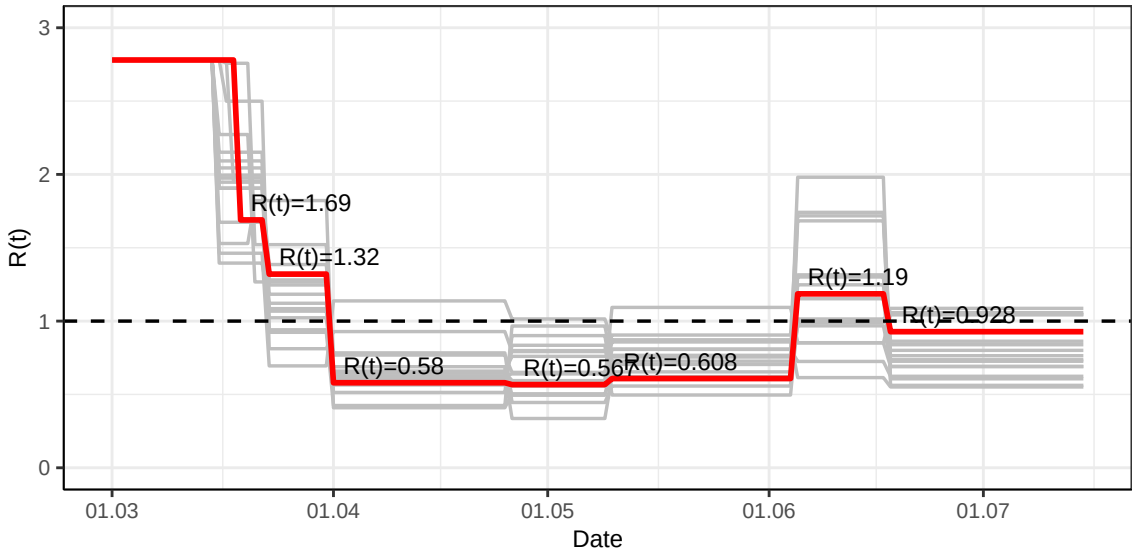


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

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

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.

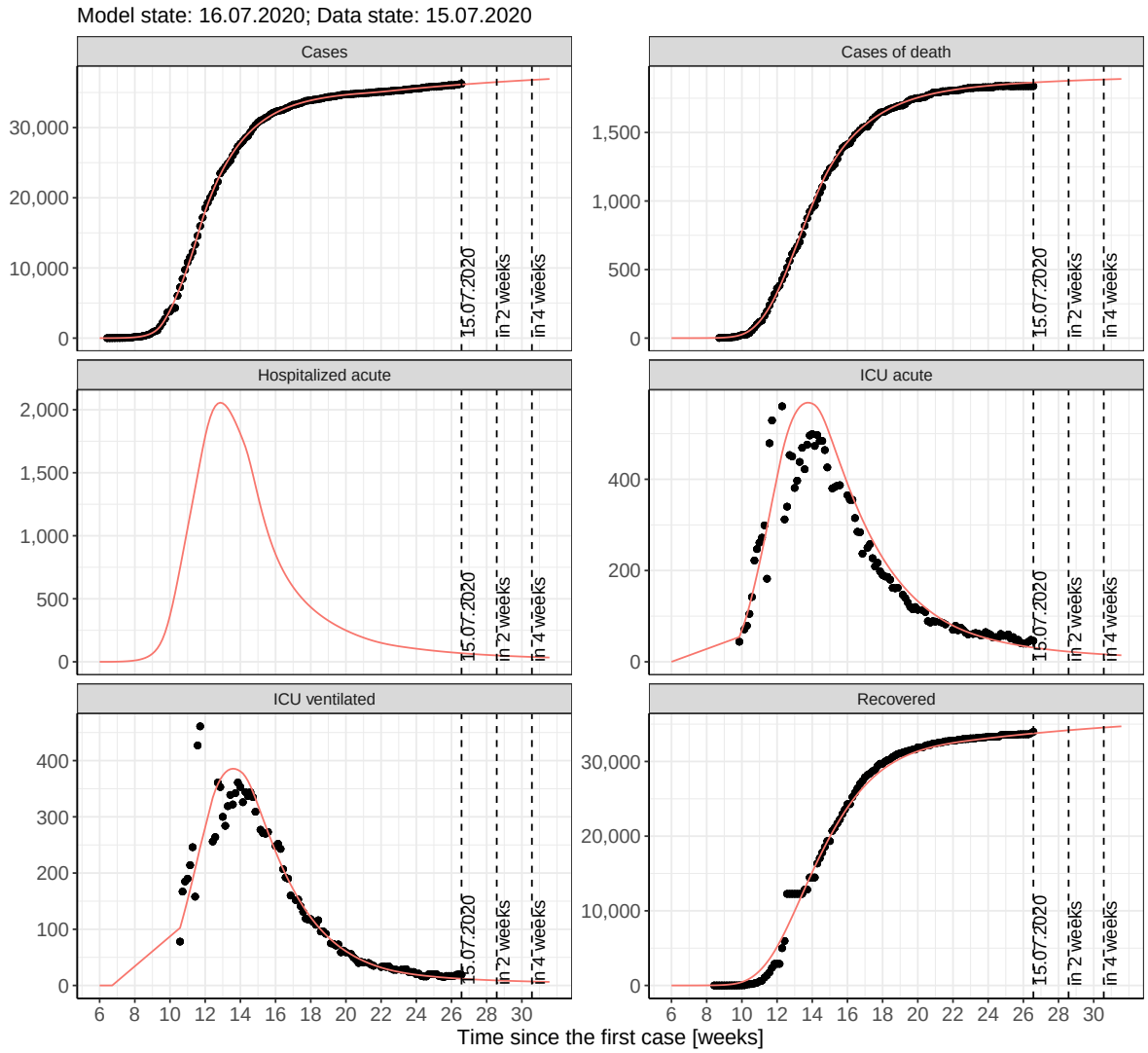


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

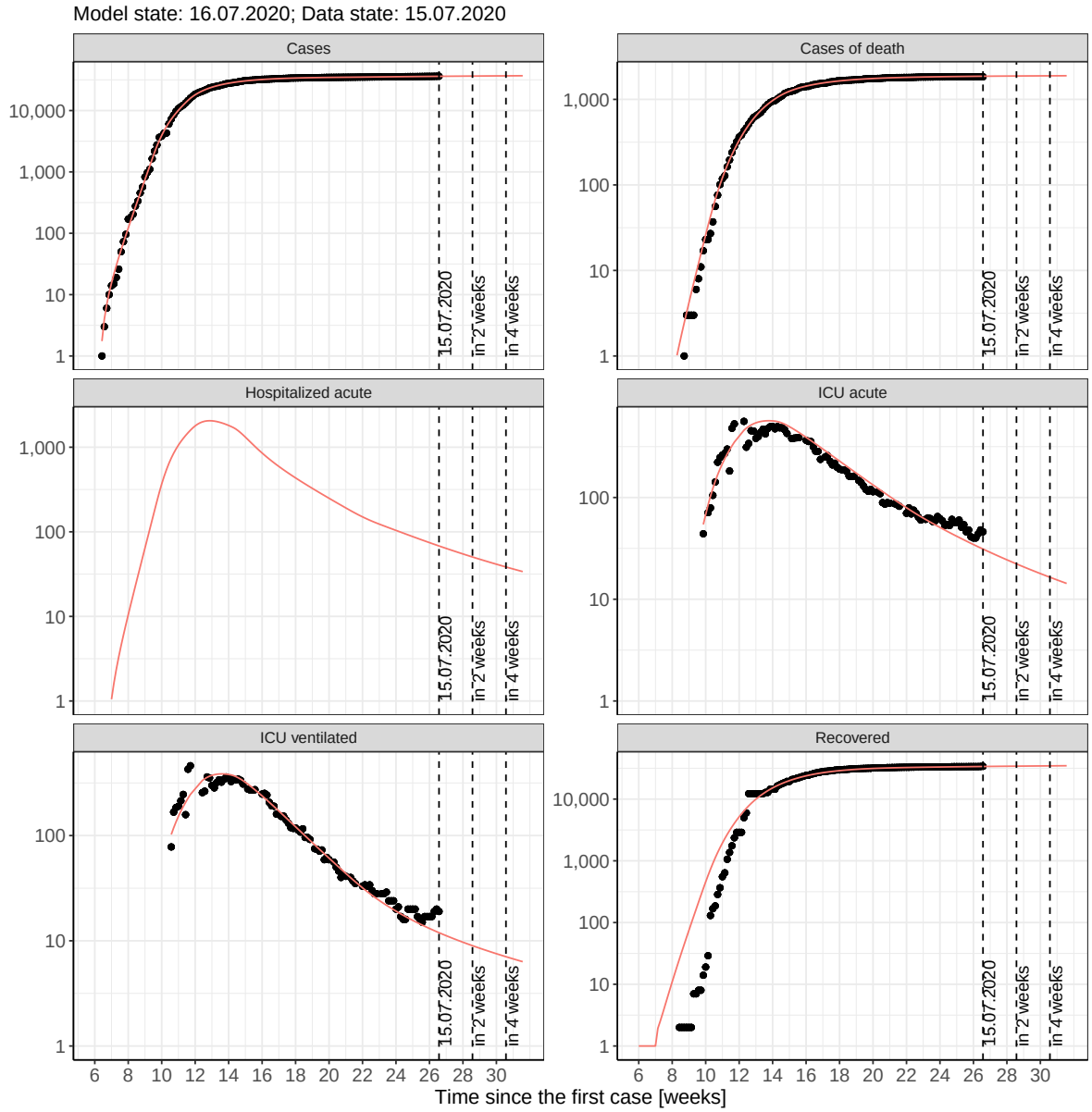


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

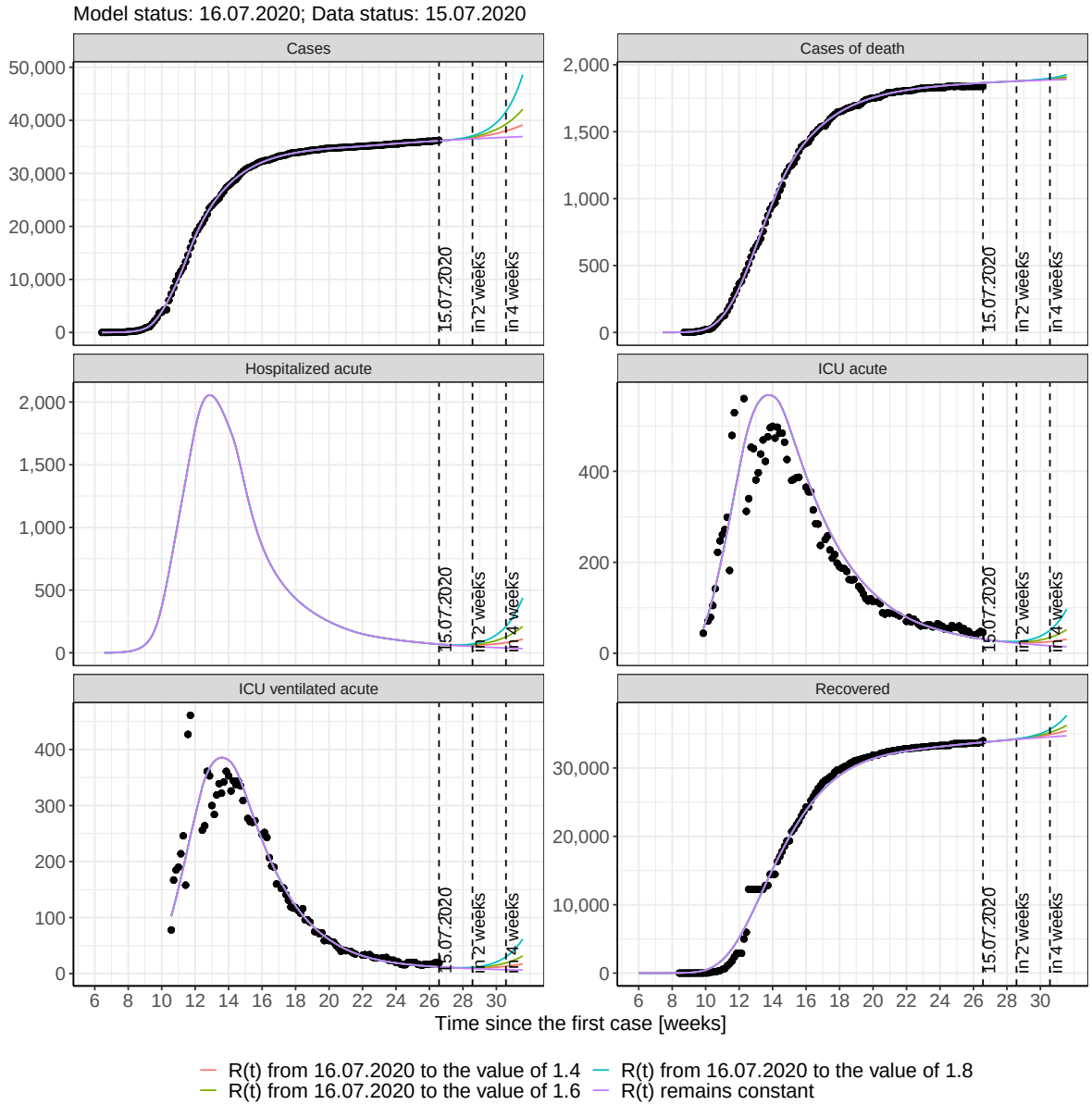


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

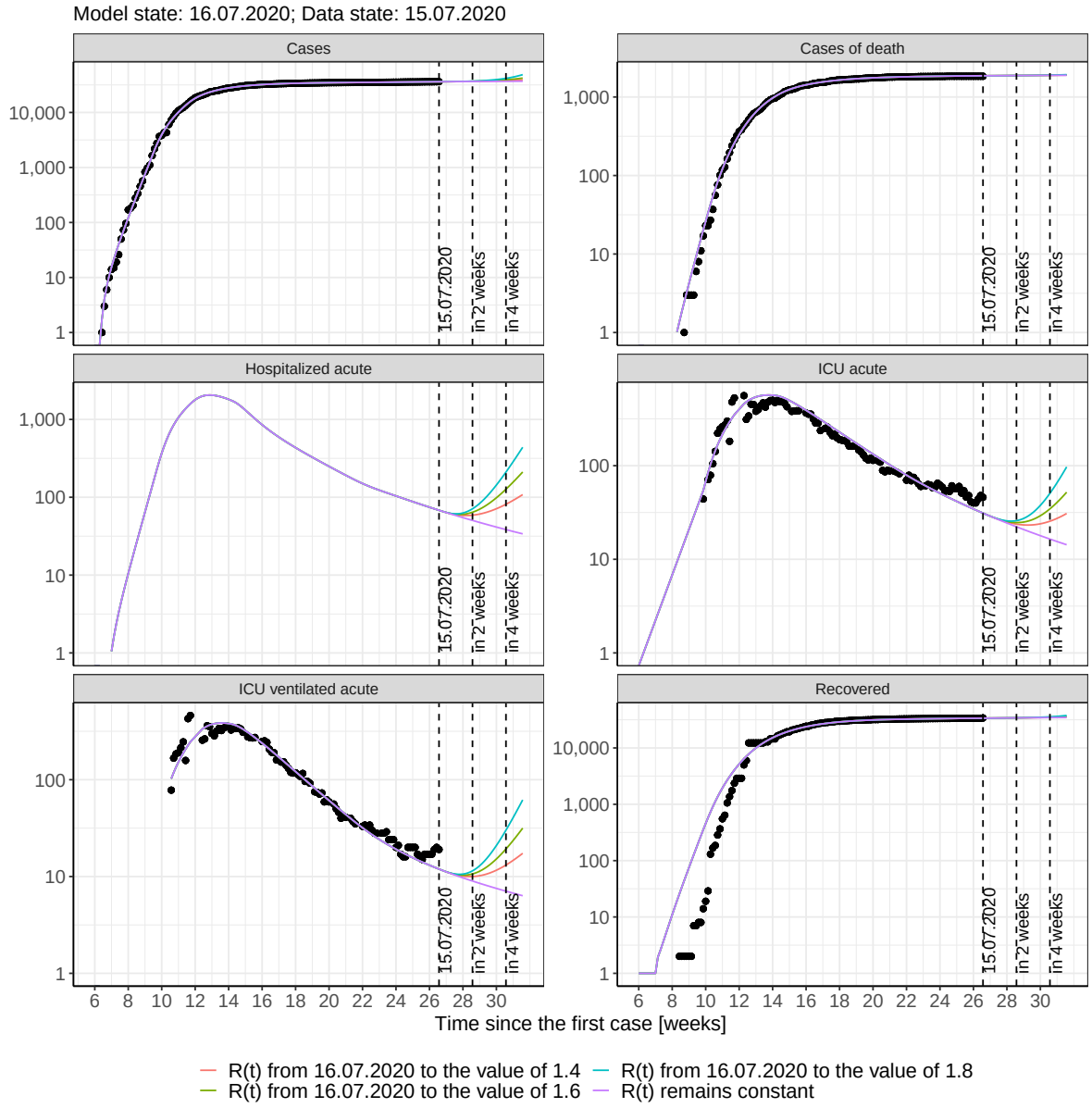


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

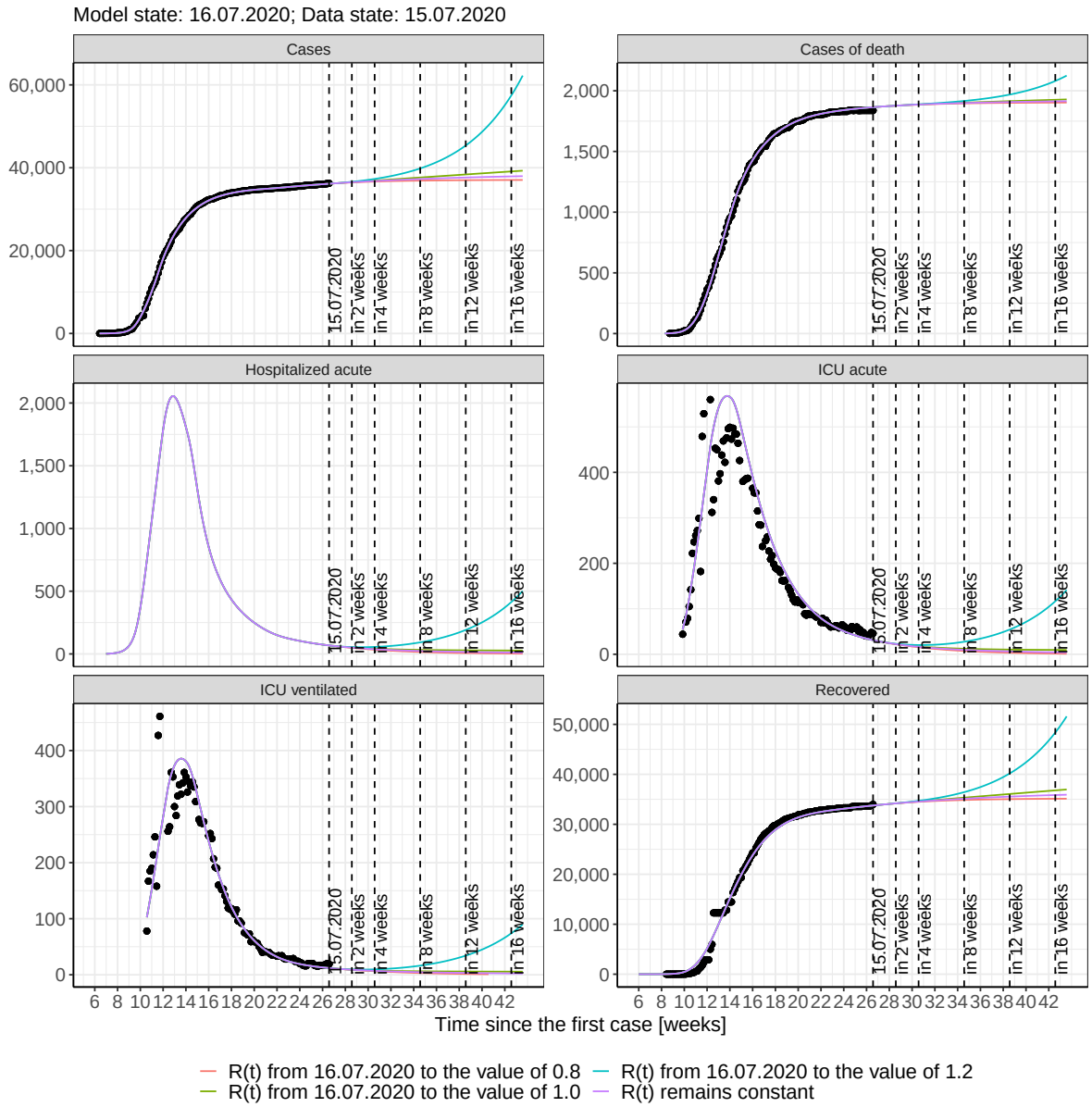


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

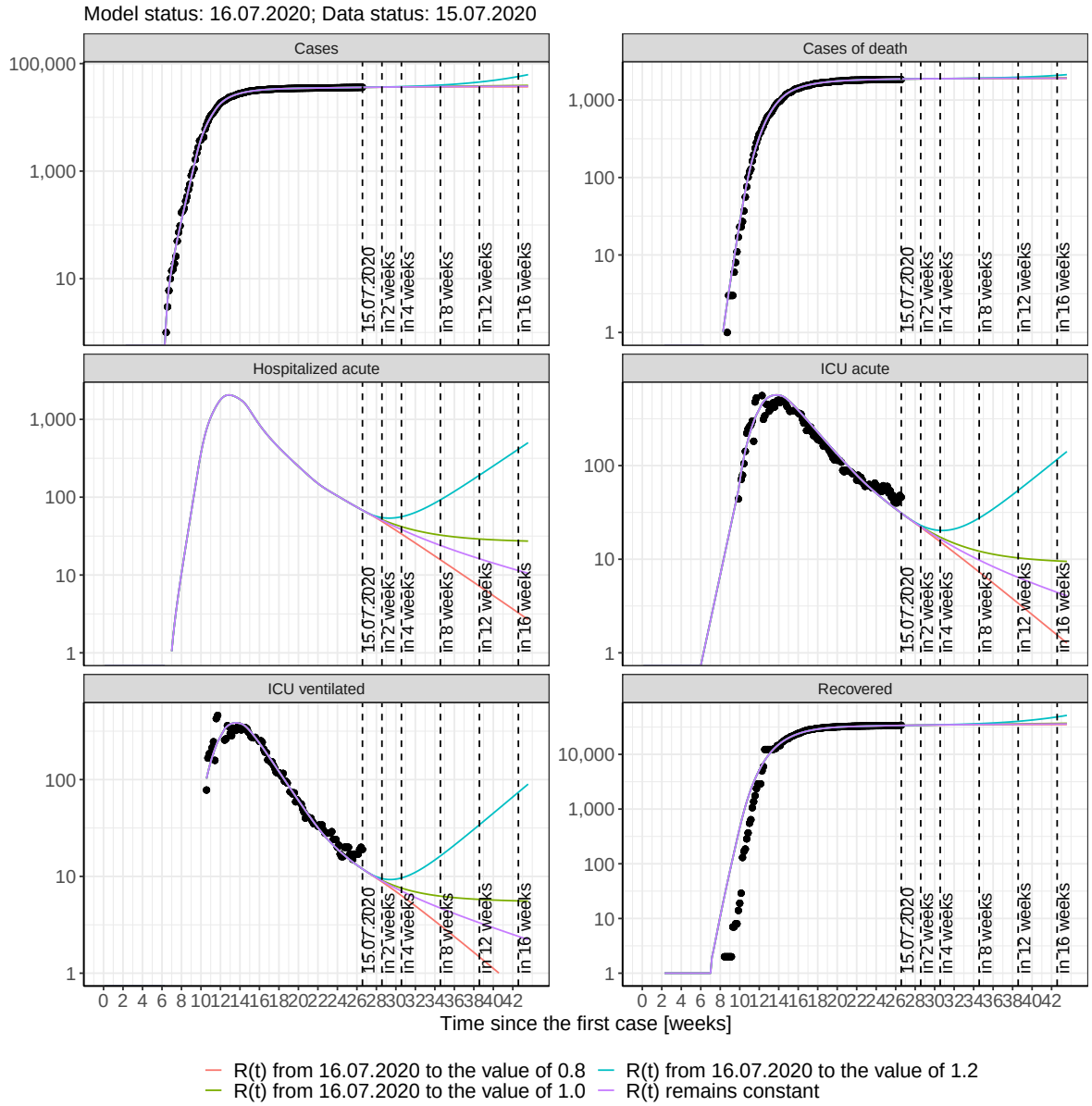


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 5) Model status from 16.07.2020; Data status: 15.07.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	36165	1866	33793	67	30	12
17.07.2020	36191	1867	33825	65	30	11
18.07.2020	36218	1868	33857	64	29	11
19.07.2020	36244	1869	33888	62	28	11
20.07.2020	36270	1870	33919	61	28	11
21.07.2020	36296	1870	33950	60	27	10
22.07.2020	36321	1871	33980	58	26	10
23.07.2020	36346	1872	34010	57	26	10
24.07.2020	36371	1873	34039	56	25	10
25.07.2020	36396	1874	34069	55	24	10
26.07.2020	36420	1875	34098	54	24	10
27.07.2020	36444	1876	34126	53	23	9
28.07.2020	36468	1876	34155	51	23	9
29.07.2020	36491	1877	34183	50	22	9
30.07.2020	36515	1878	34211	49	22	9
31.07.2020	36538	1878	34238	48	21	9
01.08.2020	36561	1879	34265	47	21	9
02.08.2020	36583	1880	34292	47	20	8
03.08.2020	36605	1881	34319	46	20	8
04.08.2020	36628	1881	34345	45	19	8
05.08.2020	36649	1882	34371	44	19	8
06.08.2020	36671	1883	34397	43	19	8
07.08.2020	36692	1883	34422	42	18	8
08.08.2020	36714	1884	34447	41	18	8
09.08.2020	36734	1885	34472	41	18	7
10.08.2020	36755	1885	34497	40	17	7
11.08.2020	36776	1886	34521	39	17	7
12.08.2020	36796	1886	34545	38	16	7

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	36164	1866	33793	67	30	12
17.07.2020	36190	1867	33825	65	30	11
18.07.2020	36216	1868	33857	64	29	11
19.07.2020	36240	1869	33888	62	28	11
20.07.2020	36264	1870	33919	61	27	11
21.07.2020	36287	1870	33949	59	27	10
22.07.2020	36310	1871	33979	58	26	10
23.07.2020	36332	1872	34009	57	26	10
24.07.2020	36353	1873	34038	55	25	10
25.07.2020	36374	1874	34067	54	24	10
26.07.2020	36394	1875	34095	53	24	9
27.07.2020	36414	1876	34123	51	23	9
28.07.2020	36432	1876	34150	50	23	9
29.07.2020	36451	1877	34177	49	22	9
30.07.2020	36469	1878	34203	48	21	9
31.07.2020	36486	1878	34228	46	21	8
01.08.2020	36503	1879	34253	45	20	8
02.08.2020	36519	1880	34278	44	20	8
03.08.2020	36535	1880	34302	43	19	8
04.08.2020	36551	1881	34326	42	19	8
05.08.2020	36566	1882	34349	41	18	7
06.08.2020	36581	1882	34371	40	18	7
07.08.2020	36595	1883	34393	39	17	7
08.08.2020	36609	1884	34414	38	17	7
09.08.2020	36622	1884	34435	37	17	7
10.08.2020	36635	1885	34455	36	16	7
11.08.2020	36648	1885	34475	35	16	6
12.08.2020	36660	1886	34495	34	15	6

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	36165	1866	33793	67	30	12
17.07.2020	36192	1867	33825	65	30	11
18.07.2020	36219	1868	33857	64	29	11
19.07.2020	36246	1869	33888	62	28	11
20.07.2020	36274	1870	33919	61	28	11
21.07.2020	36301	1870	33950	60	27	11
22.07.2020	36328	1871	33980	59	26	10
23.07.2020	36355	1872	34010	57	26	10
24.07.2020	36382	1873	34040	56	25	10
25.07.2020	36409	1874	34070	55	24	10
26.07.2020	36436	1875	34100	54	24	10
27.07.2020	36463	1876	34129	53	23	9
28.07.2020	36490	1876	34158	52	23	9
29.07.2020	36517	1877	34187	51	22	9
30.07.2020	36545	1878	34216	51	22	9
31.07.2020	36572	1879	34244	50	22	9
01.08.2020	36599	1879	34273	49	21	9
02.08.2020	36626	1880	34301	48	21	9
03.08.2020	36653	1881	34329	47	20	8
04.08.2020	36680	1882	34358	47	20	8
05.08.2020	36706	1882	34386	46	19	8
06.08.2020	36733	1883	34413	45	19	8
07.08.2020	36760	1884	34441	45	19	8
08.08.2020	36787	1884	34469	44	18	8
09.08.2020	36814	1885	34497	44	18	8
10.08.2020	36841	1886	34524	43	18	8
11.08.2020	36868	1886	34552	42	18	8
12.08.2020	36895	1887	34579	42	17	8

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	36165	1866	33793	67	30	12
17.07.2020	36194	1867	33825	65	30	11
18.07.2020	36223	1868	33857	64	29	11
19.07.2020	36253	1869	33888	62	28	11
20.07.2020	36284	1870	33919	61	28	11
21.07.2020	36315	1870	33950	60	27	11
22.07.2020	36348	1871	33981	59	26	10
23.07.2020	36382	1872	34012	58	26	10
24.07.2020	36416	1873	34043	57	25	10
25.07.2020	36452	1874	34074	57	25	10
26.07.2020	36488	1875	34105	56	24	10
27.07.2020	36526	1876	34136	56	24	10
28.07.2020	36565	1876	34168	55	23	10
29.07.2020	36604	1877	34199	55	23	10
30.07.2020	36645	1878	34231	54	23	9
31.07.2020	36687	1879	34264	54	22	9
01.08.2020	36730	1880	34297	54	22	9
02.08.2020	36775	1880	34330	54	22	9
03.08.2020	36821	1881	34365	54	21	9
04.08.2020	36868	1882	34399	54	21	9
05.08.2020	36916	1883	34435	54	21	9
06.08.2020	36966	1884	34471	54	21	9
07.08.2020	37017	1884	34507	54	21	9
08.08.2020	37069	1885	34545	54	21	9
09.08.2020	37124	1886	34583	55	20	9
10.08.2020	37179	1887	34623	55	20	9
11.08.2020	37236	1888	34663	56	20	10
12.08.2020	37295	1888	34704	56	20	10

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 21 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

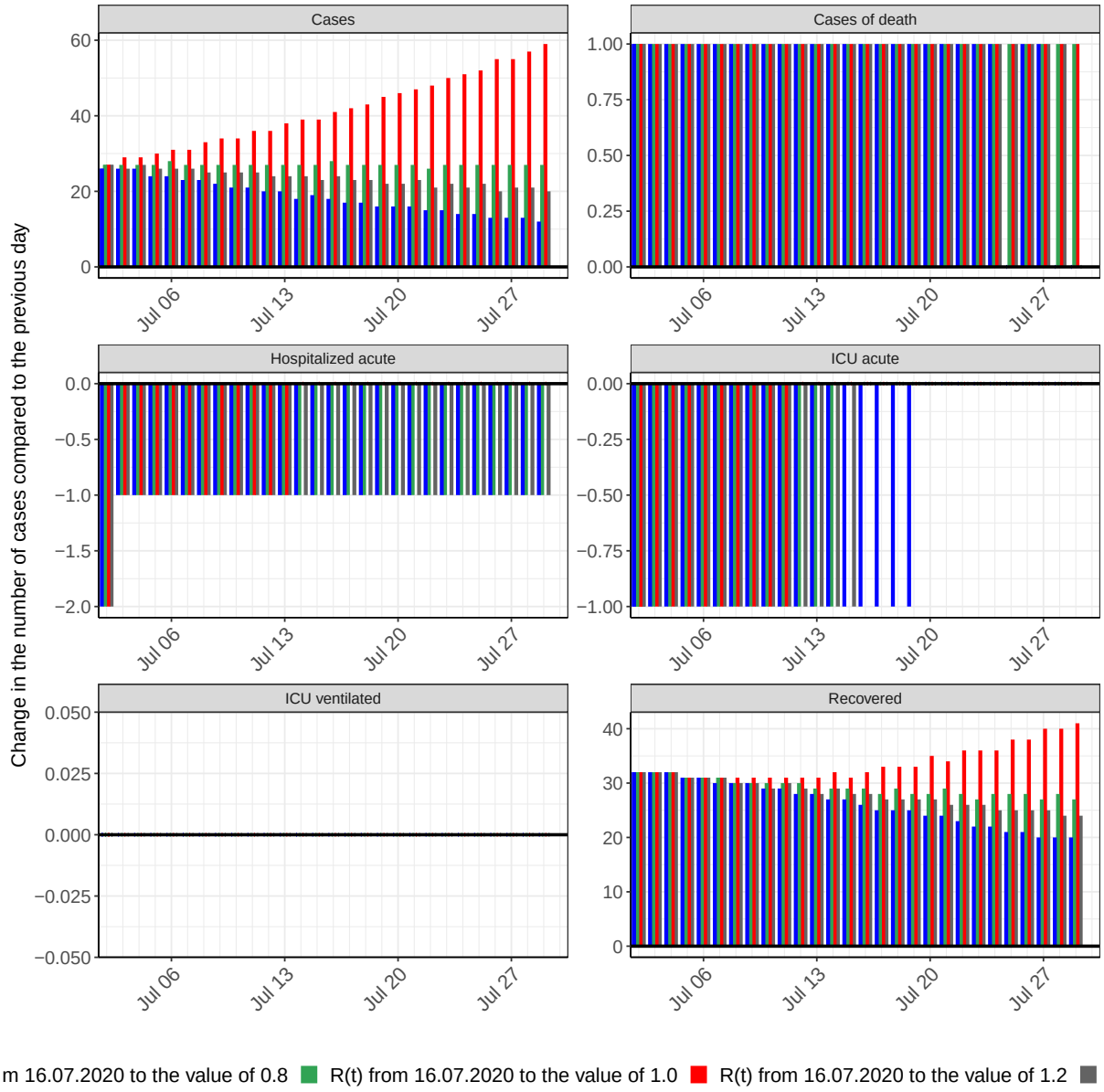


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

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.

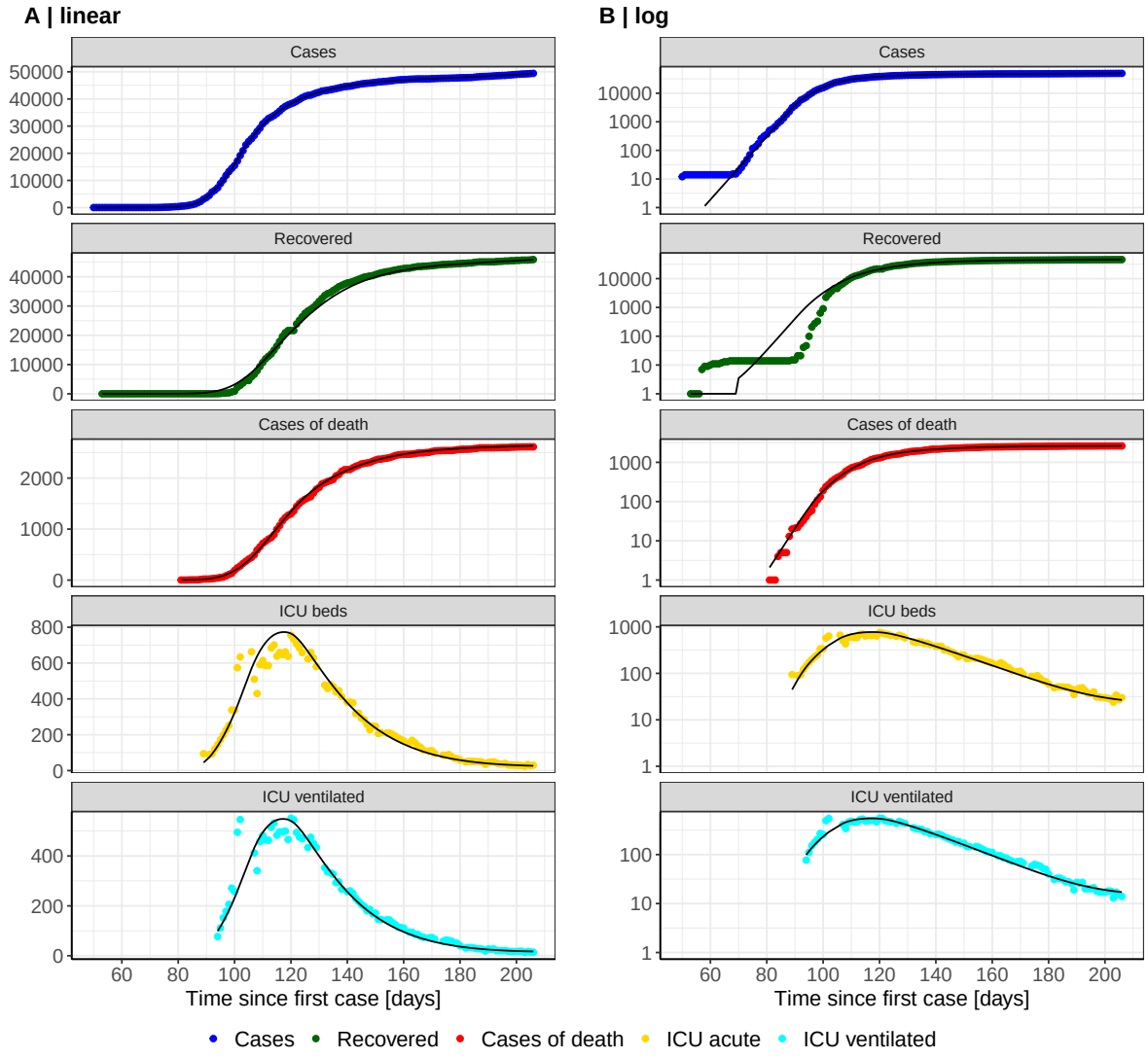


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

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.

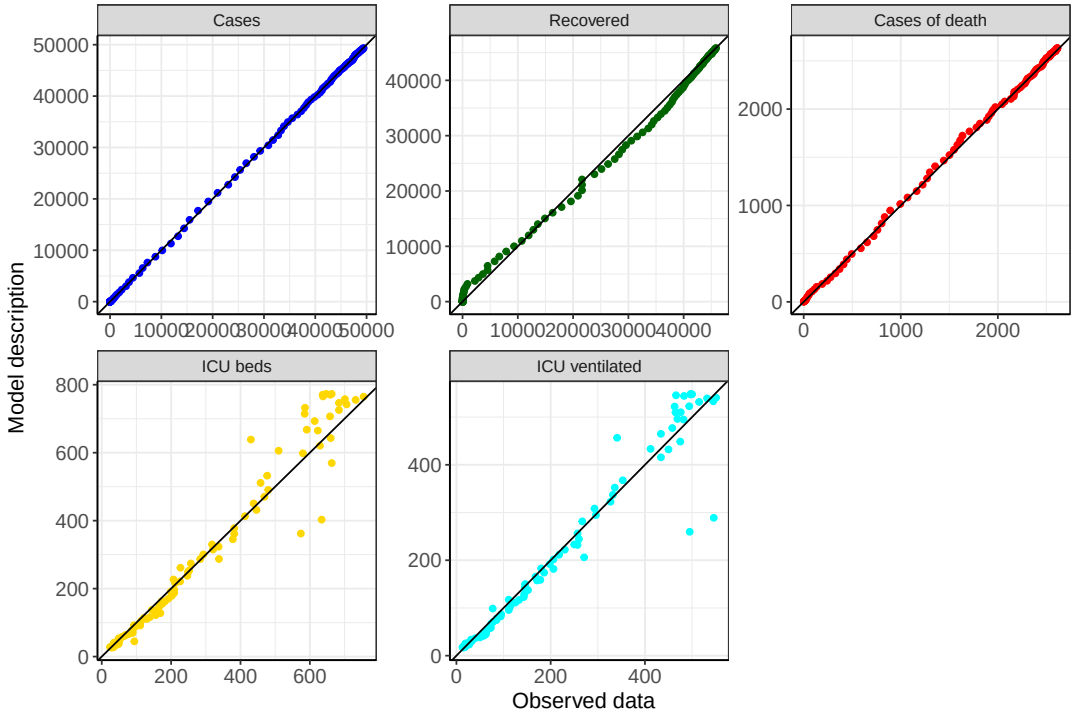


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

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).

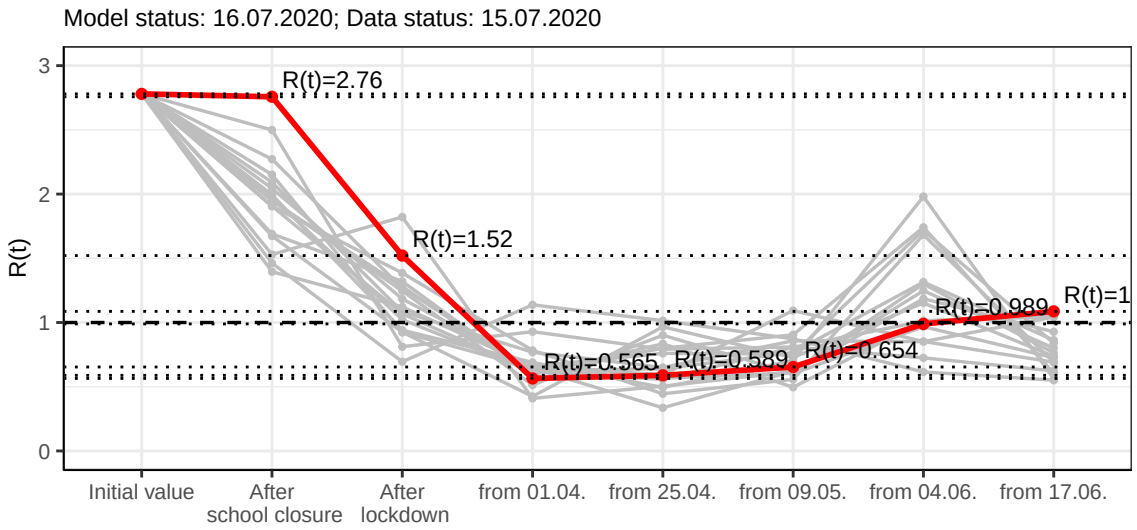


Figure 24: R(t) values before and after the NPIs for Bavaria

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

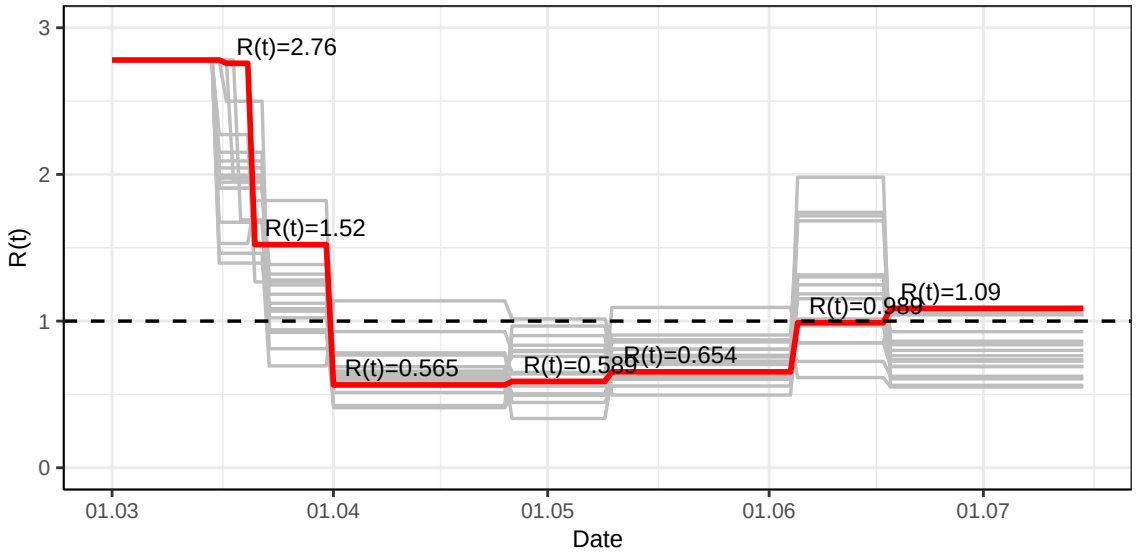


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

3.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.09)

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.

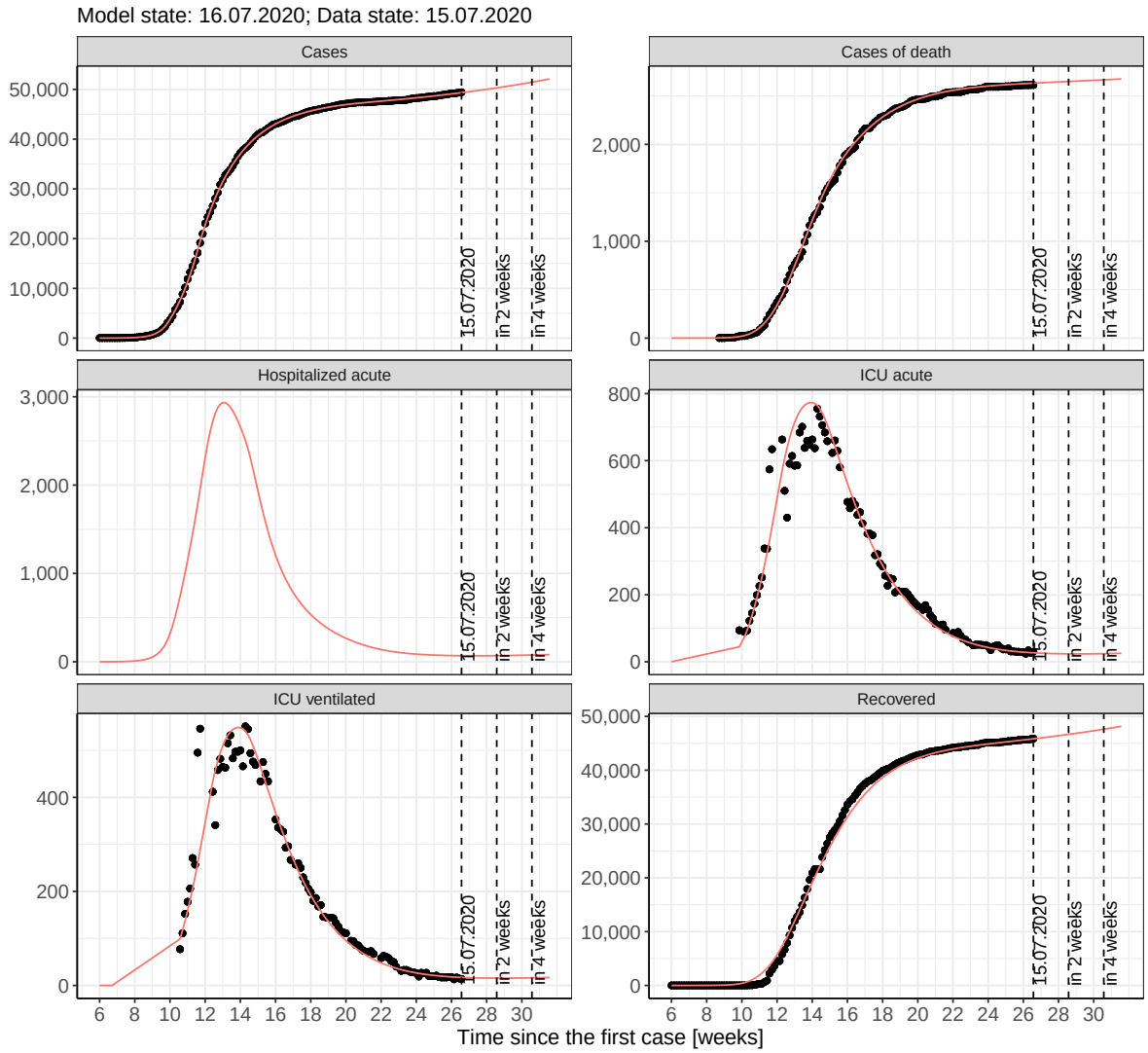


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

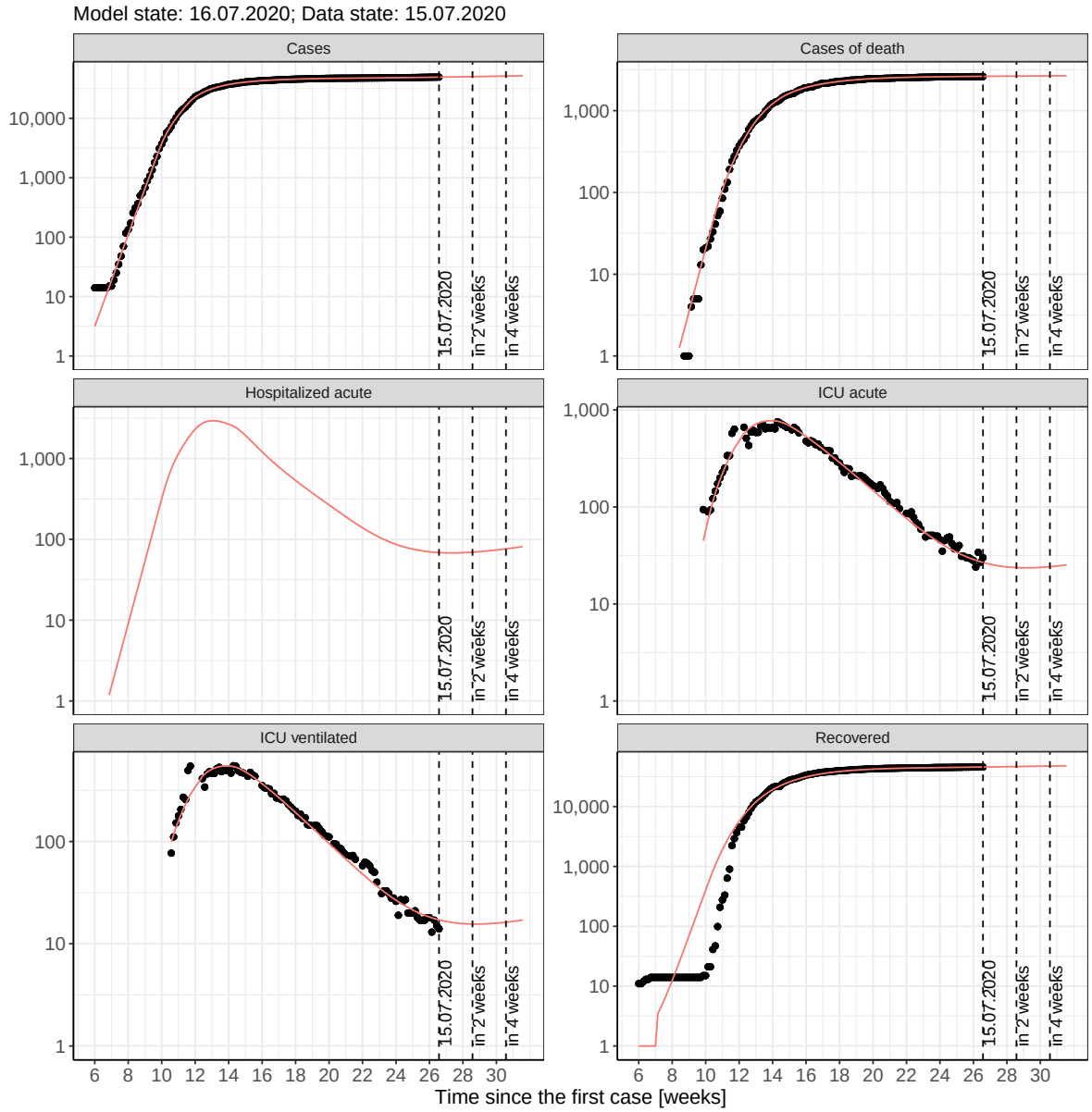


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

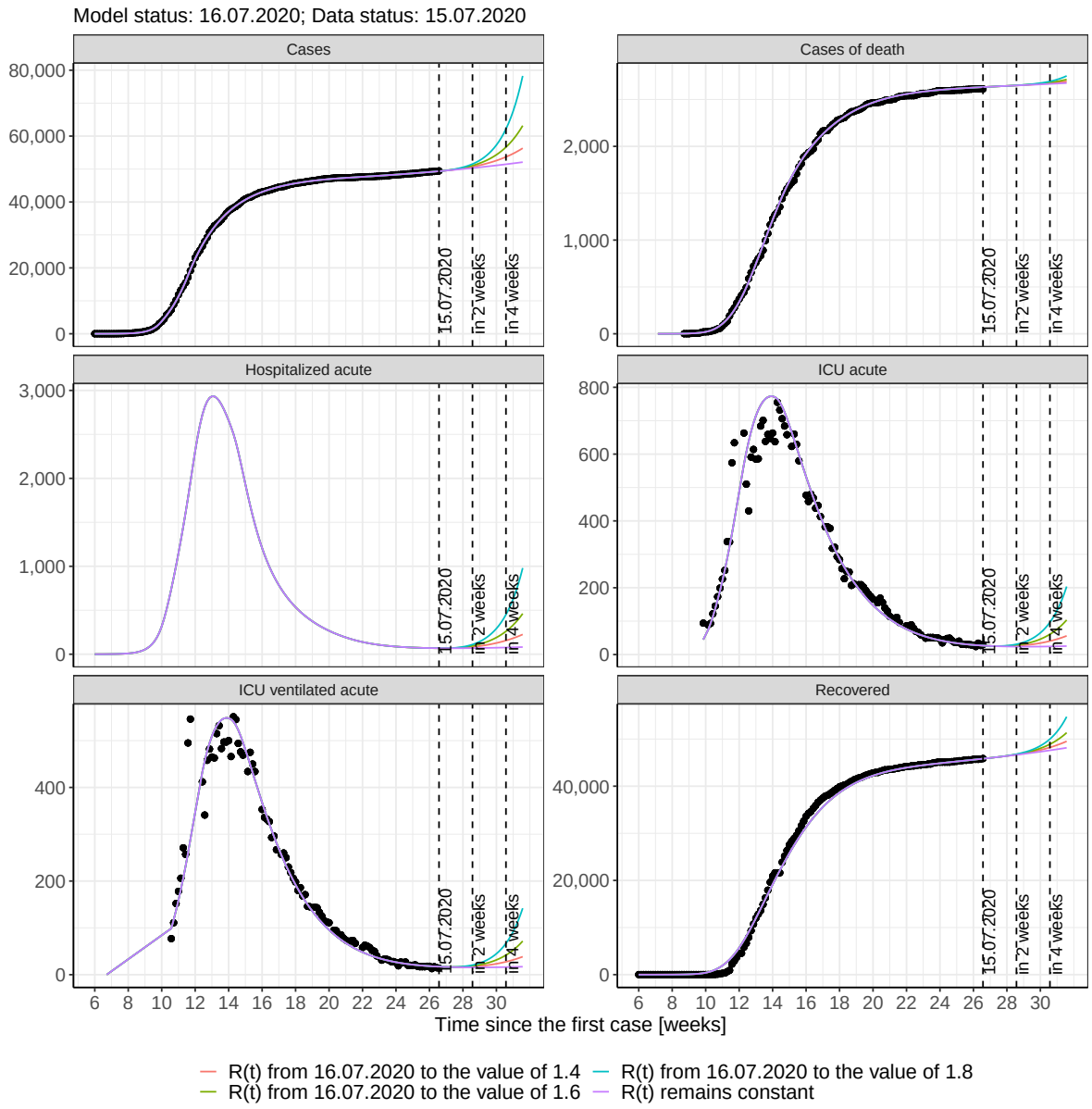


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

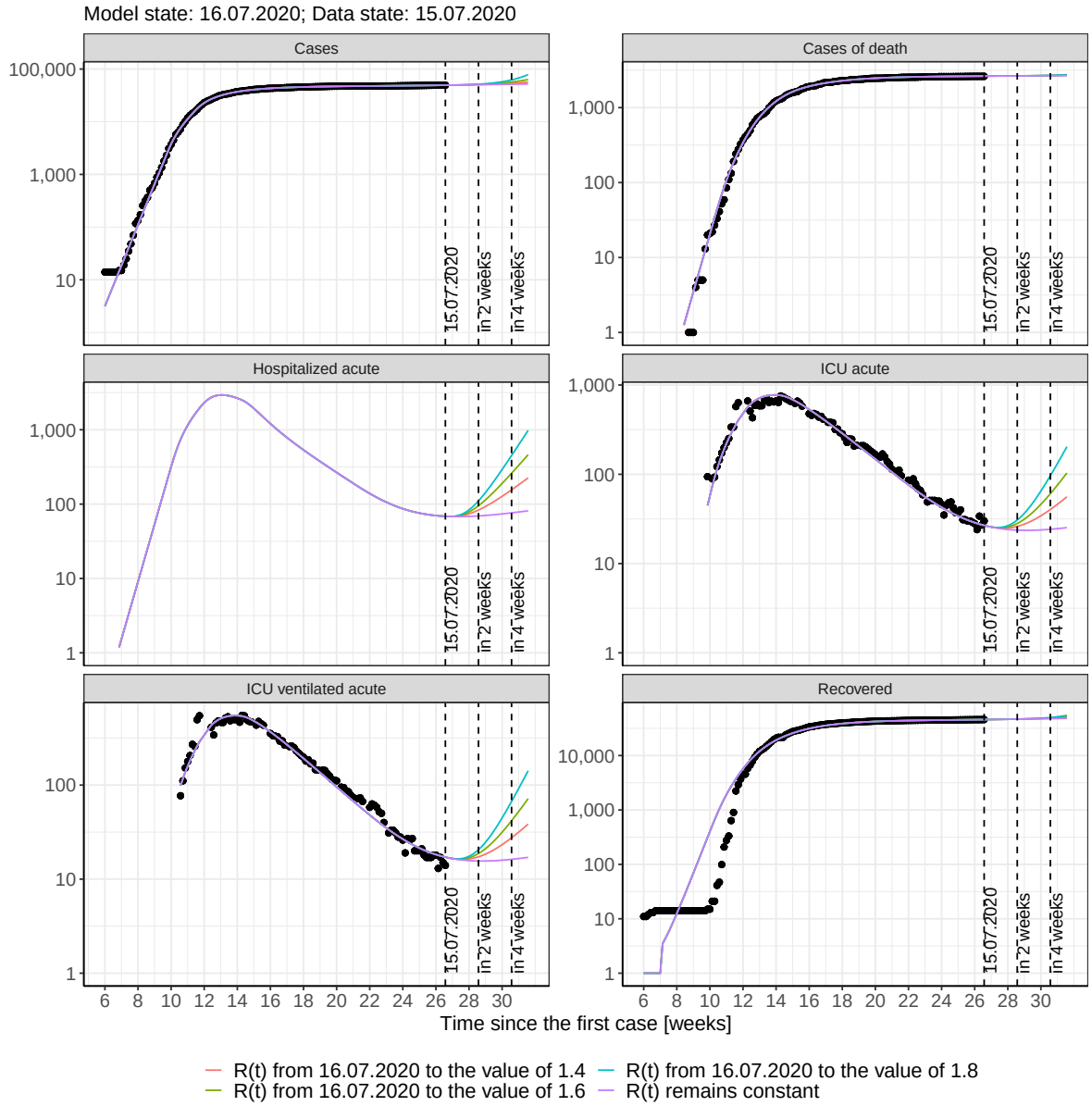


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

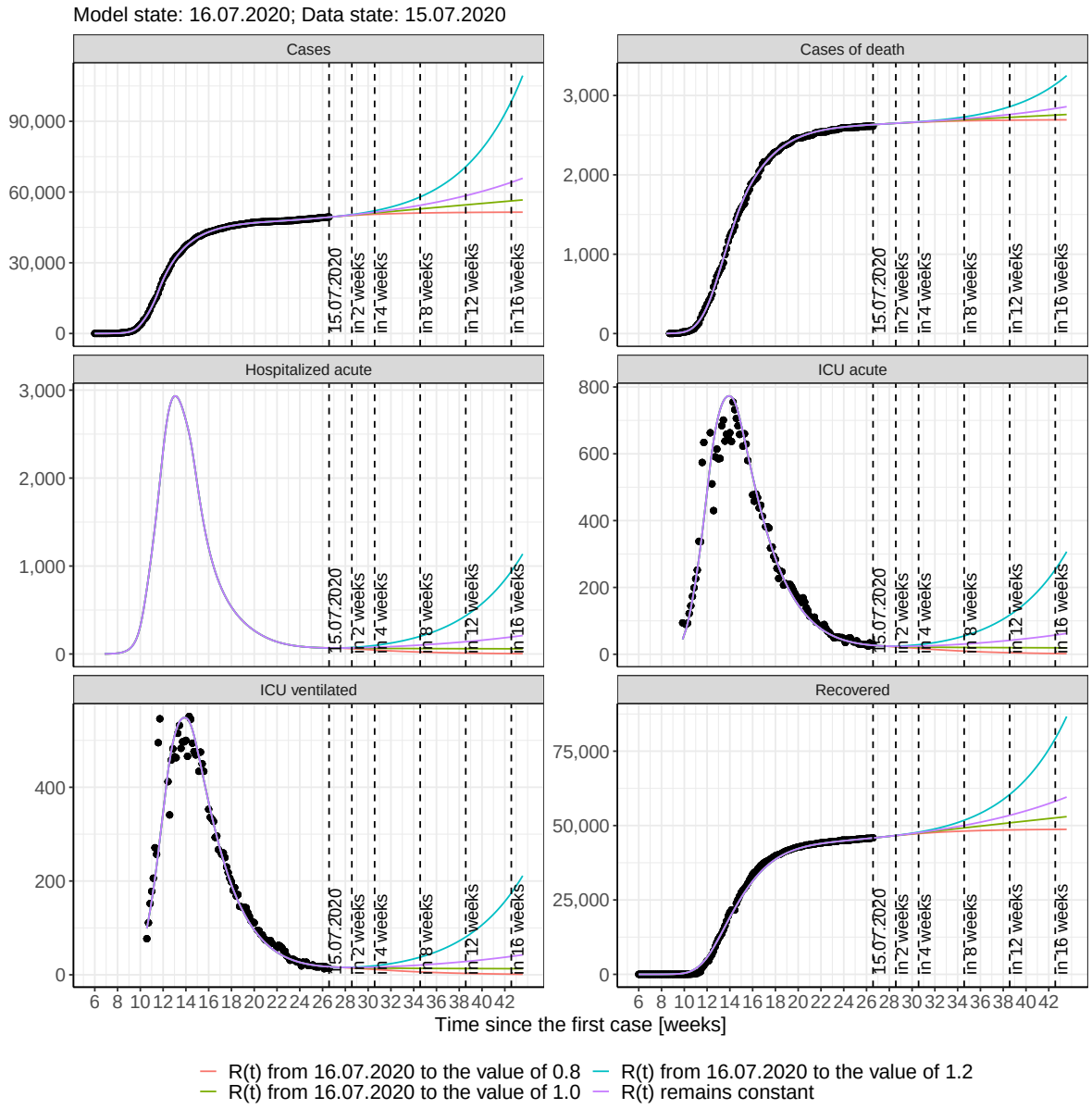


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

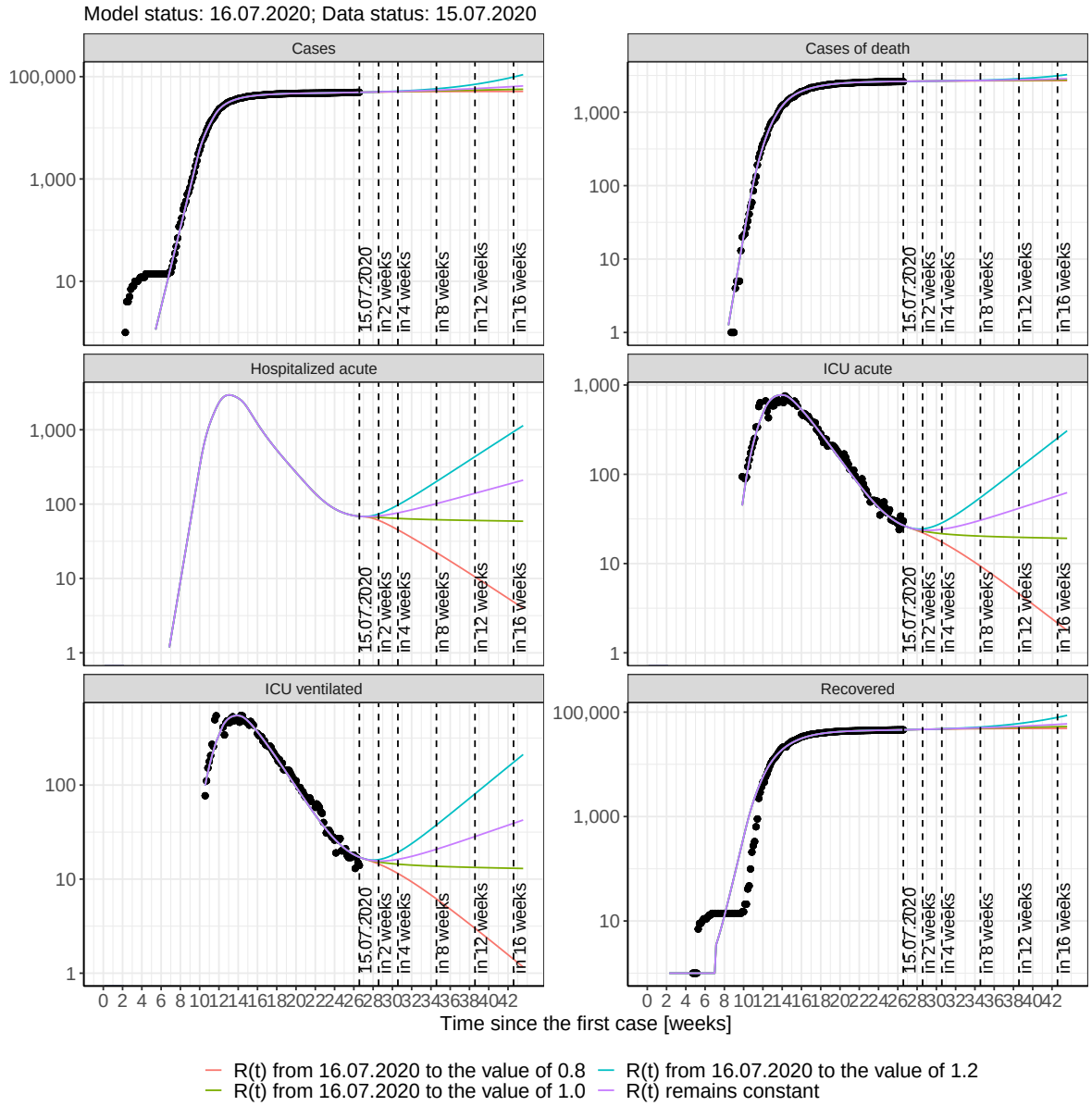


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 9) Model status from 16.07.2020; Data status: 15.07.2020.

Table 6: Bavaria - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	49405	2634	45888	68	26	17
17.07.2020	49470	2635	45943	68	26	17
18.07.2020	49535	2636	46000	68	26	17
19.07.2020	49602	2638	46056	68	25	16
20.07.2020	49669	2639	46113	68	25	16
21.07.2020	49736	2640	46171	68	25	16
22.07.2020	49805	2641	46229	68	25	16
23.07.2020	49874	2643	46288	68	24	16
24.07.2020	49945	2644	46348	68	24	16
25.07.2020	50016	2645	46408	68	24	16
26.07.2020	50088	2646	46468	69	24	16
27.07.2020	50160	2647	46530	69	24	16
28.07.2020	50234	2648	46592	69	24	16
29.07.2020	50309	2650	46654	69	24	16
30.07.2020	50384	2651	46718	70	24	16
31.07.2020	50460	2652	46782	70	24	16
01.08.2020	50538	2653	46846	70	24	16
02.08.2020	50616	2654	46912	71	24	16
03.08.2020	50695	2656	46978	71	24	16
04.08.2020	50775	2657	47045	72	24	16
05.08.2020	50856	2658	47113	72	24	16
06.08.2020	50938	2659	47181	73	24	16
07.08.2020	51021	2660	47251	73	24	16
08.08.2020	51104	2662	47321	74	24	16
09.08.2020	51189	2663	47392	74	24	16
10.08.2020	51275	2664	47463	75	24	16
11.08.2020	51362	2665	47536	76	24	16
12.08.2020	51450	2666	47609	76	24	16

Table 7: Bavaria - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	49404	2634	45888	68	26	17
17.07.2020	49465	2635	45943	68	26	17
18.07.2020	49524	2636	45999	68	26	17
19.07.2020	49581	2638	46056	68	25	16
20.07.2020	49637	2639	46112	67	25	16
21.07.2020	49691	2640	46169	67	25	16
22.07.2020	49744	2641	46226	66	24	16
23.07.2020	49795	2642	46283	66	24	16
24.07.2020	49845	2644	46340	65	24	15
25.07.2020	49893	2645	46396	64	23	15
26.07.2020	49940	2646	46452	63	23	15
27.07.2020	49985	2647	46508	62	23	15
28.07.2020	50029	2648	46563	61	22	15
29.07.2020	50072	2649	46618	60	22	14
30.07.2020	50114	2650	46672	59	22	14
31.07.2020	50155	2652	46726	58	21	14
01.08.2020	50194	2652	46779	57	21	14
02.08.2020	50232	2654	46830	56	21	14
03.08.2020	50269	2654	46882	55	20	13
04.08.2020	50305	2656	46932	54	20	13
05.08.2020	50340	2656	46981	53	20	13
06.08.2020	50374	2657	47030	52	19	13
07.08.2020	50408	2658	47077	50	19	13
08.08.2020	50440	2659	47124	49	19	12
09.08.2020	50471	2660	47169	48	18	12
10.08.2020	50501	2661	47214	47	18	12
11.08.2020	50531	2662	47258	46	18	12
12.08.2020	50559	2663	47300	45	17	11

Table 8: Bavaria - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	49405	2634	45888	68	26	17
17.07.2020	49468	2635	45943	68	26	17
18.07.2020	49532	2636	46000	68	26	17
19.07.2020	49595	2638	46056	68	25	16
20.07.2020	49659	2639	46113	68	25	16
21.07.2020	49722	2640	46171	68	25	16
22.07.2020	49785	2641	46228	67	25	16
23.07.2020	49848	2643	46287	67	24	16
24.07.2020	49912	2644	46345	67	24	16
25.07.2020	49975	2645	46404	67	24	16
26.07.2020	50038	2646	46463	67	24	15
27.07.2020	50101	2647	46523	67	23	15
28.07.2020	50164	2648	46582	67	23	15
29.07.2020	50227	2650	46642	66	23	15
30.07.2020	50290	2651	46703	66	23	15
31.07.2020	50353	2652	46763	66	23	15
01.08.2020	50416	2653	46824	66	23	15
02.08.2020	50479	2654	46884	66	23	15
03.08.2020	50542	2655	46945	65	22	15
04.08.2020	50605	2656	47006	65	22	15
05.08.2020	50668	2657	47067	65	22	15
06.08.2020	50731	2658	47129	65	22	15
07.08.2020	50794	2660	47190	65	22	15
08.08.2020	50856	2661	47251	65	22	15
09.08.2020	50919	2662	47313	65	22	15
10.08.2020	50982	2663	47374	64	22	15
11.08.2020	51044	2664	47436	64	22	14
12.08.2020	51107	2665	47497	64	22	14

Table 9: Bavaria - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	49406	2634	45888	68	26	17
17.07.2020	49472	2635	45943	68	26	17
18.07.2020	49540	2636	46000	68	26	17
19.07.2020	49610	2638	46056	68	25	16
20.07.2020	49682	2639	46114	68	25	16
21.07.2020	49756	2640	46172	68	25	16
22.07.2020	49833	2641	46231	69	25	16
23.07.2020	49911	2643	46291	69	25	16
24.07.2020	49991	2644	46351	70	24	16
25.07.2020	50074	2645	46413	70	24	16
26.07.2020	50160	2646	46476	71	24	16
27.07.2020	50247	2647	46540	72	24	16
28.07.2020	50337	2649	46605	73	24	16
29.07.2020	50430	2650	46671	74	24	16
30.07.2020	50525	2651	46739	75	25	16
31.07.2020	50623	2652	46809	76	25	16
01.08.2020	50724	2654	46880	77	25	16
02.08.2020	50827	2655	46953	79	25	17
03.08.2020	50934	2656	47027	80	25	17
04.08.2020	51044	2657	47103	82	26	17
05.08.2020	51156	2659	47181	83	26	17
06.08.2020	51272	2660	47261	85	26	17
07.08.2020	51391	2661	47344	87	26	18
08.08.2020	51514	2663	47428	89	27	18
09.08.2020	51640	2664	47514	91	27	18
10.08.2020	51769	2666	47603	93	28	19
11.08.2020	51902	2667	47694	95	28	19
12.08.2020	52039	2669	47788	97	29	19

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 32 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

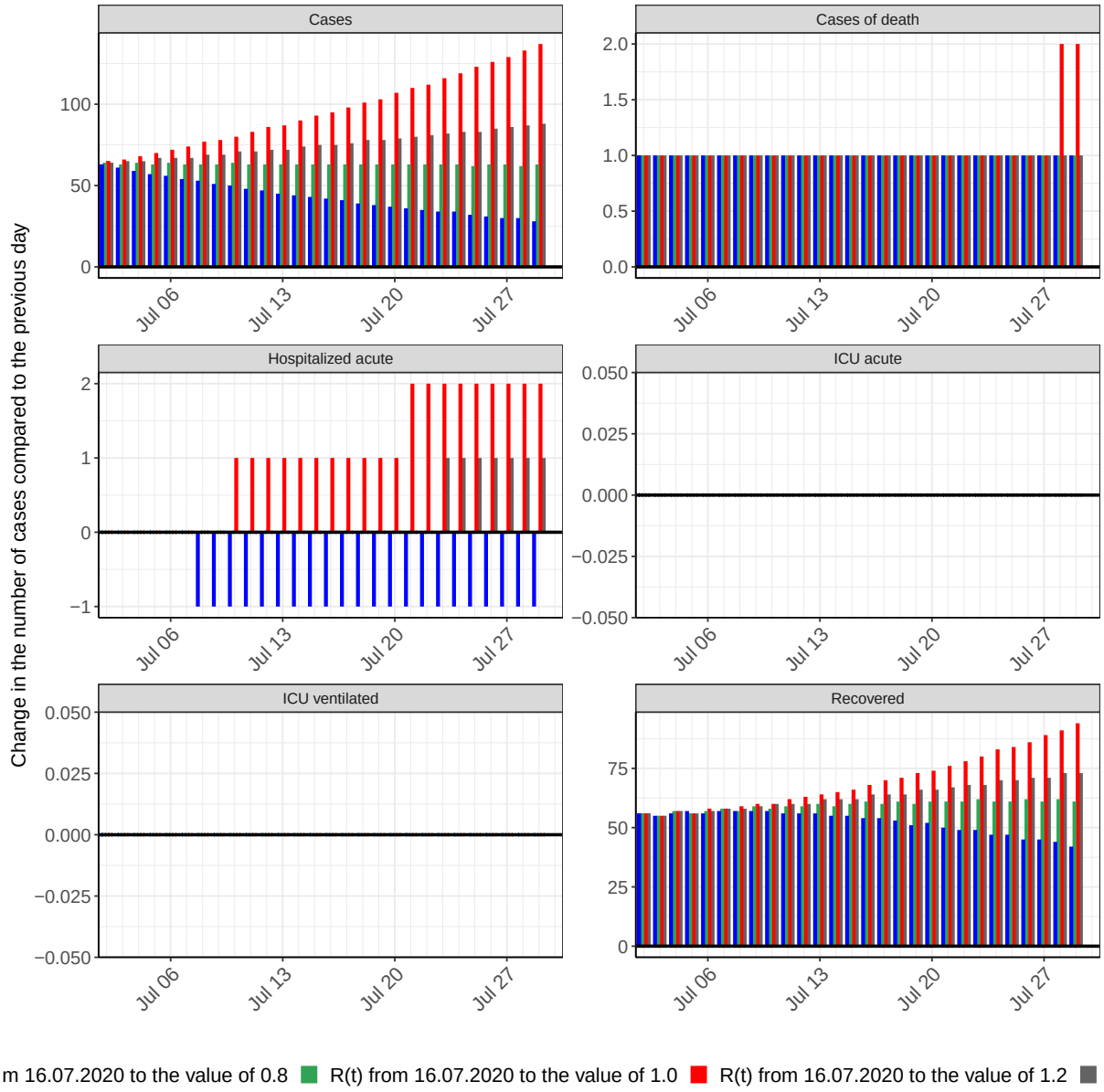


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

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.

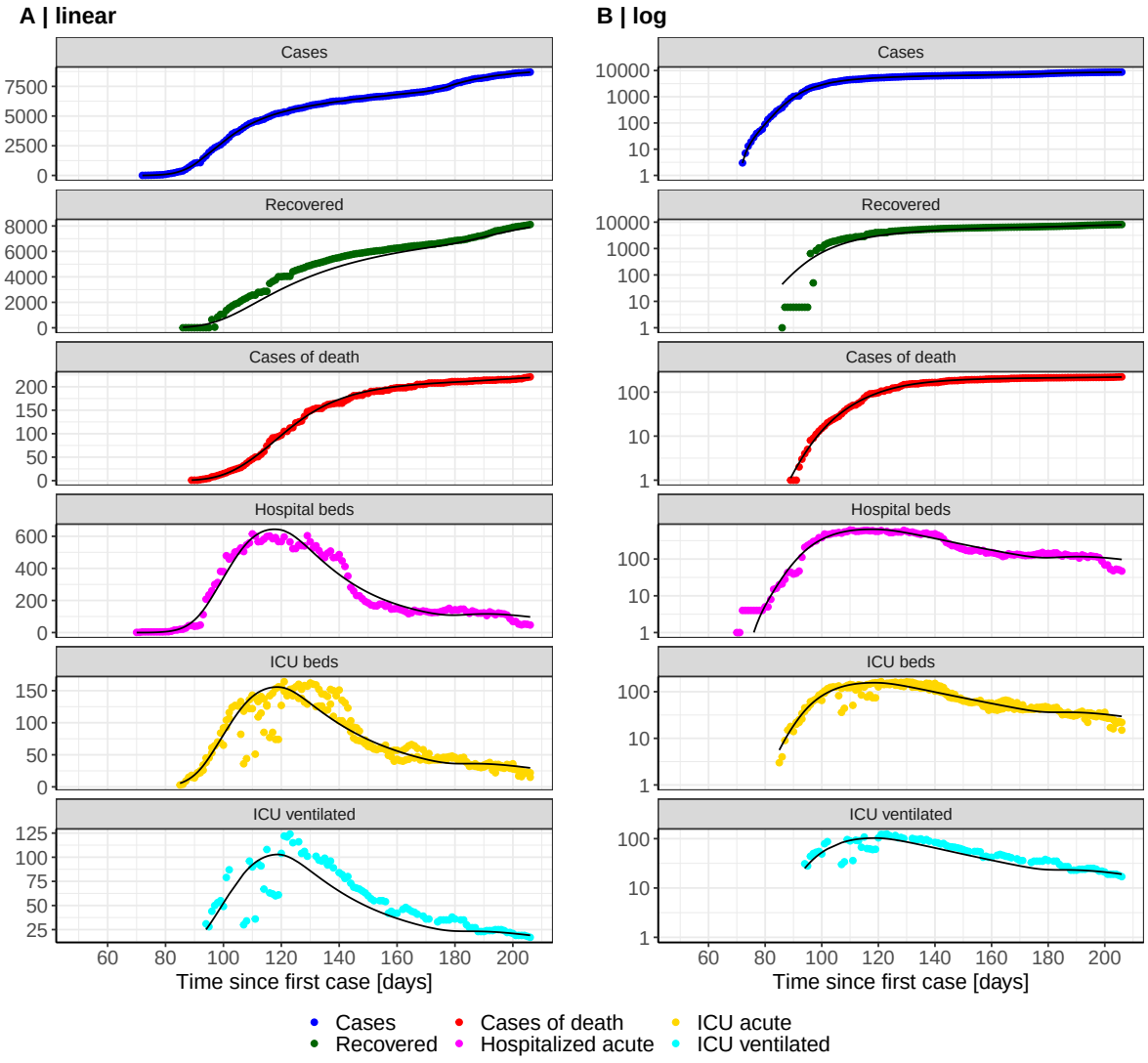


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

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.

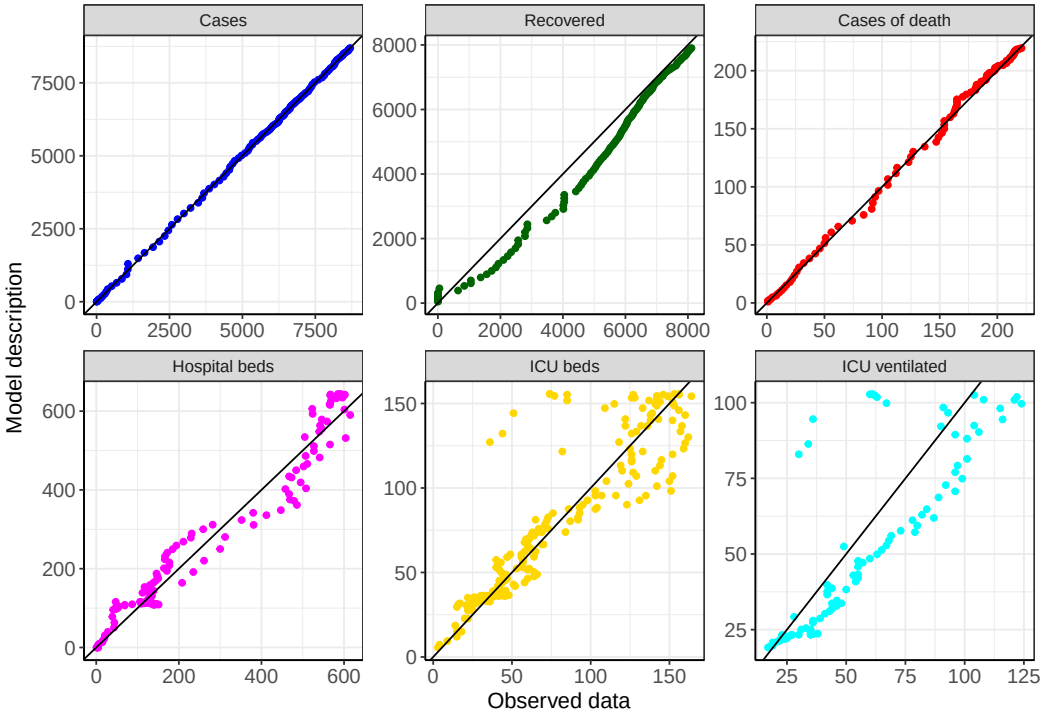


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

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).

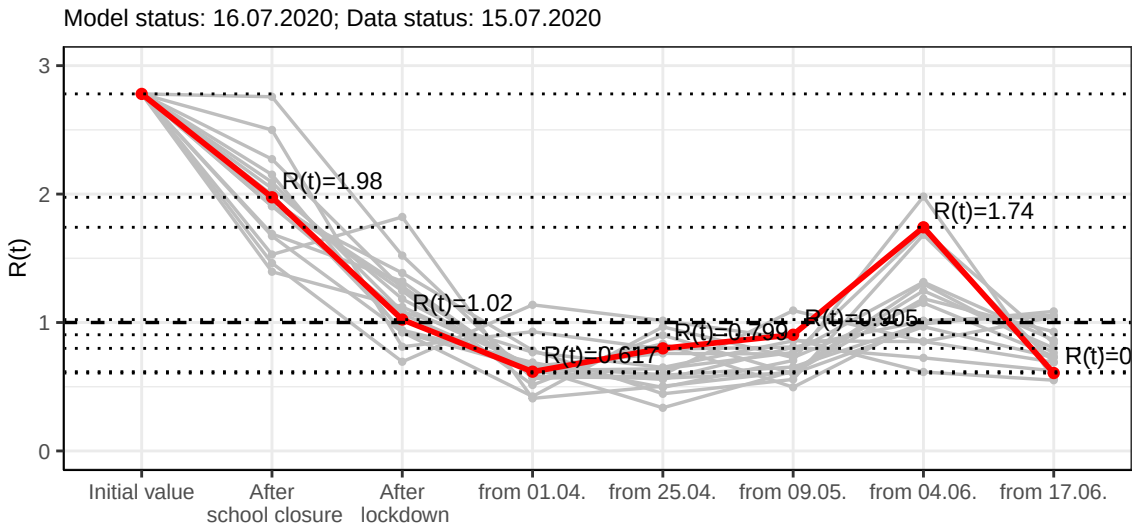


Figure 35: R(t) values before and after the NPIs for Berlin

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

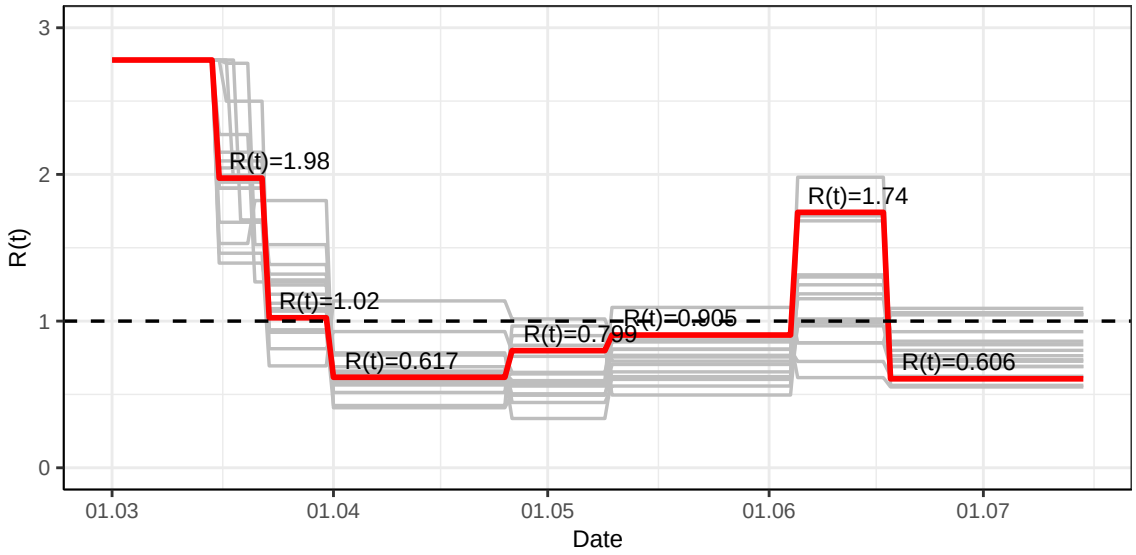


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.61)

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.

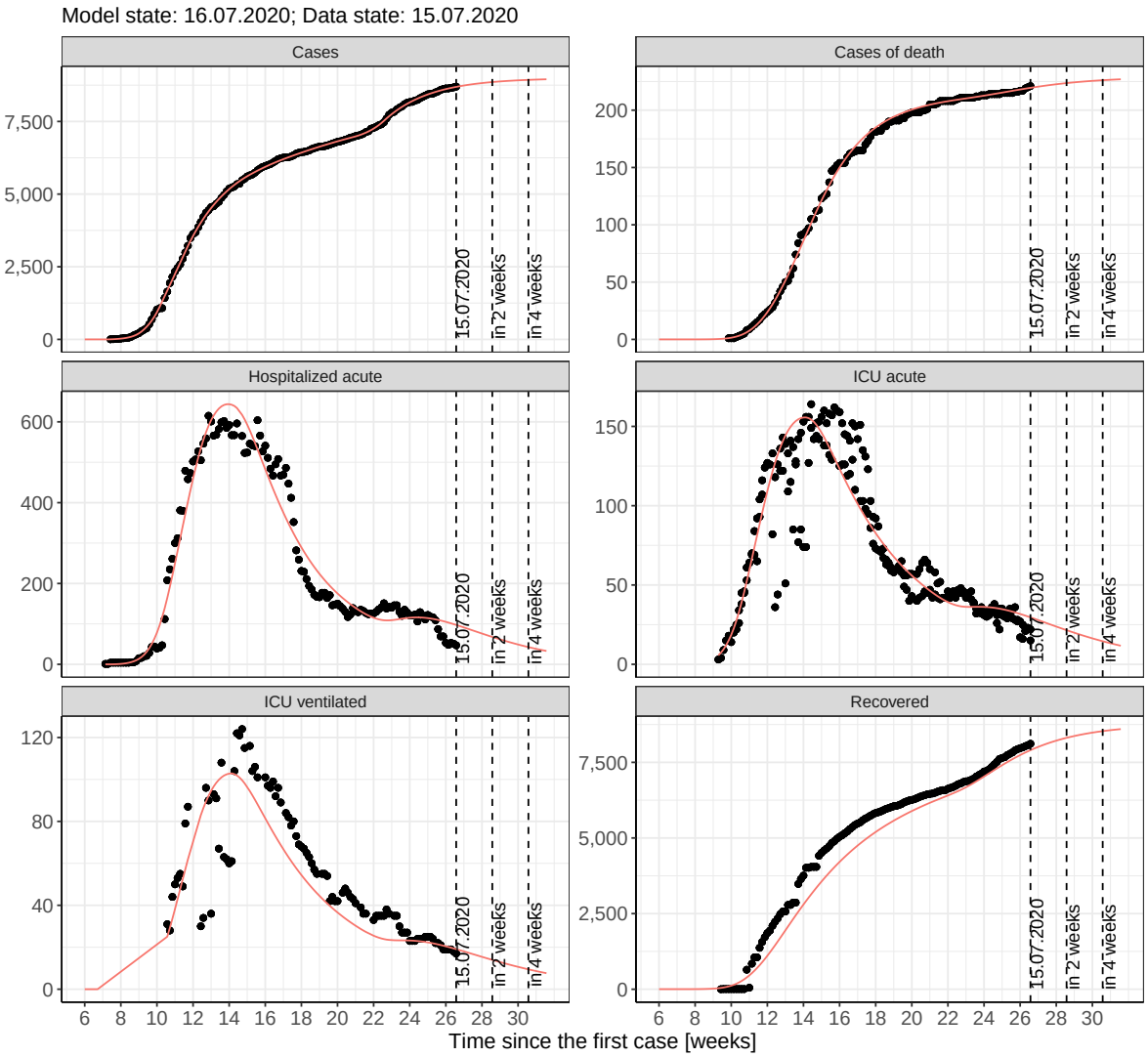


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

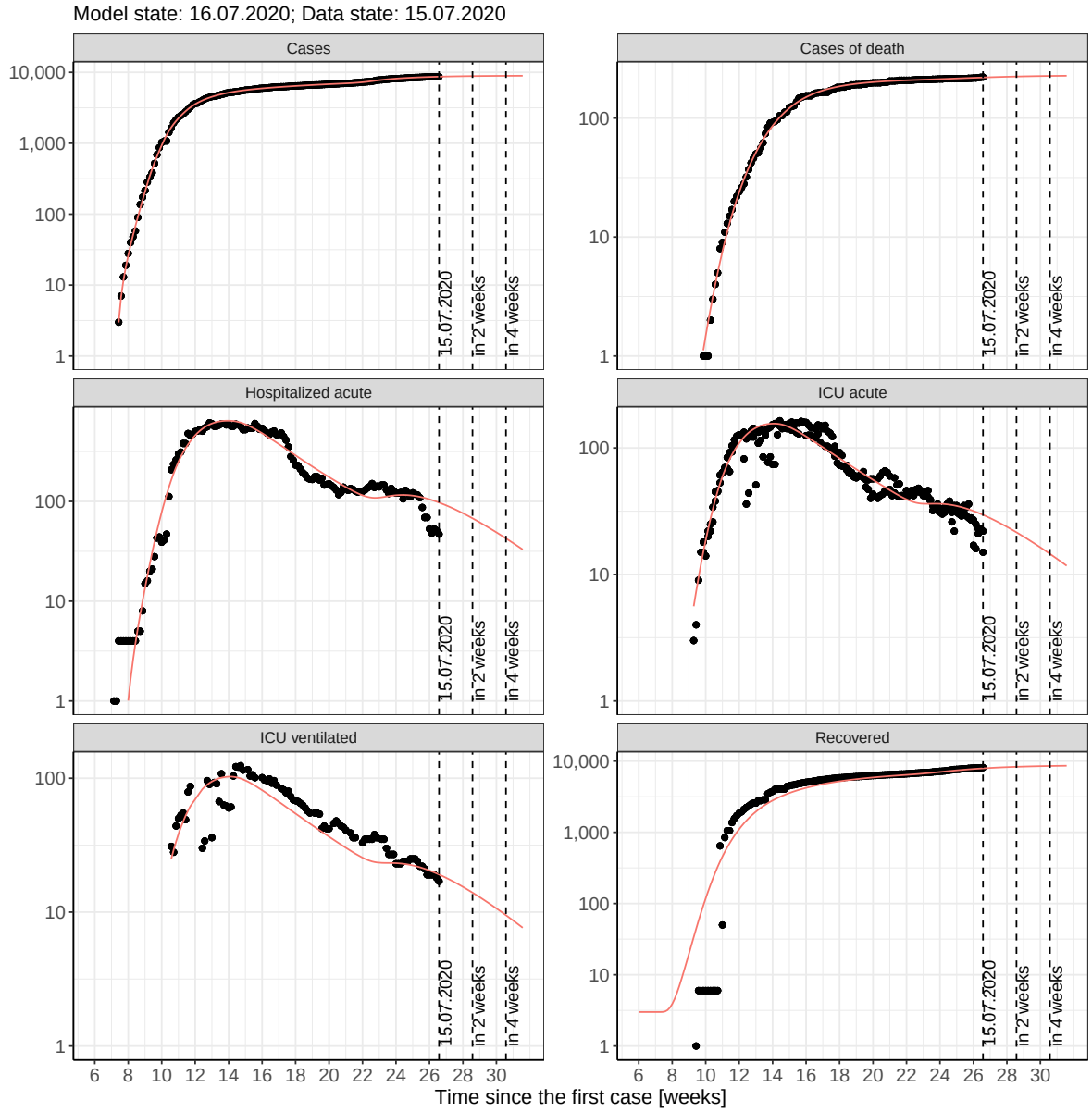


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

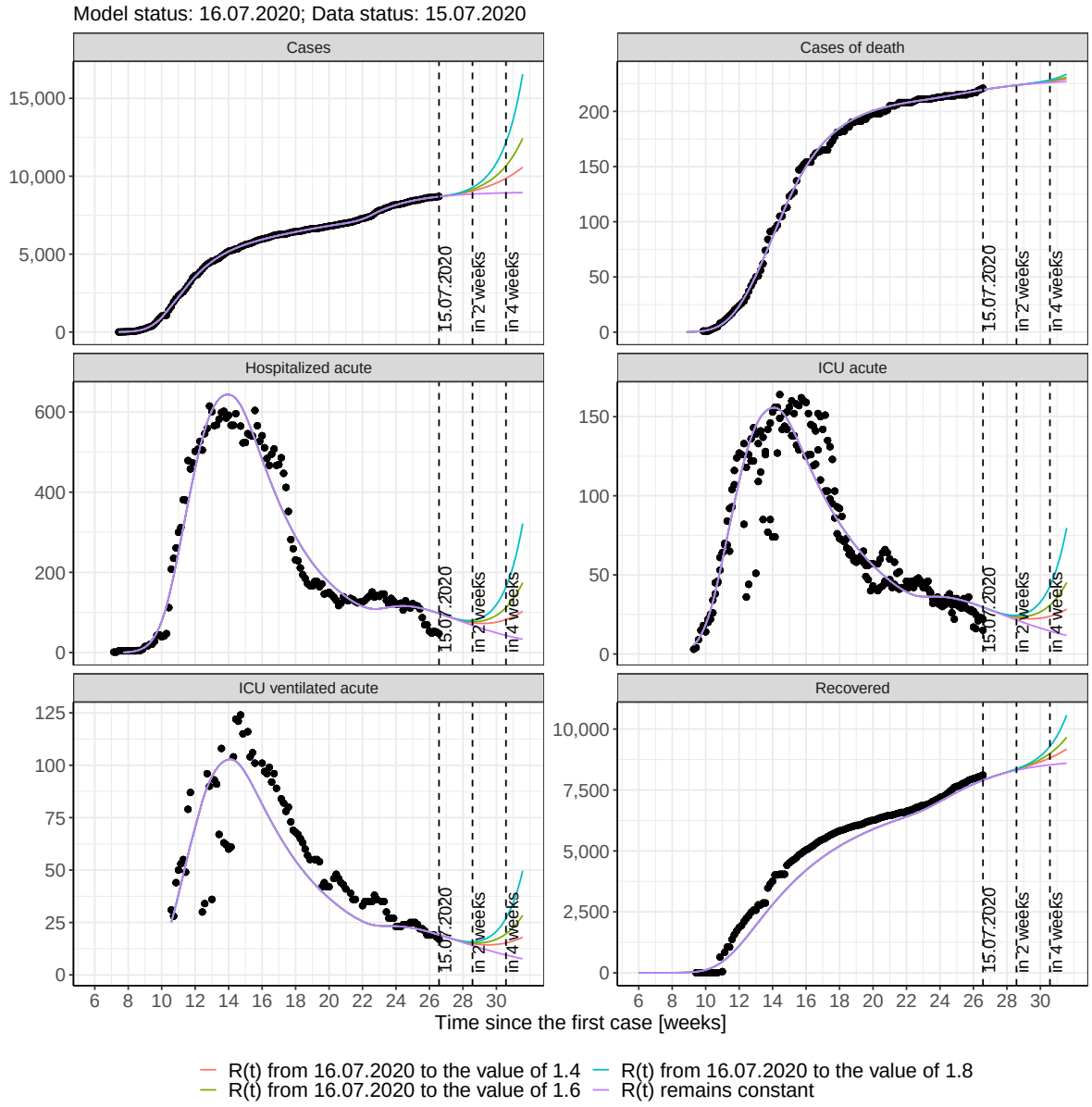


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

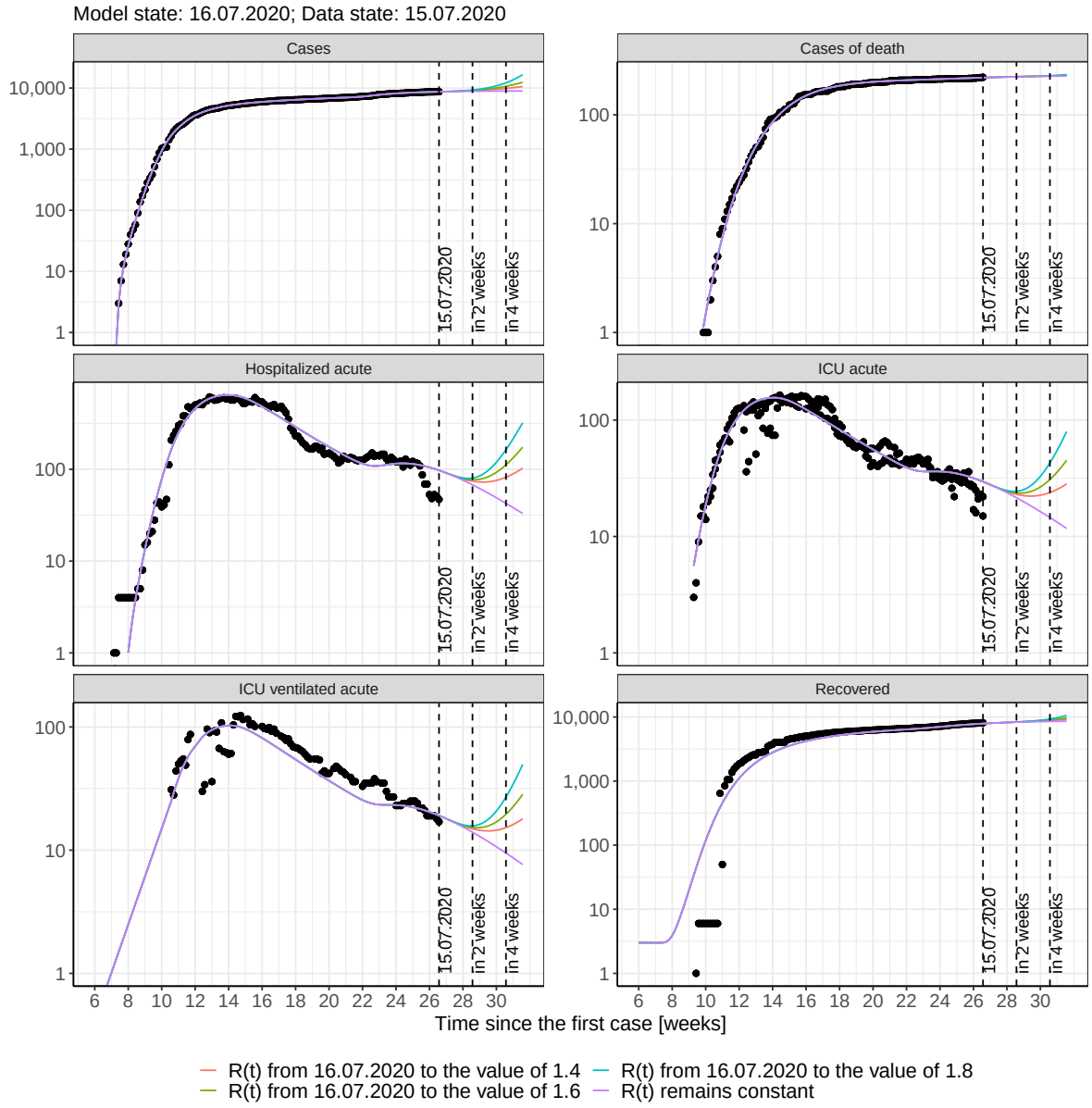


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

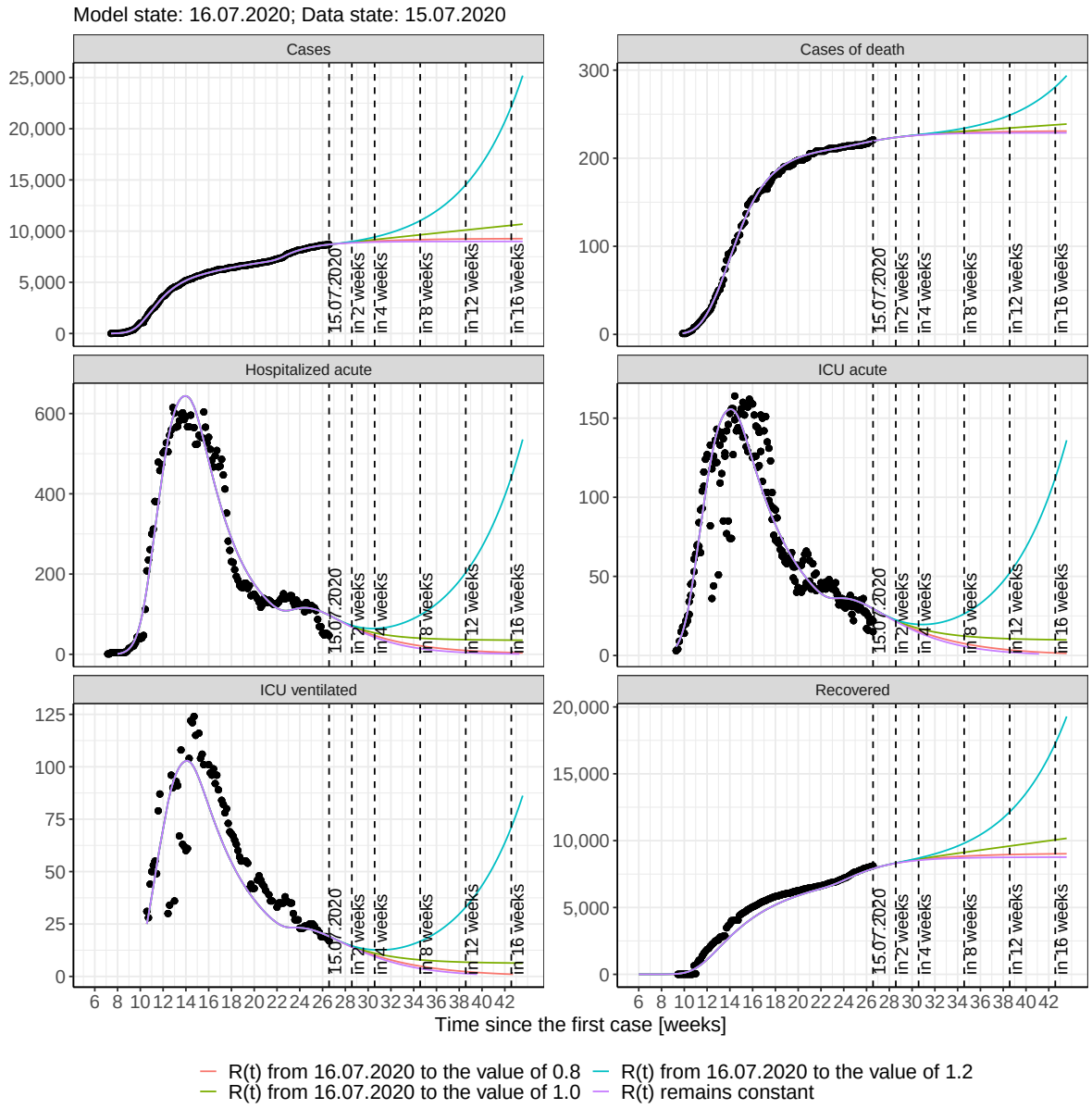


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

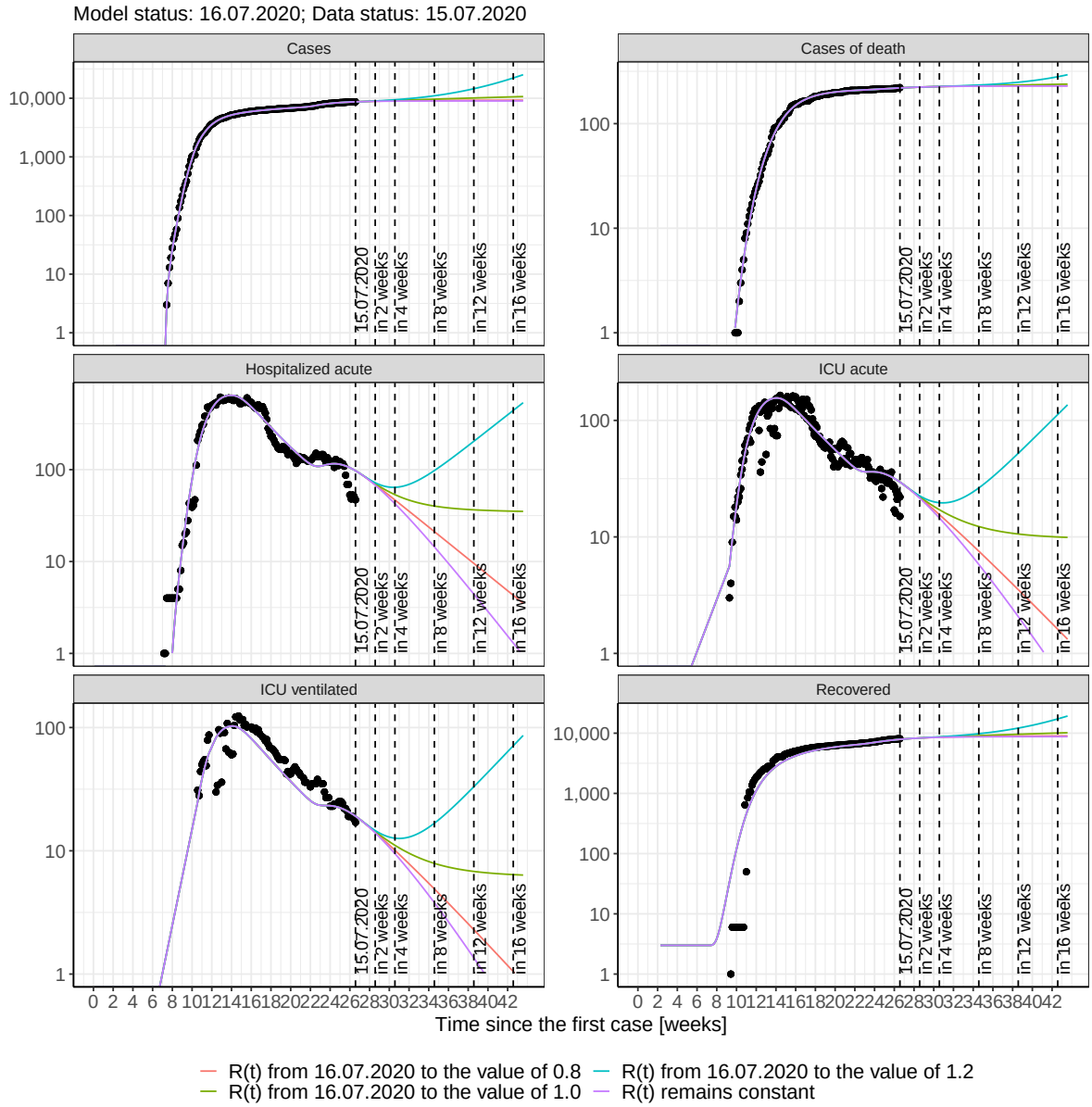


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 13) Model status from 16.07.2020; Data status: 15.07.2020.

Table 10: Berlin - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	8707	220	7940	95	29	19
17.07.2020	8723	220	7976	93	28	18
18.07.2020	8738	221	8010	91	28	18
19.07.2020	8752	221	8044	89	27	18
20.07.2020	8765	221	8076	87	27	17
21.07.2020	8778	221	8106	85	26	17
22.07.2020	8789	222	8136	83	26	17
23.07.2020	8800	222	8164	80	25	16
24.07.2020	8811	222	8191	78	24	16
25.07.2020	8821	223	8217	76	24	15
26.07.2020	8831	223	8242	74	23	15
27.07.2020	8840	223	8266	72	23	15
28.07.2020	8848	223	8289	70	22	14
29.07.2020	8856	224	8311	68	22	14
30.07.2020	8864	224	8331	66	21	14
31.07.2020	8871	224	8351	64	20	13
01.08.2020	8877	224	8370	62	20	13
02.08.2020	8884	224	8389	60	19	13
03.08.2020	8890	225	8406	58	19	12
04.08.2020	8895	225	8423	56	18	12
05.08.2020	8901	225	8439	54	18	12
06.08.2020	8906	225	8454	52	17	11
07.08.2020	8911	225	8468	51	17	11
08.08.2020	8915	226	8482	49	16	11
09.08.2020	8920	226	8496	47	16	10
10.08.2020	8924	226	8508	46	15	10
11.08.2020	8927	226	8520	44	15	10
12.08.2020	8931	226	8532	43	15	9

Table 11: Berlin - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	8707	220	7940	95	29	19
17.07.2020	8724	220	7976	93	28	18
18.07.2020	8740	221	8011	91	28	18
19.07.2020	8755	221	8044	89	27	18
20.07.2020	8770	221	8076	87	27	17
21.07.2020	8785	221	8107	85	26	17
22.07.2020	8799	222	8136	83	26	17
23.07.2020	8813	222	8165	81	25	16
24.07.2020	8826	222	8192	79	24	16
25.07.2020	8839	223	8219	77	24	16
26.07.2020	8852	223	8245	75	23	15
27.07.2020	8864	223	8269	73	23	15
28.07.2020	8876	223	8293	71	22	14
29.07.2020	8887	224	8316	69	22	14
30.07.2020	8899	224	8338	67	21	14
31.07.2020	8910	224	8359	65	21	13
01.08.2020	8920	224	8380	63	20	13
02.08.2020	8930	225	8400	62	20	13
03.08.2020	8940	225	8419	60	19	13
04.08.2020	8950	225	8438	58	19	12
05.08.2020	8960	225	8456	57	18	12
06.08.2020	8969	225	8473	55	18	12
07.08.2020	8978	225	8490	54	18	11
08.08.2020	8986	226	8507	52	17	11
09.08.2020	8995	226	8522	51	17	11
10.08.2020	9003	226	8538	49	16	11
11.08.2020	9011	226	8553	48	16	10
12.08.2020	9019	226	8567	47	16	10

Table 12: Berlin - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	8708	220	7940	95	29	19
17.07.2020	8725	220	7976	93	28	18
18.07.2020	8742	221	8011	91	28	18
19.07.2020	8759	221	8044	89	27	18
20.07.2020	8776	221	8076	87	27	17
21.07.2020	8793	221	8107	85	26	17
22.07.2020	8810	222	8137	83	26	17
23.07.2020	8827	222	8166	81	25	16
24.07.2020	8844	222	8194	79	25	16
25.07.2020	8861	223	8221	77	24	16
26.07.2020	8878	223	8248	75	24	15
27.07.2020	8895	223	8273	74	23	15
28.07.2020	8912	223	8298	72	23	15
29.07.2020	8929	224	8322	70	22	14
30.07.2020	8946	224	8346	69	22	14
31.07.2020	8963	224	8369	67	21	14
01.08.2020	8980	224	8392	66	21	14
02.08.2020	8997	225	8414	64	20	13
03.08.2020	9014	225	8436	63	20	13
04.08.2020	9031	225	8458	62	20	13
05.08.2020	9048	225	8479	61	19	13
06.08.2020	9065	225	8500	59	19	12
07.08.2020	9082	226	8520	58	19	12
08.08.2020	9099	226	8541	57	18	12
09.08.2020	9116	226	8561	56	18	12
10.08.2020	9133	226	8581	55	18	11
11.08.2020	9150	226	8600	54	17	11
12.08.2020	9167	226	8620	53	17	11

Table 13: Berlin - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	8708	220	7940	95	29	19
17.07.2020	8726	220	7976	93	28	18
18.07.2020	8744	221	8011	91	28	18
19.07.2020	8763	221	8044	89	27	18
20.07.2020	8782	221	8076	87	27	17
21.07.2020	8802	221	8107	85	26	17
22.07.2020	8823	222	8138	83	26	17
23.07.2020	8844	222	8167	81	25	16
24.07.2020	8866	222	8196	80	25	16
25.07.2020	8888	223	8224	78	24	16
26.07.2020	8911	223	8251	76	24	15
27.07.2020	8934	223	8278	75	23	15
28.07.2020	8959	223	8304	73	23	15
29.07.2020	8984	224	8330	72	23	15
30.07.2020	9010	224	8356	71	22	14
31.07.2020	9036	224	8382	70	22	14
01.08.2020	9063	224	8407	69	22	14
02.08.2020	9091	225	8433	68	21	14
03.08.2020	9120	225	8458	67	21	14
04.08.2020	9150	225	8484	66	21	13
05.08.2020	9180	225	8510	66	21	13
06.08.2020	9211	225	8535	65	20	13
07.08.2020	9244	226	8562	65	20	13
08.08.2020	9277	226	8588	65	20	13
09.08.2020	9311	226	8615	64	20	13
10.08.2020	9346	226	8642	64	20	13
11.08.2020	9382	227	8669	64	20	13
12.08.2020	9419	227	8697	64	20	13

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 43 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

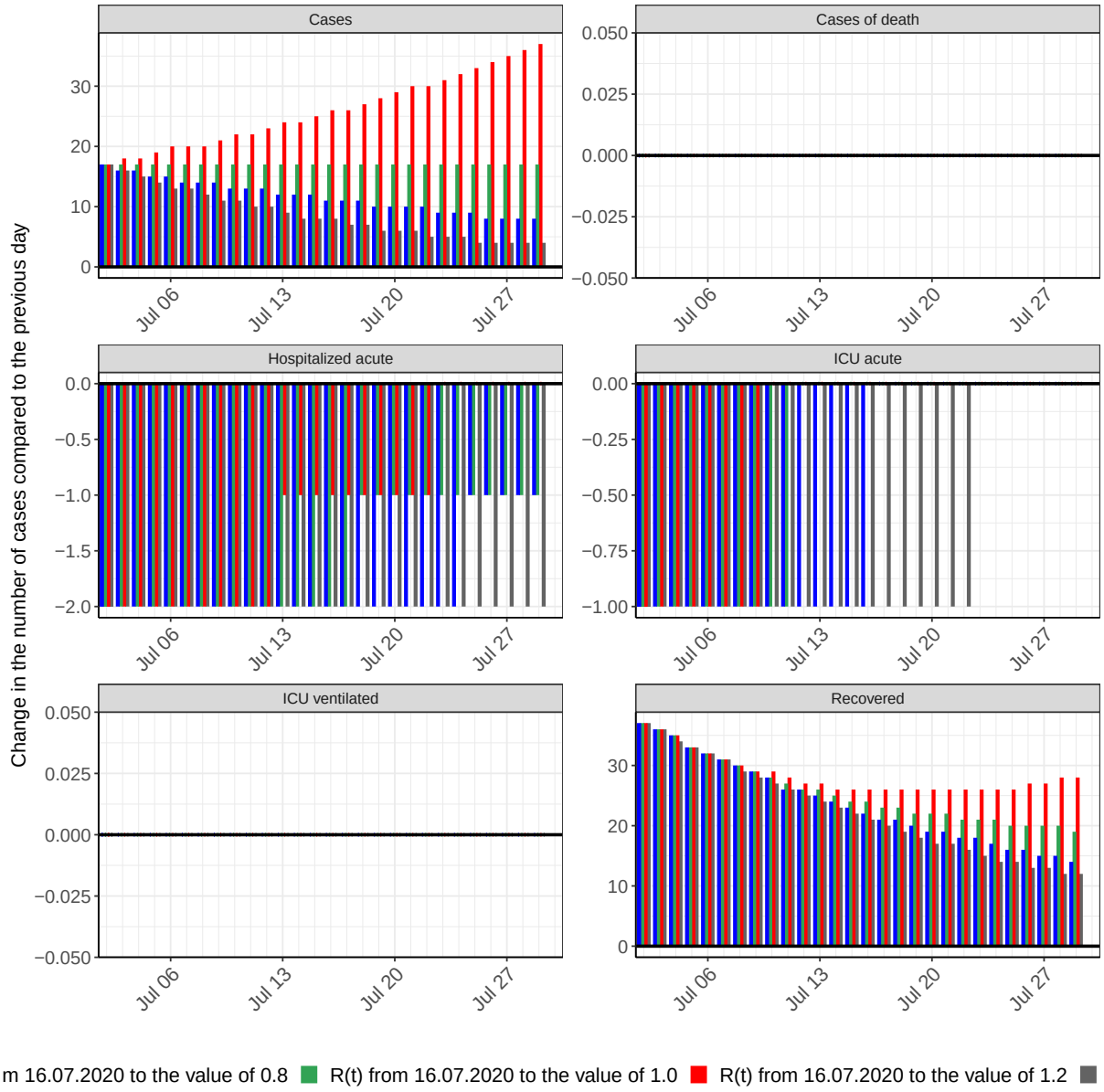


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

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.

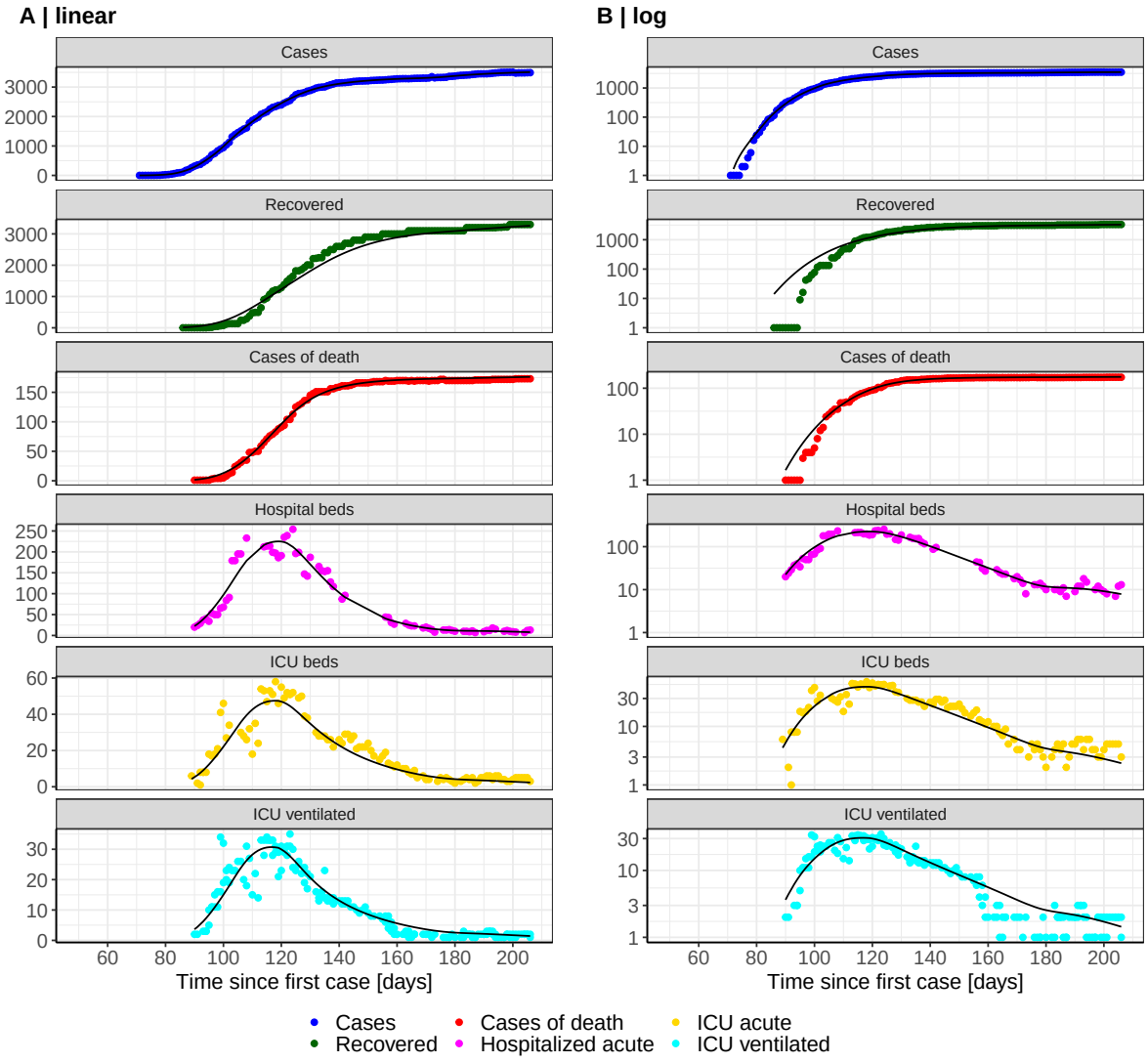


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

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.

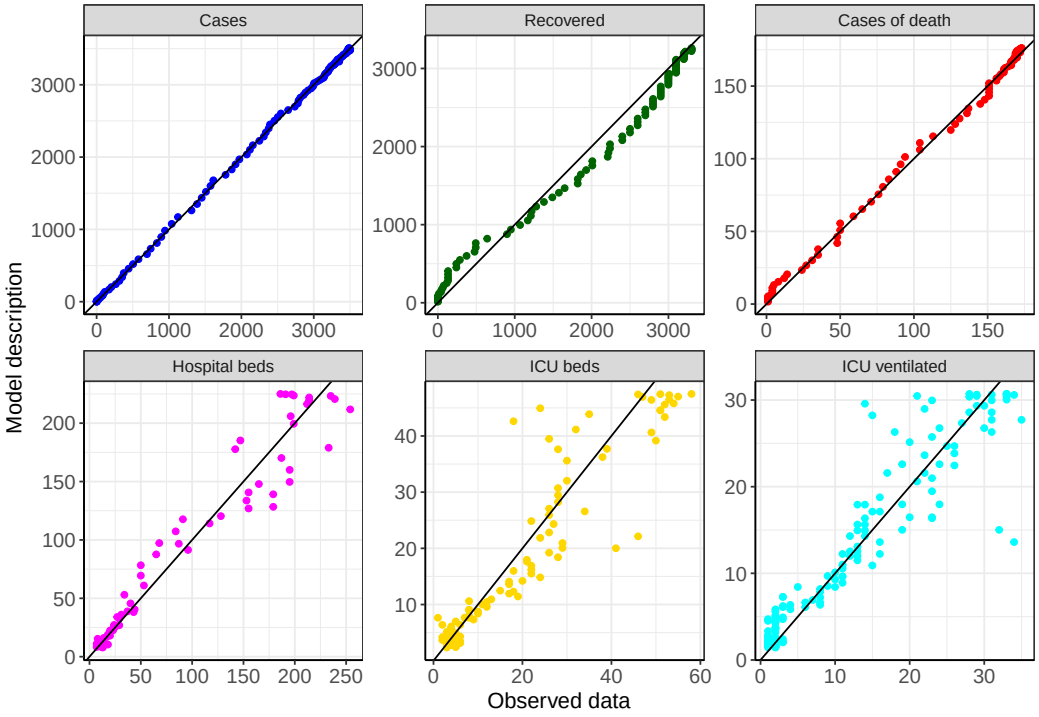


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

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).

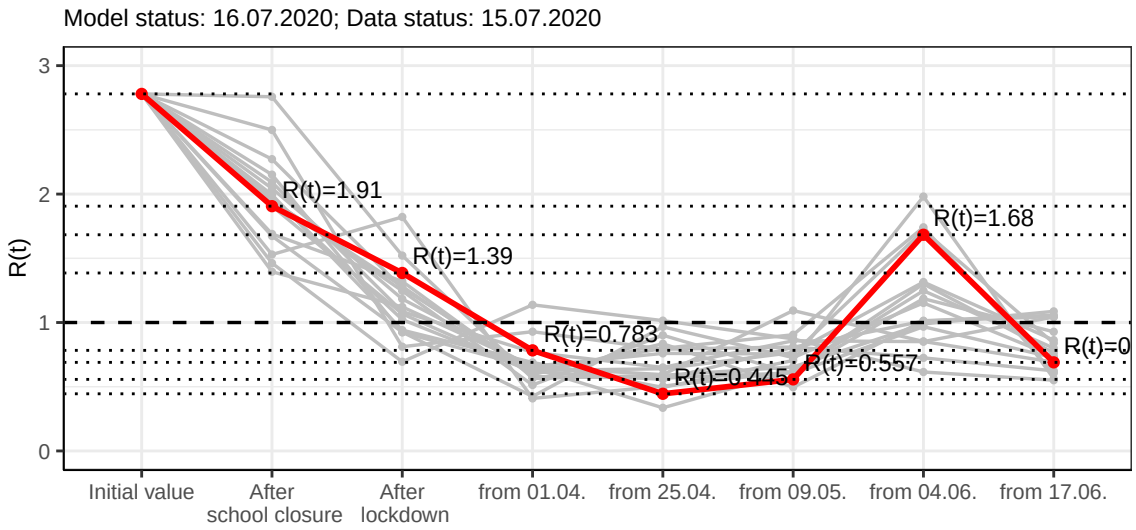


Figure 46: R(t) values before and after the NPIs for Brandenburg

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

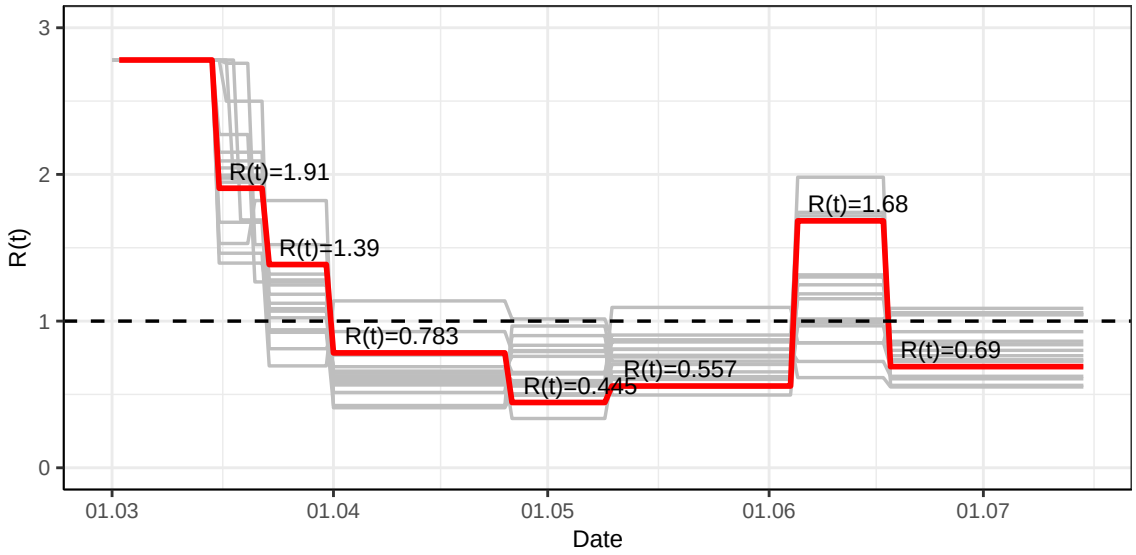


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

5.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.69)

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.

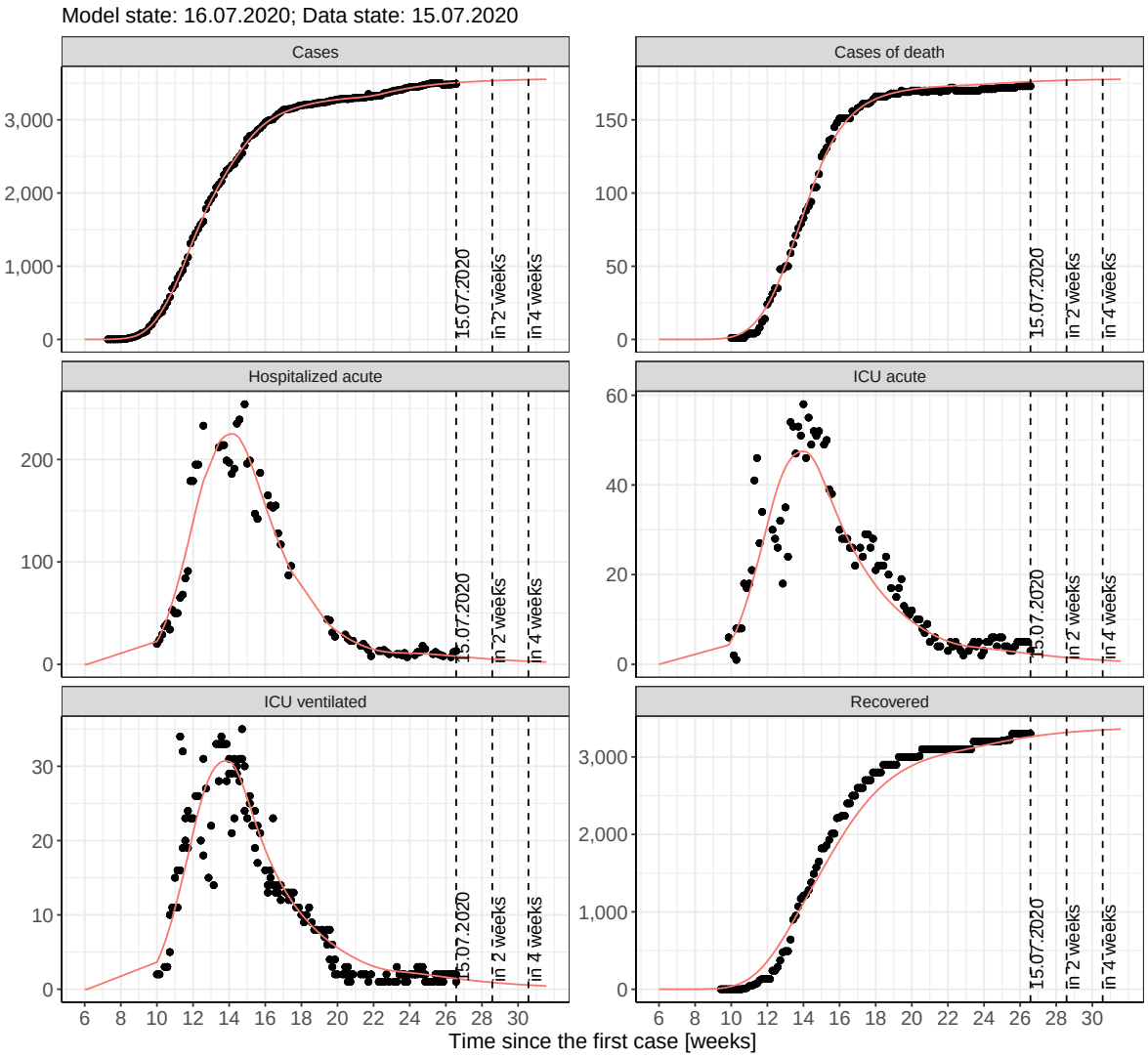


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

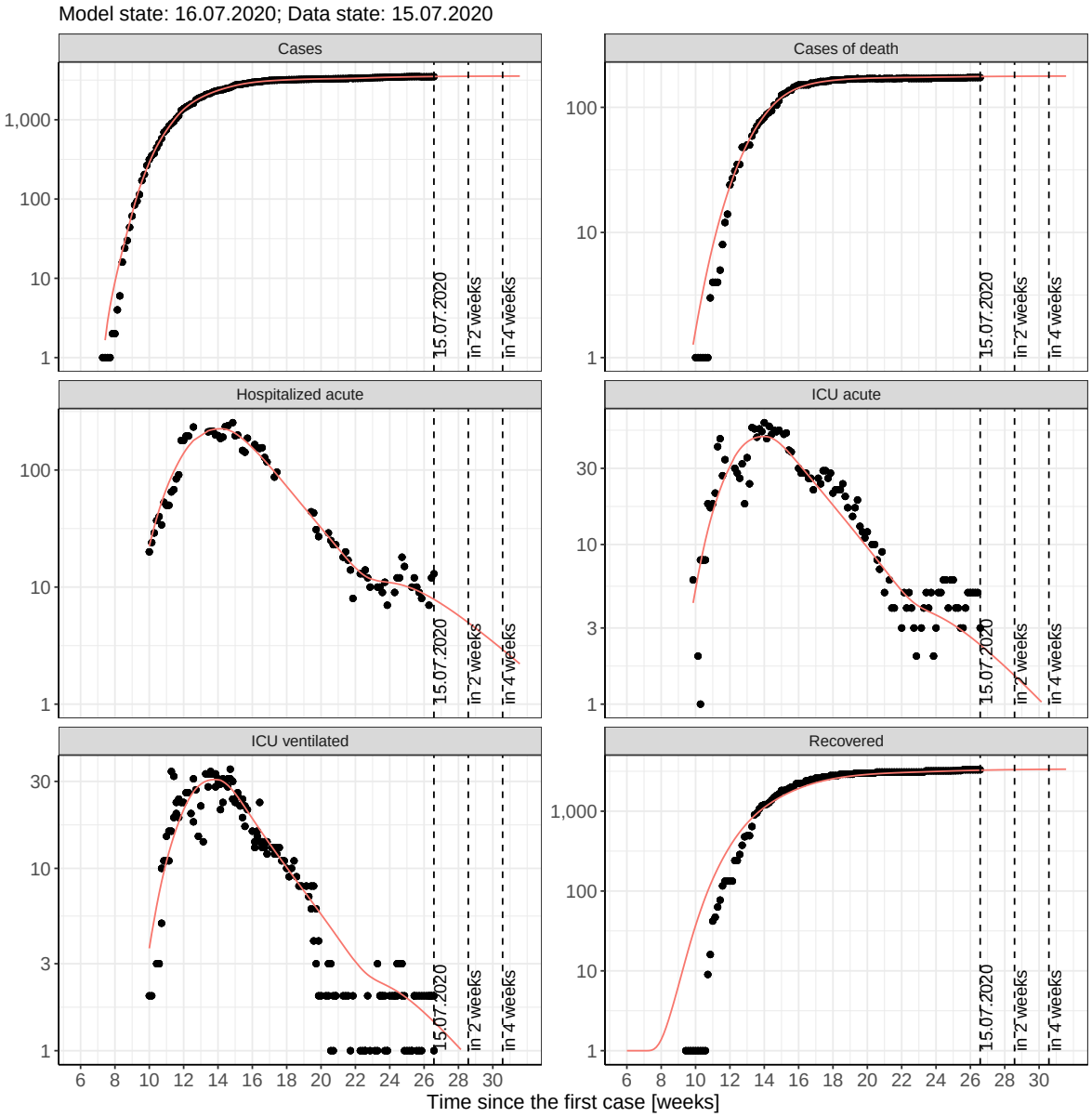


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

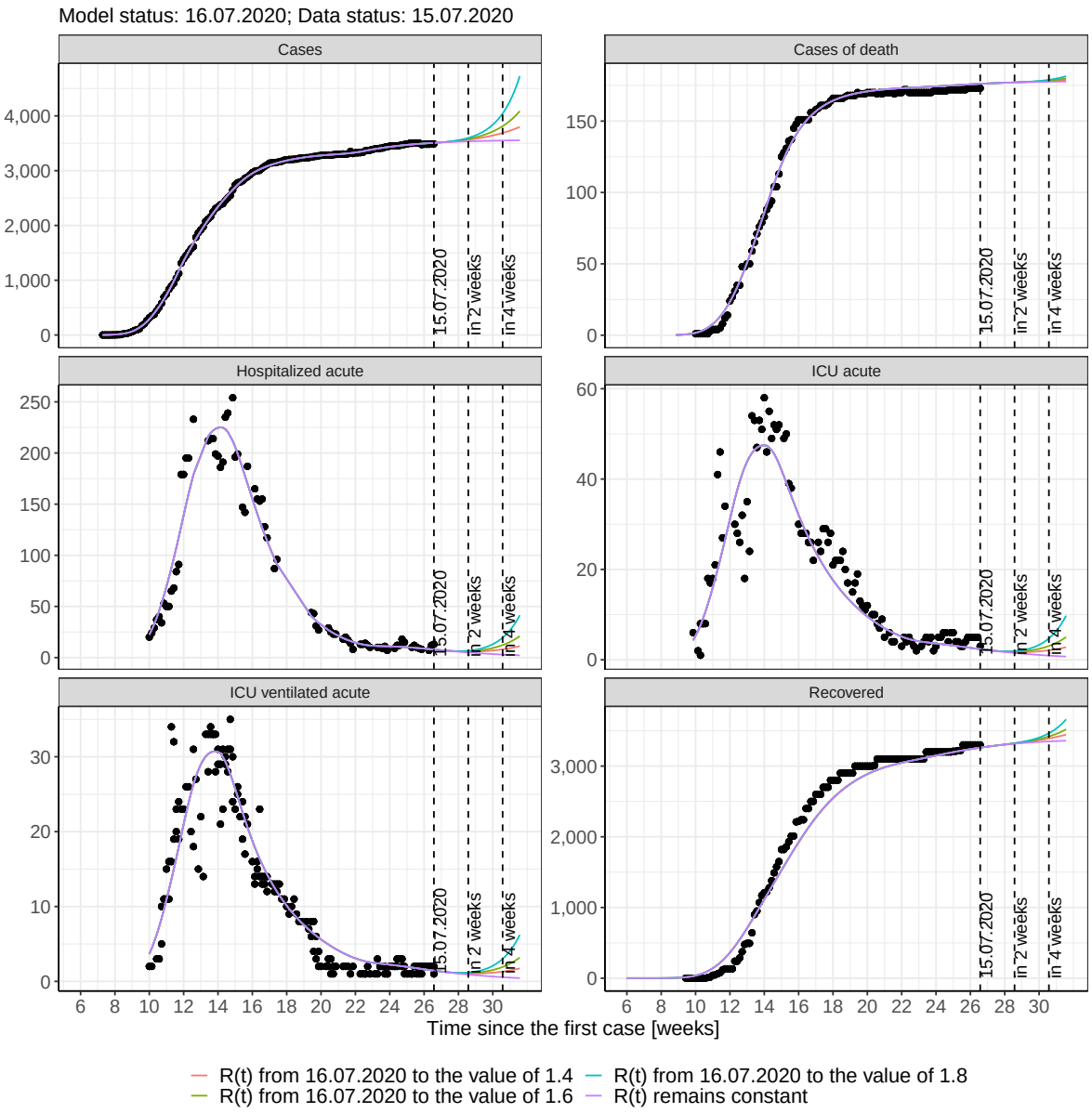


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

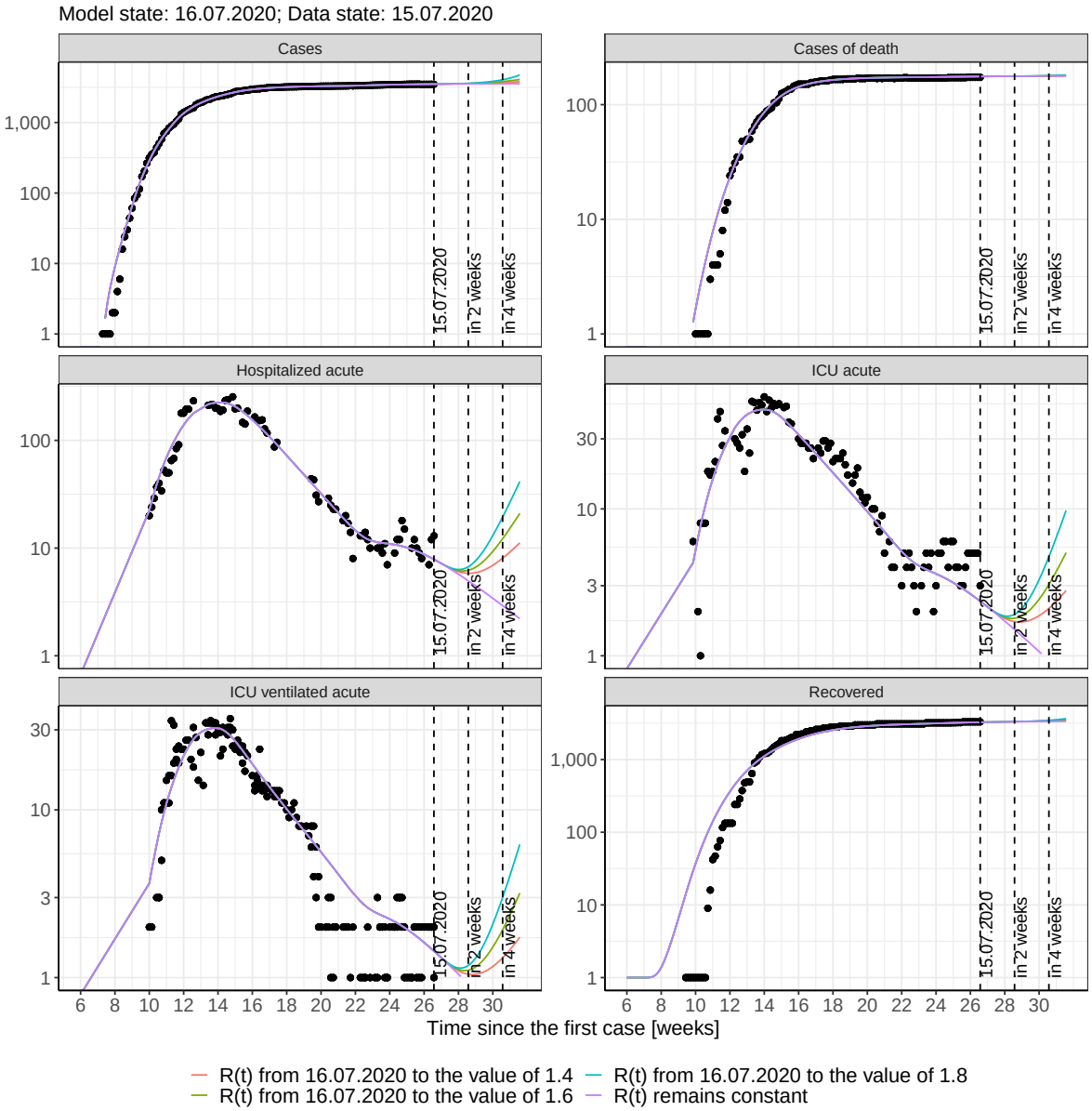


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

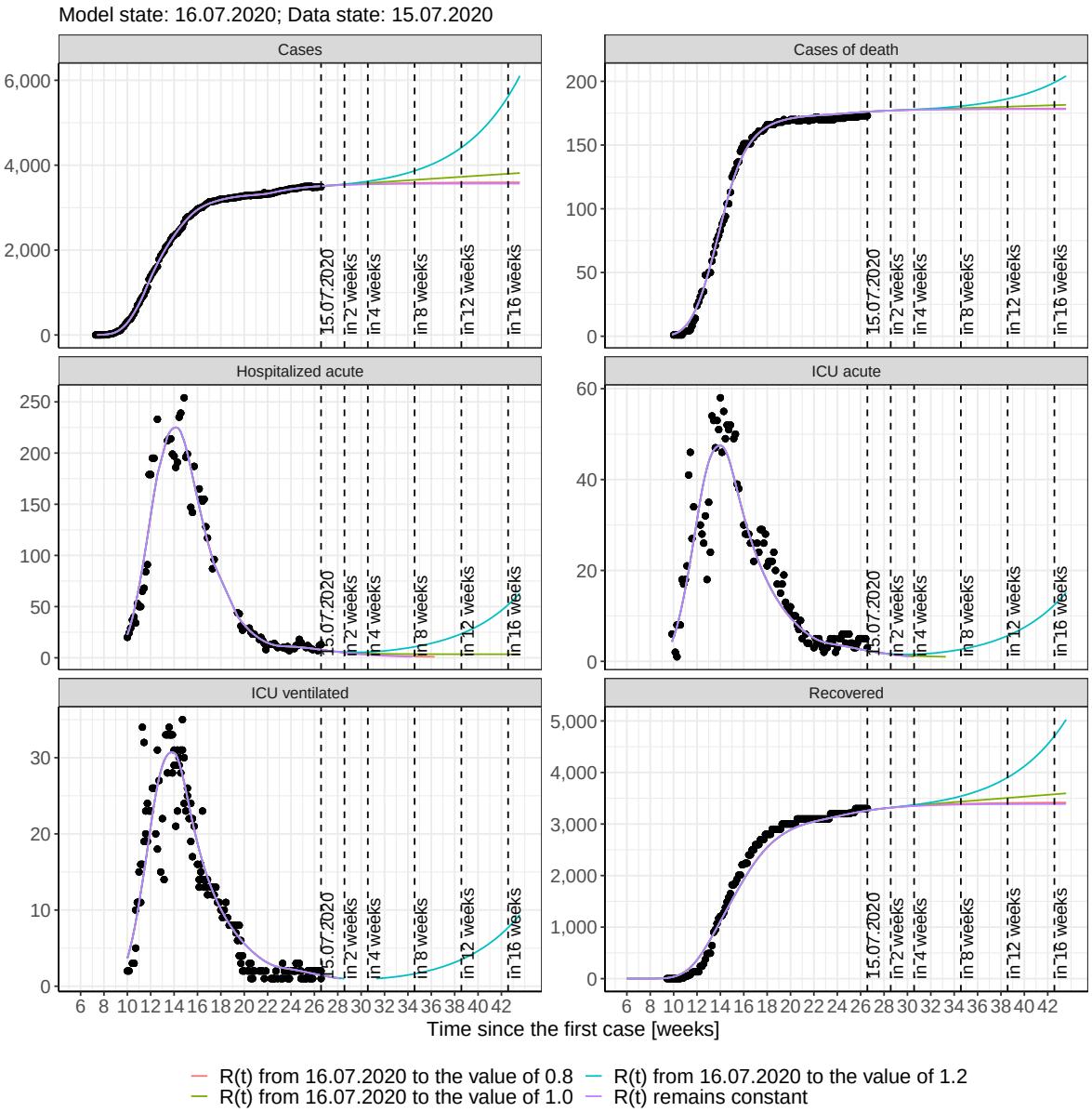


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

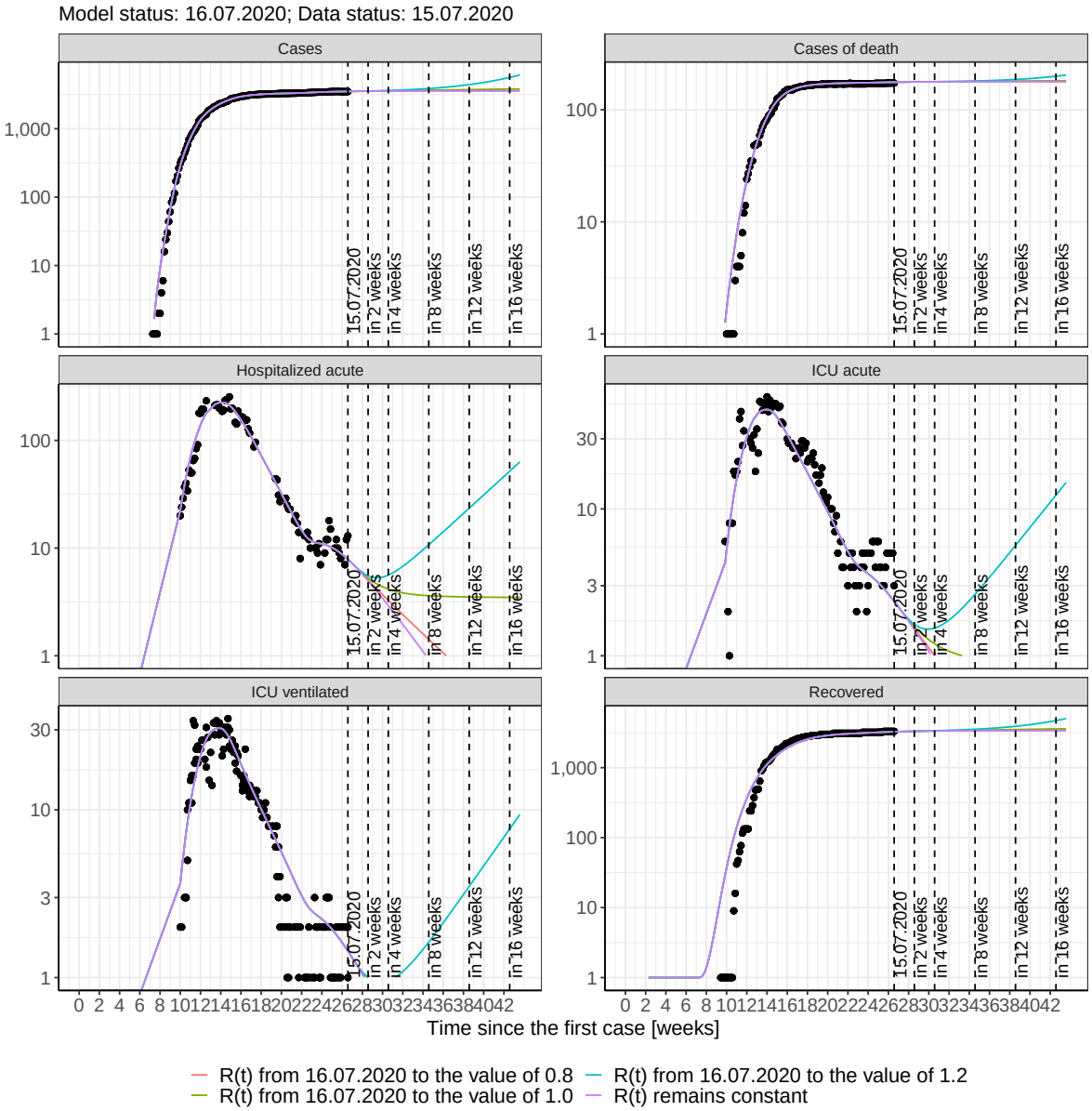


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 17) Model status from 16.07.2020; Data status: 15.07.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3510	176	3266	8	2	1
17.07.2020	3513	176	3271	7	2	1
18.07.2020	3515	176	3275	7	2	1
19.07.2020	3517	176	3280	7	2	1
20.07.2020	3519	177	3284	7	2	1
21.07.2020	3521	177	3288	7	2	1
22.07.2020	3523	177	3292	6	2	1
23.07.2020	3525	177	3296	6	2	1
24.07.2020	3527	177	3300	6	2	1
25.07.2020	3529	177	3303	6	2	1
26.07.2020	3530	177	3307	6	2	1
27.07.2020	3532	177	3310	5	2	1
28.07.2020	3534	177	3313	5	2	1
29.07.2020	3535	177	3316	5	2	1
30.07.2020	3536	177	3319	5	1	1
31.07.2020	3538	177	3322	5	1	1
01.08.2020	3539	177	3325	4	1	1
02.08.2020	3540	177	3328	4	1	1
03.08.2020	3541	177	3330	4	1	1
04.08.2020	3542	177	3332	4	1	1
05.08.2020	3543	177	3335	4	1	1
06.08.2020	3544	177	3337	4	1	1
07.08.2020	3545	177	3339	4	1	1
08.08.2020	3546	177	3341	3	1	1
09.08.2020	3547	177	3343	3	1	1
10.08.2020	3548	178	3345	3	1	1
11.08.2020	3549	178	3347	3	1	1
12.08.2020	3550	178	3349	3	1	1

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3510	176	3266	8	2	1
17.07.2020	3513	176	3271	7	2	1
18.07.2020	3515	176	3275	7	2	1
19.07.2020	3518	176	3280	7	2	1
20.07.2020	3520	177	3284	7	2	1
21.07.2020	3522	177	3288	7	2	1
22.07.2020	3524	177	3292	6	2	1
23.07.2020	3526	177	3296	6	2	1
24.07.2020	3528	177	3300	6	2	1
25.07.2020	3530	177	3304	6	2	1
26.07.2020	3532	177	3307	6	2	1
27.07.2020	3534	177	3310	5	2	1
28.07.2020	3536	177	3314	5	2	1
29.07.2020	3538	177	3317	5	2	1
30.07.2020	3540	177	3320	5	1	1
31.07.2020	3541	177	3323	5	1	1
01.08.2020	3543	177	3326	5	1	1
02.08.2020	3544	177	3329	4	1	1
03.08.2020	3546	177	3331	4	1	1
04.08.2020	3548	177	3334	4	1	1
05.08.2020	3549	177	3336	4	1	1
06.08.2020	3550	177	3339	4	1	1
07.08.2020	3552	177	3341	4	1	1
08.08.2020	3553	177	3344	4	1	1
09.08.2020	3554	178	3346	4	1	1
10.08.2020	3556	178	3348	3	1	1
11.08.2020	3557	178	3350	3	1	1
12.08.2020	3558	178	3352	3	1	1

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3510	176	3266	8	2	1
17.07.2020	3513	176	3271	7	2	1
18.07.2020	3516	176	3275	7	2	1
19.07.2020	3518	176	3280	7	2	1
20.07.2020	3521	177	3284	7	2	1
21.07.2020	3523	177	3288	7	2	1
22.07.2020	3526	177	3292	6	2	1
23.07.2020	3529	177	3296	6	2	1
24.07.2020	3531	177	3300	6	2	1
25.07.2020	3534	177	3304	6	2	1
26.07.2020	3536	177	3307	6	2	1
27.07.2020	3539	177	3311	6	2	1
28.07.2020	3542	177	3314	5	2	1
29.07.2020	3544	177	3318	5	2	1
30.07.2020	3547	177	3321	5	2	1
31.07.2020	3550	177	3324	5	2	1
01.08.2020	3552	177	3328	5	1	1
02.08.2020	3555	177	3331	5	1	1
03.08.2020	3557	177	3334	5	1	1
04.08.2020	3560	177	3337	5	1	1
05.08.2020	3562	177	3340	5	1	1
06.08.2020	3565	177	3343	5	1	1
07.08.2020	3568	178	3346	4	1	1
08.08.2020	3570	178	3349	4	1	1
09.08.2020	3573	178	3352	4	1	1
10.08.2020	3576	178	3355	4	1	1
11.08.2020	3578	178	3357	4	1	1
12.08.2020	3581	178	3360	4	1	1

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3510	176	3266	8	2	1
17.07.2020	3513	176	3271	7	2	1
18.07.2020	3516	176	3275	7	2	1
19.07.2020	3519	176	3280	7	2	1
20.07.2020	3522	177	3284	7	2	1
21.07.2020	3525	177	3288	7	2	1
22.07.2020	3528	177	3292	6	2	1
23.07.2020	3531	177	3296	6	2	1
24.07.2020	3534	177	3300	6	2	1
25.07.2020	3538	177	3304	6	2	1
26.07.2020	3541	177	3308	6	2	1
27.07.2020	3545	177	3312	6	2	1
28.07.2020	3549	177	3315	6	2	1
29.07.2020	3553	177	3319	6	2	1
30.07.2020	3557	177	3323	5	2	1
31.07.2020	3561	177	3326	5	2	1
01.08.2020	3565	177	3330	5	2	1
02.08.2020	3569	177	3334	5	2	1
03.08.2020	3574	177	3337	5	2	1
04.08.2020	3578	177	3341	5	2	1
05.08.2020	3583	177	3345	5	2	1
06.08.2020	3588	178	3348	5	2	1
07.08.2020	3593	178	3352	5	2	1
08.08.2020	3598	178	3356	5	2	1
09.08.2020	3603	178	3360	5	2	1
10.08.2020	3608	178	3364	5	2	1
11.08.2020	3614	178	3368	6	2	1
12.08.2020	3620	178	3372	6	2	1

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 54 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

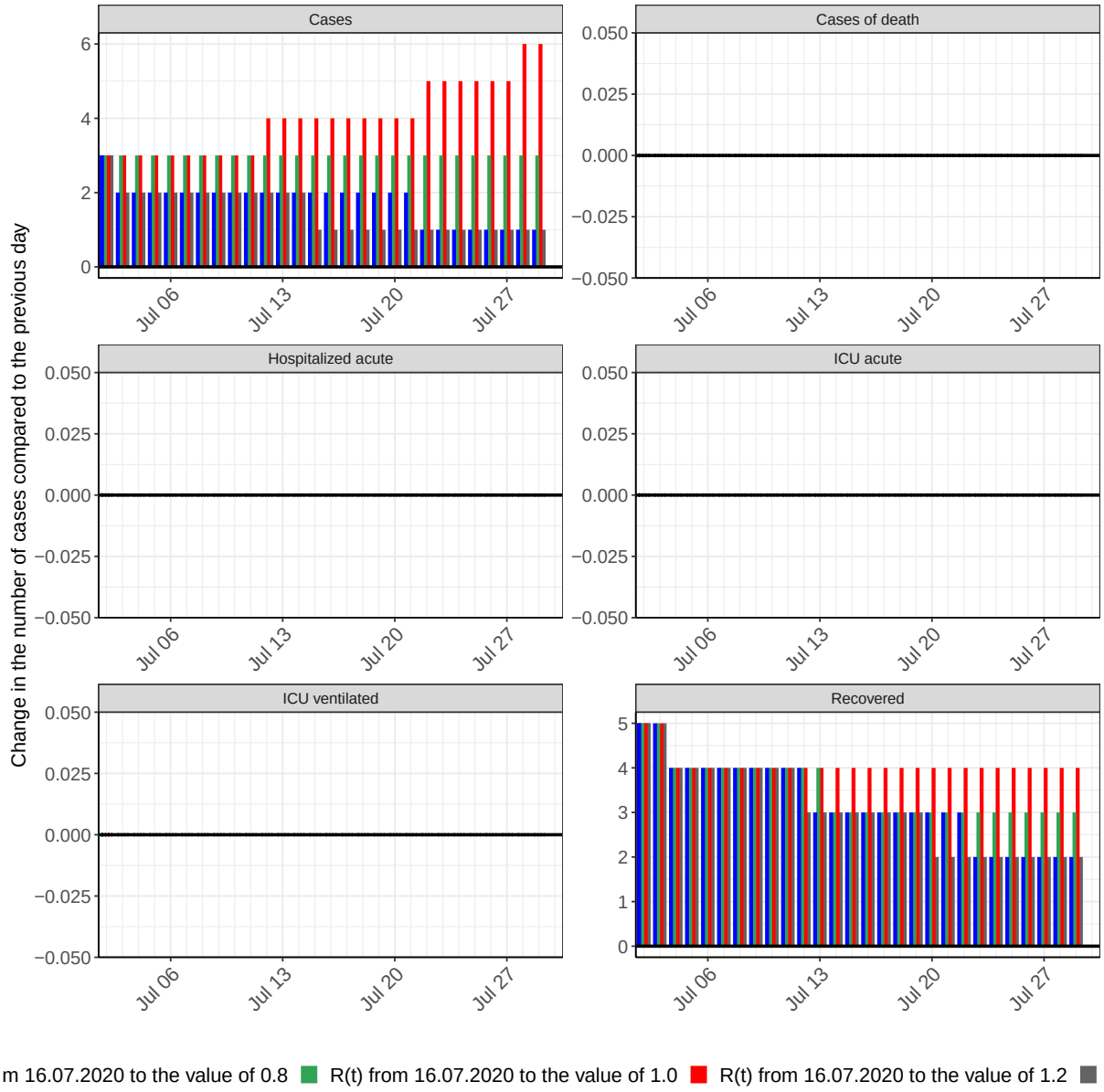


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

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.

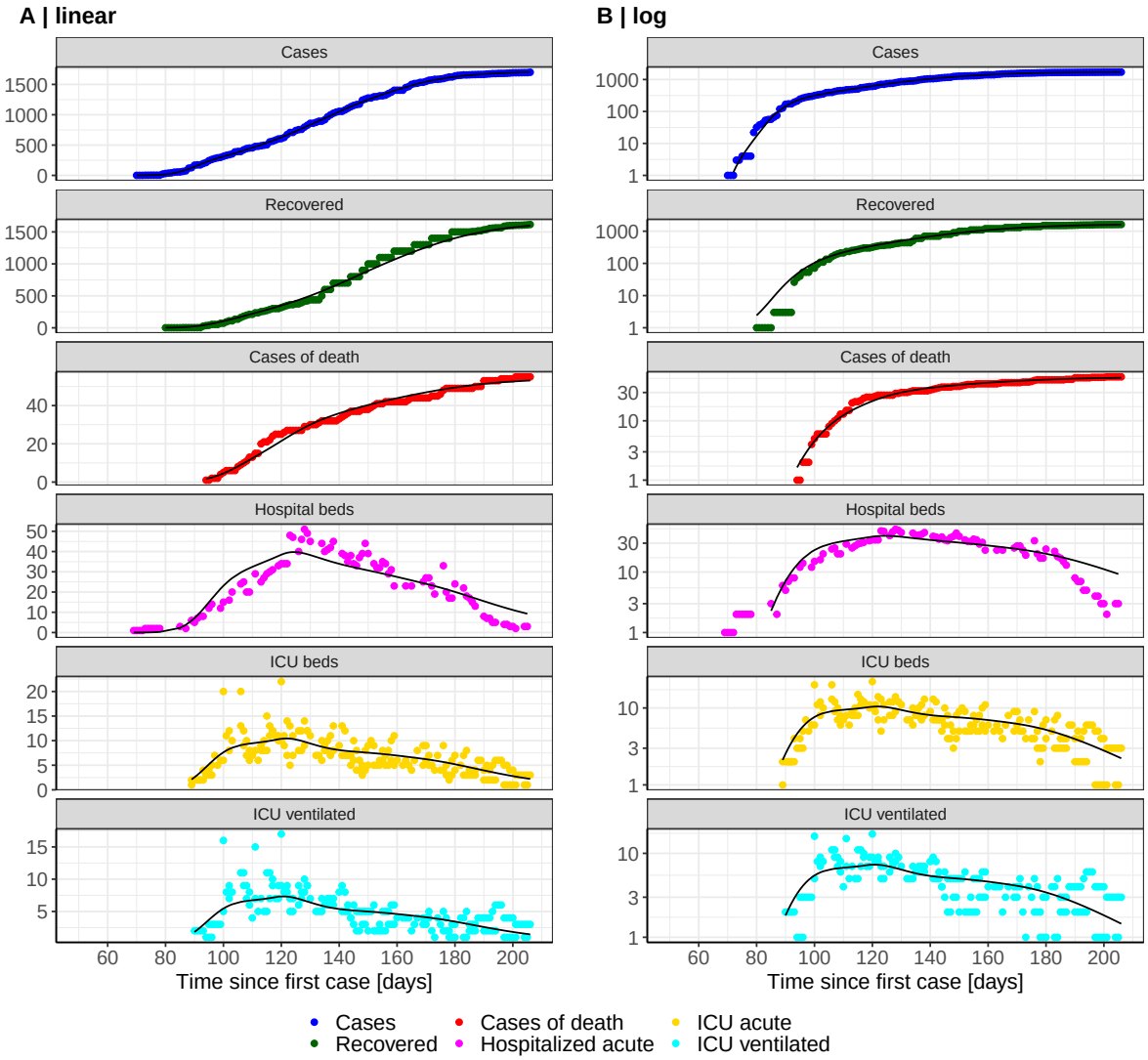


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

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.

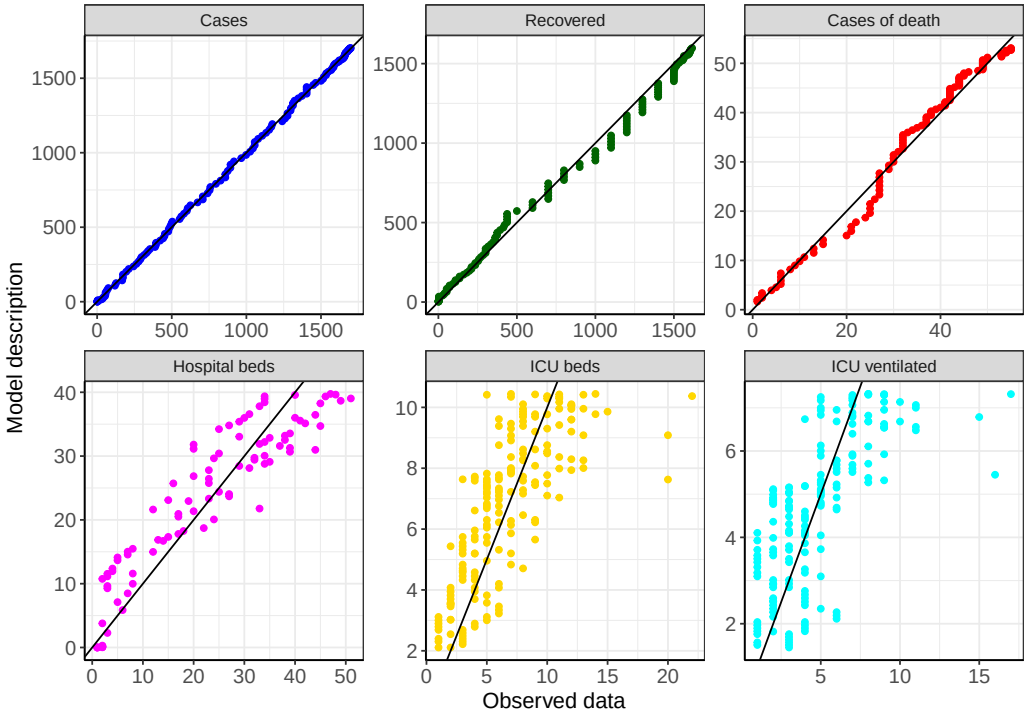


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

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).

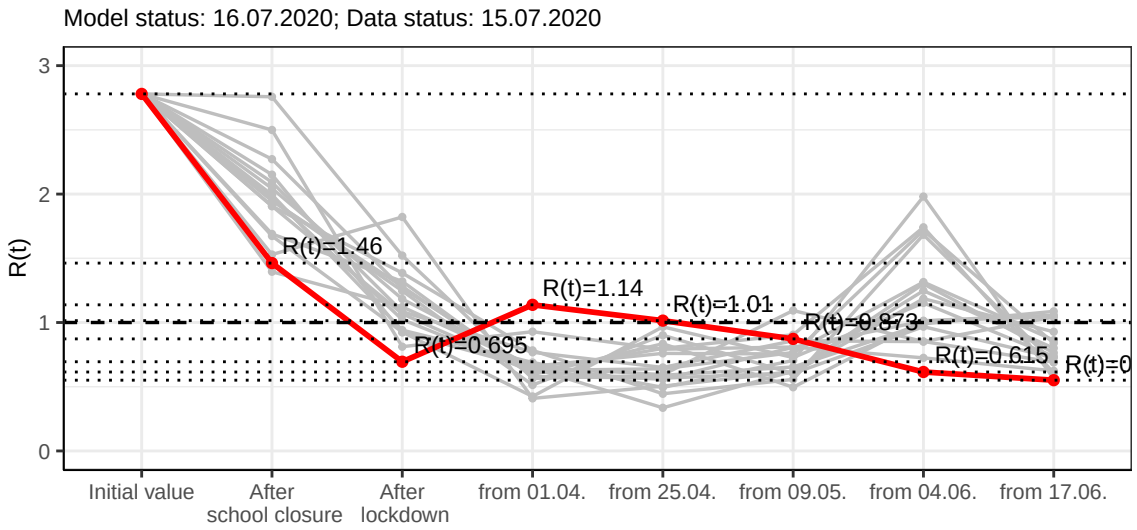


Figure 57: R(t) values before and after the NPIs for Bremen

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

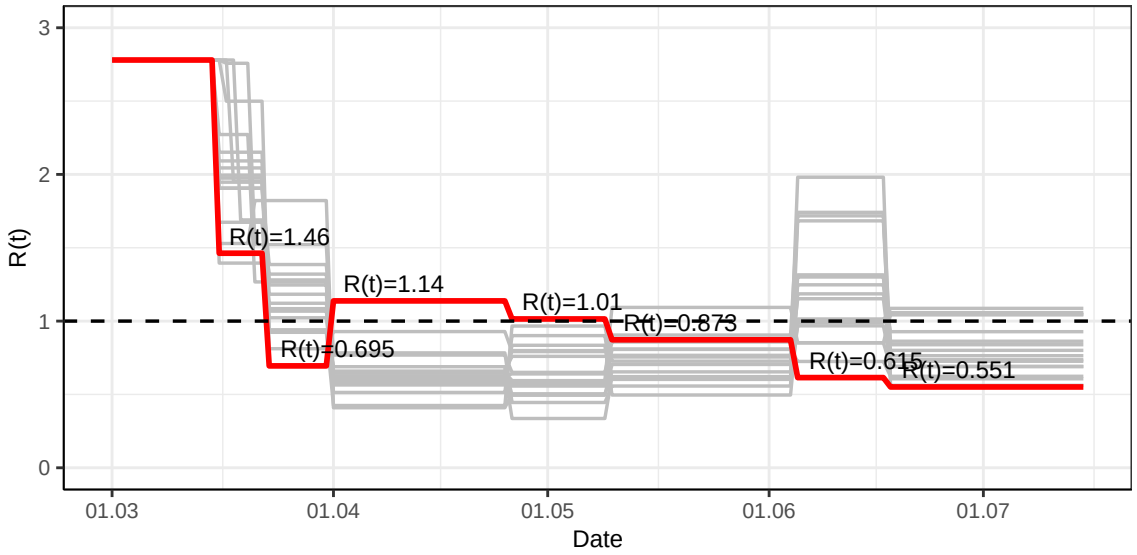


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

6.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.55)

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.

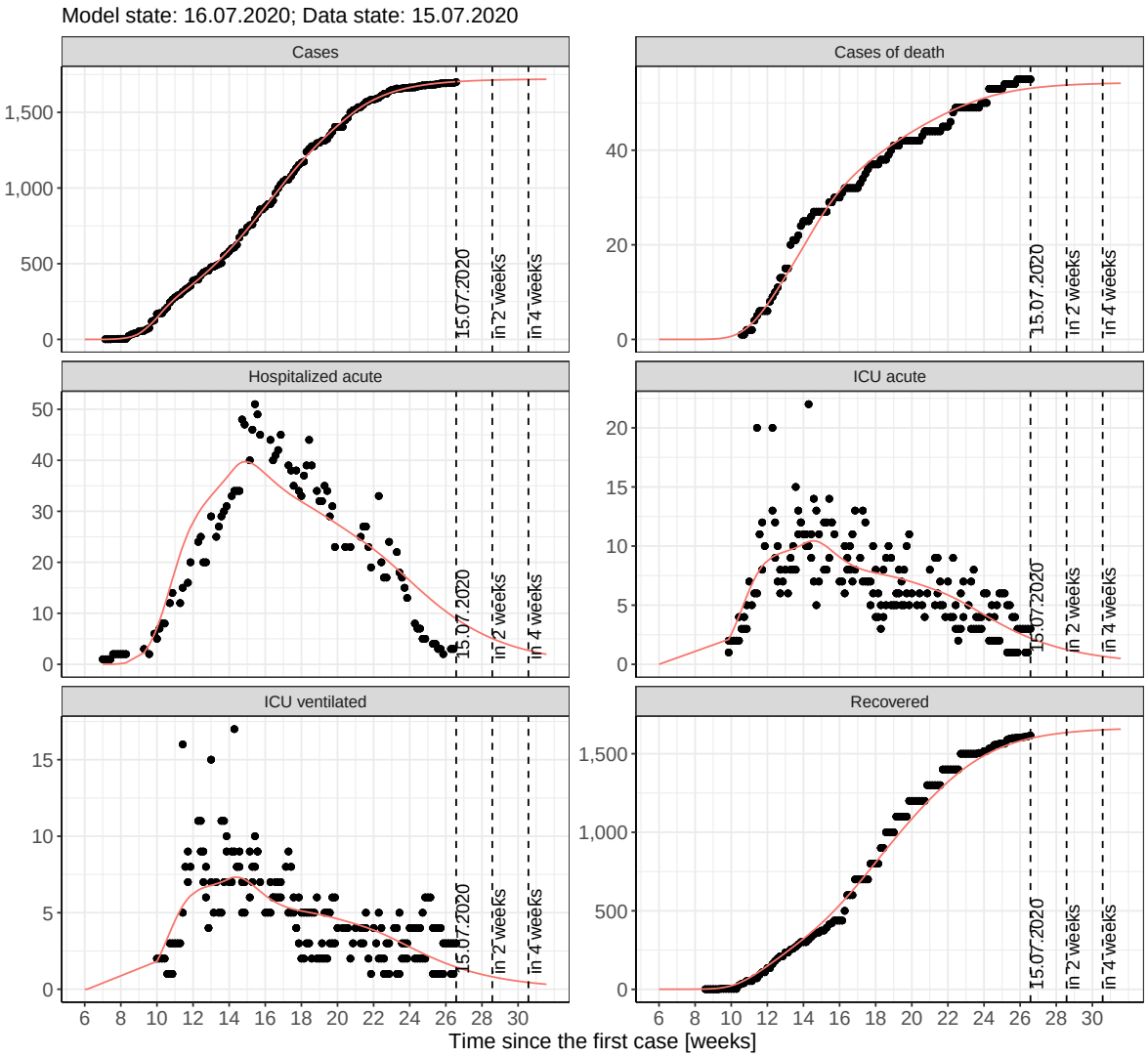


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

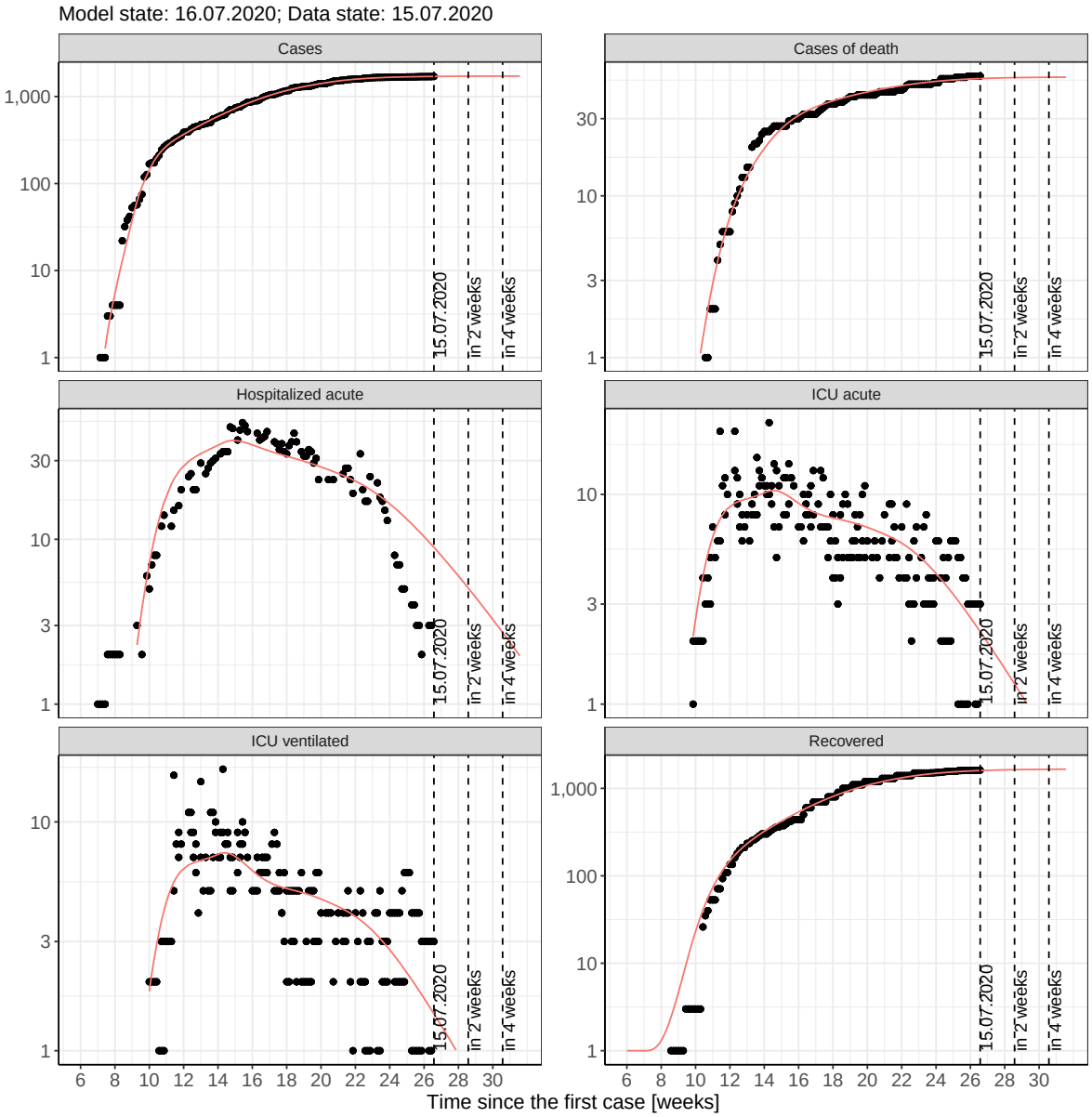


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

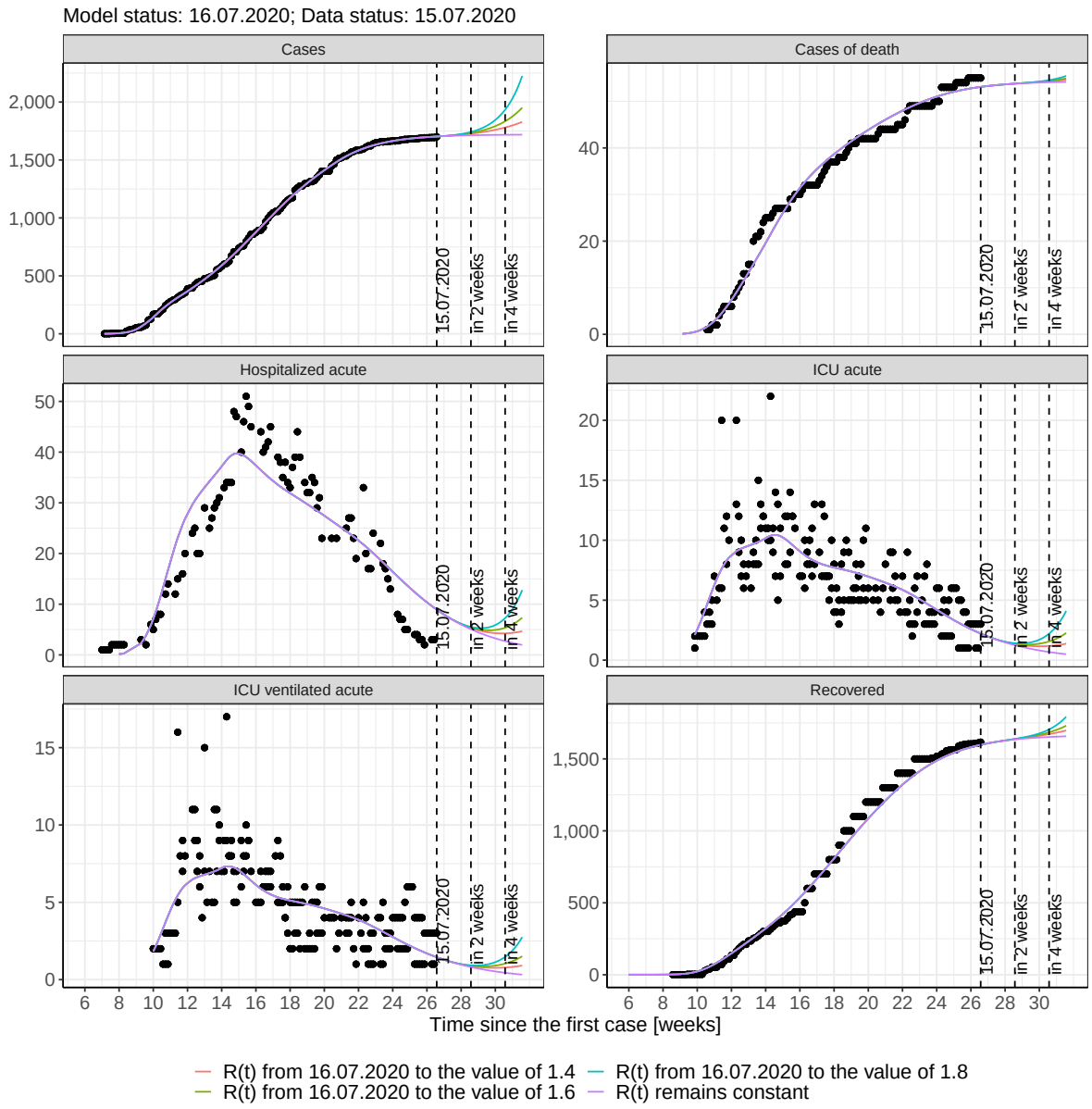


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

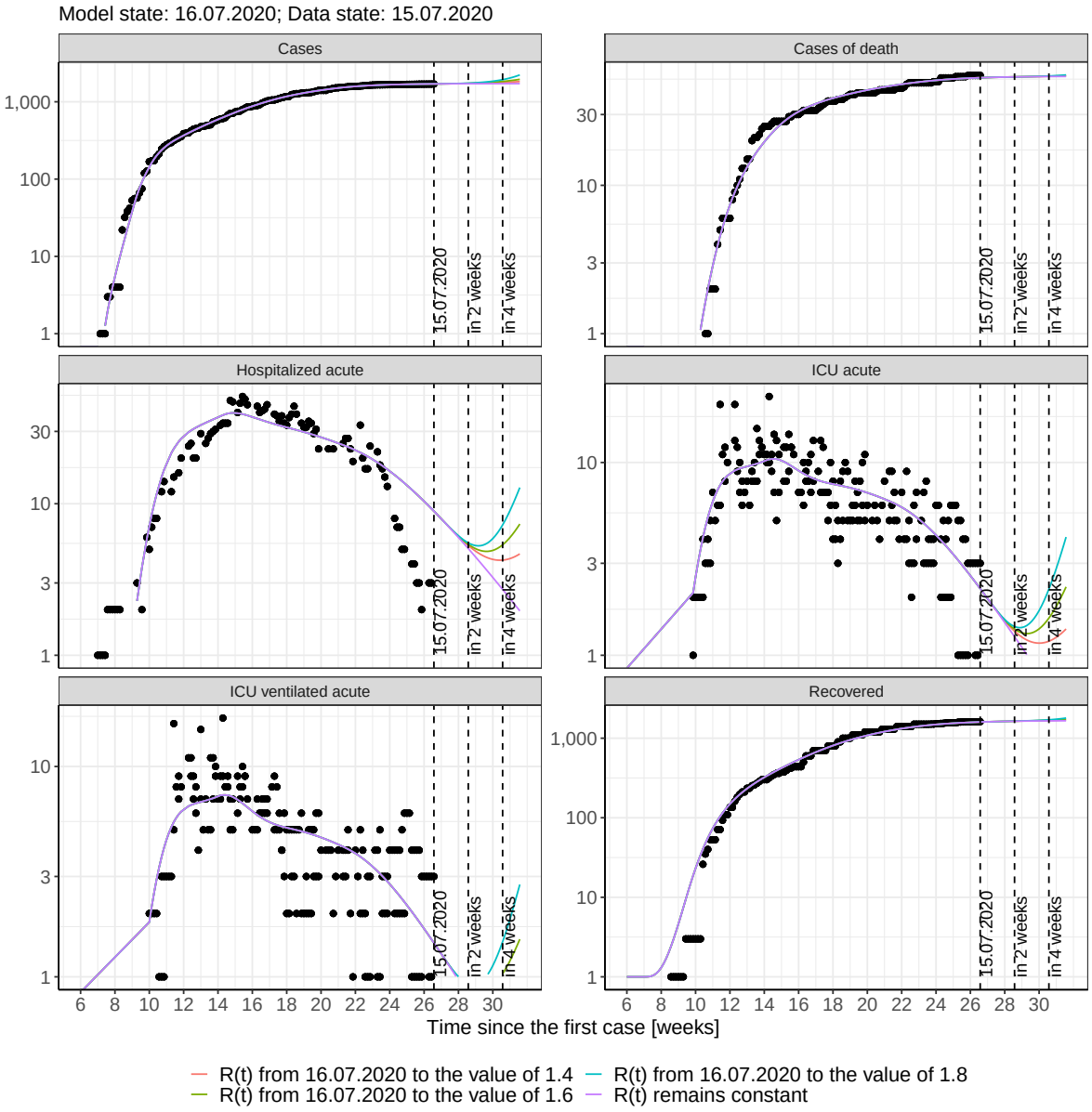


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

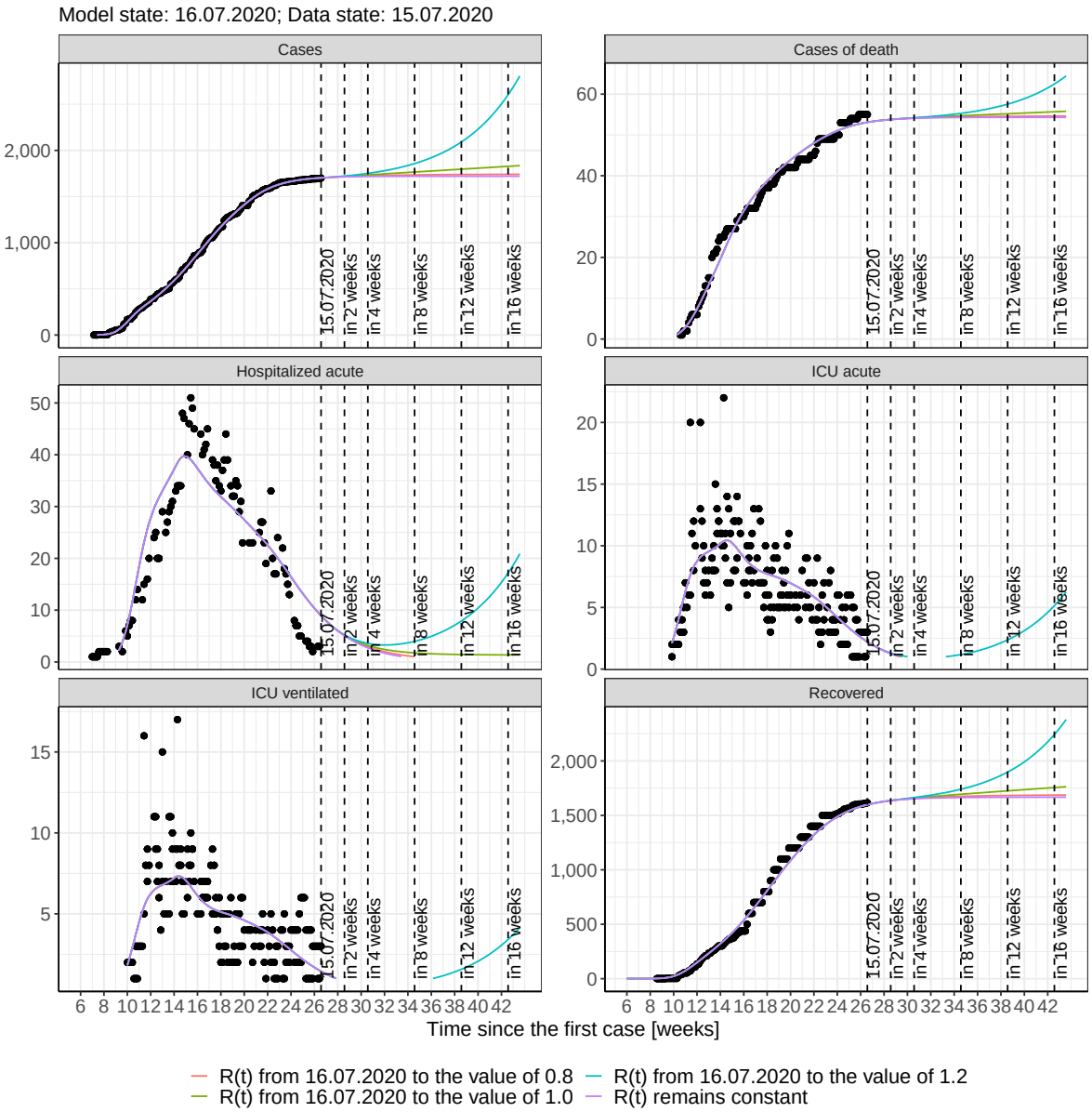


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

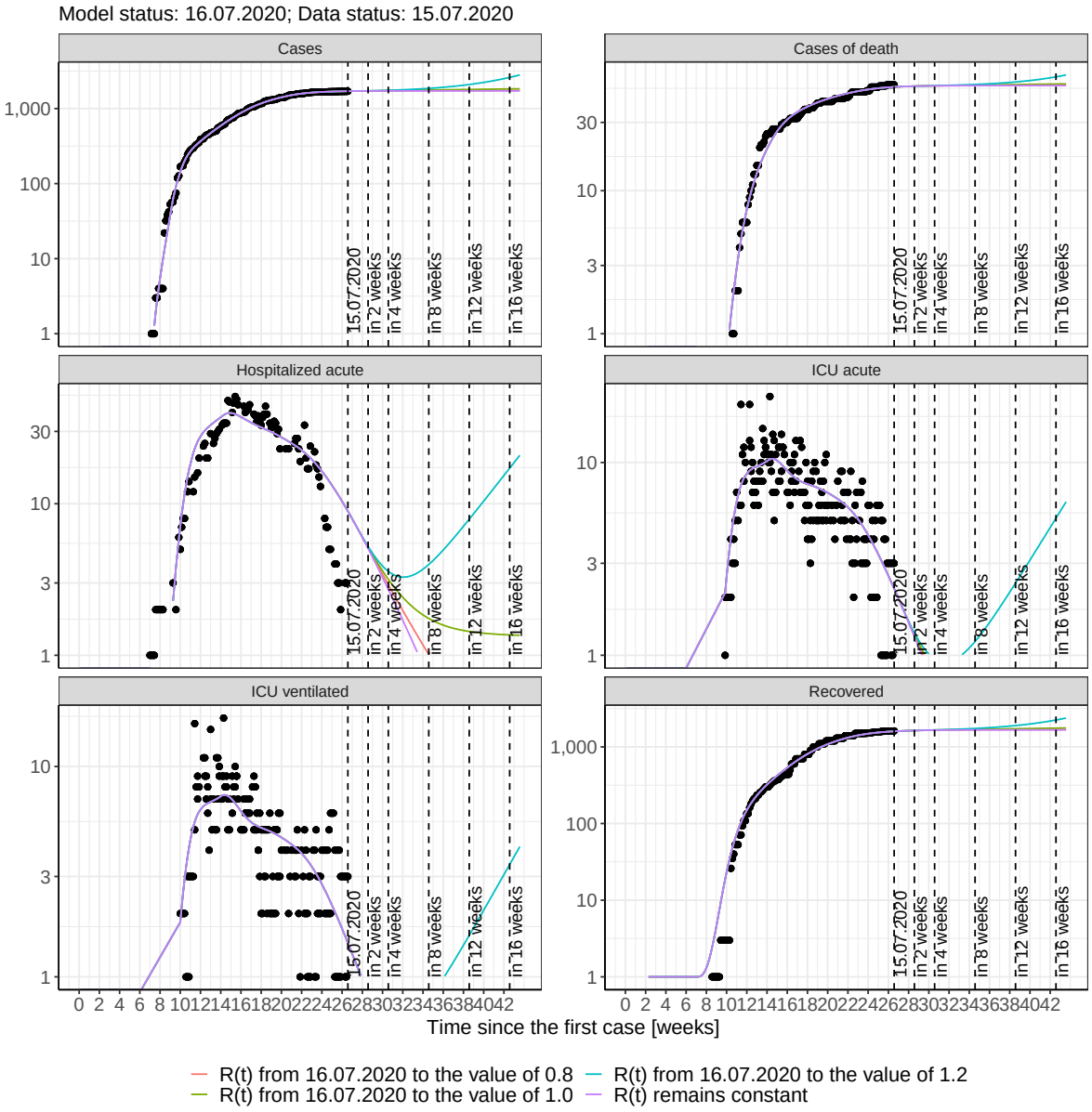


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 21) Model status from 16.07.2020; Data status: 15.07.2020.

Table 18: Bremen - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1704	53	1602	9	2	1
17.07.2020	1705	53	1605	8	2	1
18.07.2020	1706	53	1608	8	2	1
19.07.2020	1706	53	1611	8	2	1
20.07.2020	1707	53	1614	7	2	1
21.07.2020	1708	53	1617	7	2	1
22.07.2020	1709	54	1620	7	2	1
23.07.2020	1710	54	1622	7	2	1
24.07.2020	1710	54	1625	6	2	1
25.07.2020	1711	54	1627	6	1	1
26.07.2020	1712	54	1629	6	1	1
27.07.2020	1712	54	1631	6	1	1
28.07.2020	1712	54	1633	5	1	1
29.07.2020	1713	54	1635	5	1	1
30.07.2020	1714	54	1637	5	1	1
31.07.2020	1714	54	1638	5	1	1
01.08.2020	1714	54	1640	4	1	1
02.08.2020	1715	54	1641	4	1	1
03.08.2020	1715	54	1643	4	1	1
04.08.2020	1715	54	1644	4	1	1
05.08.2020	1716	54	1645	4	1	1
06.08.2020	1716	54	1646	4	1	1
07.08.2020	1716	54	1648	3	1	1
08.08.2020	1716	54	1648	3	1	1
09.08.2020	1717	54	1650	3	1	1
10.08.2020	1717	54	1650	3	1	0
11.08.2020	1717	54	1651	3	1	0
12.08.2020	1717	54	1652	3	1	0

Table 19: Bremen - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1704	53	1602	9	2	1
17.07.2020	1705	53	1605	8	2	1
18.07.2020	1706	53	1608	8	2	1
19.07.2020	1707	53	1611	8	2	1
20.07.2020	1708	53	1614	7	2	1
21.07.2020	1709	53	1617	7	2	1
22.07.2020	1710	54	1620	7	2	1
23.07.2020	1711	54	1622	7	2	1
24.07.2020	1712	54	1625	6	2	1
25.07.2020	1712	54	1627	6	1	1
26.07.2020	1713	54	1629	6	1	1
27.07.2020	1714	54	1632	6	1	1
28.07.2020	1715	54	1634	5	1	1
29.07.2020	1716	54	1635	5	1	1
30.07.2020	1716	54	1637	5	1	1
31.07.2020	1717	54	1639	5	1	1
01.08.2020	1718	54	1641	5	1	1
02.08.2020	1718	54	1642	4	1	1
03.08.2020	1719	54	1644	4	1	1
04.08.2020	1720	54	1645	4	1	1
05.08.2020	1720	54	1647	4	1	1
06.08.2020	1721	54	1648	4	1	1
07.08.2020	1722	54	1649	4	1	1
08.08.2020	1722	54	1651	3	1	1
09.08.2020	1723	54	1652	3	1	1
10.08.2020	1723	54	1653	3	1	1
11.08.2020	1724	54	1654	3	1	1
12.08.2020	1724	54	1655	3	1	0

Table 20: Bremen - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1704	53	1602	9	2	1
17.07.2020	1705	53	1605	8	2	1
18.07.2020	1706	53	1608	8	2	1
19.07.2020	1707	53	1612	8	2	1
20.07.2020	1708	53	1614	7	2	1
21.07.2020	1709	53	1617	7	2	1
22.07.2020	1710	54	1620	7	2	1
23.07.2020	1712	54	1622	7	2	1
24.07.2020	1713	54	1625	6	2	1
25.07.2020	1714	54	1627	6	1	1
26.07.2020	1715	54	1630	6	1	1
27.07.2020	1716	54	1632	6	1	1
28.07.2020	1717	54	1634	5	1	1
29.07.2020	1718	54	1636	5	1	1
30.07.2020	1720	54	1638	5	1	1
31.07.2020	1721	54	1640	5	1	1
01.08.2020	1722	54	1642	5	1	1
02.08.2020	1723	54	1643	4	1	1
03.08.2020	1724	54	1645	4	1	1
04.08.2020	1725	54	1647	4	1	1
05.08.2020	1726	54	1648	4	1	1
06.08.2020	1727	54	1650	4	1	1
07.08.2020	1728	54	1651	4	1	1
08.08.2020	1730	54	1653	4	1	1
09.08.2020	1731	54	1654	3	1	1
10.08.2020	1732	54	1656	3	1	1
11.08.2020	1733	54	1657	3	1	1
12.08.2020	1734	54	1659	3	1	1

Table 21: Bremen - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1704	53	1602	9	2	1
17.07.2020	1705	53	1605	8	2	1
18.07.2020	1706	53	1608	8	2	1
19.07.2020	1707	53	1612	8	2	1
20.07.2020	1709	53	1614	7	2	1
21.07.2020	1710	53	1617	7	2	1
22.07.2020	1711	54	1620	7	2	1
23.07.2020	1713	54	1623	7	2	1
24.07.2020	1714	54	1625	6	2	1
25.07.2020	1716	54	1628	6	2	1
26.07.2020	1717	54	1630	6	1	1
27.07.2020	1719	54	1632	6	1	1
28.07.2020	1720	54	1634	5	1	1
29.07.2020	1722	54	1636	5	1	1
30.07.2020	1724	54	1638	5	1	1
31.07.2020	1726	54	1640	5	1	1
01.08.2020	1727	54	1642	5	1	1
02.08.2020	1729	54	1644	5	1	1
03.08.2020	1731	54	1646	4	1	1
04.08.2020	1733	54	1648	4	1	1
05.08.2020	1735	54	1650	4	1	1
06.08.2020	1737	54	1652	4	1	1
07.08.2020	1739	54	1654	4	1	1
08.08.2020	1742	54	1656	4	1	1
09.08.2020	1744	54	1658	4	1	1
10.08.2020	1746	54	1660	4	1	1
11.08.2020	1748	54	1662	4	1	1
12.08.2020	1751	54	1664	4	1	1

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 65 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

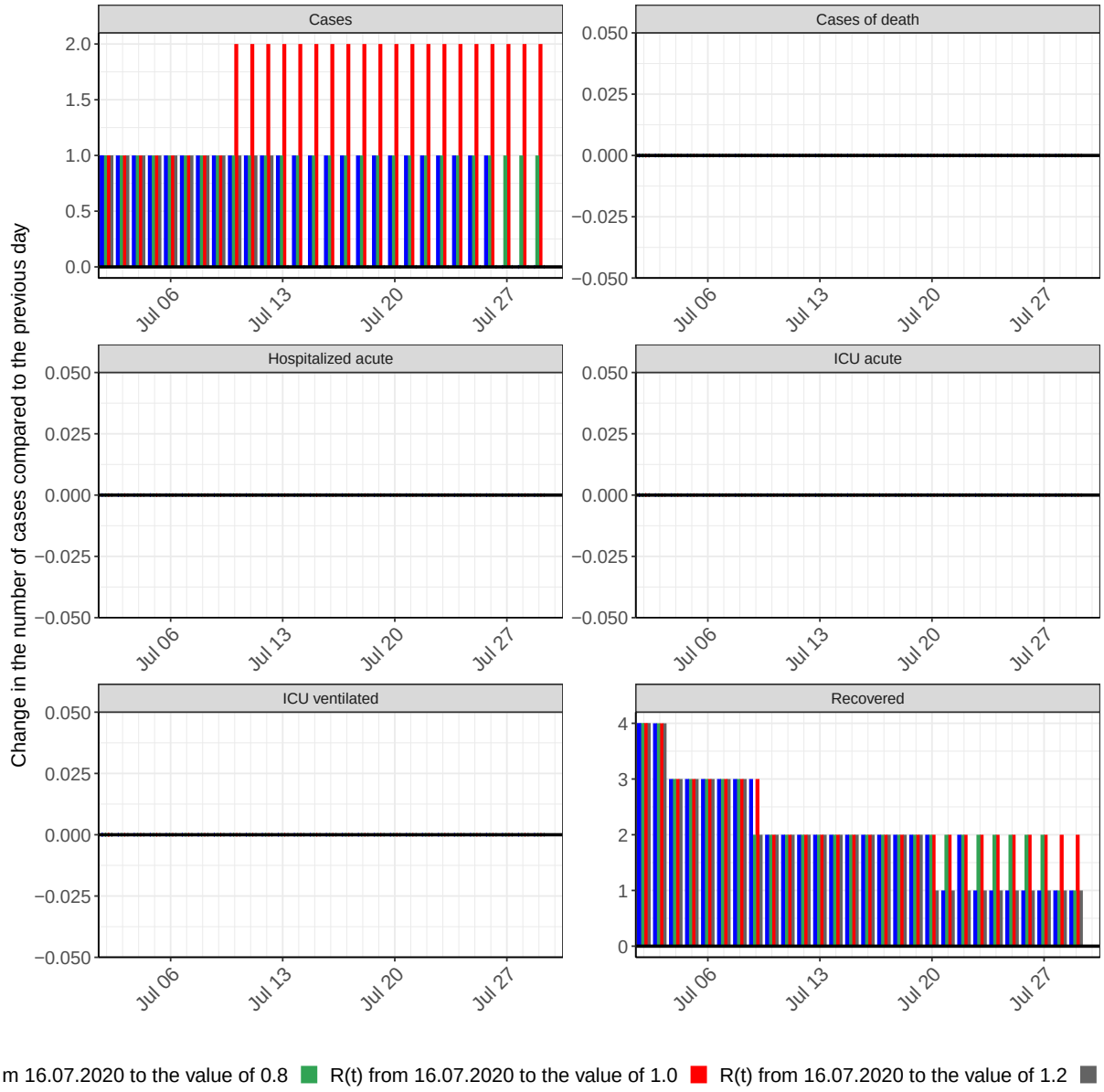


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

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.

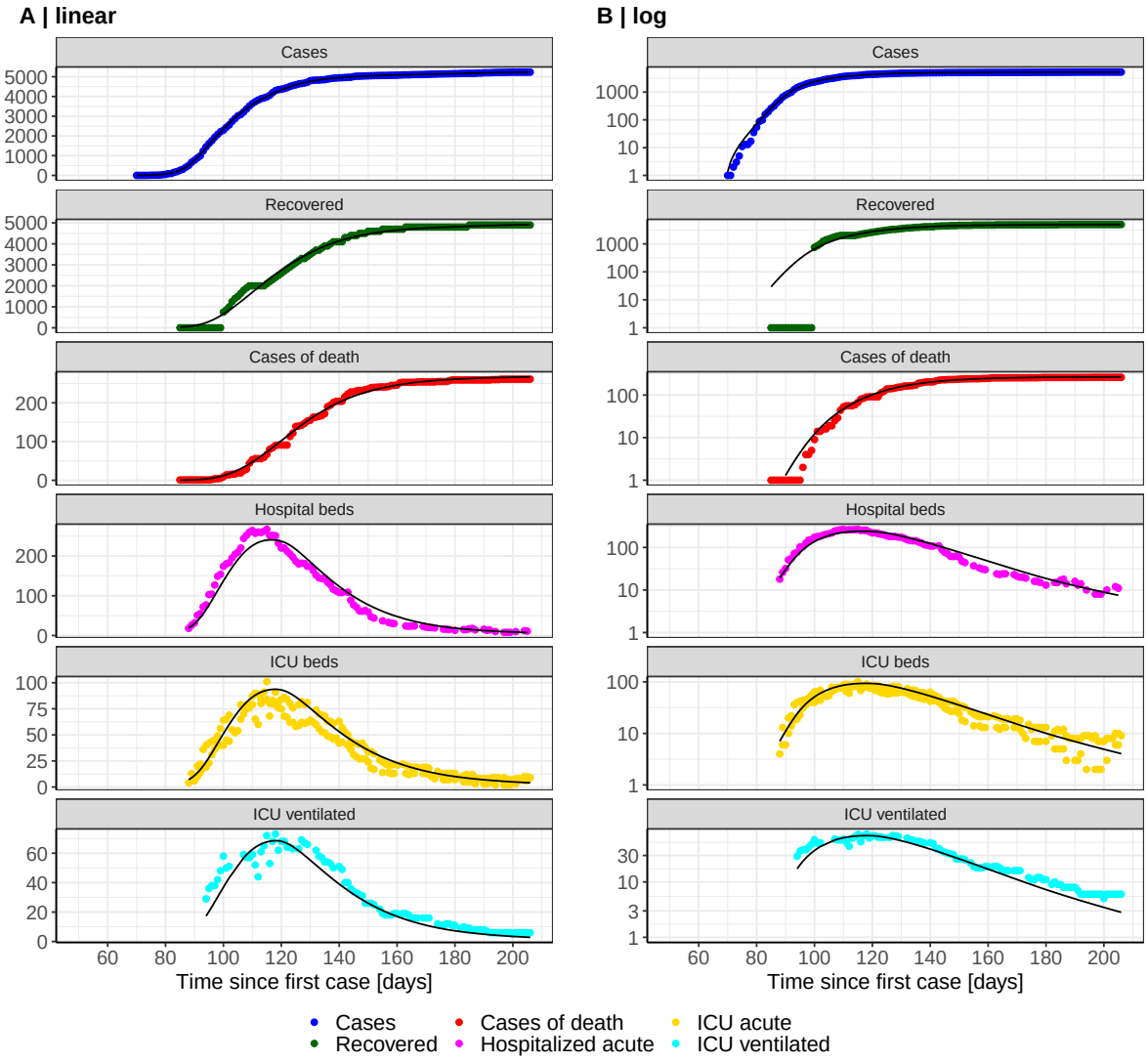


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

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.

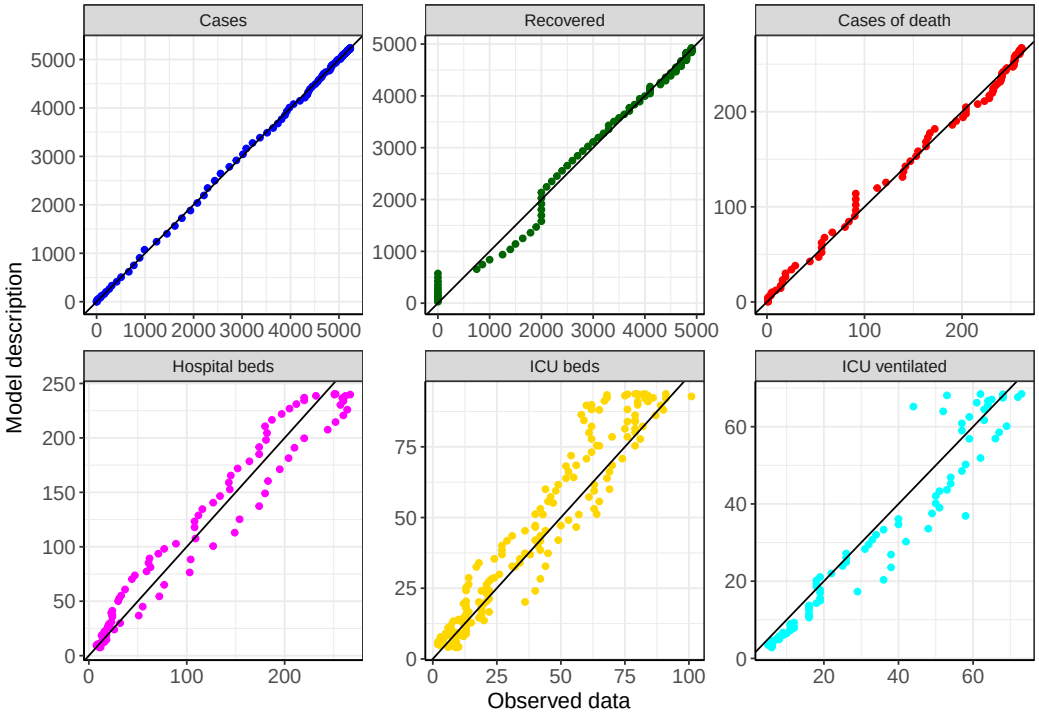


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

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).

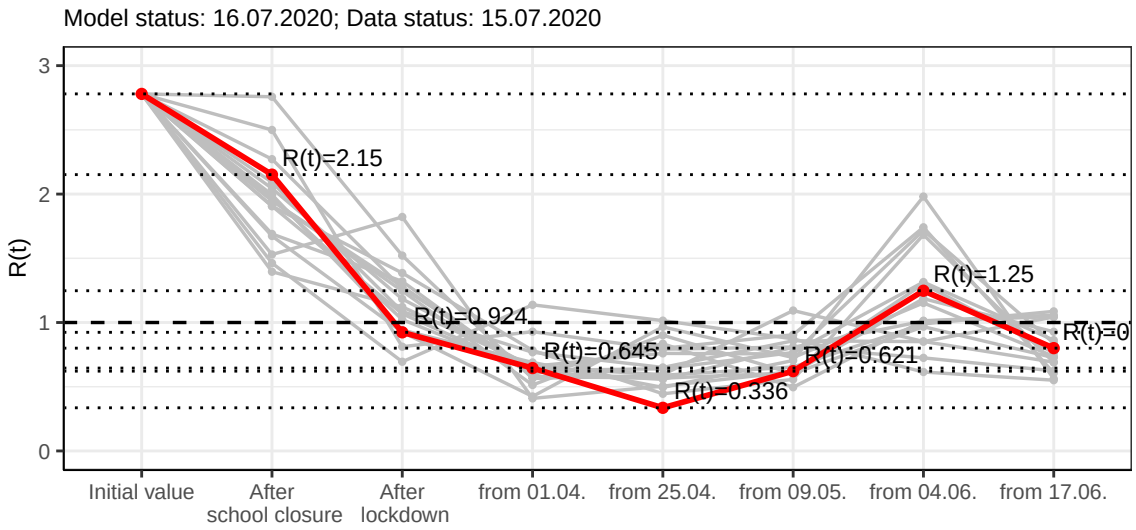


Figure 68: R(t) values before and after the NPIs for Hamburg

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

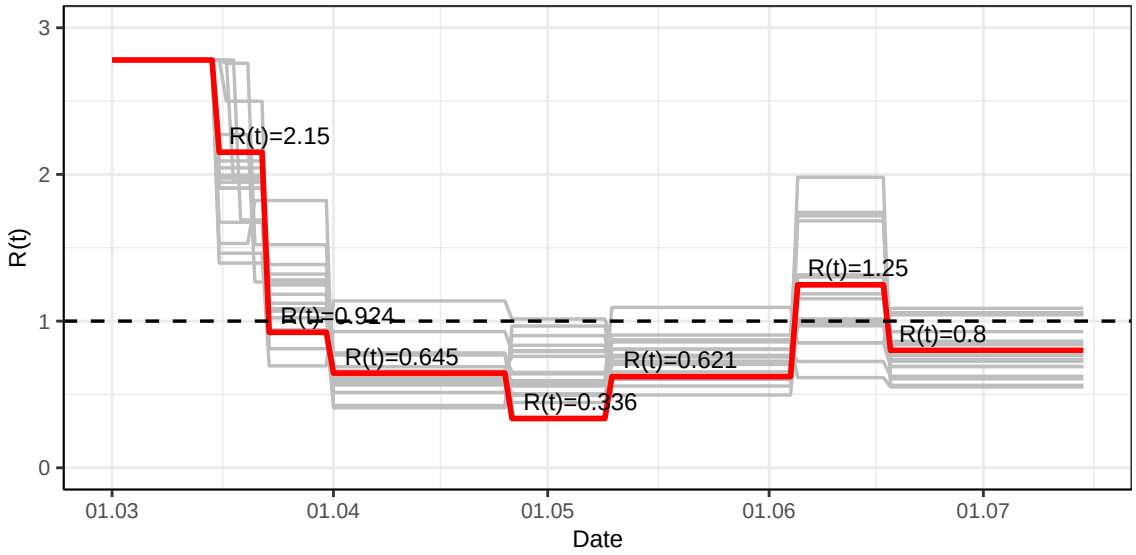


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

7.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.8)

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.

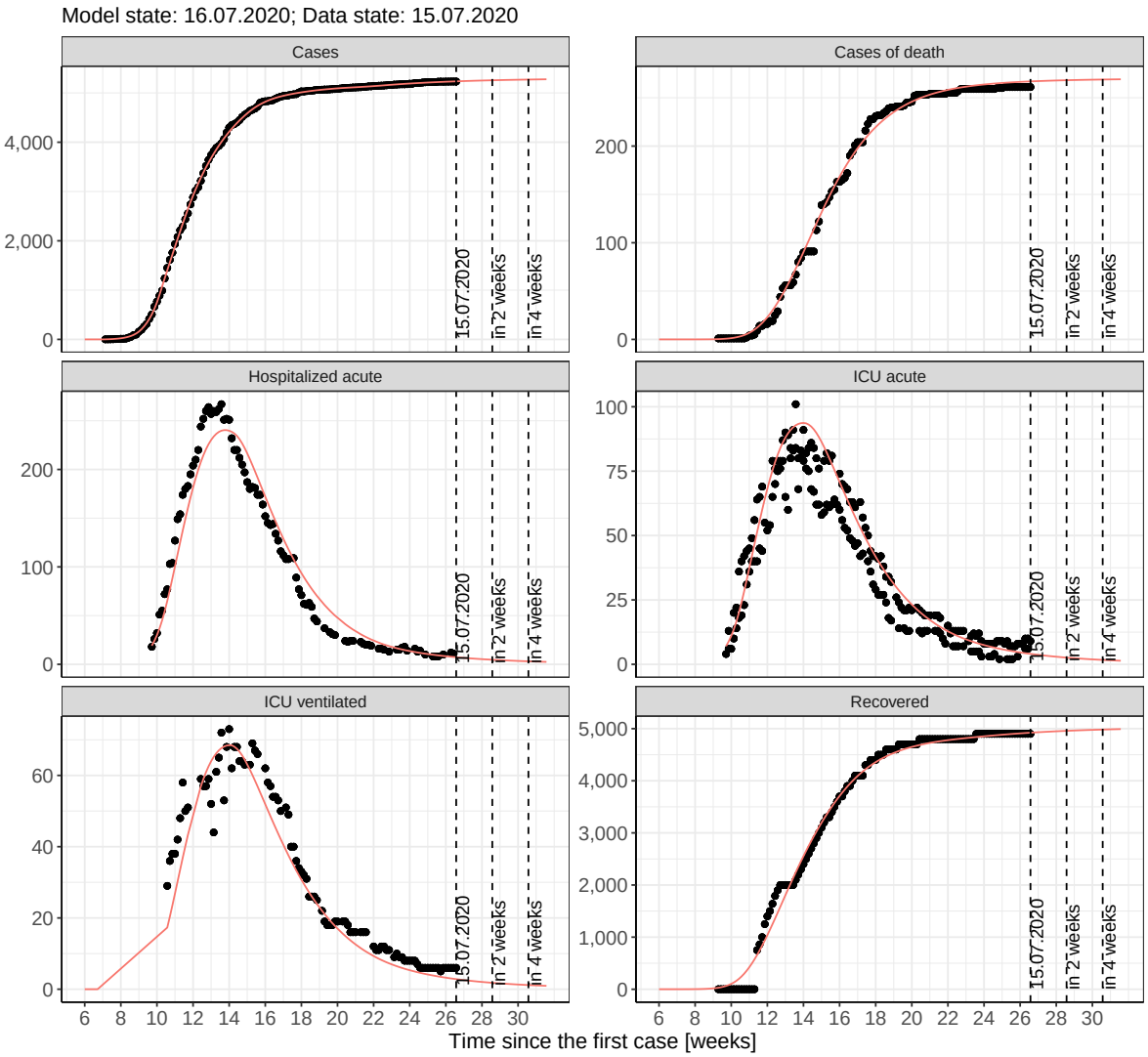


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

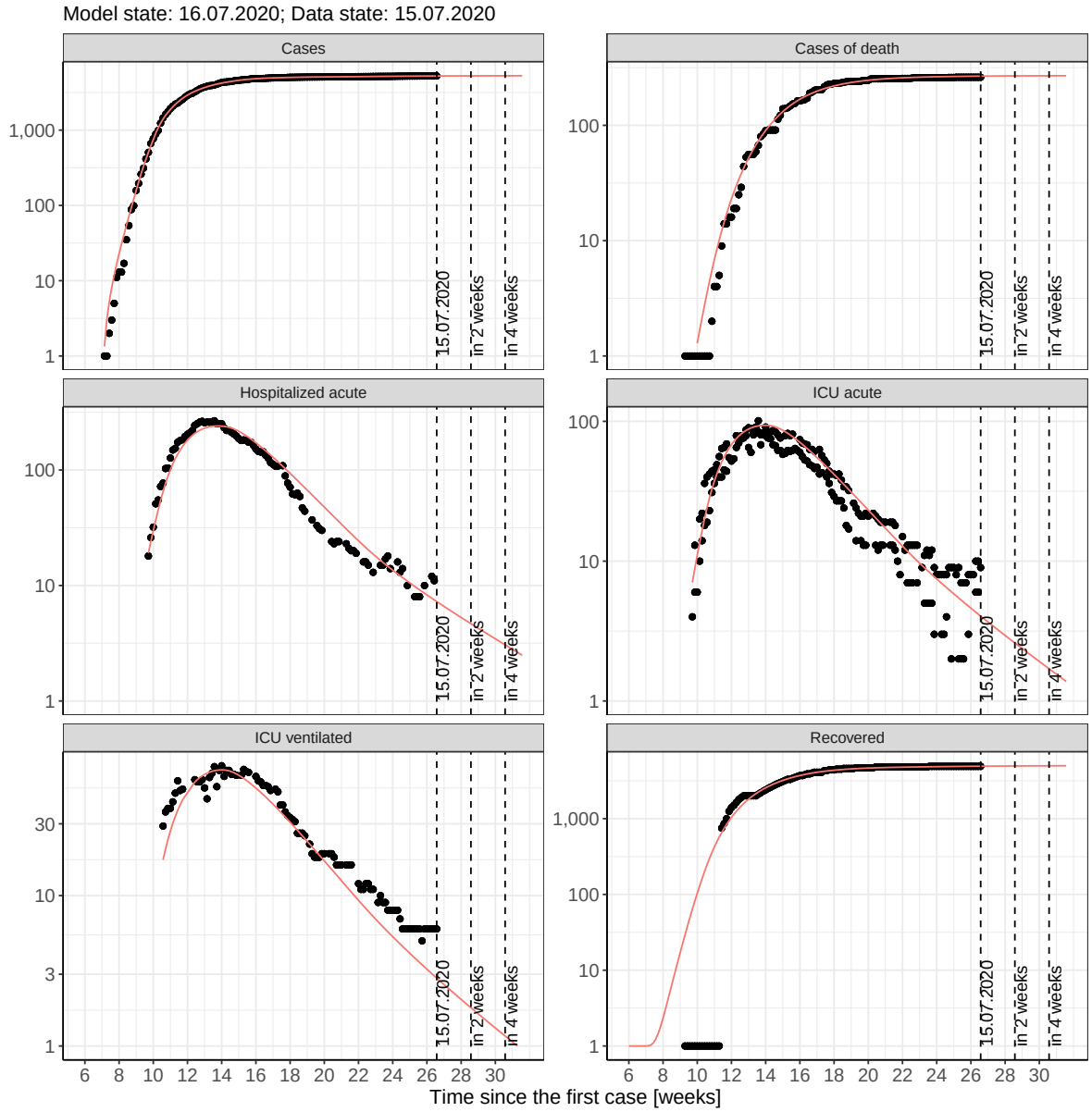


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

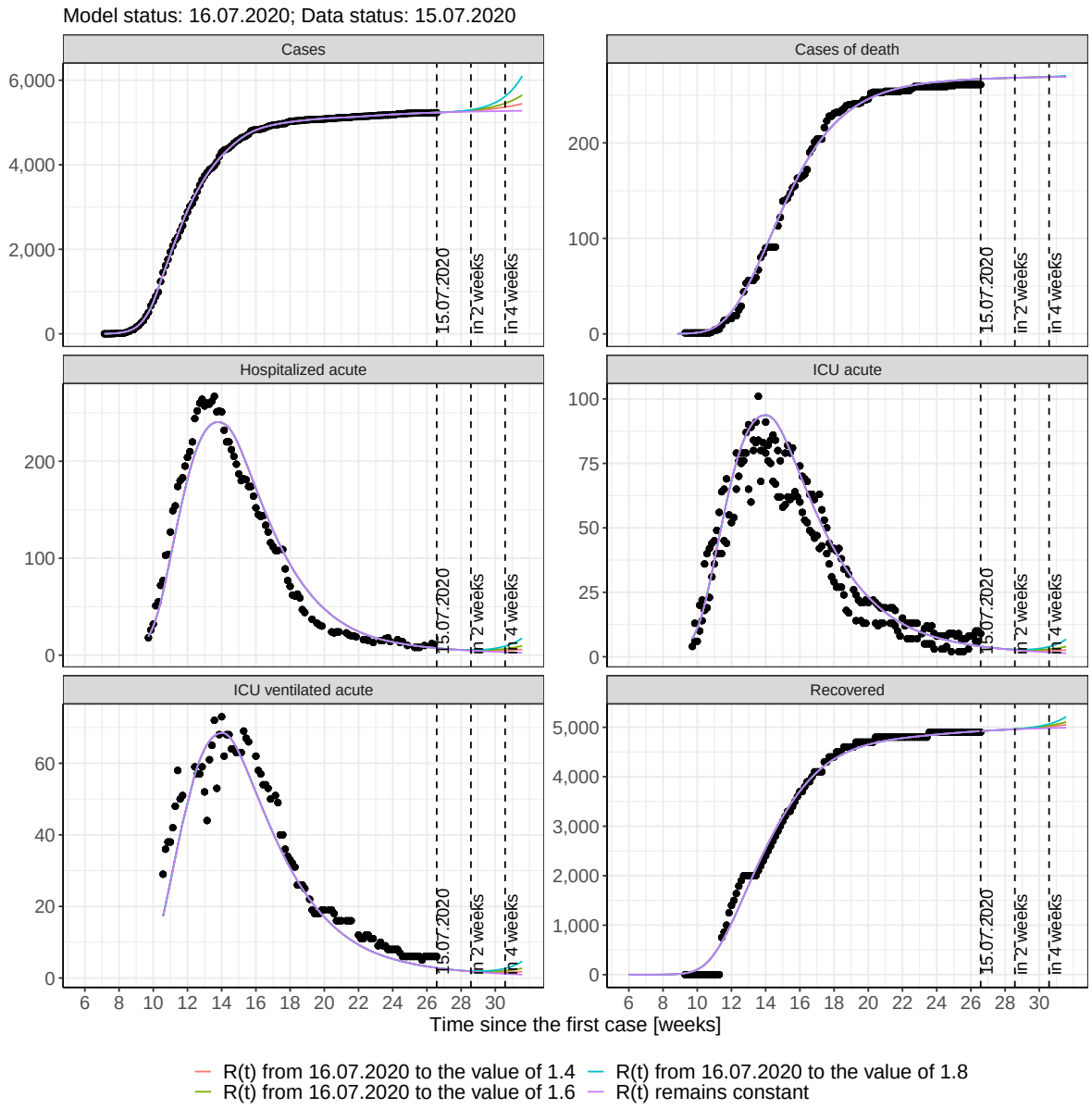


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

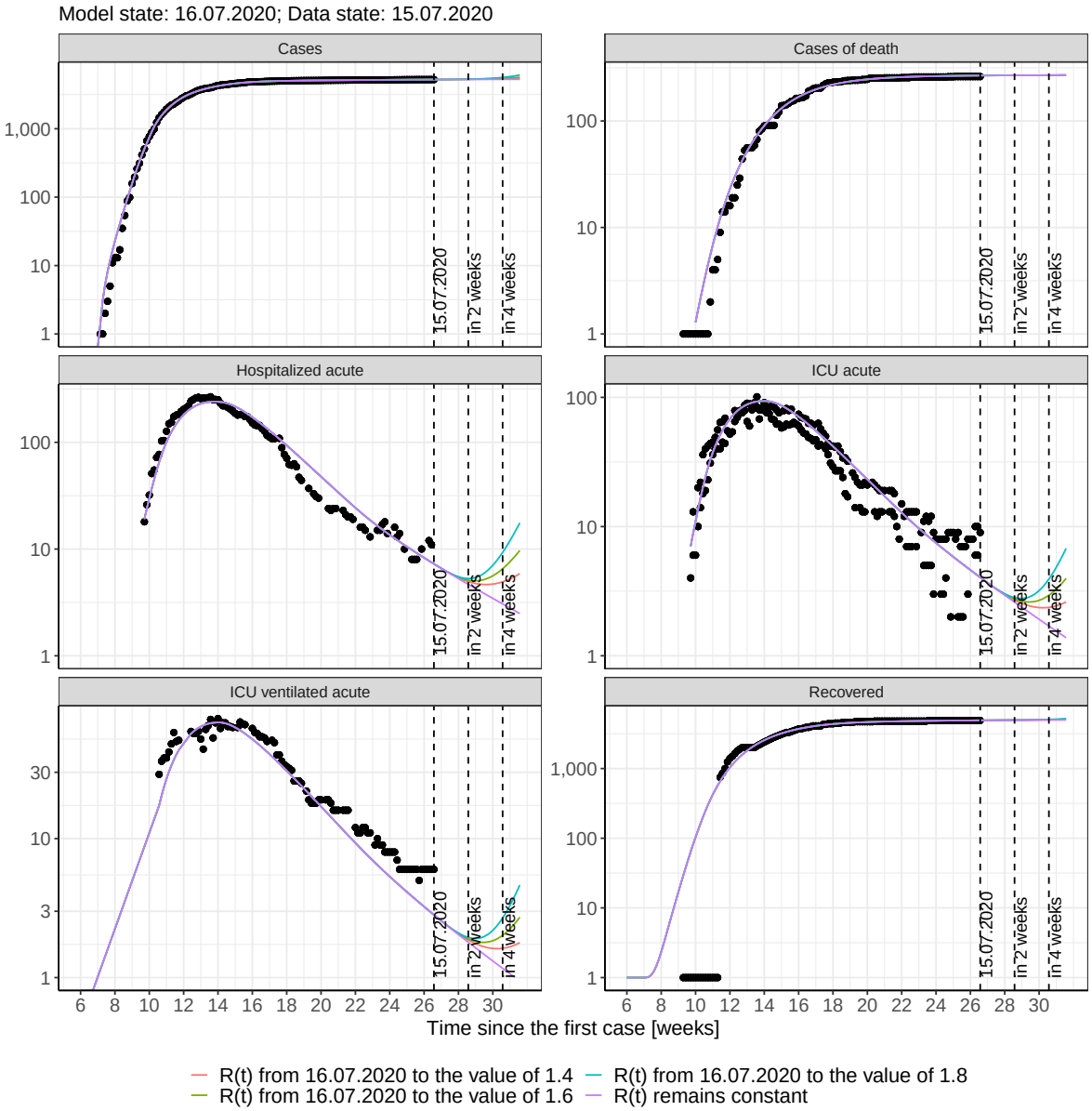


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

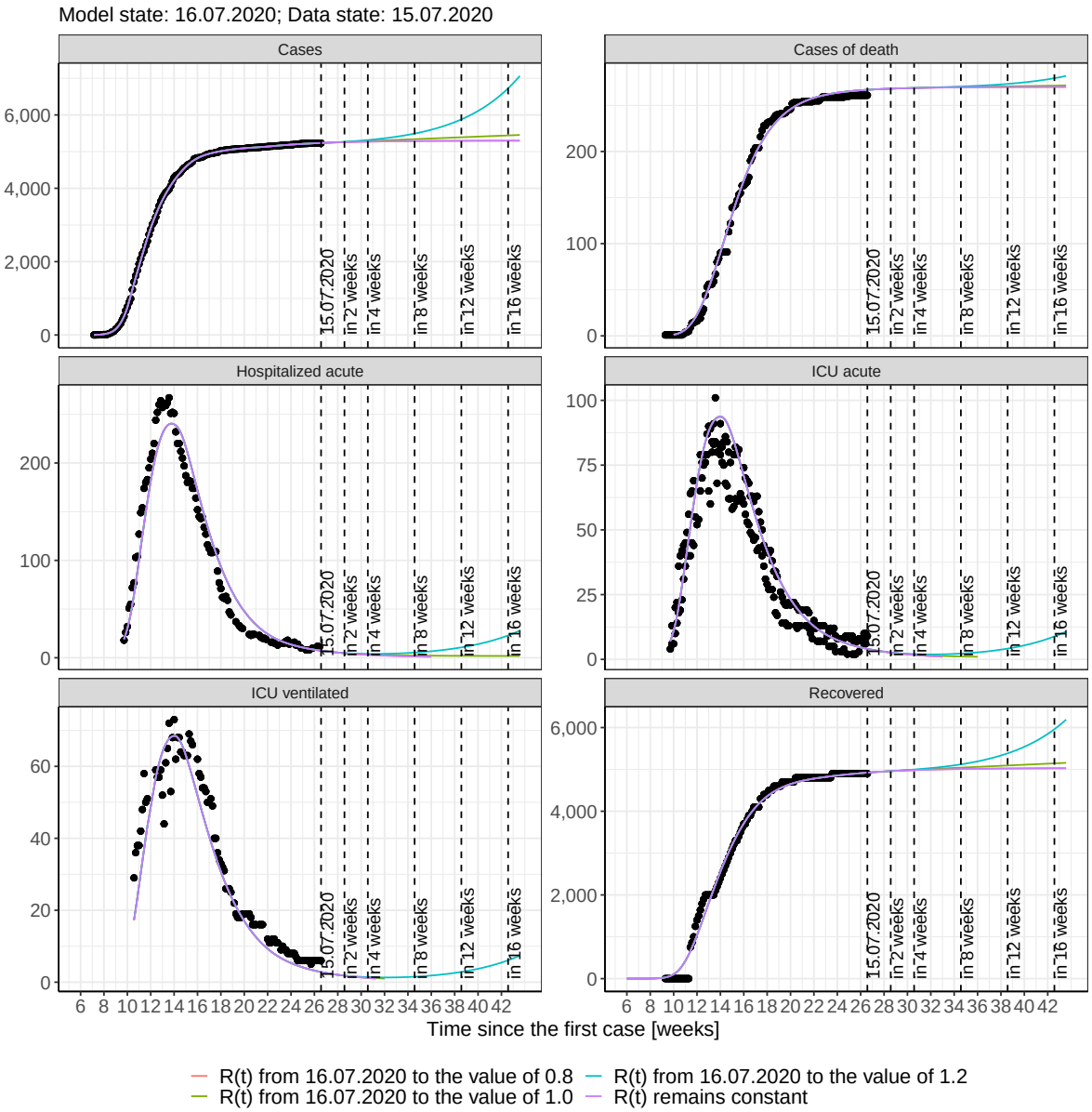


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

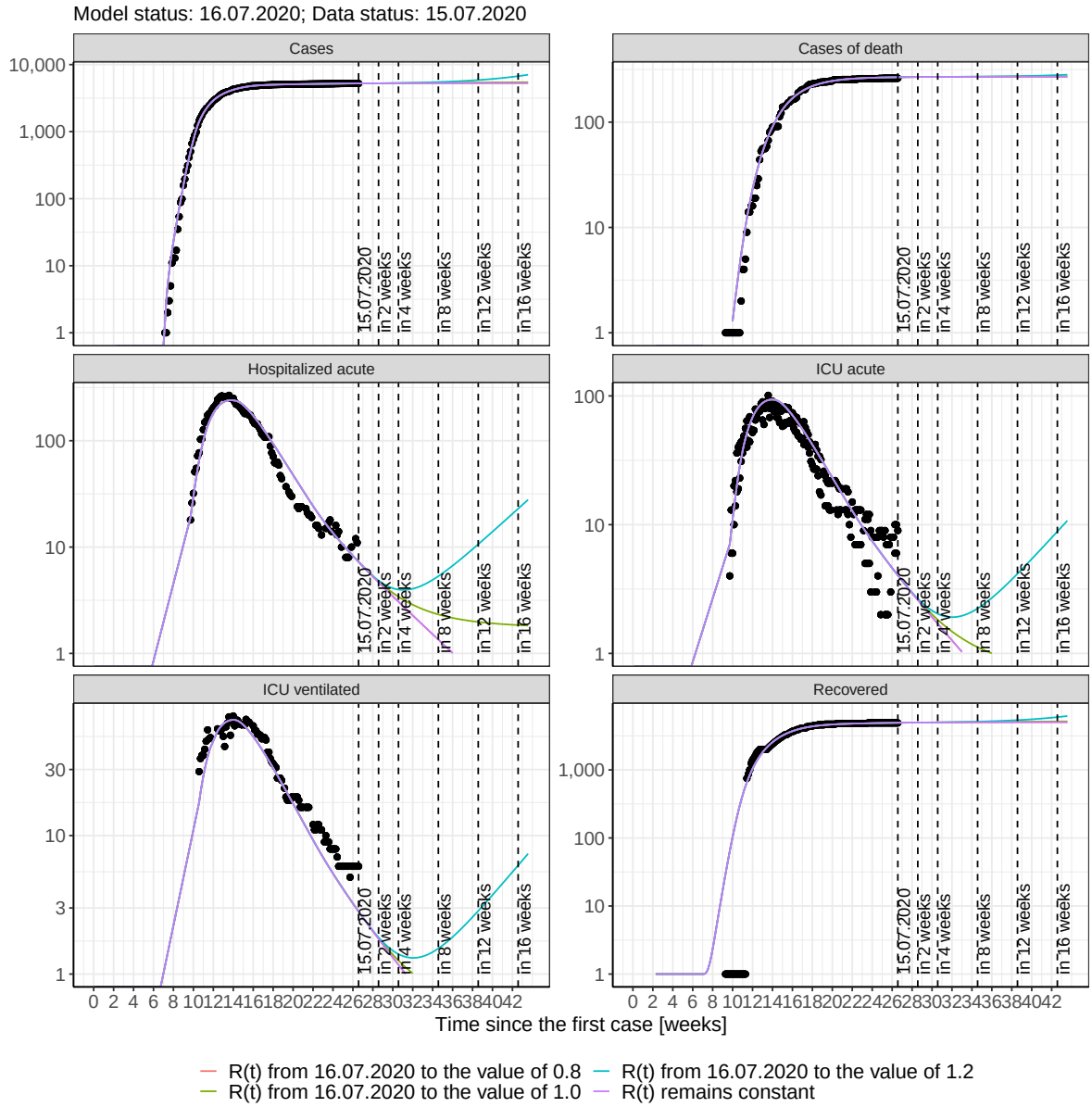


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 25) Model status from 16.07.2020; Data status: 15.07.2020.

Table 22: Hamburg - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5237	267	4925	7	4	3
17.07.2020	5239	267	4928	7	4	3
18.07.2020	5240	267	4931	7	4	3
19.07.2020	5242	267	4934	6	4	2
20.07.2020	5244	267	4937	6	3	2
21.07.2020	5246	268	4939	6	3	2
22.07.2020	5247	268	4942	6	3	2
23.07.2020	5249	268	4944	6	3	2
24.07.2020	5250	268	4947	5	3	2
25.07.2020	5252	268	4949	5	3	2
26.07.2020	5253	268	4952	5	3	2
27.07.2020	5254	268	4954	5	3	2
28.07.2020	5256	268	4956	5	3	2
29.07.2020	5257	268	4958	5	3	2
30.07.2020	5258	268	4960	5	3	2
31.07.2020	5259	268	4962	4	2	2
01.08.2020	5260	268	4964	4	2	2
02.08.2020	5262	268	4966	4	2	2
03.08.2020	5263	268	4968	4	2	2
04.08.2020	5264	268	4970	4	2	1
05.08.2020	5265	269	4972	4	2	1
06.08.2020	5266	269	4973	4	2	1
07.08.2020	5267	269	4975	4	2	1
08.08.2020	5268	269	4976	3	2	1
09.08.2020	5269	269	4978	3	2	1
10.08.2020	5270	269	4980	3	2	1
11.08.2020	5270	269	4981	3	2	1
12.08.2020	5271	269	4982	3	2	1

Table 23: Hamburg - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5237	267	4925	7	4	3
17.07.2020	5239	267	4928	7	4	3
18.07.2020	5240	267	4931	7	4	3
19.07.2020	5242	267	4934	6	4	2
20.07.2020	5244	267	4937	6	3	2
21.07.2020	5246	268	4939	6	3	2
22.07.2020	5247	268	4942	6	3	2
23.07.2020	5249	268	4944	6	3	2
24.07.2020	5250	268	4947	5	3	2
25.07.2020	5252	268	4949	5	3	2
26.07.2020	5253	268	4952	5	3	2
27.07.2020	5254	268	4954	5	3	2
28.07.2020	5256	268	4956	5	3	2
29.07.2020	5257	268	4958	5	3	2
30.07.2020	5258	268	4960	5	3	2
31.07.2020	5259	268	4962	4	2	2
01.08.2020	5260	268	4964	4	2	2
02.08.2020	5262	268	4966	4	2	2
03.08.2020	5263	268	4968	4	2	2
04.08.2020	5264	268	4970	4	2	1
05.08.2020	5265	269	4972	4	2	1
06.08.2020	5266	269	4973	4	2	1
07.08.2020	5267	269	4975	4	2	1
08.08.2020	5268	269	4976	3	2	1
09.08.2020	5269	269	4978	3	2	1
10.08.2020	5270	269	4980	3	2	1
11.08.2020	5270	269	4981	3	2	1
12.08.2020	5271	269	4982	3	2	1

Table 24: Hamburg - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5237	267	4925	7	4	3
17.07.2020	5239	267	4928	7	4	3
18.07.2020	5241	267	4931	7	4	3
19.07.2020	5243	267	4934	6	4	2
20.07.2020	5244	267	4937	6	3	2
21.07.2020	5246	268	4939	6	3	2
22.07.2020	5248	268	4942	6	3	2
23.07.2020	5250	268	4945	6	3	2
24.07.2020	5252	268	4947	5	3	2
25.07.2020	5254	268	4950	5	3	2
26.07.2020	5256	268	4952	5	3	2
27.07.2020	5258	268	4954	5	3	2
28.07.2020	5260	268	4957	5	3	2
29.07.2020	5261	268	4959	5	3	2
30.07.2020	5263	268	4961	5	3	2
31.07.2020	5265	268	4964	5	2	2
01.08.2020	5267	268	4966	4	2	2
02.08.2020	5269	268	4968	4	2	2
03.08.2020	5271	268	4970	4	2	2
04.08.2020	5273	269	4972	4	2	2
05.08.2020	5274	269	4974	4	2	1
06.08.2020	5276	269	4976	4	2	1
07.08.2020	5278	269	4978	4	2	1
08.08.2020	5280	269	4980	4	2	1
09.08.2020	5282	269	4982	4	2	1
10.08.2020	5284	269	4984	4	2	1
11.08.2020	5286	269	4986	3	2	1
12.08.2020	5288	269	4988	3	2	1

Table 25: Hamburg - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5237	267	4925	7	4	3
17.07.2020	5239	267	4928	7	4	3
18.07.2020	5241	267	4931	7	4	3
19.07.2020	5243	267	4934	6	4	2
20.07.2020	5245	267	4937	6	3	2
21.07.2020	5247	268	4940	6	3	2
22.07.2020	5250	268	4942	6	3	2
23.07.2020	5252	268	4945	6	3	2
24.07.2020	5254	268	4947	6	3	2
25.07.2020	5257	268	4950	5	3	2
26.07.2020	5259	268	4952	5	3	2
27.07.2020	5262	268	4955	5	3	2
28.07.2020	5265	268	4957	5	3	2
29.07.2020	5268	268	4960	5	3	2
30.07.2020	5270	268	4962	5	3	2
31.07.2020	5273	268	4965	5	3	2
01.08.2020	5276	268	4967	5	2	2
02.08.2020	5279	268	4970	4	2	2
03.08.2020	5282	268	4972	4	2	2
04.08.2020	5286	269	4975	4	2	2
05.08.2020	5289	269	4978	4	2	2
06.08.2020	5292	269	4980	4	2	2
07.08.2020	5296	269	4983	4	2	2
08.08.2020	5300	269	4986	4	2	1
09.08.2020	5304	269	4989	4	2	1
10.08.2020	5307	269	4992	4	2	1
11.08.2020	5311	269	4994	4	2	1
12.08.2020	5315	269	4997	4	2	1

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 76 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

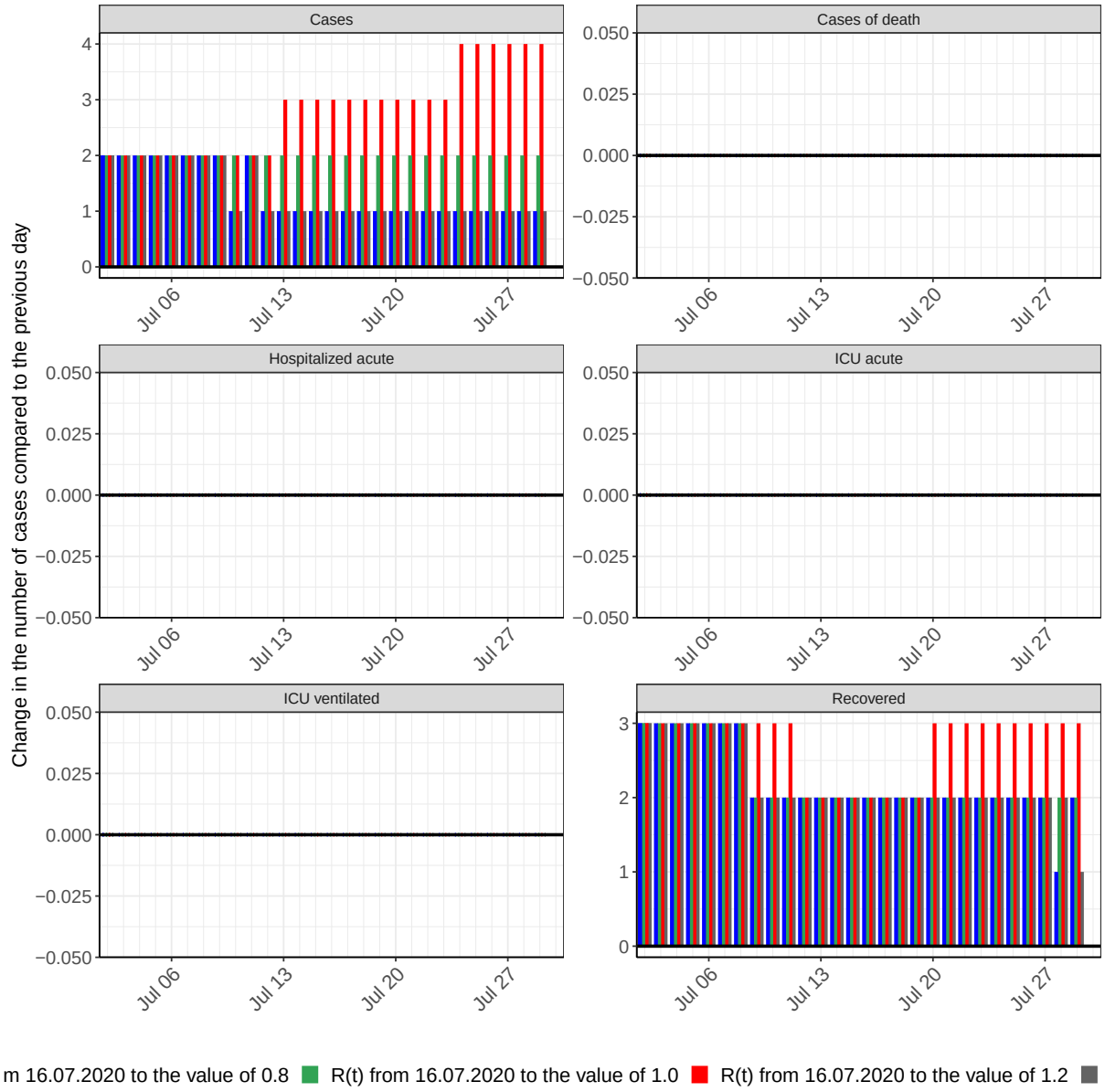


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

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.

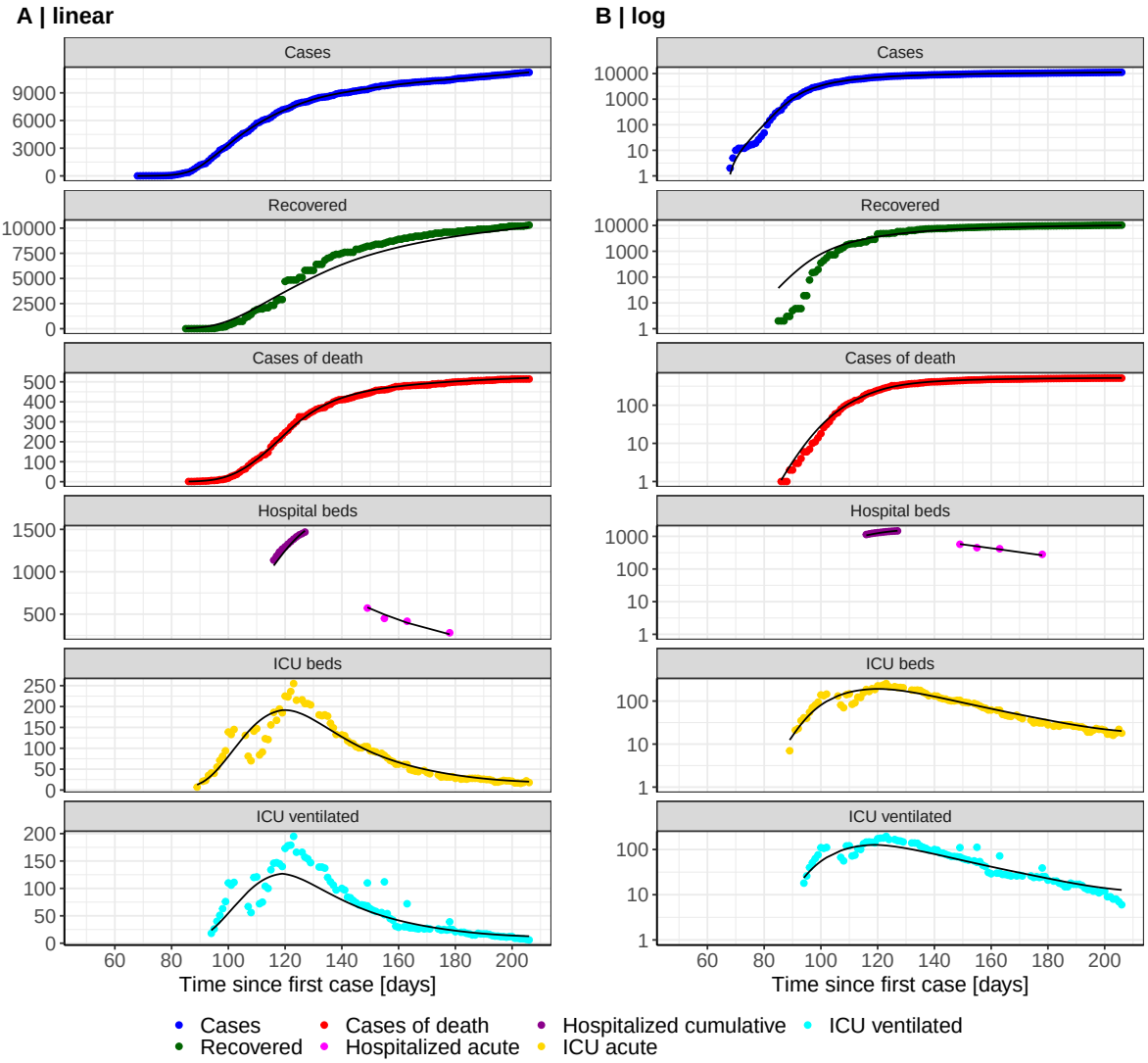


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

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.

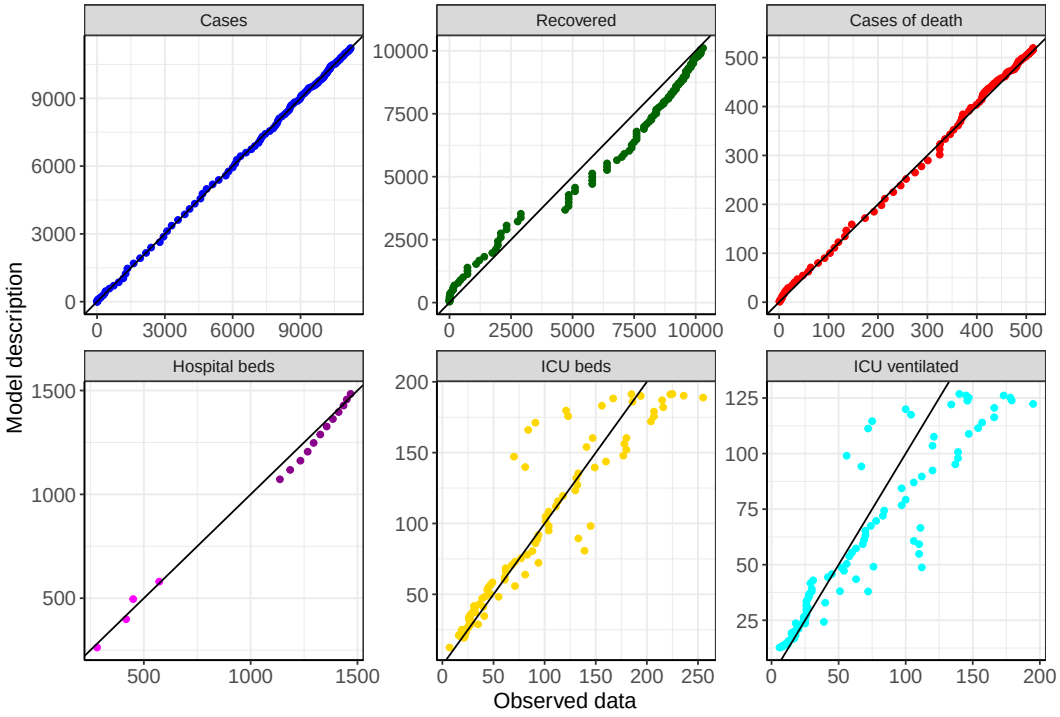


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

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).

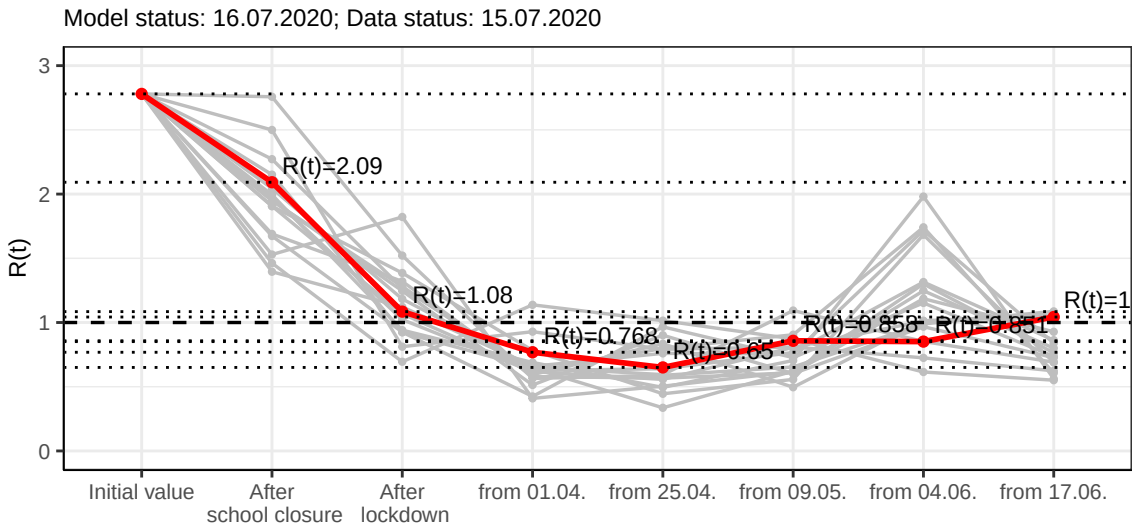


Figure 79: R(t) values before and after the NPIs for Hesse

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

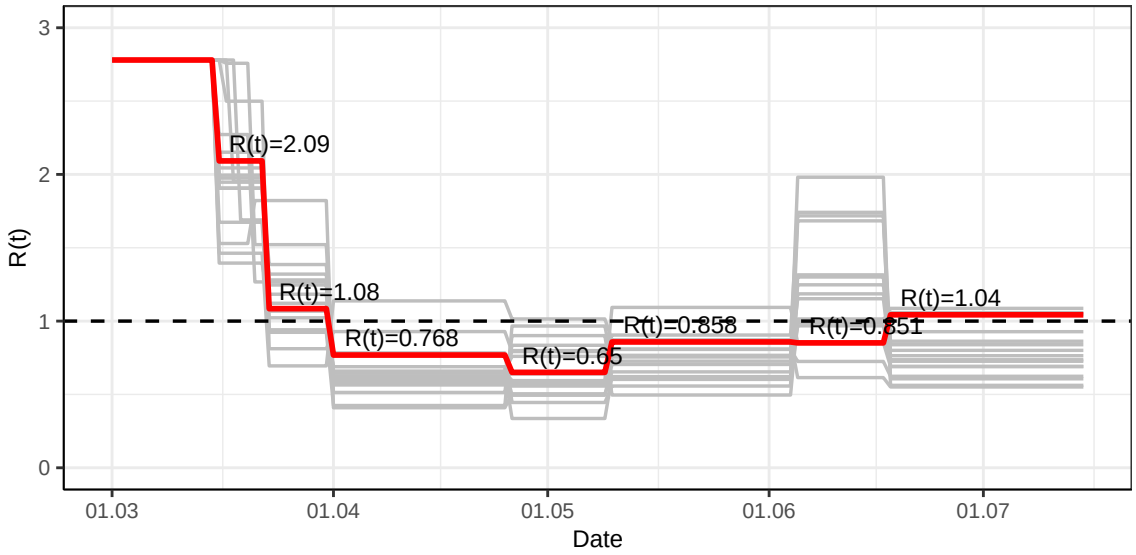


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

8.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.04)

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.

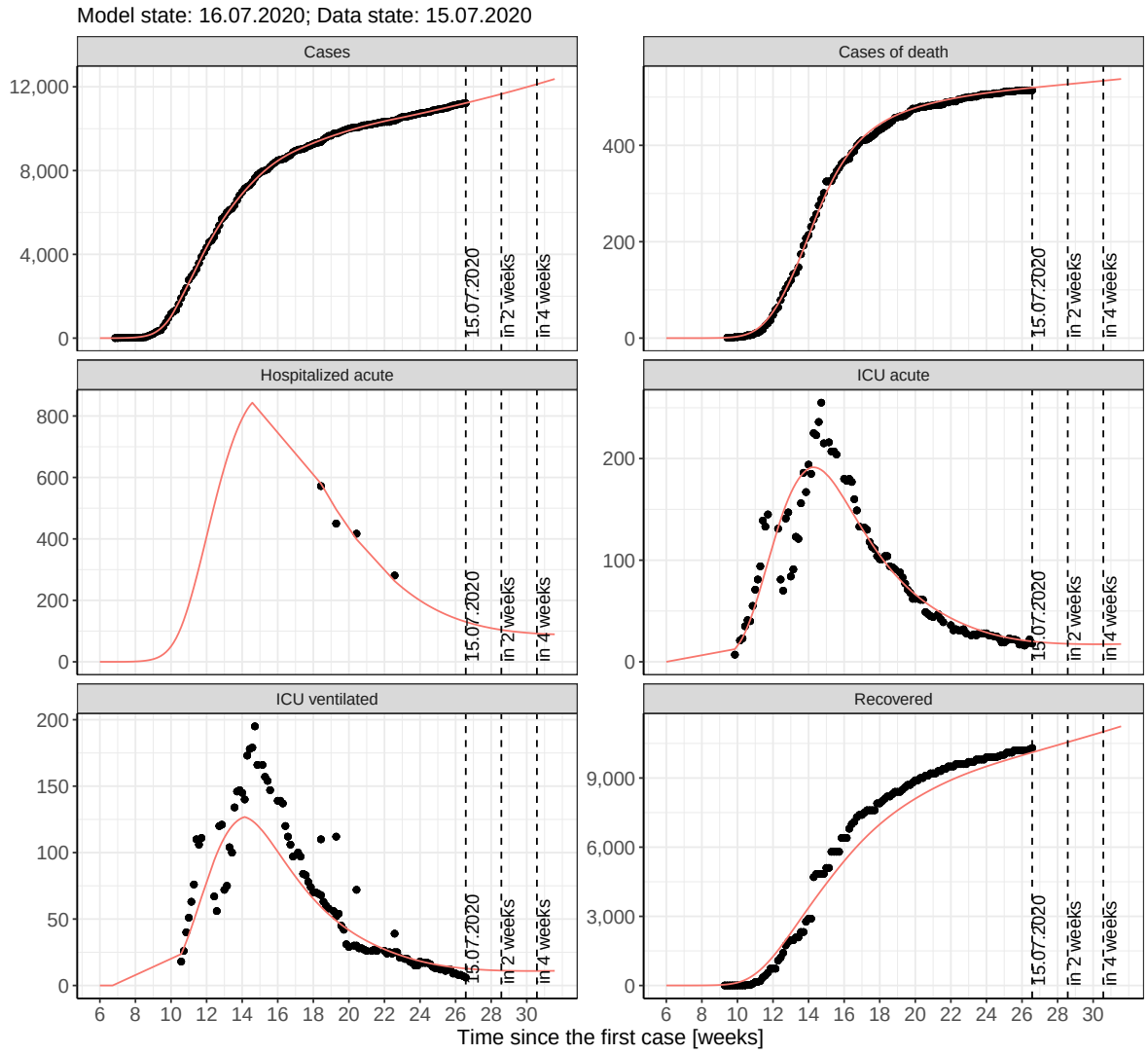


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

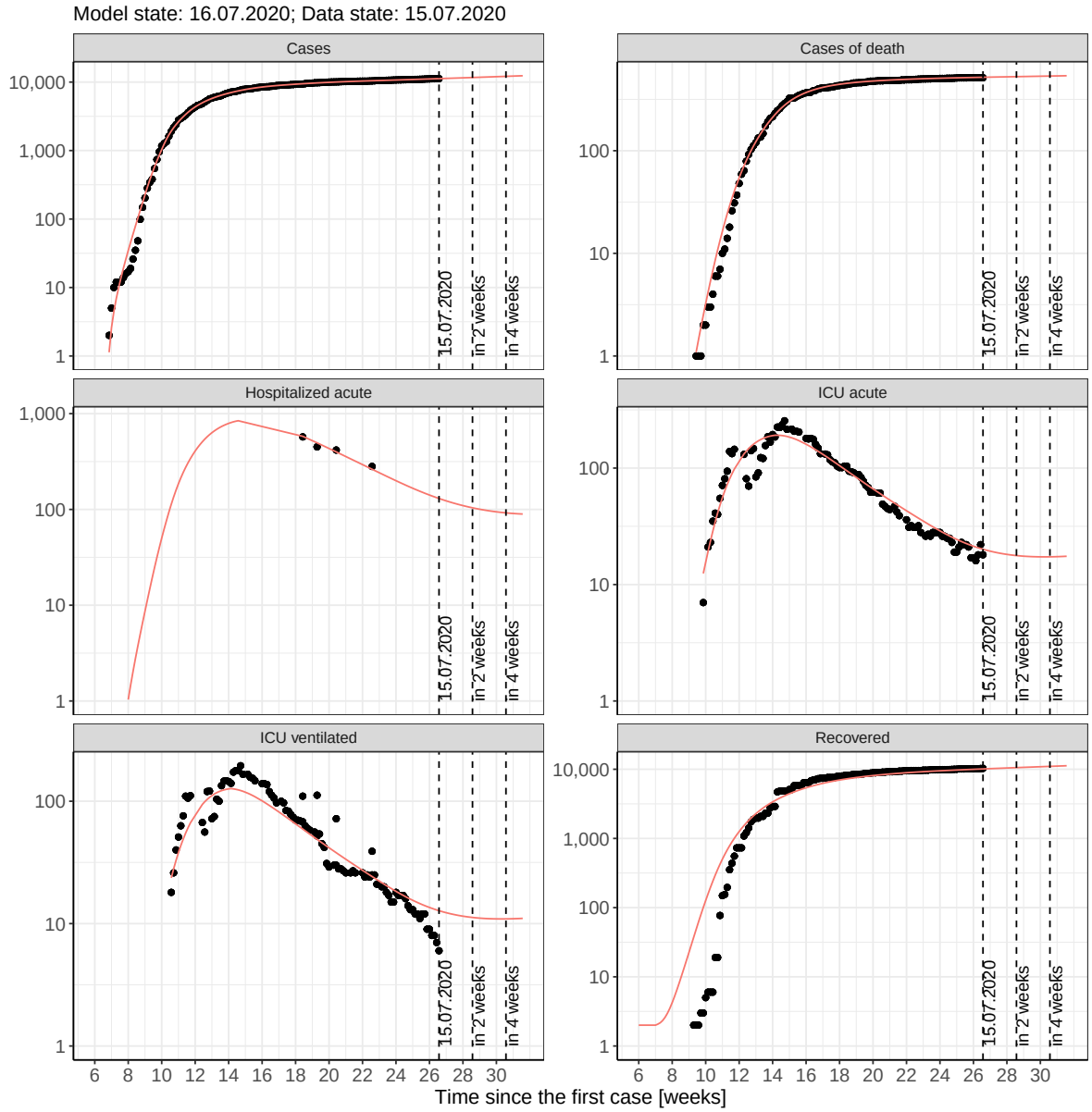


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

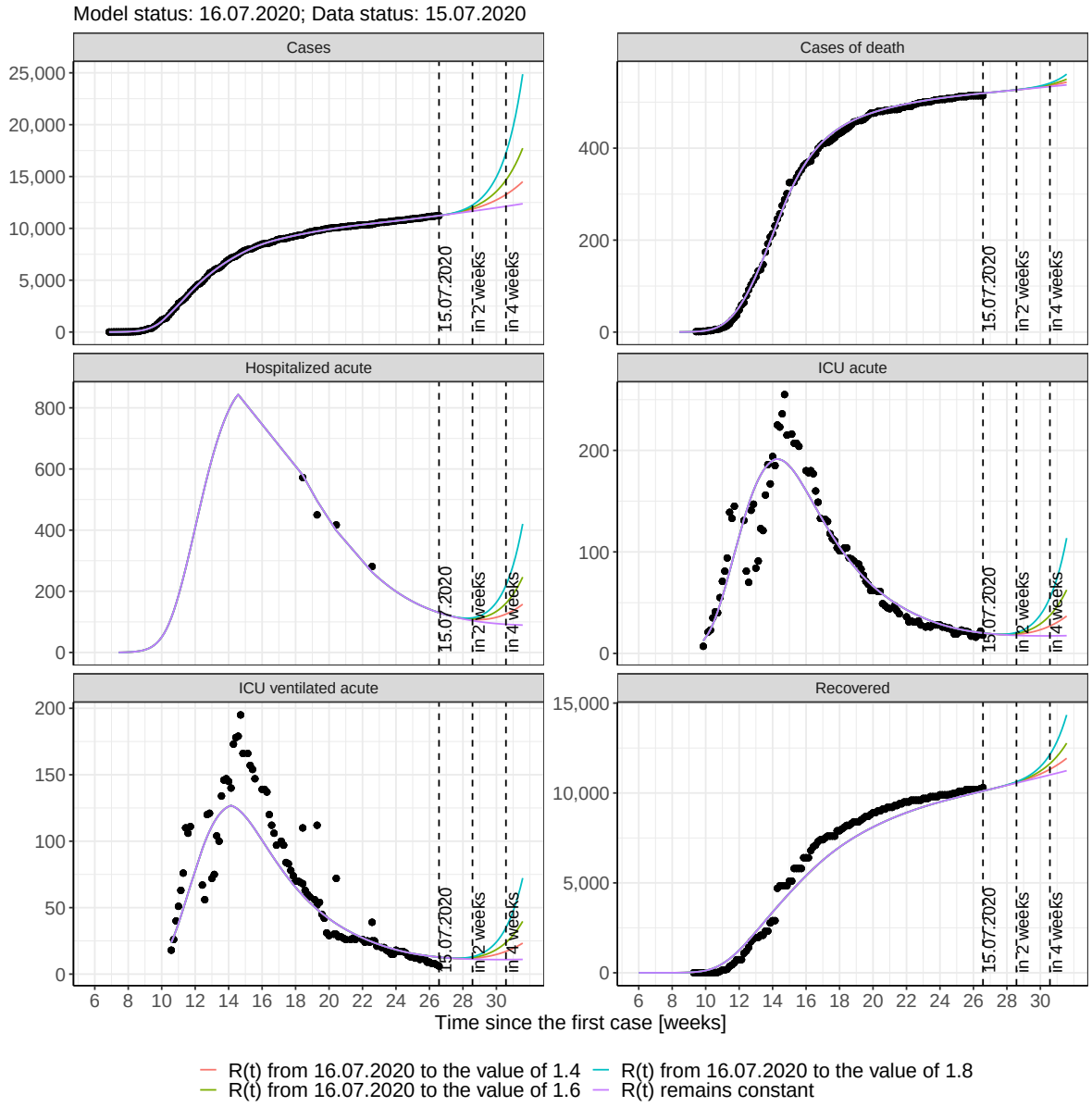


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

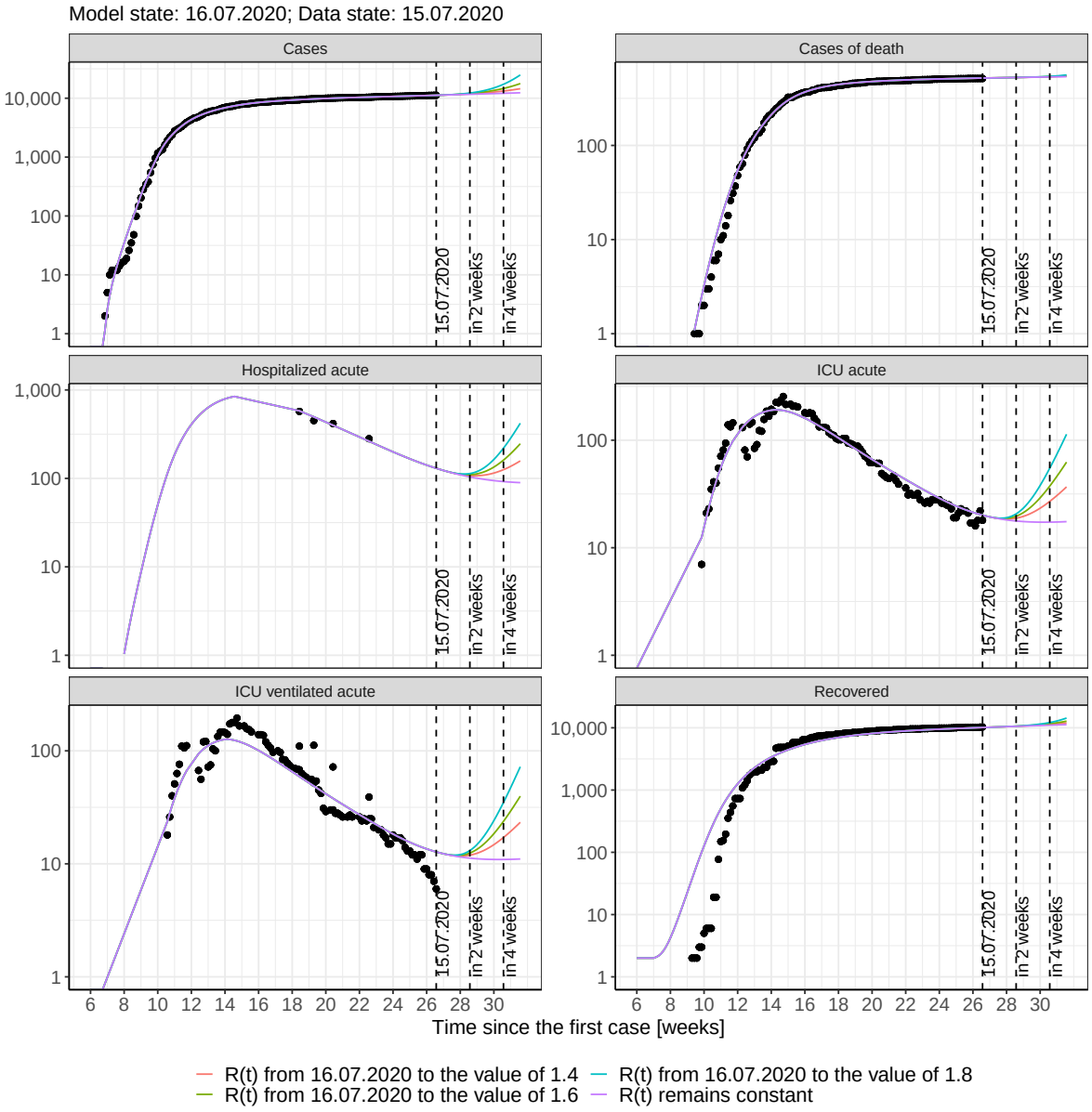


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

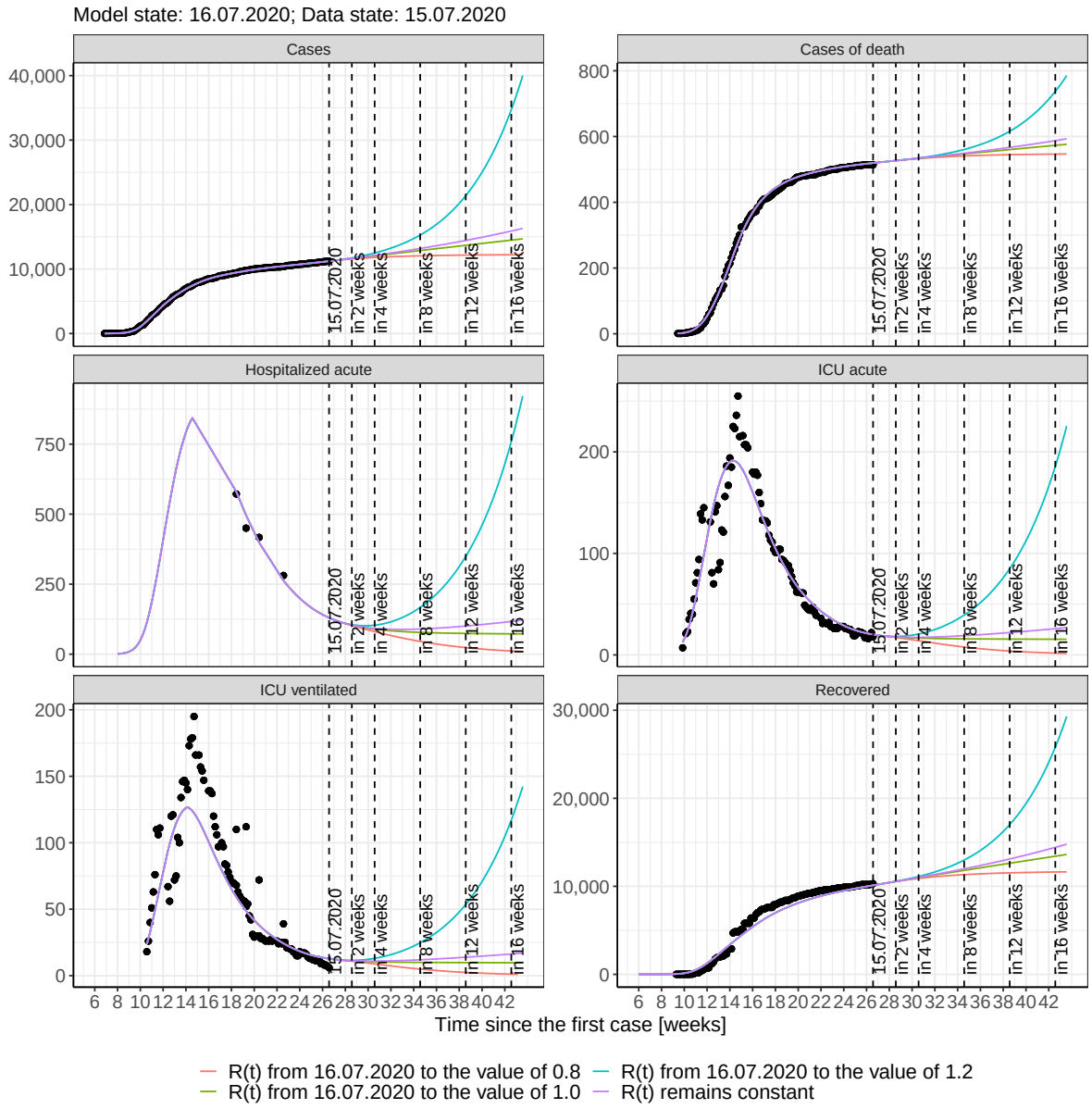


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

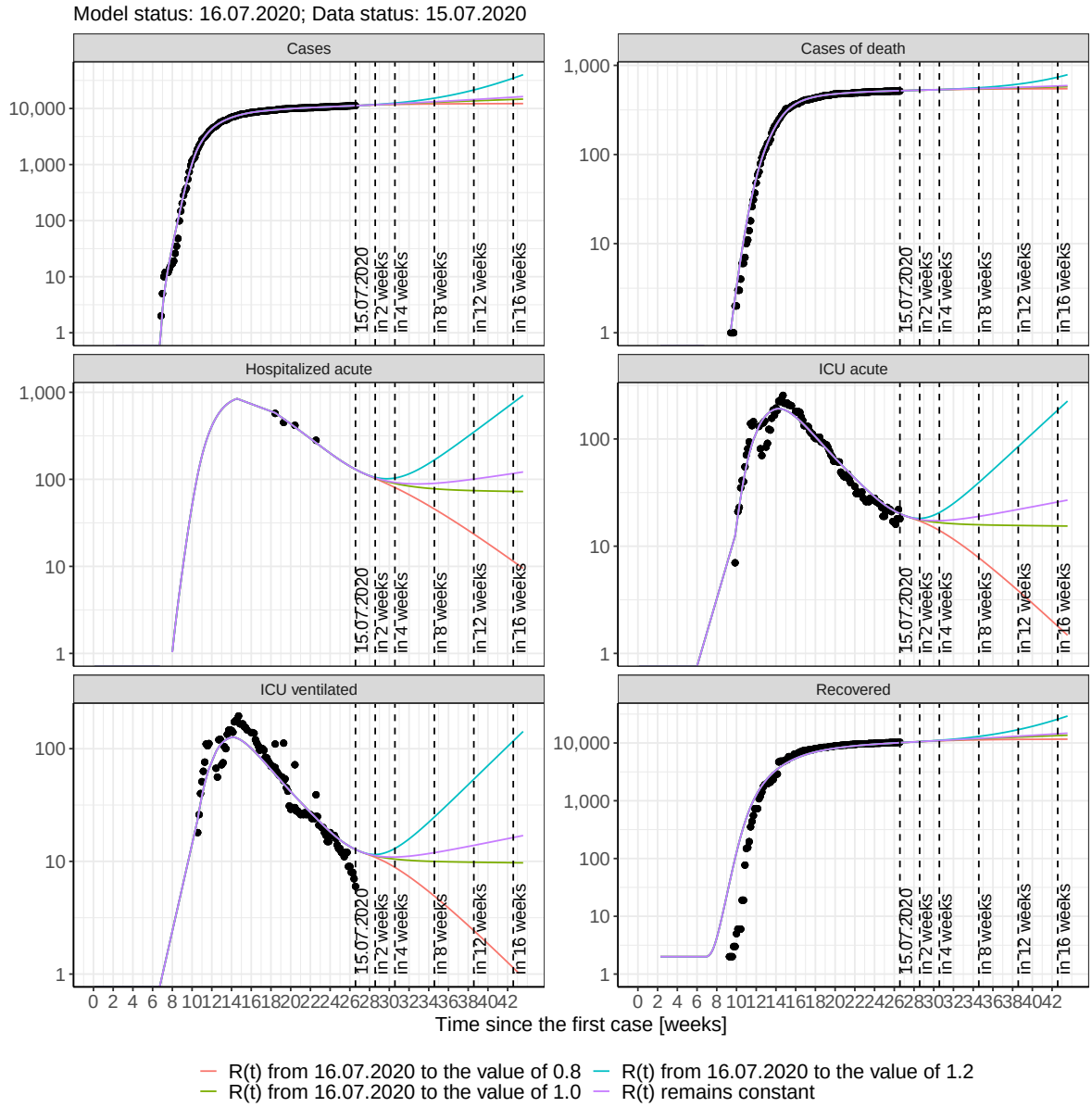


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 29) Model status from 16.07.2020; Data status: 15.07.2020.

Table 26: Hesse - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	11255	520	10141	128	20	13
17.07.2020	11284	520	10173	125	20	12
18.07.2020	11314	521	10205	123	19	12
19.07.2020	11345	522	10237	121	19	12
20.07.2020	11375	522	10269	119	19	12
21.07.2020	11405	523	10300	117	19	12
22.07.2020	11436	523	10332	115	19	12
23.07.2020	11467	524	10364	113	18	12
24.07.2020	11498	524	10395	111	18	12
25.07.2020	11529	525	10427	110	18	12
26.07.2020	11561	525	10459	108	18	11
27.07.2020	11592	526	10491	107	18	11
28.07.2020	11624	526	10522	105	18	11
29.07.2020	11656	527	10554	104	18	11
30.07.2020	11688	527	10586	103	18	11
31.07.2020	11721	528	10618	102	18	11
01.08.2020	11753	528	10650	100	18	11
02.08.2020	11786	529	10682	99	17	11
03.08.2020	11819	529	10714	98	17	11
04.08.2020	11852	530	10746	98	17	11
05.08.2020	11885	530	10778	97	17	11
06.08.2020	11919	531	10810	96	17	11
07.08.2020	11953	531	10843	95	17	11
08.08.2020	11987	532	10875	94	17	11
09.08.2020	12021	532	10908	94	17	11
10.08.2020	12055	533	10940	93	17	11
11.08.2020	12090	533	10973	93	17	11
12.08.2020	12124	534	11006	92	17	11

Table 27: Hesse - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	11254	520	10141	128	20	13
17.07.2020	11282	520	10173	125	20	12
18.07.2020	11310	521	10205	123	19	12
19.07.2020	11337	522	10237	121	19	12
20.07.2020	11363	522	10268	119	19	12
21.07.2020	11388	523	10300	117	19	12
22.07.2020	11412	523	10331	115	19	12
23.07.2020	11436	524	10362	113	18	12
24.07.2020	11459	524	10392	111	18	11
25.07.2020	11482	525	10423	109	18	11
26.07.2020	11504	525	10453	107	18	11
27.07.2020	11525	526	10482	106	18	11
28.07.2020	11545	526	10511	104	17	11
29.07.2020	11565	527	10540	102	17	11
30.07.2020	11585	527	10569	101	17	11
31.07.2020	11604	528	10596	99	17	11
01.08.2020	11622	528	10624	97	17	10
02.08.2020	11640	529	10651	96	16	10
03.08.2020	11657	529	10677	94	16	10
04.08.2020	11674	530	10703	93	16	10
05.08.2020	11691	530	10728	91	16	10
06.08.2020	11707	530	10753	89	15	10
07.08.2020	11722	531	10778	88	15	10
08.08.2020	11737	531	10801	86	15	9
09.08.2020	11752	532	10825	85	15	9
10.08.2020	11766	532	10847	83	14	9
11.08.2020	11780	533	10870	82	14	9
12.08.2020	11793	533	10891	81	14	9

Table 28: Hesse - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	11254	520	10141	128	20	13
17.07.2020	11284	520	10173	125	20	12
18.07.2020	11314	521	10205	123	19	12
19.07.2020	11343	522	10237	121	19	12
20.07.2020	11373	522	10268	119	19	12
21.07.2020	11402	523	10300	117	19	12
22.07.2020	11432	523	10332	115	19	12
23.07.2020	11461	524	10363	113	18	12
24.07.2020	11491	524	10395	111	18	12
25.07.2020	11520	525	10426	110	18	11
26.07.2020	11550	525	10458	108	18	11
27.07.2020	11579	526	10489	106	18	11
28.07.2020	11609	526	10520	105	18	11
29.07.2020	11638	527	10551	104	18	11
30.07.2020	11667	527	10583	102	18	11
31.07.2020	11697	528	10614	101	17	11
01.08.2020	11726	528	10645	100	17	11
02.08.2020	11756	529	10676	99	17	11
03.08.2020	11785	529	10706	98	17	11
04.08.2020	11815	530	10737	97	17	11
05.08.2020	11844	530	10768	96	17	11
06.08.2020	11873	531	10799	95	17	11
07.08.2020	11903	531	10829	94	17	11
08.08.2020	11932	532	10860	93	17	11
09.08.2020	11961	532	10890	92	17	11
10.08.2020	11991	533	10921	91	17	11
11.08.2020	12020	533	10951	90	17	11
12.08.2020	12050	534	10982	90	17	10

Table 29: Hesse - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	11255	520	10141	128	20	13
17.07.2020	11286	520	10173	125	20	12
18.07.2020	11317	521	10205	123	19	12
19.07.2020	11350	522	10237	121	19	12
20.07.2020	11384	522	10269	119	19	12
21.07.2020	11418	523	10301	117	19	12
22.07.2020	11454	523	10333	115	19	12
23.07.2020	11490	524	10365	113	18	12
24.07.2020	11528	524	10398	112	18	12
25.07.2020	11567	525	10430	110	18	12
26.07.2020	11606	525	10463	109	18	12
27.07.2020	11647	526	10497	108	18	12
28.07.2020	11689	526	10531	106	18	12
29.07.2020	11733	527	10565	105	18	12
30.07.2020	11777	527	10600	105	18	12
31.07.2020	11823	528	10635	104	18	12
01.08.2020	11870	528	10671	103	18	12
02.08.2020	11919	529	10707	103	18	12
03.08.2020	11969	529	10744	102	19	12
04.08.2020	12020	530	10782	102	19	12
05.08.2020	12073	531	10821	102	19	12
06.08.2020	12127	531	10860	102	19	12
07.08.2020	12183	532	10900	102	19	12
08.08.2020	12240	532	10941	102	19	12
09.08.2020	12299	533	10983	102	20	12
10.08.2020	12360	533	11026	102	20	13
11.08.2020	12422	534	11070	103	20	13
12.08.2020	12487	535	11115	104	21	13

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 87 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

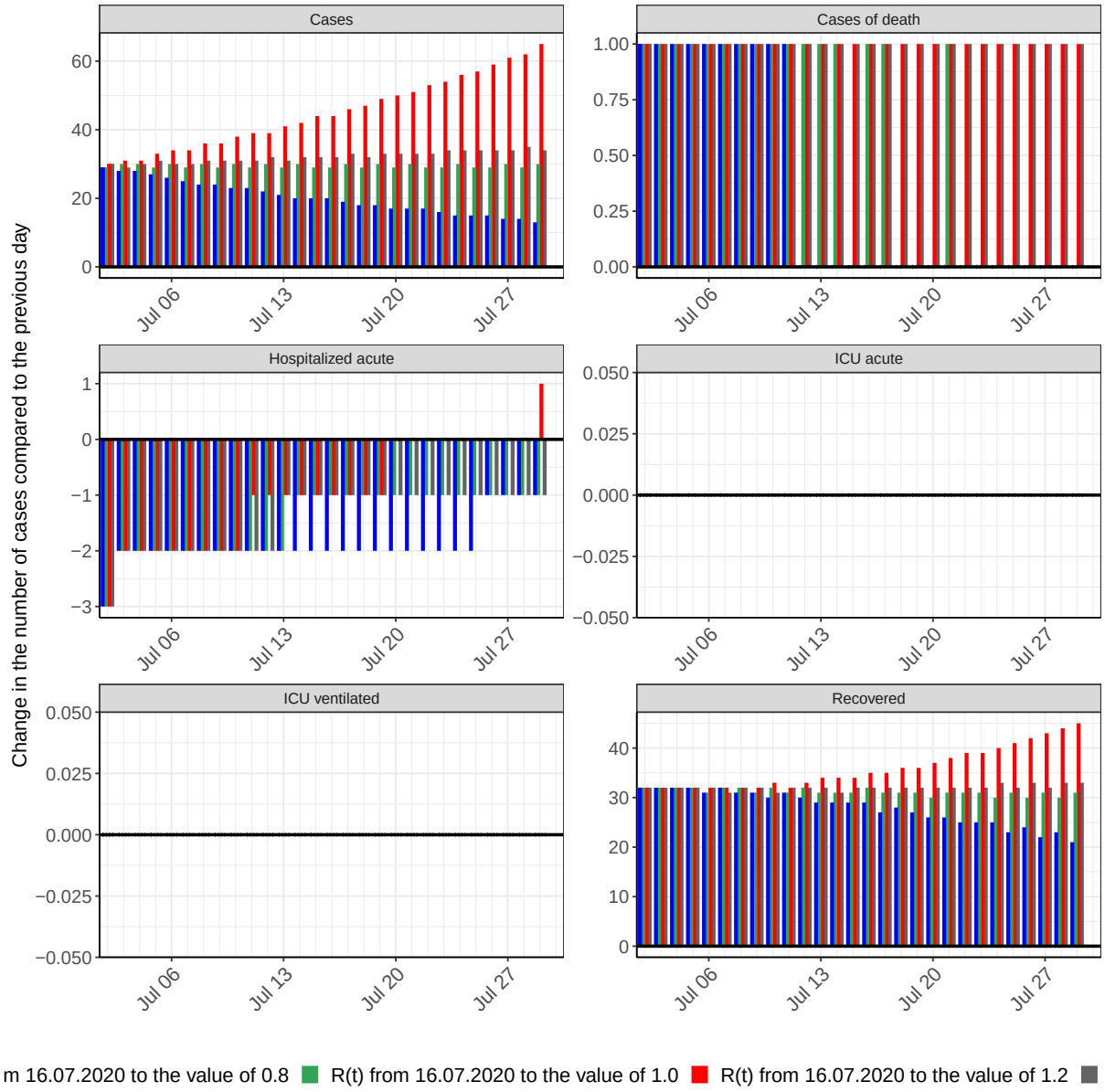


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

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.

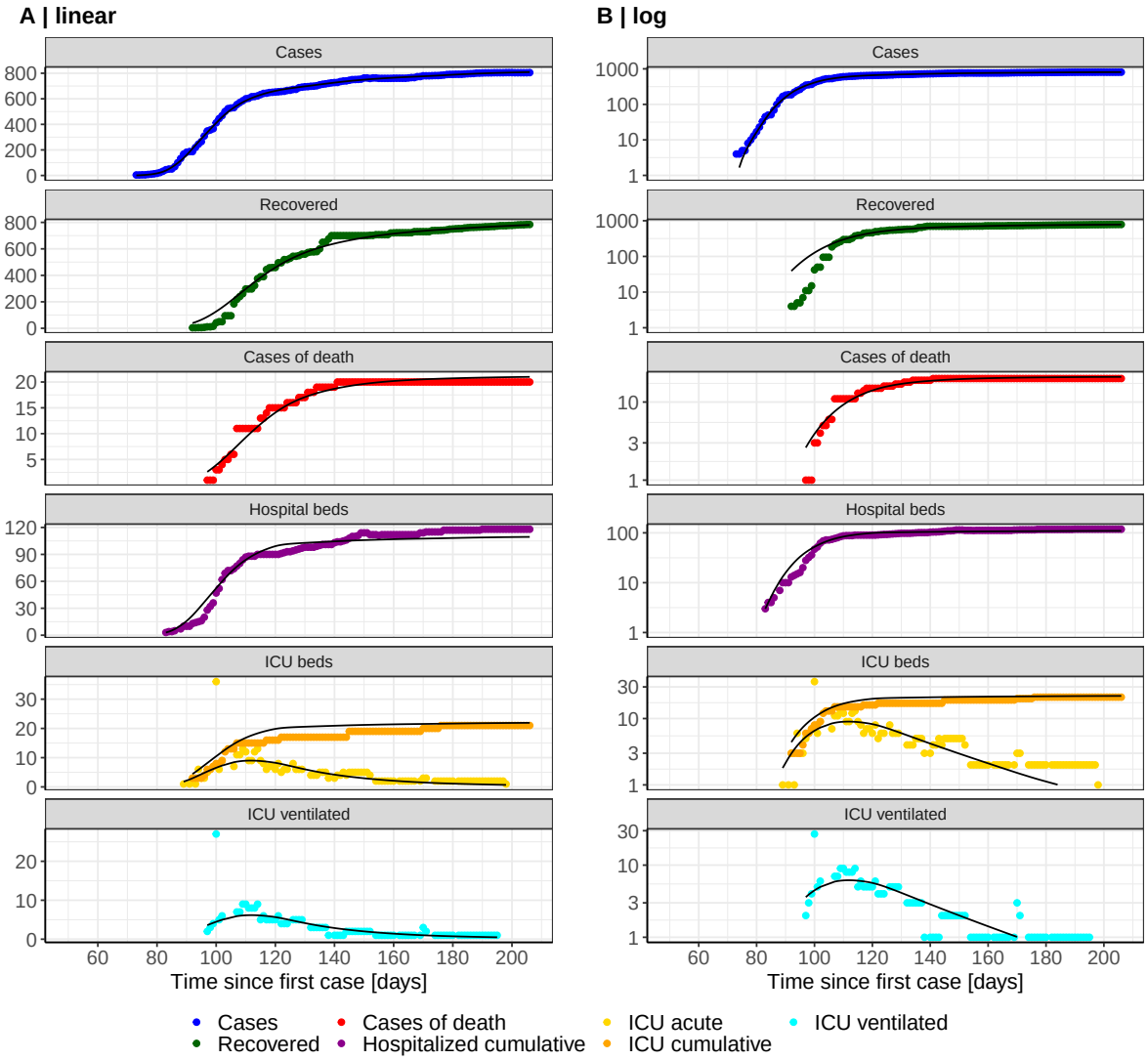


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

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.

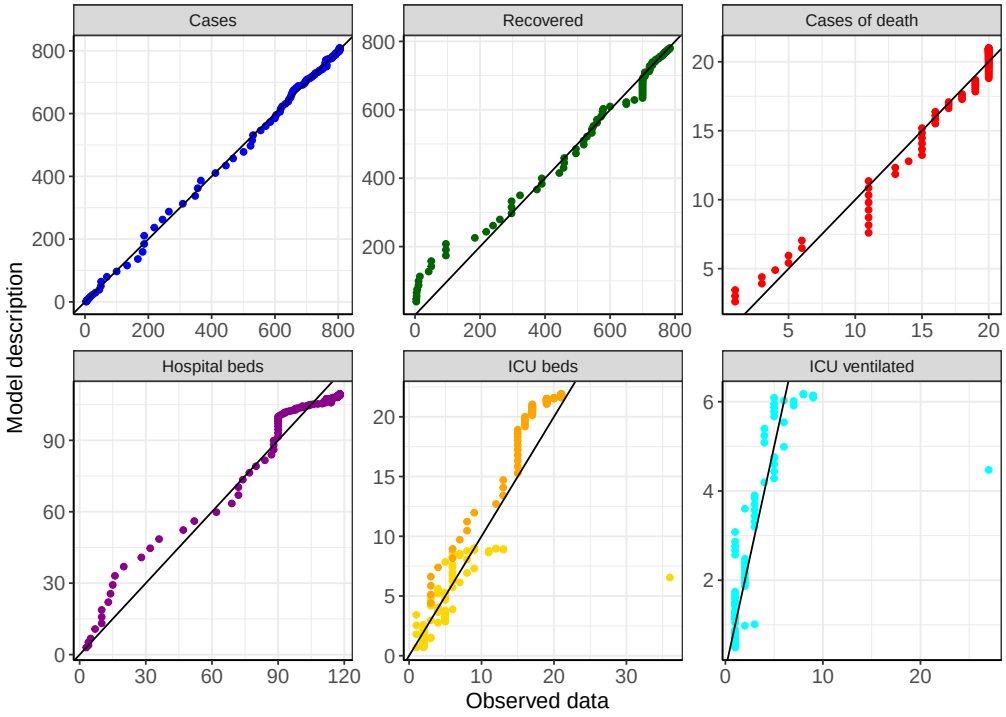


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

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).

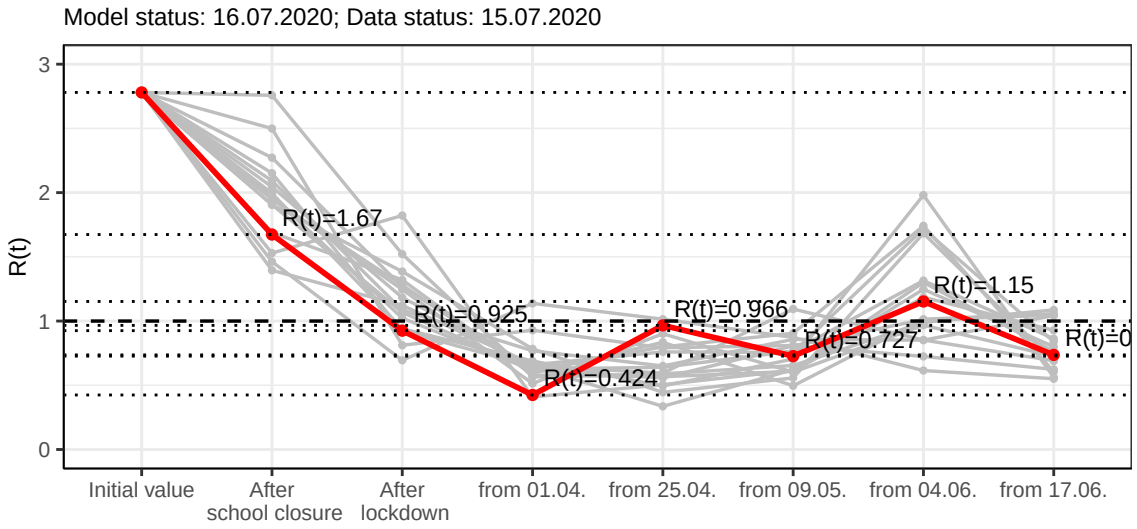


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

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

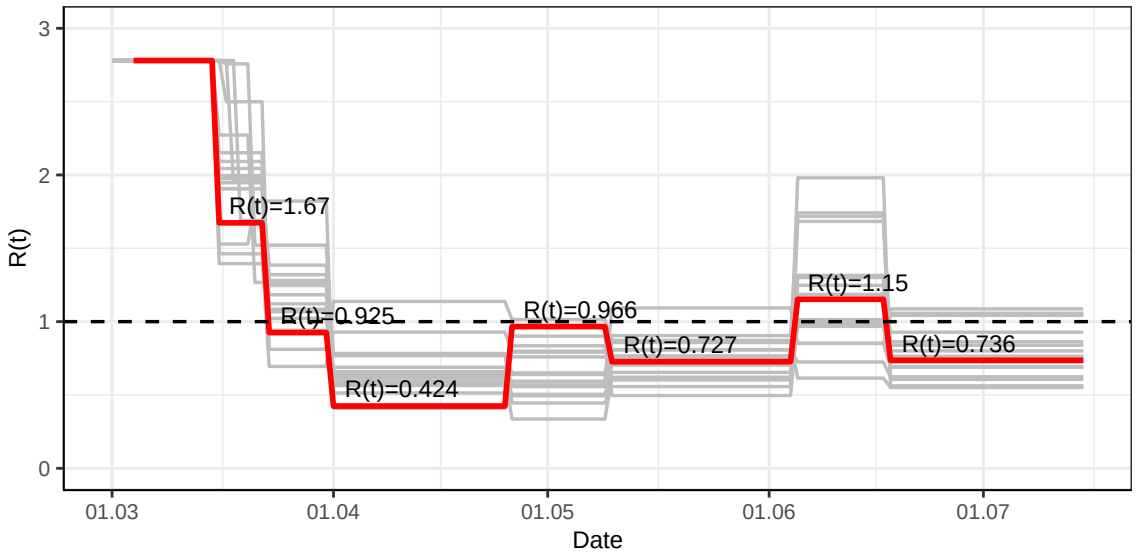


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

9.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.74)

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.

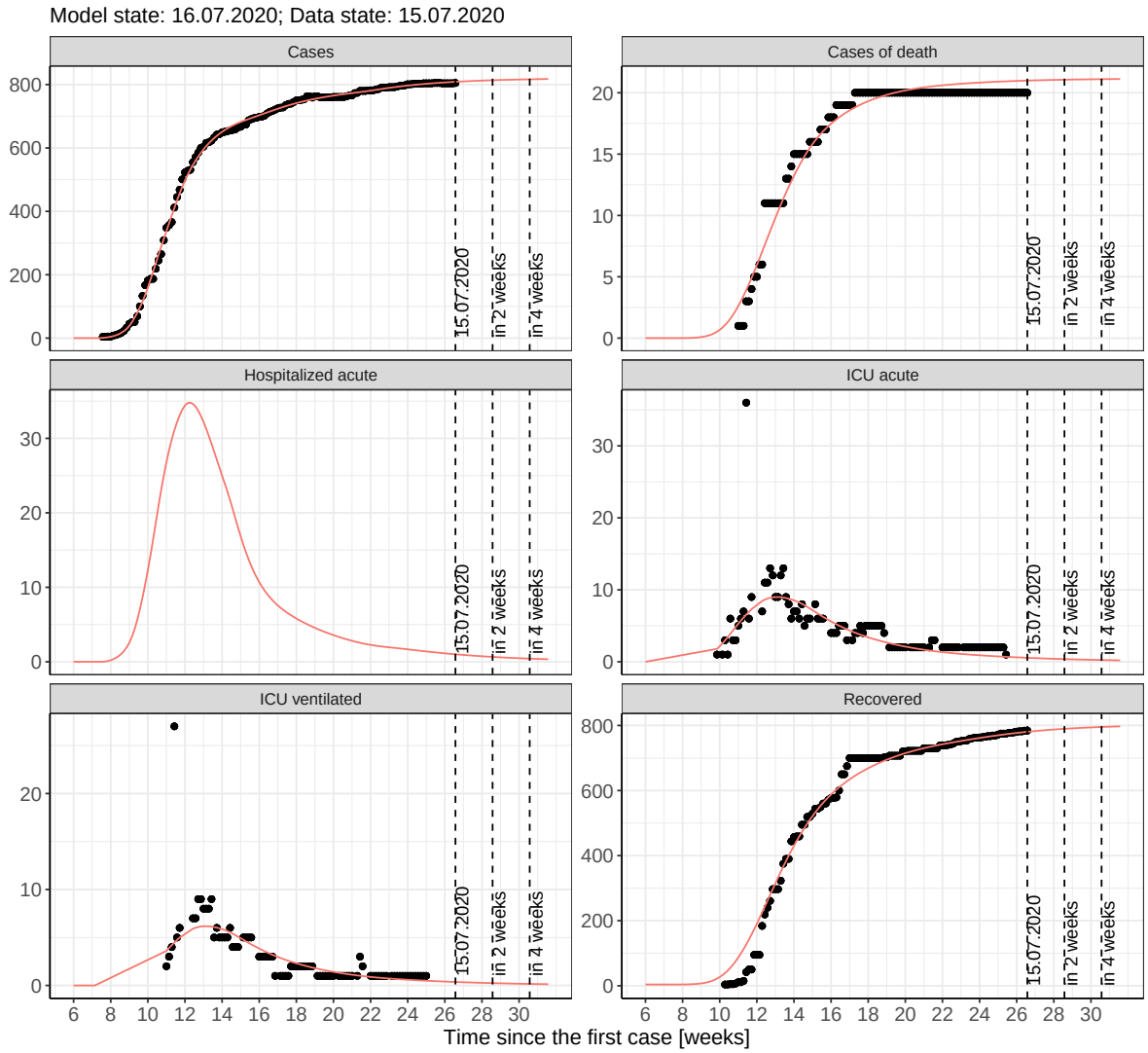


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

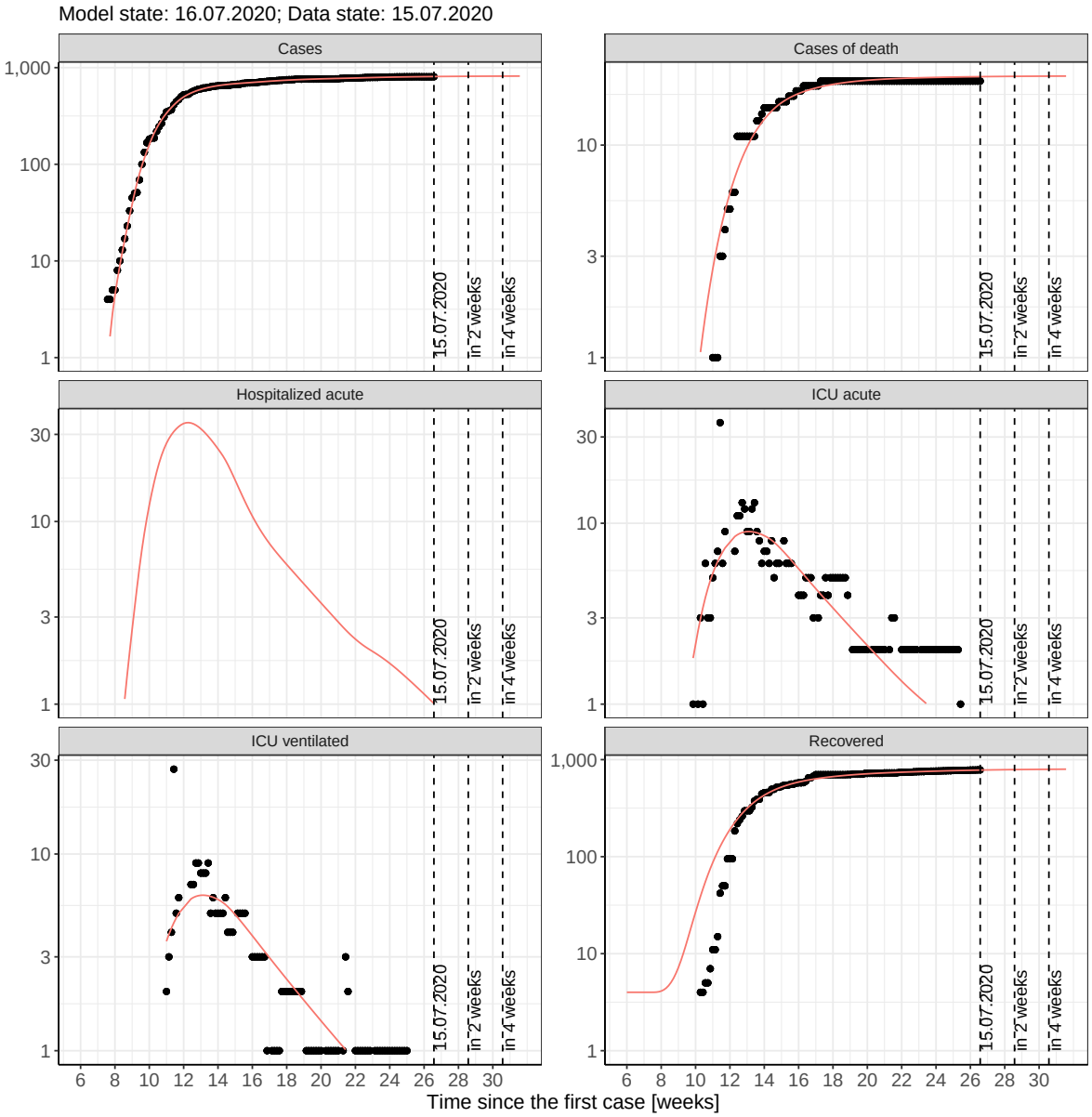


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

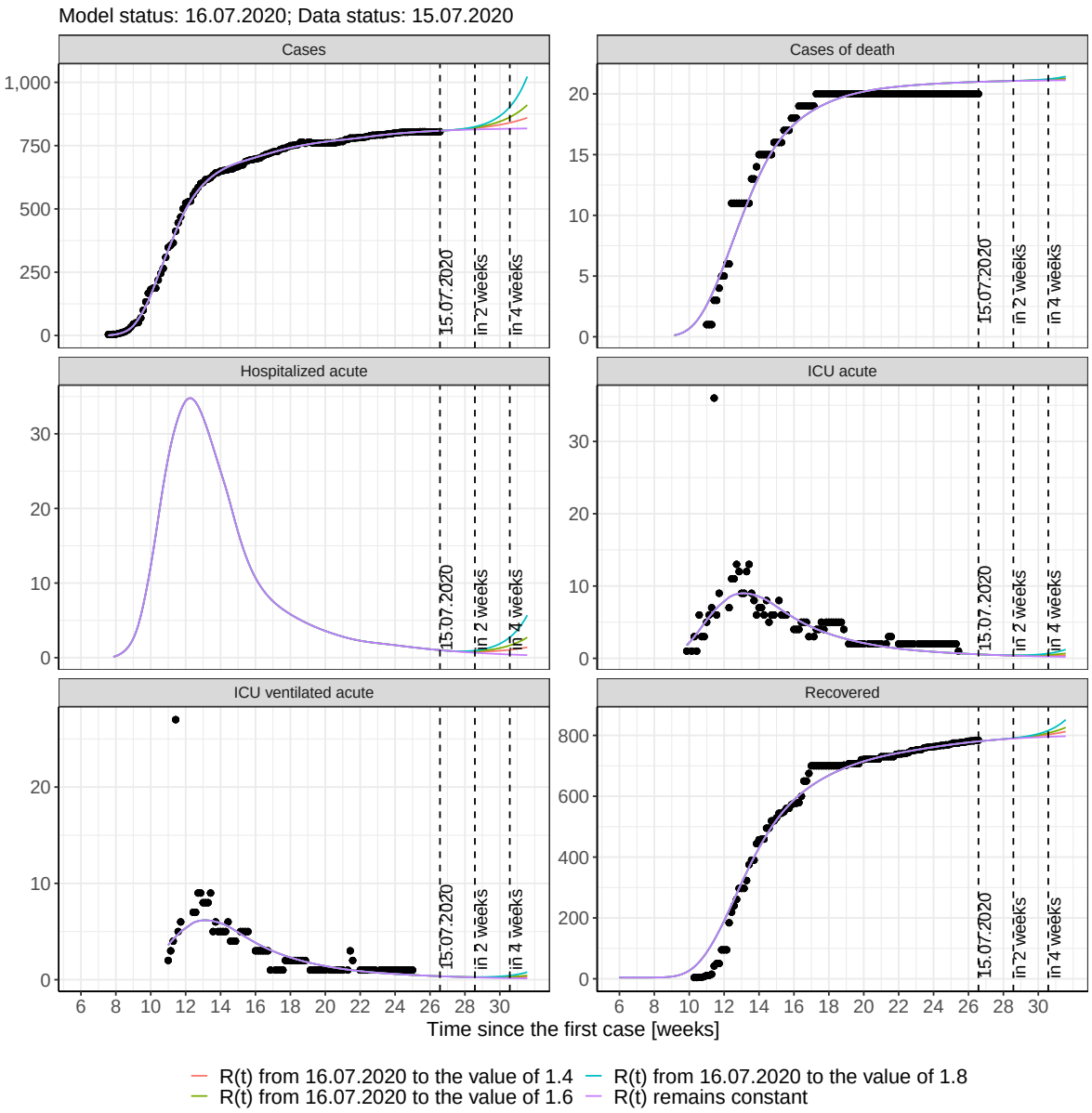


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

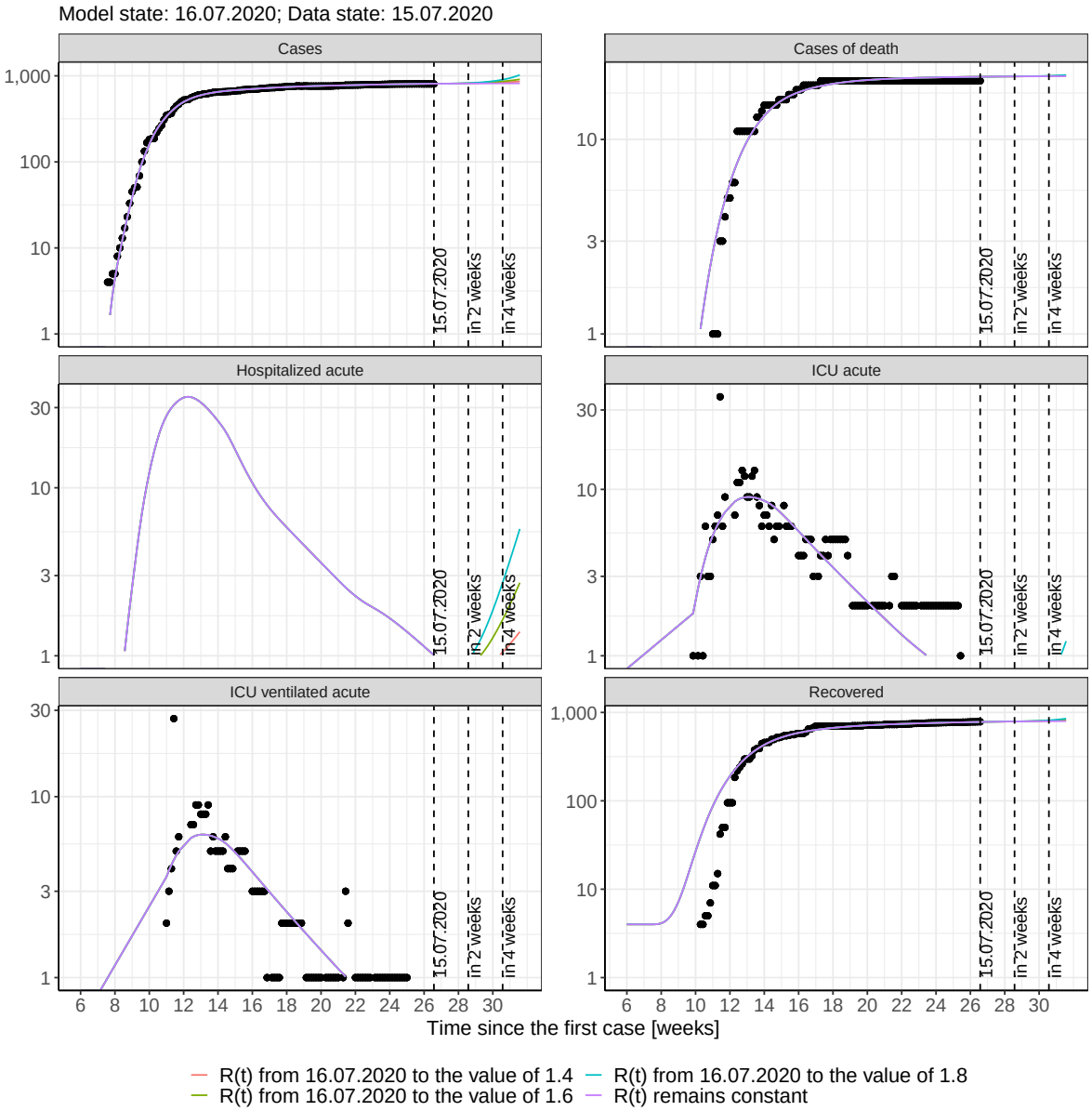


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

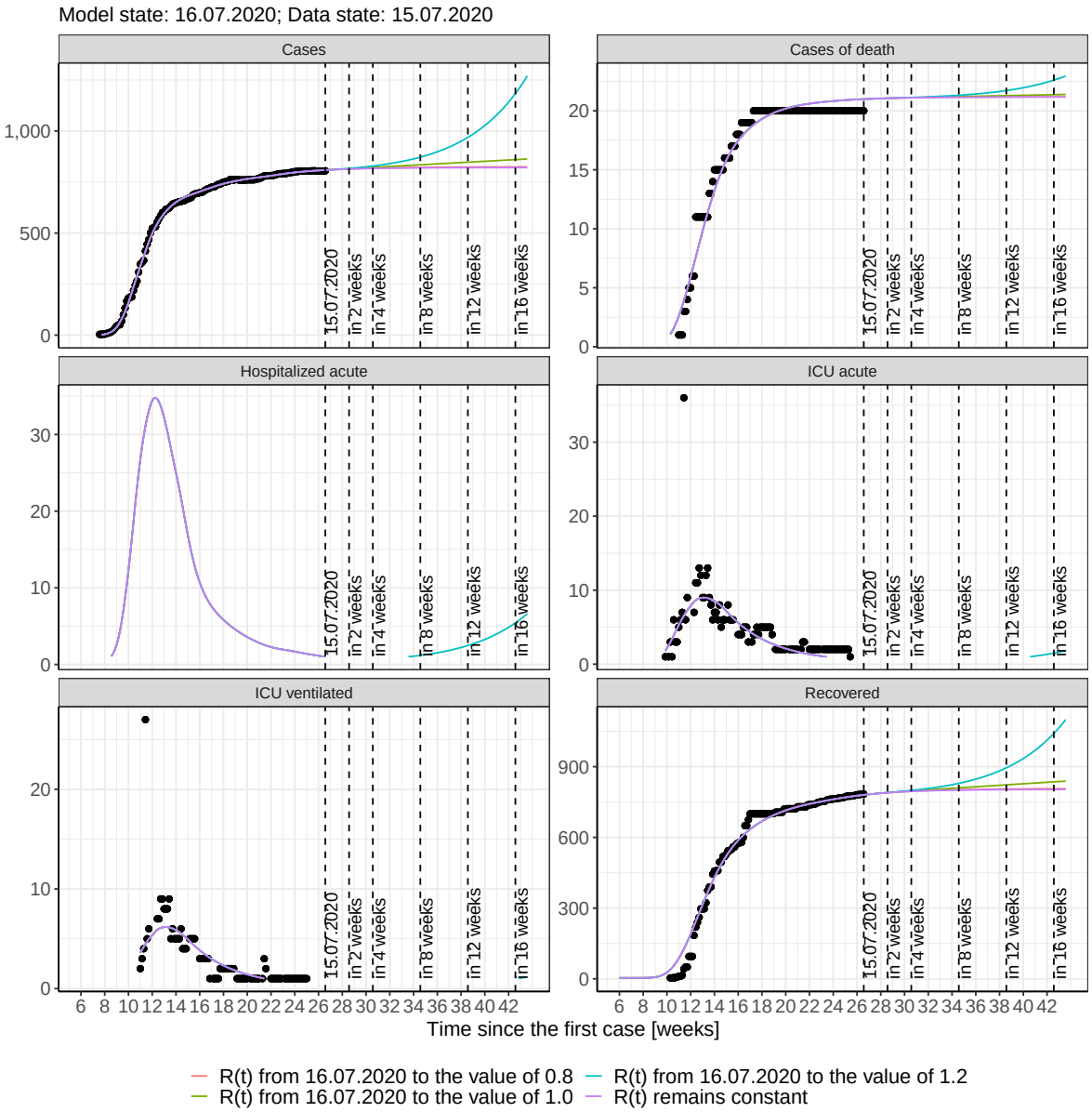


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

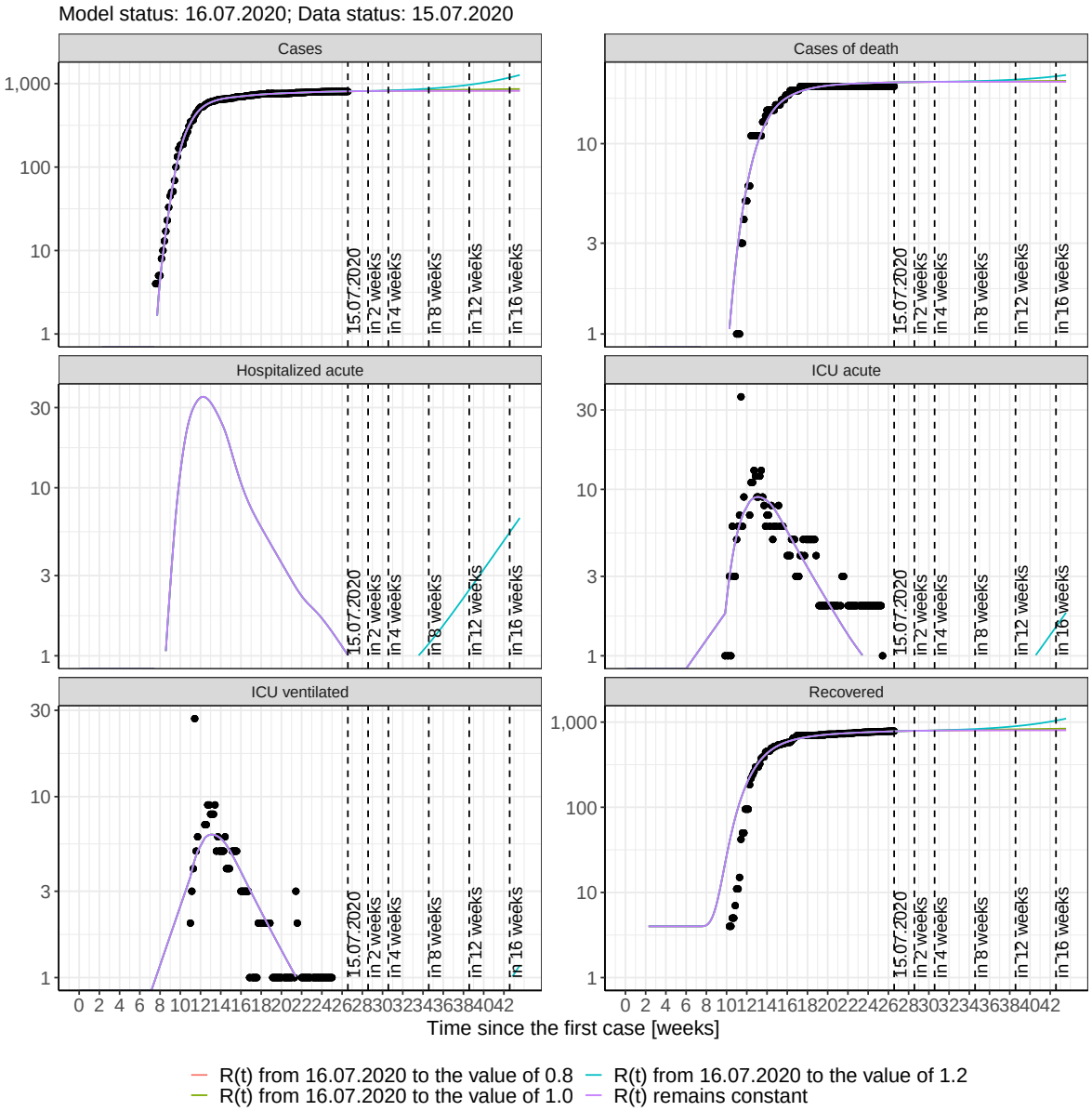


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 33) Model status from 16.07.2020; Data status: 15.07.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	809	21	781	1	1	0
17.07.2020	810	21	782	1	1	0
18.07.2020	810	21	783	1	1	0
19.07.2020	810	21	784	1	0	0
20.07.2020	811	21	784	1	0	0
21.07.2020	811	21	785	1	0	0
22.07.2020	812	21	786	1	0	0
23.07.2020	812	21	786	1	0	0
24.07.2020	812	21	787	1	0	0
25.07.2020	813	21	787	1	0	0
26.07.2020	813	21	788	1	0	0
27.07.2020	813	21	789	1	0	0
28.07.2020	813	21	789	1	0	0
29.07.2020	814	21	790	1	0	0
30.07.2020	814	21	790	1	0	0
31.07.2020	814	21	791	1	0	0
01.08.2020	815	21	791	1	0	0
02.08.2020	815	21	792	1	0	0
03.08.2020	815	21	792	1	0	0
04.08.2020	815	21	792	1	0	0
05.08.2020	815	21	793	1	0	0
06.08.2020	816	21	793	1	0	0
07.08.2020	816	21	794	0	0	0
08.08.2020	816	21	794	0	0	0
09.08.2020	816	21	794	0	0	0
10.08.2020	816	21	795	0	0	0
11.08.2020	817	21	795	0	0	0
12.08.2020	817	21	795	0	0	0

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	809	21	781	1	1	0
17.07.2020	810	21	782	1	1	0
18.07.2020	810	21	783	1	1	0
19.07.2020	810	21	784	1	0	0
20.07.2020	811	21	784	1	0	0
21.07.2020	811	21	785	1	0	0
22.07.2020	812	21	786	1	0	0
23.07.2020	812	21	786	1	0	0
24.07.2020	812	21	787	1	0	0
25.07.2020	813	21	787	1	0	0
26.07.2020	813	21	788	1	0	0
27.07.2020	813	21	789	1	0	0
28.07.2020	814	21	789	1	0	0
29.07.2020	814	21	790	1	0	0
30.07.2020	814	21	790	1	0	0
31.07.2020	815	21	791	1	0	0
01.08.2020	815	21	791	1	0	0
02.08.2020	815	21	792	1	0	0
03.08.2020	815	21	792	1	0	0
04.08.2020	816	21	793	1	0	0
05.08.2020	816	21	793	1	0	0
06.08.2020	816	21	793	1	0	0
07.08.2020	816	21	794	1	0	0
08.08.2020	817	21	794	1	0	0
09.08.2020	817	21	795	0	0	0
10.08.2020	817	21	795	0	0	0
11.08.2020	817	21	795	0	0	0
12.08.2020	818	21	796	0	0	0

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	809	21	781	1	1	0
17.07.2020	810	21	782	1	1	0
18.07.2020	810	21	783	1	1	0
19.07.2020	811	21	784	1	0	0
20.07.2020	811	21	784	1	0	0
21.07.2020	812	21	785	1	0	0
22.07.2020	812	21	786	1	0	0
23.07.2020	812	21	786	1	0	0
24.07.2020	813	21	787	1	0	0
25.07.2020	813	21	788	1	0	0
26.07.2020	814	21	788	1	0	0
27.07.2020	814	21	789	1	0	0
28.07.2020	815	21	789	1	0	0
29.07.2020	815	21	790	1	0	0
30.07.2020	816	21	790	1	0	0
31.07.2020	816	21	791	1	0	0
01.08.2020	817	21	792	1	0	0
02.08.2020	817	21	792	1	0	0
03.08.2020	817	21	793	1	0	0
04.08.2020	818	21	793	1	0	0
05.08.2020	818	21	794	1	0	0
06.08.2020	819	21	794	1	0	0
07.08.2020	819	21	795	1	0	0
08.08.2020	820	21	795	1	0	0
09.08.2020	820	21	796	1	0	0
10.08.2020	821	21	796	1	0	0
11.08.2020	821	21	797	1	0	0
12.08.2020	822	21	797	1	0	0

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	809	21	781	1	1	0
17.07.2020	810	21	782	1	1	0
18.07.2020	810	21	783	1	1	0
19.07.2020	811	21	784	1	0	0
20.07.2020	811	21	784	1	0	0
21.07.2020	812	21	785	1	0	0
22.07.2020	812	21	786	1	0	0
23.07.2020	813	21	786	1	0	0
24.07.2020	813	21	787	1	0	0
25.07.2020	814	21	788	1	0	0
26.07.2020	815	21	788	1	0	0
27.07.2020	815	21	789	1	0	0
28.07.2020	816	21	789	1	0	0
29.07.2020	817	21	790	1	0	0
30.07.2020	817	21	791	1	0	0
31.07.2020	818	21	791	1	0	0
01.08.2020	819	21	792	1	0	0
02.08.2020	820	21	793	1	0	0
03.08.2020	820	21	793	1	0	0
04.08.2020	821	21	794	1	0	0
05.08.2020	822	21	794	1	0	0
06.08.2020	823	21	795	1	0	0
07.08.2020	824	21	796	1	0	0
08.08.2020	825	21	796	1	0	0
09.08.2020	825	21	797	1	0	0
10.08.2020	826	21	798	1	0	0
11.08.2020	827	21	799	1	0	0
12.08.2020	828	21	799	1	0	0

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 98 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

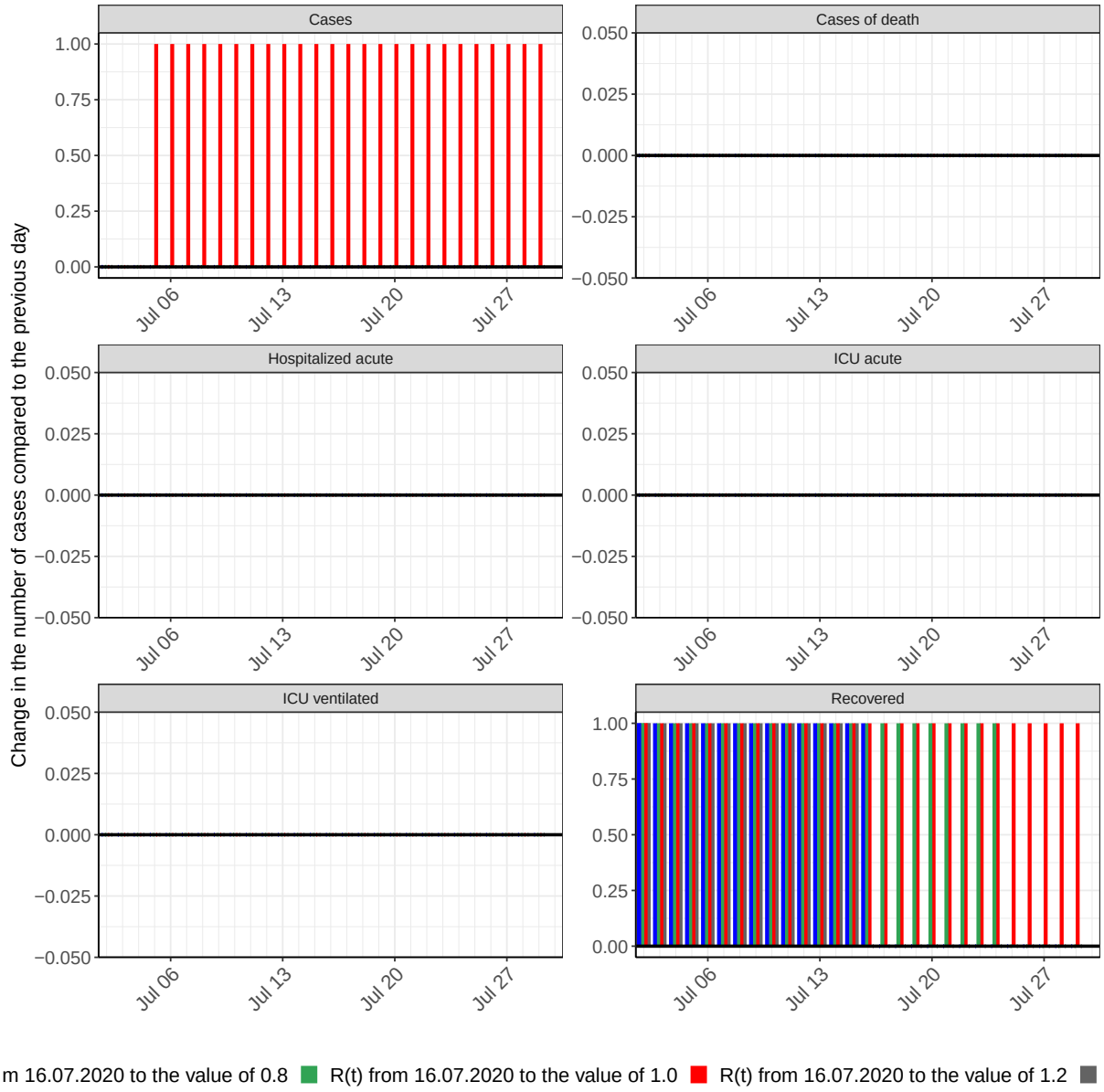


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

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.

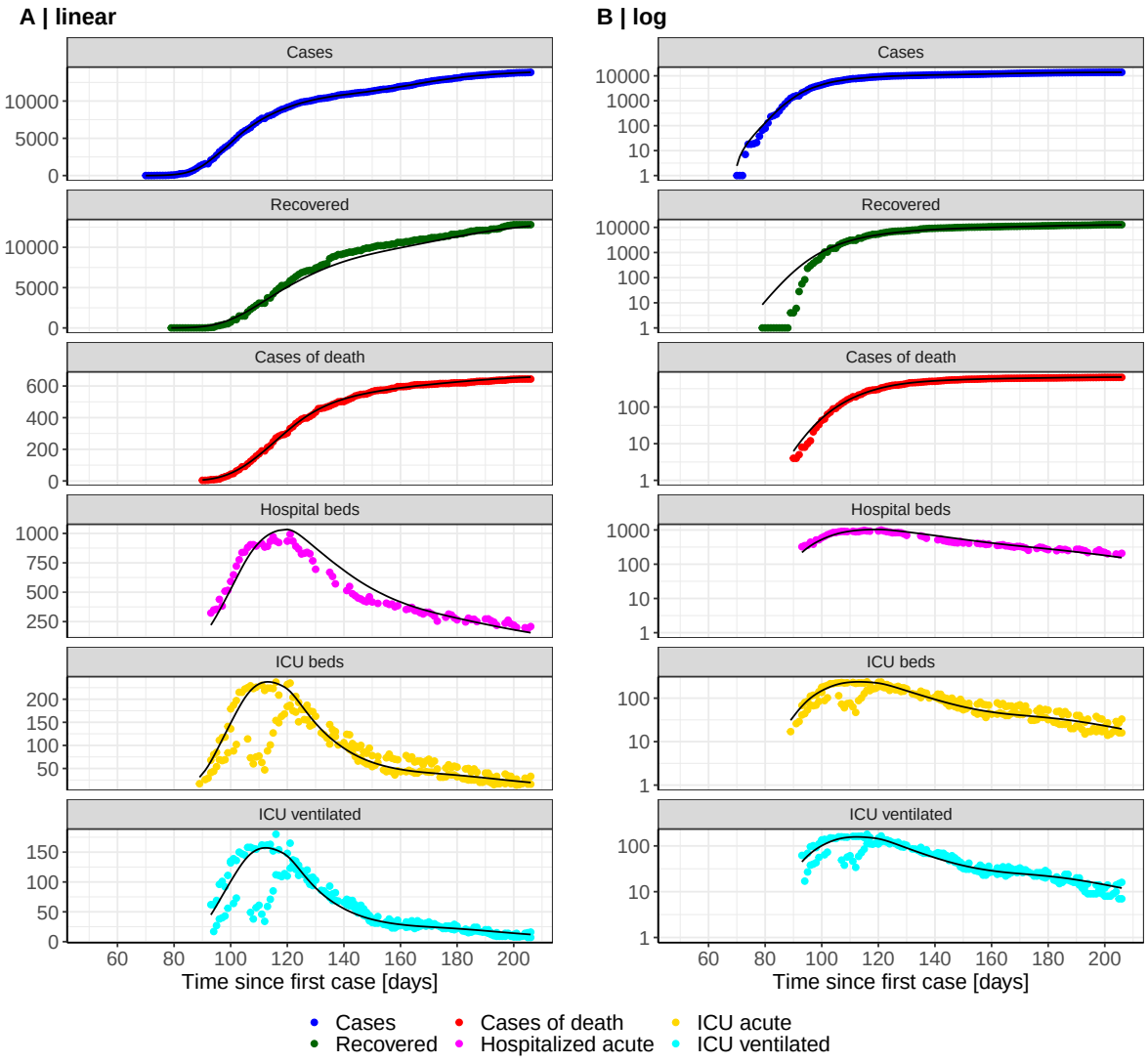


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

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.

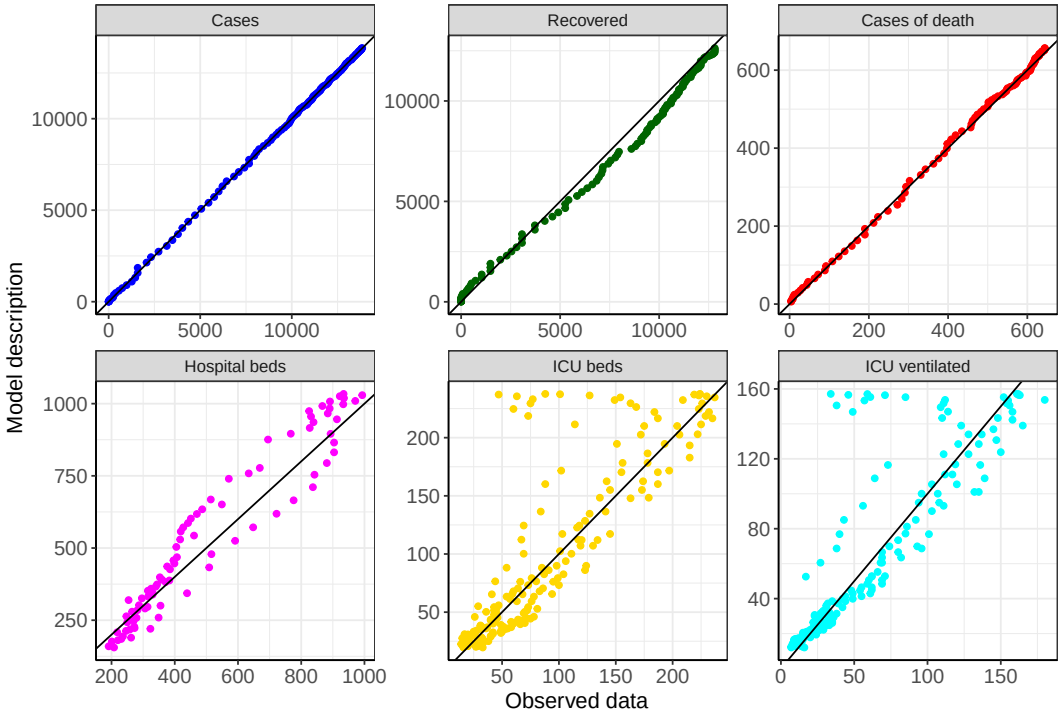


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

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).

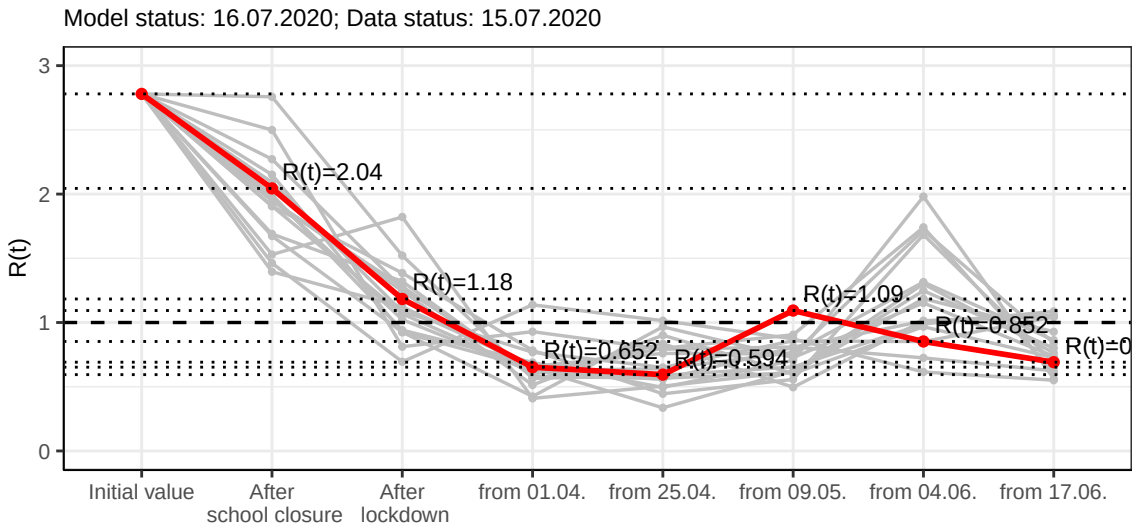


Figure 101: R(t) values before and after the NPIs for Lower Saxony

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

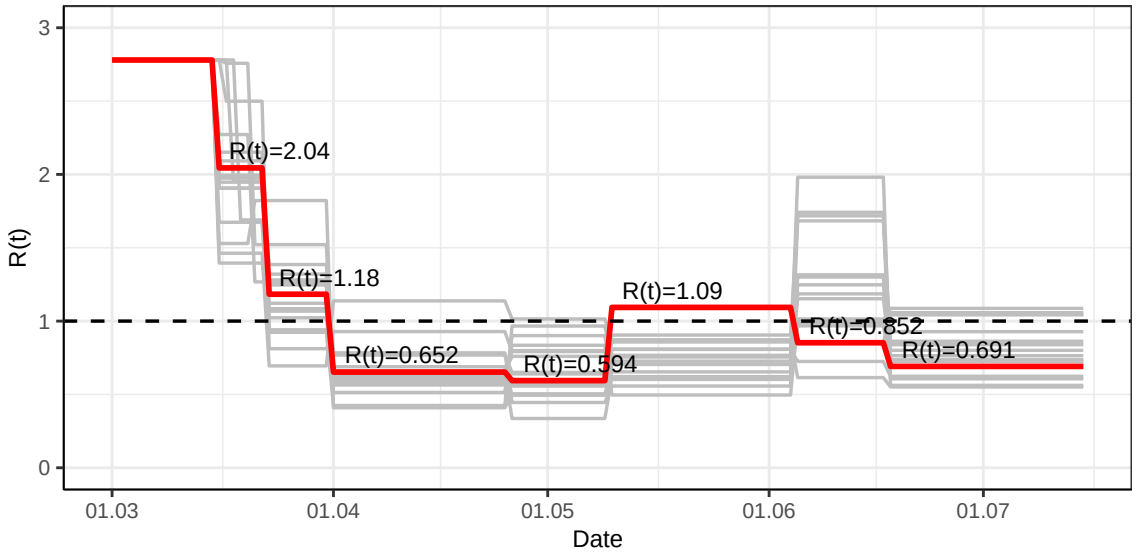


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

10.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.69)

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.

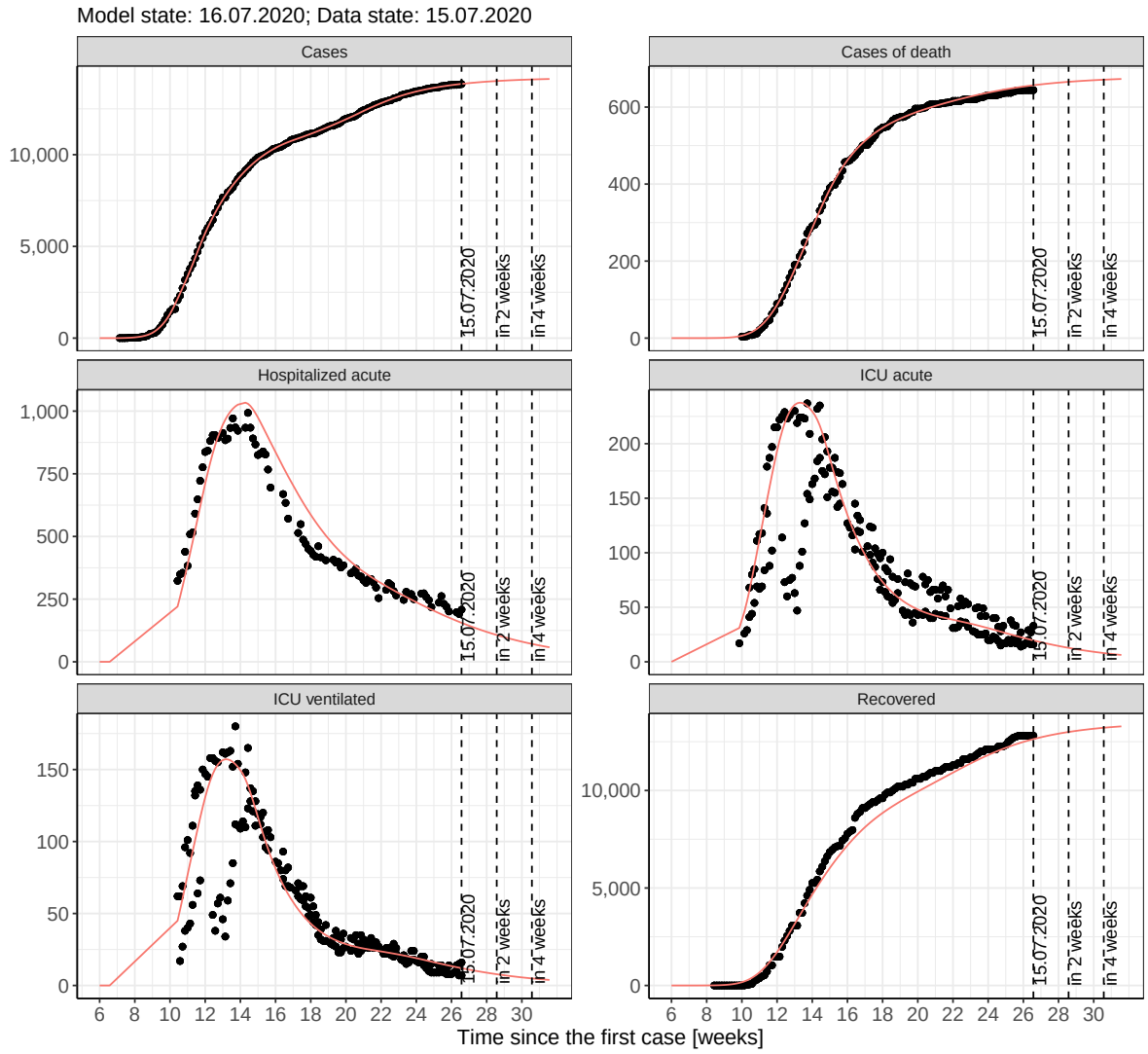


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

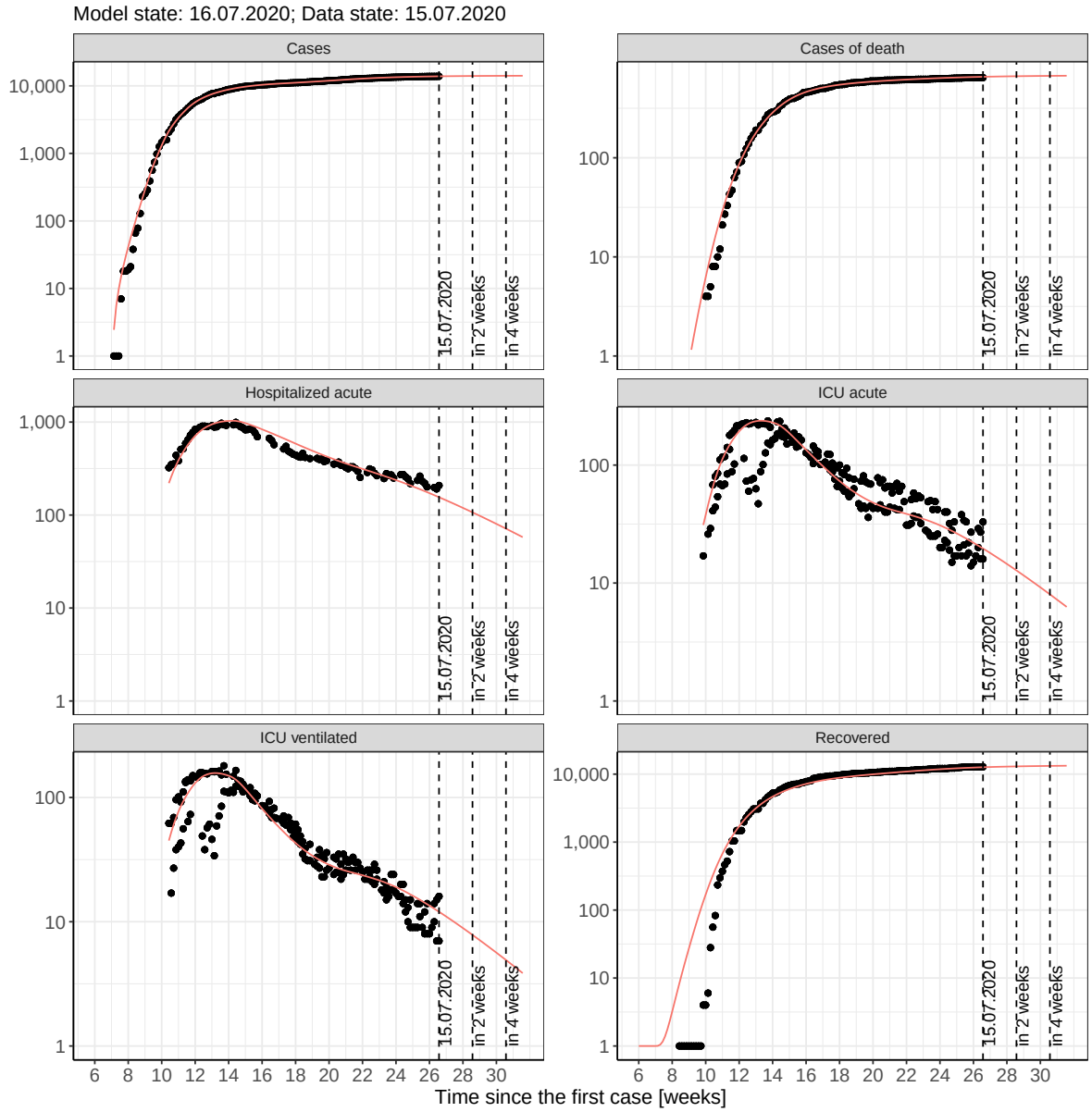


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

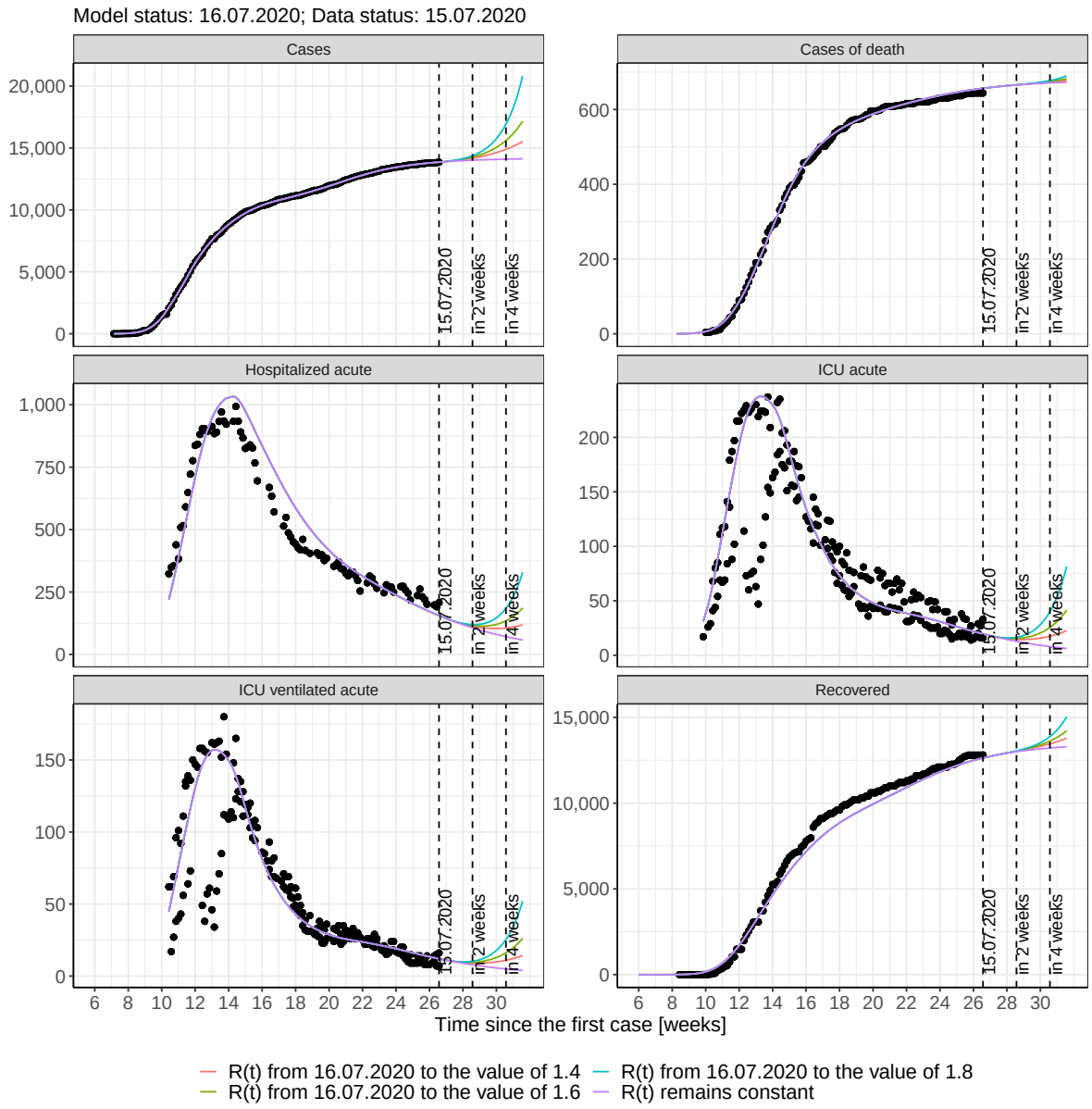


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

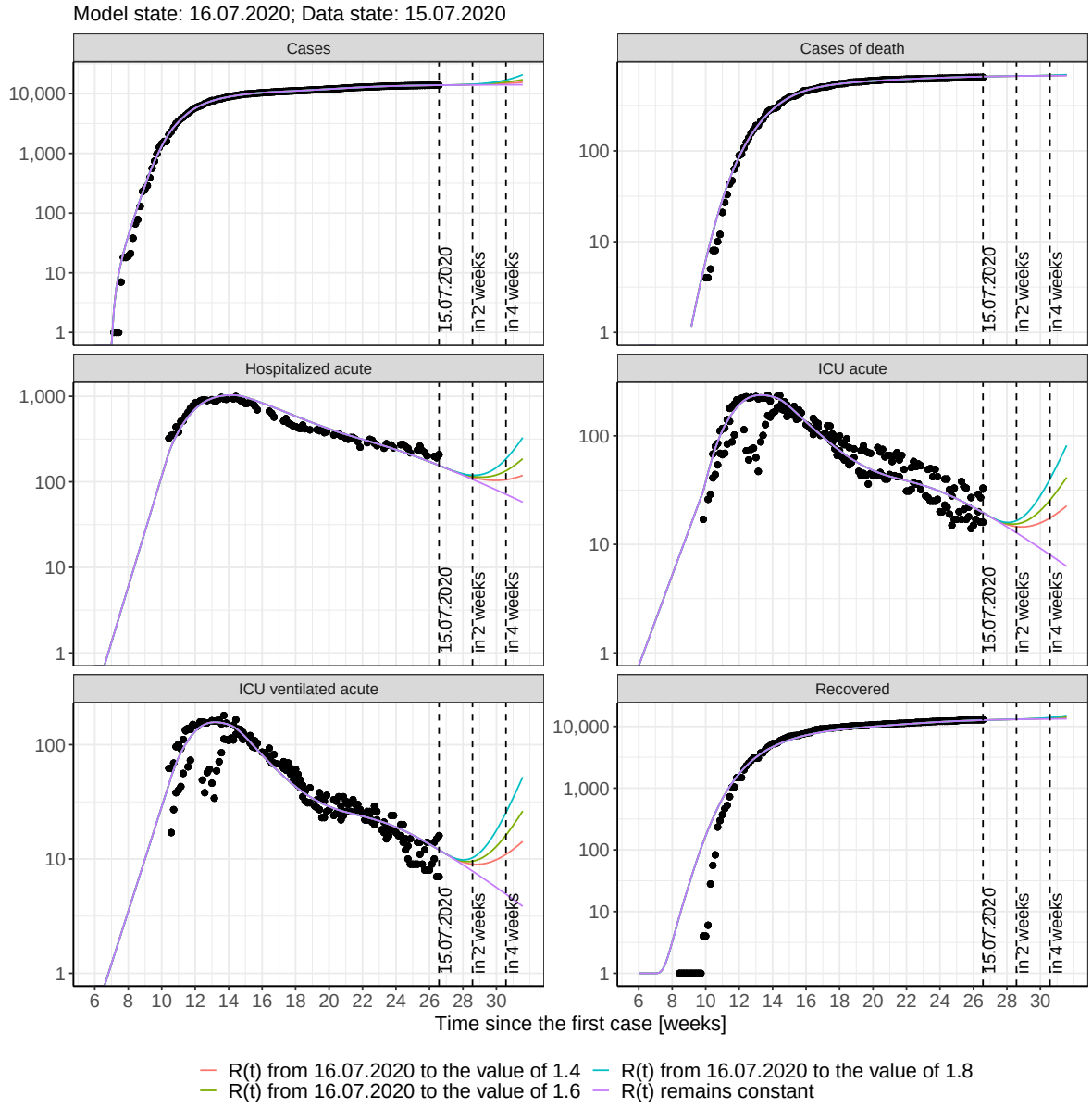


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

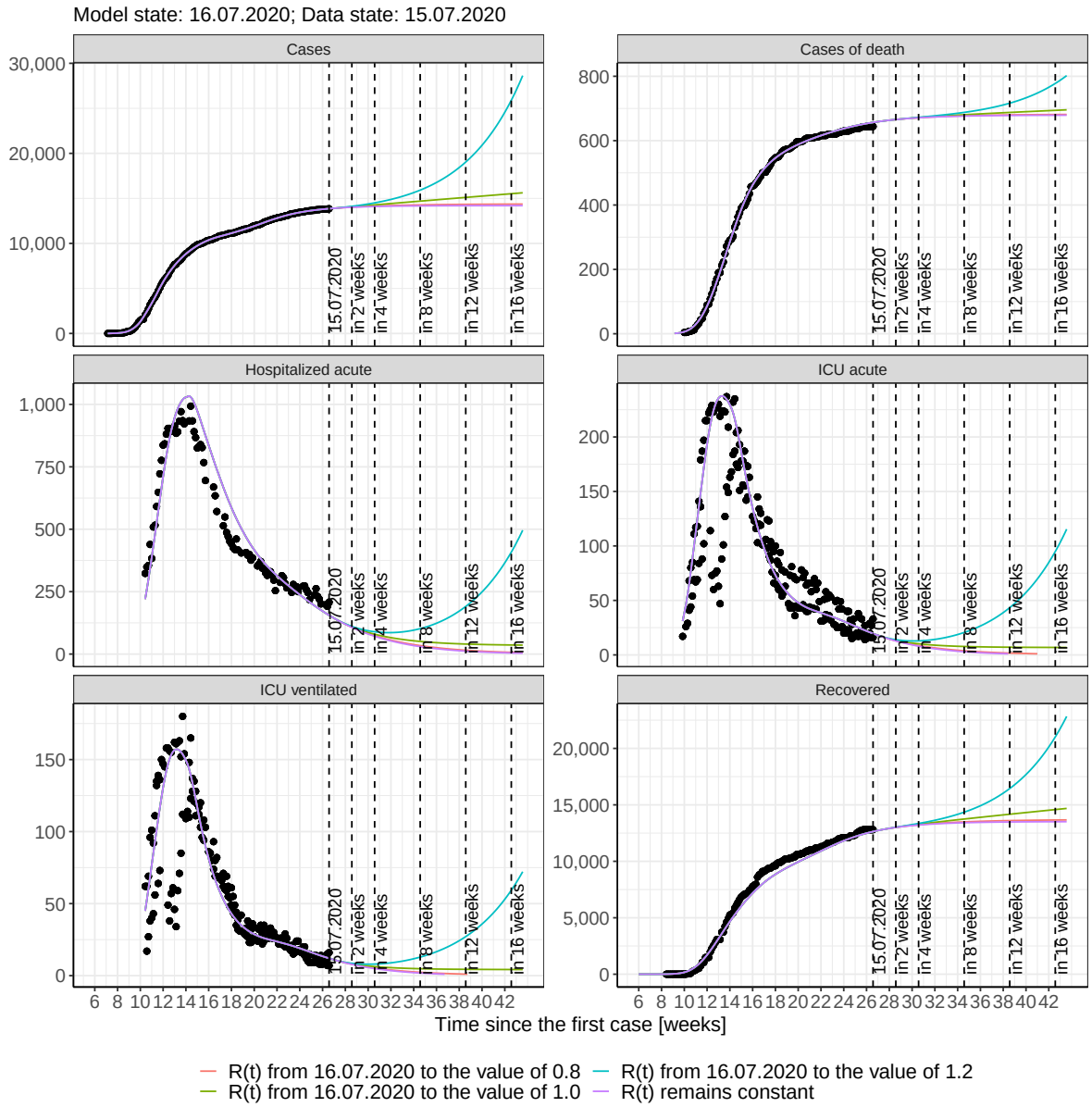


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

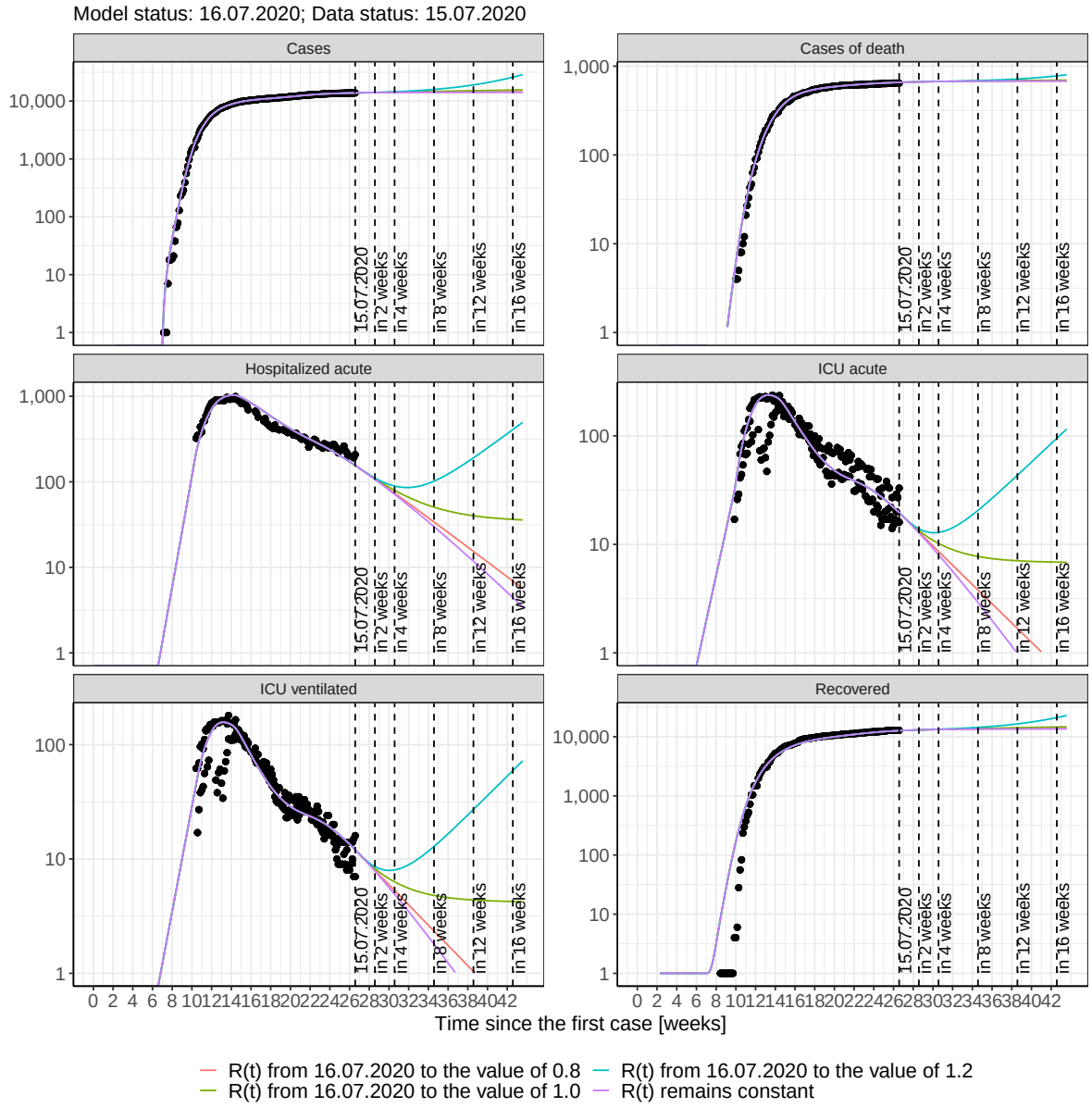


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 37) Model status from 16.07.2020; Data status: 15.07.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	13873	657	12666	152	19	12
17.07.2020	13887	658	12698	148	19	11
18.07.2020	13901	659	12728	144	18	11
19.07.2020	13914	660	12758	140	17	11
20.07.2020	13926	660	12786	137	17	10
21.07.2020	13938	661	12814	133	16	10
22.07.2020	13949	662	12840	129	16	10
23.07.2020	13960	662	12866	126	15	9
24.07.2020	13970	663	12890	123	15	9
25.07.2020	13980	663	12914	119	15	9
26.07.2020	13990	664	12937	116	14	9
27.07.2020	13999	665	12958	113	14	8
28.07.2020	14007	665	12980	110	13	8
29.07.2020	14016	666	13000	107	13	8
30.07.2020	14023	666	13019	104	12	8
31.07.2020	14031	666	13038	101	12	7
01.08.2020	14038	667	13056	98	12	7
02.08.2020	14045	667	13074	96	11	7
03.08.2020	14052	668	13091	93	11	7
04.08.2020	14058	668	13107	90	11	6
05.08.2020	14064	669	13122	88	10	6
06.08.2020	14070	669	13137	85	10	6
07.08.2020	14076	669	13152	83	10	6
08.08.2020	14081	670	13166	80	9	6
09.08.2020	14086	670	13179	78	9	5
10.08.2020	14091	670	13192	76	9	5
11.08.2020	14096	671	13204	74	8	5
12.08.2020	14100	671	13216	71	8	5

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	13874	657	12666	152	19	12
17.07.2020	13888	658	12698	148	19	11
18.07.2020	13902	659	12728	144	18	11
19.07.2020	13916	660	12758	140	17	11
20.07.2020	13929	660	12786	137	17	10
21.07.2020	13942	661	12814	133	16	10
22.07.2020	13954	662	12840	130	16	10
23.07.2020	13966	662	12866	126	16	9
24.07.2020	13978	663	12891	123	15	9
25.07.2020	13989	663	12915	120	15	9
26.07.2020	14000	664	12938	117	14	9
27.07.2020	14011	665	12960	113	14	8
28.07.2020	14022	665	12982	110	13	8
29.07.2020	14032	666	13003	108	13	8
30.07.2020	14042	666	13023	105	13	8
31.07.2020	14052	667	13042	102	12	8
01.08.2020	14061	667	13061	99	12	7
02.08.2020	14070	667	13080	97	12	7
03.08.2020	14079	668	13098	94	11	7
04.08.2020	14087	668	13115	92	11	7
05.08.2020	14096	669	13131	89	11	6
06.08.2020	14104	669	13148	87	10	6
07.08.2020	14112	669	13163	84	10	6
08.08.2020	14119	670	13179	82	10	6
09.08.2020	14127	670	13193	80	9	6
10.08.2020	14134	671	13208	78	9	6
11.08.2020	14141	671	13222	76	9	5
12.08.2020	14148	671	13235	74	9	5

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	13874	657	12666	152	19	12
17.07.2020	13889	658	12698	148	19	11
18.07.2020	13904	659	12728	144	18	11
19.07.2020	13919	660	12758	140	17	11
20.07.2020	13934	660	12787	137	17	10
21.07.2020	13949	661	12814	133	16	10
22.07.2020	13964	662	12841	130	16	10
23.07.2020	13979	662	12867	127	16	10
24.07.2020	13994	663	12892	123	15	9
25.07.2020	14009	663	12917	120	15	9
26.07.2020	14024	664	12940	117	14	9
27.07.2020	14039	665	12964	114	14	9
28.07.2020	14054	665	12986	112	14	8
29.07.2020	14069	666	13008	109	13	8
30.07.2020	14084	666	13030	106	13	8
31.07.2020	14099	667	13051	104	13	8
01.08.2020	14114	667	13072	101	13	8
02.08.2020	14129	668	13093	99	12	8
03.08.2020	14144	668	13113	97	12	7
04.08.2020	14159	668	13133	95	12	7
05.08.2020	14174	669	13152	93	12	7
06.08.2020	14189	669	13171	90	11	7
07.08.2020	14204	670	13190	89	11	7
08.08.2020	14219	670	13209	87	11	7
09.08.2020	14233	671	13227	85	11	7
10.08.2020	14248	671	13246	83	11	7
11.08.2020	14263	671	13264	81	10	6
12.08.2020	14278	672	13282	80	10	6

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	13874	657	12666	152	19	12
17.07.2020	13890	658	12698	148	19	11
18.07.2020	13906	659	12728	144	18	11
19.07.2020	13922	660	12758	140	17	11
20.07.2020	13939	660	12787	137	17	10
21.07.2020	13957	661	12815	133	17	10
22.07.2020	13975	662	12842	130	16	10
23.07.2020	13994	662	12868	127	16	10
24.07.2020	14013	663	12894	124	15	9
25.07.2020	14032	663	12919	121	15	9
26.07.2020	14053	664	12943	118	15	9
27.07.2020	14074	665	12968	116	14	9
28.07.2020	14095	665	12992	113	14	9
29.07.2020	14117	666	13015	111	14	9
30.07.2020	14140	666	13039	109	14	8
31.07.2020	14163	667	13062	106	14	8
01.08.2020	14187	667	13086	104	13	8
02.08.2020	14212	668	13109	103	13	8
03.08.2020	14237	668	13132	101	13	8
04.08.2020	14263	669	13156	99	13	8
05.08.2020	14290	669	13179	97	13	8
06.08.2020	14318	670	13203	96	13	8
07.08.2020	14346	670	13227	95	13	8
08.08.2020	14375	671	13251	93	13	8
09.08.2020	14405	671	13276	92	13	8
10.08.2020	14436	671	13300	91	13	8
11.08.2020	14468	672	13326	90	13	8
12.08.2020	14501	672	13351	89	13	8

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 109 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

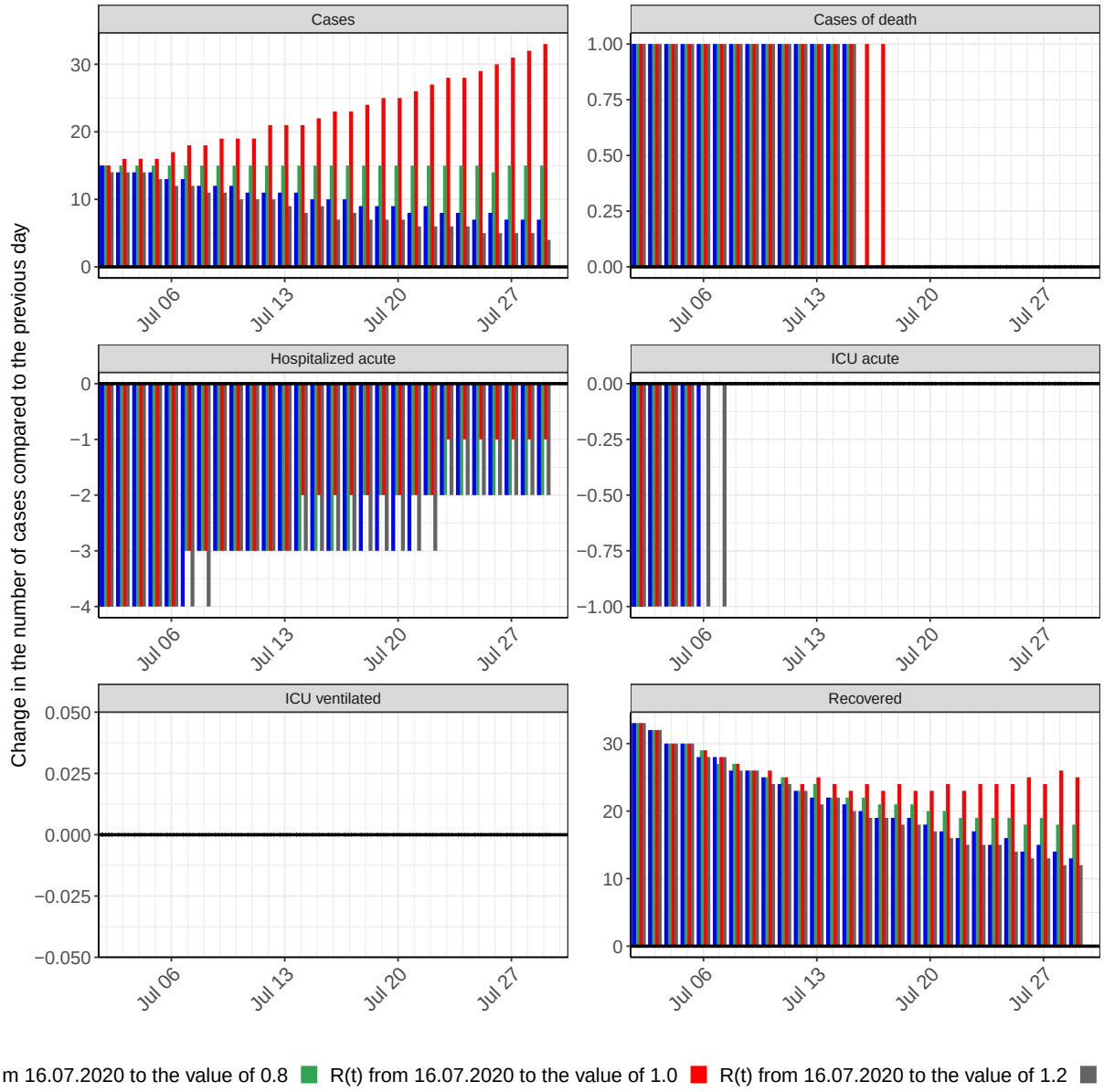


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

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.

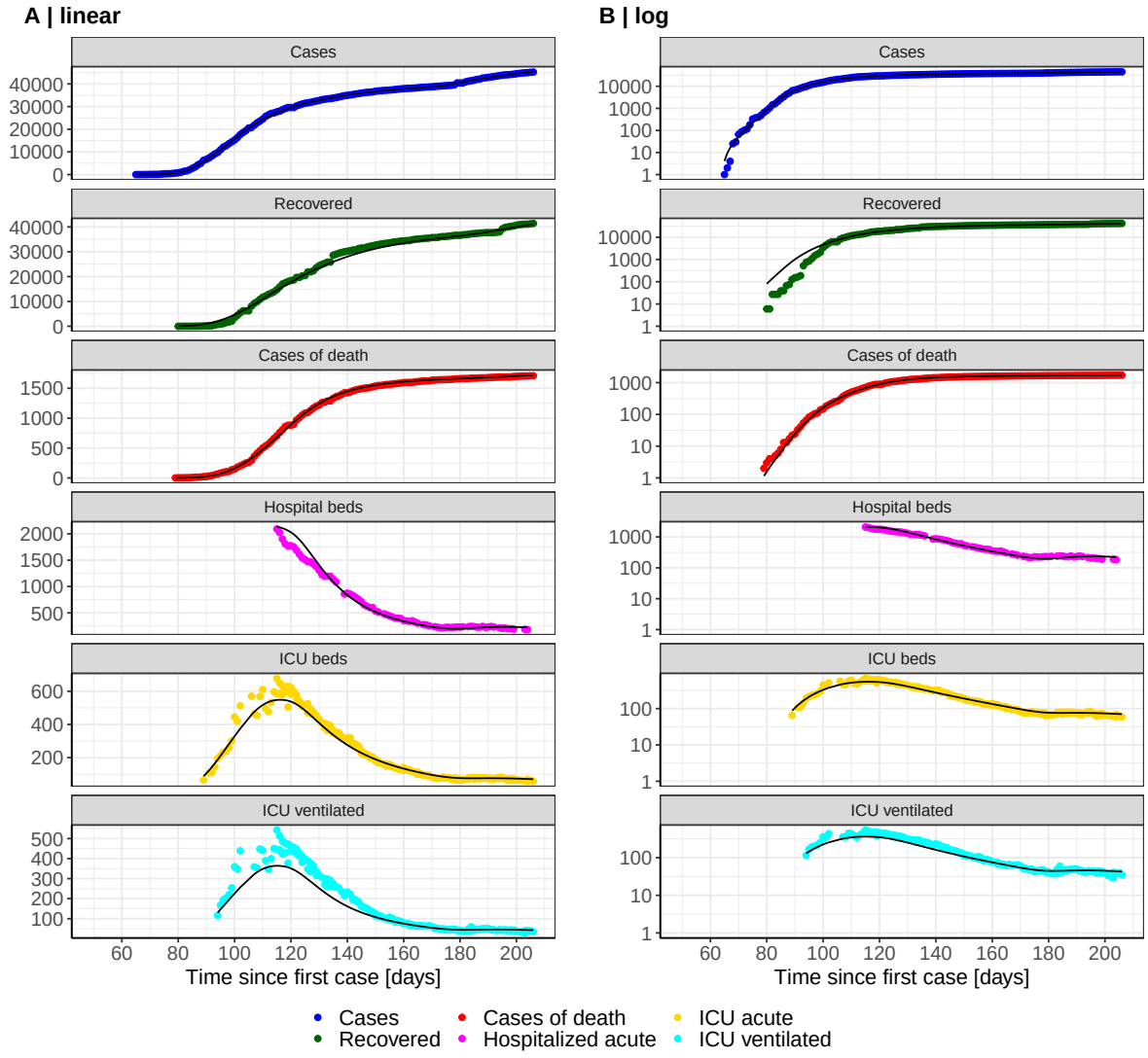


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

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.

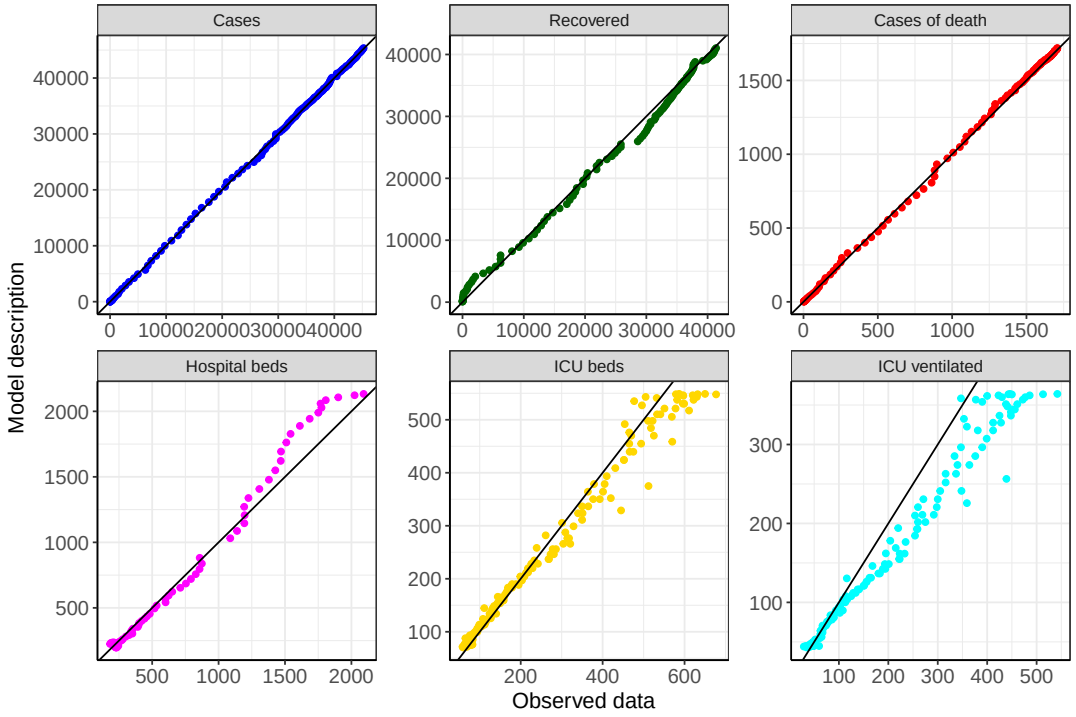


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

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).

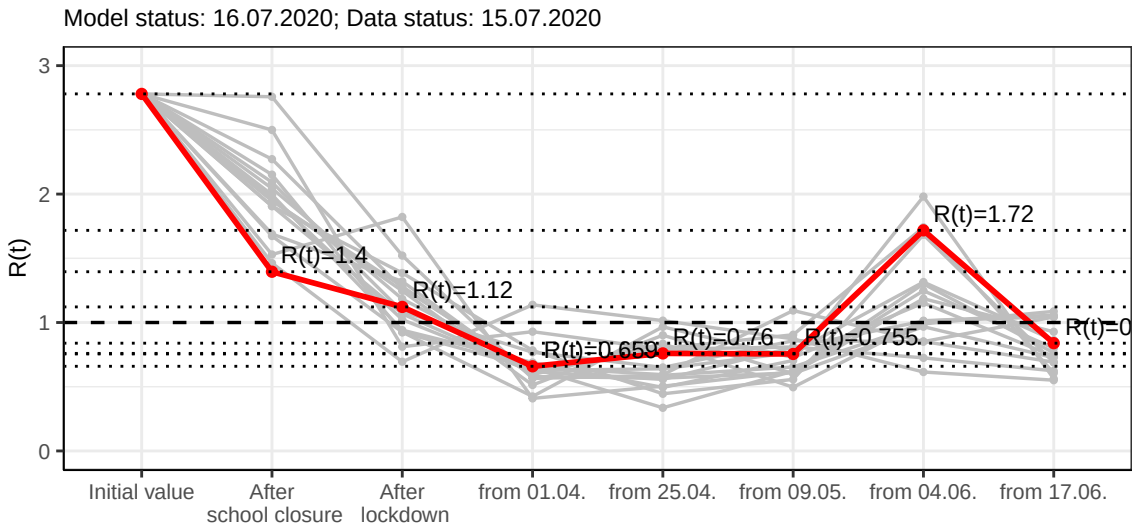


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

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).

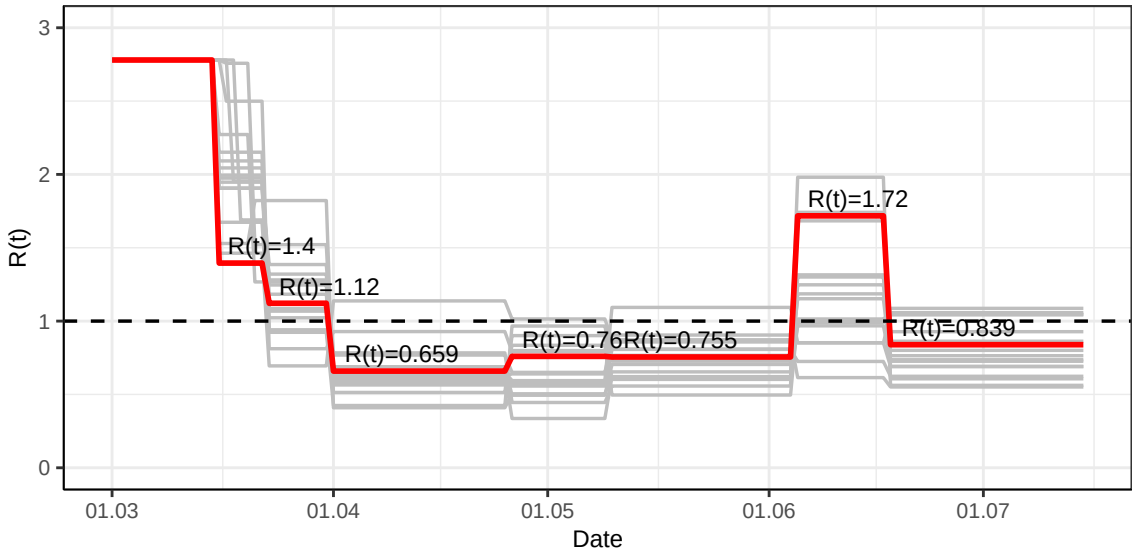


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.84)

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.

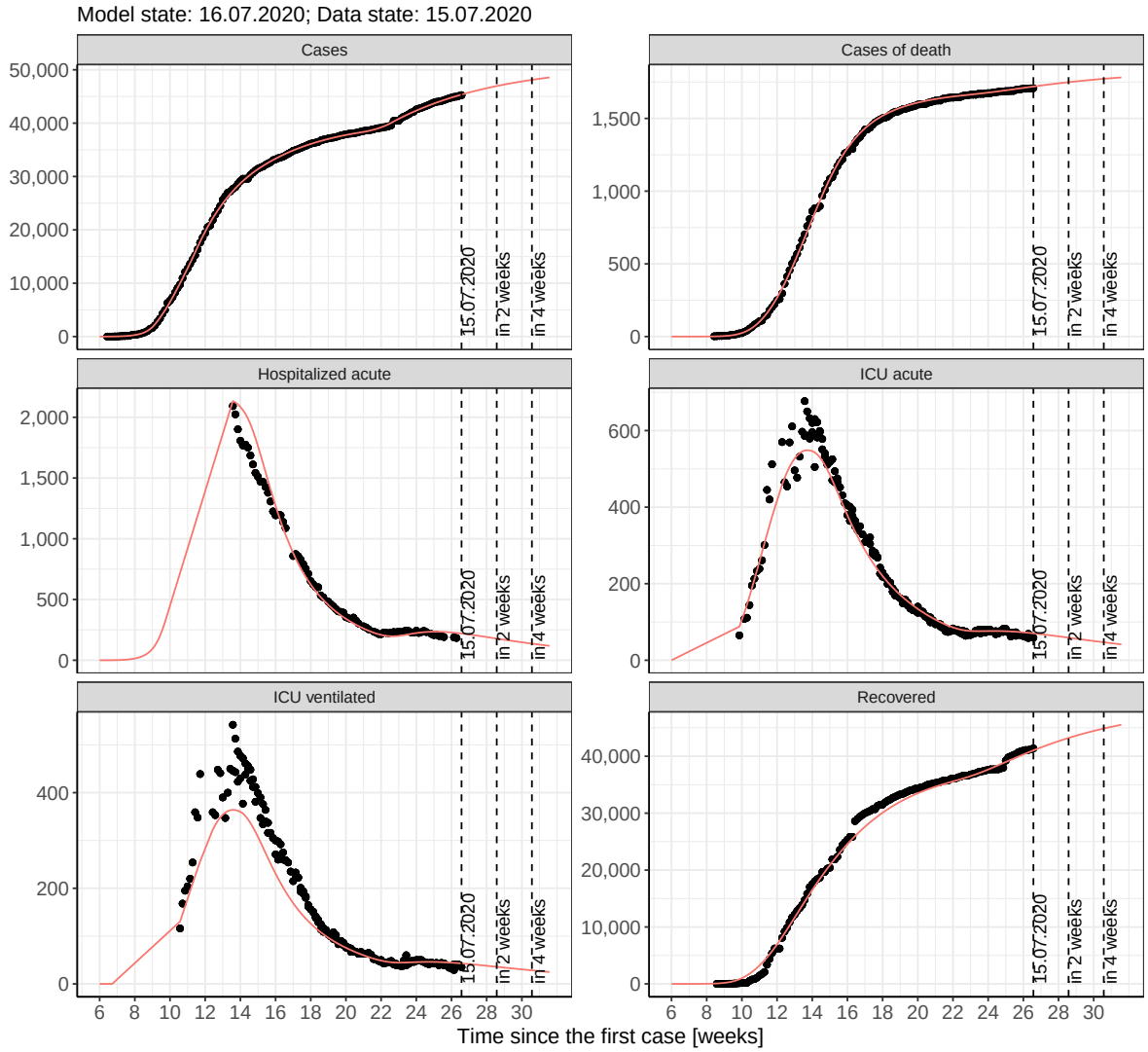


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model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

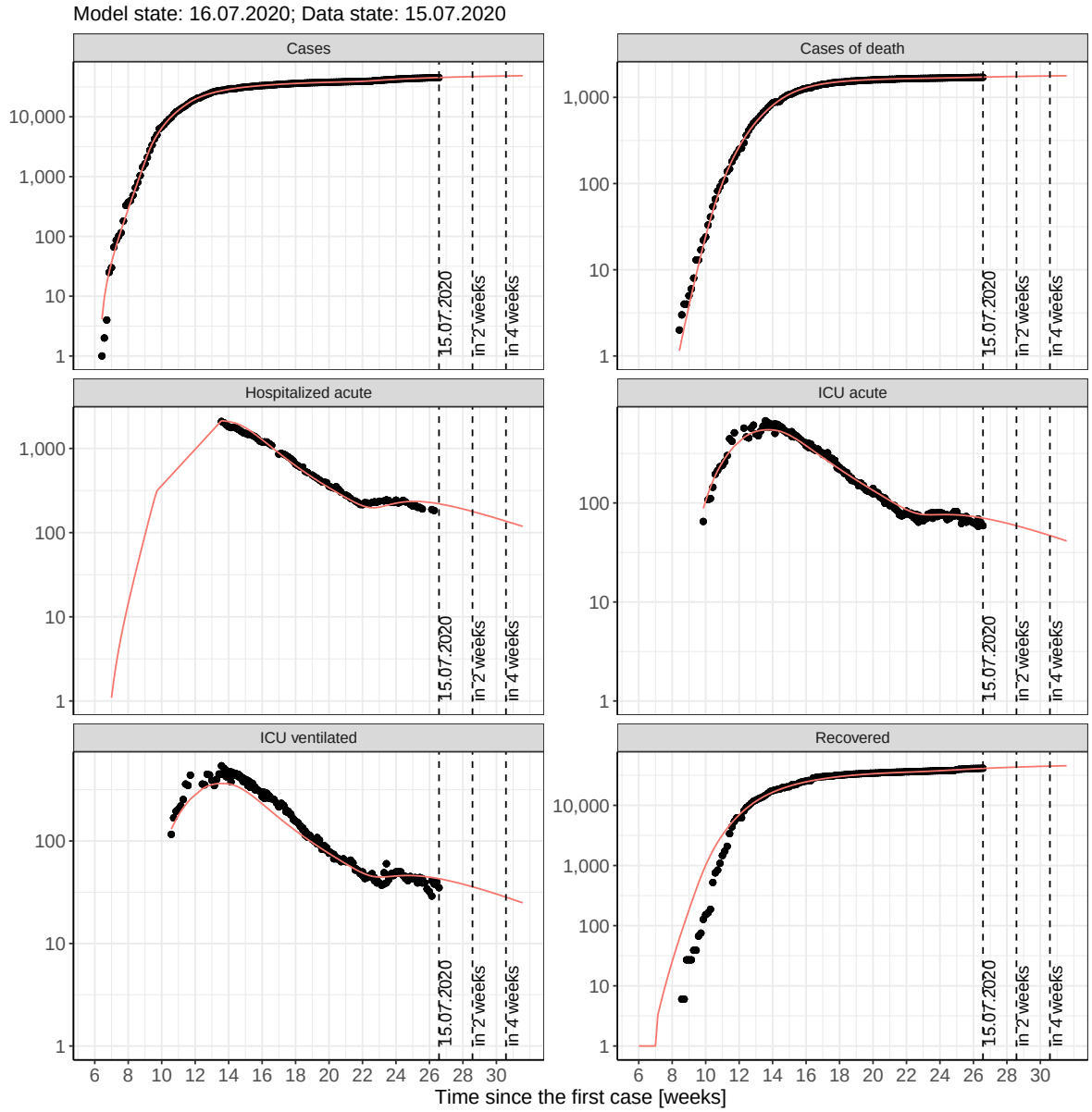


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model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

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

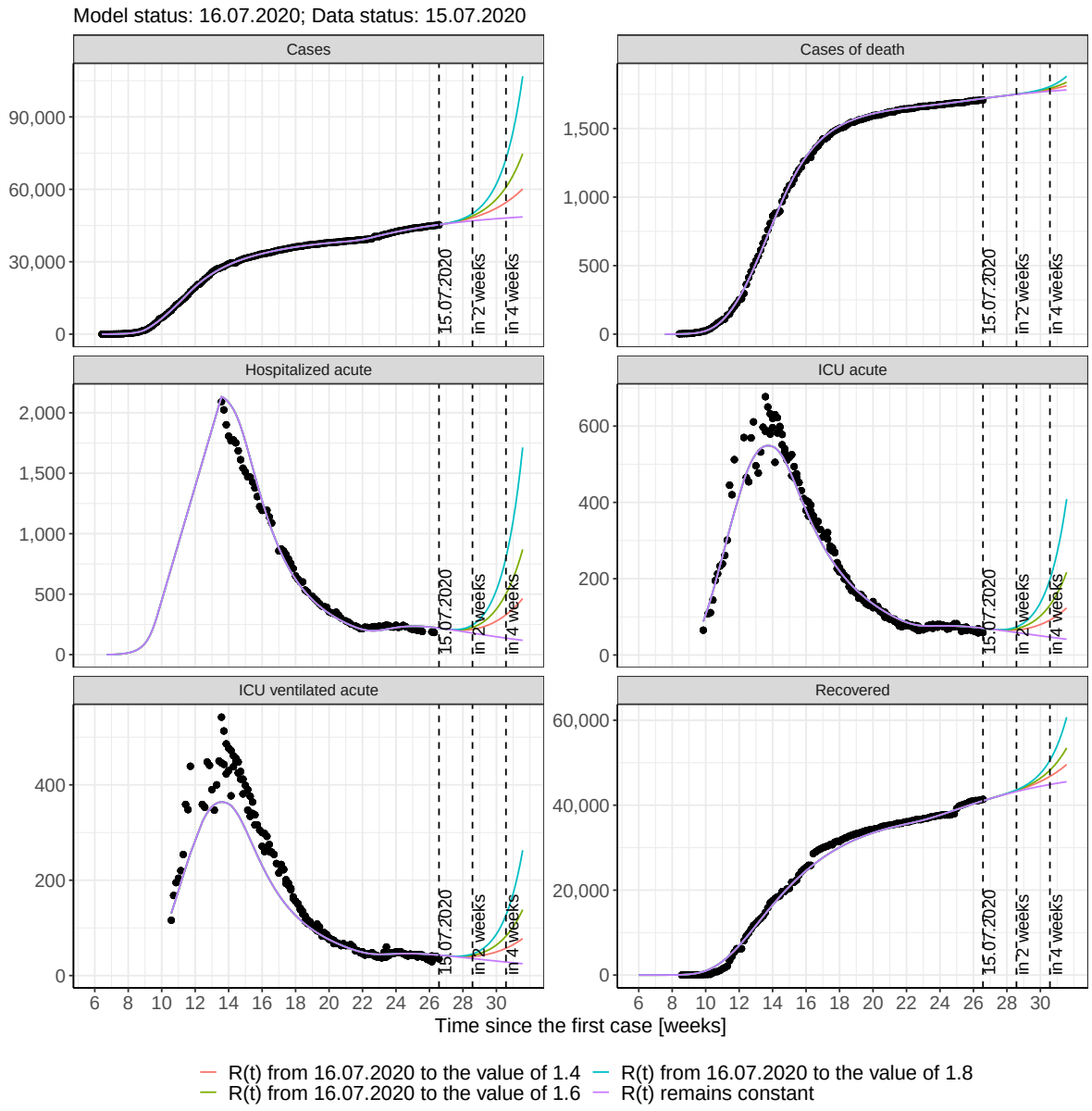


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

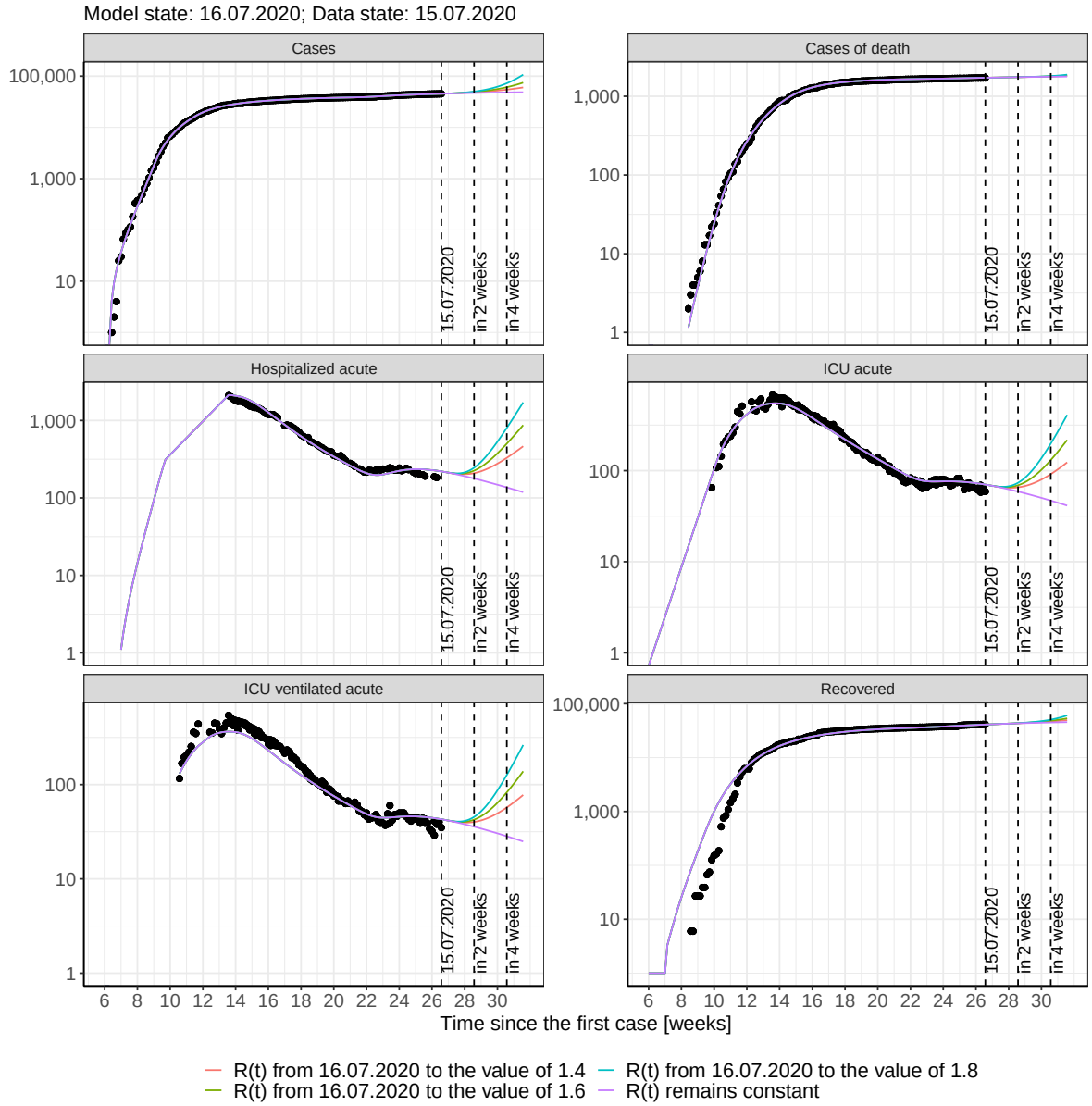


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

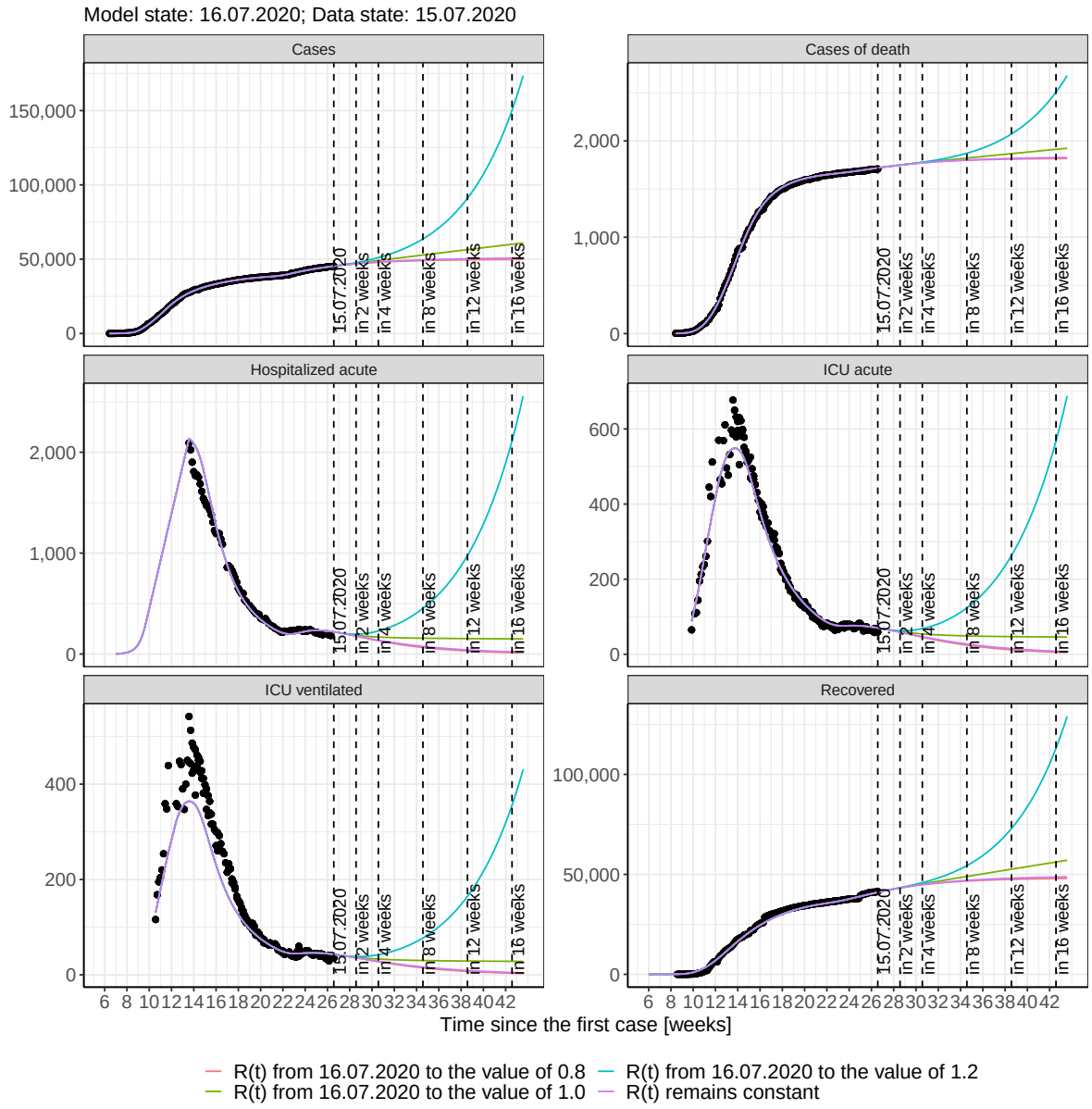


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

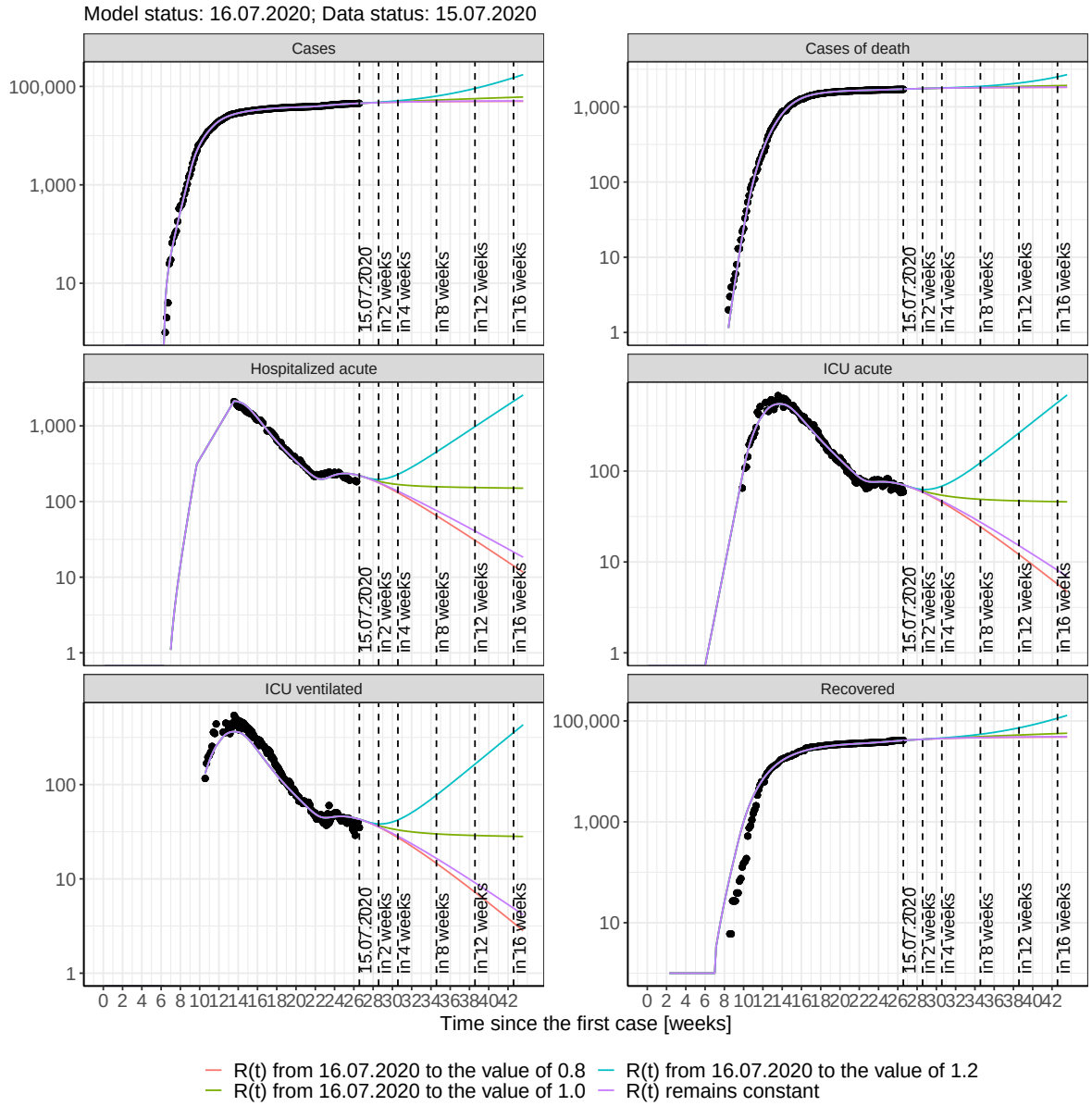


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 41) Model status from 16.07.2020; Data status: 15.07.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	45487	1722	41206	217	70	42
17.07.2020	45617	1724	41378	215	69	42
18.07.2020	45744	1726	41546	212	68	42
19.07.2020	45867	1728	41712	209	67	41
20.07.2020	45988	1731	41875	206	67	41
21.07.2020	46106	1733	42035	203	66	40
22.07.2020	46222	1735	42193	200	65	40
23.07.2020	46334	1737	42348	197	64	39
24.07.2020	46444	1739	42500	194	63	38
25.07.2020	46552	1741	42649	191	62	38
26.07.2020	46657	1743	42795	188	62	37
27.07.2020	46760	1745	42938	185	61	37
28.07.2020	46860	1747	43079	181	60	36
29.07.2020	46958	1749	43217	178	59	36
30.07.2020	47054	1751	43352	175	58	35
31.07.2020	47147	1753	43484	172	57	35
01.08.2020	47239	1755	43614	169	56	34
02.08.2020	47328	1756	43741	166	55	34
03.08.2020	47415	1758	43865	163	55	33
04.08.2020	47500	1760	43987	160	54	33
05.08.2020	47584	1762	44106	157	53	32
06.08.2020	47665	1763	44222	154	52	31
07.08.2020	47744	1765	44337	151	51	31
08.08.2020	47822	1766	44448	148	50	30
09.08.2020	47898	1768	44558	145	49	30
10.08.2020	47972	1770	44664	142	49	29
11.08.2020	48044	1771	44769	139	48	29
12.08.2020	48115	1772	44871	137	47	28

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	45487	1722	41206	217	70	42
17.07.2020	45616	1724	41378	215	69	42
18.07.2020	45740	1726	41546	212	68	42
19.07.2020	45862	1728	41712	209	67	41
20.07.2020	45980	1731	41875	206	67	41
21.07.2020	46094	1733	42035	203	66	40
22.07.2020	46205	1735	42192	200	65	39
23.07.2020	46313	1737	42346	197	64	39
24.07.2020	46418	1739	42497	194	63	38
25.07.2020	46520	1741	42645	190	62	38
26.07.2020	46620	1743	42790	187	61	37
27.07.2020	46716	1745	42932	184	60	37
28.07.2020	46809	1747	43071	180	60	36
29.07.2020	46900	1749	43207	177	59	36
30.07.2020	46989	1751	43340	173	58	35
31.07.2020	47074	1753	43470	170	57	34
01.08.2020	47158	1755	43596	167	56	34
02.08.2020	47239	1756	43720	163	55	33
03.08.2020	47317	1758	43841	160	54	33
04.08.2020	47394	1760	43959	156	53	32
05.08.2020	47468	1762	44074	153	52	31
06.08.2020	47540	1763	44186	150	51	31
07.08.2020	47610	1765	44295	147	50	30
08.08.2020	47678	1766	44402	143	49	30
09.08.2020	47745	1768	44505	140	48	29
10.08.2020	47809	1769	44607	137	47	29
11.08.2020	47871	1771	44705	134	46	28
12.08.2020	47932	1772	44801	131	45	27

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	45489	1722	41206	217	70	42
17.07.2020	45623	1724	41378	215	69	42
18.07.2020	45757	1726	41546	212	68	42
19.07.2020	45891	1728	41713	209	67	41
20.07.2020	46025	1731	41876	207	67	41
21.07.2020	46159	1733	42038	204	66	40
22.07.2020	46293	1735	42197	201	65	40
23.07.2020	46427	1737	42354	199	64	39
24.07.2020	46561	1739	42509	196	64	39
25.07.2020	46694	1741	42662	194	63	38
26.07.2020	46828	1743	42814	191	62	38
27.07.2020	46962	1745	42964	189	62	38
28.07.2020	47095	1747	43112	187	61	37
29.07.2020	47229	1749	43259	185	60	37
30.07.2020	47362	1751	43405	183	60	36
31.07.2020	47496	1753	43549	182	59	36
01.08.2020	47629	1755	43693	180	59	36
02.08.2020	47763	1757	43835	179	58	35
03.08.2020	47896	1759	43977	177	58	35
04.08.2020	48029	1761	44118	176	57	35
05.08.2020	48162	1762	44258	175	57	35
06.08.2020	48296	1764	44397	173	56	34
07.08.2020	48429	1766	44535	172	56	34
08.08.2020	48562	1768	44673	171	56	34
09.08.2020	48695	1770	44811	170	55	34
10.08.2020	48828	1772	44948	170	55	33
11.08.2020	48960	1773	45084	169	55	33
12.08.2020	49093	1775	45220	168	54	33

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	45491	1722	41206	217	70	42
17.07.2020	45631	1724	41378	215	69	42
18.07.2020	45775	1726	41547	212	68	42
19.07.2020	45923	1728	41713	209	67	41
20.07.2020	46075	1731	41878	207	67	41
21.07.2020	46232	1733	42041	205	66	40
22.07.2020	46393	1735	42202	202	65	40
23.07.2020	46559	1737	42363	201	65	39
24.07.2020	46729	1739	42522	199	64	39
25.07.2020	46905	1741	42681	198	64	39
26.07.2020	47085	1744	42841	197	63	39
27.07.2020	47271	1746	43000	196	63	38
28.07.2020	47462	1748	43160	196	63	38
29.07.2020	47658	1750	43321	196	63	38
30.07.2020	47860	1752	43484	196	63	38
31.07.2020	48067	1754	43648	197	63	38
01.08.2020	48281	1756	43813	198	63	38
02.08.2020	48500	1758	43981	199	63	38
03.08.2020	48726	1760	44152	201	63	39
04.08.2020	48958	1762	44325	203	63	39
05.08.2020	49197	1764	44501	205	64	39
06.08.2020	49443	1766	44681	208	64	39
07.08.2020	49696	1768	44864	210	65	40
08.08.2020	49956	1770	45050	213	65	40
09.08.2020	50223	1772	45241	217	66	41
10.08.2020	50498	1775	45436	220	67	41
11.08.2020	50781	1777	45635	224	67	42
12.08.2020	51072	1779	45839	228	68	42

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 120 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

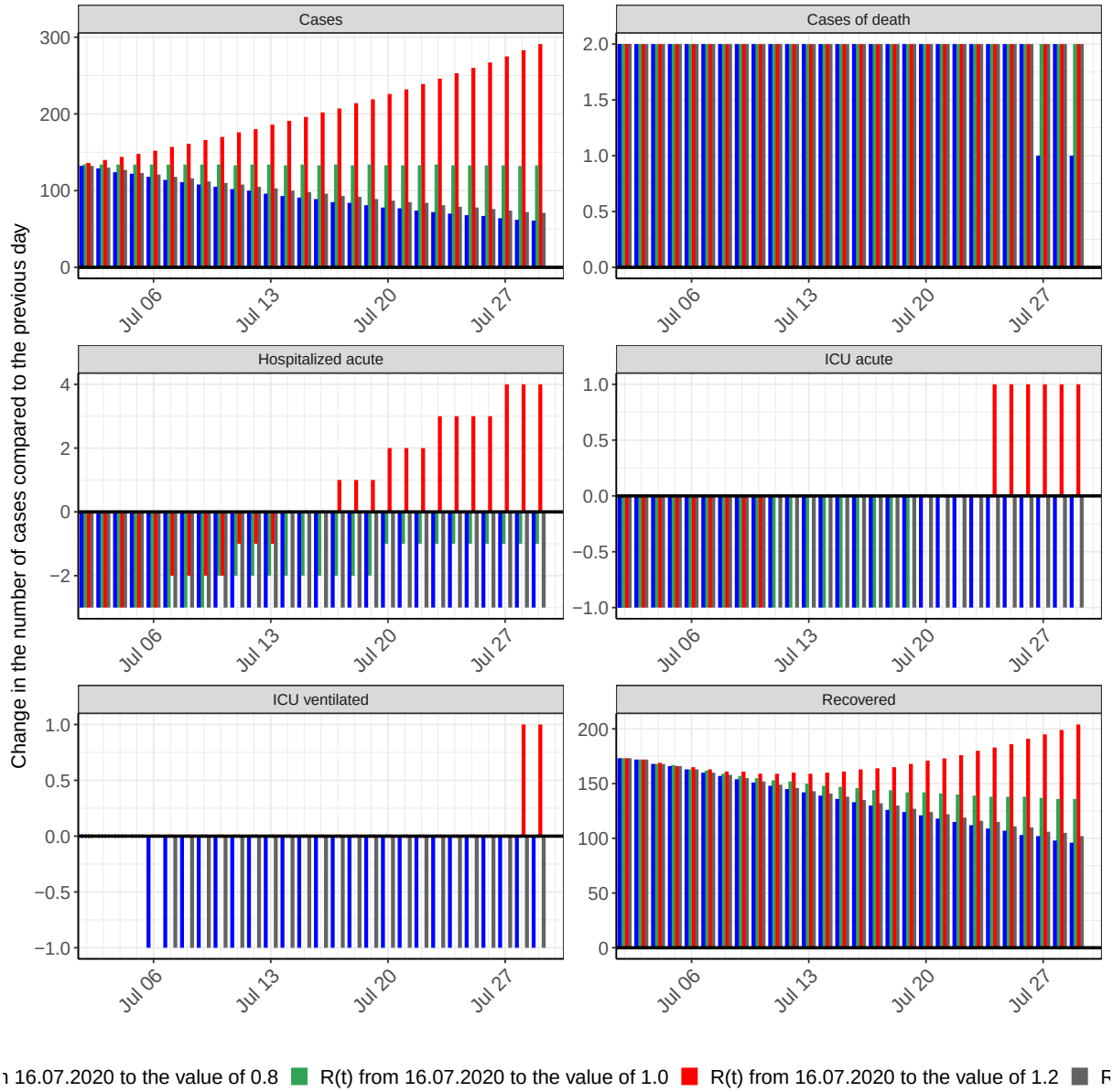


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

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.

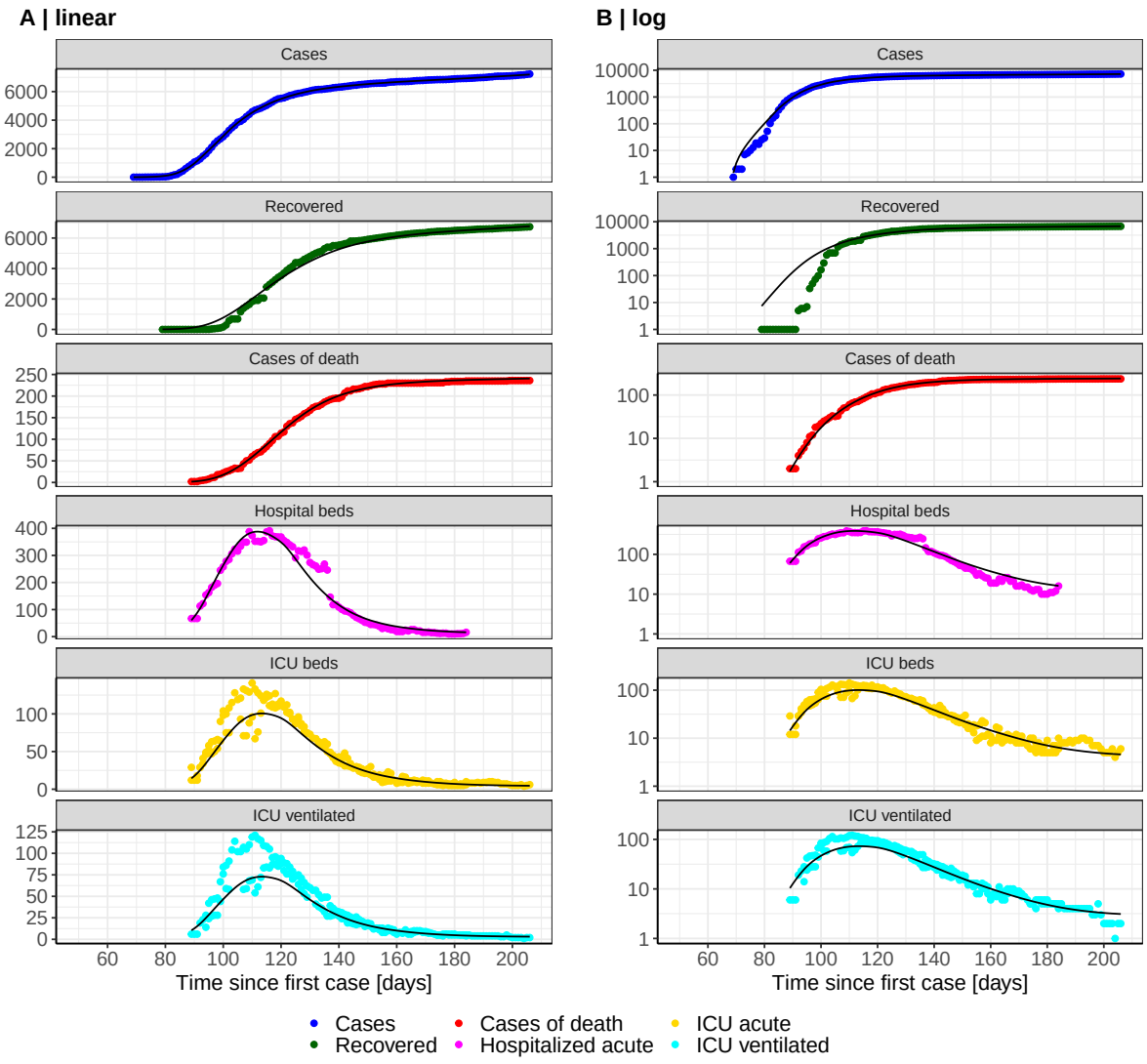


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

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.

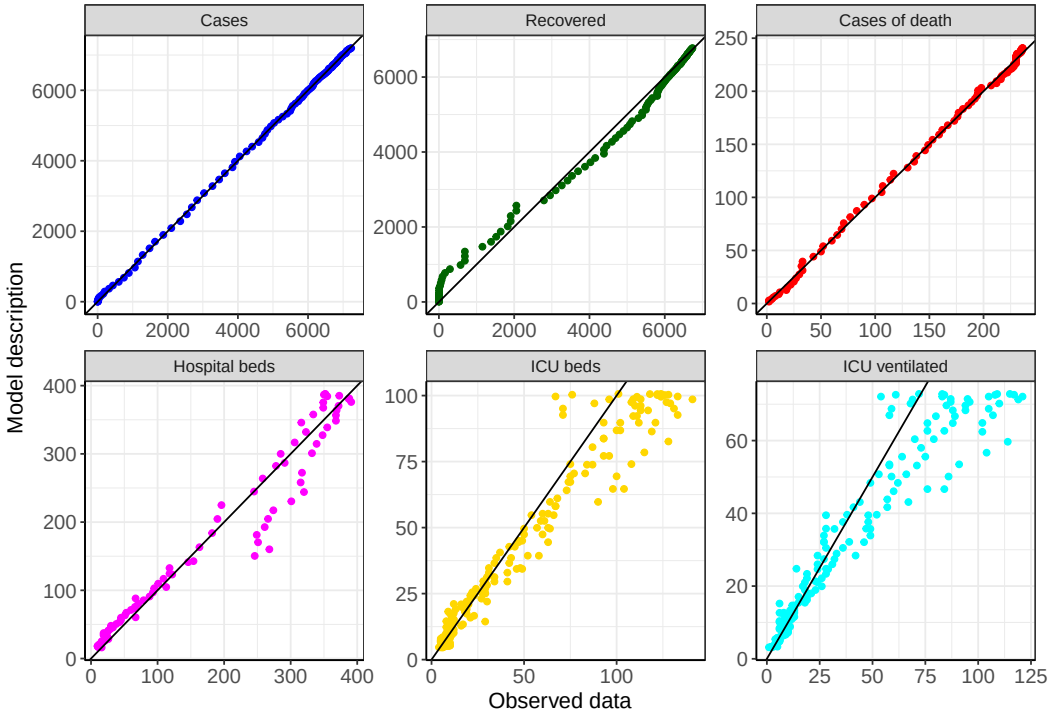


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

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).

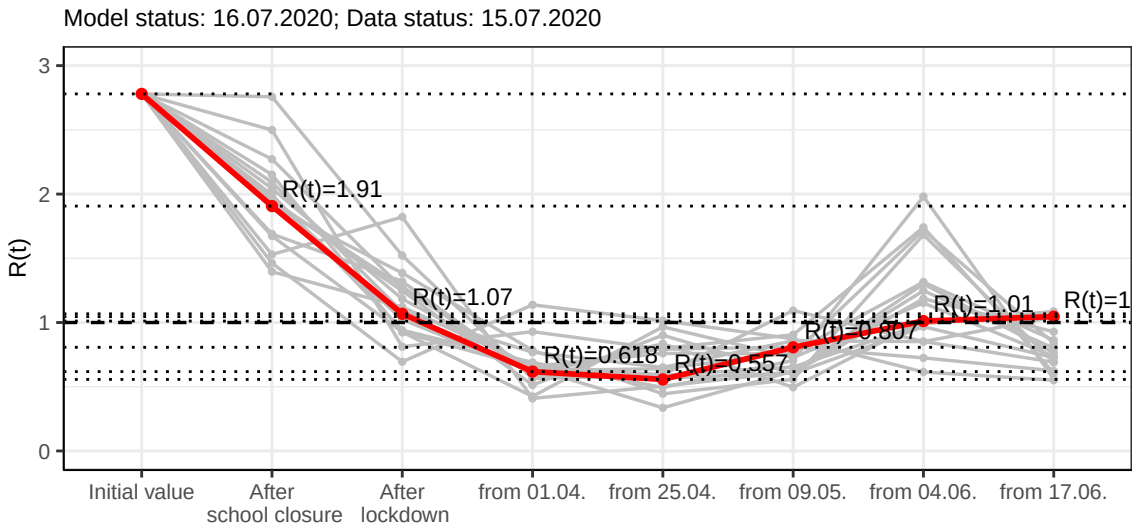


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

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

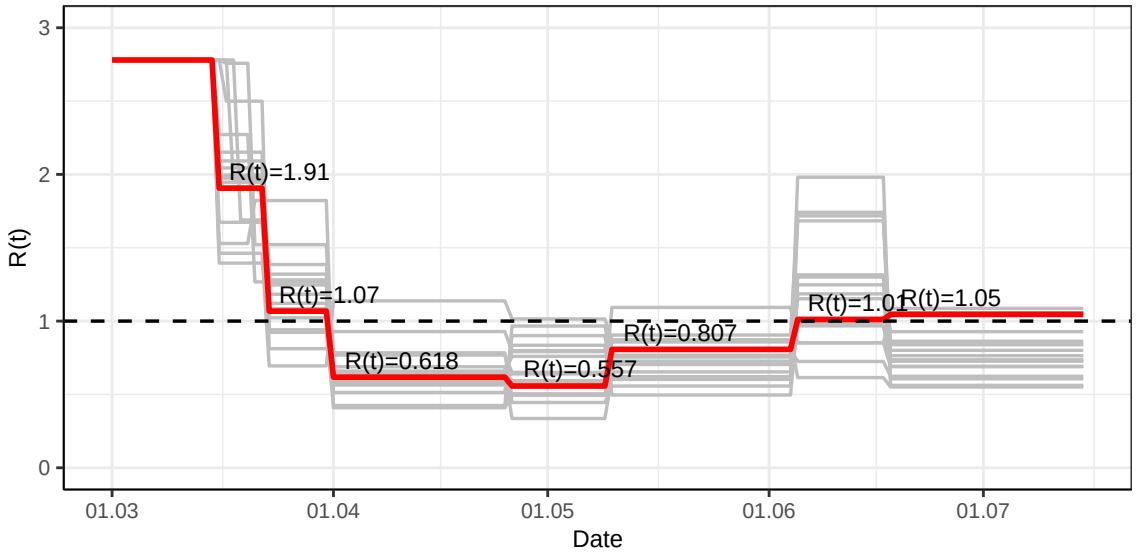


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

12.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.05)

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.

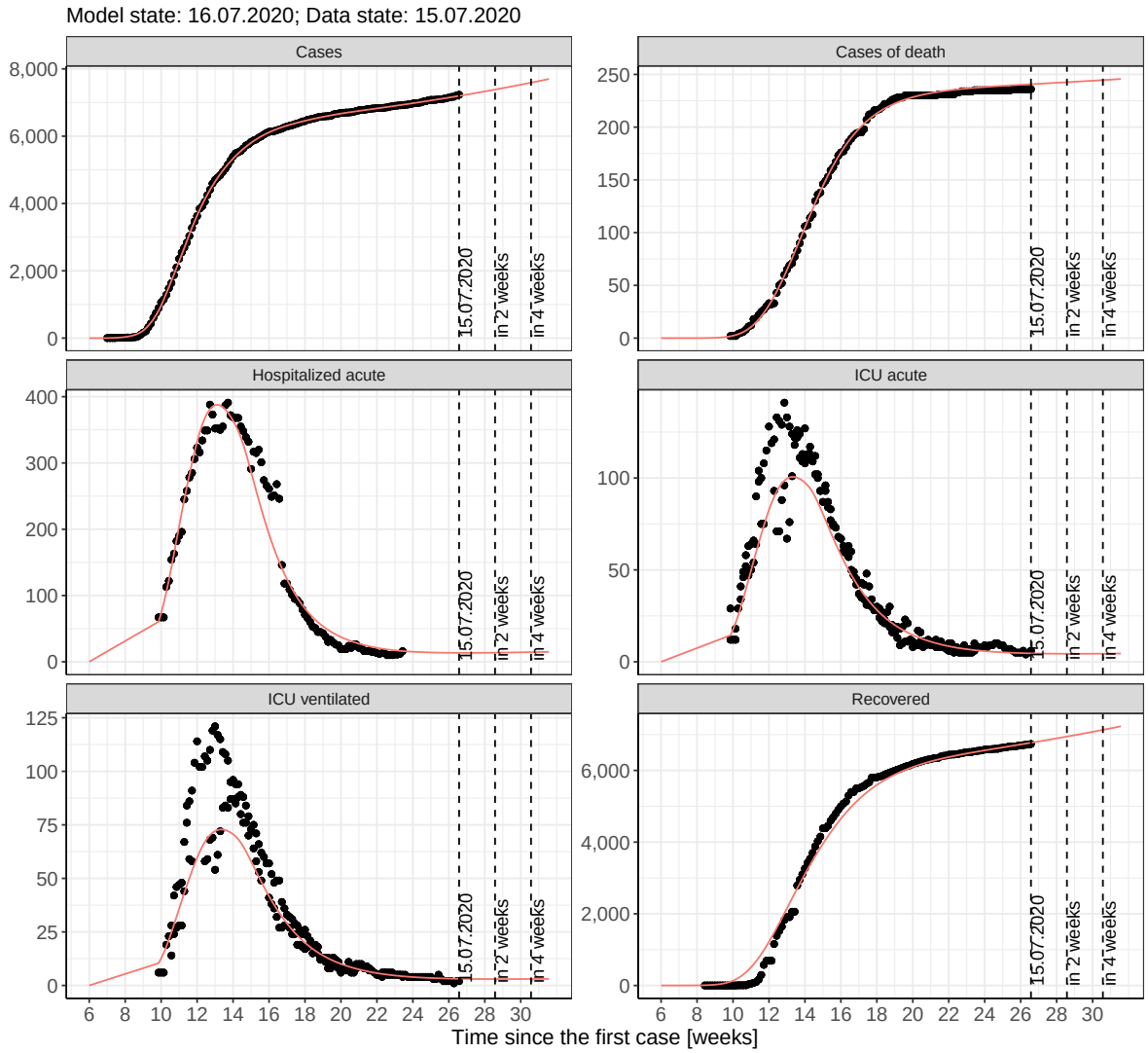


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

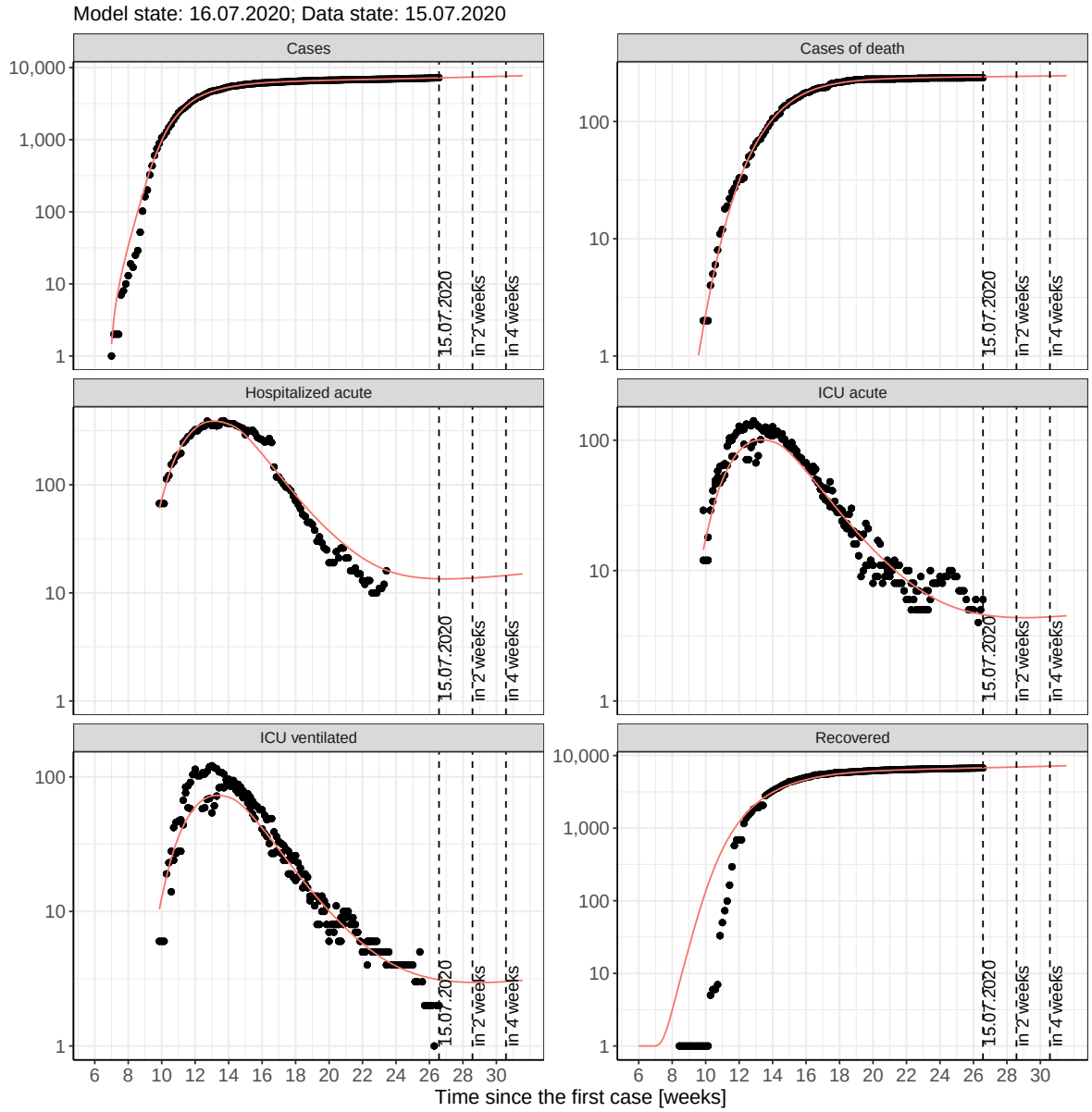


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

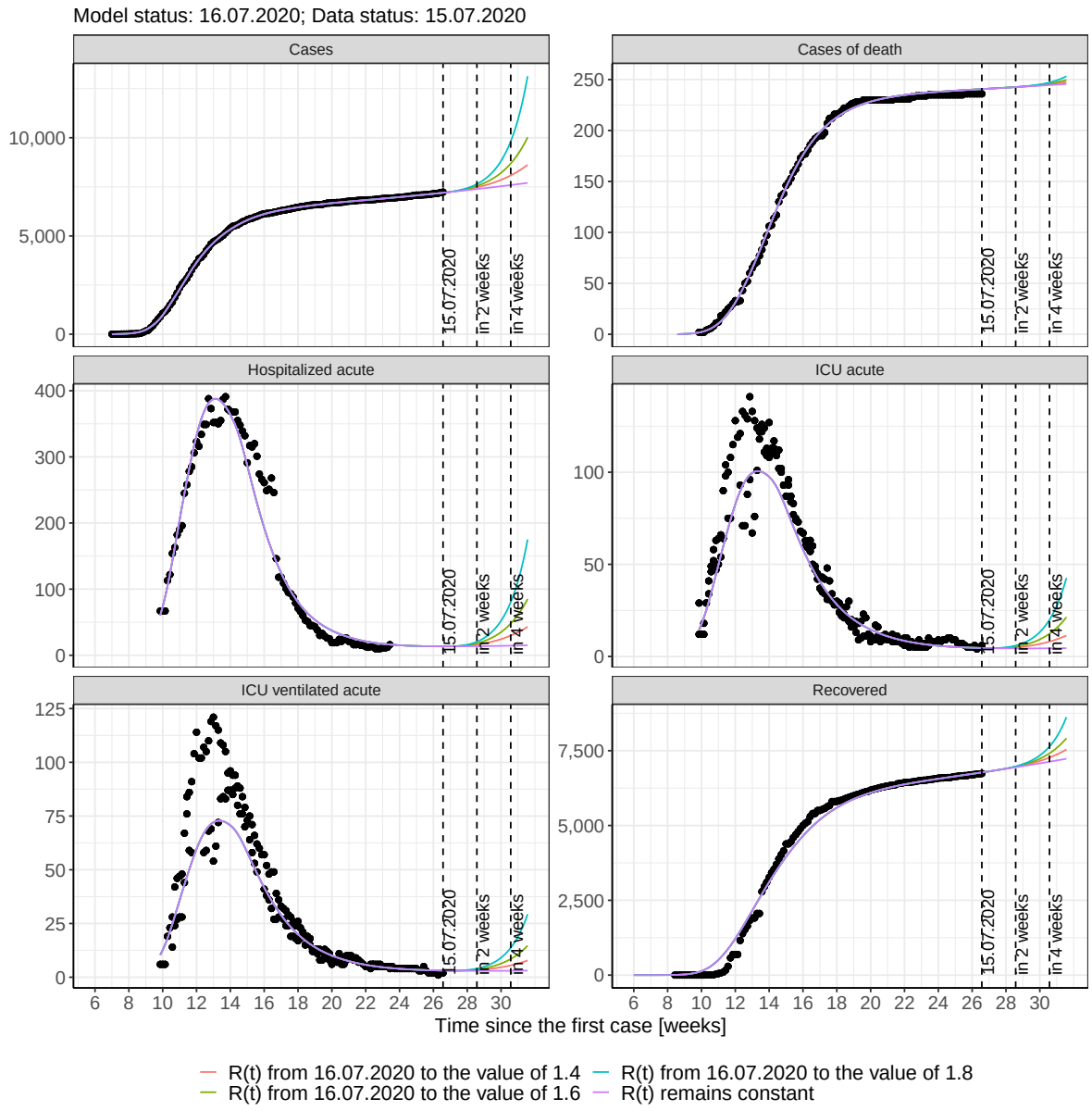


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

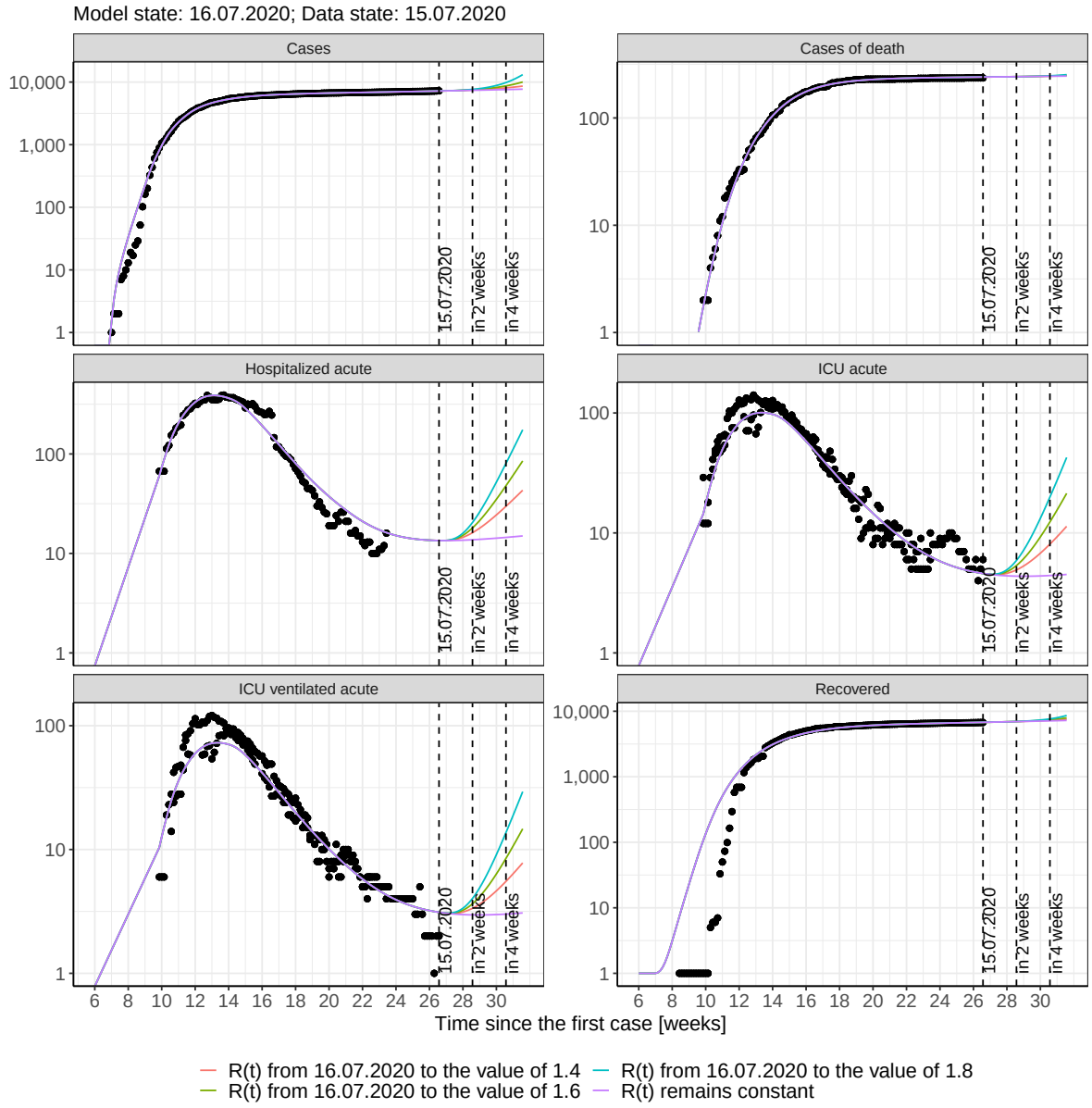


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

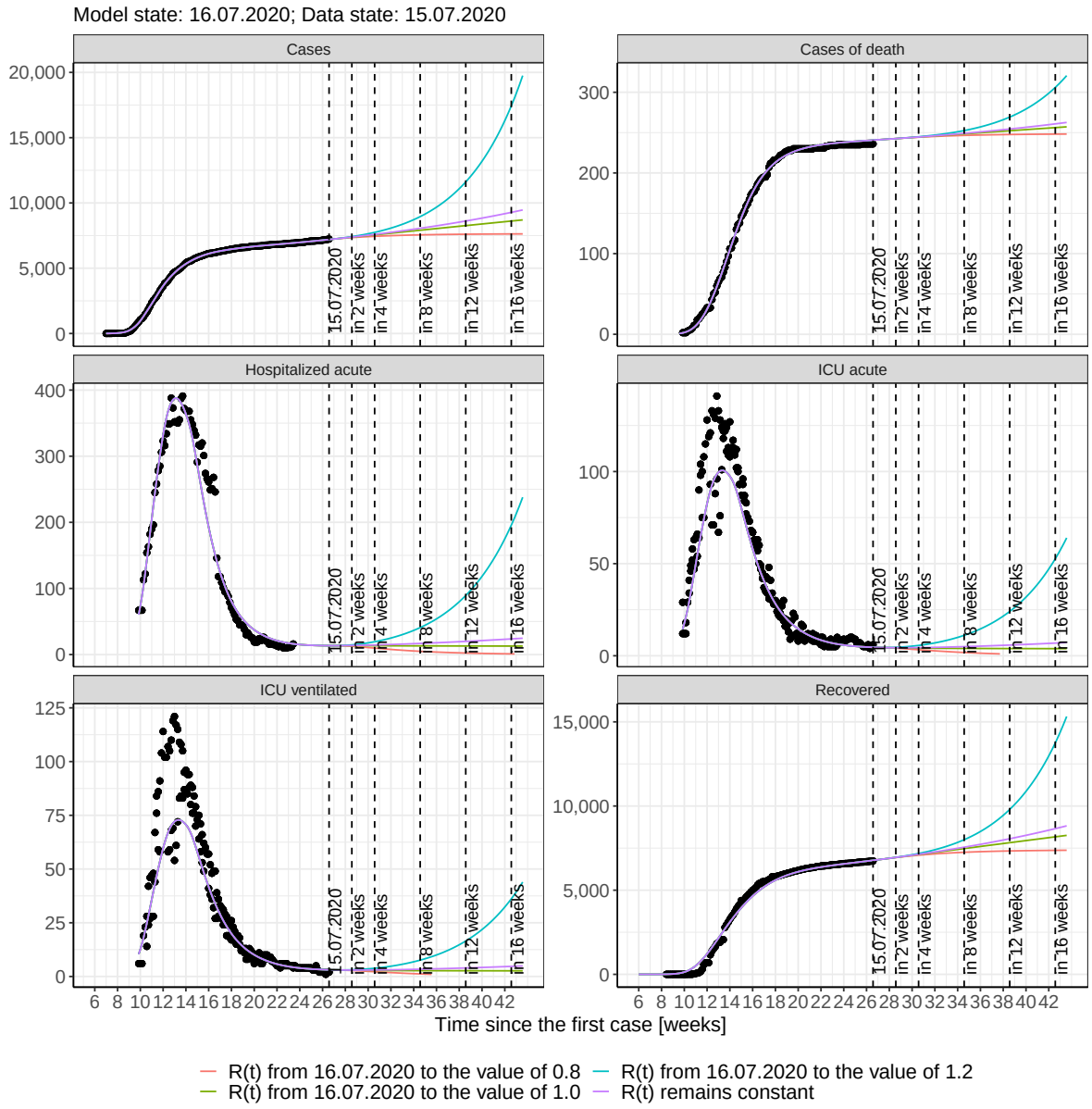


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

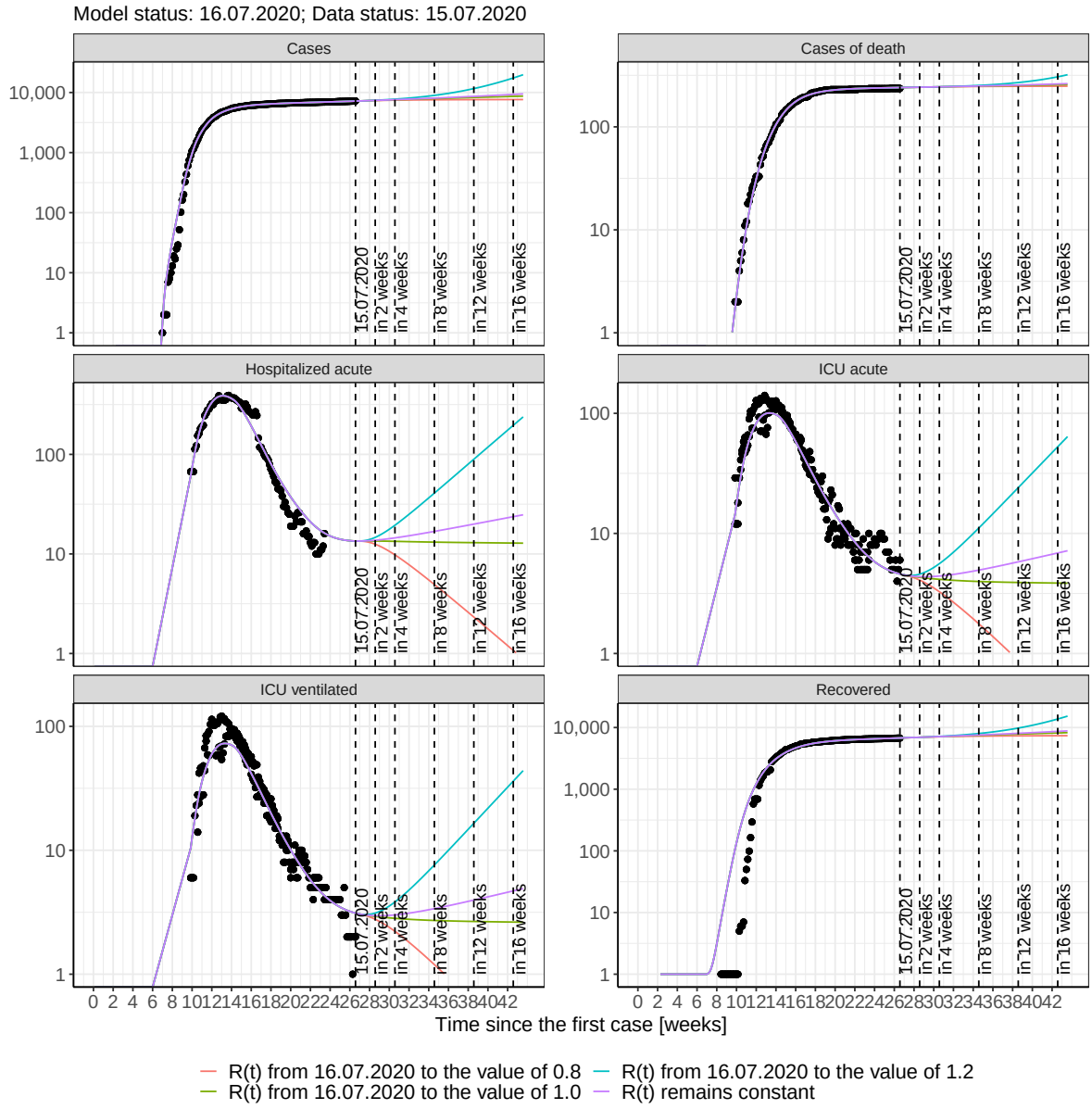


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 45) Model status from 16.07.2020; Data status: 15.07.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	7211	241	6785	13	5	3
17.07.2020	7224	241	6797	13	5	3
18.07.2020	7237	241	6809	13	5	3
19.07.2020	7250	241	6821	13	4	3
20.07.2020	7263	241	6833	13	4	3
21.07.2020	7276	242	6845	13	4	3
22.07.2020	7290	242	6858	14	4	3
23.07.2020	7303	242	6870	14	4	3
24.07.2020	7317	242	6882	14	4	3
25.07.2020	7330	242	6895	14	4	3
26.07.2020	7344	242	6907	14	4	3
27.07.2020	7358	242	6920	14	4	3
28.07.2020	7372	242	6932	14	4	3
29.07.2020	7386	243	6945	14	4	3
30.07.2020	7400	243	6958	14	4	3
31.07.2020	7414	243	6971	14	4	3
01.08.2020	7428	243	6984	14	4	3
02.08.2020	7442	243	6997	14	4	3
03.08.2020	7457	243	7010	14	4	3
04.08.2020	7471	243	7023	14	4	3
05.08.2020	7486	244	7036	14	4	3
06.08.2020	7501	244	7050	14	4	3
07.08.2020	7515	244	7063	14	4	3
08.08.2020	7530	244	7076	14	4	3
09.08.2020	7545	244	7090	14	4	3
10.08.2020	7560	244	7104	14	4	3
11.08.2020	7576	244	7118	14	4	3
12.08.2020	7591	245	7131	14	4	3

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	7211	241	6785	13	5	3
17.07.2020	7223	241	6797	13	5	3
18.07.2020	7235	241	6809	13	5	3
19.07.2020	7246	241	6821	13	4	3
20.07.2020	7258	241	6833	13	4	3
21.07.2020	7269	241	6845	13	4	3
22.07.2020	7279	242	6857	13	4	3
23.07.2020	7290	242	6869	13	4	3
24.07.2020	7300	242	6881	13	4	3
25.07.2020	7310	242	6893	13	4	3
26.07.2020	7319	242	6904	13	4	3
27.07.2020	7328	242	6916	13	4	3
28.07.2020	7337	242	6928	13	4	3
29.07.2020	7346	243	6939	13	4	3
30.07.2020	7354	243	6950	12	4	3
31.07.2020	7362	243	6961	12	4	3
01.08.2020	7370	243	6972	12	4	3
02.08.2020	7378	243	6983	12	4	3
03.08.2020	7386	243	6993	12	4	3
04.08.2020	7393	243	7004	11	4	3
05.08.2020	7400	243	7014	11	4	3
06.08.2020	7407	244	7024	11	4	2
07.08.2020	7414	244	7034	11	4	2
08.08.2020	7420	244	7043	11	4	2
09.08.2020	7427	244	7052	10	3	2
10.08.2020	7433	244	7062	10	3	2
11.08.2020	7439	244	7070	10	3	2
12.08.2020	7445	244	7079	10	3	2

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	7211	241	6785	13	5	3
17.07.2020	7224	241	6797	13	5	3
18.07.2020	7236	241	6809	13	5	3
19.07.2020	7249	241	6821	13	4	3
20.07.2020	7262	241	6833	13	4	3
21.07.2020	7275	242	6845	13	4	3
22.07.2020	7288	242	6858	13	4	3
23.07.2020	7300	242	6870	13	4	3
24.07.2020	7313	242	6882	13	4	3
25.07.2020	7326	242	6894	13	4	3
26.07.2020	7339	242	6907	13	4	3
27.07.2020	7352	242	6919	13	4	3
28.07.2020	7364	242	6932	13	4	3
29.07.2020	7377	243	6944	13	4	3
30.07.2020	7390	243	6956	13	4	3
31.07.2020	7403	243	6969	13	4	3
01.08.2020	7416	243	6981	13	4	3
02.08.2020	7428	243	6994	13	4	3
03.08.2020	7441	243	7006	13	4	3
04.08.2020	7454	243	7019	13	4	3
05.08.2020	7467	244	7032	13	4	3
06.08.2020	7480	244	7044	13	4	3
07.08.2020	7492	244	7057	13	4	3
08.08.2020	7505	244	7069	13	4	3
09.08.2020	7518	244	7082	13	4	3
10.08.2020	7530	244	7094	13	4	3
11.08.2020	7543	244	7107	13	4	3
12.08.2020	7556	245	7120	13	4	3

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	7211	241	6785	13	5	3
17.07.2020	7224	241	6797	13	5	3
18.07.2020	7238	241	6809	13	5	3
19.07.2020	7252	241	6821	13	4	3
20.07.2020	7267	241	6833	14	4	3
21.07.2020	7282	242	6846	14	4	3
22.07.2020	7297	242	6858	14	4	3
23.07.2020	7313	242	6871	14	4	3
24.07.2020	7330	242	6883	14	4	3
25.07.2020	7346	242	6896	14	4	3
26.07.2020	7364	242	6909	14	4	3
27.07.2020	7381	242	6923	14	5	3
28.07.2020	7400	242	6936	14	5	3
29.07.2020	7418	243	6950	15	5	3
30.07.2020	7438	243	6964	15	5	3
31.07.2020	7458	243	6978	15	5	3
01.08.2020	7478	243	6993	15	5	3
02.08.2020	7499	243	7008	16	5	3
03.08.2020	7521	243	7023	16	5	3
04.08.2020	7543	244	7039	16	5	3
05.08.2020	7566	244	7055	17	5	3
06.08.2020	7590	244	7072	17	5	3
07.08.2020	7614	244	7088	17	5	3
08.08.2020	7639	244	7106	18	5	4
09.08.2020	7664	244	7123	18	5	4
10.08.2020	7691	244	7142	19	5	4
11.08.2020	7718	245	7160	19	5	4
12.08.2020	7746	245	7180	19	6	4

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 131 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

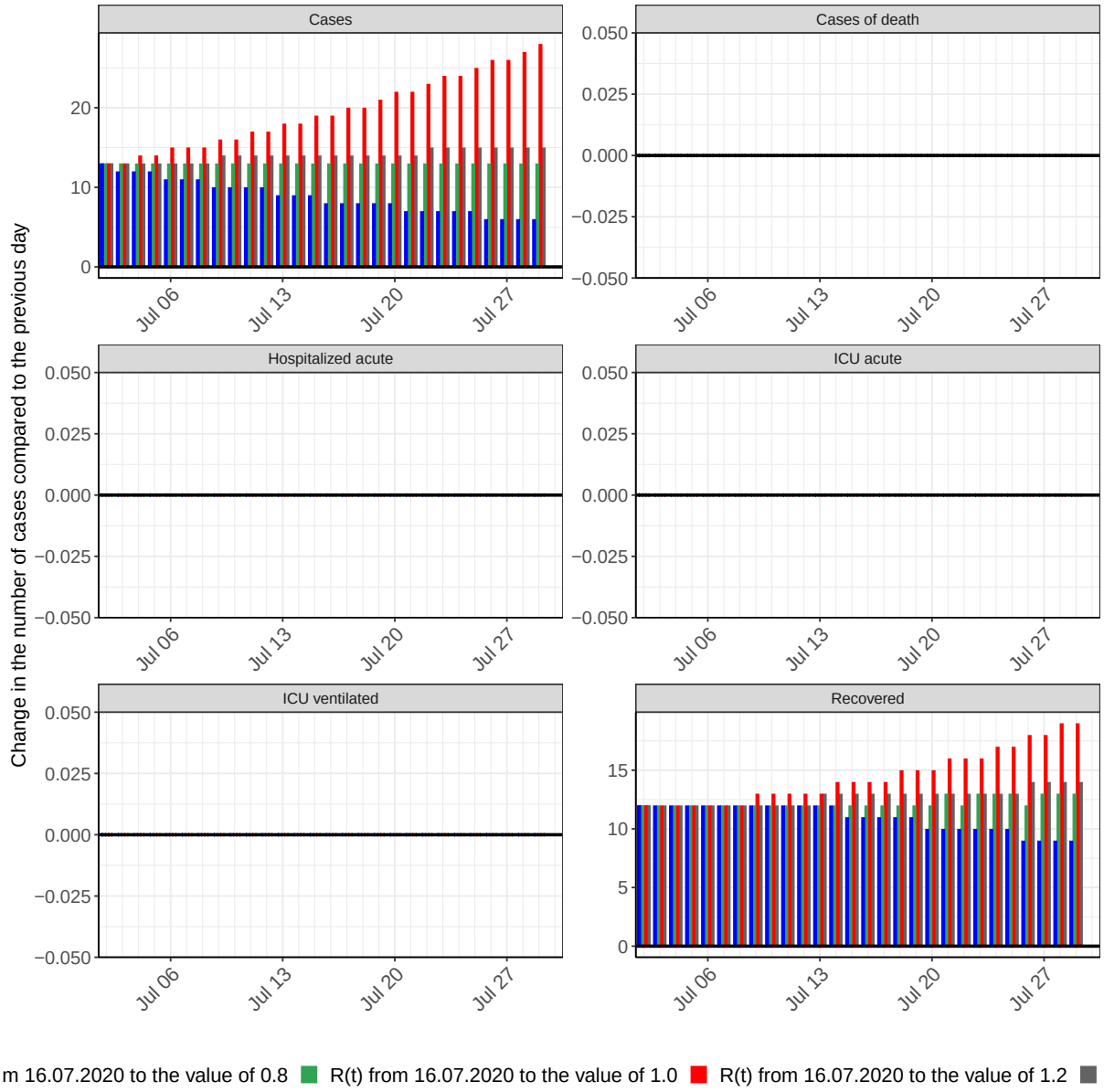


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

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.

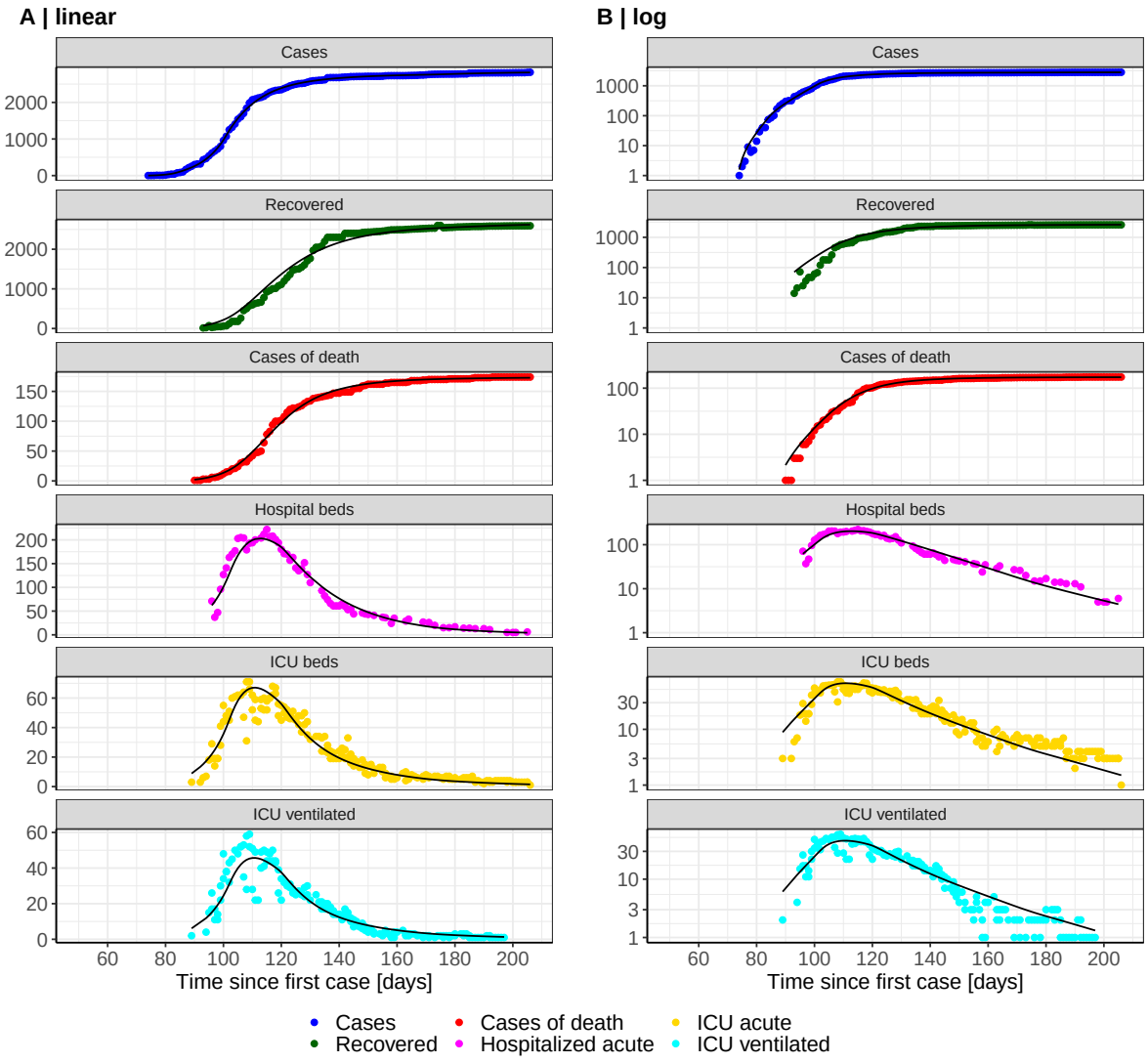


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

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.

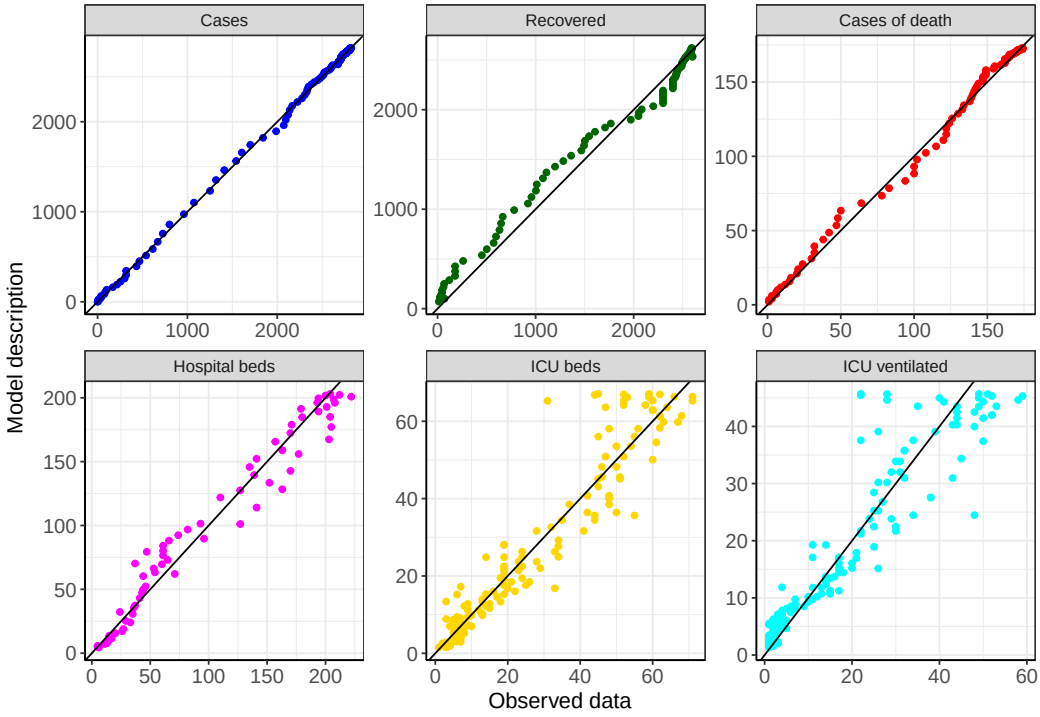


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

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).

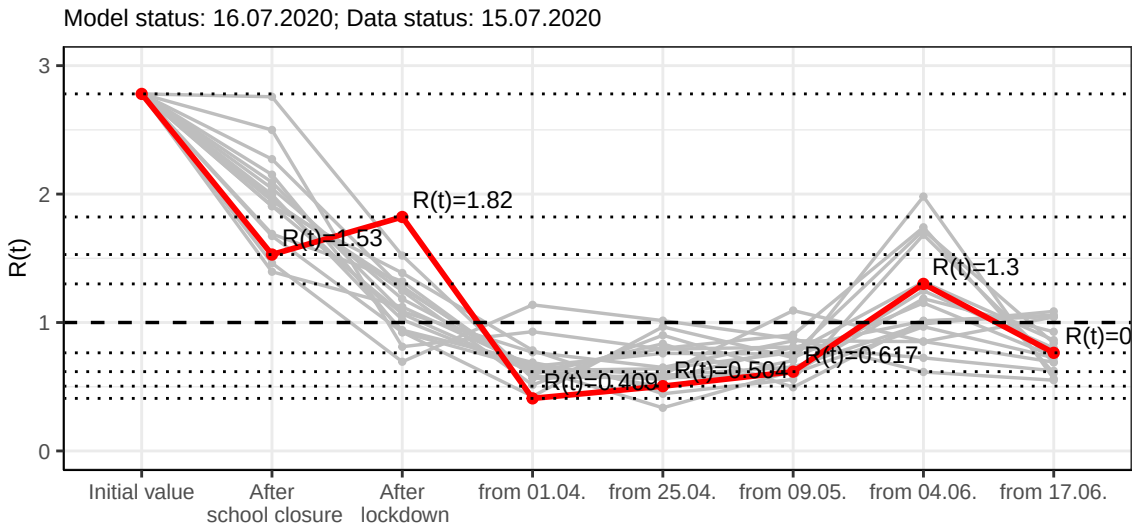


Figure 134: R(t) values before and after the NPIs for Saarland

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

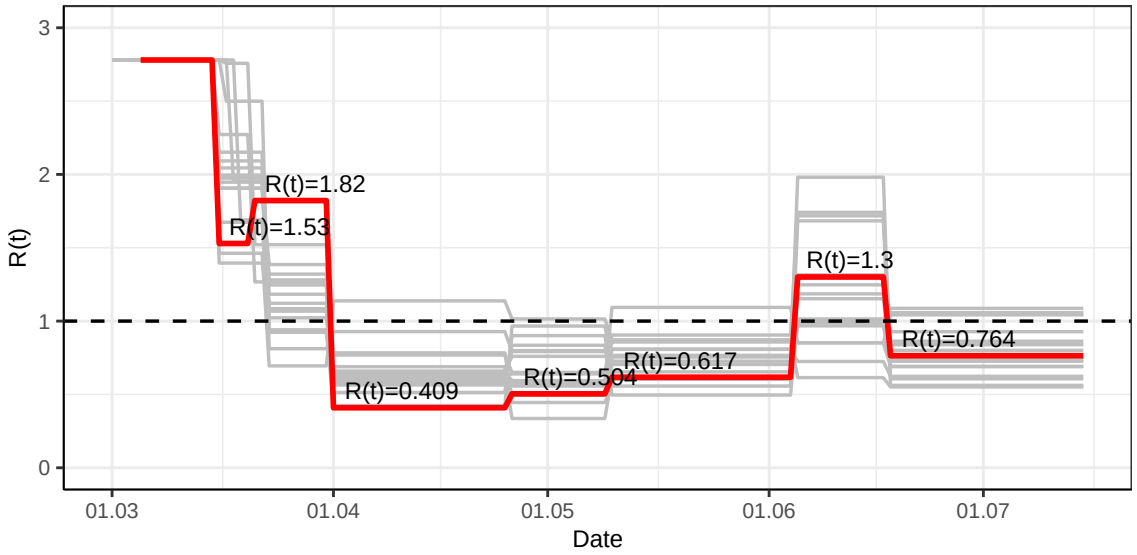


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

13.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.76)

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.

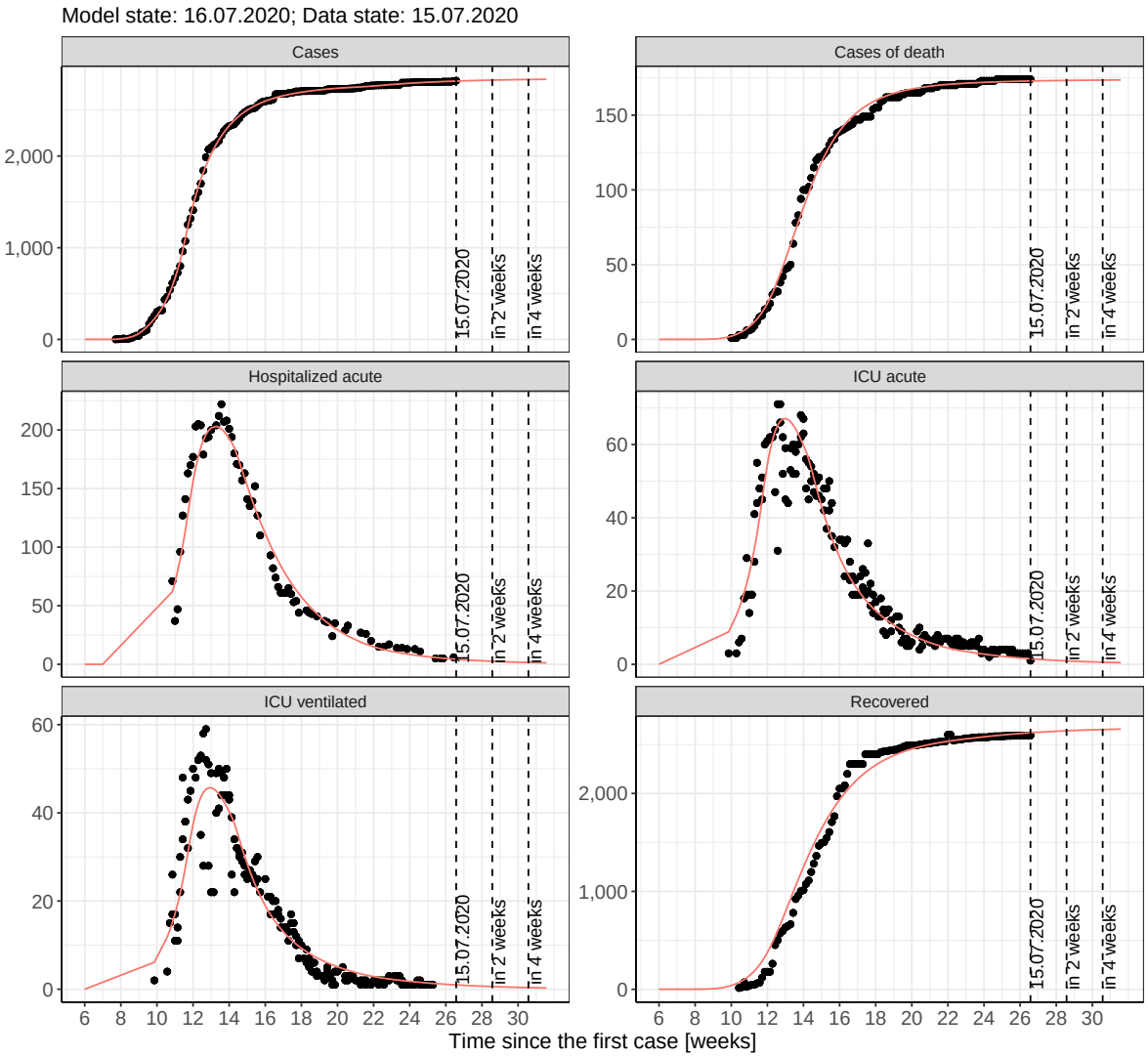


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

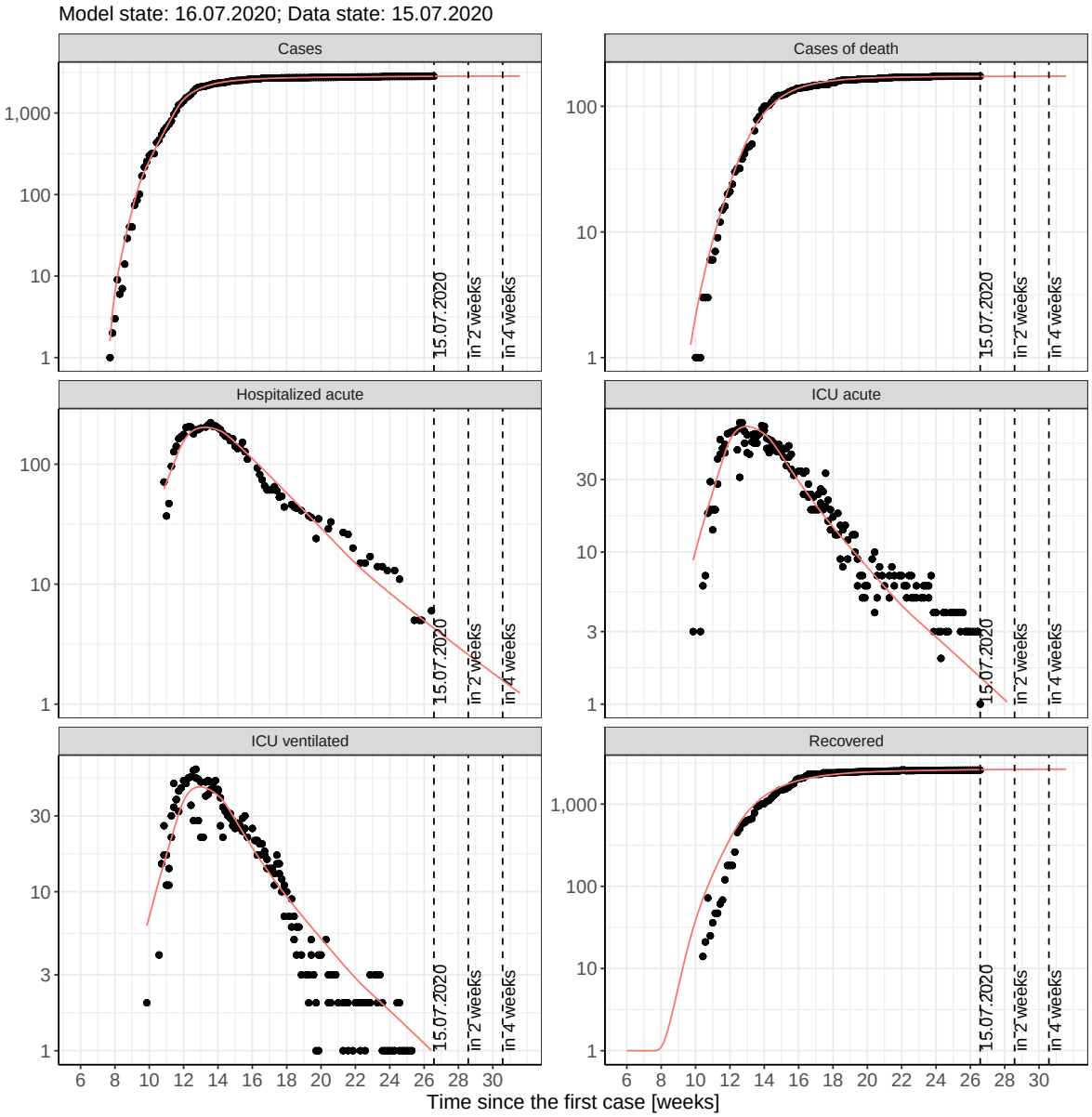


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

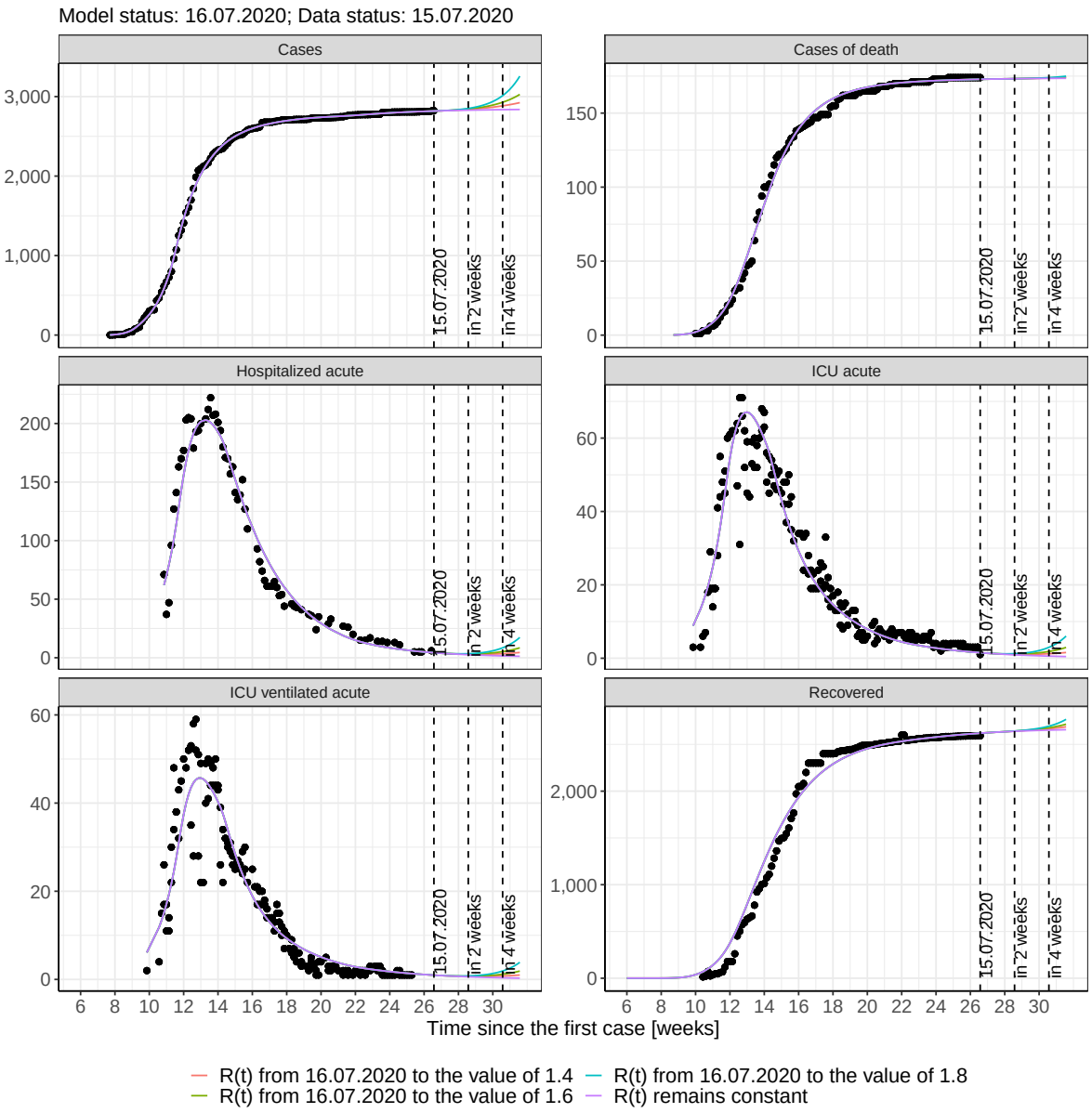


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

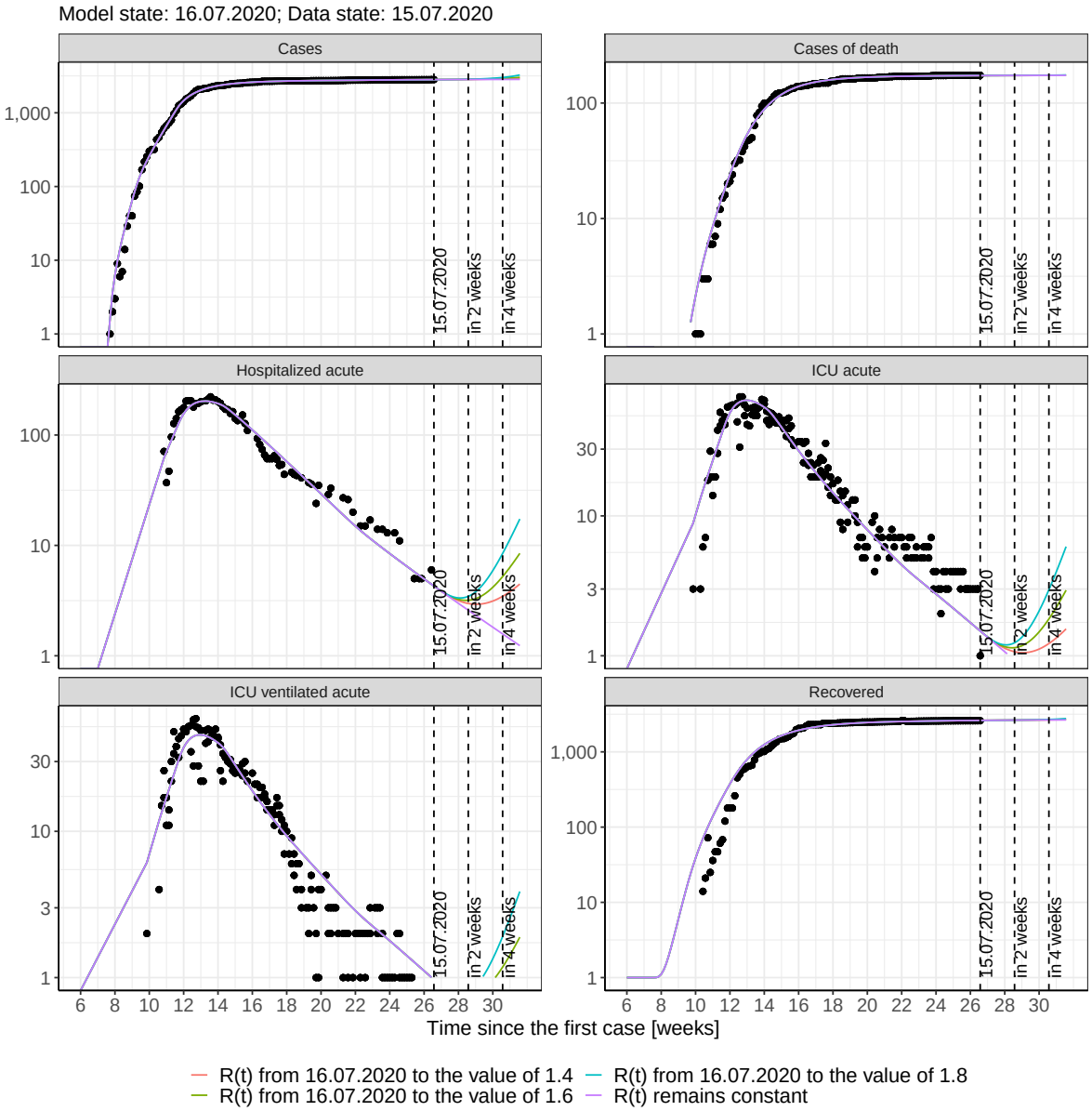


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

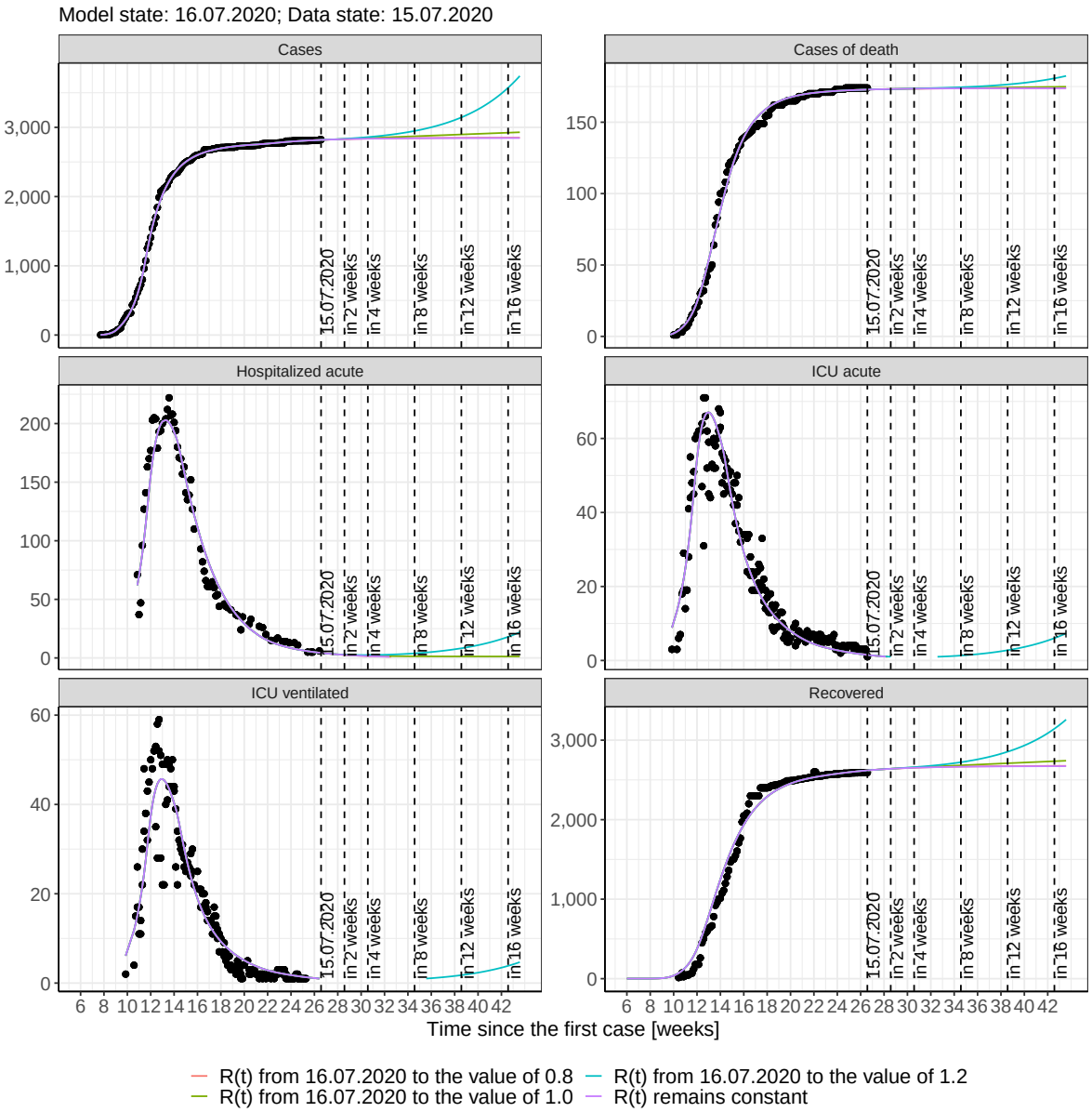


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

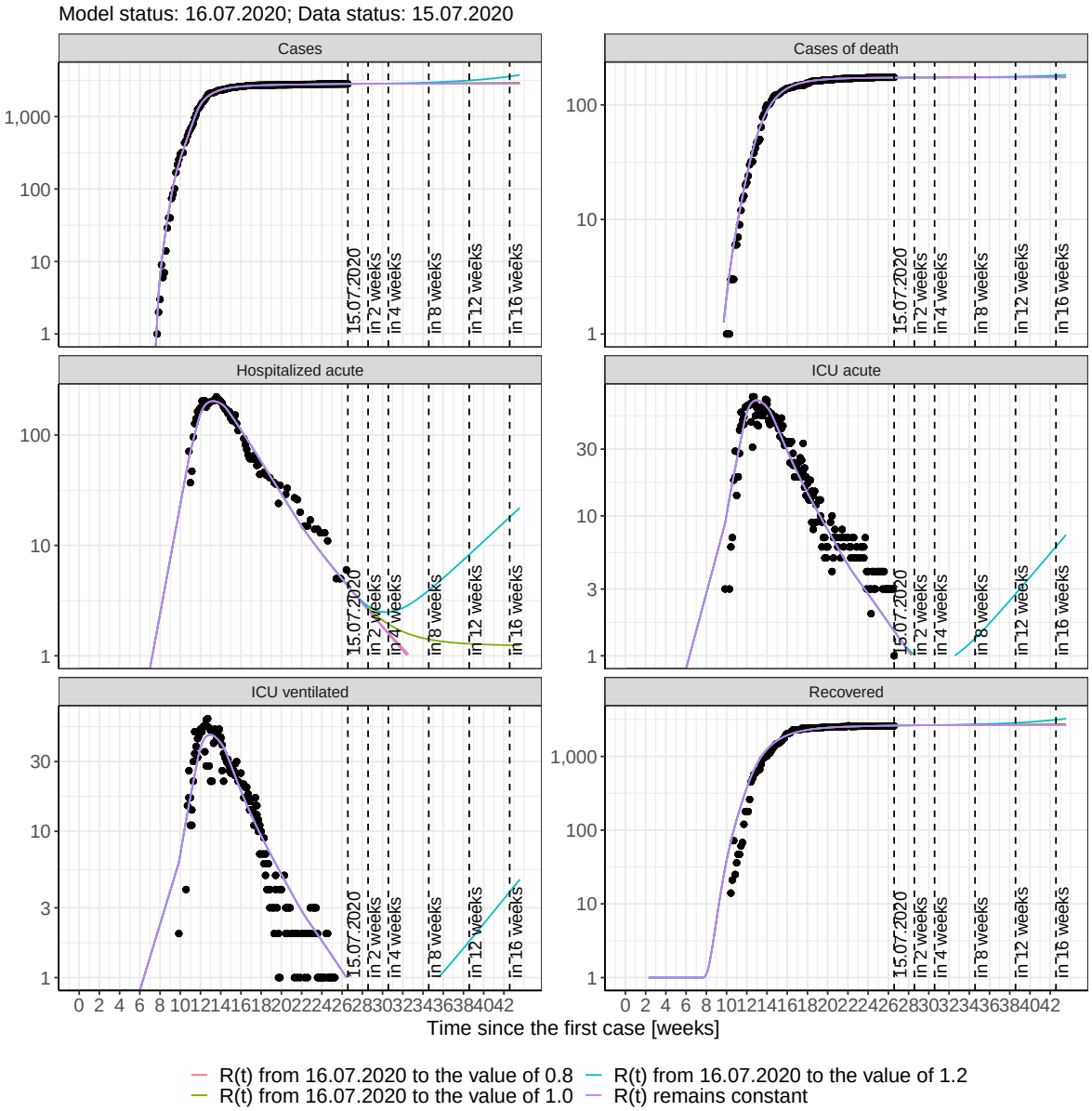


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 49) Model status from 16.07.2020; Data status: 15.07.2020.

Table 46: Saarland - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	2819	173	2622	4	1	1
17.07.2020	2820	173	2623	4	1	1
18.07.2020	2821	173	2625	4	1	1
19.07.2020	2822	173	2626	4	1	1
20.07.2020	2823	173	2628	4	1	1
21.07.2020	2824	173	2630	3	1	1
22.07.2020	2824	173	2631	3	1	1
23.07.2020	2825	173	2632	3	1	1
24.07.2020	2826	173	2634	3	1	1
25.07.2020	2826	173	2635	3	1	1
26.07.2020	2827	173	2636	3	1	1
27.07.2020	2828	173	2638	3	1	1
28.07.2020	2828	173	2639	3	1	1
29.07.2020	2829	173	2640	3	1	1
30.07.2020	2830	173	2641	2	1	1
31.07.2020	2830	173	2642	2	1	1
01.08.2020	2831	173	2643	2	1	1
02.08.2020	2831	173	2644	2	1	1
03.08.2020	2832	173	2645	2	1	1
04.08.2020	2832	173	2646	2	1	0
05.08.2020	2833	173	2647	2	1	0
06.08.2020	2833	173	2648	2	1	0
07.08.2020	2834	173	2649	2	1	0
08.08.2020	2834	173	2650	2	1	0
09.08.2020	2834	173	2650	2	1	0
10.08.2020	2835	173	2651	2	1	0
11.08.2020	2835	173	2652	2	1	0
12.08.2020	2836	173	2653	2	1	0

Table 47: Saarland - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	2819	173	2622	4	1	1
17.07.2020	2820	173	2623	4	1	1
18.07.2020	2821	173	2625	4	1	1
19.07.2020	2822	173	2626	4	1	1
20.07.2020	2823	173	2628	4	1	1
21.07.2020	2824	173	2630	3	1	1
22.07.2020	2824	173	2631	3	1	1
23.07.2020	2825	173	2632	3	1	1
24.07.2020	2826	173	2634	3	1	1
25.07.2020	2827	173	2635	3	1	1
26.07.2020	2827	173	2636	3	1	1
27.07.2020	2828	173	2638	3	1	1
28.07.2020	2829	173	2639	3	1	1
29.07.2020	2829	173	2640	3	1	1
30.07.2020	2830	173	2641	3	1	1
31.07.2020	2831	173	2642	2	1	1
01.08.2020	2831	173	2643	2	1	1
02.08.2020	2832	173	2644	2	1	1
03.08.2020	2832	173	2645	2	1	1
04.08.2020	2833	173	2646	2	1	0
05.08.2020	2833	173	2647	2	1	0
06.08.2020	2834	173	2648	2	1	0
07.08.2020	2834	173	2649	2	1	0
08.08.2020	2835	173	2650	2	1	0
09.08.2020	2835	173	2651	2	1	0
10.08.2020	2836	173	2652	2	1	0
11.08.2020	2836	173	2652	2	1	0
12.08.2020	2837	173	2653	2	1	0

Table 48: Saarland - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	2819	173	2622	4	1	1
17.07.2020	2820	173	2623	4	1	1
18.07.2020	2821	173	2625	4	1	1
19.07.2020	2822	173	2626	4	1	1
20.07.2020	2823	173	2628	4	1	1
21.07.2020	2824	173	2630	3	1	1
22.07.2020	2825	173	2631	3	1	1
23.07.2020	2826	173	2632	3	1	1
24.07.2020	2827	173	2634	3	1	1
25.07.2020	2828	173	2635	3	1	1
26.07.2020	2829	173	2637	3	1	1
27.07.2020	2830	173	2638	3	1	1
28.07.2020	2831	173	2639	3	1	1
29.07.2020	2832	173	2640	3	1	1
30.07.2020	2833	173	2642	3	1	1
31.07.2020	2834	173	2643	3	1	1
01.08.2020	2835	173	2644	2	1	1
02.08.2020	2836	173	2645	2	1	1
03.08.2020	2836	173	2646	2	1	1
04.08.2020	2837	173	2648	2	1	1
05.08.2020	2838	173	2649	2	1	1
06.08.2020	2839	173	2650	2	1	1
07.08.2020	2840	173	2651	2	1	0
08.08.2020	2841	173	2652	2	1	0
09.08.2020	2842	173	2653	2	1	0
10.08.2020	2843	173	2654	2	1	0
11.08.2020	2844	173	2655	2	1	0
12.08.2020	2845	174	2656	2	1	0

Table 49: Saarland - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	2819	173	2622	4	1	1
17.07.2020	2820	173	2623	4	1	1
18.07.2020	2821	173	2625	4	1	1
19.07.2020	2822	173	2626	4	1	1
20.07.2020	2824	173	2628	4	1	1
21.07.2020	2825	173	2630	3	1	1
22.07.2020	2826	173	2631	3	1	1
23.07.2020	2827	173	2633	3	1	1
24.07.2020	2828	173	2634	3	1	1
25.07.2020	2829	173	2635	3	1	1
26.07.2020	2831	173	2637	3	1	1
27.07.2020	2832	173	2638	3	1	1
28.07.2020	2833	173	2640	3	1	1
29.07.2020	2835	173	2641	3	1	1
30.07.2020	2836	173	2642	3	1	1
31.07.2020	2838	173	2644	3	1	1
01.08.2020	2839	173	2645	3	1	1
02.08.2020	2841	173	2646	3	1	1
03.08.2020	2842	173	2648	3	1	1
04.08.2020	2844	173	2649	3	1	1
05.08.2020	2846	173	2650	3	1	1
06.08.2020	2847	173	2652	3	1	1
07.08.2020	2849	173	2653	3	1	1
08.08.2020	2851	173	2655	2	1	1
09.08.2020	2853	174	2656	2	1	1
10.08.2020	2855	174	2658	2	1	1
11.08.2020	2857	174	2659	2	1	1
12.08.2020	2859	174	2661	2	1	1

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 142 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

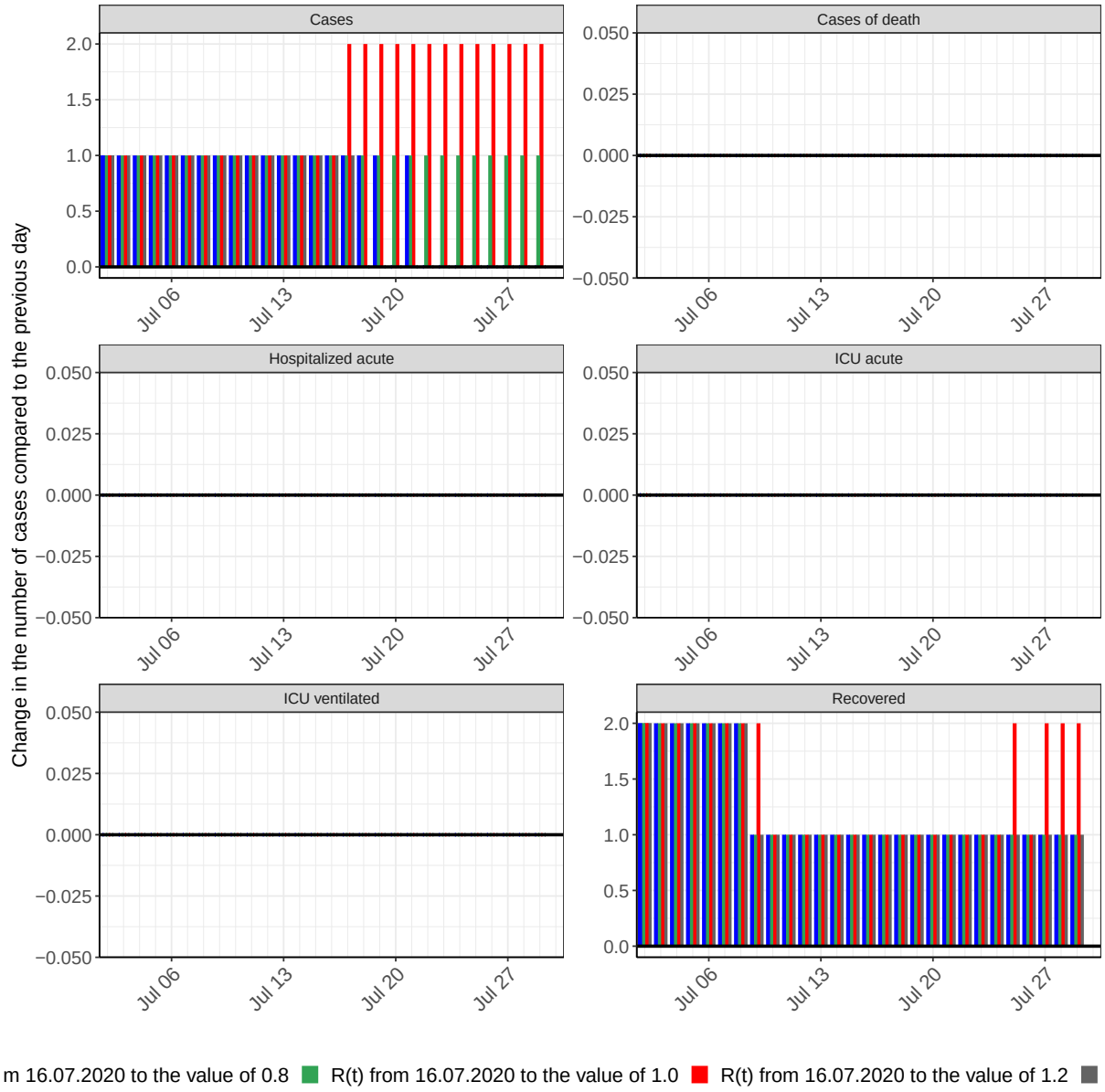


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

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.

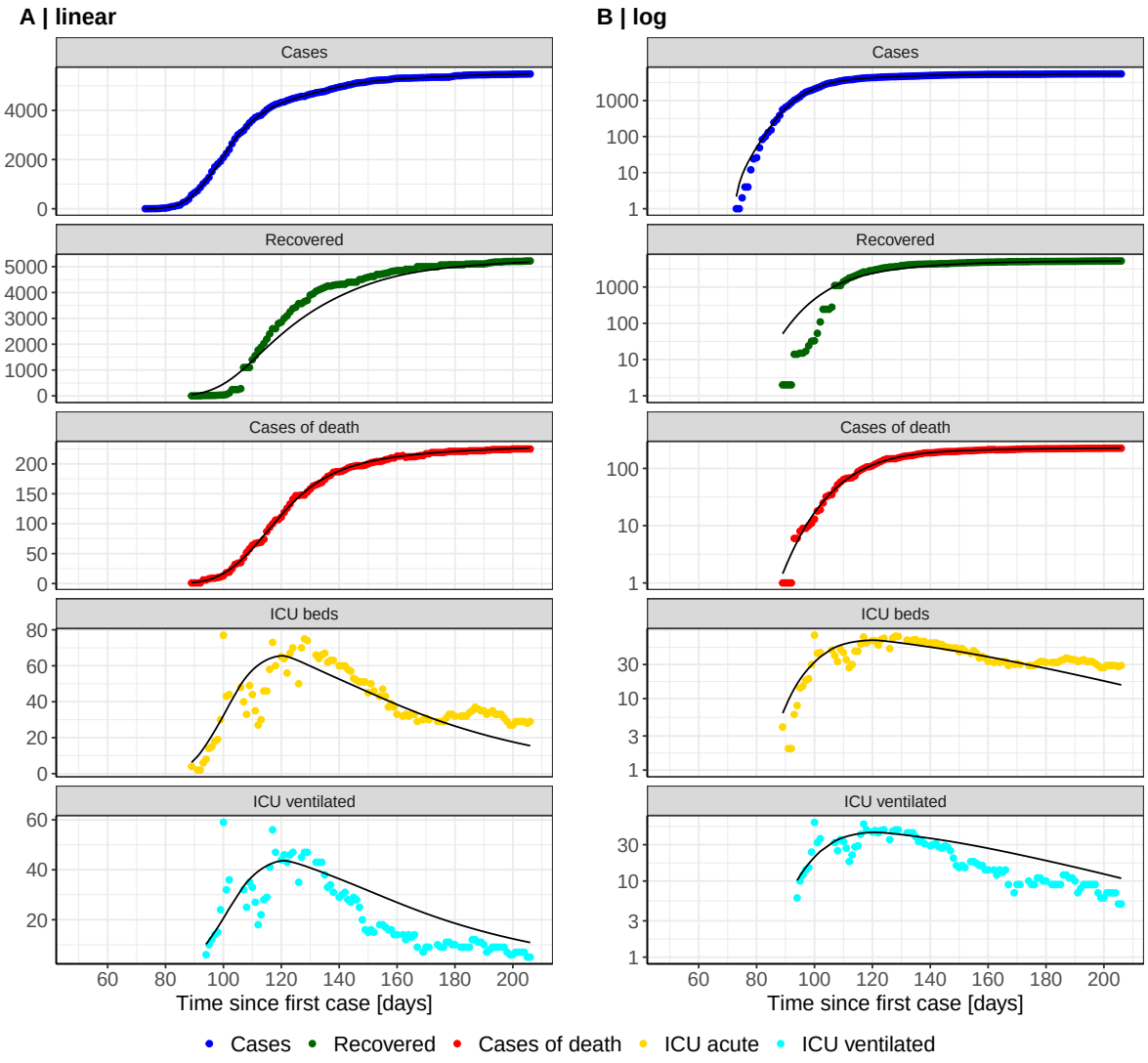


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

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.

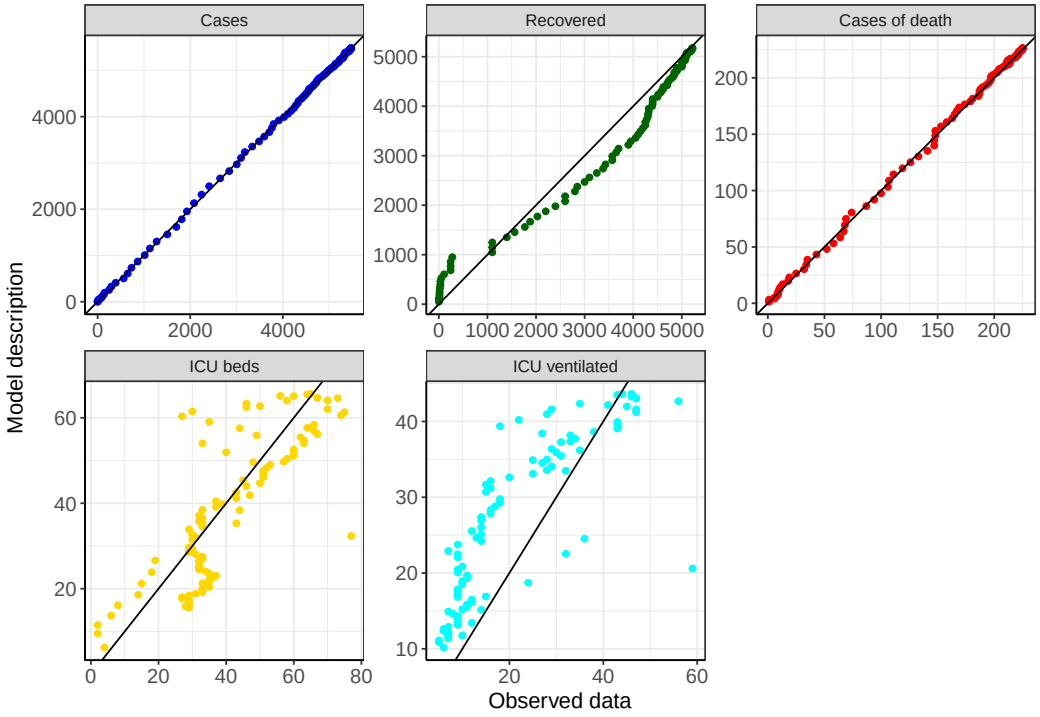


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

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).

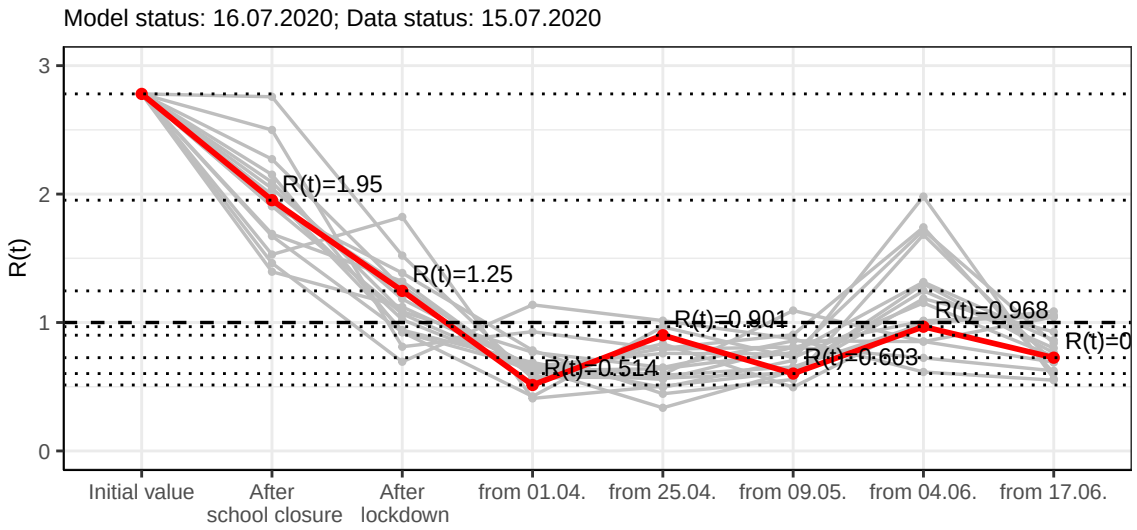


Figure 145: R(t) values before and after the NPIs for Saxony

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

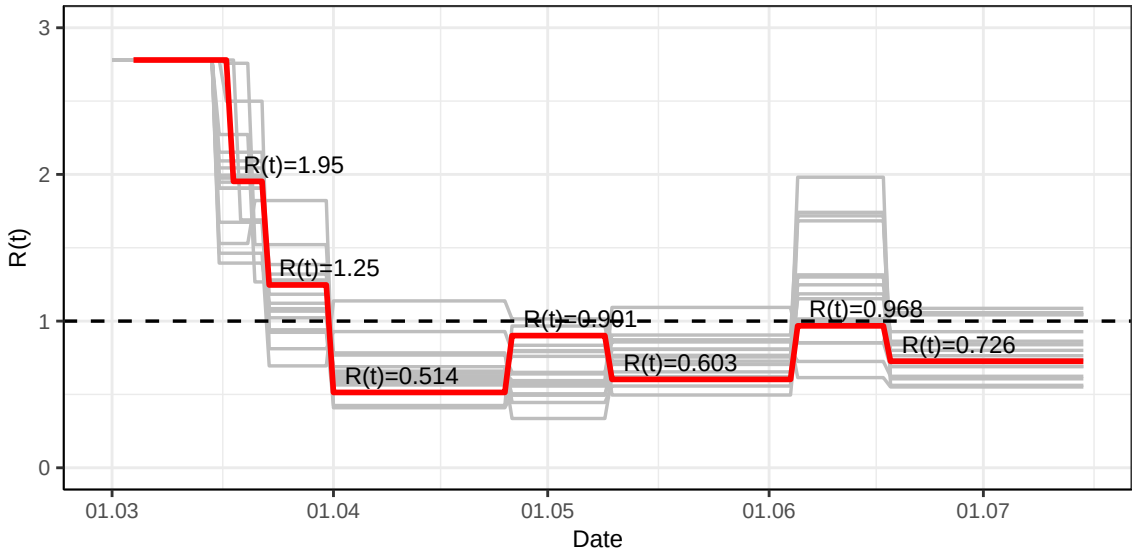


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

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

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.

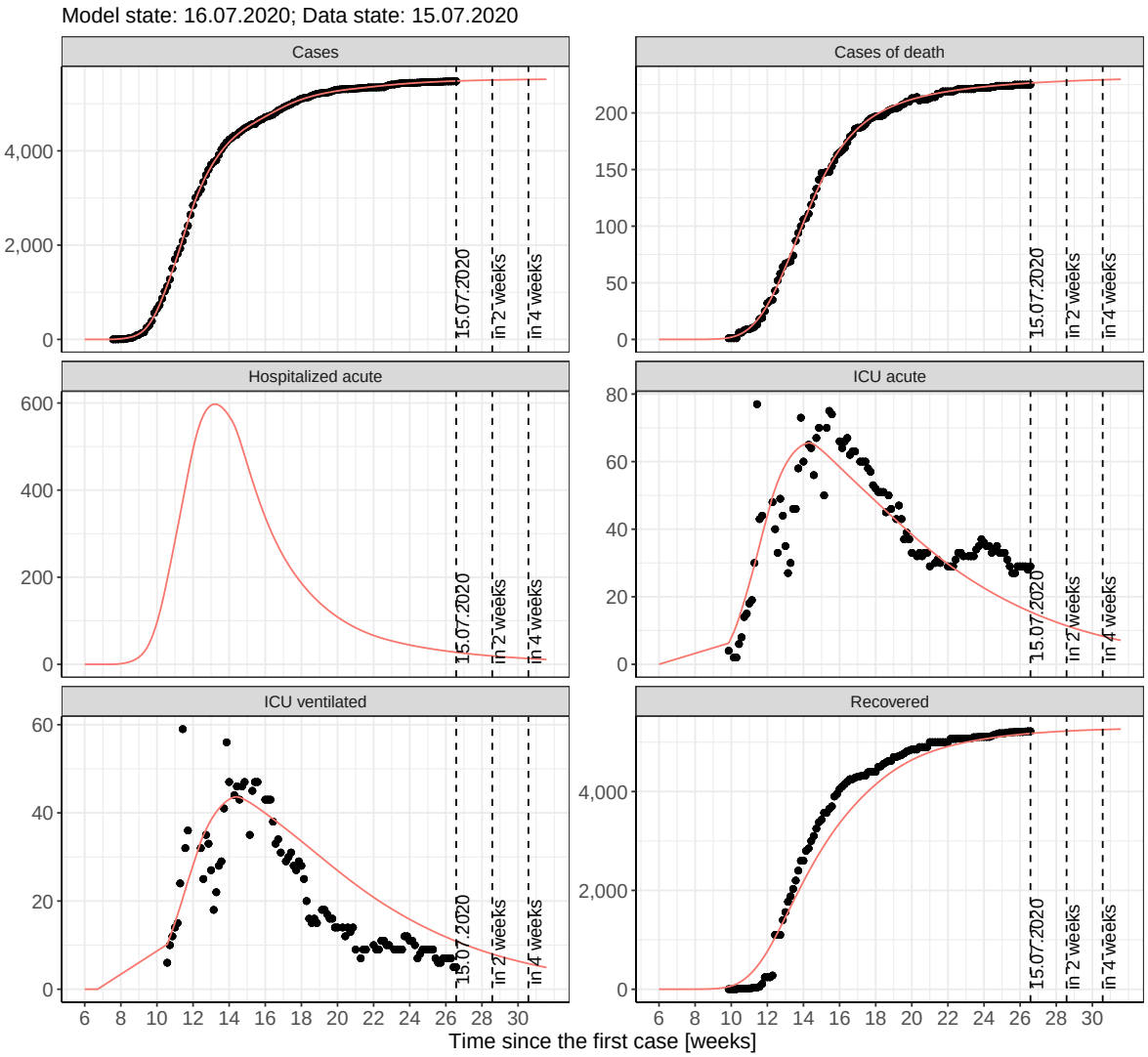


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

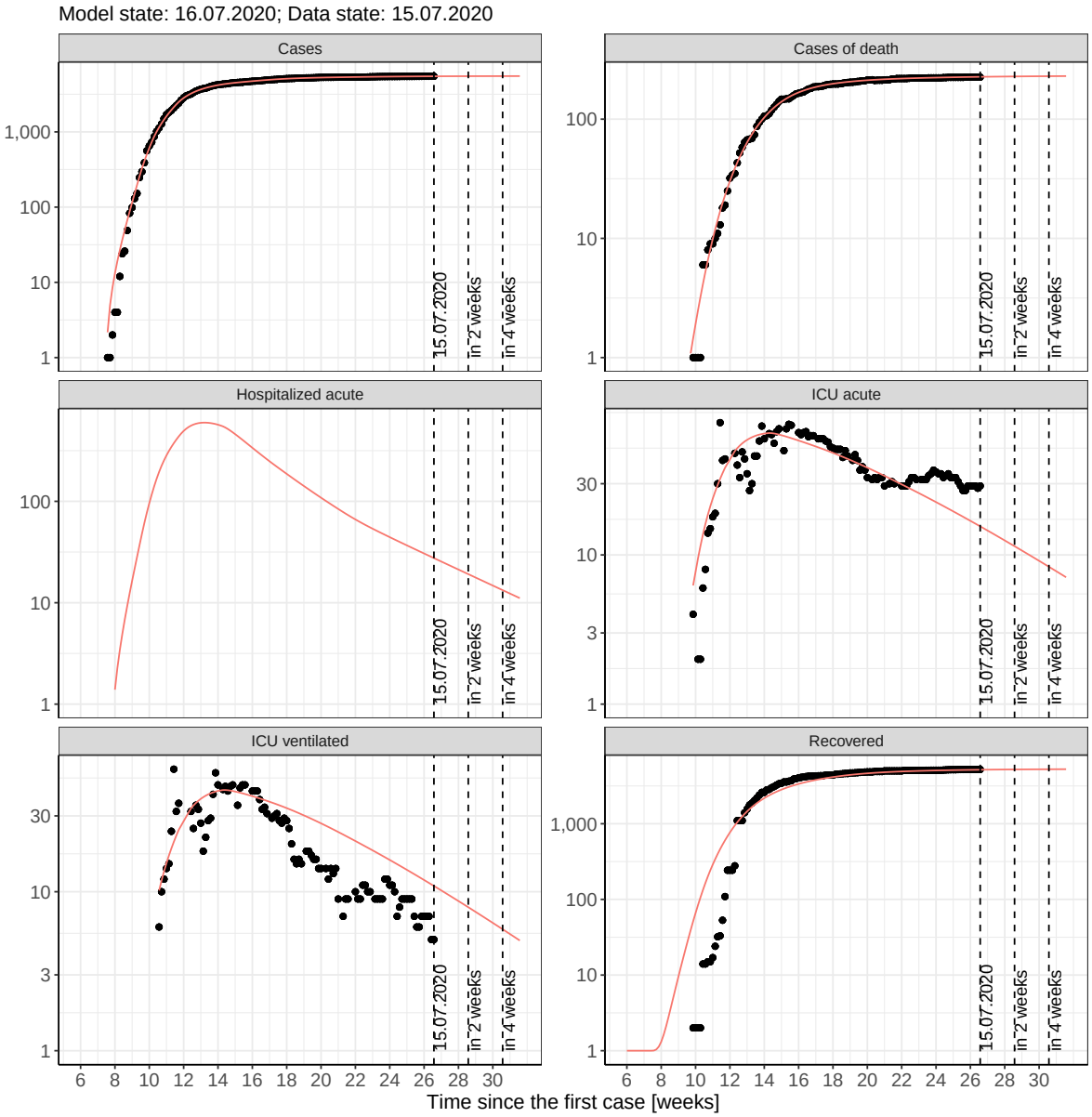


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

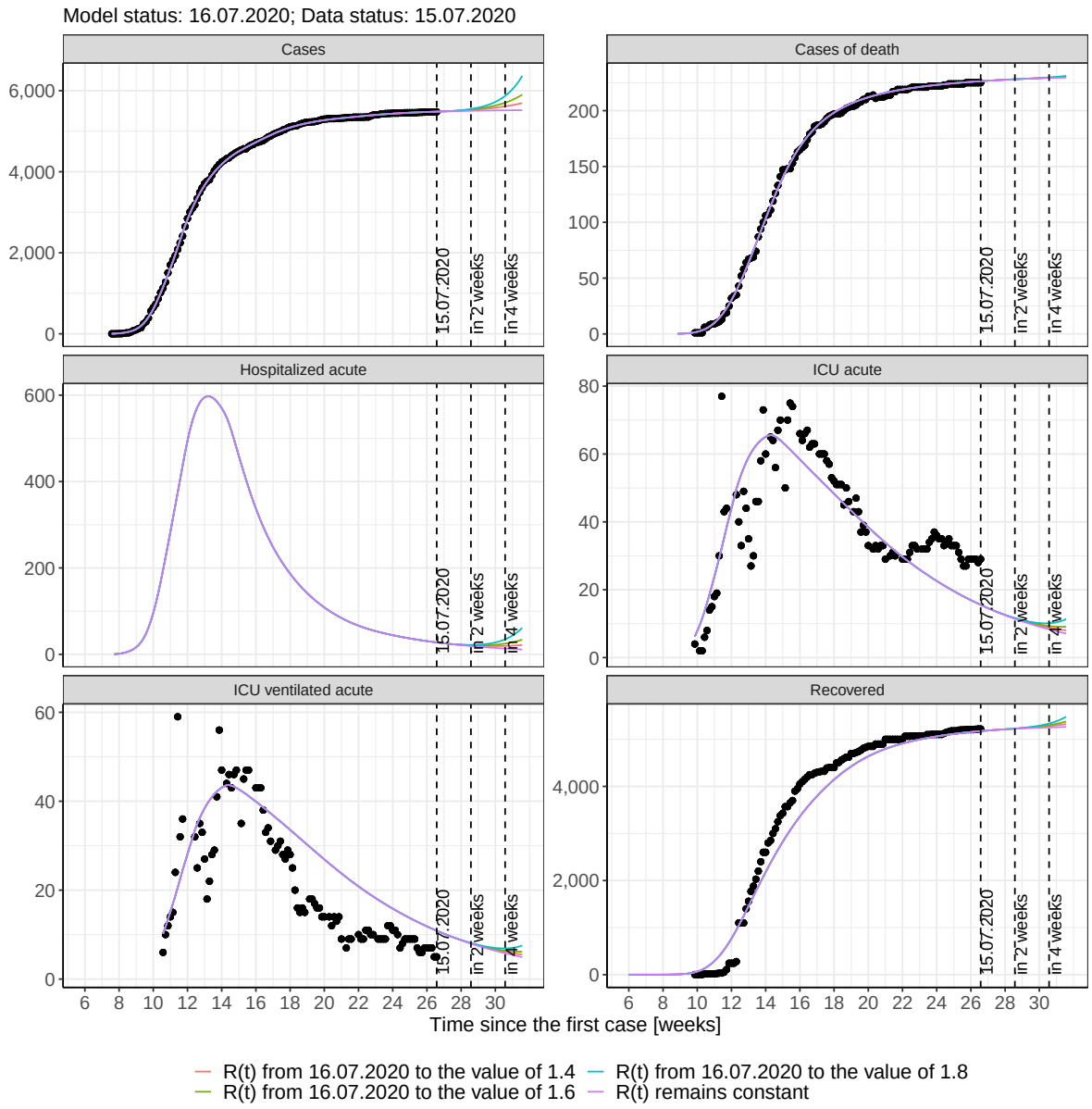


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

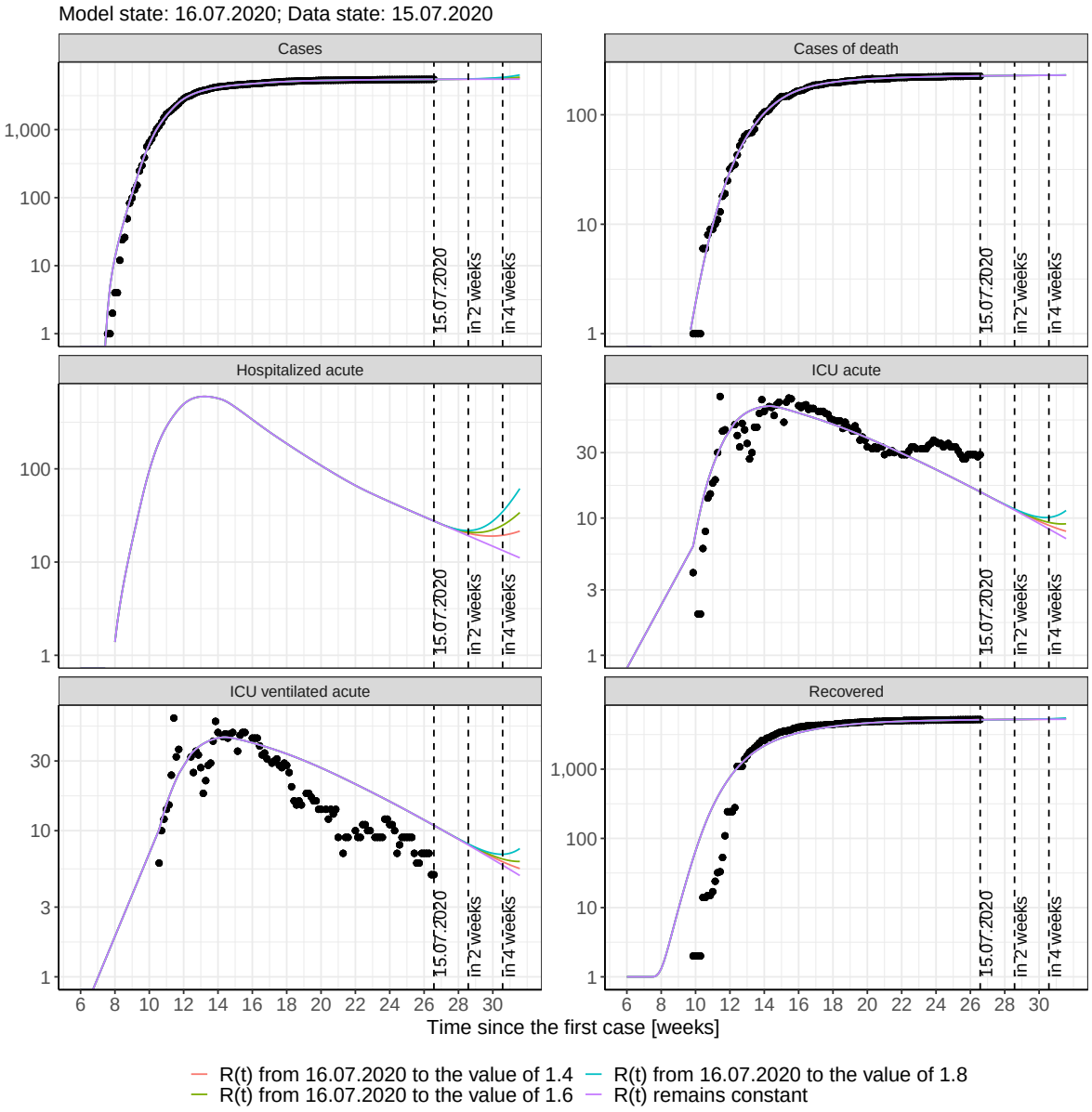


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

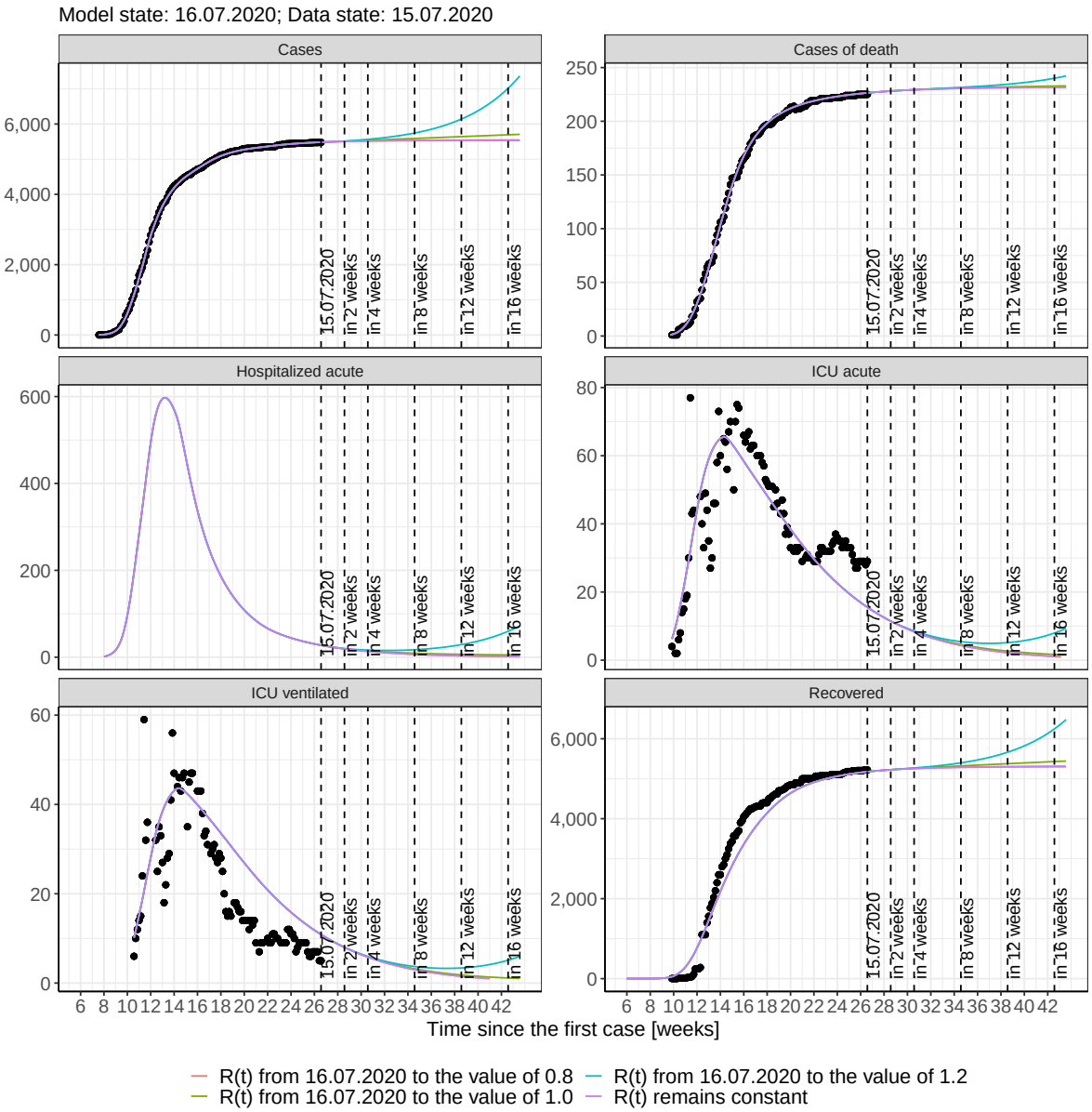


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

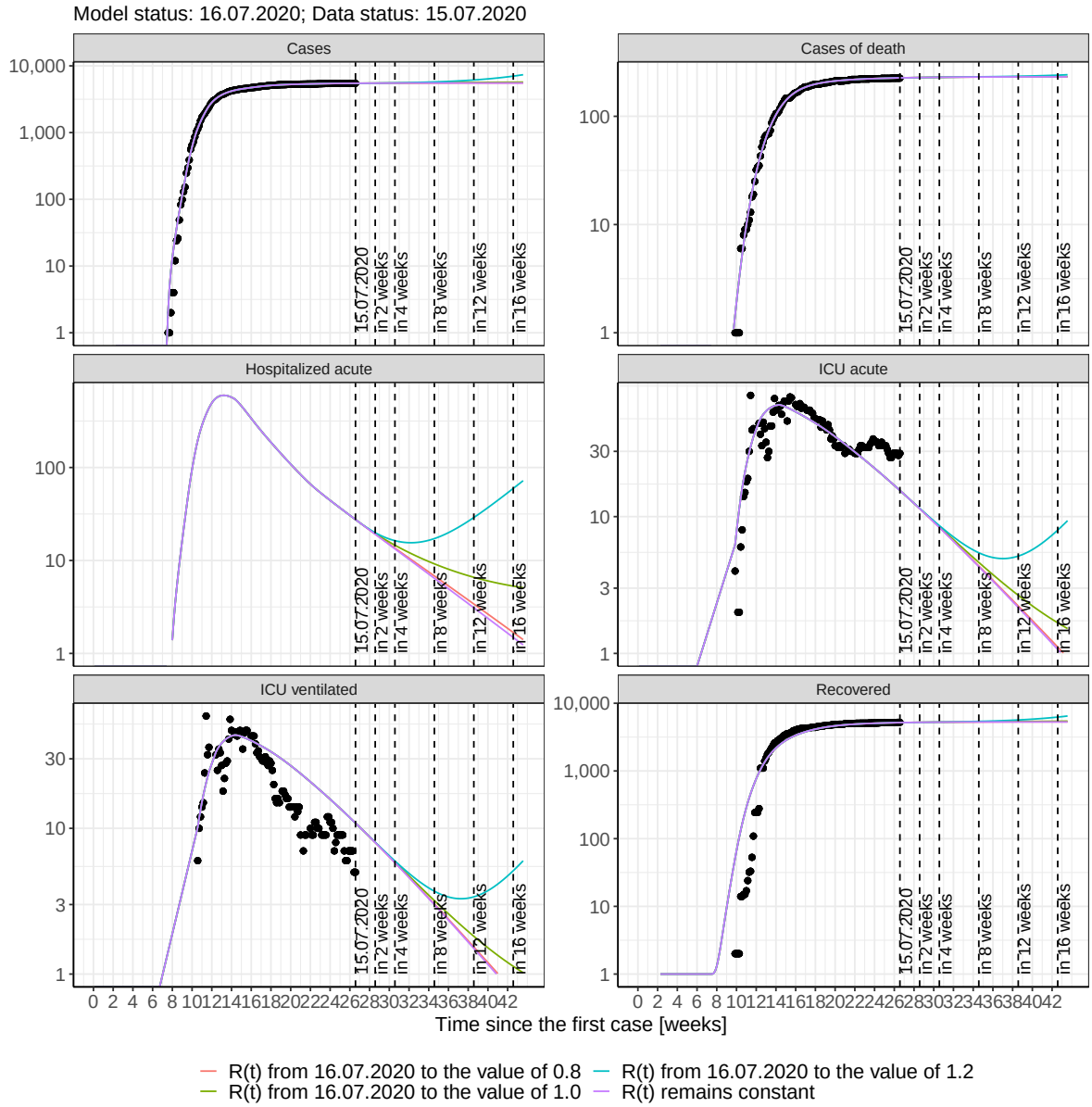


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 53) Model status from 16.07.2020; Data status: 15.07.2020.

Table 50: Saxony - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5485	227	5179	27	15	11
17.07.2020	5486	227	5183	26	15	10
18.07.2020	5488	227	5188	25	15	10
19.07.2020	5490	227	5191	25	14	10
20.07.2020	5491	227	5195	24	14	10
21.07.2020	5493	227	5199	24	14	10
22.07.2020	5494	227	5202	23	13	9
23.07.2020	5496	227	5206	22	13	9
24.07.2020	5497	228	5209	22	13	9
25.07.2020	5498	228	5212	21	12	9
26.07.2020	5500	228	5215	21	12	9
27.07.2020	5501	228	5218	20	12	8
28.07.2020	5502	228	5221	20	12	8
29.07.2020	5503	228	5224	19	11	8
30.07.2020	5504	228	5226	19	11	8
31.07.2020	5505	228	5229	18	11	8
01.08.2020	5506	228	5232	18	11	7
02.08.2020	5507	228	5234	17	10	7
03.08.2020	5508	229	5236	17	10	7
04.08.2020	5509	229	5238	16	10	7
05.08.2020	5510	229	5240	16	10	7
06.08.2020	5511	229	5242	16	10	7
07.08.2020	5512	229	5244	15	9	7
08.08.2020	5512	229	5246	15	9	6
09.08.2020	5513	229	5248	14	9	6
10.08.2020	5514	229	5250	14	9	6
11.08.2020	5514	229	5252	14	9	6
12.08.2020	5515	229	5253	13	8	6

Table 51: Saxony - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5485	227	5179	27	15	11
17.07.2020	5486	227	5183	26	15	10
18.07.2020	5488	227	5188	25	15	10
19.07.2020	5490	227	5191	25	14	10
20.07.2020	5492	227	5195	24	14	10
21.07.2020	5493	227	5199	24	14	10
22.07.2020	5495	227	5202	23	13	9
23.07.2020	5496	227	5206	22	13	9
24.07.2020	5498	228	5209	22	13	9
25.07.2020	5499	228	5212	21	13	9
26.07.2020	5501	228	5215	21	12	9
27.07.2020	5502	228	5218	20	12	8
28.07.2020	5503	228	5221	20	12	8
29.07.2020	5505	228	5224	19	11	8
30.07.2020	5506	228	5227	19	11	8
31.07.2020	5507	228	5229	18	11	8
01.08.2020	5508	228	5232	18	11	7
02.08.2020	5509	228	5234	17	10	7
03.08.2020	5511	229	5237	17	10	7
04.08.2020	5512	229	5239	17	10	7
05.08.2020	5513	229	5241	16	10	7
06.08.2020	5514	229	5243	16	10	7
07.08.2020	5515	229	5246	15	9	7
08.08.2020	5516	229	5248	15	9	6
09.08.2020	5517	229	5250	15	9	6
10.08.2020	5518	229	5251	14	9	6
11.08.2020	5518	229	5253	14	9	6
12.08.2020	5519	229	5255	14	8	6

Table 52: Saxony - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5485	227	5179	27	15	11
17.07.2020	5487	227	5183	26	15	10
18.07.2020	5488	227	5188	25	15	10
19.07.2020	5490	227	5191	25	14	10
20.07.2020	5492	227	5195	24	14	10
21.07.2020	5494	227	5199	24	14	10
22.07.2020	5496	227	5202	23	13	9
23.07.2020	5498	227	5206	22	13	9
24.07.2020	5500	228	5209	22	13	9
25.07.2020	5502	228	5213	21	13	9
26.07.2020	5504	228	5216	21	12	9
27.07.2020	5506	228	5219	20	12	8
28.07.2020	5507	228	5222	20	12	8
29.07.2020	5509	228	5225	20	11	8
30.07.2020	5511	228	5228	19	11	8
31.07.2020	5513	228	5230	19	11	8
01.08.2020	5515	228	5233	18	11	7
02.08.2020	5517	228	5236	18	11	7
03.08.2020	5519	229	5239	18	10	7
04.08.2020	5521	229	5241	17	10	7
05.08.2020	5523	229	5244	17	10	7
06.08.2020	5524	229	5246	16	10	7
07.08.2020	5526	229	5249	16	9	7
08.08.2020	5528	229	5251	16	9	6
09.08.2020	5530	229	5254	15	9	6
10.08.2020	5532	229	5256	15	9	6
11.08.2020	5534	229	5258	15	9	6
12.08.2020	5536	229	5261	15	8	6

Table 53: Saxony - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	5485	227	5179	27	15	11
17.07.2020	5487	227	5183	26	15	10
18.07.2020	5489	227	5188	26	15	10
19.07.2020	5491	227	5191	25	14	10
20.07.2020	5493	227	5195	24	14	10
21.07.2020	5495	227	5199	24	14	10
22.07.2020	5498	227	5203	23	13	9
23.07.2020	5500	227	5206	23	13	9
24.07.2020	5502	228	5210	22	13	9
25.07.2020	5505	228	5213	22	13	9
26.07.2020	5507	228	5216	21	12	9
27.07.2020	5510	228	5219	21	12	8
28.07.2020	5513	228	5222	20	12	8
29.07.2020	5515	228	5226	20	11	8
30.07.2020	5518	228	5229	20	11	8
31.07.2020	5521	228	5232	19	11	8
01.08.2020	5524	228	5235	19	11	8
02.08.2020	5527	229	5238	19	11	7
03.08.2020	5531	229	5241	18	10	7
04.08.2020	5534	229	5244	18	10	7
05.08.2020	5537	229	5247	18	10	7
06.08.2020	5541	229	5250	17	10	7
07.08.2020	5544	229	5253	17	10	7
08.08.2020	5548	229	5256	17	9	6
09.08.2020	5552	229	5260	17	9	6
10.08.2020	5556	229	5263	17	9	6
11.08.2020	5560	229	5266	16	9	6
12.08.2020	5564	229	5269	16	9	6

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 153 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

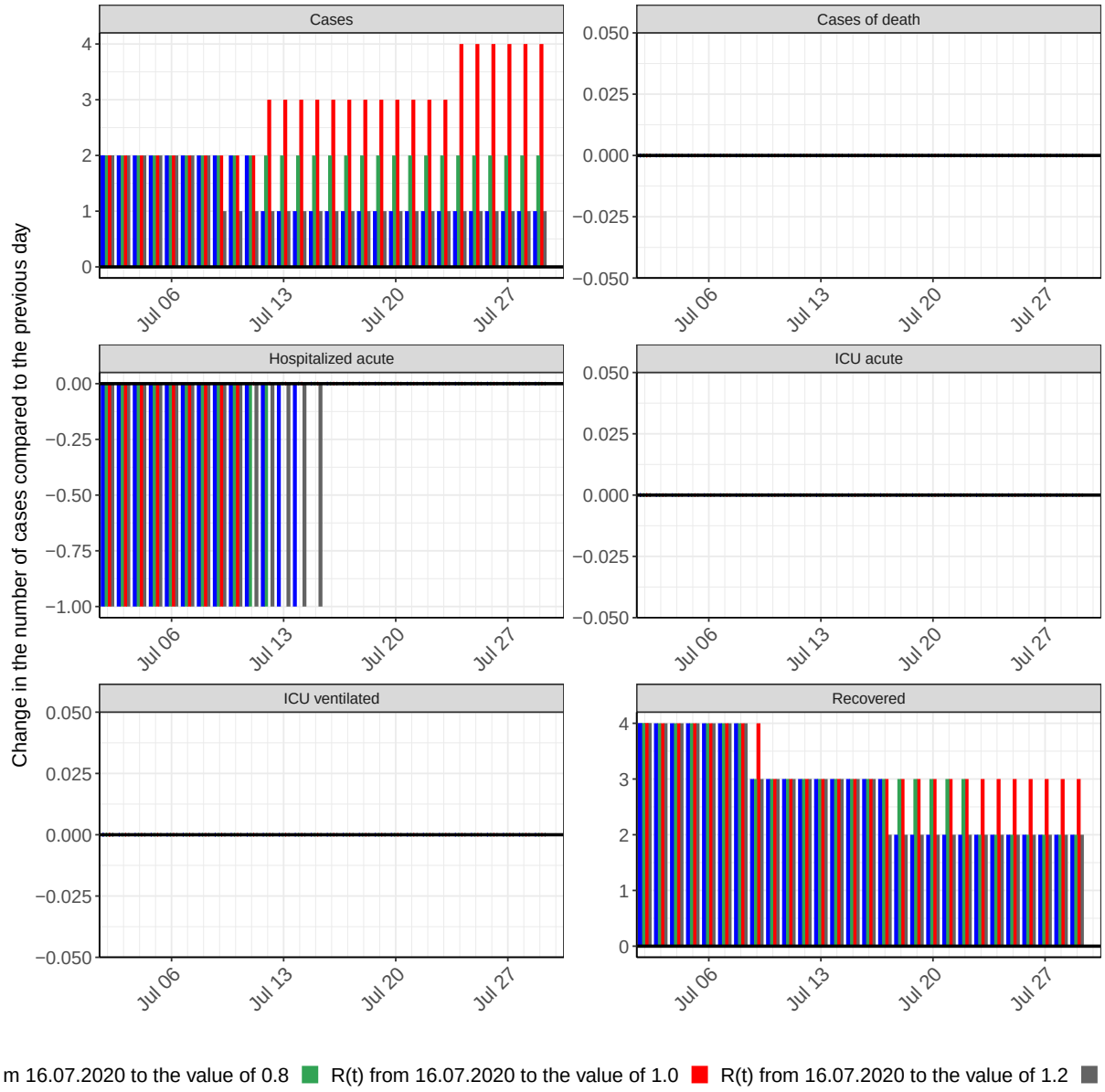


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

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.

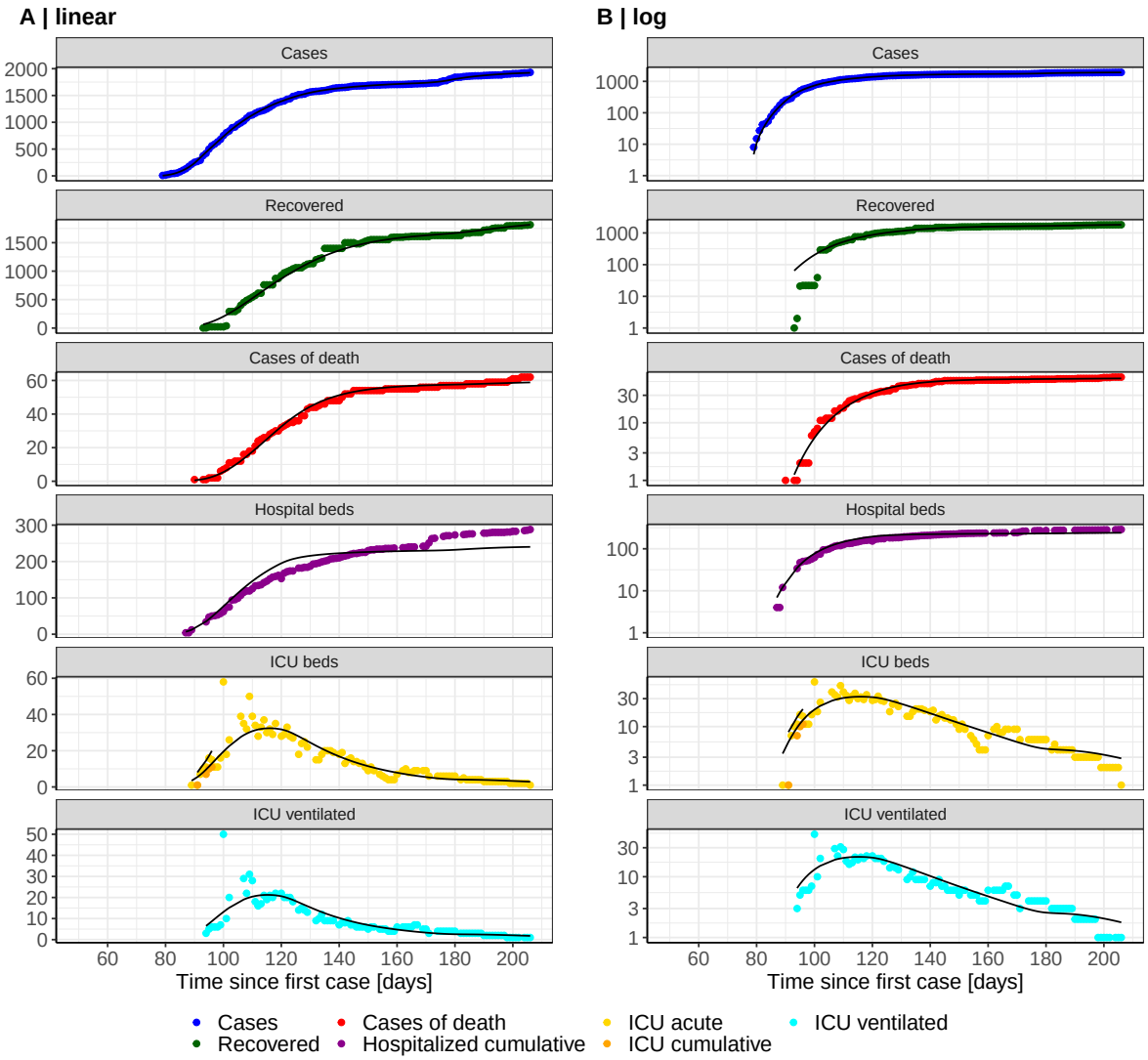


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

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.

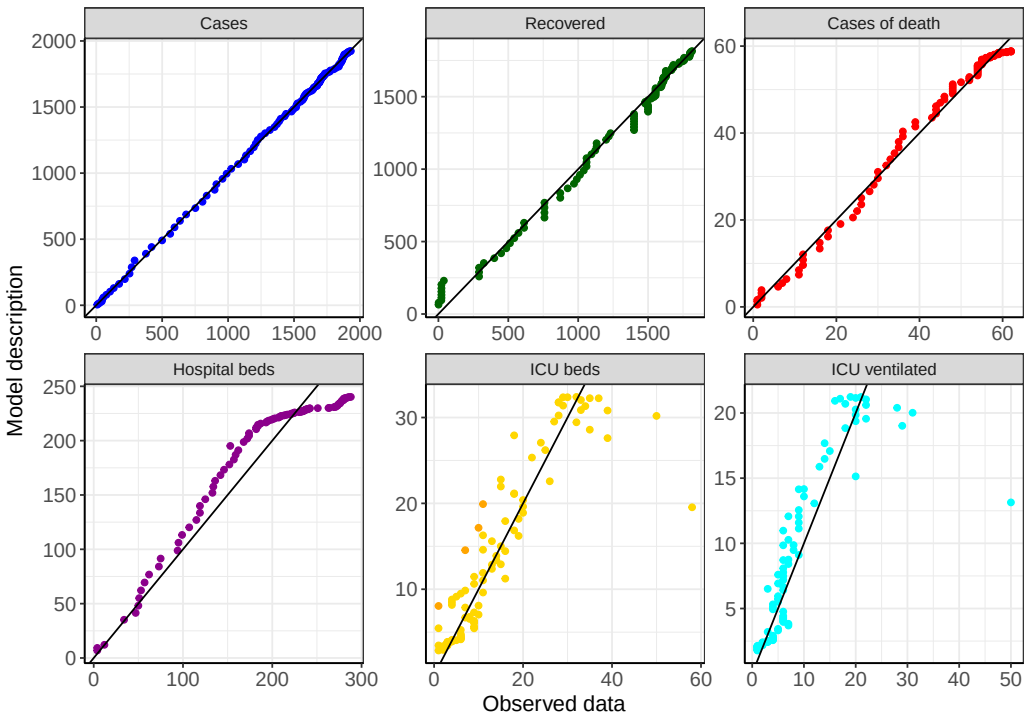


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

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).

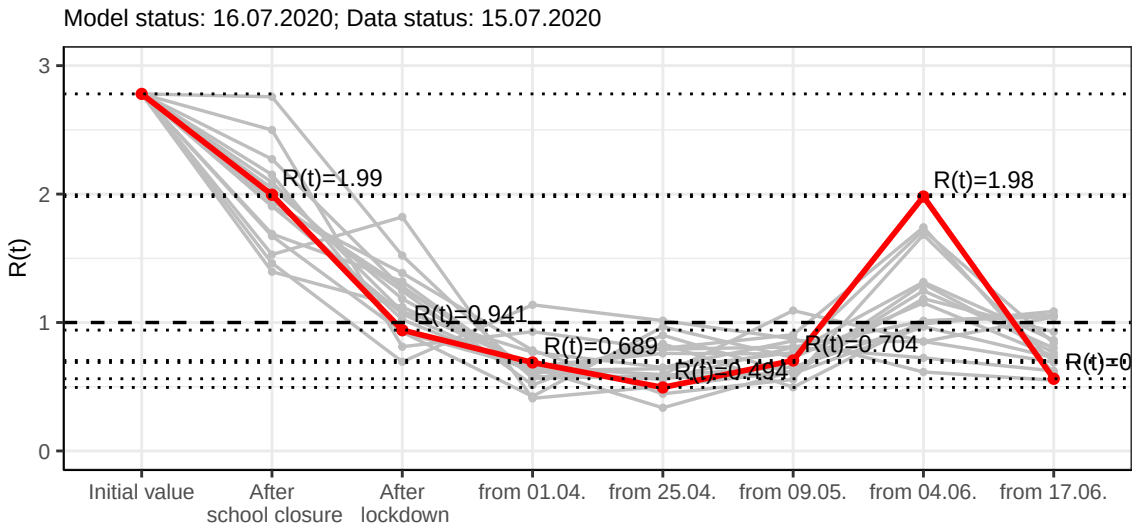


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

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

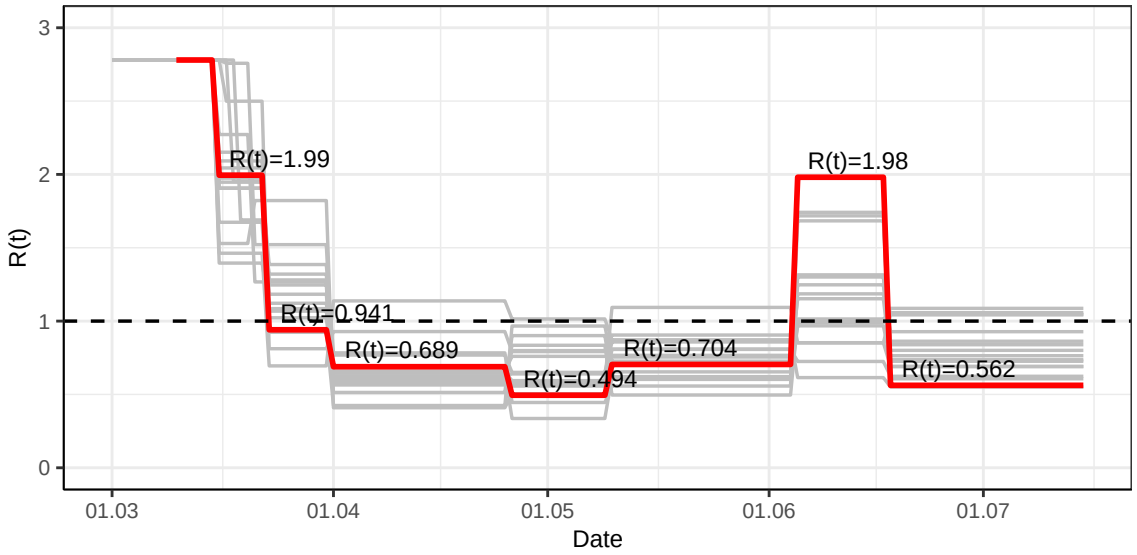


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.56)

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.

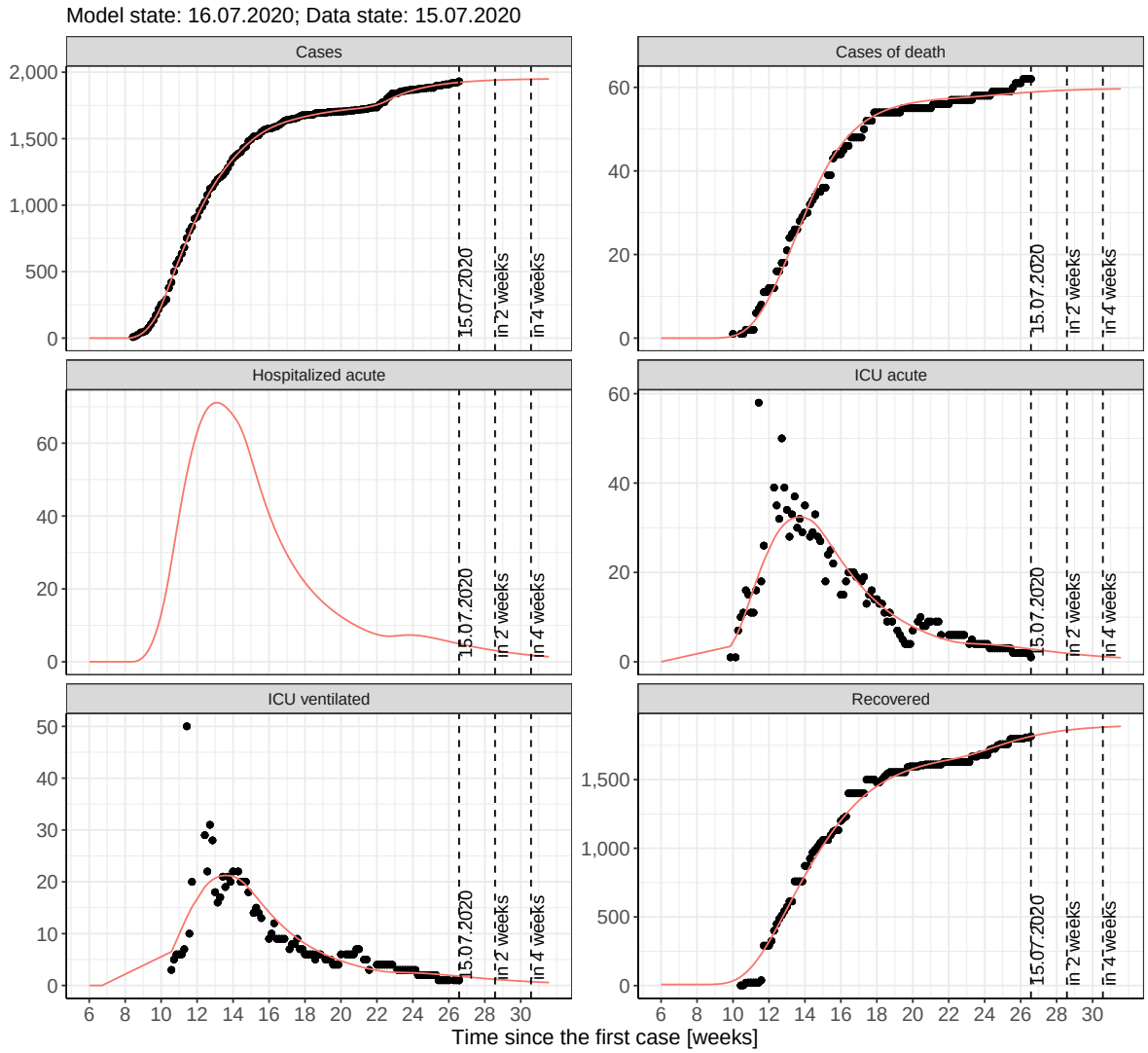


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

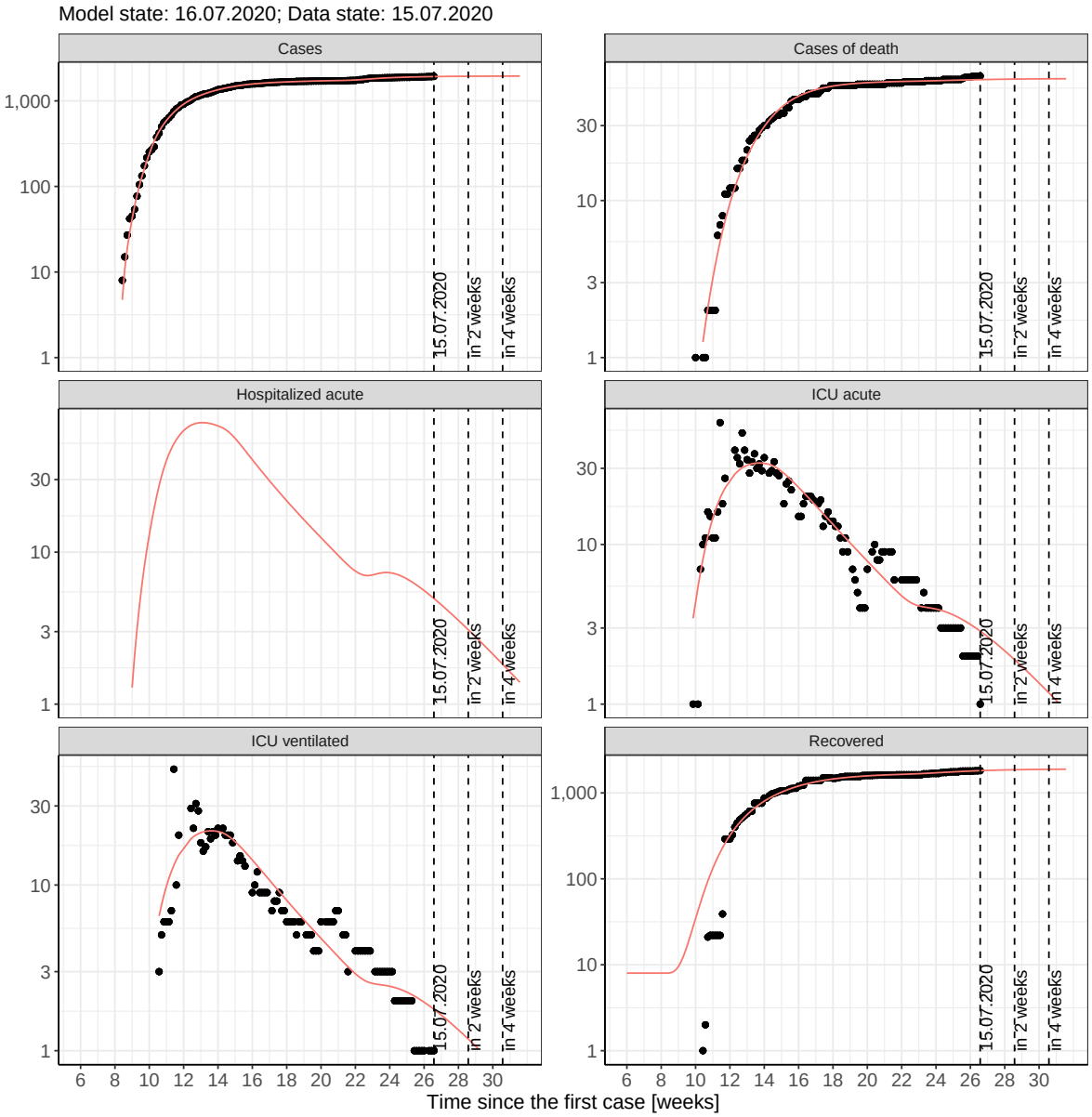


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

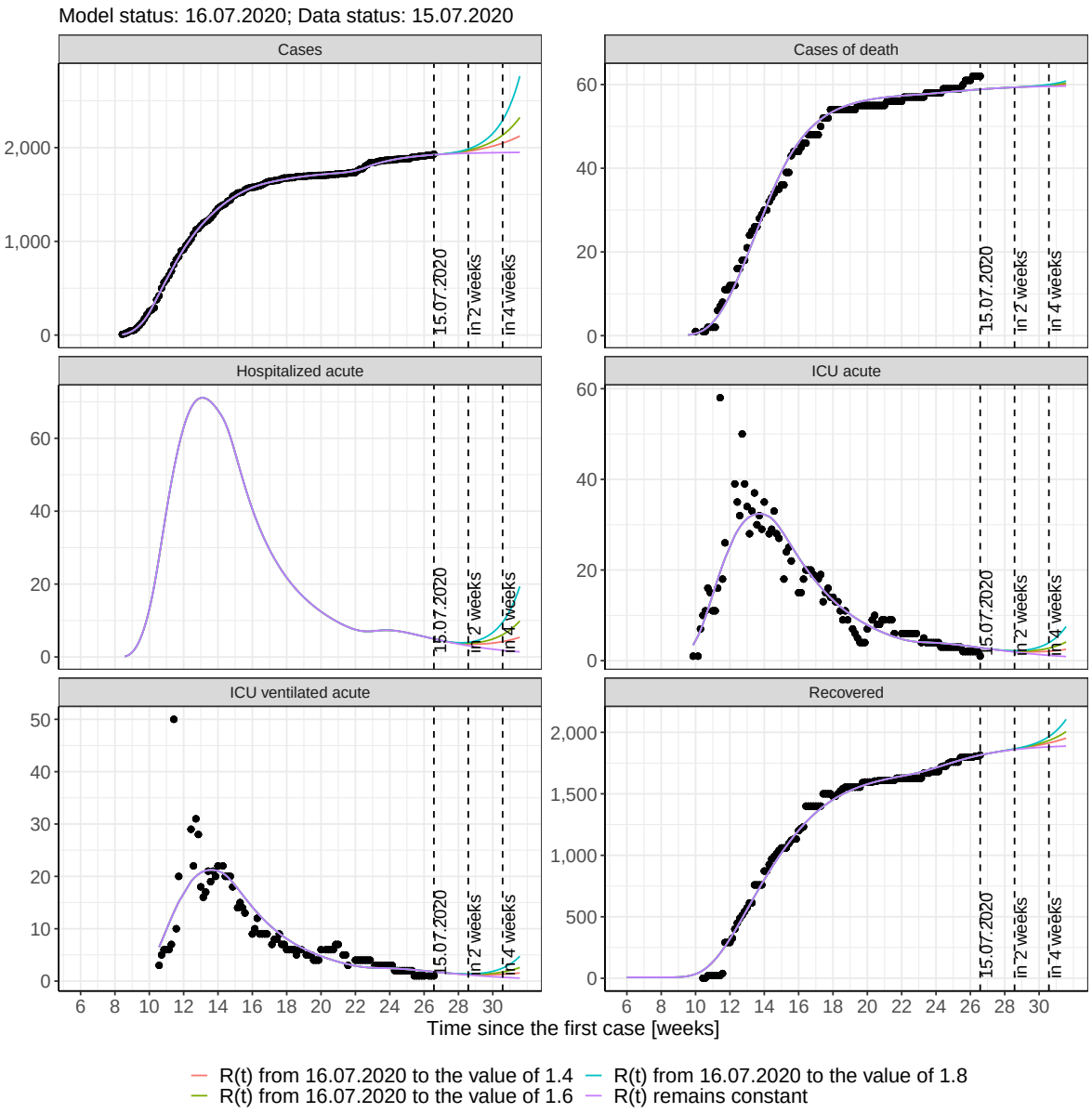


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

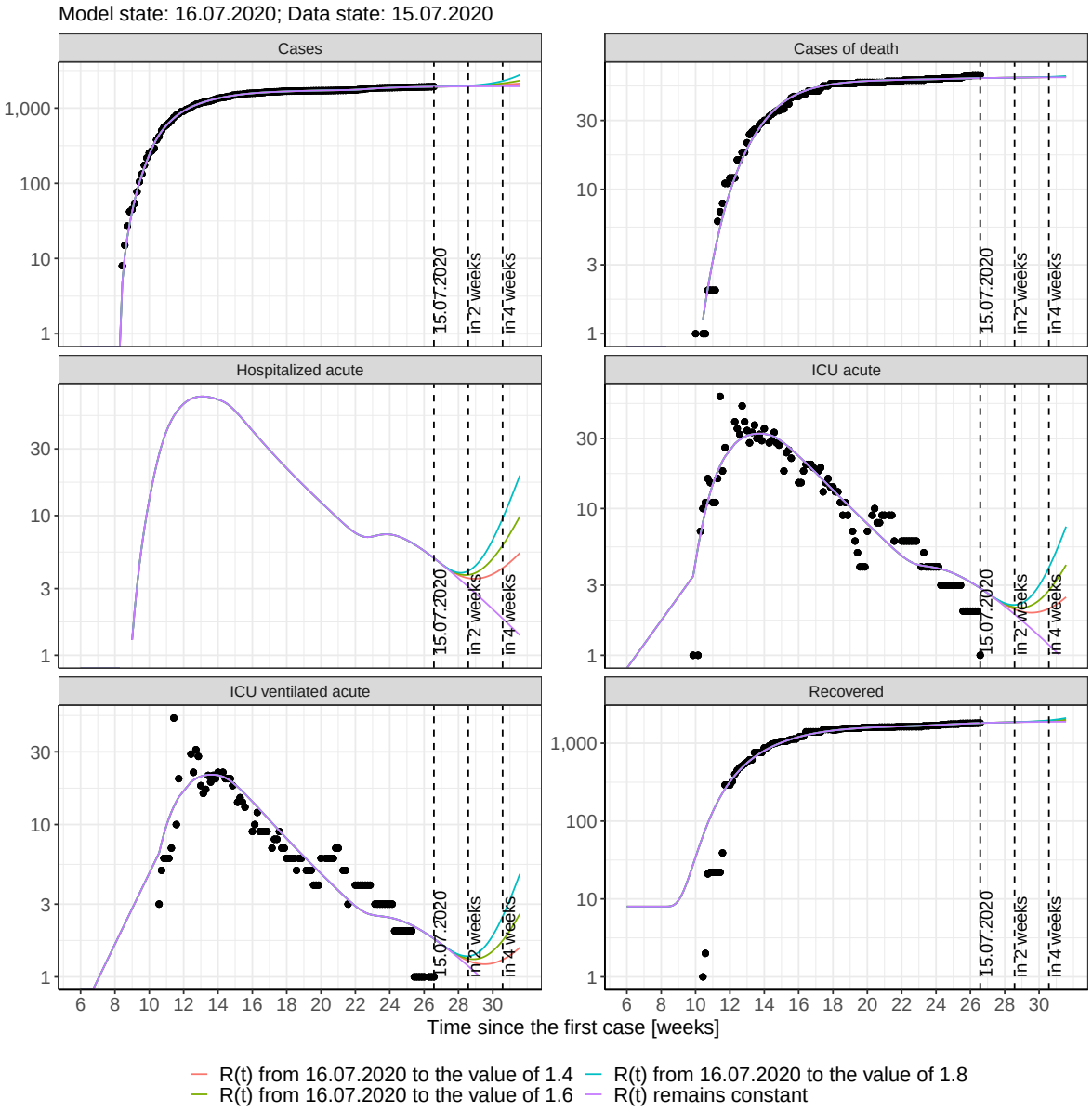


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

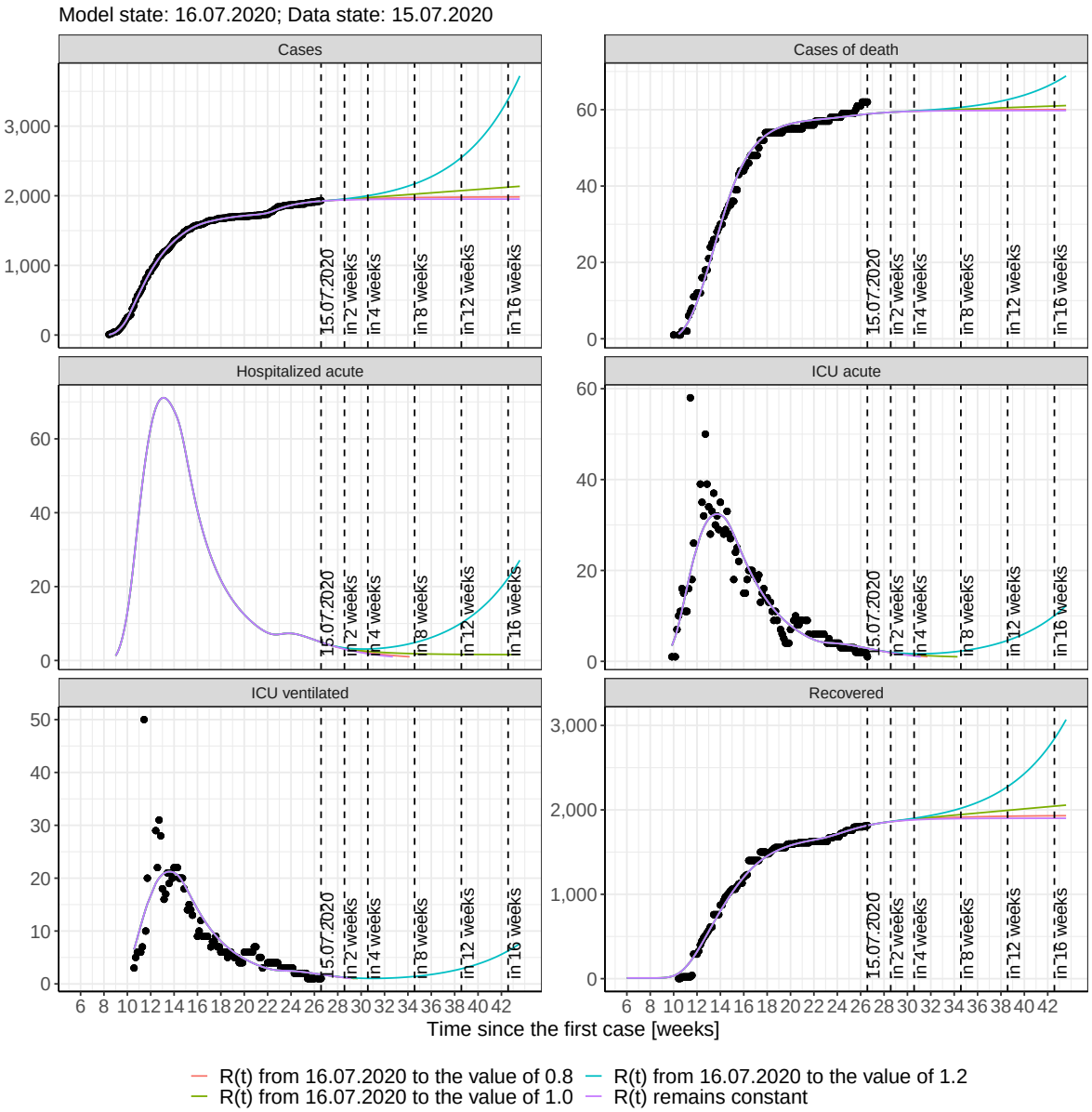


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

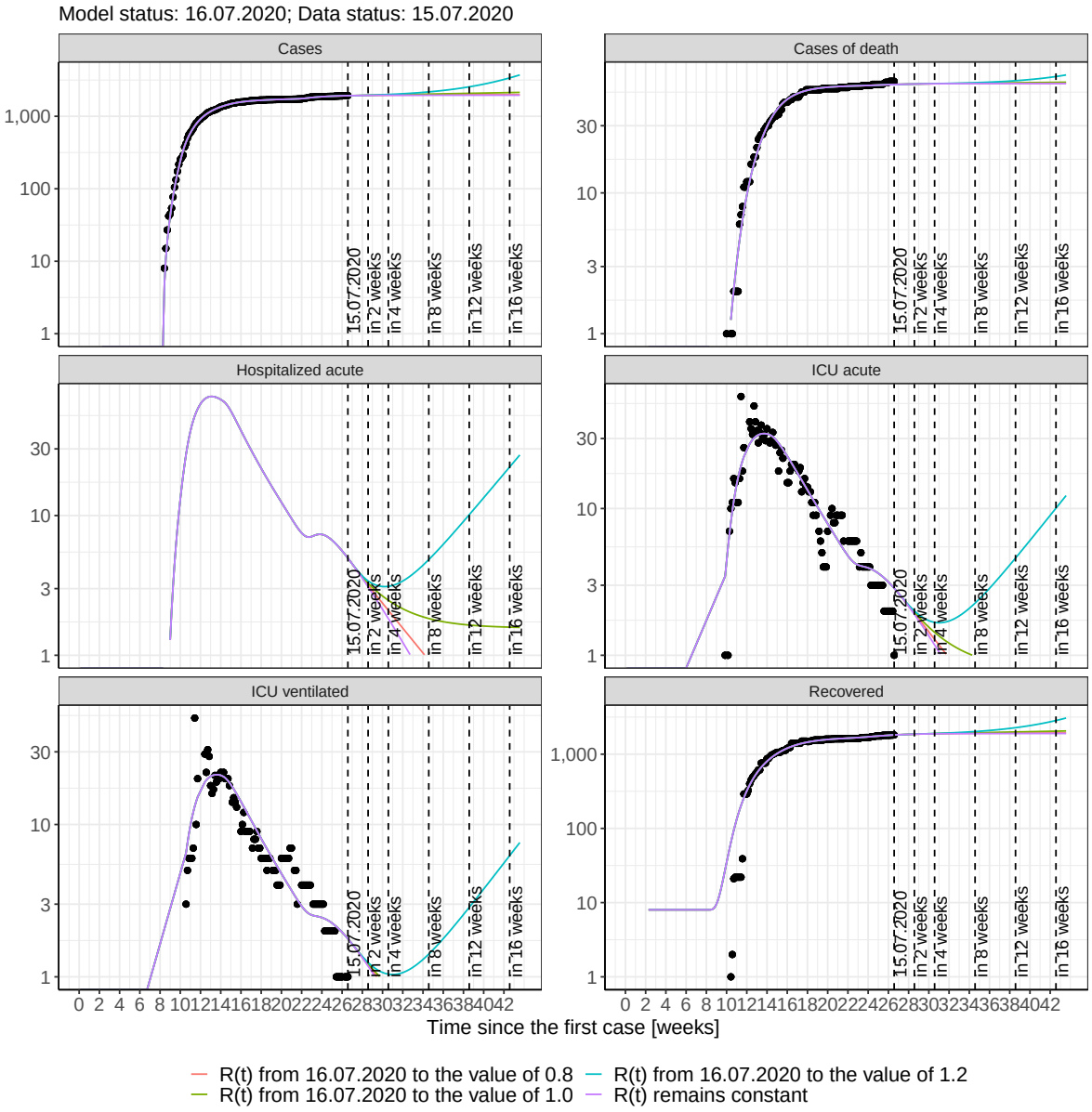


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 57) Model status from 16.07.2020; Data status: 15.07.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1925	59	1819	5	3	2
17.07.2020	1927	59	1823	5	3	2
18.07.2020	1928	59	1827	5	3	2
19.07.2020	1930	59	1831	4	3	2
20.07.2020	1931	59	1834	4	3	2
21.07.2020	1932	59	1838	4	2	2
22.07.2020	1934	59	1841	4	2	1
23.07.2020	1935	59	1844	4	2	1
24.07.2020	1936	59	1847	4	2	1
25.07.2020	1937	59	1850	4	2	1
26.07.2020	1938	59	1853	3	2	1
27.07.2020	1939	59	1855	3	2	1
28.07.2020	1939	59	1858	3	2	1
29.07.2020	1940	59	1860	3	2	1
30.07.2020	1941	59	1862	3	2	1
31.07.2020	1942	59	1864	3	2	1
01.08.2020	1942	59	1866	3	2	1
02.08.2020	1943	59	1868	3	2	1
03.08.2020	1943	59	1870	3	2	1
04.08.2020	1944	59	1871	2	2	1
05.08.2020	1944	59	1873	2	2	1
06.08.2020	1945	59	1874	2	1	1
07.08.2020	1945	60	1876	2	1	1
08.08.2020	1946	60	1877	2	1	1
09.08.2020	1946	60	1878	2	1	1
10.08.2020	1946	60	1880	2	1	1
11.08.2020	1947	60	1881	2	1	1
12.08.2020	1947	60	1882	2	1	1

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1925	59	1819	5	3	2
17.07.2020	1927	59	1823	5	3	2
18.07.2020	1929	59	1827	5	3	2
19.07.2020	1930	59	1831	4	3	2
20.07.2020	1932	59	1834	4	3	2
21.07.2020	1933	59	1838	4	2	2
22.07.2020	1935	59	1841	4	2	1
23.07.2020	1936	59	1844	4	2	1
24.07.2020	1938	59	1847	4	2	1
25.07.2020	1939	59	1850	4	2	1
26.07.2020	1940	59	1853	3	2	1
27.07.2020	1942	59	1856	3	2	1
28.07.2020	1943	59	1858	3	2	1
29.07.2020	1944	59	1860	3	2	1
30.07.2020	1945	59	1863	3	2	1
31.07.2020	1946	59	1865	3	2	1
01.08.2020	1948	59	1867	3	2	1
02.08.2020	1949	59	1869	3	2	1
03.08.2020	1950	59	1871	3	2	1
04.08.2020	1951	59	1873	3	2	1
05.08.2020	1952	59	1875	3	2	1
06.08.2020	1953	59	1877	3	2	1
07.08.2020	1954	60	1879	2	1	1
08.08.2020	1955	60	1880	2	1	1
09.08.2020	1956	60	1882	2	1	1
10.08.2020	1956	60	1884	2	1	1
11.08.2020	1957	60	1885	2	1	1
12.08.2020	1958	60	1886	2	1	1

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1925	59	1819	5	3	2
17.07.2020	1927	59	1823	5	3	2
18.07.2020	1929	59	1827	5	3	2
19.07.2020	1931	59	1831	4	3	2
20.07.2020	1932	59	1834	4	3	2
21.07.2020	1934	59	1838	4	2	2
22.07.2020	1936	59	1841	4	2	1
23.07.2020	1938	59	1844	4	2	1
24.07.2020	1940	59	1847	4	2	1
25.07.2020	1941	59	1850	4	2	1
26.07.2020	1943	59	1853	4	2	1
27.07.2020	1945	59	1856	3	2	1
28.07.2020	1947	59	1859	3	2	1
29.07.2020	1949	59	1861	3	2	1
30.07.2020	1950	59	1864	3	2	1
31.07.2020	1952	59	1866	3	2	1
01.08.2020	1954	59	1869	3	2	1
02.08.2020	1956	59	1871	3	2	1
03.08.2020	1958	59	1873	3	2	1
04.08.2020	1959	59	1876	3	2	1
05.08.2020	1961	59	1878	3	2	1
06.08.2020	1963	60	1880	3	2	1
07.08.2020	1965	60	1882	3	2	1
08.08.2020	1966	60	1884	3	2	1
09.08.2020	1968	60	1886	3	2	1
10.08.2020	1970	60	1888	3	1	1
11.08.2020	1972	60	1890	3	1	1
12.08.2020	1974	60	1892	2	1	1

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	1925	59	1819	5	3	2
17.07.2020	1927	59	1823	5	3	2
18.07.2020	1929	59	1827	5	3	2
19.07.2020	1931	59	1831	4	3	2
20.07.2020	1933	59	1834	4	3	2
21.07.2020	1935	59	1838	4	2	2
22.07.2020	1937	59	1841	4	2	1
23.07.2020	1940	59	1844	4	2	1
24.07.2020	1942	59	1848	4	2	1
25.07.2020	1944	59	1851	4	2	1
26.07.2020	1947	59	1854	4	2	1
27.07.2020	1949	59	1856	4	2	1
28.07.2020	1952	59	1859	3	2	1
29.07.2020	1954	59	1862	3	2	1
30.07.2020	1957	59	1865	3	2	1
31.07.2020	1960	59	1868	3	2	1
01.08.2020	1963	59	1870	3	2	1
02.08.2020	1966	59	1873	3	2	1
03.08.2020	1969	59	1876	3	2	1
04.08.2020	1972	59	1878	3	2	1
05.08.2020	1975	60	1881	3	2	1
06.08.2020	1978	60	1884	3	2	1
07.08.2020	1982	60	1886	3	2	1
08.08.2020	1985	60	1889	3	2	1
09.08.2020	1989	60	1892	3	2	1
10.08.2020	1993	60	1895	3	2	1
11.08.2020	1996	60	1898	3	2	1
12.08.2020	2000	60	1901	3	2	1

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 164 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

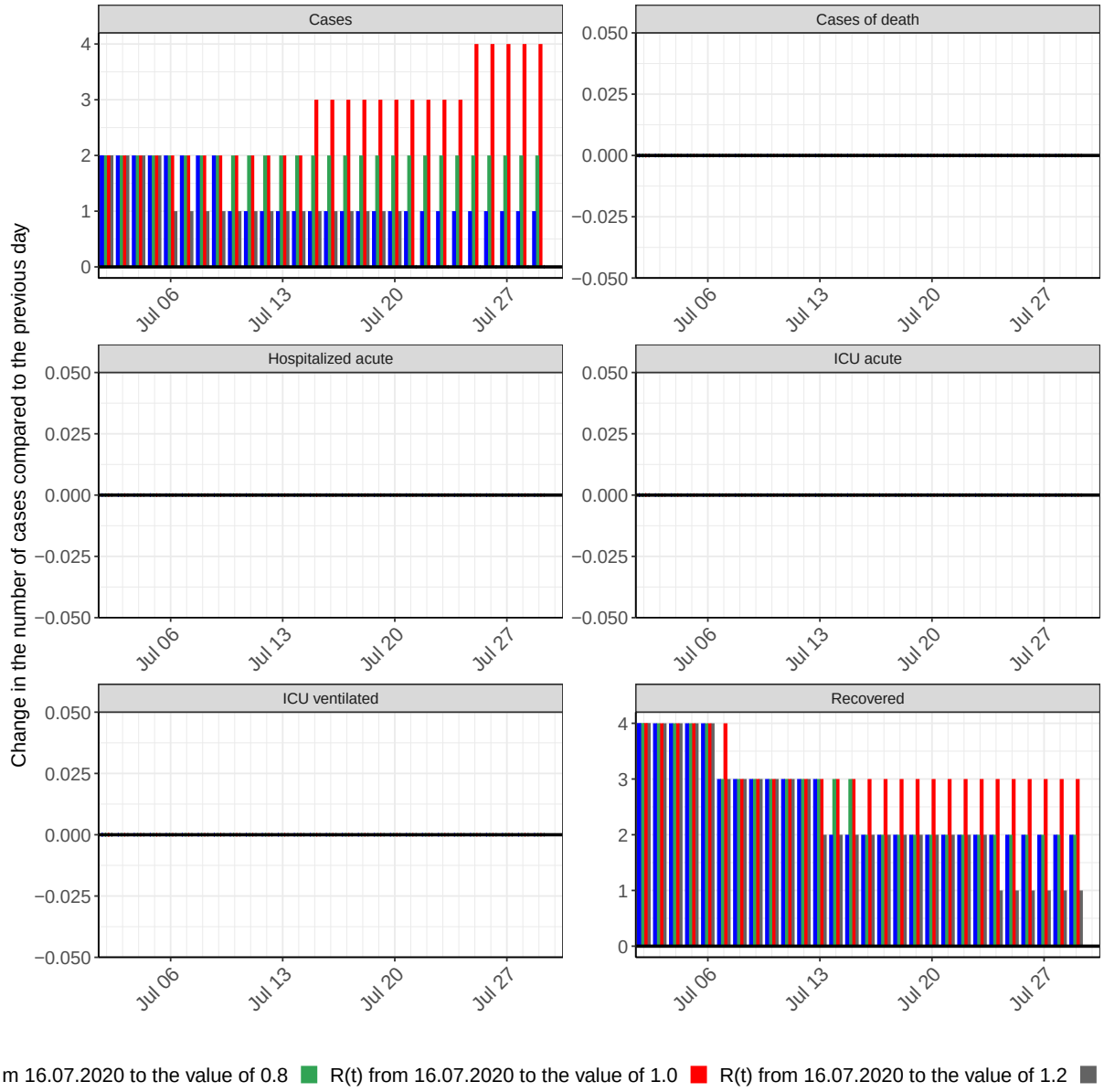


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

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.

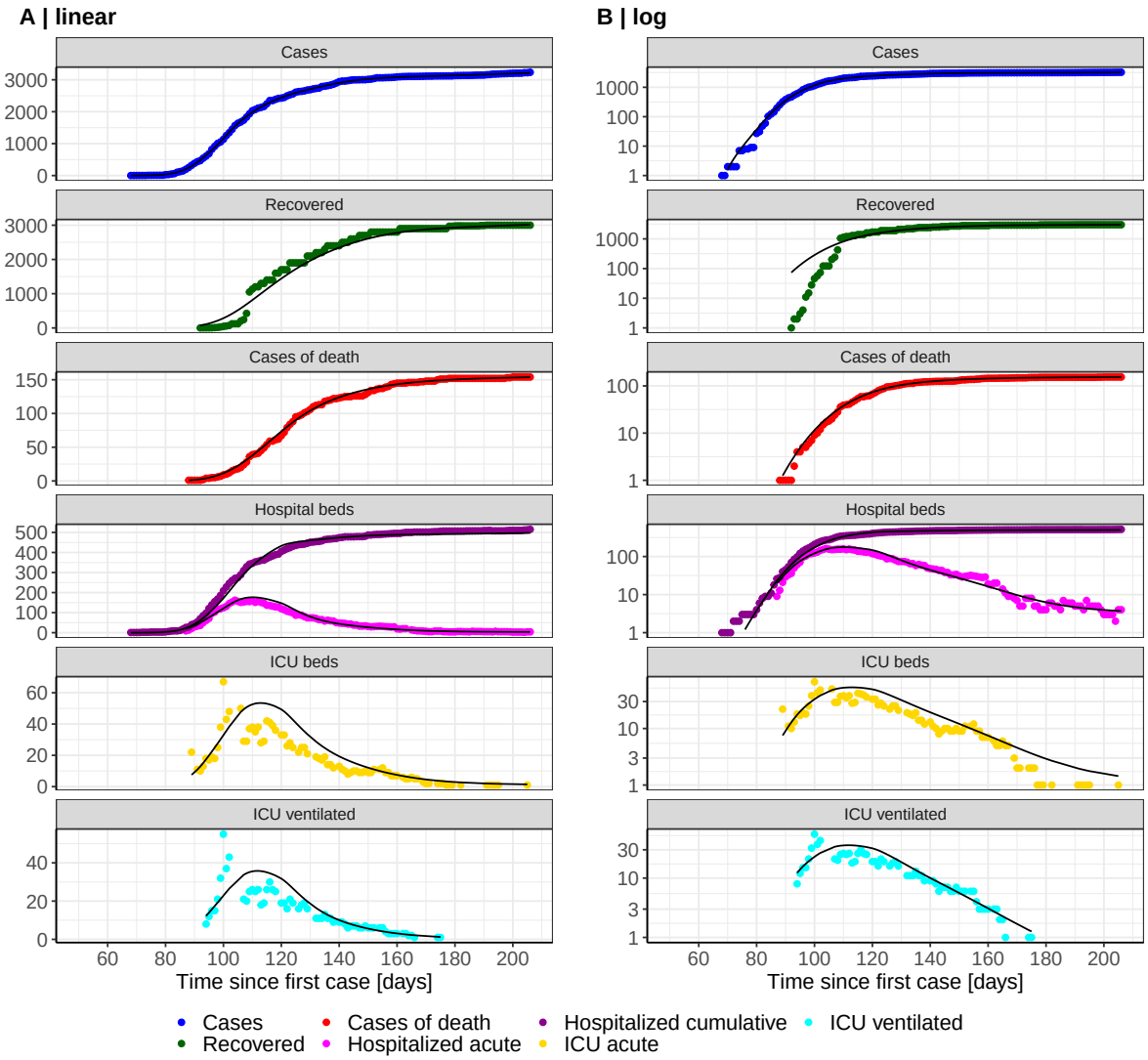


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

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.

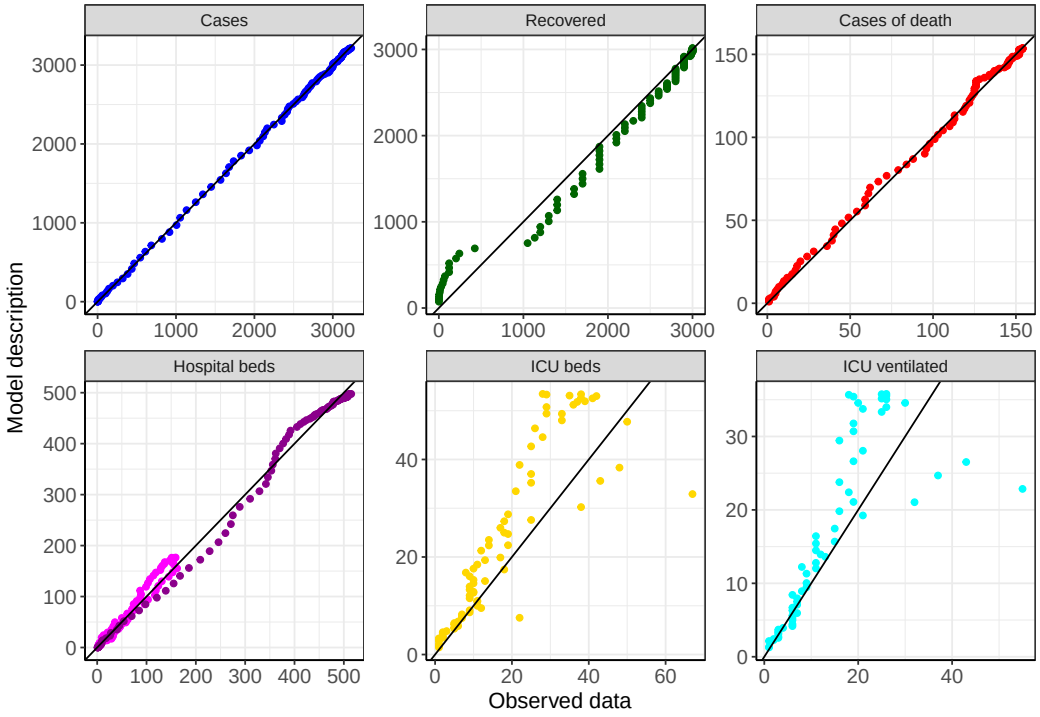


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

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).

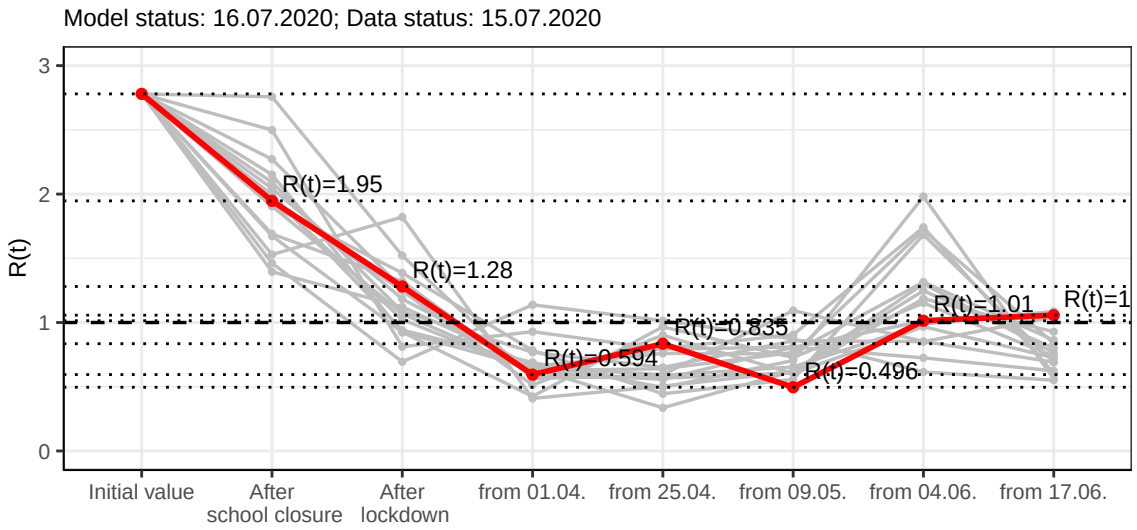


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

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

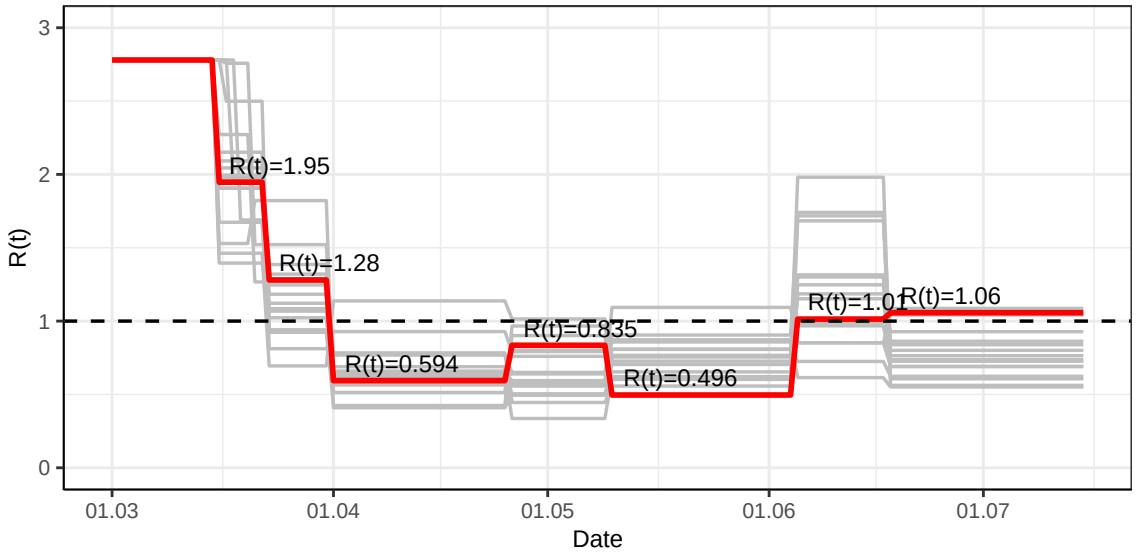


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

16.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.06)

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.

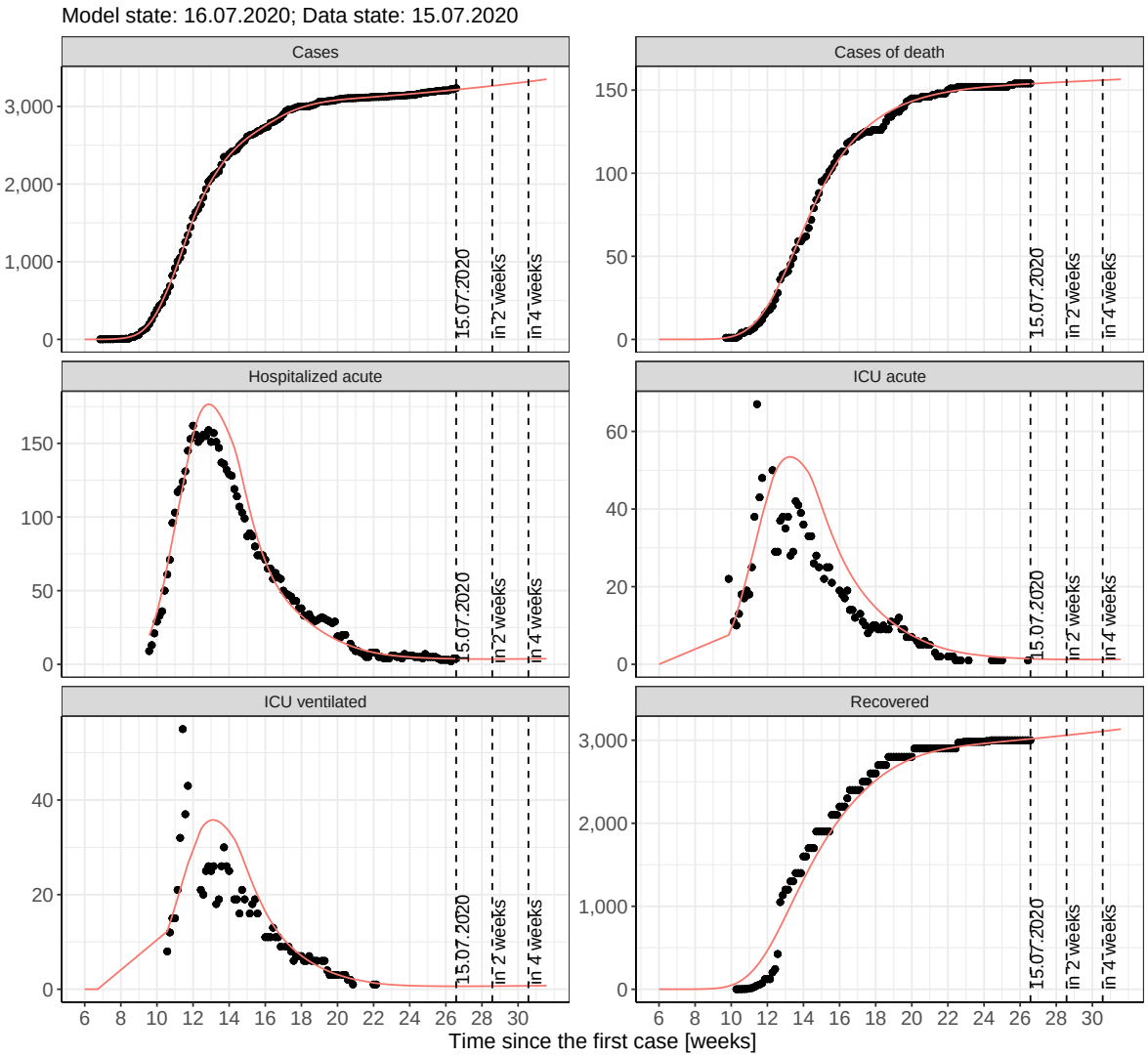


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

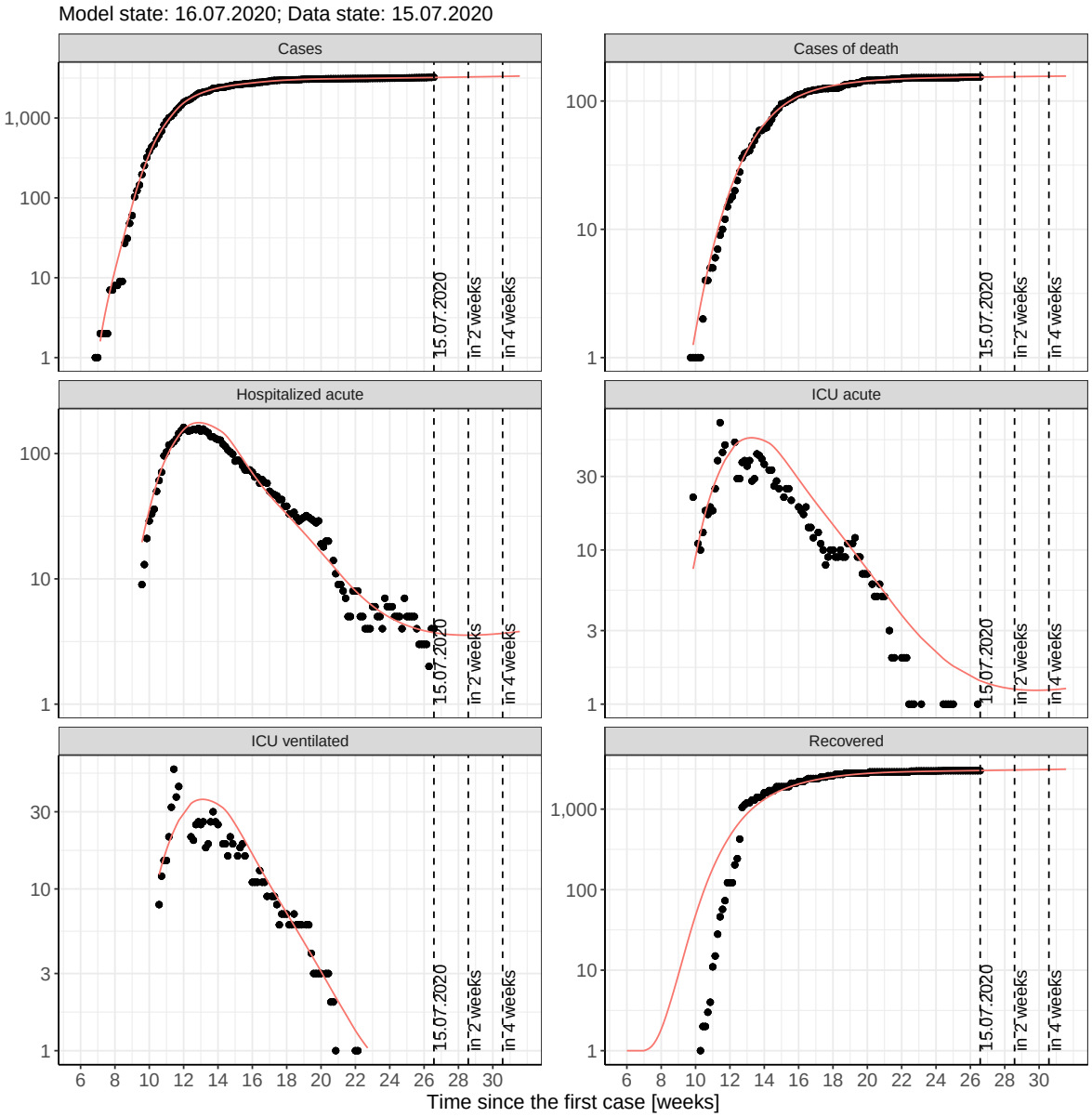


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

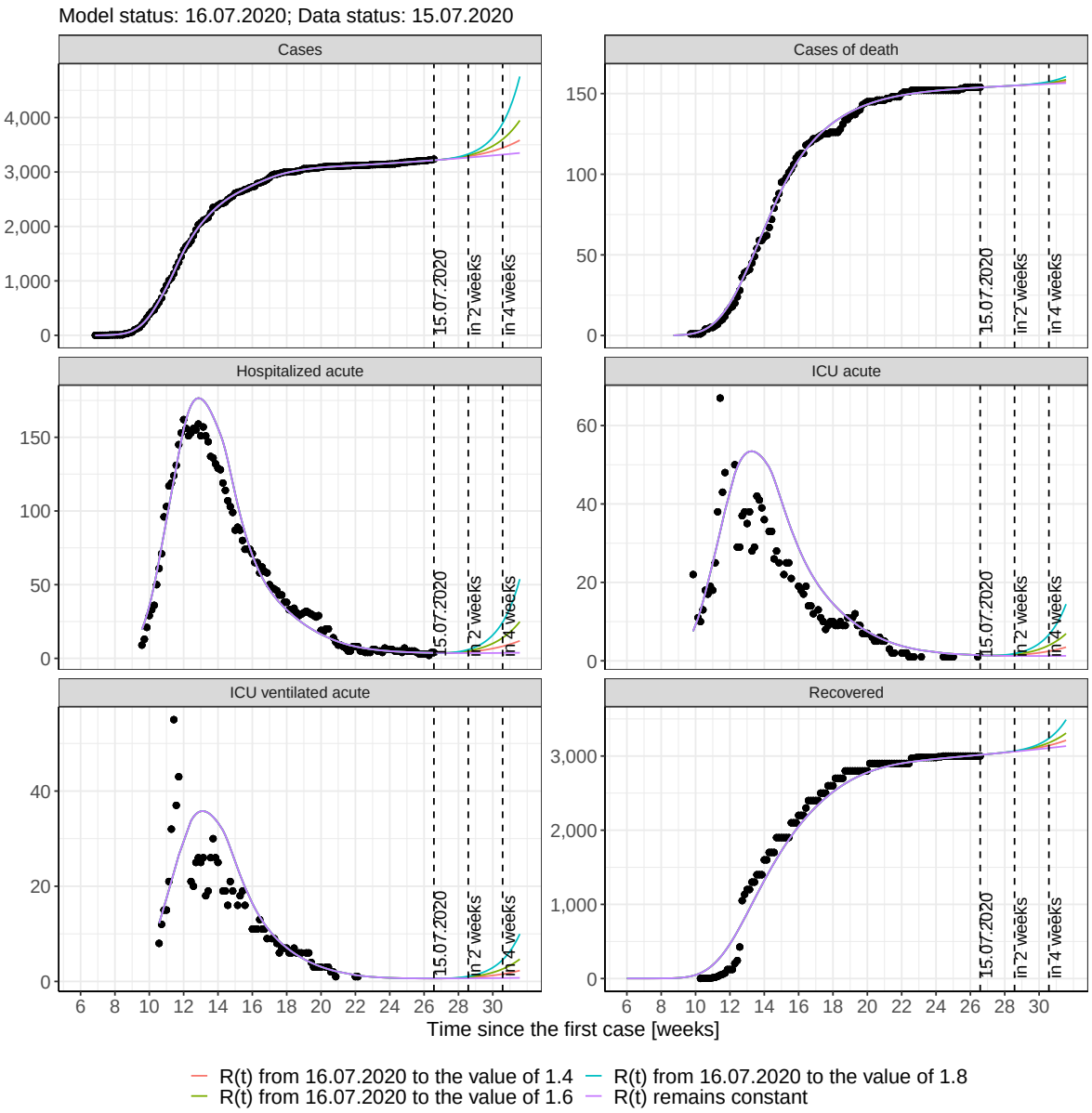


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

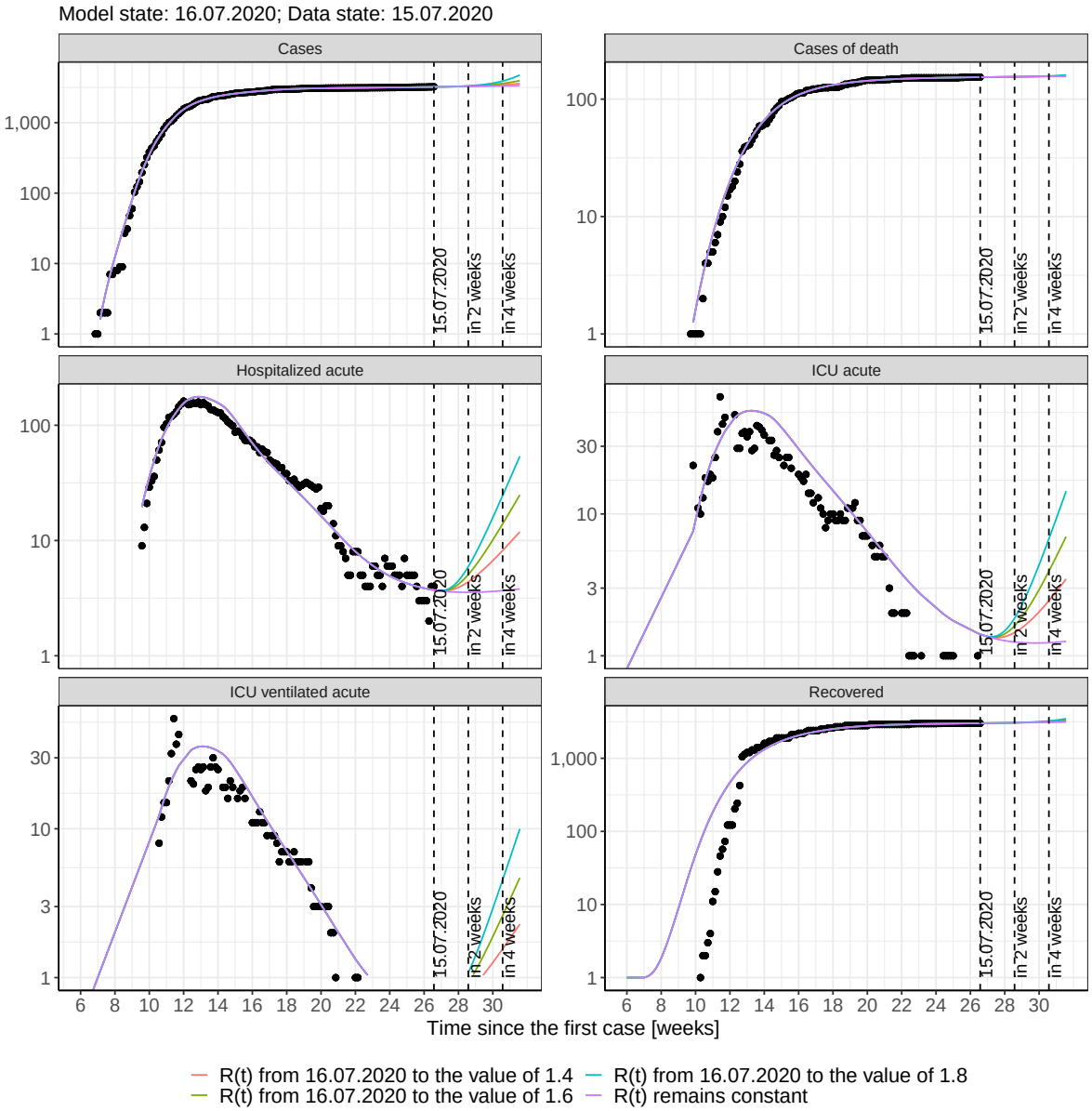


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

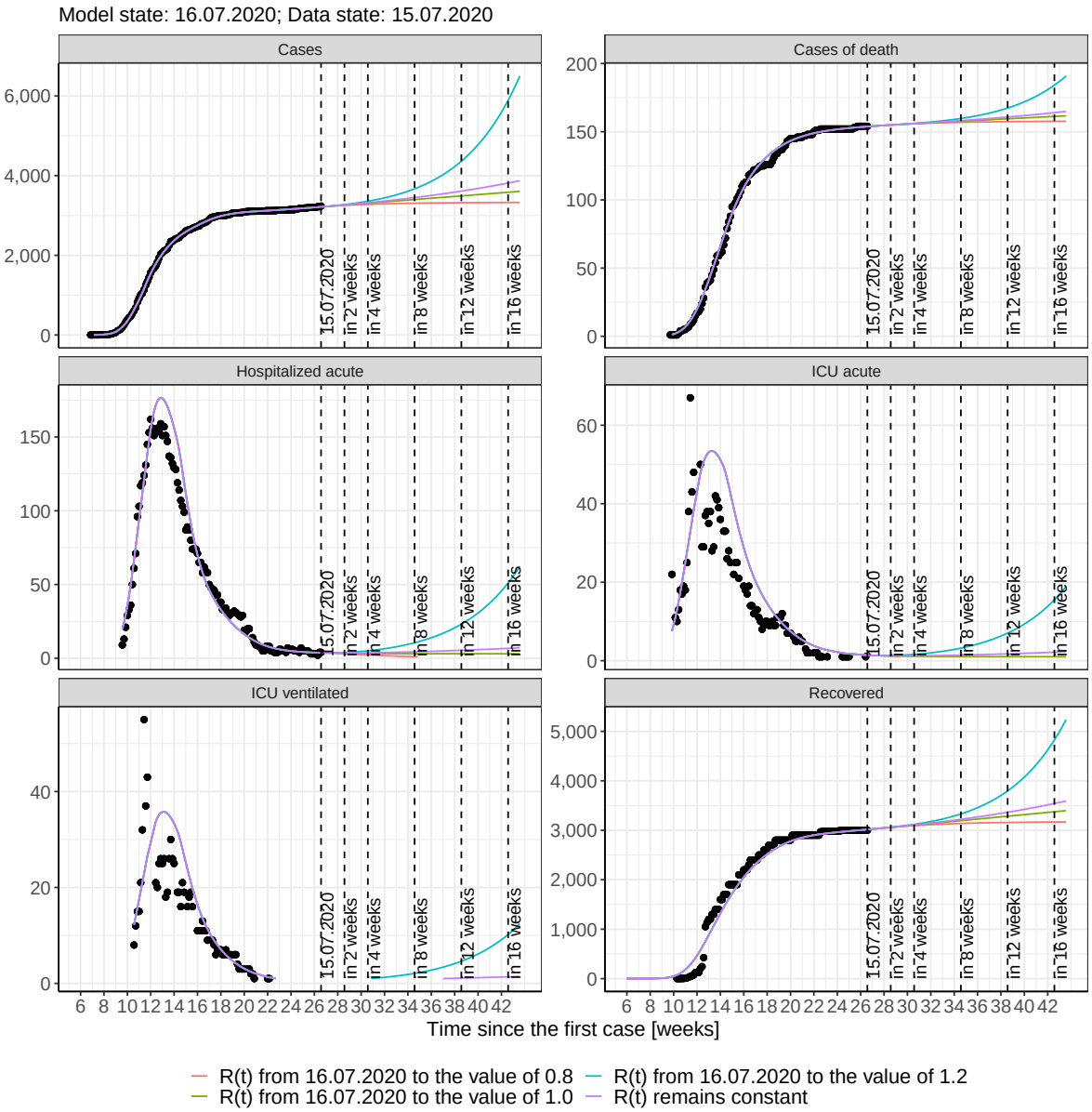


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

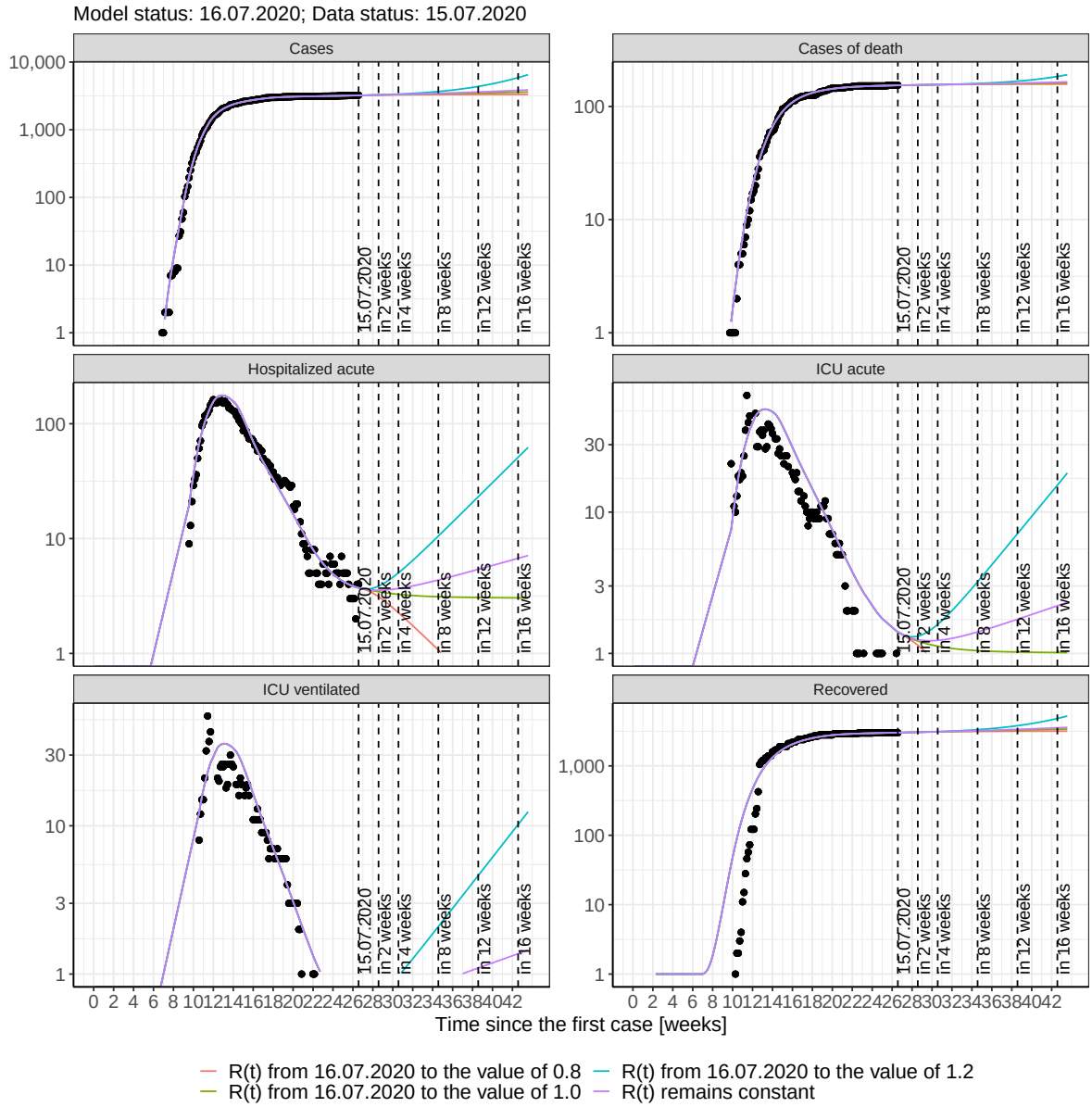


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 61) Model status from 16.07.2020; Data status: 15.07.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3219	154	3019	4	1	1
17.07.2020	3222	154	3022	4	1	1
18.07.2020	3226	154	3025	4	1	1
19.07.2020	3229	154	3028	4	1	1
20.07.2020	3232	154	3031	4	1	1
21.07.2020	3236	154	3034	4	1	1
22.07.2020	3240	154	3037	4	1	1
23.07.2020	3243	154	3040	4	1	1
24.07.2020	3246	155	3044	4	1	1
25.07.2020	3250	155	3047	4	1	1
26.07.2020	3254	155	3050	4	1	1
27.07.2020	3257	155	3053	4	1	1
28.07.2020	3261	155	3056	4	1	1
29.07.2020	3265	155	3060	4	1	1
30.07.2020	3268	155	3063	4	1	1
31.07.2020	3272	155	3066	4	1	1
01.08.2020	3276	155	3070	4	1	1
02.08.2020	3280	155	3073	4	1	1
03.08.2020	3284	155	3076	4	1	1
04.08.2020	3287	155	3080	4	1	1
05.08.2020	3291	155	3083	4	1	1
06.08.2020	3295	156	3086	4	1	1
07.08.2020	3299	156	3090	4	1	1
08.08.2020	3303	156	3094	4	1	1
09.08.2020	3307	156	3097	4	1	1
10.08.2020	3311	156	3101	4	1	1
11.08.2020	3315	156	3104	4	1	1
12.08.2020	3319	156	3108	4	1	1

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3219	154	3019	4	1	1
17.07.2020	3222	154	3022	4	1	1
18.07.2020	3225	154	3025	4	1	1
19.07.2020	3228	154	3028	4	1	1
20.07.2020	3231	154	3031	4	1	1
21.07.2020	3234	154	3034	4	1	1
22.07.2020	3237	154	3037	4	1	1
23.07.2020	3239	154	3040	3	1	1
24.07.2020	3242	155	3043	3	1	1
25.07.2020	3244	155	3046	3	1	1
26.07.2020	3247	155	3049	3	1	1
27.07.2020	3249	155	3052	3	1	1
28.07.2020	3252	155	3055	3	1	1
29.07.2020	3254	155	3058	3	1	1
30.07.2020	3256	155	3061	3	1	1
31.07.2020	3258	155	3064	3	1	1
01.08.2020	3260	155	3066	3	1	1
02.08.2020	3262	155	3069	3	1	1
03.08.2020	3264	155	3072	3	1	1
04.08.2020	3266	155	3074	3	1	1
05.08.2020	3268	155	3077	3	1	1
06.08.2020	3270	155	3080	3	1	1
07.08.2020	3271	156	3082	3	1	0
08.08.2020	3273	156	3084	2	1	0
09.08.2020	3275	156	3087	2	1	0
10.08.2020	3276	156	3089	2	1	0
11.08.2020	3278	156	3091	2	1	0
12.08.2020	3279	156	3094	2	1	0

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3219	154	3019	4	1	1
17.07.2020	3222	154	3022	4	1	1
18.07.2020	3226	154	3025	4	1	1
19.07.2020	3229	154	3028	4	1	1
20.07.2020	3232	154	3031	4	1	1
21.07.2020	3236	154	3034	4	1	1
22.07.2020	3239	154	3037	4	1	1
23.07.2020	3242	154	3040	4	1	1
24.07.2020	3245	155	3043	4	1	1
25.07.2020	3249	155	3047	4	1	1
26.07.2020	3252	155	3050	3	1	1
27.07.2020	3255	155	3053	3	1	1
28.07.2020	3259	155	3056	3	1	1
29.07.2020	3262	155	3059	3	1	1
30.07.2020	3265	155	3062	3	1	1
31.07.2020	3268	155	3066	3	1	1
01.08.2020	3272	155	3069	3	1	1
02.08.2020	3275	155	3072	3	1	1
03.08.2020	3278	155	3075	3	1	1
04.08.2020	3282	155	3078	3	1	1
05.08.2020	3285	155	3082	3	1	1
06.08.2020	3288	156	3085	3	1	1
07.08.2020	3292	156	3088	3	1	1
08.08.2020	3295	156	3091	3	1	1
09.08.2020	3298	156	3094	3	1	1
10.08.2020	3301	156	3098	3	1	1
11.08.2020	3305	156	3101	3	1	1
12.08.2020	3308	156	3104	3	1	1

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3219	154	3019	4	1	1
17.07.2020	3222	154	3022	4	1	1
18.07.2020	3226	154	3025	4	1	1
19.07.2020	3230	154	3028	4	1	1
20.07.2020	3233	154	3031	4	1	1
21.07.2020	3237	154	3034	4	1	1
22.07.2020	3241	154	3037	4	1	1
23.07.2020	3245	154	3040	4	1	1
24.07.2020	3250	155	3044	4	1	1
25.07.2020	3254	155	3047	4	1	1
26.07.2020	3258	155	3050	4	1	1
27.07.2020	3263	155	3054	4	1	1
28.07.2020	3268	155	3057	4	1	1
29.07.2020	3272	155	3061	4	1	1
30.07.2020	3278	155	3064	4	1	1
31.07.2020	3283	155	3068	4	1	1
01.08.2020	3288	155	3072	4	1	1
02.08.2020	3293	155	3076	4	1	1
03.08.2020	3299	155	3079	4	1	1
04.08.2020	3305	155	3084	4	1	1
05.08.2020	3311	156	3088	4	1	1
06.08.2020	3317	156	3092	4	1	1
07.08.2020	3323	156	3096	5	1	1
08.08.2020	3329	156	3100	5	1	1
09.08.2020	3336	156	3105	5	2	1
10.08.2020	3343	156	3110	5	2	1
11.08.2020	3350	156	3114	5	2	1
12.08.2020	3357	156	3119	5	2	1

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 175 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

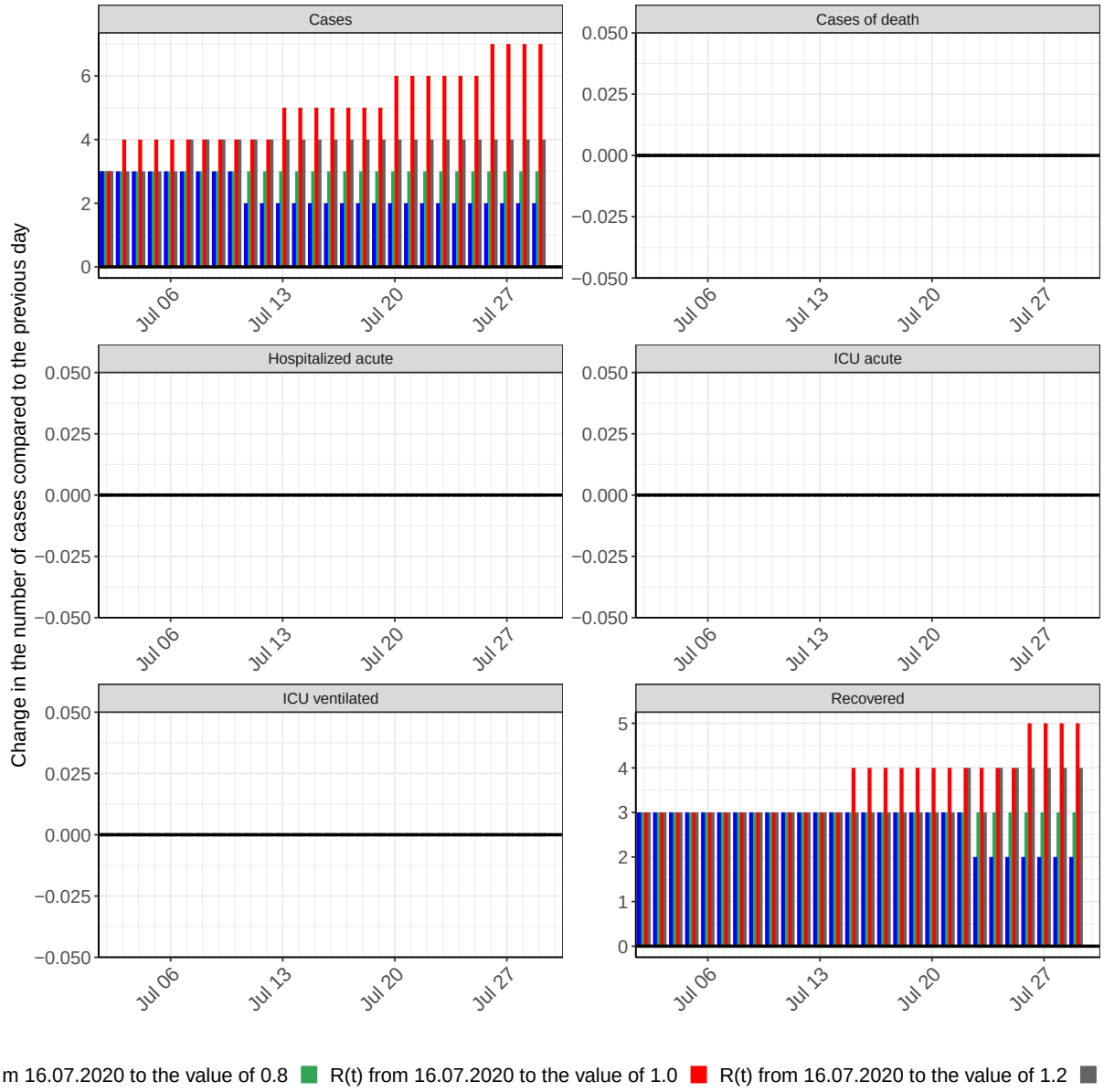


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

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.

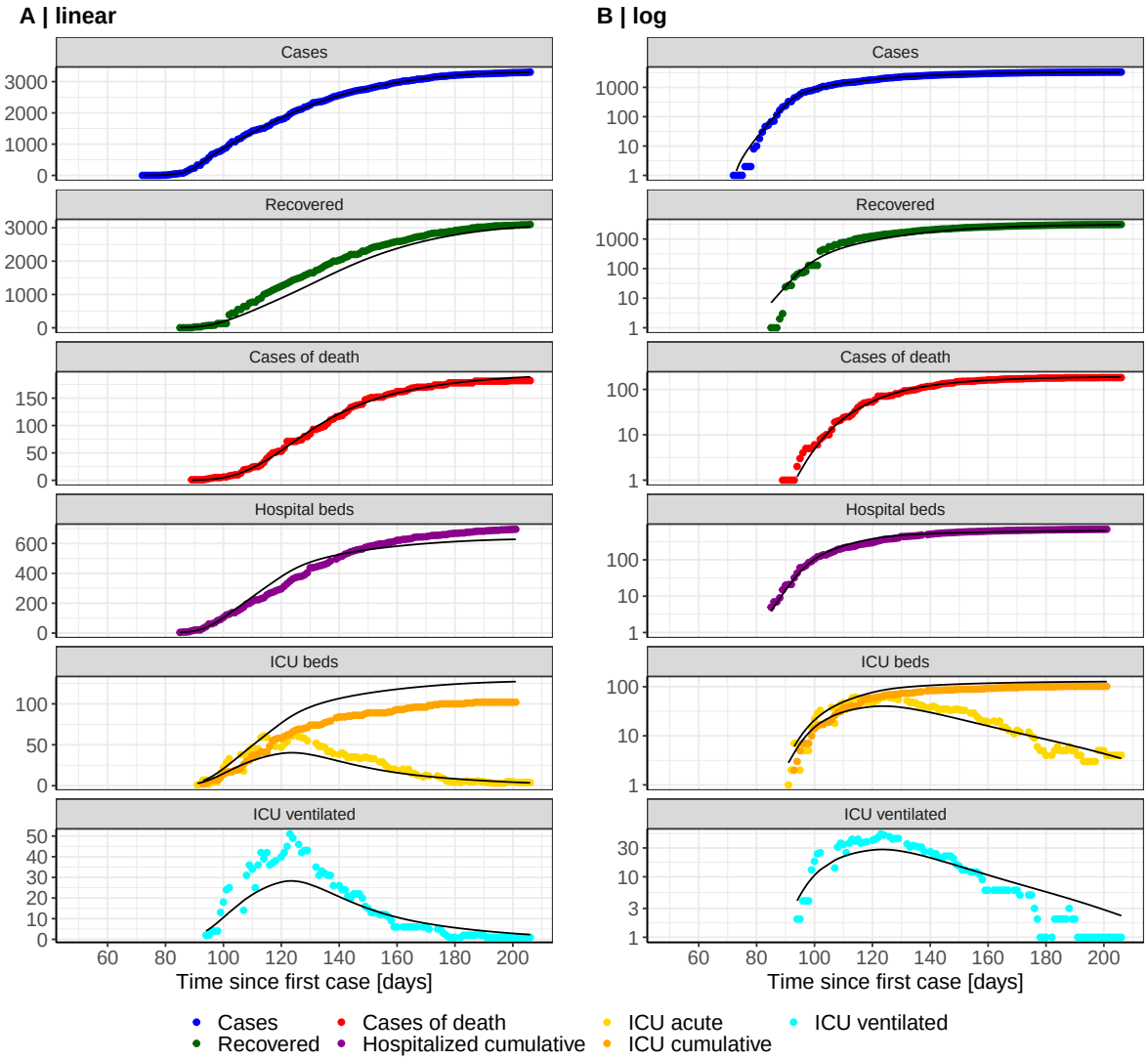


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

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.

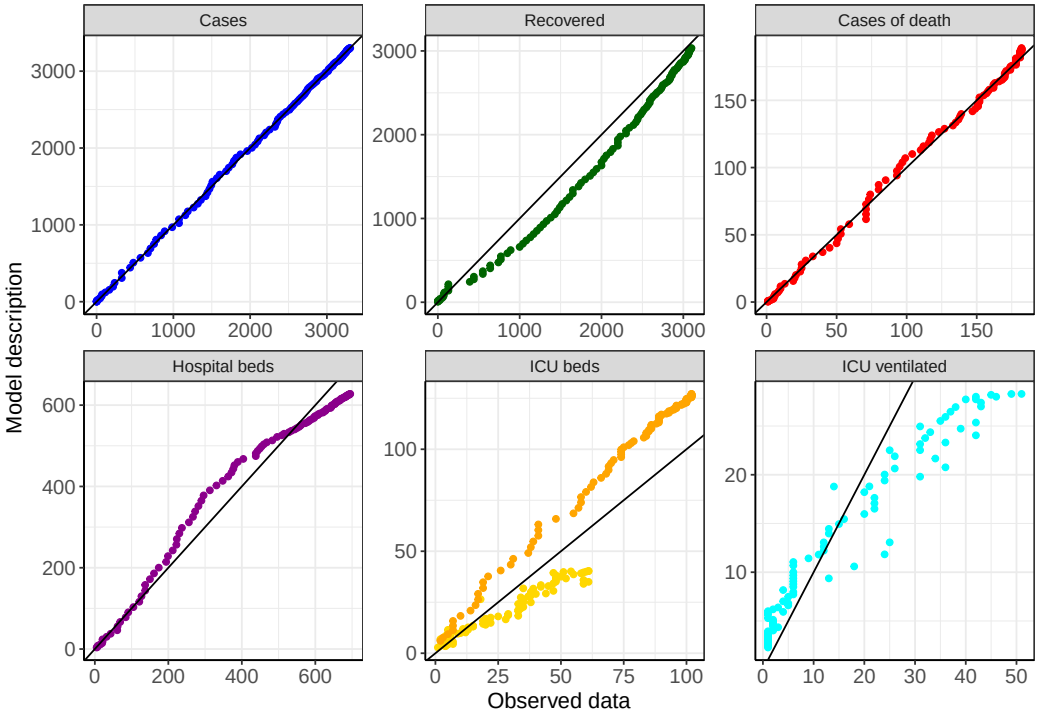


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

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).

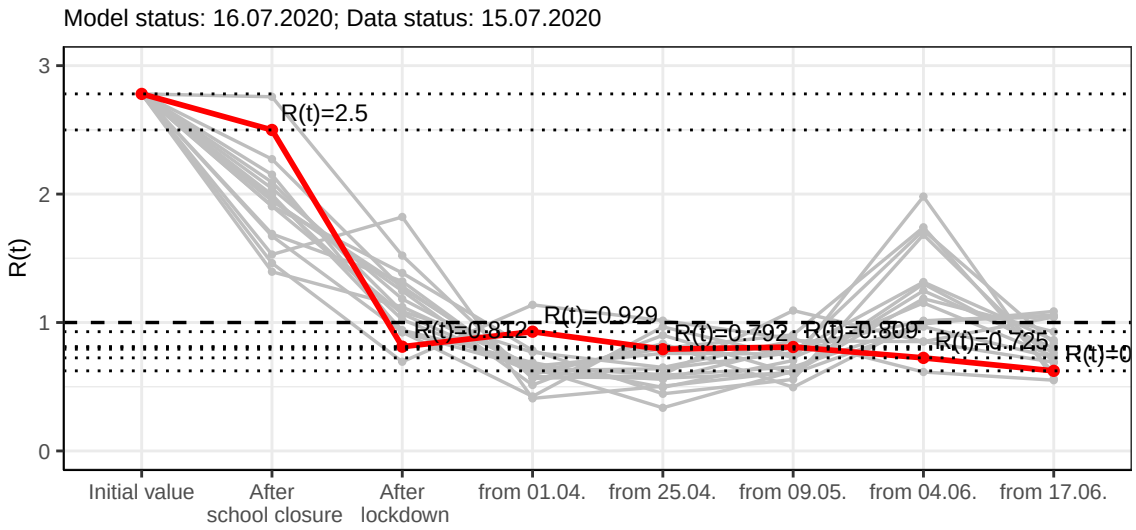


Figure 178: R(t) values before and after the NPIs for Thuringia

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

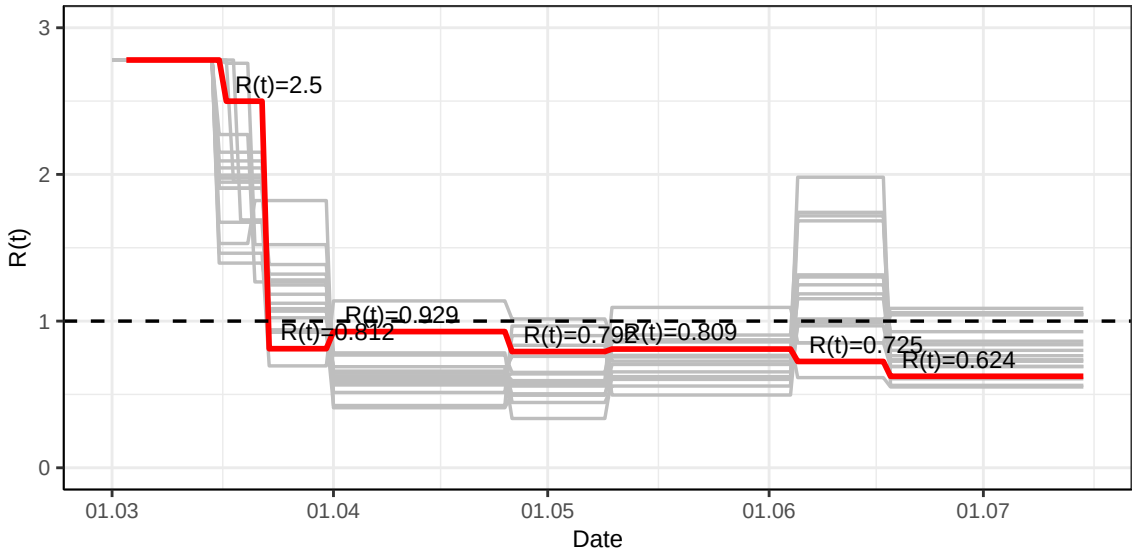


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

17.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.62)

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.

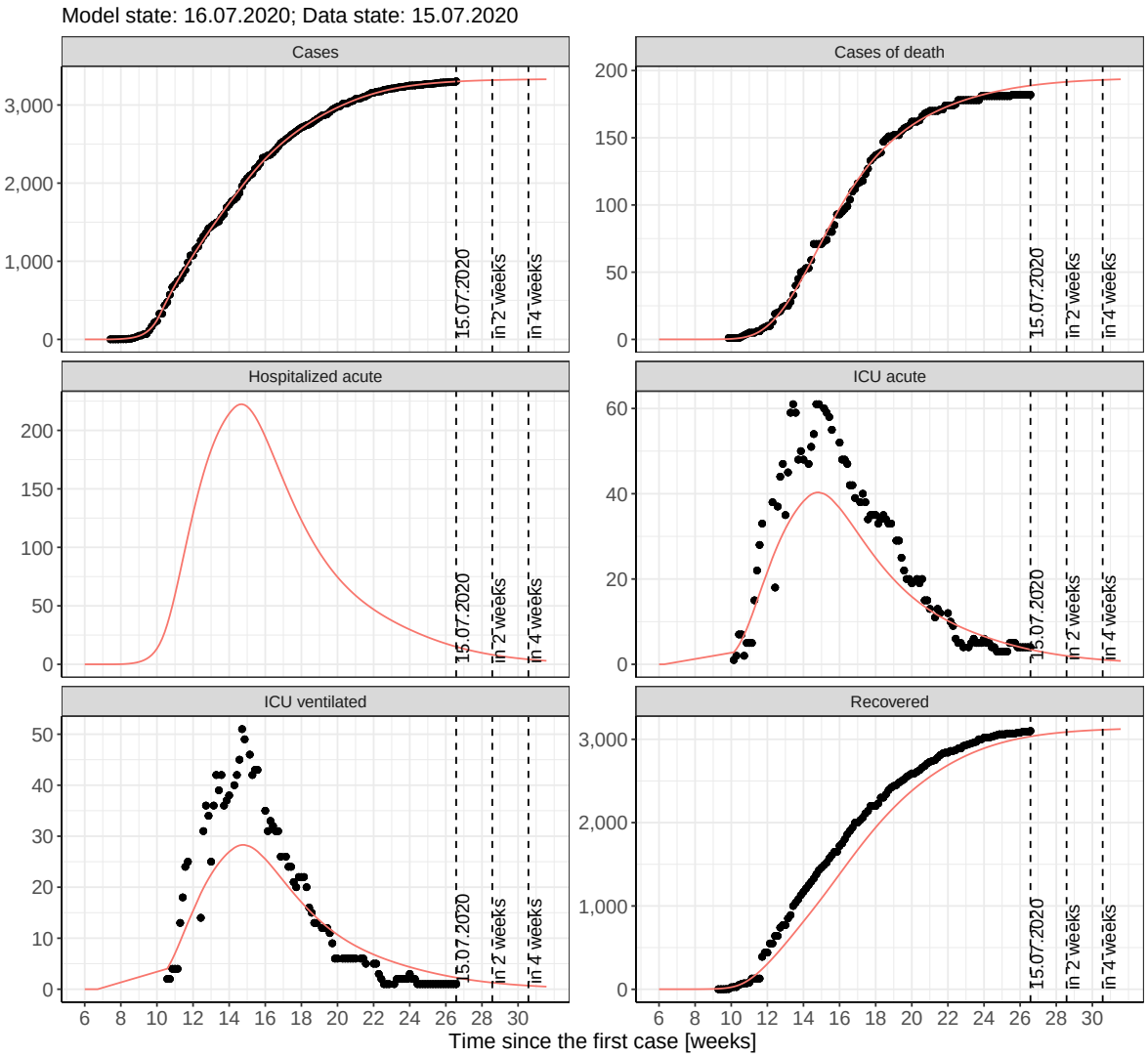


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

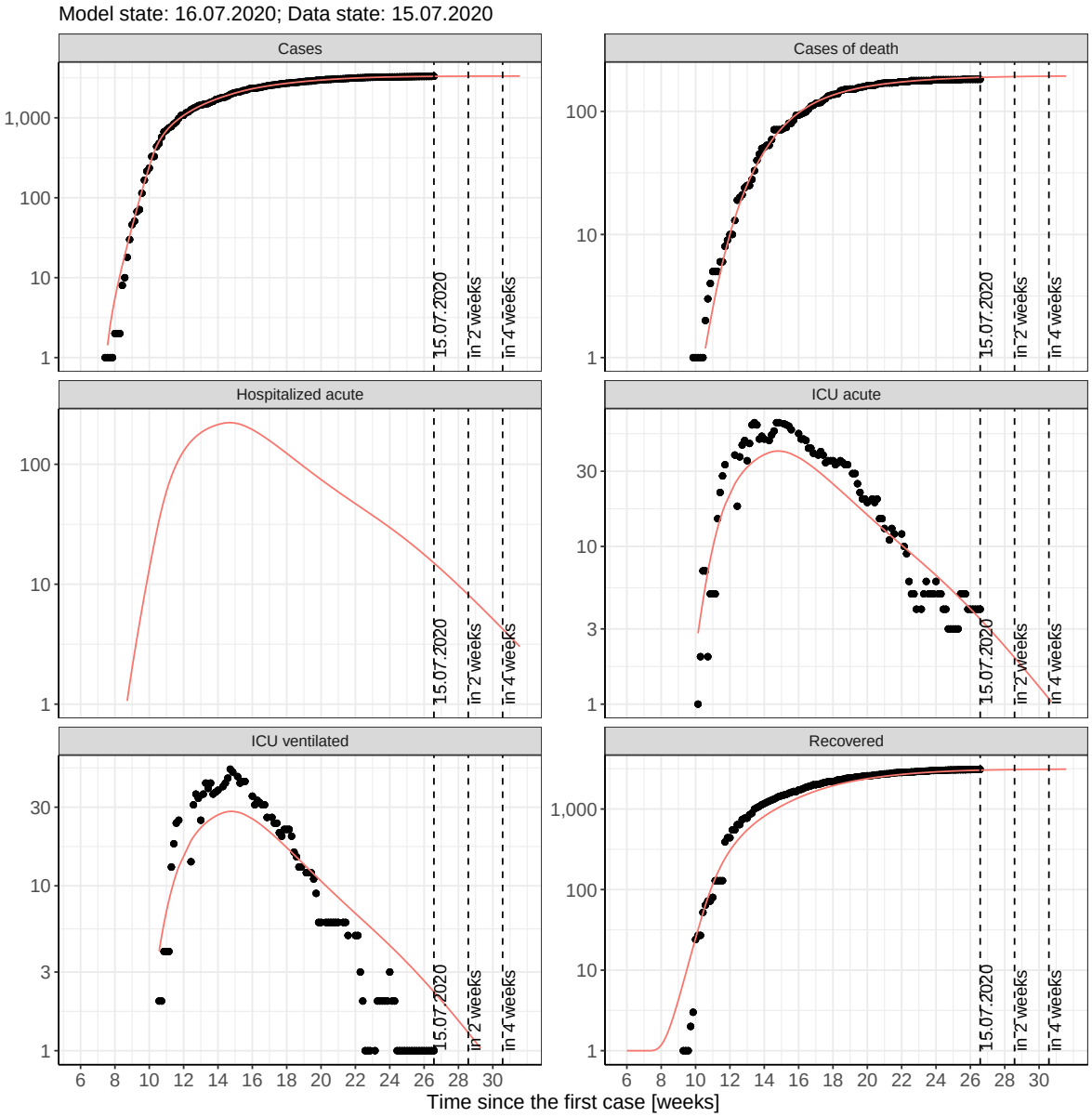


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

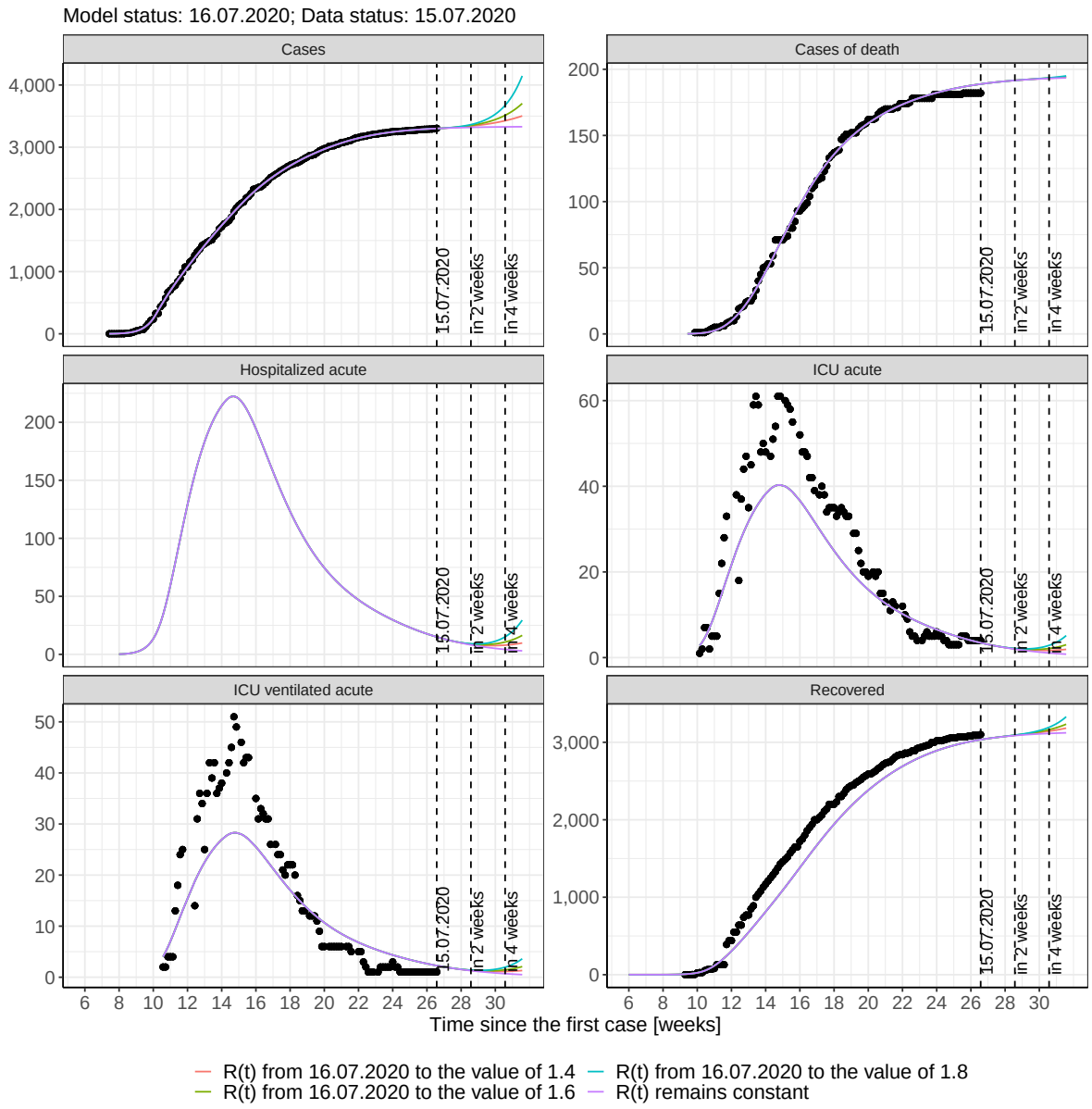


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

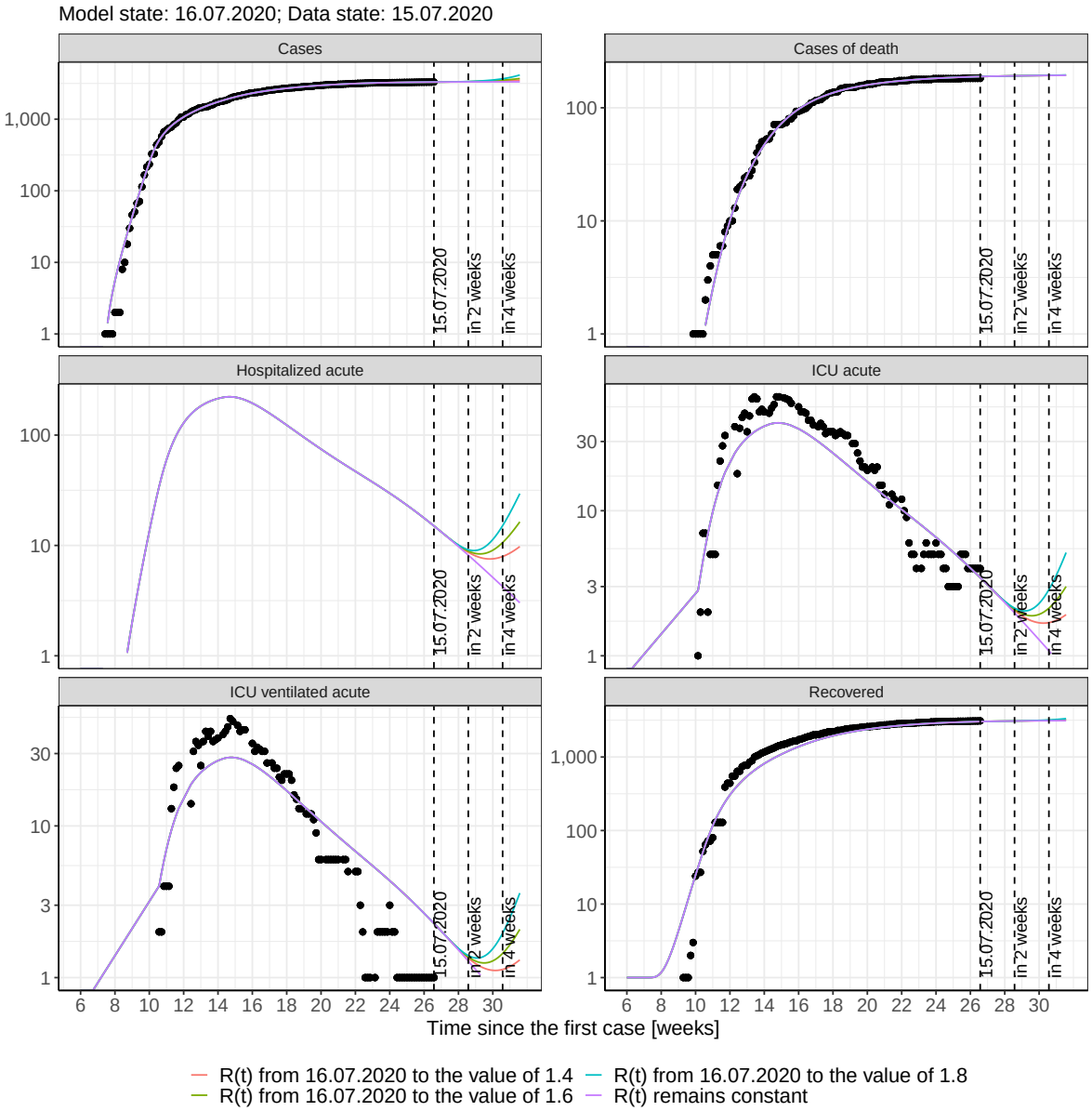


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

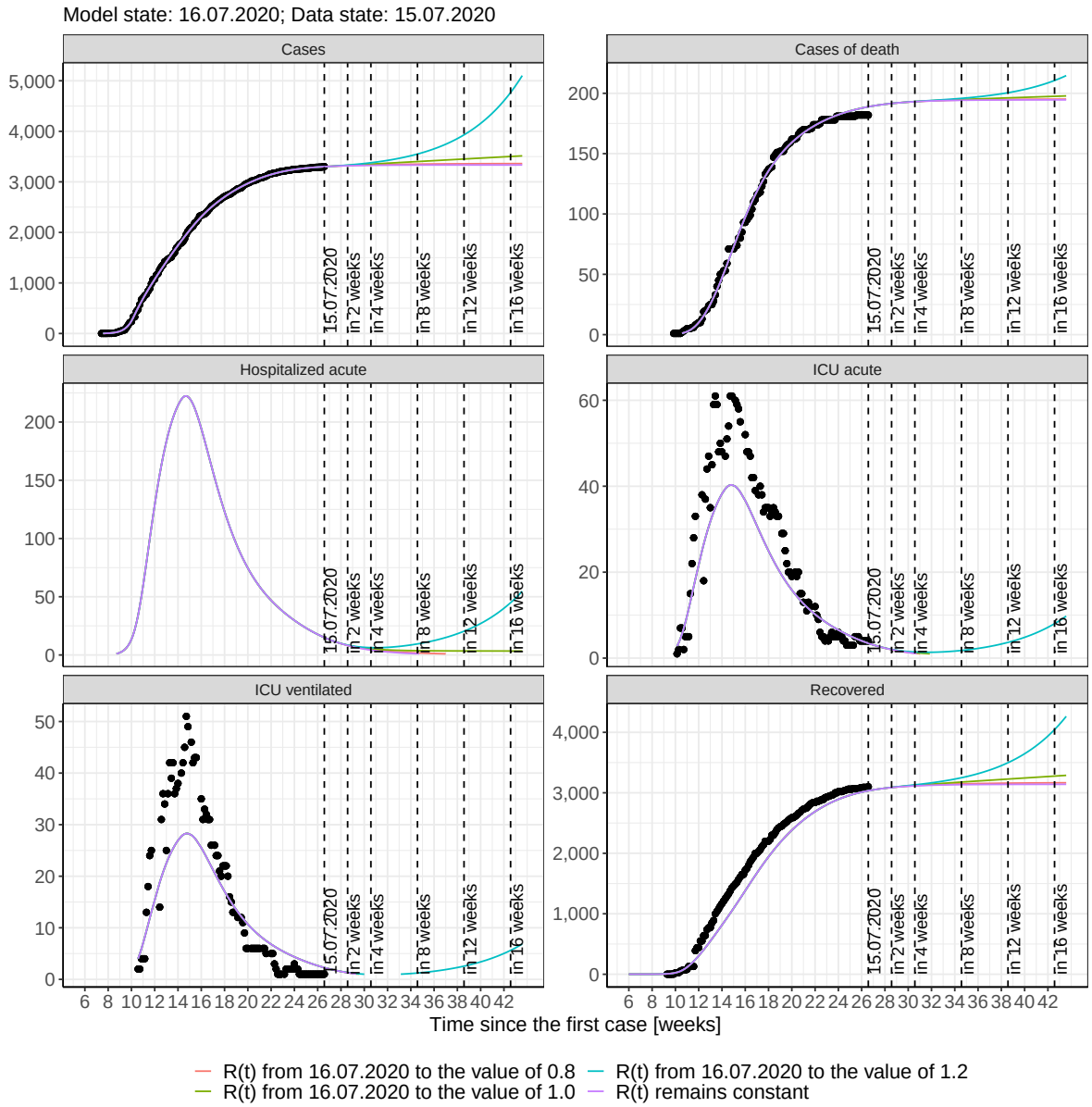


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

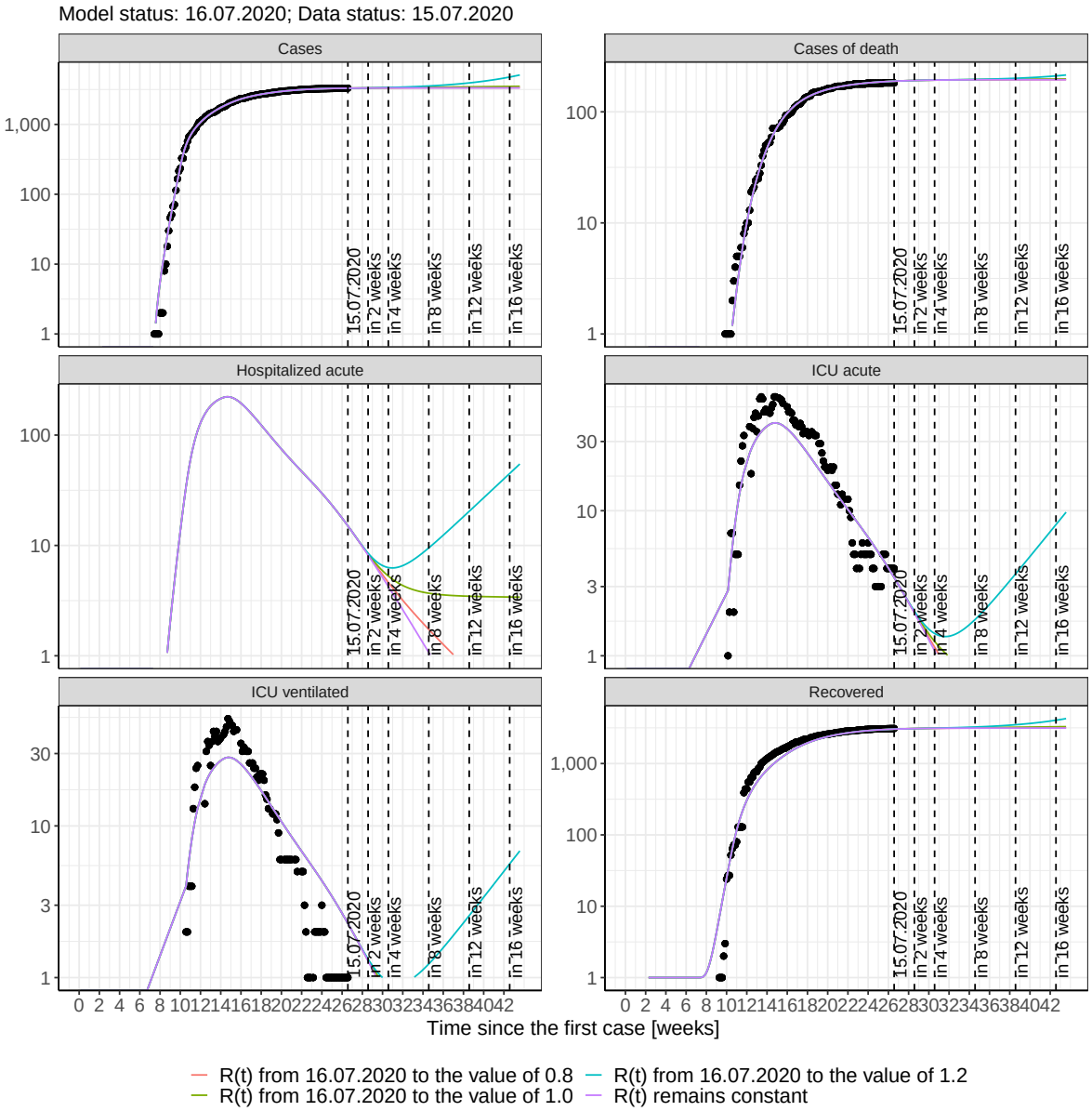


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 65) Model status from 16.07.2020; Data status: 15.07.2020.

Table 62: Thuringia - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3302	189	3039	14	3	2
17.07.2020	3304	189	3044	14	3	2
18.07.2020	3305	190	3048	13	3	2
19.07.2020	3307	190	3053	13	3	2
20.07.2020	3308	190	3057	12	3	2
21.07.2020	3310	190	3061	12	3	2
22.07.2020	3311	190	3065	11	3	2
23.07.2020	3312	191	3069	11	3	2
24.07.2020	3313	191	3072	10	2	2
25.07.2020	3314	191	3075	10	2	2
26.07.2020	3316	191	3079	9	2	1
27.07.2020	3316	191	3082	9	2	1
28.07.2020	3317	191	3084	9	2	1
29.07.2020	3318	192	3087	8	2	1
30.07.2020	3319	192	3090	8	2	1
31.07.2020	3320	192	3092	7	2	1
01.08.2020	3321	192	3095	7	2	1
02.08.2020	3321	192	3097	7	2	1
03.08.2020	3322	192	3099	6	2	1
04.08.2020	3323	192	3101	6	2	1
05.08.2020	3323	192	3103	6	1	1
06.08.2020	3324	193	3105	6	1	1
07.08.2020	3324	193	3107	5	1	1
08.08.2020	3325	193	3108	5	1	1
09.08.2020	3325	193	3110	5	1	1
10.08.2020	3326	193	3112	5	1	1
11.08.2020	3326	193	3113	4	1	1
12.08.2020	3327	193	3114	4	1	1

Table 63: Thuringia - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3302	189	3039	14	3	2
17.07.2020	3304	189	3044	14	3	2
18.07.2020	3306	190	3048	13	3	2
19.07.2020	3307	190	3053	13	3	2
20.07.2020	3309	190	3057	12	3	2
21.07.2020	3310	190	3061	12	3	2
22.07.2020	3312	190	3065	11	3	2
23.07.2020	3313	191	3069	11	3	2
24.07.2020	3315	191	3072	10	2	2
25.07.2020	3316	191	3076	10	2	2
26.07.2020	3318	191	3079	9	2	1
27.07.2020	3319	191	3082	9	2	1
28.07.2020	3320	191	3085	9	2	1
29.07.2020	3321	192	3088	8	2	1
30.07.2020	3323	192	3090	8	2	1
31.07.2020	3324	192	3093	8	2	1
01.08.2020	3325	192	3096	7	2	1
02.08.2020	3326	192	3098	7	2	1
03.08.2020	3327	192	3100	7	2	1
04.08.2020	3328	192	3103	6	2	1
05.08.2020	3329	192	3105	6	2	1
06.08.2020	3330	193	3107	6	1	1
07.08.2020	3331	193	3109	6	1	1
08.08.2020	3332	193	3111	5	1	1
09.08.2020	3333	193	3113	5	1	1
10.08.2020	3334	193	3114	5	1	1
11.08.2020	3335	193	3116	5	1	1
12.08.2020	3335	193	3118	5	1	1

Table 64: Thuringia - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3302	189	3039	14	3	2
17.07.2020	3304	189	3044	14	3	2
18.07.2020	3306	190	3048	13	3	2
19.07.2020	3308	190	3053	13	3	2
20.07.2020	3310	190	3057	12	3	2
21.07.2020	3311	190	3061	12	3	2
22.07.2020	3313	190	3065	11	3	2
23.07.2020	3315	191	3069	11	3	2
24.07.2020	3317	191	3072	10	2	2
25.07.2020	3319	191	3076	10	2	2
26.07.2020	3320	191	3079	9	2	1
27.07.2020	3322	191	3082	9	2	1
28.07.2020	3324	191	3085	9	2	1
29.07.2020	3326	192	3088	8	2	1
30.07.2020	3328	192	3091	8	2	1
31.07.2020	3330	192	3094	8	2	1
01.08.2020	3331	192	3097	7	2	1
02.08.2020	3333	192	3100	7	2	1
03.08.2020	3335	192	3102	7	2	1
04.08.2020	3337	192	3105	7	2	1
05.08.2020	3339	192	3107	6	2	1
06.08.2020	3340	193	3110	6	2	1
07.08.2020	3342	193	3112	6	1	1
08.08.2020	3344	193	3114	6	1	1
09.08.2020	3346	193	3117	6	1	1
10.08.2020	3348	193	3119	6	1	1
11.08.2020	3350	193	3121	5	1	1
12.08.2020	3351	193	3123	5	1	1

Table 65: Thuringia - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	3302	189	3039	14	3	2
17.07.2020	3304	189	3044	14	3	2
18.07.2020	3306	190	3048	13	3	2
19.07.2020	3308	190	3053	13	3	2
20.07.2020	3310	190	3057	12	3	2
21.07.2020	3312	190	3061	12	3	2
22.07.2020	3314	190	3065	11	3	2
23.07.2020	3317	191	3069	11	3	2
24.07.2020	3319	191	3073	10	2	2
25.07.2020	3322	191	3076	10	2	2
26.07.2020	3324	191	3080	10	2	1
27.07.2020	3326	191	3083	9	2	1
28.07.2020	3329	191	3086	9	2	1
29.07.2020	3332	192	3089	9	2	1
30.07.2020	3334	192	3092	8	2	1
31.07.2020	3337	192	3095	8	2	1
01.08.2020	3340	192	3098	8	2	1
02.08.2020	3343	192	3102	7	2	1
03.08.2020	3346	192	3104	7	2	1
04.08.2020	3349	192	3107	7	2	1
05.08.2020	3353	192	3110	7	2	1
06.08.2020	3356	193	3113	7	2	1
07.08.2020	3360	193	3116	7	2	1
08.08.2020	3363	193	3119	7	2	1
09.08.2020	3367	193	3122	6	1	1
10.08.2020	3370	193	3125	6	1	1
11.08.2020	3374	193	3128	6	1	1
12.08.2020	3378	193	3131	6	1	1

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 186 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

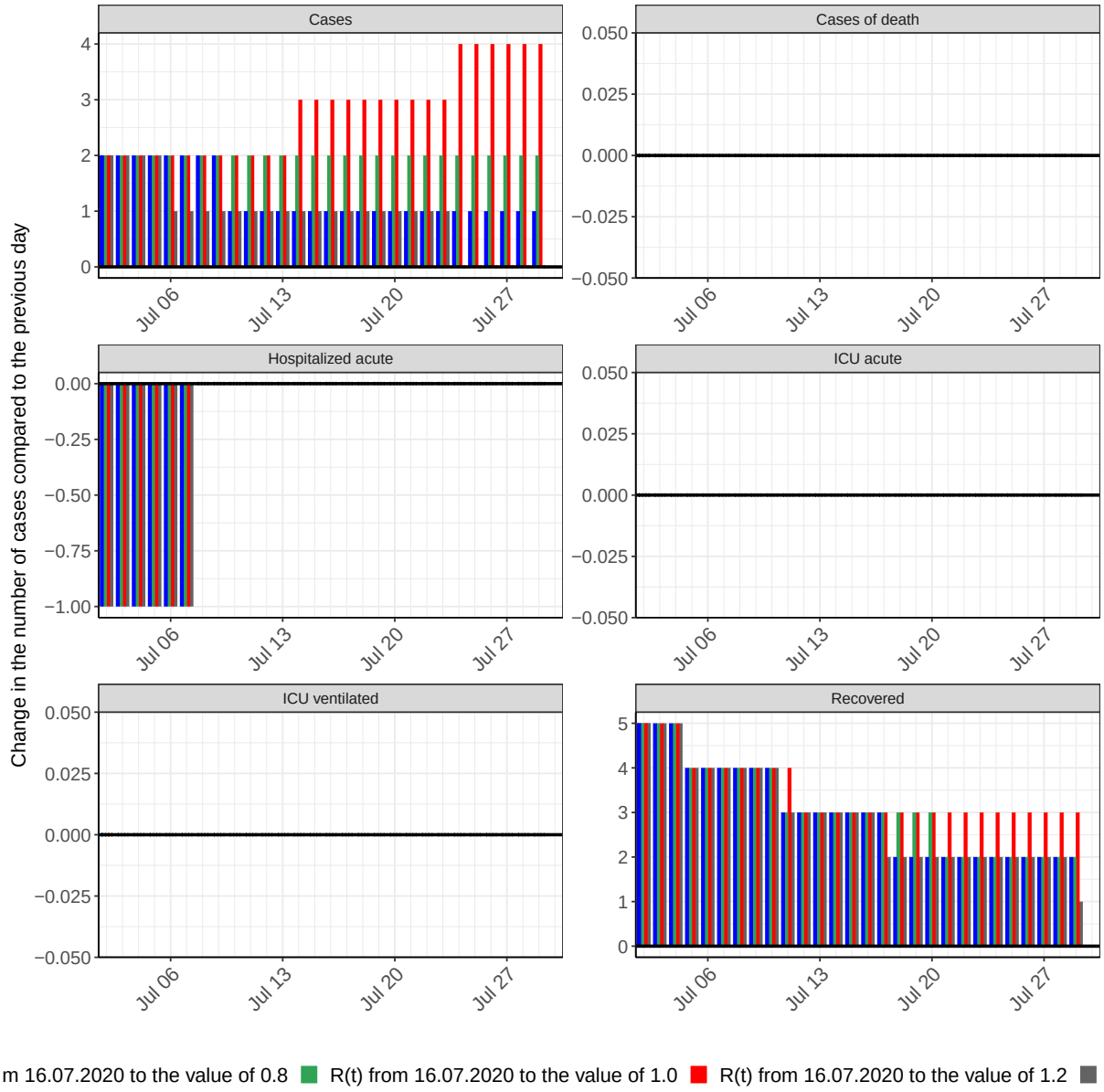


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

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.

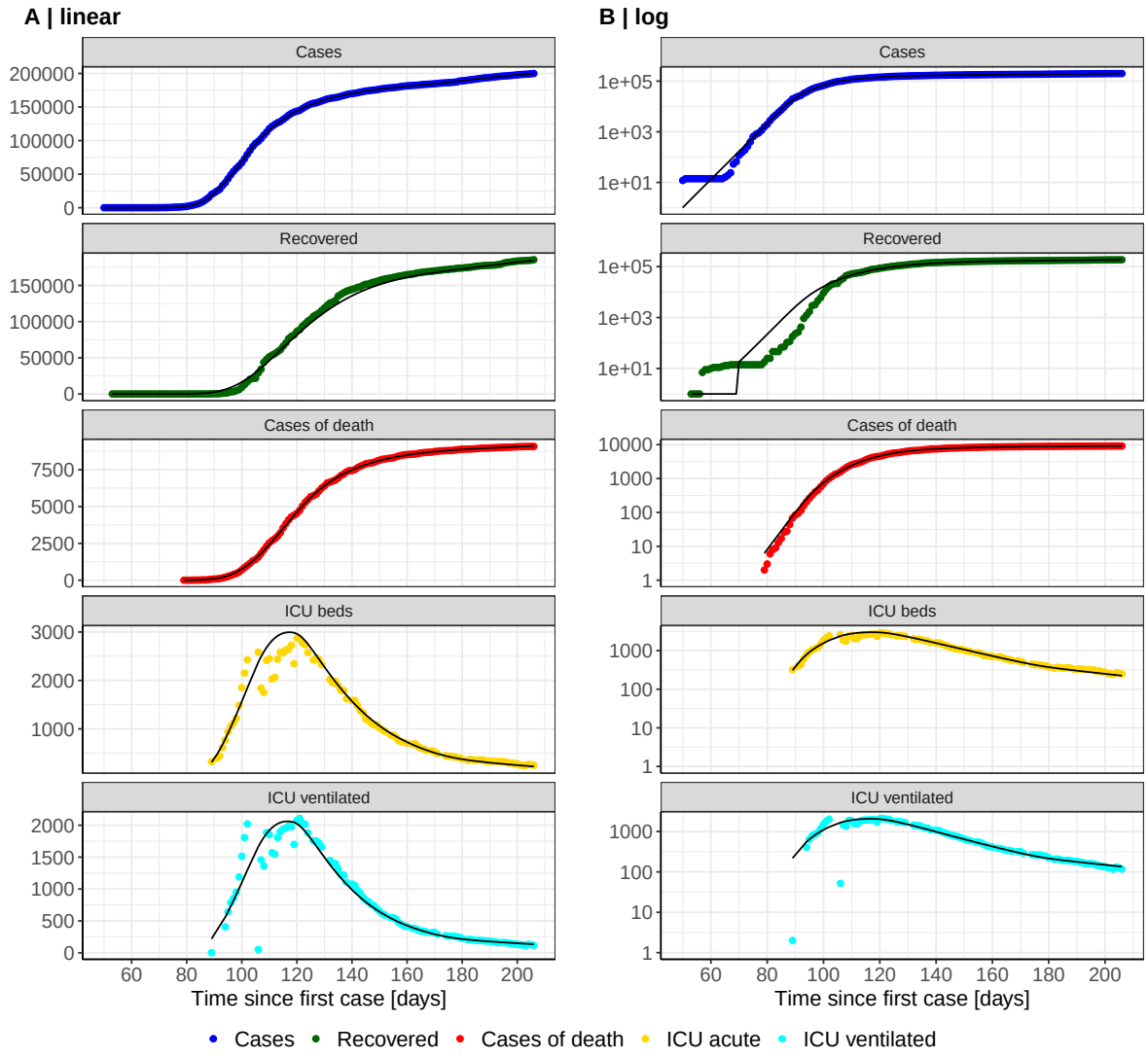


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

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.

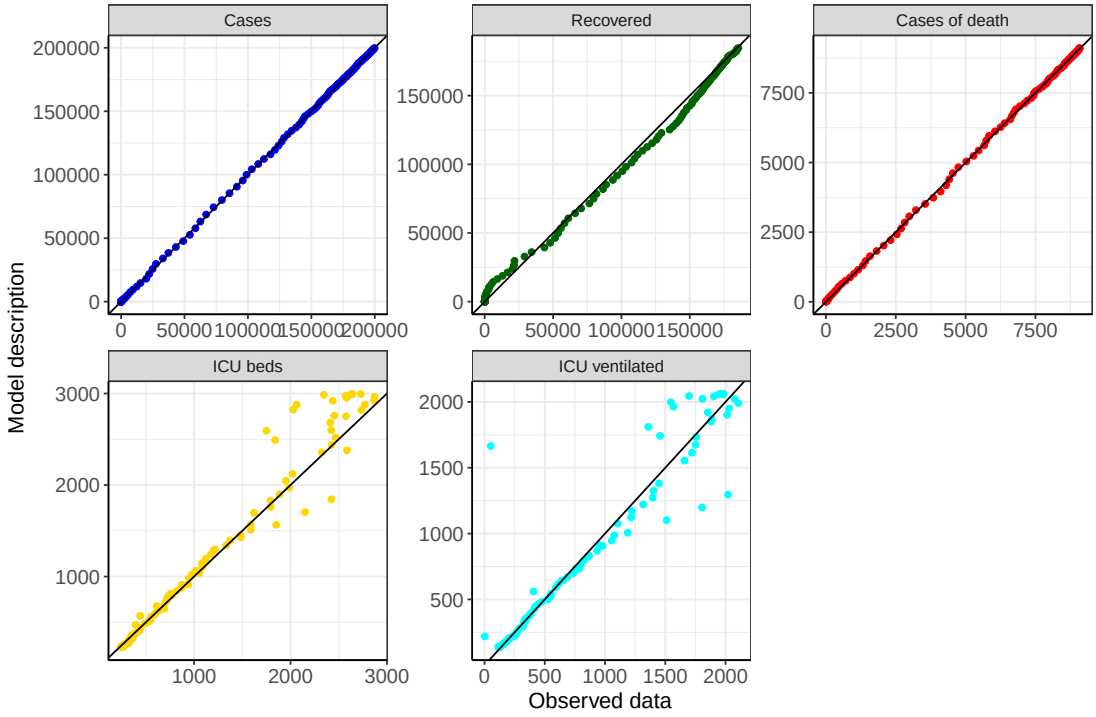


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

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).

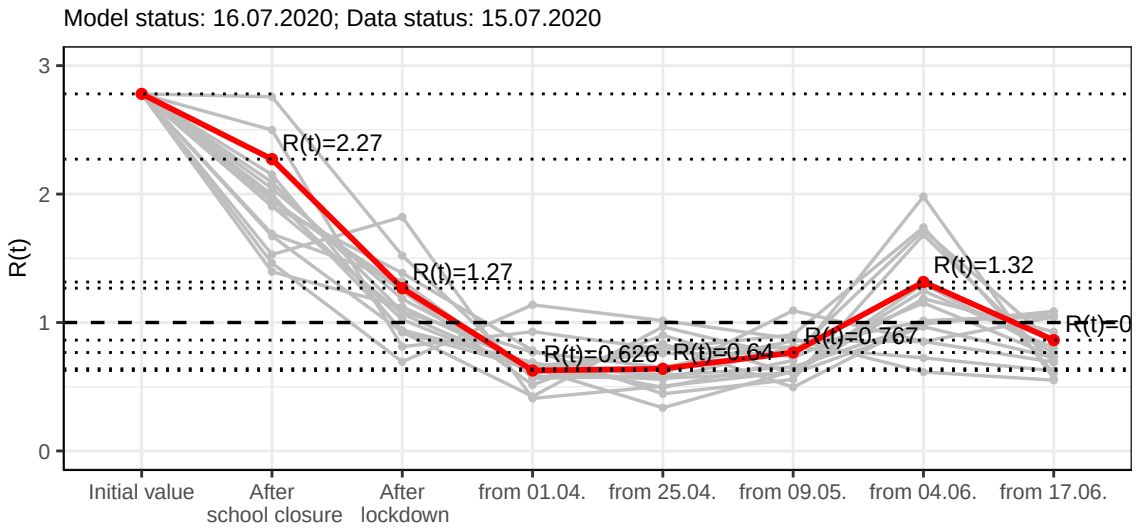


Figure 189: R(t) values before and after the NPIs for Germany

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

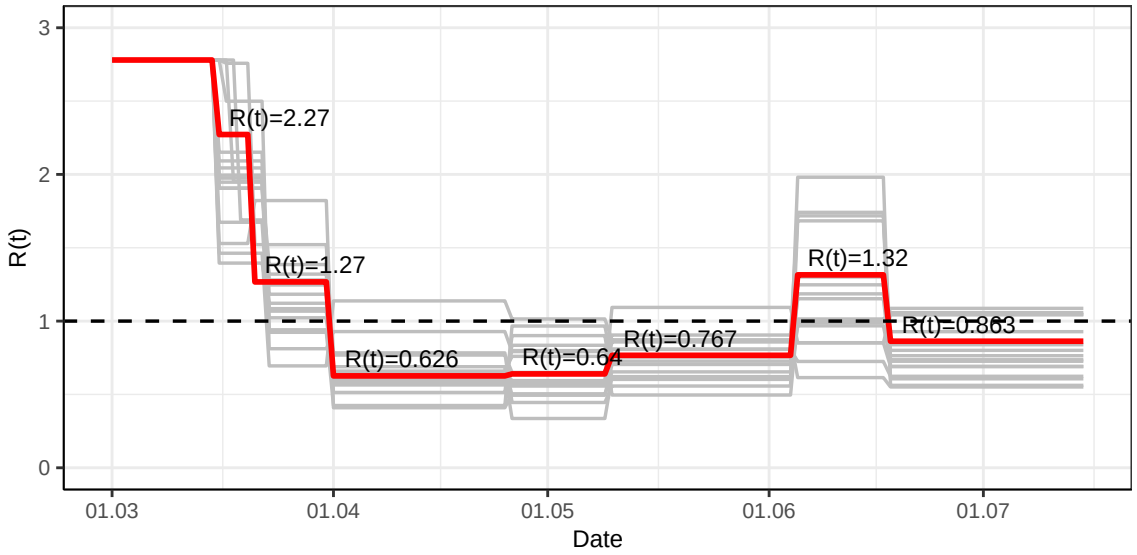


Figure 190: R(t) values over time for Germany

18.2 Model predictions

18.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.86)

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.

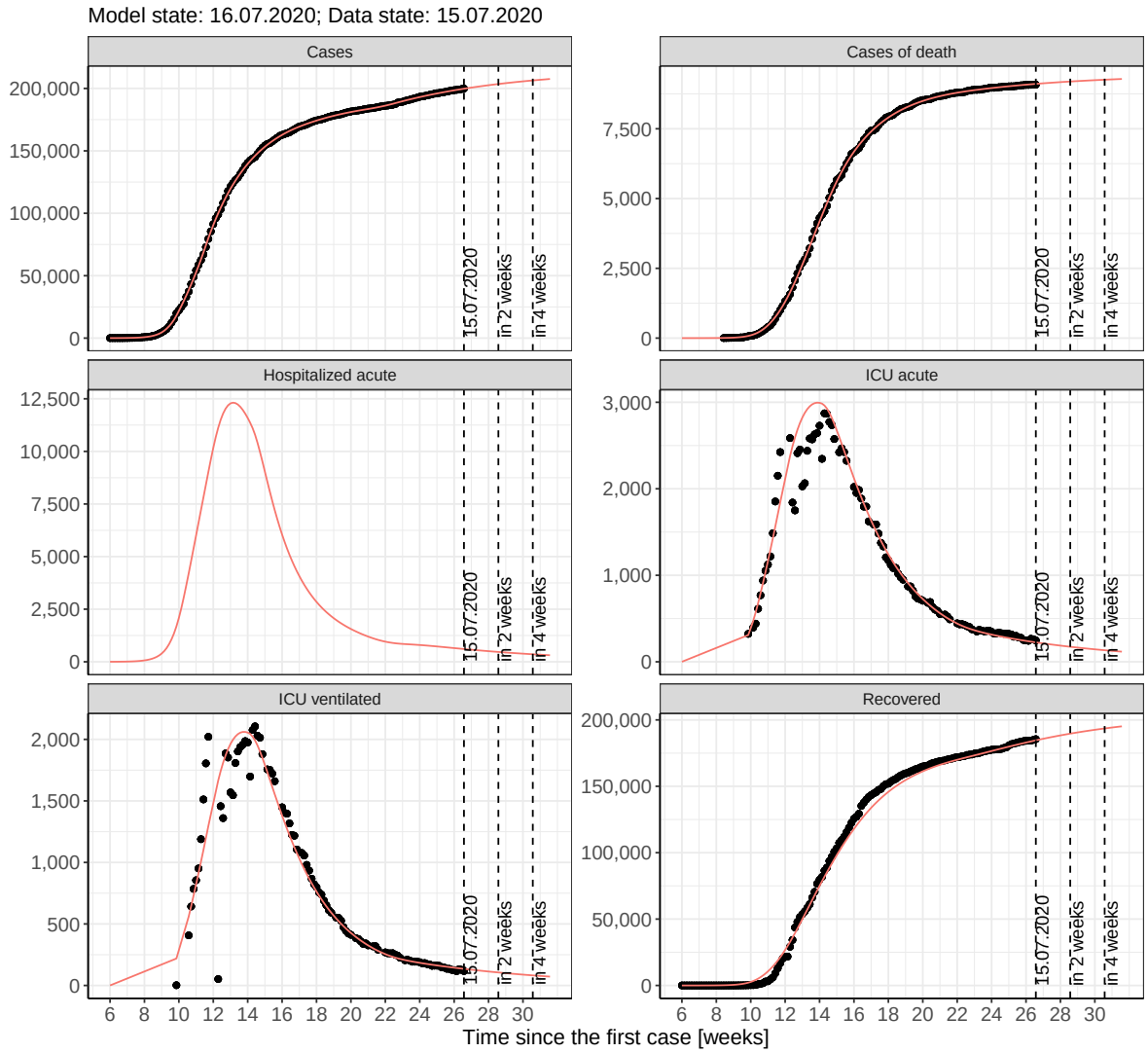


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

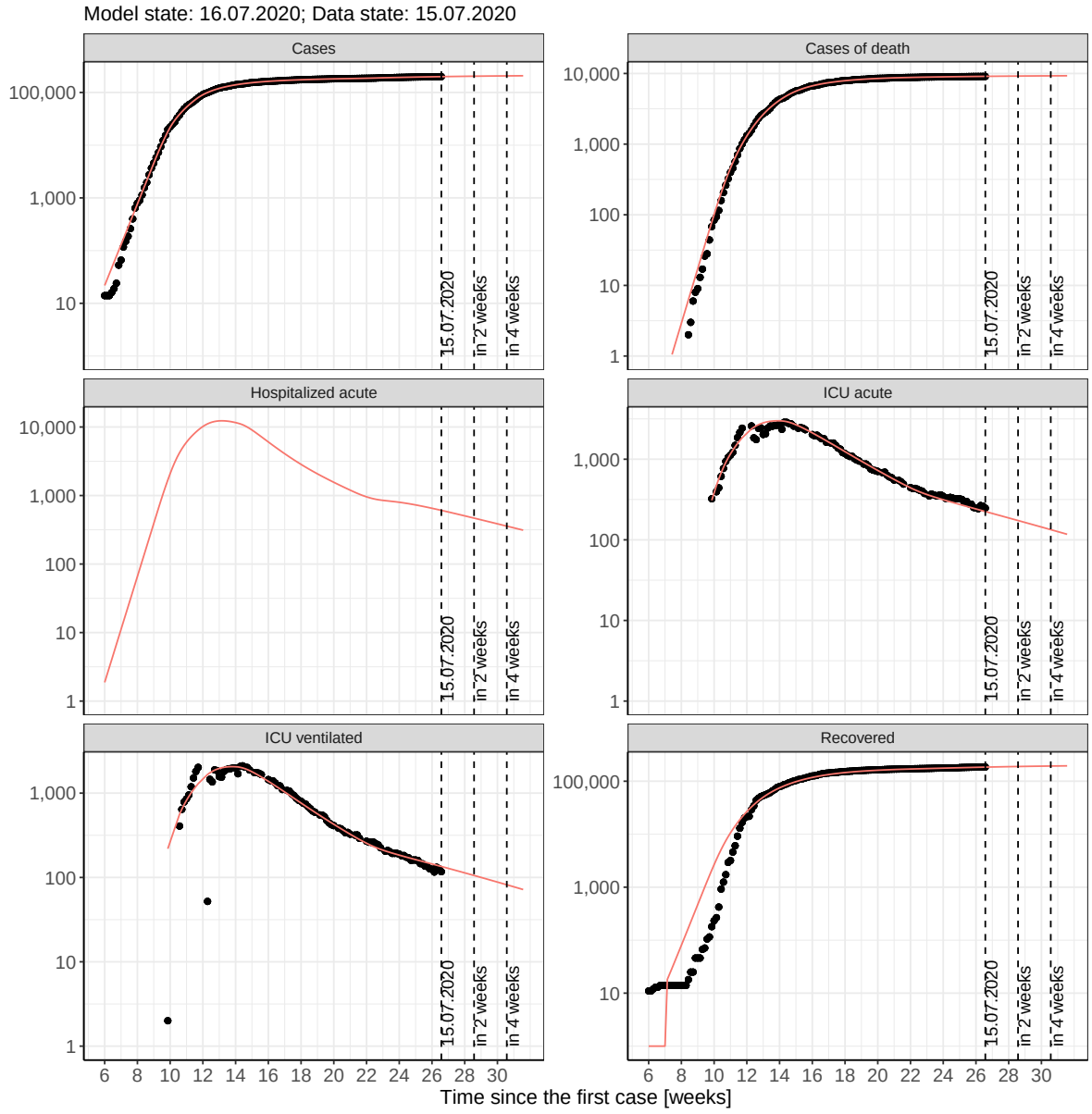


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 16.07.2020

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 16.07.2020 were tested.

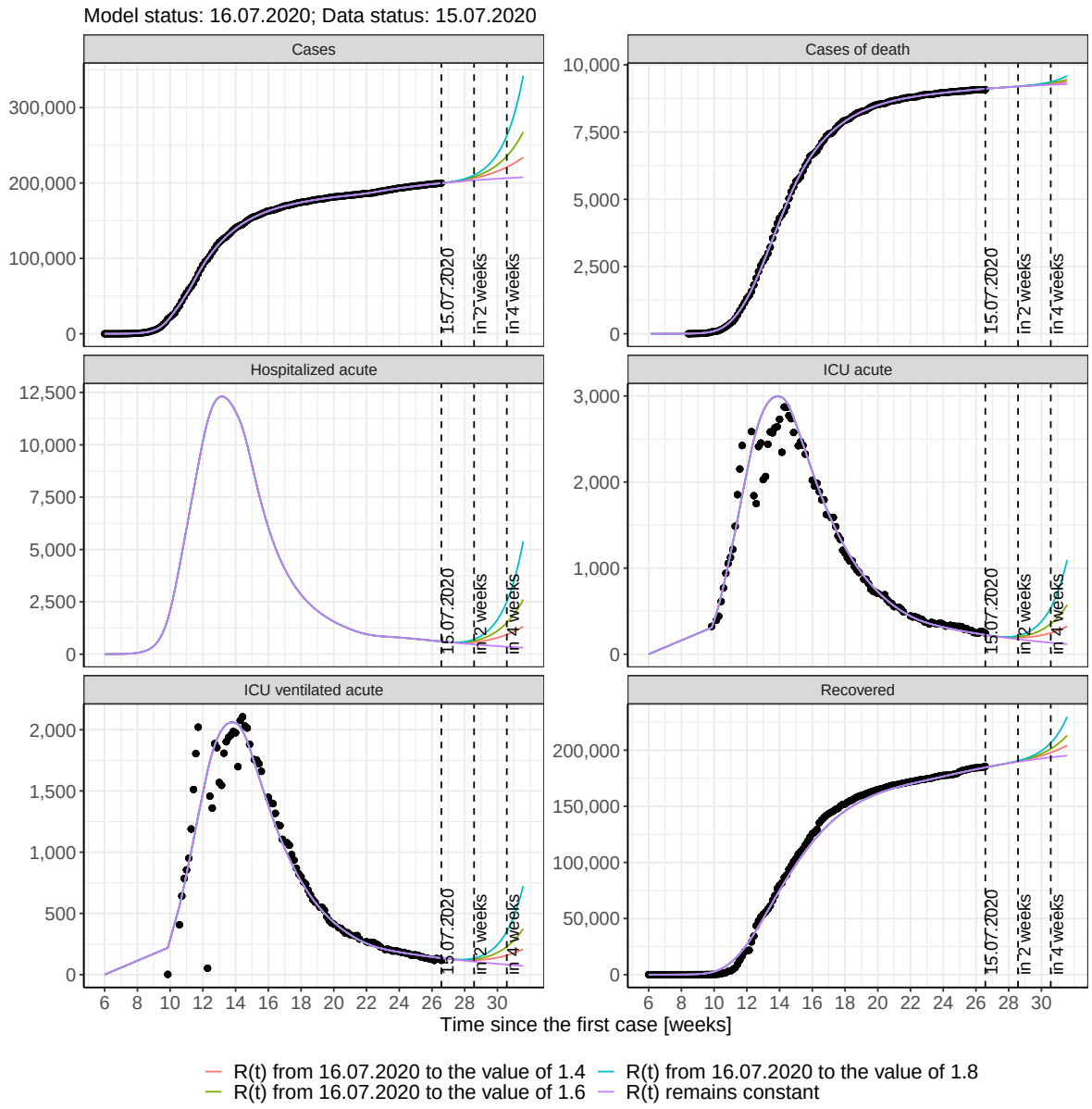


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

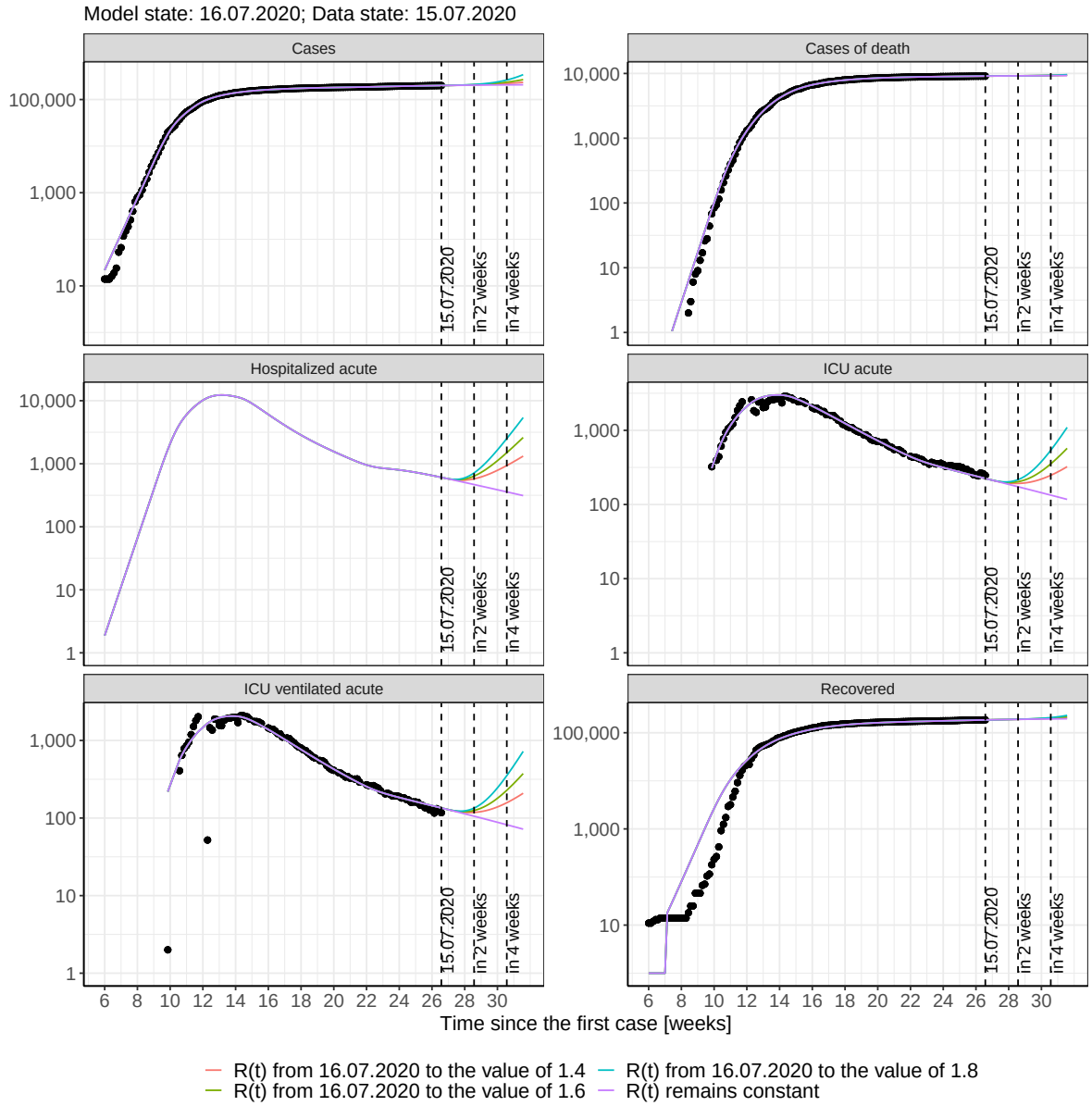


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 16.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 16.07.2020 were tested.

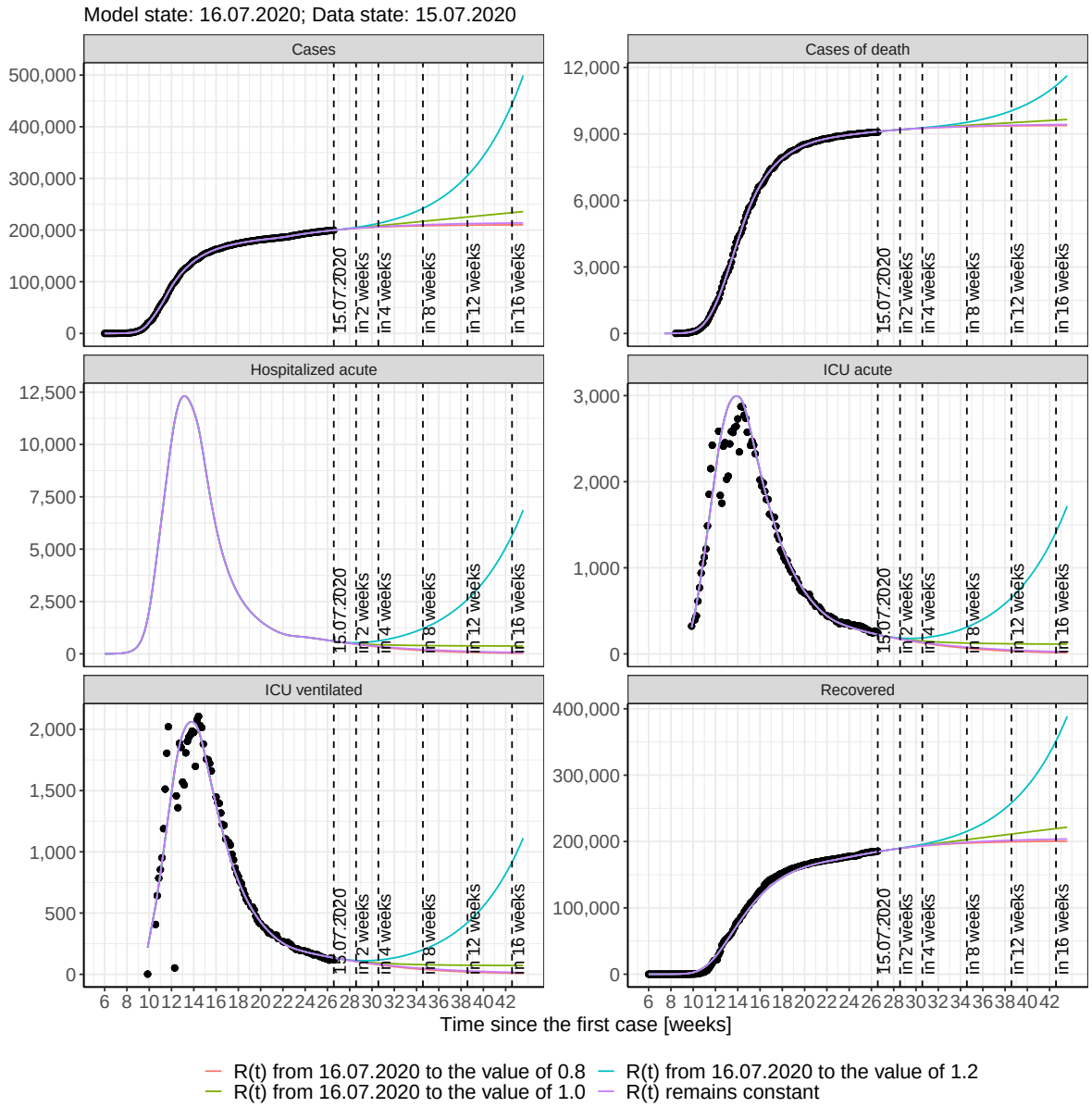


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 16.07.2020. Points: reported case numbers; lines: model prediction.

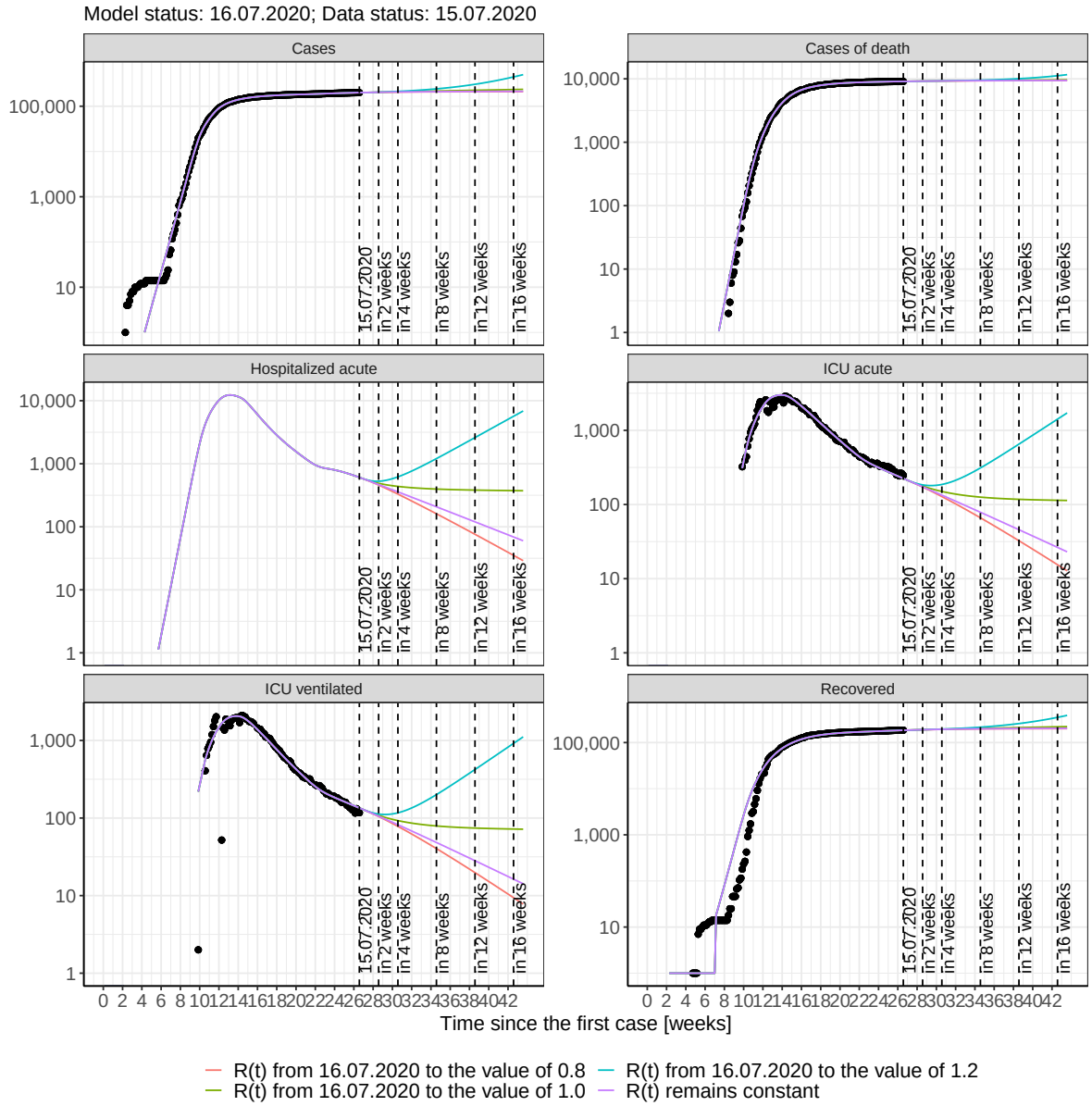


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 16.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 16.07.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 16.07.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 16.07.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 16.07.2020 (Tab. 69) Model status from 16.07.2020; Data status: 15.07.2020.

Table 66: Germany - R(t) remains unchanged after the 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	200080	9115	185020	596	220	133
17.07.2020	200380	9122	185420	586	216	130
18.07.2020	200680	9128	185800	575	213	128
19.07.2020	200960	9135	186180	565	209	126
20.07.2020	201250	9141	186560	554	205	124
21.07.2020	201520	9148	186930	544	201	122
22.07.2020	201800	9154	187290	534	197	120
23.07.2020	202060	9160	187650	524	194	117
24.07.2020	202320	9166	188000	514	190	115
25.07.2020	202580	9171	188340	505	187	113
26.07.2020	202830	9177	188680	495	183	111
27.07.2020	203080	9182	189010	486	180	109
28.07.2020	203320	9188	189340	477	177	108
29.07.2020	203550	9193	189660	468	174	106
30.07.2020	203780	9198	189980	459	170	104
31.07.2020	204010	9204	190280	450	167	102
01.08.2020	204230	9208	190590	442	164	100
02.08.2020	204450	9213	190890	434	161	98
03.08.2020	204670	9218	191180	425	158	97
04.08.2020	204880	9223	191460	417	155	95
05.08.2020	205080	9228	191750	409	152	93
06.08.2020	205280	9232	192020	401	150	91
07.08.2020	205480	9237	192290	394	147	90
08.08.2020	205670	9241	192560	386	144	88
09.08.2020	205860	9245	192820	379	141	87
10.08.2020	206050	9249	193070	372	139	85
11.08.2020	206230	9254	193320	365	136	83
12.08.2020	206410	9258	193570	358	134	82

Table 67: Germany - R(t) takes on the value of 0.8 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	200080	9115	185020	596	220	133
17.07.2020	200380	9122	185420	586	216	130
18.07.2020	200660	9128	185800	575	212	128
19.07.2020	200940	9135	186180	564	209	126
20.07.2020	201210	9141	186560	554	205	124
21.07.2020	201480	9148	186930	543	201	122
22.07.2020	201730	9154	187290	532	197	119
23.07.2020	201980	9160	187640	522	194	117
24.07.2020	202230	9165	187990	511	190	115
25.07.2020	202460	9171	188330	501	186	113
26.07.2020	202690	9177	188670	490	183	111
27.07.2020	202910	9182	188990	480	179	109
28.07.2020	203130	9188	189310	469	176	107
29.07.2020	203340	9193	189630	459	172	105
30.07.2020	203540	9198	189930	449	169	103
31.07.2020	203740	9203	190230	439	165	100
01.08.2020	203930	9208	190520	429	162	98
02.08.2020	204120	9213	190810	419	159	97
03.08.2020	204300	9218	191090	410	155	95
04.08.2020	204470	9222	191360	400	152	93
05.08.2020	204650	9227	191630	391	149	91
06.08.2020	204810	9231	191890	381	146	89
07.08.2020	204970	9235	192140	372	143	87
08.08.2020	205130	9239	192380	364	140	85
09.08.2020	205280	9243	192620	355	137	83
10.08.2020	205430	9247	192860	346	134	82
11.08.2020	205570	9251	193090	338	131	80
12.08.2020	205710	9255	193310	330	128	78

Table 68: Germany - R(t) takes on the value of 1.0 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	200080	9115	185020	596	220	133
17.07.2020	200390	9122	185420	586	216	130
18.07.2020	200700	9128	185800	575	213	128
19.07.2020	201010	9135	186190	565	209	126
20.07.2020	201320	9141	186560	556	205	124
21.07.2020	201630	9148	186930	546	202	122
22.07.2020	201940	9154	187300	538	198	120
23.07.2020	202250	9160	187660	530	195	118
24.07.2020	202550	9166	188020	522	192	116
25.07.2020	202860	9171	188370	515	189	114
26.07.2020	203170	9177	188720	508	186	113
27.07.2020	203480	9183	189060	501	183	111
28.07.2020	203790	9188	189410	495	180	110
29.07.2020	204090	9194	189740	490	177	108
30.07.2020	204400	9199	190080	484	175	107
31.07.2020	204710	9204	190410	479	172	105
01.08.2020	205020	9210	190740	474	170	104
02.08.2020	205320	9215	191070	470	168	103
03.08.2020	205630	9220	191400	466	166	102
04.08.2020	205940	9225	191720	462	164	100
05.08.2020	206250	9230	192050	458	162	99
06.08.2020	206550	9235	192370	455	160	98
07.08.2020	206860	9240	192690	451	158	97
08.08.2020	207170	9245	193000	448	156	96
09.08.2020	207470	9250	193320	445	155	95
10.08.2020	207780	9254	193640	442	153	94
11.08.2020	208090	9259	193950	439	151	93
12.08.2020	208390	9264	194260	437	150	93

Table 69: Germany - R(t) takes on the value of 1.2 after 16.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
16.07.2020	200090	9115	185020	596	220	133
17.07.2020	200410	9122	185420	586	216	130
18.07.2020	200740	9128	185800	576	213	128
19.07.2020	201080	9135	186190	566	209	126
20.07.2020	201440	9141	186570	558	205	124
21.07.2020	201800	9148	186940	550	202	122
22.07.2020	202170	9154	187310	544	199	121
23.07.2020	202550	9160	187680	538	196	119
24.07.2020	202940	9166	188050	534	194	118
25.07.2020	203350	9172	188410	531	191	116
26.07.2020	203760	9177	188780	528	189	115
27.07.2020	204190	9183	189150	527	187	114
28.07.2020	204630	9189	189520	527	185	113
29.07.2020	205080	9195	189890	528	184	113
30.07.2020	205550	9200	190260	529	183	112
31.07.2020	206030	9206	190640	532	182	112
01.08.2020	206520	9212	191020	535	181	111
02.08.2020	207020	9217	191410	539	180	111
03.08.2020	207550	9223	191800	544	180	111
04.08.2020	208080	9229	192200	550	180	111
05.08.2020	208630	9234	192600	556	180	111
06.08.2020	209200	9240	193010	563	180	112
07.08.2020	209780	9246	193440	571	181	112
08.08.2020	210380	9252	193870	579	182	113
09.08.2020	211000	9258	194300	588	182	114
10.08.2020	211630	9264	194750	598	184	115
11.08.2020	212280	9271	195210	608	185	116
12.08.2020	212950	9277	195680	619	186	117

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 16.07.2020

Fig. 197 shows the absolute changes in case numbers compared to the previous day for the next 4 weeks for different R(t) values.

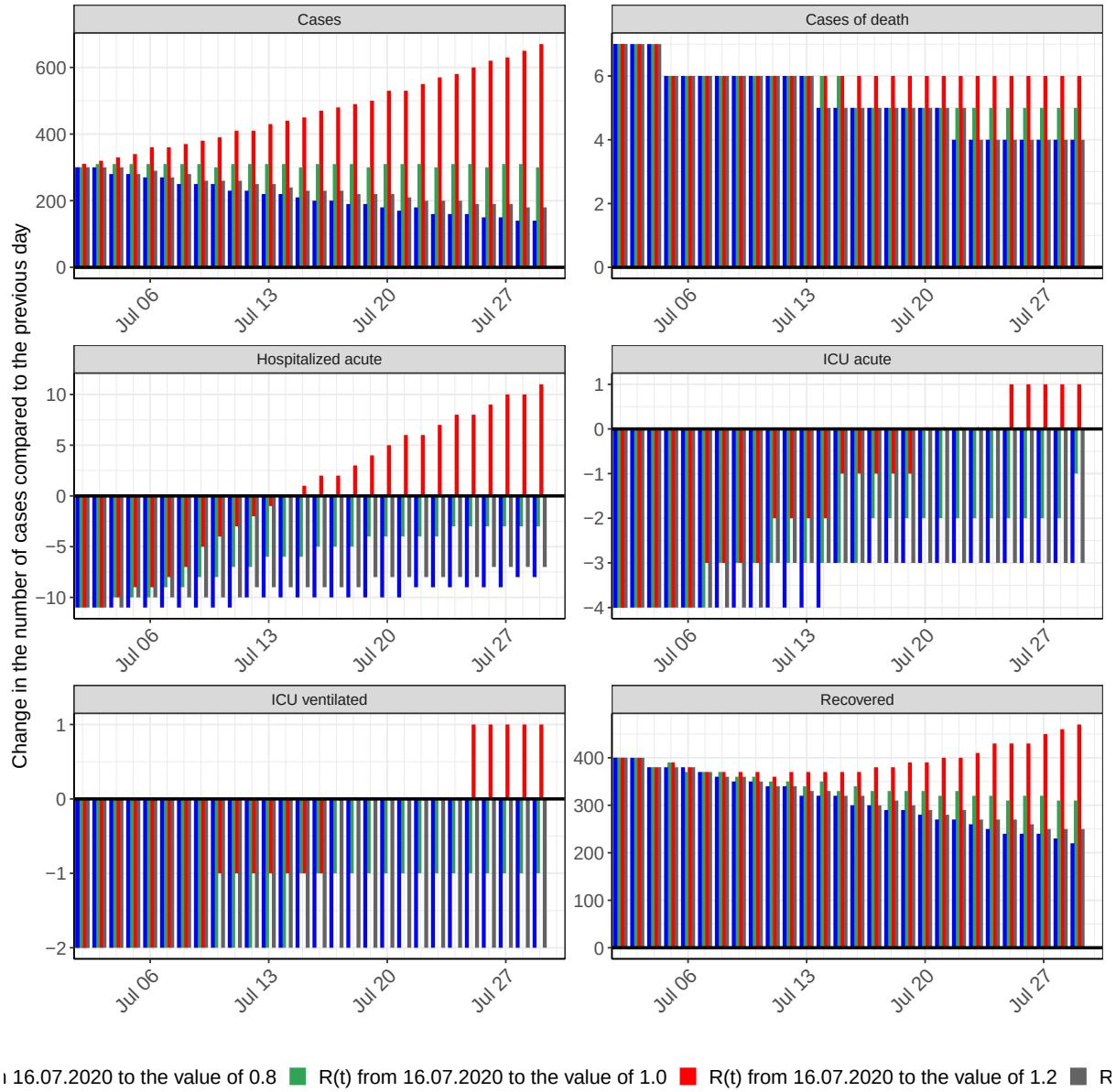


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany