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

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Summary

Aims

- The aim of this project is to develop a mechanistic mathematical model to predict COVID-19 infections including hospital bed occupancy, intensive care units (ICU), ventilation and death rates in the individual German federal states and to estimate non-pharmaceutical interventions (NPI, e.g. school closure) over time.
- The model will be used to predict the further course of infections (including hospital occupancy, ICU, ventilation, death rates) and to simulate various possible scenarios (e.g. lifting of lockdown).
- The model and the predictions will be adjusted with new data at regular intervals (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 05.05.2020 (one day after school reopening on 04.05.2020), there was a small increase of R(t) by 11% on average to 0.705. After 31.05.2020, there was a further increase of R(t) by approx. 32% from 0.71 to 0.94 in the national average.
  - The current R(t) values are estimated to be less than 1 for all federal states, with the exception of those with known "corona hotspots" (Berlin, Brandenburg, North Rhine-Westphalia and Saxony-Anhalt).

- 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 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

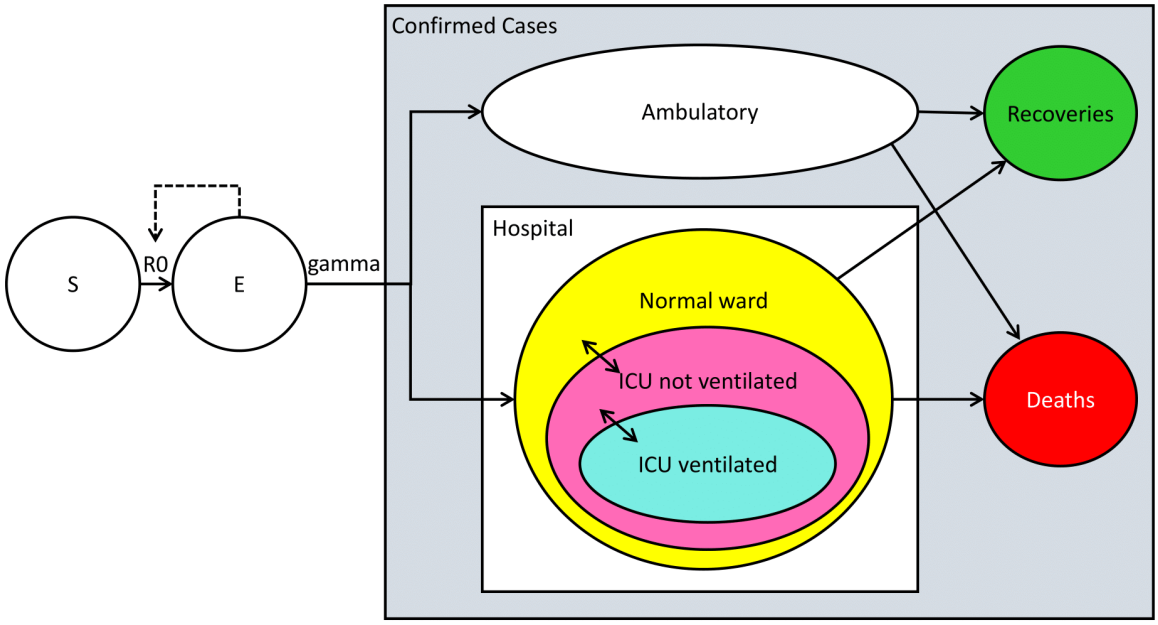
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected,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

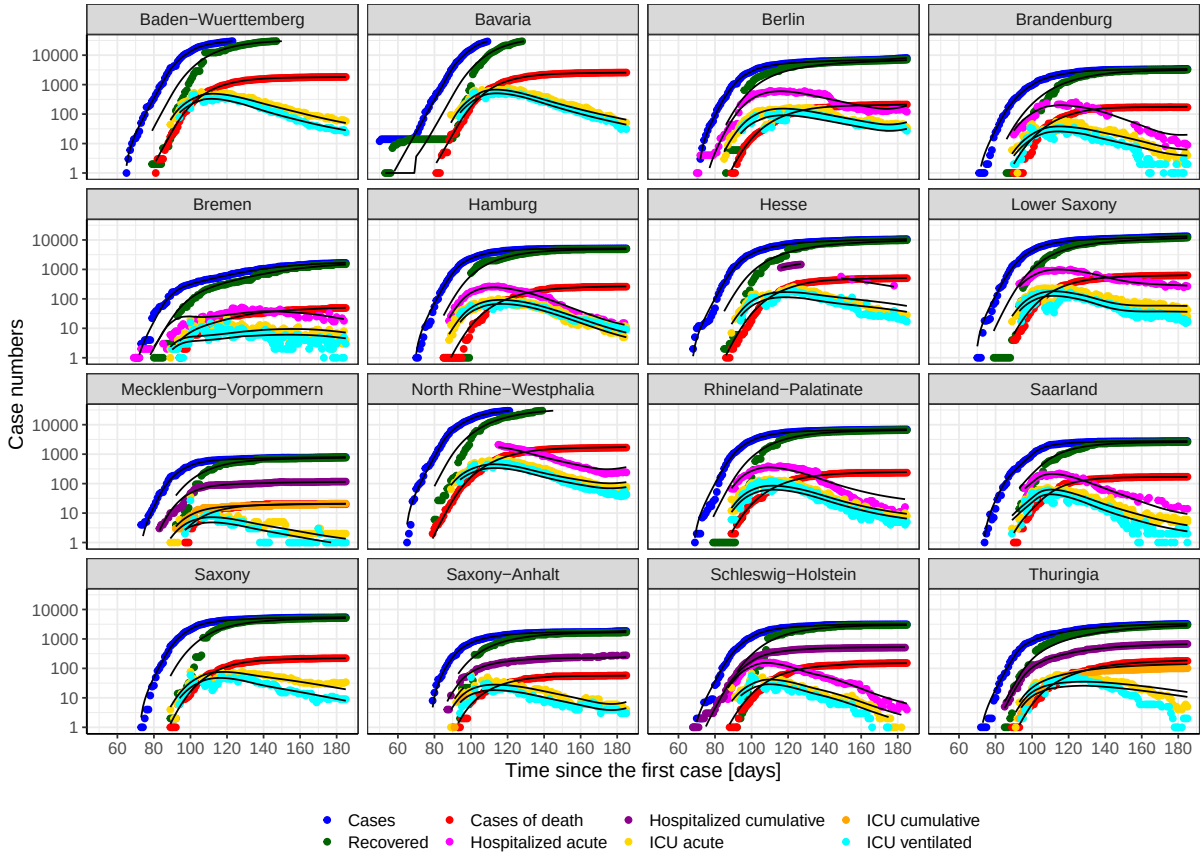


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

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.

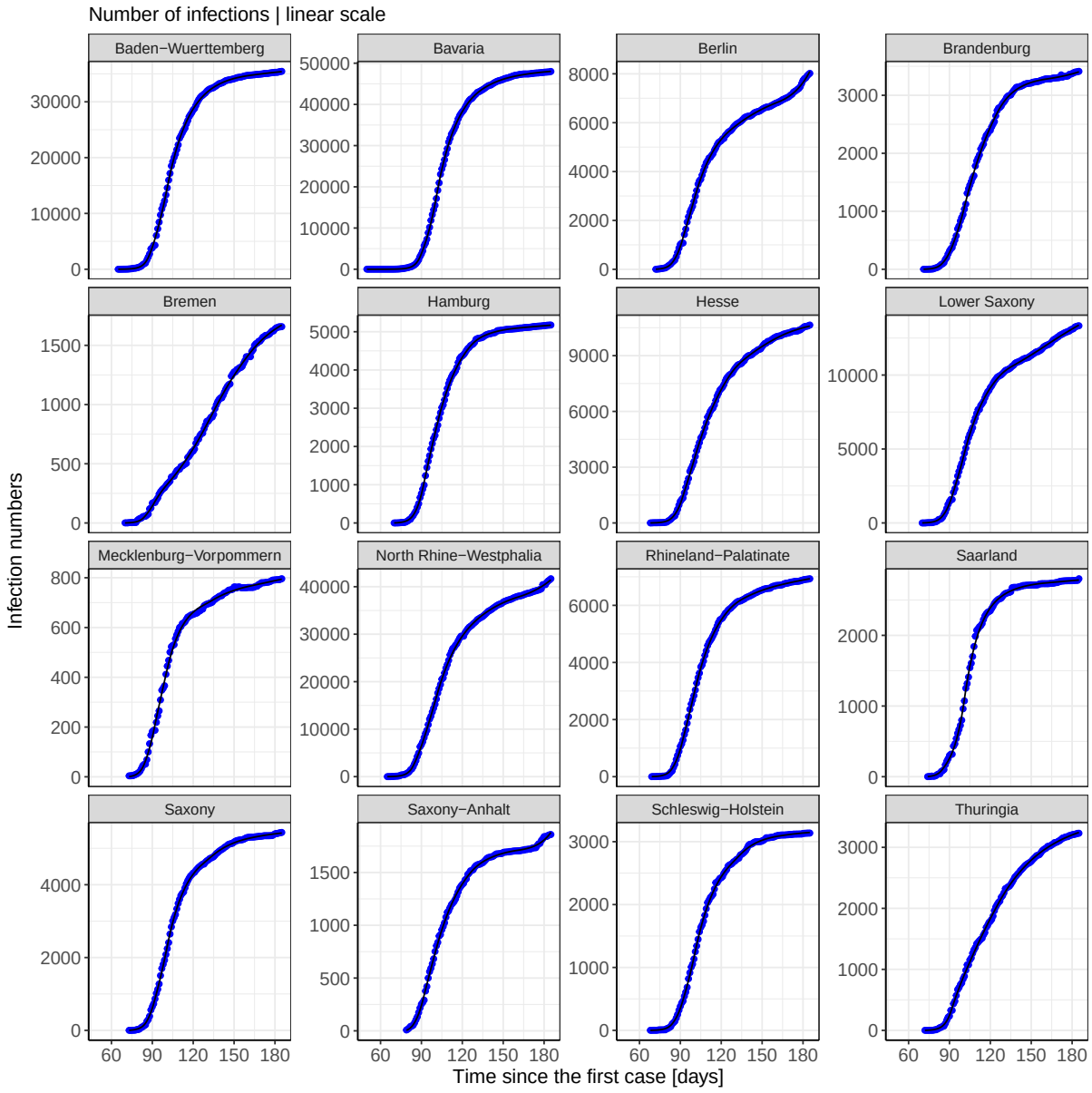


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

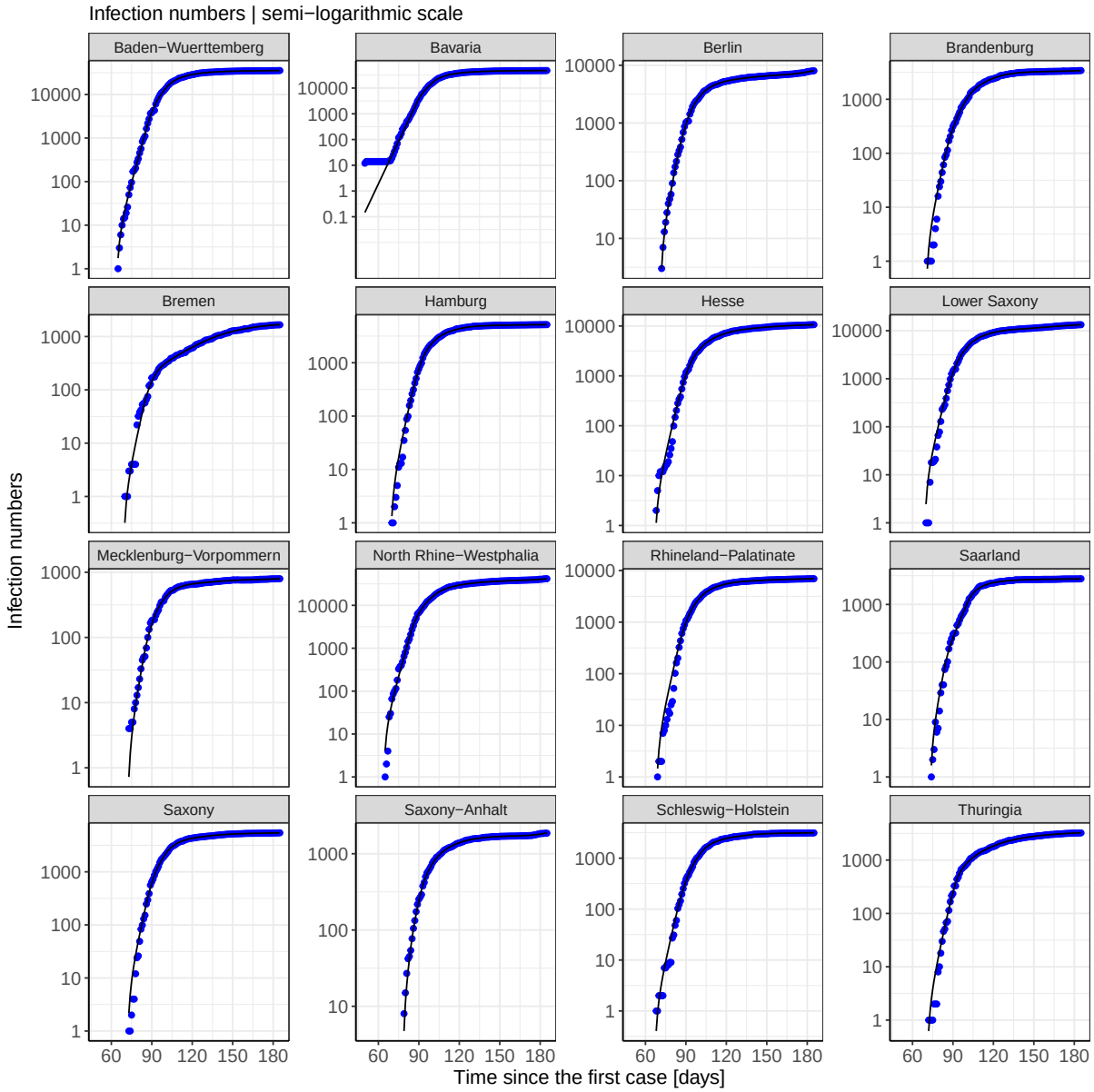


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

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.

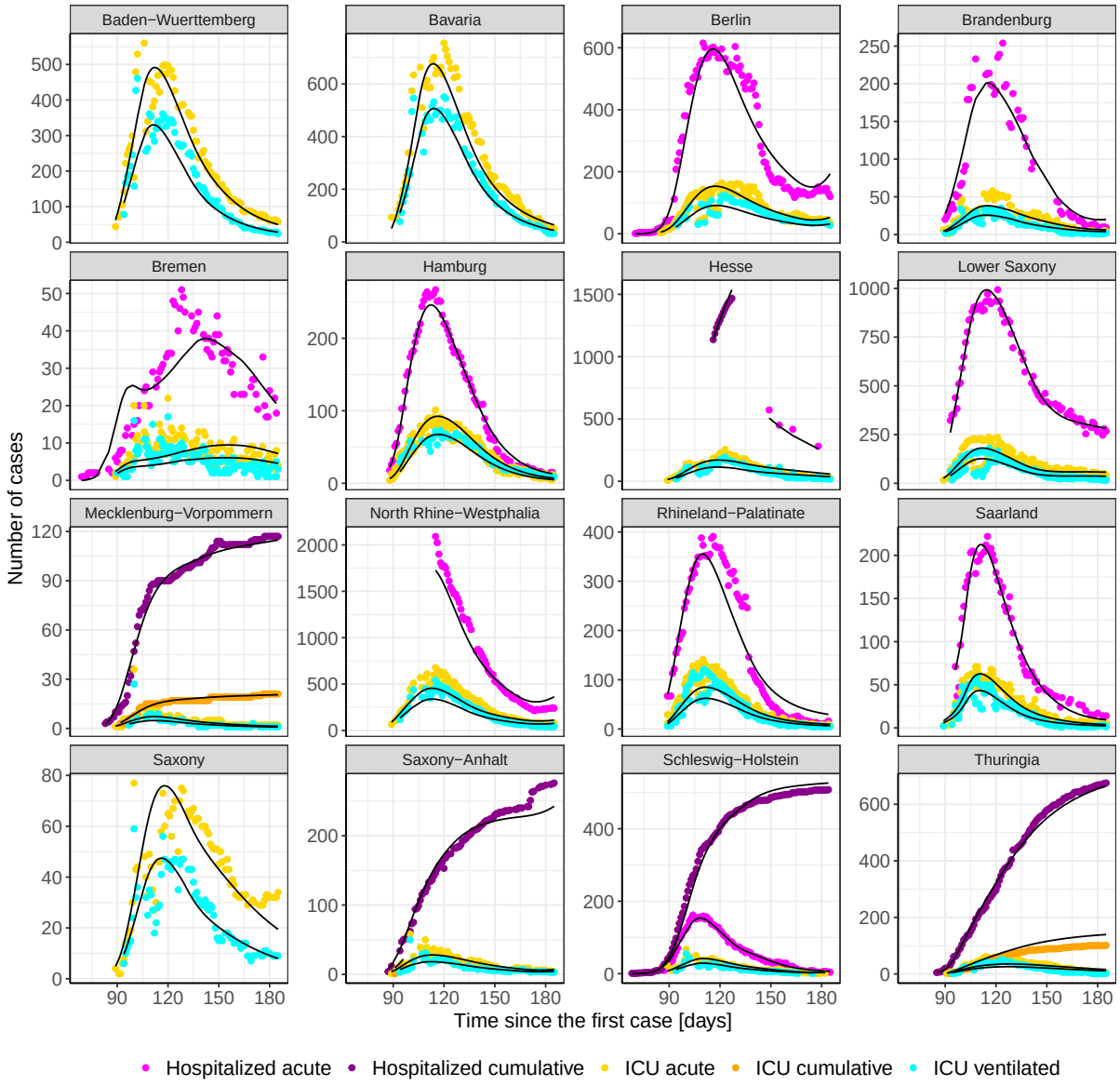


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

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.

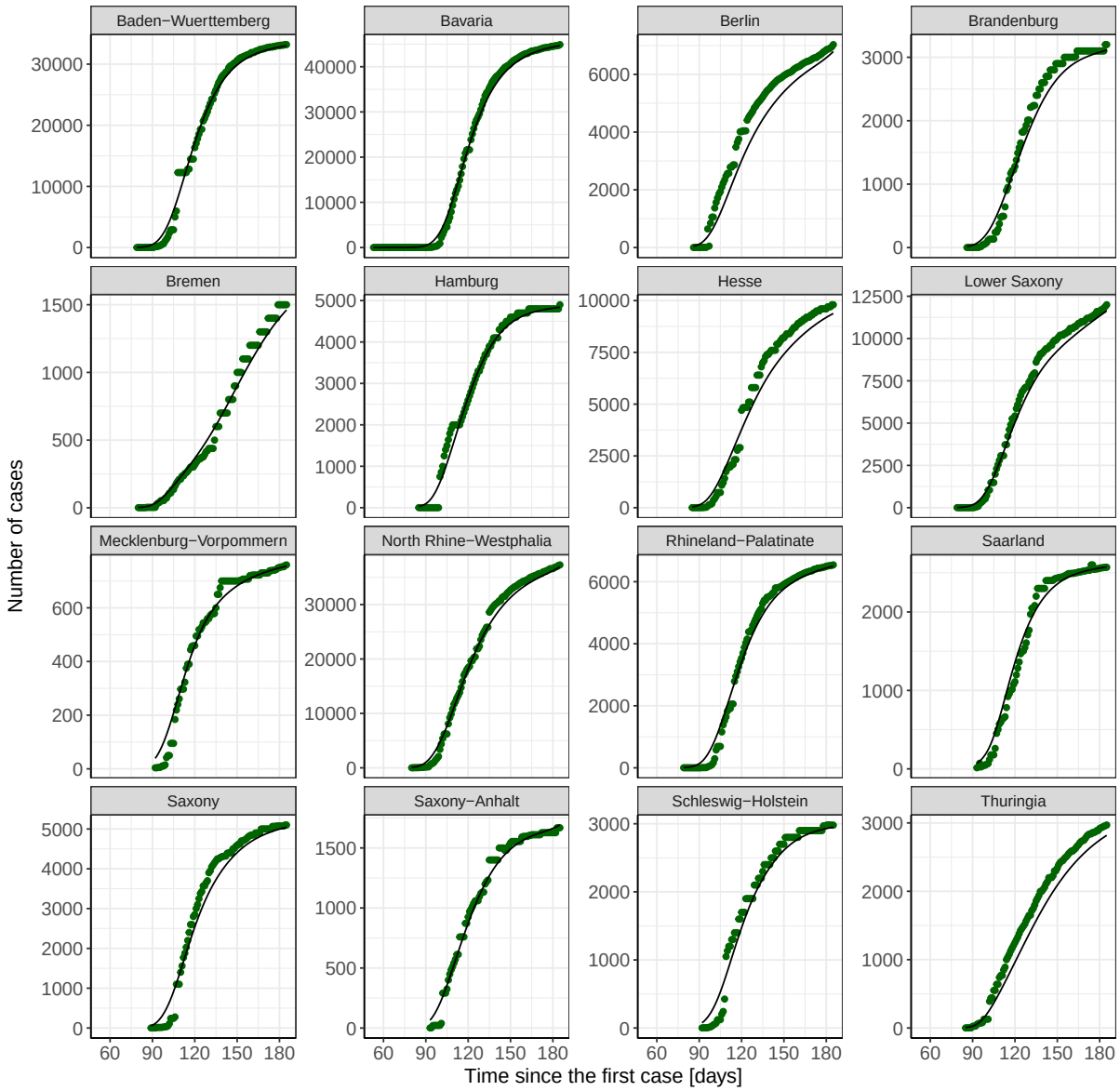


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

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.

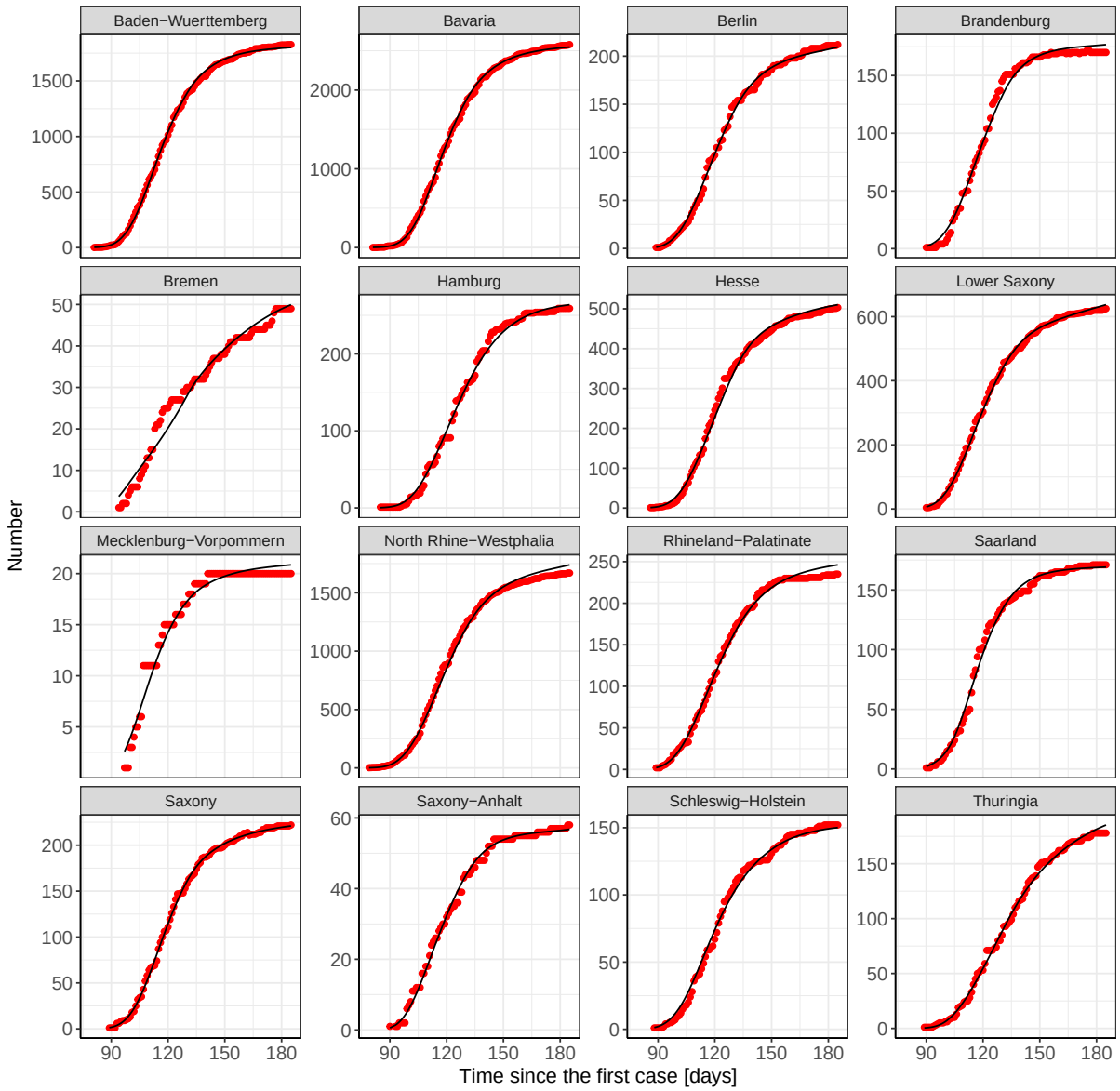


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

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.

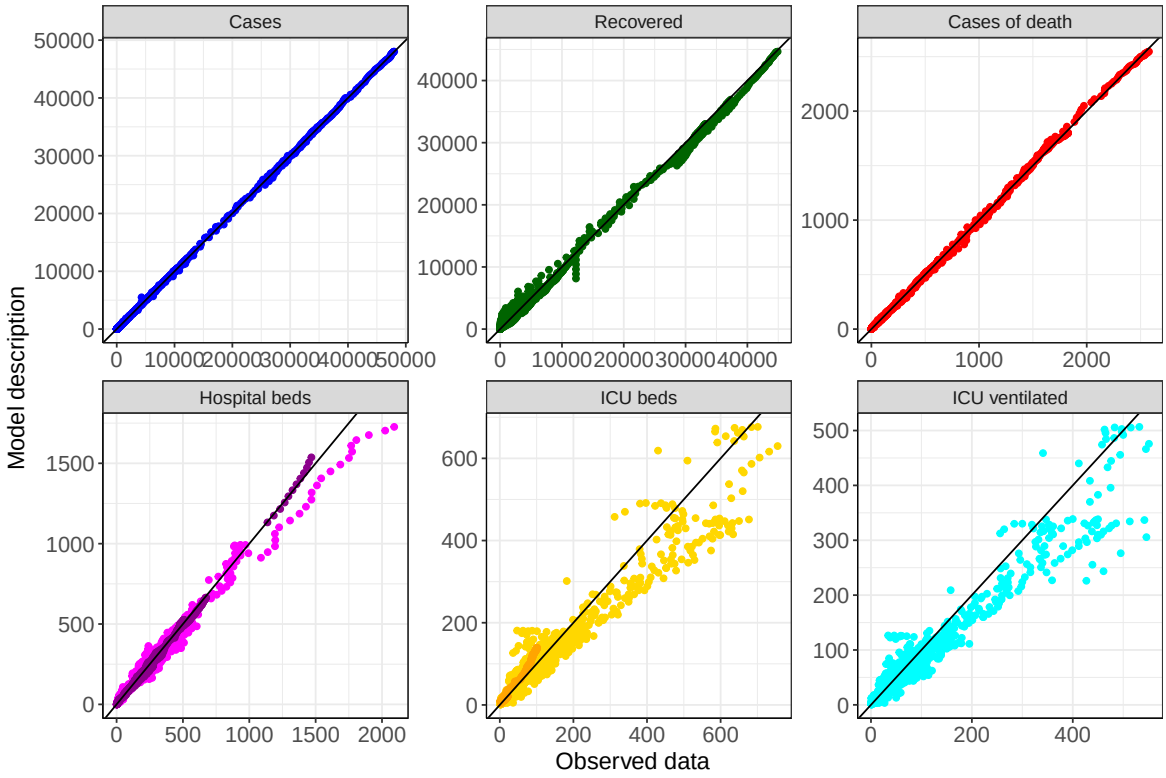


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

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, 05.05.2020 and 31.05.2020. 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. One day after the school reopening on 04.05.2020, the R(t) value increased by approx. 11% 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. 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 05.05.2020: A slight increase of R(t) by about 11% to 0.71 (p-value < 0.001).
- From 31.05.2010: A further increase of R(t) by approx. 32% from 0.71 to 0.94 (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 05.05.	From 31.05.
Baden-Wuerttemberg	2.78	1.68	1.32	0.58	0.57	0.60	0.90
Bavaria	2.78	2.75	1.52	0.56	0.57	0.66	0.77
Berlin	2.78	1.97	1.03	0.61	0.84	0.84	1.48
Brandenburg	2.78	1.90	1.39	0.78	0.45	0.52	1.24
Bremen	2.78	1.46	0.70	1.13	1.05	0.89	0.76
Hamburg	2.78	2.15	0.92	0.65	0.32	0.56	0.96
Hesse	2.78	2.10	1.08	0.77	0.56	0.87	0.76
Mecklenburg-Vorpommern	2.78	1.67	0.93	0.42	1.03	0.74	1.00
Lower Saxony	2.78	2.04	1.18	0.65	0.49	1.05	0.95
North Rhine-Westphalia	2.78	1.40	1.12	0.66	0.73	0.77	1.30
Rhineland-Palatinate	2.78	1.91	1.06	0.62	0.50	0.79	0.90
Saarland	2.78	1.54	1.82	0.41	0.51	0.57	1.00
Saxony	2.78	1.96	1.24	0.52	0.93	0.65	0.79
Saxony-Anhalt	2.78	1.99	0.94	0.69	0.49	0.61	1.68
Schleswig-Holstein	2.78	1.94	1.28	0.59	0.91	0.53	0.76
Thuringia	2.78	2.49	0.82	0.93	0.80	0.80	0.80
Germany	2.78	2.28	1.26	0.63	0.61	0.75	1.07

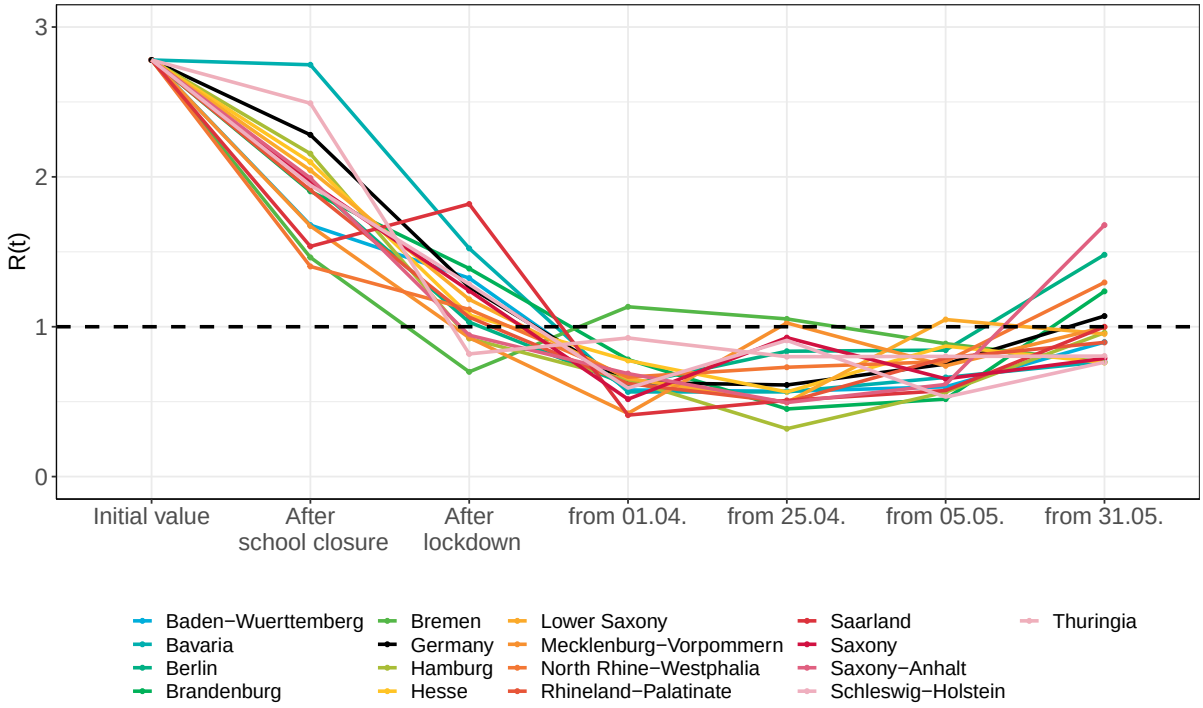


Figure 9: R(t) distribution before and after NPIs

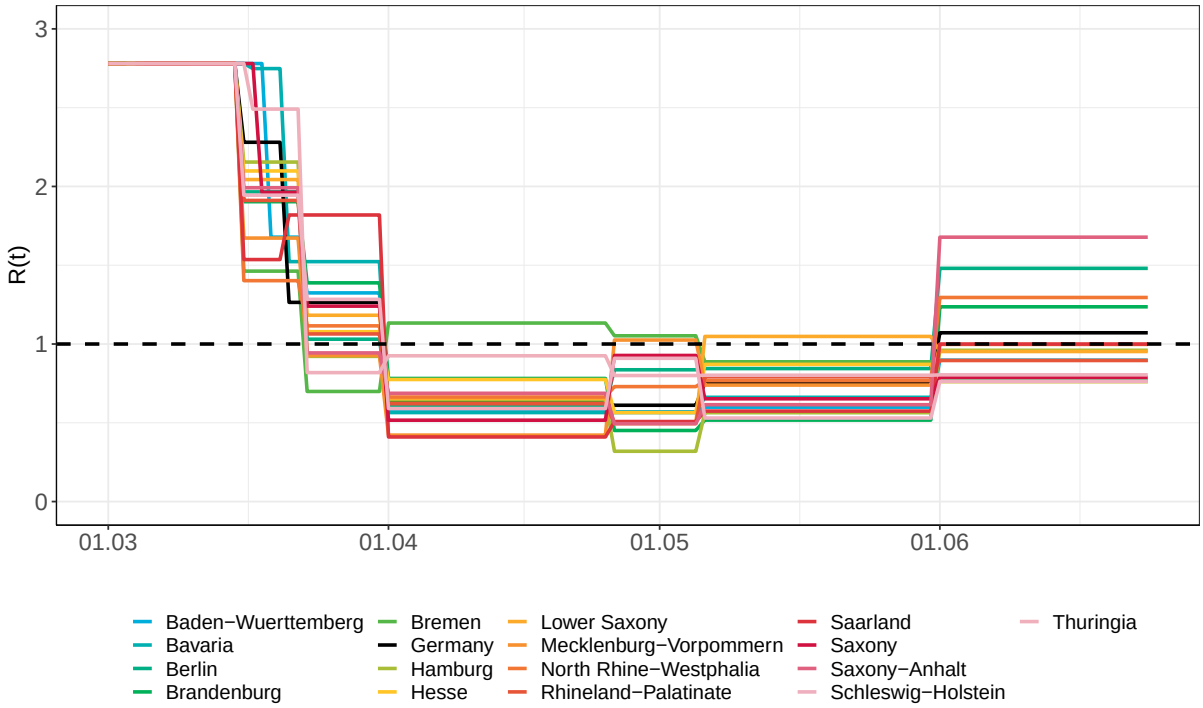


Figure 10: R(t) over time

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.

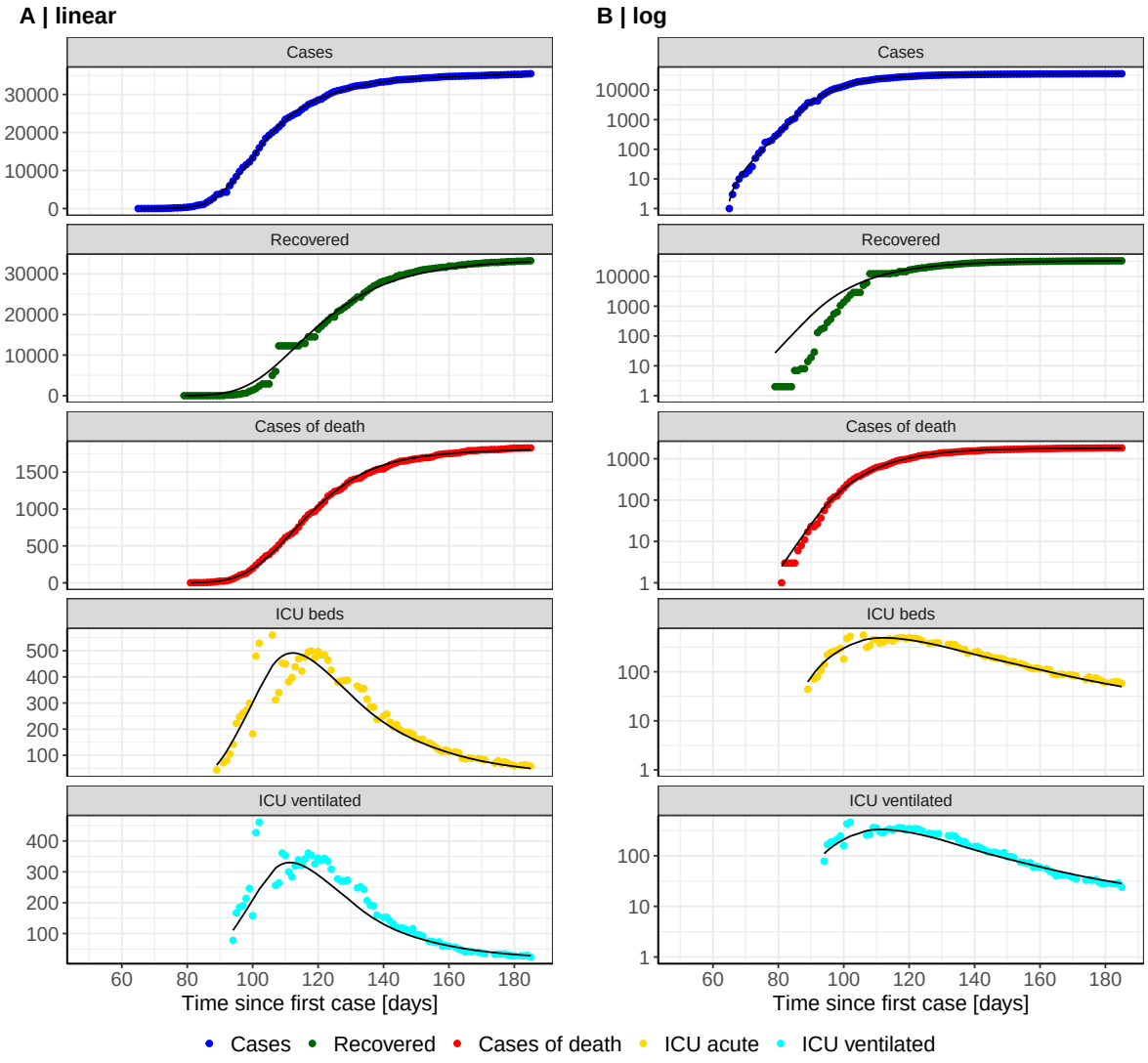


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

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.

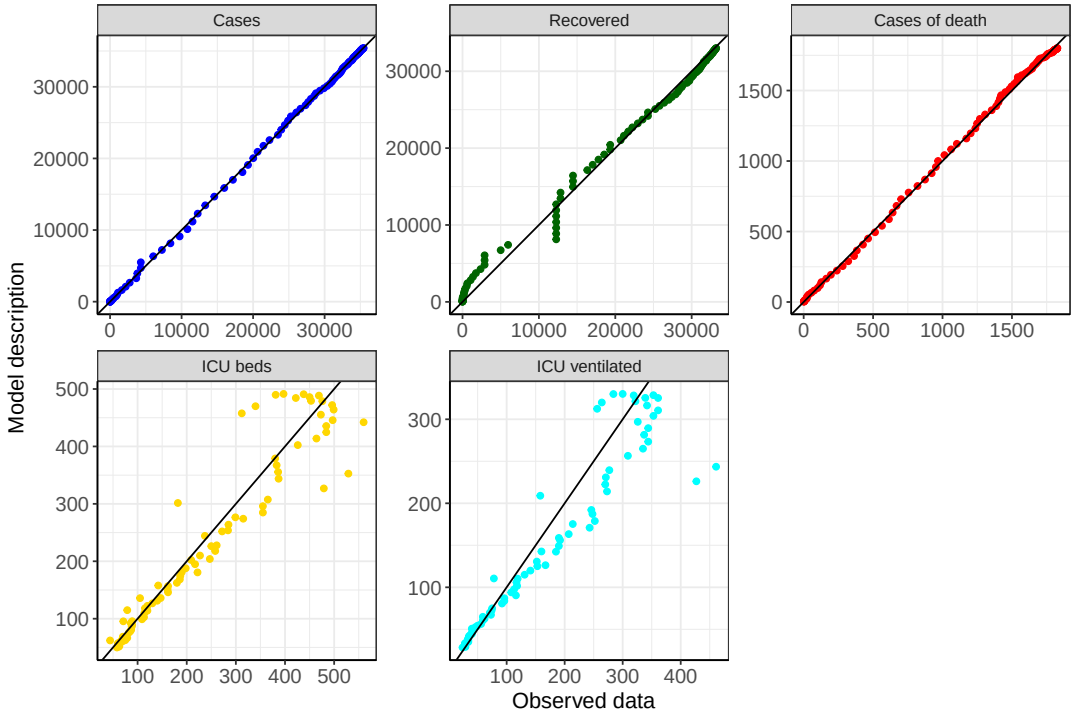


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

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).

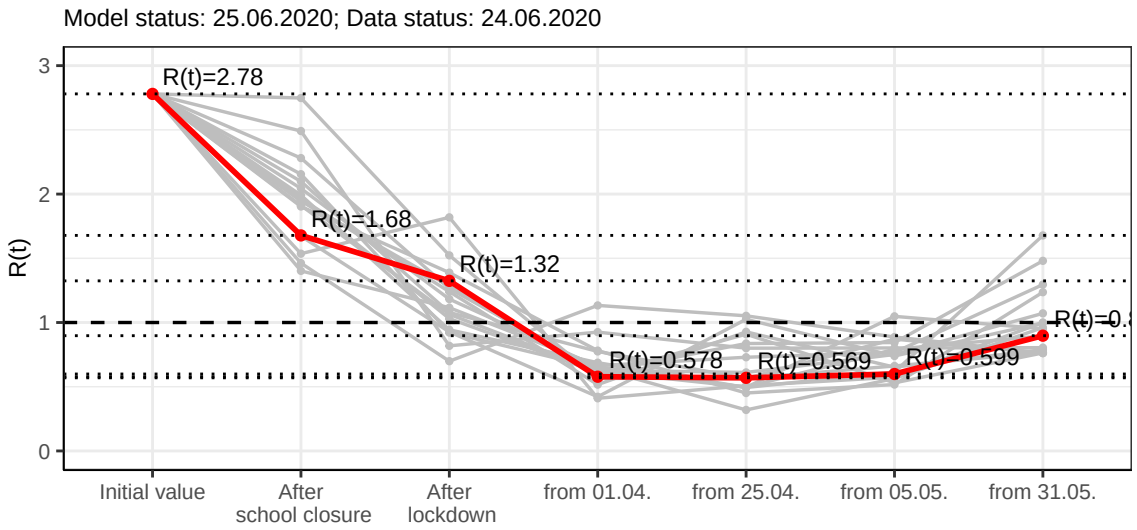


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

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

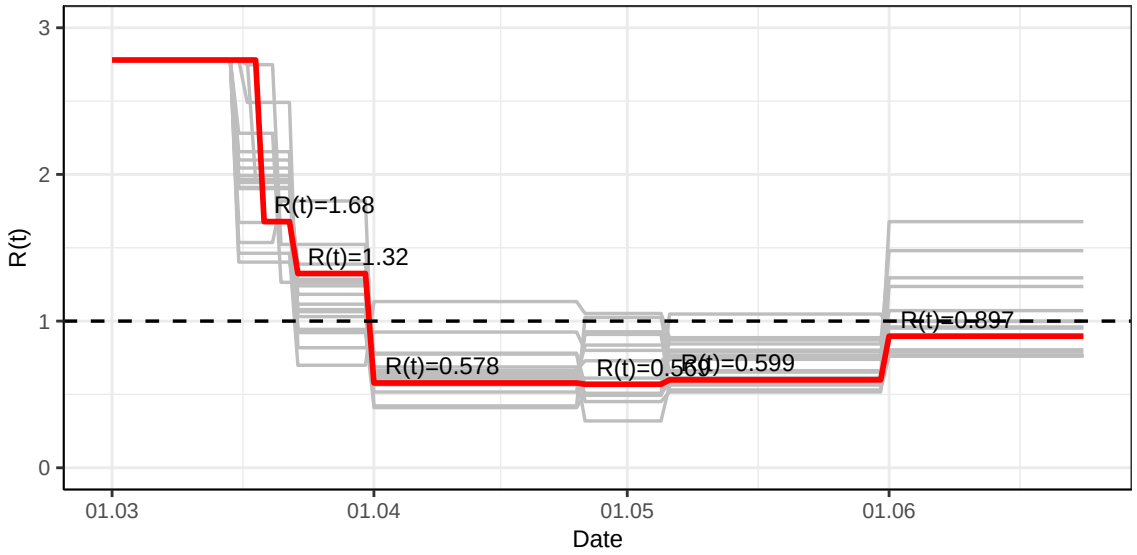


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

2.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.9)

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.

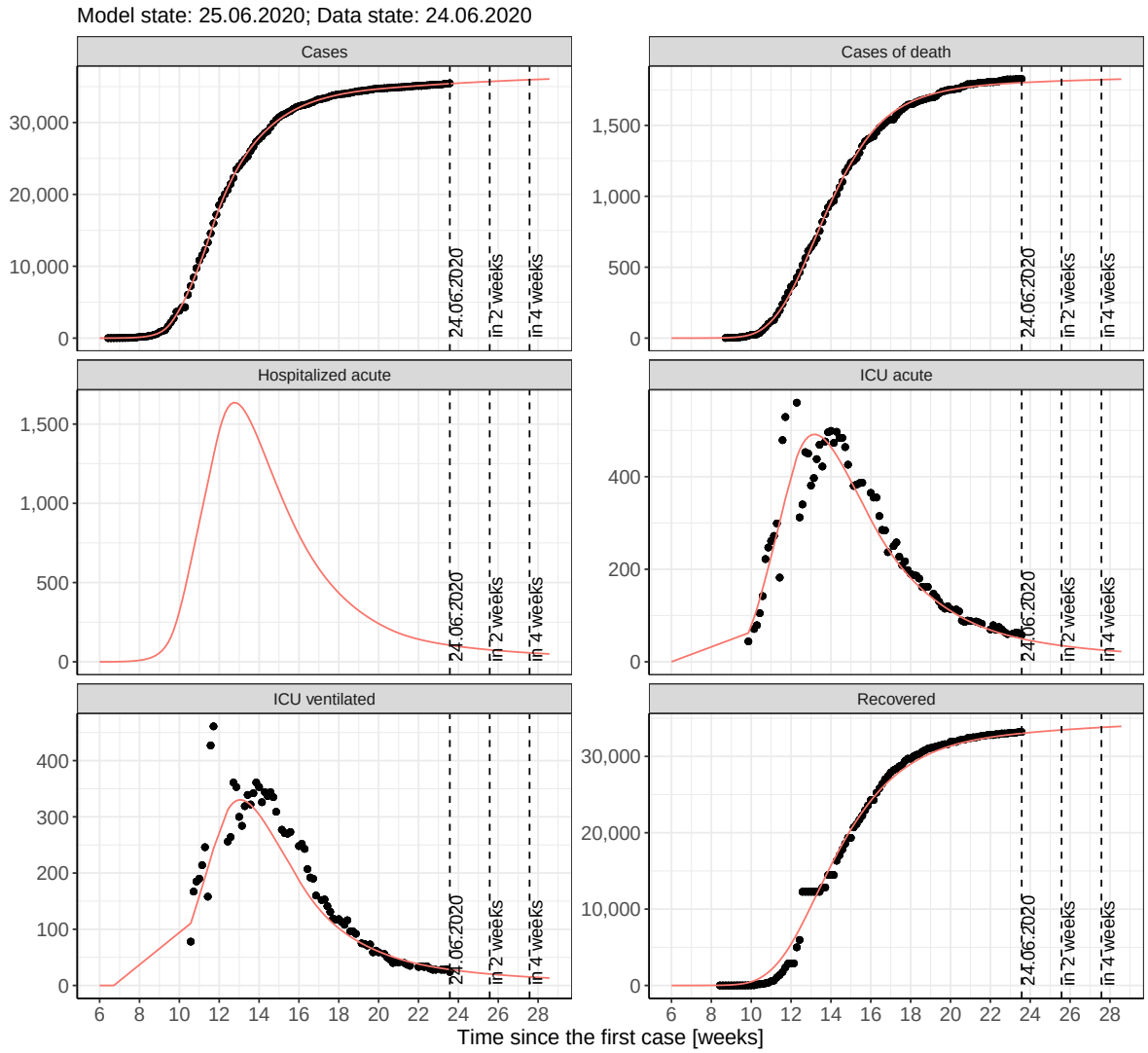


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

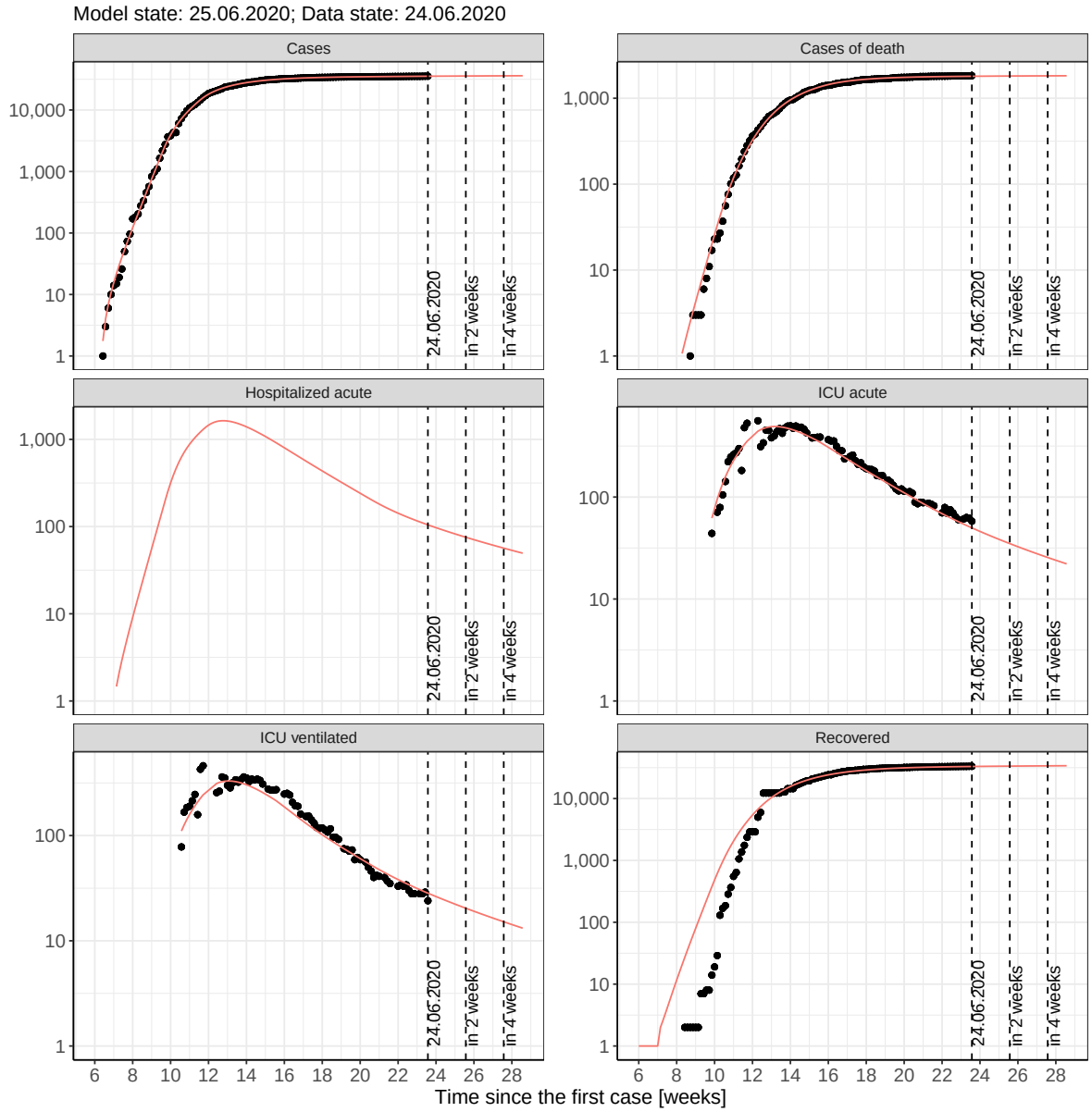


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

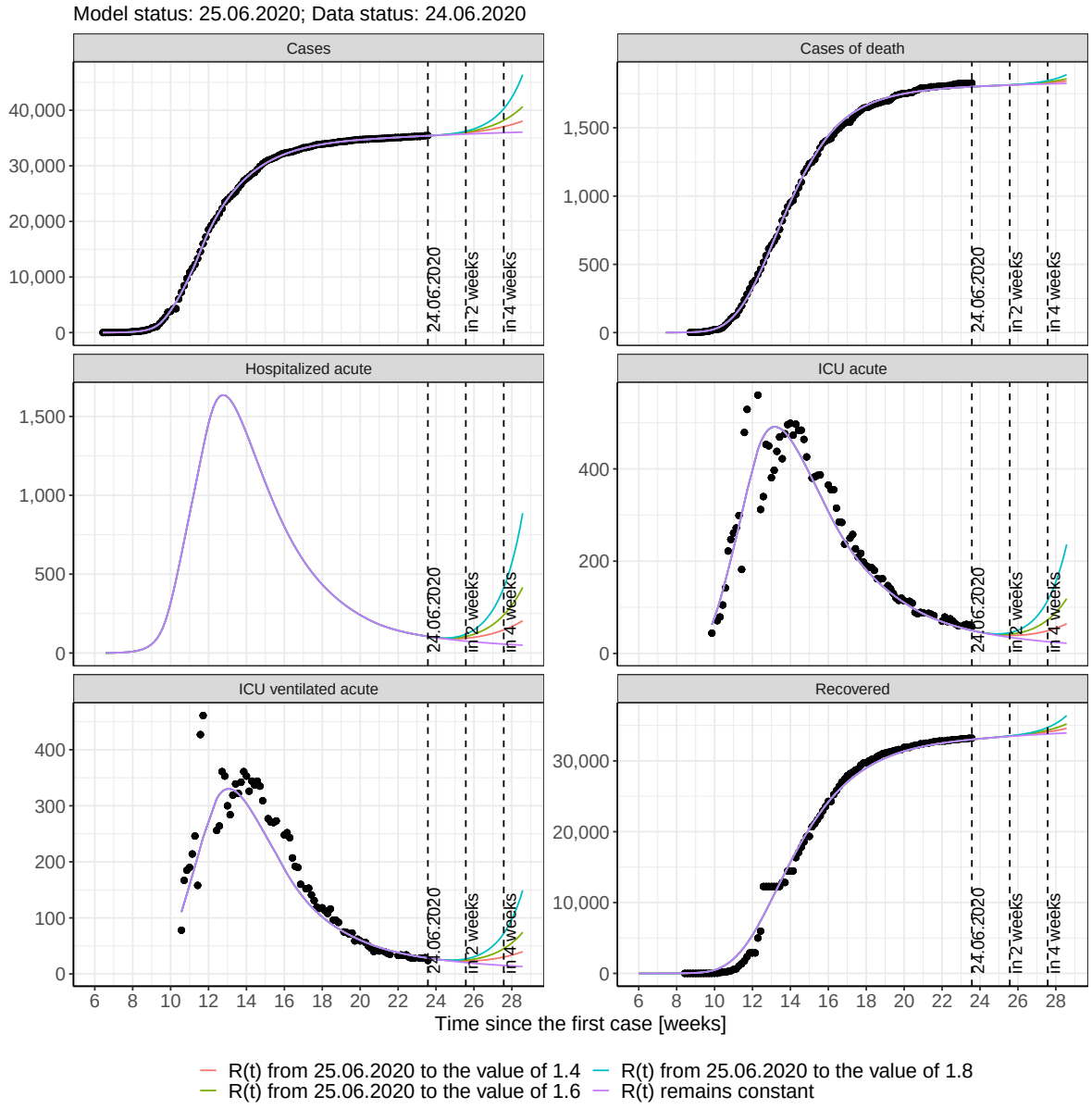


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

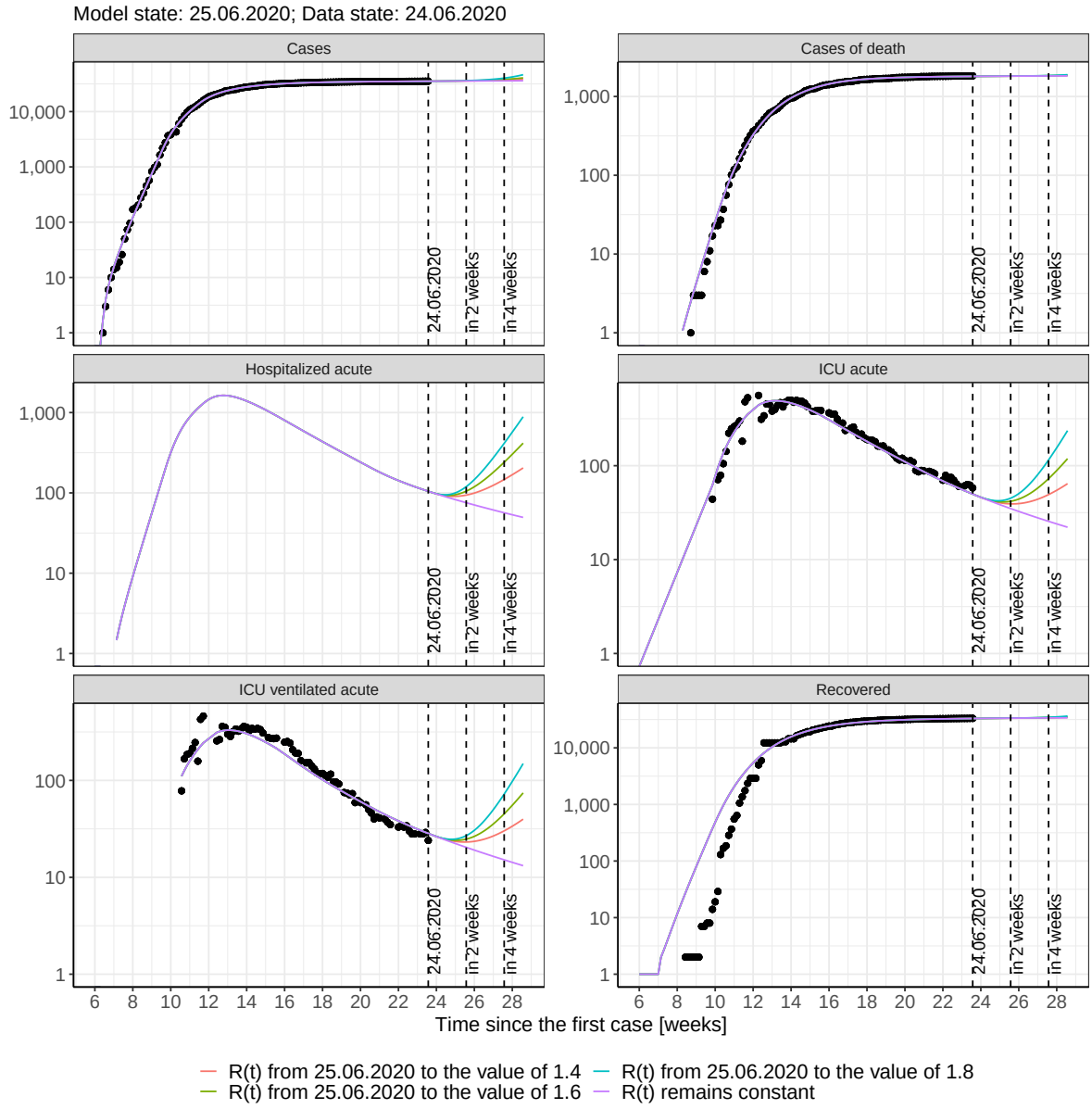


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

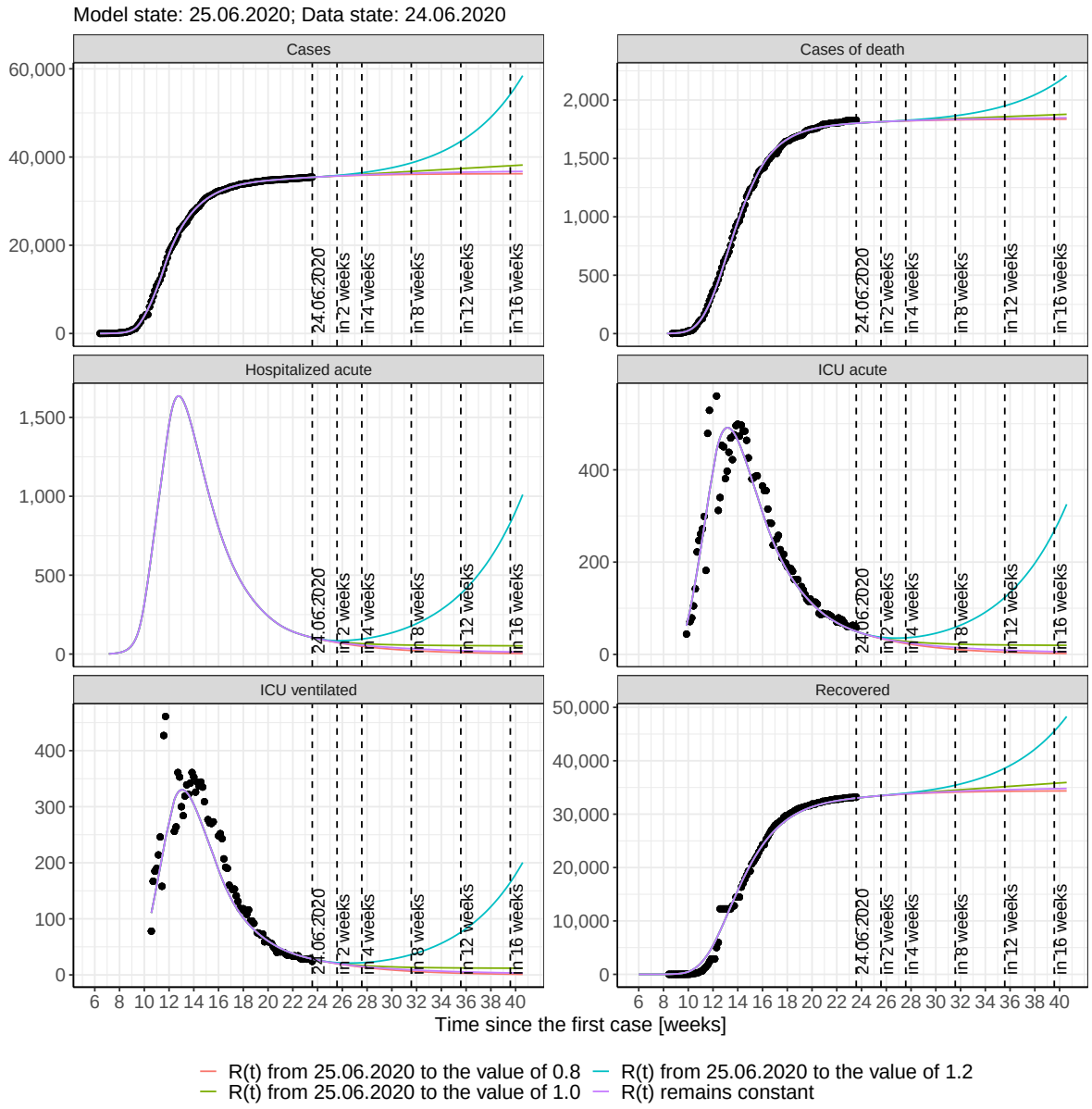


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

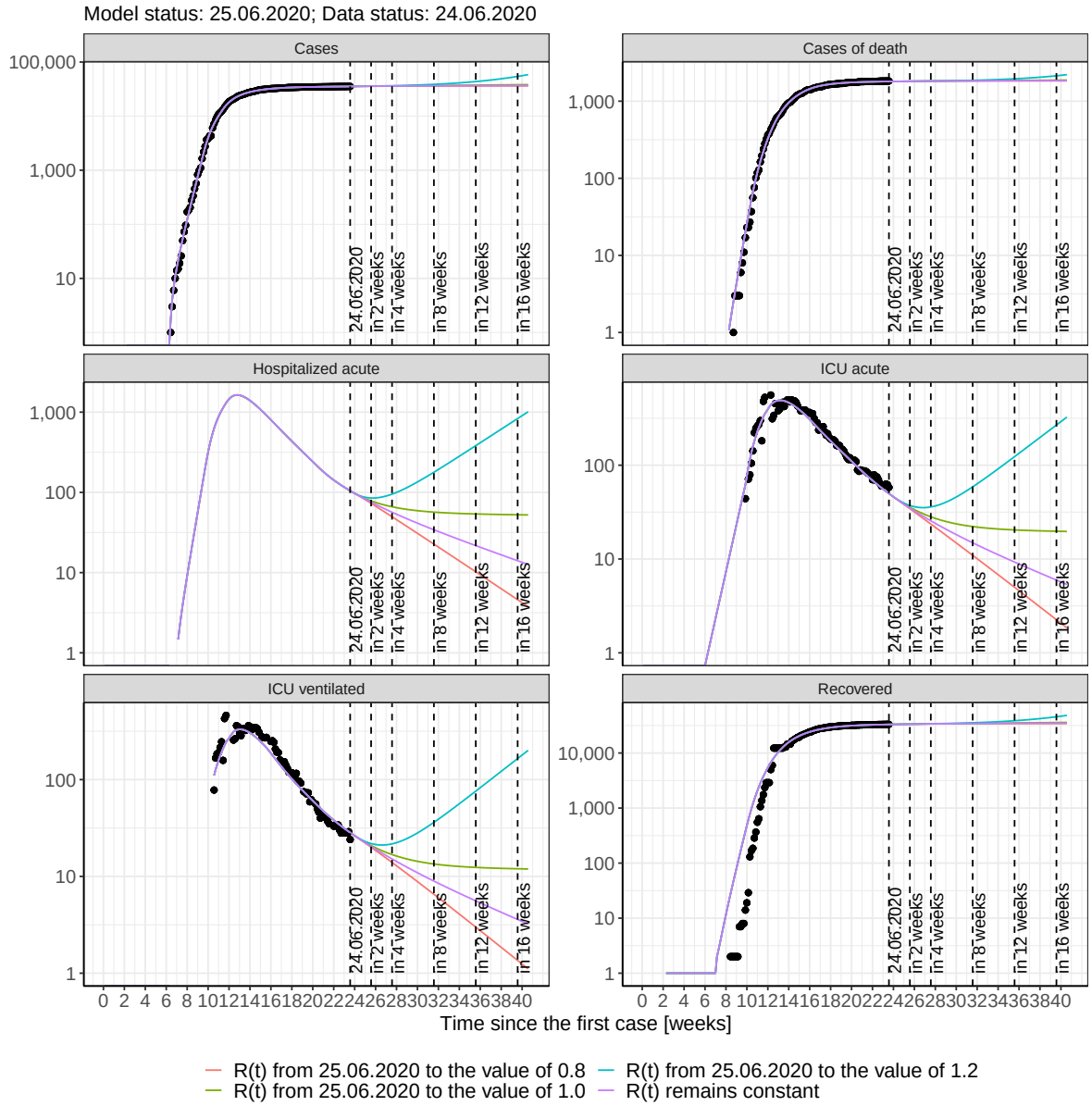


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 5) Model status from 25.06.2020; Data status: 24.06.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	35432	1802	33052	102	49	28
26.06.2020	35455	1803	33088	100	47	27
27.06.2020	35479	1804	33124	97	46	26
28.06.2020	35501	1805	33158	95	45	26
29.06.2020	35524	1806	33192	93	44	25
30.06.2020	35546	1807	33225	90	43	24
01.07.2020	35568	1808	33257	88	41	24
02.07.2020	35589	1809	33288	86	40	23
03.07.2020	35610	1810	33319	84	39	23
04.07.2020	35631	1810	33348	82	38	22
05.07.2020	35651	1811	33378	81	38	22
06.07.2020	35672	1812	33406	79	37	21
07.07.2020	35691	1813	33434	77	36	21
08.07.2020	35711	1813	33462	75	35	20
09.07.2020	35730	1814	33488	74	34	20
10.07.2020	35749	1815	33515	72	33	20
11.07.2020	35768	1816	33541	71	33	19
12.07.2020	35786	1816	33566	69	32	19
13.07.2020	35805	1817	33591	68	31	18
14.07.2020	35822	1817	33615	66	30	18
15.07.2020	35840	1818	33639	65	30	18
16.07.2020	35857	1819	33663	64	29	17
17.07.2020	35874	1819	33686	62	28	17
18.07.2020	35891	1820	33708	61	28	16
19.07.2020	35908	1820	33731	60	27	16
20.07.2020	35924	1821	33753	59	27	16
21.07.2020	35940	1822	33774	58	26	15
22.07.2020	35956	1822	33795	57	26	15

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	35432	1802	33052	102	49	28
26.06.2020	35455	1803	33088	100	47	27
27.06.2020	35477	1804	33124	97	46	26
28.06.2020	35499	1805	33158	95	45	26
29.06.2020	35520	1806	33192	92	44	25
30.06.2020	35540	1807	33225	90	42	24
01.07.2020	35560	1808	33256	88	41	24
02.07.2020	35579	1809	33287	86	40	23
03.07.2020	35598	1810	33318	83	39	23
04.07.2020	35616	1810	33347	81	38	22
05.07.2020	35634	1811	33376	79	37	22
06.07.2020	35651	1812	33404	77	36	21
07.07.2020	35668	1813	33431	75	35	21
08.07.2020	35684	1813	33458	73	34	20
09.07.2020	35700	1814	33484	71	33	20
10.07.2020	35715	1815	33509	69	33	19
11.07.2020	35730	1815	33533	67	32	19
12.07.2020	35745	1816	33557	65	31	18
13.07.2020	35759	1816	33581	64	30	18
14.07.2020	35772	1817	33603	62	29	17
15.07.2020	35786	1818	33625	60	29	17
16.07.2020	35799	1818	33647	59	28	16
17.07.2020	35811	1819	33668	57	27	16
18.07.2020	35823	1819	33688	56	26	15
19.07.2020	35835	1820	33708	54	26	15
20.07.2020	35846	1820	33728	53	25	15
21.07.2020	35858	1821	33746	51	24	14
22.07.2020	35868	1821	33765	50	24	14

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	35432	1802	33052	102	49	28
26.06.2020	35456	1803	33088	100	47	27
27.06.2020	35480	1804	33124	97	46	26
28.06.2020	35504	1805	33158	95	45	26
29.06.2020	35528	1806	33192	93	44	25
30.06.2020	35552	1807	33225	91	43	25
01.07.2020	35576	1808	33257	89	42	24
02.07.2020	35600	1809	33289	87	41	23
03.07.2020	35624	1810	33320	85	40	23
04.07.2020	35648	1810	33350	84	39	23
05.07.2020	35671	1811	33380	82	38	22
06.07.2020	35695	1812	33409	81	37	22
07.07.2020	35719	1813	33438	80	36	21
08.07.2020	35743	1814	33466	78	36	21
09.07.2020	35767	1814	33494	77	35	20
10.07.2020	35791	1815	33522	76	34	20
11.07.2020	35814	1816	33549	75	34	20
12.07.2020	35838	1816	33576	74	33	19
13.07.2020	35862	1817	33603	73	32	19
14.07.2020	35886	1818	33629	72	32	19
15.07.2020	35910	1818	33655	71	31	19
16.07.2020	35933	1819	33681	70	31	18
17.07.2020	35957	1820	33707	70	30	18
18.07.2020	35981	1820	33733	69	30	18
19.07.2020	36004	1821	33758	68	29	17
20.07.2020	36028	1822	33784	67	29	17
21.07.2020	36052	1822	33809	67	29	17
22.07.2020	36076	1823	33834	66	28	17

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	35432	1802	33052	102	49	28
26.06.2020	35458	1803	33088	100	47	27
27.06.2020	35483	1804	33124	97	46	26
28.06.2020	35510	1805	33158	95	45	26
29.06.2020	35537	1806	33192	93	44	25
30.06.2020	35565	1807	33225	92	43	25
01.07.2020	35594	1808	33258	90	42	24
02.07.2020	35623	1809	33290	89	41	24
03.07.2020	35654	1810	33322	88	40	23
04.07.2020	35685	1810	33353	87	39	23
05.07.2020	35717	1811	33384	86	39	23
06.07.2020	35750	1812	33415	86	38	22
07.07.2020	35784	1813	33445	85	38	22
08.07.2020	35819	1814	33476	85	37	22
09.07.2020	35855	1814	33507	85	37	22
10.07.2020	35893	1815	33538	85	36	21
11.07.2020	35931	1816	33568	85	36	21
12.07.2020	35970	1817	33600	86	36	21
13.07.2020	36010	1818	33631	86	36	21
14.07.2020	36052	1819	33663	87	35	21
15.07.2020	36094	1820	33695	87	35	21
16.07.2020	36138	1820	33728	88	35	21
17.07.2020	36183	1821	33761	89	35	21
18.07.2020	36229	1822	33794	90	35	21
19.07.2020	36277	1823	33829	91	35	21
20.07.2020	36326	1824	33864	92	36	21
21.07.2020	36377	1825	33899	94	36	22
22.07.2020	36428	1826	33935	95	36	22

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

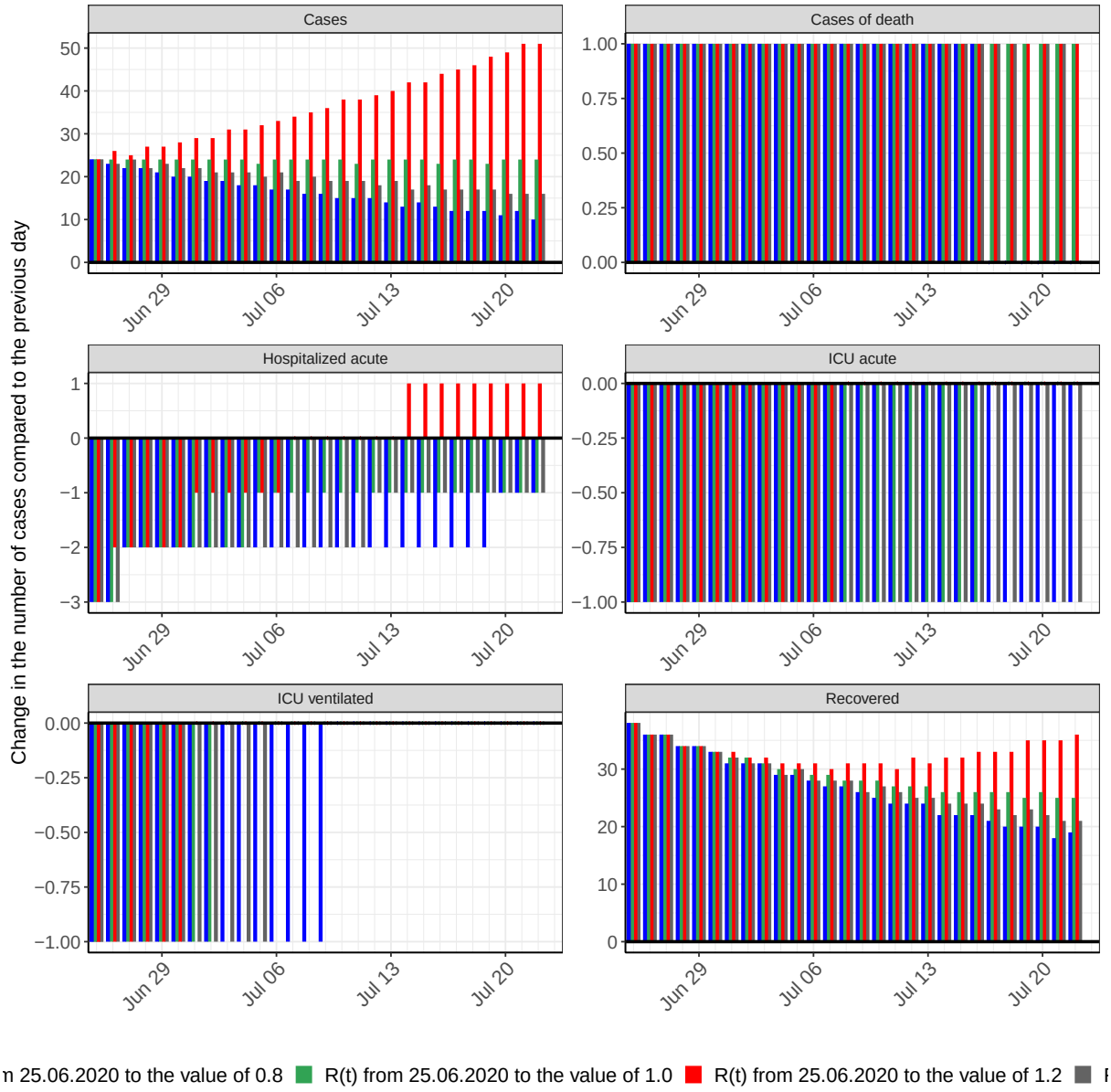


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

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.

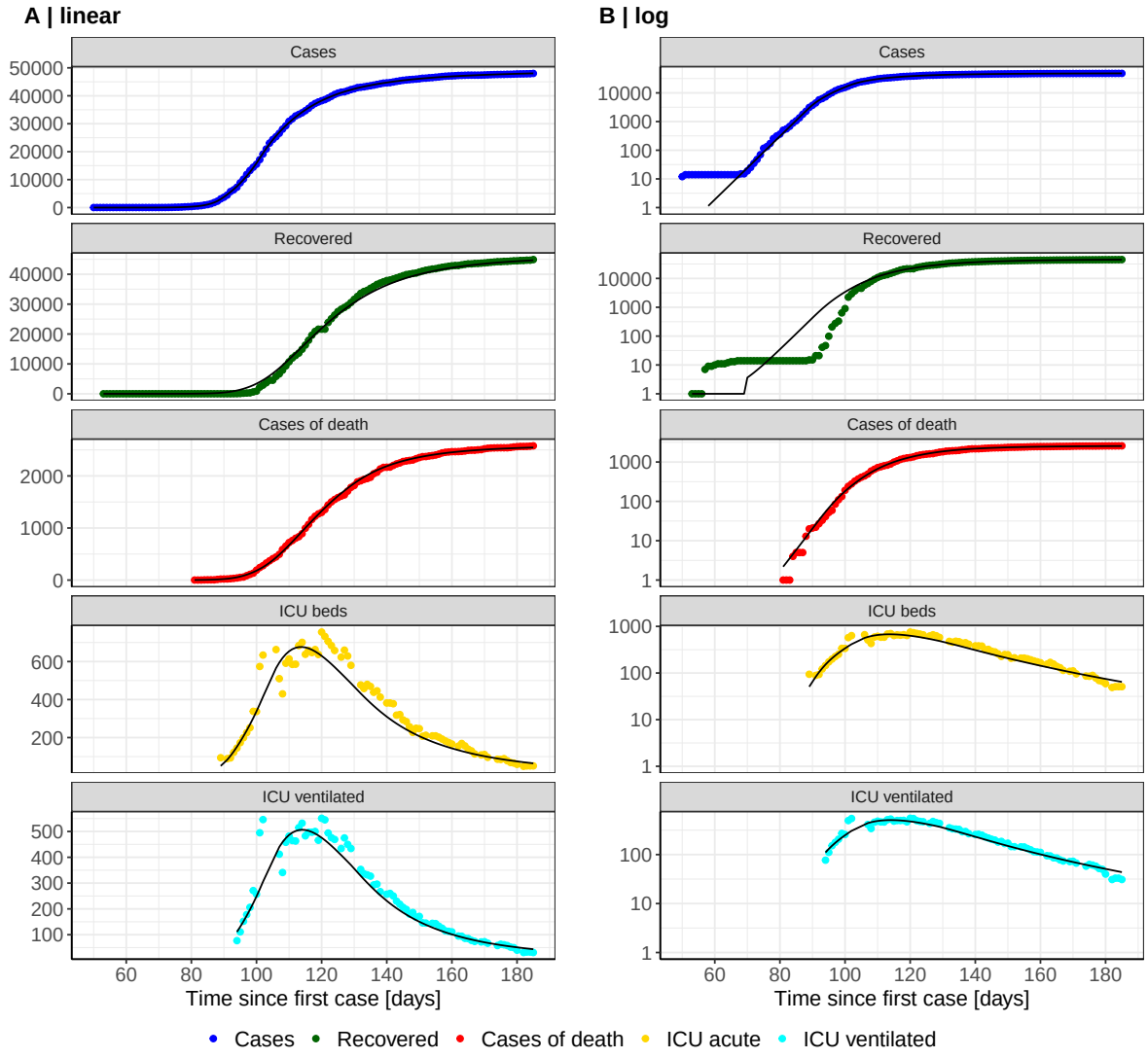


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

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.

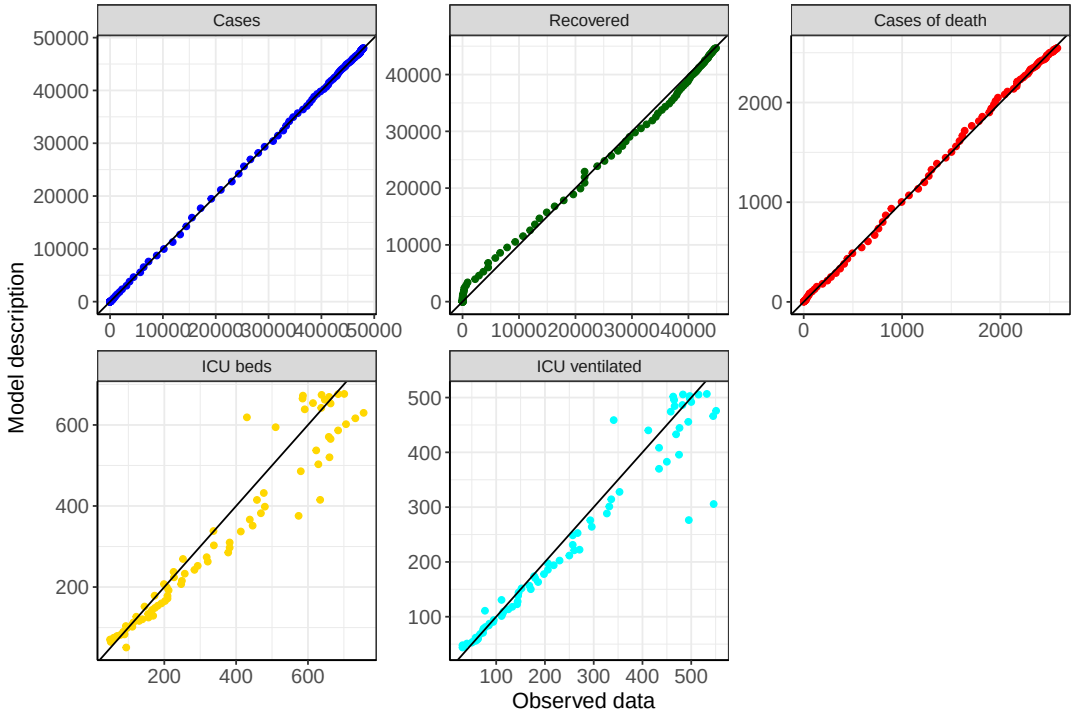


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

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).

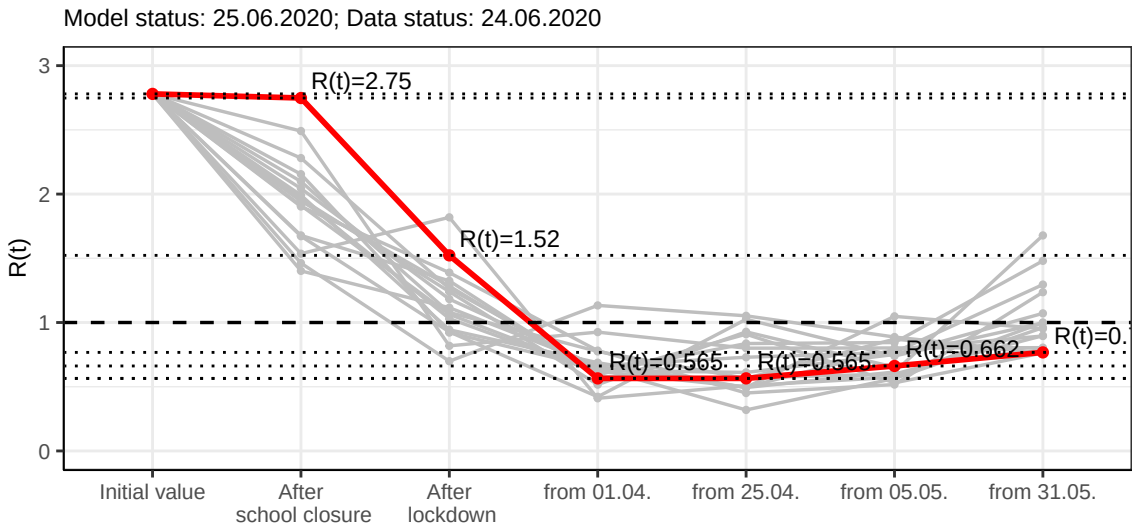


Figure 24: R(t) values before and after the NPIs for Bavaria

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

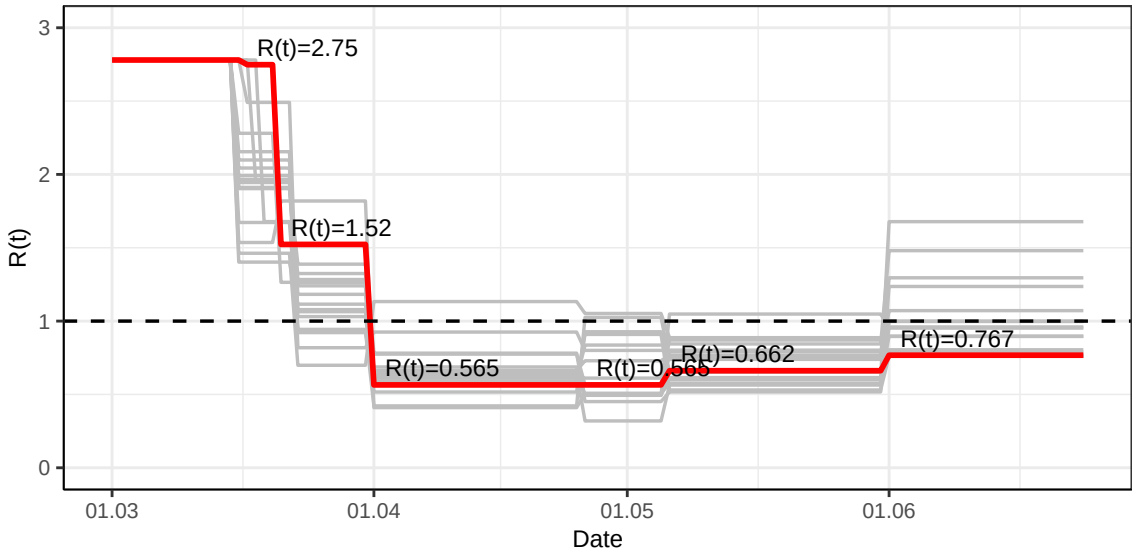


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

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

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.

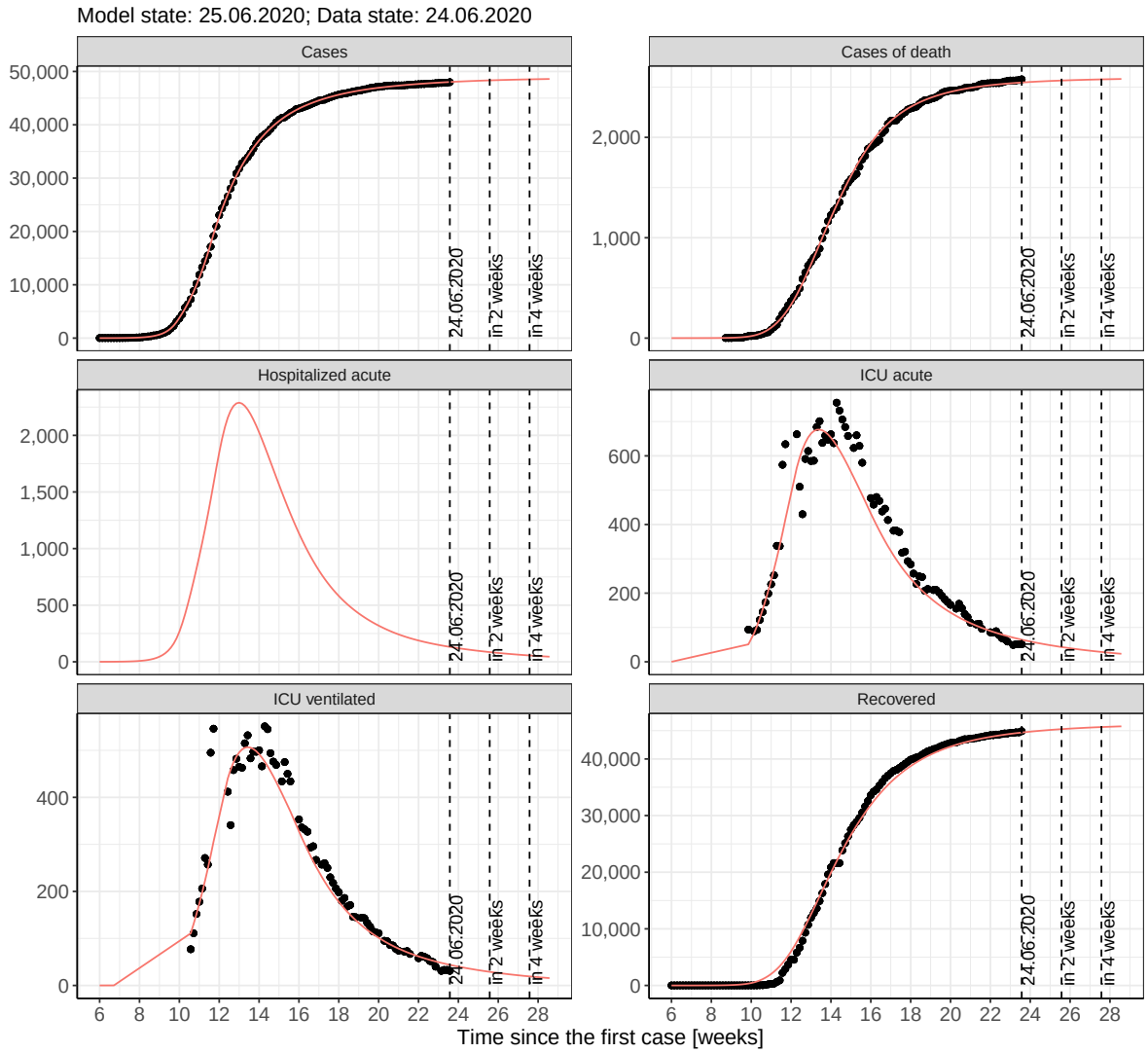


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

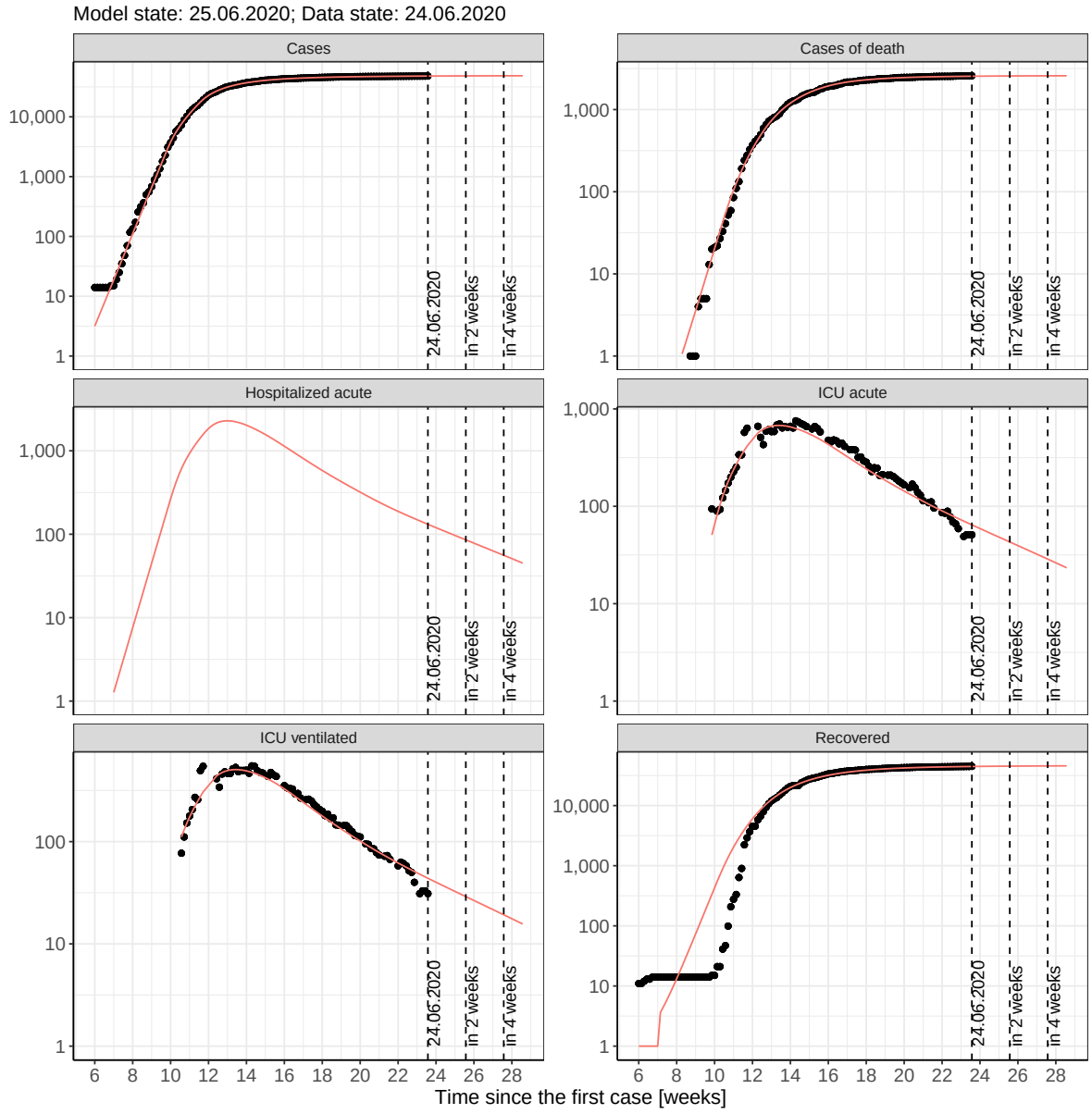


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

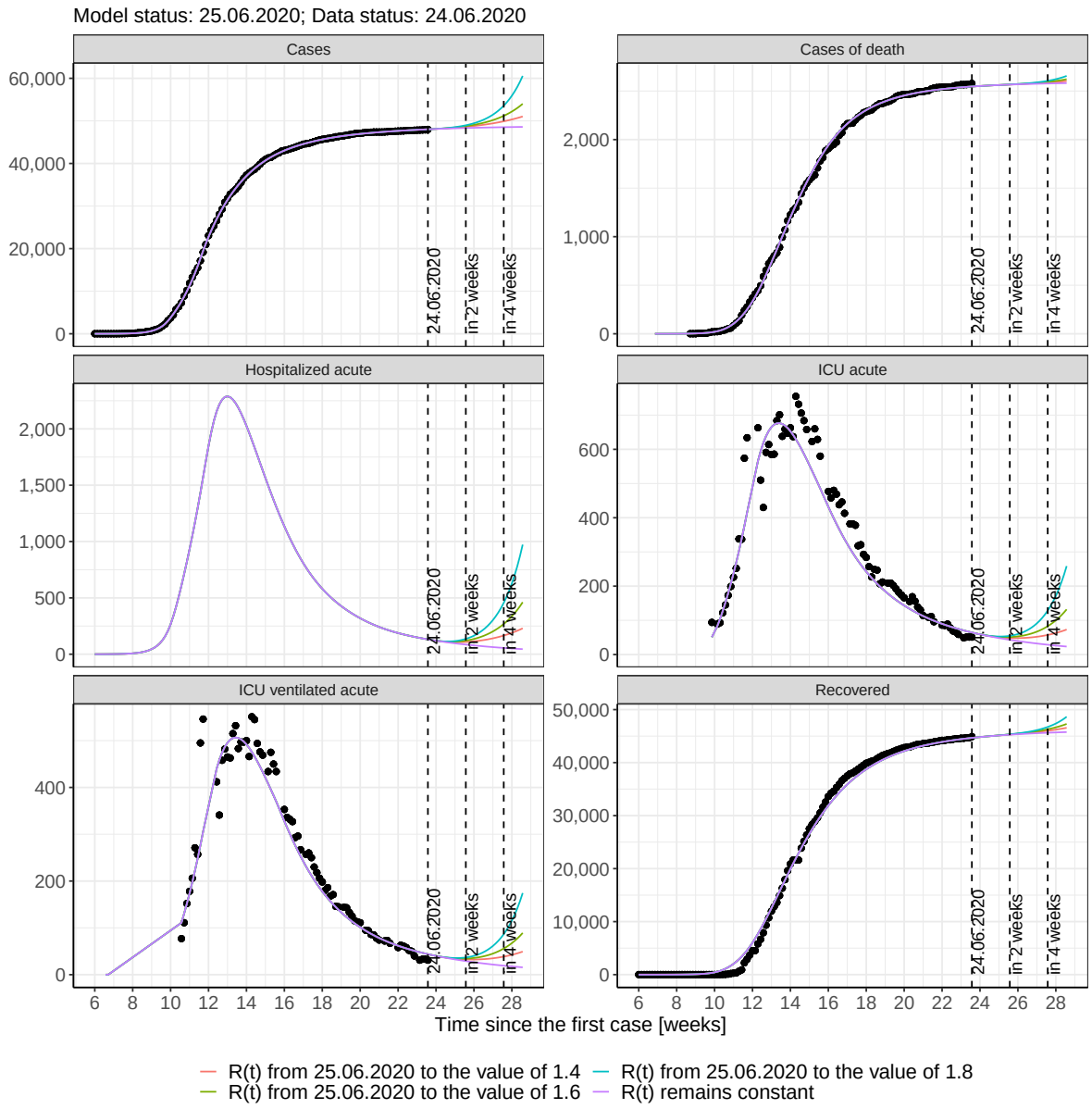


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

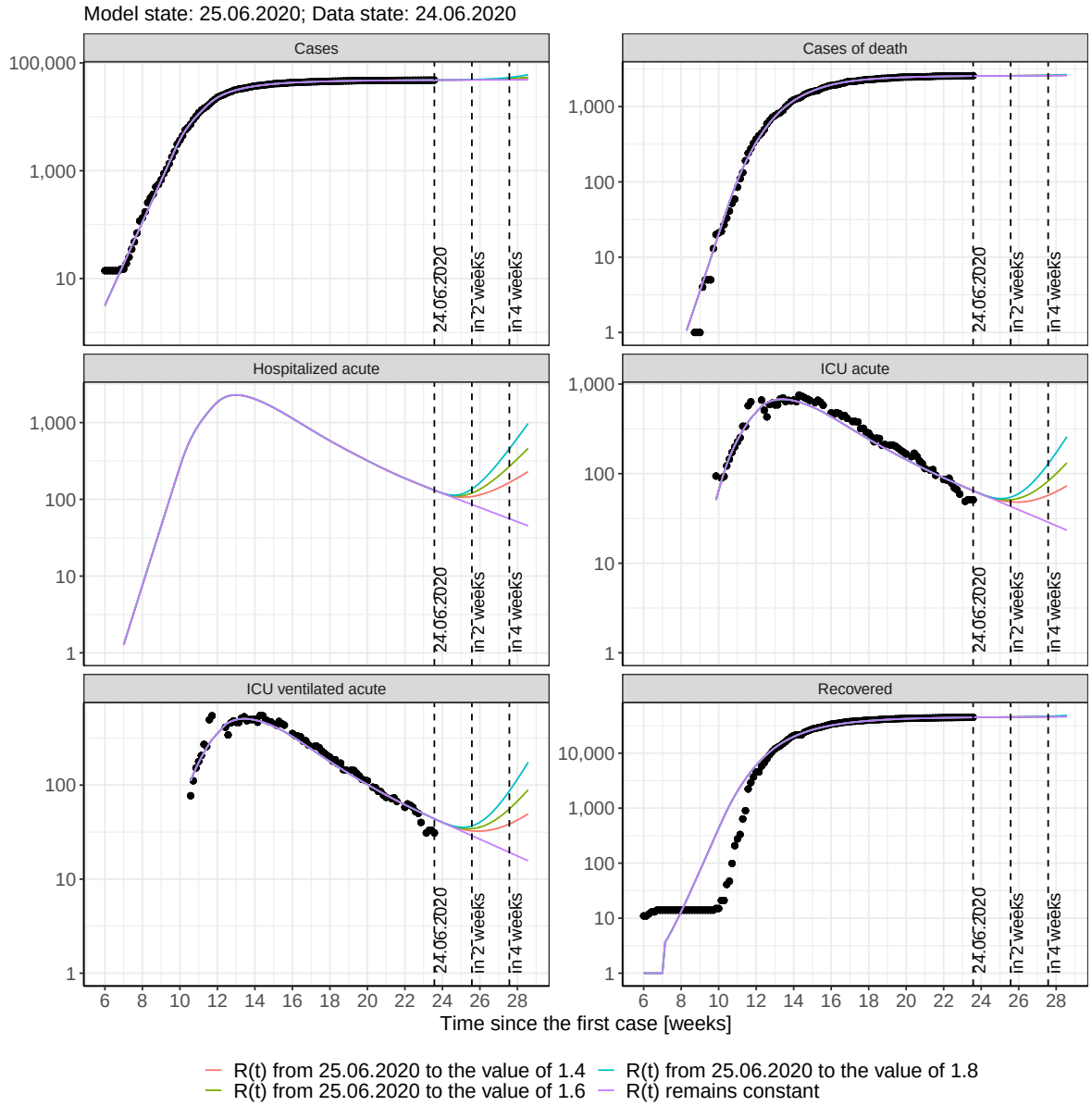


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

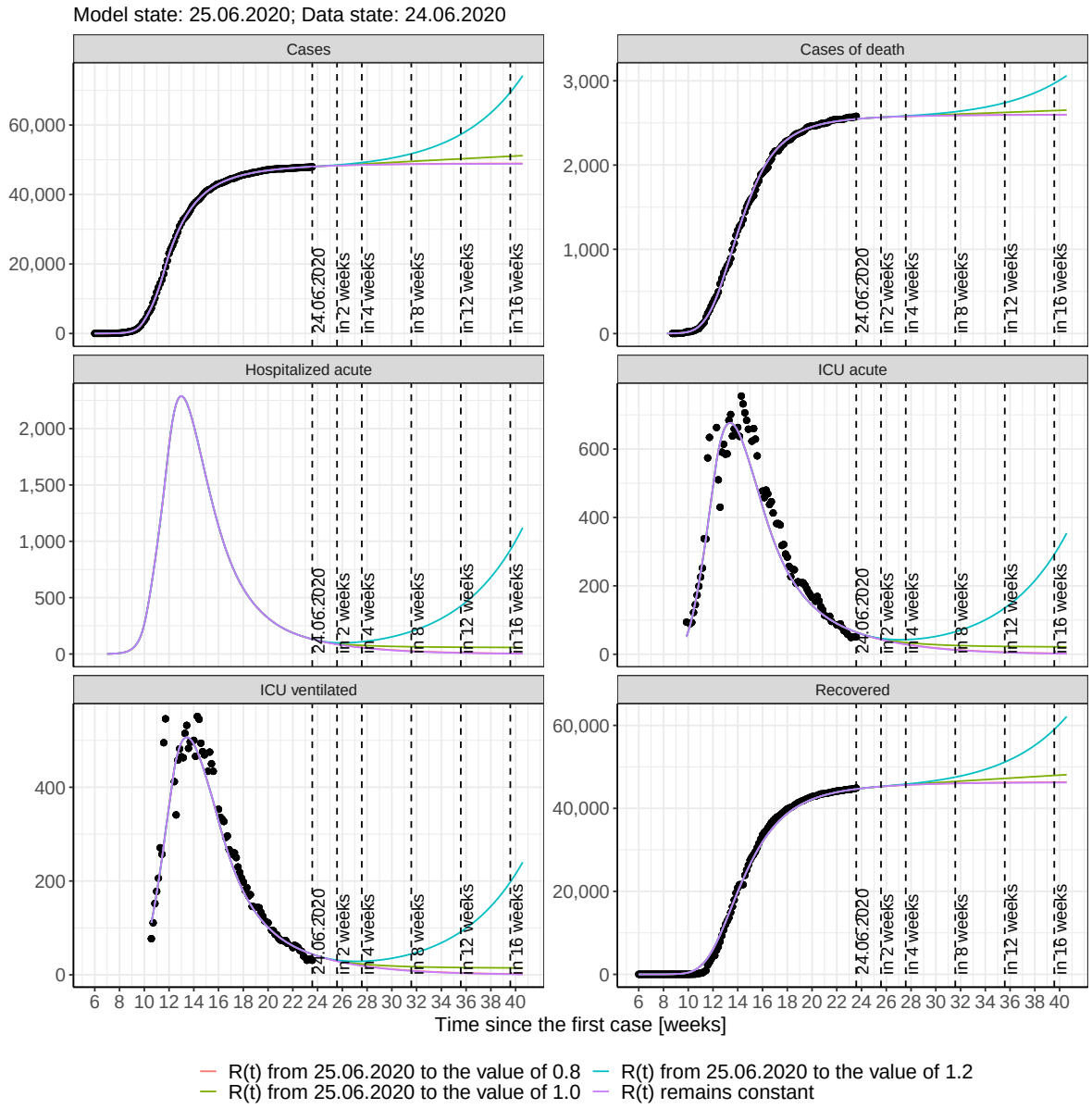


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

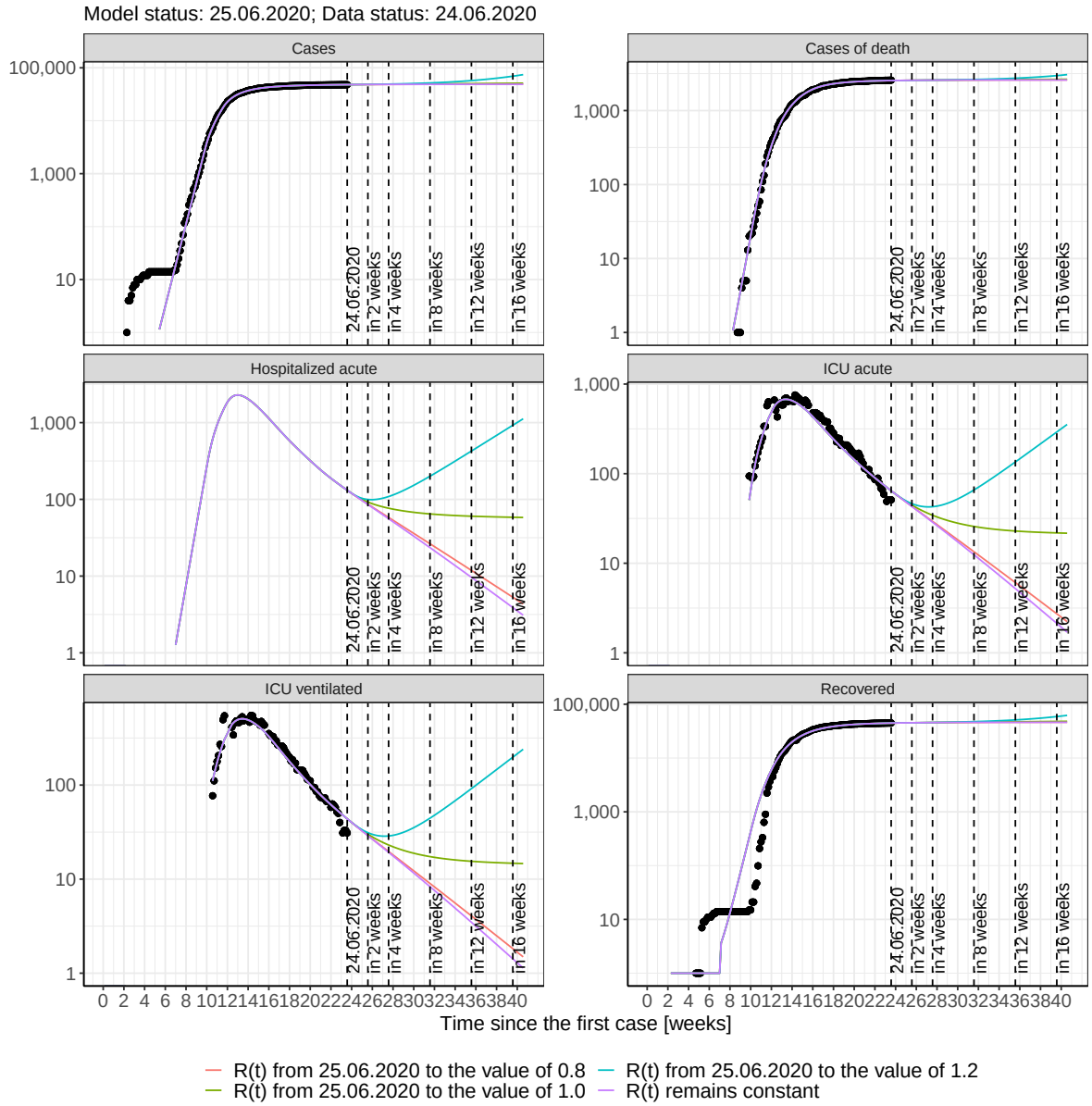


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 9) Model status from 25.06.2020; Data status: 24.06.2020.

Table 6: Bavaria - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	48050	2548	44718	128	63	43
26.06.2020	48076	2550	44771	124	61	41
27.06.2020	48101	2552	44821	120	59	40
28.06.2020	48126	2553	44869	116	57	39
29.06.2020	48149	2555	44915	113	56	38
30.06.2020	48172	2556	44960	109	54	37
01.07.2020	48194	2558	45003	106	53	36
02.07.2020	48215	2559	45045	103	51	35
03.07.2020	48236	2560	45085	100	50	34
04.07.2020	48256	2562	45124	97	48	33
05.07.2020	48275	2563	45161	94	47	32
06.07.2020	48294	2564	45197	91	46	31
07.07.2020	48312	2565	45232	88	44	30
08.07.2020	48329	2566	45265	86	43	29
09.07.2020	48346	2567	45297	83	42	28
10.07.2020	48363	2568	45329	81	41	27
11.07.2020	48378	2569	45359	78	39	27
12.07.2020	48394	2570	45388	76	38	26
13.07.2020	48408	2571	45416	74	37	25
14.07.2020	48423	2572	45443	71	36	24
15.07.2020	48436	2573	45470	69	35	24
16.07.2020	48450	2573	45495	67	34	23
17.07.2020	48463	2574	45520	65	33	22
18.07.2020	48475	2575	45543	63	32	22
19.07.2020	48487	2576	45566	61	31	21
20.07.2020	48499	2576	45589	59	30	20
21.07.2020	48510	2577	45610	58	30	20
22.07.2020	48521	2578	45631	56	29	19

Table 7: Bavaria - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	48050	2548	44718	128	63	43
26.06.2020	48076	2550	44771	124	61	41
27.06.2020	48102	2552	44821	120	59	40
28.06.2020	48127	2553	44869	116	57	39
29.06.2020	48151	2555	44915	113	56	38
30.06.2020	48174	2556	44960	109	54	37
01.07.2020	48197	2558	45003	106	53	36
02.07.2020	48219	2559	45045	103	51	35
03.07.2020	48240	2560	45085	100	50	34
04.07.2020	48261	2562	45124	97	48	33
05.07.2020	48281	2563	45162	94	47	32
06.07.2020	48301	2564	45198	92	46	31
07.07.2020	48320	2565	45233	89	44	30
08.07.2020	48339	2566	45267	86	43	29
09.07.2020	48357	2567	45299	84	42	28
10.07.2020	48374	2568	45331	82	41	28
11.07.2020	48391	2569	45361	79	40	27
12.07.2020	48408	2570	45391	77	39	26
13.07.2020	48424	2571	45420	75	38	25
14.07.2020	48440	2572	45448	73	37	25
15.07.2020	48455	2573	45475	71	36	24
16.07.2020	48469	2574	45501	69	35	23
17.07.2020	48484	2574	45526	67	34	23
18.07.2020	48498	2575	45550	65	33	22
19.07.2020	48511	2576	45574	63	32	21
20.07.2020	48524	2577	45597	61	31	21
21.07.2020	48537	2577	45619	60	30	20
22.07.2020	48549	2578	45641	58	29	20

Table 8: Bavaria - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	48050	2548	44718	128	63	43
26.06.2020	48078	2550	44771	124	61	41
27.06.2020	48105	2552	44821	120	59	40
28.06.2020	48133	2553	44869	116	57	39
29.06.2020	48160	2555	44916	113	56	38
30.06.2020	48187	2556	44961	110	54	37
01.07.2020	48215	2558	45004	107	53	36
02.07.2020	48242	2559	45046	105	52	35
03.07.2020	48269	2560	45087	102	50	34
04.07.2020	48297	2562	45127	100	49	33
05.07.2020	48324	2563	45166	98	48	32
06.07.2020	48351	2564	45203	96	47	31
07.07.2020	48379	2565	45240	94	46	31
08.07.2020	48406	2566	45276	92	45	30
09.07.2020	48433	2568	45311	91	44	29
10.07.2020	48460	2569	45346	89	43	29
11.07.2020	48488	2570	45379	88	42	28
12.07.2020	48515	2571	45413	86	41	28
13.07.2020	48542	2572	45445	85	40	27
14.07.2020	48569	2573	45477	84	39	26
15.07.2020	48596	2574	45509	83	39	26
16.07.2020	48624	2575	45540	82	38	25
17.07.2020	48651	2576	45571	81	37	25
18.07.2020	48678	2576	45601	80	37	25
19.07.2020	48705	2577	45631	79	36	24
20.07.2020	48732	2578	45661	78	35	24
21.07.2020	48759	2579	45691	77	35	23
22.07.2020	48786	2580	45720	77	34	23

Table 9: Bavaria - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	48051	2548	44718	128	63	43
26.06.2020	48079	2550	44771	124	61	41
27.06.2020	48109	2552	44821	120	59	40
28.06.2020	48139	2553	44869	117	58	39
29.06.2020	48170	2555	44916	114	56	38
30.06.2020	48202	2556	44961	111	55	37
01.07.2020	48235	2558	45005	109	53	36
02.07.2020	48269	2559	45048	106	52	35
03.07.2020	48304	2560	45090	105	51	34
04.07.2020	48340	2562	45131	103	50	34
05.07.2020	48377	2563	45171	102	49	33
06.07.2020	48414	2564	45210	101	48	32
07.07.2020	48453	2566	45249	100	47	32
08.07.2020	48493	2567	45288	100	46	31
09.07.2020	48535	2568	45326	99	46	31
10.07.2020	48577	2569	45364	99	45	30
11.07.2020	48621	2570	45402	99	44	30
12.07.2020	48665	2571	45440	99	44	30
13.07.2020	48711	2572	45478	100	44	29
14.07.2020	48759	2574	45516	100	43	29
15.07.2020	48807	2575	45554	101	43	29
16.07.2020	48858	2576	45593	101	43	29
17.07.2020	48909	2577	45632	102	43	29
18.07.2020	48962	2578	45672	103	43	29
19.07.2020	49016	2579	45712	105	43	29
20.07.2020	49072	2581	45753	106	43	29
21.07.2020	49130	2582	45794	107	43	29
22.07.2020	49189	2583	45836	109	43	29

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

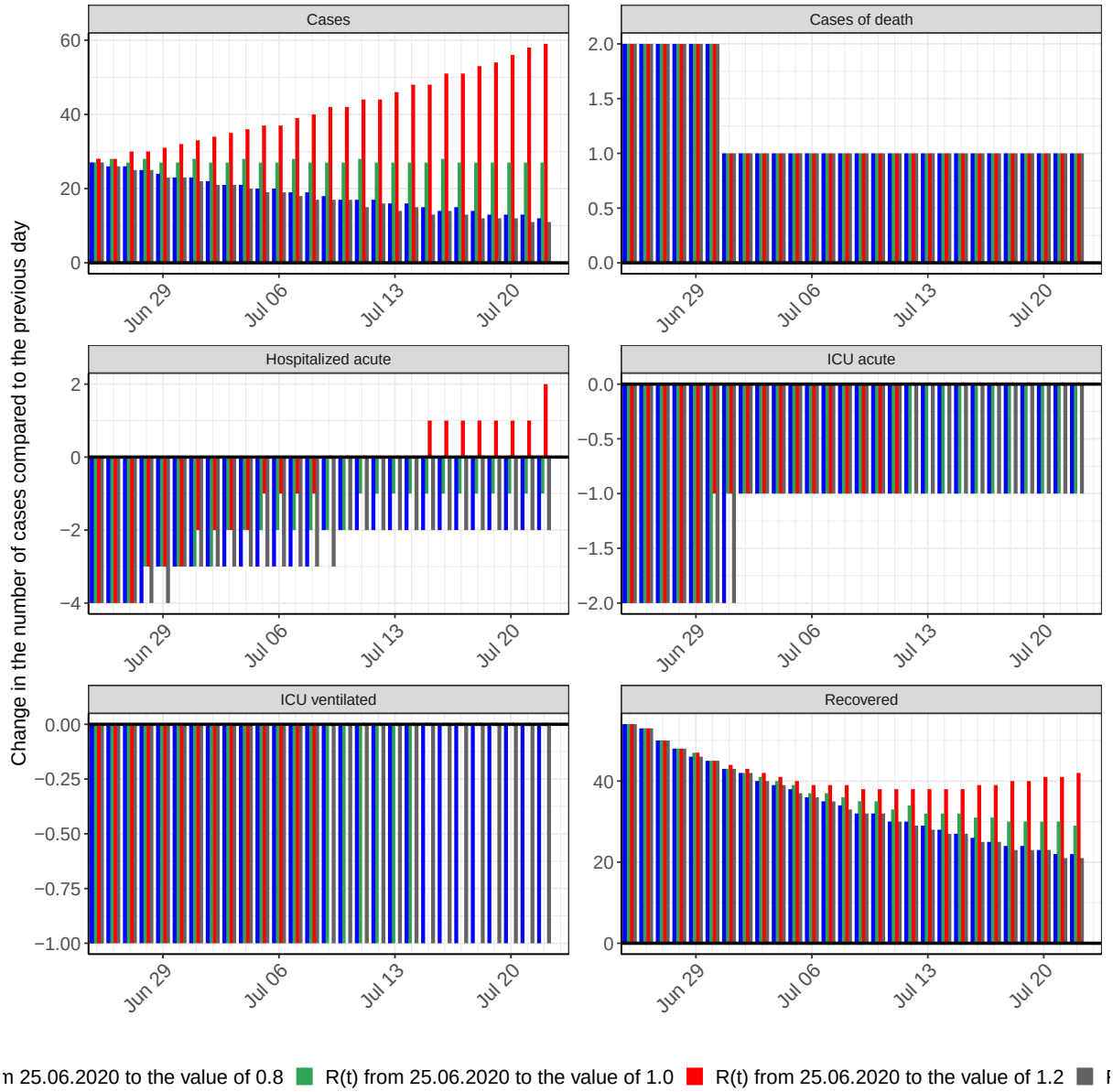


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

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.

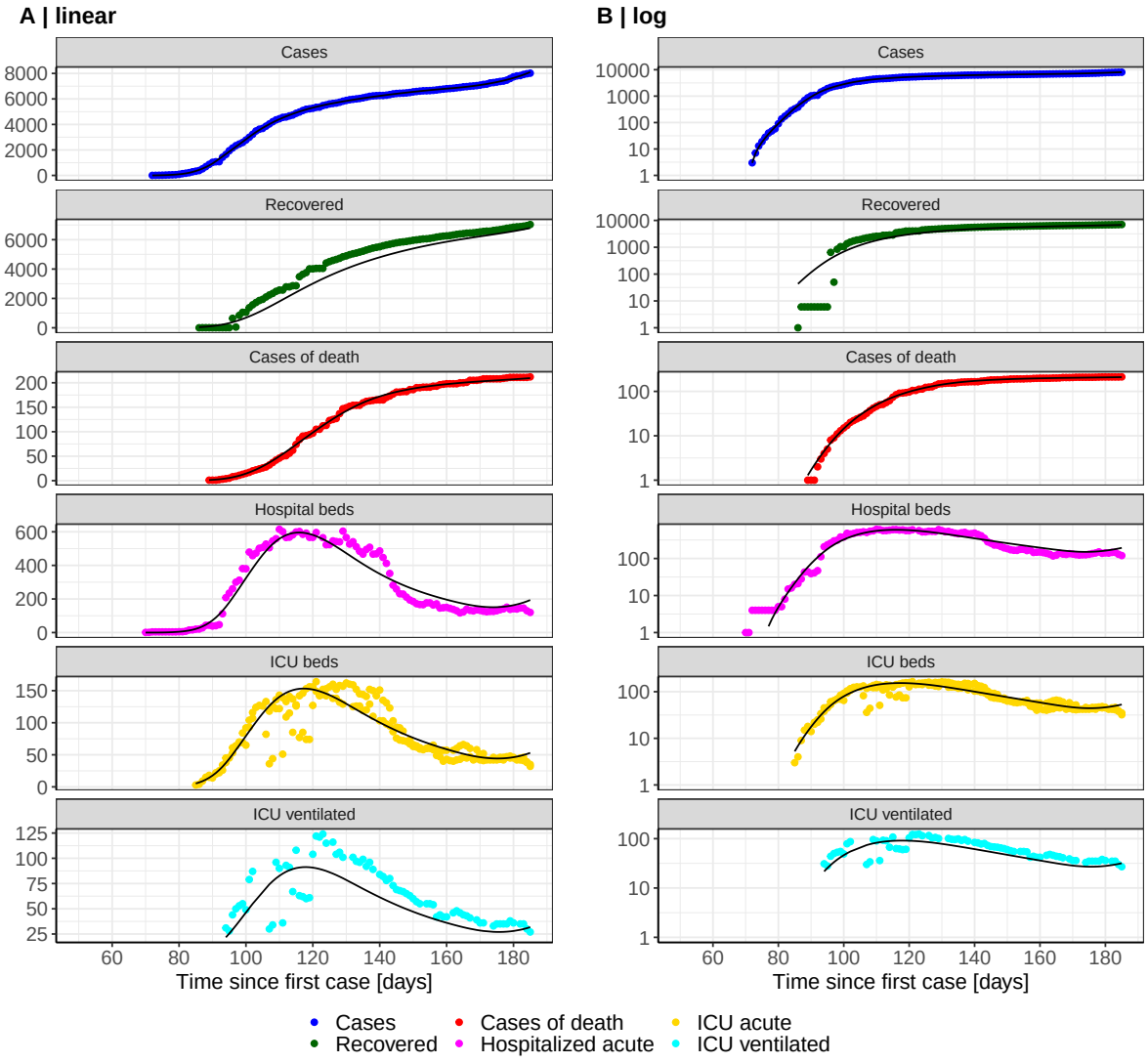


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

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.

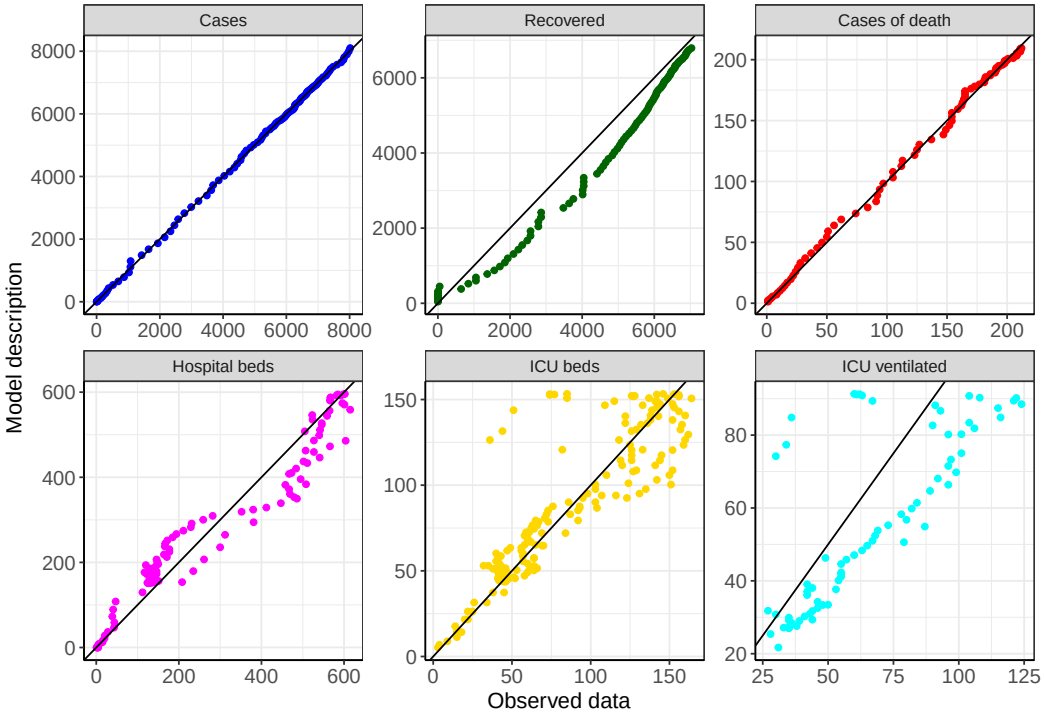


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

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).

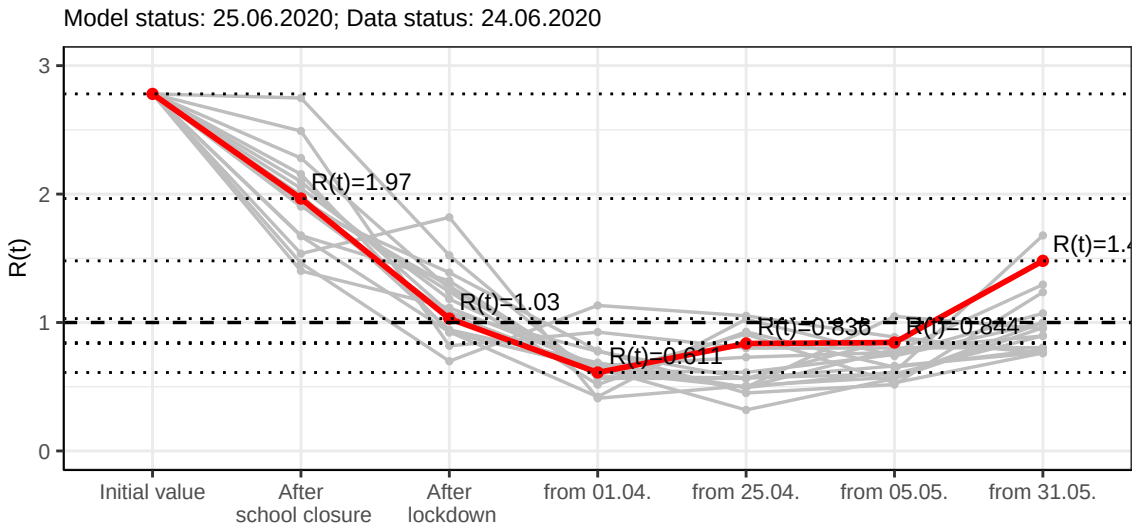


Figure 35: R(t) values before and after the NPIs for Berlin

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

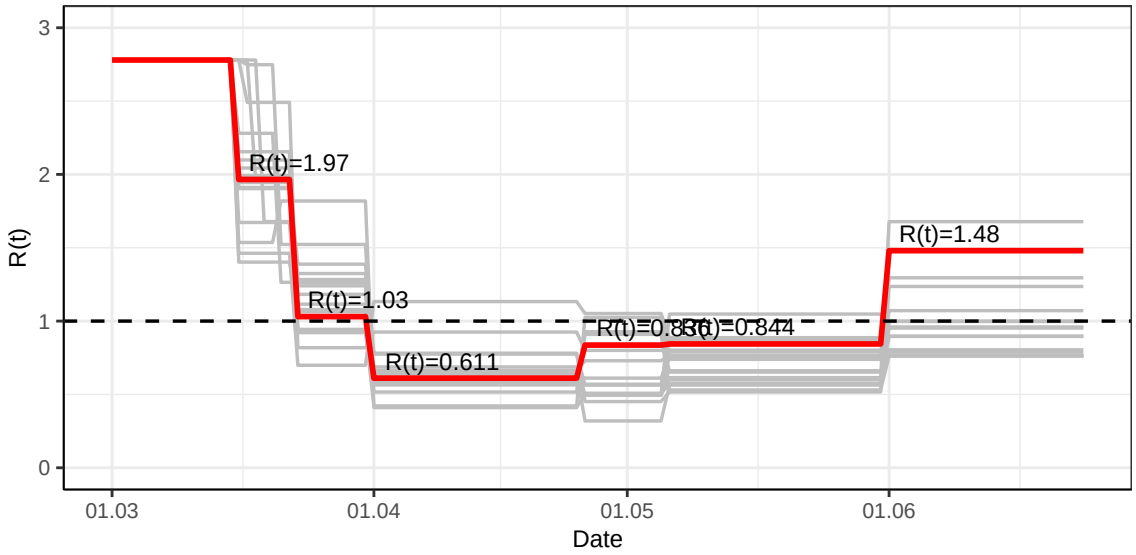


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.48)

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.

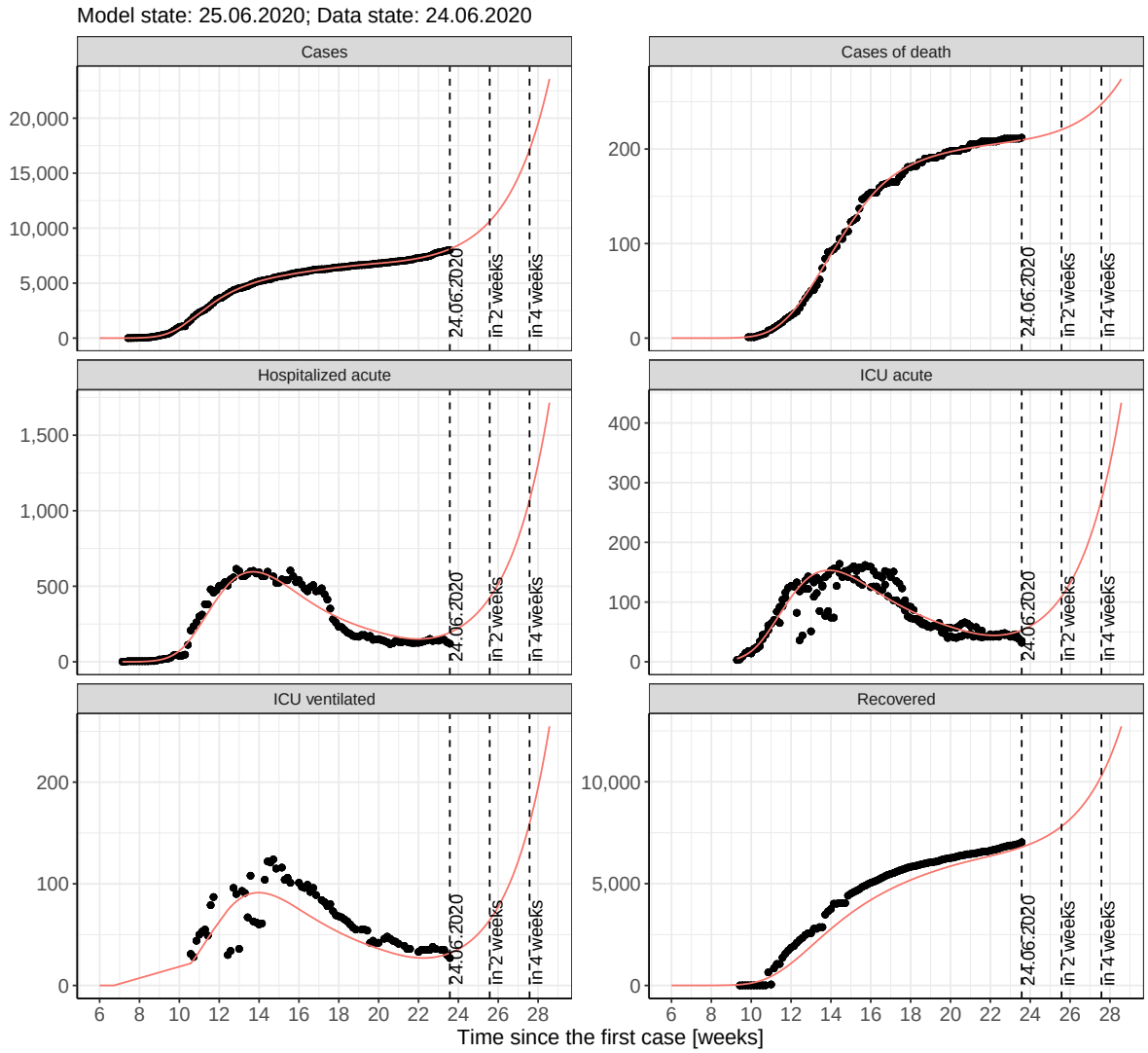


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

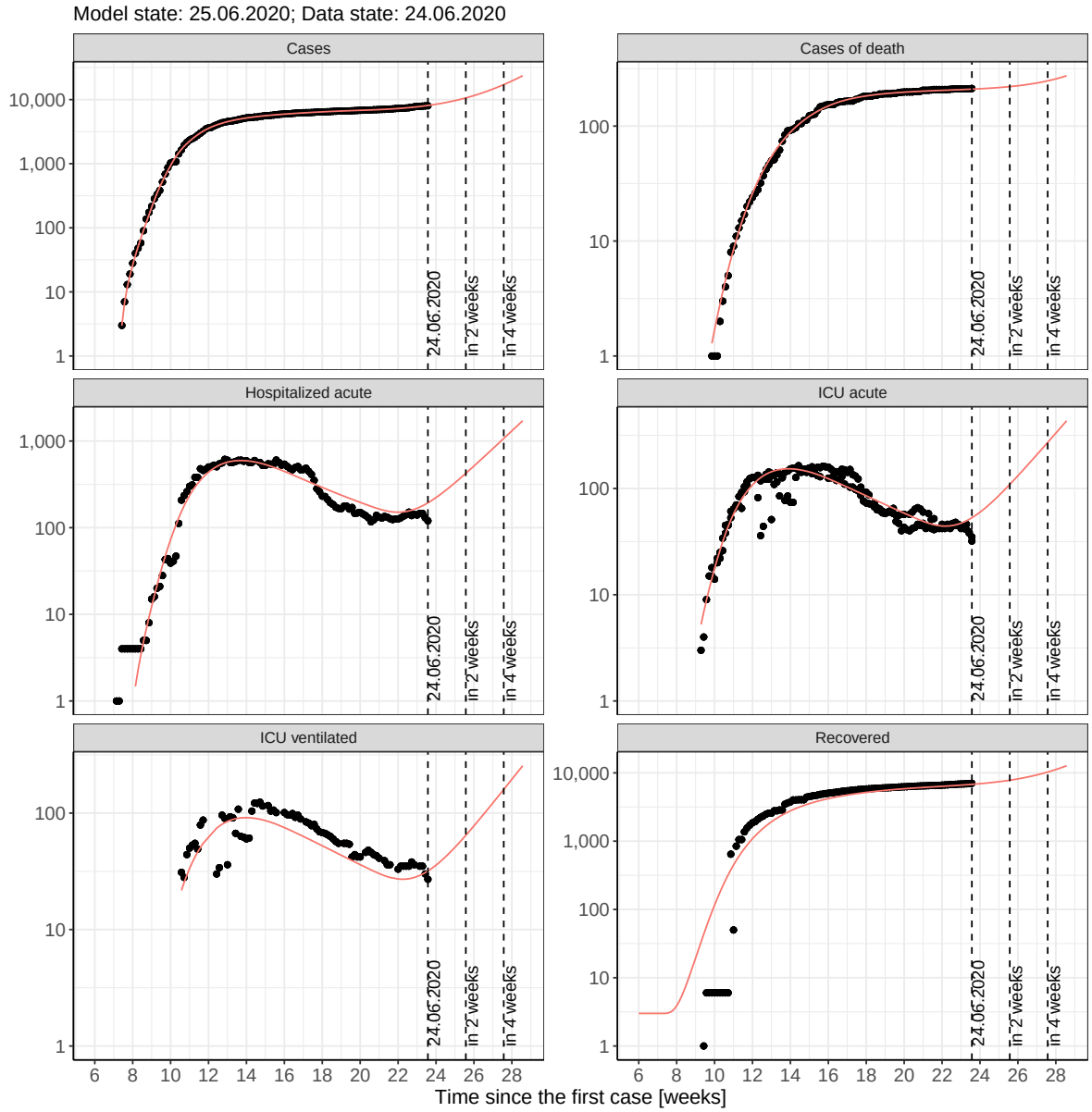


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

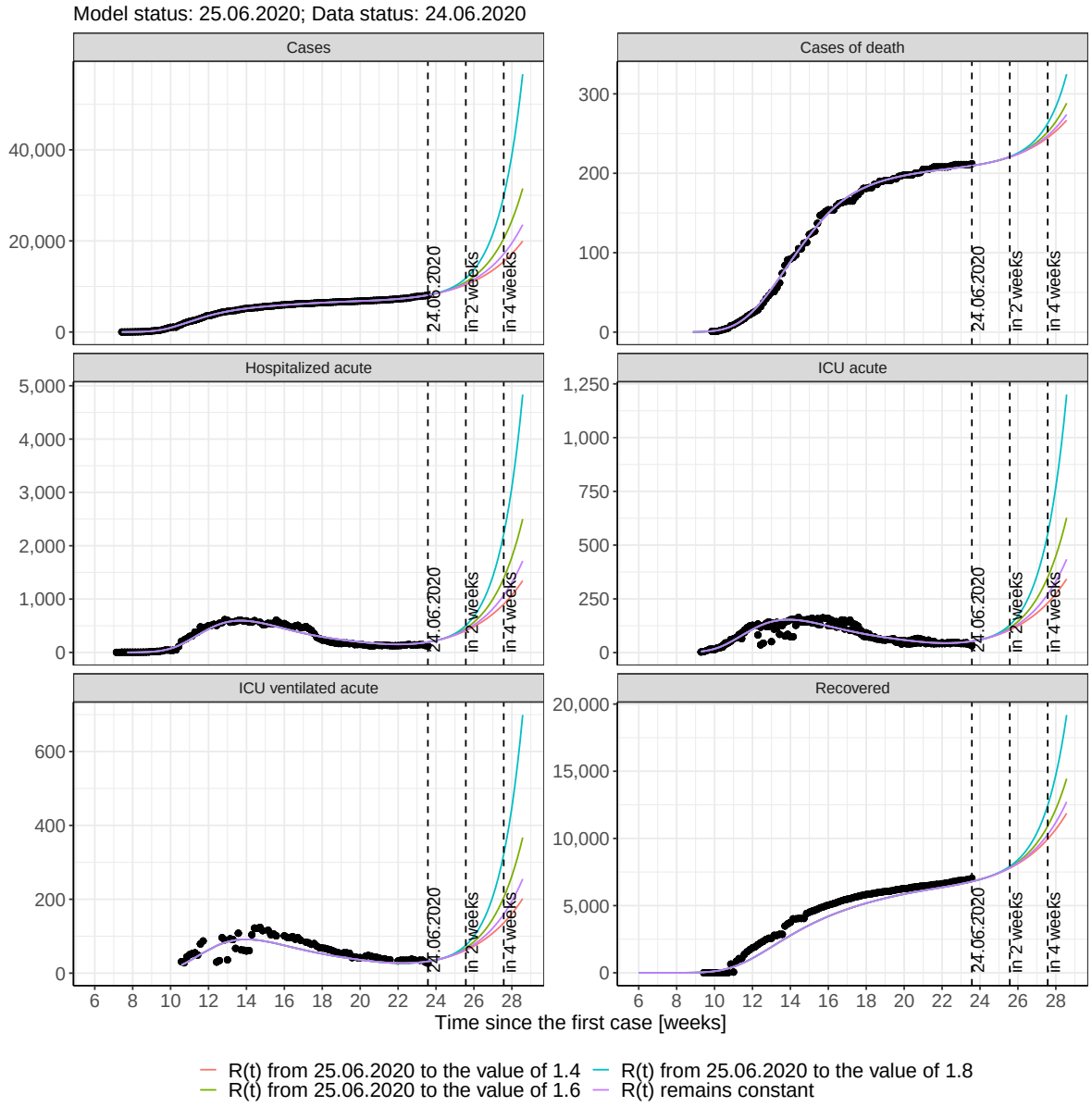


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

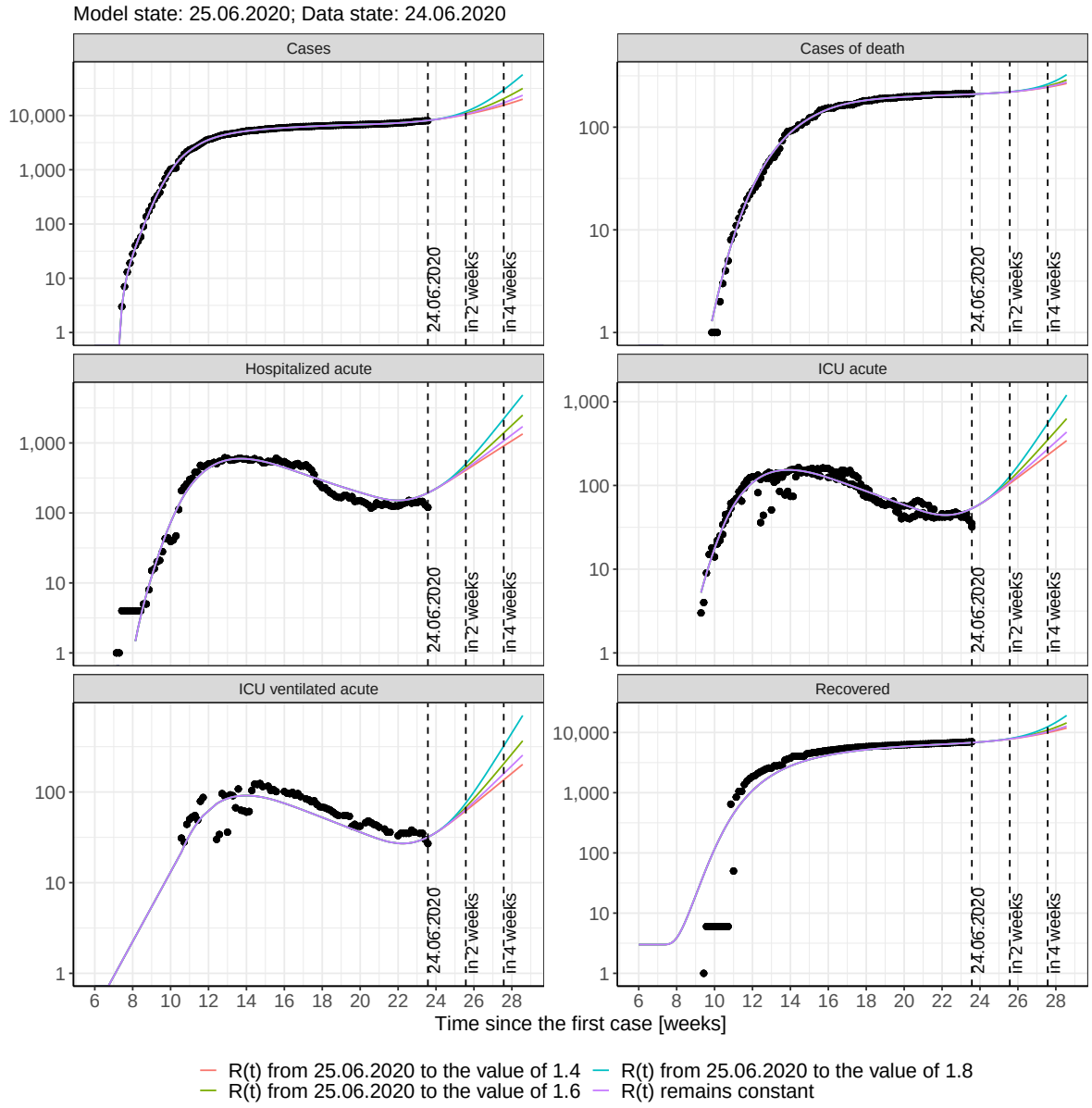


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

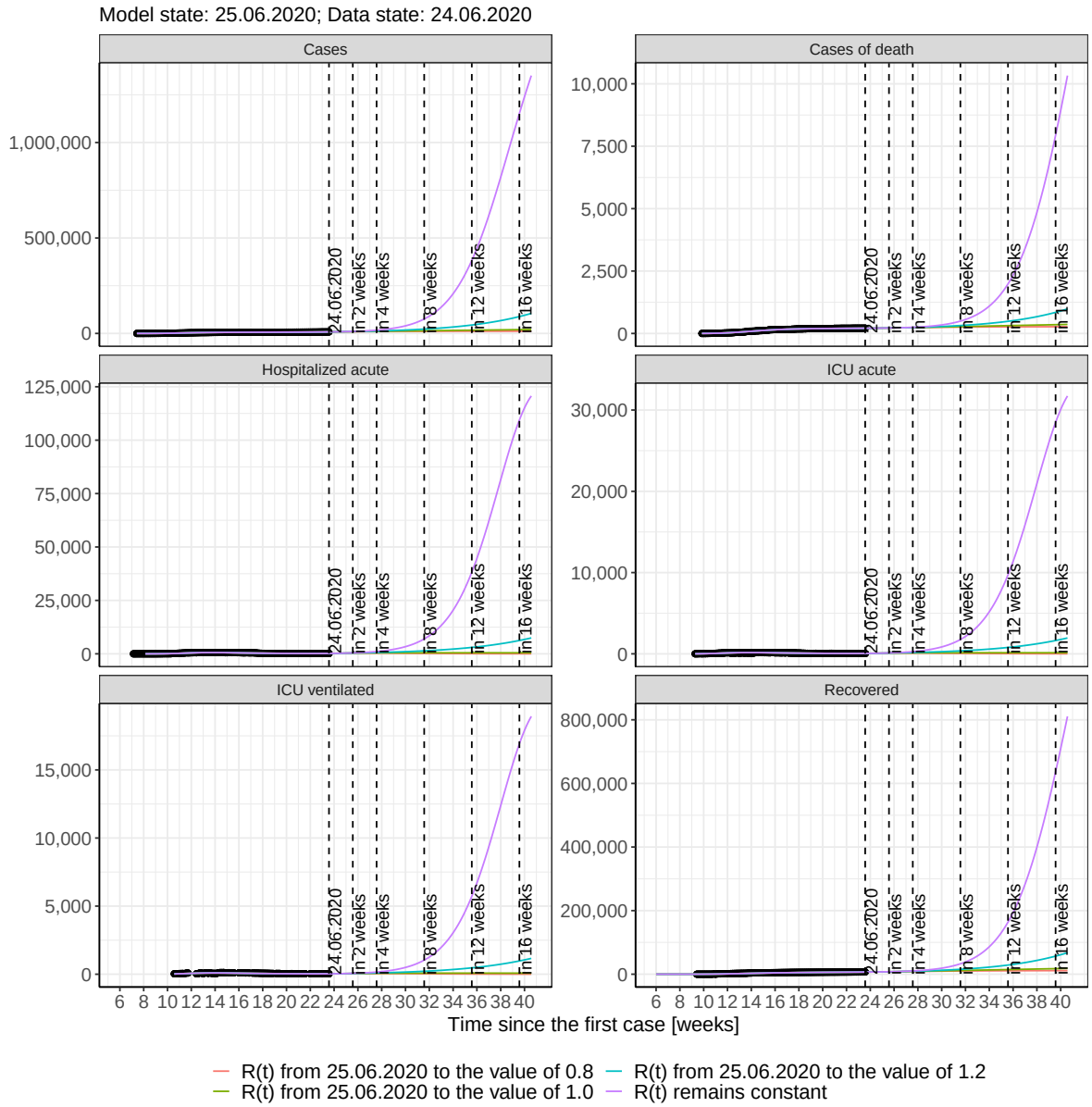


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

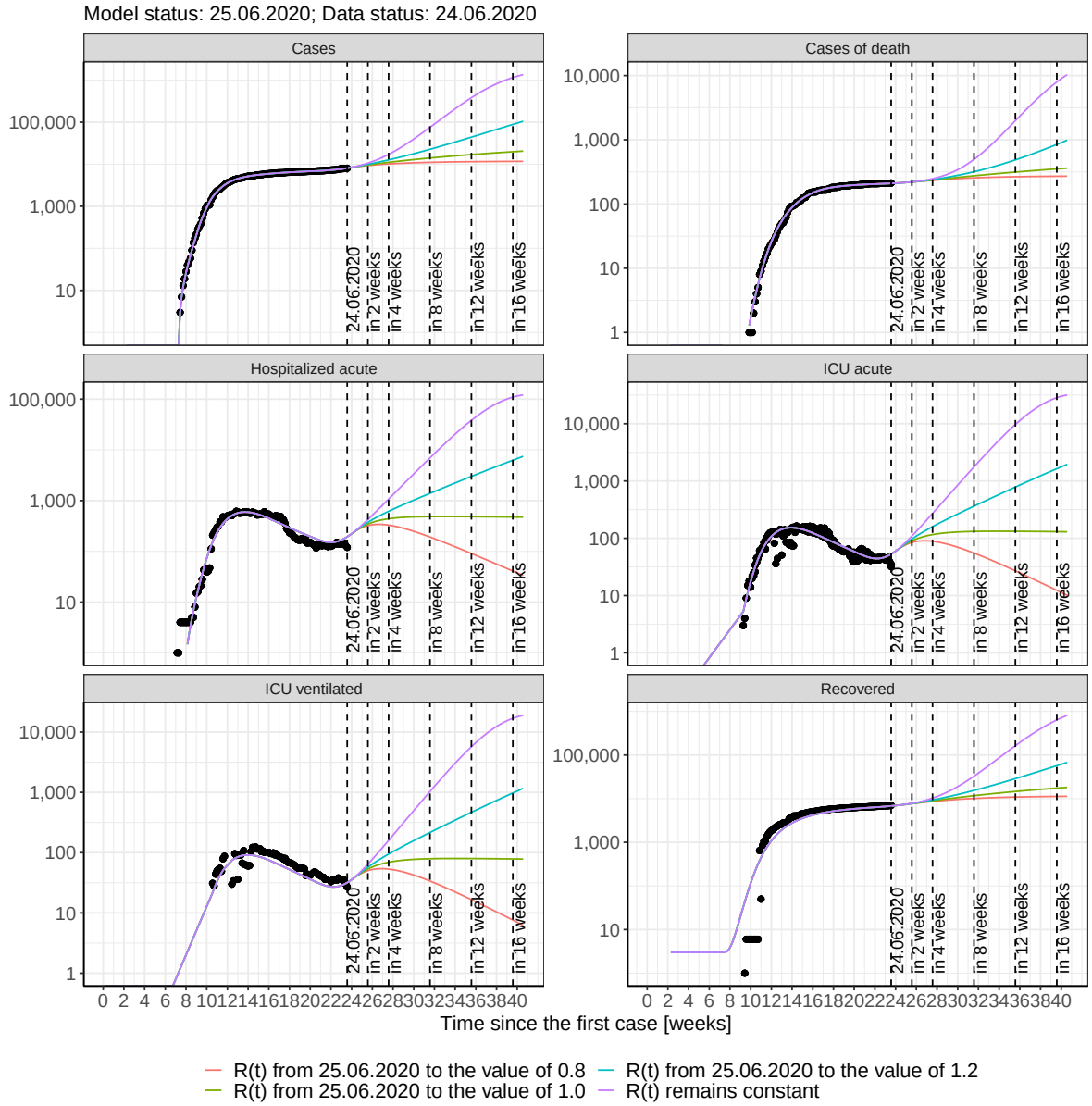


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 13) Model status from 25.06.2020; Data status: 24.06.2020.

Table 10: Berlin - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	8212	210	6842	202	55	33
26.06.2020	8332	211	6893	212	57	34
27.06.2020	8460	211	6948	223	60	36
28.06.2020	8596	212	7005	234	63	37
29.06.2020	8743	212	7066	247	66	39
30.06.2020	8899	213	7130	261	69	41
01.07.2020	9067	214	7199	276	73	43
02.07.2020	9246	215	7271	293	77	46
03.07.2020	9438	215	7347	311	81	48
04.07.2020	9644	216	7429	330	86	51
05.07.2020	9864	217	7515	351	91	54
06.07.2020	10100	218	7608	374	97	57
07.07.2020	10352	219	7706	398	103	61
08.07.2020	10622	220	7810	424	109	64
09.07.2020	10910	222	7922	452	116	68
10.07.2020	11219	223	8041	482	124	73
11.07.2020	11550	224	8168	515	132	78
12.07.2020	11904	226	8303	550	140	83
13.07.2020	12283	227	8448	587	150	88
14.07.2020	12688	229	8602	627	160	94
15.07.2020	13122	231	8768	670	171	100
16.07.2020	13586	233	8944	716	182	107
17.07.2020	14083	235	9132	766	195	114
18.07.2020	14614	237	9334	818	208	122
19.07.2020	15182	239	9550	875	222	131
20.07.2020	15790	242	9780	936	238	140
21.07.2020	16441	245	10026	1001	254	149
22.07.2020	17137	247	10290	1070	271	159

Table 11: Berlin - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	8207	210	6842	202	55	33
26.06.2020	8310	211	6893	212	57	34
27.06.2020	8410	211	6947	222	60	36
28.06.2020	8508	212	7004	233	62	37
29.06.2020	8602	212	7063	244	65	39
30.06.2020	8694	213	7124	254	67	40
01.07.2020	8784	214	7187	265	70	42
02.07.2020	8870	215	7251	275	73	43
03.07.2020	8954	215	7317	285	75	45
04.07.2020	9036	216	7385	294	77	46
05.07.2020	9116	217	7454	302	79	47
06.07.2020	9193	218	7523	310	81	48
07.07.2020	9268	219	7593	316	83	49
08.07.2020	9341	220	7664	322	85	50
09.07.2020	9412	221	7735	327	86	51
10.07.2020	9481	222	7806	331	87	52
11.07.2020	9548	223	7878	335	88	52
12.07.2020	9613	224	7949	337	89	53
13.07.2020	9676	225	8021	339	90	53
14.07.2020	9737	226	8092	340	90	54
15.07.2020	9797	227	8162	341	90	54
16.07.2020	9854	228	8233	341	90	54
17.07.2020	9911	229	8302	340	90	54
18.07.2020	9965	230	8372	339	90	54
19.07.2020	10018	231	8440	337	90	54
20.07.2020	10070	232	8508	335	90	54
21.07.2020	10120	233	8575	332	89	54
22.07.2020	10169	234	8641	329	89	53

Table 12: Berlin - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	8209	210	6842	202	55	33
26.06.2020	8316	211	6893	212	57	34
27.06.2020	8424	211	6948	222	60	36
28.06.2020	8531	212	7004	233	62	37
29.06.2020	8639	212	7064	245	65	39
30.06.2020	8746	213	7126	256	68	40
01.07.2020	8854	214	7190	268	71	42
02.07.2020	8961	215	7256	280	74	44
03.07.2020	9069	215	7325	291	77	45
04.07.2020	9176	216	7396	303	79	47
05.07.2020	9283	217	7469	314	82	49
06.07.2020	9390	218	7543	325	85	50
07.07.2020	9498	219	7620	335	88	52
08.07.2020	9605	220	7698	345	90	53
09.07.2020	9712	221	7778	355	93	55
10.07.2020	9819	222	7859	364	95	56
11.07.2020	9926	223	7941	372	97	58
12.07.2020	10033	224	8025	380	99	59
13.07.2020	10140	225	8110	388	101	60
14.07.2020	10247	226	8196	395	103	62
15.07.2020	10353	228	8284	402	105	63
16.07.2020	10460	229	8372	409	107	64
17.07.2020	10567	230	8461	415	109	65
18.07.2020	10674	231	8552	420	110	66
19.07.2020	10780	233	8642	425	112	67
20.07.2020	10887	234	8734	430	113	68
21.07.2020	10993	235	8827	435	115	68
22.07.2020	11100	236	8920	439	116	69

Table 13: Berlin - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	8210	210	6842	202	55	33
26.06.2020	8323	211	6893	212	57	34
27.06.2020	8438	211	6948	222	60	36
28.06.2020	8557	212	7005	234	62	37
29.06.2020	8679	212	7065	246	65	39
30.06.2020	8805	213	7128	258	68	41
01.07.2020	8934	214	7193	271	72	42
02.07.2020	9067	215	7262	285	75	44
03.07.2020	9204	215	7334	299	78	46
04.07.2020	9345	216	7408	313	82	49
05.07.2020	9489	217	7486	328	85	51
06.07.2020	9638	218	7567	343	89	53
07.07.2020	9791	219	7651	358	93	55
08.07.2020	9949	220	7739	373	97	57
09.07.2020	10110	221	7829	389	101	60
10.07.2020	10277	222	7923	405	105	62
11.07.2020	10448	224	8021	421	109	65
12.07.2020	10624	225	8121	437	113	67
13.07.2020	10805	226	8226	454	117	70
14.07.2020	10992	227	8333	471	122	72
15.07.2020	11183	229	8444	488	126	75
16.07.2020	11380	230	8559	505	131	77
17.07.2020	11583	232	8678	523	135	80
18.07.2020	11791	233	8801	541	140	83
19.07.2020	12005	235	8927	559	145	86
20.07.2020	12225	236	9058	578	150	89
21.07.2020	12452	238	9192	596	155	92
22.07.2020	12685	240	9331	616	160	95

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

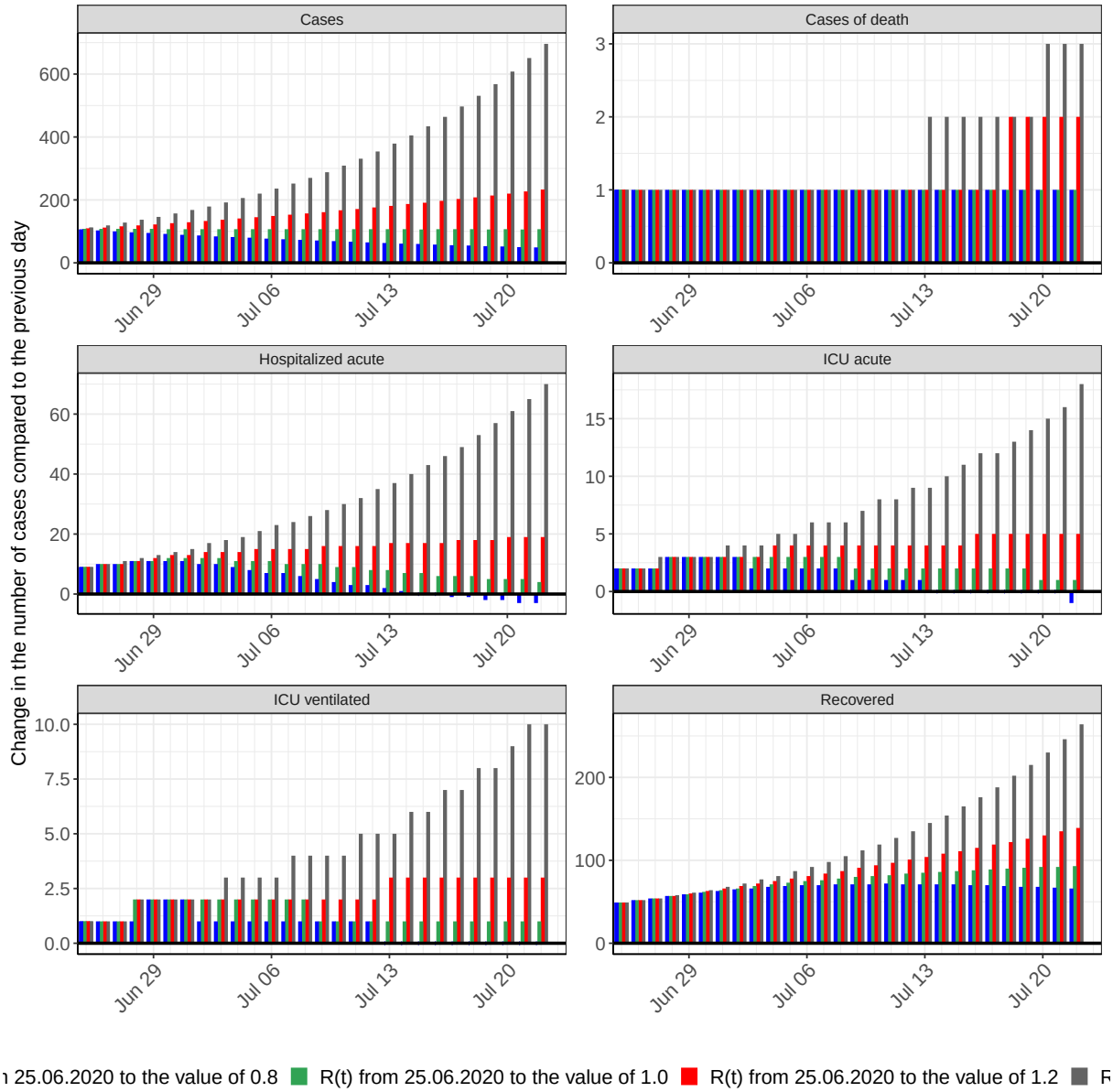


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

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.

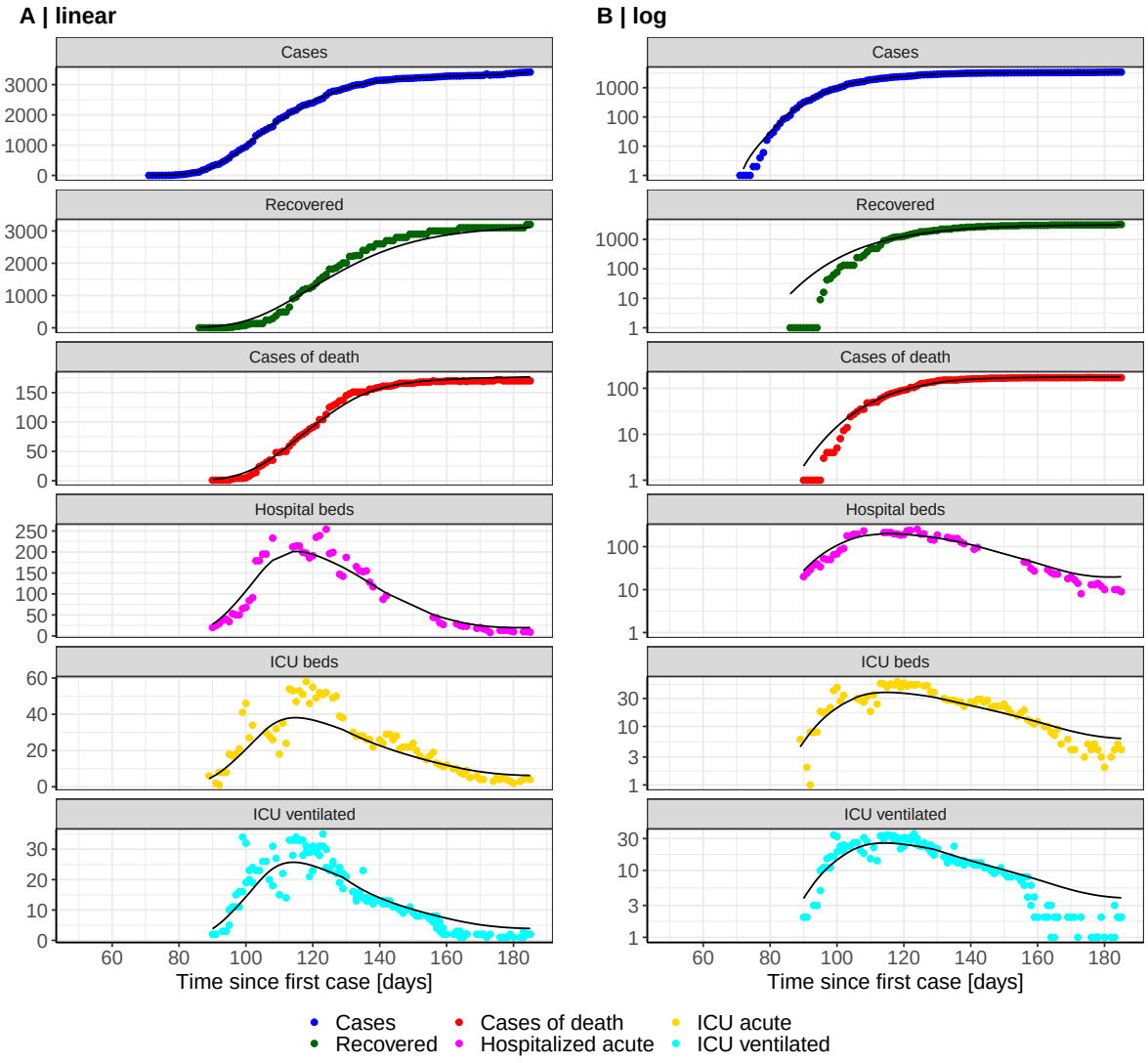


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

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.

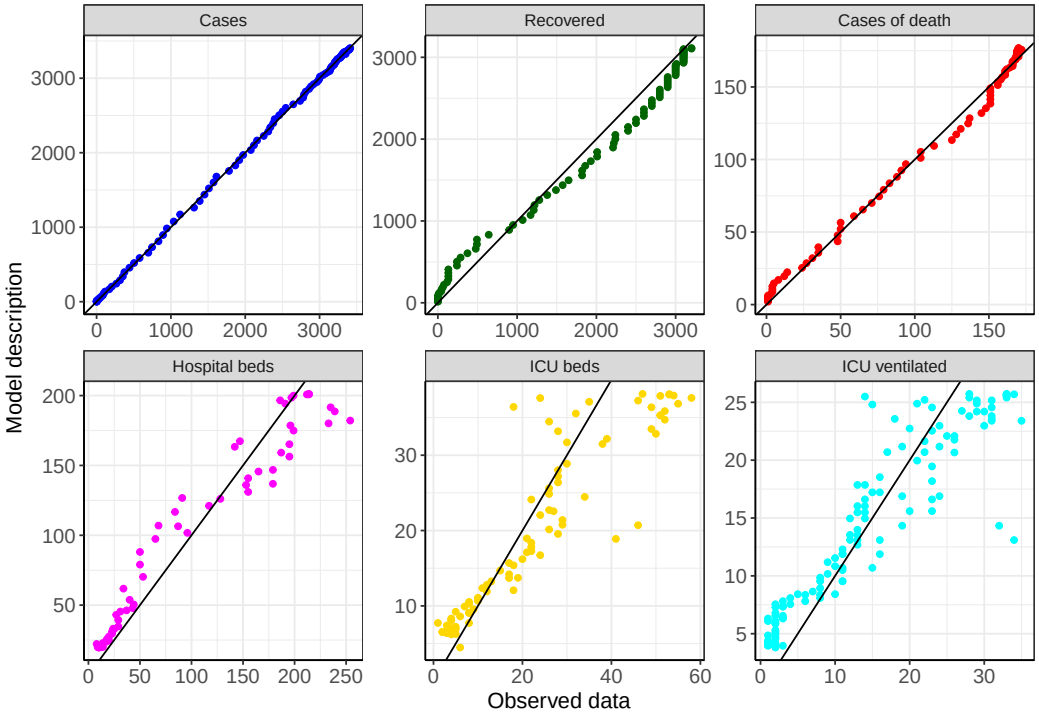


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

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).

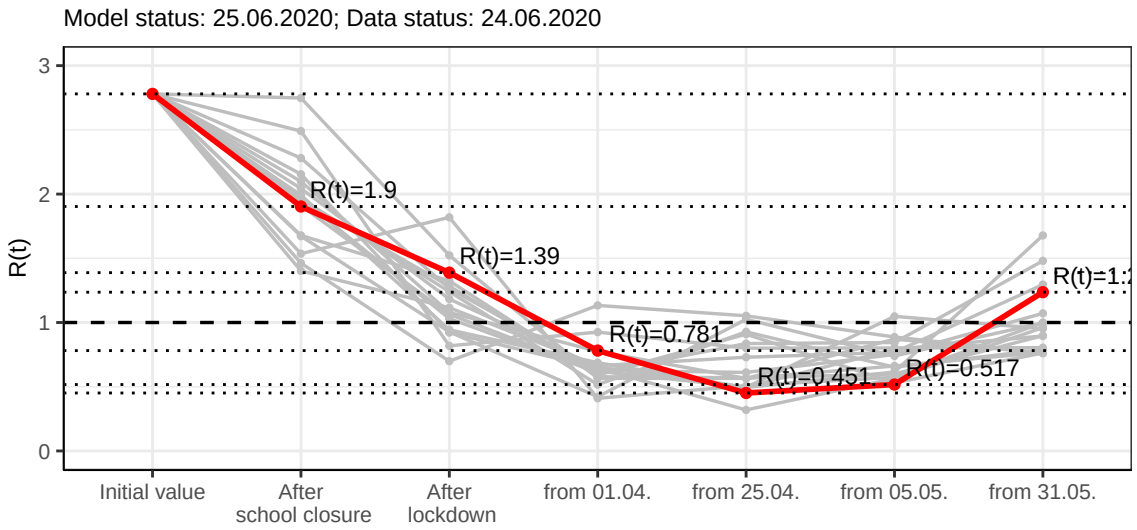


Figure 46: R(t) values before and after the NPIs for Brandenburg

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

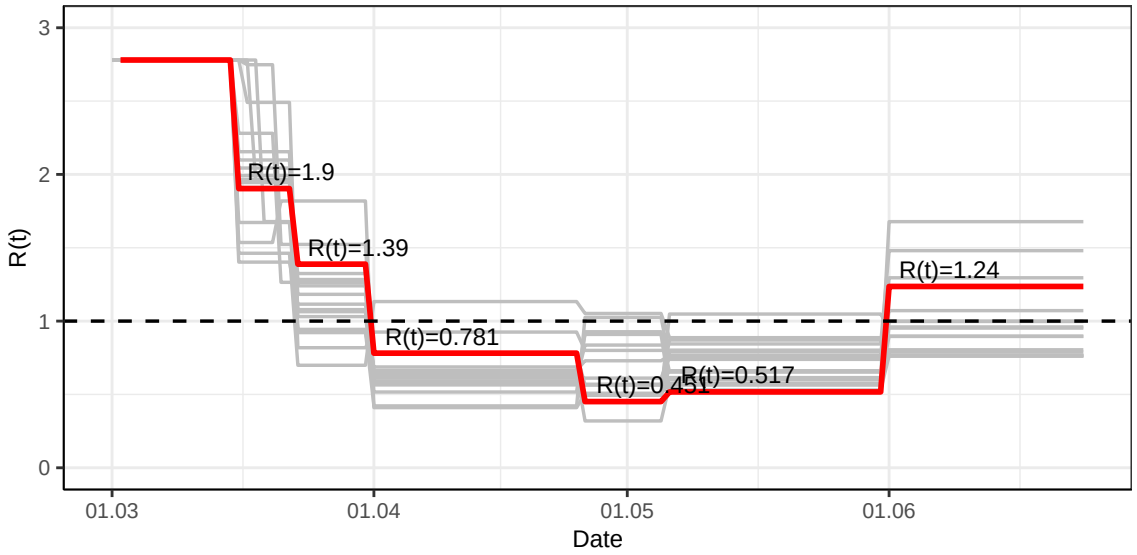


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

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

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.

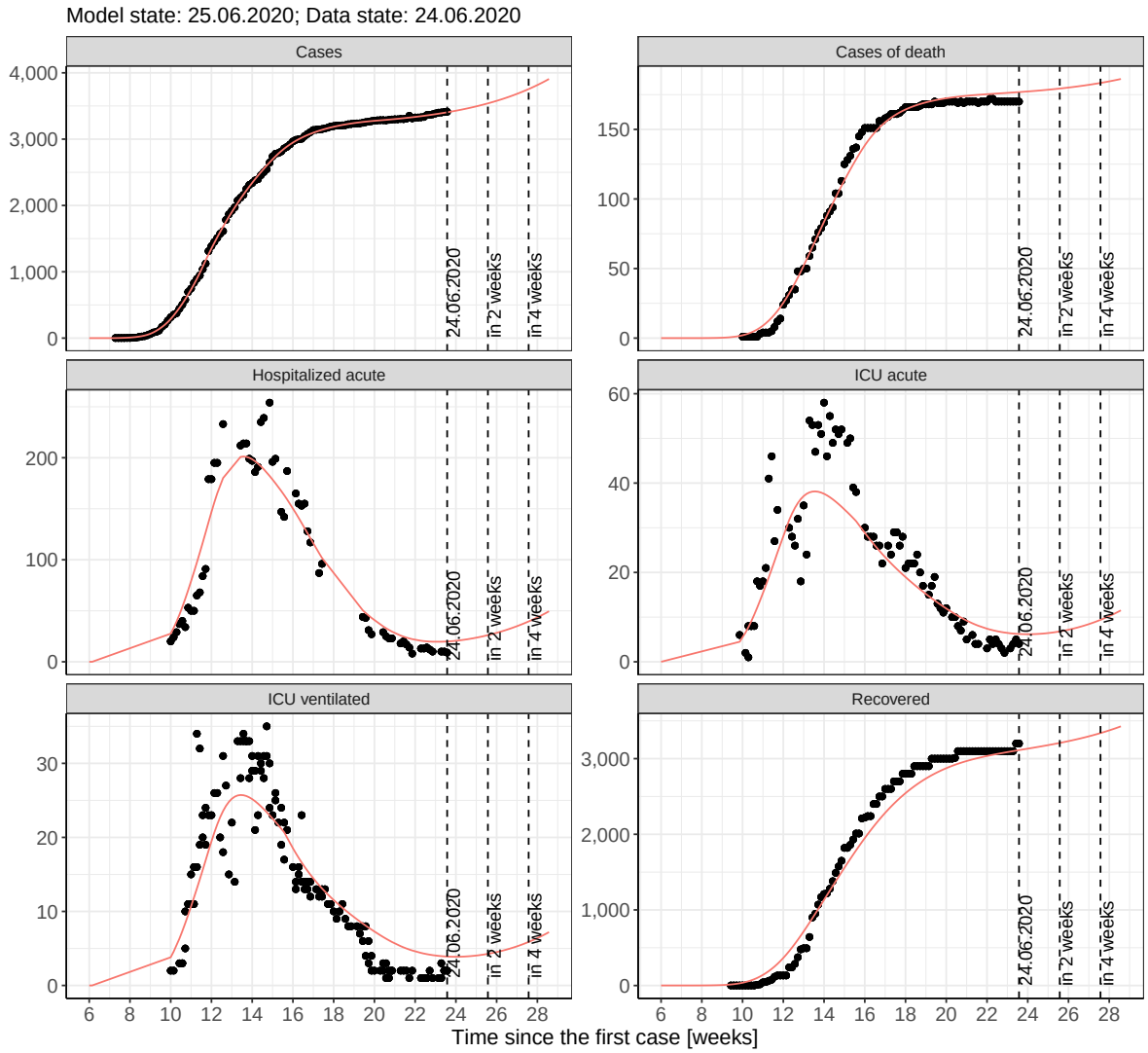


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

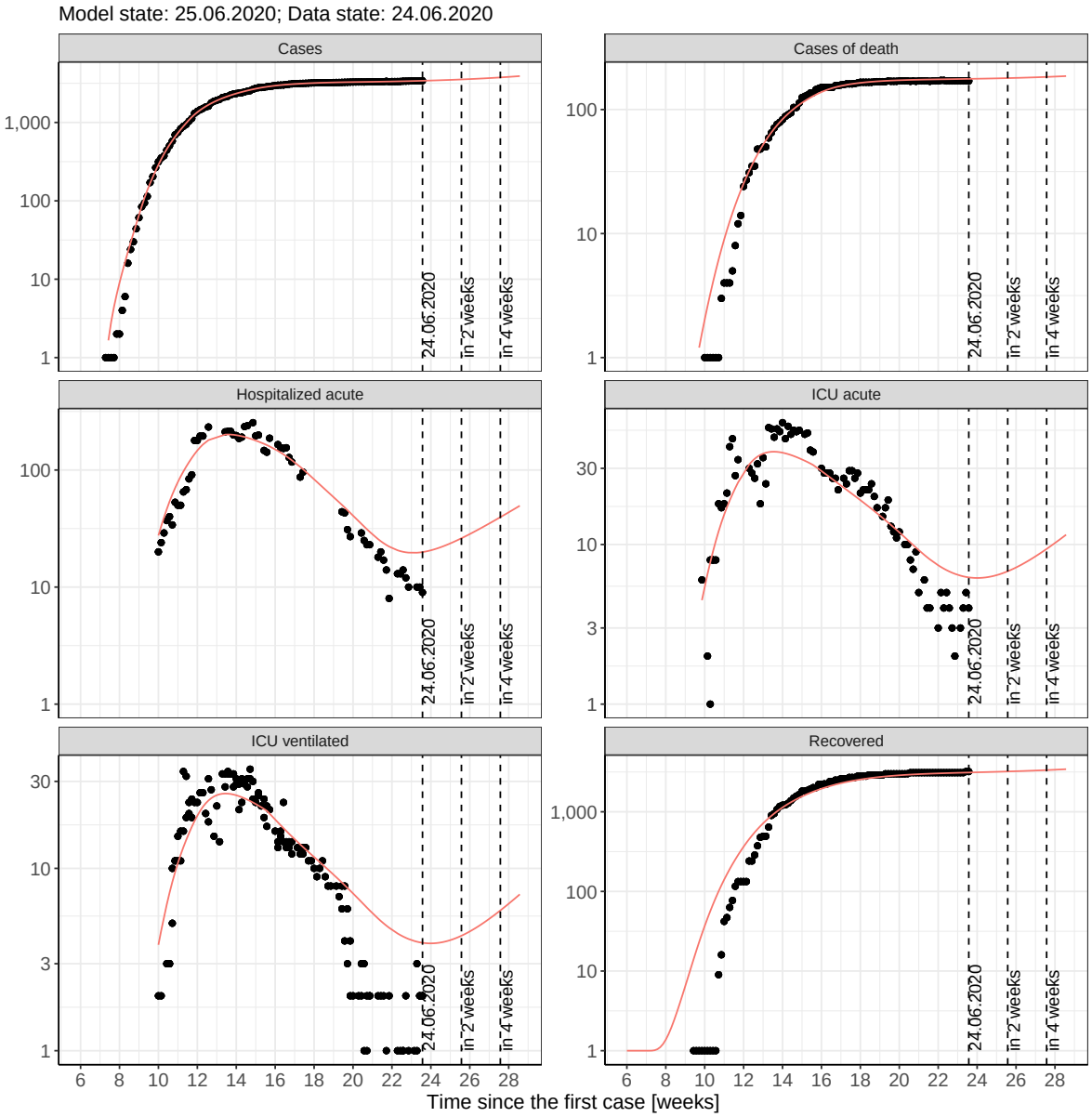


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

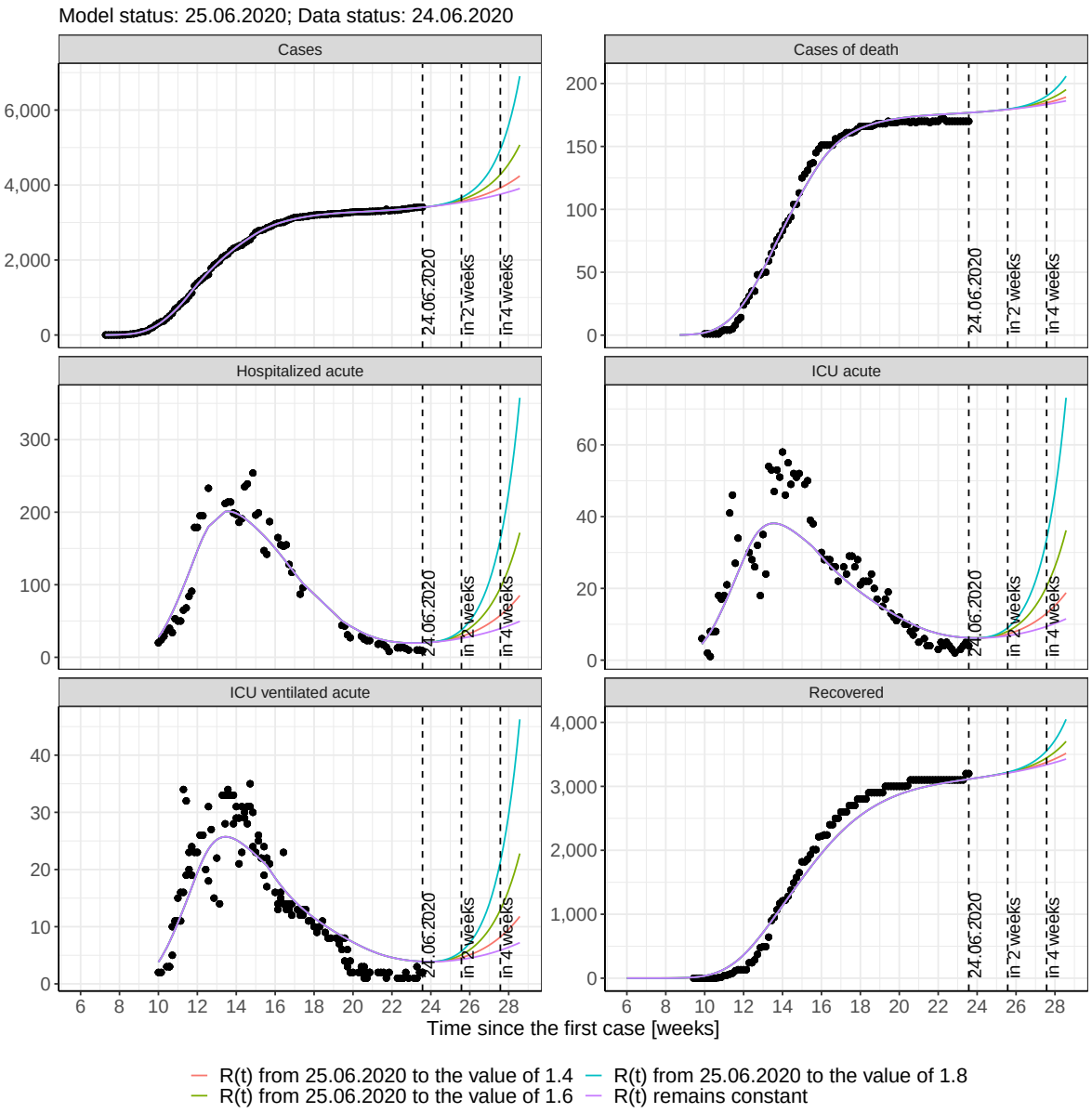


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

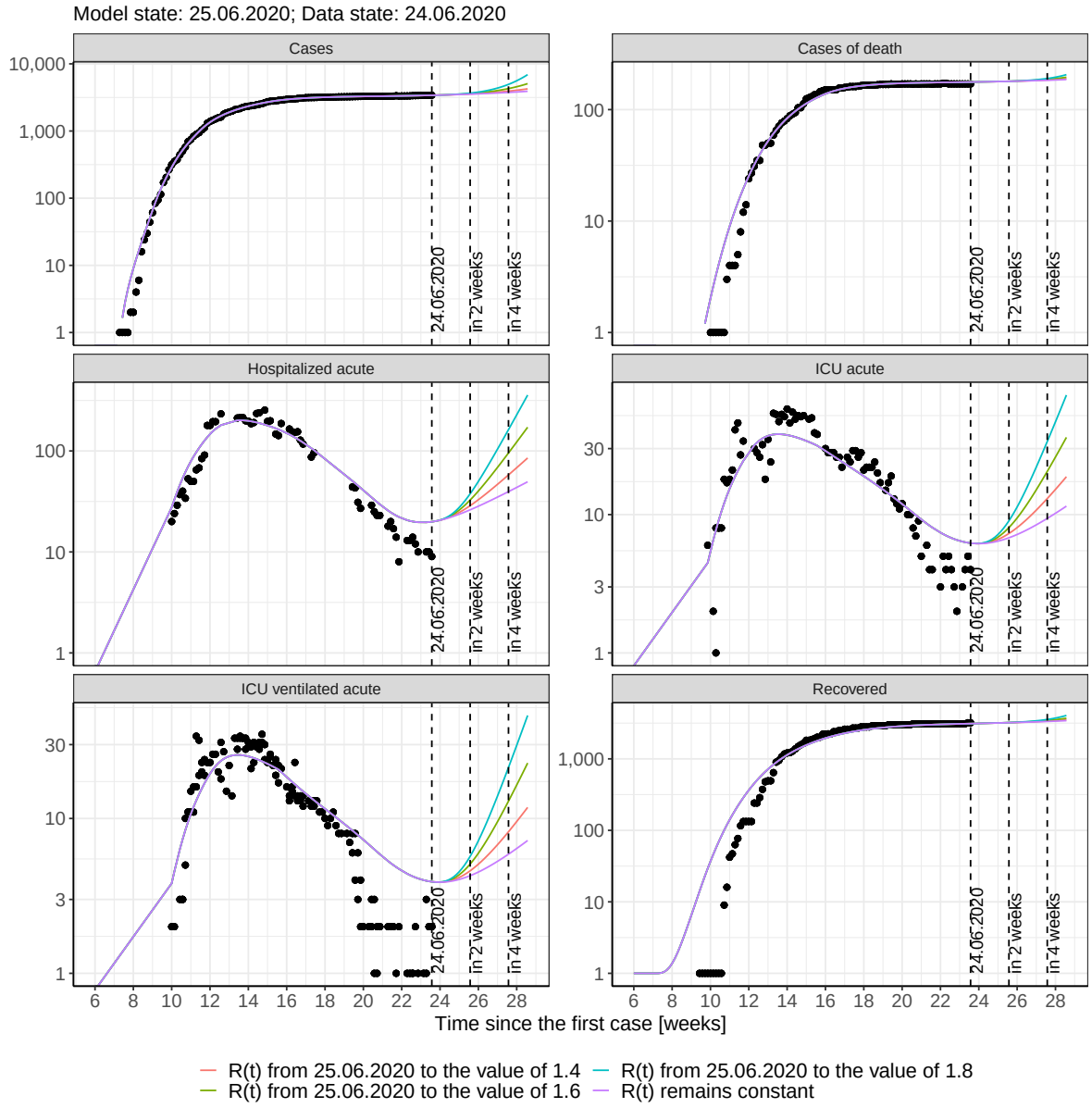


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

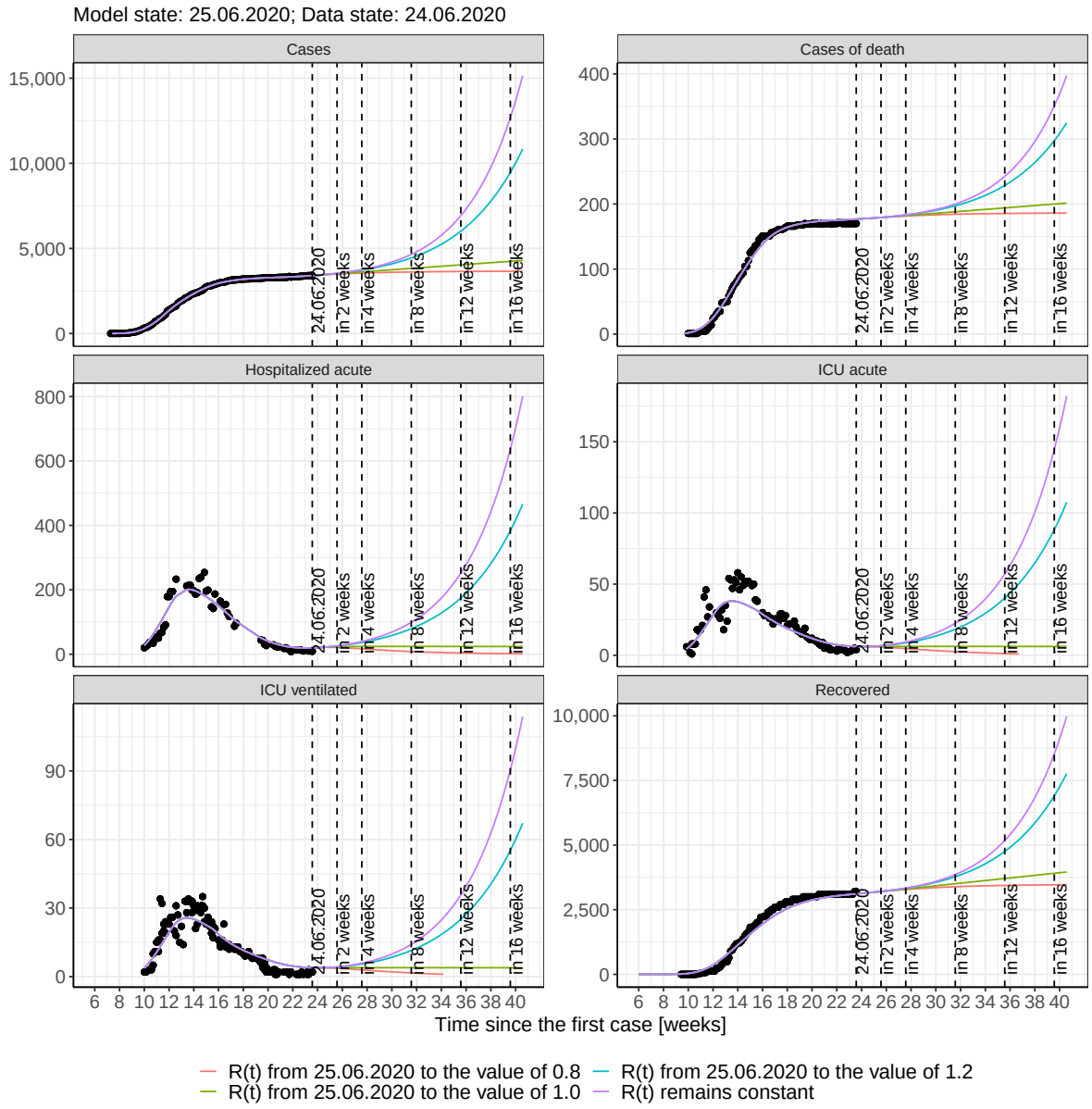


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

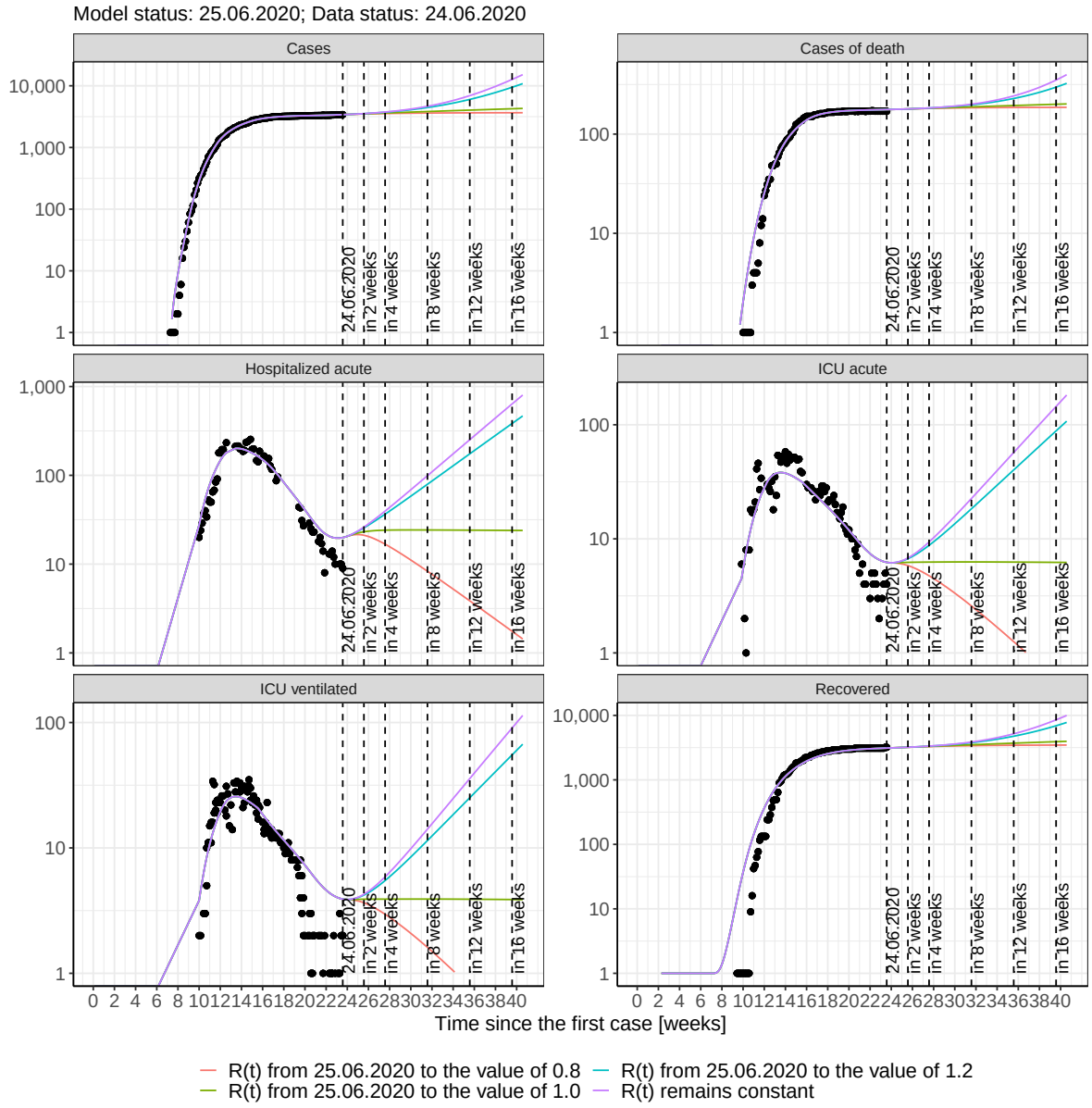


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 17) Model status from 25.06.2020; Data status: 24.06.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3412	177	3119	20	6	4
26.06.2020	3420	177	3126	20	6	4
27.06.2020	3428	177	3132	21	6	4
28.06.2020	3437	177	3138	21	6	4
29.06.2020	3446	178	3145	21	6	4
30.06.2020	3455	178	3152	22	6	4
01.07.2020	3464	178	3158	22	6	4
02.07.2020	3474	178	3165	23	6	4
03.07.2020	3484	178	3172	23	6	4
04.07.2020	3494	178	3179	24	6	4
05.07.2020	3505	179	3186	24	7	4
06.07.2020	3516	179	3193	25	7	4
07.07.2020	3528	179	3200	25	7	4
08.07.2020	3539	179	3208	26	7	4
09.07.2020	3552	180	3216	27	7	4
10.07.2020	3564	180	3224	28	7	4
11.07.2020	3577	180	3232	28	7	5
12.07.2020	3591	180	3240	29	7	5
13.07.2020	3605	181	3249	30	7	5
14.07.2020	3620	181	3257	31	8	5
15.07.2020	3634	181	3266	32	8	5
16.07.2020	3650	181	3276	33	8	5
17.07.2020	3666	182	3285	34	8	5
18.07.2020	3683	182	3295	35	8	5
19.07.2020	3700	182	3306	36	9	5
20.07.2020	3718	183	3316	37	9	6
21.07.2020	3736	183	3327	38	9	6
22.07.2020	3755	183	3338	40	9	6

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3412	177	3119	20	6	4
26.06.2020	3419	177	3126	20	6	4
27.06.2020	3426	177	3132	21	6	4
28.06.2020	3433	177	3138	21	6	4
29.06.2020	3440	178	3145	21	6	4
30.06.2020	3446	178	3151	21	6	4
01.07.2020	3452	178	3158	21	6	4
02.07.2020	3458	178	3164	21	6	4
03.07.2020	3464	178	3170	22	6	4
04.07.2020	3470	178	3177	22	6	4
05.07.2020	3476	179	3183	21	6	4
06.07.2020	3481	179	3190	21	6	4
07.07.2020	3486	179	3196	21	6	4
08.07.2020	3492	179	3202	21	6	4
09.07.2020	3496	179	3208	21	6	4
10.07.2020	3501	180	3214	21	6	4
11.07.2020	3506	180	3220	20	6	4
12.07.2020	3511	180	3226	20	6	3
13.07.2020	3515	180	3232	20	5	3
14.07.2020	3519	180	3238	20	5	3
15.07.2020	3524	180	3244	19	5	3
16.07.2020	3528	181	3250	19	5	3
17.07.2020	3532	181	3255	19	5	3
18.07.2020	3535	181	3261	18	5	3
19.07.2020	3539	181	3266	18	5	3
20.07.2020	3543	181	3272	18	5	3
21.07.2020	3546	181	3277	17	5	3
22.07.2020	3550	181	3282	17	5	3

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3412	177	3119	20	6	4
26.06.2020	3420	177	3126	20	6	4
27.06.2020	3427	177	3132	21	6	4
28.06.2020	3435	177	3138	21	6	4
29.06.2020	3442	178	3145	21	6	4
30.06.2020	3450	178	3151	21	6	4
01.07.2020	3457	178	3158	22	6	4
02.07.2020	3465	178	3164	22	6	4
03.07.2020	3472	178	3171	22	6	4
04.07.2020	3480	178	3178	22	6	4
05.07.2020	3488	179	3184	23	6	4
06.07.2020	3495	179	3191	23	6	4
07.07.2020	3502	179	3198	23	6	4
08.07.2020	3510	179	3204	23	6	4
09.07.2020	3518	179	3211	23	6	4
10.07.2020	3525	180	3218	23	6	4
11.07.2020	3533	180	3225	23	6	4
12.07.2020	3540	180	3232	24	6	4
13.07.2020	3548	180	3239	24	6	4
14.07.2020	3555	180	3246	24	6	4
15.07.2020	3563	181	3253	24	6	4
16.07.2020	3570	181	3260	24	6	4
17.07.2020	3578	181	3266	24	6	4
18.07.2020	3585	181	3274	24	6	4
19.07.2020	3593	182	3281	24	6	4
20.07.2020	3600	182	3288	24	6	4
21.07.2020	3608	182	3295	24	6	4
22.07.2020	3615	182	3302	24	6	4

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3412	177	3119	20	6	4
26.06.2020	3420	177	3126	20	6	4
27.06.2020	3428	177	3132	21	6	4
28.06.2020	3436	177	3138	21	6	4
29.06.2020	3445	178	3145	21	6	4
30.06.2020	3454	178	3152	22	6	4
01.07.2020	3463	178	3158	22	6	4
02.07.2020	3472	178	3165	22	6	4
03.07.2020	3482	178	3172	23	6	4
04.07.2020	3492	178	3179	23	6	4
05.07.2020	3502	179	3186	24	6	4
06.07.2020	3512	179	3193	24	7	4
07.07.2020	3523	179	3200	25	7	4
08.07.2020	3534	179	3207	26	7	4
09.07.2020	3546	180	3215	26	7	4
10.07.2020	3557	180	3223	27	7	4
11.07.2020	3569	180	3230	28	7	4
12.07.2020	3582	180	3239	28	7	4
13.07.2020	3594	181	3247	29	7	5
14.07.2020	3608	181	3255	30	7	5
15.07.2020	3621	181	3264	30	8	5
16.07.2020	3635	181	3273	31	8	5
17.07.2020	3649	182	3282	32	8	5
18.07.2020	3664	182	3291	33	8	5
19.07.2020	3679	182	3301	34	8	5
20.07.2020	3695	183	3311	35	8	5
21.07.2020	3711	183	3321	36	9	5
22.07.2020	3727	183	3331	37	9	5

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

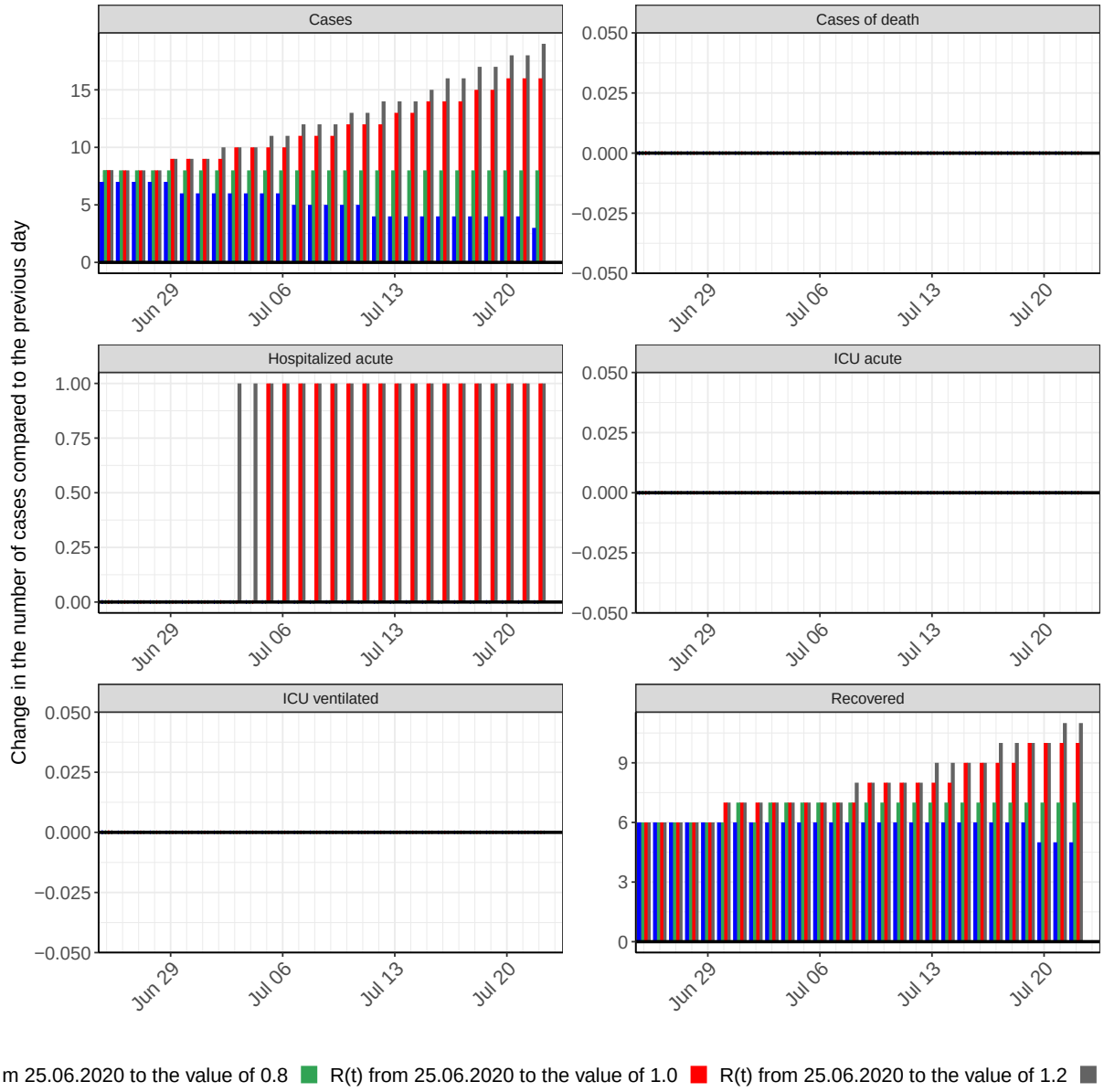


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

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.

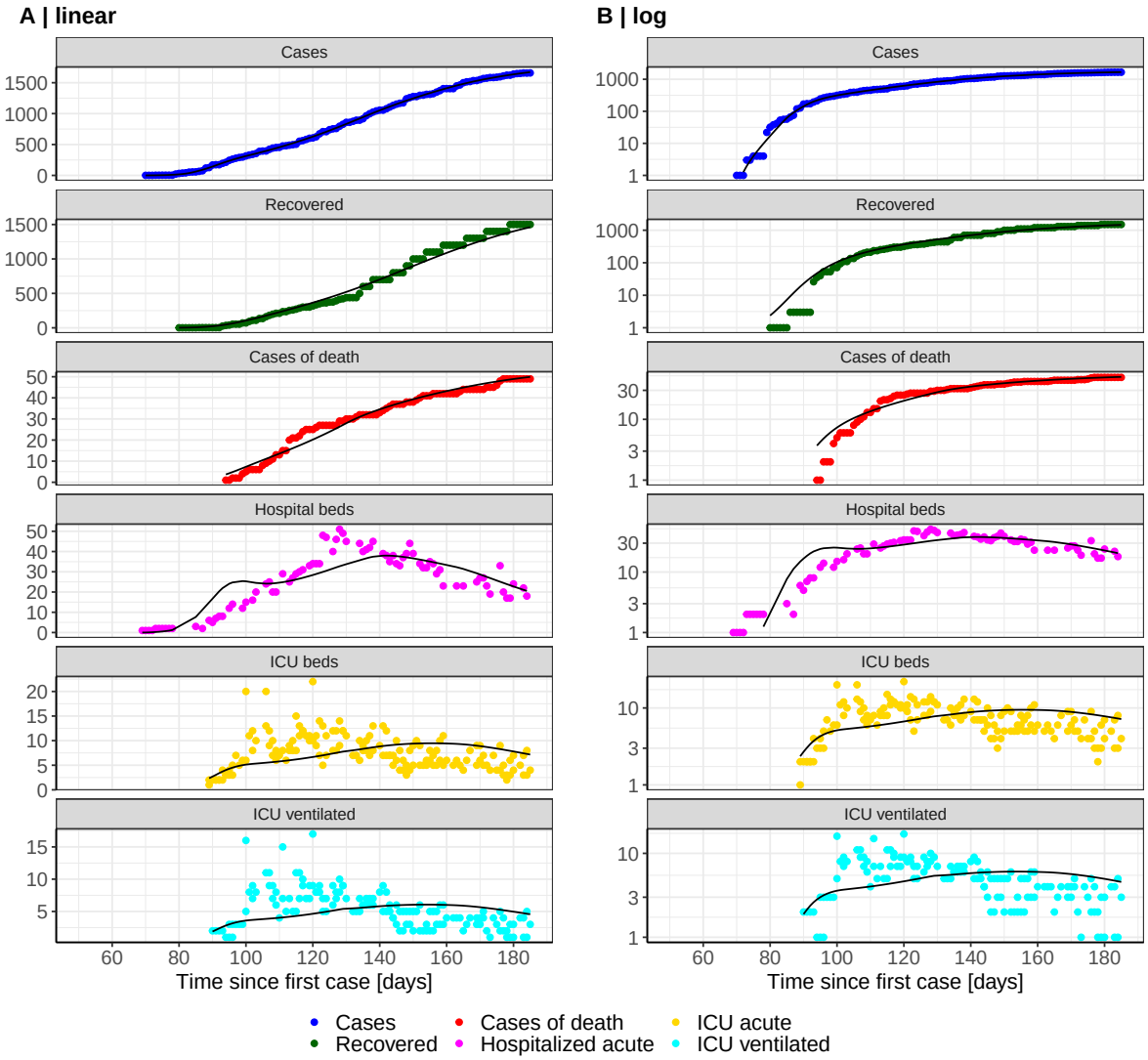


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

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.

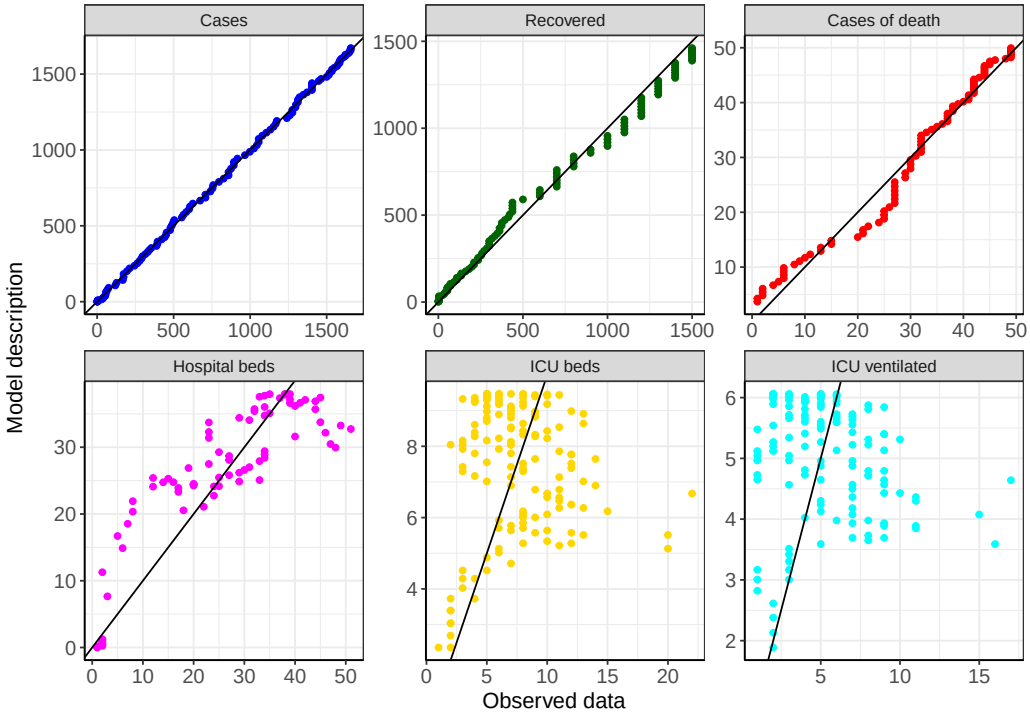


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

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).

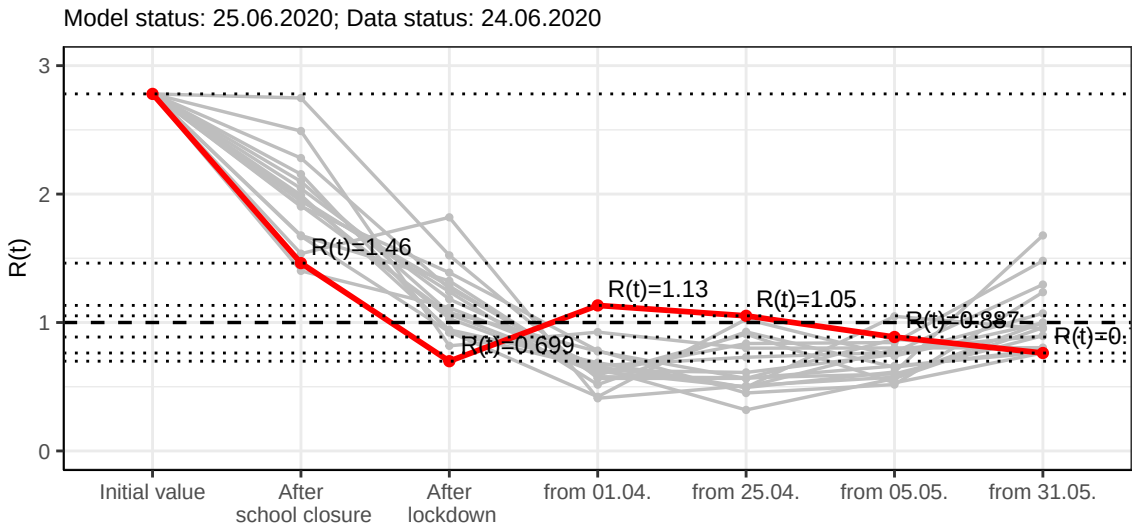


Figure 57: R(t) values before and after the NPIs for Bremen

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

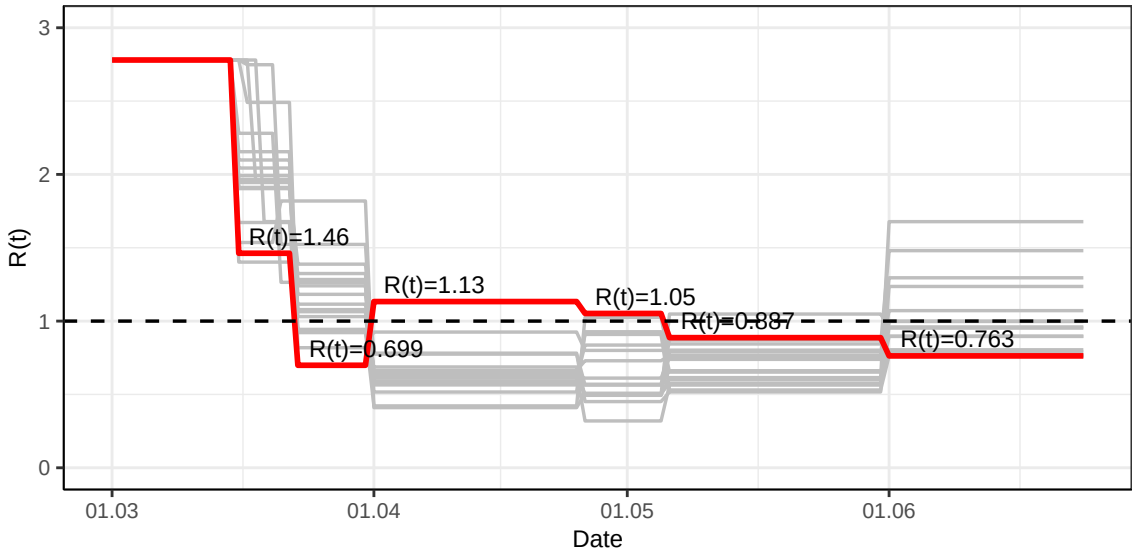


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

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

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.

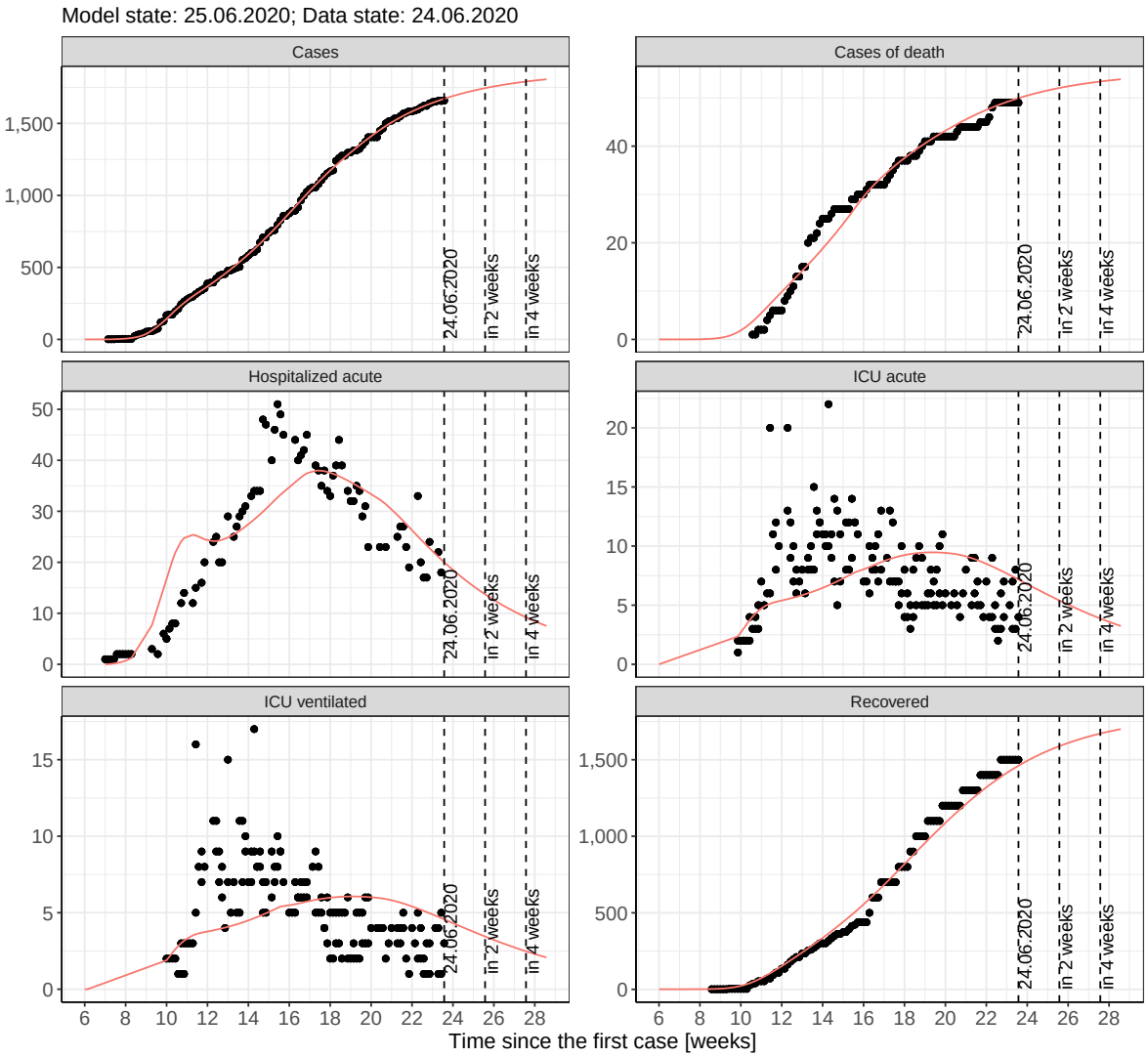


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

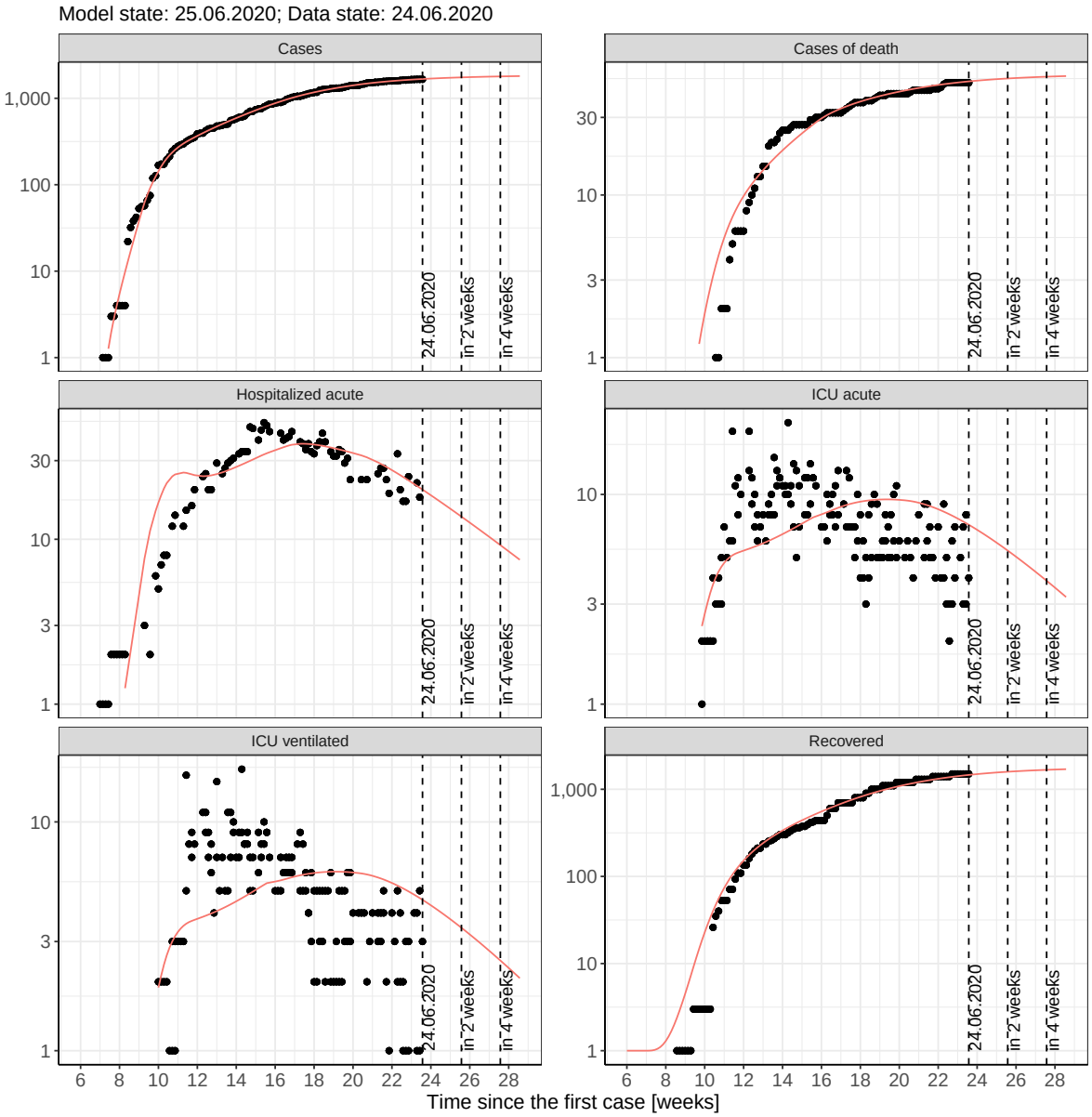


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

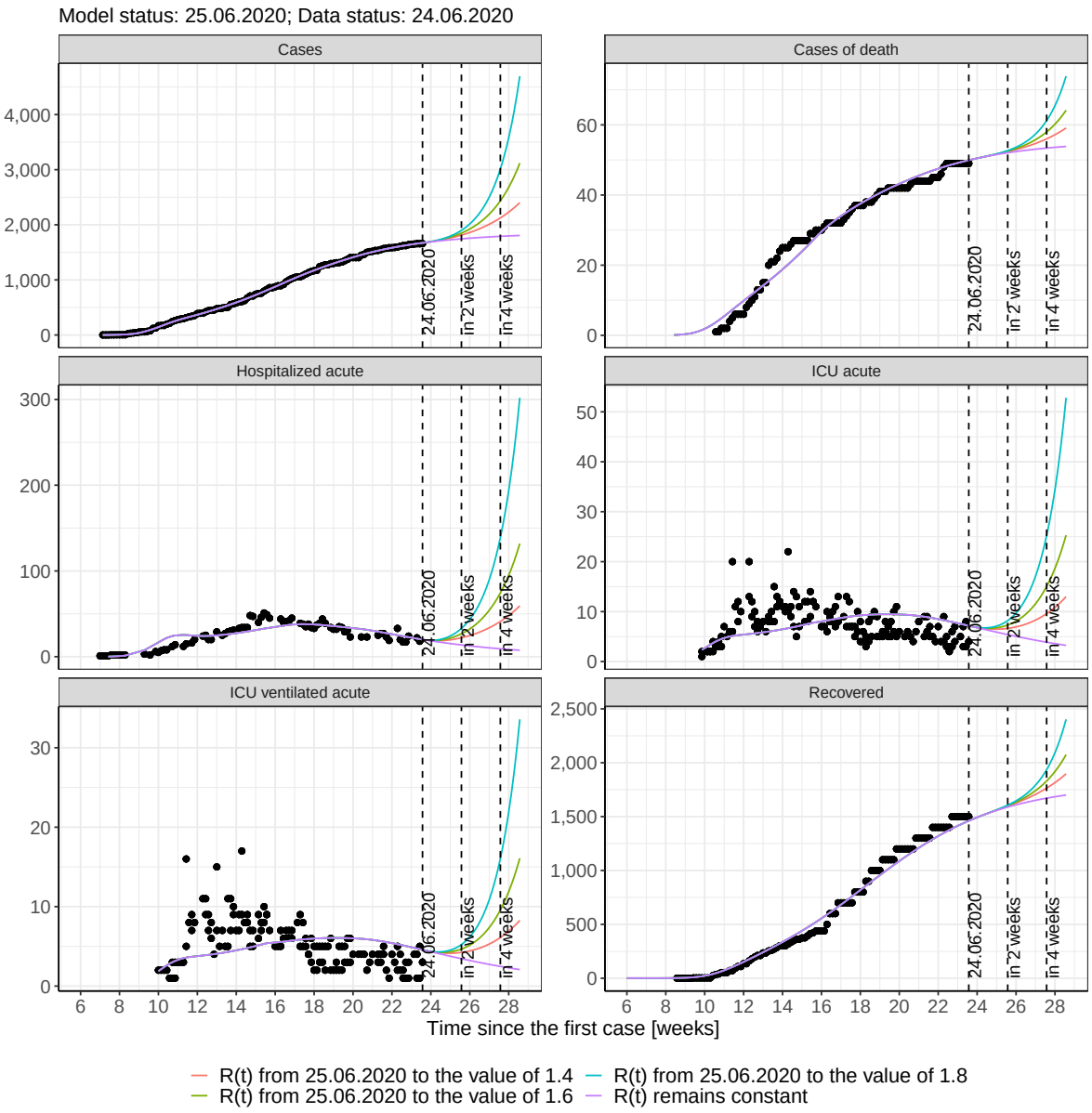


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

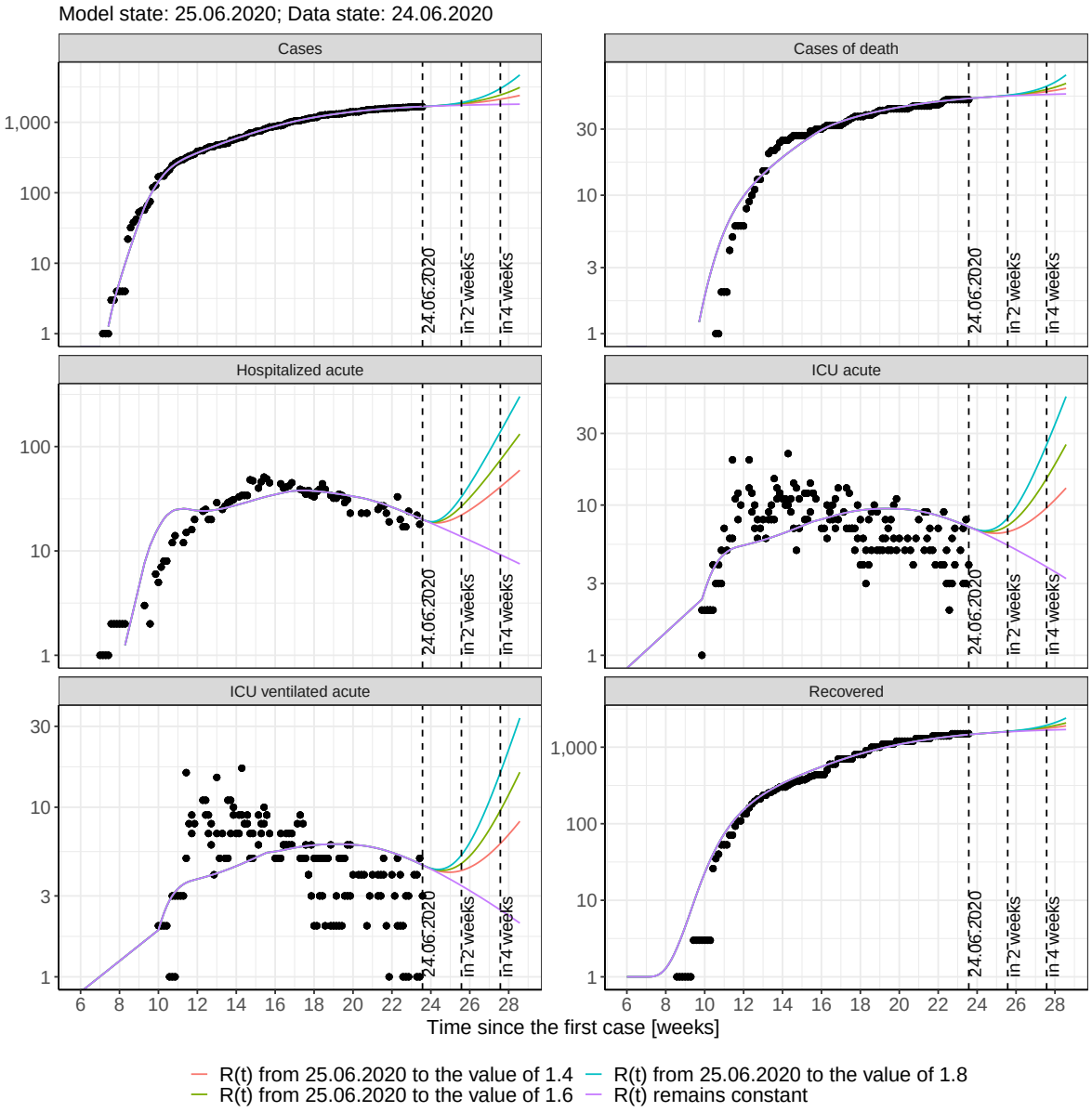


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

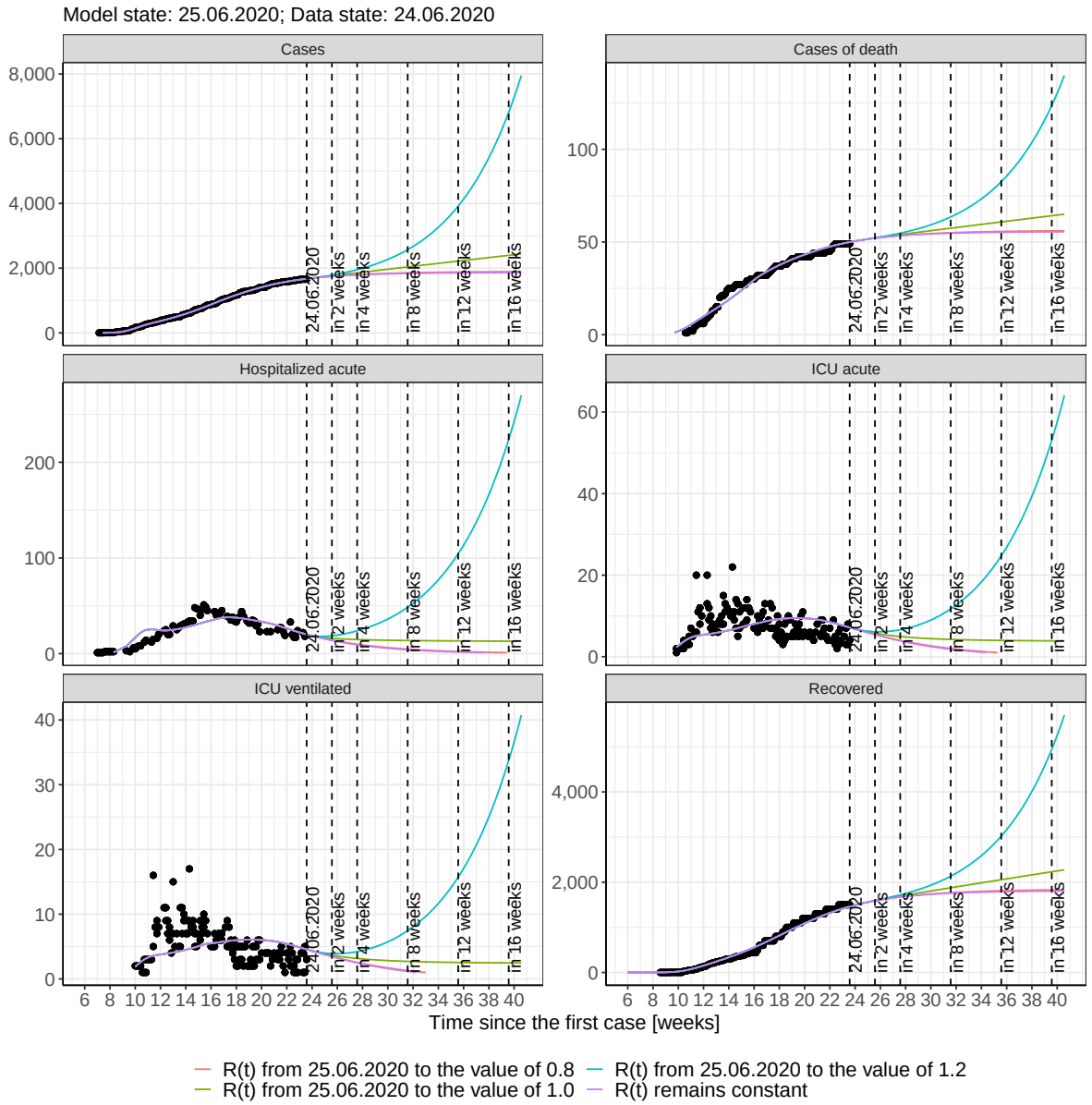


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

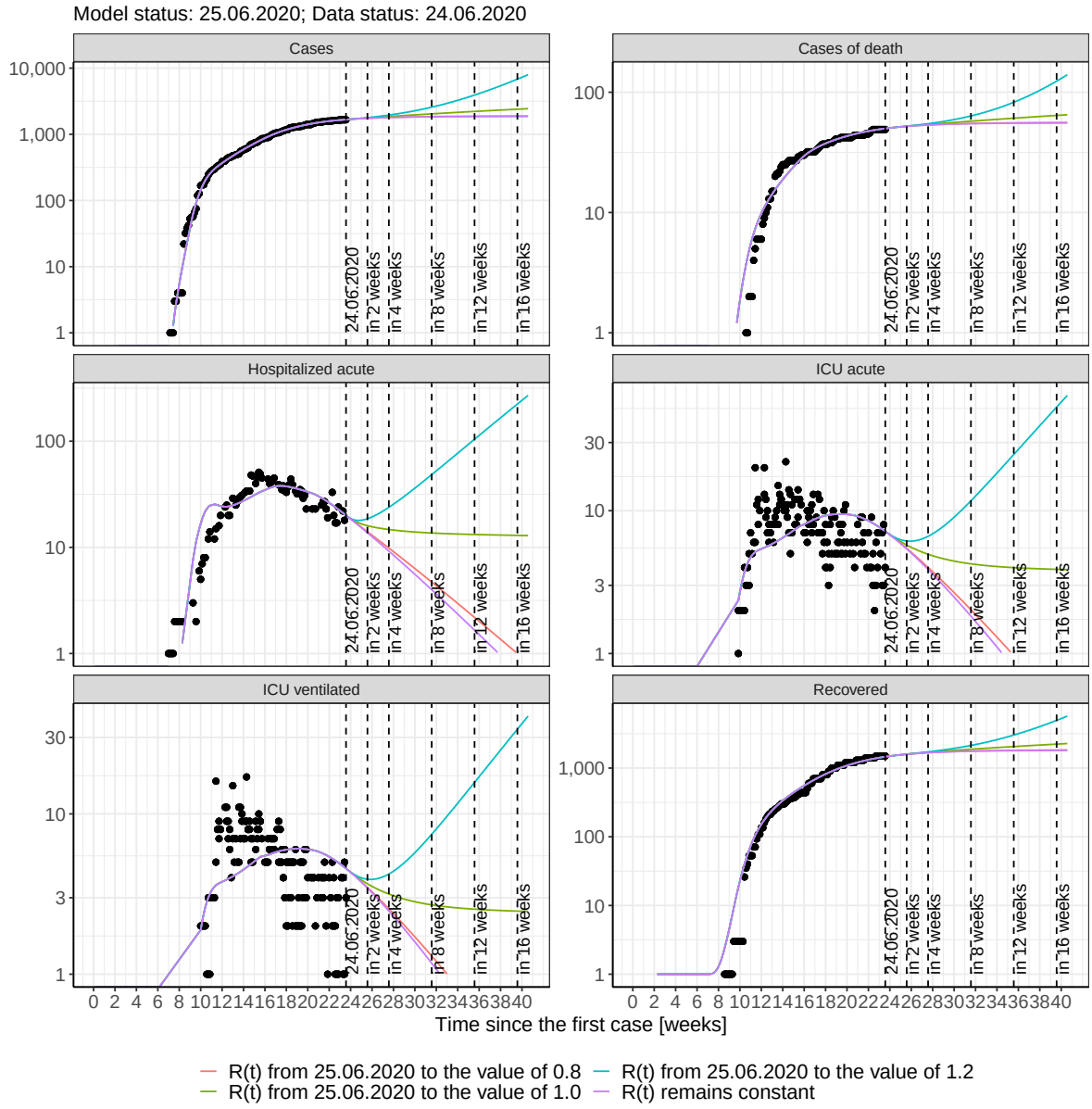


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 21) Model status from 25.06.2020; Data status: 24.06.2020.

Table 18: Bremen - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1678	50	1472	20	7	4
26.06.2020	1684	50	1483	19	7	4
27.06.2020	1690	50	1493	19	7	4
28.06.2020	1696	51	1503	18	7	4
29.06.2020	1702	51	1513	18	7	4
30.06.2020	1707	51	1522	17	6	4
01.07.2020	1713	51	1532	17	6	4
02.07.2020	1718	51	1540	16	6	4
03.07.2020	1723	51	1549	16	6	4
04.07.2020	1727	52	1558	15	6	4
05.07.2020	1732	52	1566	15	6	4
06.07.2020	1736	52	1574	15	6	4
07.07.2020	1741	52	1581	14	6	4
08.07.2020	1745	52	1589	14	5	3
09.07.2020	1749	52	1596	13	5	3
10.07.2020	1753	52	1603	13	5	3
11.07.2020	1757	52	1610	13	5	3
12.07.2020	1760	52	1616	12	5	3
13.07.2020	1764	53	1622	12	5	3
14.07.2020	1767	53	1628	12	5	3
15.07.2020	1770	53	1634	11	5	3
16.07.2020	1774	53	1640	11	4	3
17.07.2020	1777	53	1646	11	4	3
18.07.2020	1780	53	1651	10	4	3
19.07.2020	1783	53	1656	10	4	3
20.07.2020	1785	53	1661	10	4	3
21.07.2020	1788	53	1666	9	4	3
22.07.2020	1791	53	1671	9	4	2

Table 19: Bremen - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1678	50	1472	20	7	4
26.06.2020	1684	50	1483	19	7	4
27.06.2020	1690	50	1493	19	7	4
28.06.2020	1696	51	1503	18	7	4
29.06.2020	1702	51	1513	18	7	4
30.06.2020	1708	51	1522	17	6	4
01.07.2020	1713	51	1532	17	6	4
02.07.2020	1719	51	1540	16	6	4
03.07.2020	1724	51	1549	16	6	4
04.07.2020	1729	52	1558	16	6	4
05.07.2020	1734	52	1566	15	6	4
06.07.2020	1738	52	1574	15	6	4
07.07.2020	1743	52	1582	14	6	4
08.07.2020	1748	52	1589	14	5	3
09.07.2020	1752	52	1596	14	5	3
10.07.2020	1756	52	1603	13	5	3
11.07.2020	1760	52	1610	13	5	3
12.07.2020	1764	53	1617	13	5	3
13.07.2020	1768	53	1623	12	5	3
14.07.2020	1772	53	1630	12	5	3
15.07.2020	1776	53	1636	12	5	3
16.07.2020	1779	53	1642	11	5	3
17.07.2020	1783	53	1648	11	4	3
18.07.2020	1786	53	1653	11	4	3
19.07.2020	1789	53	1658	11	4	3
20.07.2020	1792	53	1664	10	4	3
21.07.2020	1795	53	1669	10	4	3
22.07.2020	1798	53	1674	10	4	3

Table 20: Bremen - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1678	50	1472	20	7	4
26.06.2020	1685	50	1483	19	7	4
27.06.2020	1691	50	1493	19	7	4
28.06.2020	1698	51	1503	18	7	4
29.06.2020	1704	51	1513	18	7	4
30.06.2020	1711	51	1522	18	6	4
01.07.2020	1718	51	1532	17	6	4
02.07.2020	1724	51	1541	17	6	4
03.07.2020	1731	51	1550	17	6	4
04.07.2020	1737	52	1558	17	6	4
05.07.2020	1744	52	1567	16	6	4
06.07.2020	1751	52	1575	16	6	4
07.07.2020	1757	52	1583	16	6	4
08.07.2020	1764	52	1591	16	6	4
09.07.2020	1770	52	1599	16	6	4
10.07.2020	1777	52	1607	16	6	4
11.07.2020	1784	53	1615	16	6	4
12.07.2020	1790	53	1622	16	5	3
13.07.2020	1797	53	1630	15	5	3
14.07.2020	1803	53	1637	15	5	3
15.07.2020	1810	53	1644	15	5	3
16.07.2020	1816	53	1651	15	5	3
17.07.2020	1823	53	1658	15	5	3
18.07.2020	1829	53	1665	15	5	3
19.07.2020	1836	54	1672	15	5	3
20.07.2020	1842	54	1679	15	5	3
21.07.2020	1849	54	1686	15	5	3
22.07.2020	1856	54	1693	15	5	3

Table 21: Bremen - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1678	50	1472	20	7	4
26.06.2020	1685	50	1483	19	7	4
27.06.2020	1692	50	1493	19	7	4
28.06.2020	1699	51	1503	18	7	4
29.06.2020	1707	51	1513	18	7	4
30.06.2020	1715	51	1523	18	7	4
01.07.2020	1723	51	1532	18	6	4
02.07.2020	1731	51	1541	18	6	4
03.07.2020	1739	51	1550	18	6	4
04.07.2020	1748	52	1559	18	6	4
05.07.2020	1757	52	1568	18	6	4
06.07.2020	1766	52	1577	18	6	4
07.07.2020	1775	52	1585	18	6	4
08.07.2020	1785	52	1594	19	6	4
09.07.2020	1795	52	1603	19	6	4
10.07.2020	1805	53	1611	19	6	4
11.07.2020	1816	53	1620	19	6	4
12.07.2020	1826	53	1629	20	6	4
13.07.2020	1838	53	1637	20	6	4
14.07.2020	1849	53	1646	20	6	4
15.07.2020	1861	53	1655	21	6	4
16.07.2020	1873	54	1664	21	6	4
17.07.2020	1885	54	1673	21	6	4
18.07.2020	1898	54	1682	22	6	4
19.07.2020	1911	54	1692	22	6	4
20.07.2020	1925	54	1702	23	6	4
21.07.2020	1939	55	1711	23	7	4
22.07.2020	1953	55	1721	24	7	4

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

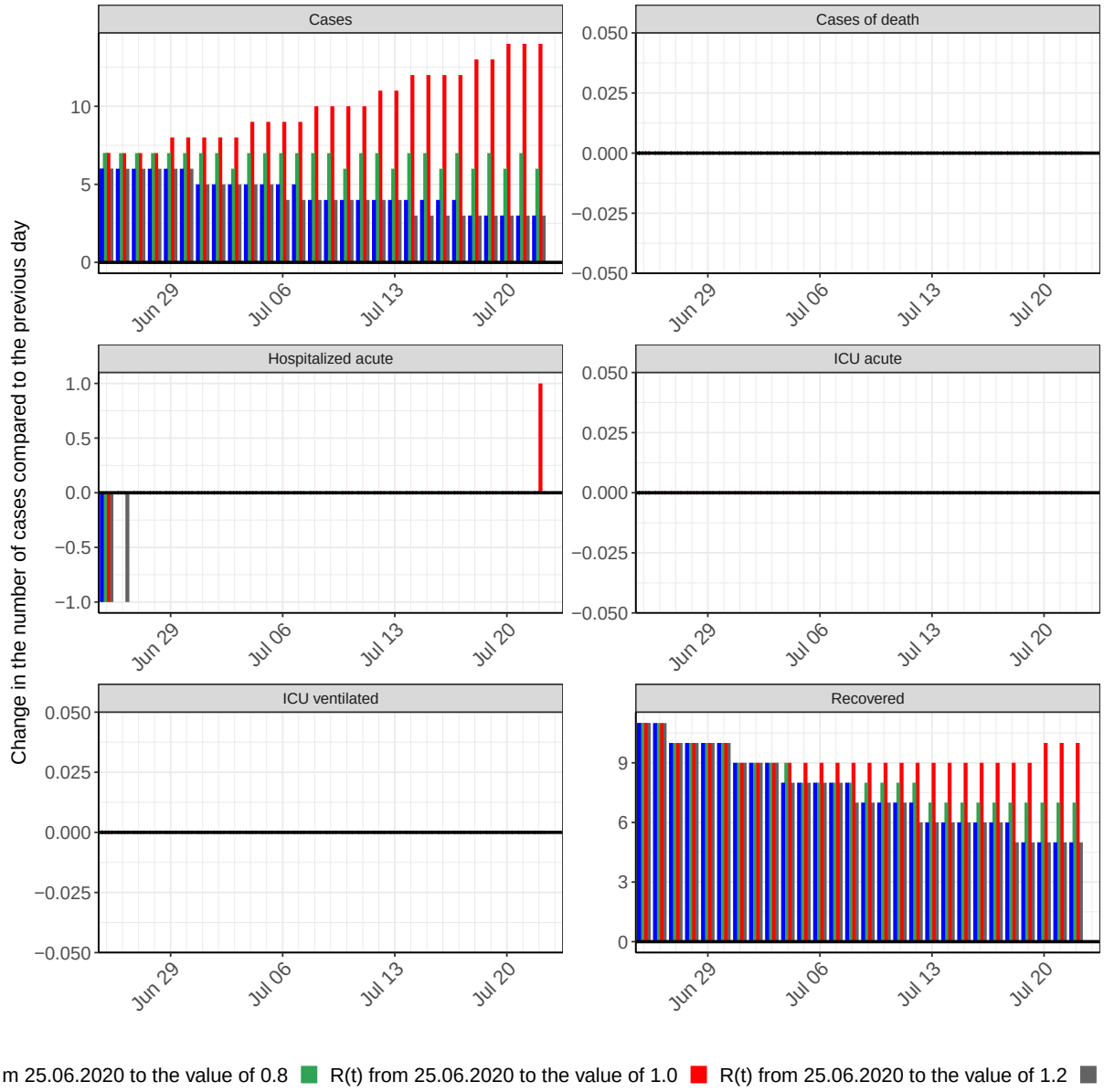


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

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.

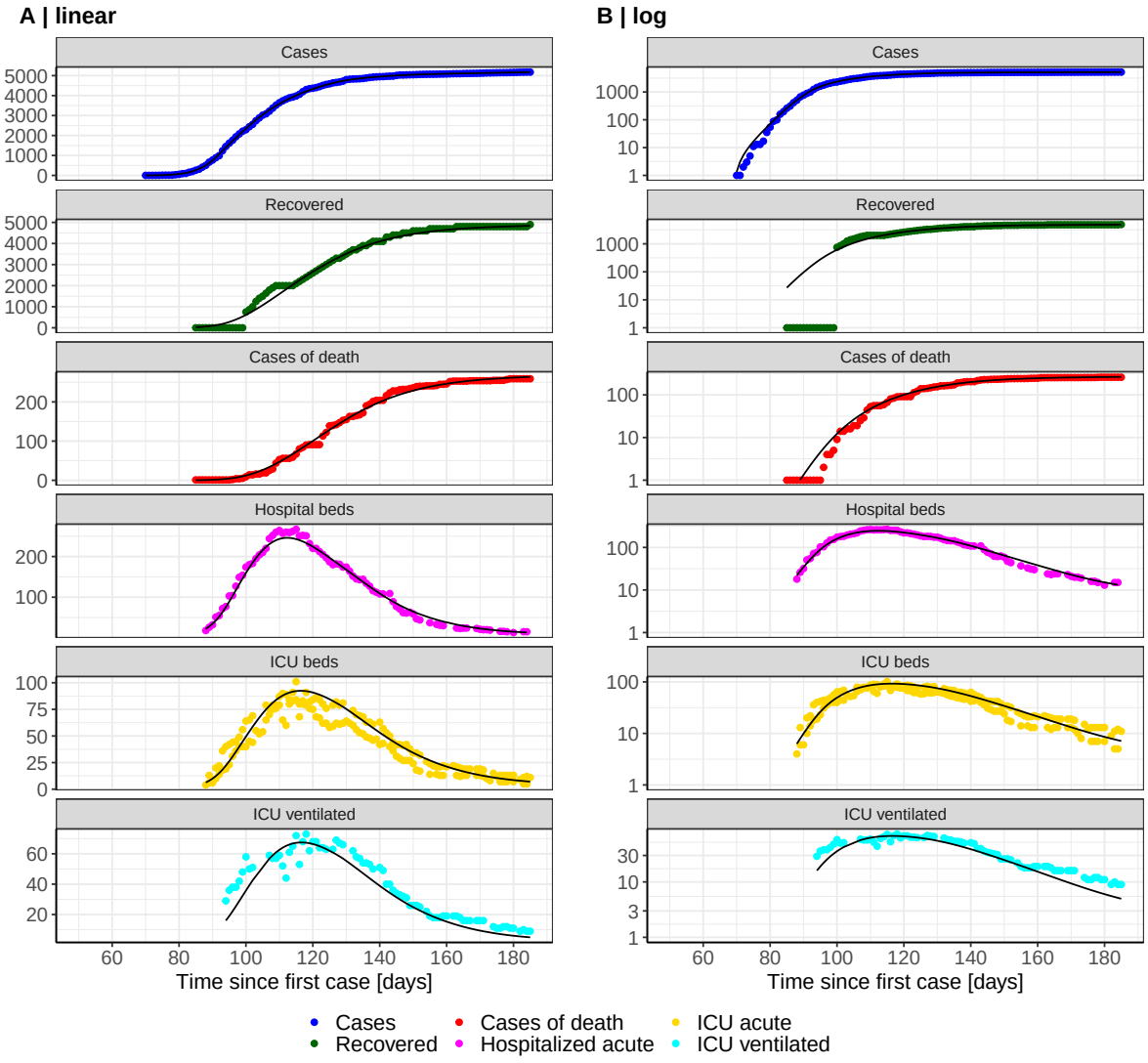


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

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.

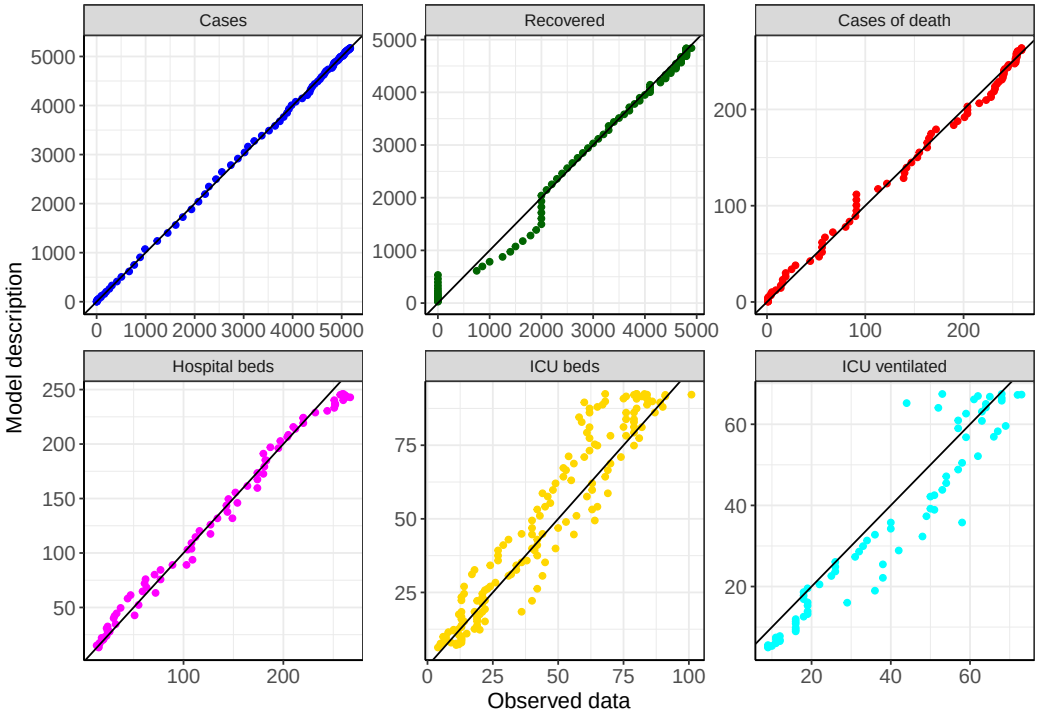


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

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).

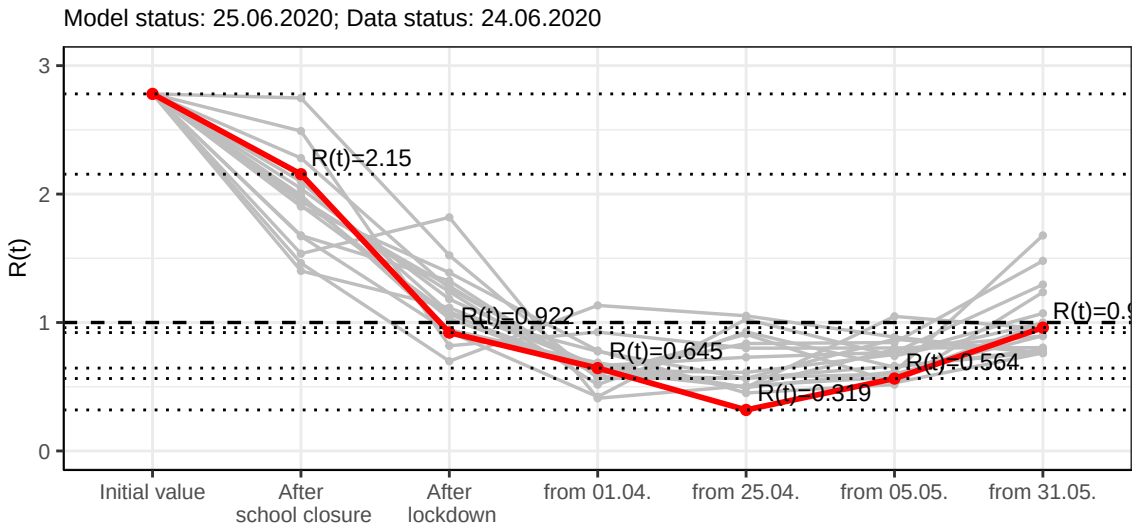


Figure 68: R(t) values before and after the NPIs for Hamburg

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

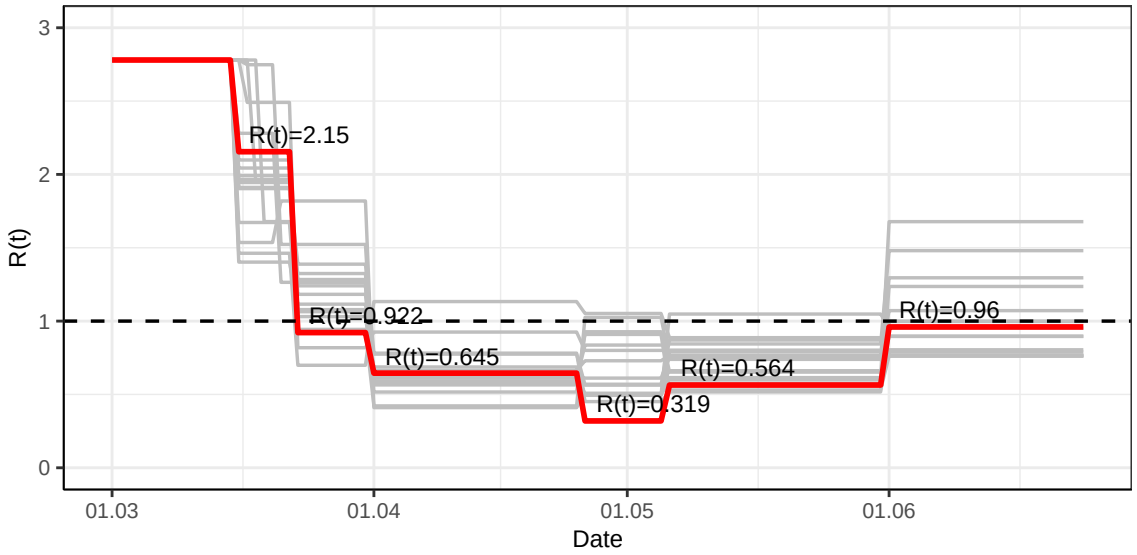


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

7.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.96)

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.

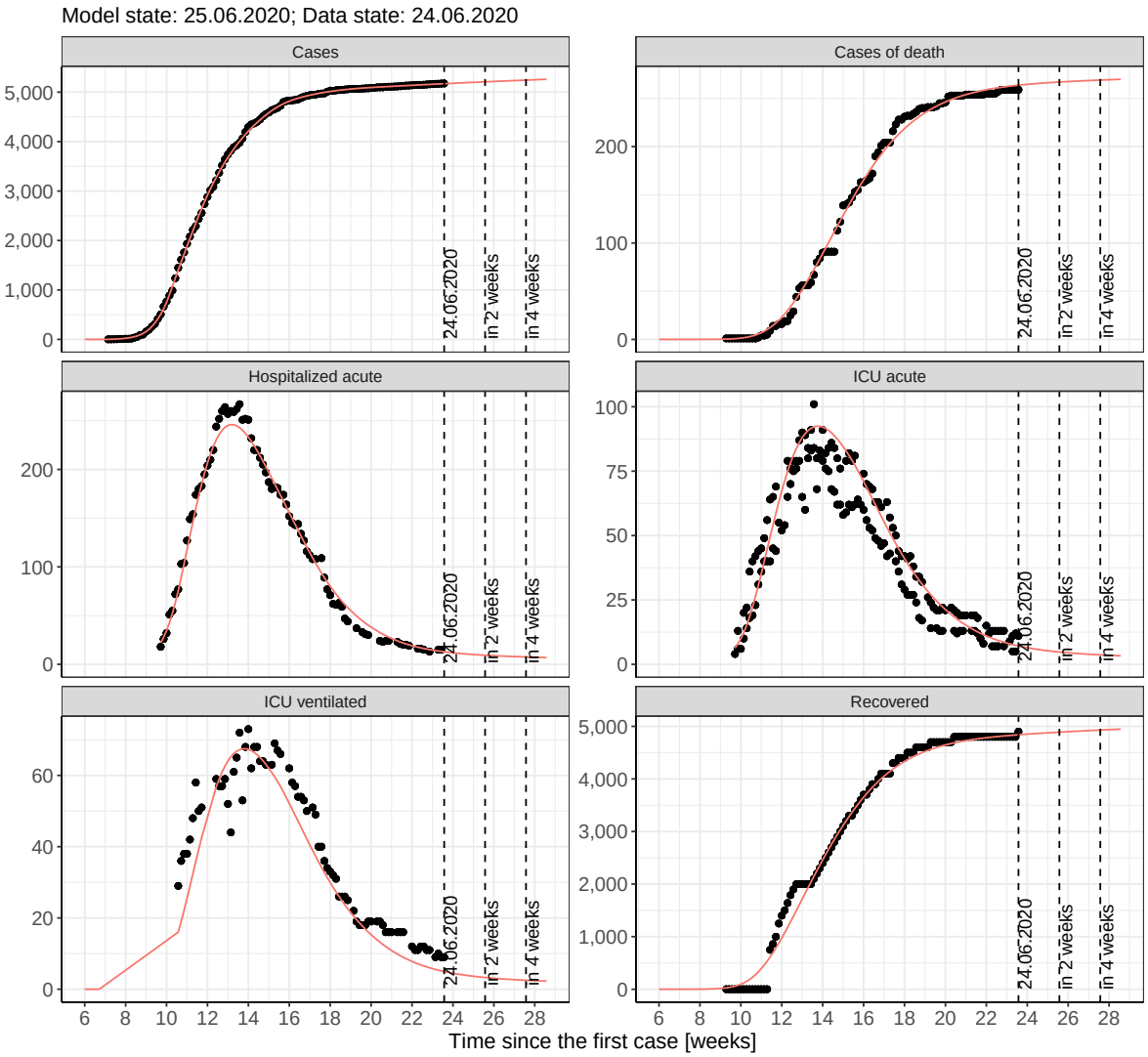


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

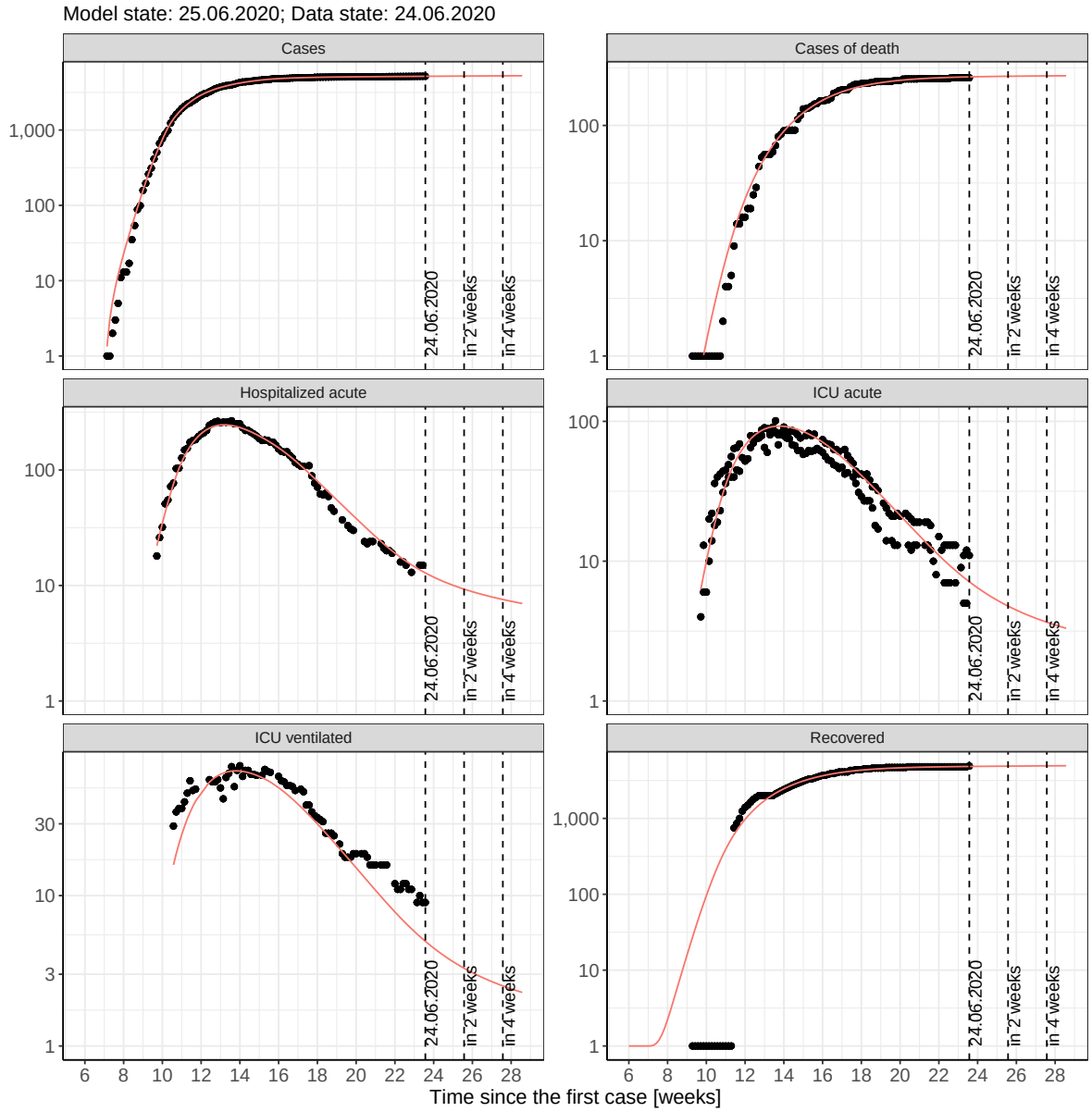


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

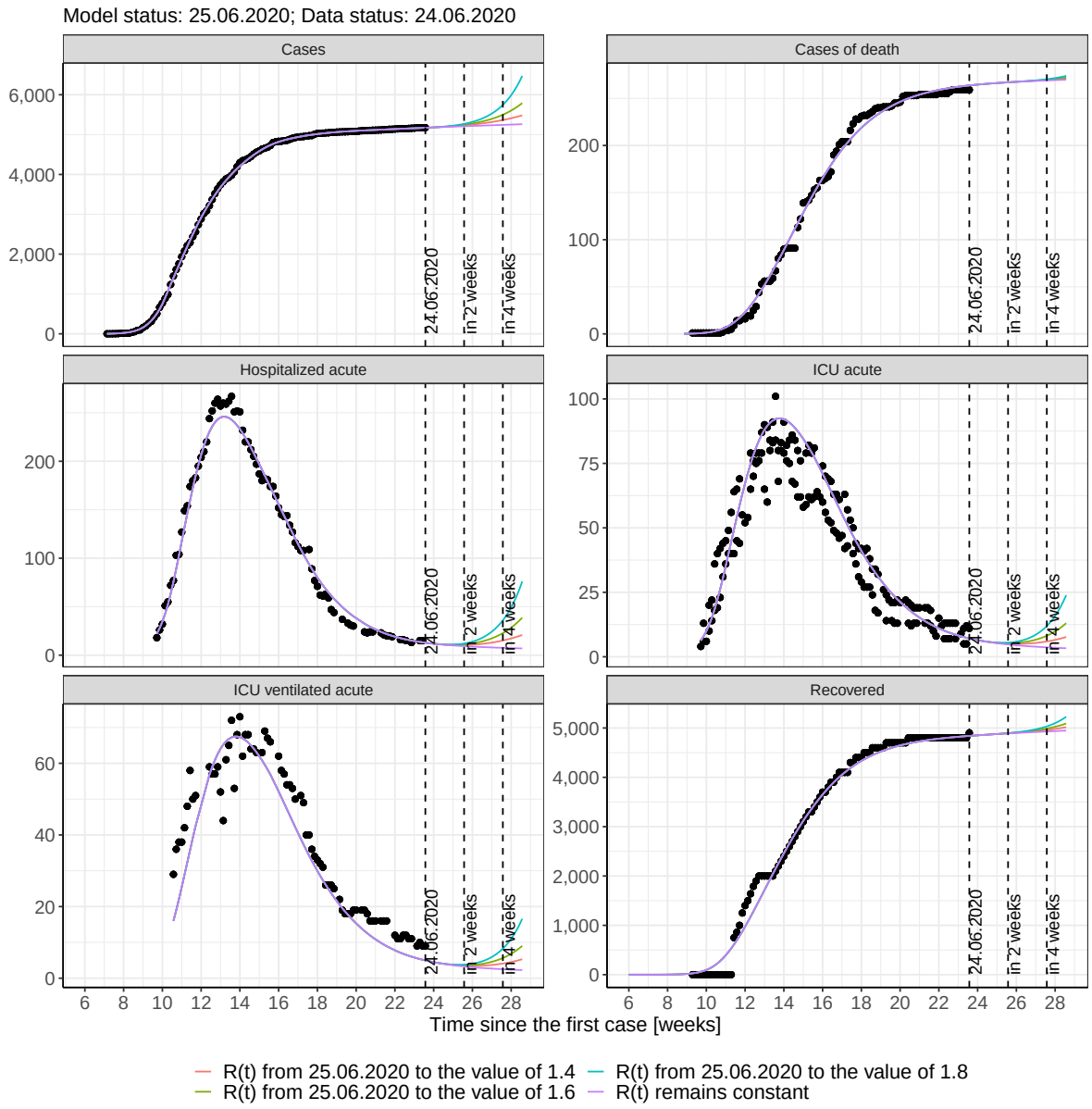


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

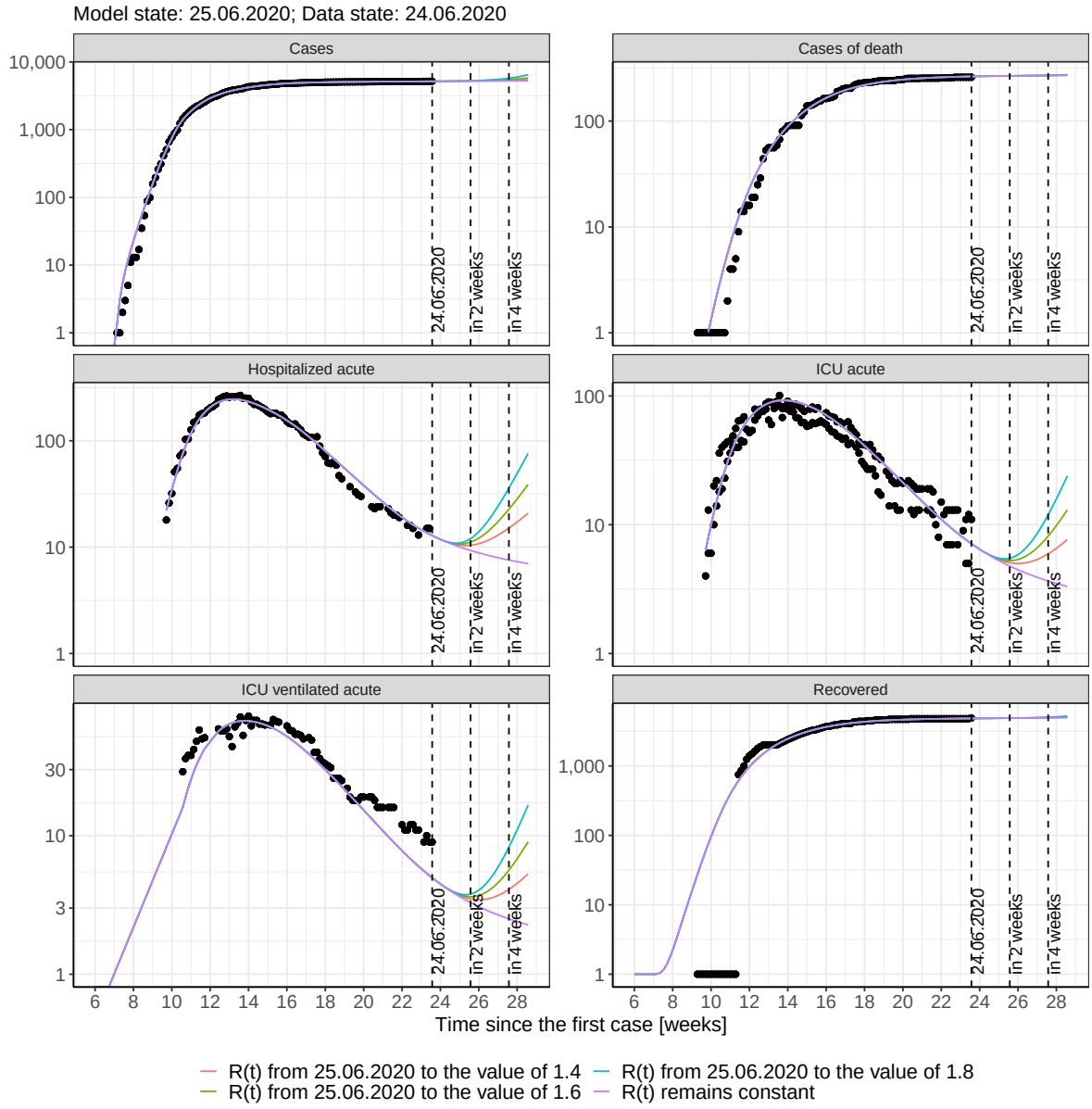


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

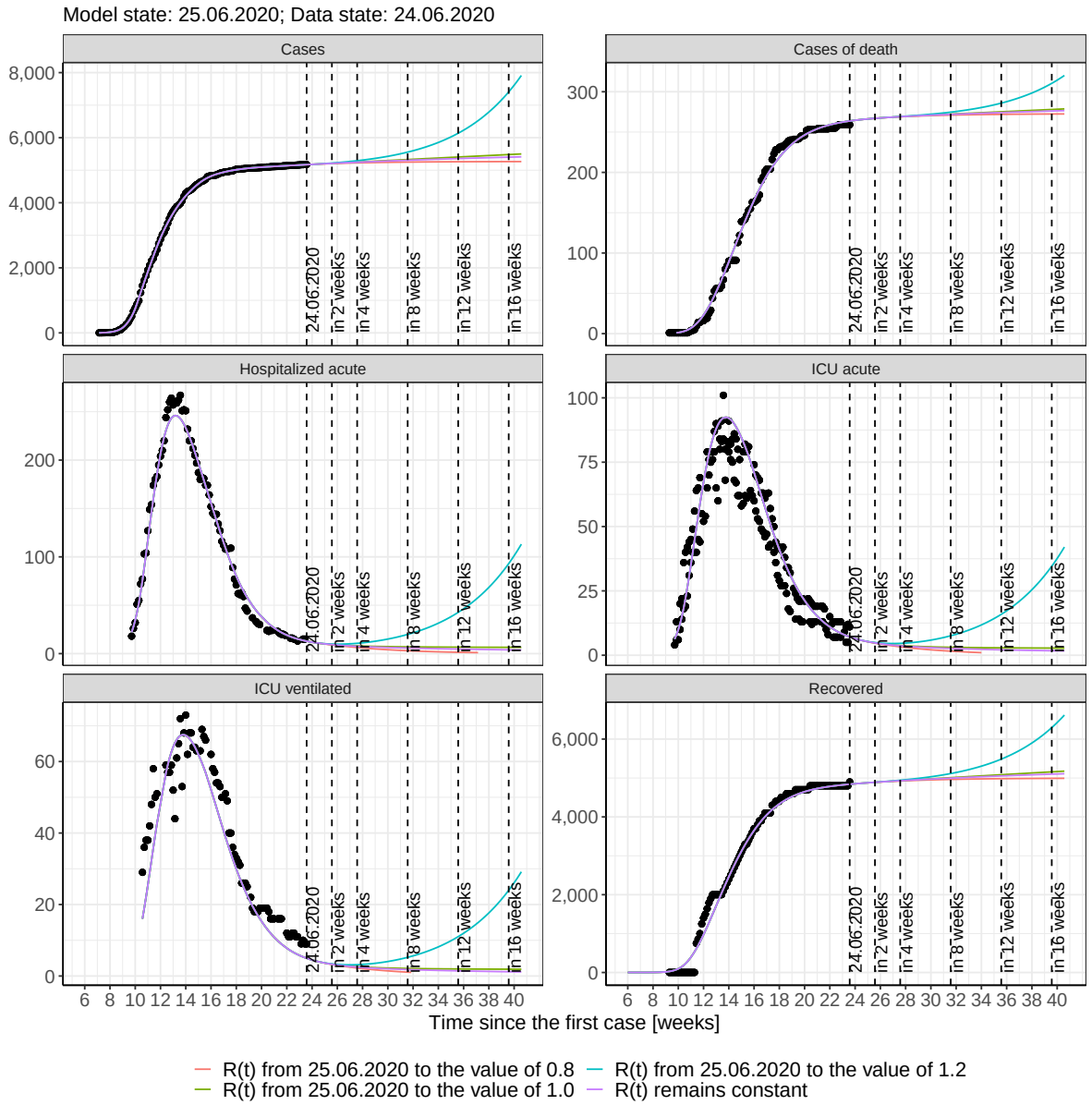


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

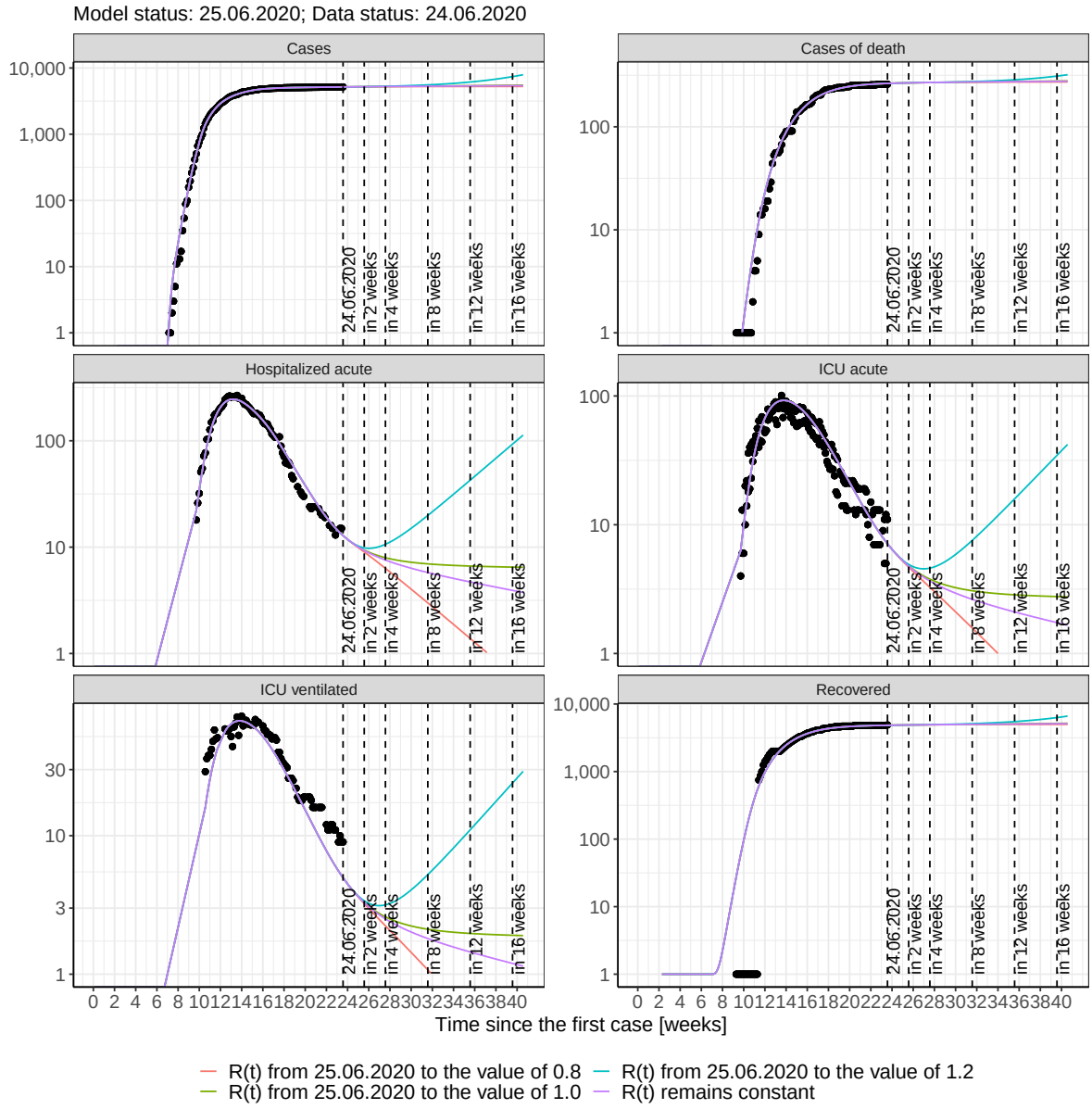


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 25) Model status from 25.06.2020; Data status: 24.06.2020.

Table 22: Hamburg - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5174	264	4844	12	7	5
26.06.2020	5177	264	4848	12	7	5
27.06.2020	5180	265	4852	12	6	4
28.06.2020	5182	265	4856	12	6	4
29.06.2020	5185	265	4859	11	6	4
30.06.2020	5188	265	4863	11	6	4
01.07.2020	5190	266	4866	11	6	4
02.07.2020	5193	266	4870	10	6	4
03.07.2020	5196	266	4873	10	5	4
04.07.2020	5199	266	4876	10	5	4
05.07.2020	5201	266	4880	10	5	4
06.07.2020	5204	267	4883	10	5	3
07.07.2020	5206	267	4886	9	5	3
08.07.2020	5209	267	4889	9	5	3
09.07.2020	5212	267	4892	9	5	3
10.07.2020	5214	267	4896	9	5	3
11.07.2020	5217	268	4898	9	4	3
12.07.2020	5219	268	4901	9	4	3
13.07.2020	5222	268	4904	9	4	3
14.07.2020	5224	268	4907	8	4	3
15.07.2020	5227	268	4910	8	4	3
16.07.2020	5229	268	4913	8	4	3
17.07.2020	5232	268	4916	8	4	3
18.07.2020	5234	269	4918	8	4	3
19.07.2020	5237	269	4921	8	4	3
20.07.2020	5239	269	4924	8	4	3
21.07.2020	5242	269	4927	8	4	3
22.07.2020	5244	269	4929	8	4	3

Table 23: Hamburg - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5174	264	4844	12	7	5
26.06.2020	5177	264	4848	12	7	5
27.06.2020	5179	265	4852	12	6	4
28.06.2020	5182	265	4856	12	6	4
29.06.2020	5184	265	4859	11	6	4
30.06.2020	5187	265	4863	11	6	4
01.07.2020	5189	266	4866	11	6	4
02.07.2020	5191	266	4870	10	6	4
03.07.2020	5194	266	4873	10	5	4
04.07.2020	5196	266	4876	10	5	4
05.07.2020	5198	266	4880	10	5	4
06.07.2020	5200	267	4883	9	5	3
07.07.2020	5202	267	4886	9	5	3
08.07.2020	5204	267	4889	9	5	3
09.07.2020	5206	267	4892	9	5	3
10.07.2020	5207	267	4894	9	4	3
11.07.2020	5209	268	4897	8	4	3
12.07.2020	5211	268	4900	8	4	3
13.07.2020	5212	268	4902	8	4	3
14.07.2020	5214	268	4905	8	4	3
15.07.2020	5216	268	4907	8	4	3
16.07.2020	5217	268	4910	7	4	3
17.07.2020	5219	268	4912	7	4	3
18.07.2020	5220	268	4914	7	4	2
19.07.2020	5222	269	4917	7	4	2
20.07.2020	5223	269	4919	7	3	2
21.07.2020	5224	269	4921	6	3	2
22.07.2020	5226	269	4923	6	3	2

Table 24: Hamburg - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5174	264	4844	12	7	5
26.06.2020	5177	264	4848	12	7	5
27.06.2020	5180	265	4852	12	6	4
28.06.2020	5182	265	4856	12	6	4
29.06.2020	5185	265	4859	11	6	4
30.06.2020	5188	265	4863	11	6	4
01.07.2020	5191	266	4866	11	6	4
02.07.2020	5194	266	4870	10	6	4
03.07.2020	5196	266	4873	10	5	4
04.07.2020	5199	266	4877	10	5	4
05.07.2020	5202	266	4880	10	5	4
06.07.2020	5205	267	4883	10	5	3
07.07.2020	5208	267	4886	10	5	3
08.07.2020	5211	267	4890	9	5	3
09.07.2020	5214	267	4893	9	5	3
10.07.2020	5216	267	4896	9	5	3
11.07.2020	5219	268	4899	9	5	3
12.07.2020	5222	268	4902	9	4	3
13.07.2020	5225	268	4905	9	4	3
14.07.2020	5228	268	4908	9	4	3
15.07.2020	5230	268	4911	9	4	3
16.07.2020	5233	268	4914	8	4	3
17.07.2020	5236	268	4917	8	4	3
18.07.2020	5239	269	4920	8	4	3
19.07.2020	5242	269	4923	8	4	3
20.07.2020	5244	269	4925	8	4	3
21.07.2020	5247	269	4928	8	4	3
22.07.2020	5250	269	4931	8	4	3

Table 25: Hamburg - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5174	264	4844	12	7	5
26.06.2020	5177	264	4848	12	7	5
27.06.2020	5180	265	4852	12	6	4
28.06.2020	5183	265	4856	12	6	4
29.06.2020	5186	265	4859	11	6	4
30.06.2020	5190	265	4863	11	6	4
01.07.2020	5193	266	4866	11	6	4
02.07.2020	5196	266	4870	11	6	4
03.07.2020	5200	266	4874	10	5	4
04.07.2020	5204	266	4877	10	5	4
05.07.2020	5208	266	4880	10	5	4
06.07.2020	5212	267	4884	10	5	4
07.07.2020	5216	267	4887	10	5	3
08.07.2020	5220	267	4891	10	5	3
09.07.2020	5224	267	4894	10	5	3
10.07.2020	5228	267	4898	10	5	3
11.07.2020	5233	268	4901	10	5	3
12.07.2020	5237	268	4905	10	5	3
13.07.2020	5242	268	4908	10	5	3
14.07.2020	5247	268	4912	10	5	3
15.07.2020	5252	268	4916	10	5	3
16.07.2020	5257	268	4919	10	5	3
17.07.2020	5263	268	4923	10	5	3
18.07.2020	5268	269	4927	10	5	3
19.07.2020	5274	269	4931	10	5	3
20.07.2020	5280	269	4935	10	5	3
21.07.2020	5286	269	4939	10	5	3
22.07.2020	5292	269	4943	11	5	3

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

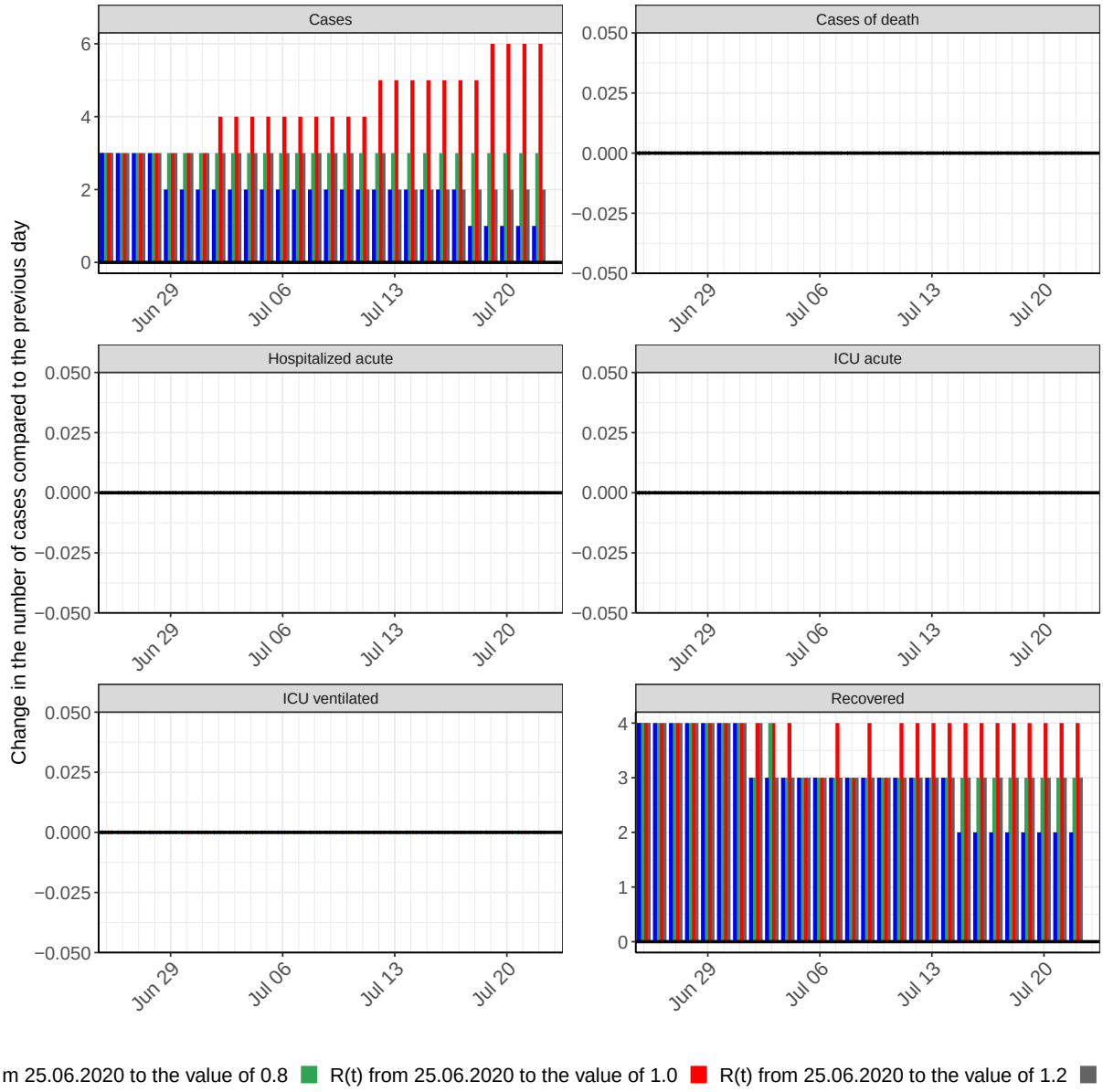


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

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.

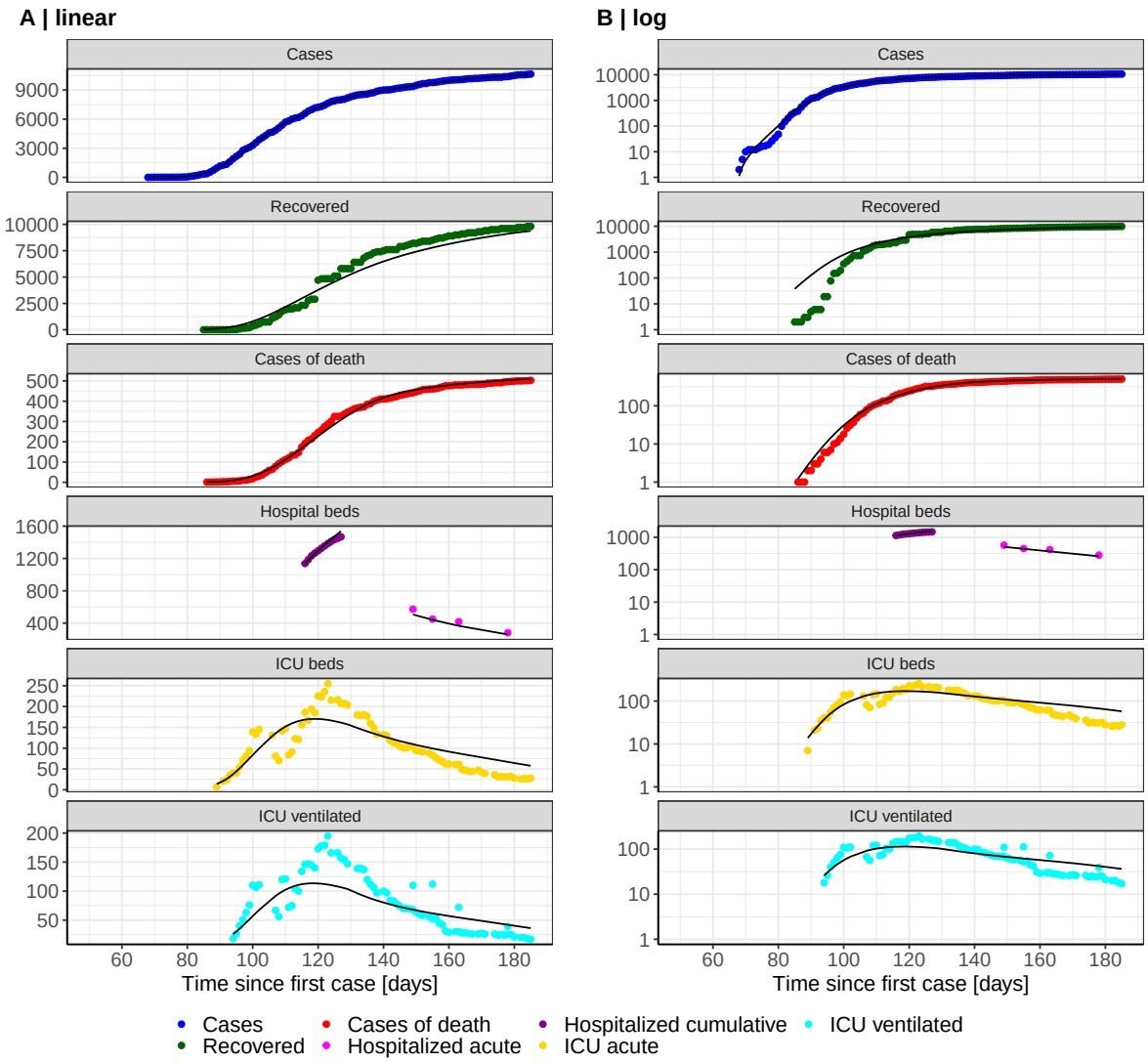


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

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.

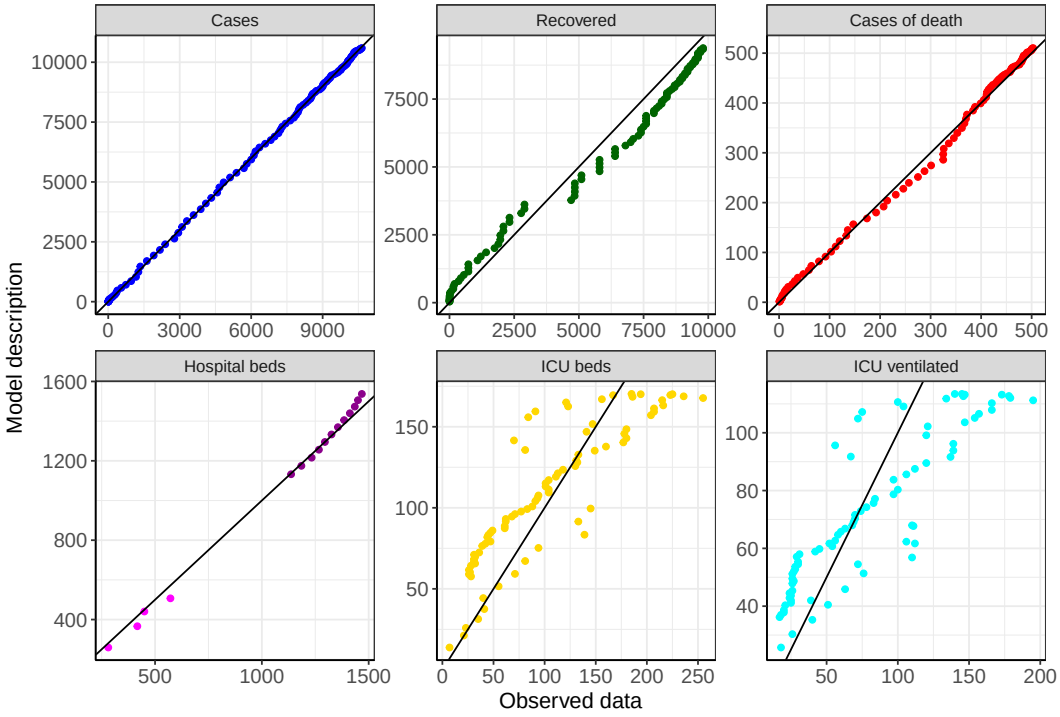


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

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).

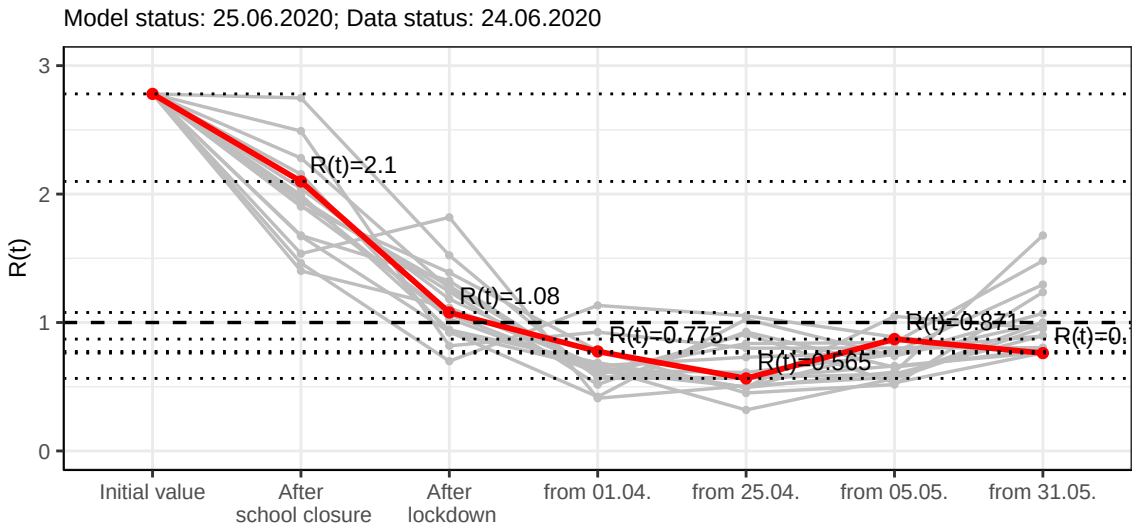


Figure 79: R(t) values before and after the NPIs for Hesse

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

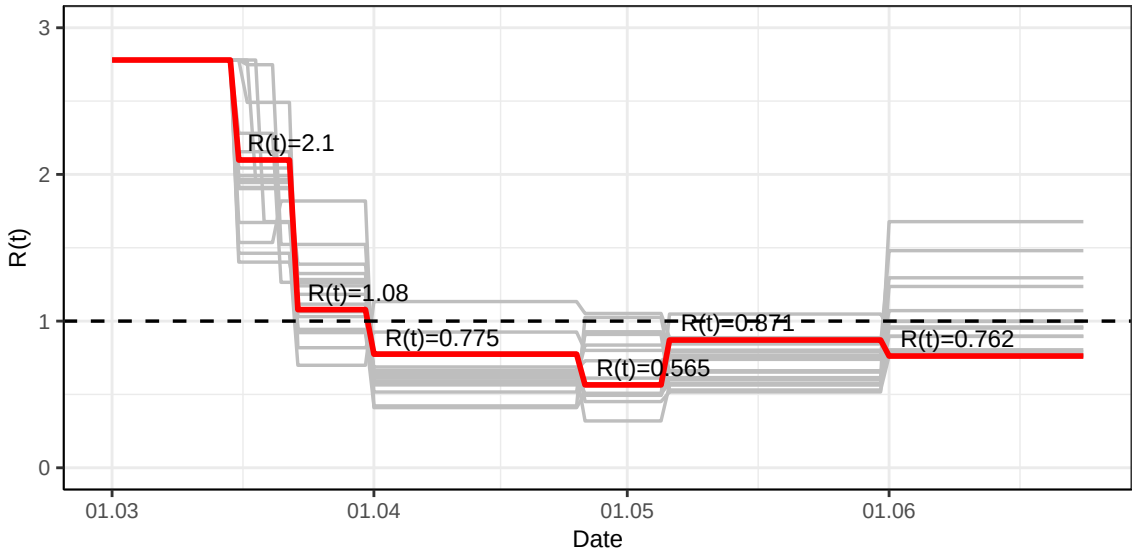


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

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

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.

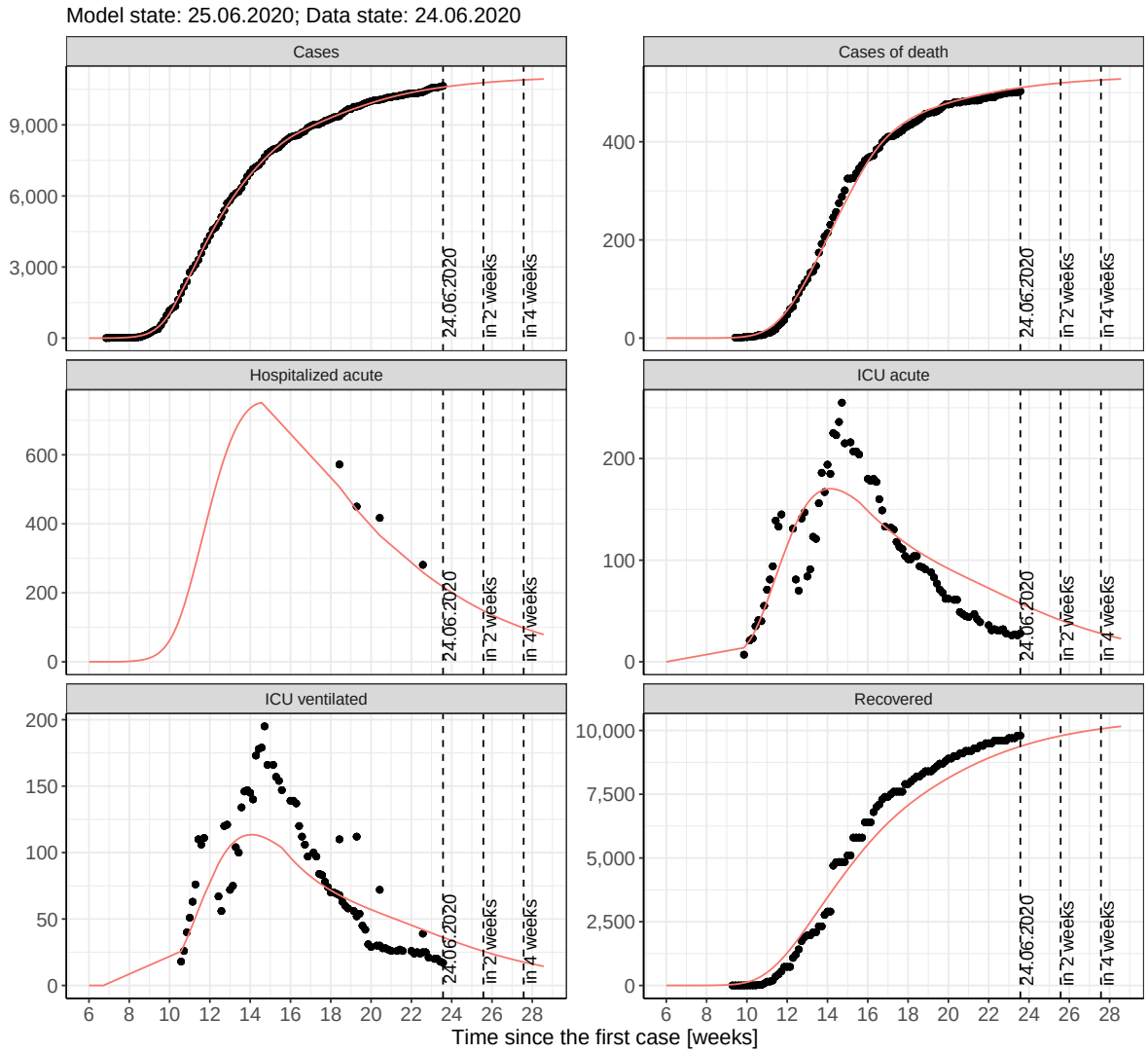


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

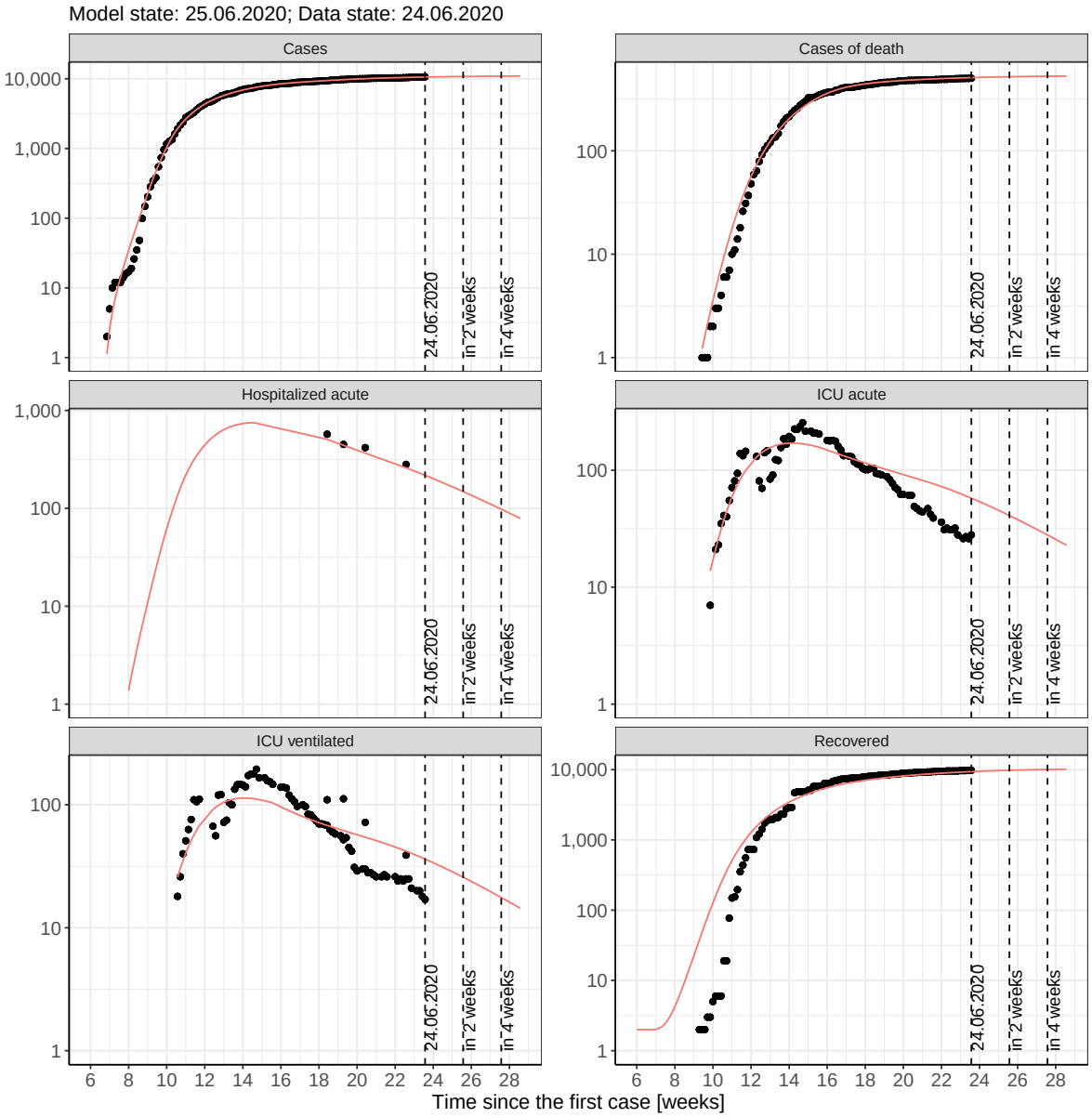


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

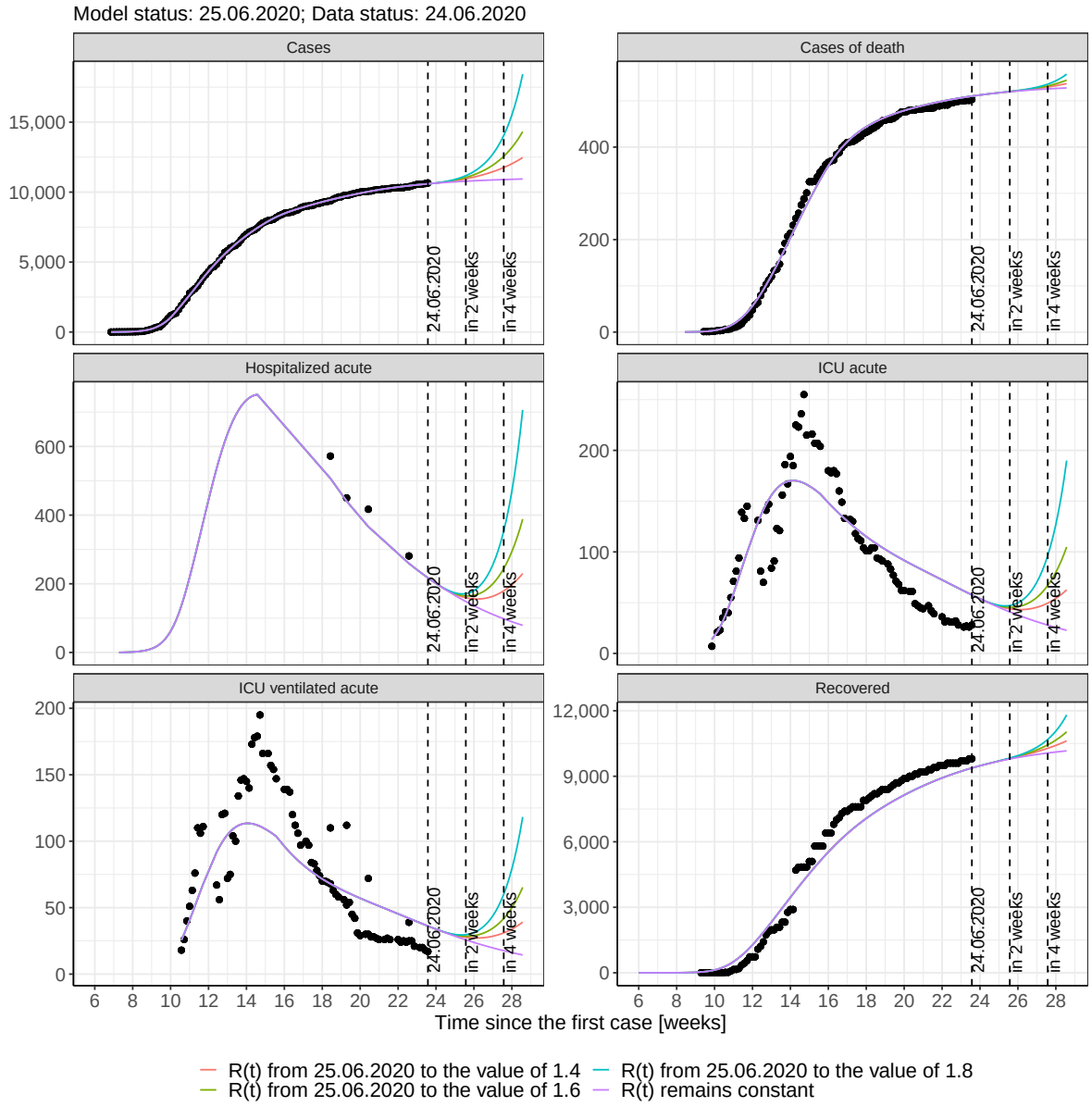


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

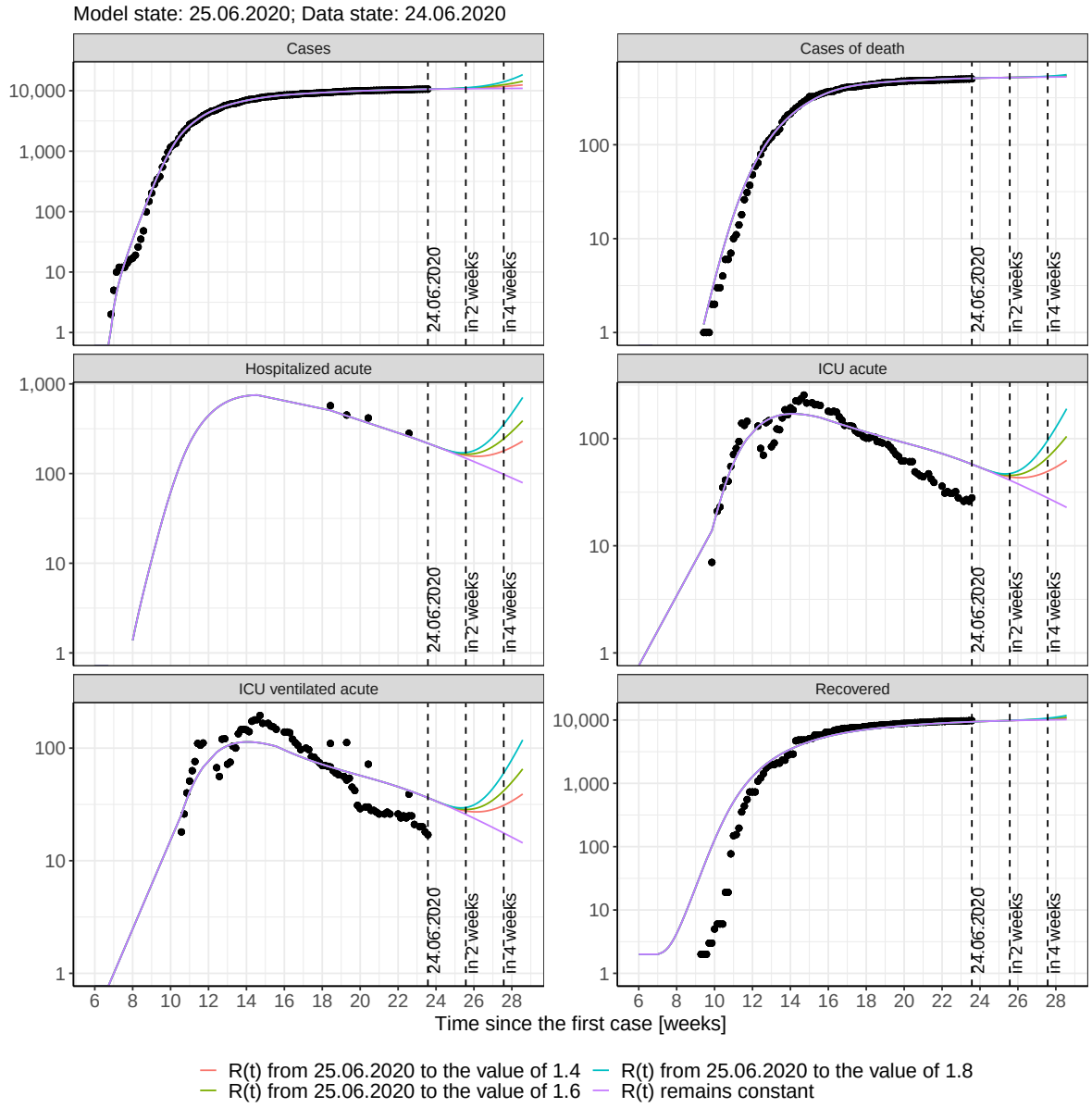


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

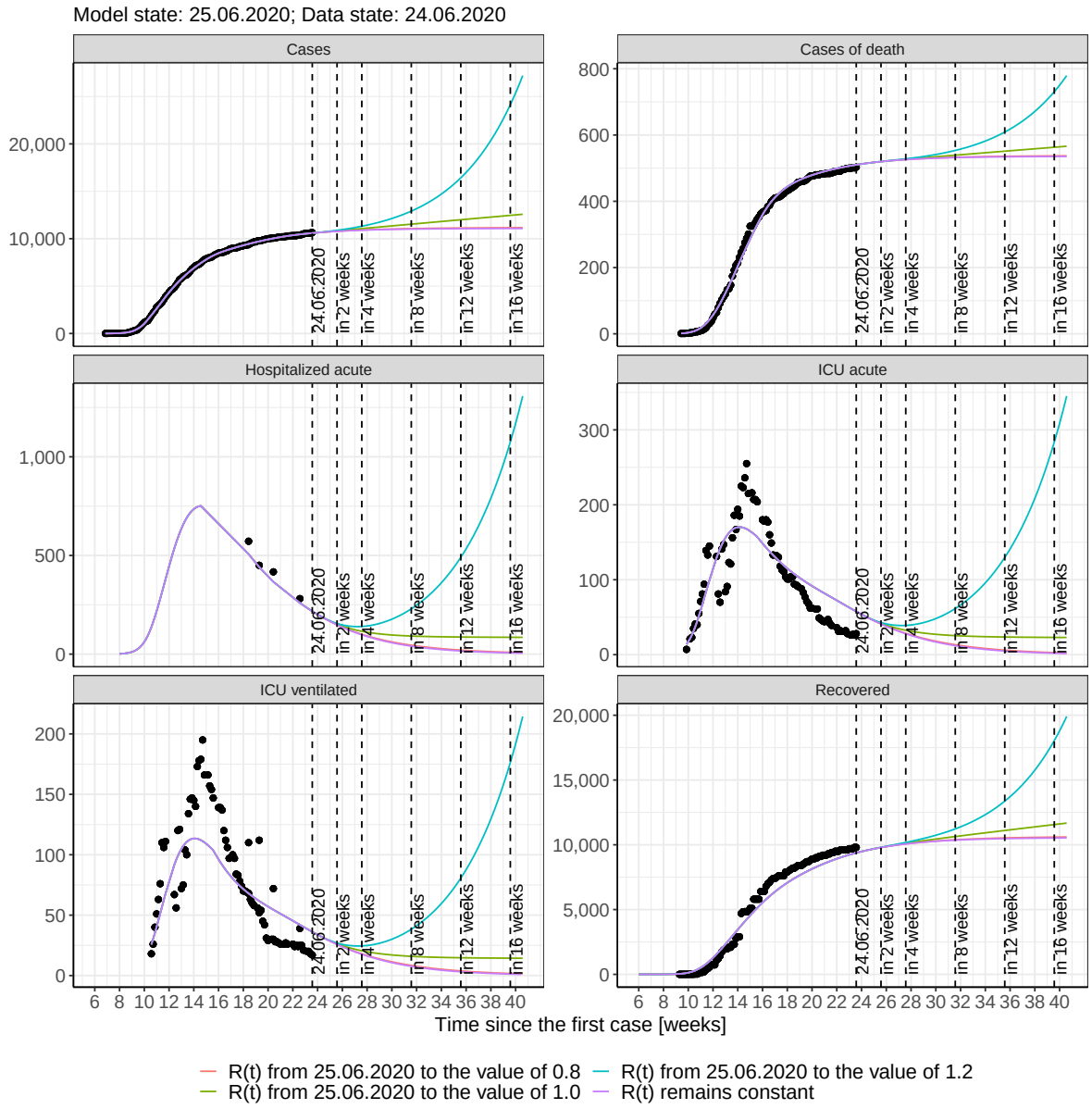


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

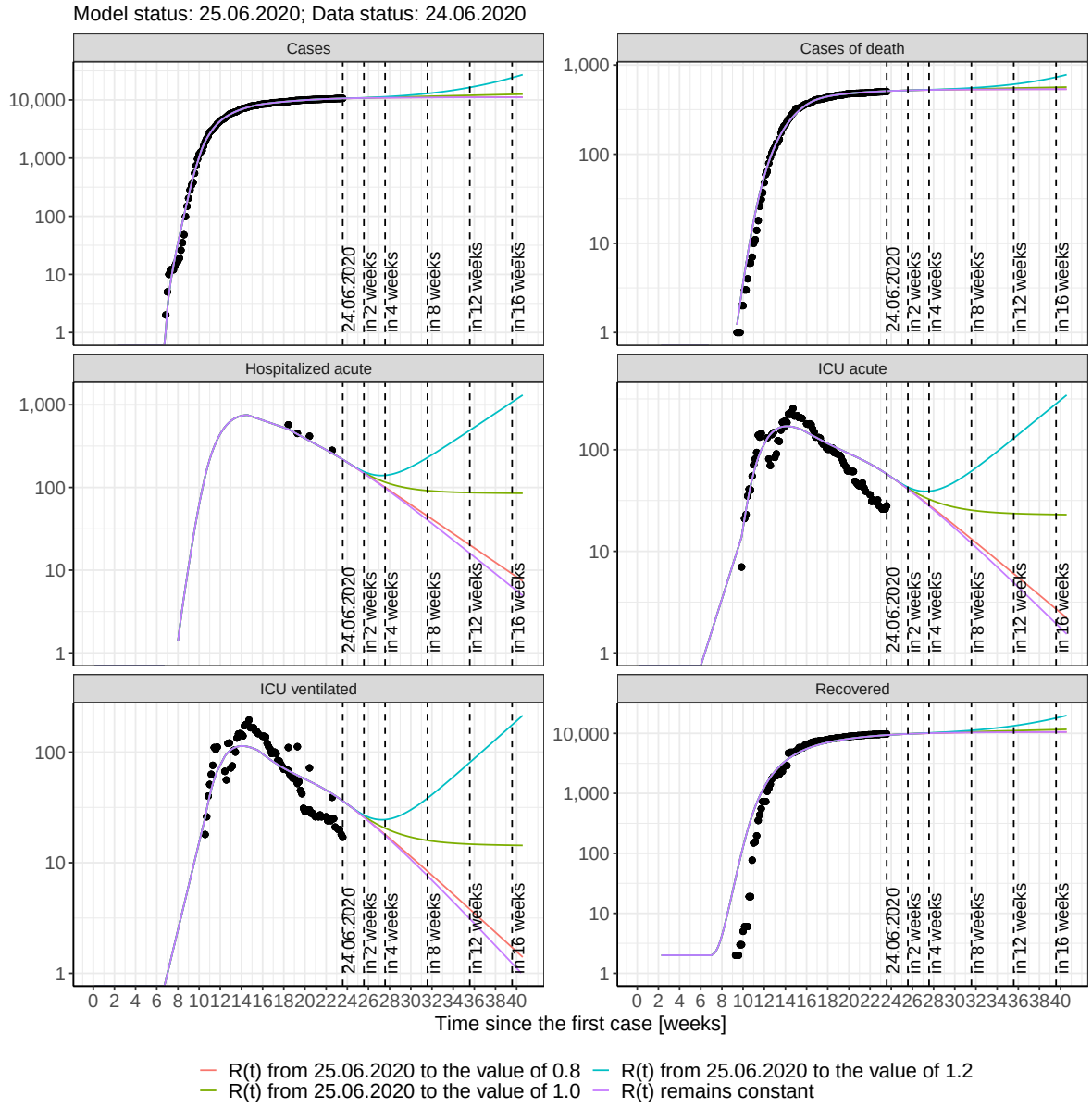


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 29) Model status from 25.06.2020; Data status: 24.06.2020.

Table 26: Hesse - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	10608	511	9413	212	56	35
26.06.2020	10624	512	9447	206	55	35
27.06.2020	10640	513	9481	201	54	34
28.06.2020	10655	513	9513	196	53	33
29.06.2020	10669	514	9545	190	51	32
30.06.2020	10683	515	9575	185	50	31
01.07.2020	10697	516	9605	180	49	31
02.07.2020	10710	516	9634	176	48	30
03.07.2020	10723	517	9662	171	47	29
04.07.2020	10735	517	9689	166	45	29
05.07.2020	10747	518	9716	161	44	28
06.07.2020	10758	519	9742	157	43	27
07.07.2020	10769	519	9766	153	42	26
08.07.2020	10780	520	9791	148	41	26
09.07.2020	10790	520	9814	144	40	25
10.07.2020	10800	521	9837	140	39	24
11.07.2020	10810	521	9860	136	38	24
12.07.2020	10819	522	9881	132	37	23
13.07.2020	10828	522	9902	128	36	23
14.07.2020	10837	523	9922	125	35	22
15.07.2020	10845	523	9942	121	34	21
16.07.2020	10853	524	9961	117	33	21
17.07.2020	10861	524	9980	114	32	20
18.07.2020	10869	524	9998	111	31	20
19.07.2020	10876	525	10015	107	30	19
20.07.2020	10883	525	10032	104	30	19
21.07.2020	10890	525	10049	101	29	18
22.07.2020	10896	526	10065	98	28	18

Table 27: Hesse - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	10608	511	9413	212	56	35
26.06.2020	10624	512	9447	206	55	35
27.06.2020	10640	513	9481	201	54	34
28.06.2020	10655	513	9513	196	53	33
29.06.2020	10670	514	9545	191	51	32
30.06.2020	10685	515	9575	185	50	31
01.07.2020	10699	516	9605	180	49	31
02.07.2020	10712	516	9634	176	48	30
03.07.2020	10726	517	9662	171	47	29
04.07.2020	10739	517	9690	166	45	29
05.07.2020	10751	518	9716	162	44	28
06.07.2020	10763	519	9742	157	43	27
07.07.2020	10775	519	9767	153	42	27
08.07.2020	10787	520	9792	149	41	26
09.07.2020	10798	520	9816	145	40	25
10.07.2020	10809	521	9839	141	39	25
11.07.2020	10819	521	9861	137	38	24
12.07.2020	10829	522	9883	133	37	23
13.07.2020	10839	522	9904	129	36	23
14.07.2020	10849	523	9925	126	35	22
15.07.2020	10858	523	9945	122	34	22
16.07.2020	10867	524	9965	119	33	21
17.07.2020	10876	524	9984	116	33	21
18.07.2020	10885	524	10002	112	32	20
19.07.2020	10893	525	10020	109	31	19
20.07.2020	10901	525	10038	106	30	19
21.07.2020	10909	526	10055	103	29	18
22.07.2020	10917	526	10071	100	28	18

Table 28: Hesse - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	10608	511	9413	212	56	35
26.06.2020	10625	512	9447	206	55	35
27.06.2020	10642	513	9481	201	54	34
28.06.2020	10659	513	9513	196	53	33
29.06.2020	10676	514	9545	191	51	32
30.06.2020	10693	515	9576	186	50	32
01.07.2020	10710	516	9606	181	49	31
02.07.2020	10727	516	9635	176	48	30
03.07.2020	10744	517	9663	172	47	29
04.07.2020	10761	517	9691	167	46	29
05.07.2020	10777	518	9719	163	45	28
06.07.2020	10794	519	9745	159	44	28
07.07.2020	10811	519	9772	155	43	27
08.07.2020	10828	520	9797	152	42	26
09.07.2020	10845	520	9822	148	41	26
10.07.2020	10862	521	9847	145	40	25
11.07.2020	10879	521	9871	142	39	25
12.07.2020	10896	522	9895	139	39	24
13.07.2020	10912	523	9919	136	38	24
14.07.2020	10929	523	9942	133	37	23
15.07.2020	10946	524	9965	130	36	23
16.07.2020	10963	524	9987	128	36	23
17.07.2020	10980	524	10009	126	35	22
18.07.2020	10997	525	10031	123	35	22
19.07.2020	11014	525	10053	121	34	21
20.07.2020	11030	526	10074	119	34	21
21.07.2020	11047	526	10095	118	33	21
22.07.2020	11064	527	10116	116	33	21

Table 29: Hesse - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	10609	511	9413	212	56	35
26.06.2020	10626	512	9447	206	55	35
27.06.2020	10644	513	9481	201	54	34
28.06.2020	10663	513	9513	196	53	33
29.06.2020	10682	514	9545	191	51	32
30.06.2020	10702	515	9576	186	50	32
01.07.2020	10723	516	9606	181	49	31
02.07.2020	10743	516	9636	177	48	30
03.07.2020	10765	517	9665	173	47	30
04.07.2020	10787	518	9693	169	46	29
05.07.2020	10810	518	9722	165	45	28
06.07.2020	10833	519	9749	161	44	28
07.07.2020	10858	519	9777	158	44	27
08.07.2020	10882	520	9804	155	43	27
09.07.2020	10908	520	9831	152	42	27
10.07.2020	10934	521	9858	150	42	26
11.07.2020	10961	522	9884	148	41	26
12.07.2020	10989	522	9911	146	41	26
13.07.2020	11018	523	9937	144	40	25
14.07.2020	11047	523	9964	143	40	25
15.07.2020	11077	524	9990	142	40	25
16.07.2020	11108	524	10017	141	39	25
17.07.2020	11140	525	10044	140	39	25
18.07.2020	11173	526	10071	140	39	25
19.07.2020	11207	526	10098	139	39	24
20.07.2020	11242	527	10126	139	39	24
21.07.2020	11278	527	10153	140	39	24
22.07.2020	11315	528	10181	140	39	25

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

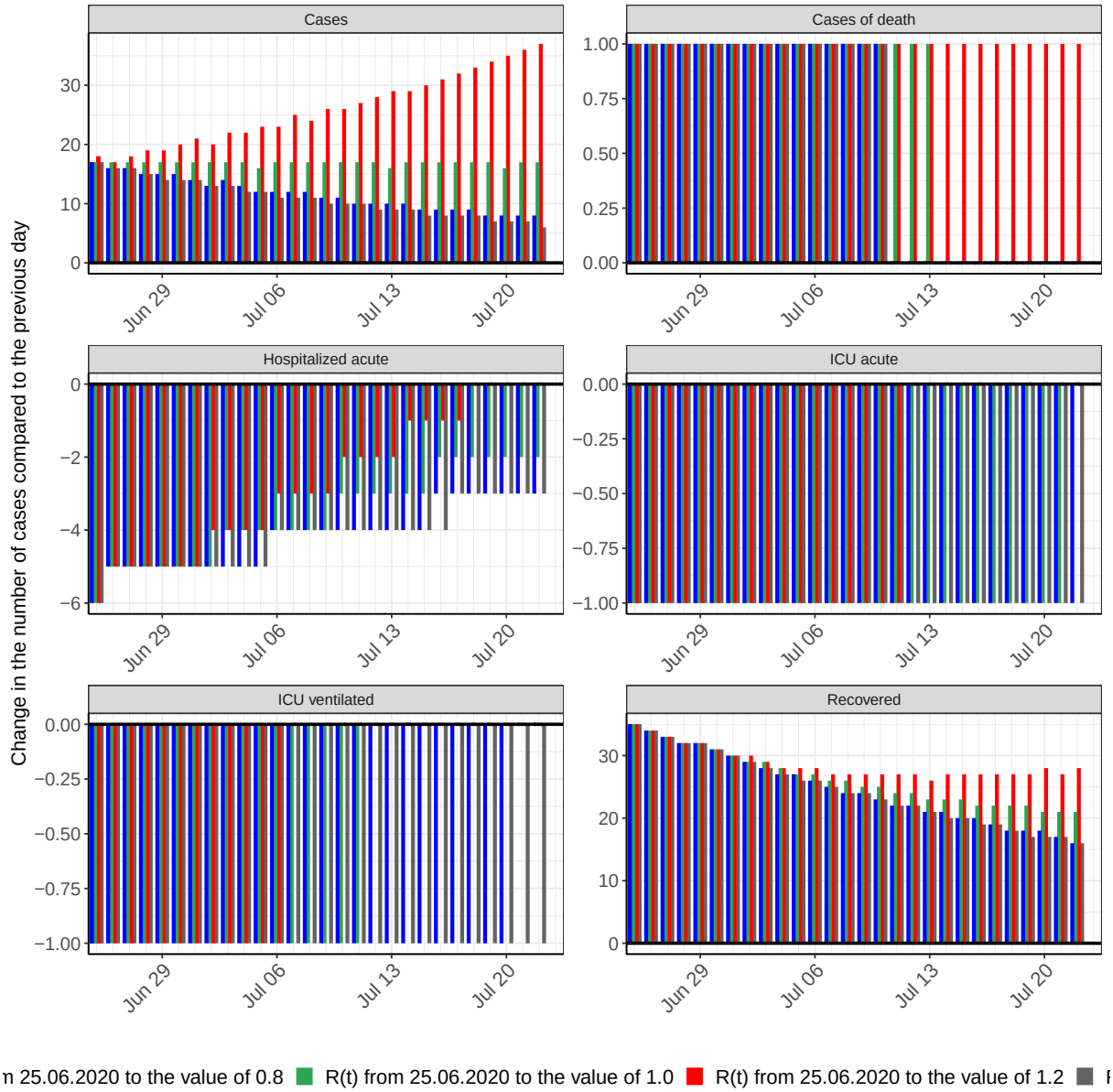


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

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.

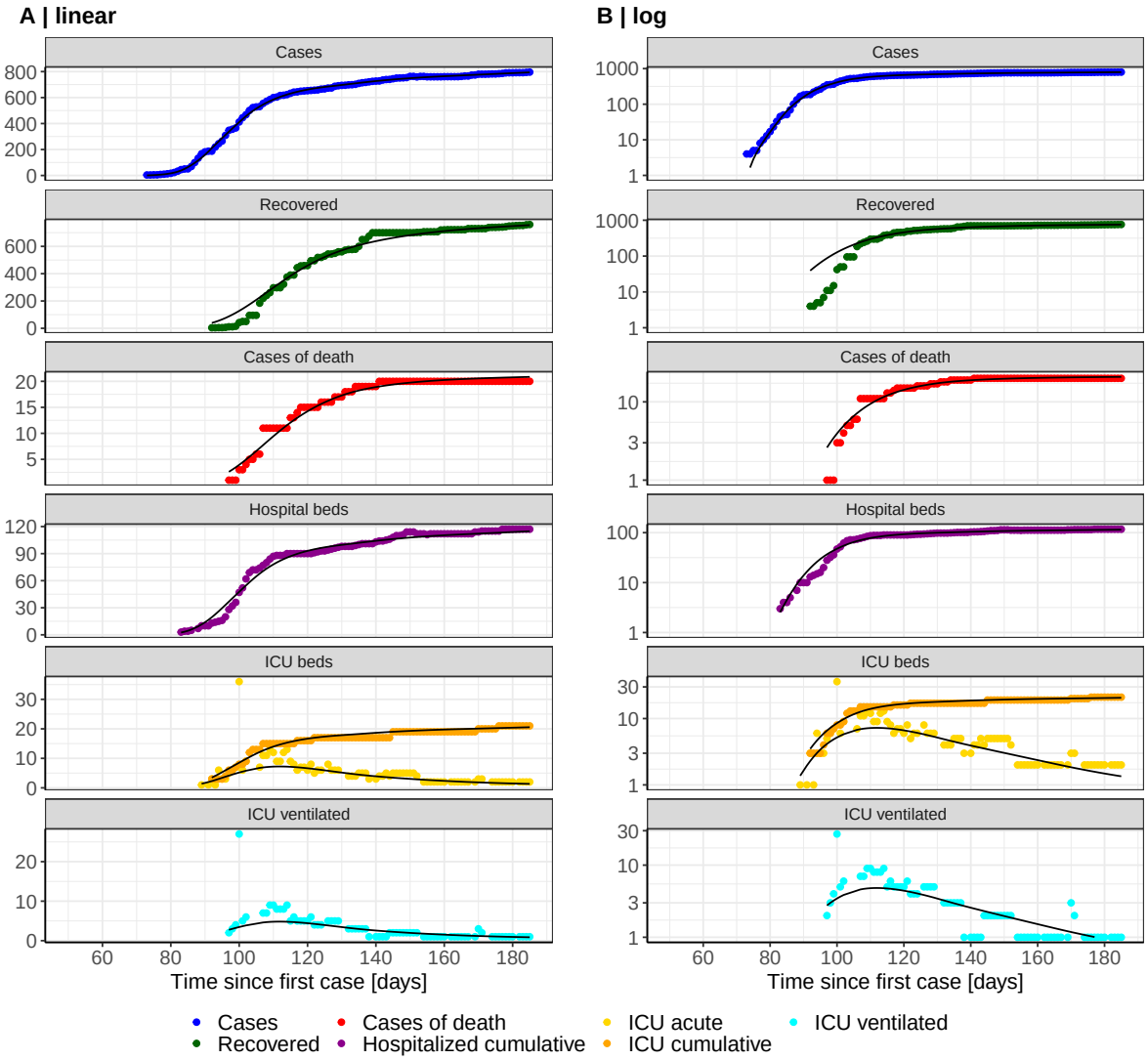


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

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.

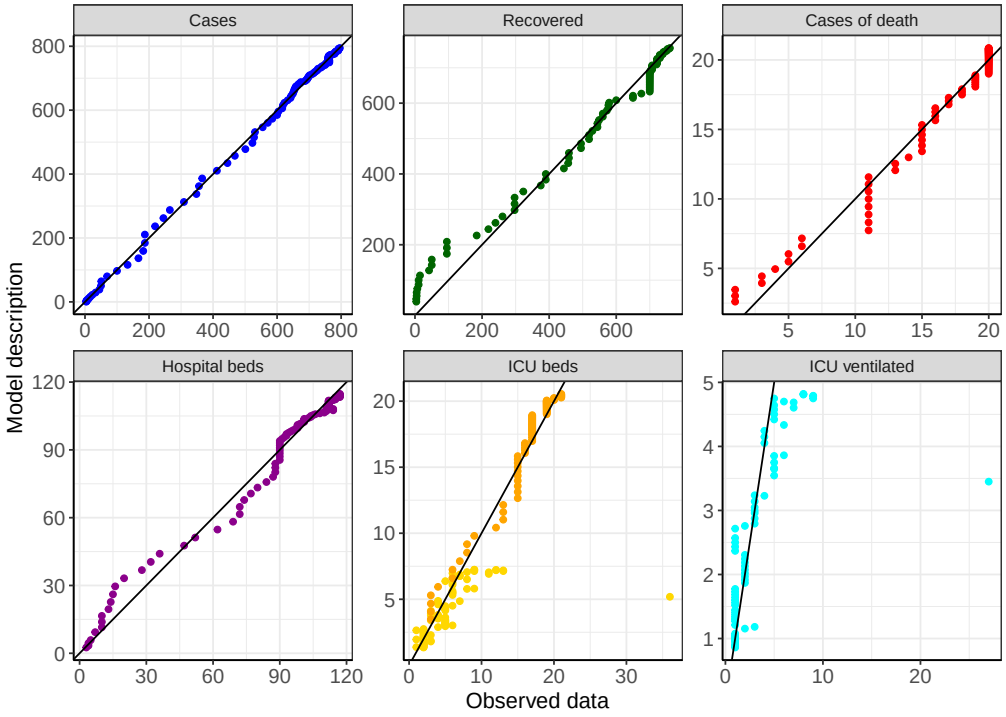


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

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).

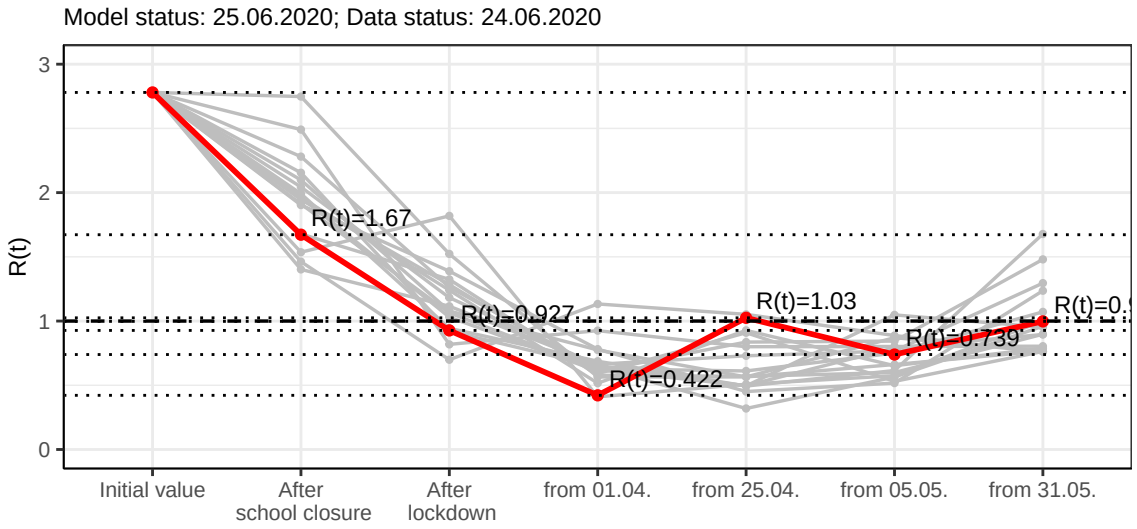


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

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

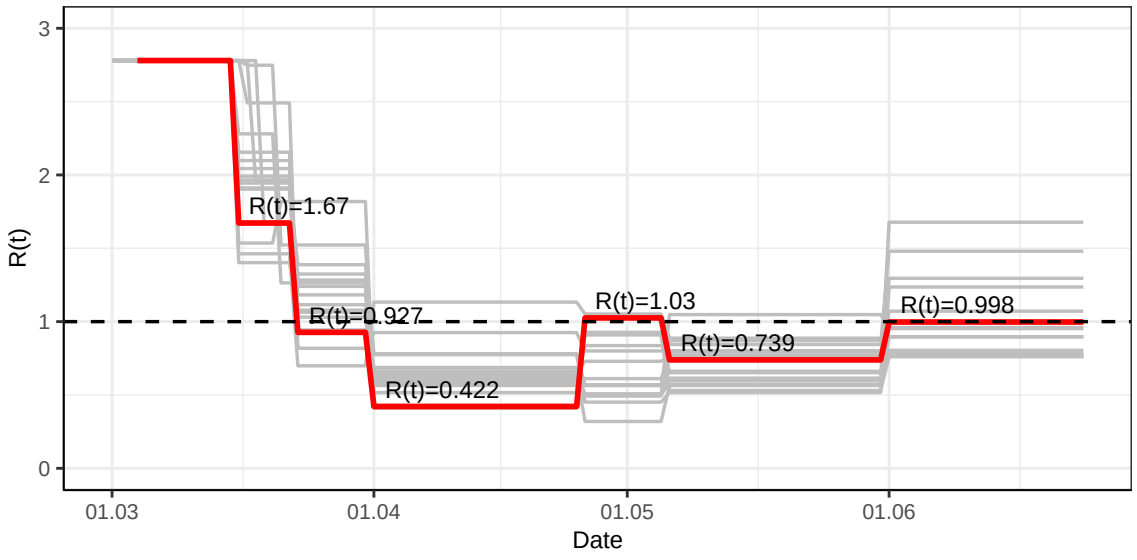


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

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

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.

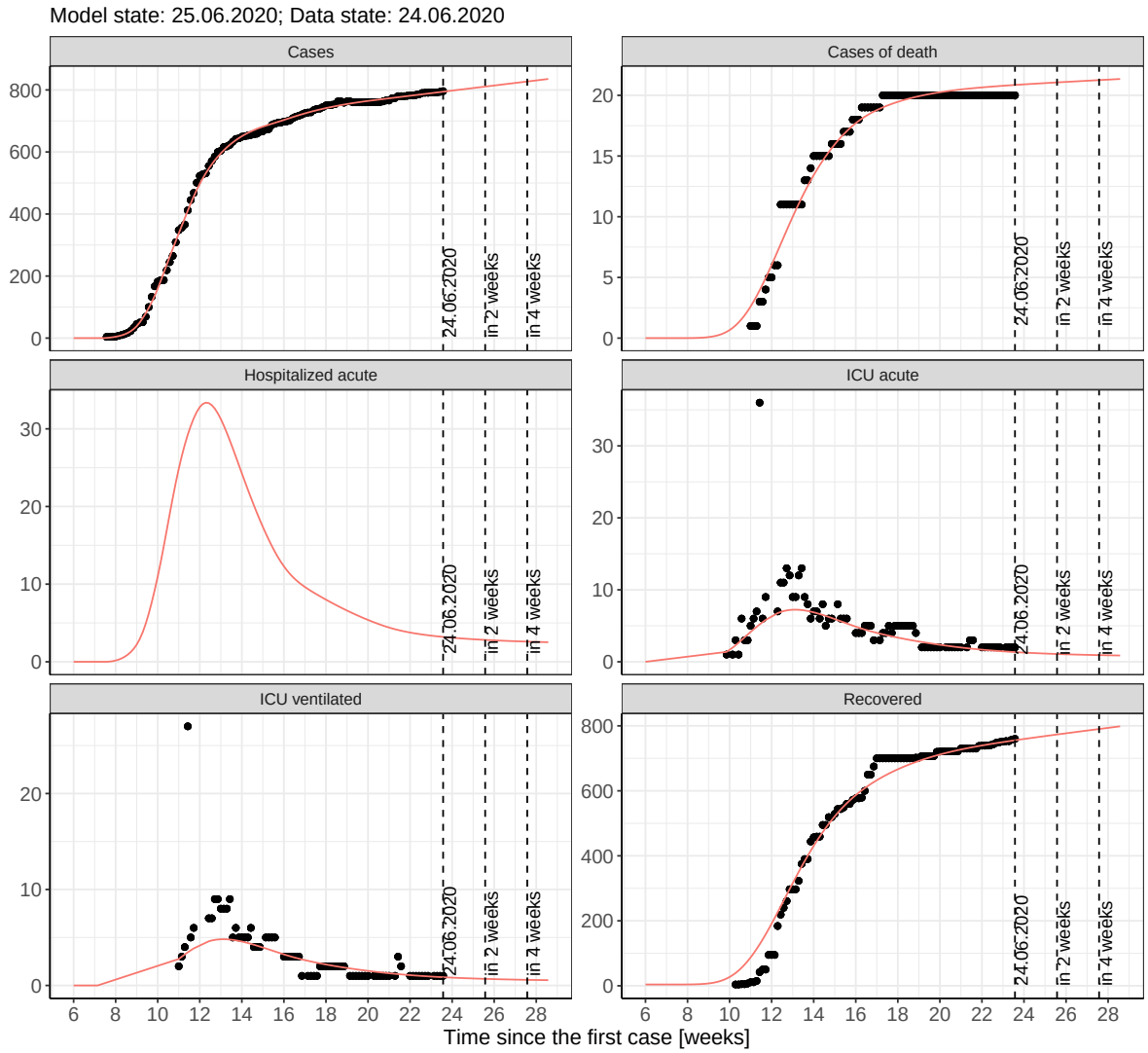


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

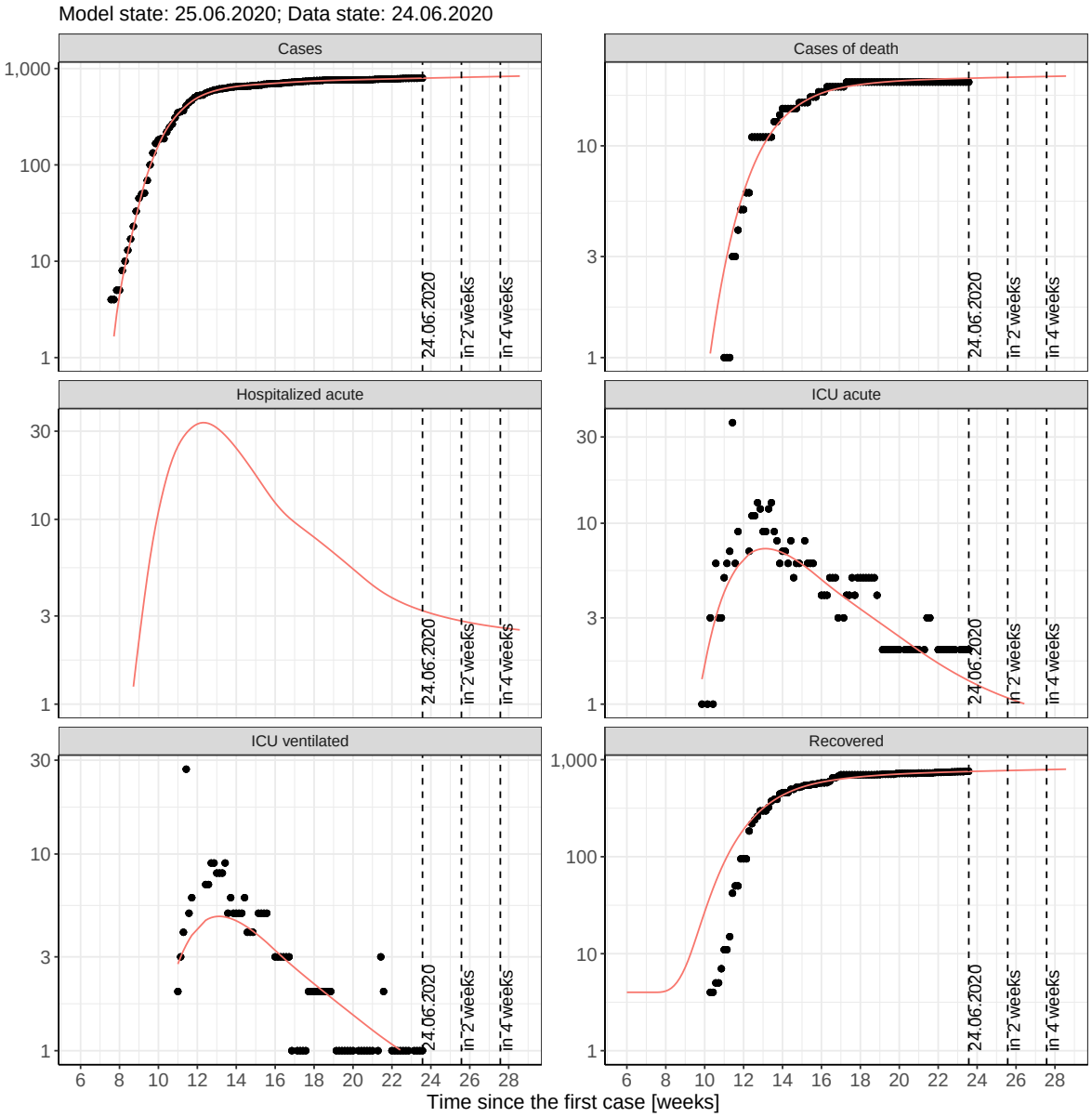


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

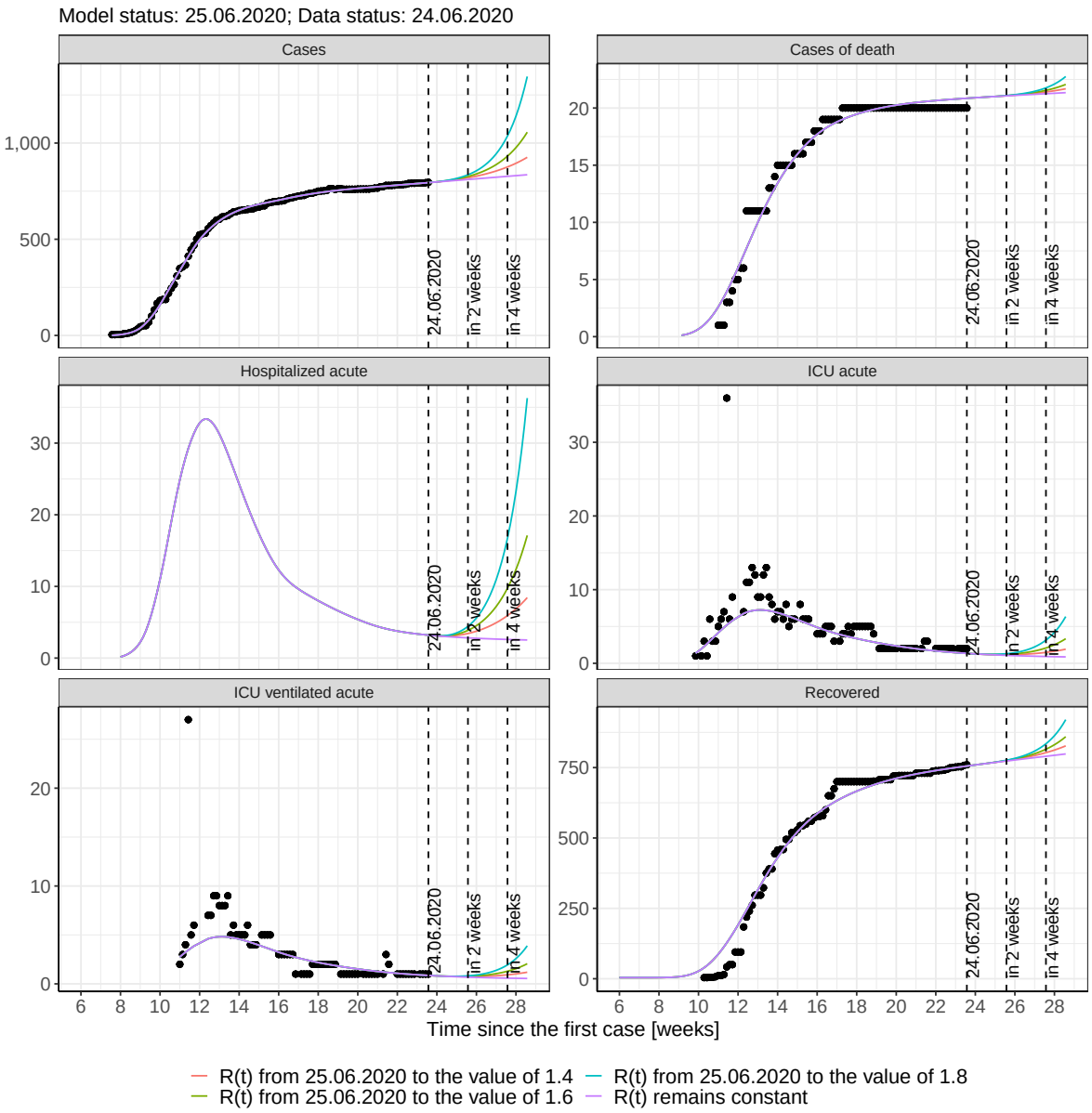


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

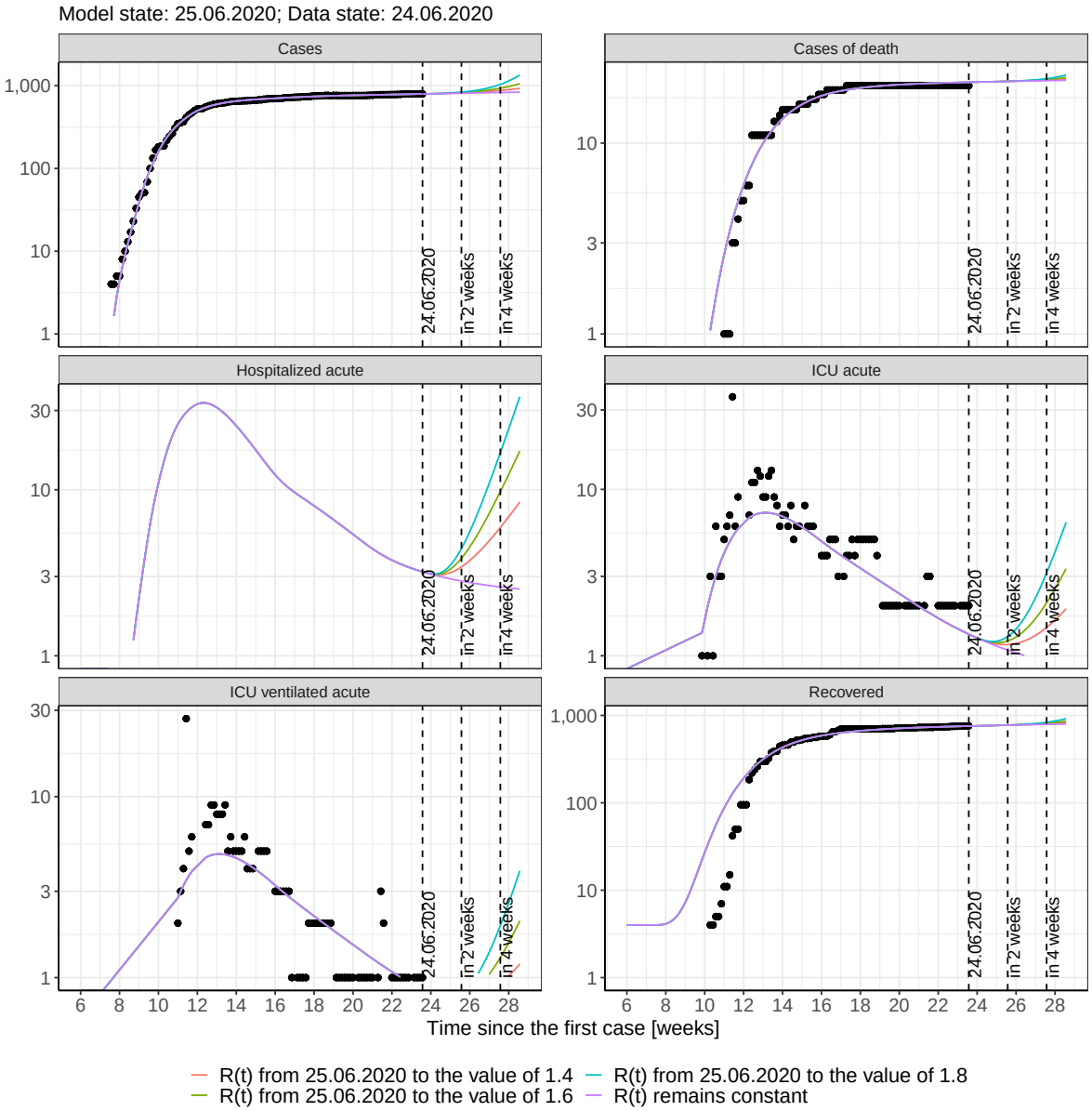


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

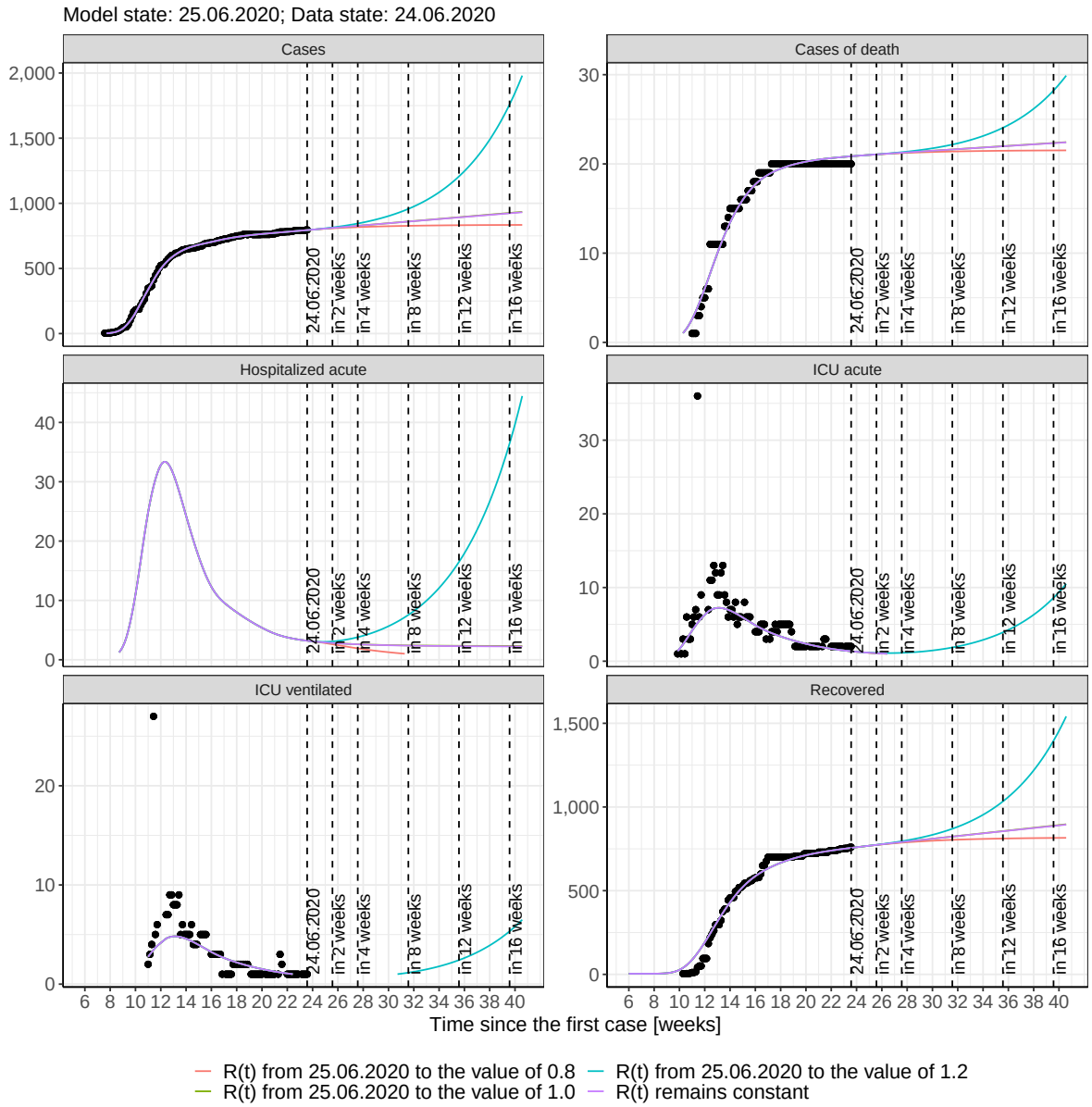


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

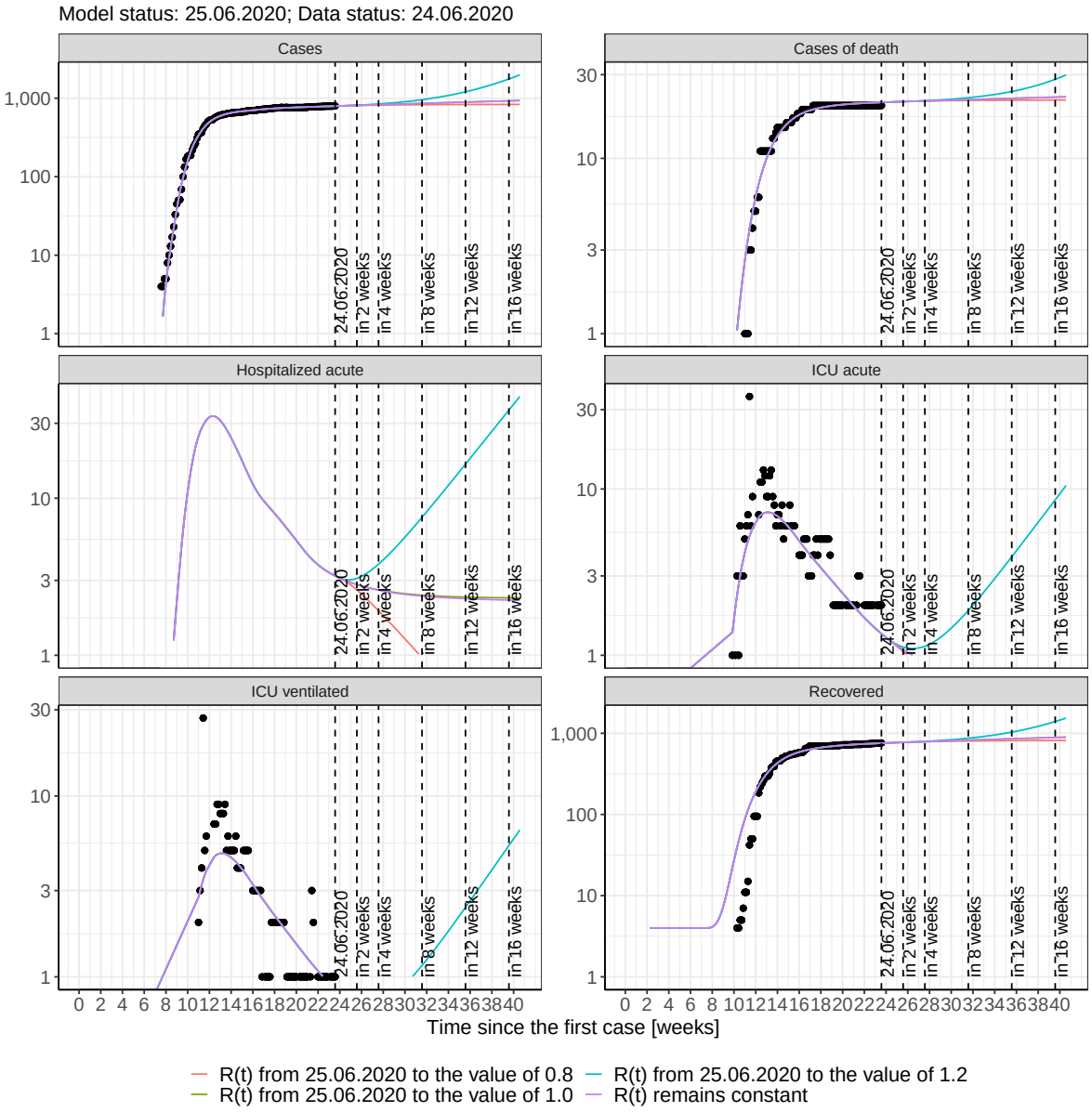


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 33) Model status from 25.06.2020; Data status: 24.06.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	795	21	757	3	1	1
26.06.2020	797	21	758	3	1	1
27.06.2020	798	21	760	3	1	1
28.06.2020	799	21	761	3	1	1
29.06.2020	800	21	762	3	1	1
30.06.2020	801	21	763	3	1	1
01.07.2020	803	21	765	3	1	1
02.07.2020	804	21	766	3	1	1
03.07.2020	805	21	767	3	1	1
04.07.2020	806	21	768	3	1	1
05.07.2020	807	21	770	3	1	1
06.07.2020	808	21	771	3	1	1
07.07.2020	810	21	772	3	1	1
08.07.2020	811	21	773	3	1	1
09.07.2020	812	21	775	3	1	1
10.07.2020	813	21	776	3	1	1
11.07.2020	814	21	777	3	1	1
12.07.2020	815	21	778	3	1	1
13.07.2020	817	21	779	3	1	1
14.07.2020	818	21	781	3	1	1
15.07.2020	819	21	782	3	1	1
16.07.2020	820	21	783	3	1	1
17.07.2020	821	21	784	3	1	1
18.07.2020	822	21	785	3	1	1
19.07.2020	824	21	787	3	1	1
20.07.2020	825	21	788	3	1	1
21.07.2020	826	21	789	3	1	1
22.07.2020	827	21	790	3	1	1

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	795	21	757	3	1	1
26.06.2020	797	21	758	3	1	1
27.06.2020	798	21	760	3	1	1
28.06.2020	799	21	761	3	1	1
29.06.2020	800	21	762	3	1	1
30.06.2020	801	21	763	3	1	1
01.07.2020	802	21	765	3	1	1
02.07.2020	803	21	766	3	1	1
03.07.2020	804	21	767	3	1	1
04.07.2020	805	21	768	3	1	1
05.07.2020	805	21	769	3	1	1
06.07.2020	806	21	771	3	1	1
07.07.2020	807	21	772	3	1	1
08.07.2020	808	21	773	3	1	1
09.07.2020	809	21	774	3	1	1
10.07.2020	809	21	775	3	1	1
11.07.2020	810	21	776	2	1	1
12.07.2020	811	21	777	2	1	1
13.07.2020	812	21	778	2	1	1
14.07.2020	812	21	779	2	1	1
15.07.2020	813	21	780	2	1	1
16.07.2020	814	21	781	2	1	1
17.07.2020	814	21	782	2	1	1
18.07.2020	815	21	783	2	1	1
19.07.2020	815	21	784	2	1	1
20.07.2020	816	21	785	2	1	1
21.07.2020	816	21	786	2	1	1
22.07.2020	817	21	787	2	1	1

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	795	21	757	3	1	1
26.06.2020	797	21	758	3	1	1
27.06.2020	798	21	760	3	1	1
28.06.2020	799	21	761	3	1	1
29.06.2020	800	21	762	3	1	1
30.06.2020	801	21	763	3	1	1
01.07.2020	803	21	765	3	1	1
02.07.2020	804	21	766	3	1	1
03.07.2020	805	21	767	3	1	1
04.07.2020	806	21	768	3	1	1
05.07.2020	807	21	770	3	1	1
06.07.2020	808	21	771	3	1	1
07.07.2020	810	21	772	3	1	1
08.07.2020	811	21	773	3	1	1
09.07.2020	812	21	775	3	1	1
10.07.2020	813	21	776	3	1	1
11.07.2020	814	21	777	3	1	1
12.07.2020	816	21	778	3	1	1
13.07.2020	817	21	779	3	1	1
14.07.2020	818	21	781	3	1	1
15.07.2020	819	21	782	3	1	1
16.07.2020	820	21	783	3	1	1
17.07.2020	821	21	784	3	1	1
18.07.2020	823	21	785	3	1	1
19.07.2020	824	21	787	3	1	1
20.07.2020	825	21	788	3	1	1
21.07.2020	826	21	789	3	1	1
22.07.2020	827	21	790	3	1	1

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	795	21	757	3	1	1
26.06.2020	797	21	758	3	1	1
27.06.2020	798	21	760	3	1	1
28.06.2020	799	21	761	3	1	1
29.06.2020	801	21	762	3	1	1
30.06.2020	802	21	763	3	1	1
01.07.2020	803	21	765	3	1	1
02.07.2020	805	21	766	3	1	1
03.07.2020	806	21	767	3	1	1
04.07.2020	808	21	769	3	1	1
05.07.2020	810	21	770	3	1	1
06.07.2020	811	21	771	3	1	1
07.07.2020	813	21	773	3	1	1
08.07.2020	815	21	774	3	1	1
09.07.2020	816	21	775	3	1	1
10.07.2020	818	21	777	3	1	1
11.07.2020	820	21	778	3	1	1
12.07.2020	822	21	779	3	1	1
13.07.2020	824	21	781	3	1	1
14.07.2020	826	21	782	3	1	1
15.07.2020	828	21	784	3	1	1
16.07.2020	830	21	785	3	1	1
17.07.2020	833	21	787	3	1	1
18.07.2020	835	21	789	4	1	1
19.07.2020	837	21	790	4	1	1
20.07.2020	840	21	792	4	1	1
21.07.2020	842	21	794	4	1	1
22.07.2020	845	21	795	4	1	1

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

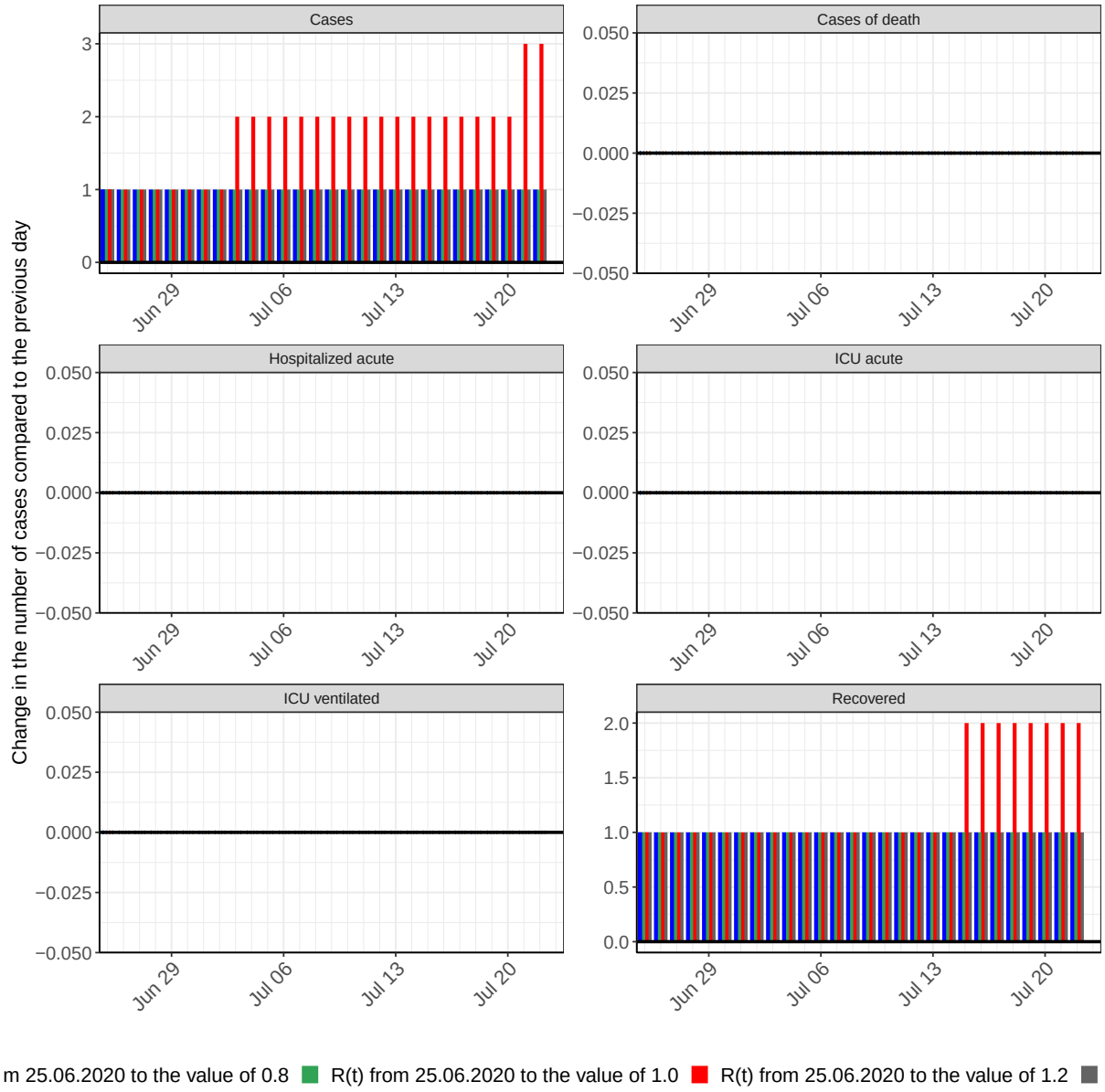


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

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.

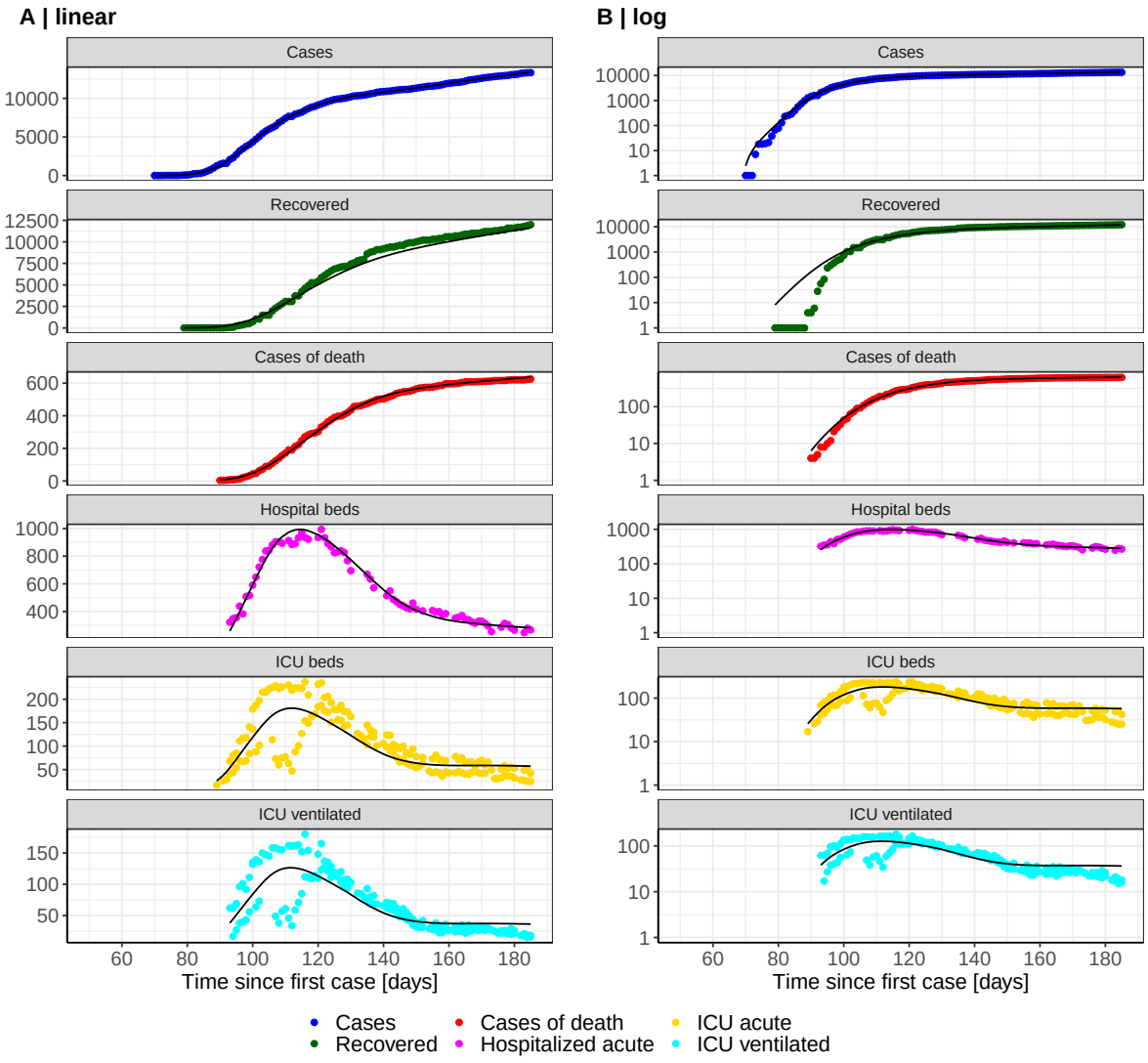


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

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.

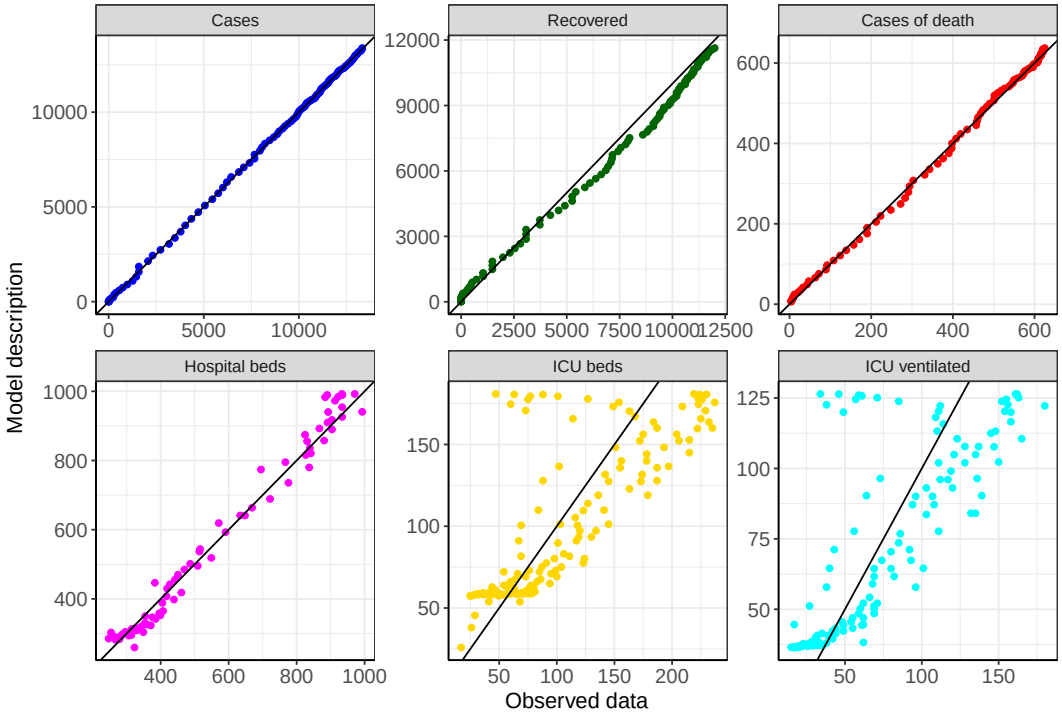


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

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).

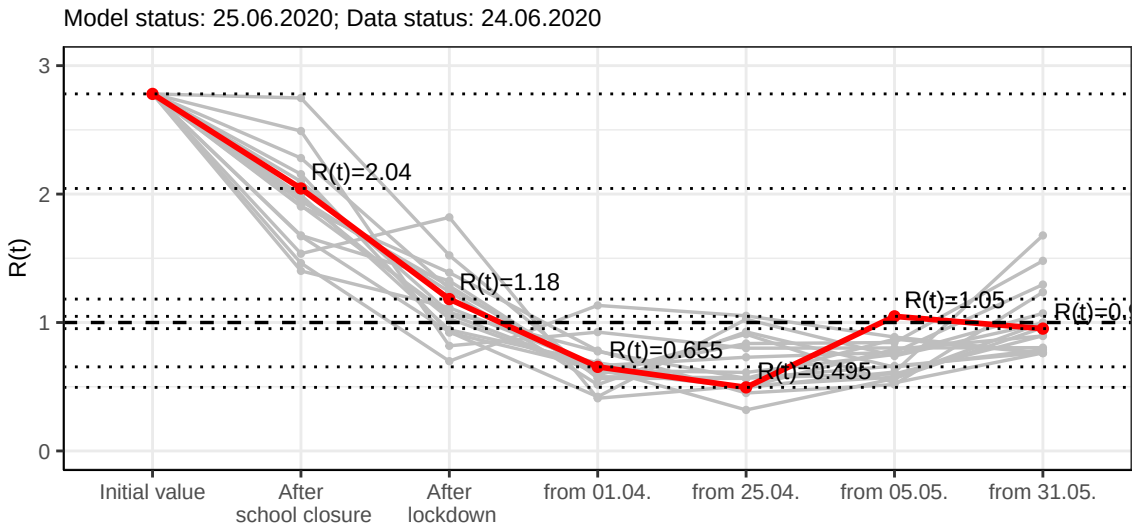


Figure 101: R(t) values before and after the NPIs for Lower Saxony

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

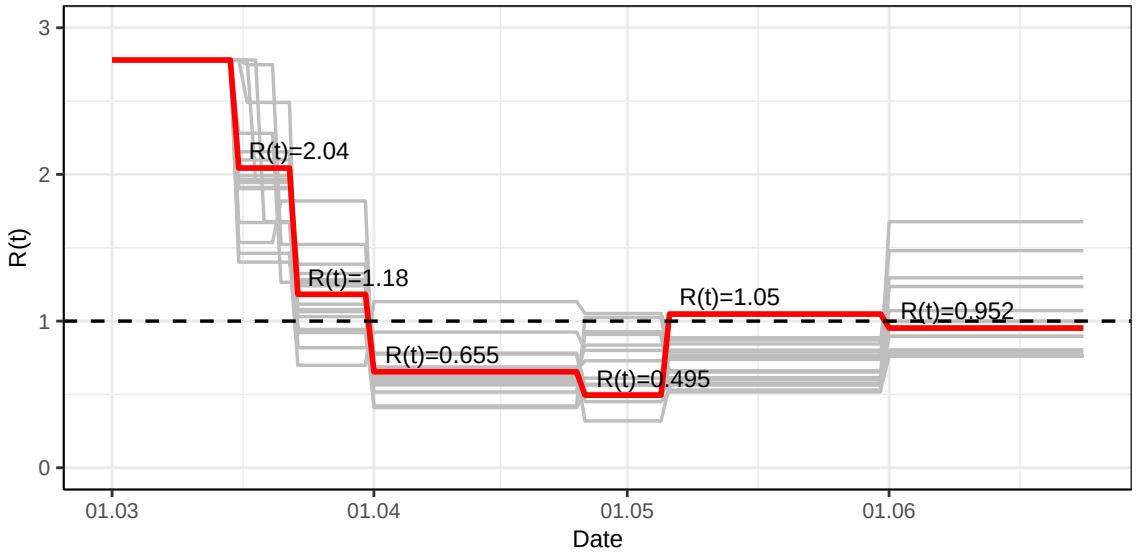


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

10.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.95)

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.

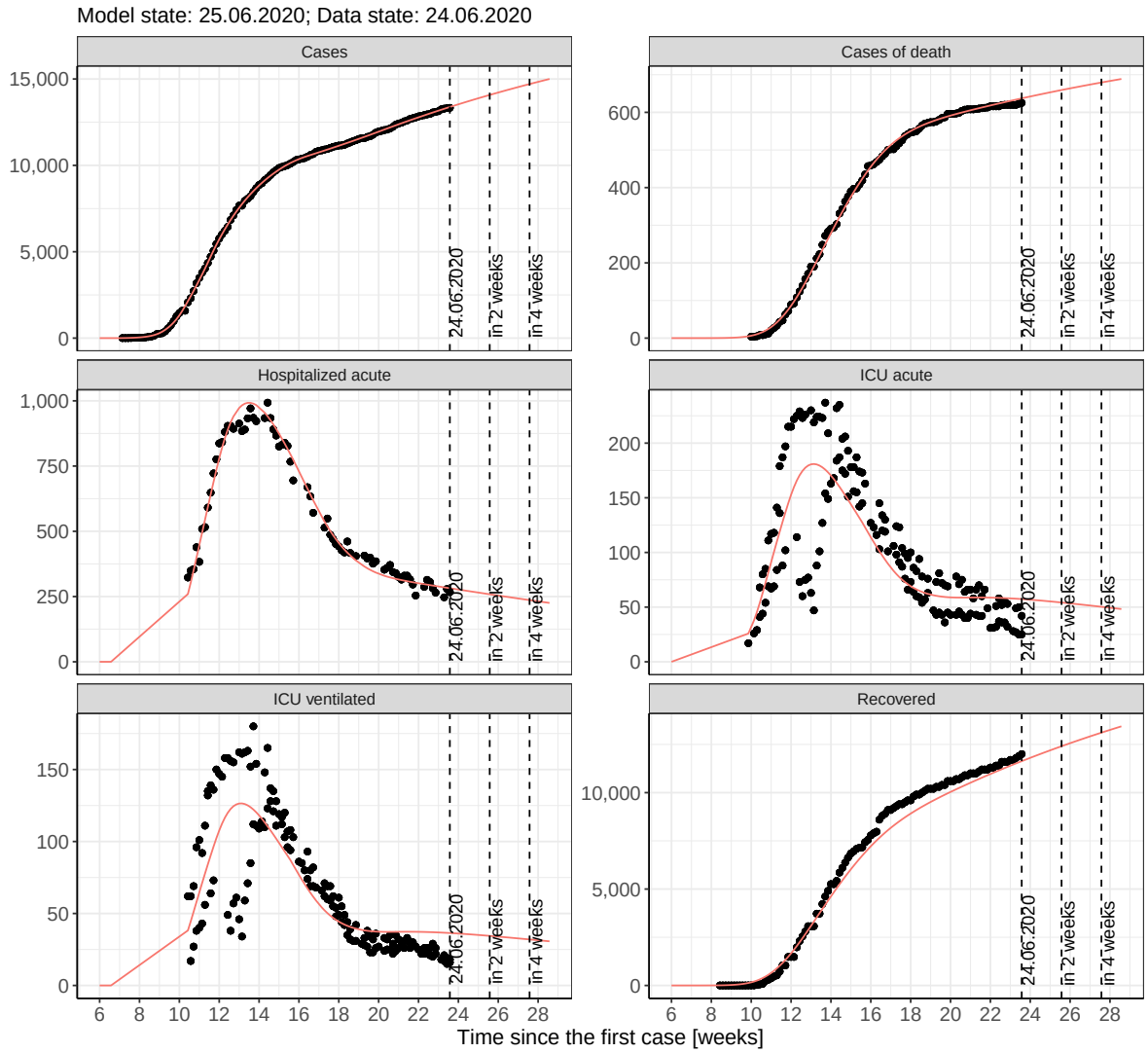


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

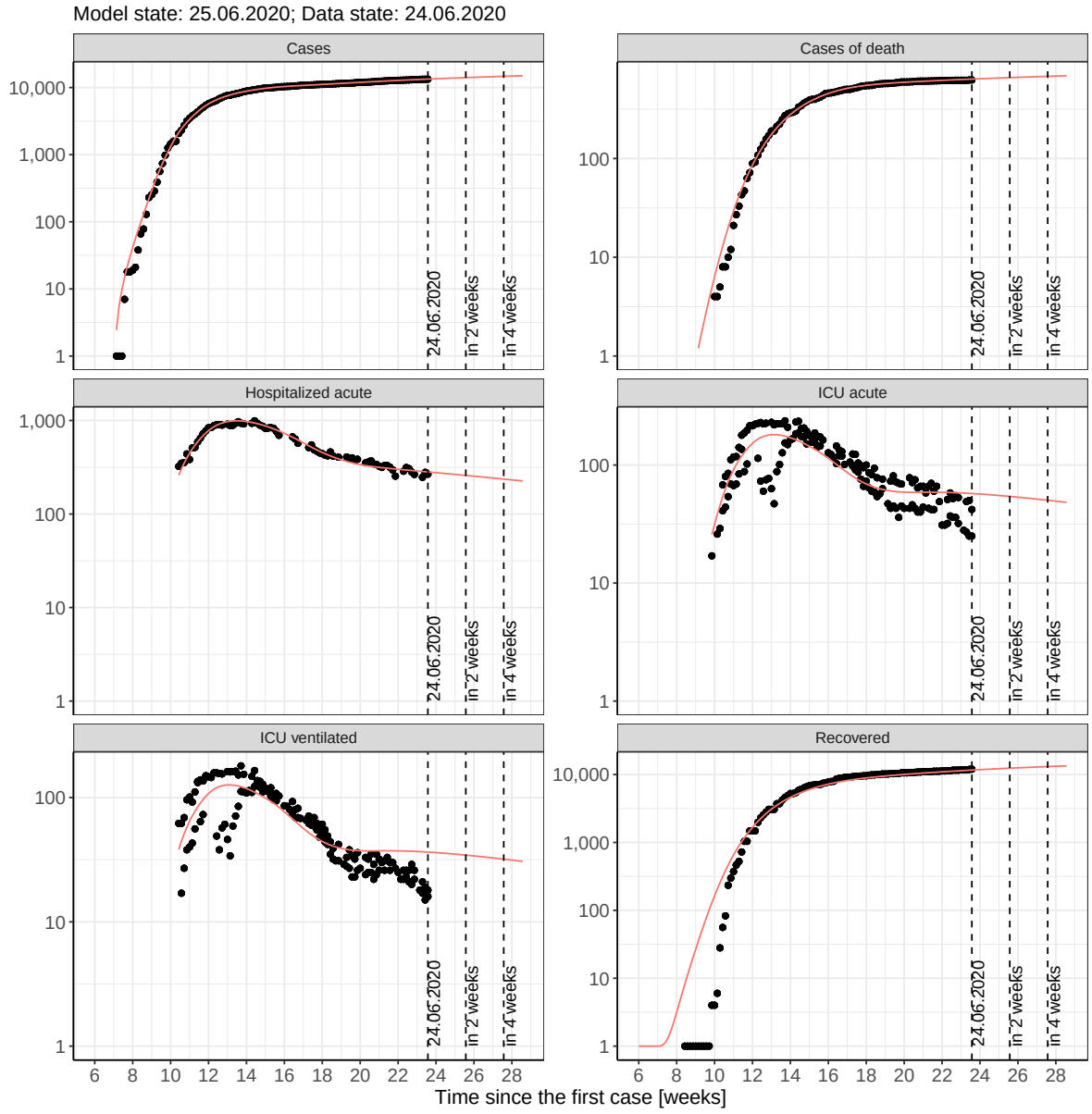


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

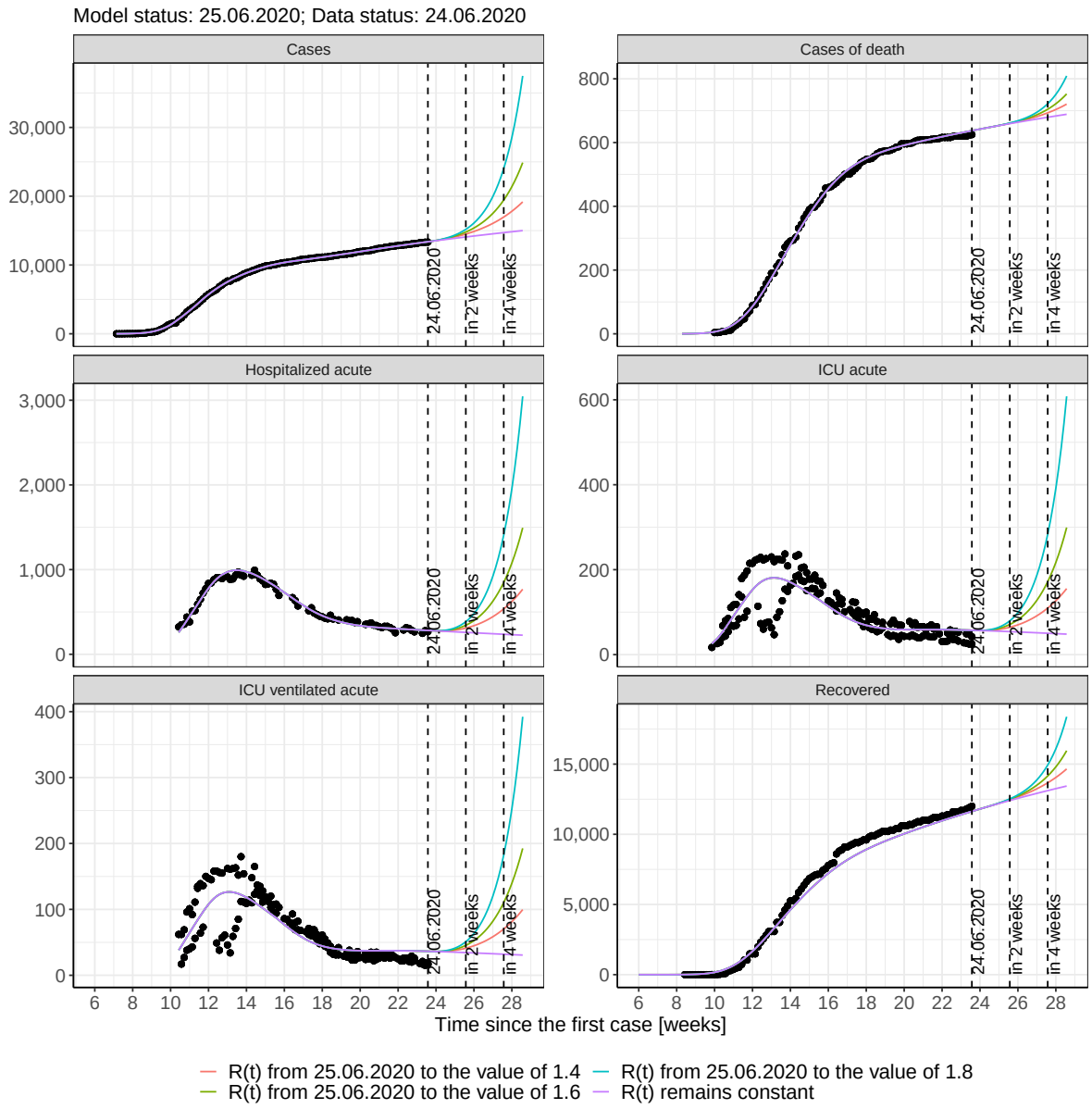


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

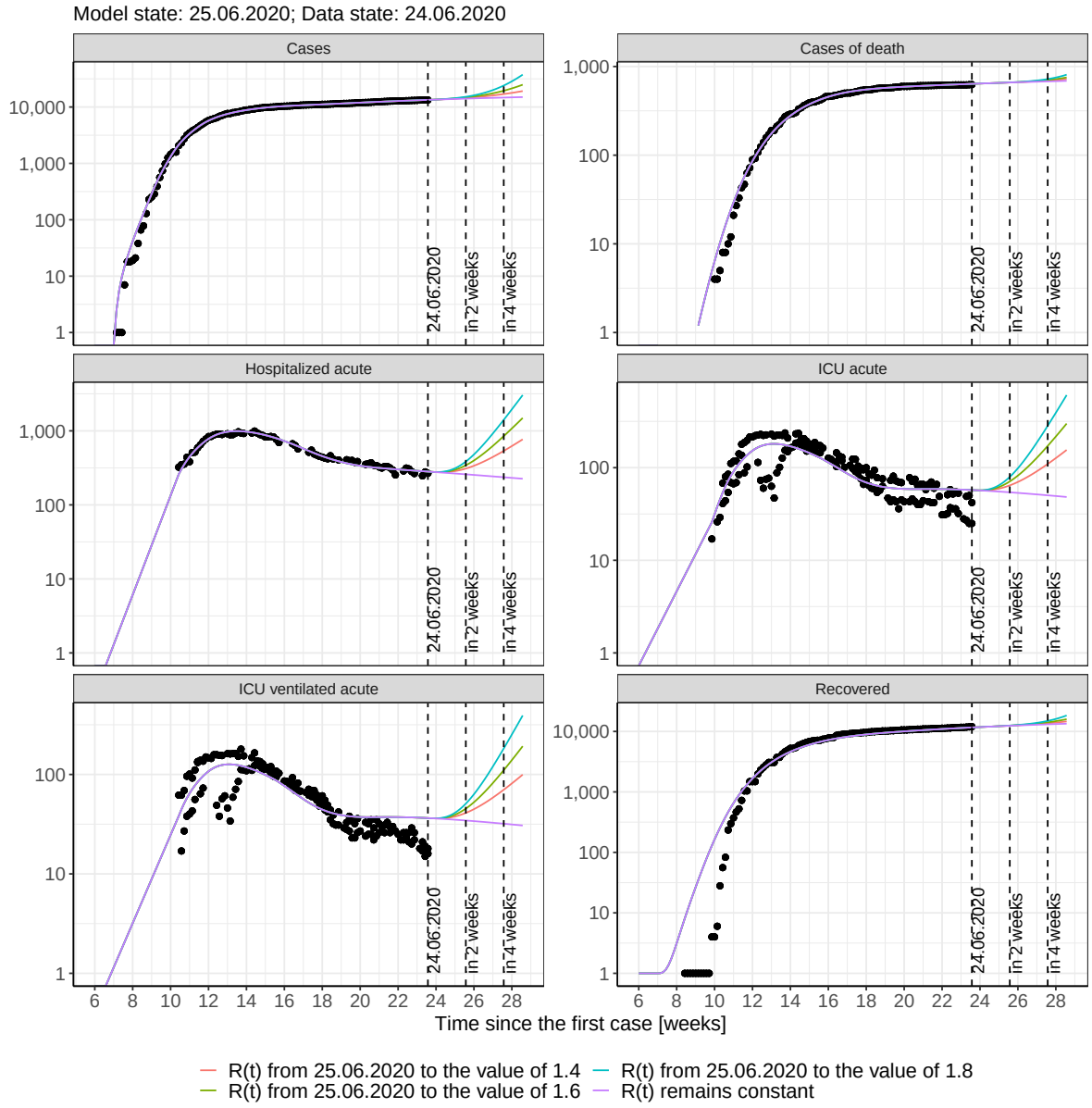


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

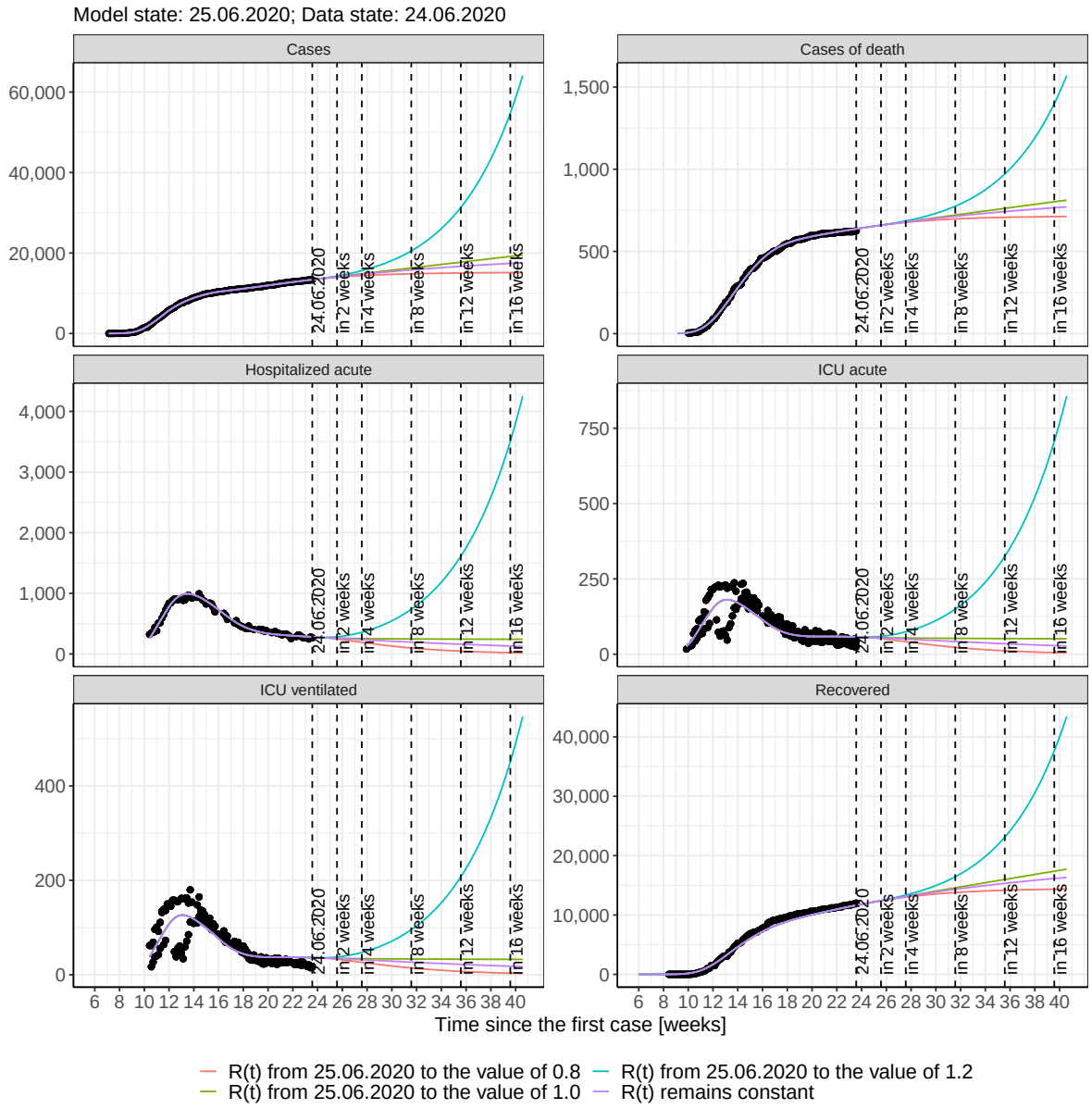


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

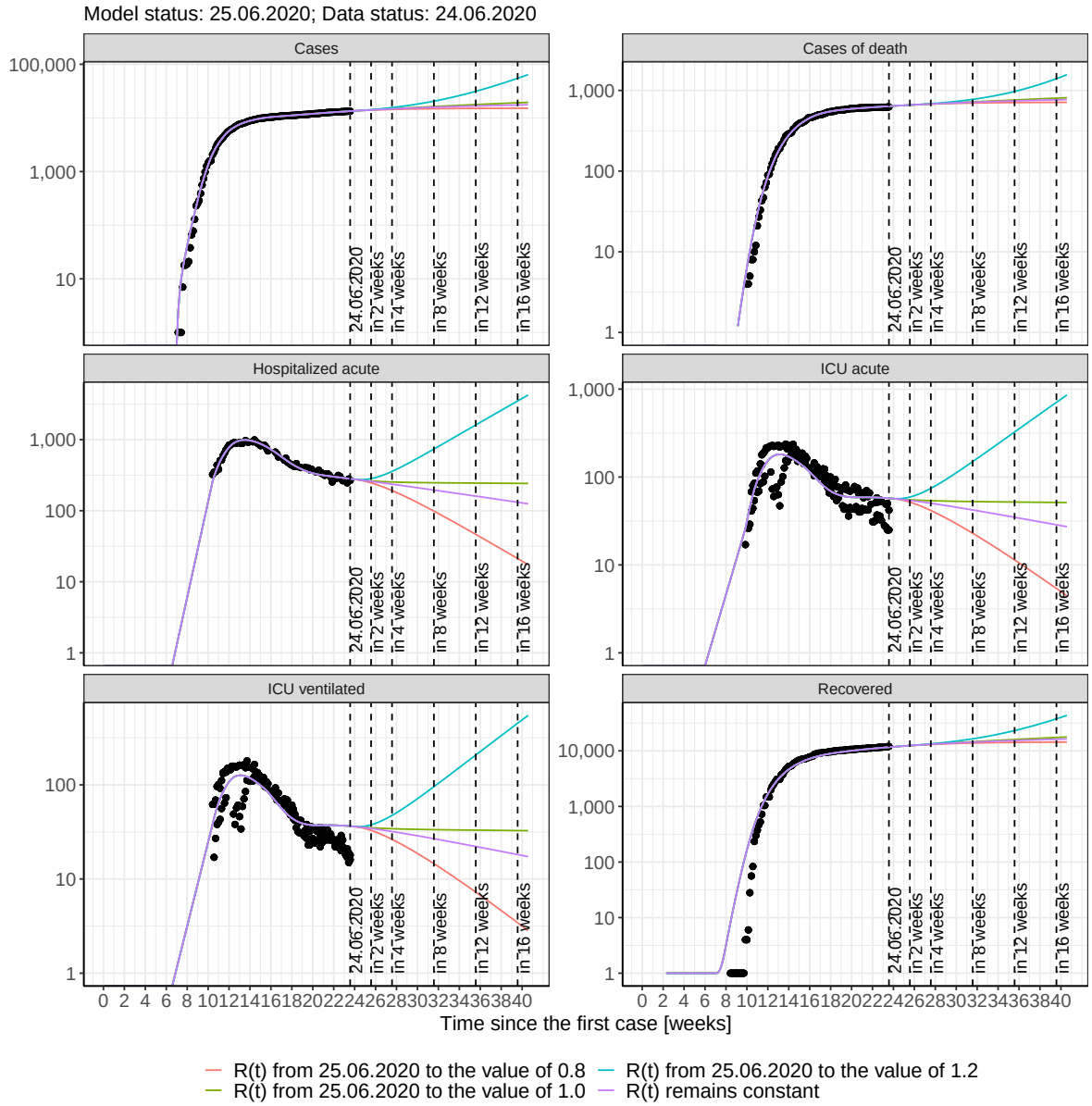


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 37) Model status from 25.06.2020; Data status: 24.06.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	13432	639	11690	280	57	36
26.06.2020	13484	640	11748	279	57	36
27.06.2020	13535	642	11805	277	57	36
28.06.2020	13586	644	11862	275	57	36
29.06.2020	13637	645	11918	274	56	36
30.06.2020	13687	647	11974	272	56	36
01.07.2020	13737	649	12030	270	56	36
02.07.2020	13787	650	12085	269	56	35
03.07.2020	13836	652	12139	267	55	35
04.07.2020	13885	653	12194	265	55	35
05.07.2020	13933	655	12248	264	55	35
06.07.2020	13981	656	12302	262	55	35
07.07.2020	14029	658	12355	260	54	35
08.07.2020	14077	659	12408	259	54	34
09.07.2020	14124	661	12460	257	54	34
10.07.2020	14171	662	12512	255	54	34
11.07.2020	14217	664	12564	254	53	34
12.07.2020	14264	665	12616	252	53	34
13.07.2020	14309	667	12667	251	53	34
14.07.2020	14355	668	12718	249	53	33
15.07.2020	14400	670	12768	247	52	33
16.07.2020	14445	671	12818	246	52	33
17.07.2020	14490	672	12868	244	52	33
18.07.2020	14534	674	12917	243	51	33
19.07.2020	14578	675	12966	241	51	33
20.07.2020	14622	677	13015	239	51	32
21.07.2020	14665	678	13063	238	51	32
22.07.2020	14708	679	13111	236	50	32

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	13431	639	11690	280	57	36
26.06.2020	13482	640	11748	278	57	36
27.06.2020	13530	642	11805	277	57	36
28.06.2020	13577	644	11861	275	56	36
29.06.2020	13623	645	11918	273	56	36
30.06.2020	13668	647	11973	270	56	35
01.07.2020	13711	648	12028	268	55	35
02.07.2020	13753	650	12083	265	55	35
03.07.2020	13794	652	12137	263	55	35
04.07.2020	13834	653	12190	260	54	34
05.07.2020	13873	655	12242	257	54	34
06.07.2020	13910	656	12294	253	53	34
07.07.2020	13947	658	12345	250	52	33
08.07.2020	13982	659	12395	247	52	33
09.07.2020	14017	660	12444	243	51	32
10.07.2020	14050	662	12493	239	50	32
11.07.2020	14083	663	12541	236	50	32
12.07.2020	14114	665	12588	232	49	31
13.07.2020	14145	666	12634	228	48	31
14.07.2020	14175	667	12679	224	48	30
15.07.2020	14204	669	12723	220	47	30
16.07.2020	14232	670	12767	216	46	29
17.07.2020	14259	671	12809	212	45	29
18.07.2020	14286	672	12851	208	45	28
19.07.2020	14312	673	12892	204	44	28
20.07.2020	14337	674	12932	200	43	27
21.07.2020	14361	676	12971	196	42	27
22.07.2020	14385	677	13010	192	42	26

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	13432	639	11690	280	57	36
26.06.2020	13484	640	11748	279	57	36
27.06.2020	13537	642	11805	277	57	36
28.06.2020	13589	644	11862	275	57	36
29.06.2020	13641	645	11918	274	56	36
30.06.2020	13693	647	11974	272	56	36
01.07.2020	13746	649	12030	271	56	36
02.07.2020	13798	650	12085	270	56	36
03.07.2020	13850	652	12140	268	56	35
04.07.2020	13902	653	12195	267	56	35
05.07.2020	13954	655	12250	266	55	35
06.07.2020	14006	656	12304	265	55	35
07.07.2020	14058	658	12358	264	55	35
08.07.2020	14111	659	12412	263	55	35
09.07.2020	14163	661	12466	262	55	35
10.07.2020	14215	662	12519	261	55	35
11.07.2020	14267	664	12573	260	55	35
12.07.2020	14319	665	12626	260	55	35
13.07.2020	14371	667	12679	259	55	35
14.07.2020	14423	668	12731	258	54	35
15.07.2020	14475	670	12784	258	54	35
16.07.2020	14527	671	12837	257	54	34
17.07.2020	14579	673	12889	256	54	34
18.07.2020	14631	674	12941	256	54	34
19.07.2020	14683	676	12993	255	54	34
20.07.2020	14735	677	13046	255	54	34
21.07.2020	14787	679	13097	254	54	34
22.07.2020	14839	680	13149	254	54	34

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	13433	639	11690	280	57	36
26.06.2020	13488	640	11748	279	57	36
27.06.2020	13544	642	11805	277	57	36
28.06.2020	13601	644	11862	276	57	36
29.06.2020	13661	645	11919	275	57	36
30.06.2020	13722	647	11975	274	57	36
01.07.2020	13785	649	12032	274	57	36
02.07.2020	13849	650	12088	274	57	36
03.07.2020	13916	652	12145	275	57	36
04.07.2020	13984	653	12202	276	57	36
05.07.2020	14055	655	12259	277	58	37
06.07.2020	14127	656	12316	279	58	37
07.07.2020	14201	658	12374	281	59	37
08.07.2020	14278	660	12433	284	59	38
09.07.2020	14357	661	12492	286	60	38
10.07.2020	14438	663	12552	290	61	39
11.07.2020	14521	665	12612	293	61	39
12.07.2020	14607	666	12674	297	62	40
13.07.2020	14695	668	12736	302	63	40
14.07.2020	14786	670	12800	307	64	41
15.07.2020	14879	672	12865	312	65	41
16.07.2020	14975	674	12931	317	66	42
17.07.2020	15074	675	12998	323	67	43
18.07.2020	15176	677	13066	329	69	44
19.07.2020	15280	679	13136	336	70	45
20.07.2020	15388	681	13208	343	71	46
21.07.2020	15498	683	13281	350	73	46
22.07.2020	15612	686	13356	358	74	47

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

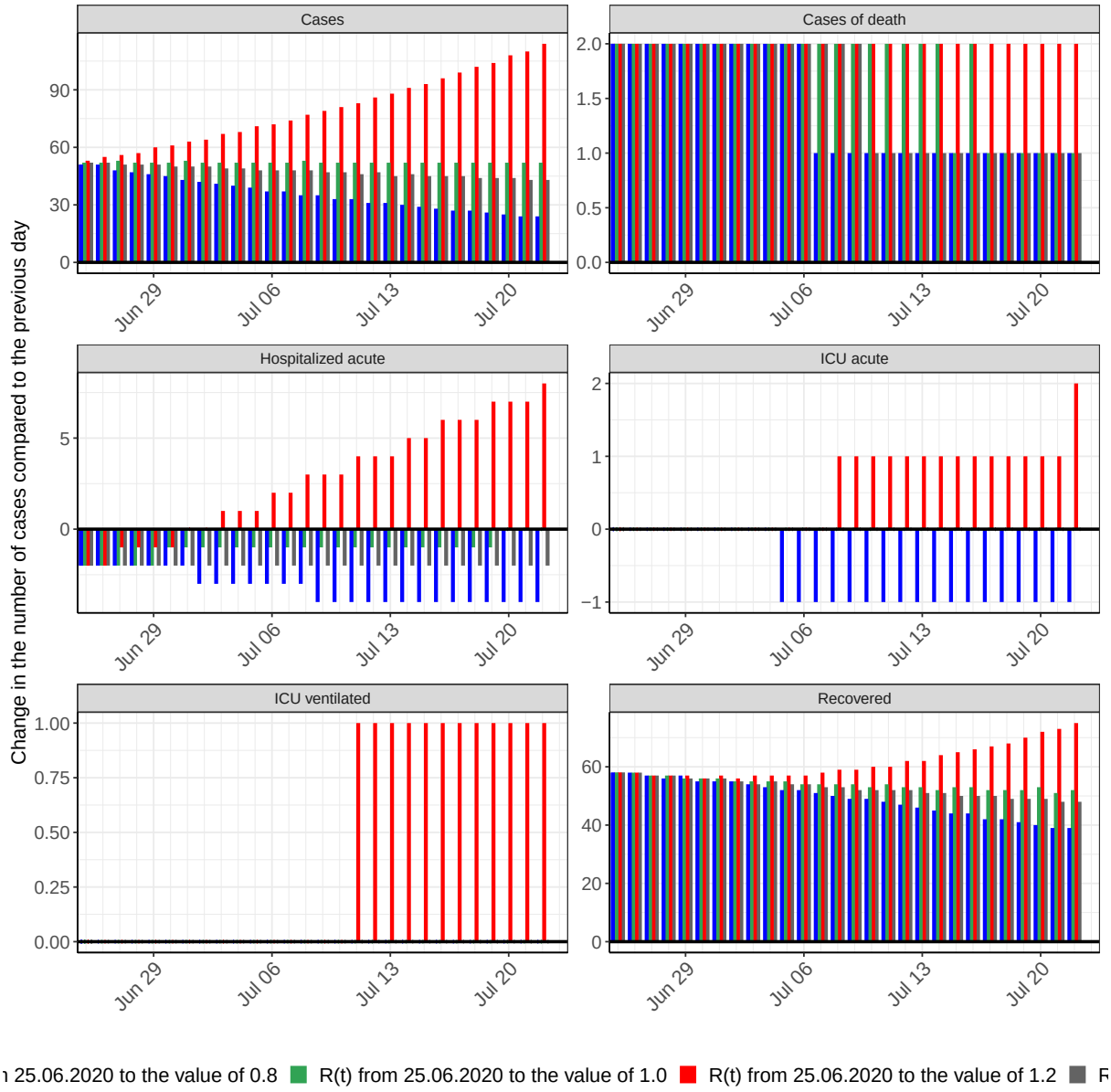


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

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.

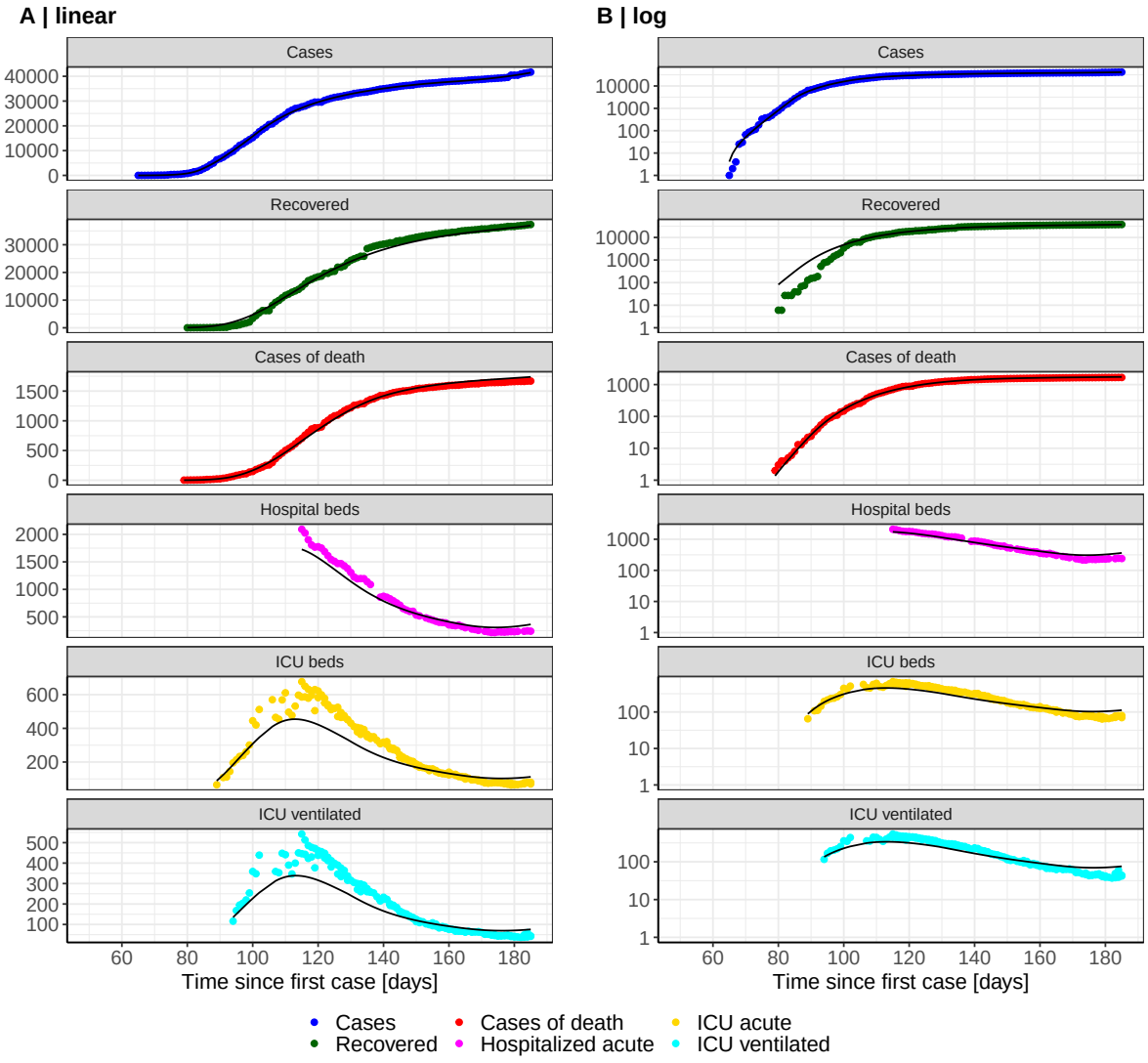


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

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.

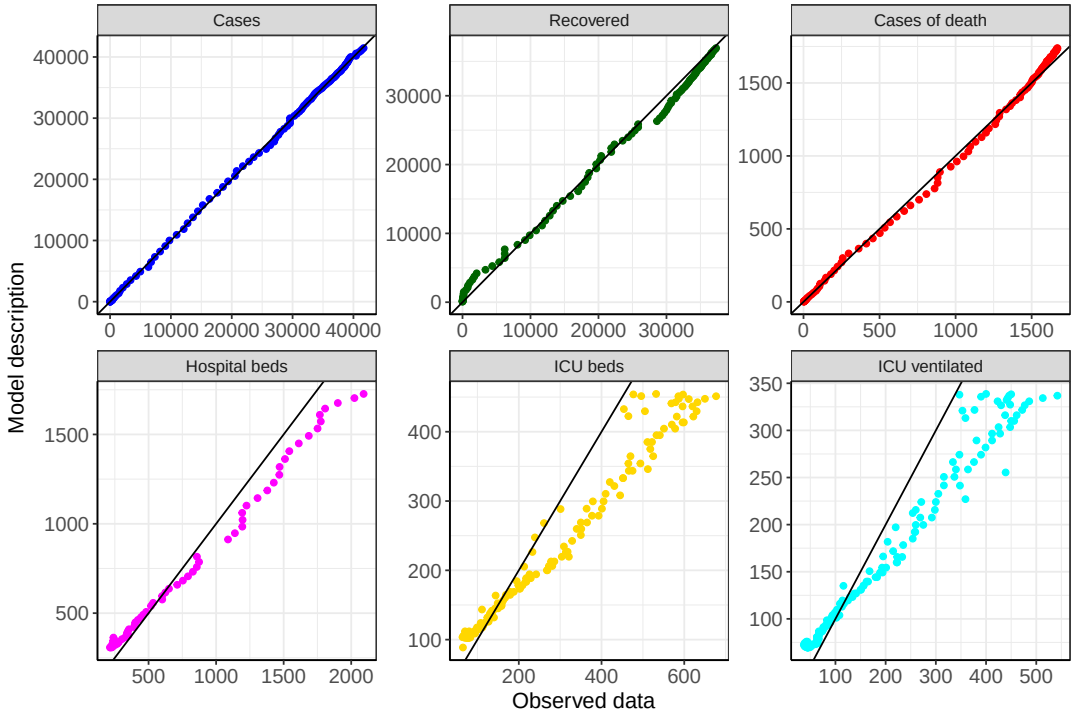


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

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).

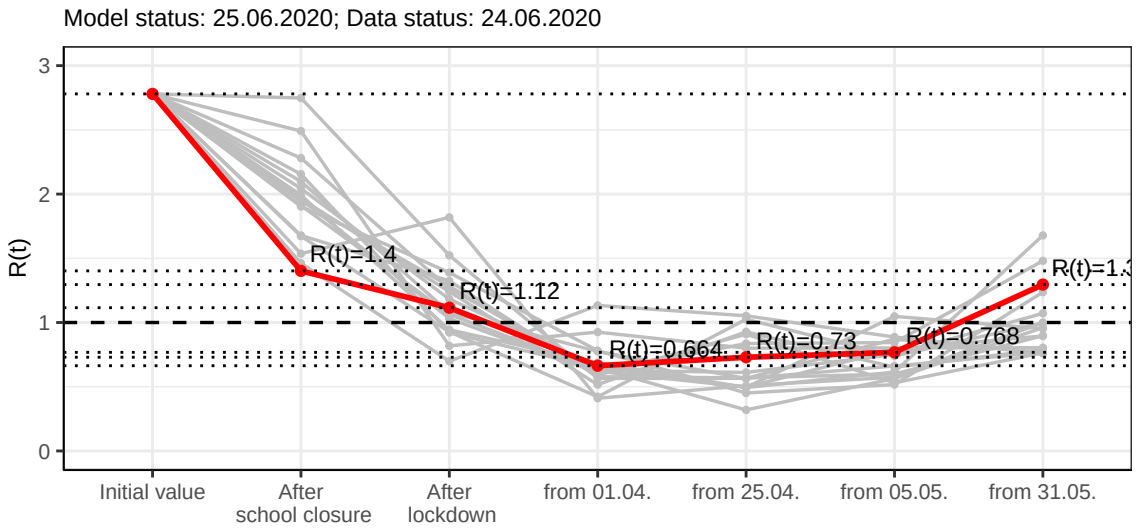


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

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).

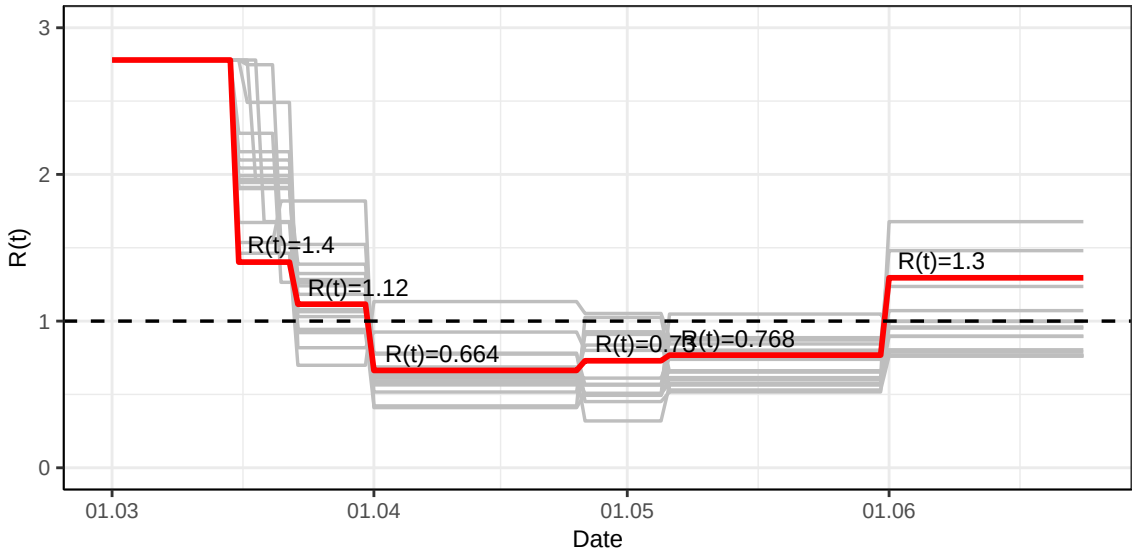


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.3)

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.

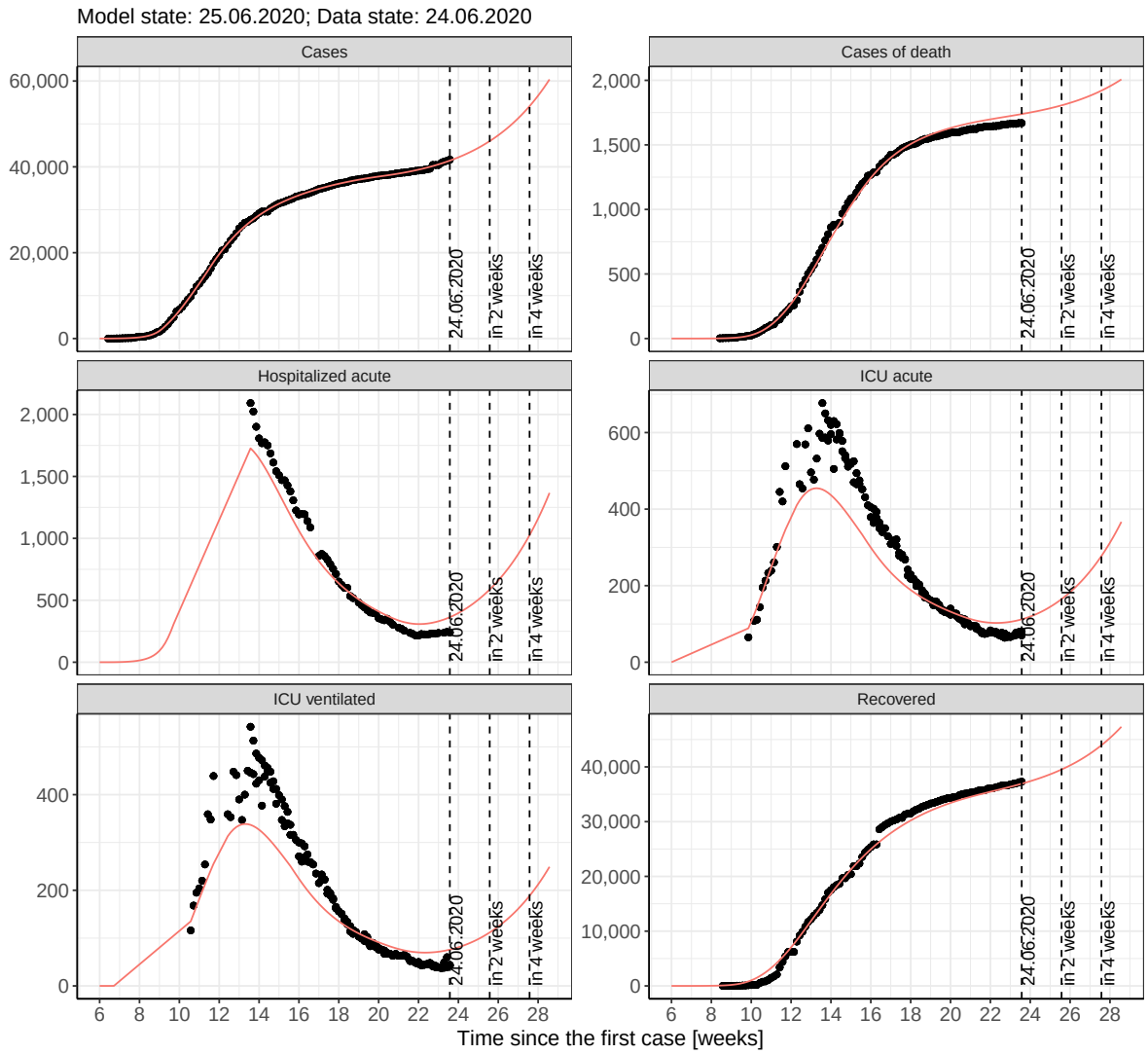


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model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

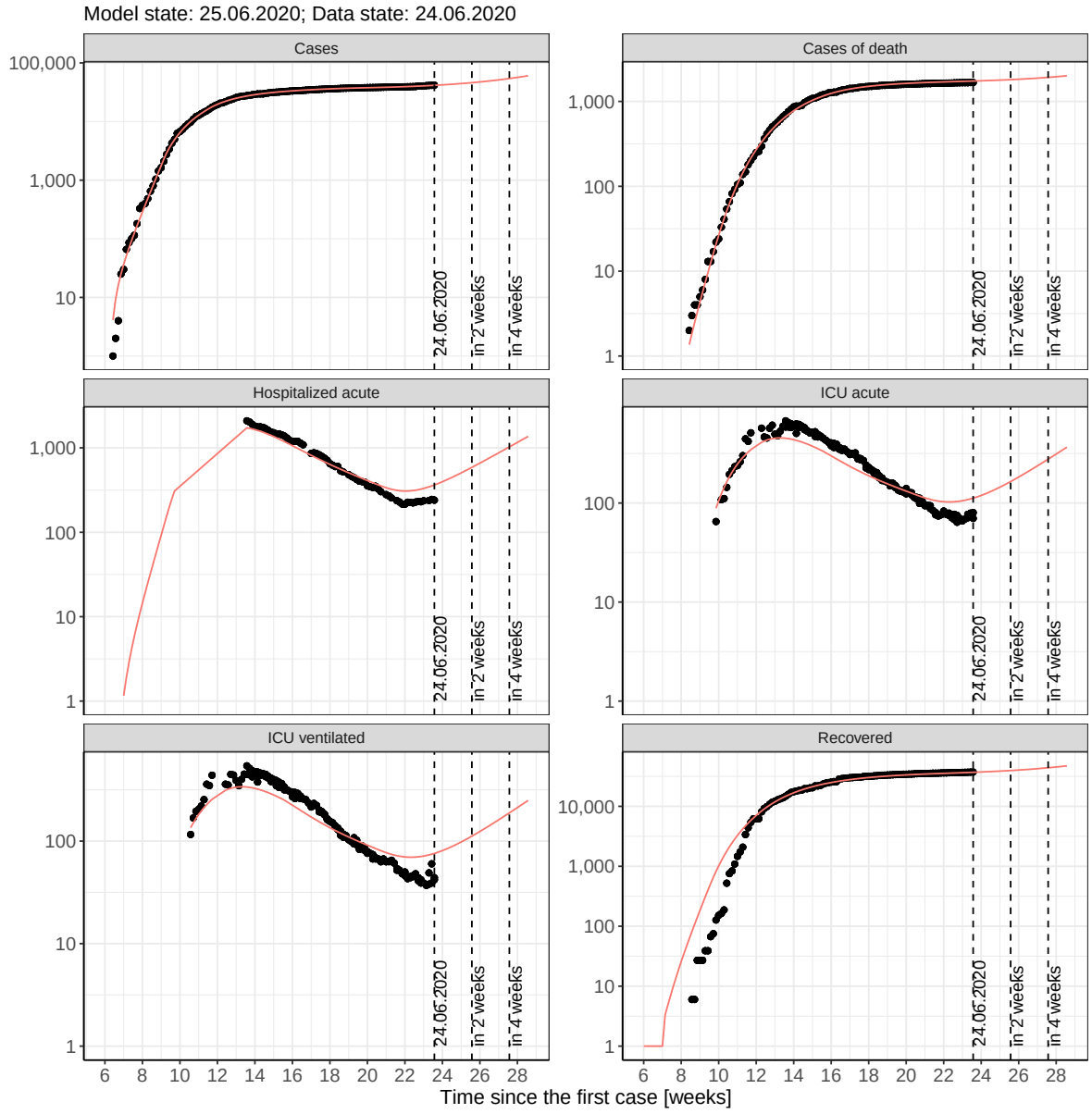


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model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

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

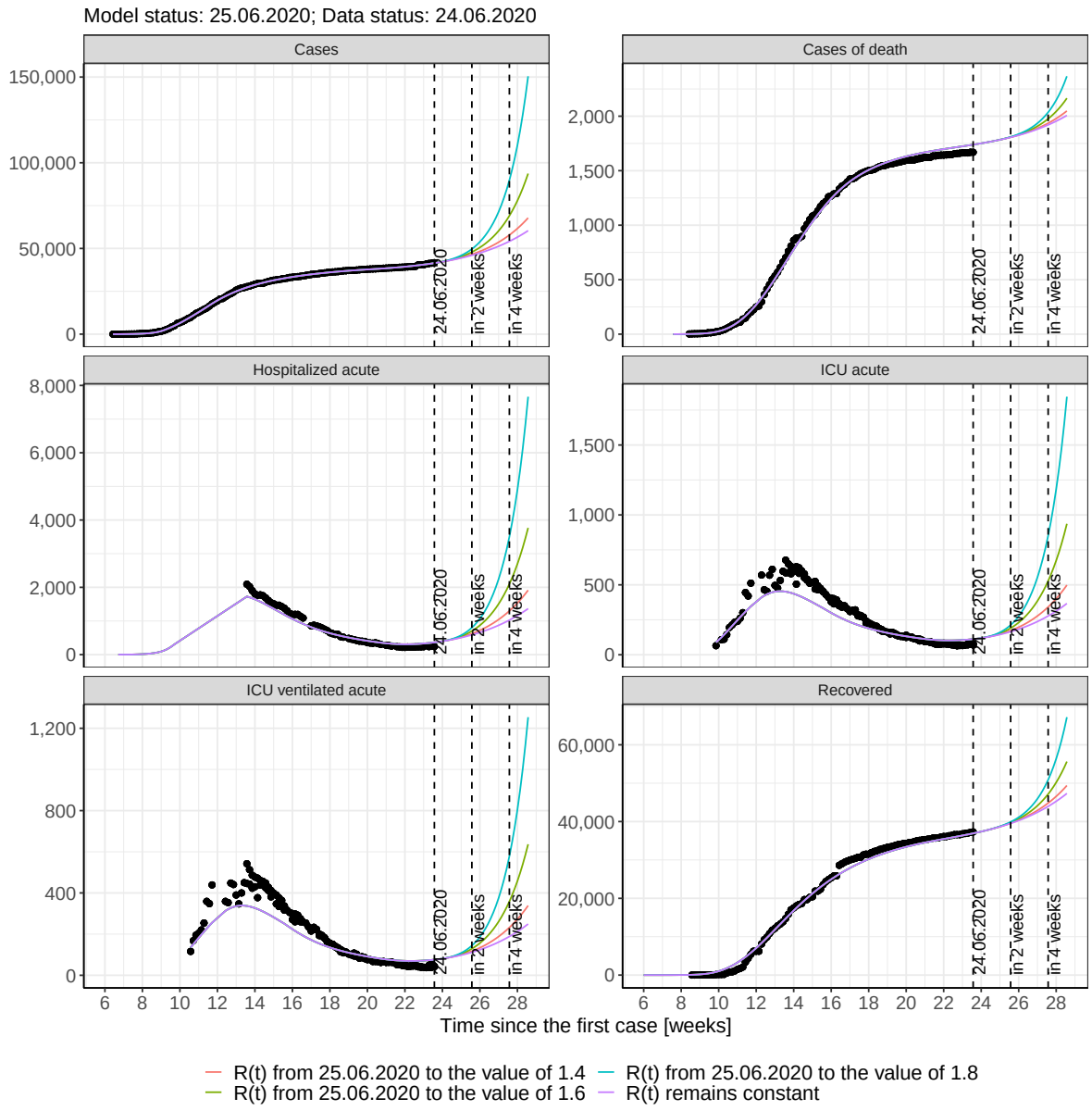


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

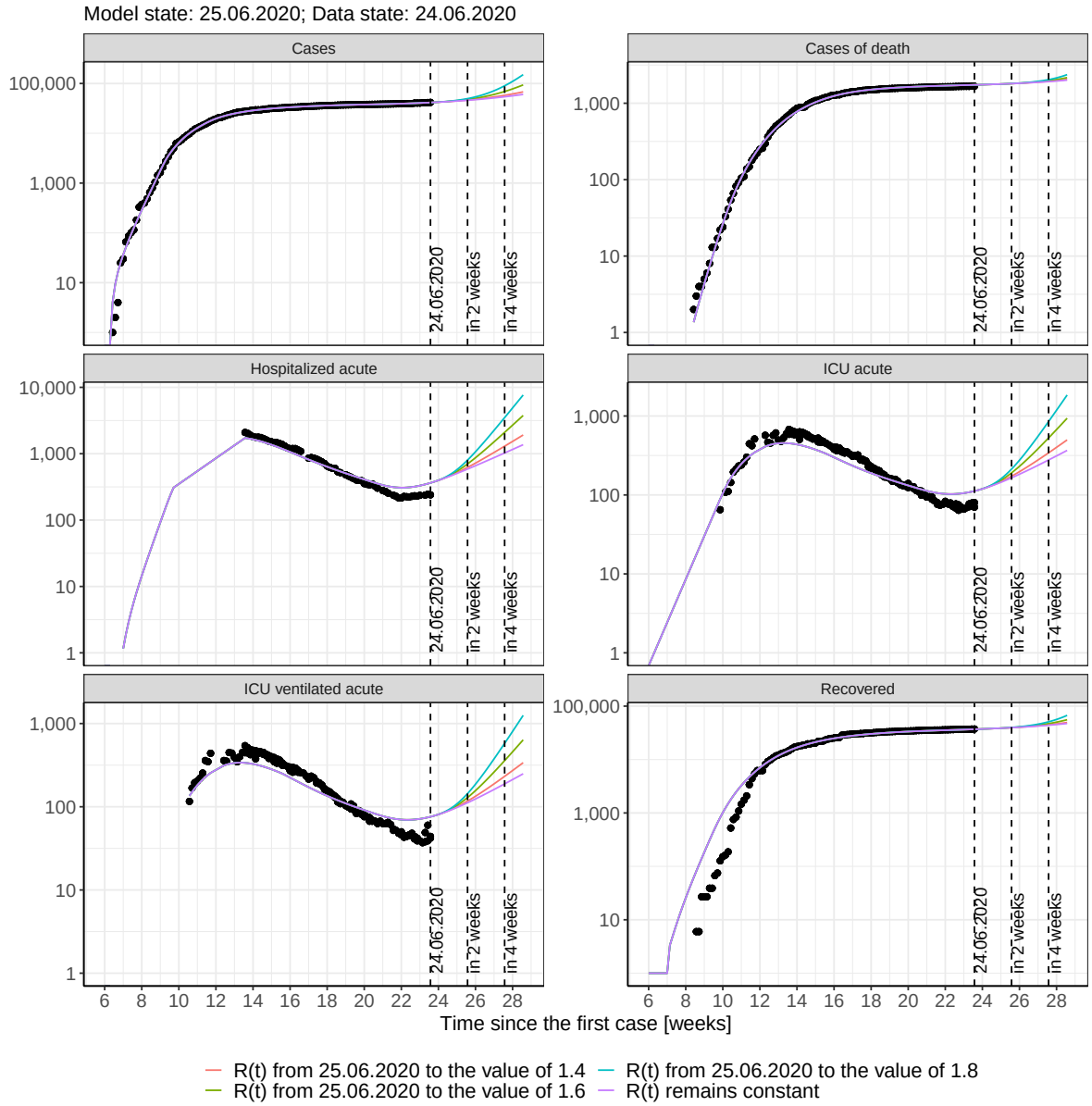


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

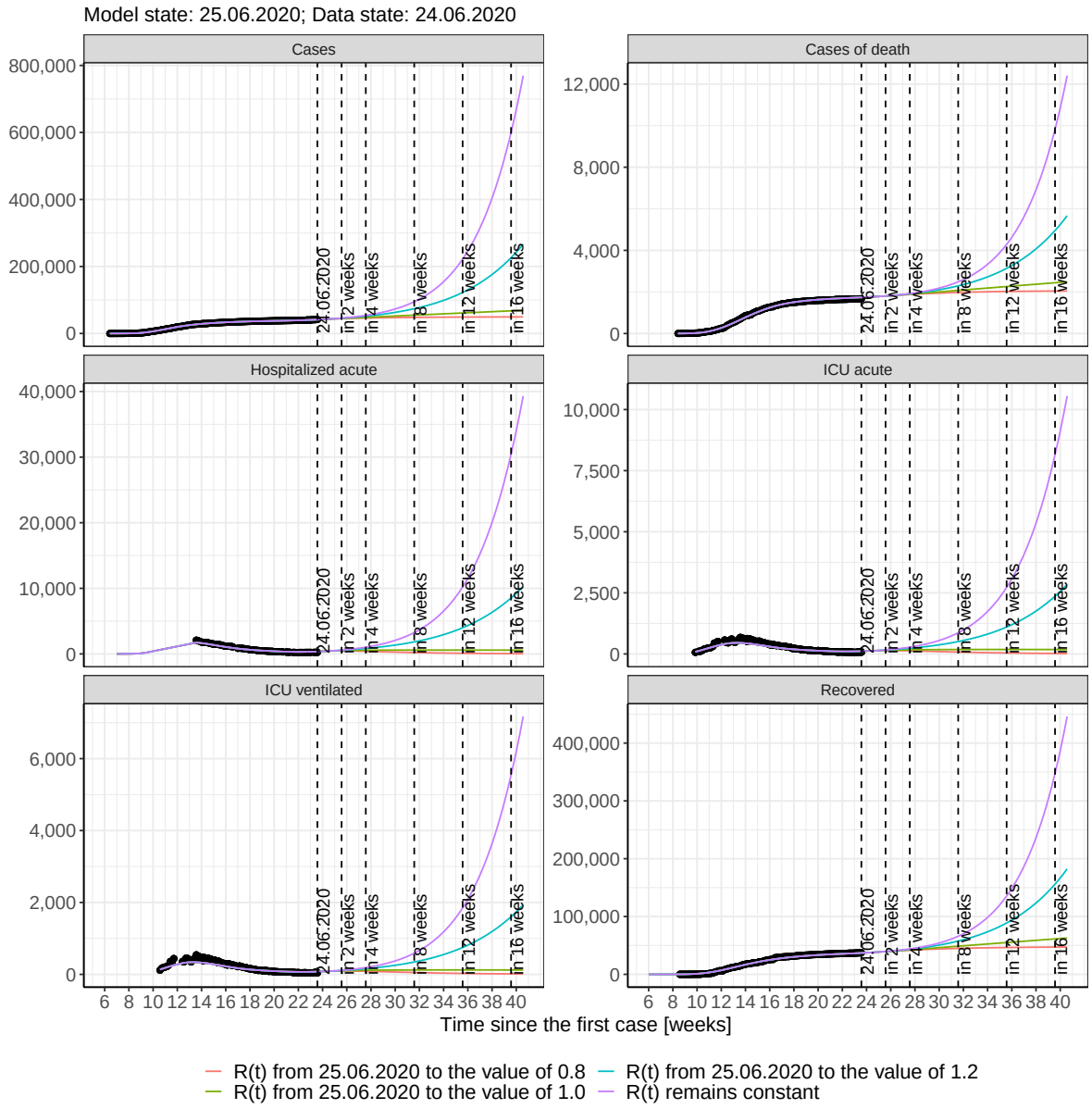


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

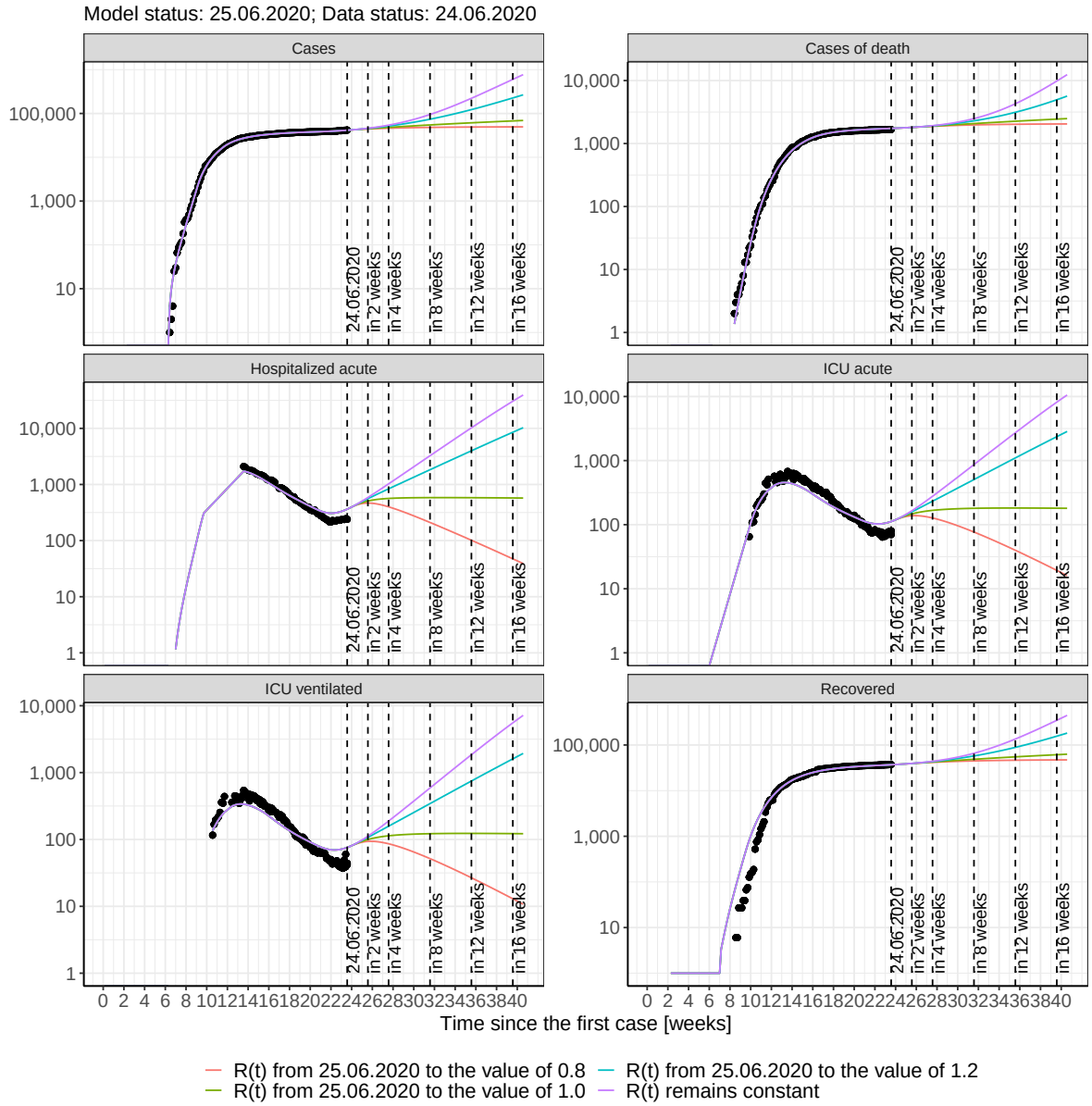


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 41) Model status from 25.06.2020; Data status: 24.06.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	41699	1743	37077	374	114	77
26.06.2020	41953	1747	37230	385	117	79
27.06.2020	42218	1751	37388	397	119	81
28.06.2020	42495	1755	37550	410	122	83
29.06.2020	42783	1760	37718	423	125	85
30.06.2020	43084	1764	37891	438	129	87
01.07.2020	43397	1769	38070	453	132	90
02.07.2020	43724	1774	38256	470	136	92
03.07.2020	44064	1778	38448	487	140	95
04.07.2020	44419	1784	38647	505	145	98
05.07.2020	44790	1789	38854	524	149	101
06.07.2020	45176	1794	39068	544	154	105
07.07.2020	45578	1800	39291	565	159	108
08.07.2020	45998	1806	39523	587	165	112
09.07.2020	46435	1812	39764	610	171	116
10.07.2020	46891	1819	40014	634	177	120
11.07.2020	47367	1826	40275	660	183	124
12.07.2020	47863	1832	40546	686	190	129
13.07.2020	48379	1840	40828	714	197	134
14.07.2020	48918	1847	41122	743	204	139
15.07.2020	49480	1855	41427	773	212	144
16.07.2020	50066	1863	41746	805	220	149
17.07.2020	50676	1872	42077	838	229	155
18.07.2020	51313	1881	42423	872	238	161
19.07.2020	51976	1890	42783	908	247	168
20.07.2020	52668	1900	43158	946	257	174
21.07.2020	53389	1910	43548	985	267	181
22.07.2020	54141	1920	43955	1026	277	188

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	41690	1743	37077	374	114	77
26.06.2020	41919	1747	37230	385	117	79
27.06.2020	42141	1751	37387	396	119	81
28.06.2020	42357	1755	37548	407	122	82
29.06.2020	42567	1760	37712	418	124	84
30.06.2020	42771	1764	37880	428	127	86
01.07.2020	42969	1769	38050	437	129	87
02.07.2020	43161	1773	38223	445	131	89
03.07.2020	43348	1778	38398	452	133	90
04.07.2020	43529	1783	38574	457	134	91
05.07.2020	43706	1788	38752	461	136	92
06.07.2020	43877	1793	38931	464	137	93
07.07.2020	44044	1798	39110	466	137	93
08.07.2020	44205	1803	39289	466	138	93
09.07.2020	44362	1809	39467	466	138	94
10.07.2020	44515	1814	39645	464	138	94
11.07.2020	44664	1819	39822	462	138	94
12.07.2020	44808	1824	39998	459	138	94
13.07.2020	44948	1830	40173	455	137	93
14.07.2020	45084	1835	40346	451	137	93
15.07.2020	45216	1840	40517	445	136	92
16.07.2020	45344	1846	40686	440	135	92
17.07.2020	45469	1851	40853	434	134	91
18.07.2020	45590	1856	41017	428	133	90
19.07.2020	45708	1861	41179	421	132	89
20.07.2020	45822	1866	41339	414	130	88
21.07.2020	45933	1871	41496	407	129	87
22.07.2020	46041	1876	41651	400	127	86

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	41694	1743	37077	374	114	77
26.06.2020	41932	1747	37230	385	117	79
27.06.2020	42171	1751	37387	396	119	81
28.06.2020	42409	1755	37549	408	122	82
29.06.2020	42648	1760	37714	420	125	84
30.06.2020	42886	1764	37884	432	127	86
01.07.2020	43125	1769	38058	443	130	88
02.07.2020	43363	1773	38235	454	133	90
03.07.2020	43601	1778	38416	465	135	92
04.07.2020	43839	1783	38601	474	138	93
05.07.2020	44077	1788	38789	484	140	95
06.07.2020	44315	1794	38980	492	143	97
07.07.2020	44552	1799	39174	500	145	98
08.07.2020	44790	1804	39371	508	147	100
09.07.2020	45028	1810	39570	514	149	101
10.07.2020	45265	1816	39772	521	151	102
11.07.2020	45502	1821	39975	526	153	104
12.07.2020	45740	1827	40181	531	155	105
13.07.2020	45977	1833	40389	536	156	106
14.07.2020	46214	1839	40599	541	158	107
15.07.2020	46451	1845	40810	545	159	108
16.07.2020	46688	1851	41022	548	160	109
17.07.2020	46925	1858	41236	551	162	110
18.07.2020	47162	1864	41452	554	163	111
19.07.2020	47398	1870	41668	557	164	111
20.07.2020	47635	1876	41886	559	165	112
21.07.2020	47872	1883	42105	562	166	113
22.07.2020	48108	1889	42324	564	167	113

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	41697	1743	37077	374	114	77
26.06.2020	41946	1747	37230	385	117	79
27.06.2020	42203	1751	37388	397	119	81
28.06.2020	42466	1755	37550	409	122	83
29.06.2020	42737	1760	37717	422	125	85
30.06.2020	43016	1764	37889	436	128	87
01.07.2020	43303	1769	38066	450	132	89
02.07.2020	43598	1773	38249	464	135	91
03.07.2020	43901	1778	38437	479	139	94
04.07.2020	44214	1783	38631	494	142	96
05.07.2020	44535	1789	38831	510	146	99
06.07.2020	44865	1794	39038	526	150	102
07.07.2020	45204	1800	39250	542	154	105
08.07.2020	45554	1806	39469	559	159	107
09.07.2020	45913	1812	39695	575	163	110
10.07.2020	46282	1818	39927	593	167	113
11.07.2020	46662	1824	40167	610	172	117
12.07.2020	47053	1831	40414	629	177	120
13.07.2020	47455	1837	40667	647	182	123
14.07.2020	47869	1844	40929	666	187	127
15.07.2020	48294	1852	41198	686	192	130
16.07.2020	48731	1859	41475	705	197	134
17.07.2020	49181	1867	41761	726	203	138
18.07.2020	49644	1874	42055	747	208	141
19.07.2020	50119	1883	42357	768	214	145
20.07.2020	50609	1891	42668	790	220	149
21.07.2020	51112	1900	42988	813	226	154
22.07.2020	51630	1908	43318	836	232	158

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

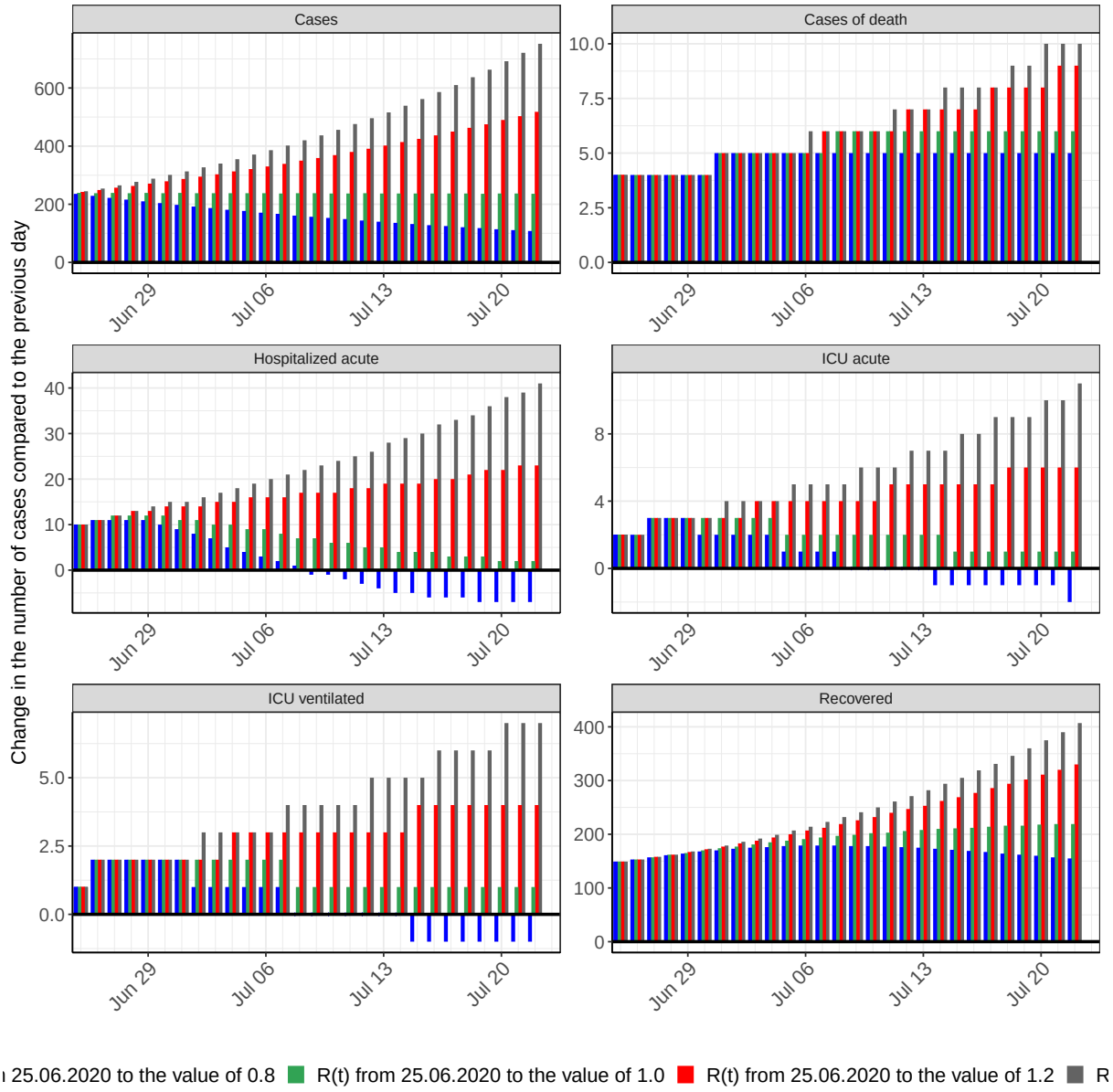


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

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.

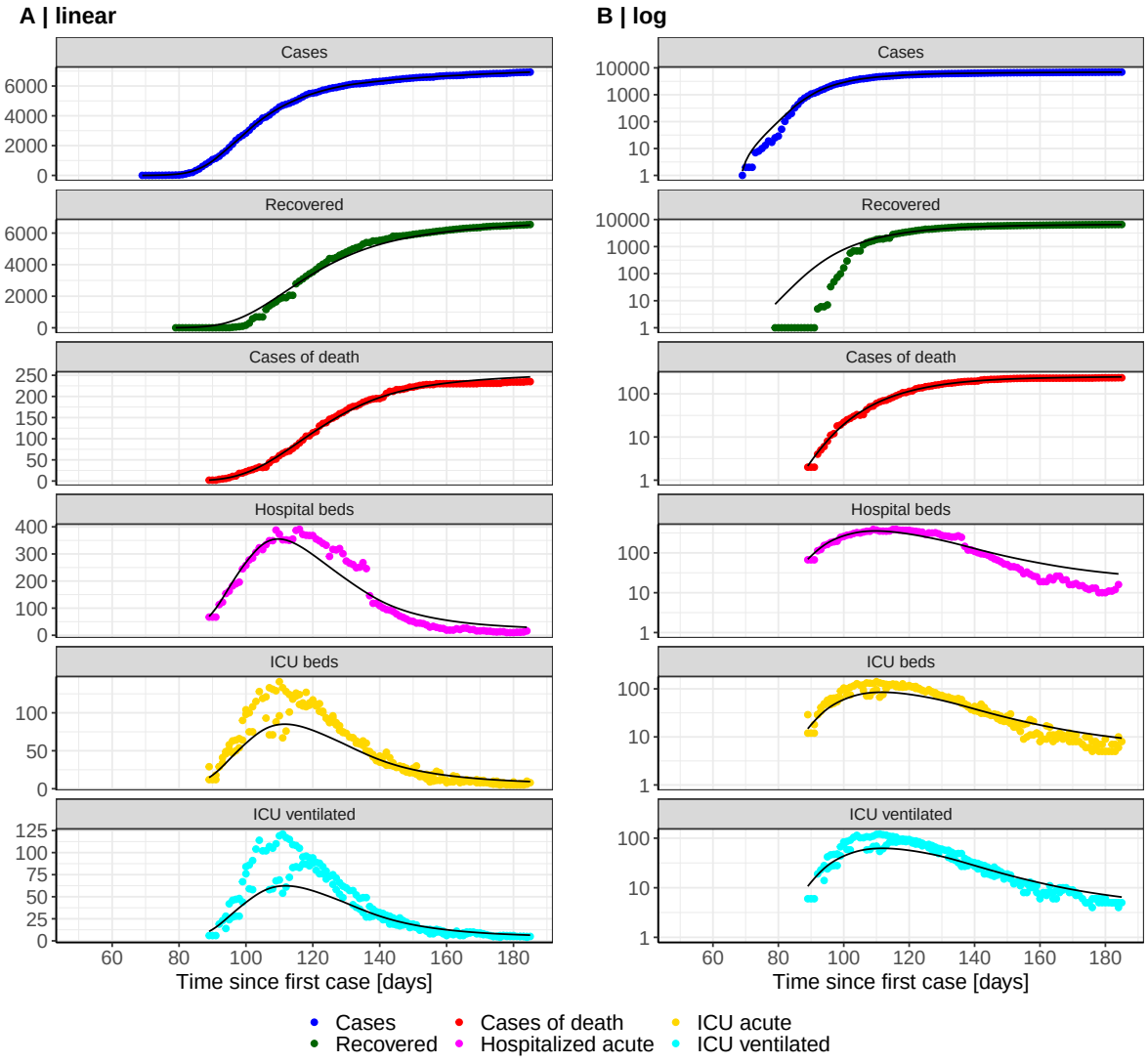


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

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.

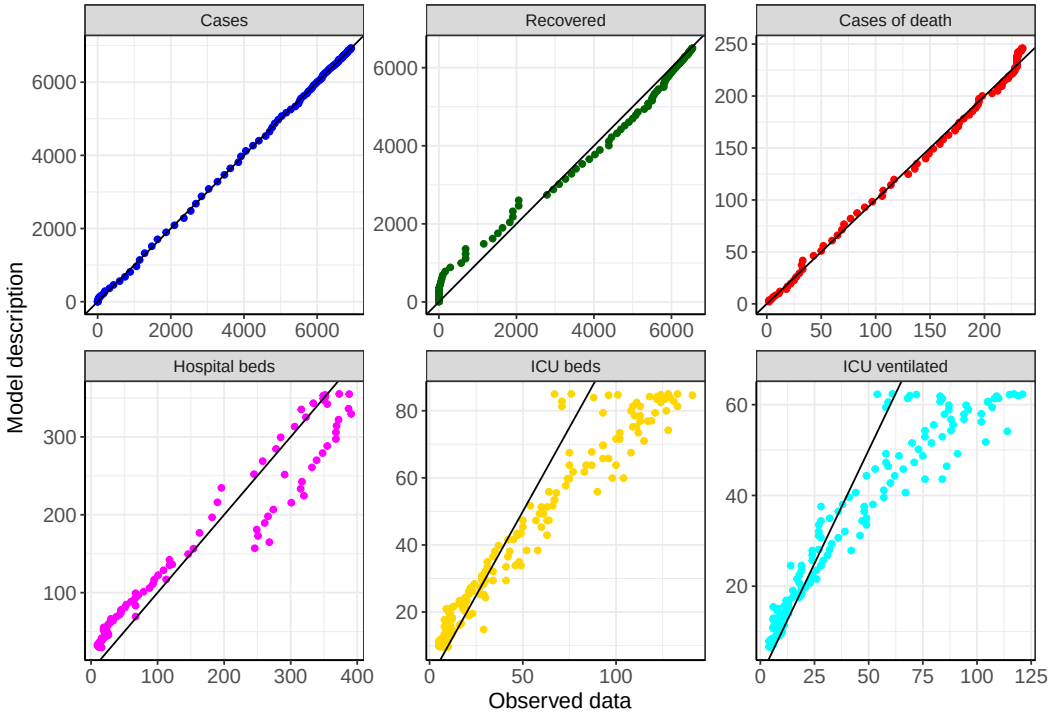


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

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).

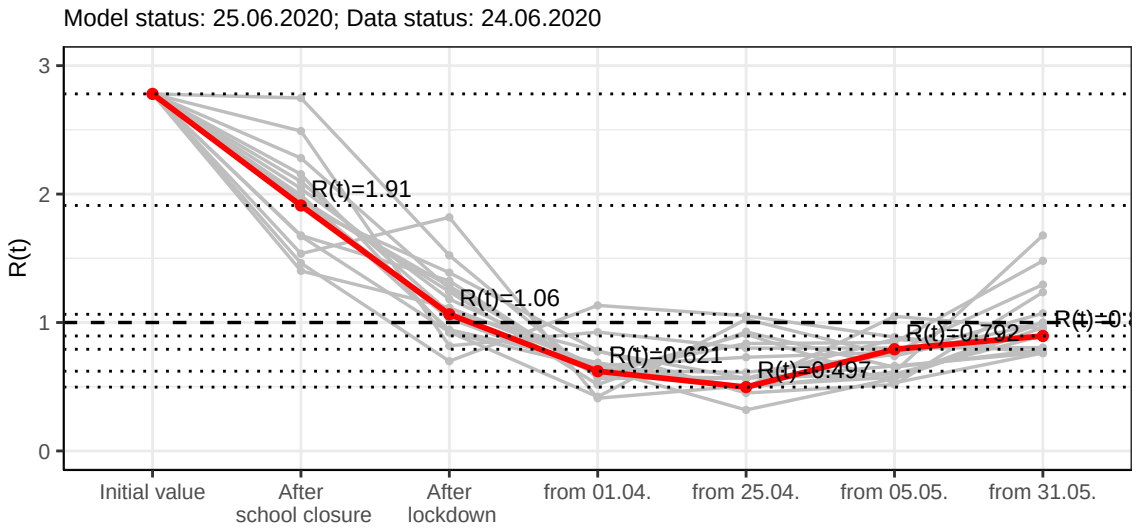


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

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

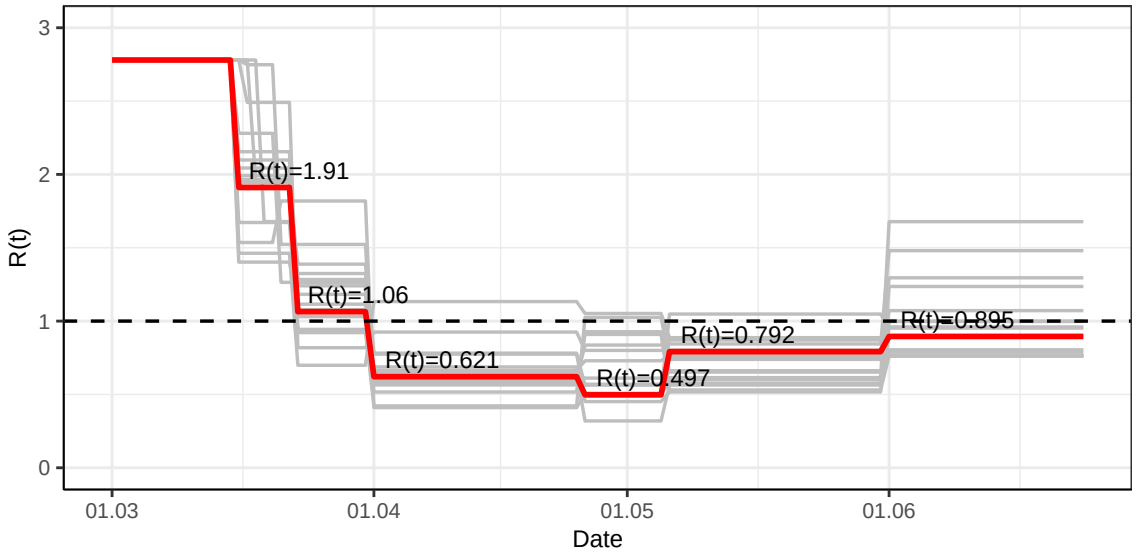


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

12.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.9)

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.

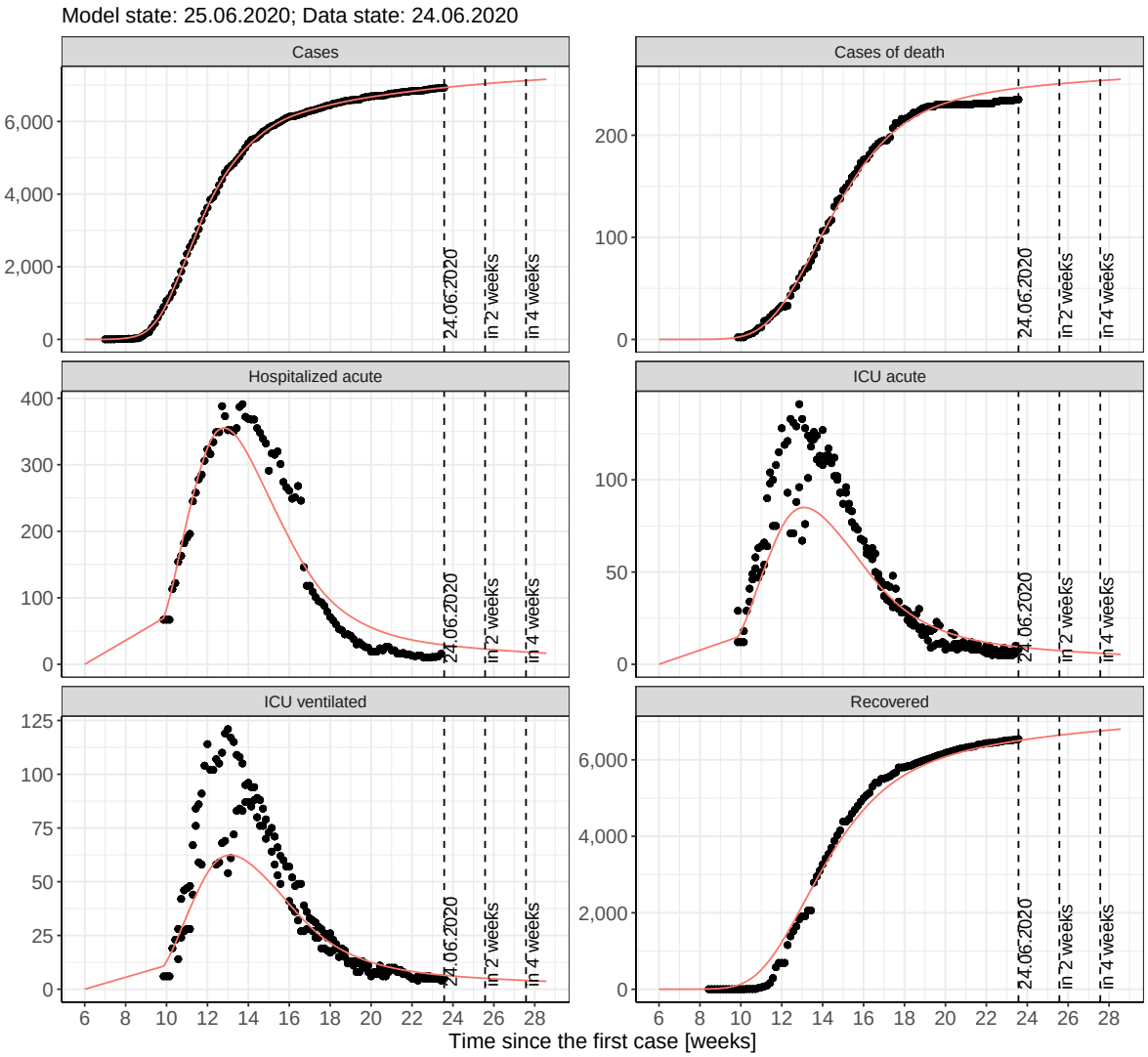


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

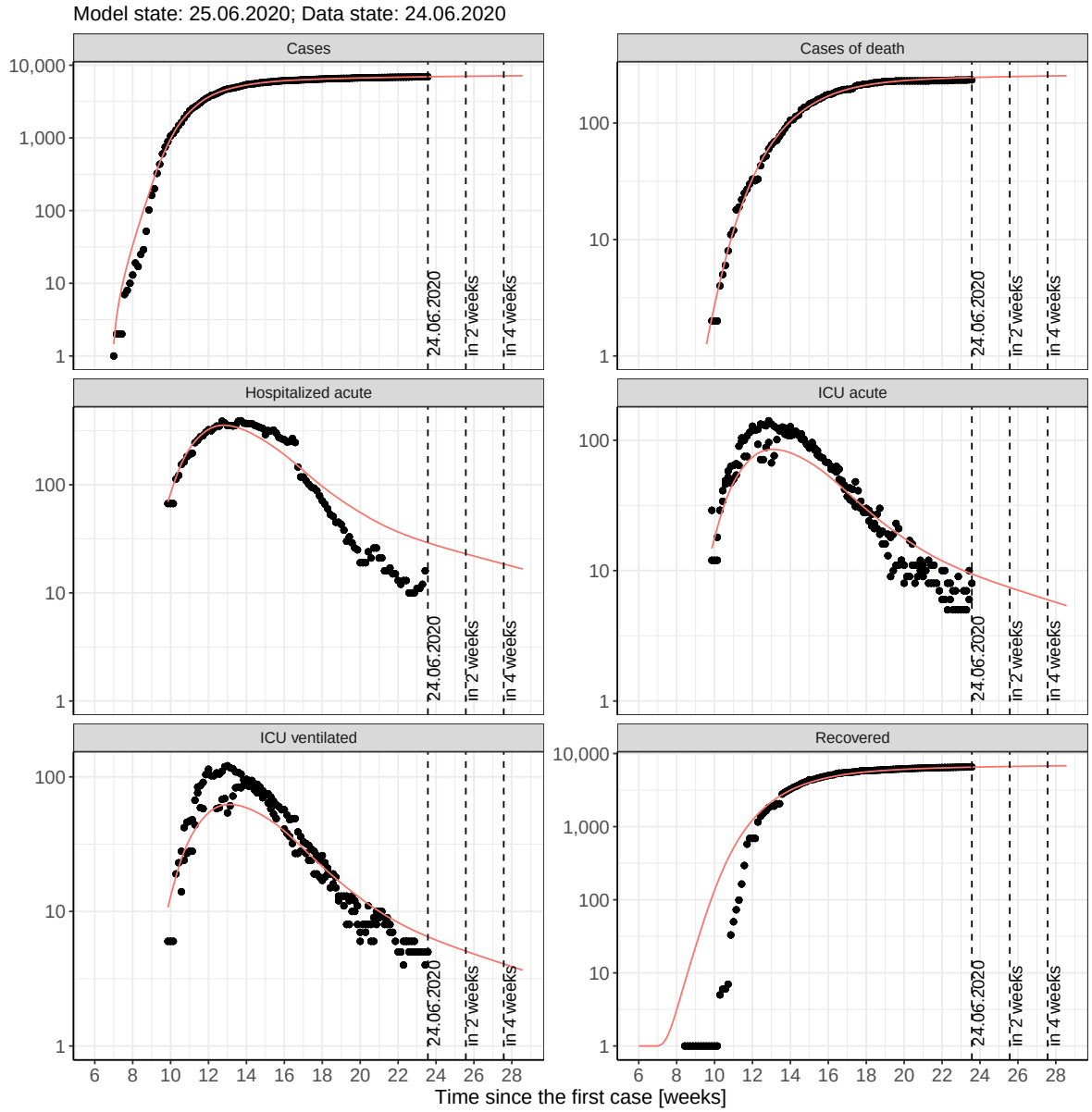


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

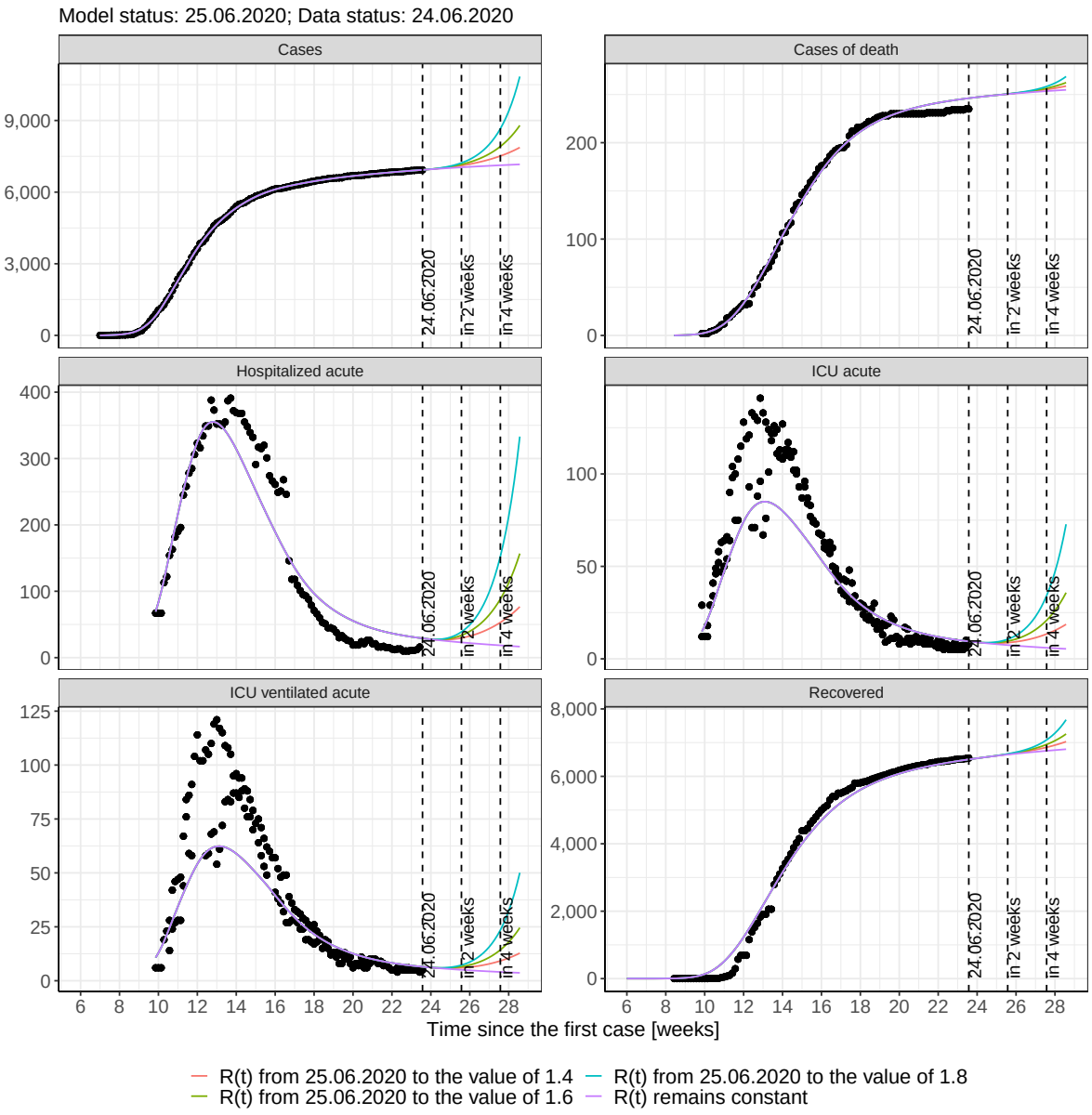


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

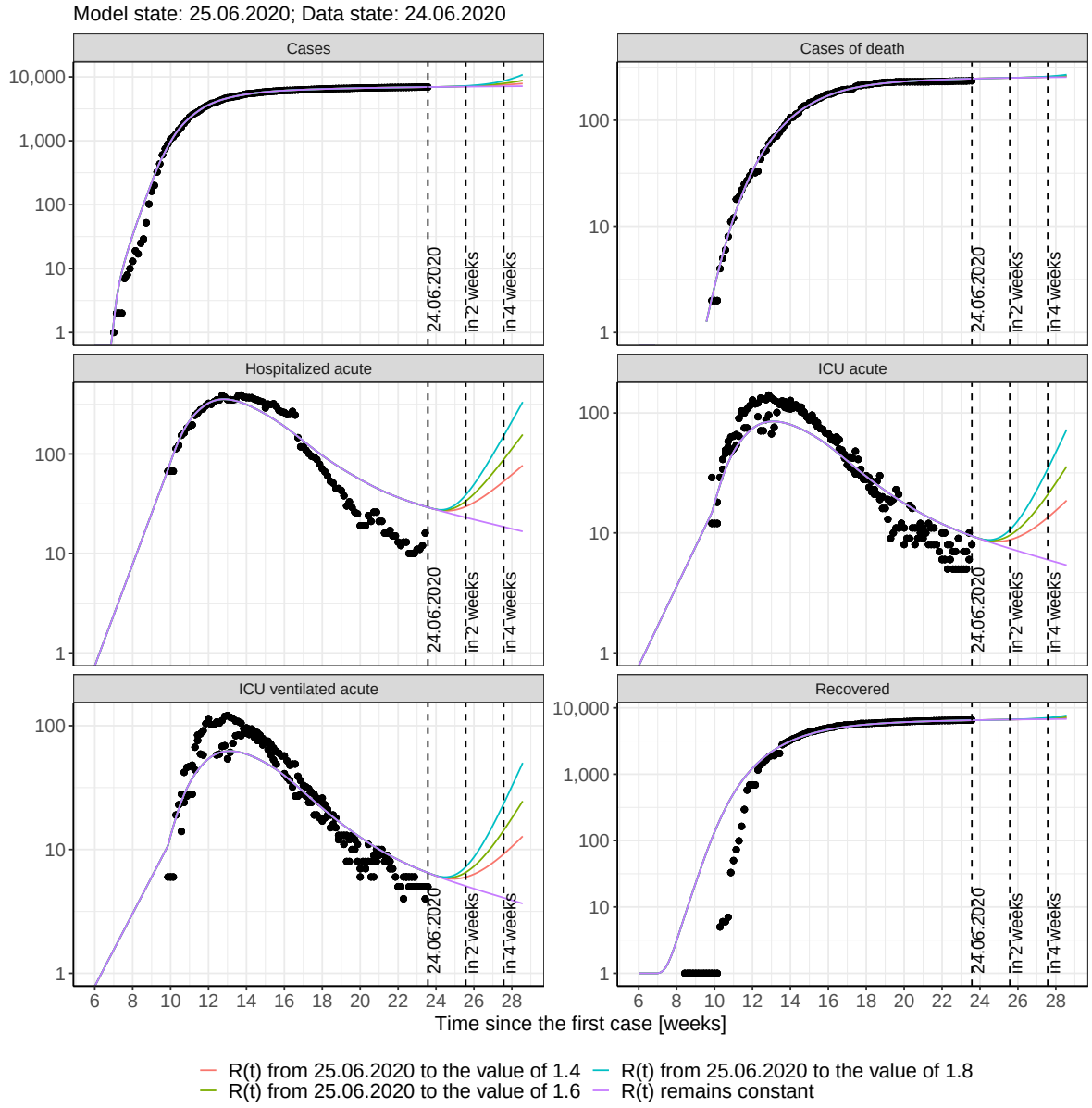


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

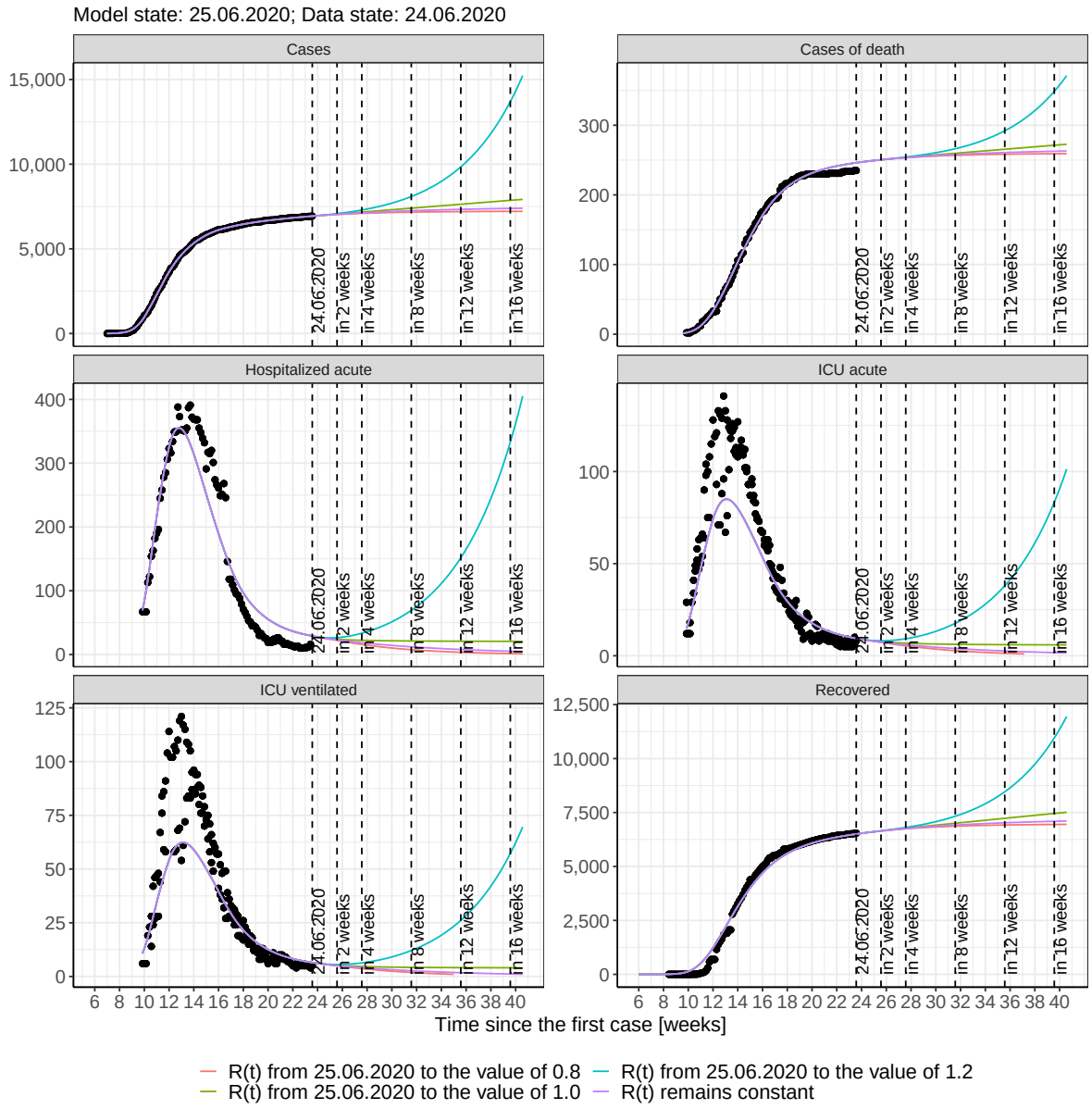


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

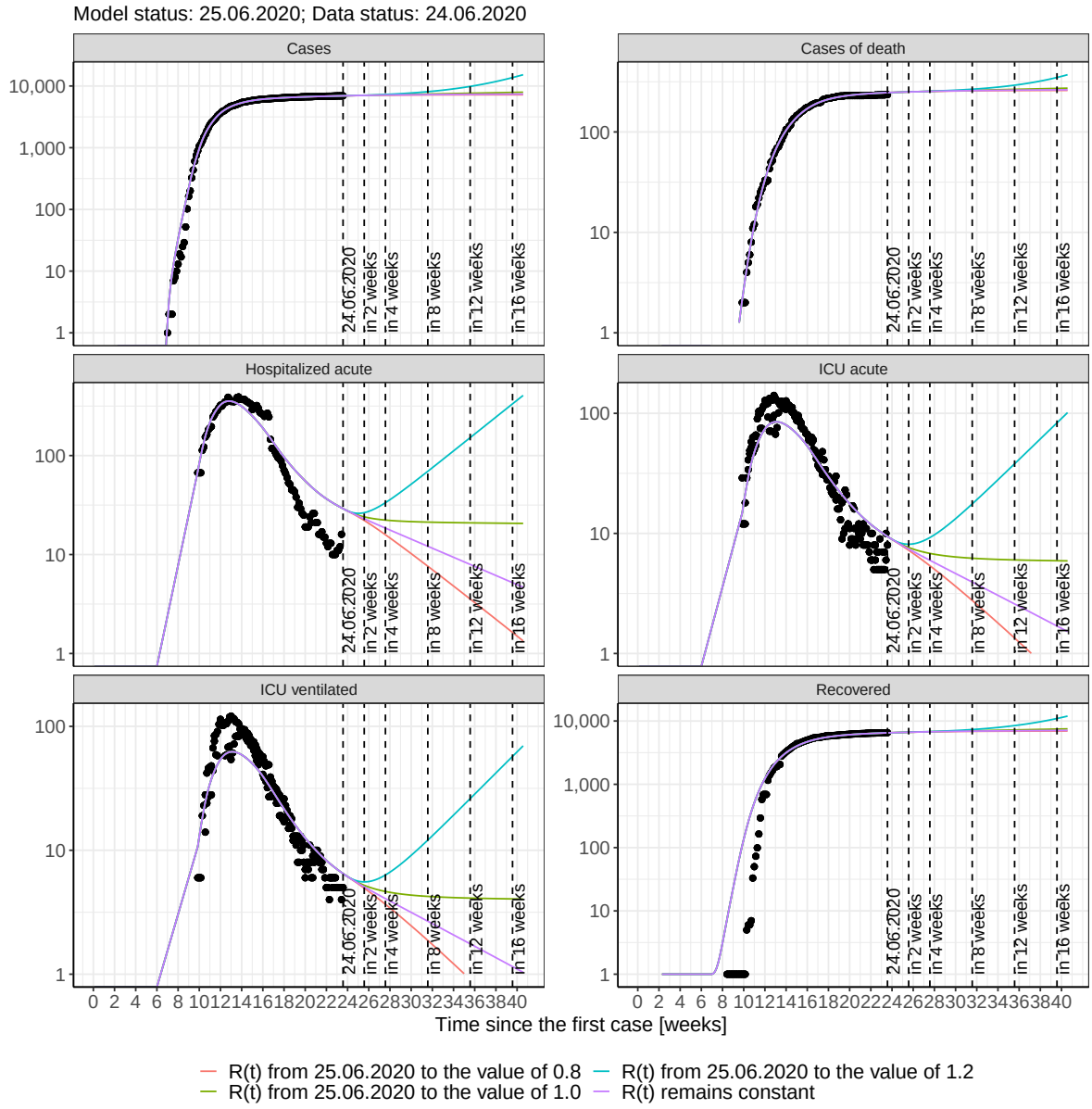


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 45) Model status from 25.06.2020; Data status: 24.06.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	6940	247	6514	29	9	6
26.06.2020	6949	247	6526	28	9	6
27.06.2020	6957	247	6537	28	9	6
28.06.2020	6965	248	6548	27	9	6
29.06.2020	6973	248	6558	27	9	6
30.06.2020	6980	248	6569	26	8	6
01.07.2020	6988	248	6579	26	8	6
02.07.2020	6996	249	6589	25	8	6
03.07.2020	7003	249	6599	25	8	6
04.07.2020	7010	249	6608	24	8	5
05.07.2020	7018	250	6618	24	8	5
06.07.2020	7025	250	6627	24	8	5
07.07.2020	7032	250	6636	23	8	5
08.07.2020	7038	250	6646	23	7	5
09.07.2020	7045	251	6654	23	7	5
10.07.2020	7052	251	6663	22	7	5
11.07.2020	7058	251	6672	22	7	5
12.07.2020	7065	251	6680	22	7	5
13.07.2020	7071	252	6688	21	7	5
14.07.2020	7078	252	6696	21	7	5
15.07.2020	7084	252	6704	21	7	5
16.07.2020	7090	252	6712	20	7	4
17.07.2020	7096	252	6720	20	6	4
18.07.2020	7102	253	6728	20	6	4
19.07.2020	7108	253	6735	19	6	4
20.07.2020	7113	253	6743	19	6	4
21.07.2020	7119	253	6750	19	6	4
22.07.2020	7125	254	6757	18	6	4

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	6940	247	6514	29	9	6
26.06.2020	6948	247	6526	28	9	6
27.06.2020	6956	247	6537	28	9	6
28.06.2020	6964	248	6548	27	9	6
29.06.2020	6971	248	6558	27	9	6
30.06.2020	6978	248	6569	26	8	6
01.07.2020	6986	248	6579	26	8	6
02.07.2020	6992	249	6589	25	8	6
03.07.2020	6999	249	6598	25	8	5
04.07.2020	7005	249	6608	24	8	5
05.07.2020	7012	250	6617	24	8	5
06.07.2020	7018	250	6626	23	8	5
07.07.2020	7024	250	6636	23	7	5
08.07.2020	7029	250	6644	22	7	5
09.07.2020	7035	251	6653	22	7	5
10.07.2020	7040	251	6661	21	7	5
11.07.2020	7046	251	6669	21	7	5
12.07.2020	7051	251	6677	20	7	5
13.07.2020	7056	252	6685	20	7	4
14.07.2020	7060	252	6692	19	6	4
15.07.2020	7065	252	6700	19	6	4
16.07.2020	7070	252	6707	18	6	4
17.07.2020	7074	252	6714	18	6	4
18.07.2020	7078	253	6721	17	6	4
19.07.2020	7082	253	6728	17	6	4
20.07.2020	7086	253	6734	17	6	4
21.07.2020	7090	253	6740	16	6	4
22.07.2020	7094	253	6747	16	5	4

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	6940	247	6514	29	9	6
26.06.2020	6949	247	6526	28	9	6
27.06.2020	6957	247	6537	28	9	6
28.06.2020	6966	248	6548	27	9	6
29.06.2020	6974	248	6558	27	9	6
30.06.2020	6983	248	6569	26	8	6
01.07.2020	6991	248	6579	26	8	6
02.07.2020	6999	249	6589	26	8	6
03.07.2020	7008	249	6599	25	8	6
04.07.2020	7016	249	6609	25	8	5
05.07.2020	7025	250	6619	25	8	5
06.07.2020	7033	250	6628	24	8	5
07.07.2020	7042	250	6638	24	8	5
08.07.2020	7050	250	6647	24	8	5
09.07.2020	7058	251	6656	24	8	5
10.07.2020	7067	251	6666	24	7	5
11.07.2020	7075	251	6675	23	7	5
12.07.2020	7084	251	6684	23	7	5
13.07.2020	7092	252	6693	23	7	5
14.07.2020	7100	252	6702	23	7	5
15.07.2020	7109	252	6710	23	7	5
16.07.2020	7117	252	6719	23	7	5
17.07.2020	7126	253	6728	23	7	5
18.07.2020	7134	253	6737	23	7	5
19.07.2020	7142	253	6745	23	7	5
20.07.2020	7151	253	6754	22	7	5
21.07.2020	7159	254	6762	22	7	5
22.07.2020	7168	254	6771	22	7	5

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	6940	247	6514	29	9	6
26.06.2020	6949	247	6526	28	9	6
27.06.2020	6958	247	6537	28	9	6
28.06.2020	6968	248	6548	27	9	6
29.06.2020	6977	248	6558	27	9	6
30.06.2020	6987	248	6569	27	9	6
01.07.2020	6997	248	6579	26	8	6
02.07.2020	7008	249	6590	26	8	6
03.07.2020	7018	249	6600	26	8	6
04.07.2020	7030	249	6610	26	8	6
05.07.2020	7041	250	6620	26	8	6
06.07.2020	7053	250	6630	26	8	6
07.07.2020	7065	250	6641	26	8	6
08.07.2020	7077	250	6651	26	8	6
09.07.2020	7090	251	6661	27	8	6
10.07.2020	7103	251	6671	27	8	6
11.07.2020	7116	251	6682	27	8	6
12.07.2020	7130	252	6692	28	8	6
13.07.2020	7144	252	6703	28	8	6
14.07.2020	7159	252	6714	29	8	6
15.07.2020	7174	252	6724	29	8	6
16.07.2020	7190	253	6736	30	9	6
17.07.2020	7206	253	6747	30	9	6
18.07.2020	7222	253	6758	31	9	6
19.07.2020	7239	253	6770	31	9	6
20.07.2020	7256	254	6782	32	9	6
21.07.2020	7274	254	6794	33	9	6
22.07.2020	7292	254	6807	33	9	6

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

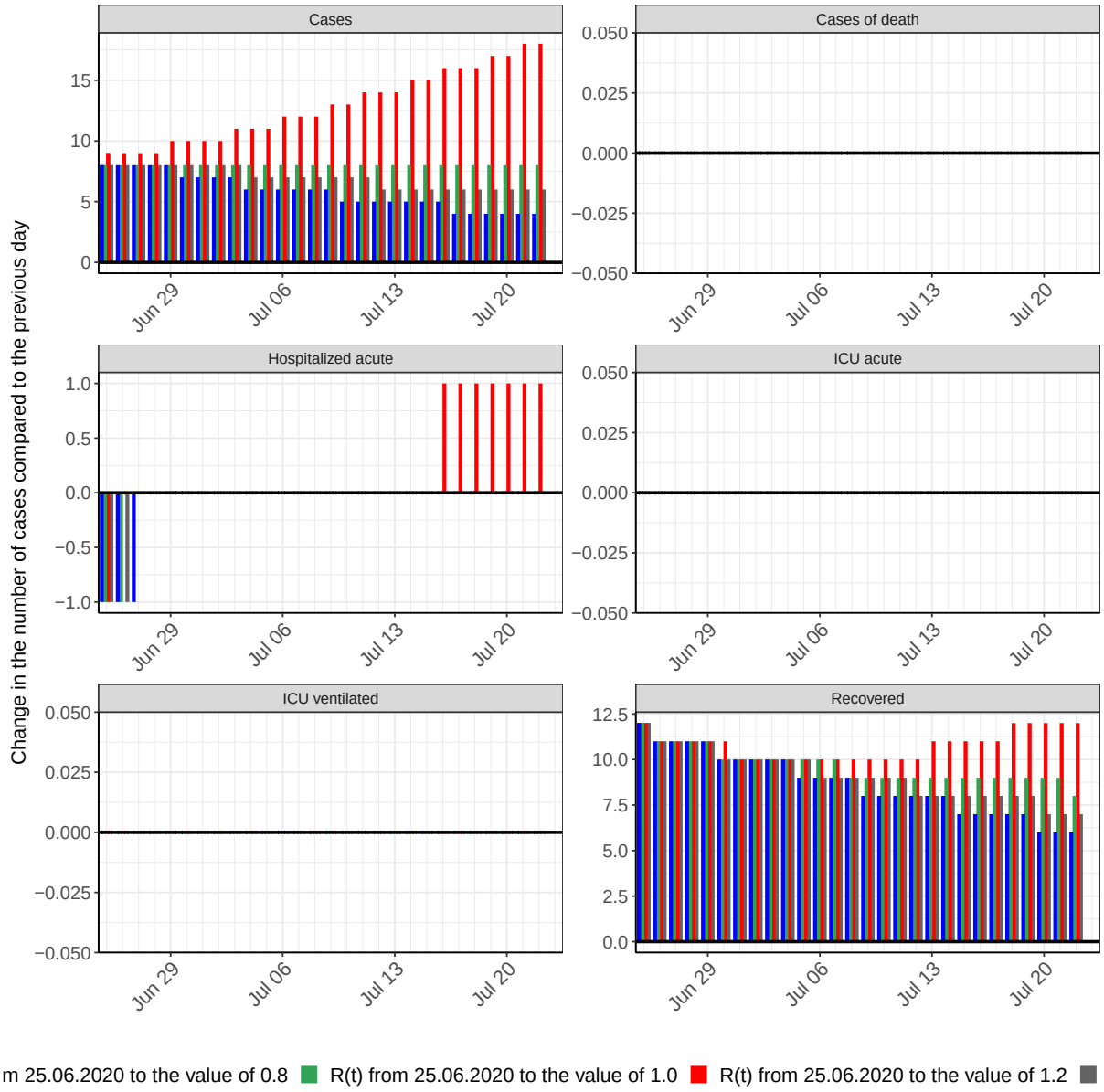


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

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.

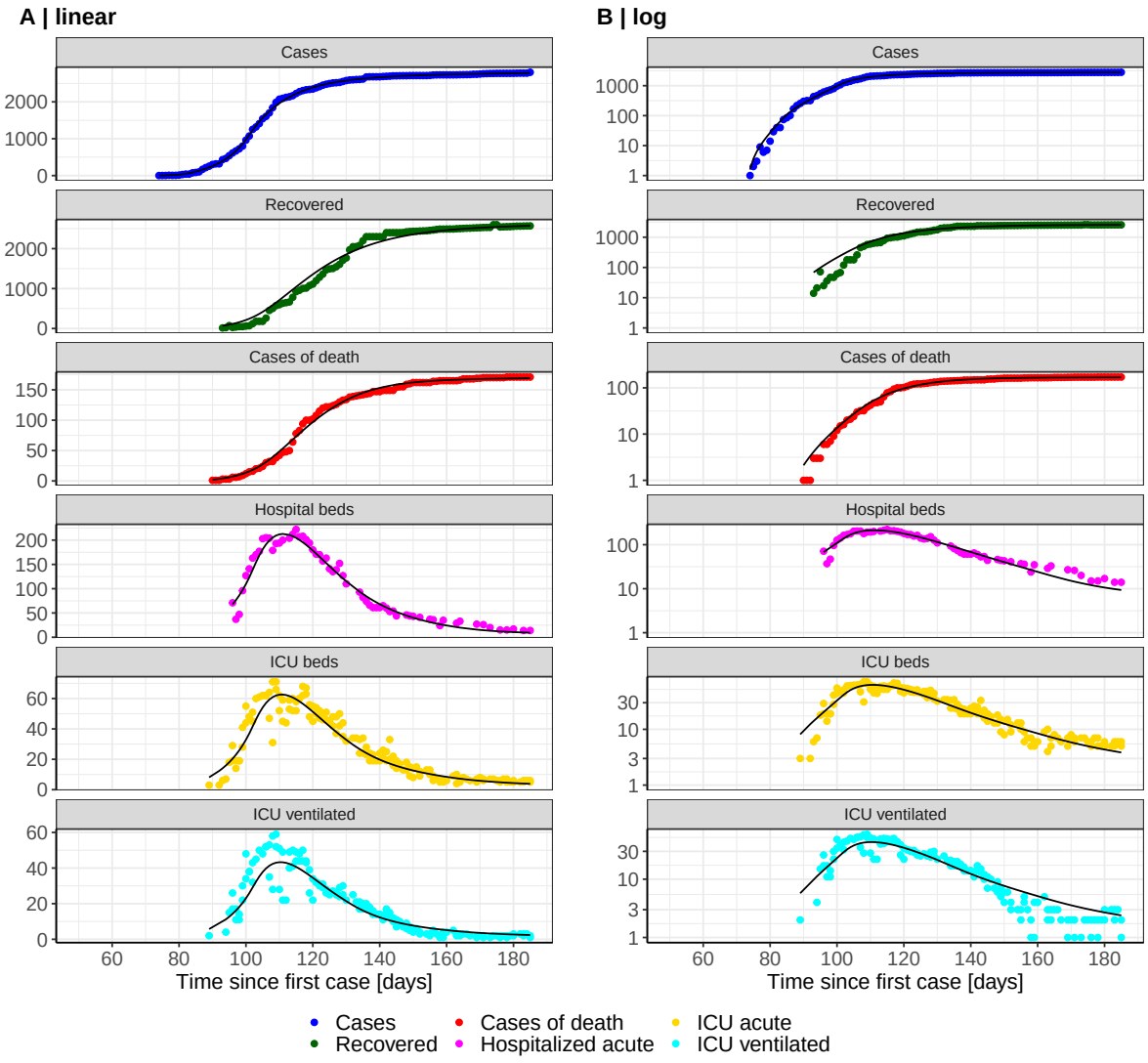


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

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.

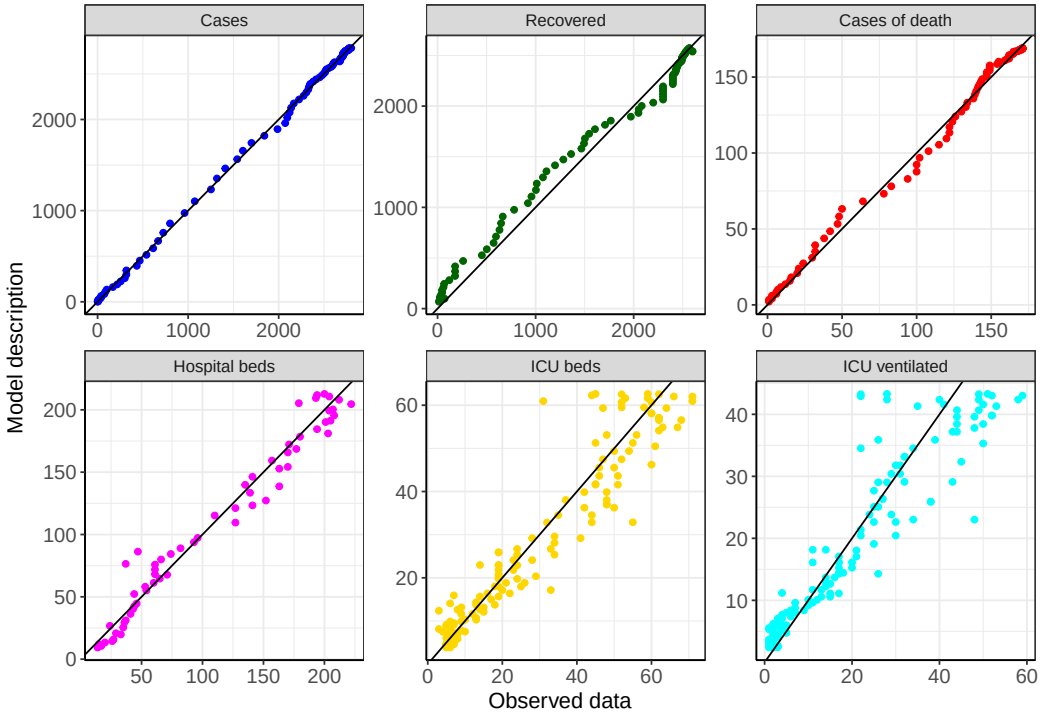


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

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).

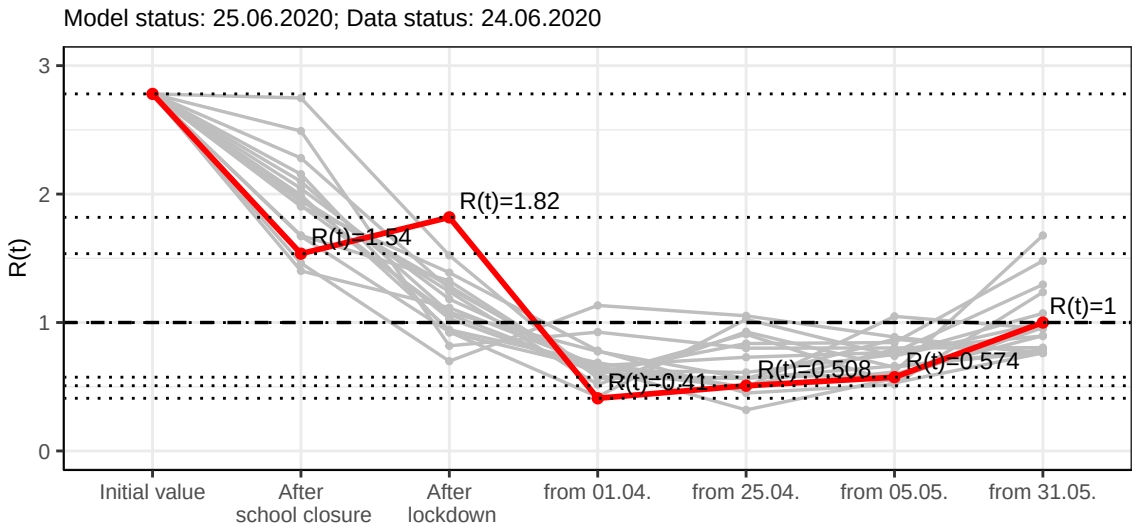


Figure 134: R(t) values before and after the NPIs for Saarland

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

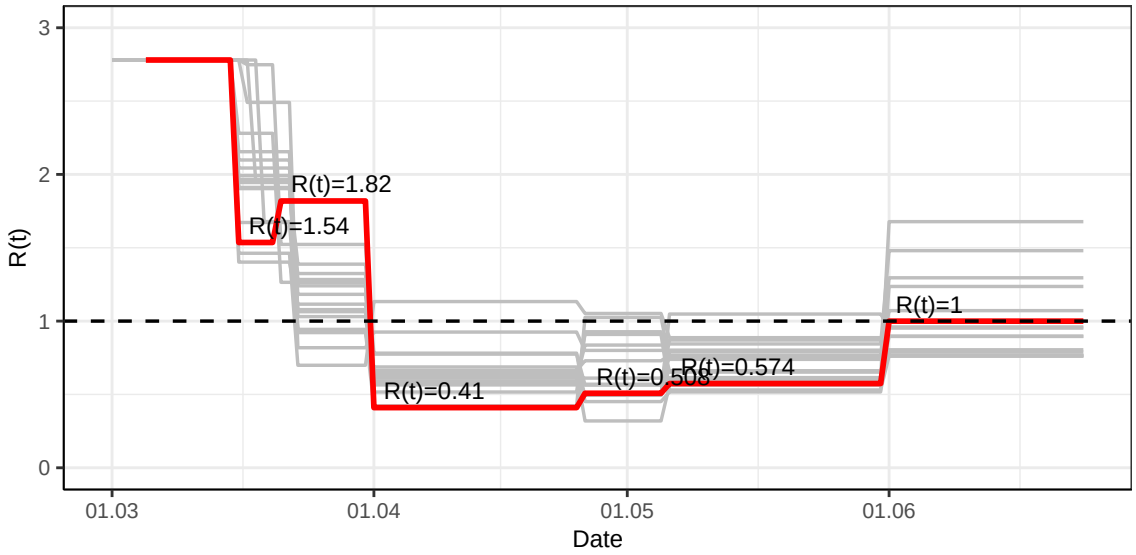


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

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

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

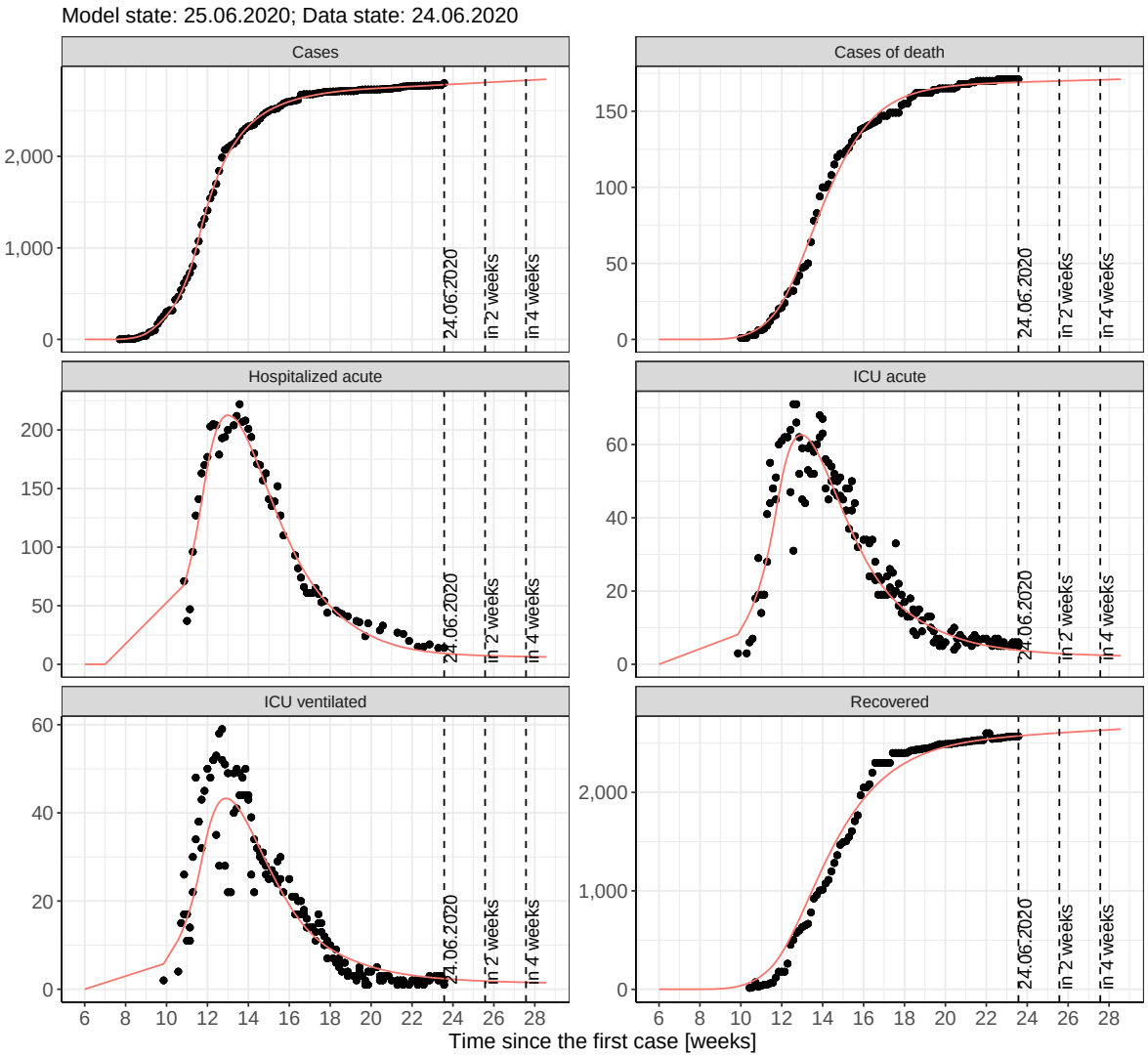


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

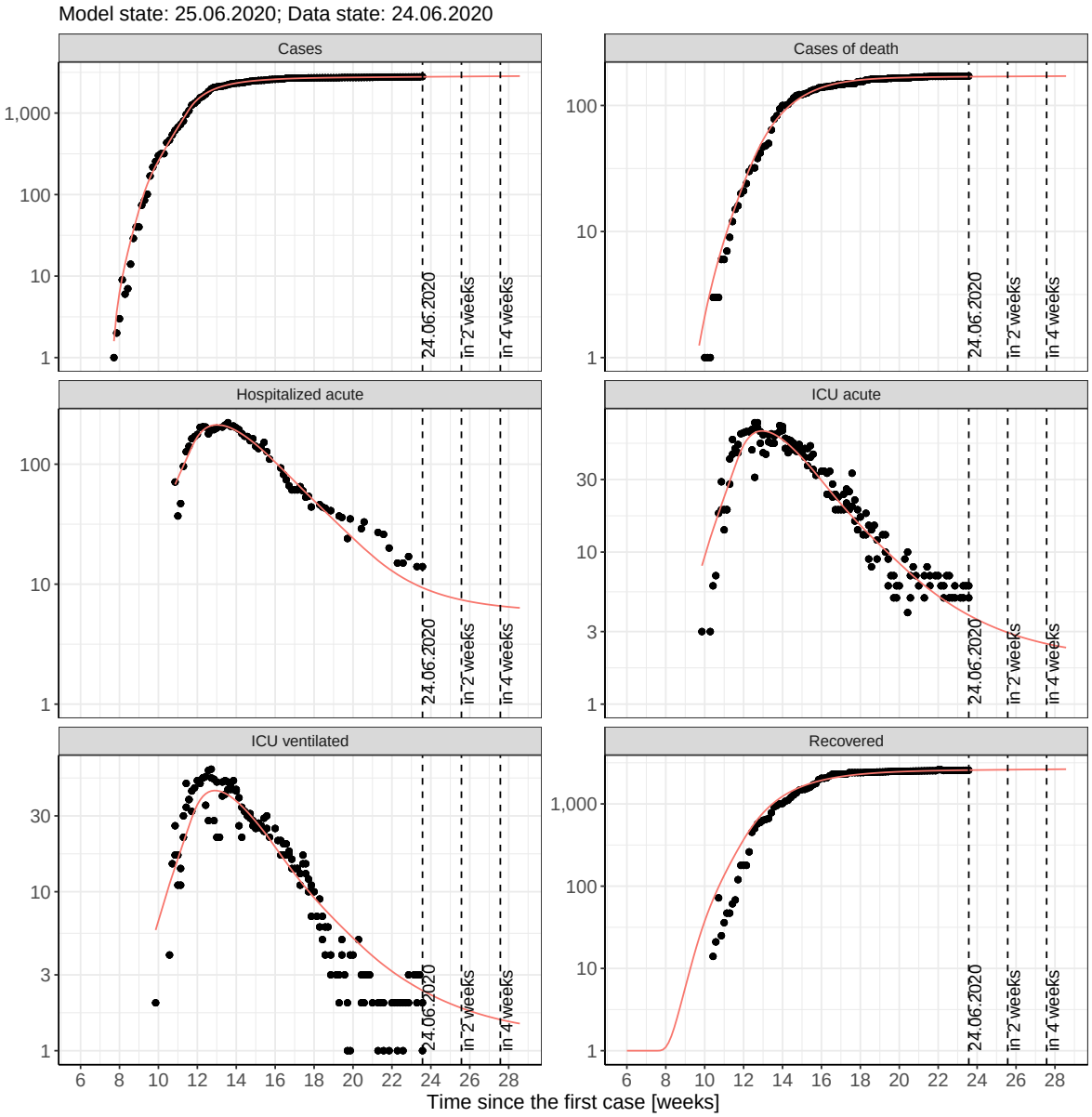


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

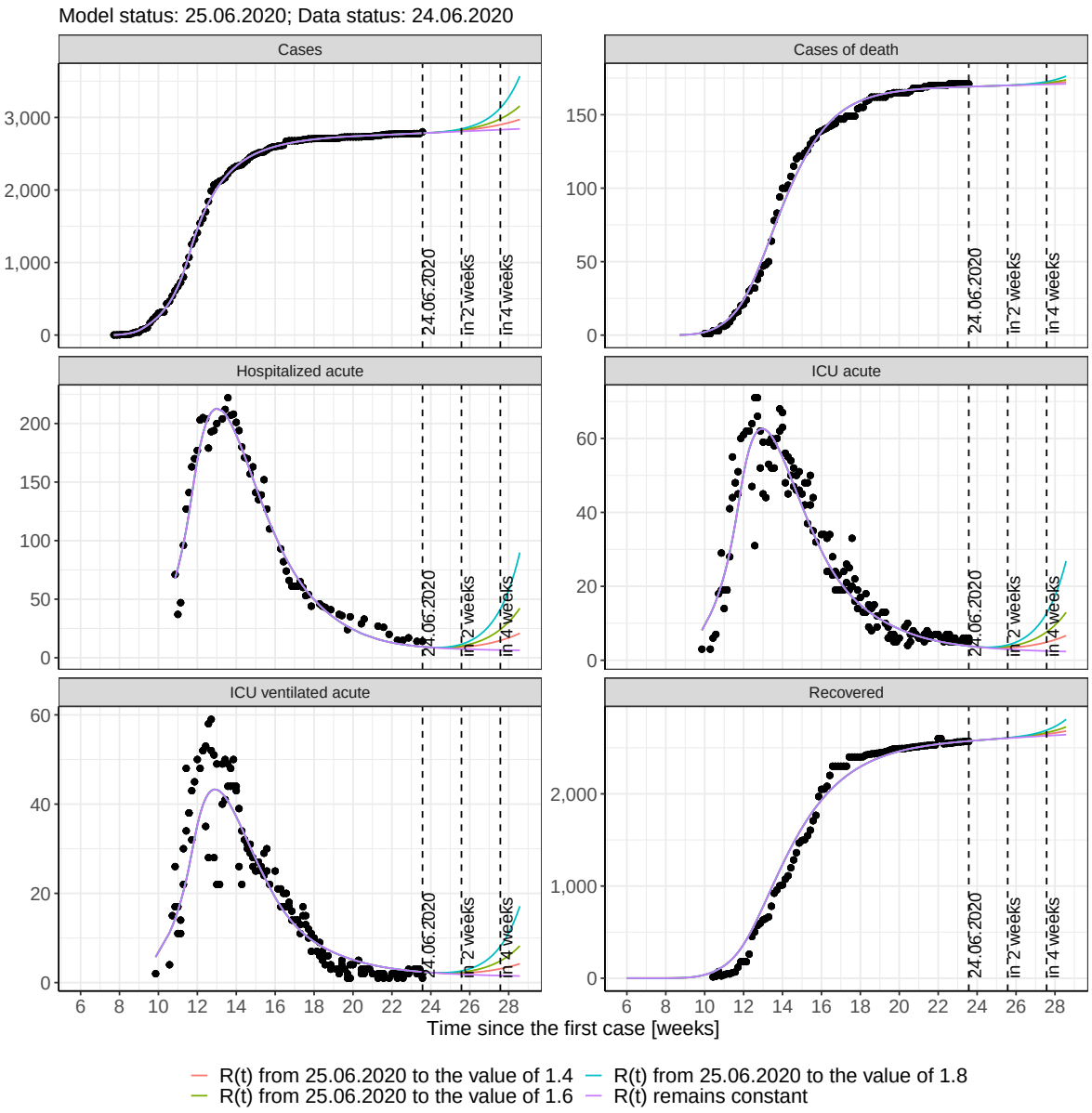


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

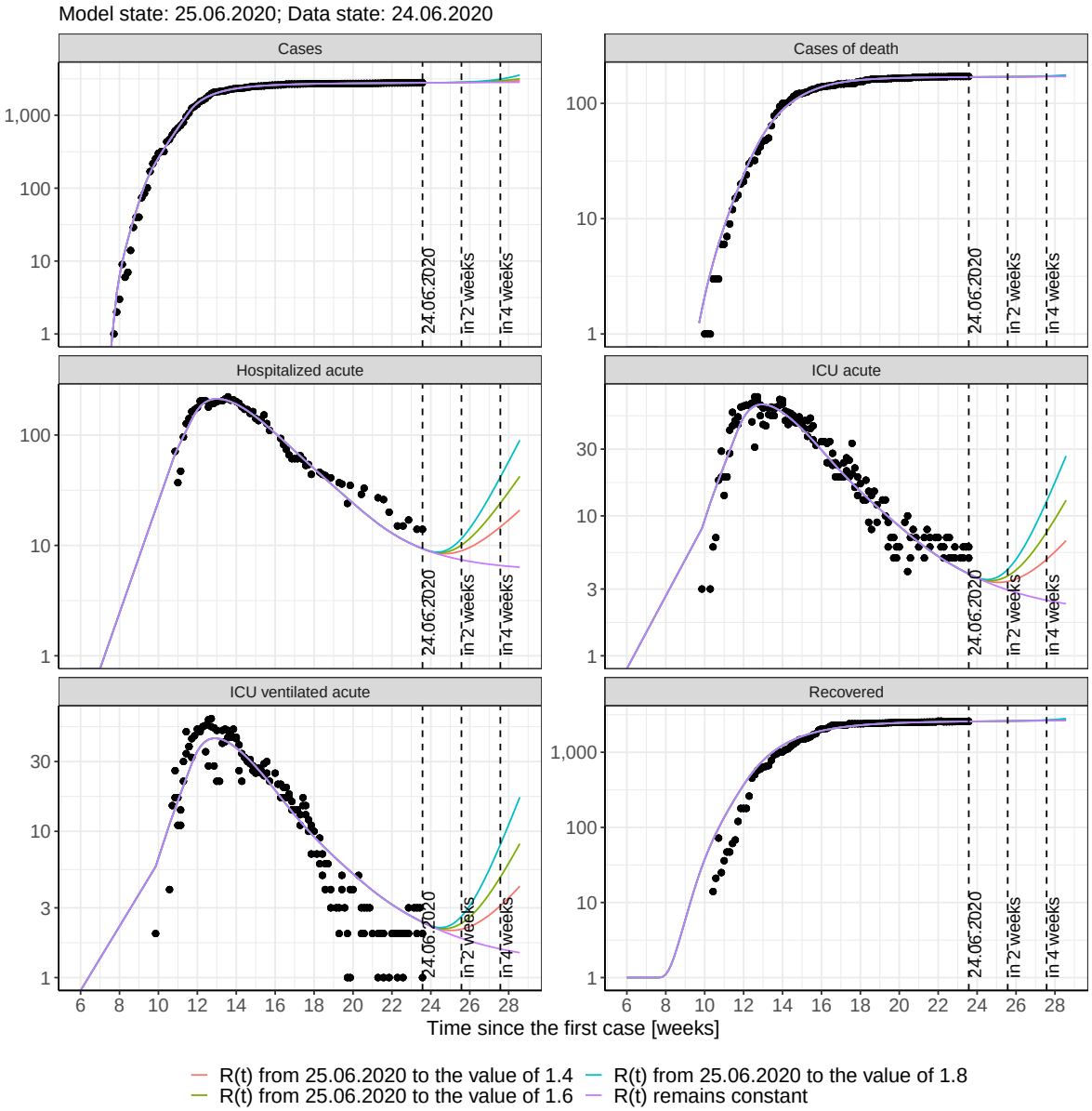


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

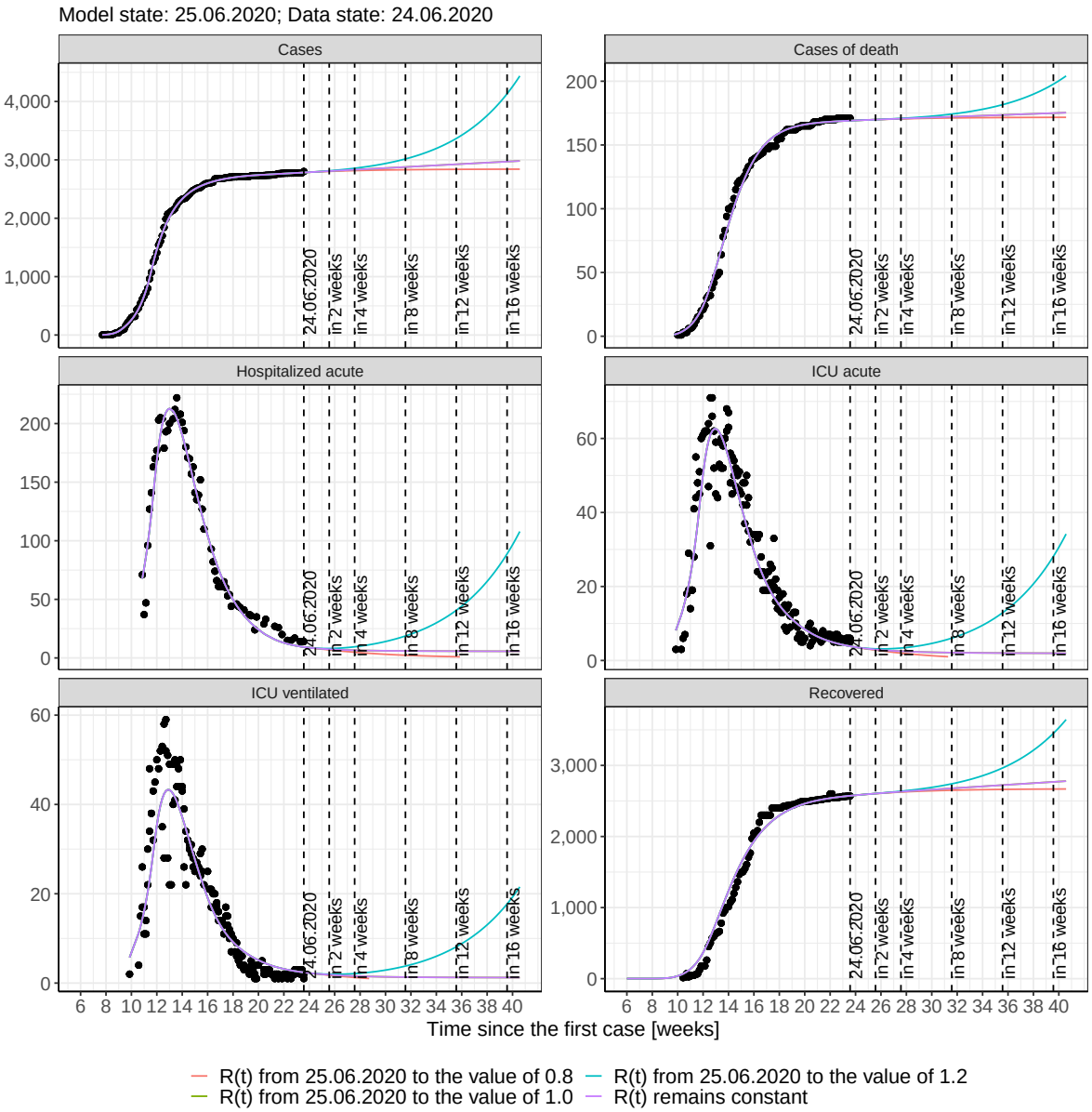


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

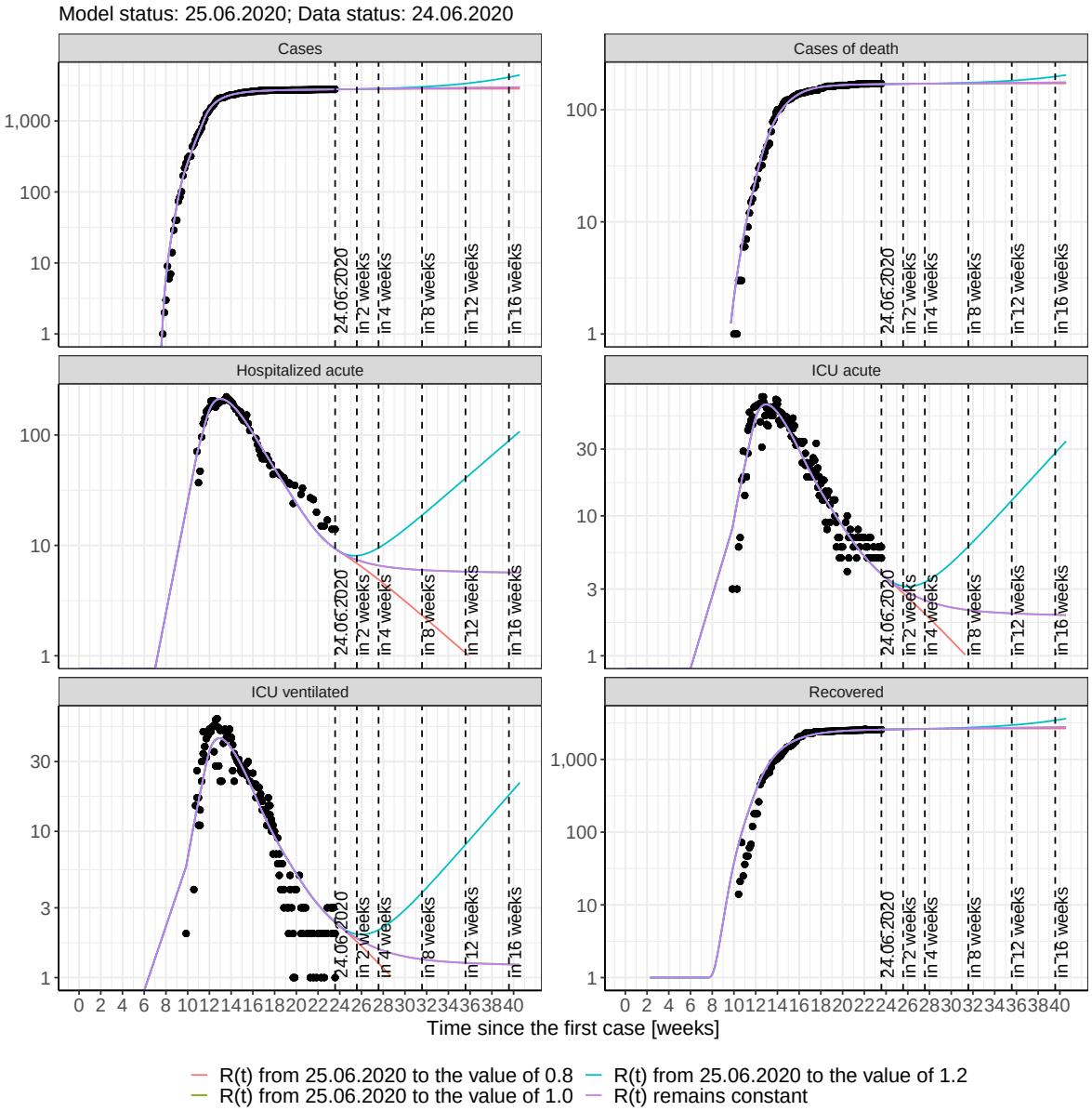


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 49) Model status from 25.06.2020; Data status: 24.06.2020.

Table 46: Saarland - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	2785	169	2576	9	4	2
26.06.2020	2787	169	2578	9	4	2
27.06.2020	2788	169	2580	9	4	2
28.06.2020	2790	169	2583	9	4	2
29.06.2020	2792	169	2585	8	3	2
30.06.2020	2794	169	2587	8	3	2
01.07.2020	2795	170	2589	8	3	2
02.07.2020	2797	170	2592	8	3	2
03.07.2020	2799	170	2594	8	3	2
04.07.2020	2800	170	2596	8	3	2
05.07.2020	2802	170	2598	8	3	2
06.07.2020	2804	170	2600	8	3	2
07.07.2020	2806	170	2602	7	3	2
08.07.2020	2807	170	2604	7	3	2
09.07.2020	2809	170	2606	7	3	2
10.07.2020	2811	170	2608	7	3	2
11.07.2020	2812	170	2610	7	3	2
12.07.2020	2814	170	2612	7	3	2
13.07.2020	2816	170	2614	7	3	2
14.07.2020	2817	170	2615	7	3	2
15.07.2020	2819	170	2617	7	3	2
16.07.2020	2821	170	2619	7	3	2
17.07.2020	2822	170	2621	7	3	2
18.07.2020	2824	170	2623	7	3	2
19.07.2020	2826	170	2624	7	3	2
20.07.2020	2828	171	2626	7	3	2
21.07.2020	2829	171	2628	7	3	2
22.07.2020	2831	171	2630	7	2	2

Table 47: Saarland - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	2785	169	2576	9	4	2
26.06.2020	2787	169	2578	9	4	2
27.06.2020	2788	169	2580	9	4	2
28.06.2020	2790	169	2583	9	4	2
29.06.2020	2791	169	2585	8	3	2
30.06.2020	2793	169	2587	8	3	2
01.07.2020	2794	170	2589	8	3	2
02.07.2020	2796	170	2592	8	3	2
03.07.2020	2797	170	2594	8	3	2
04.07.2020	2798	170	2596	8	3	2
05.07.2020	2800	170	2598	7	3	2
06.07.2020	2801	170	2600	7	3	2
07.07.2020	2802	170	2602	7	3	2
08.07.2020	2803	170	2603	7	3	2
09.07.2020	2804	170	2605	7	3	2
10.07.2020	2805	170	2607	7	3	2
11.07.2020	2806	170	2609	6	3	2
12.07.2020	2807	170	2610	6	3	2
13.07.2020	2808	170	2612	6	2	2
14.07.2020	2809	170	2614	6	2	2
15.07.2020	2810	170	2615	6	2	1
16.07.2020	2811	170	2617	6	2	1
17.07.2020	2812	170	2618	6	2	1
18.07.2020	2813	170	2620	5	2	1
19.07.2020	2814	170	2621	5	2	1
20.07.2020	2815	170	2622	5	2	1
21.07.2020	2815	170	2624	5	2	1
22.07.2020	2816	170	2625	5	2	1

Table 48: Saarland - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	2785	169	2576	9	4	2
26.06.2020	2787	169	2578	9	4	2
27.06.2020	2788	169	2580	9	4	2
28.06.2020	2790	169	2583	9	4	2
29.06.2020	2792	169	2585	8	3	2
30.06.2020	2794	169	2587	8	3	2
01.07.2020	2795	170	2589	8	3	2
02.07.2020	2797	170	2592	8	3	2
03.07.2020	2799	170	2594	8	3	2
04.07.2020	2800	170	2596	8	3	2
05.07.2020	2802	170	2598	8	3	2
06.07.2020	2804	170	2600	8	3	2
07.07.2020	2806	170	2602	7	3	2
08.07.2020	2807	170	2604	7	3	2
09.07.2020	2809	170	2606	7	3	2
10.07.2020	2811	170	2608	7	3	2
11.07.2020	2812	170	2610	7	3	2
12.07.2020	2814	170	2612	7	3	2
13.07.2020	2816	170	2614	7	3	2
14.07.2020	2817	170	2615	7	3	2
15.07.2020	2819	170	2617	7	3	2
16.07.2020	2821	170	2619	7	3	2
17.07.2020	2822	170	2621	7	3	2
18.07.2020	2824	170	2623	7	3	2
19.07.2020	2826	170	2624	7	3	2
20.07.2020	2828	171	2626	7	3	2
21.07.2020	2829	171	2628	7	3	2
22.07.2020	2831	171	2630	7	2	2

Table 49: Saarland - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	2785	169	2576	9	4	2
26.06.2020	2787	169	2578	9	4	2
27.06.2020	2789	169	2580	9	4	2
28.06.2020	2791	169	2583	9	4	2
29.06.2020	2792	169	2585	8	3	2
30.06.2020	2794	169	2587	8	3	2
01.07.2020	2797	170	2590	8	3	2
02.07.2020	2799	170	2592	8	3	2
03.07.2020	2801	170	2594	8	3	2
04.07.2020	2803	170	2596	8	3	2
05.07.2020	2805	170	2598	8	3	2
06.07.2020	2808	170	2600	8	3	2
07.07.2020	2810	170	2602	8	3	2
08.07.2020	2813	170	2605	8	3	2
09.07.2020	2815	170	2607	8	3	2
10.07.2020	2818	170	2609	8	3	2
11.07.2020	2821	170	2611	8	3	2
12.07.2020	2823	170	2613	8	3	2
13.07.2020	2826	170	2616	8	3	2
14.07.2020	2829	170	2618	8	3	2
15.07.2020	2832	170	2620	9	3	2
16.07.2020	2835	170	2622	9	3	2
17.07.2020	2839	170	2625	9	3	2
18.07.2020	2842	171	2627	9	3	2
19.07.2020	2845	171	2629	9	3	2
20.07.2020	2849	171	2632	9	3	2
21.07.2020	2852	171	2634	9	3	2
22.07.2020	2856	171	2637	10	3	2

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

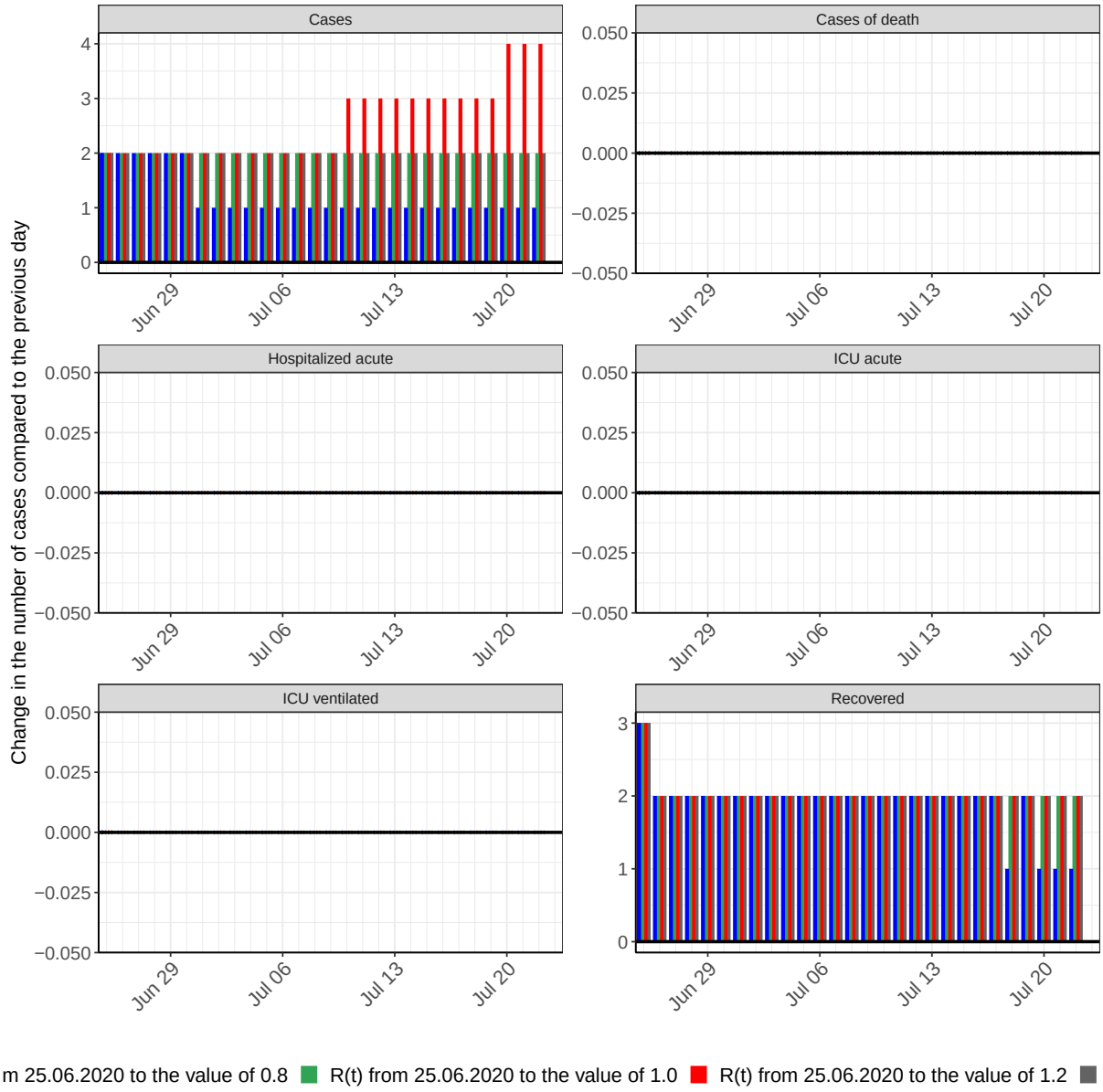


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

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.

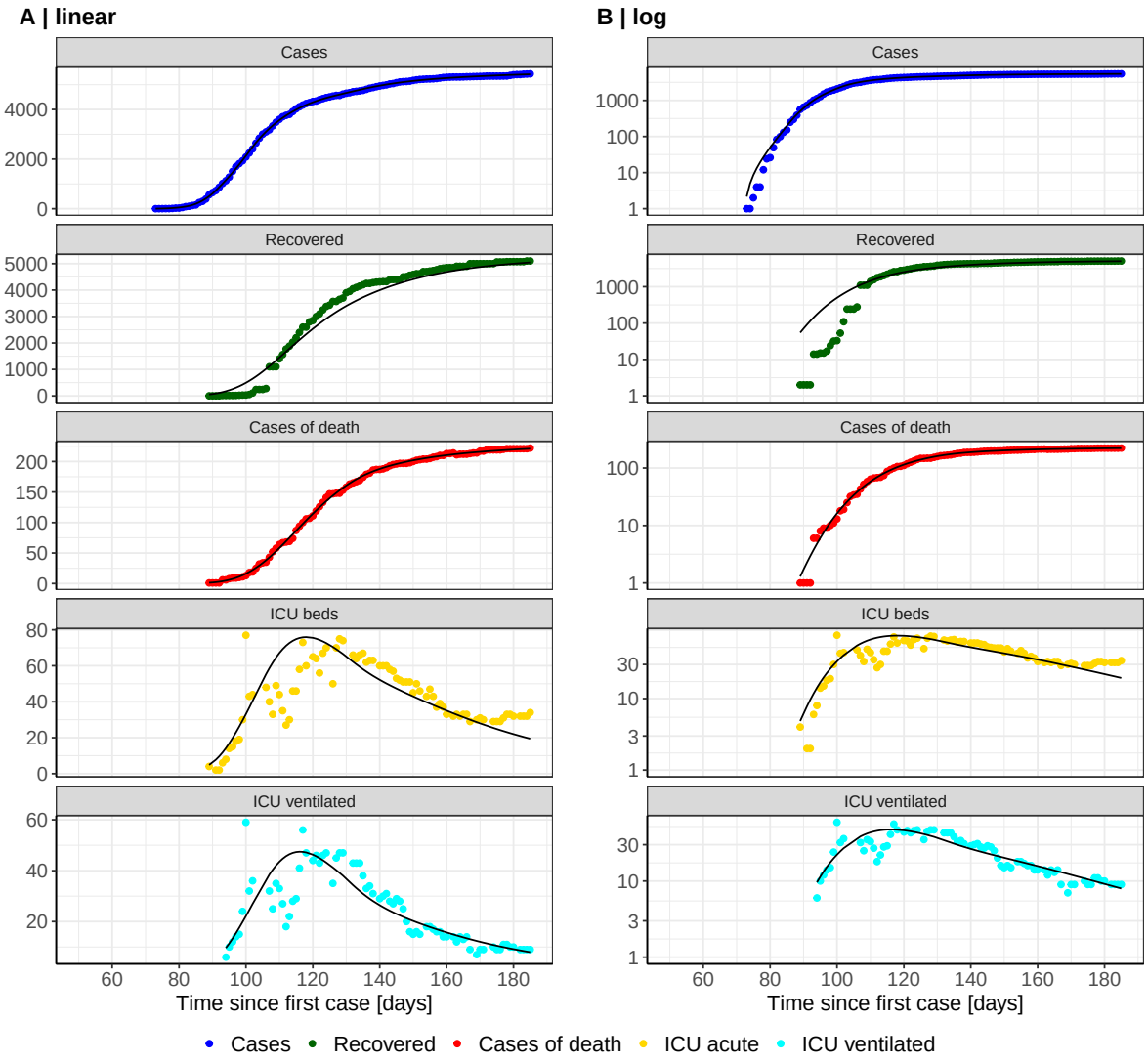


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

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.

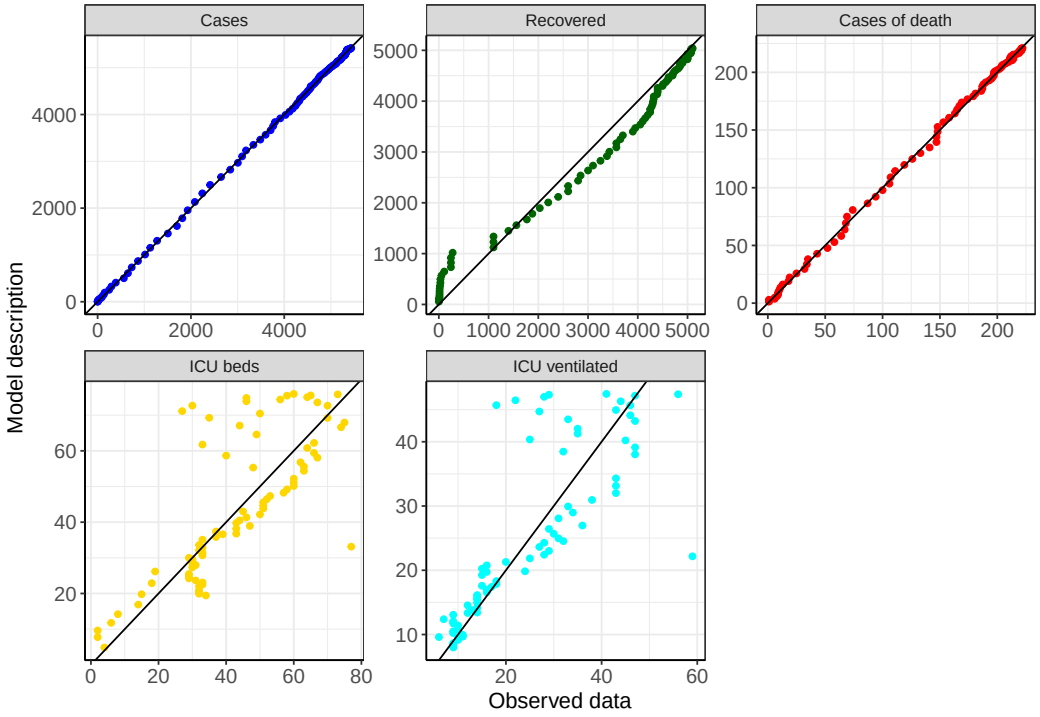


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

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).

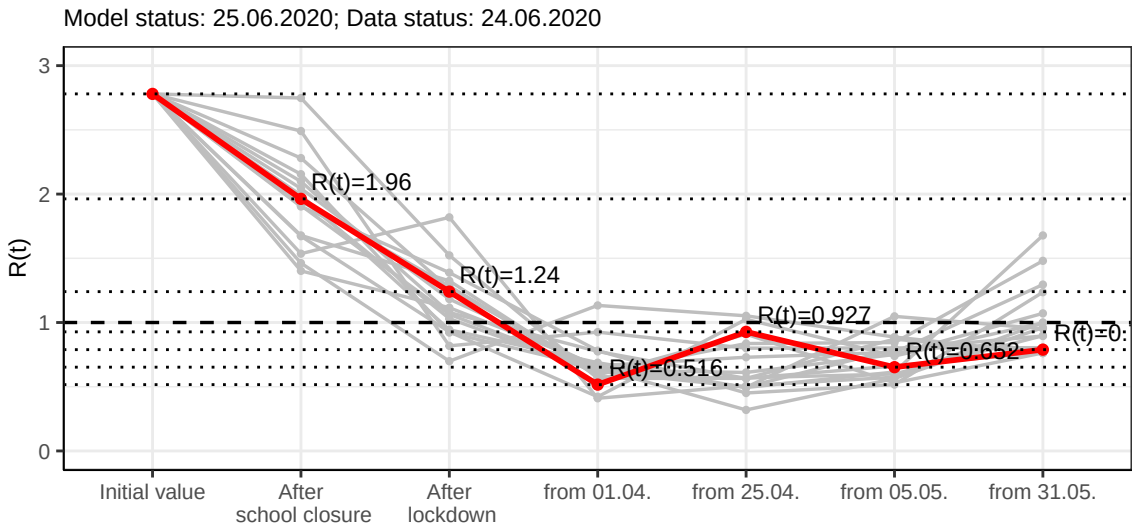


Figure 145: R(t) values before and after the NPIs for Saxony

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

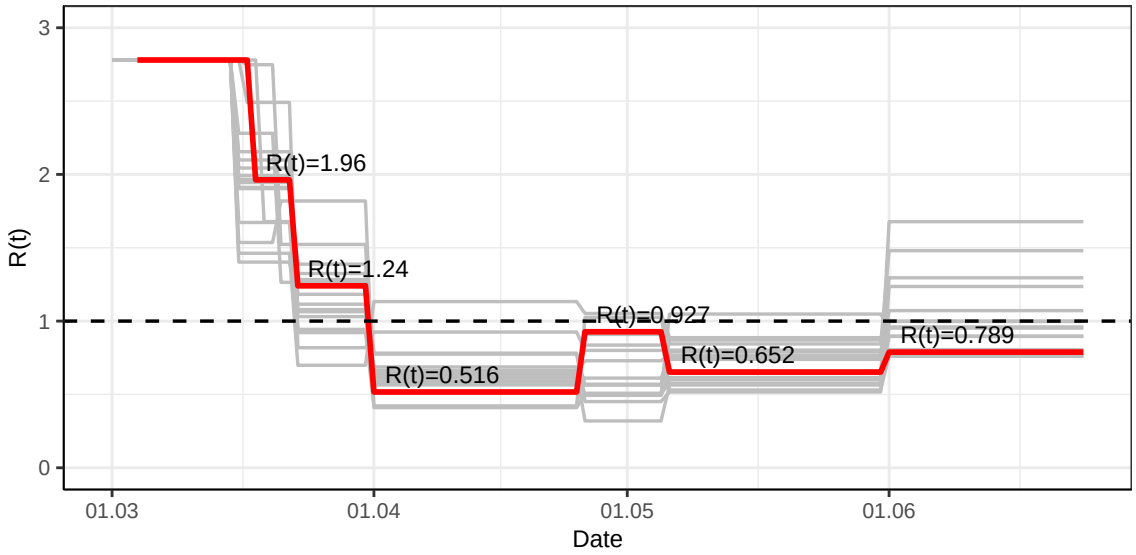


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

14.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.79)

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.

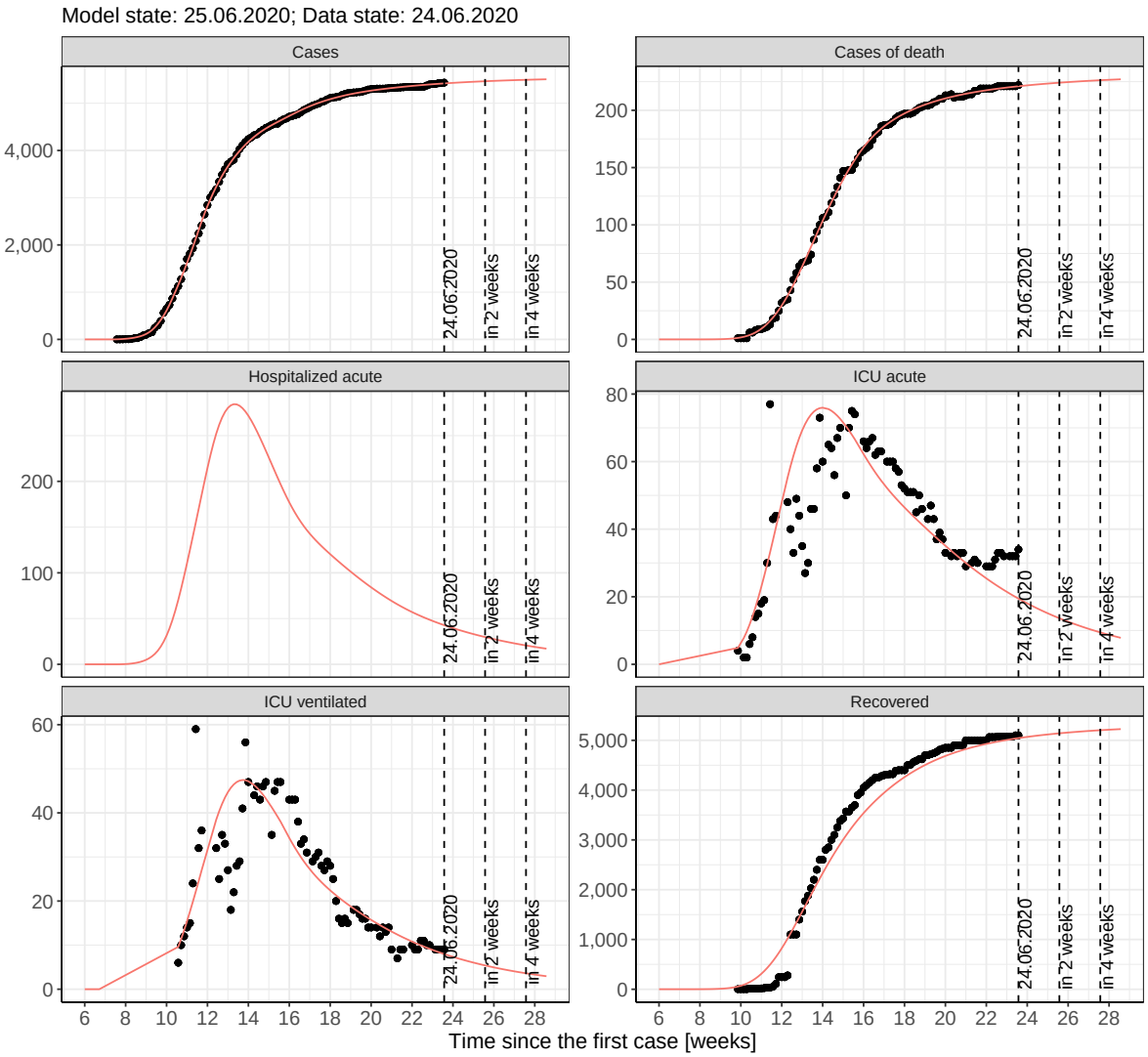


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

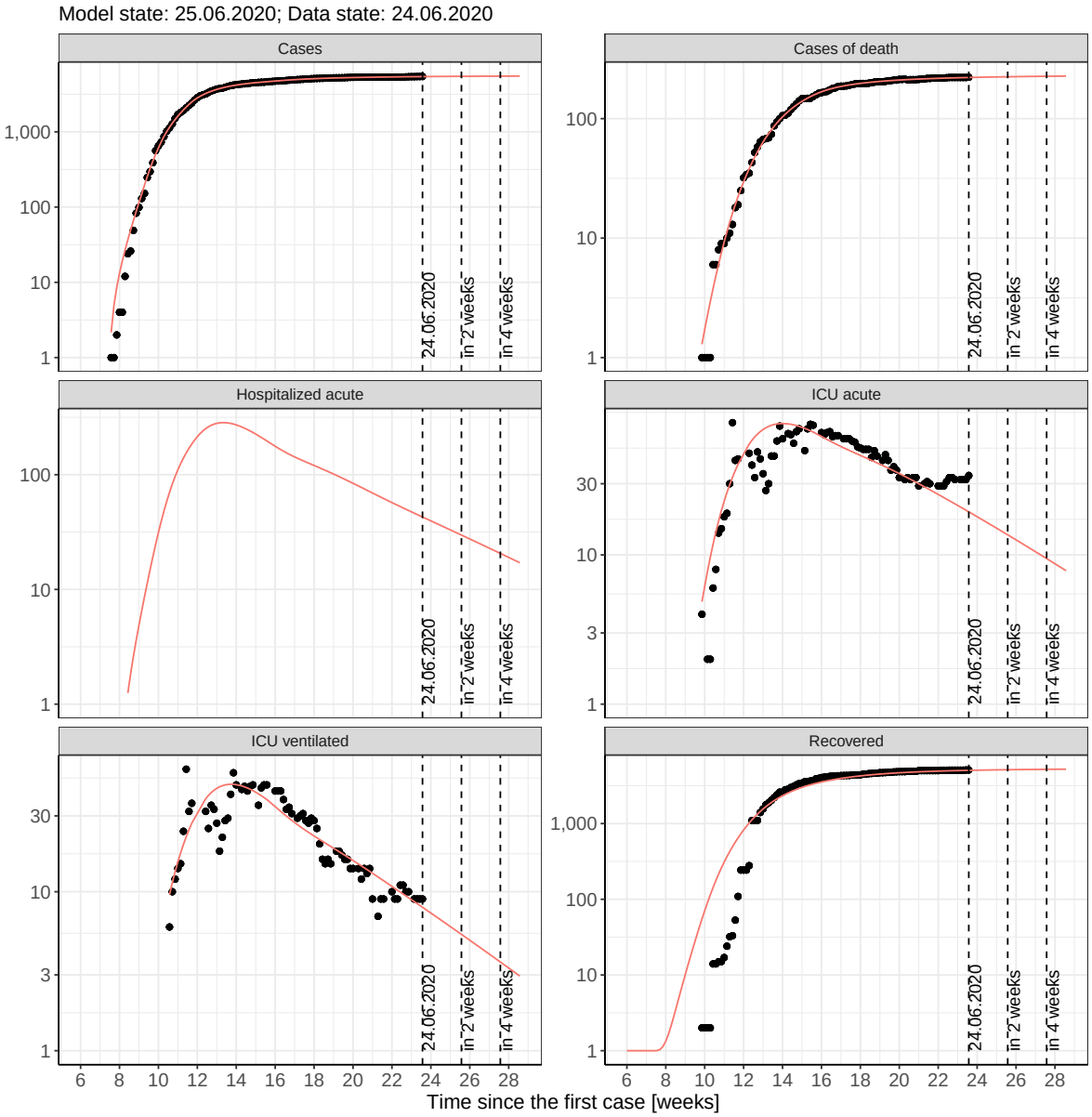


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

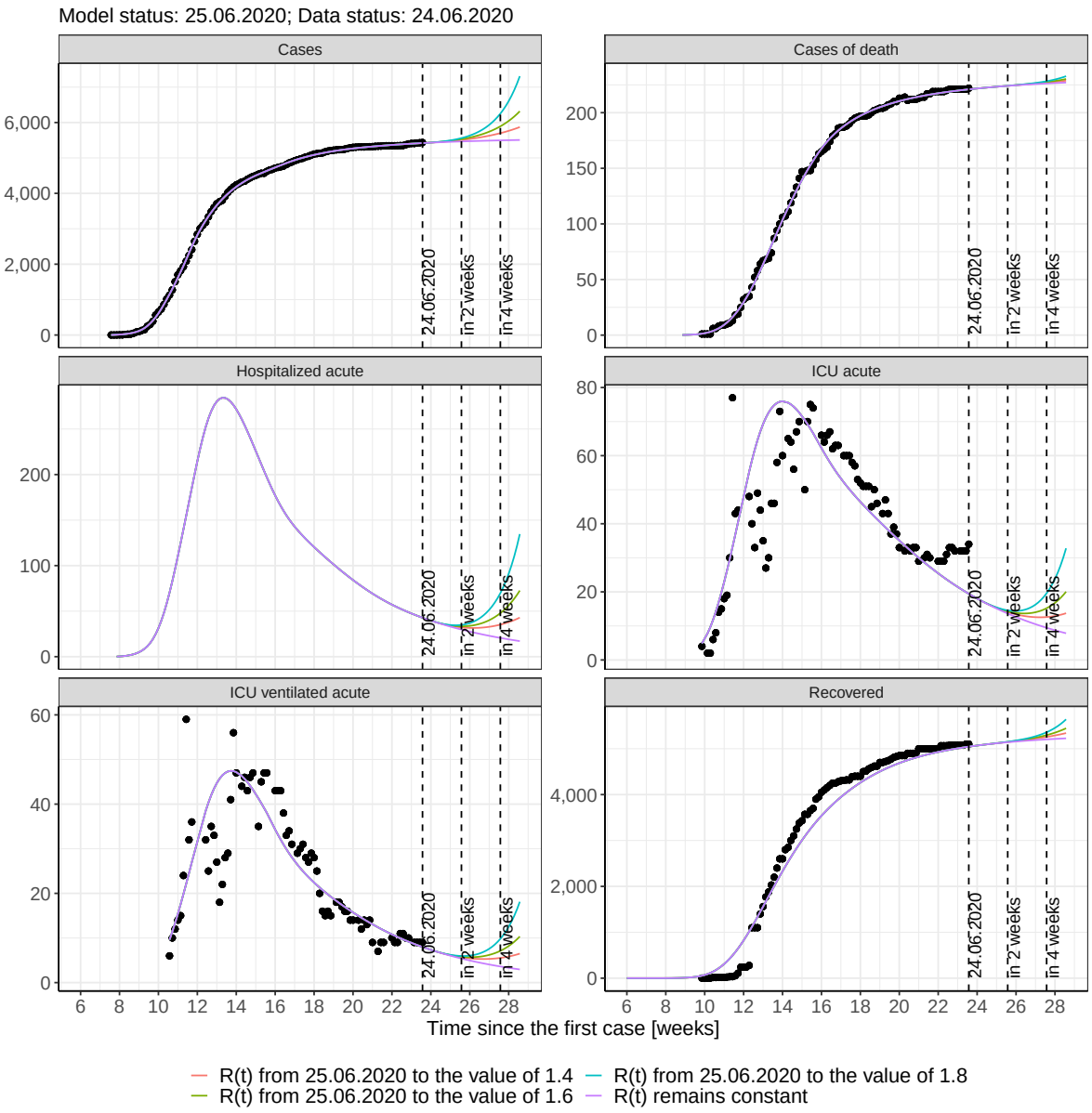


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

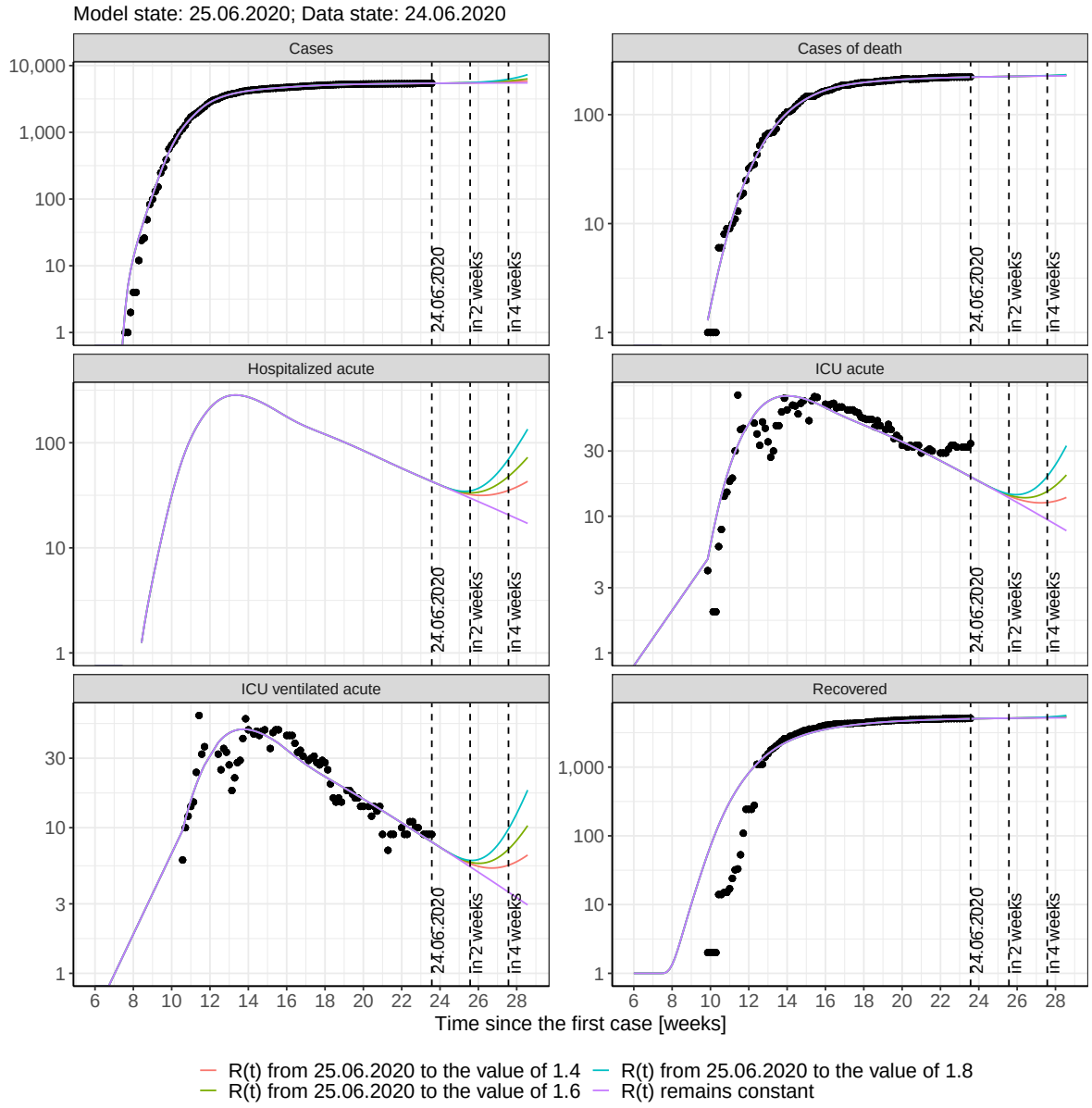


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

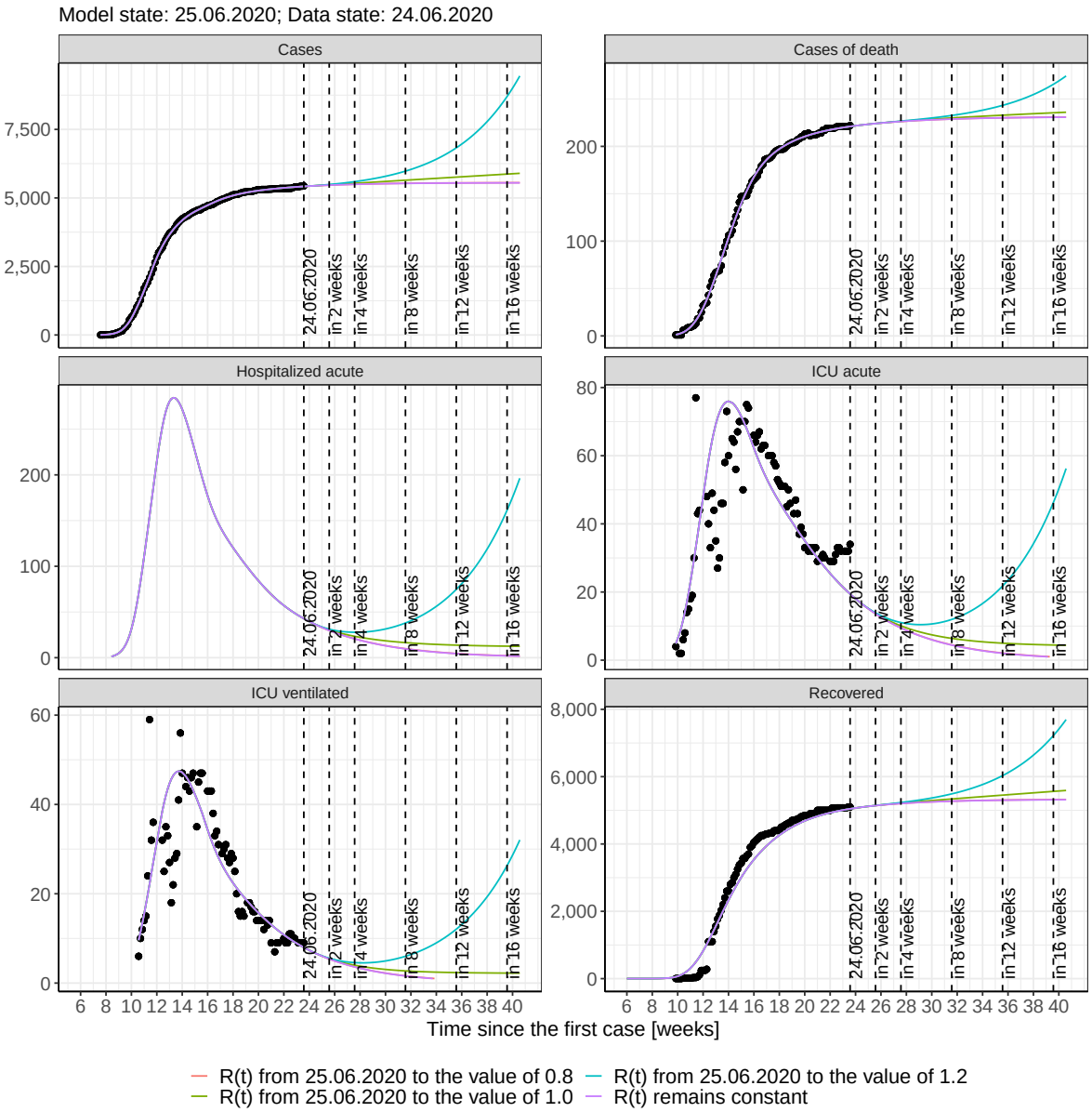


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

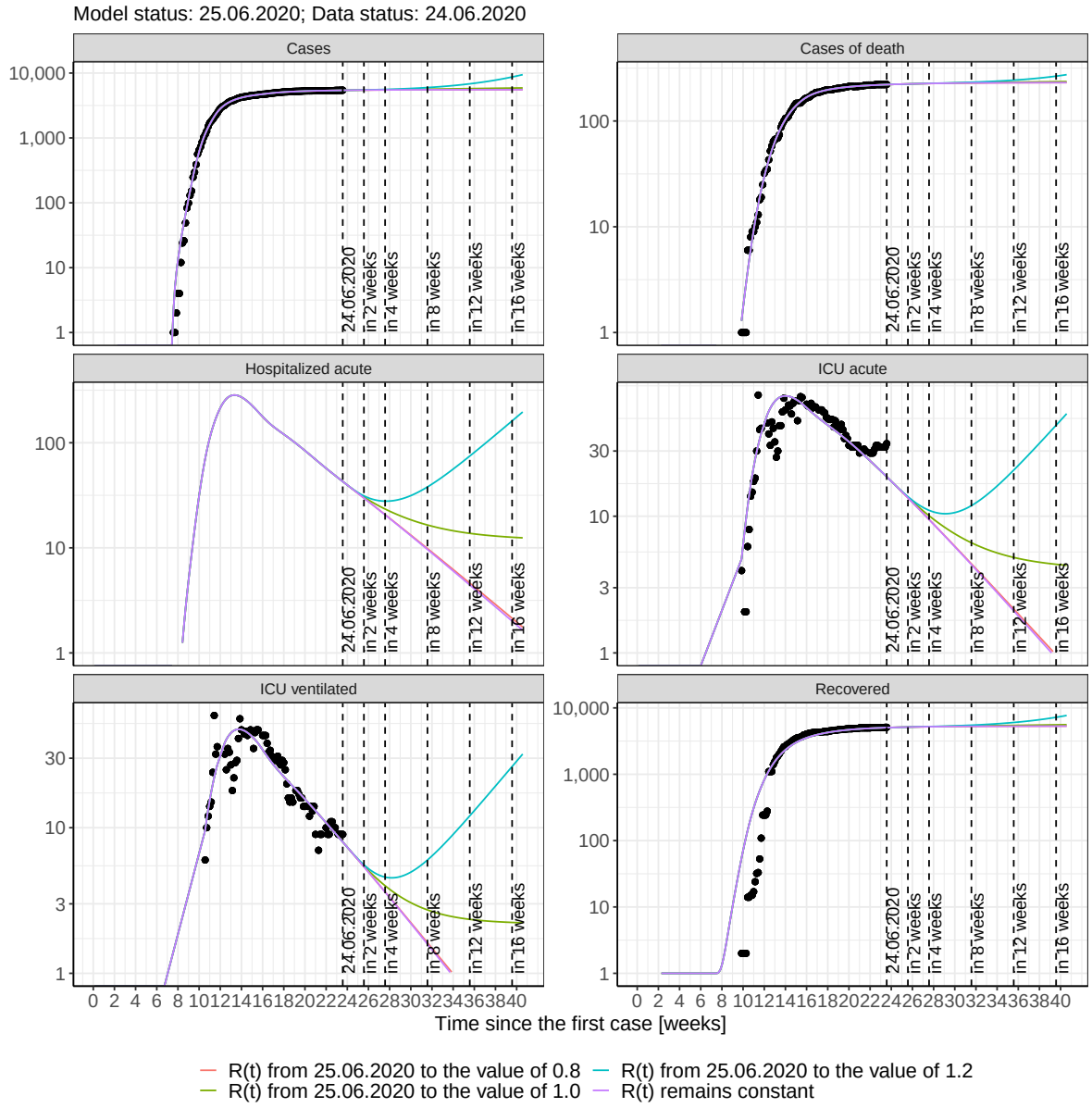


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 53) Model status from 25.06.2020; Data status: 24.06.2020.

Table 50: Saxony - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5424	221	5053	42	19	8
26.06.2020	5427	222	5061	41	18	8
27.06.2020	5431	222	5069	40	18	7
28.06.2020	5435	222	5077	39	18	7
29.06.2020	5438	222	5084	38	17	7
30.06.2020	5442	222	5091	37	17	7
01.07.2020	5445	223	5098	36	16	7
02.07.2020	5448	223	5105	35	16	6
03.07.2020	5452	223	5111	34	15	6
04.07.2020	5455	223	5118	33	15	6
05.07.2020	5458	224	5124	32	15	6
06.07.2020	5460	224	5130	31	14	6
07.07.2020	5463	224	5135	31	14	6
08.07.2020	5466	224	5141	30	14	5
09.07.2020	5468	224	5146	29	13	5
10.07.2020	5471	224	5152	28	13	5
11.07.2020	5474	225	5156	28	13	5
12.07.2020	5476	225	5161	27	12	5
13.07.2020	5478	225	5166	26	12	5
14.07.2020	5480	225	5171	25	12	5
15.07.2020	5483	225	5175	25	11	4
16.07.2020	5485	225	5180	24	11	4
17.07.2020	5487	226	5184	24	11	4
18.07.2020	5489	226	5188	23	11	4
19.07.2020	5491	226	5192	22	10	4
20.07.2020	5493	226	5196	22	10	4
21.07.2020	5494	226	5199	21	10	4
22.07.2020	5496	226	5203	21	9	4

Table 51: Saxony - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5424	221	5053	42	19	8
26.06.2020	5427	222	5061	41	18	8
27.06.2020	5431	222	5069	40	18	7
28.06.2020	5435	222	5077	39	18	7
29.06.2020	5438	222	5084	38	17	7
30.06.2020	5442	222	5091	37	17	7
01.07.2020	5445	223	5098	36	16	7
02.07.2020	5449	223	5105	35	16	6
03.07.2020	5452	223	5111	34	16	6
04.07.2020	5455	223	5118	33	15	6
05.07.2020	5458	224	5124	32	15	6
06.07.2020	5461	224	5130	31	14	6
07.07.2020	5464	224	5135	31	14	6
08.07.2020	5466	224	5141	30	14	5
09.07.2020	5469	224	5146	29	13	5
10.07.2020	5472	224	5152	28	13	5
11.07.2020	5474	225	5157	28	13	5
12.07.2020	5477	225	5162	27	12	5
13.07.2020	5479	225	5166	26	12	5
14.07.2020	5481	225	5171	26	12	5
15.07.2020	5484	225	5176	25	11	4
16.07.2020	5486	225	5180	24	11	4
17.07.2020	5488	226	5184	24	11	4
18.07.2020	5490	226	5188	23	11	4
19.07.2020	5492	226	5192	22	10	4
20.07.2020	5494	226	5196	22	10	4
21.07.2020	5496	226	5200	21	10	4
22.07.2020	5498	226	5204	21	9	4

Table 52: Saxony - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5424	221	5053	42	19	8
26.06.2020	5428	222	5061	41	18	8
27.06.2020	5432	222	5069	40	18	7
28.06.2020	5436	222	5077	39	18	7
29.06.2020	5440	222	5084	38	17	7
30.06.2020	5444	222	5091	37	17	7
01.07.2020	5448	223	5098	36	16	7
02.07.2020	5452	223	5105	35	16	6
03.07.2020	5456	223	5112	34	16	6
04.07.2020	5460	223	5118	33	15	6
05.07.2020	5464	224	5124	33	15	6
06.07.2020	5468	224	5130	32	14	6
07.07.2020	5472	224	5136	31	14	6
08.07.2020	5476	224	5142	30	14	5
09.07.2020	5480	224	5148	30	13	5
10.07.2020	5484	224	5154	29	13	5
11.07.2020	5488	225	5159	29	13	5
12.07.2020	5493	225	5165	28	13	5
13.07.2020	5497	225	5170	27	12	5
14.07.2020	5501	225	5175	27	12	5
15.07.2020	5505	225	5180	26	12	5
16.07.2020	5509	226	5186	26	11	5
17.07.2020	5513	226	5190	25	11	4
18.07.2020	5517	226	5196	25	11	4
19.07.2020	5521	226	5200	25	11	4
20.07.2020	5525	226	5205	24	11	4
21.07.2020	5529	226	5210	24	10	4
22.07.2020	5533	226	5215	23	10	4

Table 53: Saxony - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	5424	221	5053	42	19	8
26.06.2020	5428	222	5061	41	18	8
27.06.2020	5432	222	5069	40	18	7
28.06.2020	5437	222	5077	39	18	7
29.06.2020	5441	222	5084	38	17	7
30.06.2020	5446	222	5091	37	17	7
01.07.2020	5451	223	5098	36	16	7
02.07.2020	5456	223	5105	35	16	6
03.07.2020	5461	223	5112	34	16	6
04.07.2020	5466	223	5119	34	15	6
05.07.2020	5472	224	5125	33	15	6
06.07.2020	5478	224	5131	32	15	6
07.07.2020	5483	224	5138	32	14	6
08.07.2020	5489	224	5144	31	14	6
09.07.2020	5496	224	5150	31	14	5
10.07.2020	5502	224	5156	30	13	5
11.07.2020	5508	225	5162	30	13	5
12.07.2020	5515	225	5168	30	13	5
13.07.2020	5522	225	5175	29	13	5
14.07.2020	5529	225	5181	29	12	5
15.07.2020	5536	225	5187	29	12	5
16.07.2020	5544	226	5193	28	12	5
17.07.2020	5551	226	5199	28	12	5
18.07.2020	5559	226	5206	28	12	5
19.07.2020	5568	226	5212	28	11	5
20.07.2020	5576	226	5218	28	11	5
21.07.2020	5584	226	5225	28	11	5
22.07.2020	5593	227	5231	28	11	5

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

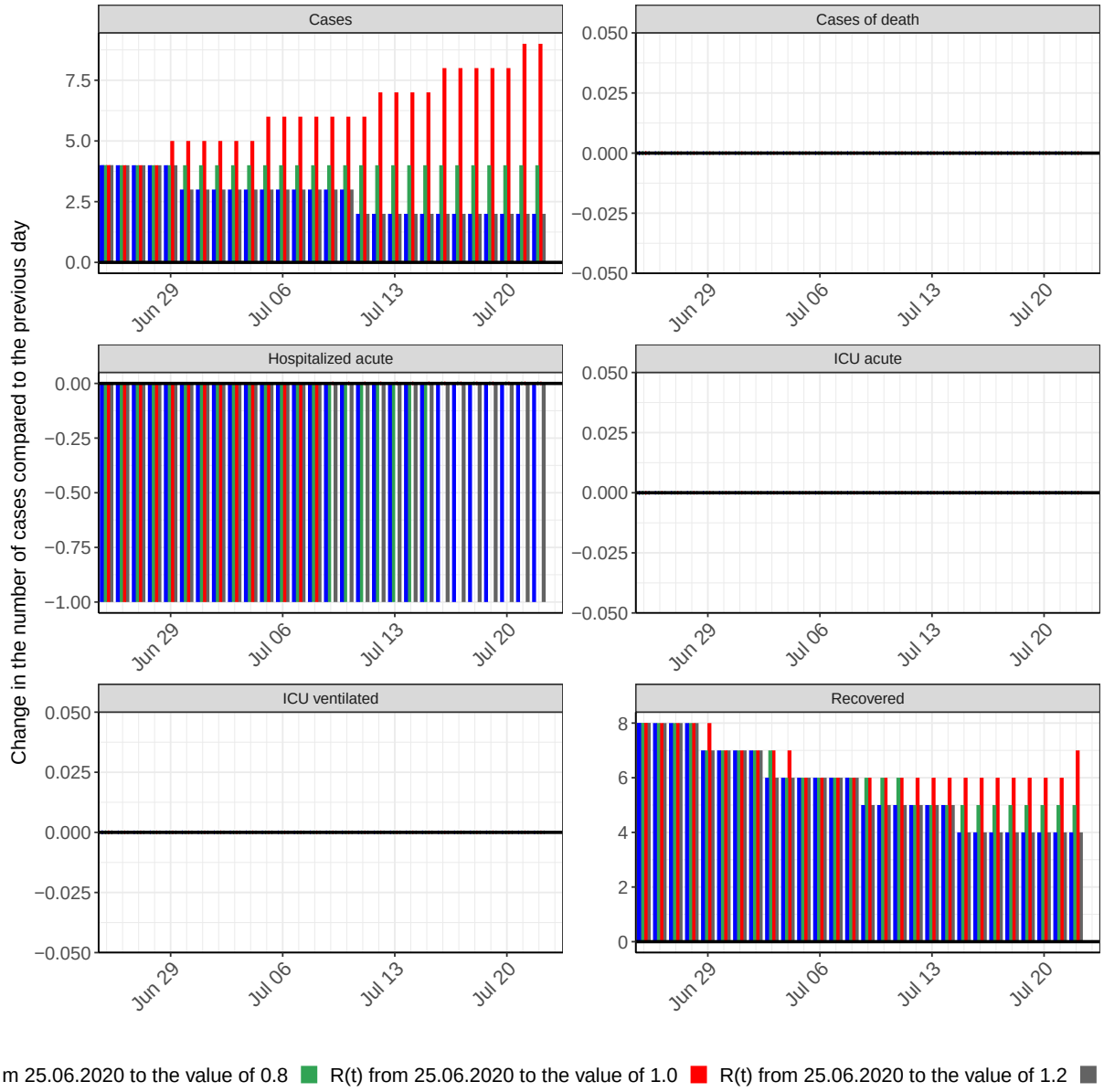


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

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.

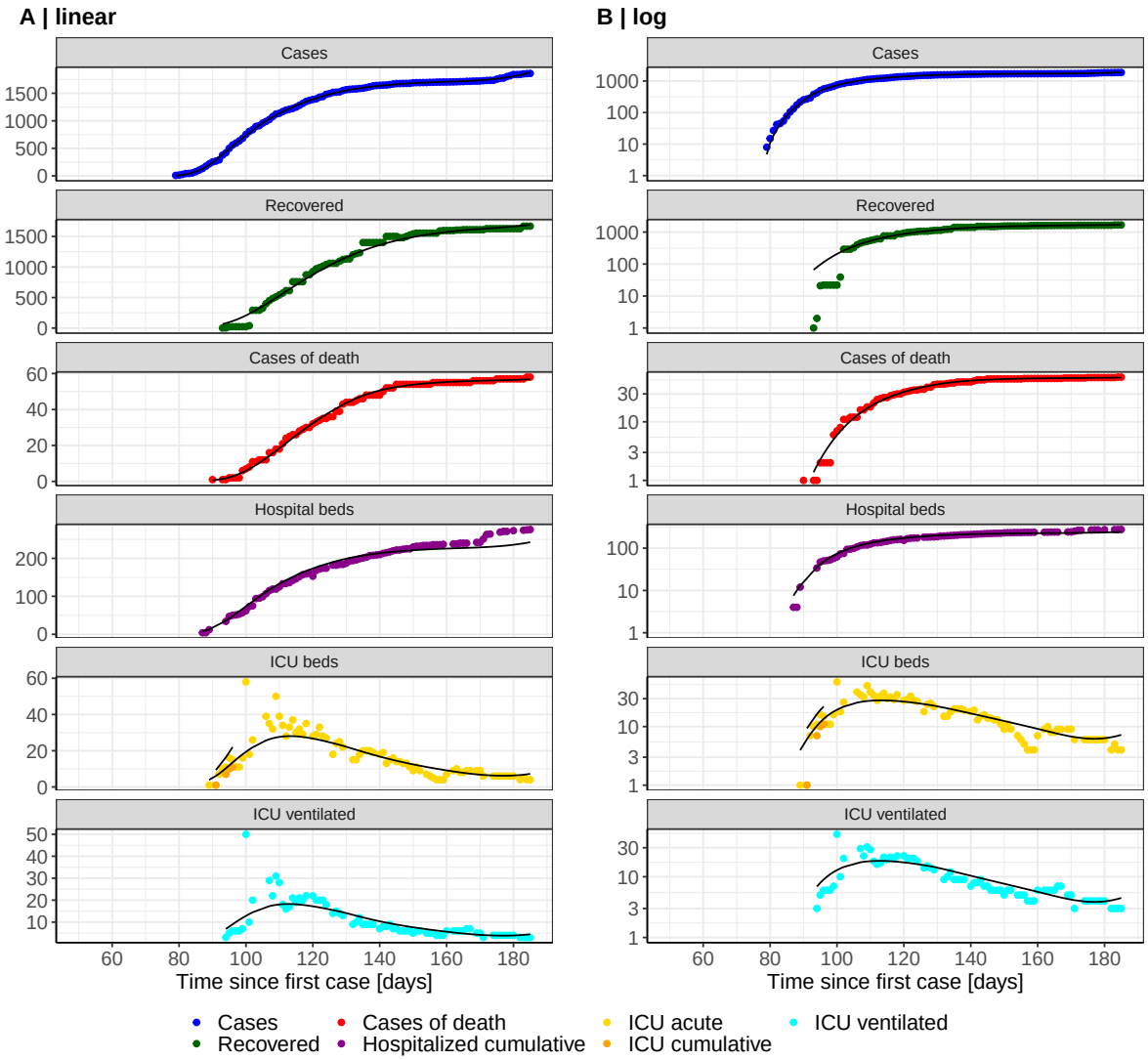


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

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.

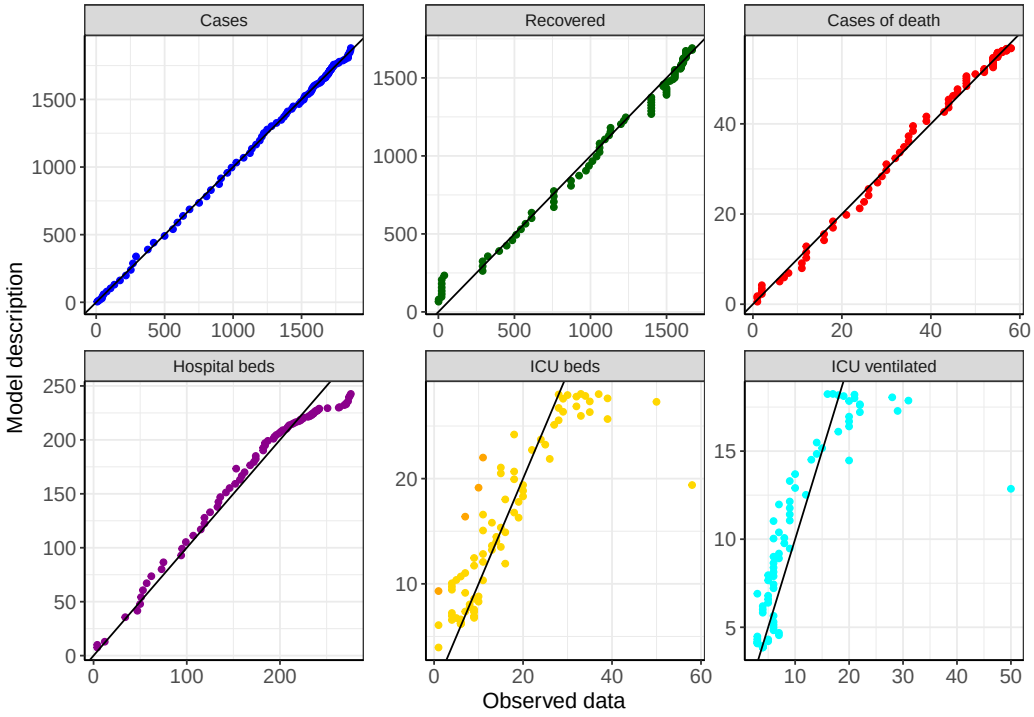


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

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).

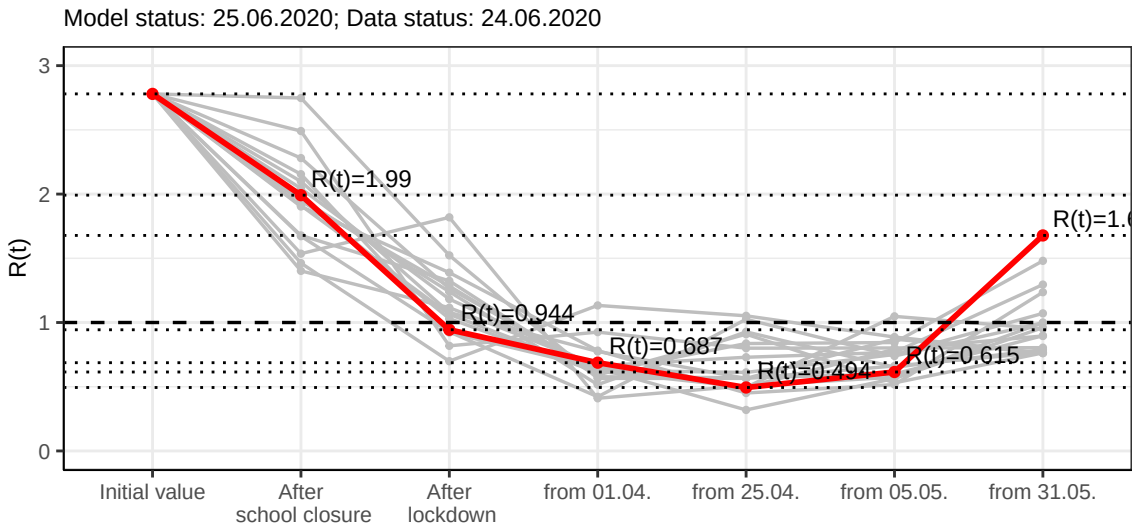


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

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

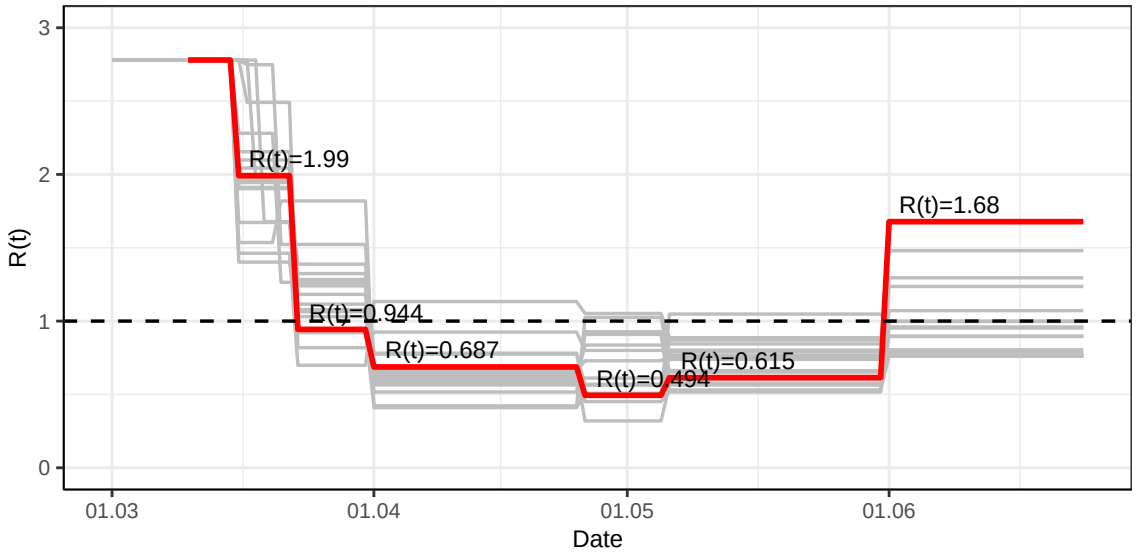


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.68)

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.

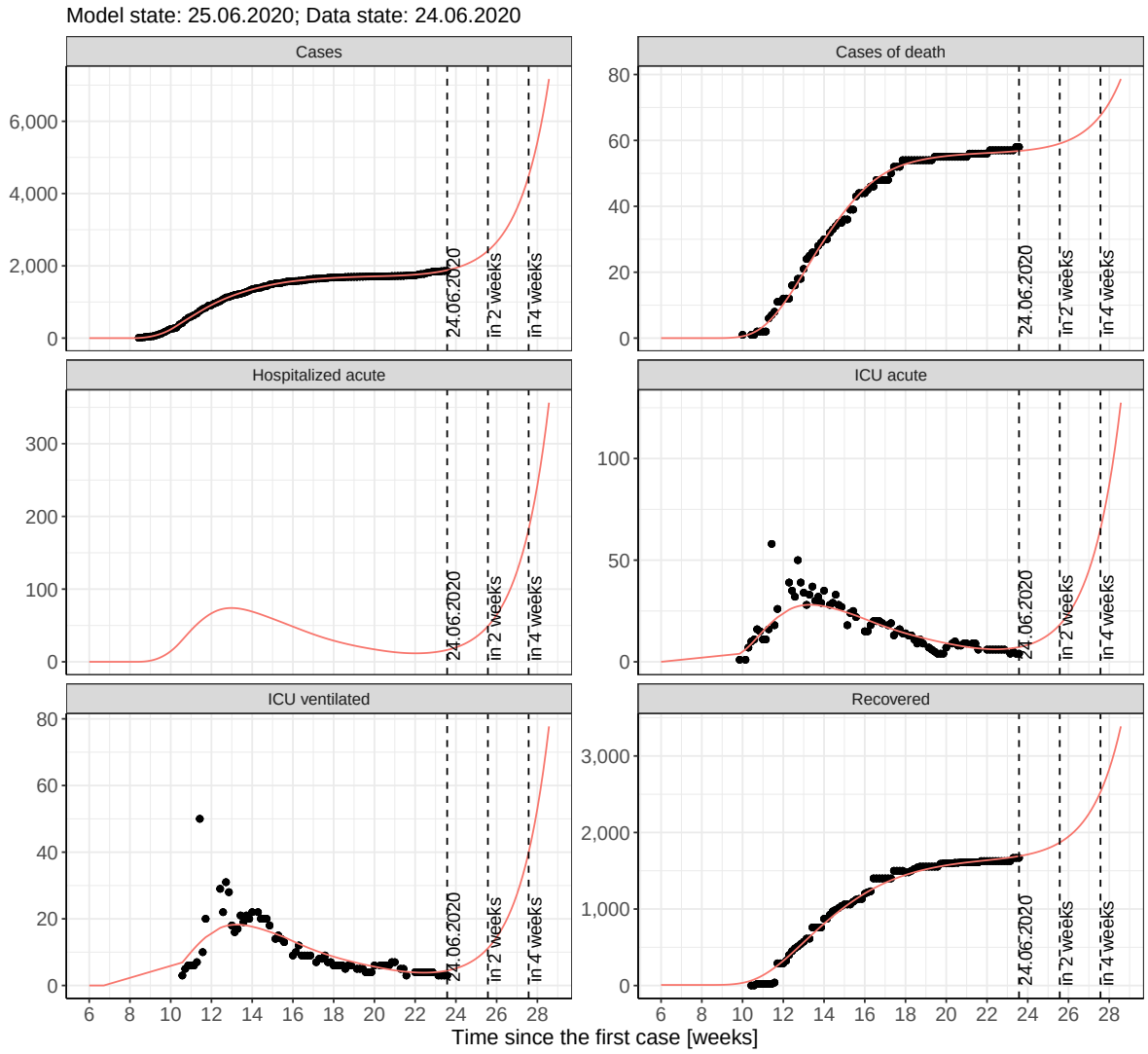


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

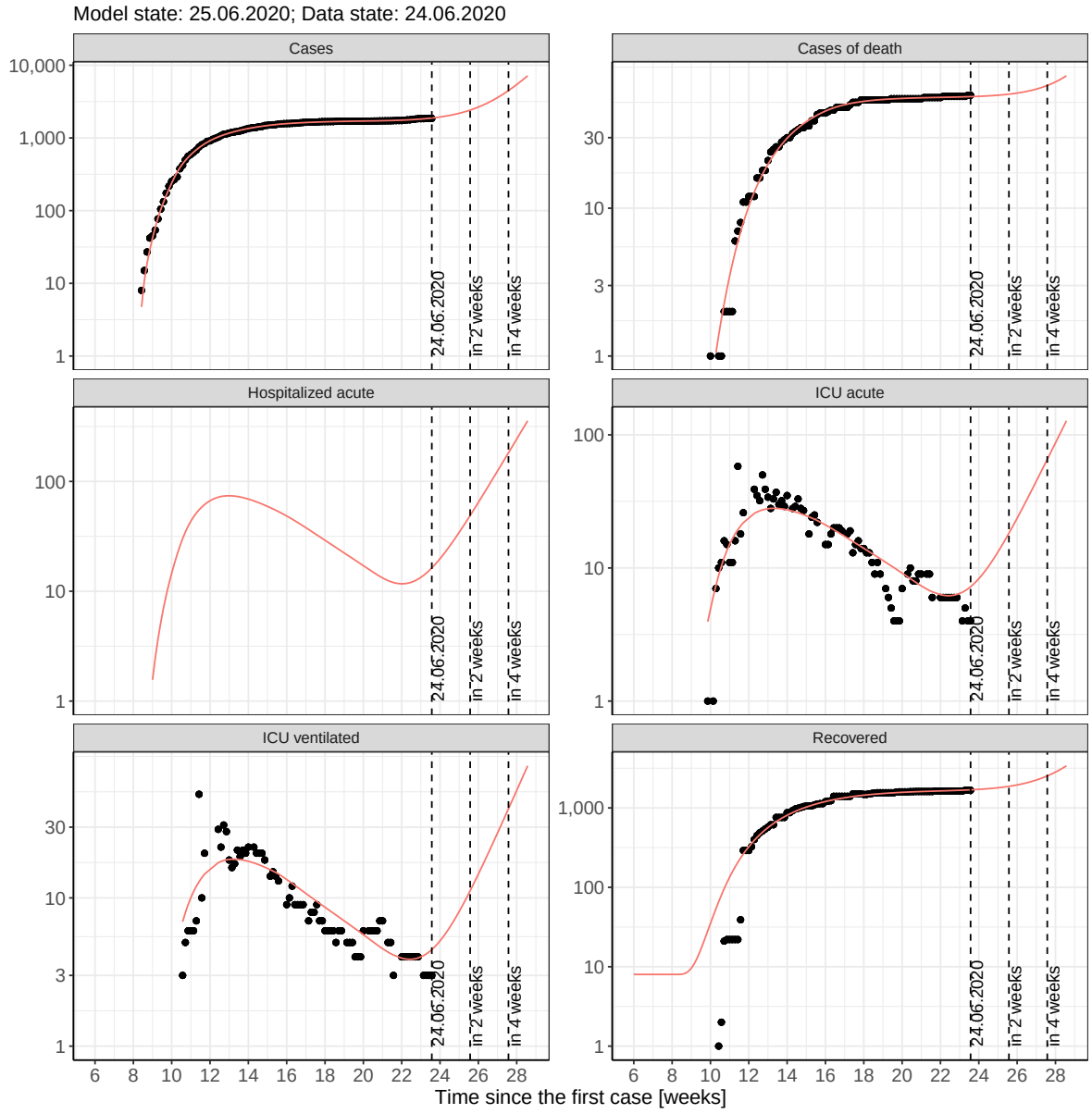


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

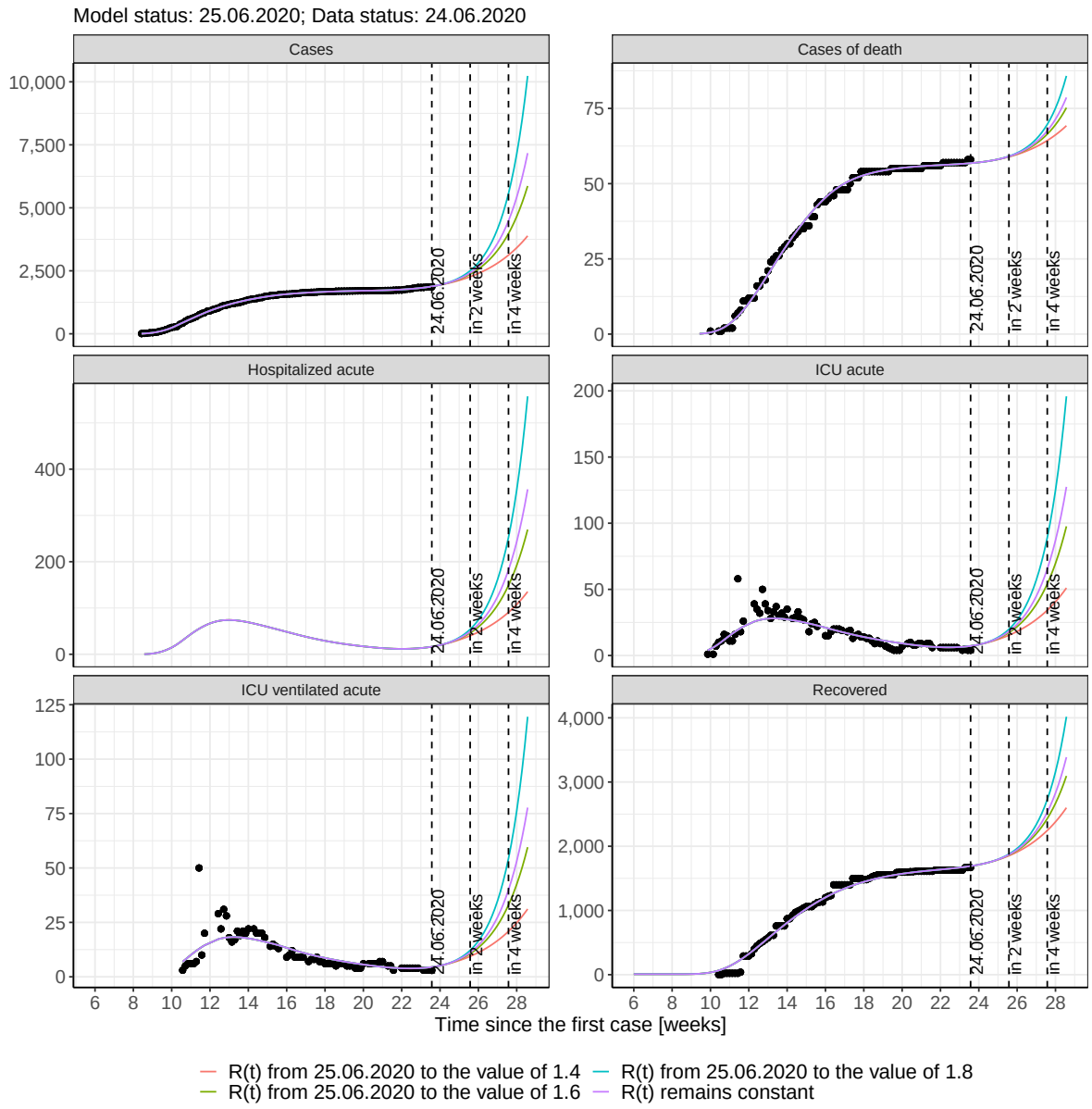


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

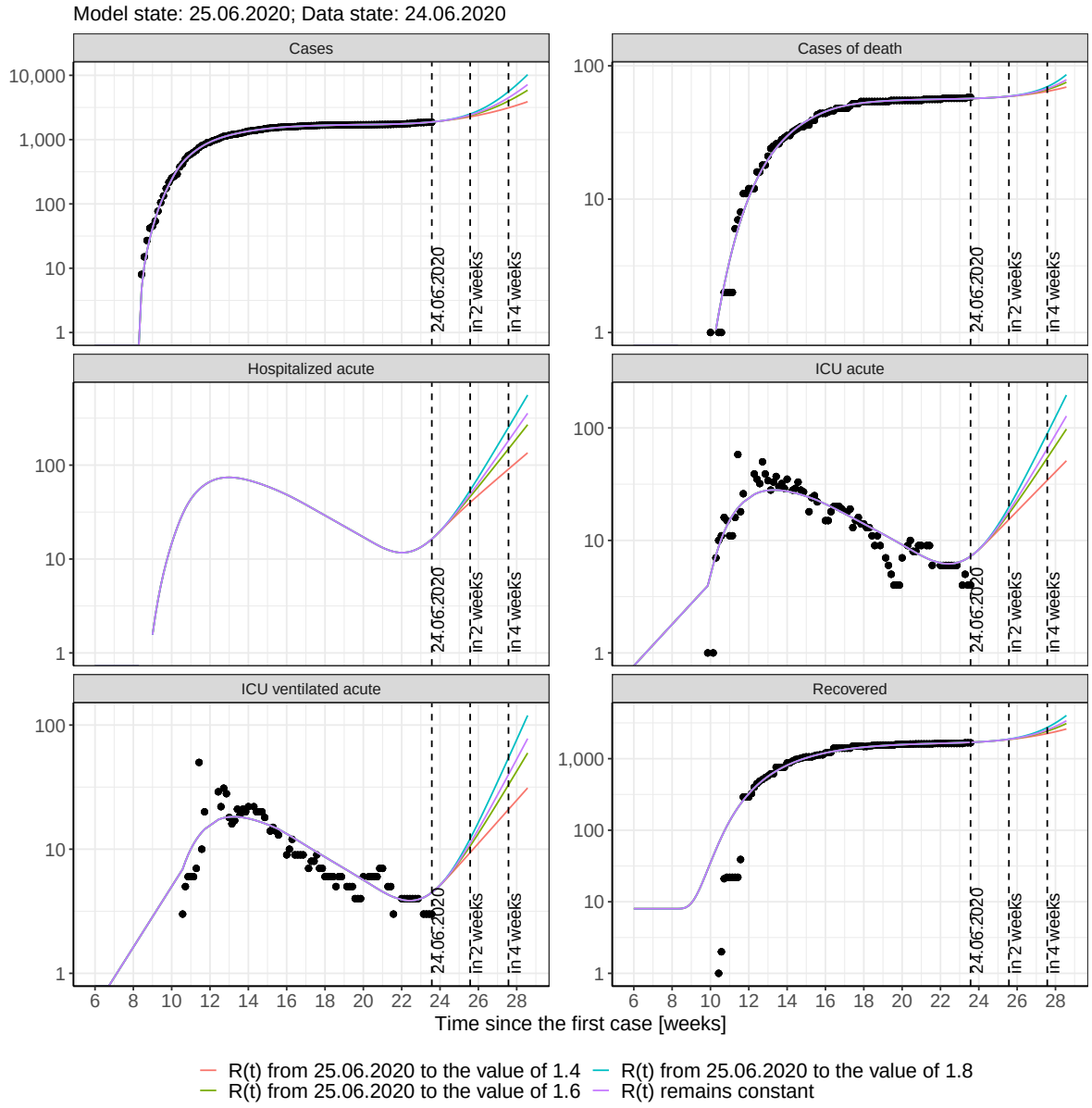


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

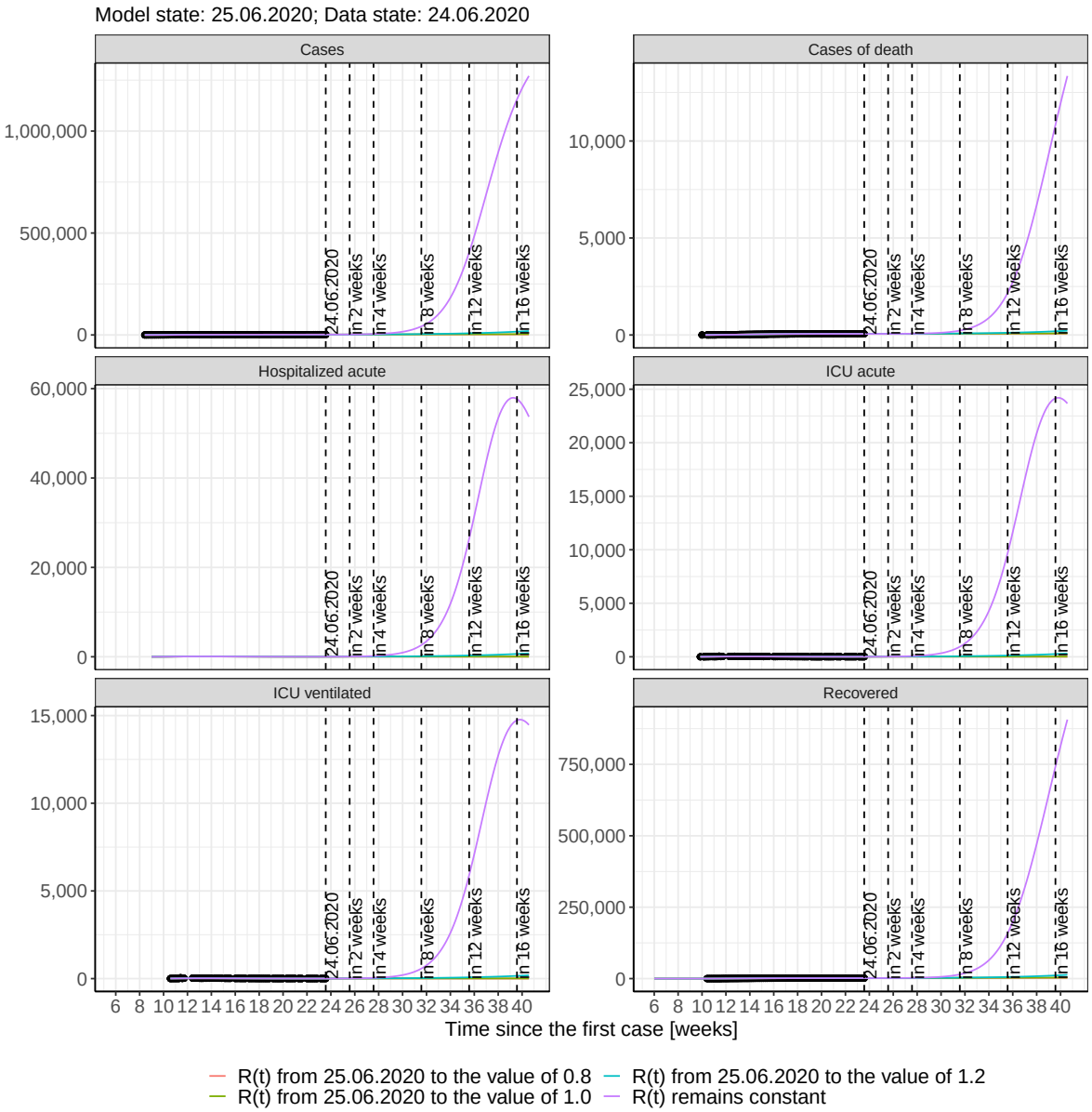


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

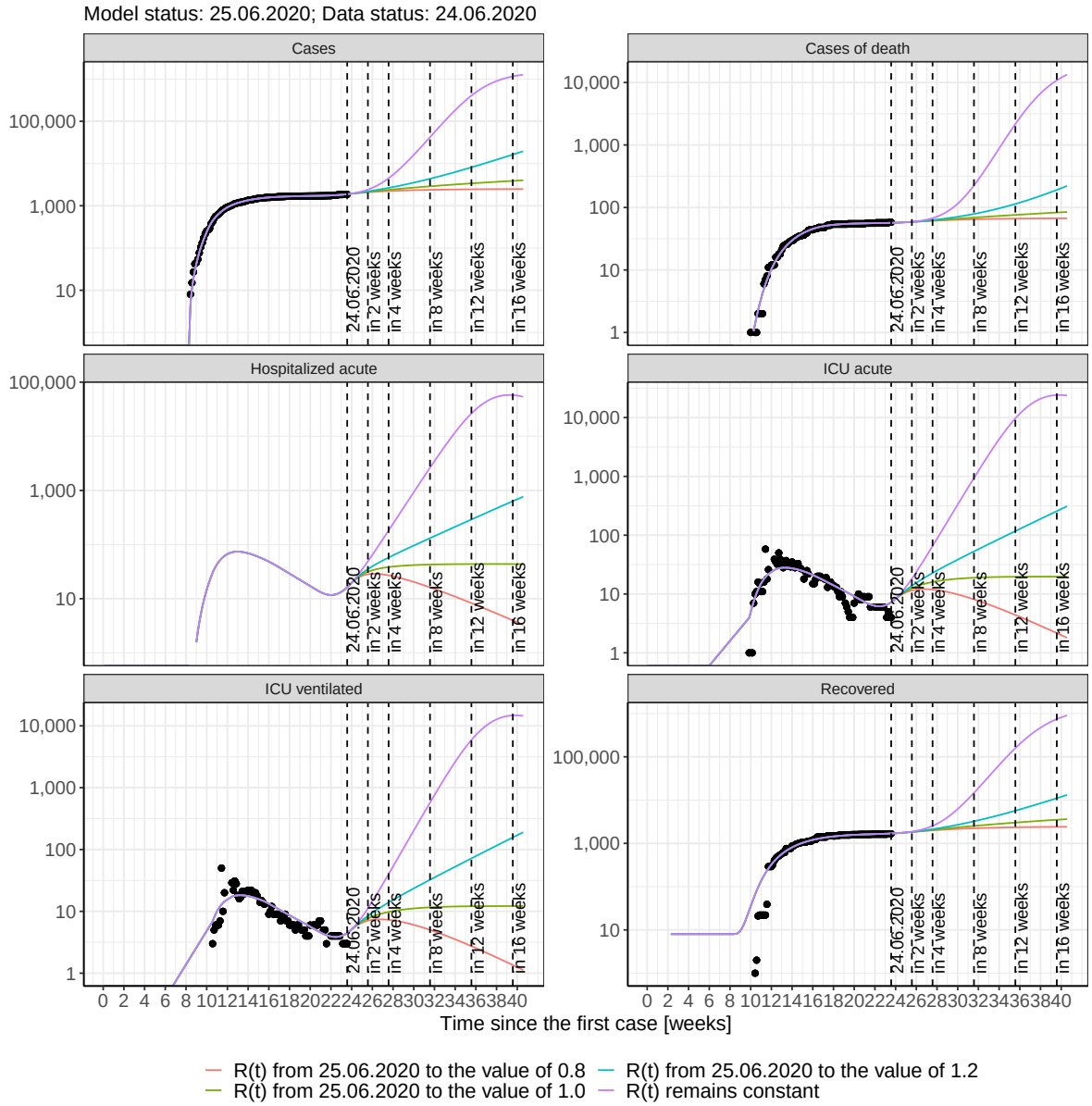


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 57) Model status from 25.06.2020; Data status: 24.06.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1898	57	1698	17	8	5
26.06.2020	1919	57	1705	18	8	5
27.06.2020	1942	57	1713	20	8	5
28.06.2020	1968	57	1722	21	9	5
29.06.2020	1996	57	1732	23	9	6
30.06.2020	2026	57	1742	25	10	6
01.07.2020	2060	58	1753	27	11	7
02.07.2020	2097	58	1765	29	11	7
03.07.2020	2138	58	1779	32	12	8
04.07.2020	2184	58	1794	34	13	8
05.07.2020	2233	58	1810	37	14	9
06.07.2020	2288	59	1828	41	15	9
07.07.2020	2348	59	1847	45	17	10
08.07.2020	2415	59	1869	49	18	11
09.07.2020	2488	59	1892	54	20	12
10.07.2020	2569	60	1918	59	22	13
11.07.2020	2658	60	1947	64	24	14
12.07.2020	2756	60	1978	71	26	16
13.07.2020	2864	61	2013	78	28	17
14.07.2020	2982	61	2051	85	31	19
15.07.2020	3113	62	2092	94	34	21
16.07.2020	3257	63	2138	103	37	23
17.07.2020	3415	63	2189	113	41	25
18.07.2020	3590	64	2245	124	45	27
19.07.2020	3782	65	2306	137	49	30
20.07.2020	3994	66	2373	151	54	33
21.07.2020	4227	66	2448	166	60	36
22.07.2020	4484	68	2530	182	65	40

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1897	57	1698	17	8	5
26.06.2020	1914	57	1705	18	8	5
27.06.2020	1931	57	1713	20	8	5
28.06.2020	1948	57	1722	21	9	5
29.06.2020	1964	57	1731	22	9	6
30.06.2020	1979	57	1740	23	9	6
01.07.2020	1994	58	1750	24	10	6
02.07.2020	2008	58	1760	25	10	6
03.07.2020	2022	58	1771	26	10	6
04.07.2020	2036	58	1782	26	11	7
05.07.2020	2050	58	1794	27	11	7
06.07.2020	2063	58	1805	28	11	7
07.07.2020	2075	59	1817	28	11	7
08.07.2020	2088	59	1829	28	12	7
09.07.2020	2099	59	1841	29	12	7
10.07.2020	2111	59	1853	29	12	7
11.07.2020	2122	59	1865	29	12	7
12.07.2020	2133	59	1877	29	12	7
13.07.2020	2144	60	1889	29	12	7
14.07.2020	2154	60	1901	29	12	7
15.07.2020	2164	60	1913	29	12	7
16.07.2020	2174	60	1925	29	12	7
17.07.2020	2183	60	1937	28	12	7
18.07.2020	2192	61	1949	28	12	7
19.07.2020	2201	61	1961	28	12	7
20.07.2020	2210	61	1972	28	12	7
21.07.2020	2218	61	1984	27	12	7
22.07.2020	2227	61	1995	27	12	7

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1898	57	1698	17	8	5
26.06.2020	1916	57	1705	18	8	5
27.06.2020	1934	57	1713	20	8	5
28.06.2020	1952	57	1722	21	9	5
29.06.2020	1970	57	1731	22	9	6
30.06.2020	1988	57	1740	23	9	6
01.07.2020	2006	58	1751	25	10	6
02.07.2020	2024	58	1761	26	10	6
03.07.2020	2042	58	1773	27	11	7
04.07.2020	2060	58	1784	28	11	7
05.07.2020	2078	58	1796	29	11	7
06.07.2020	2096	58	1809	30	12	7
07.07.2020	2114	59	1822	31	12	7
08.07.2020	2132	59	1835	31	13	8
09.07.2020	2150	59	1849	32	13	8
10.07.2020	2168	59	1863	33	13	8
11.07.2020	2186	59	1877	33	13	8
12.07.2020	2204	60	1892	34	14	8
13.07.2020	2222	60	1906	35	14	9
14.07.2020	2240	60	1921	35	14	9
15.07.2020	2258	60	1937	36	15	9
16.07.2020	2276	60	1952	36	15	9
17.07.2020	2294	61	1968	37	15	9
18.07.2020	2312	61	1983	37	15	9
19.07.2020	2330	61	1999	37	15	9
20.07.2020	2348	61	2015	38	16	10
21.07.2020	2366	62	2032	38	16	10
22.07.2020	2384	62	2048	38	16	10

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	1898	57	1698	17	8	5
26.06.2020	1917	57	1705	18	8	5
27.06.2020	1936	57	1713	20	8	5
28.06.2020	1956	57	1722	21	9	5
29.06.2020	1976	57	1731	22	9	6
30.06.2020	1998	57	1741	24	10	6
01.07.2020	2019	58	1751	25	10	6
02.07.2020	2042	58	1762	27	11	7
03.07.2020	2064	58	1774	28	11	7
04.07.2020	2088	58	1787	29	12	7
05.07.2020	2112	58	1800	31	12	7
06.07.2020	2137	58	1814	32	13	8
07.07.2020	2163	59	1828	34	13	8
08.07.2020	2190	59	1843	35	14	8
09.07.2020	2217	59	1859	37	14	9
10.07.2020	2245	59	1875	38	15	9
11.07.2020	2274	60	1892	40	15	9
12.07.2020	2303	60	1910	41	16	10
13.07.2020	2334	60	1928	43	17	10
14.07.2020	2365	60	1948	44	17	11
15.07.2020	2398	61	1967	46	18	11
16.07.2020	2431	61	1988	47	19	11
17.07.2020	2465	61	2009	49	19	12
18.07.2020	2500	62	2031	51	20	12
19.07.2020	2536	62	2054	52	21	13
20.07.2020	2574	62	2077	54	21	13
21.07.2020	2612	63	2101	56	22	13
22.07.2020	2651	63	2126	58	23	14

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

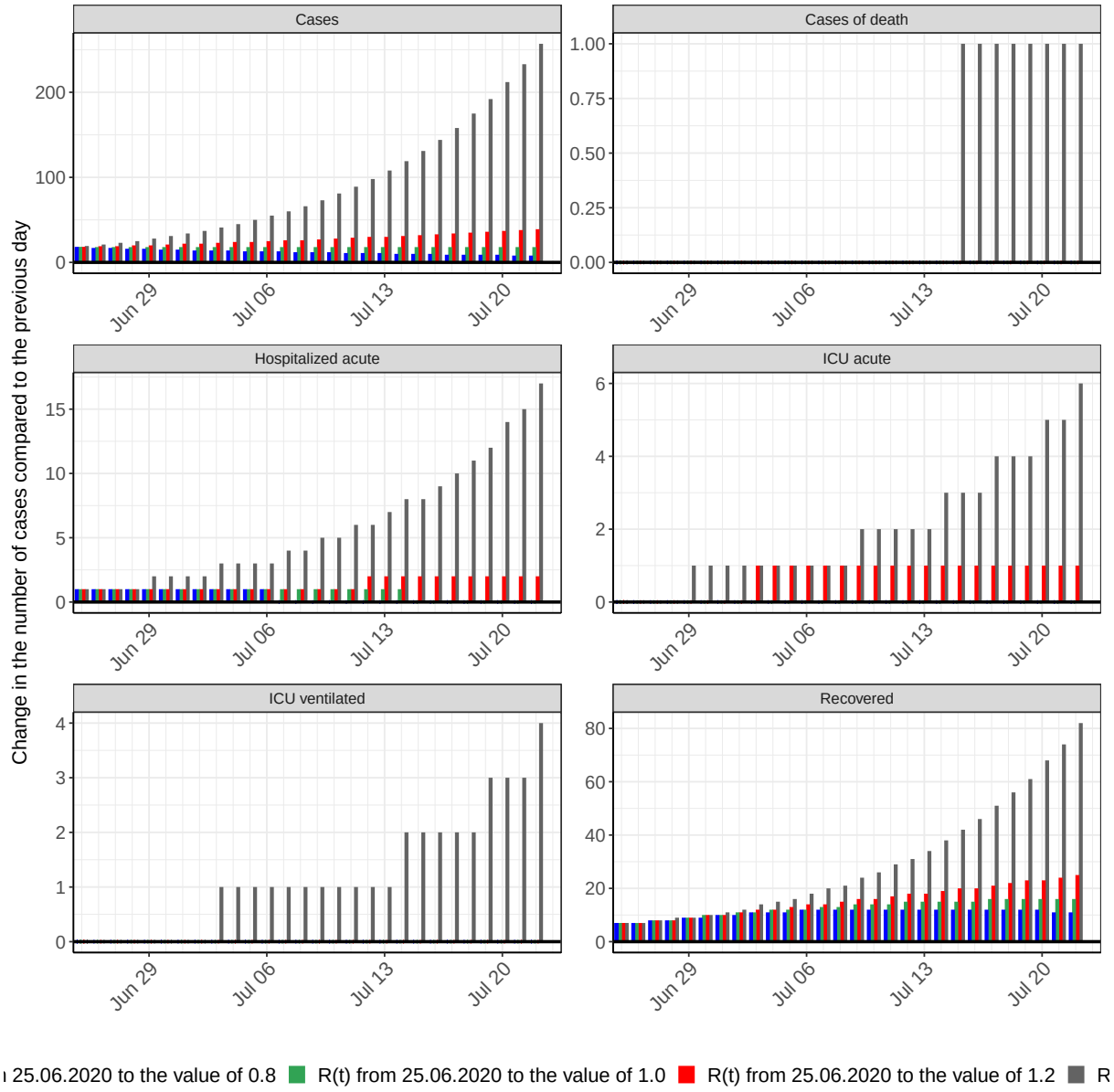


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

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.

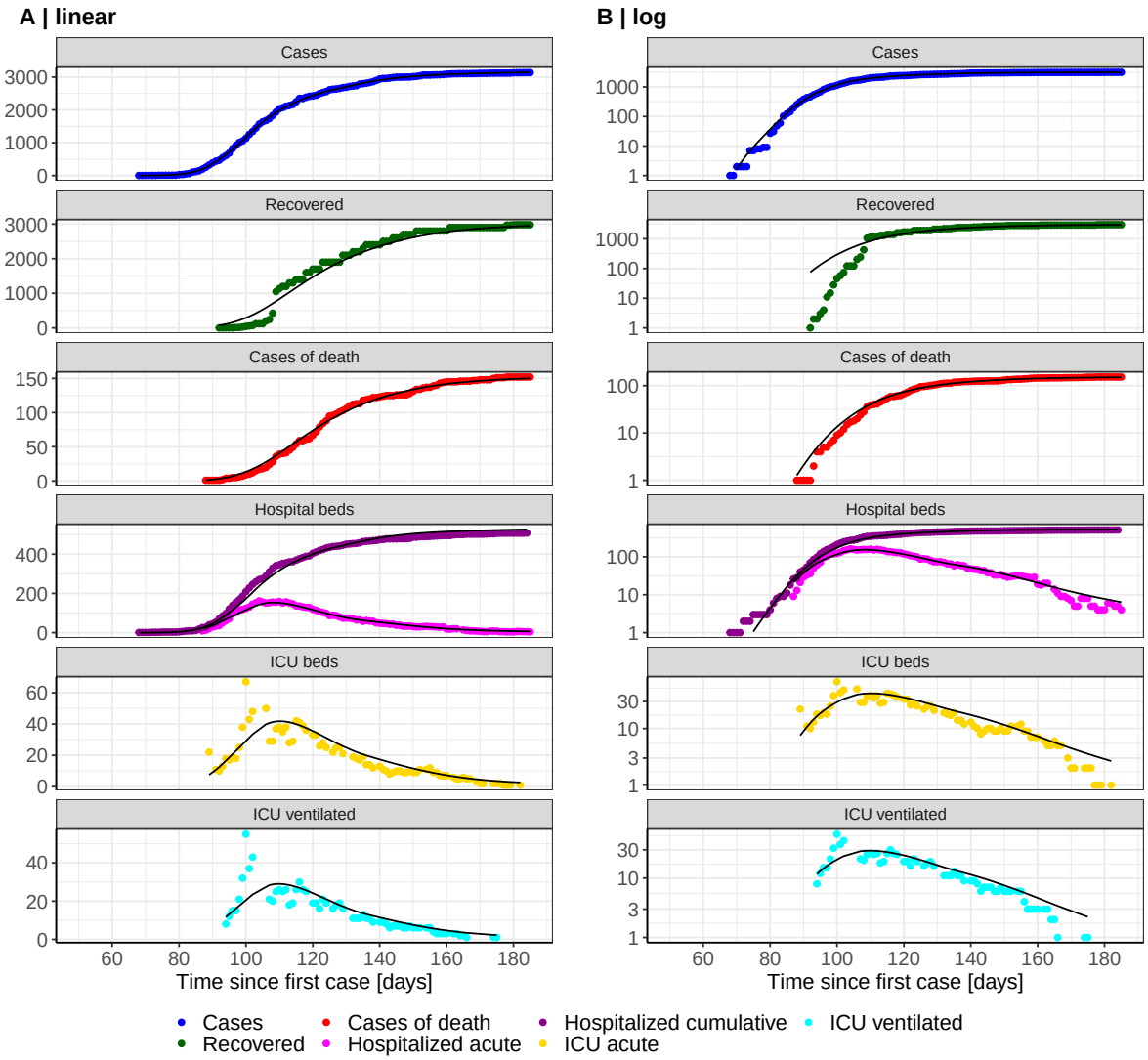


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

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.

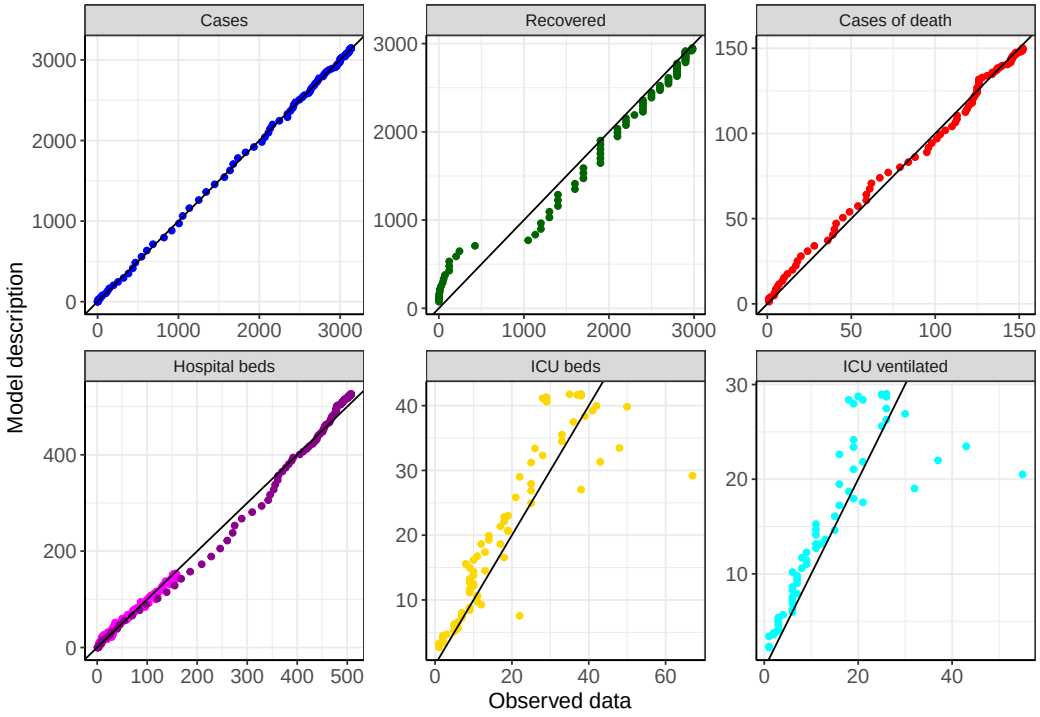


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

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).

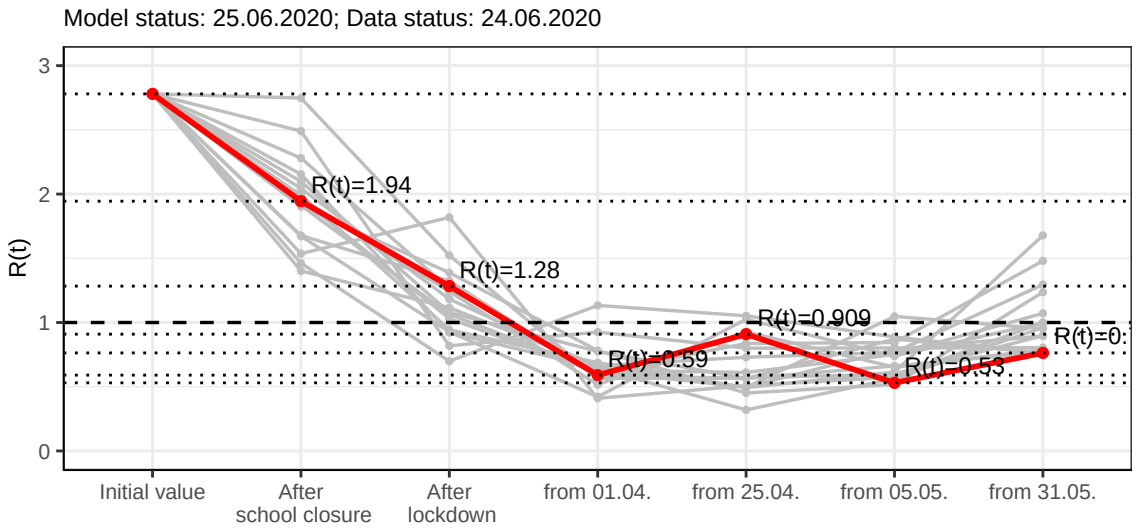


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

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

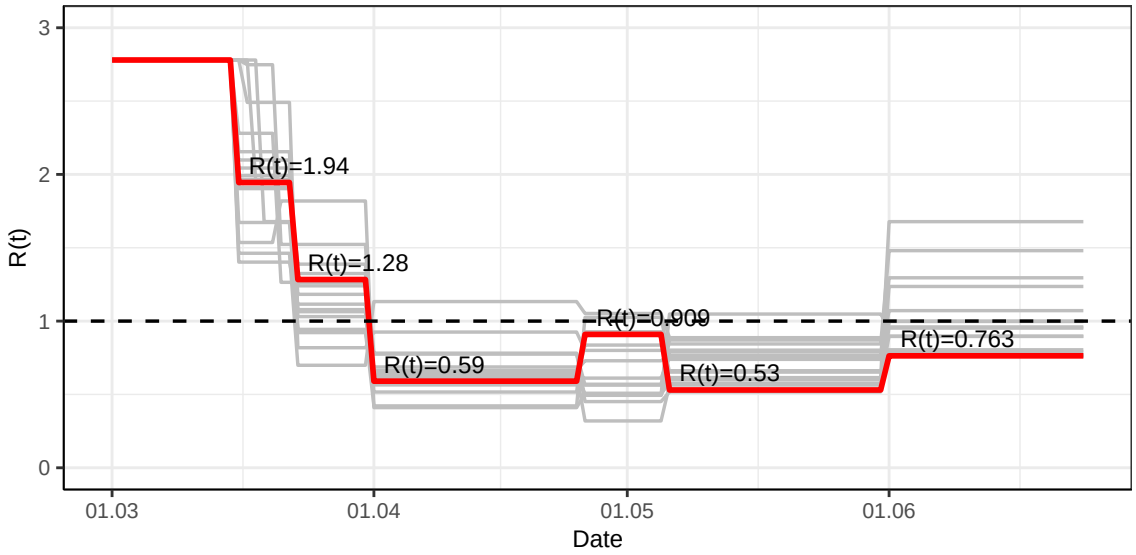


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

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

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.

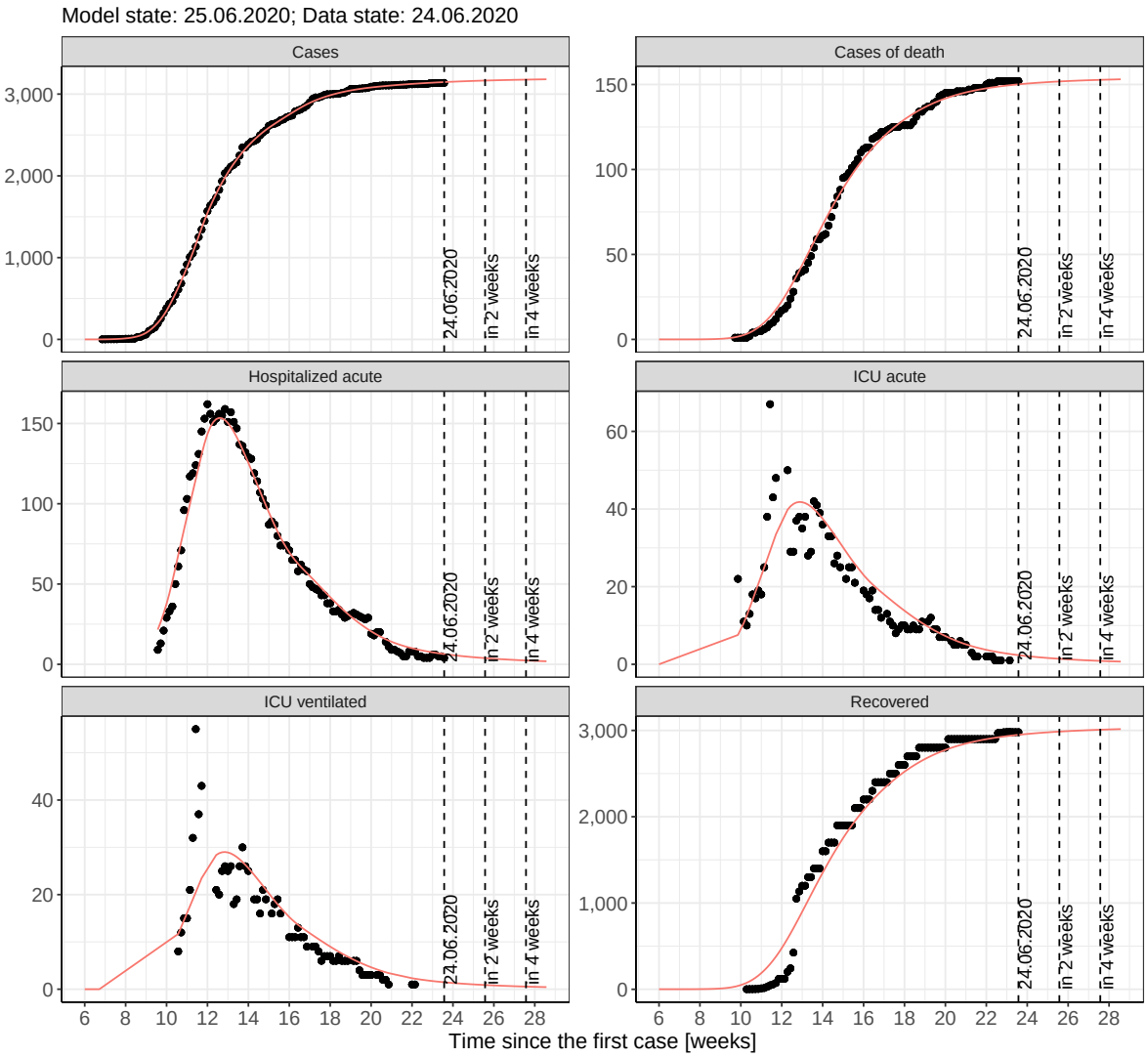


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

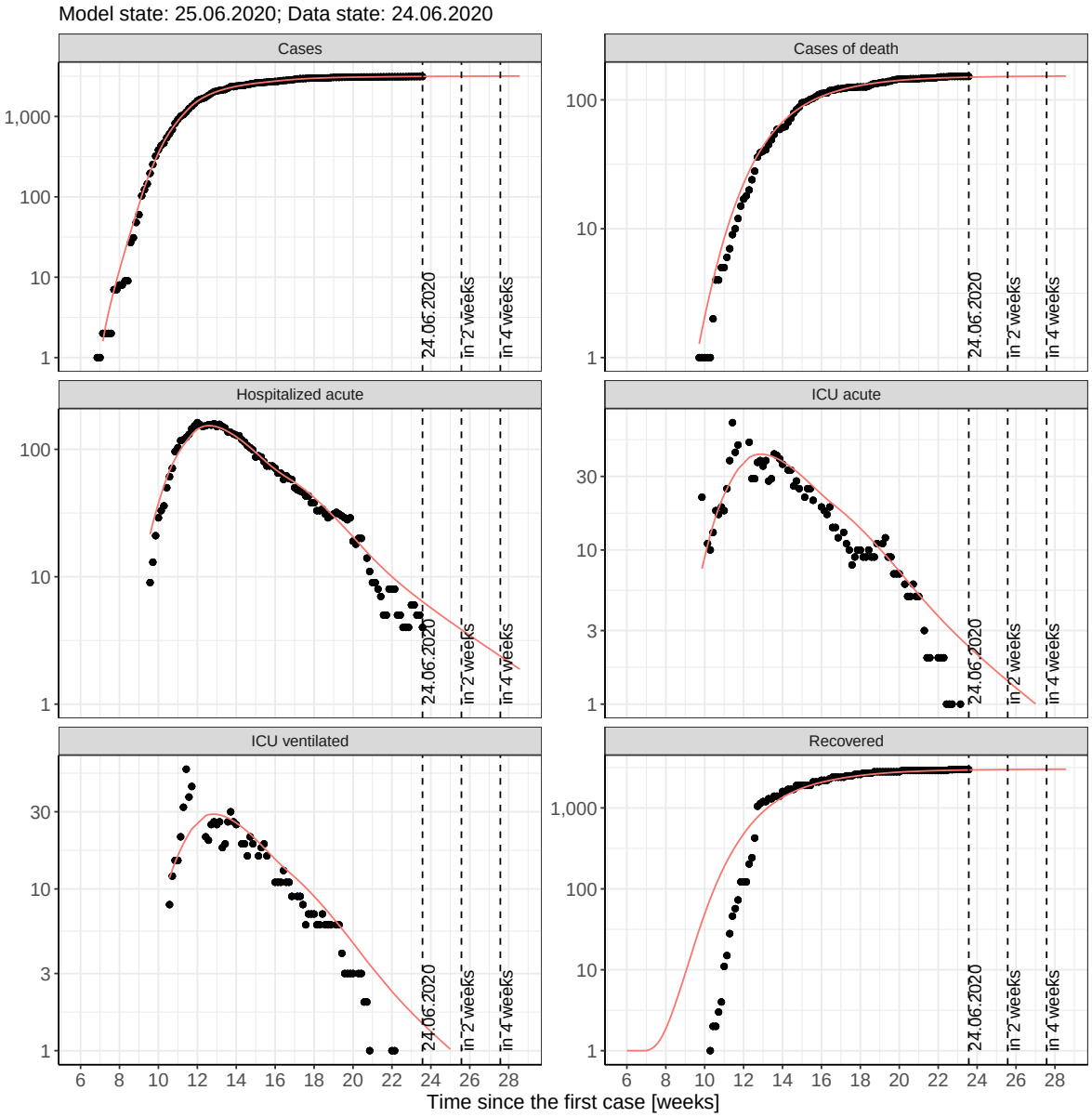


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

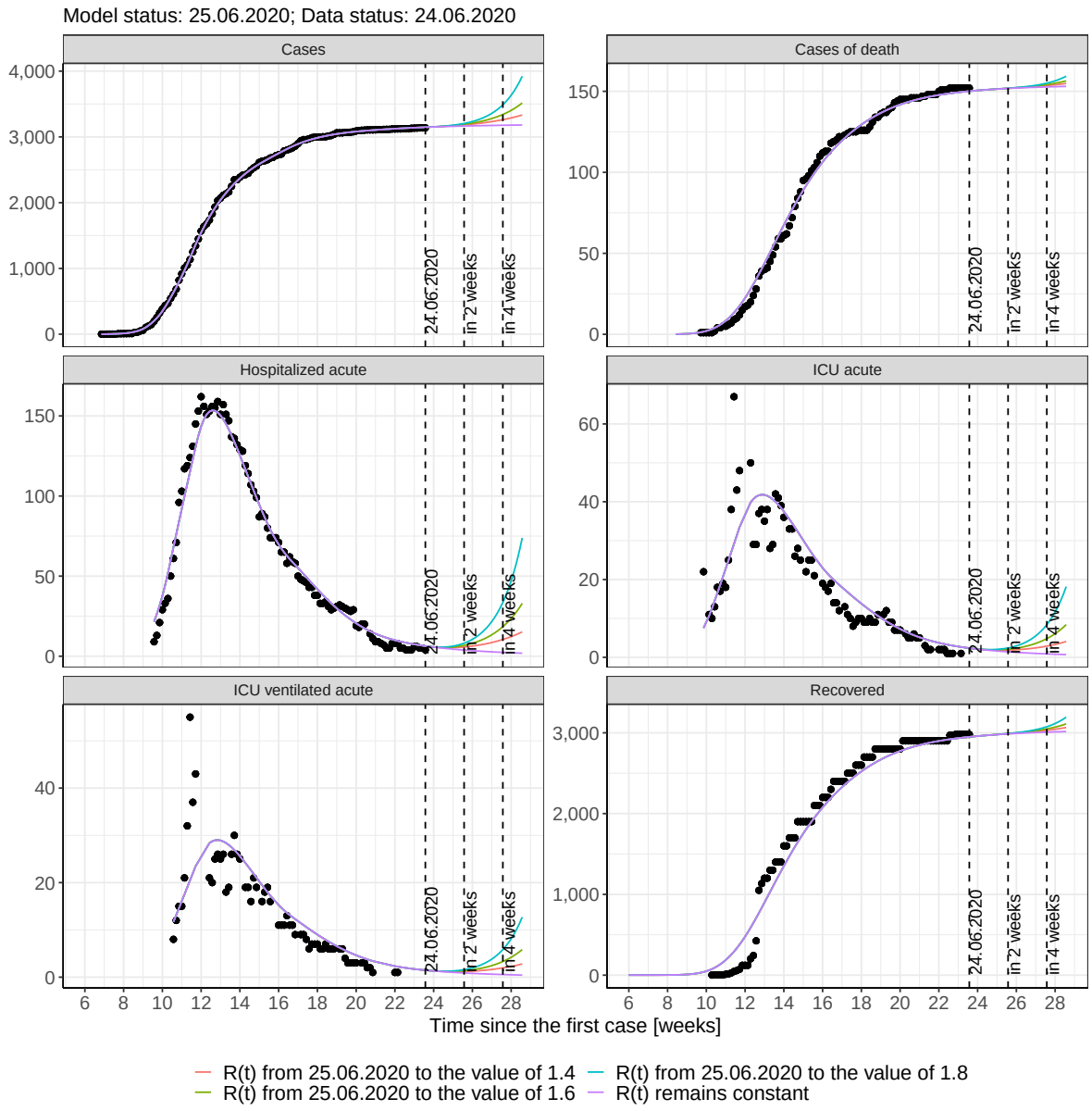


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

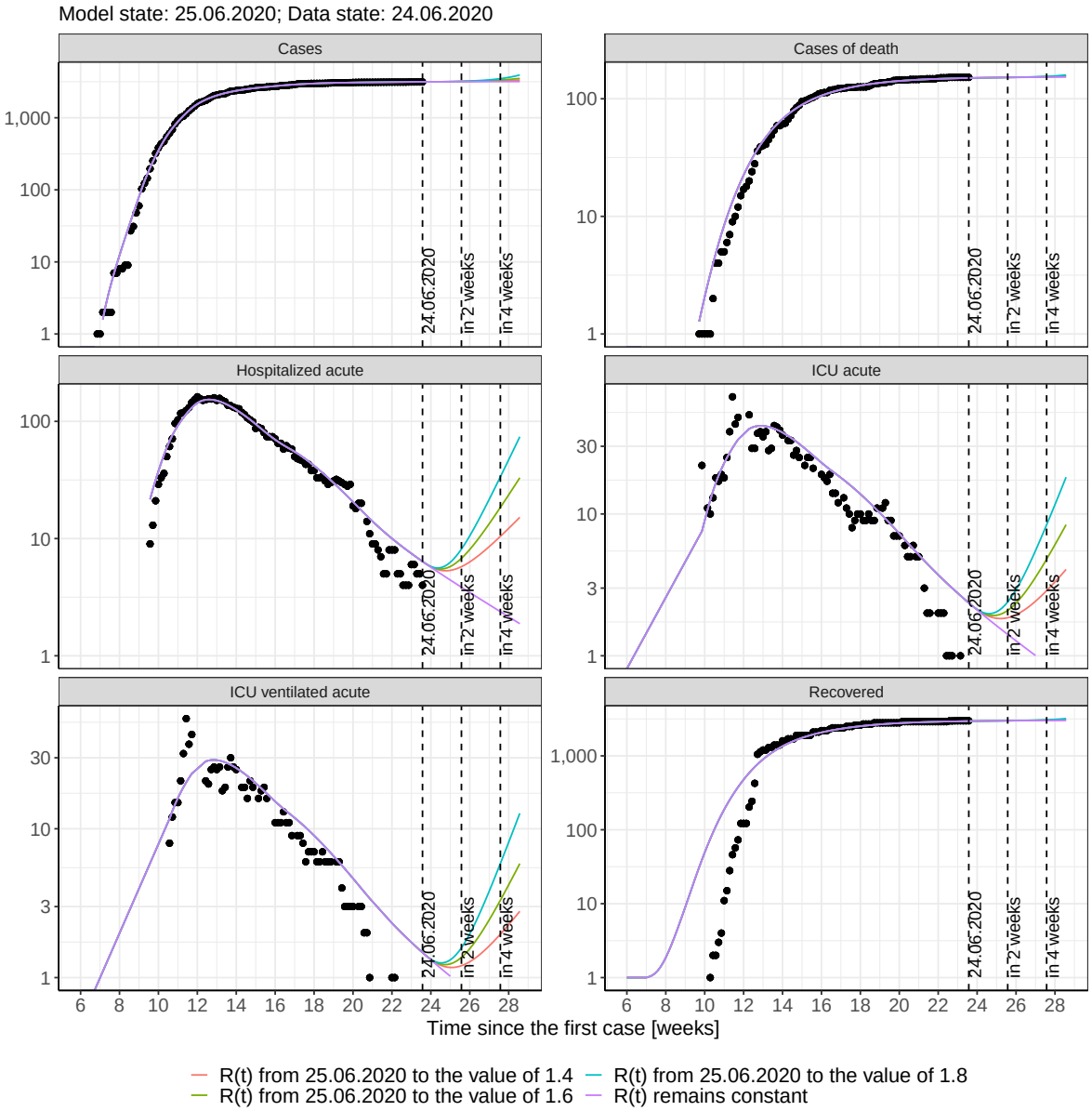


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

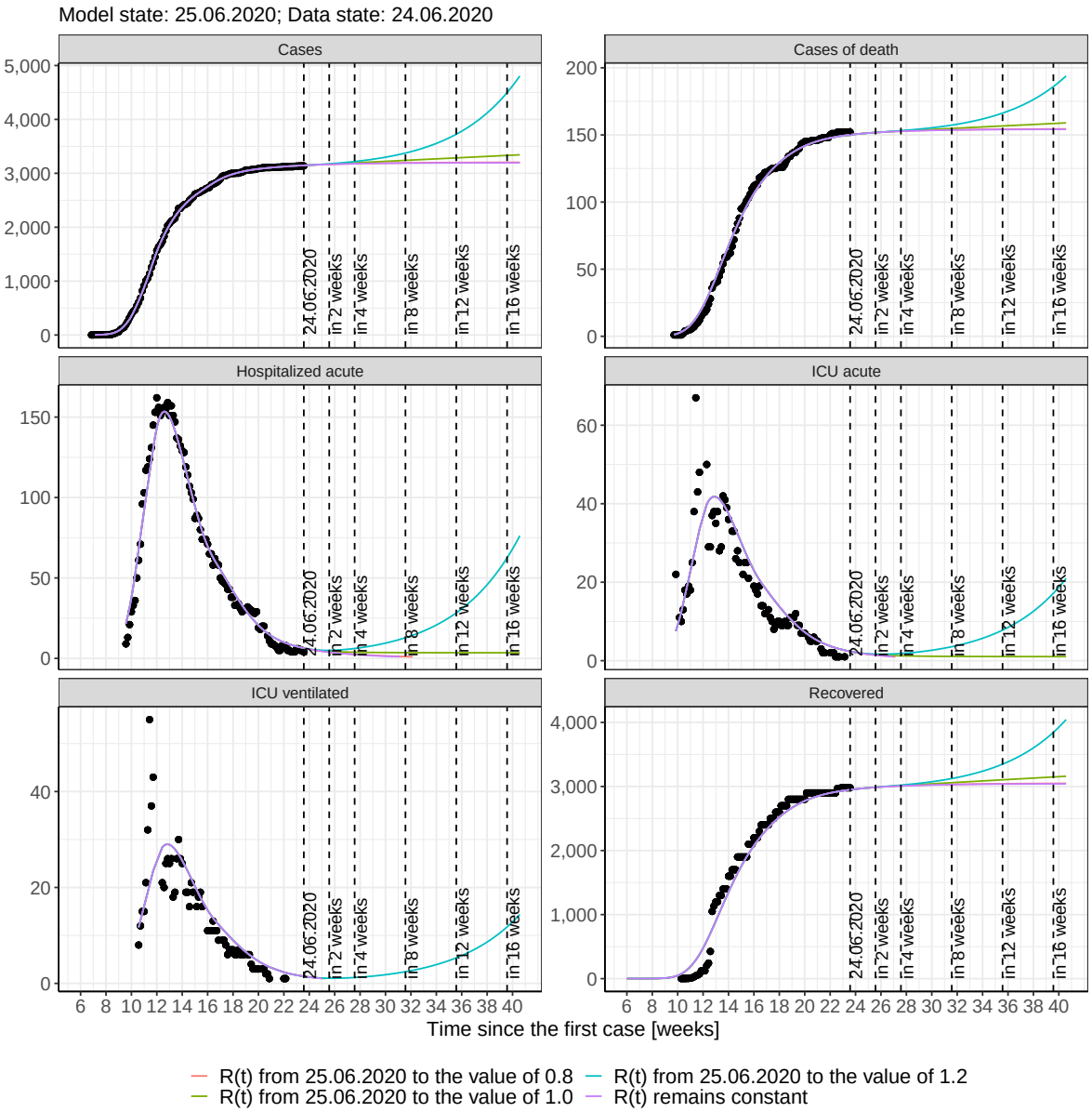


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

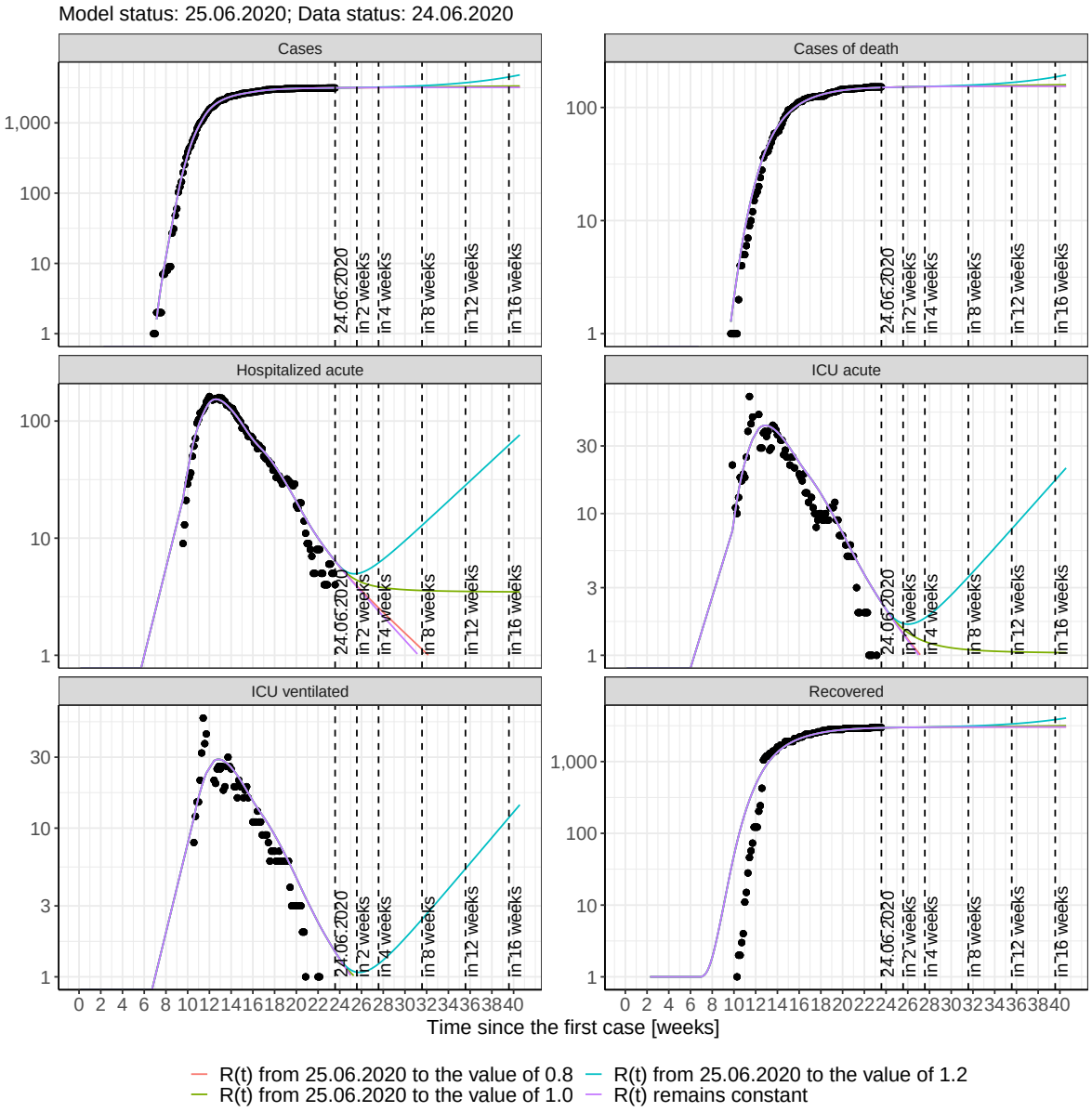


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 61) Model status from 25.06.2020; Data status: 24.06.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3148	150	2953	6	2	1
26.06.2020	3150	150	2956	6	2	1
27.06.2020	3152	151	2959	6	2	1
28.06.2020	3153	151	2962	5	2	1
29.06.2020	3154	151	2965	5	2	1
30.06.2020	3156	151	2968	5	2	1
01.07.2020	3157	151	2971	5	2	1
02.07.2020	3158	151	2973	5	2	1
03.07.2020	3160	151	2976	5	2	1
04.07.2020	3161	151	2978	4	2	1
05.07.2020	3162	152	2980	4	2	1
06.07.2020	3163	152	2982	4	2	1
07.07.2020	3164	152	2985	4	1	1
08.07.2020	3165	152	2987	4	1	1
09.07.2020	3166	152	2988	4	1	1
10.07.2020	3167	152	2990	4	1	1
11.07.2020	3168	152	2992	3	1	1
12.07.2020	3169	152	2994	3	1	1
13.07.2020	3170	152	2996	3	1	1
14.07.2020	3171	152	2997	3	1	1
15.07.2020	3172	152	2999	3	1	1
16.07.2020	3173	152	3000	3	1	1
17.07.2020	3174	152	3002	3	1	1
18.07.2020	3174	153	3003	3	1	1
19.07.2020	3175	153	3004	3	1	1
20.07.2020	3176	153	3006	3	1	1
21.07.2020	3176	153	3007	2	1	1
22.07.2020	3177	153	3008	2	1	1

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3148	150	2953	6	2	1
26.06.2020	3150	150	2956	6	2	1
27.06.2020	3152	151	2959	6	2	1
28.06.2020	3153	151	2962	5	2	1
29.06.2020	3155	151	2965	5	2	1
30.06.2020	3156	151	2968	5	2	1
01.07.2020	3157	151	2971	5	2	1
02.07.2020	3159	151	2973	5	2	1
03.07.2020	3160	151	2976	5	2	1
04.07.2020	3161	151	2978	4	2	1
05.07.2020	3163	152	2980	4	2	1
06.07.2020	3164	152	2982	4	2	1
07.07.2020	3165	152	2985	4	1	1
08.07.2020	3166	152	2987	4	1	1
09.07.2020	3167	152	2989	4	1	1
10.07.2020	3168	152	2990	4	1	1
11.07.2020	3169	152	2992	4	1	1
12.07.2020	3170	152	2994	3	1	1
13.07.2020	3171	152	2996	3	1	1
14.07.2020	3172	152	2998	3	1	1
15.07.2020	3173	152	2999	3	1	1
16.07.2020	3174	152	3001	3	1	1
17.07.2020	3175	152	3002	3	1	1
18.07.2020	3176	153	3004	3	1	1
19.07.2020	3177	153	3005	3	1	1
20.07.2020	3177	153	3006	3	1	1
21.07.2020	3178	153	3008	3	1	1
22.07.2020	3179	153	3009	3	1	1

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3148	150	2953	6	2	1
26.06.2020	3150	150	2956	6	2	1
27.06.2020	3152	151	2959	6	2	1
28.06.2020	3154	151	2962	6	2	1
29.06.2020	3155	151	2965	5	2	1
30.06.2020	3157	151	2968	5	2	1
01.07.2020	3158	151	2971	5	2	1
02.07.2020	3160	151	2973	5	2	1
03.07.2020	3162	151	2976	5	2	1
04.07.2020	3164	151	2978	5	2	1
05.07.2020	3165	152	2981	5	2	1
06.07.2020	3167	152	2983	5	2	1
07.07.2020	3168	152	2985	4	2	1
08.07.2020	3170	152	2987	4	2	1
09.07.2020	3172	152	2989	4	2	1
10.07.2020	3174	152	2991	4	1	1
11.07.2020	3175	152	2993	4	1	1
12.07.2020	3177	152	2995	4	1	1
13.07.2020	3178	152	2997	4	1	1
14.07.2020	3180	152	2999	4	1	1
15.07.2020	3182	152	3001	4	1	1
16.07.2020	3184	152	3003	4	1	1
17.07.2020	3185	153	3005	4	1	1
18.07.2020	3187	153	3007	4	1	1
19.07.2020	3188	153	3008	4	1	1
20.07.2020	3190	153	3010	4	1	1
21.07.2020	3192	153	3012	4	1	1
22.07.2020	3193	153	3014	4	1	1

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3149	150	2953	6	2	1
26.06.2020	3150	150	2956	6	2	1
27.06.2020	3152	151	2959	6	2	1
28.06.2020	3154	151	2962	6	2	1
29.06.2020	3156	151	2965	5	2	1
30.06.2020	3158	151	2968	5	2	1
01.07.2020	3160	151	2971	5	2	1
02.07.2020	3162	151	2973	5	2	1
03.07.2020	3164	151	2976	5	2	1
04.07.2020	3166	151	2978	5	2	1
05.07.2020	3168	152	2981	5	2	1
06.07.2020	3171	152	2983	5	2	1
07.07.2020	3173	152	2986	5	2	1
08.07.2020	3176	152	2988	5	2	1
09.07.2020	3178	152	2990	5	2	1
10.07.2020	3181	152	2992	5	2	1
11.07.2020	3183	152	2995	5	2	1
12.07.2020	3186	152	2997	5	2	1
13.07.2020	3189	152	2999	5	2	1
14.07.2020	3192	152	3002	5	2	1
15.07.2020	3195	152	3004	5	2	1
16.07.2020	3198	153	3006	5	2	1
17.07.2020	3201	153	3009	6	2	1
18.07.2020	3204	153	3011	6	2	1
19.07.2020	3208	153	3013	6	2	1
20.07.2020	3211	153	3016	6	2	1
21.07.2020	3214	153	3018	6	2	1
22.07.2020	3218	153	3021	6	2	1

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

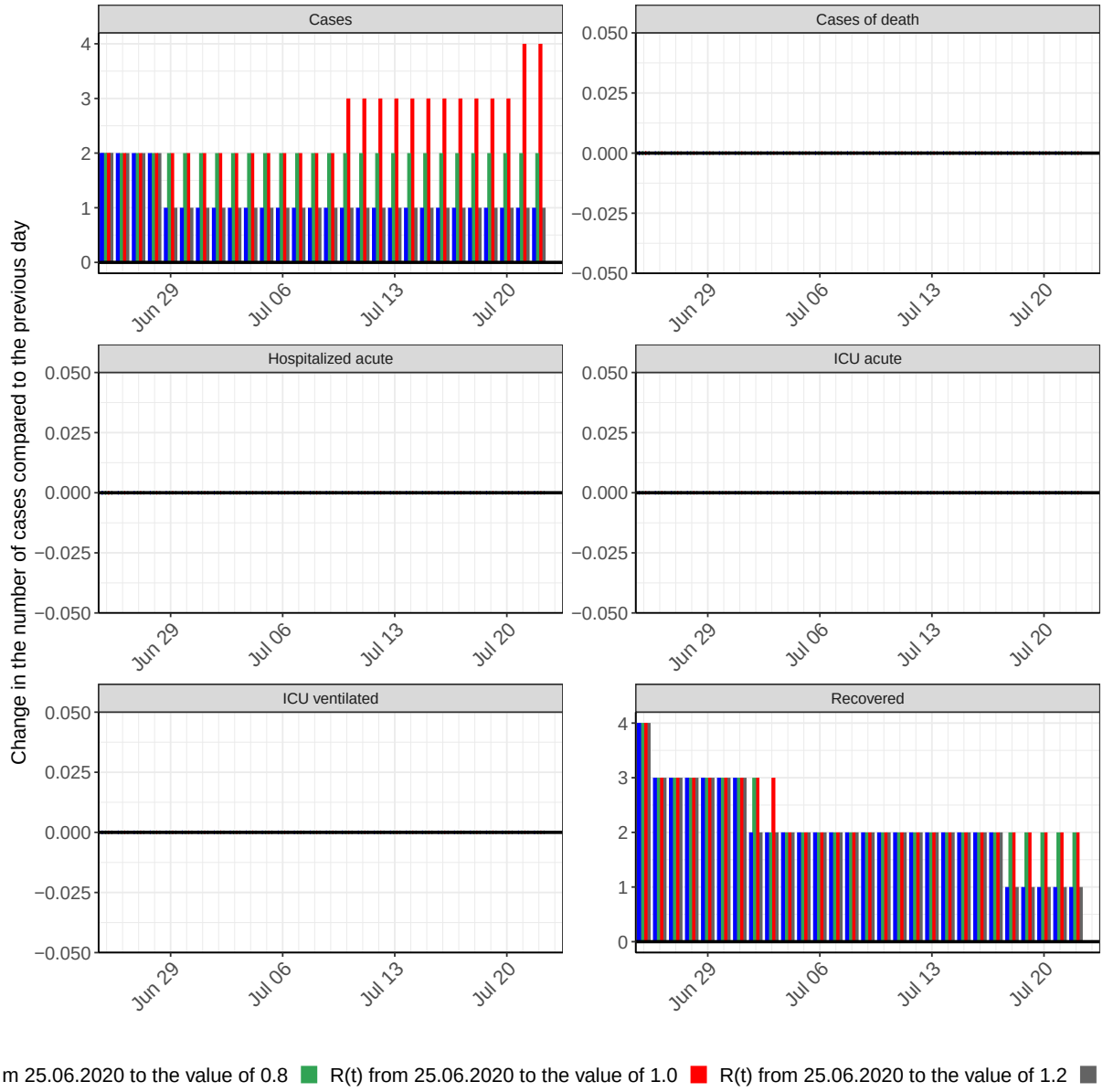


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

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.

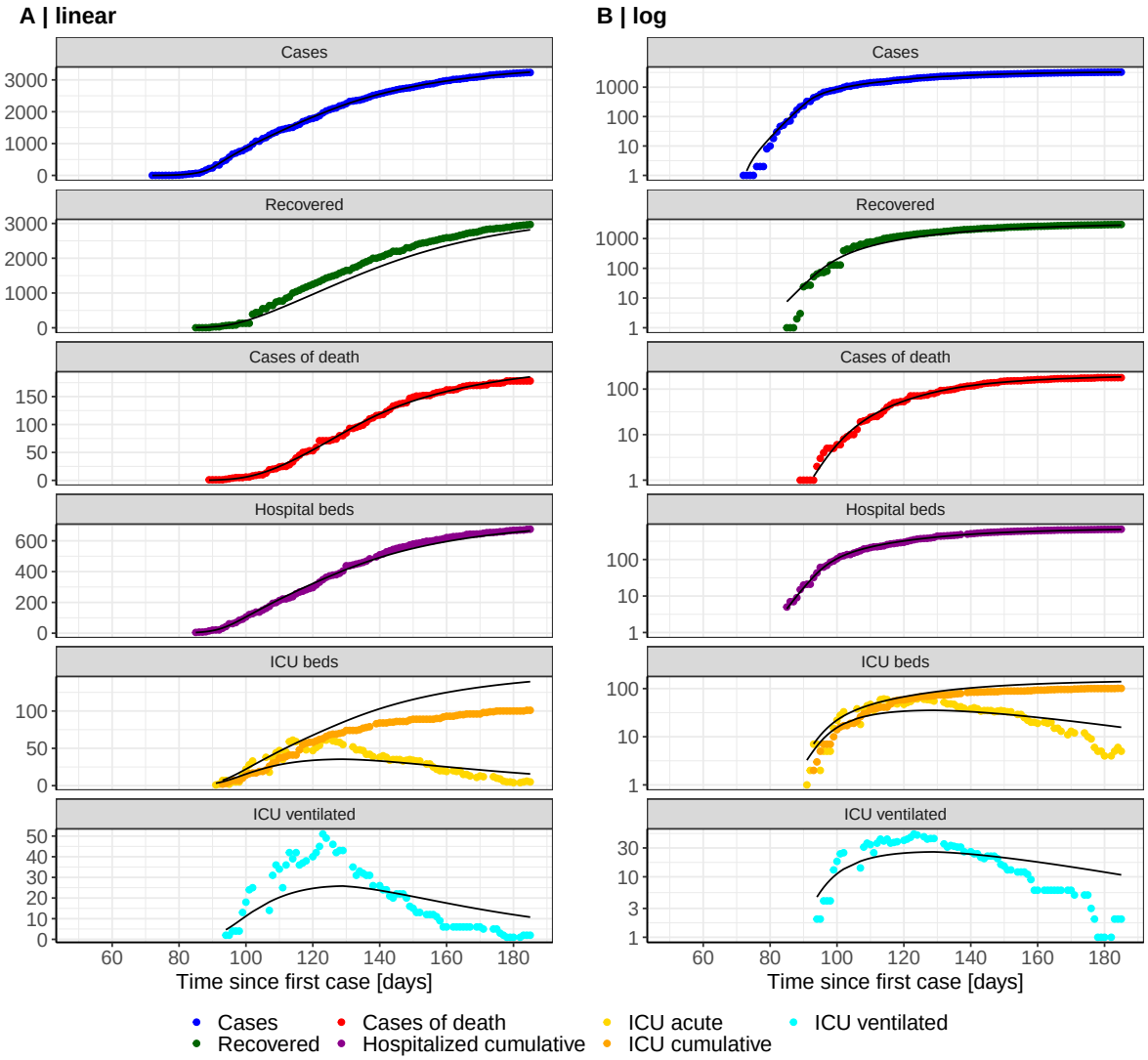


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

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.

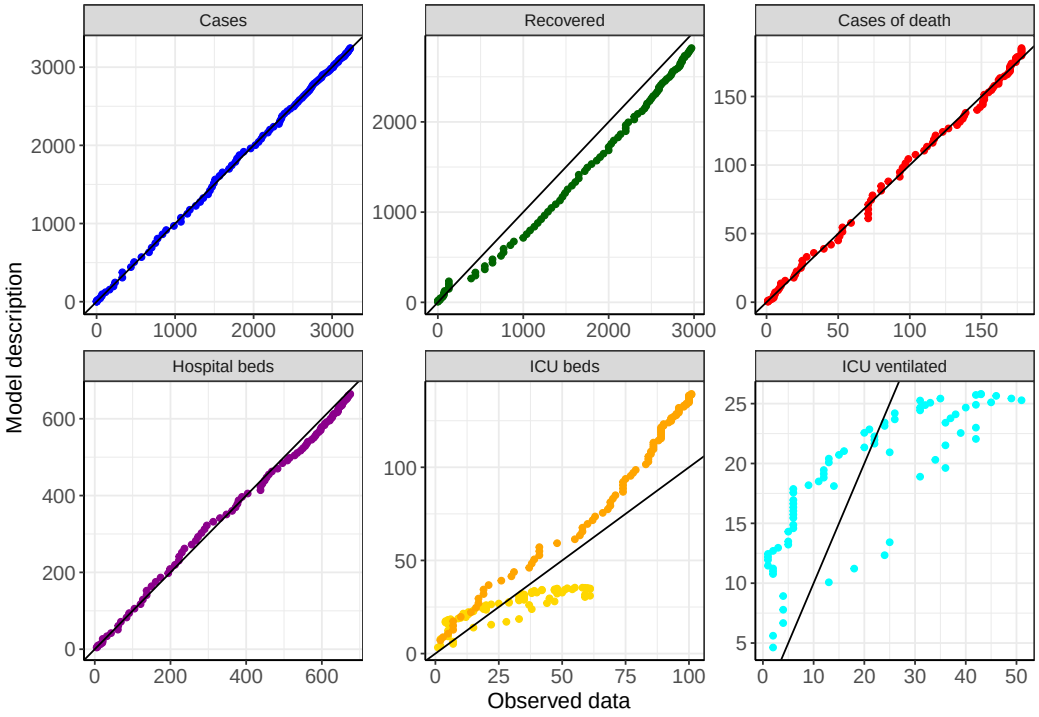


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

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).

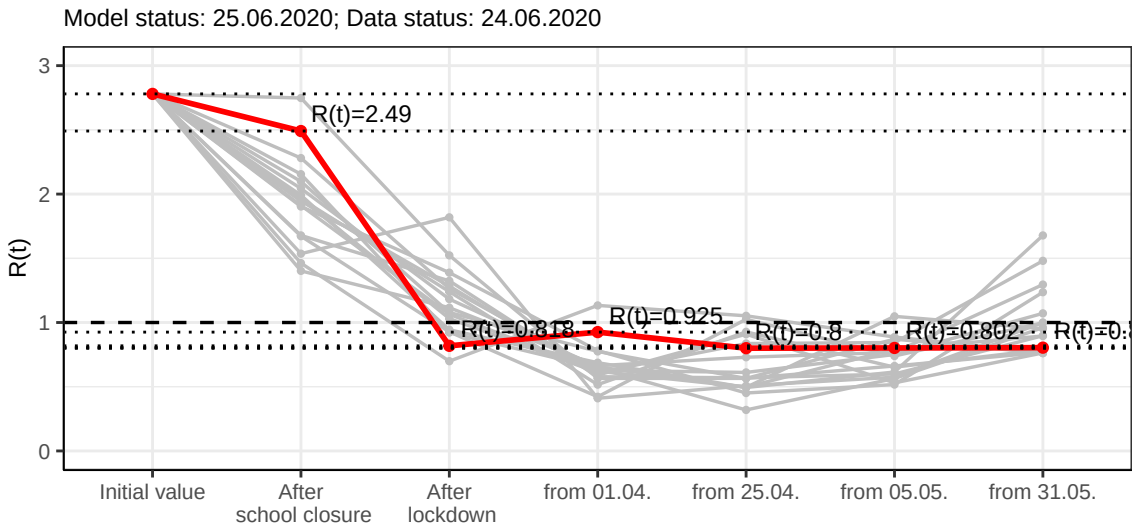


Figure 178: R(t) values before and after the NPIs for Thuringia

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

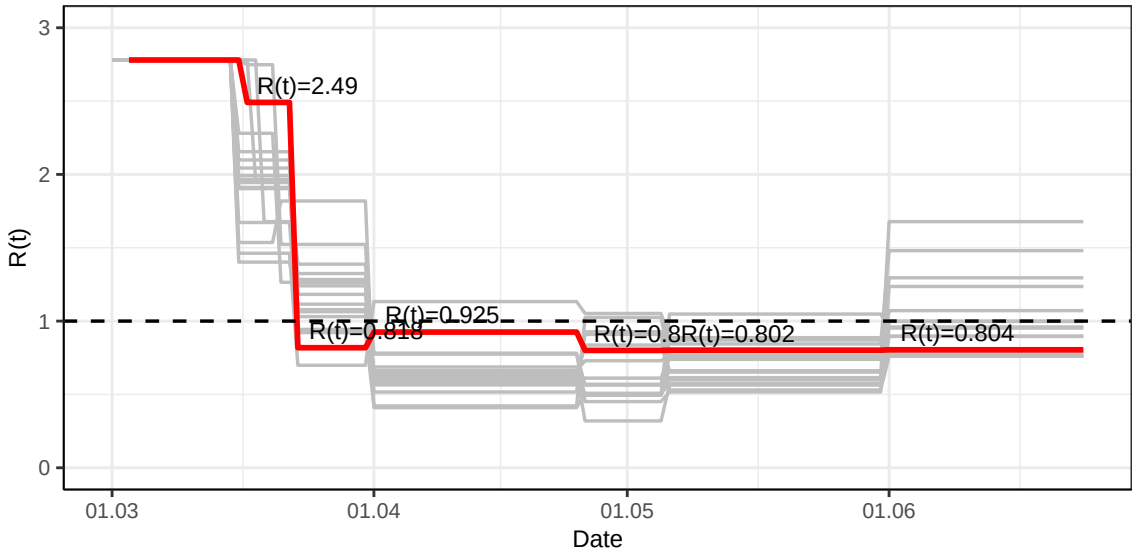


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

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

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.

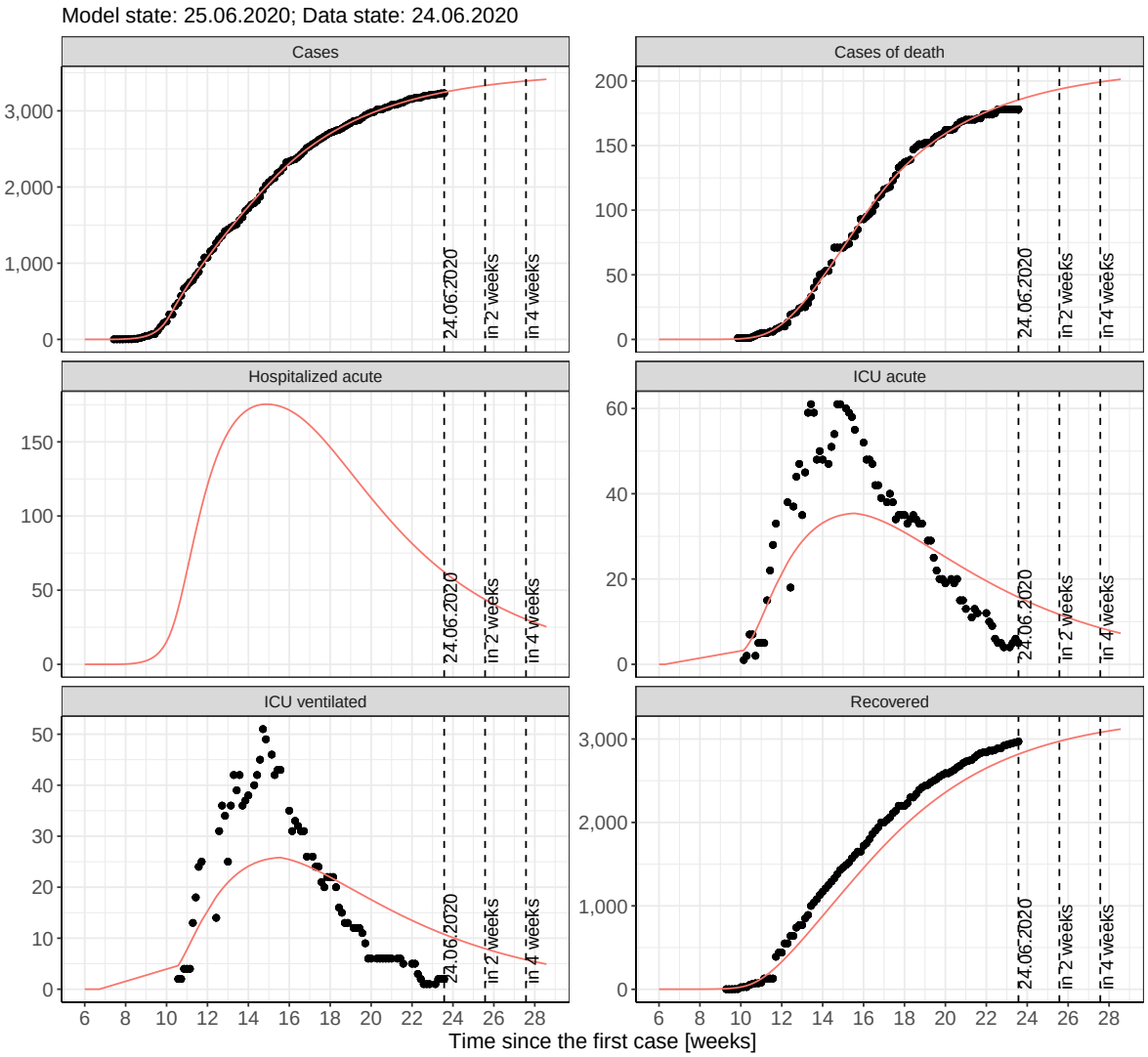


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

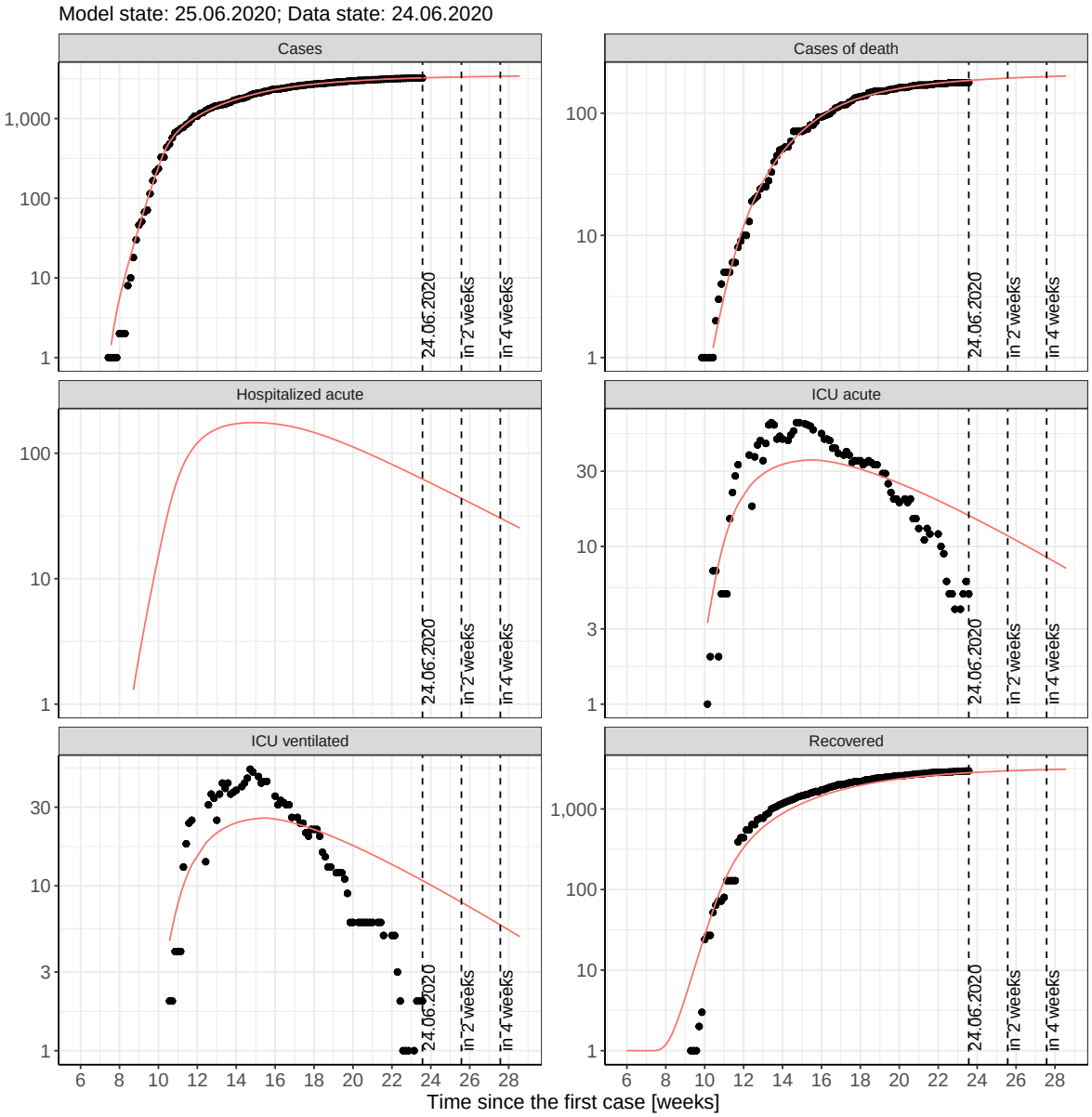


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

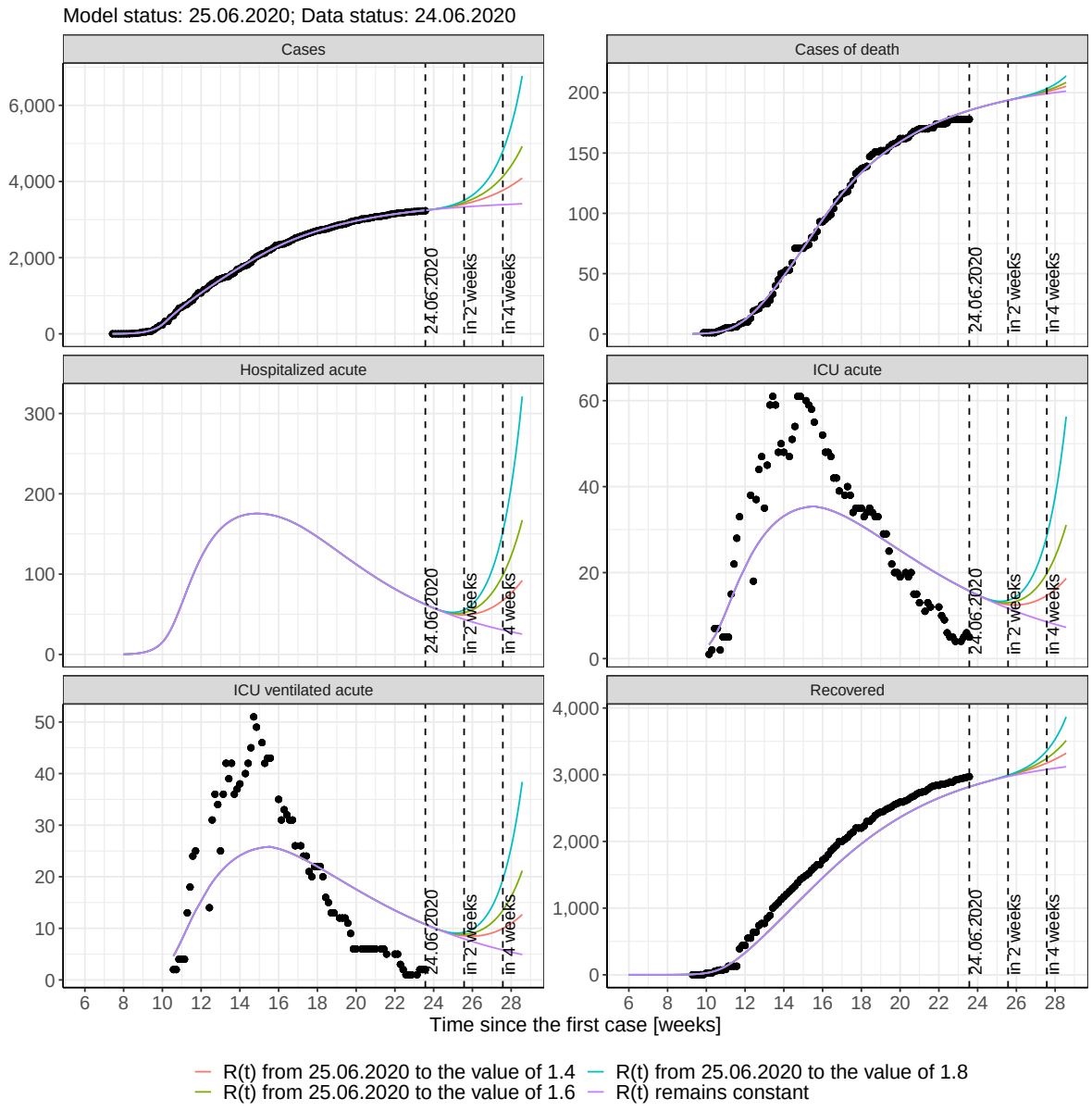


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

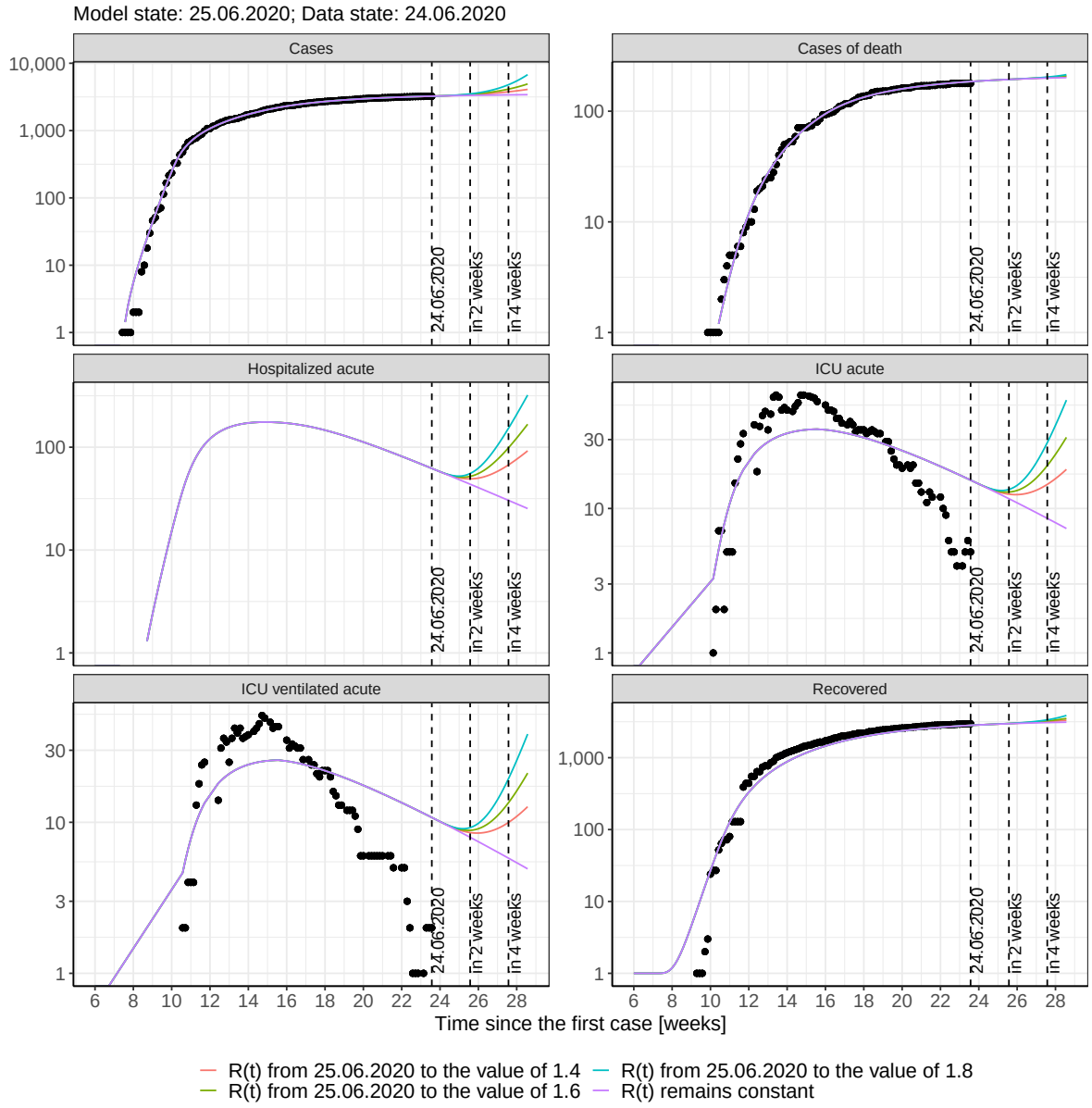


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

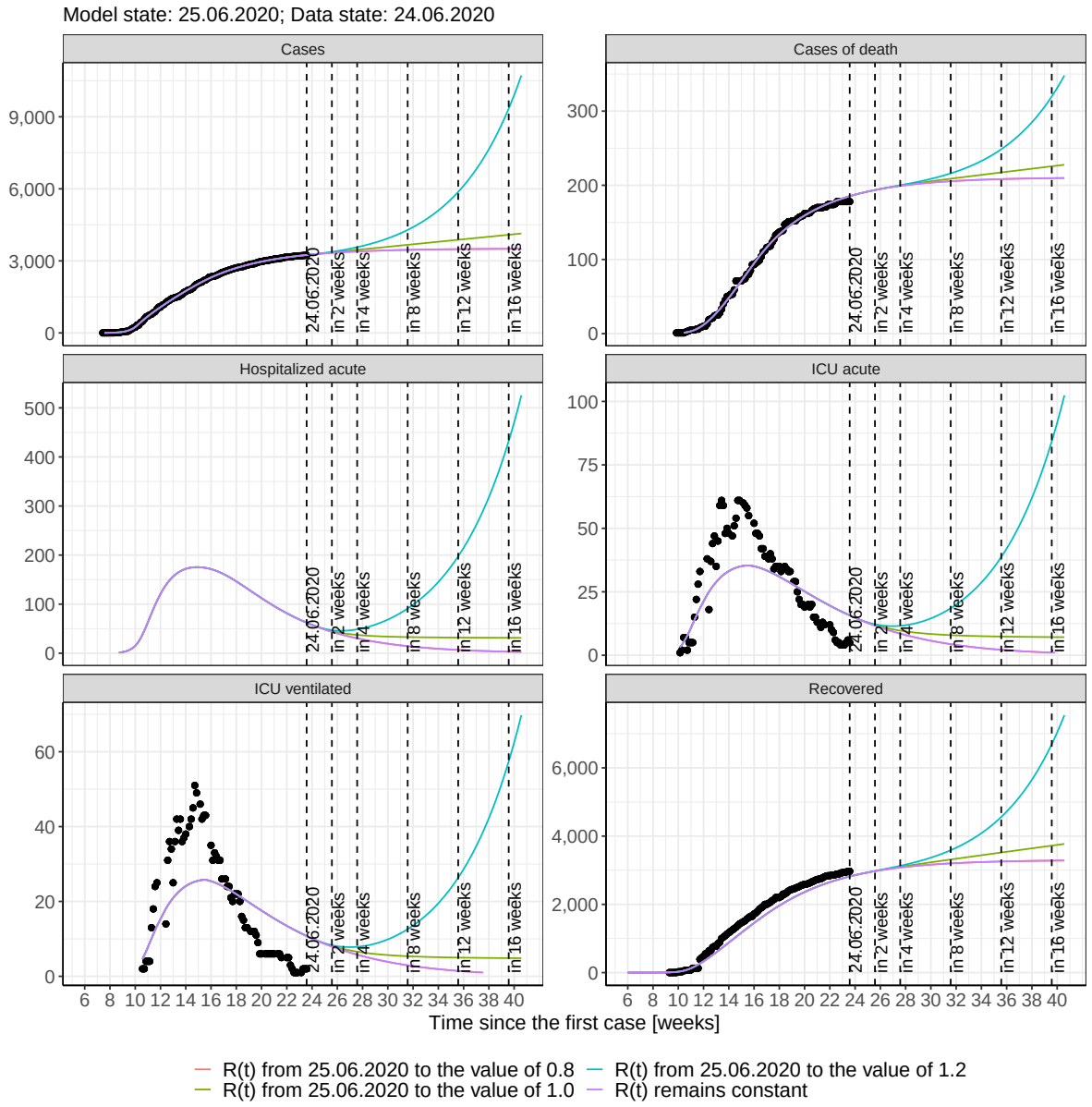


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

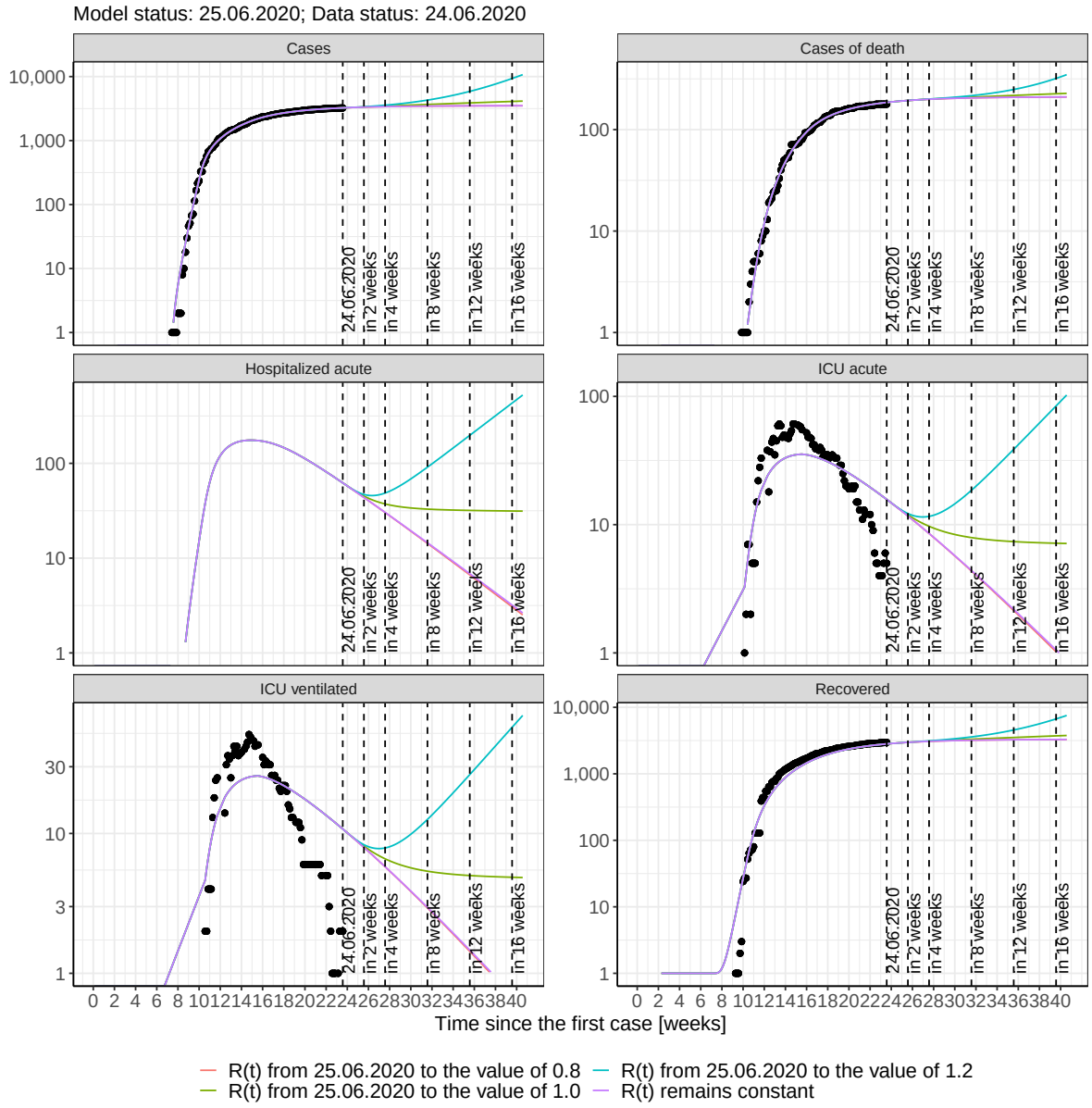


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 65) Model status from 25.06.2020; Data status: 24.06.2020.

Table 62: Thuringia - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3252	186	2831	61	15	11
26.06.2020	3259	187	2844	59	15	10
27.06.2020	3266	187	2856	58	15	10
28.06.2020	3273	188	2868	56	14	10
29.06.2020	3280	189	2880	55	14	10
30.06.2020	3286	189	2892	54	14	9
01.07.2020	3293	190	2903	52	14	9
02.07.2020	3299	190	2914	51	13	9
03.07.2020	3305	191	2924	50	13	9
04.07.2020	3311	192	2934	48	13	9
05.07.2020	3316	192	2944	47	12	8
06.07.2020	3322	193	2954	46	12	8
07.07.2020	3327	193	2964	45	12	8
08.07.2020	3332	194	2973	44	12	8
09.07.2020	3338	194	2982	43	11	8
10.07.2020	3342	195	2991	41	11	8
11.07.2020	3347	195	2999	40	11	7
12.07.2020	3352	195	3007	39	11	7
13.07.2020	3356	196	3016	38	10	7
14.07.2020	3361	196	3023	37	10	7
15.07.2020	3365	197	3031	36	10	7
16.07.2020	3369	197	3038	36	10	7
17.07.2020	3373	197	3046	35	10	6
18.07.2020	3377	198	3053	34	9	6
19.07.2020	3381	198	3060	33	9	6
20.07.2020	3385	199	3066	32	9	6
21.07.2020	3388	199	3073	31	9	6
22.07.2020	3392	199	3079	30	9	6

Table 63: Thuringia - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3252	186	2831	61	15	11
26.06.2020	3259	187	2844	59	15	10
27.06.2020	3266	187	2856	58	15	10
28.06.2020	3273	188	2868	56	14	10
29.06.2020	3280	189	2880	55	14	10
30.06.2020	3286	189	2892	54	14	9
01.07.2020	3293	190	2903	52	14	9
02.07.2020	3299	190	2914	51	13	9
03.07.2020	3305	191	2924	50	13	9
04.07.2020	3310	192	2934	48	13	9
05.07.2020	3316	192	2944	47	12	8
06.07.2020	3322	193	2954	46	12	8
07.07.2020	3327	193	2964	45	12	8
08.07.2020	3332	194	2973	44	12	8
09.07.2020	3337	194	2982	43	11	8
10.07.2020	3342	195	2991	41	11	8
11.07.2020	3347	195	2999	40	11	7
12.07.2020	3351	195	3007	39	11	7
13.07.2020	3356	196	3015	38	10	7
14.07.2020	3360	196	3023	37	10	7
15.07.2020	3364	197	3031	36	10	7
16.07.2020	3369	197	3038	35	10	7
17.07.2020	3372	197	3046	35	10	6
18.07.2020	3376	198	3052	34	9	6
19.07.2020	3380	198	3059	33	9	6
20.07.2020	3384	199	3066	32	9	6
21.07.2020	3387	199	3072	31	9	6
22.07.2020	3391	199	3079	30	9	6

Table 64: Thuringia - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3252	186	2831	61	15	11
26.06.2020	3260	187	2844	59	15	10
27.06.2020	3267	187	2856	58	15	10
28.06.2020	3275	188	2868	56	14	10
29.06.2020	3282	189	2880	55	14	10
30.06.2020	3290	189	2892	54	14	9
01.07.2020	3298	190	2903	52	14	9
02.07.2020	3305	190	2914	51	13	9
03.07.2020	3313	191	2925	50	13	9
04.07.2020	3320	192	2935	49	13	9
05.07.2020	3328	192	2946	48	13	9
06.07.2020	3336	193	2956	47	12	8
07.07.2020	3343	193	2966	46	12	8
08.07.2020	3351	194	2975	45	12	8
09.07.2020	3358	194	2985	44	12	8
10.07.2020	3366	195	2994	44	12	8
11.07.2020	3374	195	3004	43	11	8
12.07.2020	3381	195	3013	42	11	8
13.07.2020	3389	196	3022	42	11	7
14.07.2020	3396	196	3031	41	11	7
15.07.2020	3404	197	3040	40	11	7
16.07.2020	3412	197	3048	40	10	7
17.07.2020	3419	198	3057	39	10	7
18.07.2020	3427	198	3066	39	10	7
19.07.2020	3434	198	3074	38	10	7
20.07.2020	3442	199	3083	38	10	7
21.07.2020	3450	199	3091	38	10	7
22.07.2020	3457	200	3099	37	10	7

Table 65: Thuringia - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	3252	186	2831	61	15	11
26.06.2020	3260	187	2844	59	15	10
27.06.2020	3268	187	2856	58	15	10
28.06.2020	3277	188	2869	56	14	10
29.06.2020	3285	189	2880	55	14	10
30.06.2020	3294	189	2892	54	14	10
01.07.2020	3303	190	2903	53	14	9
02.07.2020	3313	190	2914	52	13	9
03.07.2020	3322	191	2925	51	13	9
04.07.2020	3332	192	2936	50	13	9
05.07.2020	3343	192	2947	49	13	9
06.07.2020	3353	193	2957	48	13	9
07.07.2020	3364	193	2968	47	12	8
08.07.2020	3375	194	2978	47	12	8
09.07.2020	3387	194	2989	47	12	8
10.07.2020	3399	195	2999	46	12	8
11.07.2020	3411	195	3010	46	12	8
12.07.2020	3423	196	3020	46	12	8
13.07.2020	3436	196	3030	46	12	8
14.07.2020	3449	196	3041	46	12	8
15.07.2020	3463	197	3052	46	12	8
16.07.2020	3477	197	3062	46	12	8
17.07.2020	3491	198	3073	46	11	8
18.07.2020	3506	198	3084	47	11	8
19.07.2020	3522	199	3095	47	11	8
20.07.2020	3537	199	3106	47	12	8
21.07.2020	3553	200	3118	48	12	8
22.07.2020	3570	200	3129	49	12	8

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

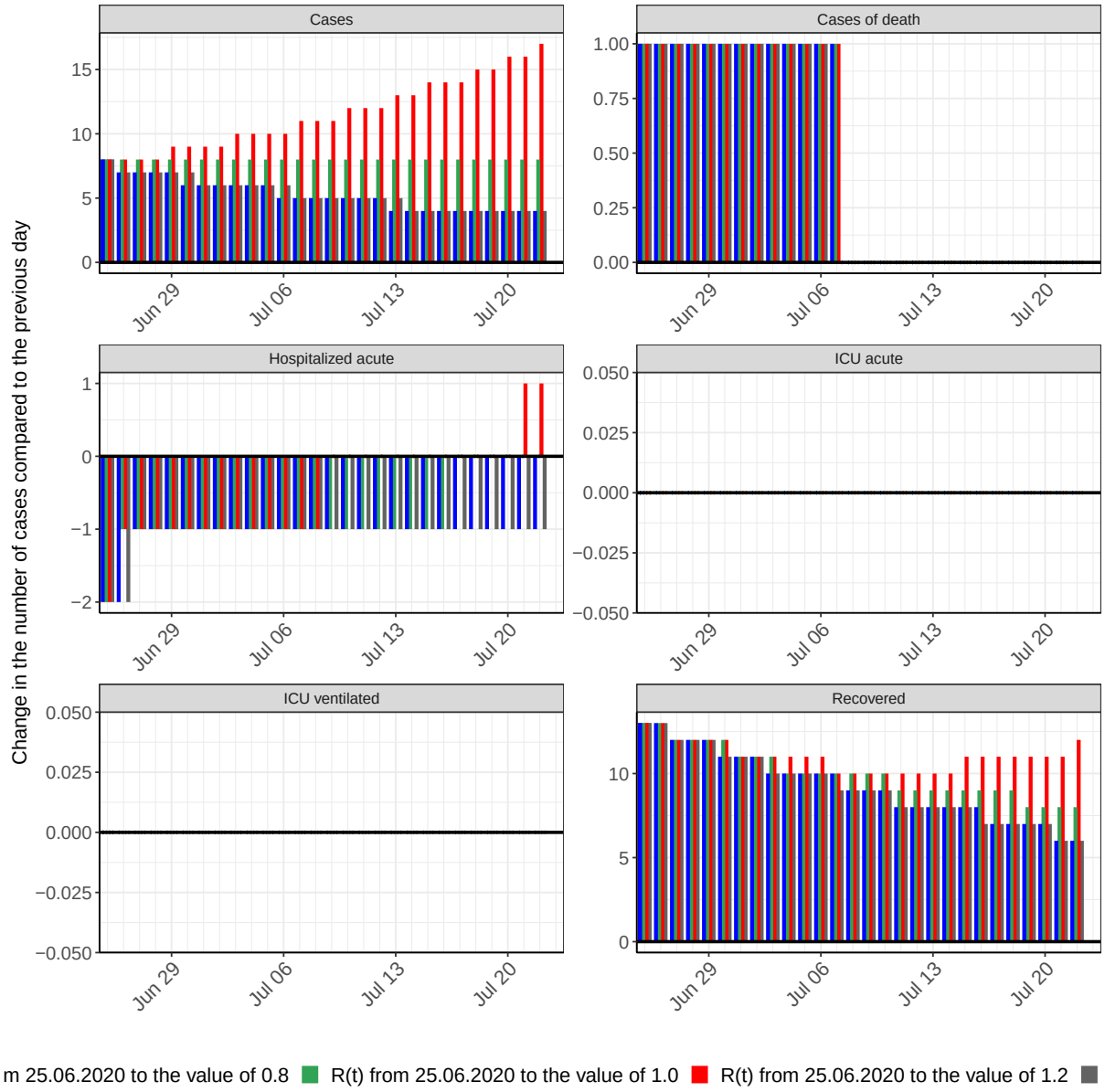


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

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.

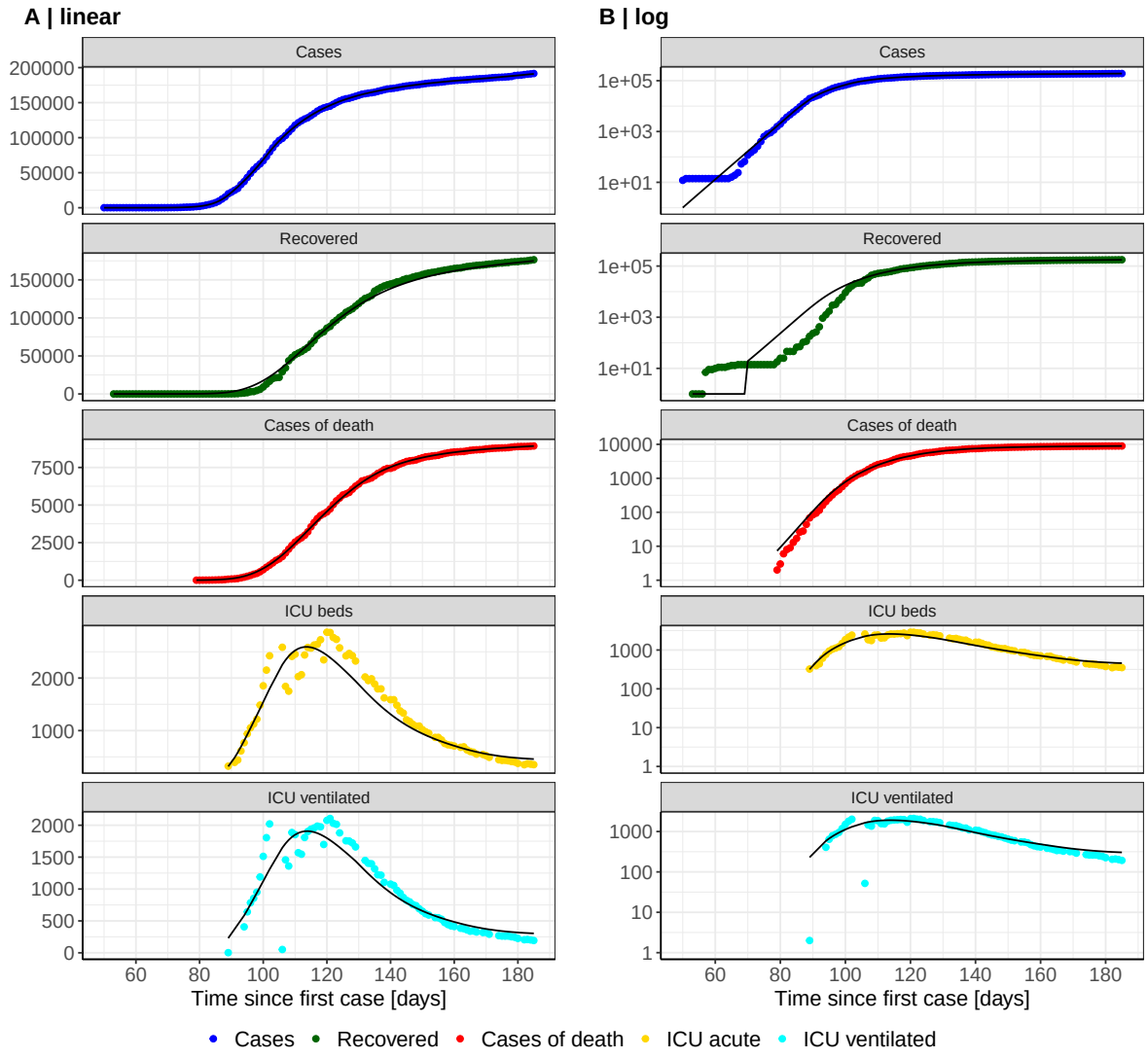


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

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.

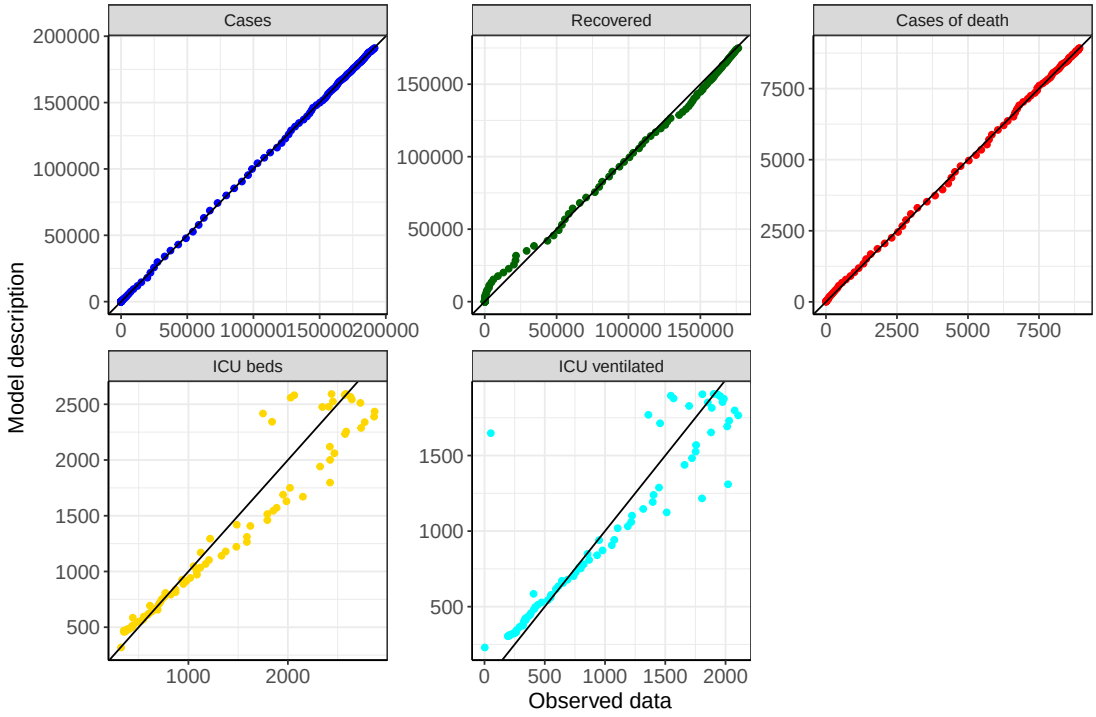


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

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).

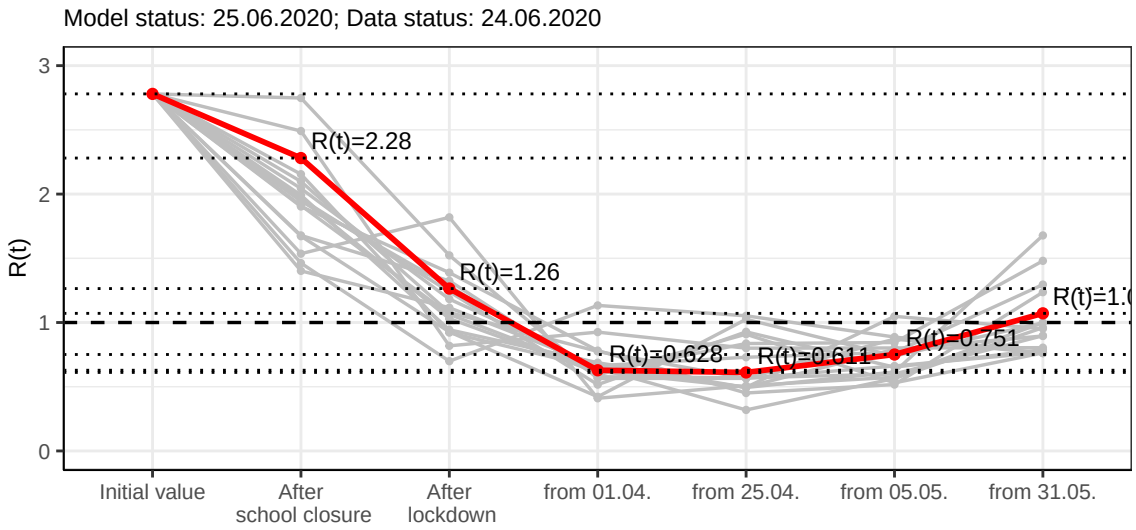


Figure 189: R(t) values before and after the NPIs for Germany

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

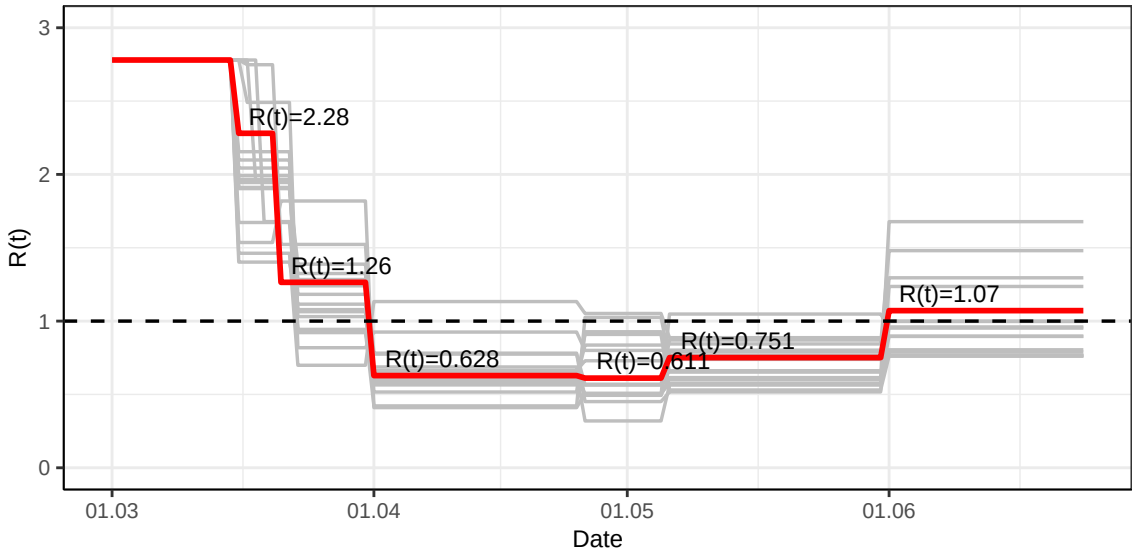


Figure 190: R(t) values over time for Germany

18.2 Model predictions

18.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.07)

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.

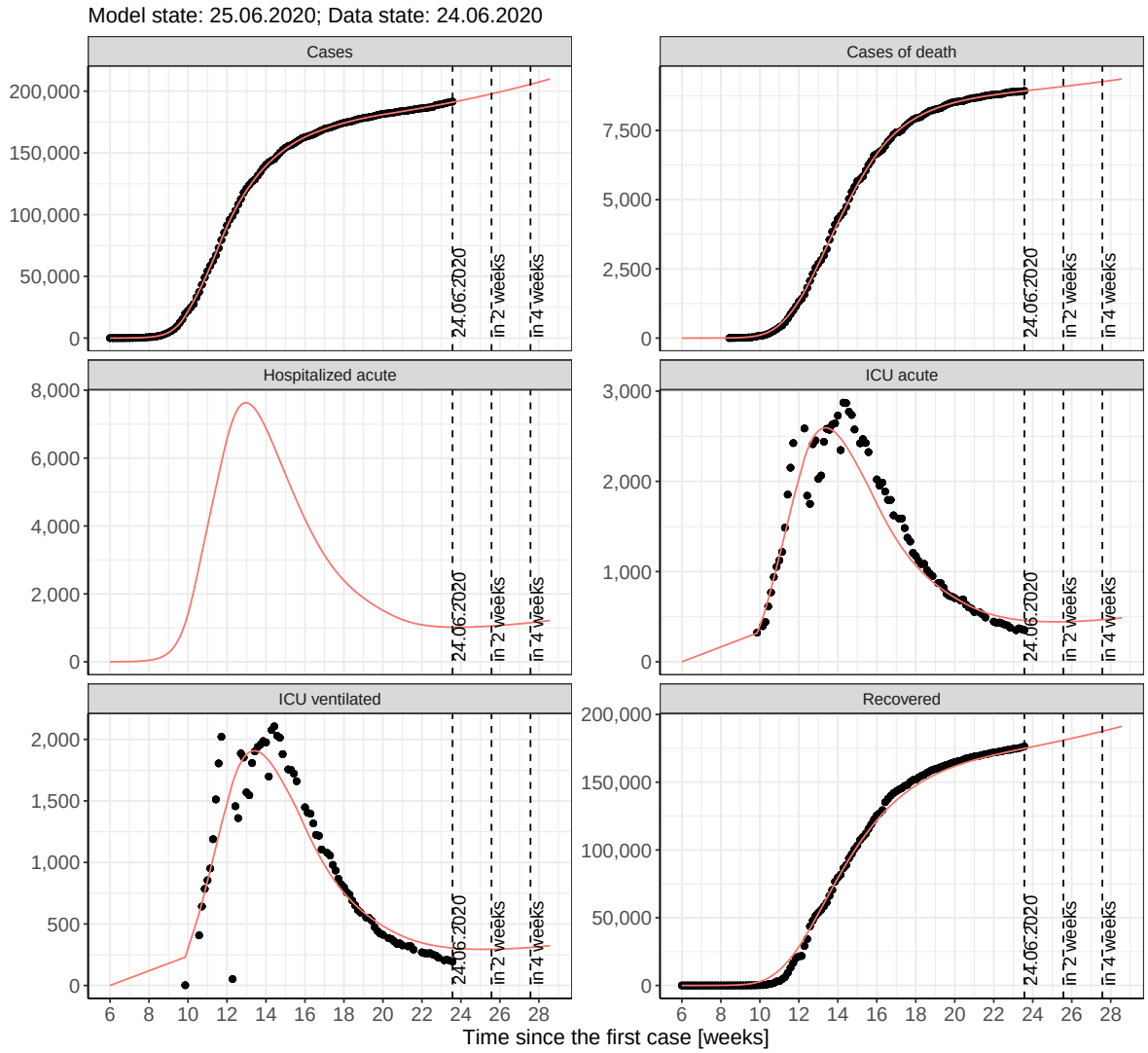


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

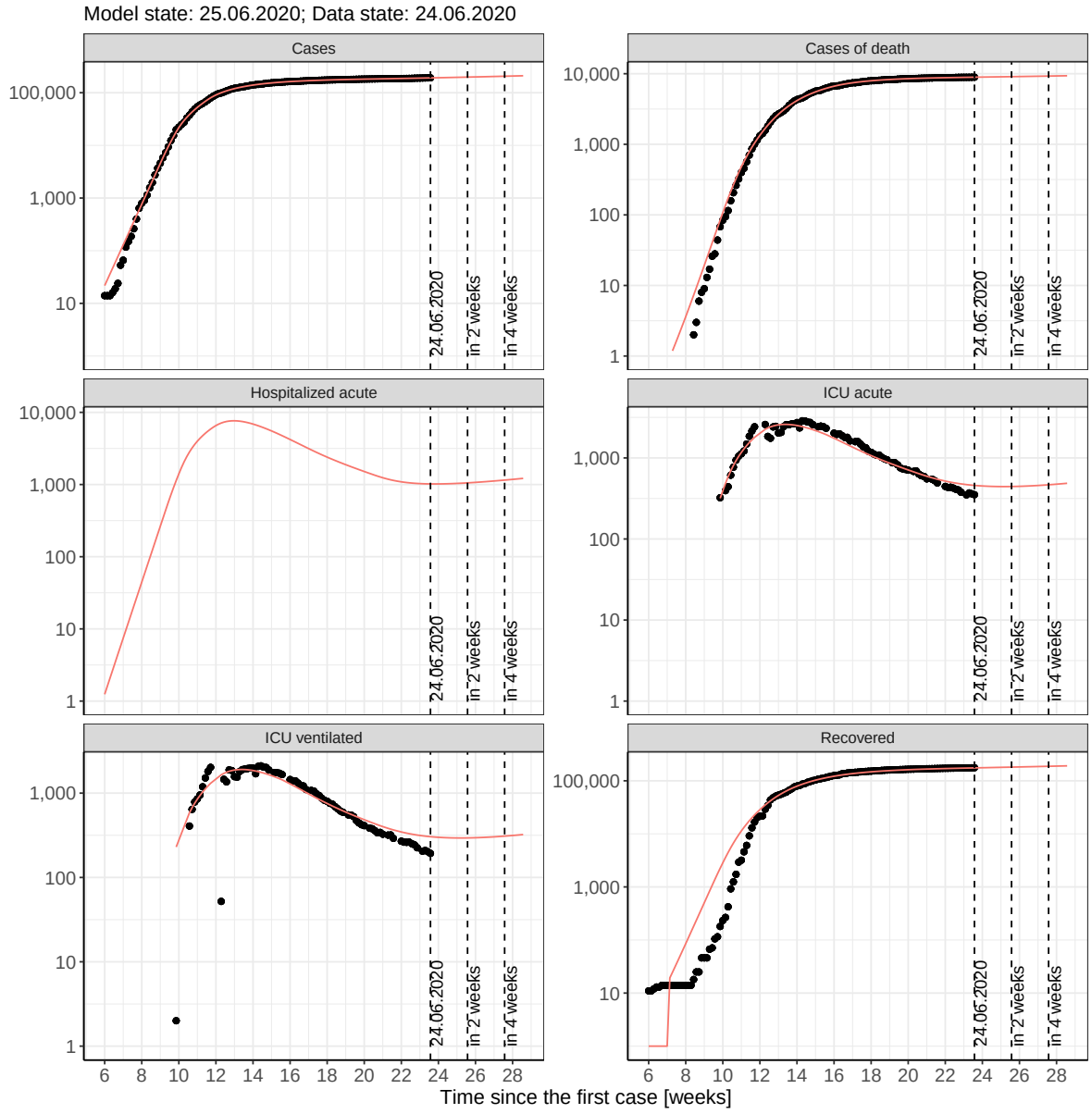


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 25.06.2020

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 25.06.2020 were tested.

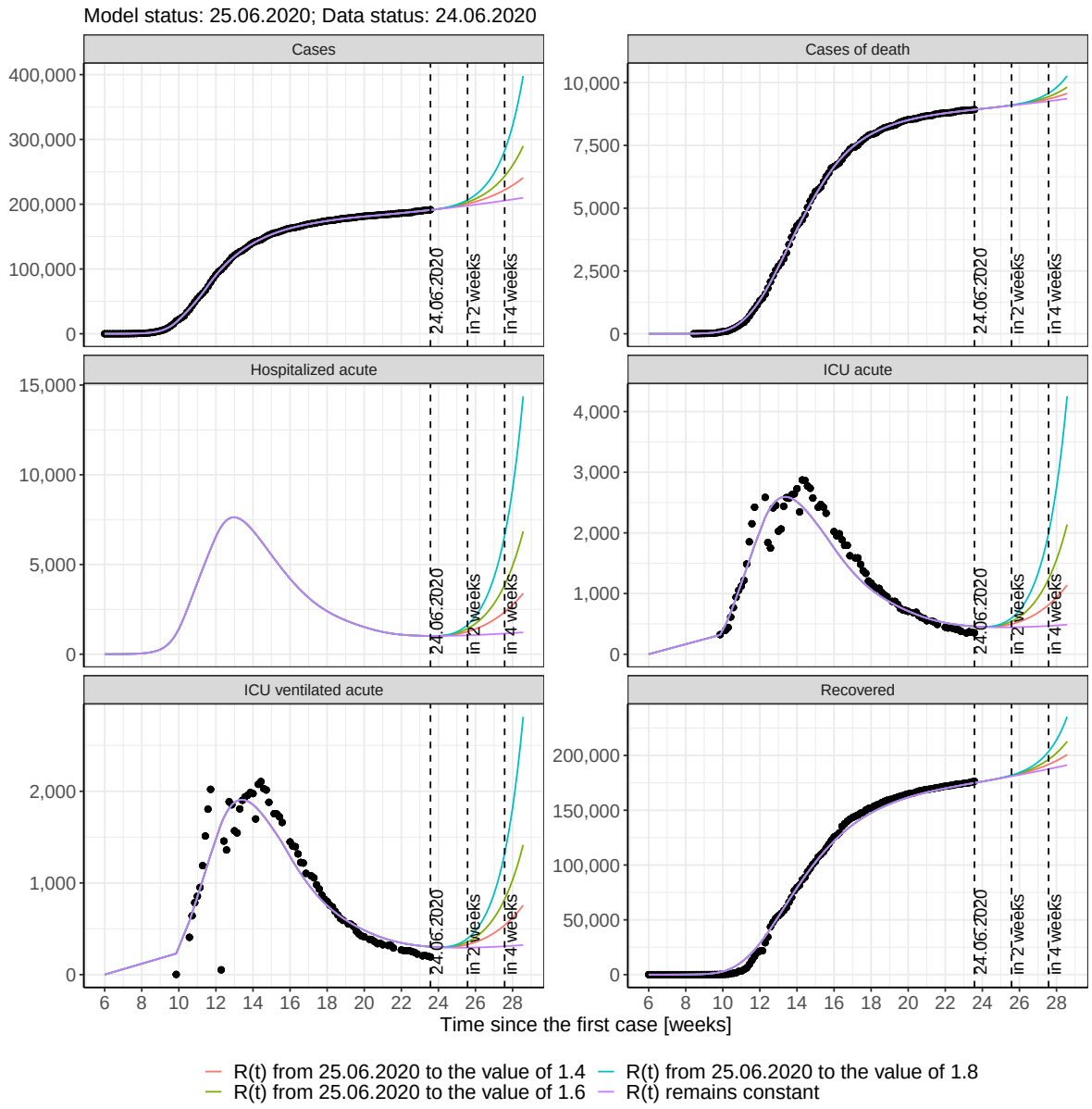


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

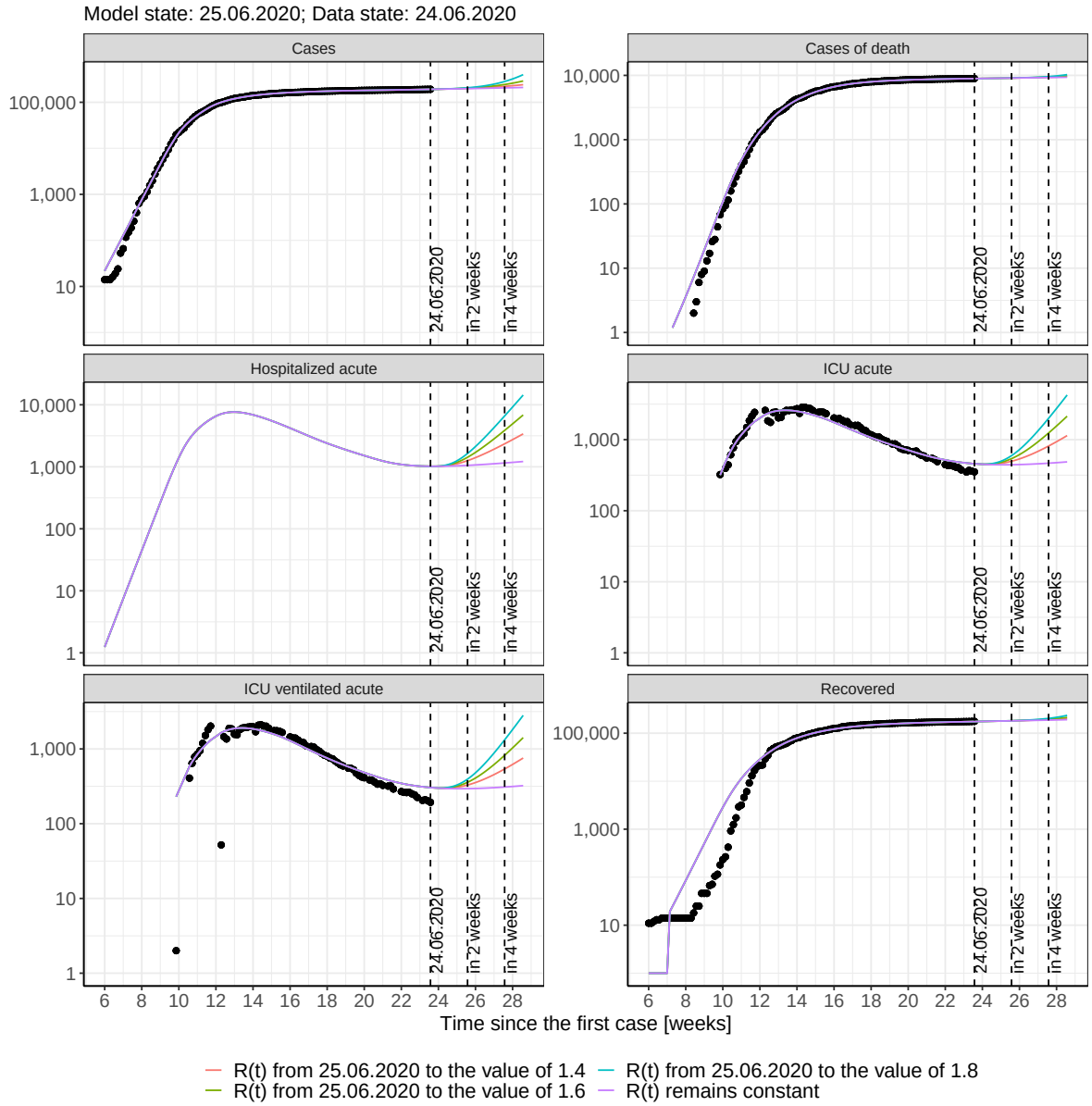


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 25.06.2020. Points: Reported case numbers; Lines: Model predictions.

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 25.06.2020 were tested.

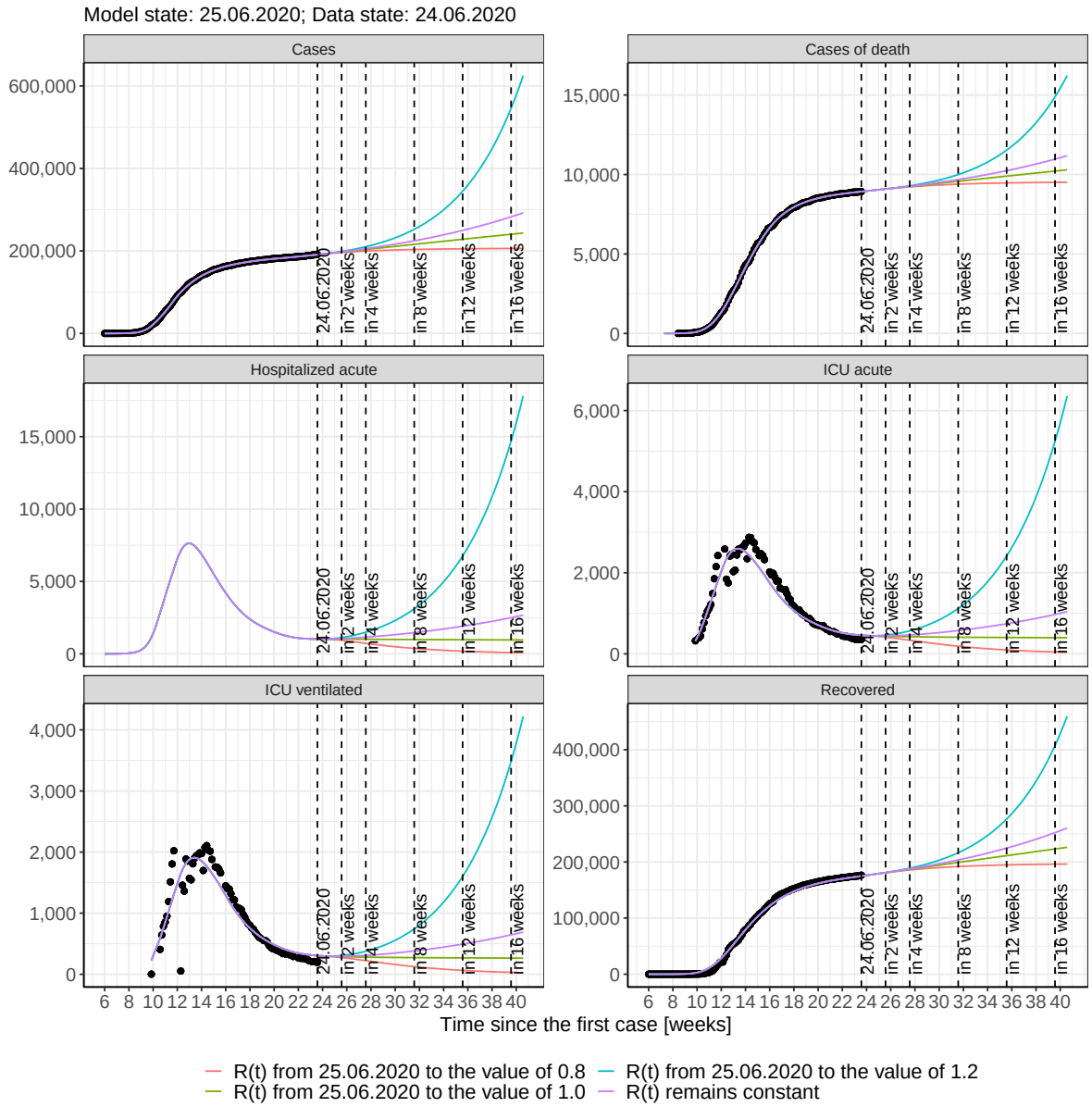


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 25.06.2020. Points: reported case numbers; lines: model prediction.

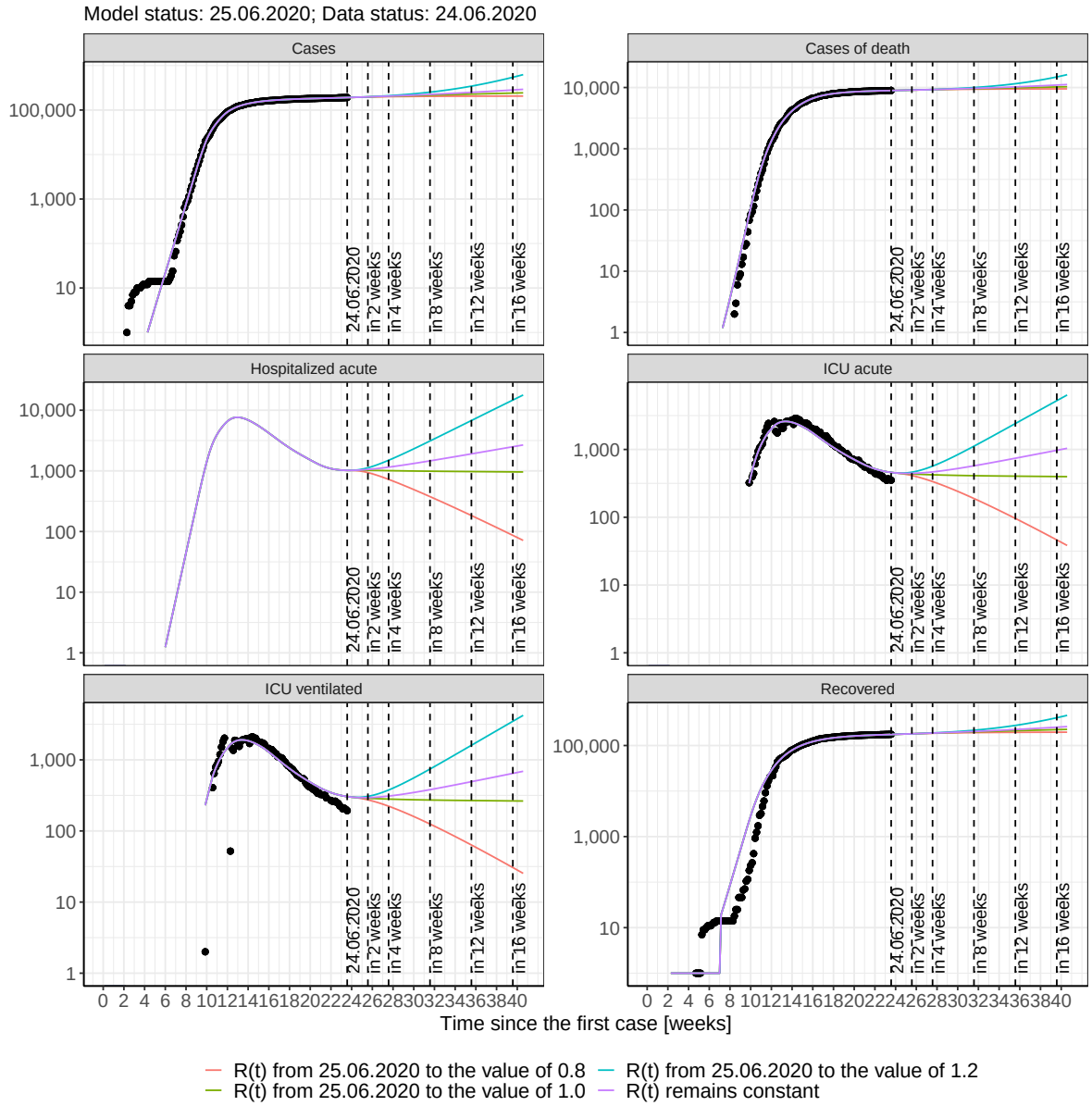


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 25.06.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 25.06.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 25.06.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 25.06.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 25.06.2020 (Tab. 69) Model status from 25.06.2020; Data status: 24.06.2020.

Table 66: Germany - R(t) remains unchanged after the 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	191510	8938	175350	1019	455	302
26.06.2020	191970	8949	175780	1018	453	301
27.06.2020	192430	8961	176200	1019	451	299
28.06.2020	192890	8972	176630	1020	449	298
29.06.2020	193360	8984	177060	1022	447	297
30.06.2020	193840	8996	177490	1024	446	296
01.07.2020	194320	9007	177920	1026	445	295
02.07.2020	194800	9019	178350	1029	444	295
03.07.2020	195290	9030	178780	1032	444	294
04.07.2020	195790	9042	179220	1036	443	294
05.07.2020	196290	9054	179660	1040	443	294
06.07.2020	196790	9065	180100	1044	443	294
07.07.2020	197300	9077	180540	1049	444	294
08.07.2020	197820	9089	180980	1054	444	294
09.07.2020	198330	9101	181430	1060	445	295
10.07.2020	198860	9113	181880	1065	445	295
11.07.2020	199390	9125	182340	1071	446	296
12.07.2020	199920	9137	182800	1077	448	297
13.07.2020	200460	9149	183260	1084	449	298
14.07.2020	201010	9161	183720	1090	450	298
15.07.2020	201560	9174	184190	1097	452	299
16.07.2020	202120	9186	184670	1104	454	301
17.07.2020	202680	9199	185140	1112	455	302
18.07.2020	203240	9212	185630	1119	457	303
19.07.2020	203820	9224	186110	1127	459	305
20.07.2020	204400	9237	186600	1135	462	306
21.07.2020	204980	9250	187100	1143	464	308
22.07.2020	205570	9263	187590	1152	466	309

Table 67: Germany - R(t) takes on the value of 0.8 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	191500	8938	175350	1018	455	302
26.06.2020	191930	8949	175780	1018	453	301
27.06.2020	192350	8961	176200	1018	450	299
28.06.2020	192760	8972	176630	1016	448	297
29.06.2020	193150	8984	177050	1014	446	296
30.06.2020	193540	8996	177480	1010	443	294
01.07.2020	193910	9007	177900	1006	440	292
02.07.2020	194270	9018	178320	999	437	290
03.07.2020	194630	9030	178730	992	433	288
04.07.2020	194970	9041	179150	983	430	285
05.07.2020	195300	9052	179560	972	426	282
06.07.2020	195620	9064	179960	961	422	280
07.07.2020	195940	9074	180360	949	417	277
08.07.2020	196240	9085	180760	936	413	274
09.07.2020	196540	9096	181150	923	408	271
10.07.2020	196830	9107	181540	909	403	267
11.07.2020	197110	9117	181920	894	398	264
12.07.2020	197380	9128	182290	879	393	261
13.07.2020	197640	9138	182660	864	388	257
14.07.2020	197900	9148	183030	849	382	253
15.07.2020	198150	9158	183380	833	377	250
16.07.2020	198390	9167	183730	817	371	246
17.07.2020	198630	9177	184080	802	365	242
18.07.2020	198850	9186	184410	786	359	238
19.07.2020	199080	9195	184740	770	354	235
20.07.2020	199290	9204	185060	755	348	231
21.07.2020	199500	9213	185380	739	342	227
22.07.2020	199710	9221	185690	724	336	223

Table 68: Germany - R(t) takes on the value of 1.0 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	191510	8938	175350	1018	455	302
26.06.2020	191960	8949	175780	1018	453	301
27.06.2020	192410	8961	176200	1019	451	299
28.06.2020	192860	8972	176630	1019	449	298
29.06.2020	193310	8984	177060	1020	447	297
30.06.2020	193760	8996	177480	1020	445	295
01.07.2020	194210	9007	177910	1020	444	294
02.07.2020	194650	9019	178340	1021	442	293
03.07.2020	195100	9030	178770	1021	441	292
04.07.2020	195550	9042	179200	1021	440	291
05.07.2020	196000	9053	179630	1021	438	291
06.07.2020	196450	9065	180060	1020	437	290
07.07.2020	196900	9076	180490	1020	436	289
08.07.2020	197350	9088	180920	1020	435	288
09.07.2020	197790	9100	181350	1019	434	288
10.07.2020	198240	9111	181780	1018	433	287
11.07.2020	198690	9123	182220	1018	432	286
12.07.2020	199140	9134	182650	1017	431	286
13.07.2020	199580	9146	183080	1016	430	285
14.07.2020	200030	9157	183520	1015	429	285
15.07.2020	200480	9169	183950	1014	428	284
16.07.2020	200930	9181	184380	1013	428	283
17.07.2020	201370	9192	184820	1012	427	283
18.07.2020	201820	9204	185250	1011	426	282
19.07.2020	202270	9215	185690	1010	425	282
20.07.2020	202710	9227	186120	1010	425	282
21.07.2020	203160	9239	186560	1009	424	281
22.07.2020	203600	9250	186990	1008	423	281

Table 69: Germany - R(t) takes on the value of 1.2 after 25.06.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
25.06.2020	191510	8938	175350	1019	455	302
26.06.2020	191980	8949	175780	1019	453	301
27.06.2020	192470	8961	176200	1020	451	299
28.06.2020	192960	8972	176630	1022	449	298
29.06.2020	193470	8984	177060	1025	448	297
30.06.2020	194000	8996	177490	1030	448	297
01.07.2020	194540	9007	177930	1037	448	297
02.07.2020	195100	9019	178370	1045	448	297
03.07.2020	195670	9031	178810	1054	449	298
04.07.2020	196260	9042	179260	1066	451	299
05.07.2020	196860	9054	179710	1078	453	300
06.07.2020	197490	9066	180170	1092	455	302
07.07.2020	198130	9079	180630	1107	459	304
08.07.2020	198790	9091	181110	1124	462	306
09.07.2020	199460	9104	181590	1142	467	309
10.07.2020	200160	9116	182080	1162	471	312
11.07.2020	200880	9129	182590	1182	477	316
12.07.2020	201610	9142	183100	1205	482	320
13.07.2020	202370	9156	183620	1228	489	324
14.07.2020	203150	9170	184150	1252	495	328
15.07.2020	203950	9184	184700	1278	503	333
16.07.2020	204780	9198	185260	1306	510	338
17.07.2020	205630	9213	185830	1334	519	344
18.07.2020	206500	9228	186420	1363	528	350
19.07.2020	207400	9243	187020	1394	537	356
20.07.2020	208320	9259	187640	1426	547	362
21.07.2020	209270	9275	188270	1460	557	369
22.07.2020	210250	9292	188920	1495	568	376

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 25.06.2020

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

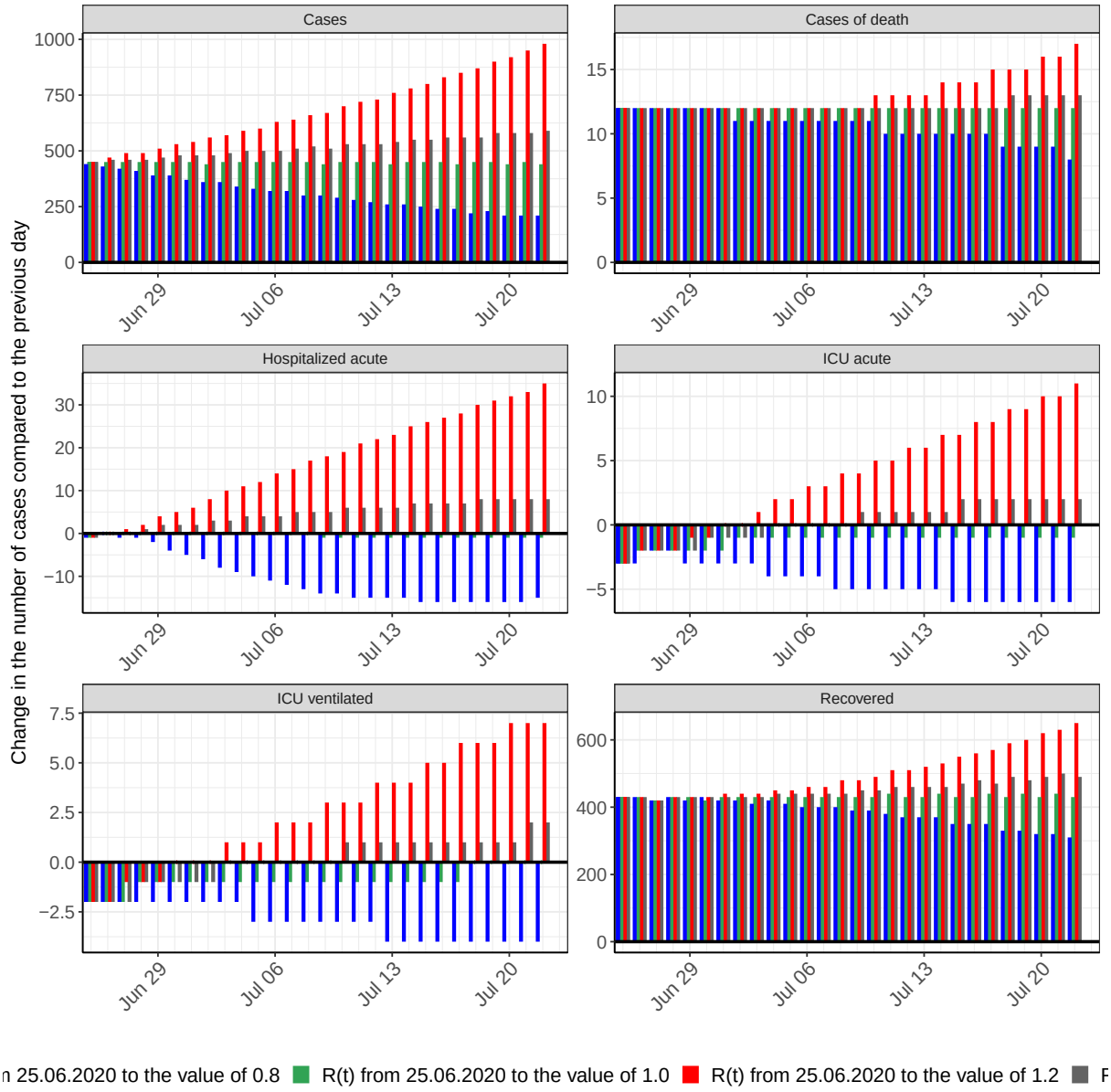


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany