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 09.05.2020 (five days after school reopening on 04.05.2020), there was a small increase of R(t) by 11.6% on average to 0.71. After 05.06.2020, there was a further increase of R(t) by approx. 53% from 0.71 to 1.09 in the national average with subsequent reduction of R(t) after 17.06.2020 by about 25% from 1.09 to 0.82.
  - On 08.07.2020, a new increase of R(t) by approx. 48% from 0.82 to 1.21 in entire Germany can be observed.

  - The R(t) changes in June seem to depict emergence of the local "corona hotspots" in some federal states (e.g. North Rhine-Westphalia, Berlin, Brandenburg, Saxony-Anhalt) followed by containment of this local outbreaks.
  - The current R(t) values are estimated at 1.21 for all federal states and show above all the increase in infection following the relaxation of NPIs nationwide.

- Forecasts with different assumptions of R0, including the lifting of intervention measures, are presented for each state.
  - Assuming that the reproduction rate (R(t)) in the federal states adopts a value below 1, the bed capacity of the hospitals appears to be sufficient in all federal states.
  - If the reproduction number stays constant at R(t)=1.2, a further increase in bed occupancy can be expected in the next six to twelve weeks in some federal states. If the R(t) value was to rise more sharply to, for example, 1.8, it would be expected that the increase would be expected earlier and steeper.

- The Robert Koch Institute (RKI) publishes regular updates on the current R0 figures in Germany and the federal states. The method of calculating the R0 number of the RKI differs significantly from our model approach. The RKI only considers new infections in the last 8 days, whereas our model considers the complete data set (extent and also other data, such as hospital stays, deceased, convalescence). Due to the short time period of the RKI data considered, their R0 value is more susceptible to changes and fluctuations in reporting and also sensitive in the range of small numbers of new infections. The R0 value of the RKI therefore fluctuates more over time compared to the R(t) value calculated by our model. Still by comparing the R0 values calculated by the RKI and our calculated R(t) values, a large agreement could be found over a long period of time (results on demand).

Changes in the document

Changes compared to the report of 16.07.2020

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

Changes compared to the report of 02.07.2020

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

Changes compared to the report of 25.06.2020

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

Changes compared to the report of 18.06.2020

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

Changes compared to the report of 11.06.2020

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

Changes compared to the report of 04.06.2020

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

Changes compared to the report dated 28.05.2020

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

Changes compared to the report dated 19.05.2020

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

Changes compared to the report dated 08.05.2020

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

Changes compared to the report dated 05.05.2020

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

Changes compared to the report dated 24.04.2020

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

Changes compared to the report dated 21.04.2020

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

Changes in comparison to the report from 15.04.2020

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

Changes compared to the report of 11.04.2020

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

Contents

1 Overview of the modeling

1.1 Question

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

1.2 Objectives

- The aim of this project is to develop a mechanistic mathematical model to predict COVID-19 infections including hospital bed occupancy, intensive care units (ICU), ventilation and death rates in the individual German states and to estimate non-pharmaceutical interventions (NPI, e.g. school closure) over time.
- The model will be used to predict the further course of infections (including hospital occupancy, ICU, ventilation, death rates) and to simulate various possible scenarios (e.g. lifting of lockdown).
- The model and the predictions will be adjusted with new data at regular intervals (1-2 times per week). New predictions for all federal states will be made available initially as a PDF report and in the medium term in web format. The website www.covid-simulator.com (under construction) is intended to be and online platform for the transmission of information and for the provision of an online simulator.

1.3 Target group

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

1.4 Methods

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

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

1.5 Model structure

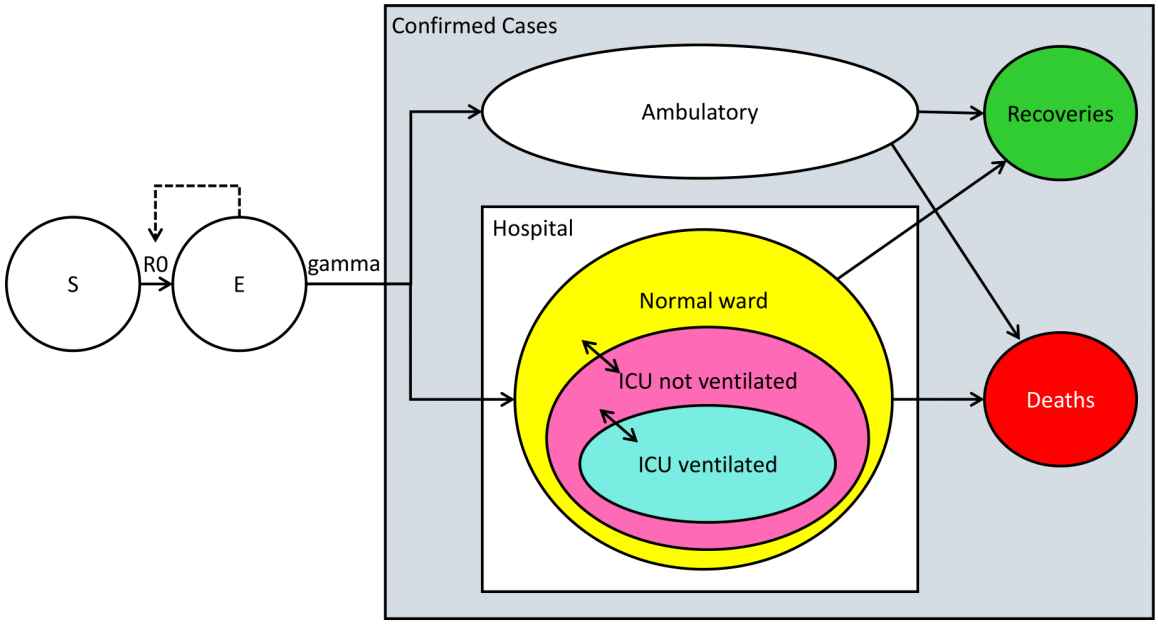
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected,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

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

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

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

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



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

Figure 1: SEIR/D Model - Model structure

1.6 Model results

1.6.1 Description of the data

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

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

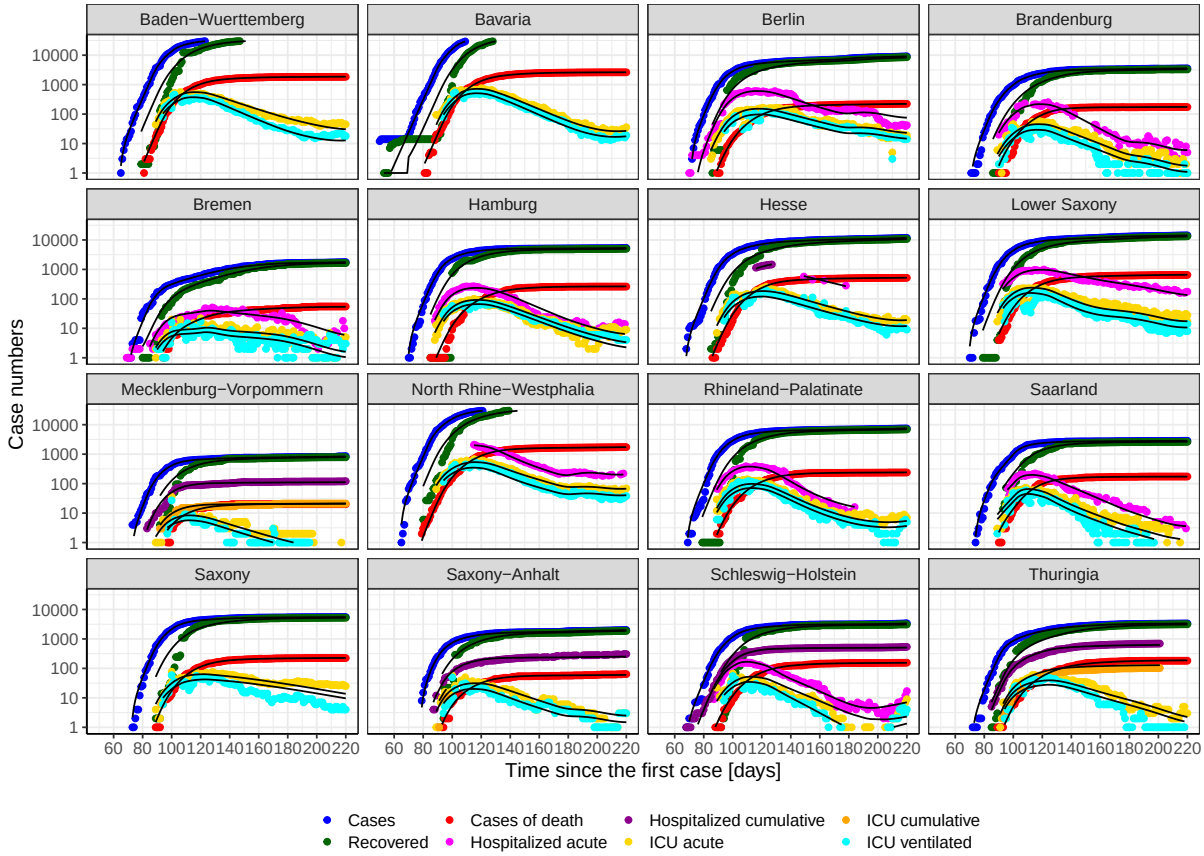


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

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

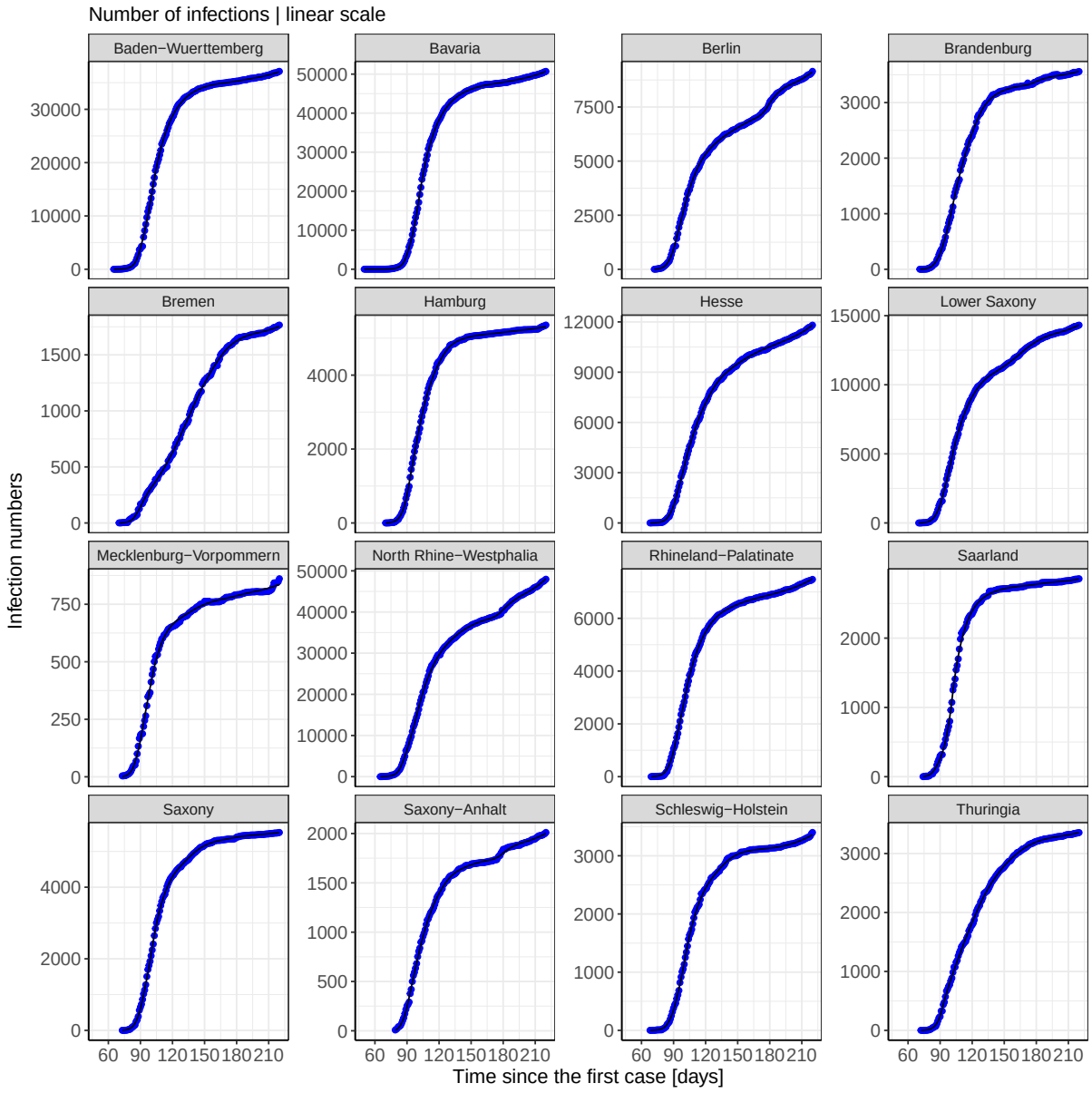


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

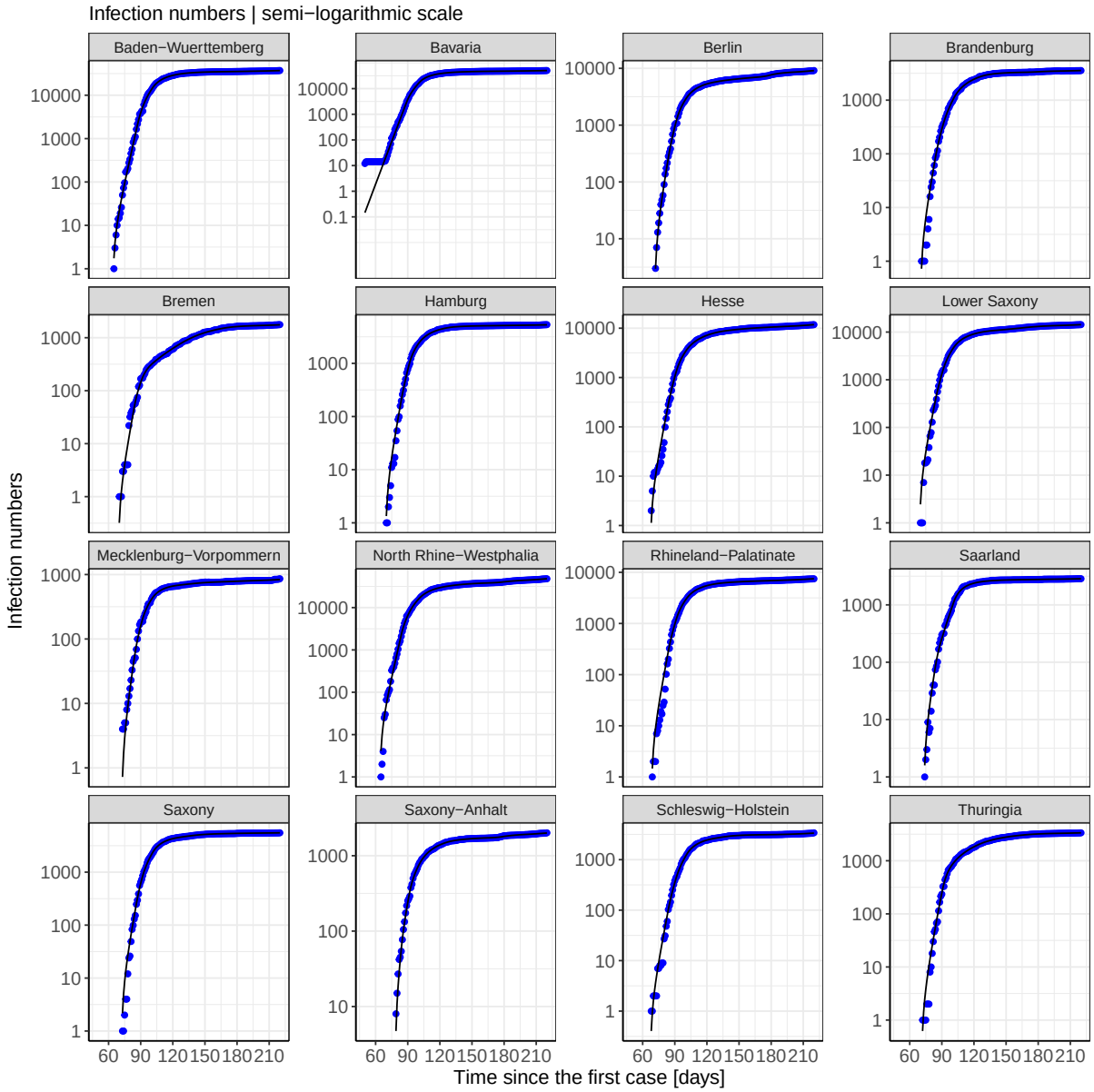


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

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

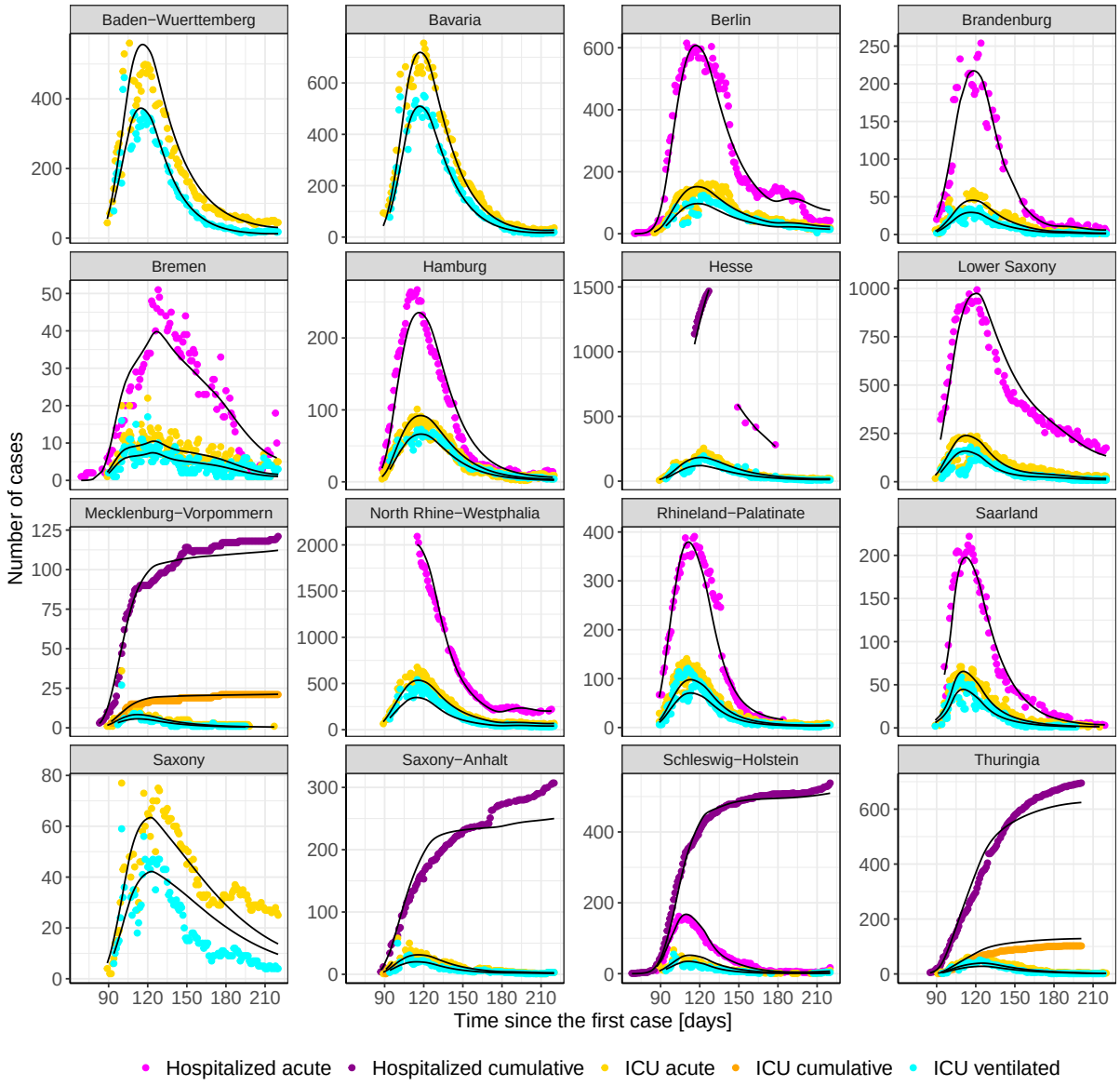


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

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

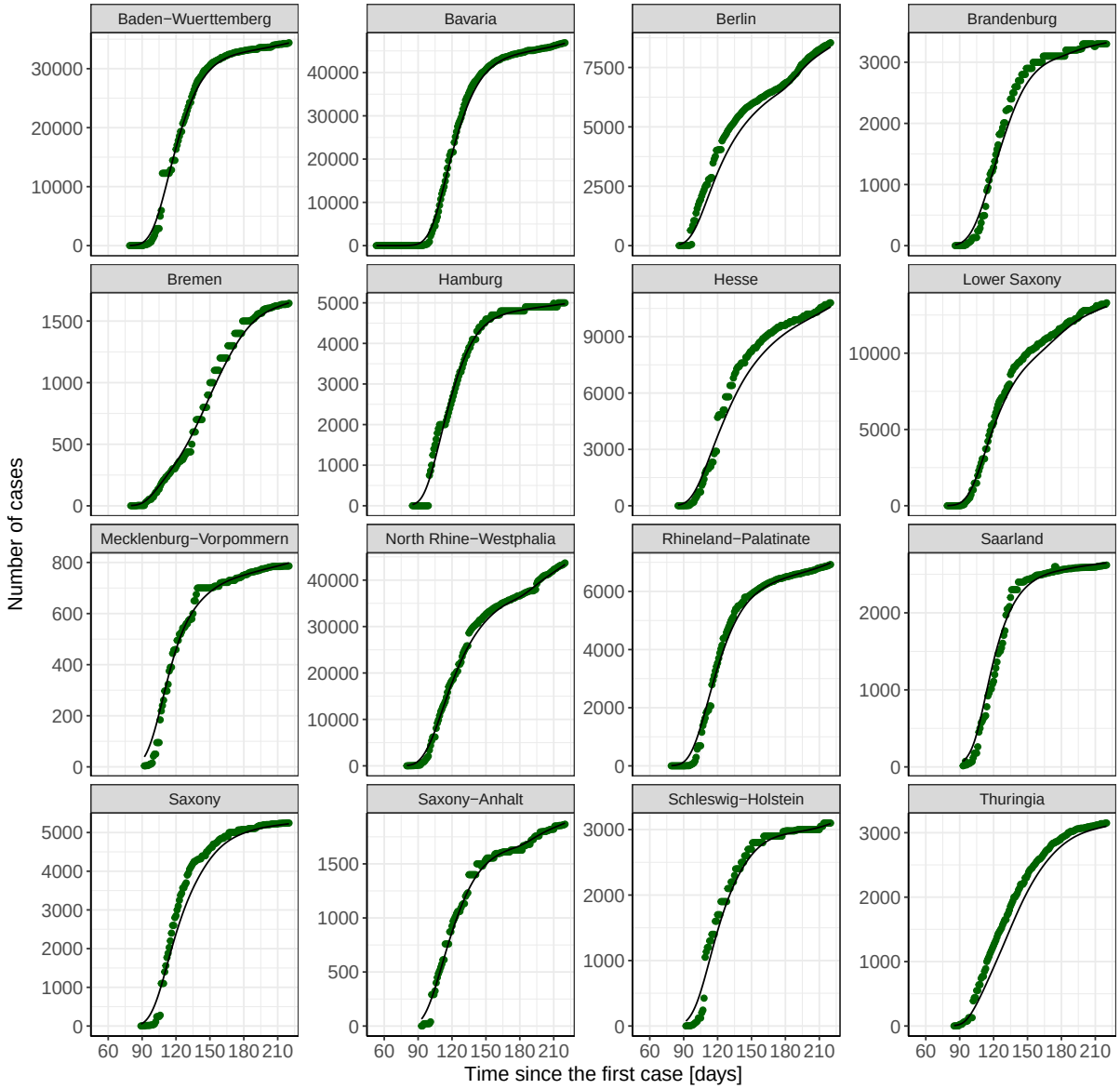


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

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

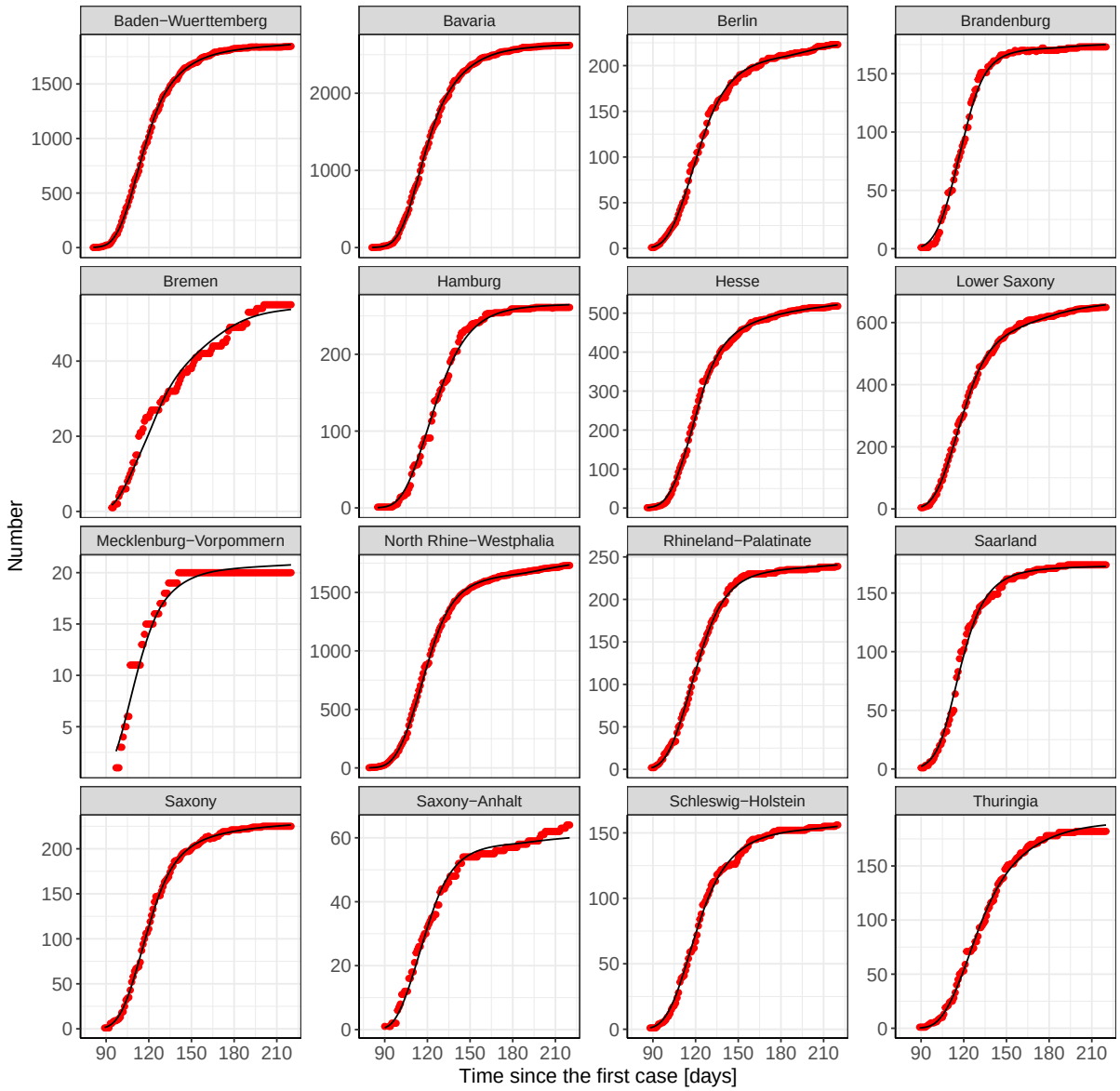


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

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

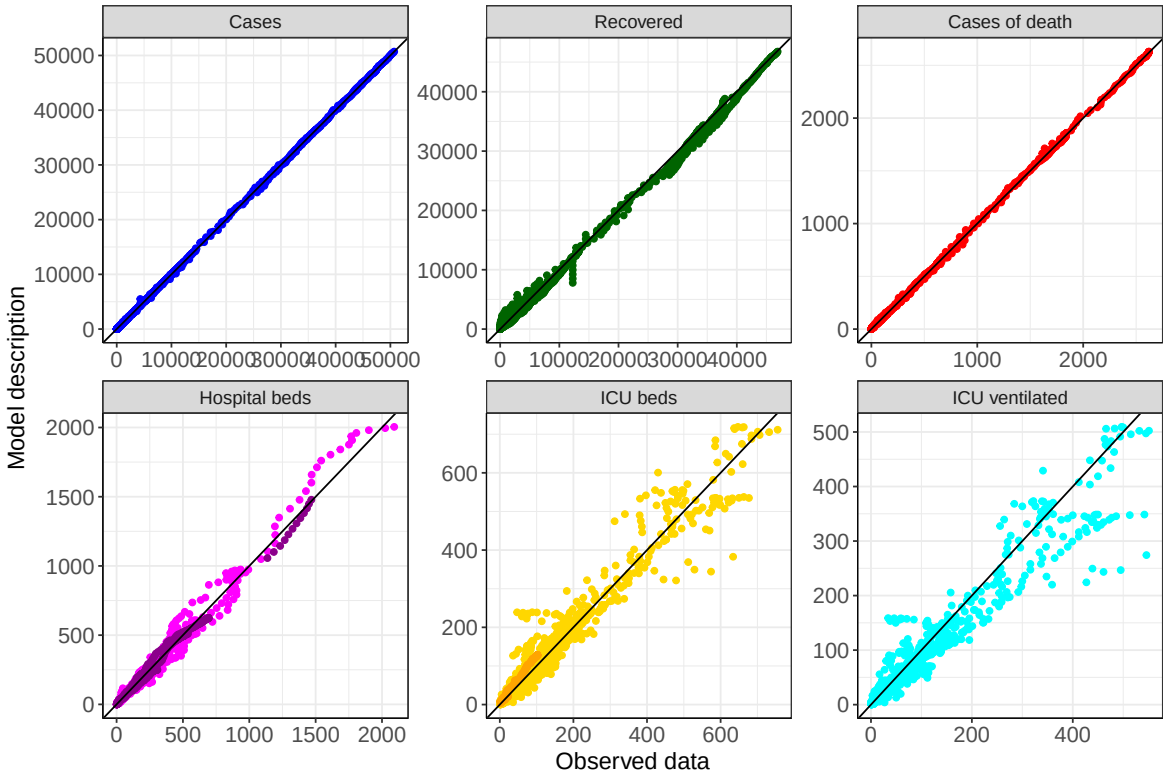


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

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

The influences of NPIs and other events were systematically investigated and incorporated into the model. Investigations of influencing factors on R(t) revealed the following statistically significant effects: school closure, lockdown, a "2nd stage" of the lockdown since 01.04.2020 and changes on 25.04.2020, 09.05.2020, 05.06.2020, 17.06.2020 and 08.07.2020. The effects vary slightly in each federal state (see Table 1, figures [9] and [10]), while the exact causes are not clear. It can be assumed that the geographical situation of the federal states ("rural" states vs. "urban" states, border region, mentality) as well as local policies play a role. Five days after the school reopening on 04.05.2020, the R(t) value increased by approx. 11.6% to 0.71 on a national average. In general, the safety measures taken appear to be effective in keeping R(t) at a stable level below 1, with the exception of the federal states with known "corona hotspots". Since the beginning of the easing of the NPIs and especially since the beginning of the current holiday season a new increase of the R(t) value is observed. The factors influencing R(t) are listed in detail below:

- School closures: Reduction of R(t) on average by approx. 31% from 2.78 to 1.92 (p-value < 0.001)
- Lockdown (on 23.03.2020): Further reduction of R(t) on average by approx. 43% from 1.92 to 1.1 (p-value < 0.001)
- "2nd stage" of the lockdown (on 01.04.2020): Further reduction R(t) on average by approx. 42% from 1.1 to 0.64 (p-value < 0.001)
- From 09.05.2020: A slight increase of R(t) by about 11% to 0.71 (p-value < 0.001).
- From 05.06.2020: A further increase of R(t) by approx. 53% from 0.71 to 1.09 (p-value < 0.001).
- From 17.06.2020: Reduction of R(t) by approx. 25% from 1.09 to 0.82 (p-value < 0.001).
- From 08.07.2020: A new increase of R(t) by approx. 48% from 0.82 to 1.21 (p-value < 0.001).

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

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

Federal state	Initial value	School closures	Lockdown	From 01.04.	From 25.04.	From 09.05.	From 05.06.	From 17.06.	From 08.07.
Baden-Wuerttemberg	2.78	1.70	1.32	0.58	0.57	0.61	1.12	1.06	1.21
Bavaria	2.78	2.76	1.52	0.57	0.59	0.66	0.96	1.13	1.21
Berlin	2.78	1.98	1.02	0.62	0.79	0.91	1.76	0.54	1.21
Brandenburg	2.78	1.91	1.39	0.78	0.44	0.56	1.70	0.62	1.21
Bremen	2.78	1.46	0.70	1.14	1.01	0.87	0.57	0.63	1.21
Hamburg	2.78	2.15	0.93	0.65	0.33	0.62	1.19	0.94	1.21
Hesse	2.78	2.09	1.09	0.77	0.65	0.86	0.86	1.04	1.21
Mecklenburg-Vorpommern	2.78	1.67	0.92	0.43	0.96	0.72	1.14	0.93	1.21
Lower Saxony	2.78	2.05	1.18	0.65	0.59	1.10	0.82	0.71	1.21
North Rhine-Westphalia	2.78	1.39	1.12	0.66	0.76	0.75	1.77	0.77	1.21
Rhineland-Palatinate	2.78	1.90	1.07	0.62	0.55	0.81	0.98	1.09	1.21
Saarland	2.78	1.53	1.82	0.41	0.51	0.61	1.29	0.84	1.21
Saxony	2.78	1.95	1.25	0.51	0.91	0.60	0.95	0.72	1.21
Saxony-Anhalt	2.78	2.00	0.94	0.69	0.49	0.72	1.92	0.63	1.21
Schleswig-Holstein	2.78	1.95	1.28	0.59	0.84	0.48	0.88	1.34	1.21
Thuringia	2.78	2.50	0.81	0.93	0.79	0.81	0.70	0.64	1.21
Germany	2.78	2.27	1.27	0.63	0.64	0.77	1.31	0.86	1.21

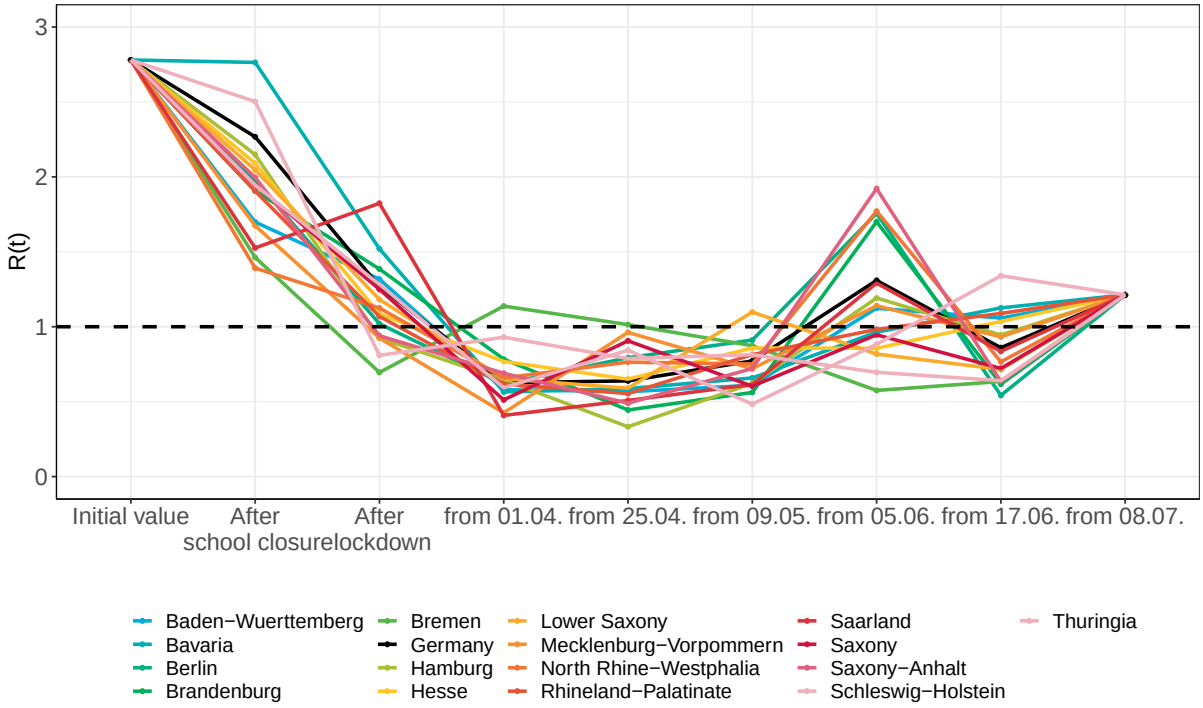


Figure 9: R(t) distribution before and after NPIs

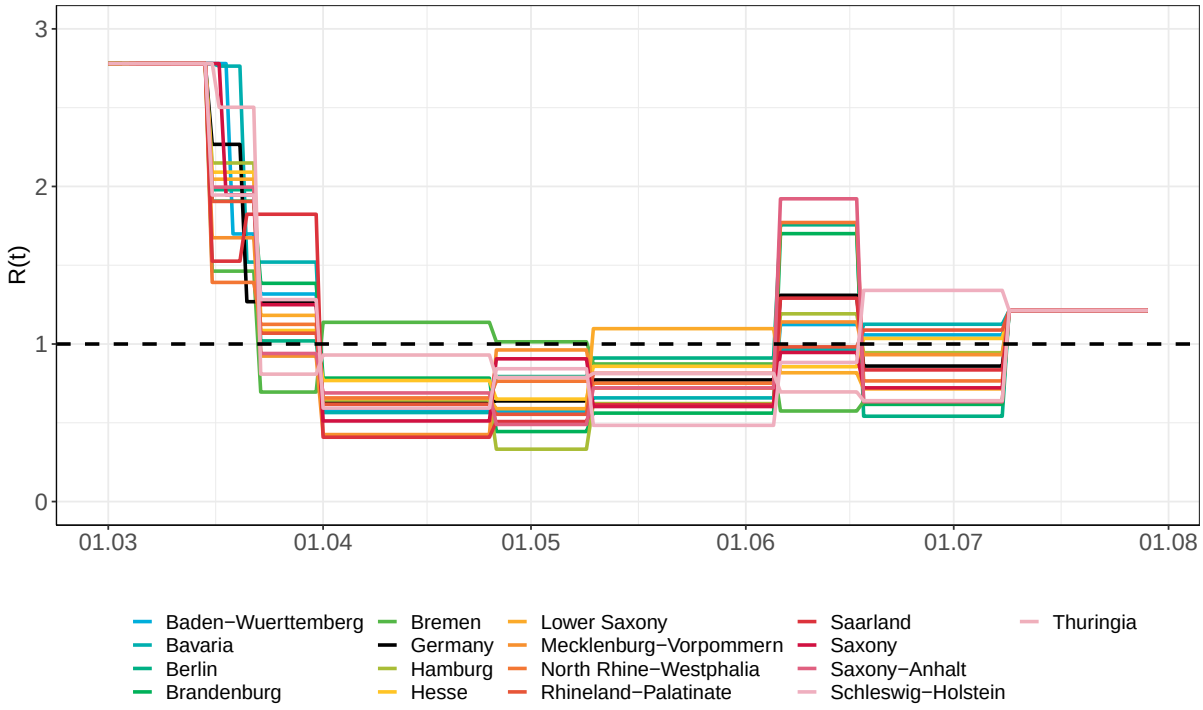


Figure 10: R(t) over time

2 Baden-Wuerttemberg

2.1 Model description

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

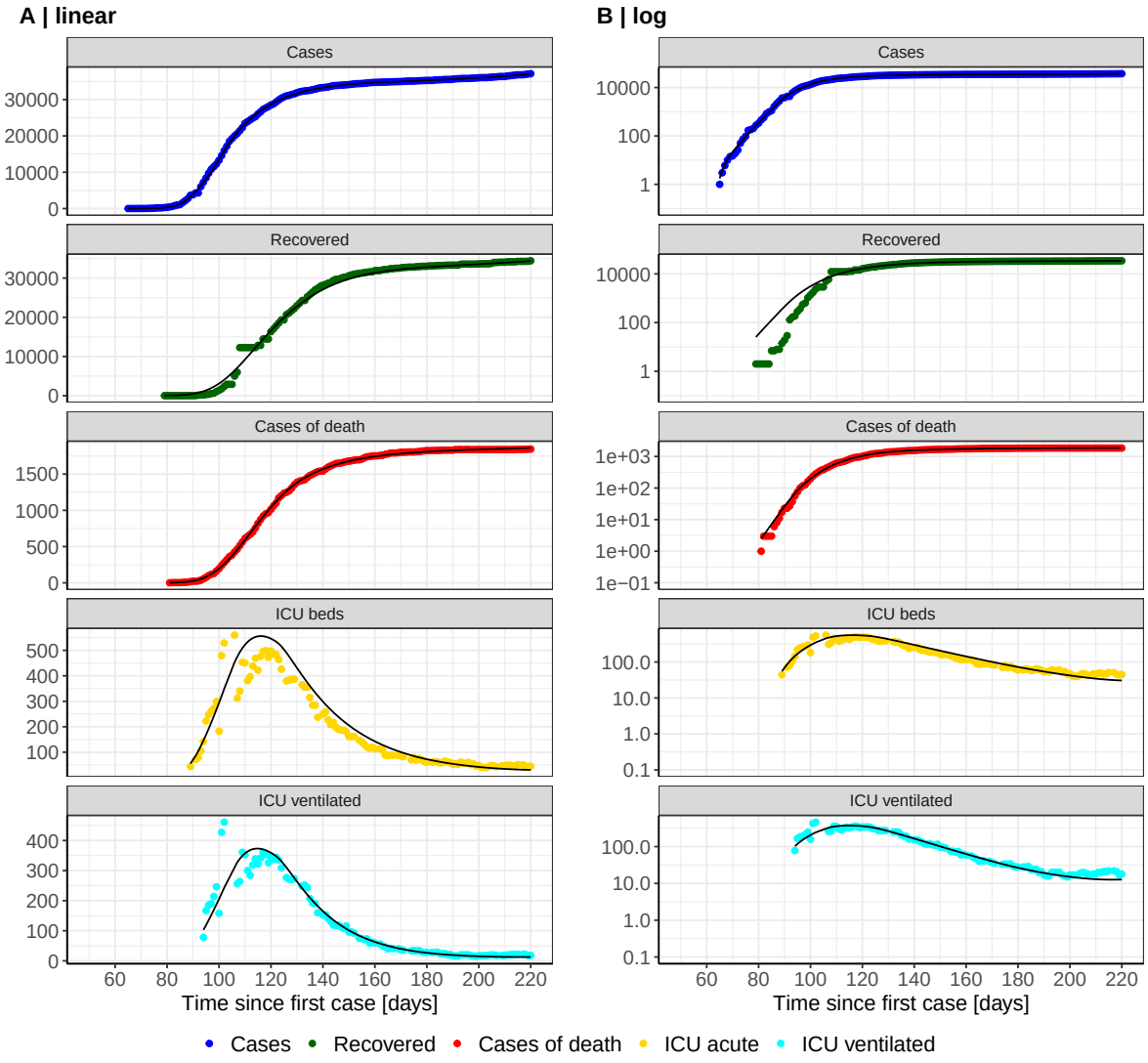


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

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

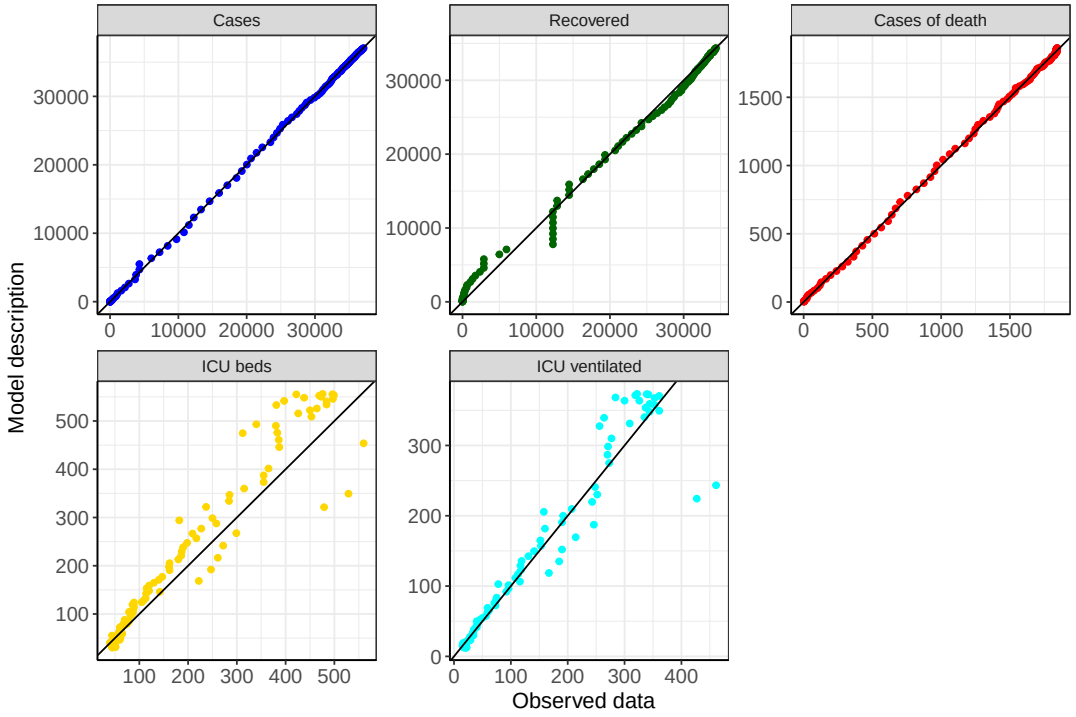


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

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

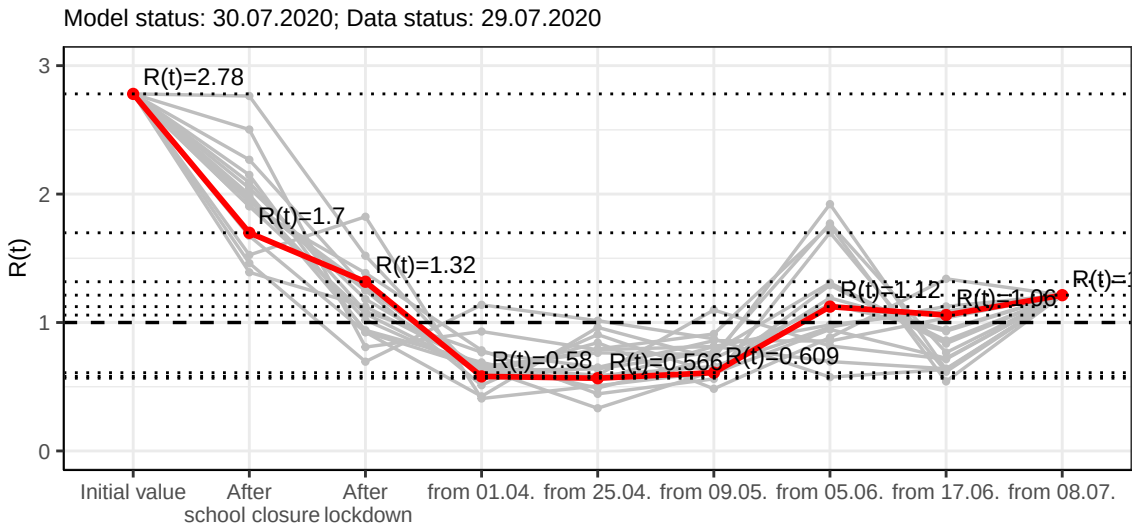


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

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

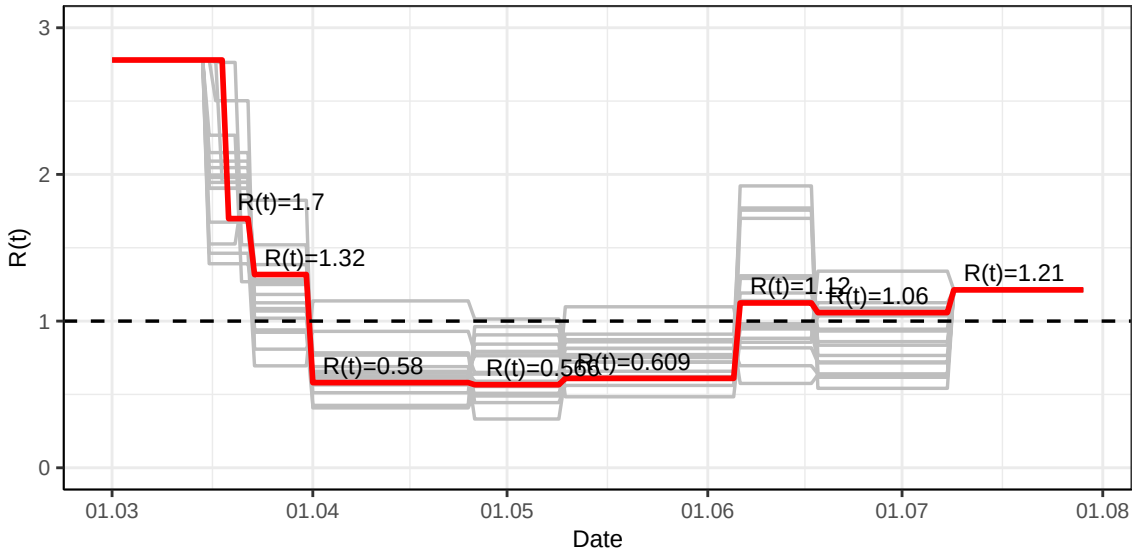


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

2.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

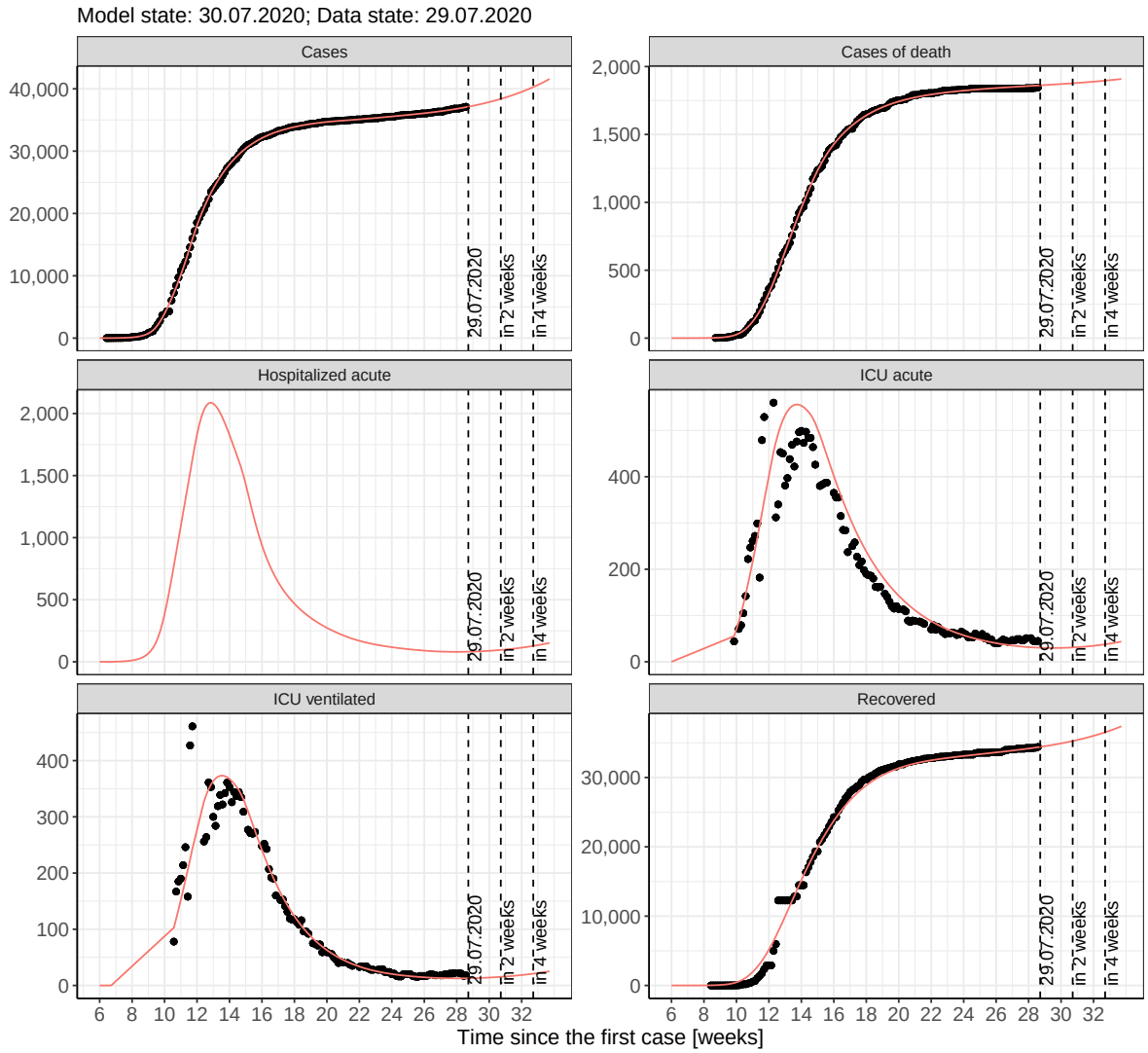


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

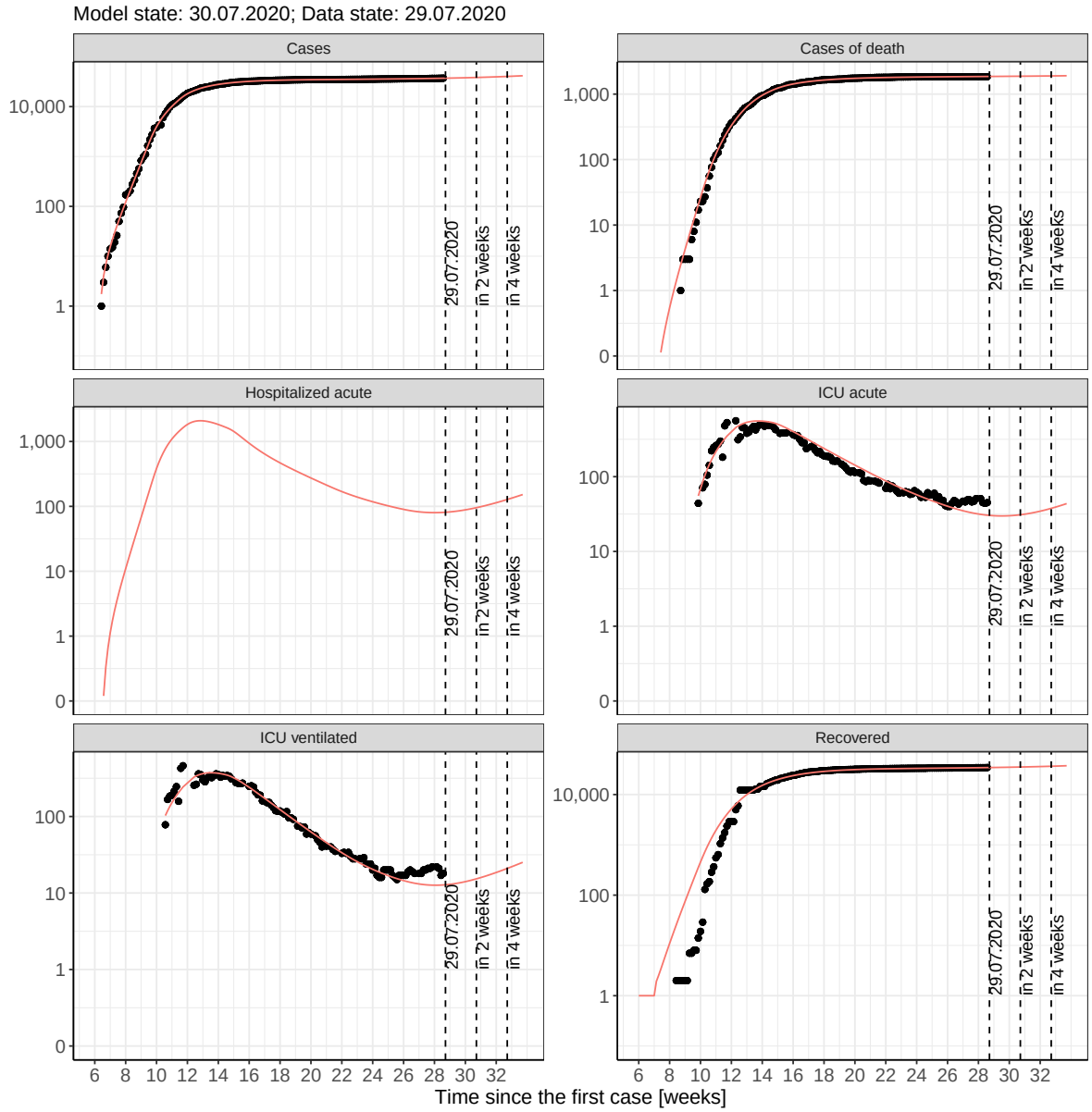


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 17 and 18 represent the model prediction for the next 4 weeks for Baden-Wuerttemberg on a linear (17) and a semi-logarithmic (18) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

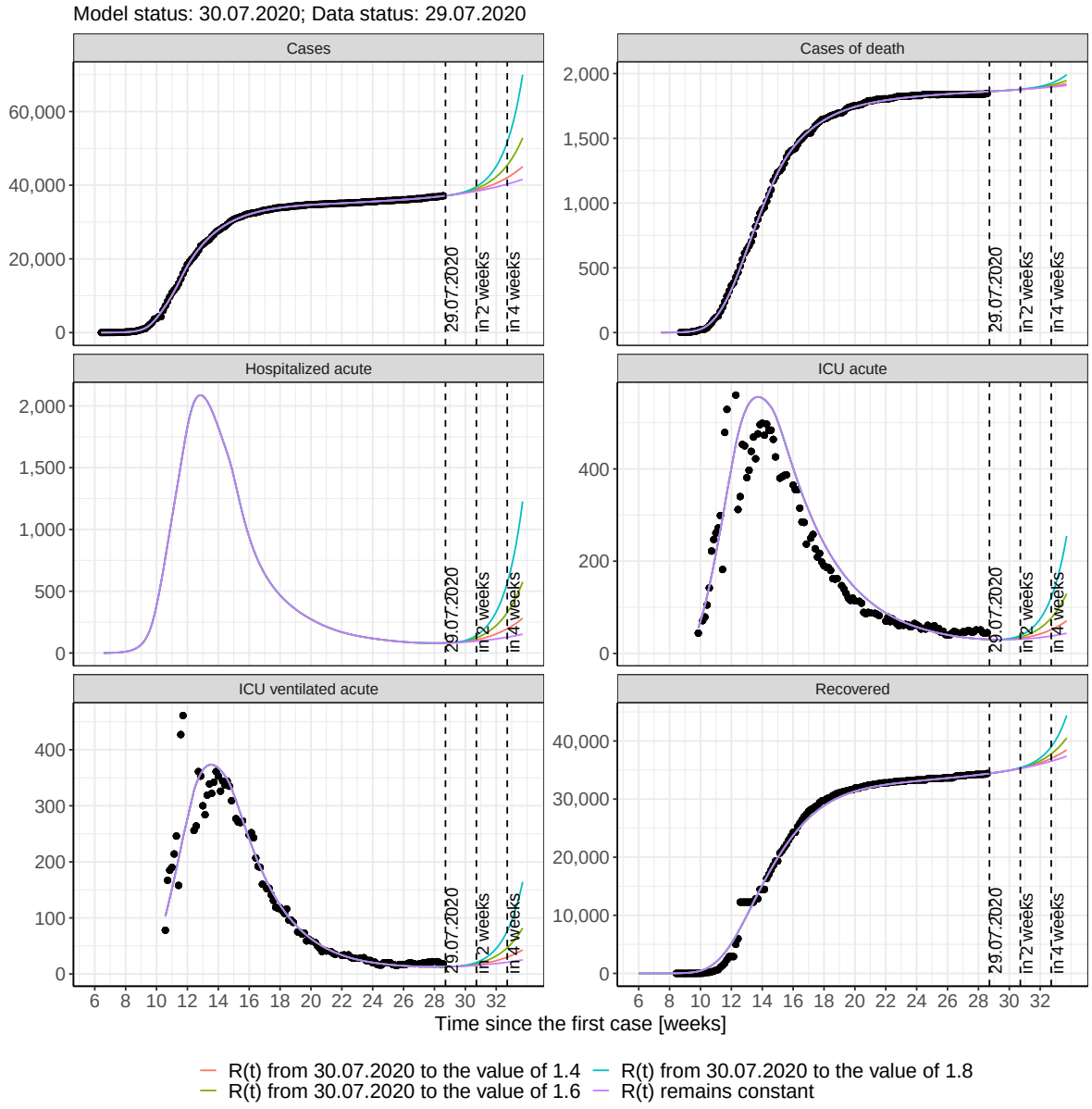


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

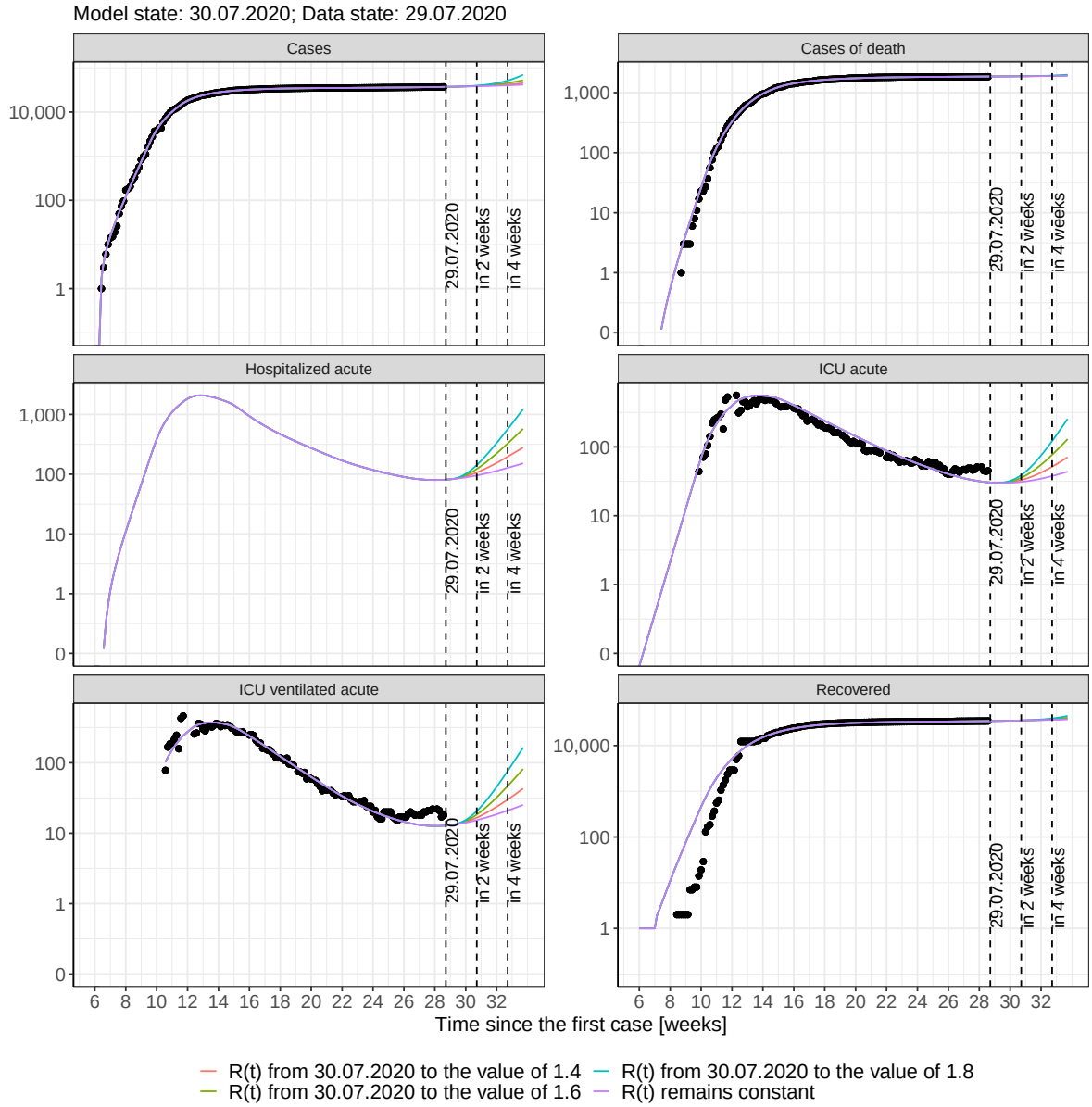


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 19 and 20 represent the model prediction for the next 16 weeks for Baden-Wuerttemberg on a linear (19) and a semi-logarithmic (20) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

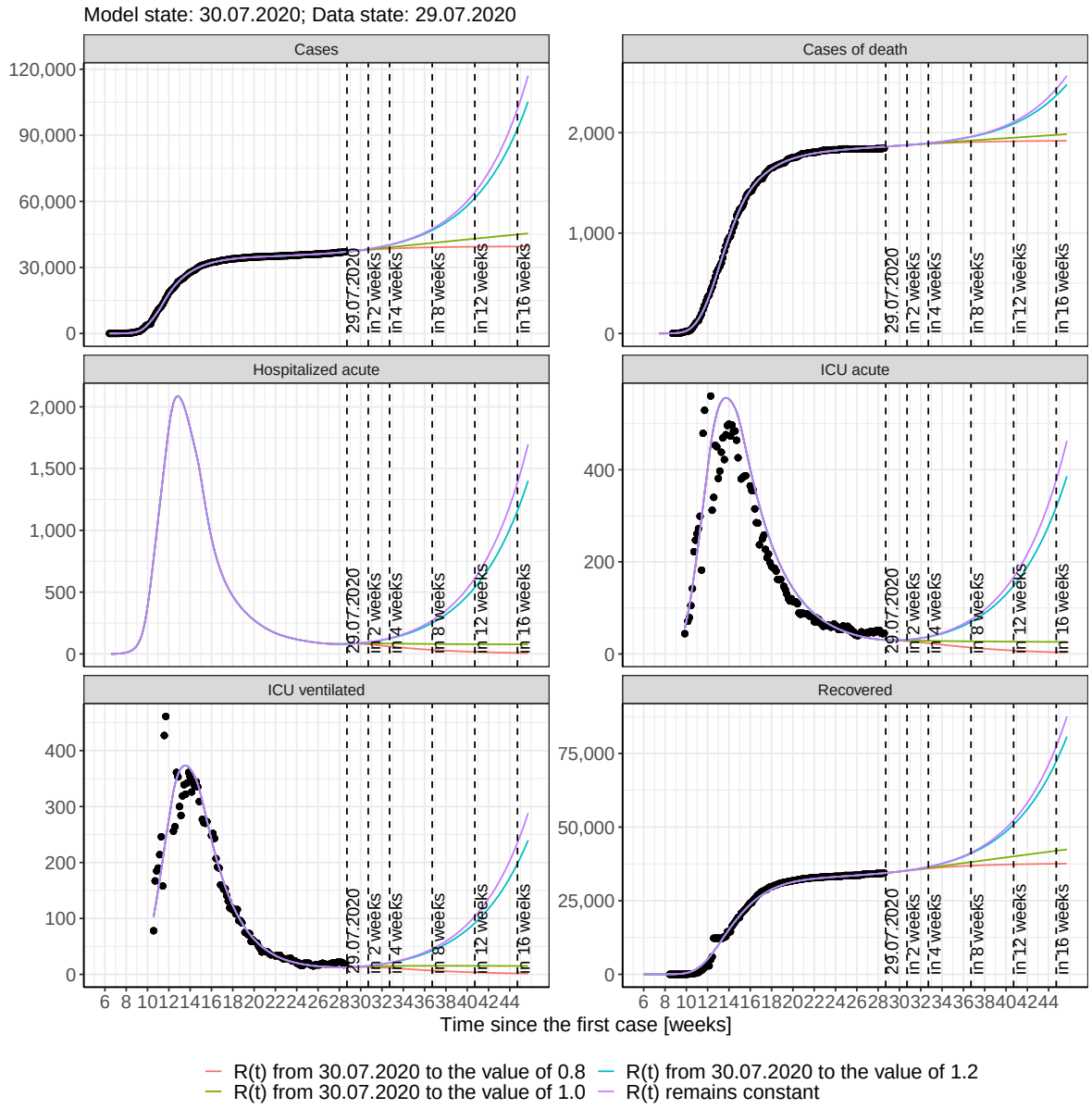


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

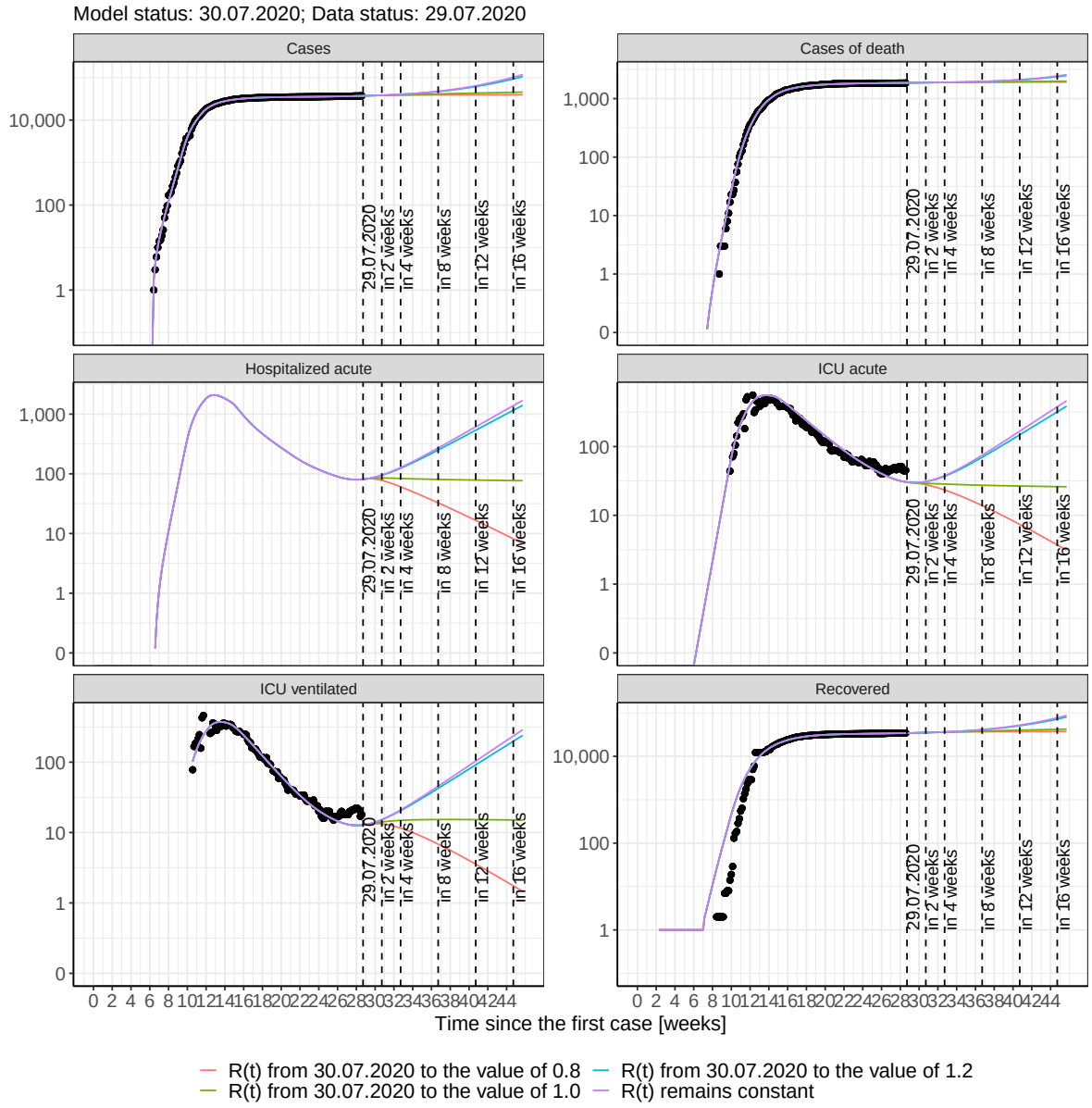


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 5) Model status from 30.07.2020; Data status: 29.07.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	37203	1863	34461	82	30	13
31.07.2020	37278	1864	34513	82	30	13
01.08.2020	37356	1865	34566	83	30	13
02.08.2020	37436	1866	34621	83	30	13
03.08.2020	37518	1867	34677	84	30	13
04.08.2020	37603	1868	34735	85	30	14
05.08.2020	37691	1869	34794	86	30	14
06.08.2020	37781	1870	34855	87	30	14
07.08.2020	37874	1871	34917	88	30	14
08.08.2020	37970	1872	34982	90	30	14
09.08.2020	38068	1873	35048	91	30	15
10.08.2020	38170	1875	35116	92	30	15
11.08.2020	38274	1876	35186	94	31	15
12.08.2020	38382	1877	35258	95	31	15
13.08.2020	38493	1878	35333	97	31	16
14.08.2020	38608	1879	35409	99	32	16
15.08.2020	38726	1881	35488	101	32	16
16.08.2020	38847	1882	35569	103	32	17
17.08.2020	38973	1883	35652	105	33	17
18.08.2020	39102	1884	35738	107	33	17
19.08.2020	39234	1886	35826	109	34	18
20.08.2020	39371	1887	35917	111	34	18
21.08.2020	39512	1889	36011	114	35	19
22.08.2020	39658	1890	36107	116	35	19
23.08.2020	39807	1892	36206	119	36	19
24.08.2020	39962	1893	36308	122	36	20
25.08.2020	40120	1895	36414	125	37	20
26.08.2020	40284	1896	36522	128	38	21

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	37200	1863	34461	82	30	13
31.07.2020	37269	1864	34513	82	30	13
01.08.2020	37337	1865	34566	83	30	13
02.08.2020	37402	1866	34620	83	30	13
03.08.2020	37465	1867	34675	83	30	13
04.08.2020	37526	1868	34732	83	30	13
05.08.2020	37586	1869	34788	83	29	13
06.08.2020	37644	1870	34846	83	29	13
07.08.2020	37701	1871	34904	82	29	13
08.08.2020	37755	1872	34962	81	29	13
09.08.2020	37808	1873	35021	81	29	13
10.08.2020	37860	1874	35079	80	28	13
11.08.2020	37910	1875	35138	79	28	13
12.08.2020	37959	1876	35196	78	28	13
13.08.2020	38006	1877	35254	77	28	13
14.08.2020	38052	1878	35311	76	27	13
15.08.2020	38097	1879	35368	74	27	13
16.08.2020	38141	1880	35424	73	27	13
17.08.2020	38183	1881	35480	72	26	13
18.08.2020	38224	1882	35535	71	26	13
19.08.2020	38263	1883	35589	69	26	13
20.08.2020	38302	1884	35643	68	25	12
21.08.2020	38340	1885	35695	67	25	12
22.08.2020	38376	1886	35747	66	25	12
23.08.2020	38412	1887	35797	64	24	12
24.08.2020	38446	1888	35847	63	24	12
25.08.2020	38480	1888	35896	62	24	12
26.08.2020	38512	1889	35943	61	23	12

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	37201	1863	34461	82	30	13
31.07.2020	37274	1864	34513	82	30	13
01.08.2020	37346	1865	34566	83	30	13
02.08.2020	37417	1866	34621	83	30	13
03.08.2020	37489	1867	34676	84	30	13
04.08.2020	37561	1868	34733	84	30	13
05.08.2020	37633	1869	34791	84	30	14
06.08.2020	37705	1870	34850	85	30	14
07.08.2020	37777	1871	34910	85	29	14
08.08.2020	37849	1872	34971	85	29	14
09.08.2020	37920	1873	35033	85	29	14
10.08.2020	37992	1874	35096	85	29	14
11.08.2020	38064	1876	35159	85	29	14
12.08.2020	38135	1877	35223	85	29	14
13.08.2020	38207	1878	35288	85	29	14
14.08.2020	38278	1879	35353	85	29	14
15.08.2020	38350	1880	35419	85	29	14
16.08.2020	38421	1881	35485	85	29	14
17.08.2020	38493	1882	35552	85	29	14
18.08.2020	38564	1883	35619	85	29	15
19.08.2020	38635	1884	35687	85	29	15
20.08.2020	38707	1885	35755	84	29	15
21.08.2020	38778	1886	35823	84	29	15
22.08.2020	38849	1888	35891	84	29	15
23.08.2020	38921	1889	35960	84	29	15
24.08.2020	38992	1890	36028	84	29	15
25.08.2020	39063	1891	36097	84	29	15
26.08.2020	39134	1892	36166	84	28	15

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	37203	1863	34461	82	30	13
31.07.2020	37278	1864	34513	82	30	13
01.08.2020	37355	1865	34566	83	30	13
02.08.2020	37435	1866	34621	83	30	13
03.08.2020	37516	1867	34677	84	30	13
04.08.2020	37600	1868	34735	85	30	14
05.08.2020	37687	1869	34794	86	30	14
06.08.2020	37776	1870	34855	87	30	14
07.08.2020	37867	1871	34917	88	30	14
08.08.2020	37961	1872	34981	89	30	14
09.08.2020	38058	1873	35047	91	30	14
10.08.2020	38158	1875	35115	92	30	15
11.08.2020	38260	1876	35184	93	31	15
12.08.2020	38365	1877	35256	95	31	15
13.08.2020	38473	1878	35330	96	31	16
14.08.2020	38585	1879	35405	98	31	16
15.08.2020	38699	1881	35483	100	32	16
16.08.2020	38817	1882	35563	101	32	16
17.08.2020	38938	1883	35645	103	32	17
18.08.2020	39062	1884	35729	105	33	17
19.08.2020	39190	1886	35816	107	33	17
20.08.2020	39322	1887	35905	109	34	18
21.08.2020	39457	1888	35997	112	34	18
22.08.2020	39596	1890	36092	114	35	19
23.08.2020	39739	1891	36188	116	35	19
24.08.2020	39887	1893	36288	119	36	20
25.08.2020	40038	1894	36391	121	36	20
26.08.2020	40193	1896	36496	124	37	20

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

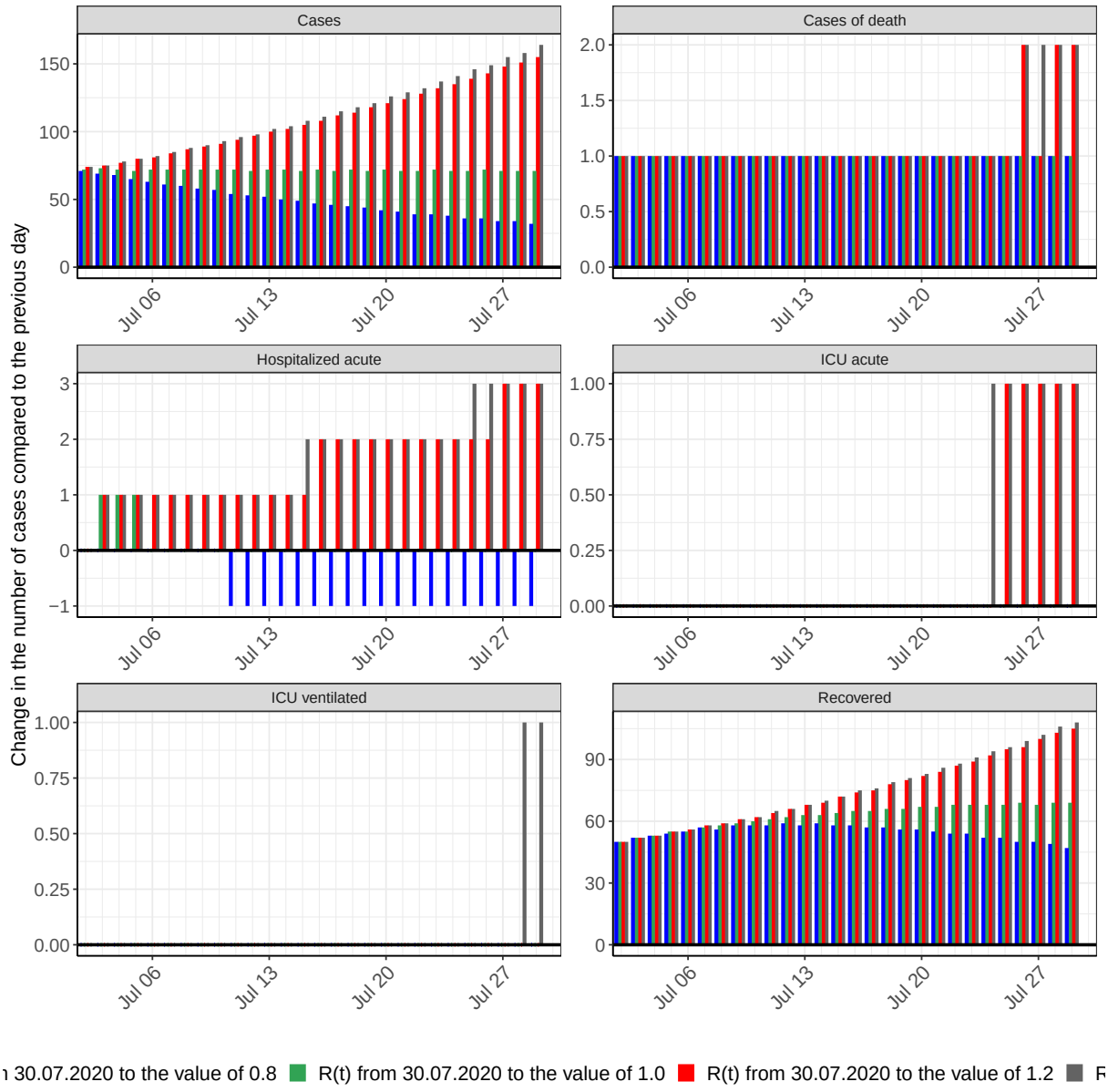


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

3 Bavaria

3.1 Model description

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

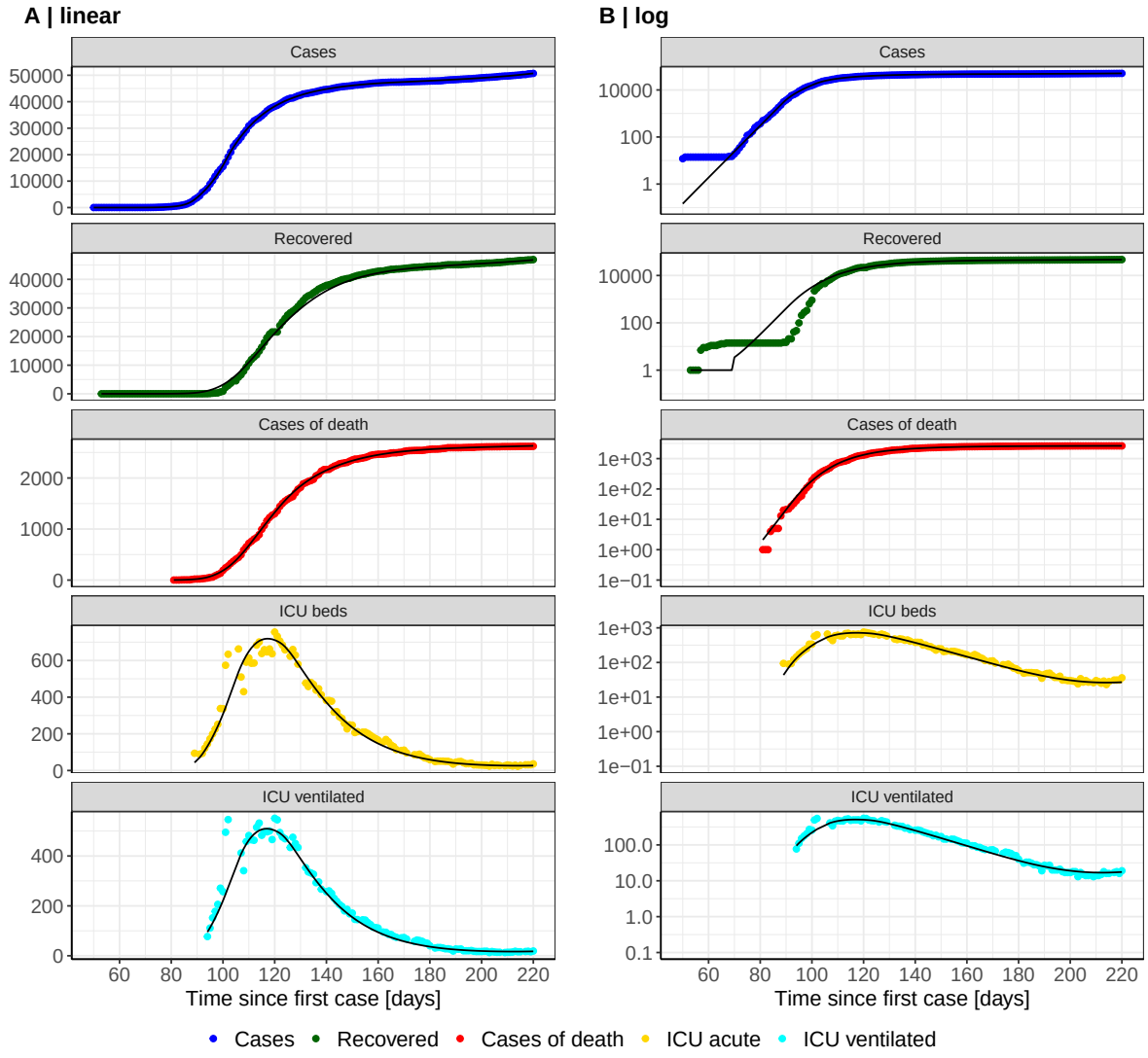


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

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

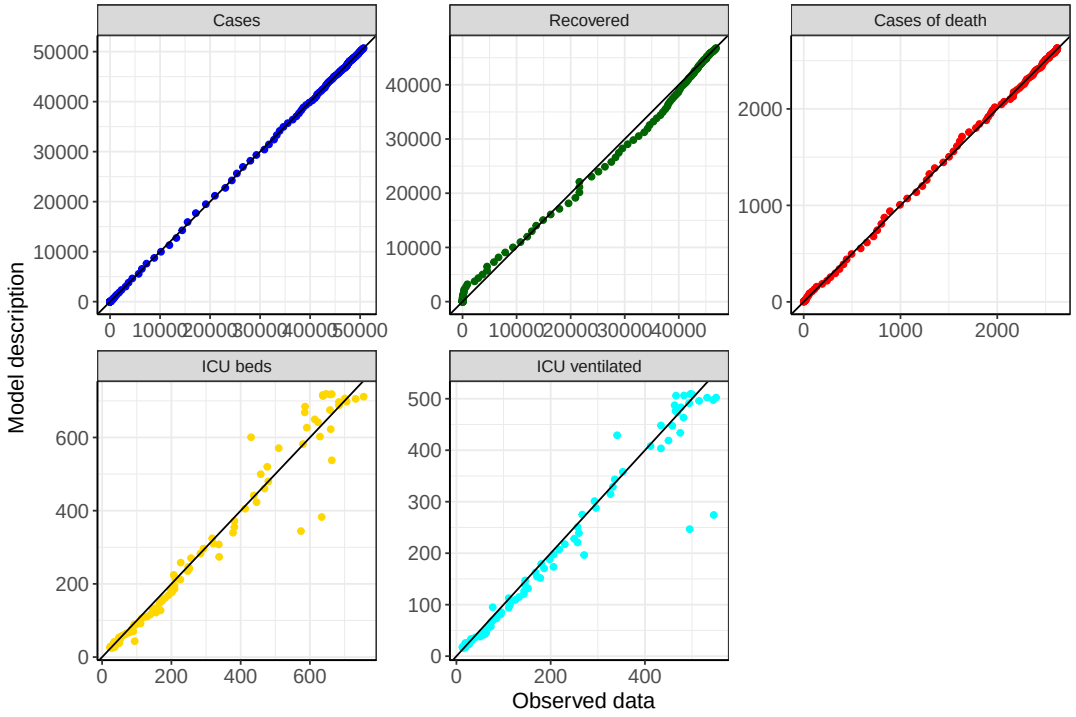


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

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

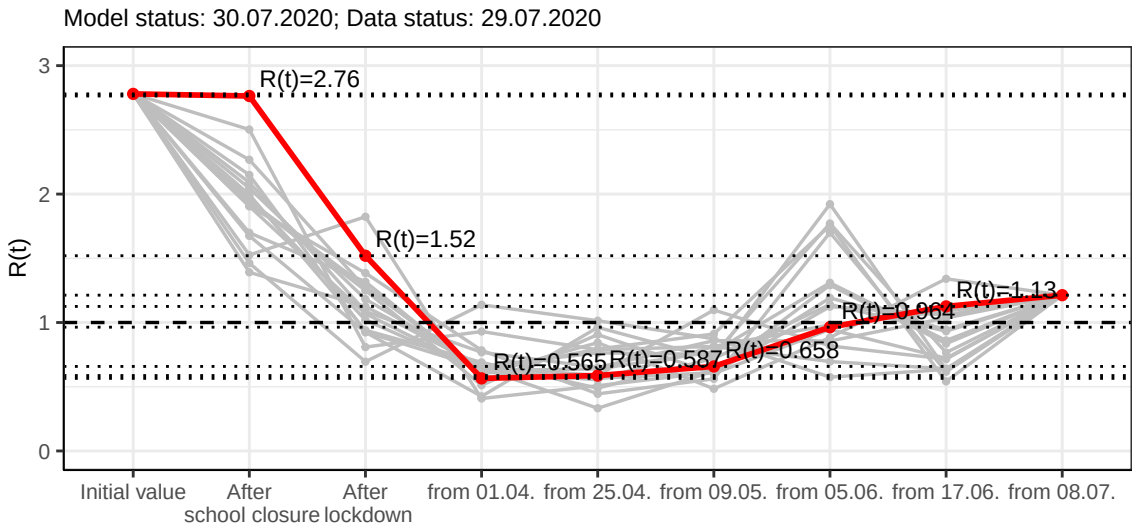


Figure 24: R(t) values before and after the NPIs for Bavaria

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

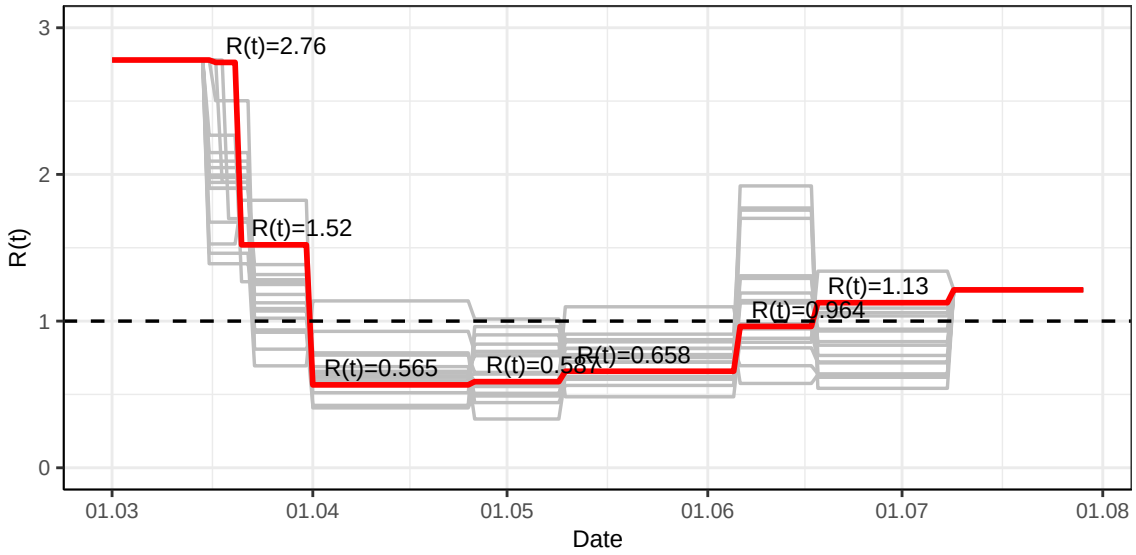


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

3.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

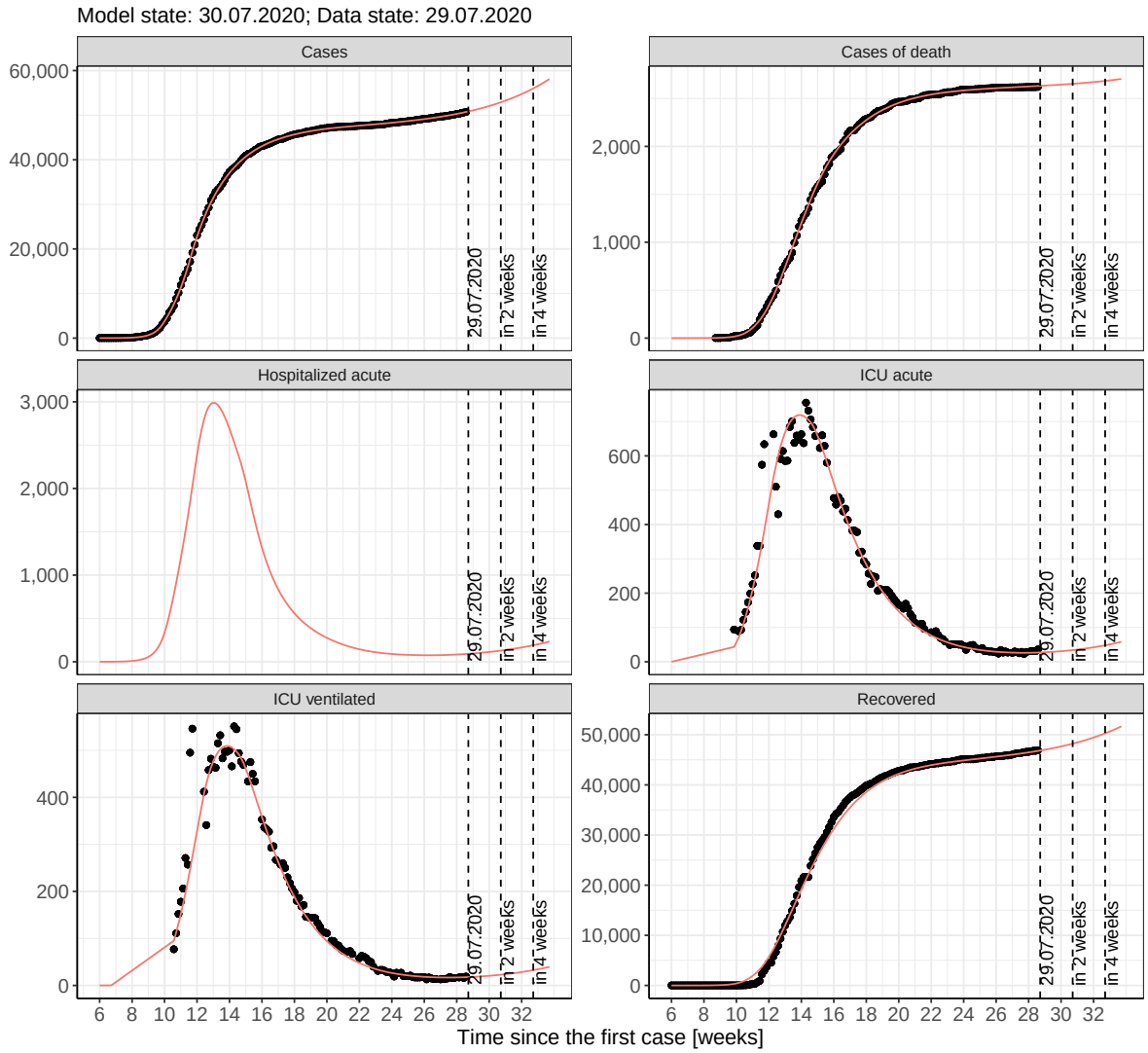


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

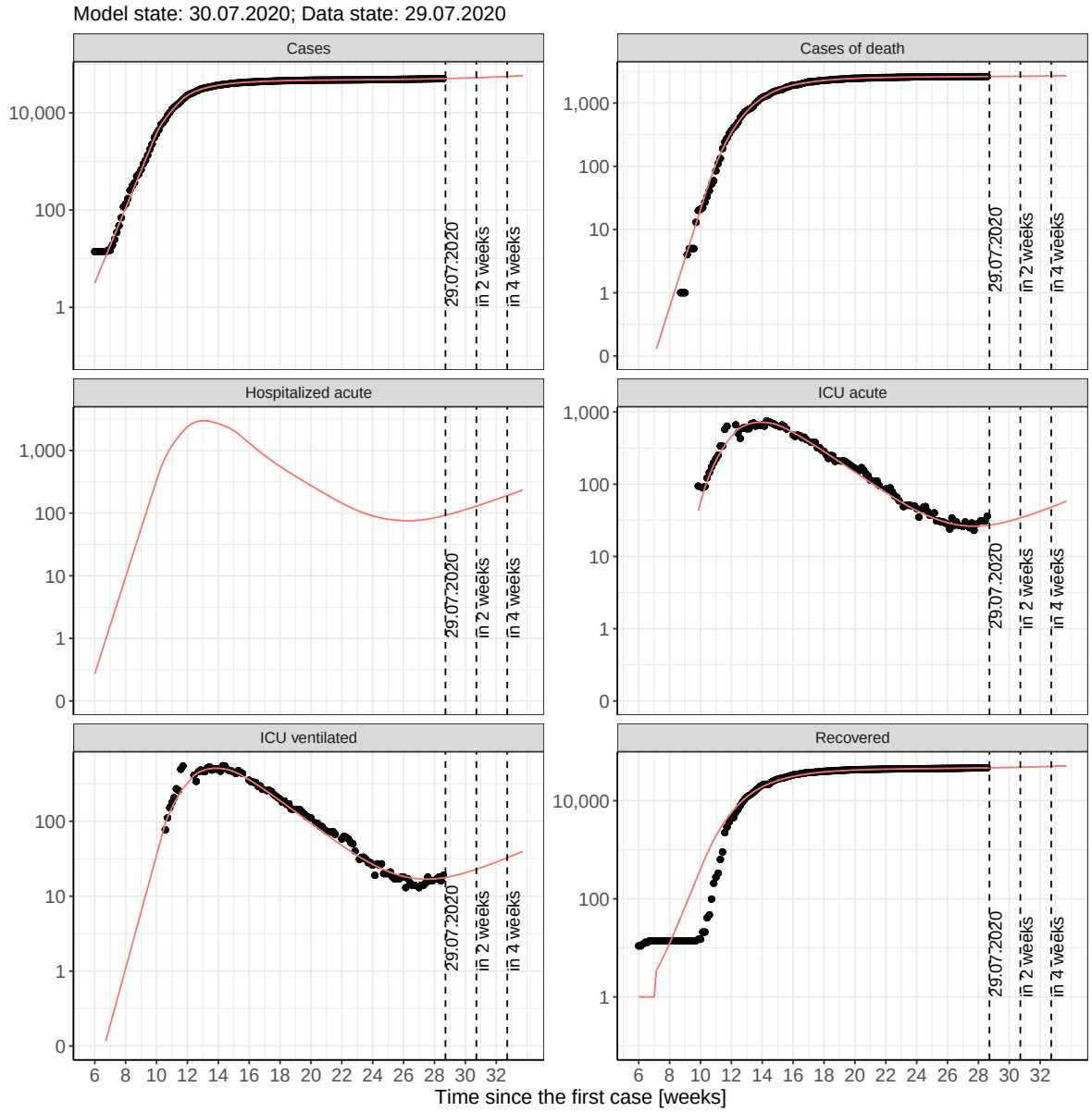


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 28 and 29 represent the model prediction for the next 4 weeks for Bavaria on a linear (28) and a semi-logarithmic (29) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

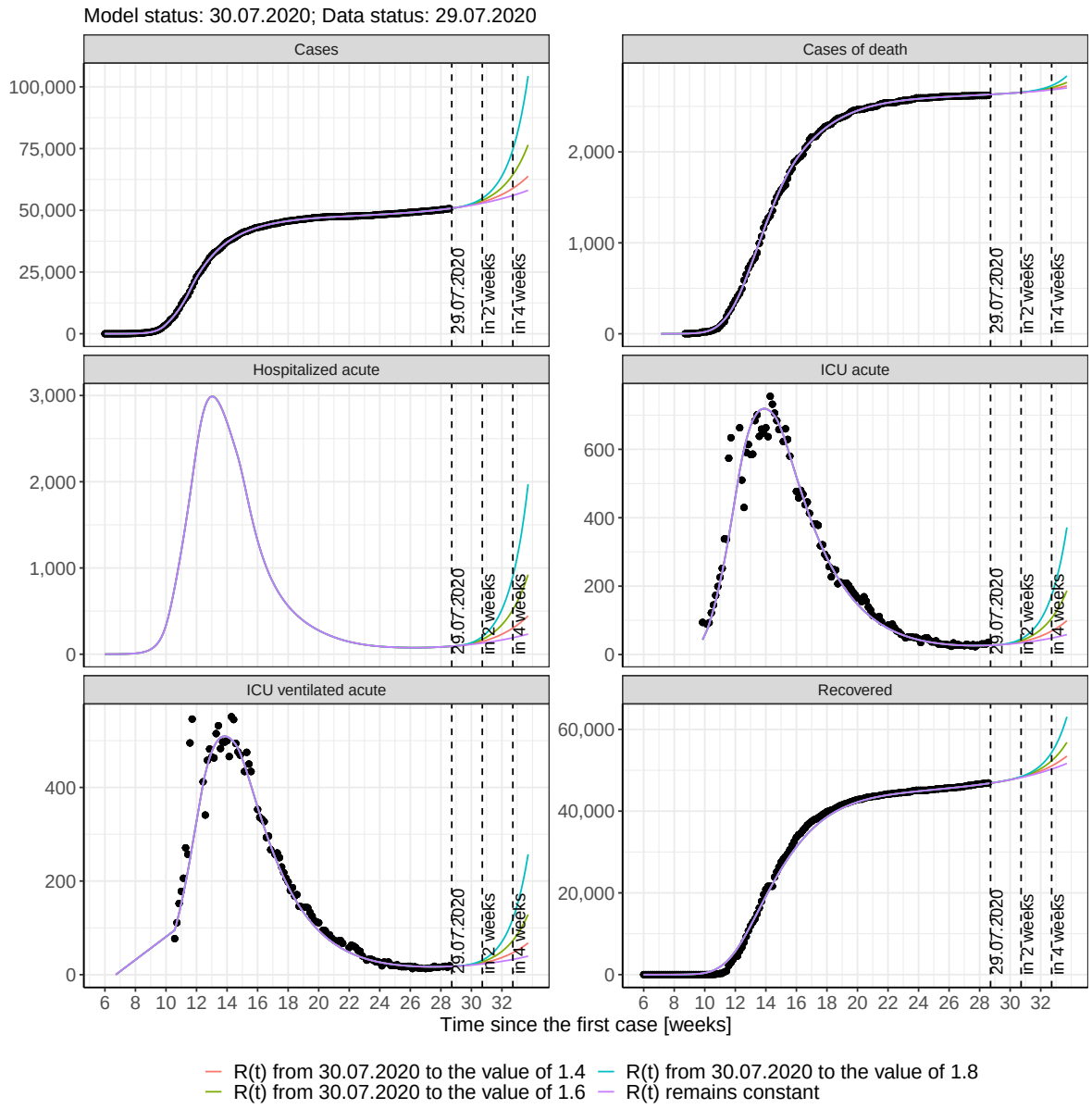


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

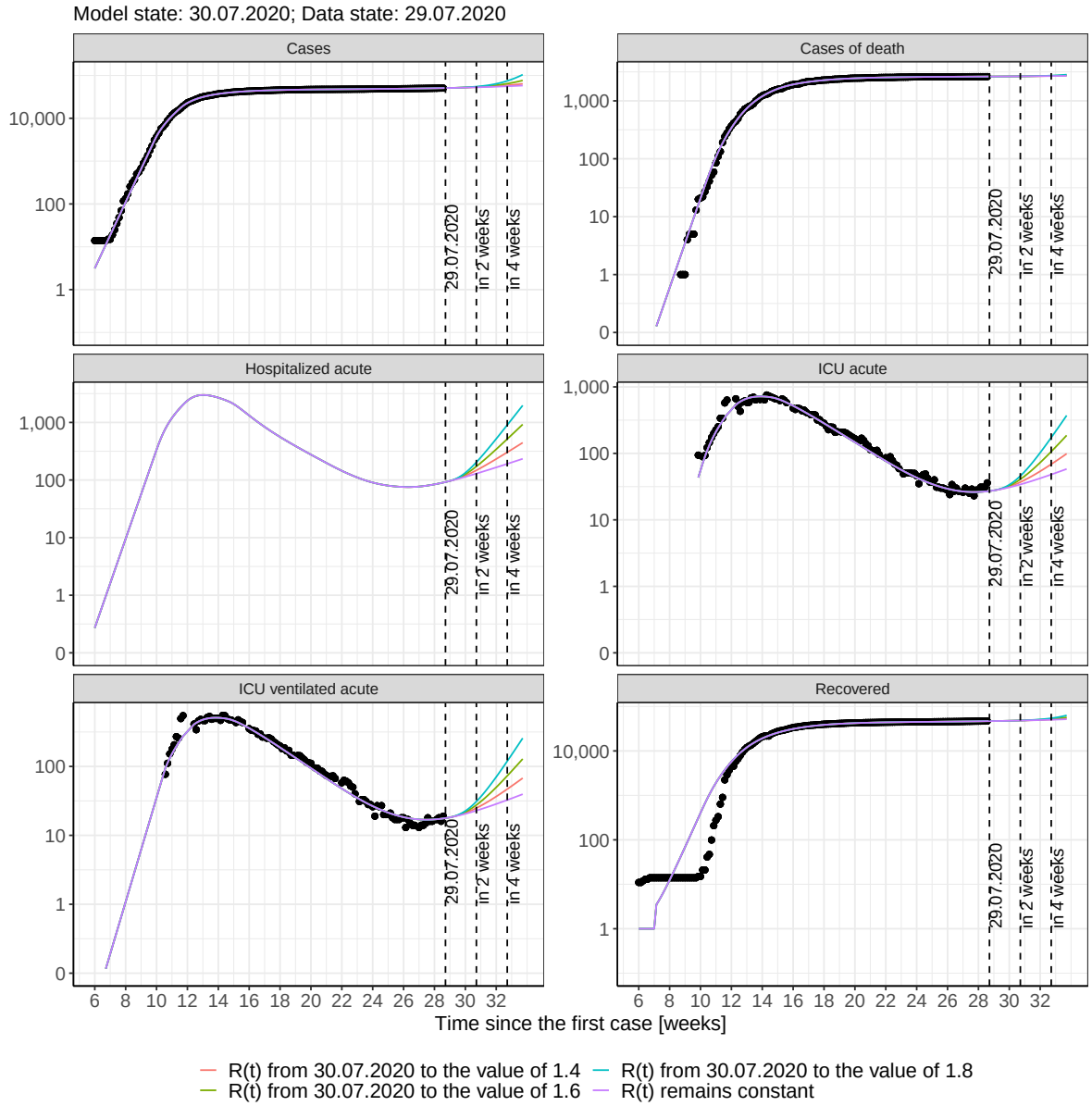


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 30 and 31 represent the model prediction for the next 16 weeks for Bavaria on a linear (30) and a semi-logarithmic (31) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

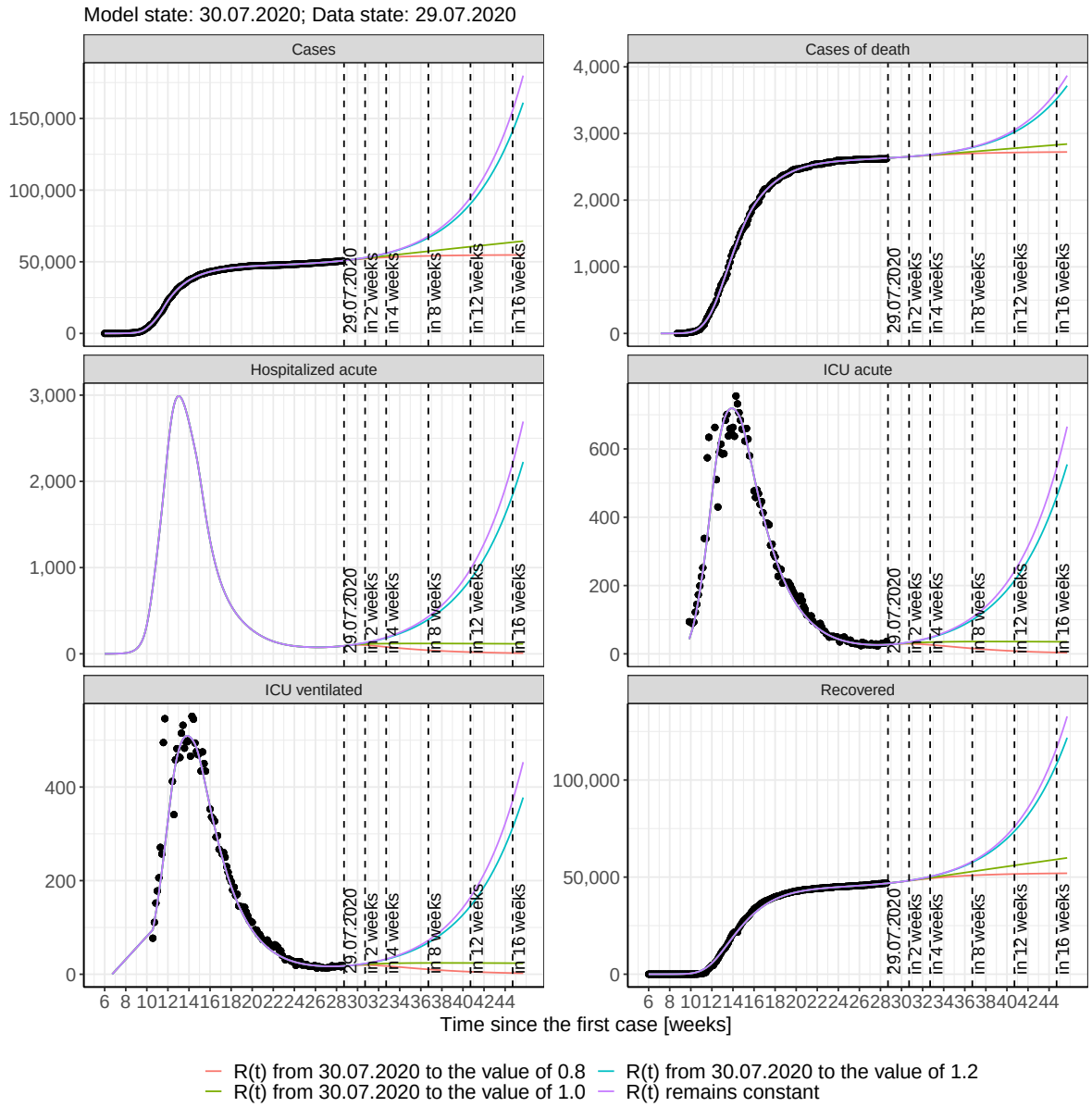


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

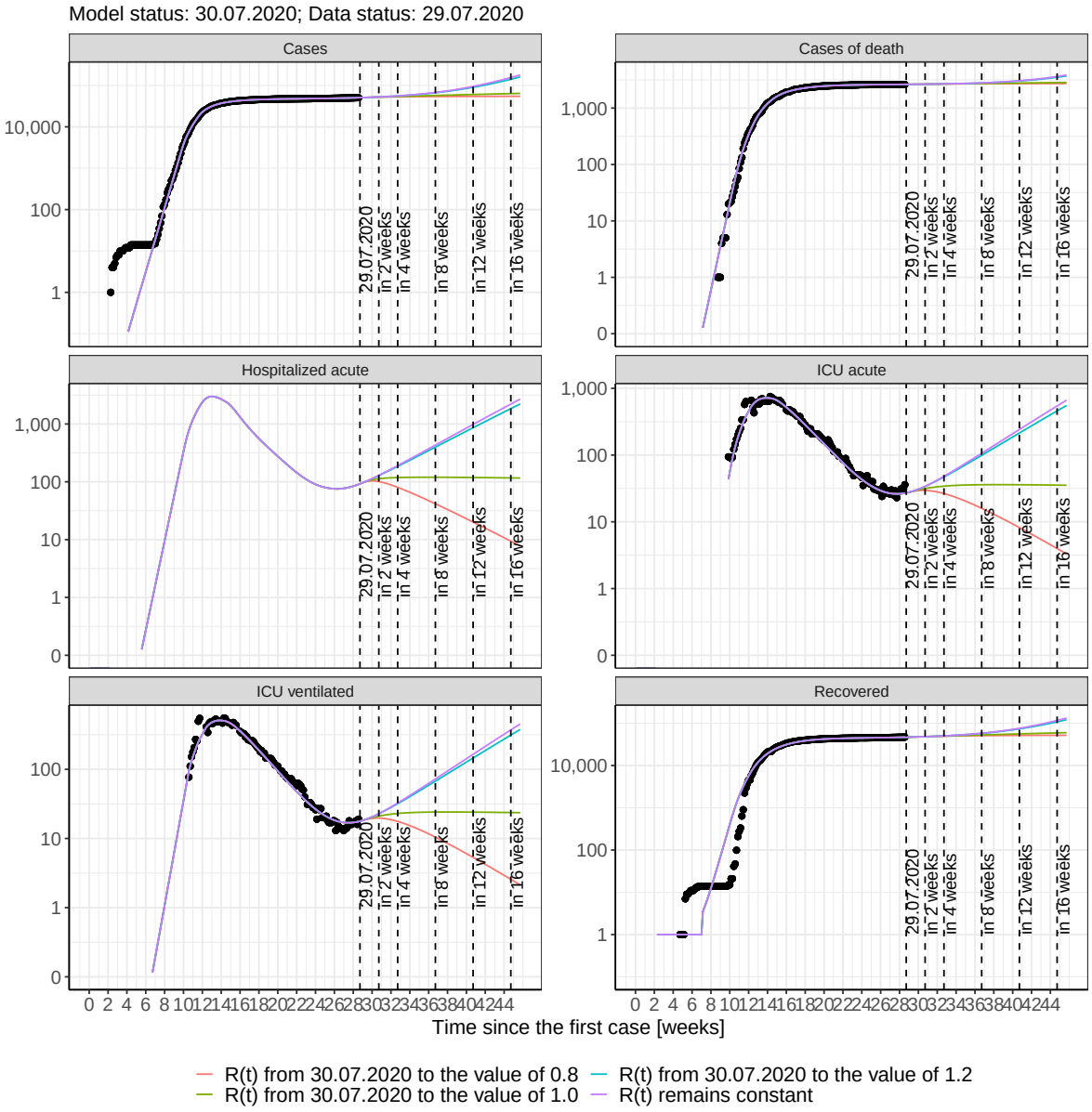


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 9) Model status from 30.07.2020; Data status: 29.07.2020.

Table 6: Bavaria - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	50949	2633	46932	94	27	18
31.07.2020	51073	2634	47016	96	28	18
01.08.2020	51200	2636	47101	98	28	19
02.08.2020	51331	2637	47189	101	28	19
03.08.2020	51466	2639	47280	103	29	19
04.08.2020	51606	2640	47373	106	29	19
05.08.2020	51749	2642	47468	108	30	20
06.08.2020	51897	2643	47567	111	30	20
07.08.2020	52049	2645	47668	114	31	21
08.08.2020	52206	2646	47772	117	31	21
09.08.2020	52368	2648	47880	120	32	21
10.08.2020	52534	2650	47990	123	33	22
11.08.2020	52706	2651	48104	126	33	22
12.08.2020	52883	2653	48221	129	34	23
13.08.2020	53065	2655	48342	133	35	23
14.08.2020	53252	2657	48466	136	36	24
15.08.2020	53445	2659	48594	140	36	25
16.08.2020	53644	2661	48725	144	37	25
17.08.2020	53849	2663	48861	148	38	26
18.08.2020	54060	2665	49001	152	39	26
19.08.2020	54278	2667	49144	157	40	27
20.08.2020	54502	2669	49292	161	41	28
21.08.2020	54733	2671	49445	166	42	29
22.08.2020	54970	2673	49602	170	43	29
23.08.2020	55215	2676	49764	175	44	30
24.08.2020	55467	2678	49931	180	46	31
25.08.2020	55727	2681	50102	185	47	32
26.08.2020	55995	2683	50279	191	48	33

Table 7: Bavaria - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	50945	2633	46932	94	27	18
31.07.2020	51059	2634	47016	96	28	18
01.08.2020	51169	2636	47101	98	28	18
02.08.2020	51275	2637	47188	100	28	19
03.08.2020	51379	2639	47277	101	29	19
04.08.2020	51480	2640	47367	102	29	19
05.08.2020	51578	2642	47459	103	29	19
06.08.2020	51673	2643	47552	104	29	19
07.08.2020	51765	2645	47646	104	29	20
08.08.2020	51855	2646	47740	104	29	20
09.08.2020	51942	2648	47835	103	30	20
10.08.2020	52027	2649	47930	103	30	20
11.08.2020	52109	2651	48024	102	30	20
12.08.2020	52189	2652	48119	101	30	20
13.08.2020	52267	2654	48212	100	30	20
14.08.2020	52342	2655	48306	99	29	20
15.08.2020	52415	2657	48398	98	29	20
16.08.2020	52487	2658	48490	96	29	19
17.08.2020	52556	2660	48580	95	29	19
18.08.2020	52623	2661	48669	93	29	19
19.08.2020	52688	2662	48757	92	29	19
20.08.2020	52751	2664	48844	90	28	19
21.08.2020	52813	2665	48929	88	28	19
22.08.2020	52873	2666	49013	87	28	18
23.08.2020	52931	2668	49096	85	27	18
24.08.2020	52987	2669	49176	83	27	18
25.08.2020	53042	2671	49256	82	27	18
26.08.2020	53095	2672	49333	80	26	18

Table 8: Bavaria - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	50947	2633	46932	94	27	18
31.07.2020	51065	2634	47016	96	28	18
01.08.2020	51183	2636	47101	98	28	18
02.08.2020	51301	2637	47188	100	28	19
03.08.2020	51419	2639	47278	102	29	19
04.08.2020	51537	2640	47370	104	29	19
05.08.2020	51655	2642	47463	105	29	20
06.08.2020	51773	2643	47559	107	30	20
07.08.2020	51890	2645	47656	108	30	20
08.08.2020	52008	2646	47755	109	30	20
09.08.2020	52126	2648	47855	111	31	20
10.08.2020	52243	2649	47956	112	31	21
11.08.2020	52360	2651	48059	112	31	21
12.08.2020	52478	2652	48163	113	32	21
13.08.2020	52595	2654	48269	114	32	21
14.08.2020	52712	2656	48375	114	32	21
15.08.2020	52829	2658	48482	115	32	22
16.08.2020	52946	2659	48589	116	32	22
17.08.2020	53063	2661	48698	116	33	22
18.08.2020	53180	2662	48807	116	33	22
19.08.2020	53297	2664	48917	117	33	22
20.08.2020	53414	2666	49027	117	33	22
21.08.2020	53531	2668	49138	117	33	22
22.08.2020	53647	2669	49249	118	34	23
23.08.2020	53764	2671	49361	118	34	23
24.08.2020	53880	2673	49473	118	34	23
25.08.2020	53997	2675	49585	118	34	23
26.08.2020	54113	2676	49698	118	34	23

Table 9: Bavaria - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	50949	2633	46932	94	27	18
31.07.2020	51072	2634	47016	96	28	18
01.08.2020	51199	2636	47101	98	28	19
02.08.2020	51329	2637	47189	101	28	19
03.08.2020	51463	2639	47279	103	29	19
04.08.2020	51601	2640	47372	105	29	19
05.08.2020	51743	2642	47468	108	30	20
06.08.2020	51889	2643	47566	111	30	20
07.08.2020	52039	2645	47667	113	31	21
08.08.2020	52193	2646	47771	116	31	21
09.08.2020	52352	2648	47878	119	32	21
10.08.2020	52515	2650	47988	122	33	22
11.08.2020	52682	2651	48101	125	33	22
12.08.2020	52855	2653	48217	128	34	23
13.08.2020	53032	2655	48337	132	35	23
14.08.2020	53214	2657	48460	135	35	24
15.08.2020	53401	2659	48586	138	36	24
16.08.2020	53594	2660	48716	142	37	25
17.08.2020	53792	2662	48850	146	38	25
18.08.2020	53996	2664	48987	150	39	26
19.08.2020	54205	2667	49129	154	40	27
20.08.2020	54421	2669	49274	158	41	27
21.08.2020	54642	2671	49423	162	42	28
22.08.2020	54870	2673	49577	166	43	29
23.08.2020	55104	2676	49735	171	44	30
24.08.2020	55345	2678	49898	175	45	30
25.08.2020	55592	2680	50065	180	46	31
26.08.2020	55847	2683	50236	185	47	32

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

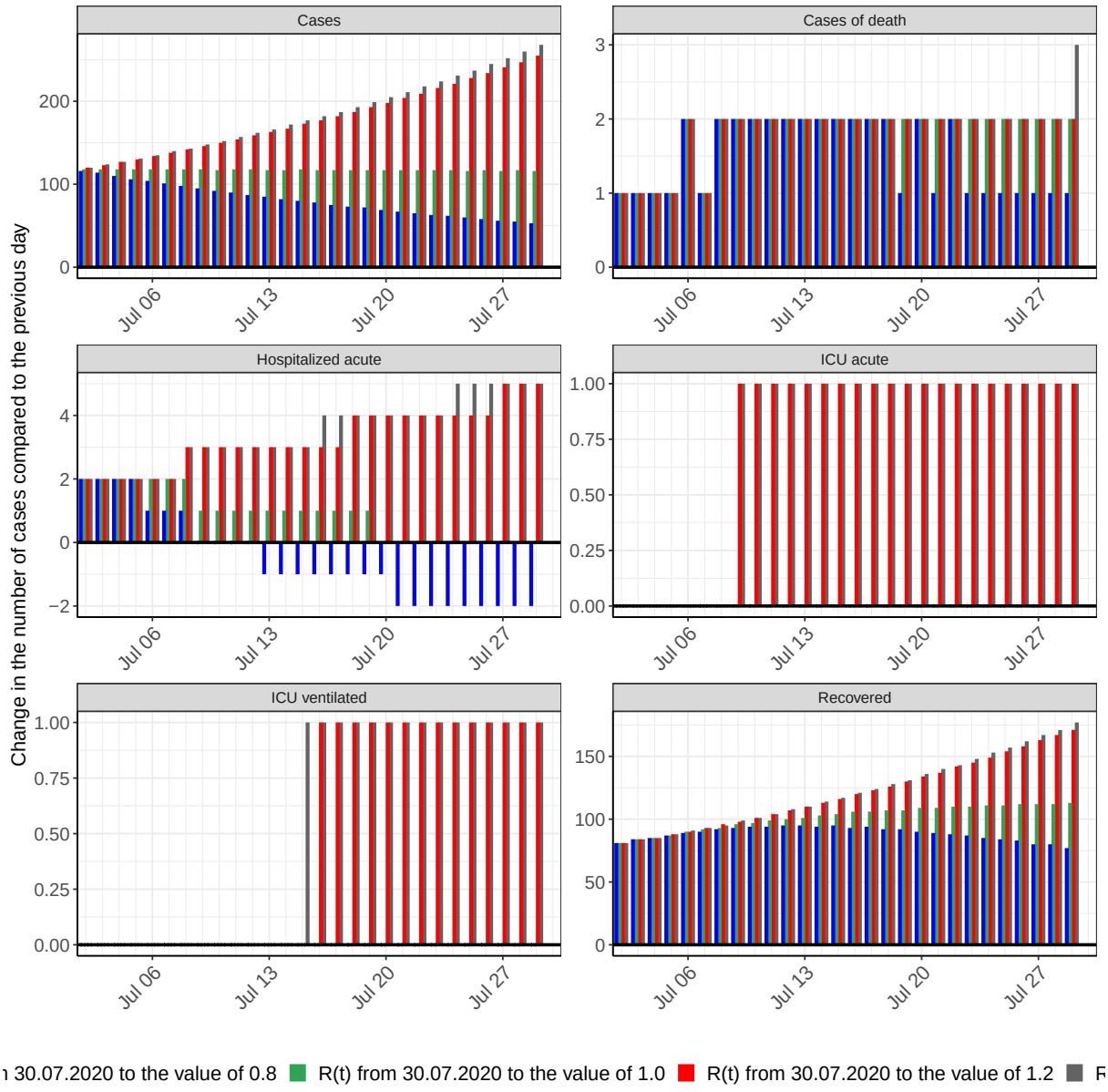


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

4 Berlin

4.1 Model description

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

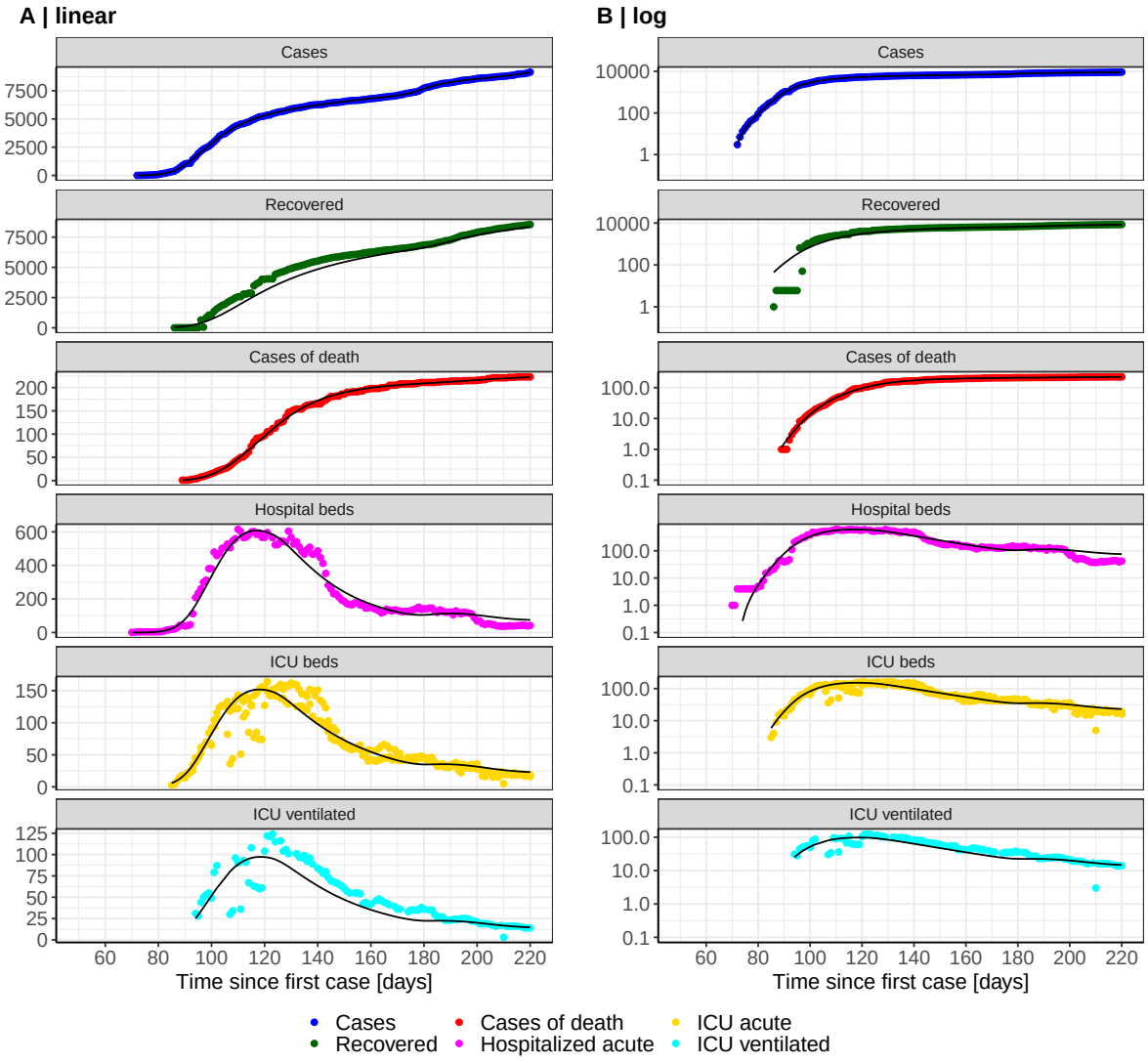


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

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

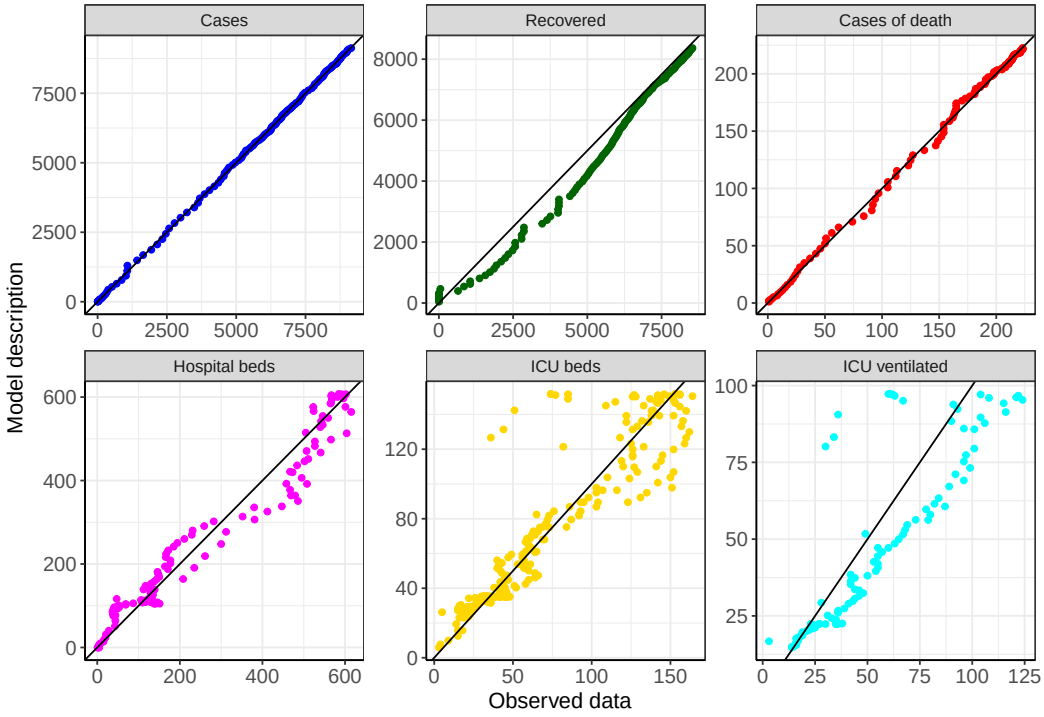


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

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

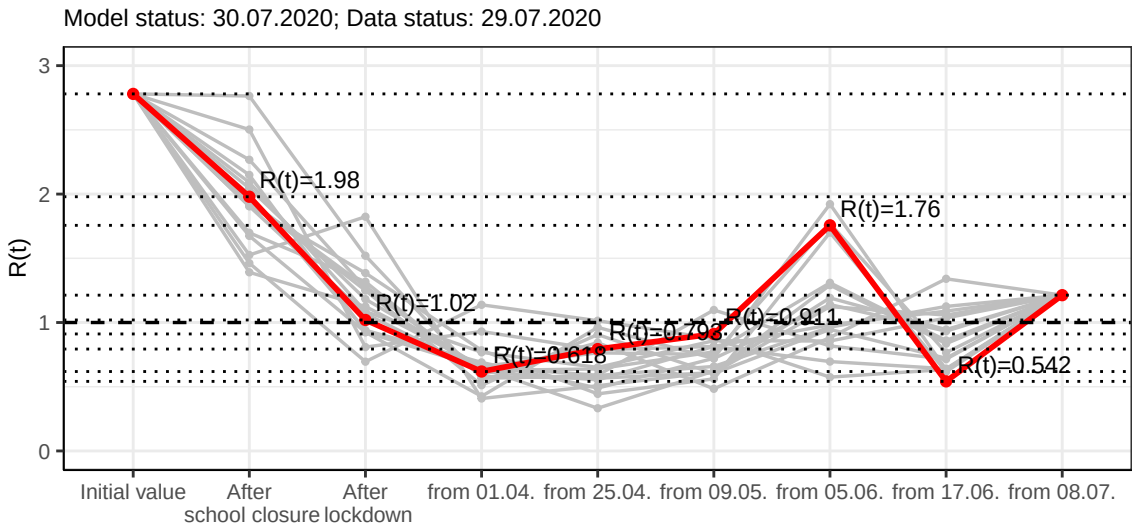


Figure 35: R(t) values before and after the NPIs for Berlin

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

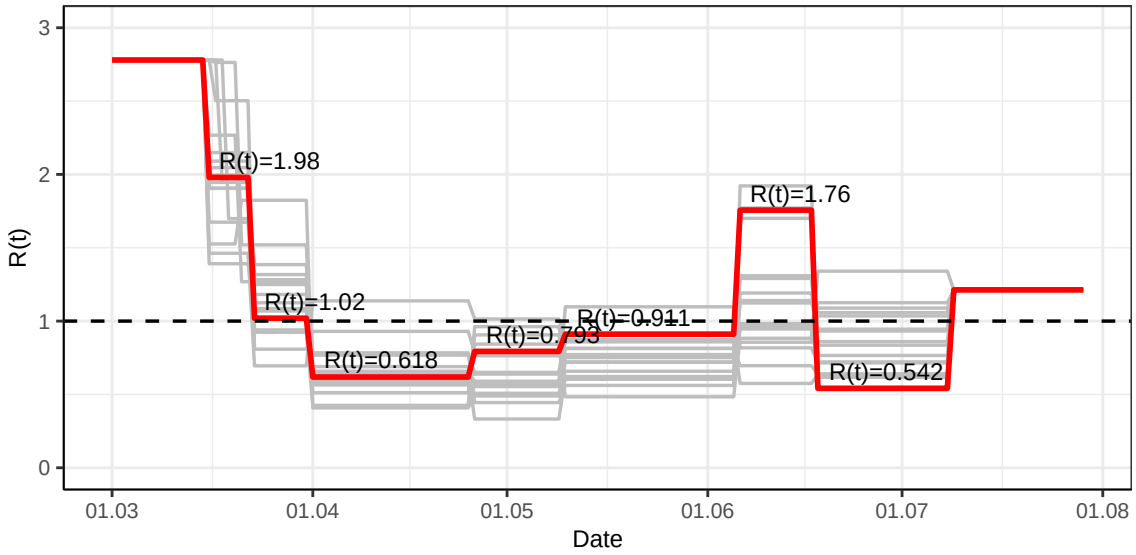


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

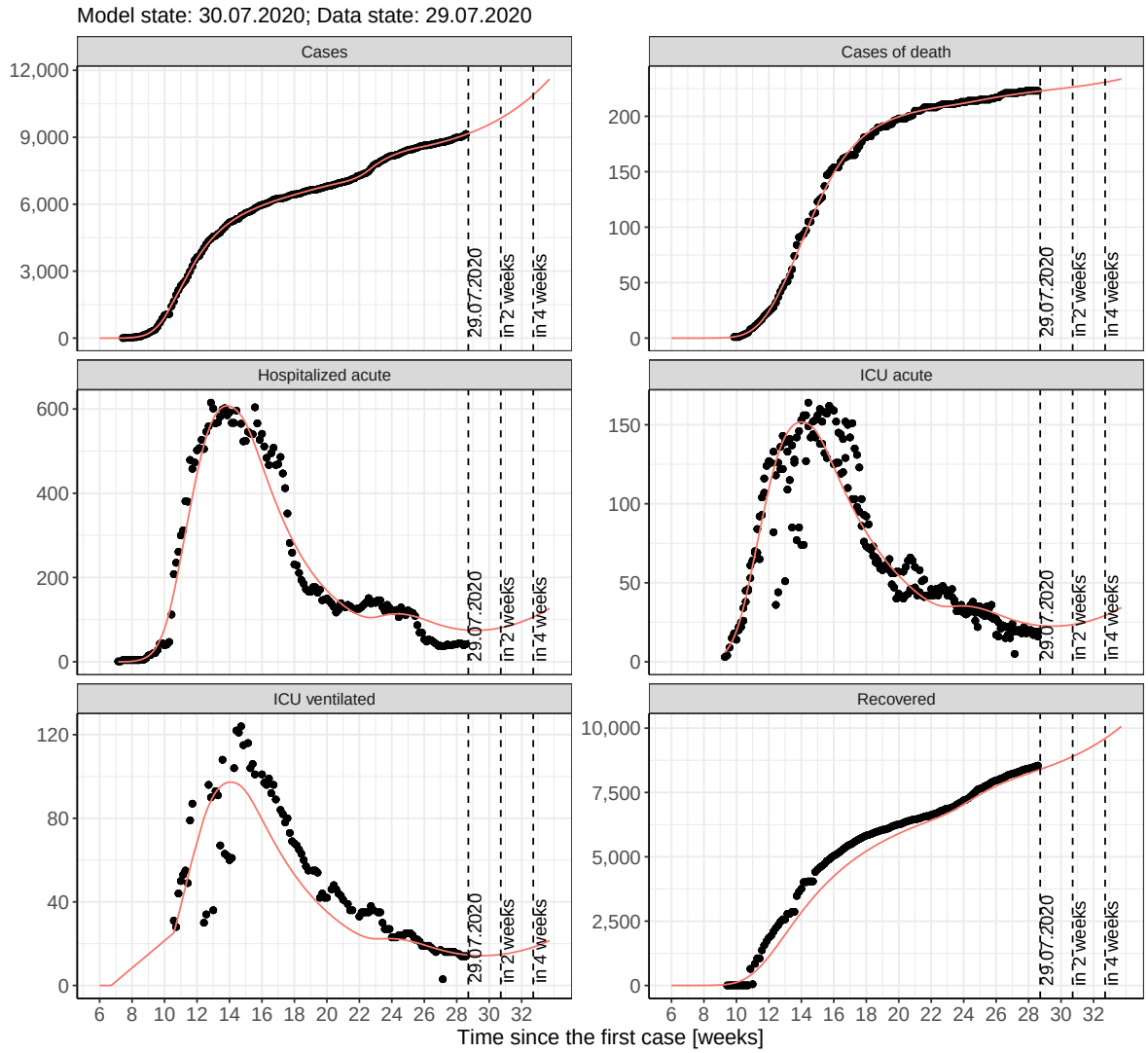


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

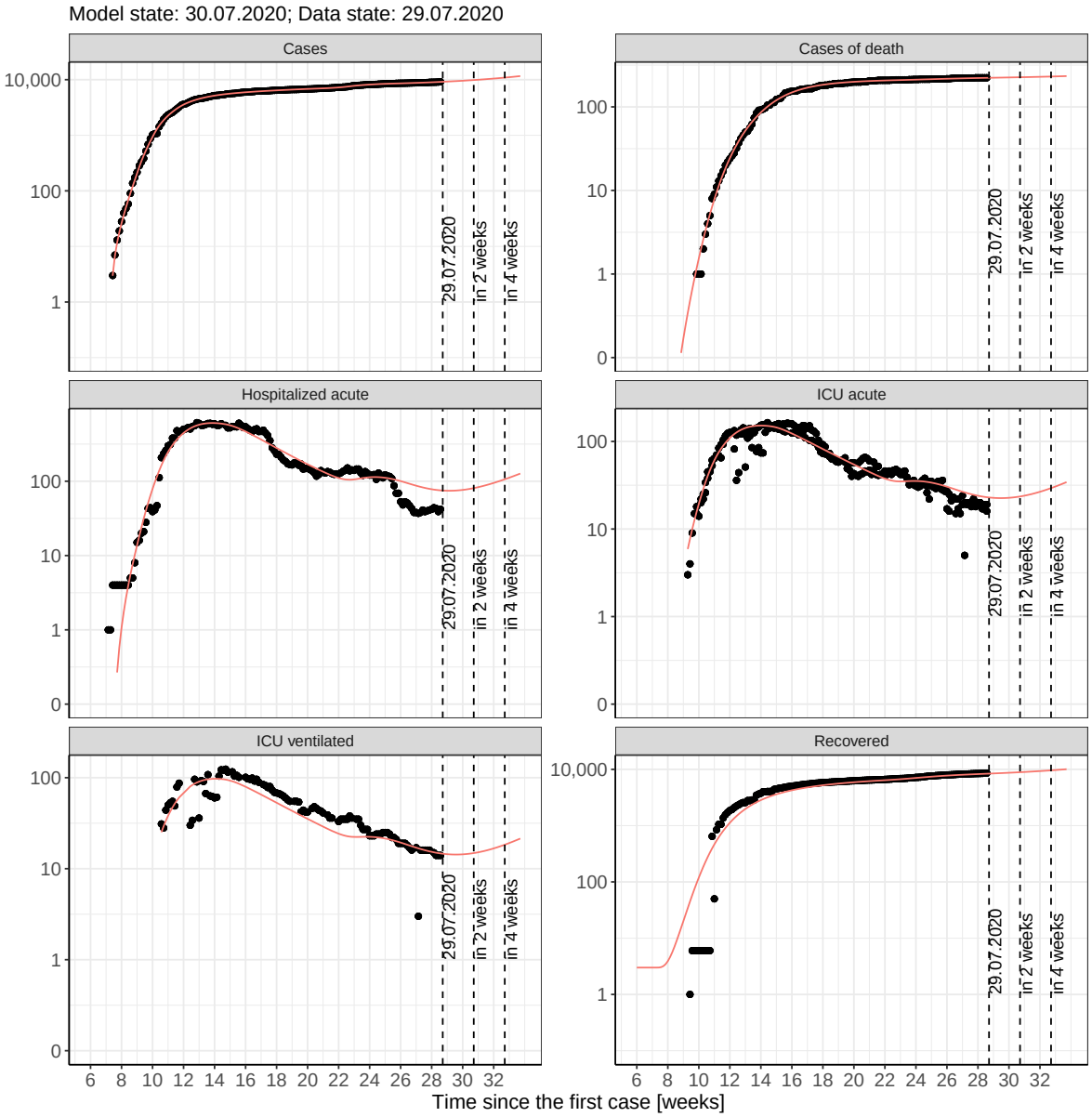


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 39 and 40 represent the model prediction for the next 4 weeks for Berlin on a linear (39) and a semi-logarithmic (40) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

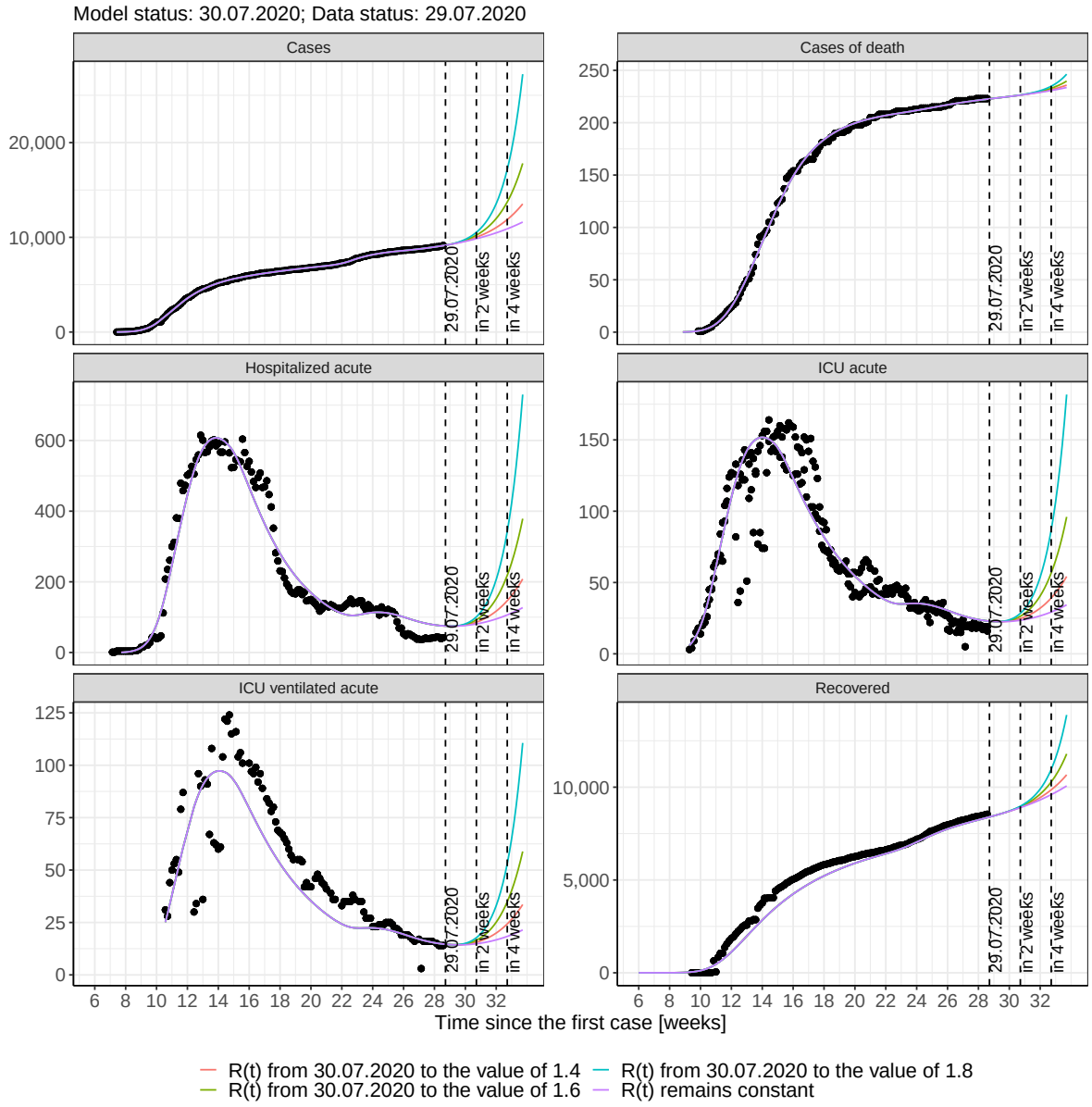


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

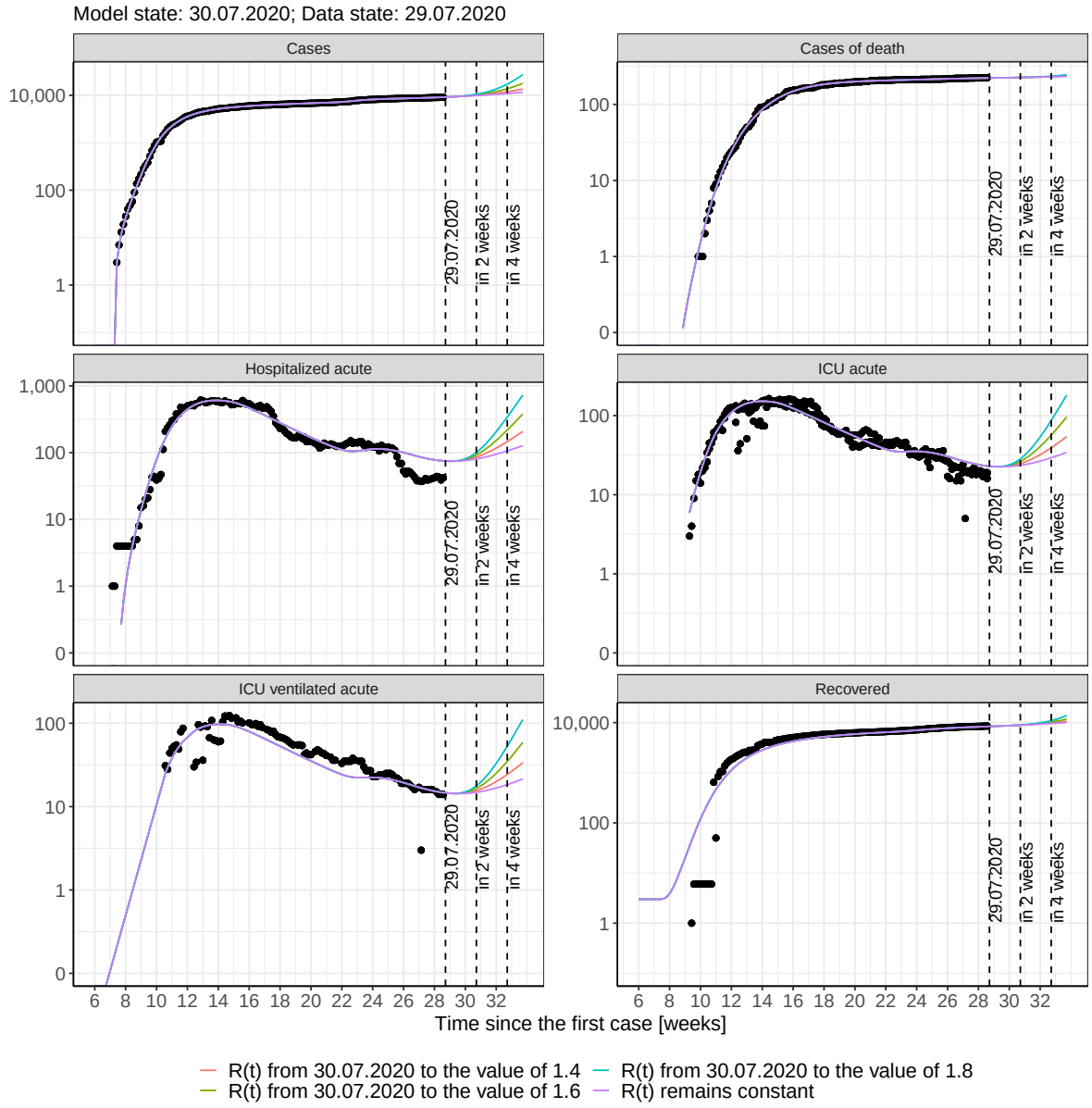


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 41 and 42 represent the model prediction for the next 16 weeks for Berlin on a linear (41) and a semi-logarithmic (42) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

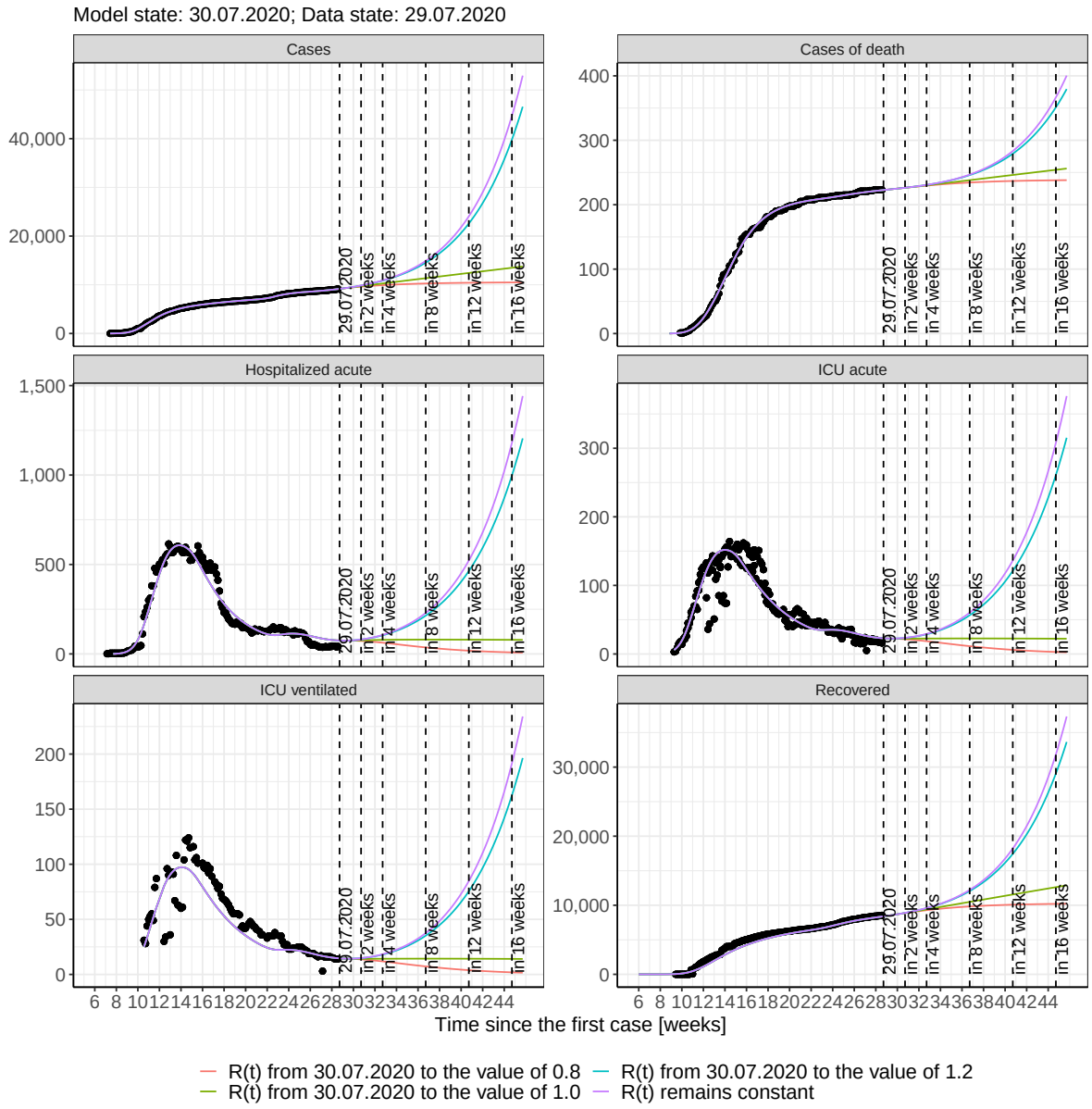


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

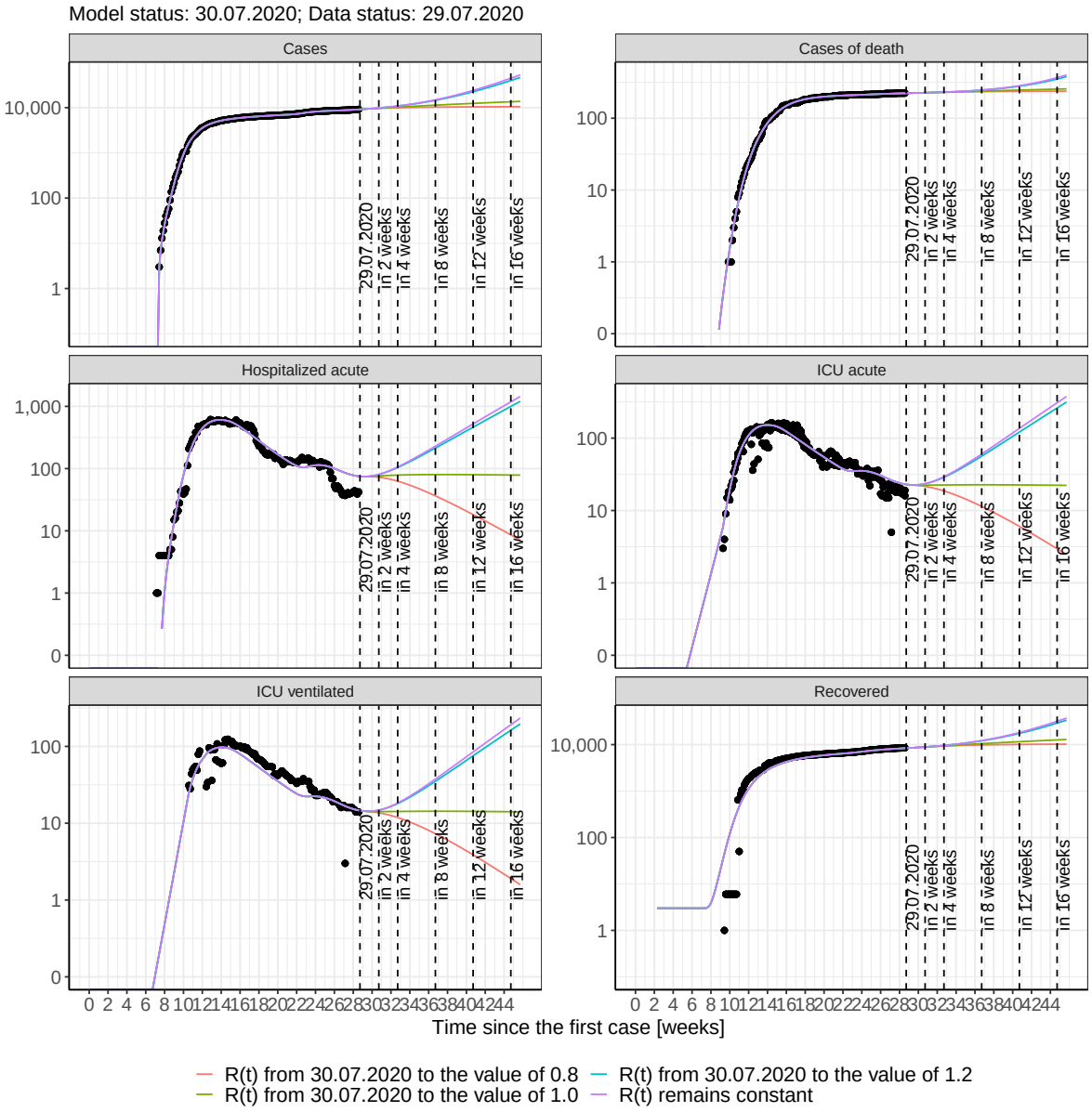


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 13) Model status from 30.07.2020; Data status: 29.07.2020.

Table 10: Berlin - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	9205	223	8428	75	23	15
31.07.2020	9247	223	8460	75	23	14
01.08.2020	9289	224	8493	75	23	14
02.08.2020	9333	224	8526	75	23	14
03.08.2020	9378	224	8560	75	23	14
04.08.2020	9425	224	8594	75	23	14
05.08.2020	9473	224	8629	75	23	14
06.08.2020	9523	225	8665	76	23	14
07.08.2020	9574	225	8702	76	23	14
08.08.2020	9626	225	8739	77	23	14
09.08.2020	9680	226	8777	78	23	15
10.08.2020	9736	226	8816	79	23	15
11.08.2020	9794	226	8856	80	23	15
12.08.2020	9853	226	8897	81	24	15
13.08.2020	9914	227	8939	82	24	15
14.08.2020	9977	227	8982	83	24	15
15.08.2020	10042	227	9026	85	24	15
16.08.2020	10109	227	9071	86	25	16
17.08.2020	10177	228	9118	88	25	16
18.08.2020	10248	228	9166	89	25	16
19.08.2020	10321	228	9215	91	26	16
20.08.2020	10397	229	9265	93	26	16
21.08.2020	10474	229	9317	95	27	17
22.08.2020	10554	229	9370	97	27	17
23.08.2020	10636	230	9425	99	28	17
24.08.2020	10721	230	9482	101	28	18
25.08.2020	10809	230	9540	104	29	18
26.08.2020	10899	231	9599	106	29	18

Table 11: Berlin - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	9204	223	8428	75	23	15
31.07.2020	9242	223	8460	75	23	14
01.08.2020	9279	223	8493	74	23	14
02.08.2020	9314	224	8526	74	23	14
03.08.2020	9349	224	8559	74	22	14
04.08.2020	9383	224	8592	74	22	14
05.08.2020	9416	224	8626	74	22	14
06.08.2020	9448	225	8660	74	22	14
07.08.2020	9478	225	8694	74	22	14
08.08.2020	9508	225	8728	74	22	14
09.08.2020	9538	225	8762	74	22	14
10.08.2020	9566	226	8796	73	22	14
11.08.2020	9594	226	8829	73	22	14
12.08.2020	9620	226	8862	73	22	14
13.08.2020	9646	226	8895	72	21	14
14.08.2020	9672	227	8928	72	21	13
15.08.2020	9696	227	8960	71	21	13
16.08.2020	9720	227	8992	71	21	13
17.08.2020	9743	227	9024	70	21	13
18.08.2020	9766	228	9055	69	20	13
19.08.2020	9788	228	9085	69	20	13
20.08.2020	9809	228	9115	68	20	13
21.08.2020	9830	228	9145	67	20	13
22.08.2020	9850	229	9174	66	20	12
23.08.2020	9869	229	9202	65	19	12
24.08.2020	9888	229	9230	65	19	12
25.08.2020	9906	229	9257	64	19	12
26.08.2020	9924	230	9284	63	19	12

Table 12: Berlin - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	9205	223	8428	75	23	15
31.07.2020	9244	223	8460	75	23	14
01.08.2020	9284	223	8493	74	23	14
02.08.2020	9323	224	8526	74	23	14
03.08.2020	9363	224	8559	75	22	14
04.08.2020	9402	224	8593	75	22	14
05.08.2020	9442	224	8628	75	22	14
06.08.2020	9481	225	8662	75	22	14
07.08.2020	9520	225	8698	75	22	14
08.08.2020	9560	225	8733	75	22	14
09.08.2020	9599	226	8769	76	22	14
10.08.2020	9638	226	8805	76	22	14
11.08.2020	9678	226	8841	76	22	14
12.08.2020	9717	226	8877	76	22	14
13.08.2020	9756	227	8914	76	22	14
14.08.2020	9796	227	8951	77	22	14
15.08.2020	9835	227	8988	77	22	14
16.08.2020	9874	227	9026	77	22	14
17.08.2020	9914	228	9063	77	22	14
18.08.2020	9953	228	9101	77	22	14
19.08.2020	9992	228	9139	78	22	14
20.08.2020	10031	228	9176	78	22	14
21.08.2020	10070	229	9214	78	22	14
22.08.2020	10110	229	9252	78	22	14
23.08.2020	10149	229	9291	78	22	14
24.08.2020	10188	230	9329	78	23	14
25.08.2020	10227	230	9367	78	23	14
26.08.2020	10266	230	9406	79	23	14

Table 13: Berlin - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	9205	223	8428	75	23	15
31.07.2020	9246	223	8460	75	23	14
01.08.2020	9289	224	8493	75	23	14
02.08.2020	9332	224	8526	75	23	14
03.08.2020	9377	224	8560	75	23	14
04.08.2020	9424	224	8594	75	23	14
05.08.2020	9471	224	8629	75	23	14
06.08.2020	9520	225	8665	76	23	14
07.08.2020	9570	225	8701	76	23	14
08.08.2020	9622	225	8738	77	23	14
09.08.2020	9675	226	8776	78	23	14
10.08.2020	9730	226	8815	79	23	15
11.08.2020	9786	226	8855	79	23	15
12.08.2020	9844	226	8896	80	23	15
13.08.2020	9903	227	8937	82	24	15
14.08.2020	9964	227	8980	83	24	15
15.08.2020	10027	227	9023	84	24	15
16.08.2020	10092	227	9068	85	24	15
17.08.2020	10158	228	9114	87	25	16
18.08.2020	10227	228	9161	88	25	16
19.08.2020	10297	228	9209	90	26	16
20.08.2020	10369	229	9259	92	26	16
21.08.2020	10444	229	9310	94	26	17
22.08.2020	10520	229	9362	96	27	17
23.08.2020	10599	230	9416	98	27	17
24.08.2020	10680	230	9470	100	28	17
25.08.2020	10763	230	9527	102	28	18
26.08.2020	10849	231	9585	104	29	18

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

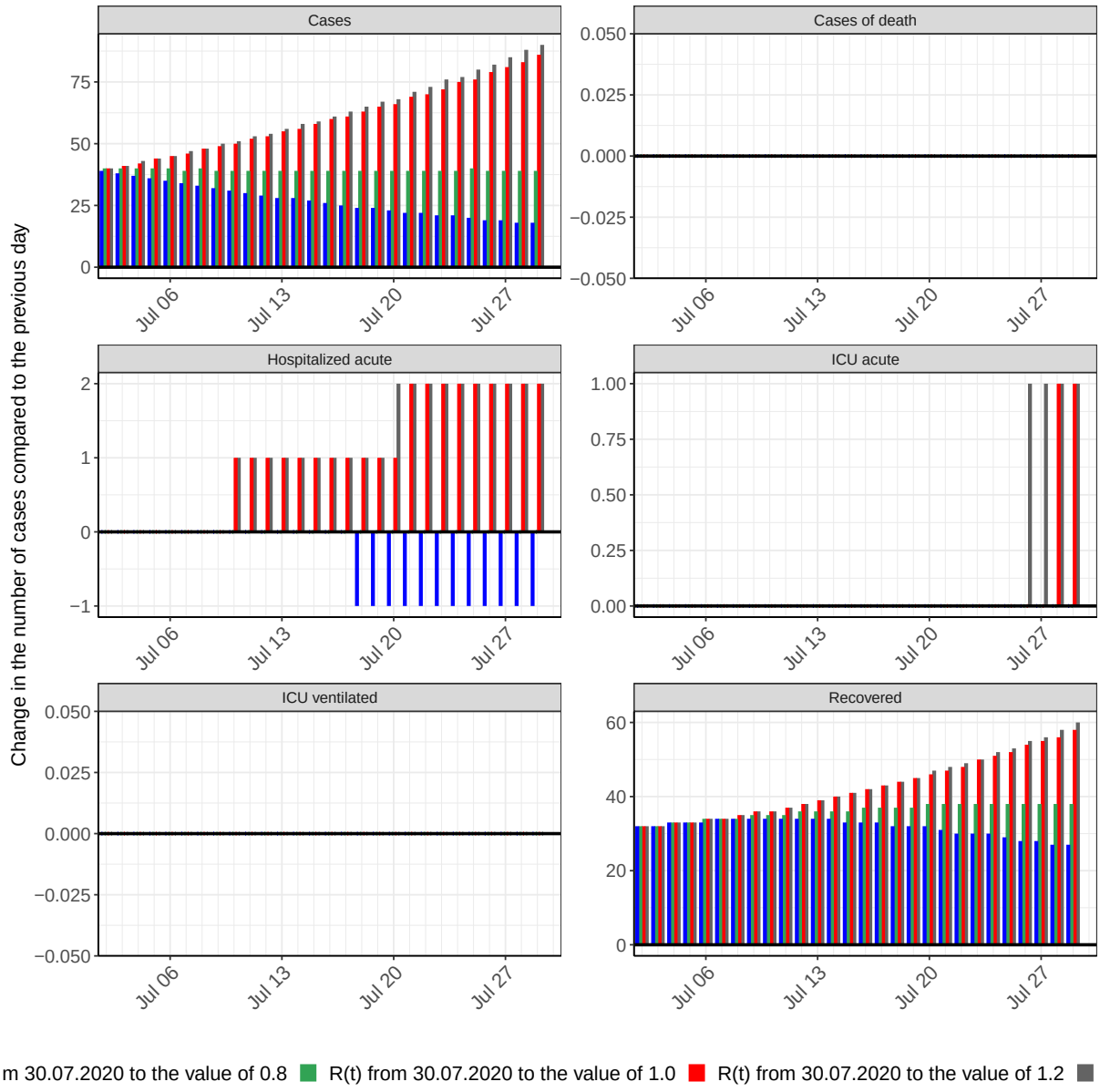


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

5 Brandenburg

5.1 Model description

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

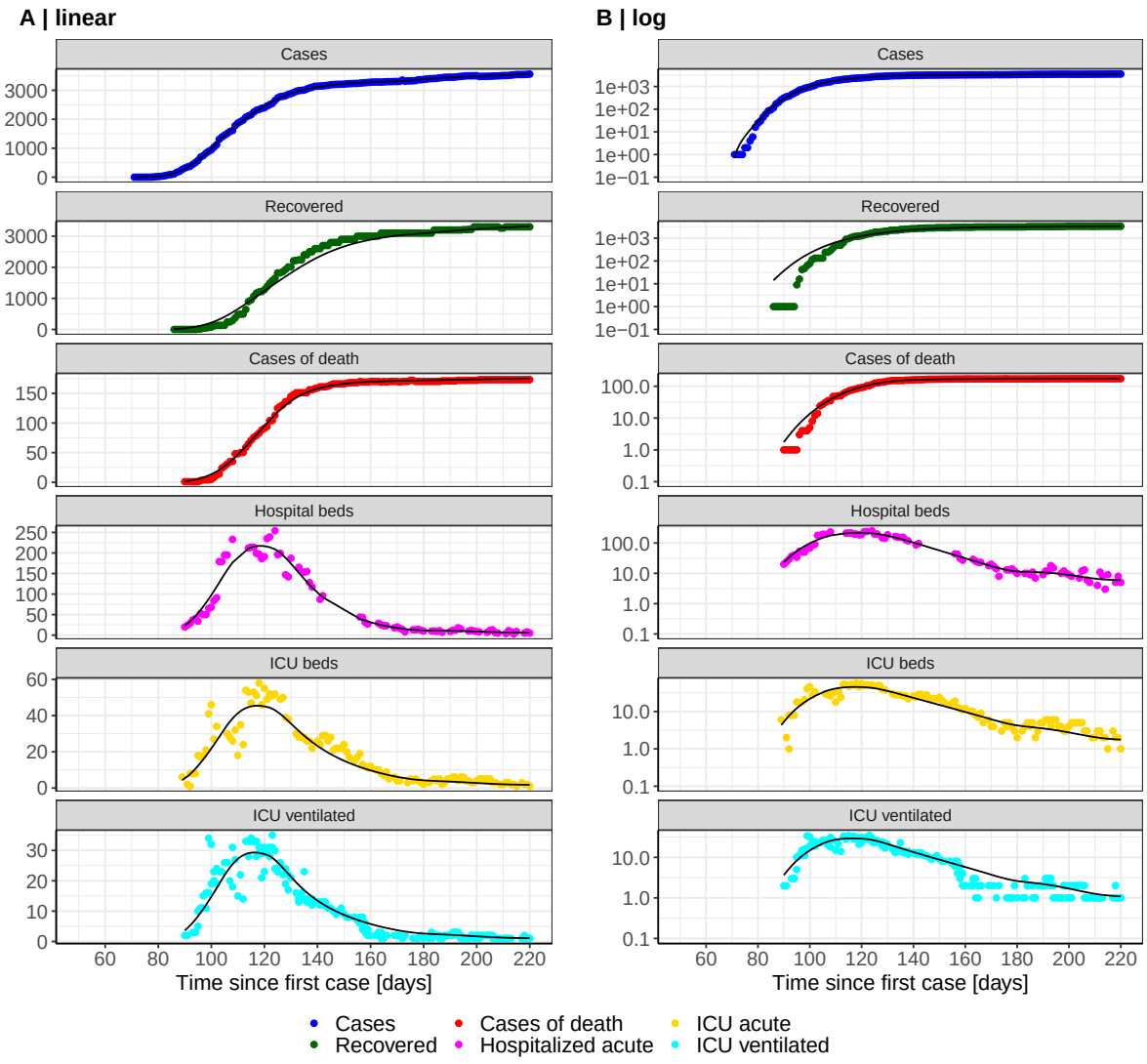


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

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

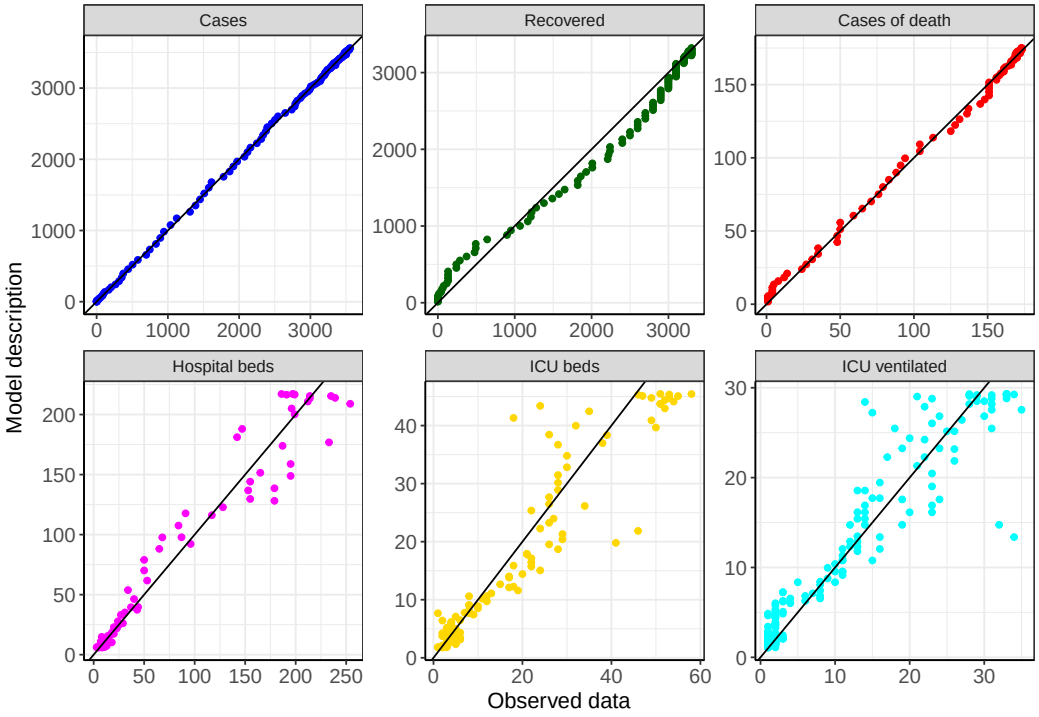


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

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

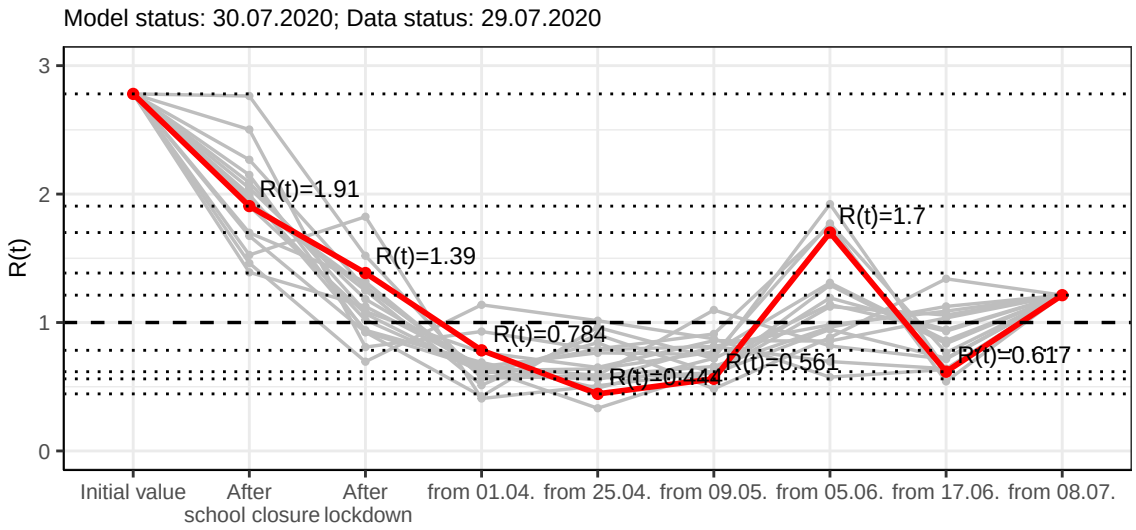


Figure 46: R(t) values before and after the NPIs for Brandenburg

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

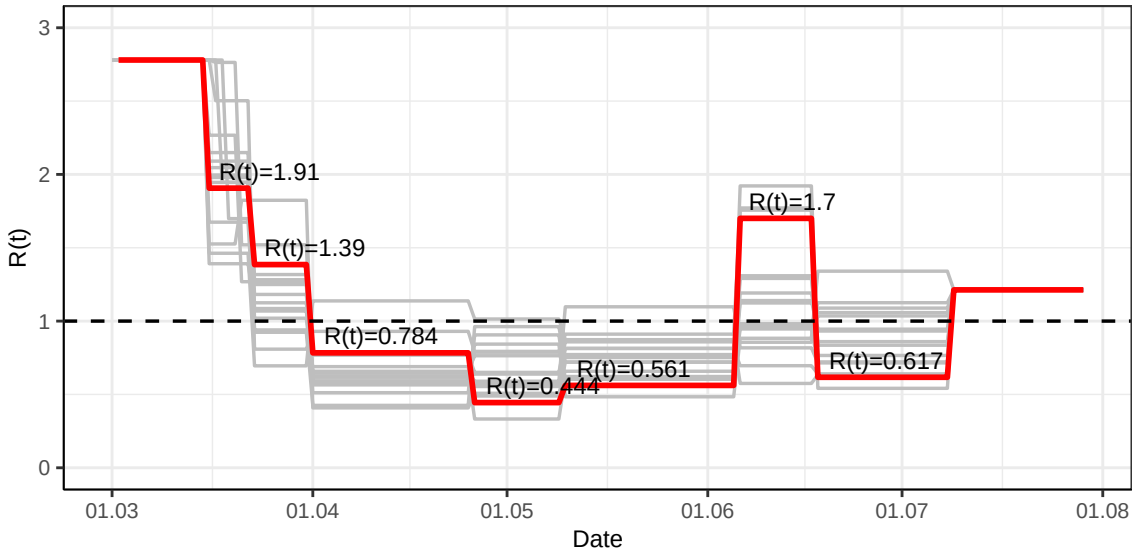


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

5.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

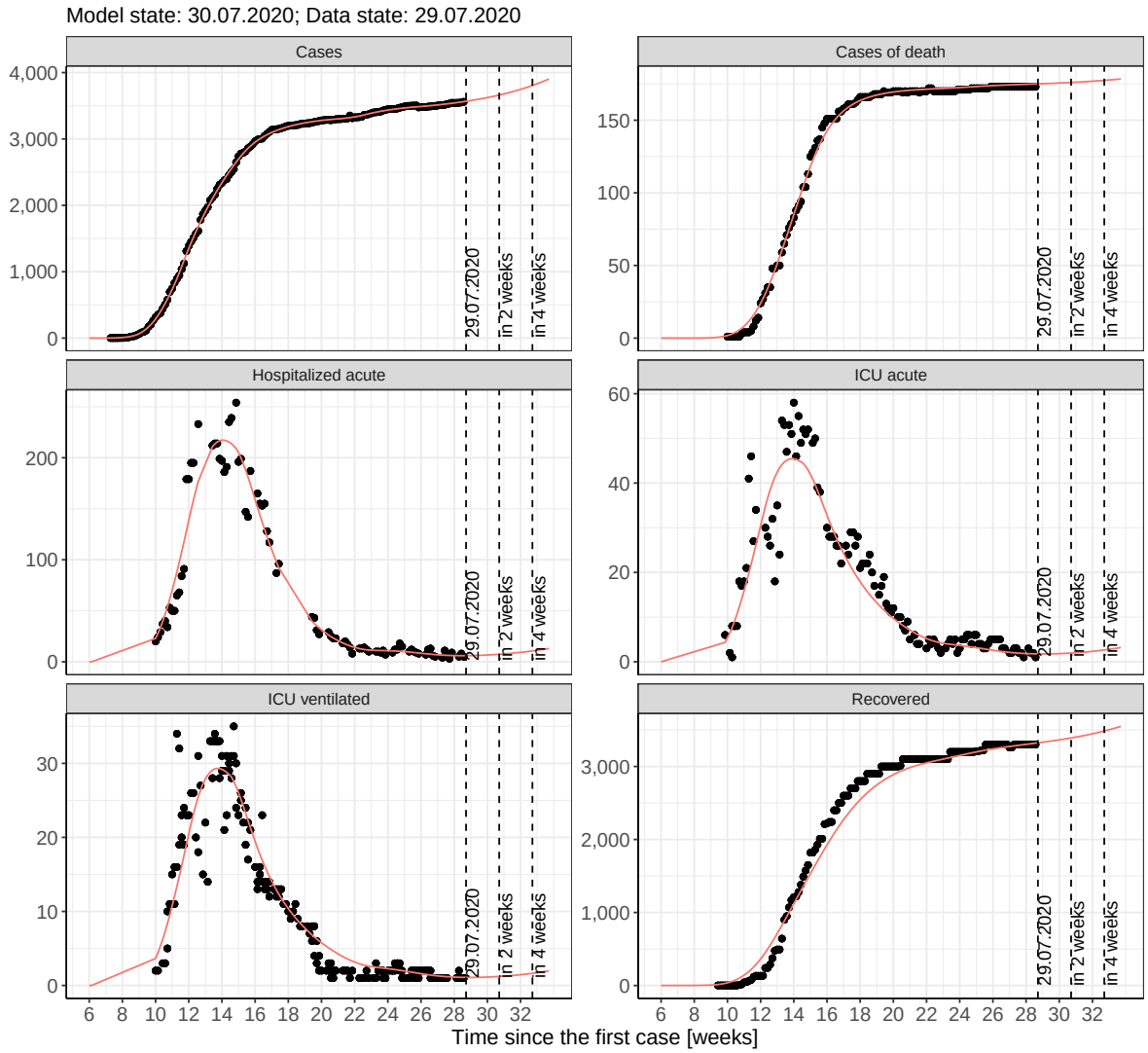


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

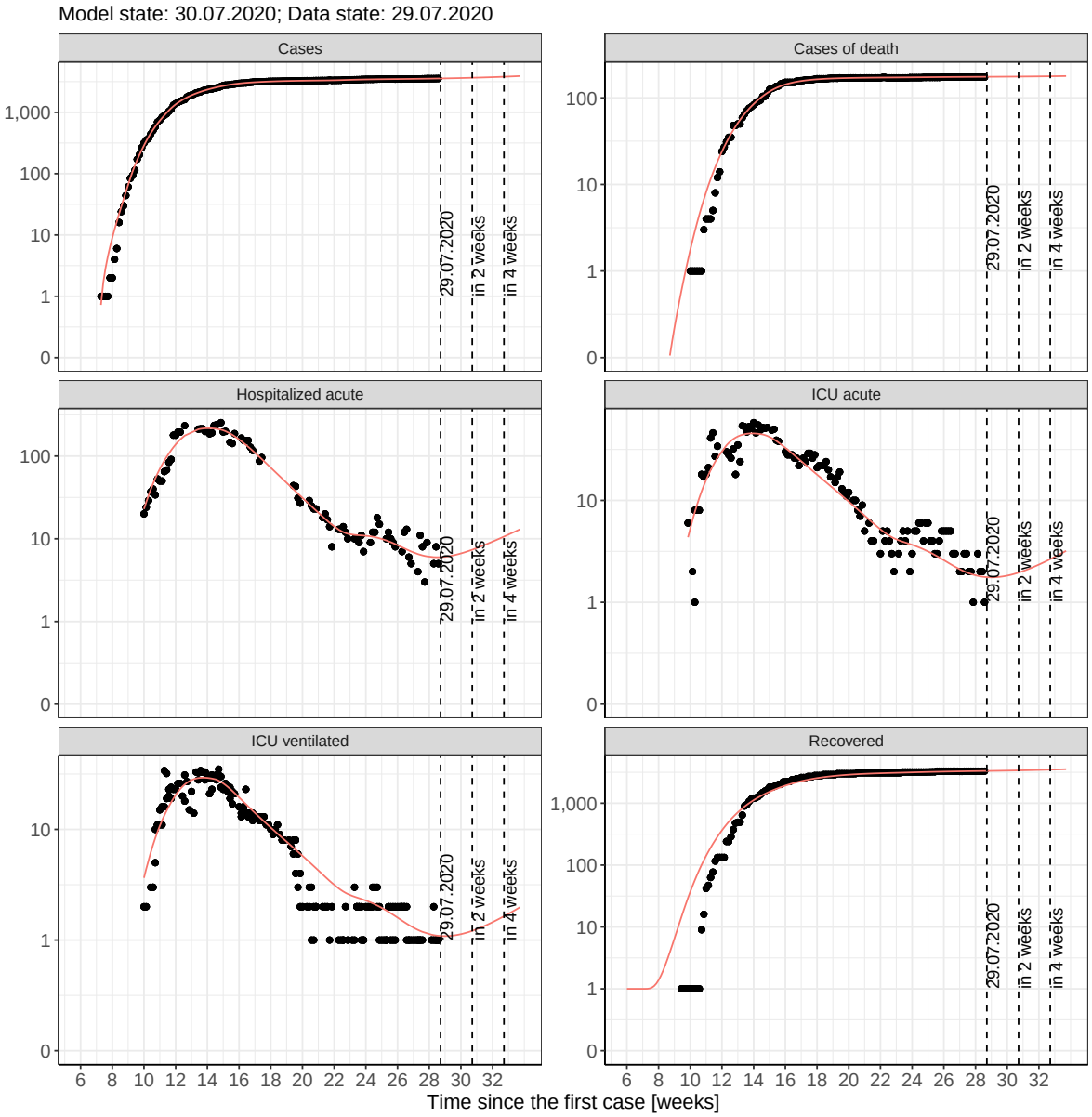


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 50 and 51 represent the model prediction for the next 4 weeks for Brandenburg on a linear (50) and a semi-logarithmic (51) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

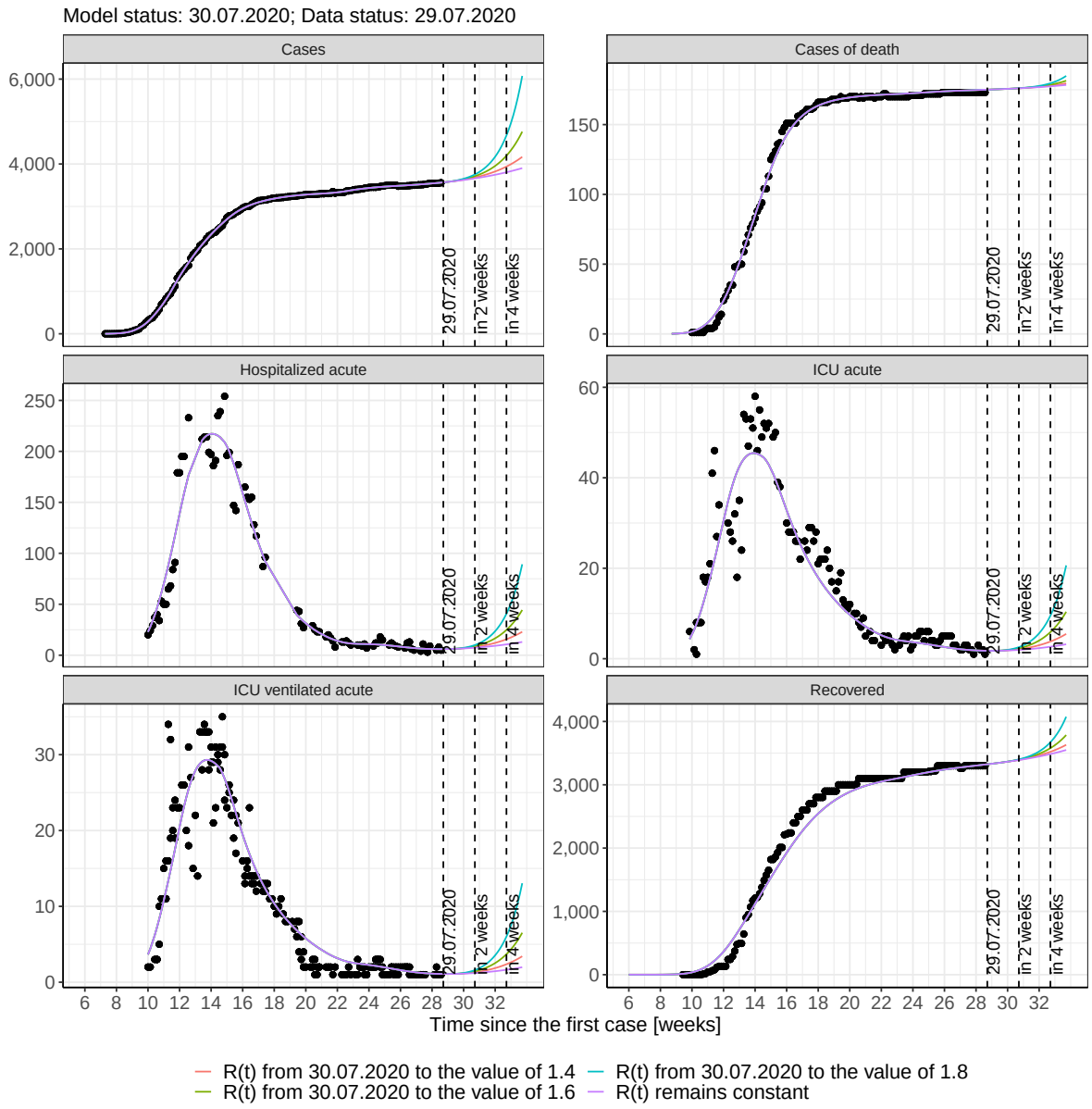


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

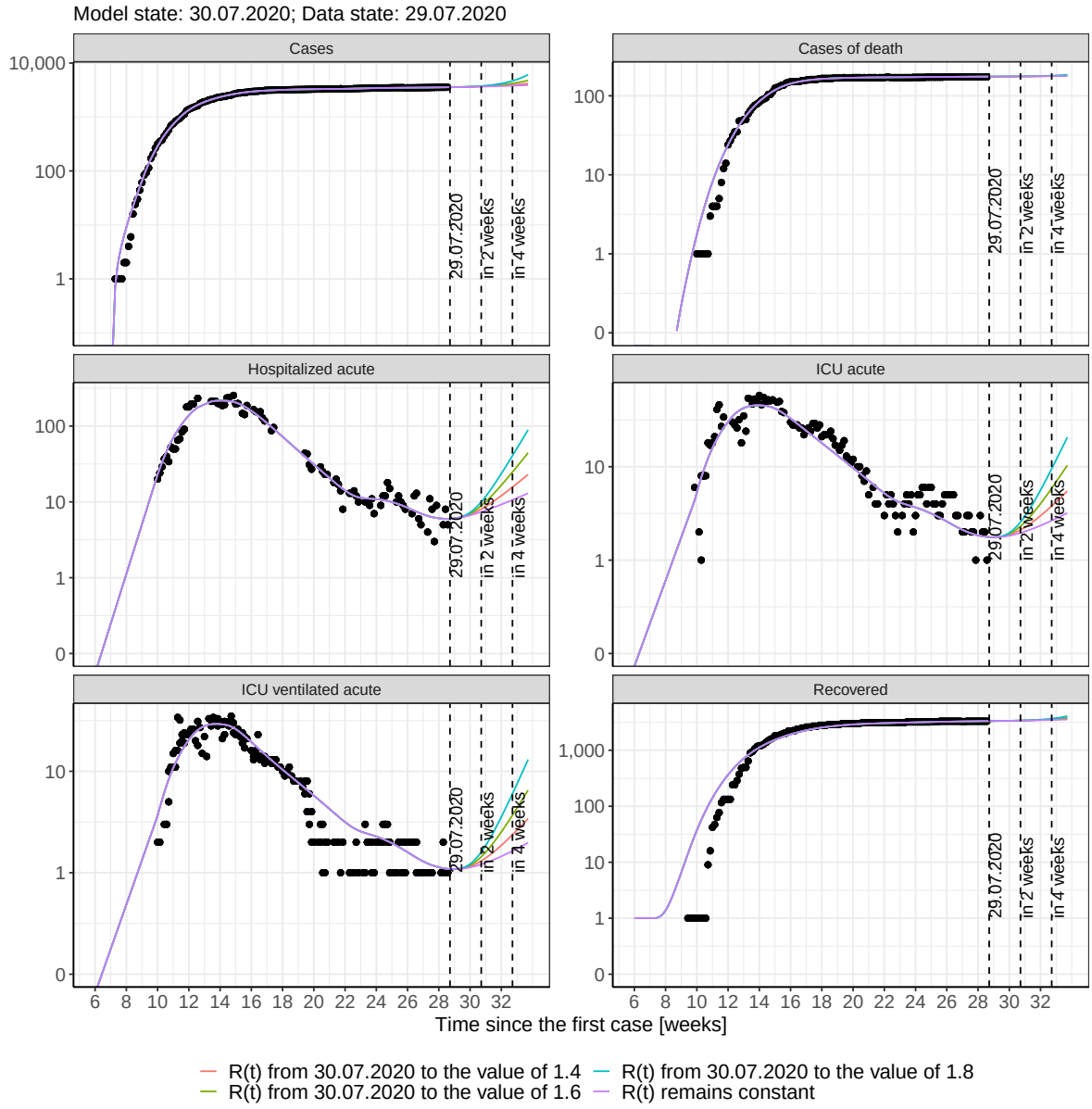


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 52 and 53 represent the model prediction for the next 16 weeks for Brandenburg on a linear (52) and a semi-logarithmic (53) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

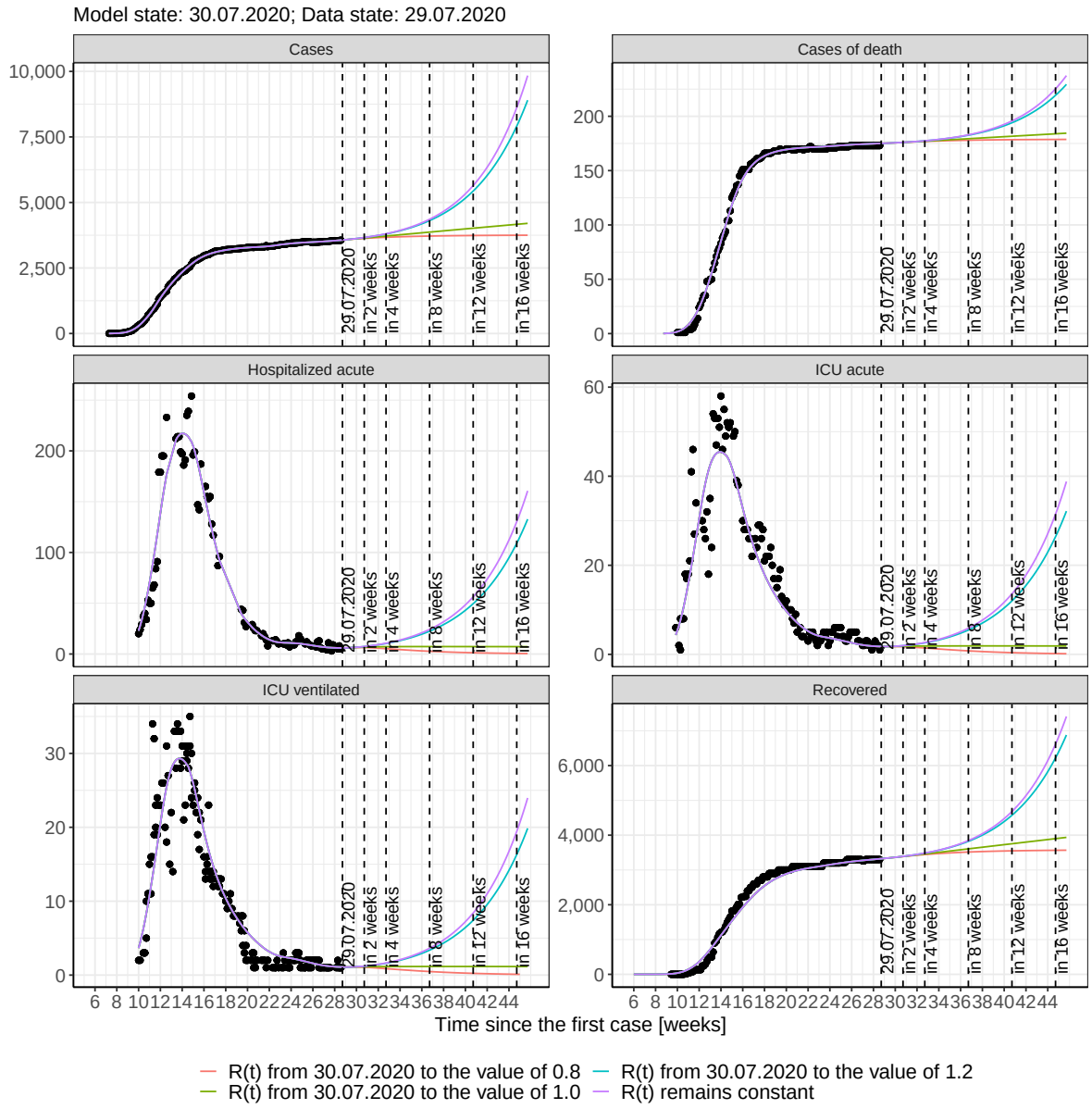


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

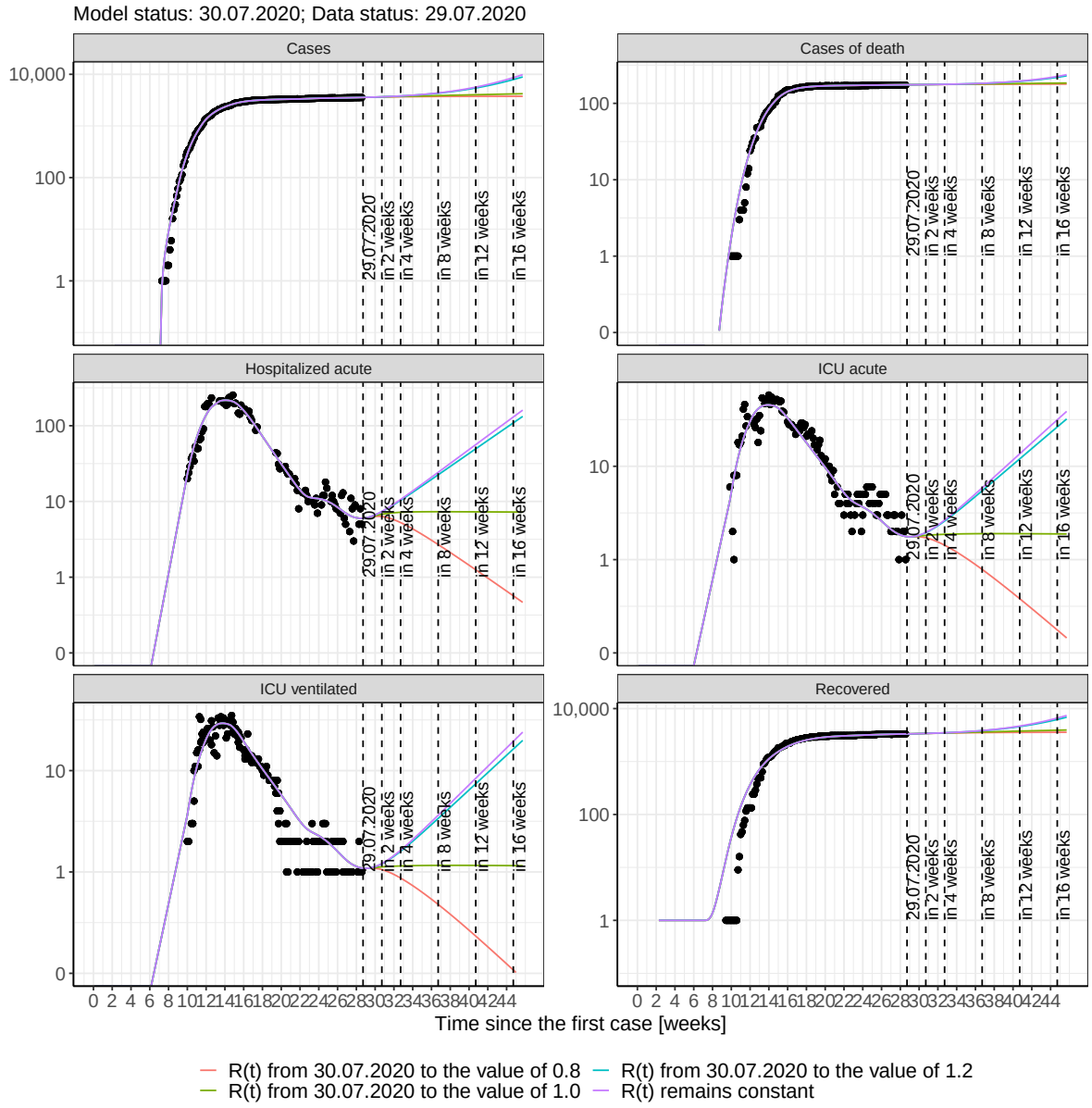


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 17) Model status from 30.07.2020; Data status: 29.07.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3573	175	3328	6	2	1
31.07.2020	3578	175	3332	6	2	1
01.08.2020	3584	175	3337	6	2	1
02.08.2020	3590	175	3341	6	2	1
03.08.2020	3596	175	3346	6	2	1
04.08.2020	3603	175	3350	6	2	1
05.08.2020	3609	175	3355	6	2	1
06.08.2020	3616	176	3360	7	2	1
07.08.2020	3623	176	3364	7	2	1
08.08.2020	3630	176	3369	7	2	1
09.08.2020	3638	176	3374	7	2	1
10.08.2020	3645	176	3380	7	2	1
11.08.2020	3653	176	3385	7	2	1
12.08.2020	3661	176	3390	7	2	1
13.08.2020	3670	176	3396	8	2	1
14.08.2020	3678	176	3402	8	2	1
15.08.2020	3687	176	3408	8	2	1
16.08.2020	3696	176	3414	8	2	1
17.08.2020	3706	176	3420	8	2	1
18.08.2020	3716	177	3427	9	2	1
19.08.2020	3726	177	3433	9	2	1
20.08.2020	3736	177	3440	9	2	1
21.08.2020	3747	177	3447	9	2	1
22.08.2020	3758	177	3454	10	2	1
23.08.2020	3769	177	3462	10	2	2
24.08.2020	3781	177	3470	10	3	2
25.08.2020	3793	177	3477	10	3	2
26.08.2020	3805	177	3486	11	3	2

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3573	175	3328	6	2	1
31.07.2020	3578	175	3332	6	2	1
01.08.2020	3583	175	3336	6	2	1
02.08.2020	3588	175	3341	6	2	1
03.08.2020	3592	175	3345	6	2	1
04.08.2020	3597	175	3350	6	2	1
05.08.2020	3602	175	3354	6	2	1
06.08.2020	3606	176	3359	6	2	1
07.08.2020	3610	176	3363	6	2	1
08.08.2020	3614	176	3368	6	2	1
09.08.2020	3618	176	3372	6	2	1
10.08.2020	3622	176	3377	6	2	1
11.08.2020	3626	176	3381	6	2	1
12.08.2020	3630	176	3386	6	2	1
13.08.2020	3633	176	3390	6	2	1
14.08.2020	3637	176	3395	6	2	1
15.08.2020	3640	176	3399	6	2	1
16.08.2020	3643	176	3403	6	2	1
17.08.2020	3646	176	3408	6	2	1
18.08.2020	3650	176	3412	6	2	1
19.08.2020	3652	176	3416	6	2	1
20.08.2020	3655	176	3420	6	2	1
21.08.2020	3658	177	3424	6	2	1
22.08.2020	3661	177	3428	6	2	1
23.08.2020	3664	177	3431	6	1	1
24.08.2020	3666	177	3435	5	1	1
25.08.2020	3669	177	3439	5	1	1
26.08.2020	3671	177	3442	5	1	1

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3573	175	3328	6	2	1
31.07.2020	3578	175	3332	6	2	1
01.08.2020	3583	175	3337	6	2	1
02.08.2020	3589	175	3341	6	2	1
03.08.2020	3594	175	3345	6	2	1
04.08.2020	3600	175	3350	6	2	1
05.08.2020	3605	175	3354	6	2	1
06.08.2020	3610	176	3359	6	2	1
07.08.2020	3616	176	3364	6	2	1
08.08.2020	3621	176	3368	7	2	1
09.08.2020	3627	176	3373	7	2	1
10.08.2020	3632	176	3378	7	2	1
11.08.2020	3637	176	3383	7	2	1
12.08.2020	3643	176	3388	7	2	1
13.08.2020	3648	176	3393	7	2	1
14.08.2020	3654	176	3398	7	2	1
15.08.2020	3659	176	3403	7	2	1
16.08.2020	3664	176	3408	7	2	1
17.08.2020	3670	176	3413	7	2	1
18.08.2020	3675	176	3418	7	2	1
19.08.2020	3680	177	3423	7	2	1
20.08.2020	3686	177	3428	7	2	1
21.08.2020	3691	177	3433	7	2	1
22.08.2020	3697	177	3438	7	2	1
23.08.2020	3702	177	3444	7	2	1
24.08.2020	3707	177	3449	7	2	1
25.08.2020	3713	177	3454	7	2	1
26.08.2020	3718	177	3459	7	2	1

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3573	175	3328	6	2	1
31.07.2020	3578	175	3332	6	2	1
01.08.2020	3584	175	3337	6	2	1
02.08.2020	3590	175	3341	6	2	1
03.08.2020	3596	175	3346	6	2	1
04.08.2020	3603	175	3350	6	2	1
05.08.2020	3609	175	3355	6	2	1
06.08.2020	3616	176	3360	7	2	1
07.08.2020	3623	176	3364	7	2	1
08.08.2020	3630	176	3369	7	2	1
09.08.2020	3637	176	3374	7	2	1
10.08.2020	3644	176	3380	7	2	1
11.08.2020	3652	176	3385	7	2	1
12.08.2020	3660	176	3390	7	2	1
13.08.2020	3668	176	3396	7	2	1
14.08.2020	3677	176	3402	8	2	1
15.08.2020	3685	176	3408	8	2	1
16.08.2020	3694	176	3414	8	2	1
17.08.2020	3703	176	3420	8	2	1
18.08.2020	3713	177	3426	8	2	1
19.08.2020	3722	177	3433	9	2	1
20.08.2020	3732	177	3439	9	2	1
21.08.2020	3743	177	3446	9	2	1
22.08.2020	3753	177	3453	9	2	1
23.08.2020	3764	177	3460	10	2	1
24.08.2020	3775	177	3468	10	2	2
25.08.2020	3786	177	3476	10	3	2
26.08.2020	3798	177	3484	10	3	2

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

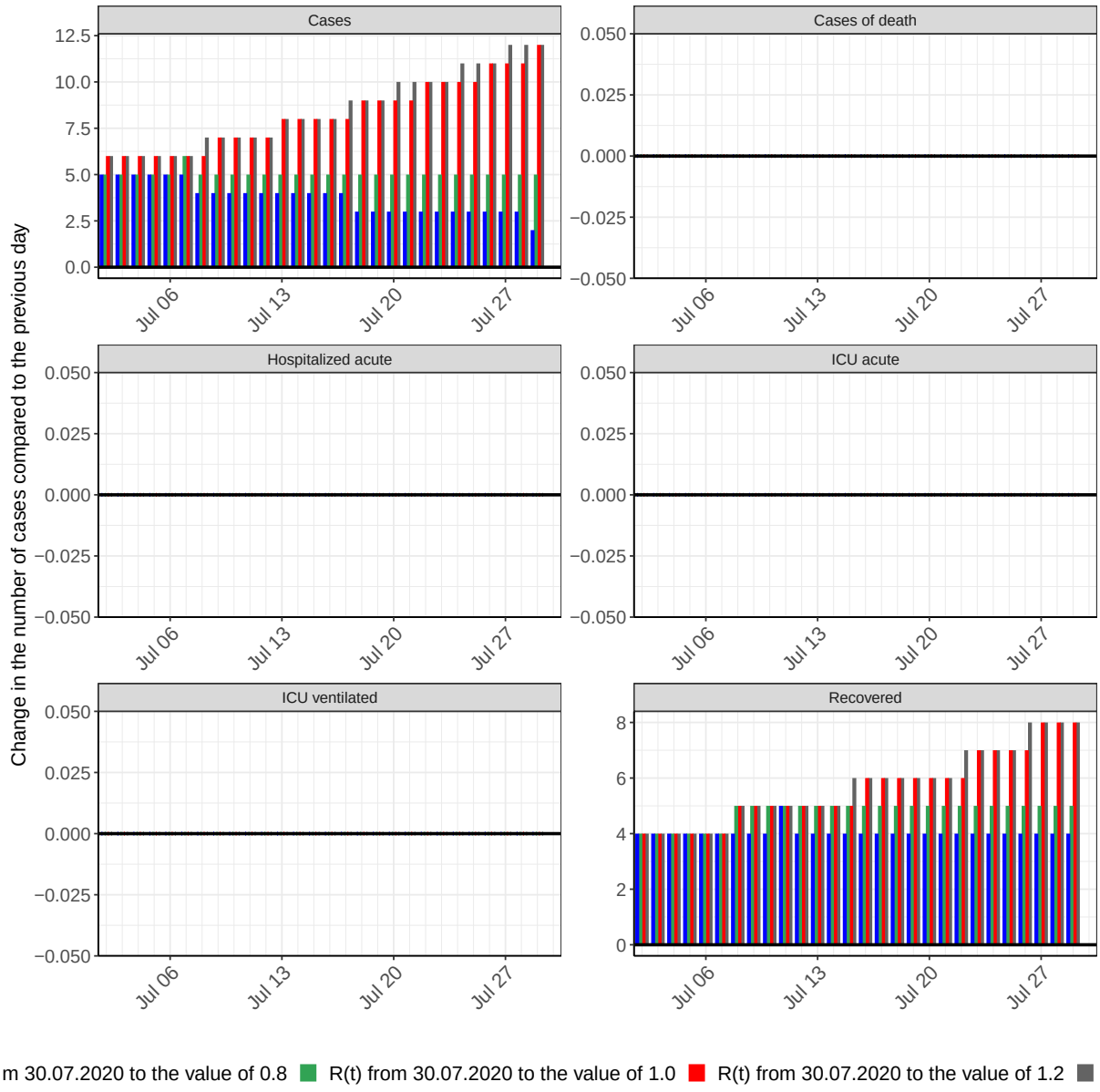


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

6 Bremen

6.1 Model description

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

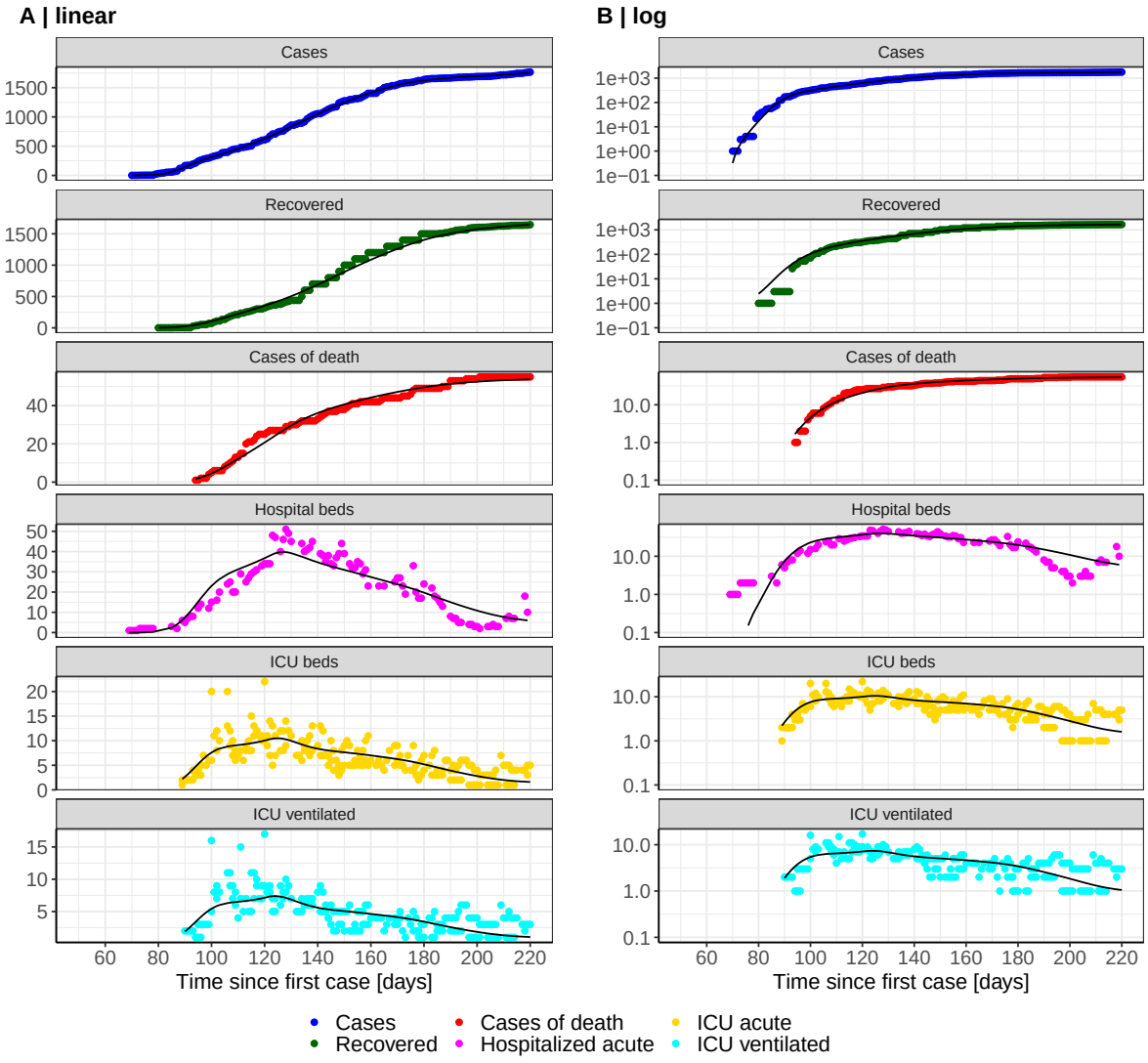


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

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

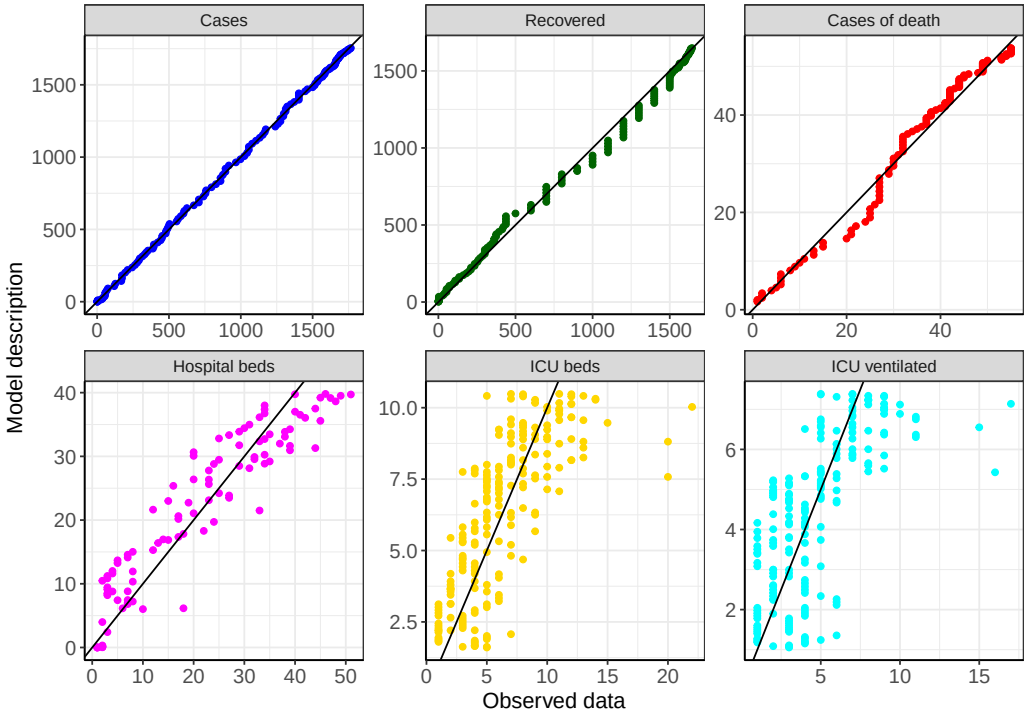


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

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

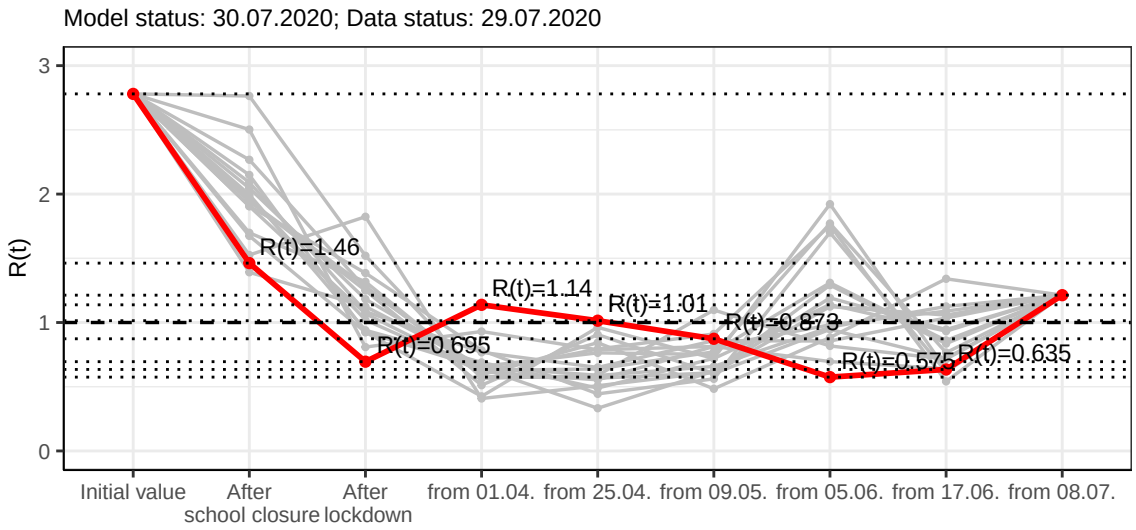


Figure 57: R(t) values before and after the NPIs for Bremen

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

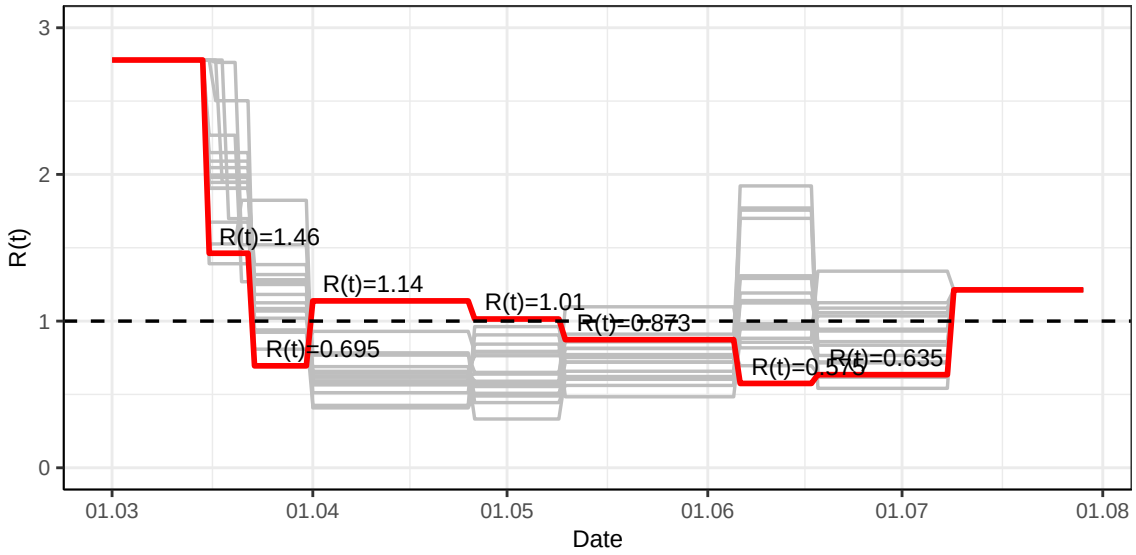


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

6.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

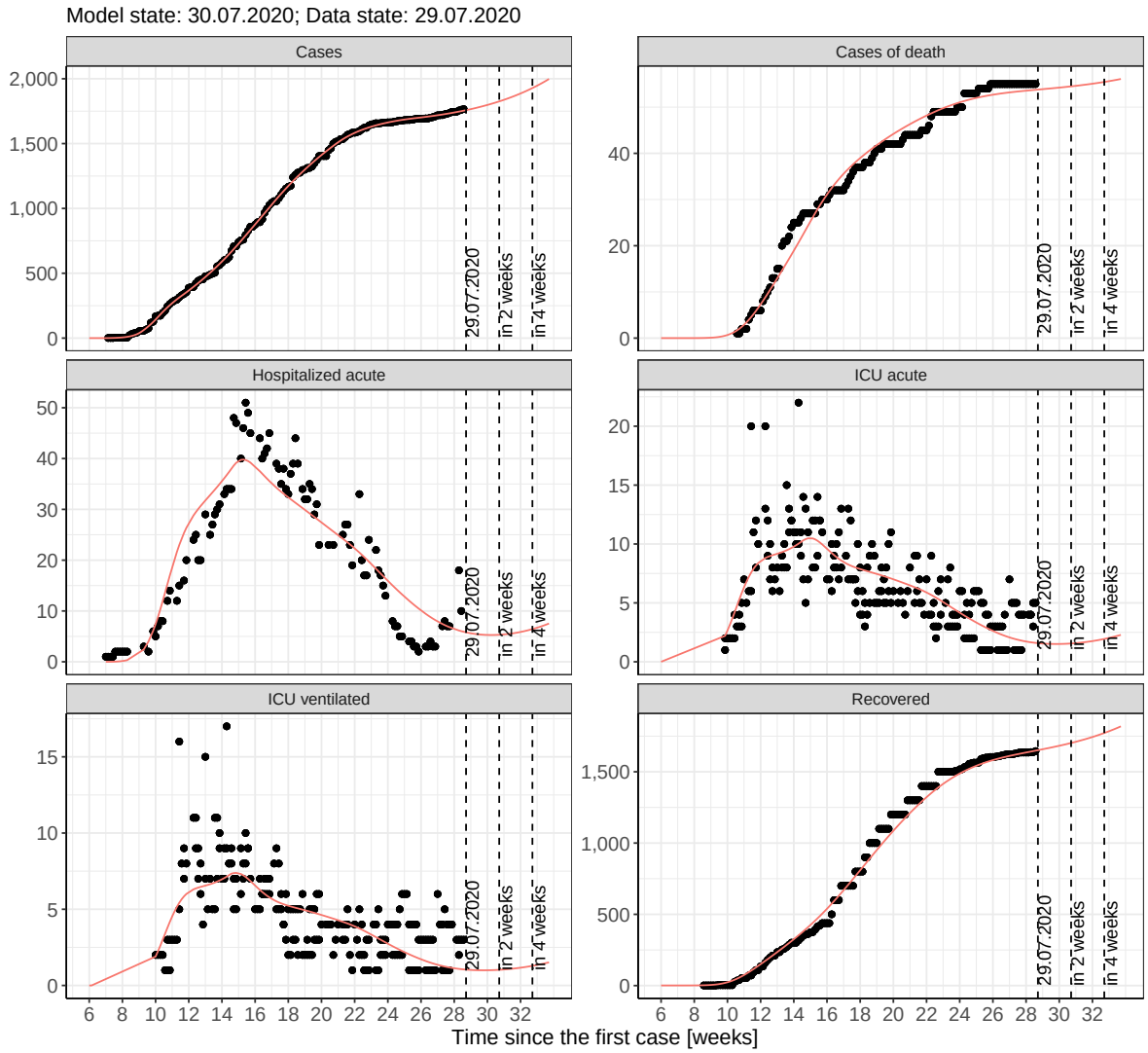


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

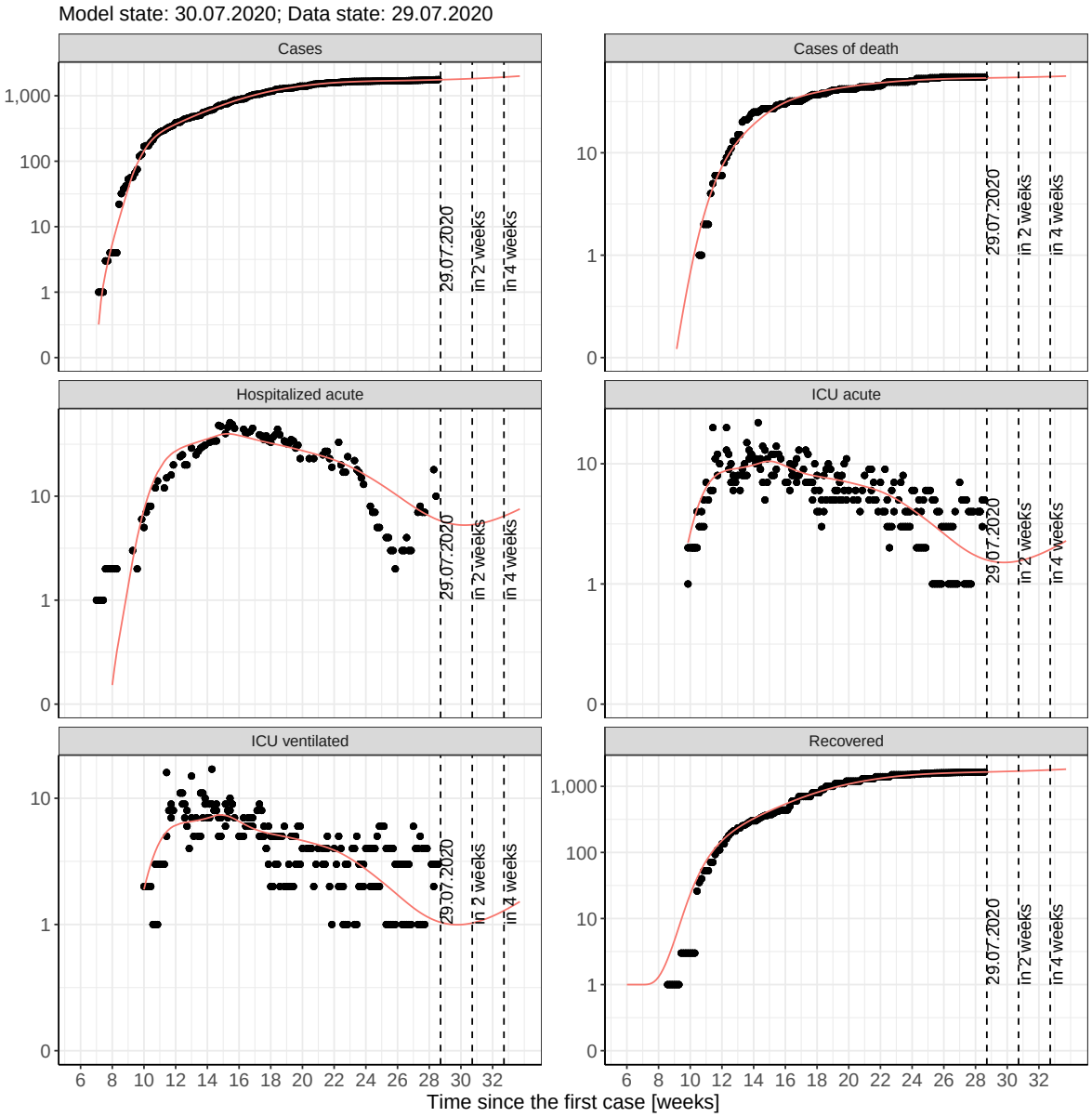


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 61 and 62 represent the model prediction for the next 4 weeks for Bremen on a linear (61) and a semi-logarithmic (62) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

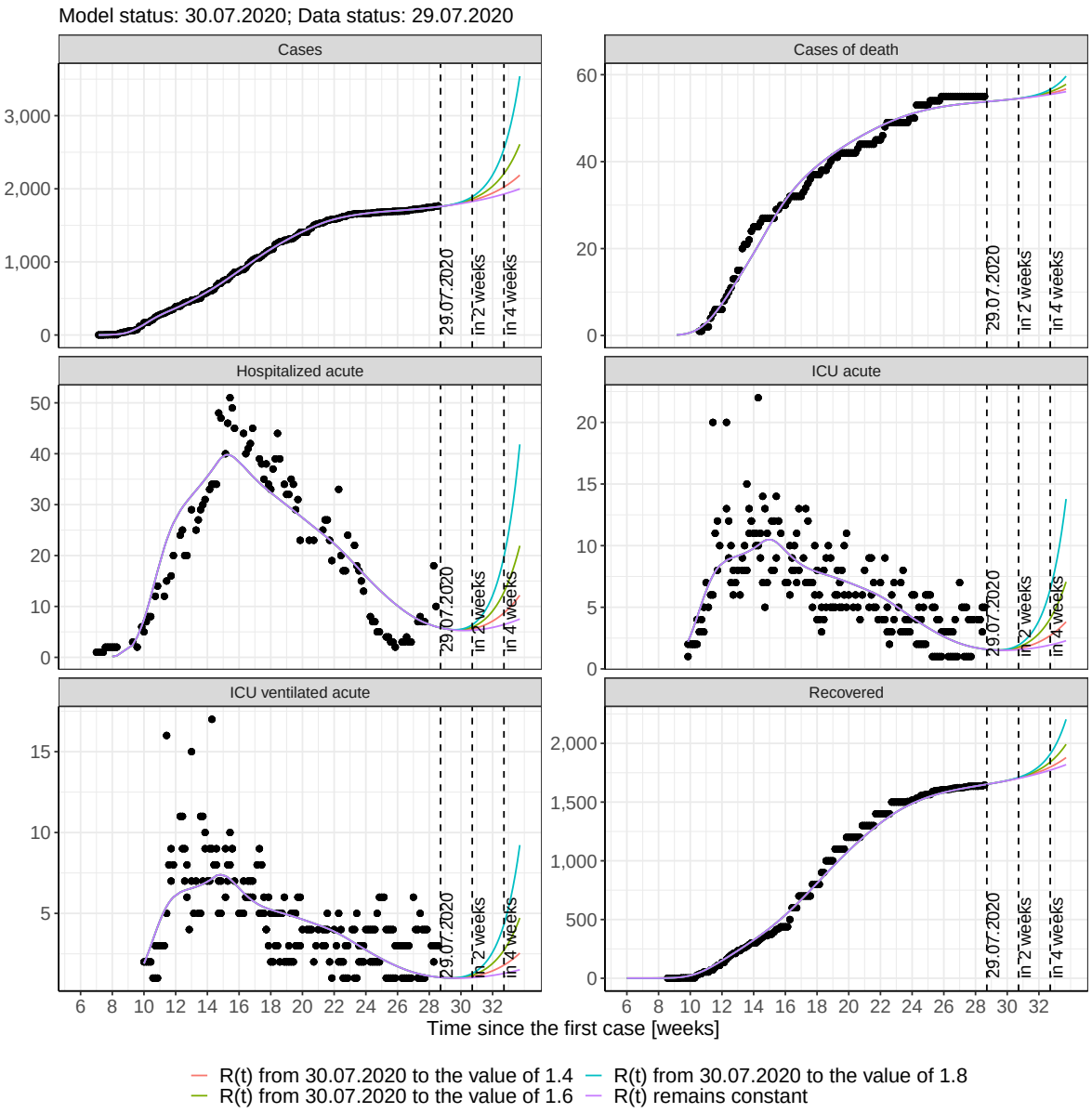


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

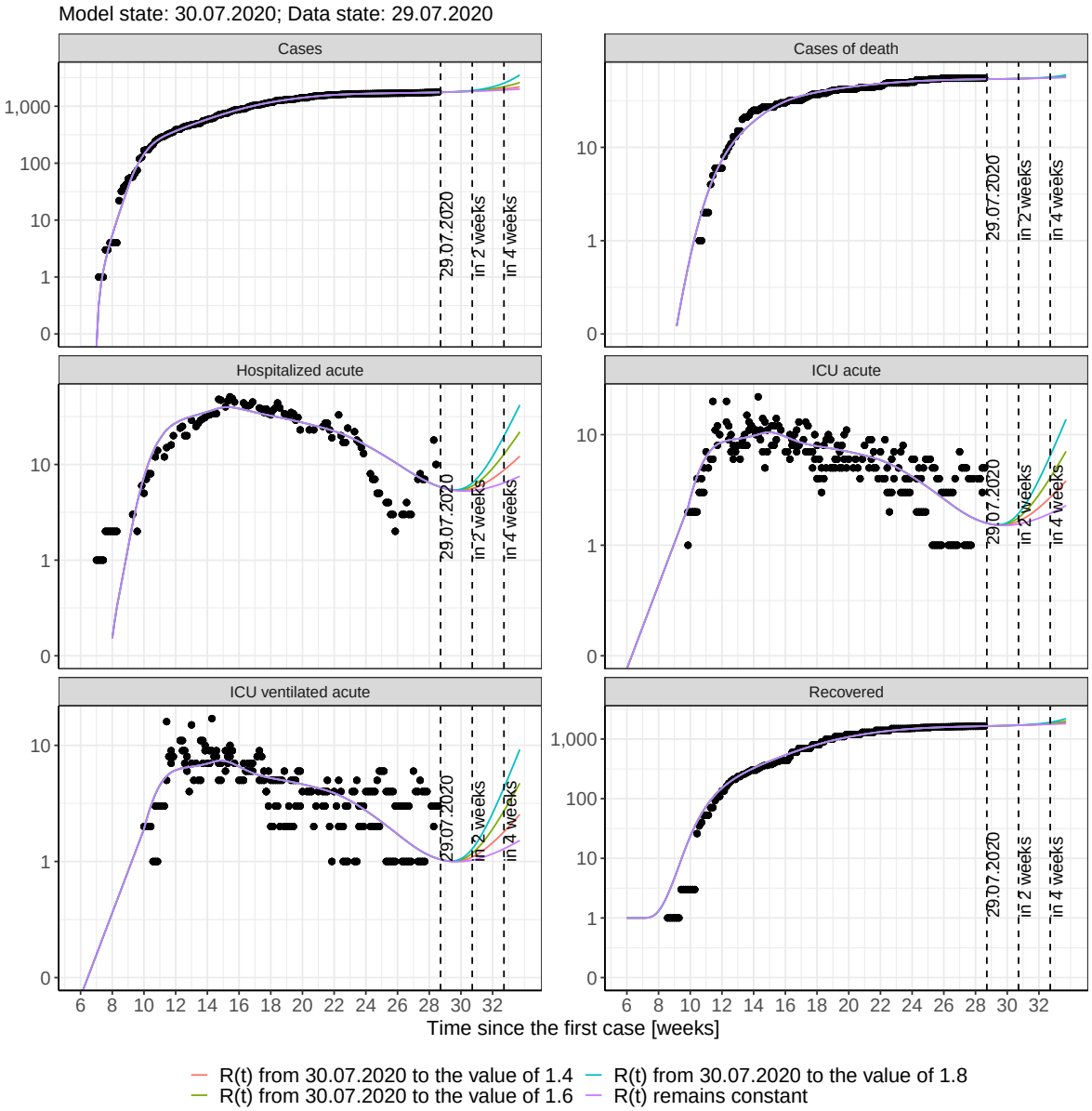


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 63 and 64 represent the model prediction for the next 16 weeks for Bremen on a linear (63) and a semi-logarithmic (64) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

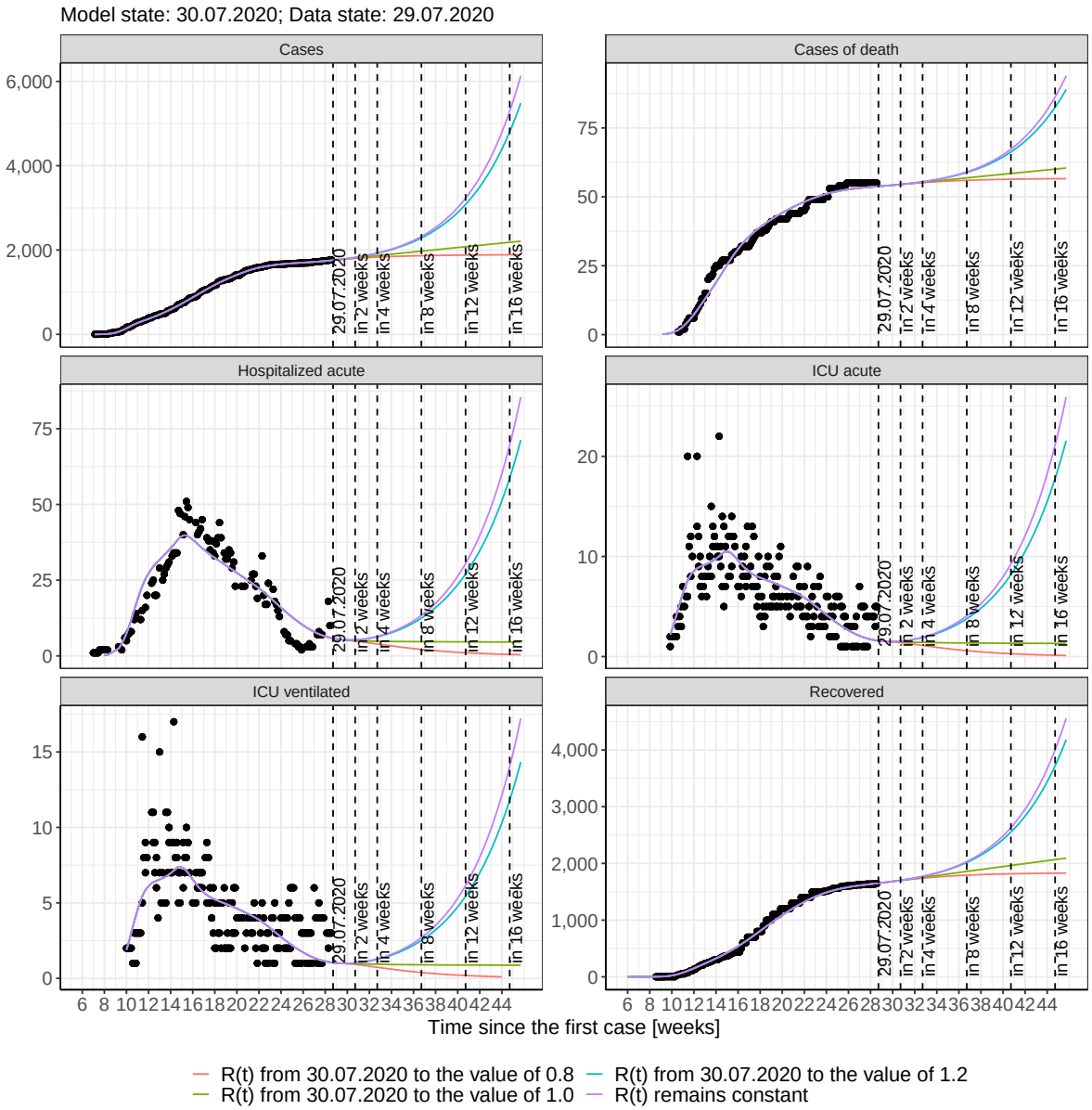


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

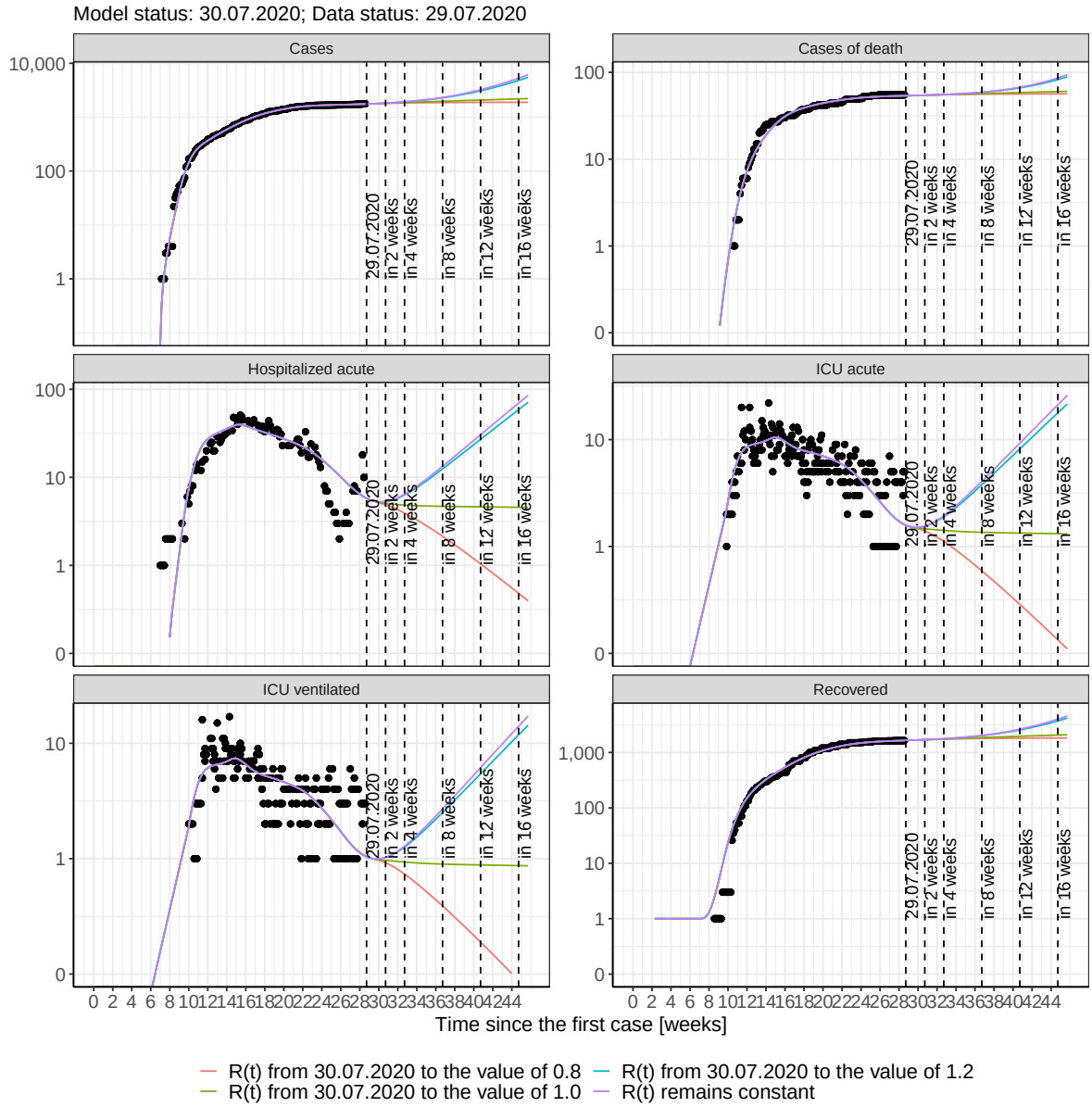


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 21) Model status from 30.07.2020; Data status: 29.07.2020.

Table 18: Bremen - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	1762	54	1655	6	2	1
31.07.2020	1766	54	1658	6	2	1
01.08.2020	1770	54	1661	6	2	1
02.08.2020	1774	54	1665	5	2	1
03.08.2020	1779	54	1668	5	2	1
04.08.2020	1783	54	1672	5	2	1
05.08.2020	1788	54	1675	5	2	1
06.08.2020	1793	54	1679	5	2	1
07.08.2020	1798	54	1682	5	2	1
08.08.2020	1803	54	1686	5	2	1
09.08.2020	1808	54	1690	5	2	1
10.08.2020	1814	54	1694	5	2	1
11.08.2020	1820	54	1698	5	2	1
12.08.2020	1825	54	1702	5	2	1
13.08.2020	1831	55	1706	5	2	1
14.08.2020	1838	55	1710	5	2	1
15.08.2020	1844	55	1715	5	2	1
16.08.2020	1850	55	1719	5	2	1
17.08.2020	1857	55	1724	6	2	1
18.08.2020	1864	55	1729	6	2	1
19.08.2020	1872	55	1734	6	2	1
20.08.2020	1879	55	1739	6	2	1
21.08.2020	1886	55	1744	6	2	1
22.08.2020	1894	55	1749	6	2	1
23.08.2020	1902	55	1755	6	2	1
24.08.2020	1911	55	1760	6	2	1
25.08.2020	1919	55	1766	6	2	1
26.08.2020	1928	55	1772	6	2	1

Table 19: Bremen - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	1762	54	1655	6	2	1
31.07.2020	1765	54	1658	6	2	1
01.08.2020	1769	54	1661	6	2	1
02.08.2020	1772	54	1665	5	2	1
03.08.2020	1776	54	1668	5	2	1
04.08.2020	1779	54	1672	5	2	1
05.08.2020	1782	54	1675	5	1	1
06.08.2020	1786	54	1678	5	1	1
07.08.2020	1789	54	1682	5	1	1
08.08.2020	1792	54	1685	5	1	1
09.08.2020	1794	54	1688	5	1	1
10.08.2020	1797	54	1692	5	1	1
11.08.2020	1800	54	1695	5	1	1
12.08.2020	1803	54	1698	5	1	1
13.08.2020	1805	55	1702	5	1	1
14.08.2020	1808	55	1705	5	1	1
15.08.2020	1810	55	1708	5	1	1
16.08.2020	1812	55	1711	5	1	1
17.08.2020	1815	55	1715	5	1	1
18.08.2020	1817	55	1718	4	1	1
19.08.2020	1819	55	1721	4	1	1
20.08.2020	1821	55	1724	4	1	1
21.08.2020	1823	55	1726	4	1	1
22.08.2020	1825	55	1729	4	1	1
23.08.2020	1827	55	1732	4	1	1
24.08.2020	1829	55	1735	4	1	1
25.08.2020	1831	55	1738	4	1	1
26.08.2020	1832	55	1740	4	1	1

Table 20: Bremen - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	1762	54	1655	6	2	1
31.07.2020	1766	54	1658	6	2	1
01.08.2020	1770	54	1661	6	2	1
02.08.2020	1773	54	1665	5	2	1
03.08.2020	1777	54	1668	5	2	1
04.08.2020	1781	54	1672	5	2	1
05.08.2020	1785	54	1675	5	1	1
06.08.2020	1789	54	1678	5	1	1
07.08.2020	1793	54	1682	5	1	1
08.08.2020	1797	54	1686	5	1	1
09.08.2020	1800	54	1689	5	1	1
10.08.2020	1804	54	1693	5	1	1
11.08.2020	1808	54	1696	5	1	1
12.08.2020	1812	54	1700	5	1	1
13.08.2020	1816	55	1704	5	1	1
14.08.2020	1820	55	1707	5	1	1
15.08.2020	1824	55	1711	5	1	1
16.08.2020	1828	55	1715	5	1	1
17.08.2020	1831	55	1718	5	1	1
18.08.2020	1835	55	1722	5	1	1
19.08.2020	1839	55	1726	5	1	1
20.08.2020	1843	55	1730	5	1	1
21.08.2020	1847	55	1734	5	1	1
22.08.2020	1851	55	1737	5	1	1
23.08.2020	1854	55	1741	5	1	1
24.08.2020	1858	55	1745	5	1	1
25.08.2020	1862	55	1749	5	1	1
26.08.2020	1866	55	1752	5	1	1

Table 21: Bremen - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	1762	54	1655	6	2	1
31.07.2020	1766	54	1658	6	2	1
01.08.2020	1770	54	1661	6	2	1
02.08.2020	1774	54	1665	5	2	1
03.08.2020	1779	54	1668	5	2	1
04.08.2020	1783	54	1672	5	2	1
05.08.2020	1788	54	1675	5	2	1
06.08.2020	1793	54	1679	5	2	1
07.08.2020	1798	54	1682	5	2	1
08.08.2020	1803	54	1686	5	2	1
09.08.2020	1808	54	1690	5	2	1
10.08.2020	1813	54	1694	5	2	1
11.08.2020	1819	54	1698	5	2	1
12.08.2020	1824	54	1702	5	2	1
13.08.2020	1830	55	1706	5	2	1
14.08.2020	1836	55	1710	5	2	1
15.08.2020	1842	55	1715	5	2	1
16.08.2020	1849	55	1719	5	2	1
17.08.2020	1855	55	1724	6	2	1
18.08.2020	1862	55	1728	6	2	1
19.08.2020	1869	55	1733	6	2	1
20.08.2020	1876	55	1738	6	2	1
21.08.2020	1884	55	1743	6	2	1
22.08.2020	1891	55	1748	6	2	1
23.08.2020	1899	55	1754	6	2	1
24.08.2020	1907	55	1759	6	2	1
25.08.2020	1915	55	1765	6	2	1
26.08.2020	1923	55	1771	6	2	1

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

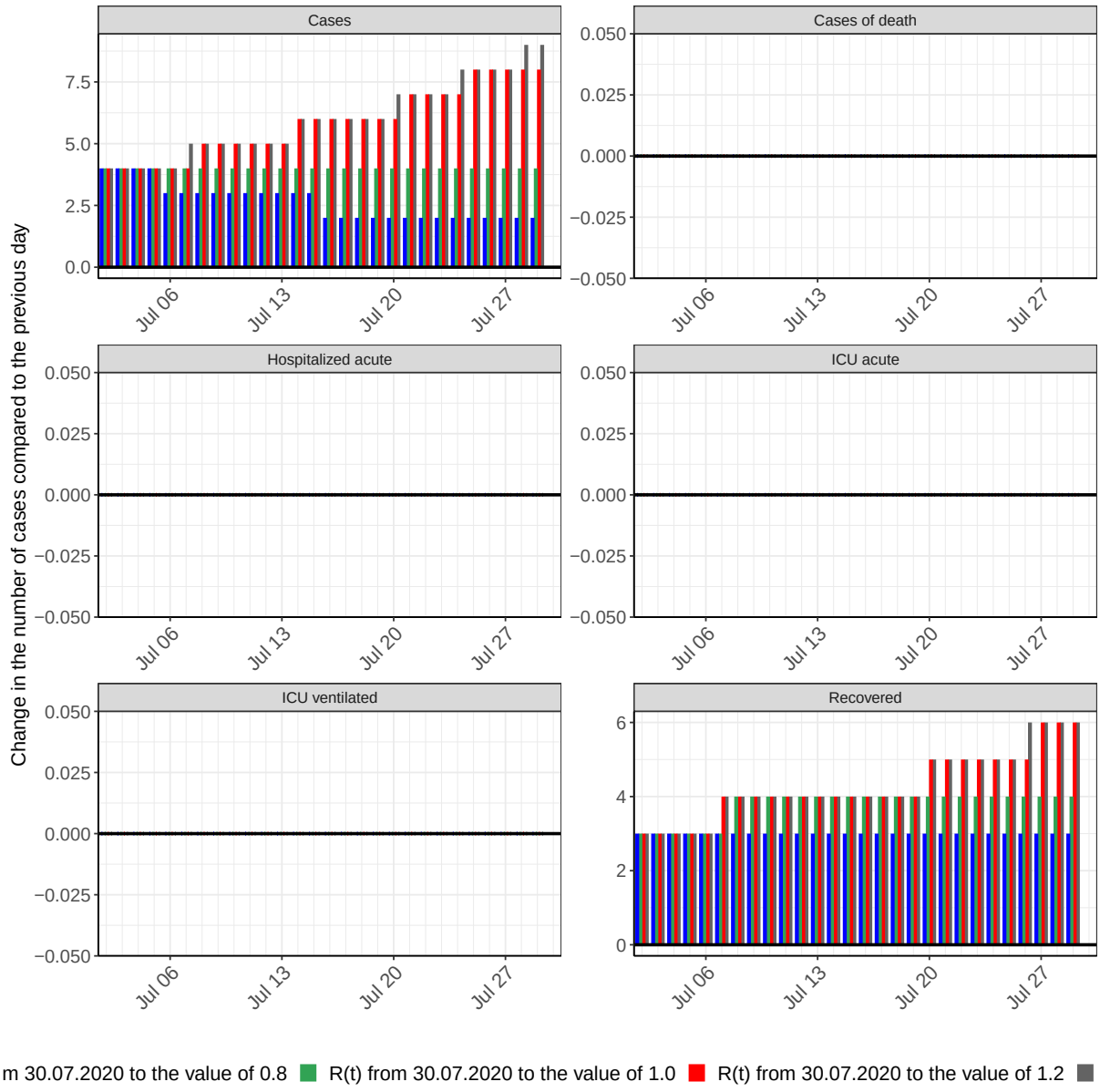


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

7 Hamburg

7.1 Model description

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

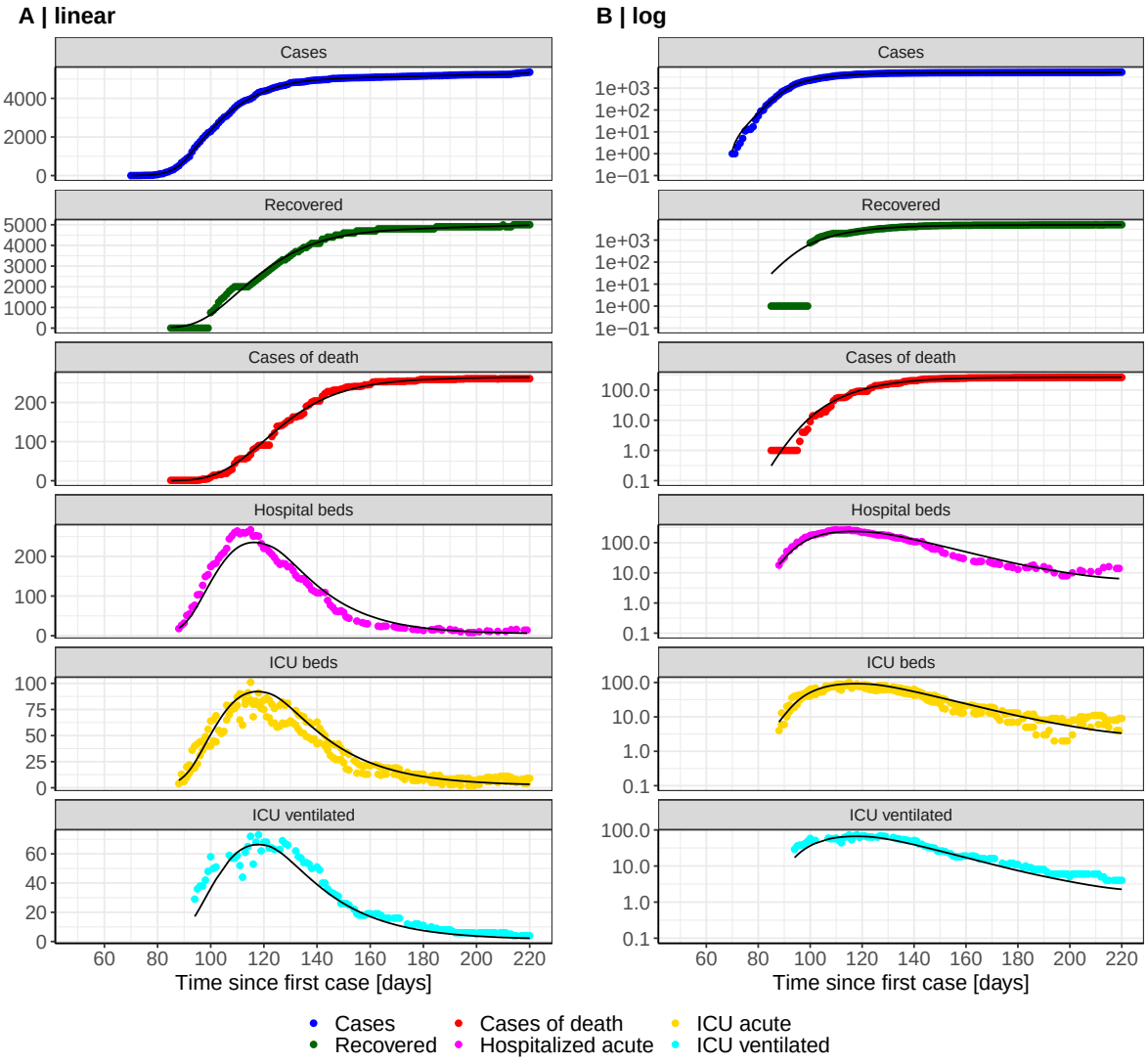


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

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

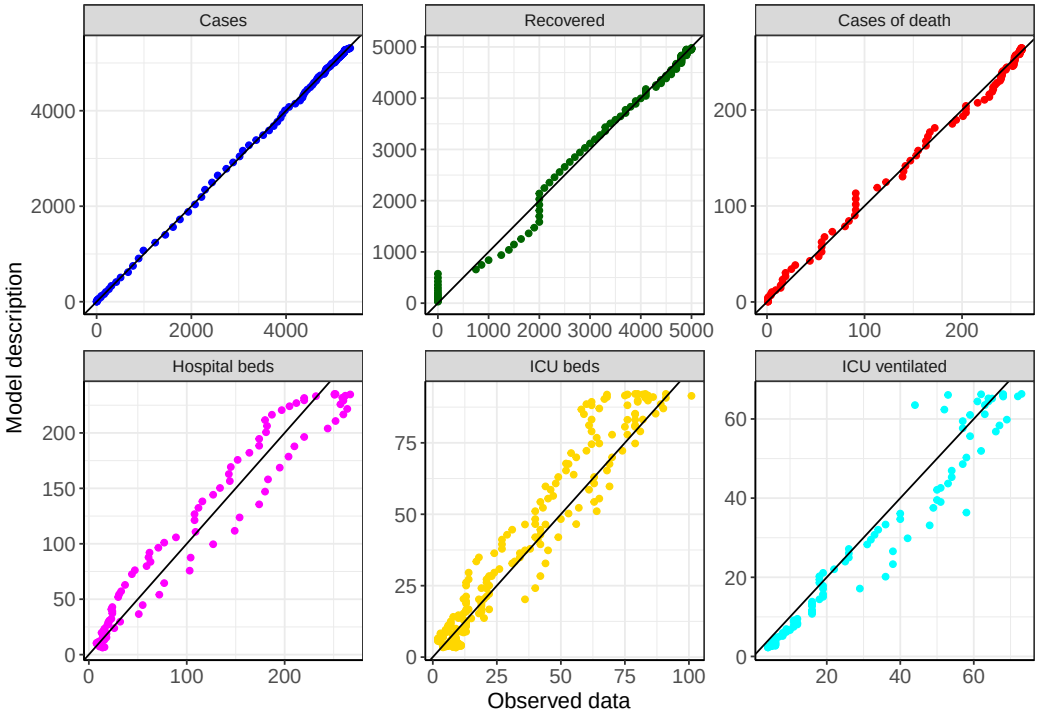


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

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

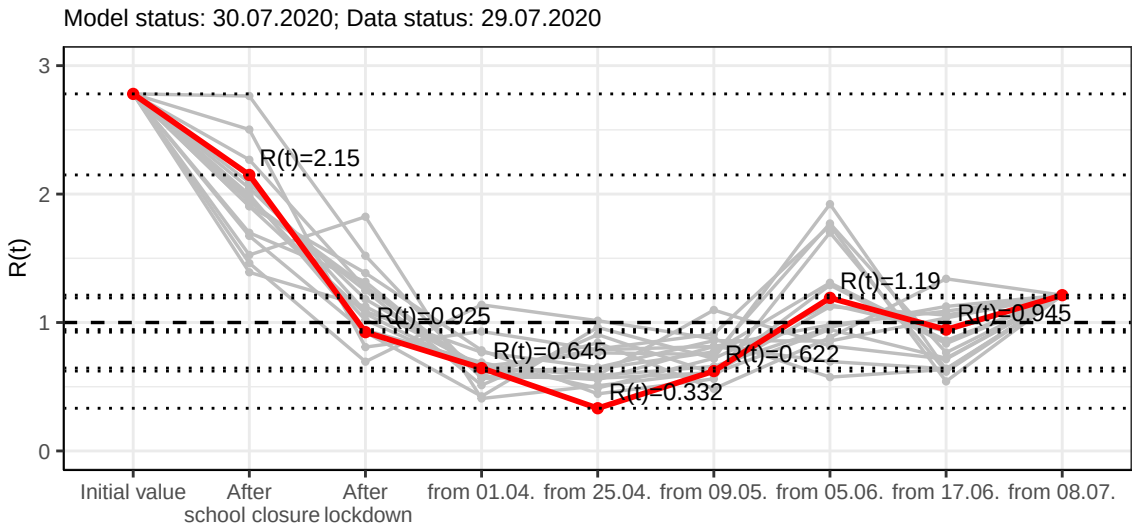


Figure 68: R(t) values before and after the NPIs for Hamburg

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

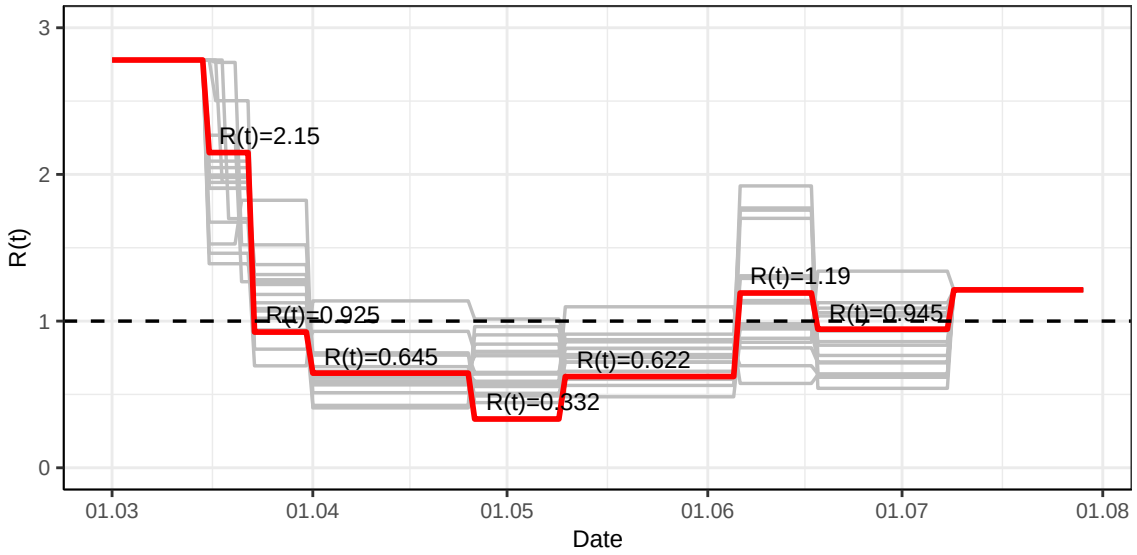


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

7.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

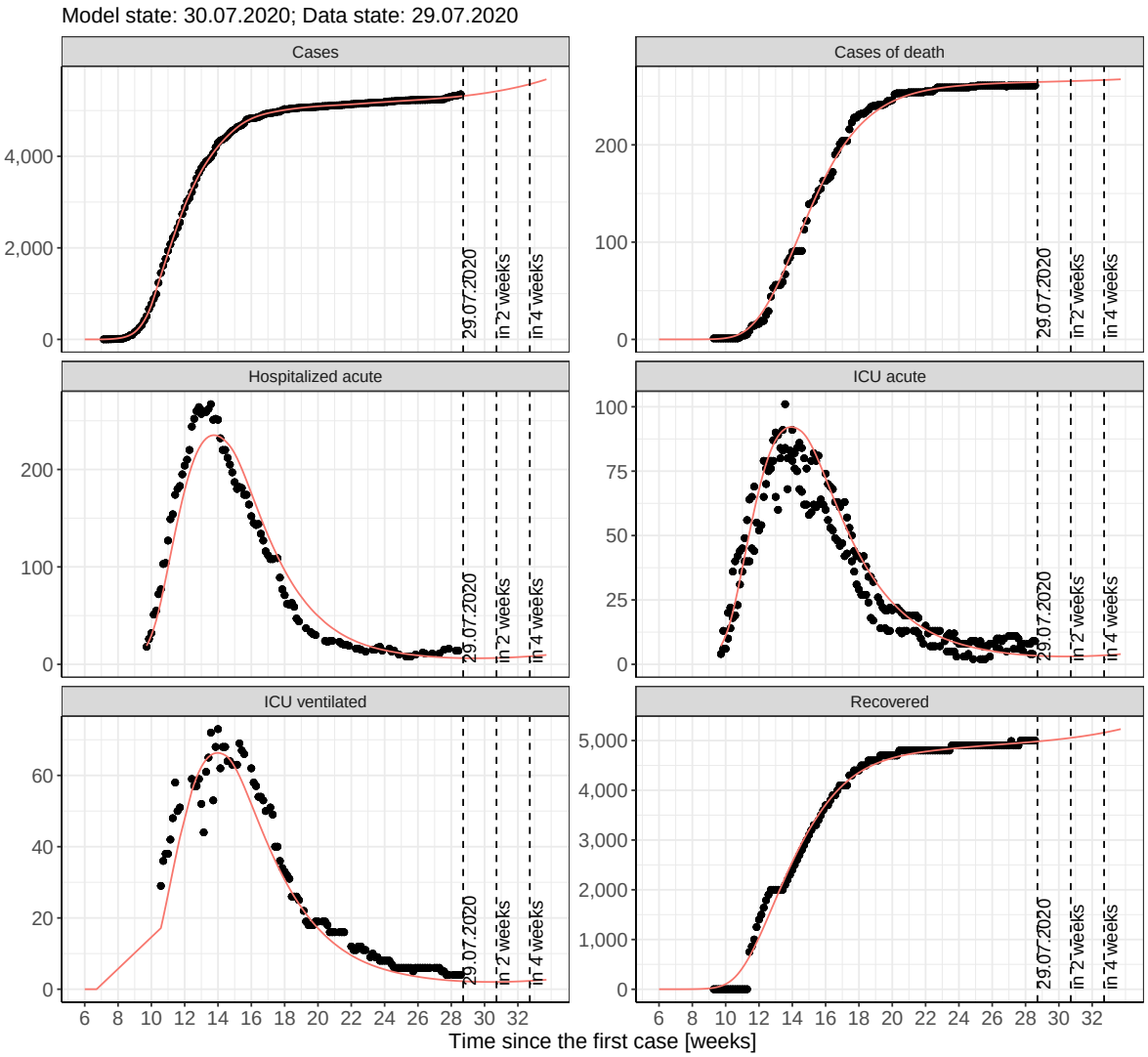


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

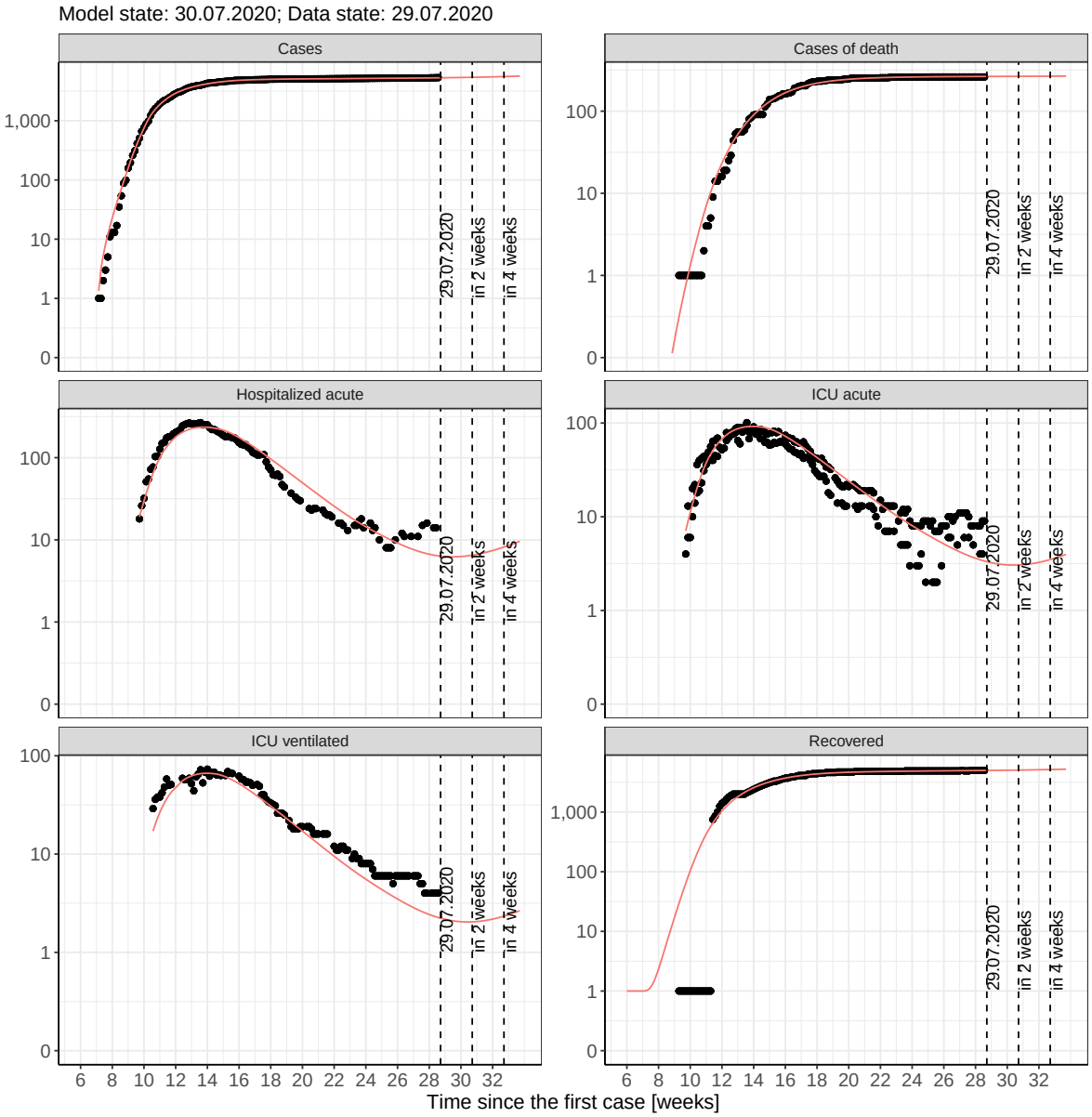


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 72 and 73 represent the model prediction for the next 4 weeks for Hamburg on a linear (72) and a semi-logarithmic (73) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

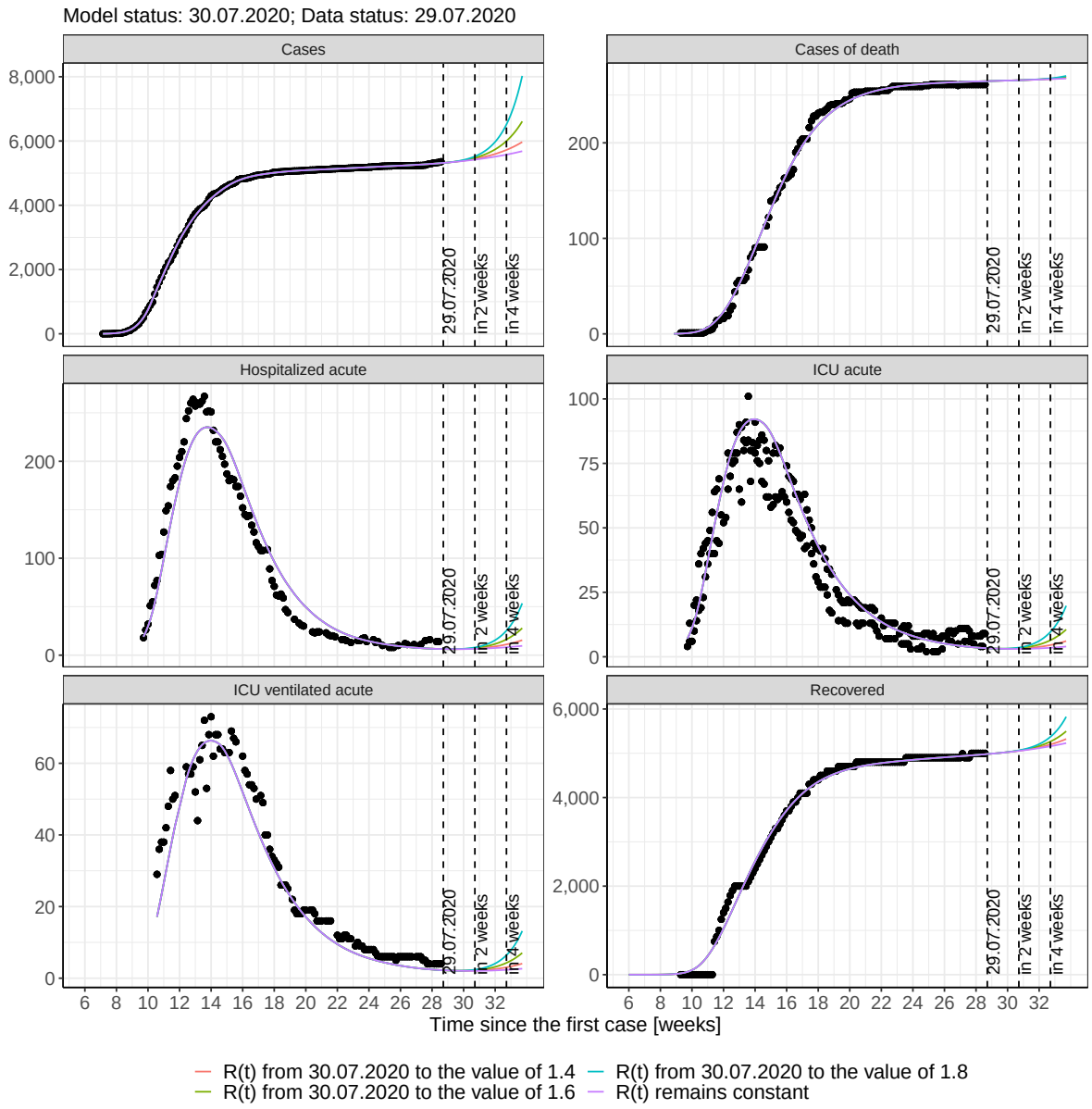


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

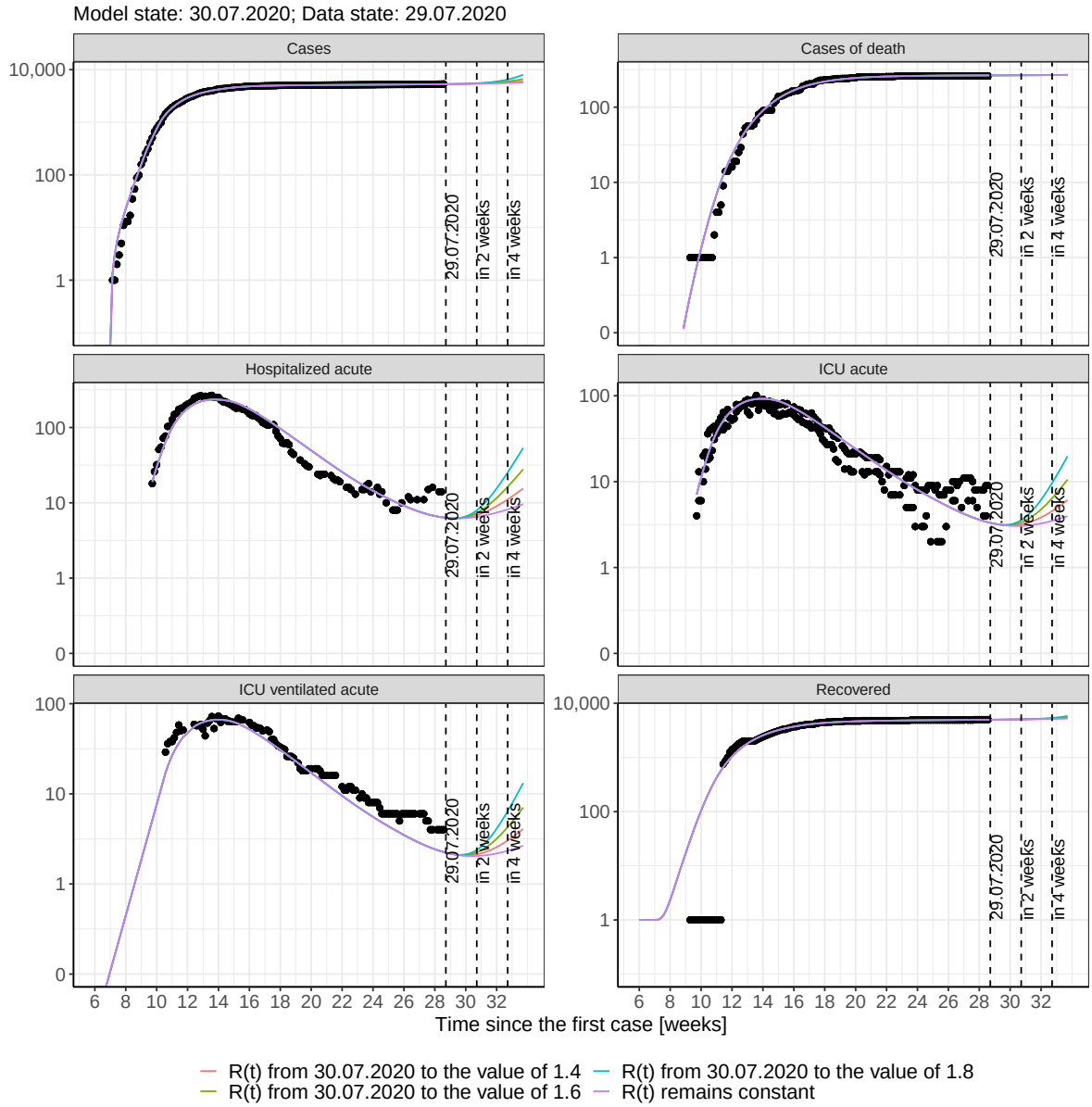


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 74 and 75 represent the model prediction for the next 16 weeks for Hamburg on a linear (74) and a semi-logarithmic (75) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

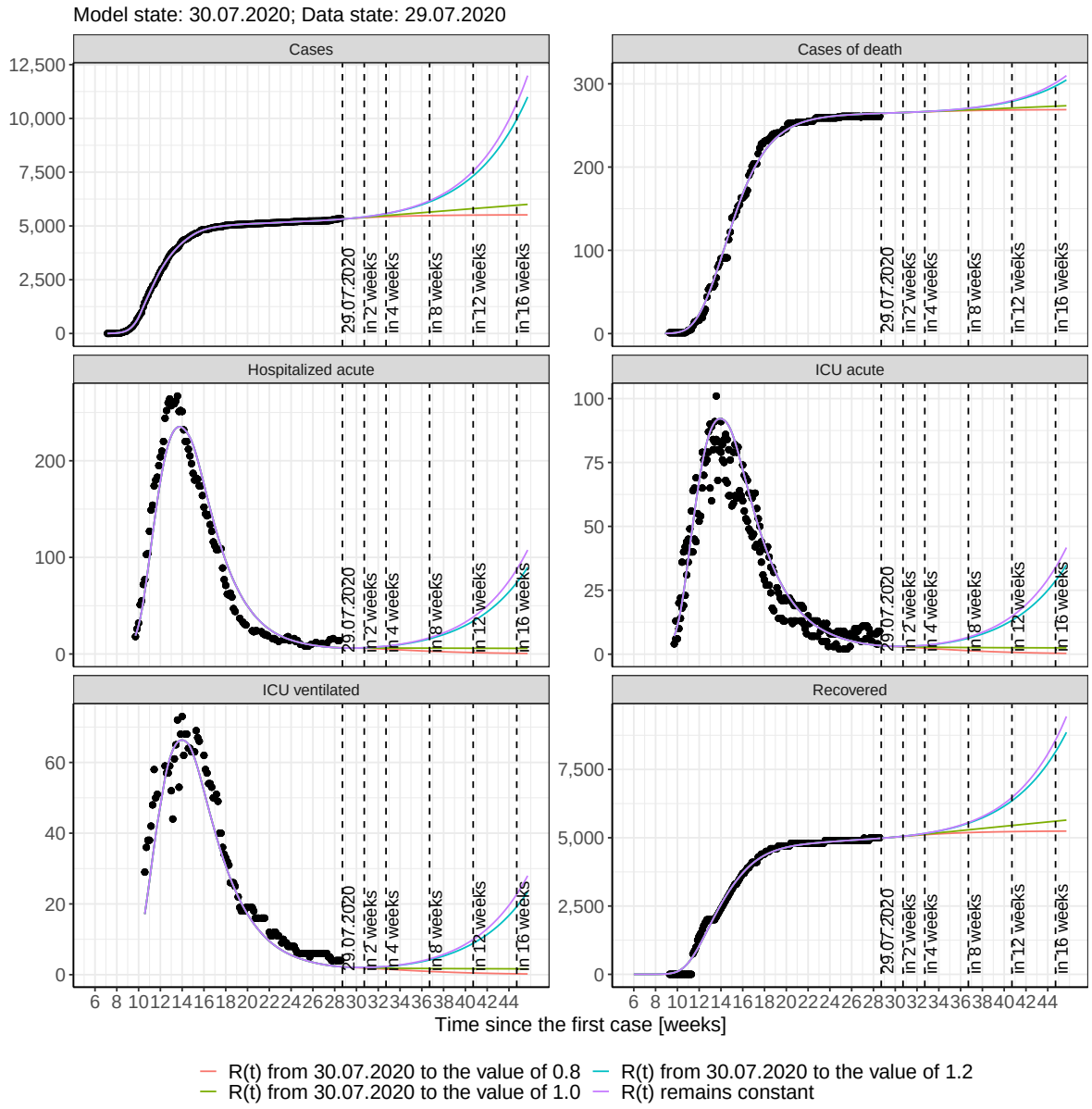


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

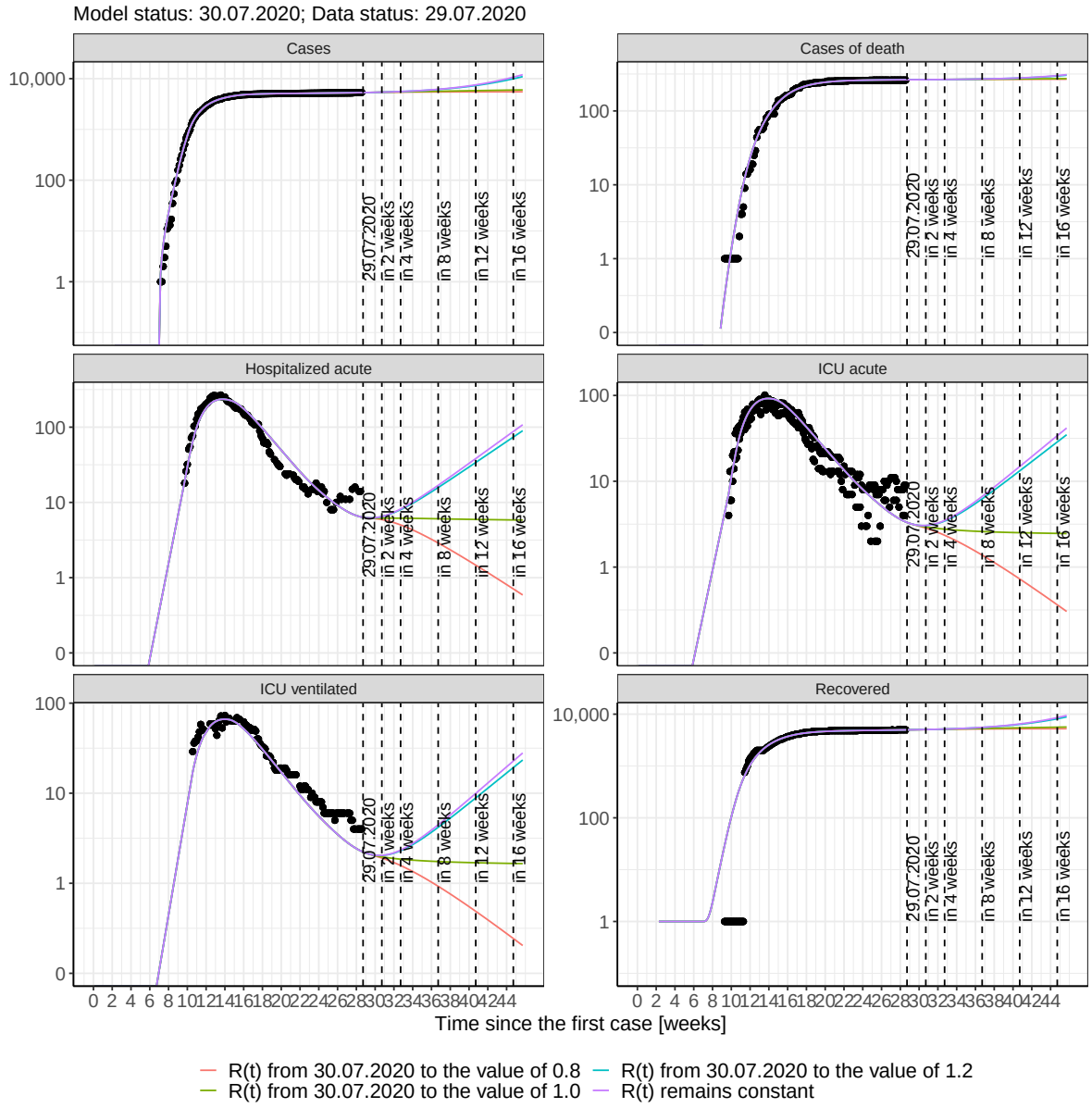


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 25) Model status from 30.07.2020; Data status: 29.07.2020.

Table 22: Hamburg - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5324	265	4986	6	3	2
31.07.2020	5330	265	4991	6	3	2
01.08.2020	5336	265	4995	6	3	2
02.08.2020	5343	265	5000	6	3	2
03.08.2020	5350	265	5005	6	3	2
04.08.2020	5356	265	5010	6	3	2
05.08.2020	5364	265	5015	6	3	2
06.08.2020	5371	265	5020	6	3	2
07.08.2020	5379	265	5025	6	3	2
08.08.2020	5387	265	5031	6	3	2
09.08.2020	5395	265	5036	6	3	2
10.08.2020	5403	265	5042	6	3	2
11.08.2020	5412	265	5048	6	3	2
12.08.2020	5420	266	5054	7	3	2
13.08.2020	5430	266	5060	7	3	2
14.08.2020	5439	266	5066	7	3	2
15.08.2020	5449	266	5073	7	3	2
16.08.2020	5458	266	5080	7	3	2
17.08.2020	5469	266	5087	7	3	2
18.08.2020	5479	266	5094	7	3	2
19.08.2020	5490	266	5101	7	3	2
20.08.2020	5502	266	5109	7	3	2
21.08.2020	5513	266	5116	7	3	2
22.08.2020	5525	266	5124	8	3	2
23.08.2020	5537	266	5133	8	3	2
24.08.2020	5550	266	5141	8	3	2
25.08.2020	5563	267	5150	8	3	2
26.08.2020	5576	267	5159	8	3	2

Table 23: Hamburg - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5324	265	4986	6	3	2
31.07.2020	5329	265	4991	6	3	2
01.08.2020	5335	265	4995	6	3	2
02.08.2020	5340	265	5000	6	3	2
03.08.2020	5345	265	5005	6	3	2
04.08.2020	5350	265	5010	6	3	2
05.08.2020	5355	265	5014	6	3	2
06.08.2020	5360	265	5019	6	3	2
07.08.2020	5364	265	5024	6	3	2
08.08.2020	5369	265	5029	6	3	2
09.08.2020	5373	265	5034	6	3	2
10.08.2020	5378	265	5039	6	3	2
11.08.2020	5382	265	5044	6	3	2
12.08.2020	5386	266	5048	6	3	2
13.08.2020	5390	266	5053	6	3	2
14.08.2020	5393	266	5058	6	3	2
15.08.2020	5397	266	5063	6	3	2
16.08.2020	5401	266	5067	6	3	2
17.08.2020	5404	266	5072	6	3	2
18.08.2020	5407	266	5077	6	3	2
19.08.2020	5411	266	5081	6	3	2
20.08.2020	5414	266	5085	5	3	2
21.08.2020	5417	266	5090	5	3	2
22.08.2020	5420	266	5094	5	2	2
23.08.2020	5423	266	5098	5	2	2
24.08.2020	5426	266	5102	5	2	2
25.08.2020	5428	266	5106	5	2	2
26.08.2020	5431	266	5110	5	2	2

Table 24: Hamburg - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5324	265	4986	6	3	2
31.07.2020	5330	265	4991	6	3	2
01.08.2020	5335	265	4995	6	3	2
02.08.2020	5341	265	5000	6	3	2
03.08.2020	5347	265	5005	6	3	2
04.08.2020	5353	265	5010	6	3	2
05.08.2020	5359	265	5014	6	3	2
06.08.2020	5365	265	5020	6	3	2
07.08.2020	5371	265	5024	6	3	2
08.08.2020	5377	265	5030	6	3	2
09.08.2020	5382	265	5035	6	3	2
10.08.2020	5388	265	5040	6	3	2
11.08.2020	5394	265	5045	6	3	2
12.08.2020	5400	266	5051	6	3	2
13.08.2020	5406	266	5056	6	3	2
14.08.2020	5412	266	5062	6	3	2
15.08.2020	5418	266	5067	6	3	2
16.08.2020	5424	266	5073	6	3	2
17.08.2020	5430	266	5078	6	3	2
18.08.2020	5435	266	5084	6	3	2
19.08.2020	5441	266	5089	6	3	2
20.08.2020	5447	266	5095	6	3	2
21.08.2020	5453	266	5101	6	3	2
22.08.2020	5459	266	5106	6	3	2
23.08.2020	5464	266	5112	6	3	2
24.08.2020	5470	266	5118	6	3	2
25.08.2020	5476	266	5123	6	3	2
26.08.2020	5482	267	5129	6	3	2

Table 25: Hamburg - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5324	265	4986	6	3	2
31.07.2020	5330	265	4991	6	3	2
01.08.2020	5336	265	4995	6	3	2
02.08.2020	5343	265	5000	6	3	2
03.08.2020	5349	265	5005	6	3	2
04.08.2020	5356	265	5010	6	3	2
05.08.2020	5363	265	5015	6	3	2
06.08.2020	5371	265	5020	6	3	2
07.08.2020	5378	265	5025	6	3	2
08.08.2020	5386	265	5030	6	3	2
09.08.2020	5394	265	5036	6	3	2
10.08.2020	5402	265	5042	6	3	2
11.08.2020	5410	265	5048	6	3	2
12.08.2020	5419	266	5054	6	3	2
13.08.2020	5428	266	5060	7	3	2
14.08.2020	5437	266	5066	7	3	2
15.08.2020	5446	266	5072	7	3	2
16.08.2020	5456	266	5079	7	3	2
17.08.2020	5466	266	5086	7	3	2
18.08.2020	5476	266	5093	7	3	2
19.08.2020	5487	266	5100	7	3	2
20.08.2020	5498	266	5108	7	3	2
21.08.2020	5509	266	5115	7	3	2
22.08.2020	5520	266	5123	7	3	2
23.08.2020	5532	266	5131	8	3	2
24.08.2020	5544	266	5140	8	3	2
25.08.2020	5556	267	5148	8	3	2
26.08.2020	5569	267	5157	8	3	2

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

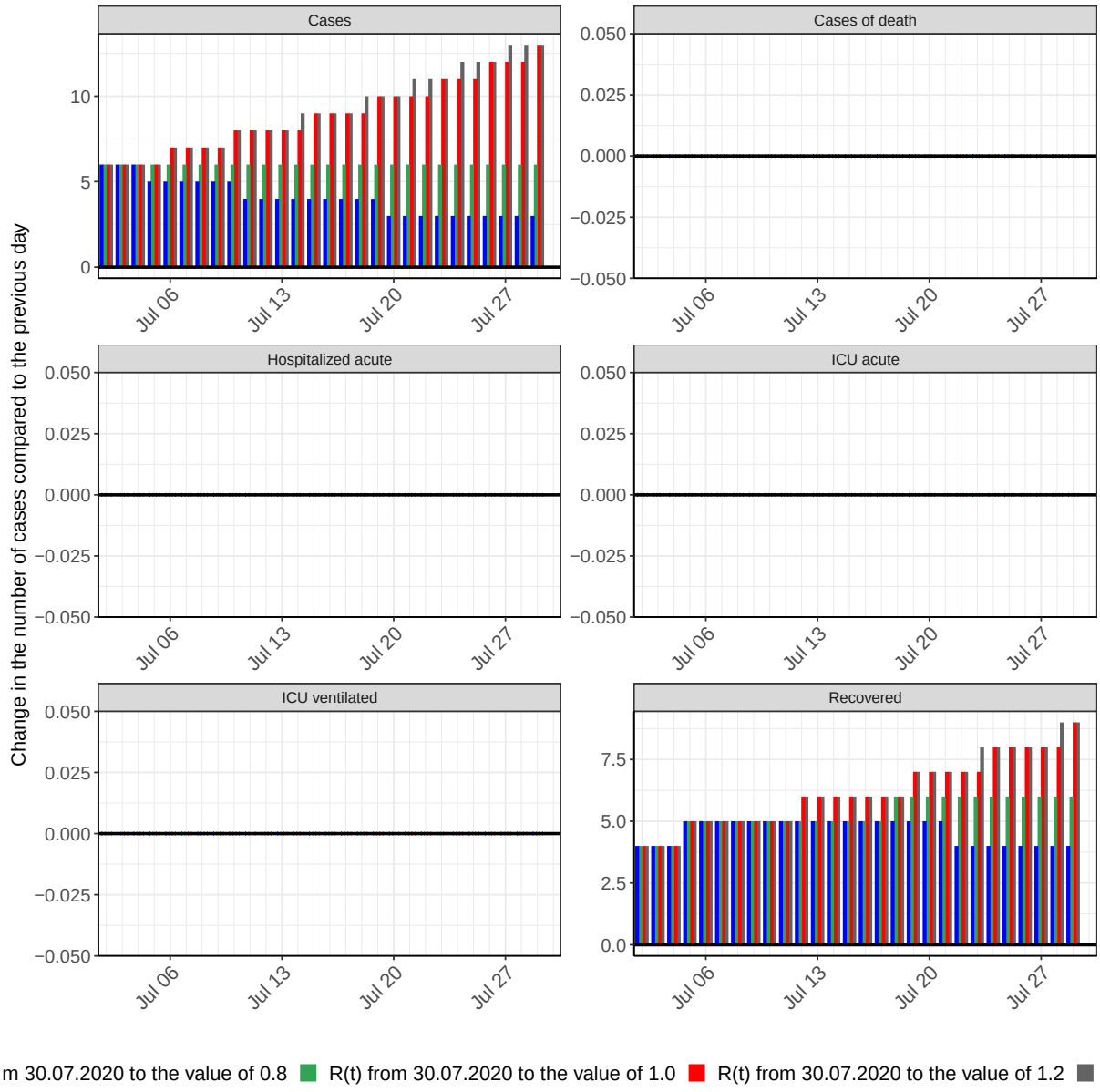


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

8 Hesse

8.1 Model description

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

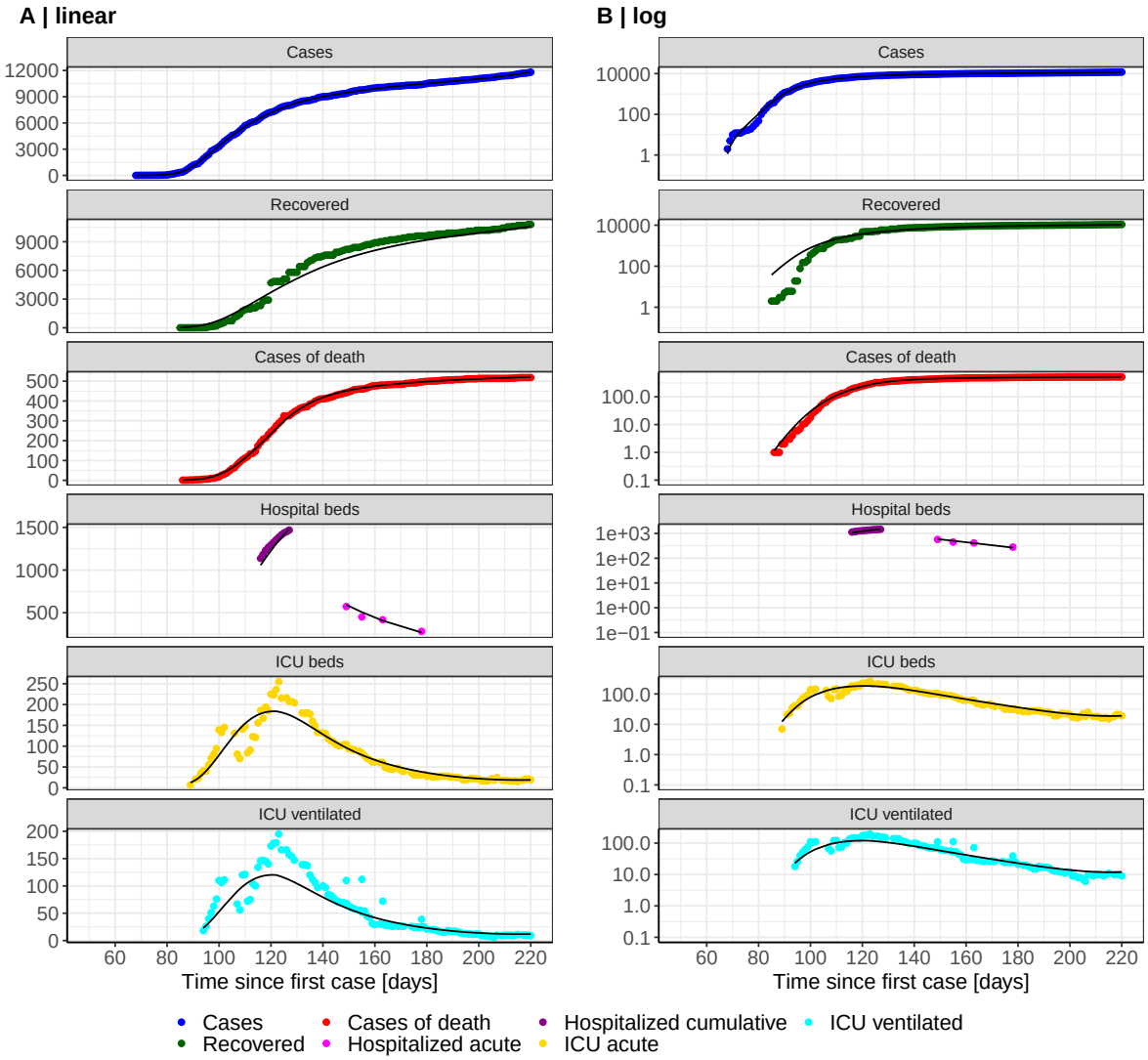


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

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

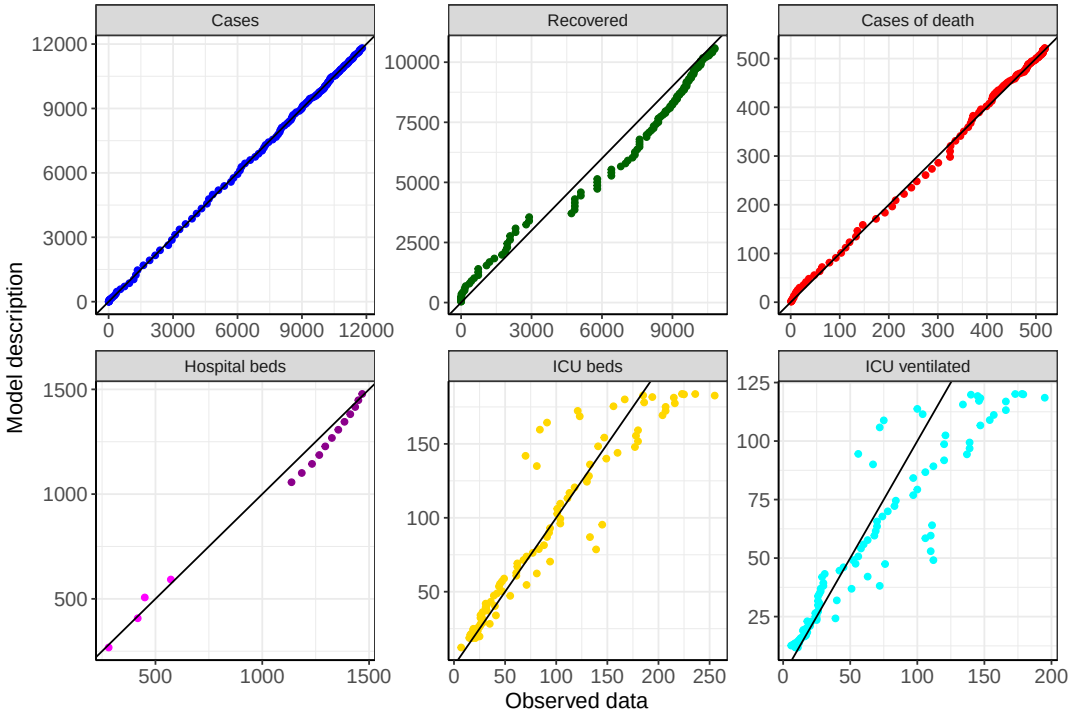


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

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

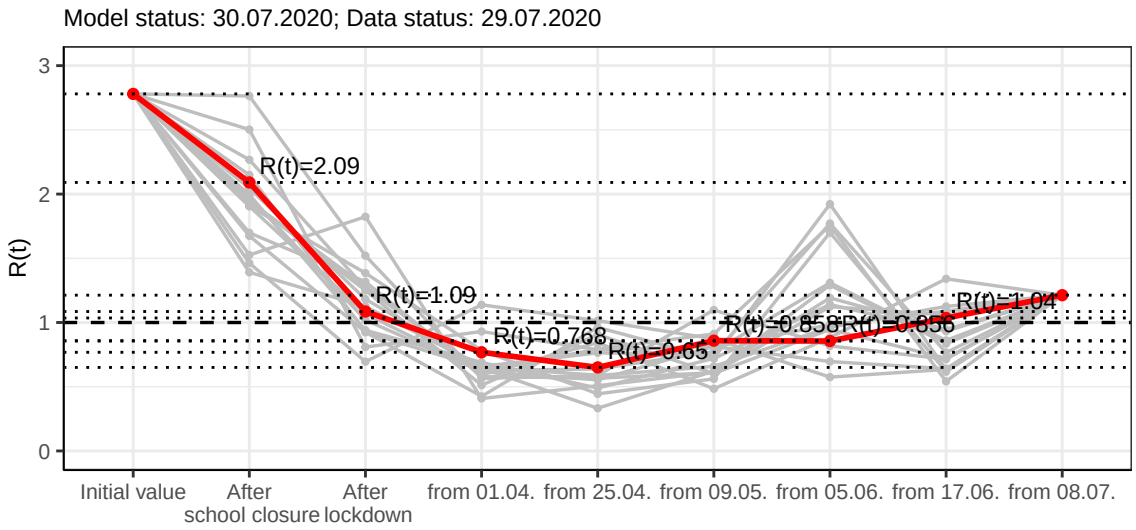


Figure 79: R(t) values before and after the NPIs for Hesse

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

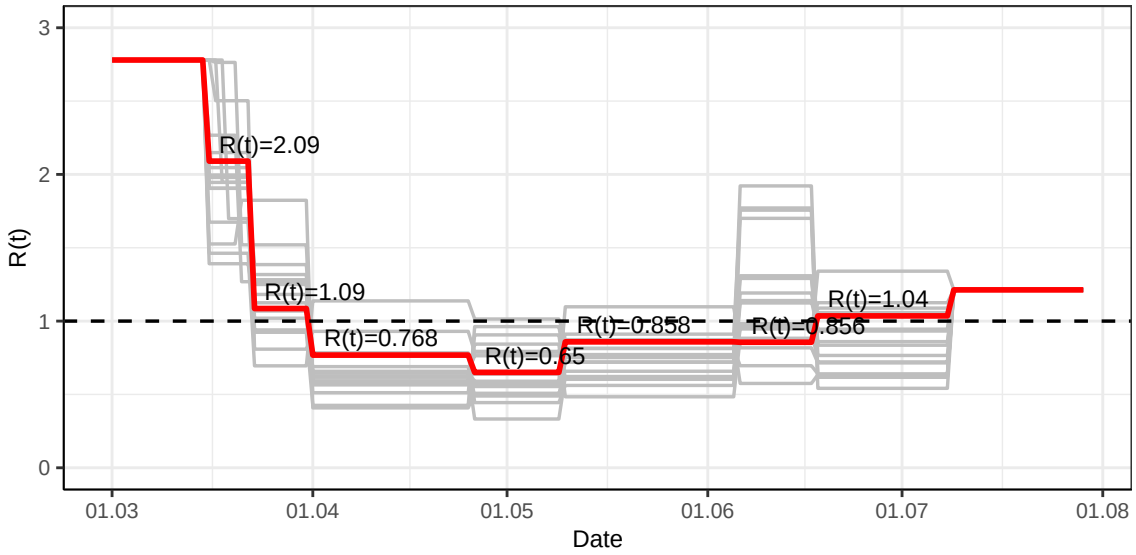


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

8.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

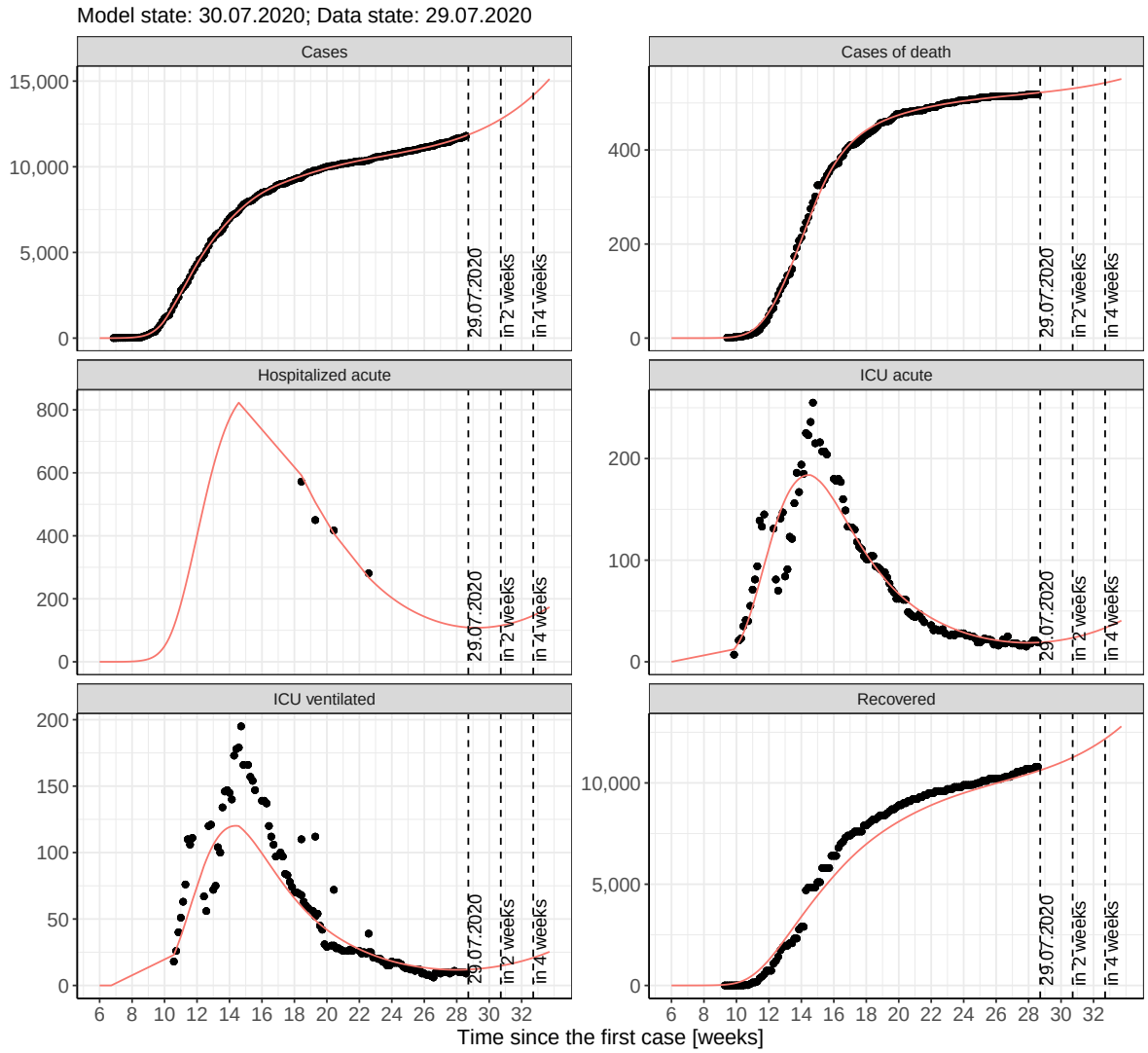


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

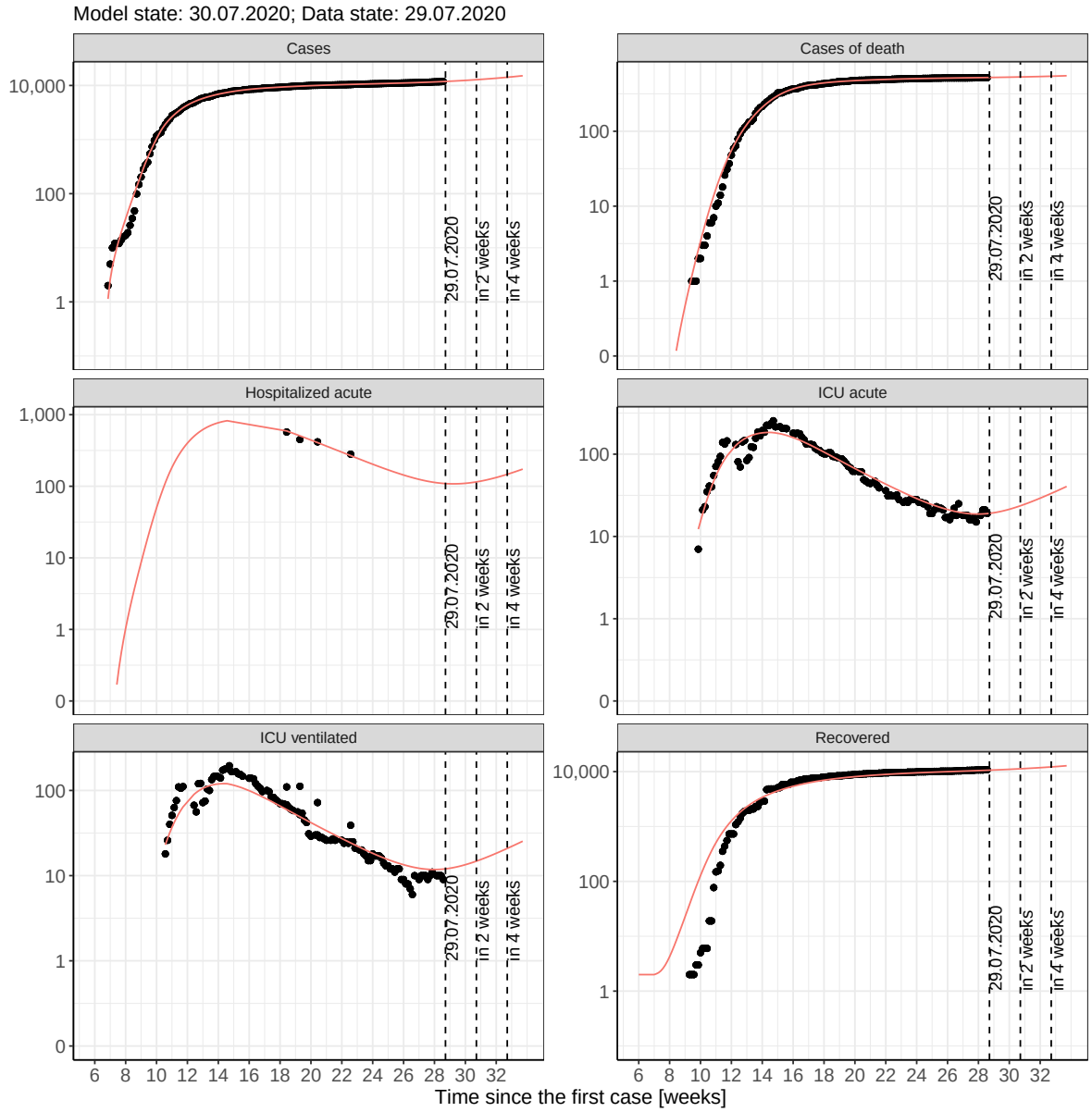


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 83 and 84 represent the model prediction for the next 4 weeks for Hesse on a linear (83) and a semi-logarithmic (84) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

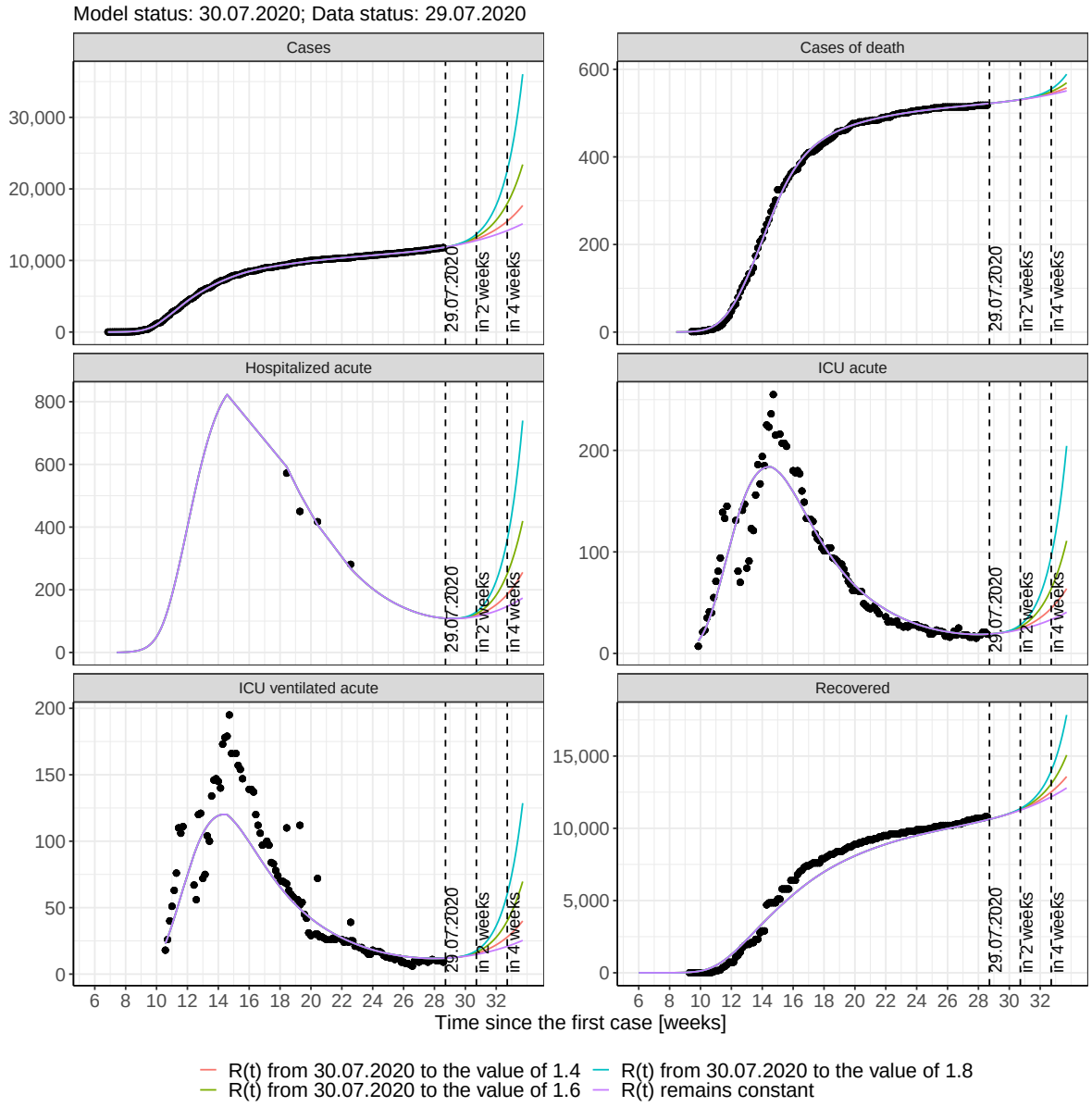


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

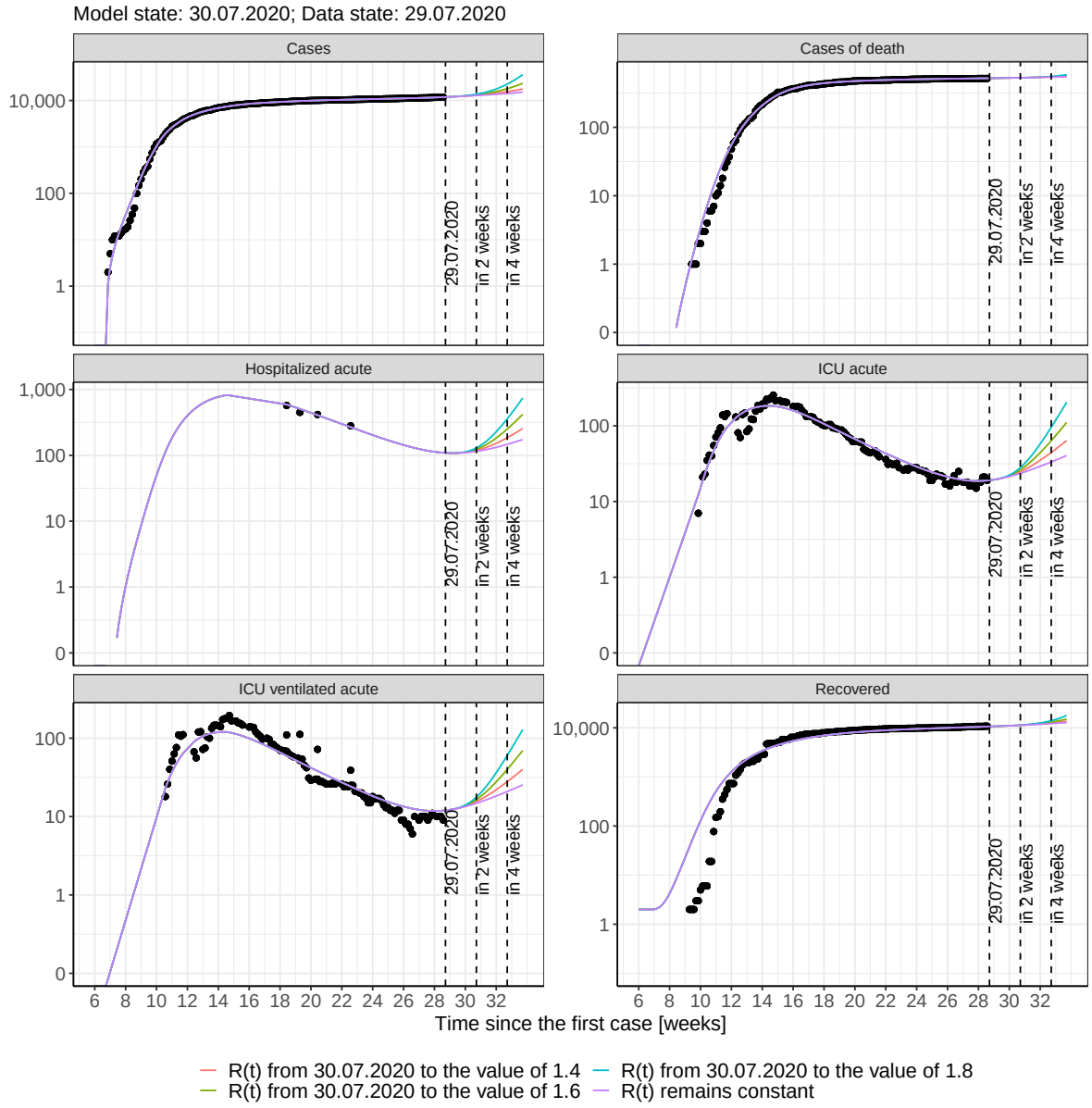


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 85 and 86 represent the model prediction for the next 16 weeks for Hesse on a linear (85) and a semi-logarithmic (86) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

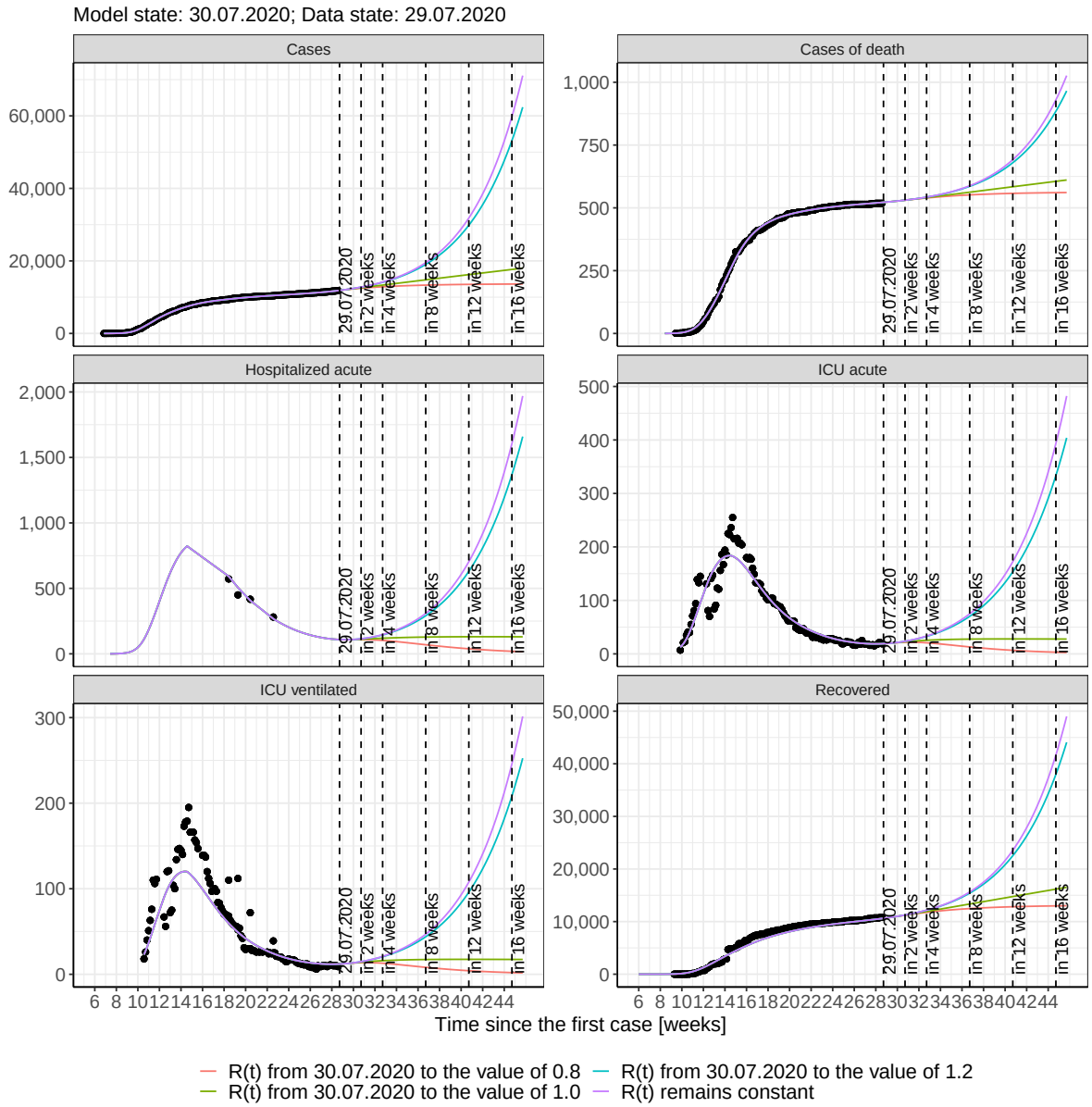


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

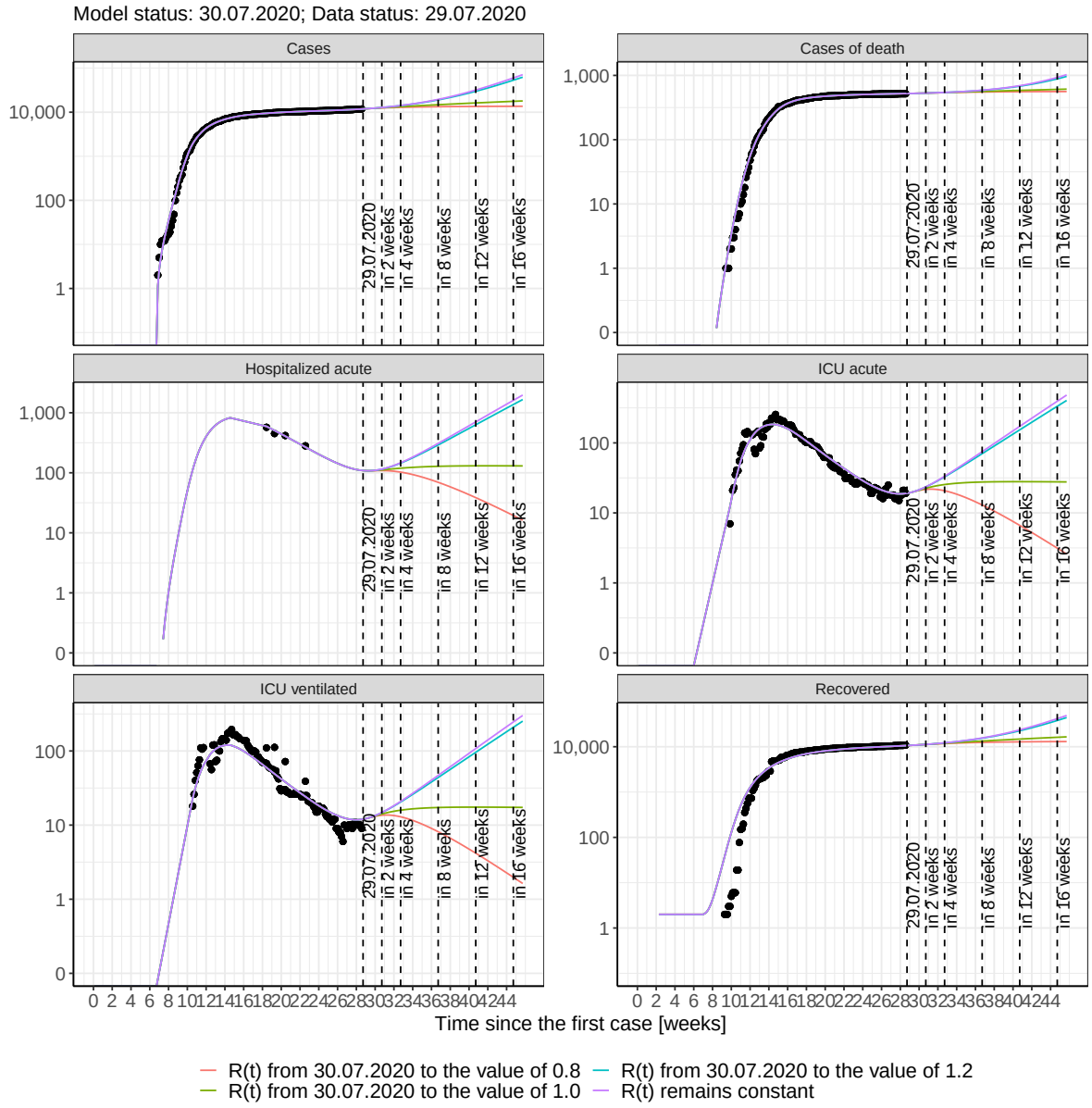


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 29) Model status from 30.07.2020; Data status: 29.07.2020.

Table 26: Hesse - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	11919	523	10663	109	19	12
31.07.2020	11974	523	10703	108	19	12
01.08.2020	12030	524	10743	108	20	12
02.08.2020	12089	524	10785	108	20	12
03.08.2020	12149	525	10827	108	20	13
04.08.2020	12211	525	10870	108	20	13
05.08.2020	12275	526	10915	109	21	13
06.08.2020	12341	527	10960	109	21	13
07.08.2020	12409	527	11007	110	21	13
08.08.2020	12479	528	11054	111	22	14
09.08.2020	12551	529	11103	112	22	14
10.08.2020	12625	529	11154	113	23	14
11.08.2020	12702	530	11205	114	23	14
12.08.2020	12780	531	11258	115	24	15
13.08.2020	12862	531	11313	116	24	15
14.08.2020	12946	532	11369	118	25	15
15.08.2020	13032	533	11426	120	25	16
16.08.2020	13121	534	11485	121	26	16
17.08.2020	13213	534	11546	123	26	17
18.08.2020	13307	535	11609	125	27	17
19.08.2020	13404	536	11673	128	28	17
20.08.2020	13505	537	11739	130	28	18
21.08.2020	13608	538	11807	132	29	18
22.08.2020	13715	539	11877	135	30	19
23.08.2020	13825	540	11949	138	31	19
24.08.2020	13938	541	12023	141	32	20
25.08.2020	14054	542	12099	144	32	20
26.08.2020	14174	543	12177	147	33	21

Table 27: Hesse - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	11917	523	10663	109	19	12
31.07.2020	11967	523	10703	108	19	12
01.08.2020	12016	524	10743	108	20	12
02.08.2020	12064	524	10784	108	20	12
03.08.2020	12110	525	10826	108	20	13
04.08.2020	12155	525	10868	108	20	13
05.08.2020	12198	526	10911	108	21	13
06.08.2020	12241	527	10954	108	21	13
07.08.2020	12282	527	10997	108	21	13
08.08.2020	12322	528	11040	109	21	13
09.08.2020	12361	529	11084	109	21	13
10.08.2020	12398	529	11127	109	21	13
11.08.2020	12435	530	11170	109	22	14
12.08.2020	12471	530	11213	109	22	14
13.08.2020	12505	531	11256	109	22	14
14.08.2020	12539	532	11298	109	22	14
15.08.2020	12572	532	11340	108	22	14
16.08.2020	12603	533	11381	108	22	14
17.08.2020	12634	534	11422	108	22	14
18.08.2020	12664	534	11462	108	22	14
19.08.2020	12693	535	11502	107	22	14
20.08.2020	12722	536	11541	107	22	14
21.08.2020	12749	536	11580	106	22	13
22.08.2020	12776	537	11617	106	21	13
23.08.2020	12802	538	11654	105	21	13
24.08.2020	12827	538	11691	104	21	13
25.08.2020	12852	539	11726	103	21	13
26.08.2020	12875	539	11761	103	21	13

Table 28: Hesse - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	11918	523	10663	109	19	12
31.07.2020	11970	523	10703	108	19	12
01.08.2020	12023	524	10743	108	20	12
02.08.2020	12075	524	10784	108	20	12
03.08.2020	12128	525	10826	108	20	13
04.08.2020	12180	525	10869	108	20	13
05.08.2020	12233	526	10912	108	21	13
06.08.2020	12285	527	10957	109	21	13
07.08.2020	12338	527	11001	109	21	13
08.08.2020	12390	528	11047	110	21	13
09.08.2020	12443	529	11092	110	22	14
10.08.2020	12495	529	11139	110	22	14
11.08.2020	12547	530	11186	111	22	14
12.08.2020	12600	531	11233	112	23	14
13.08.2020	12652	531	11281	112	23	14
14.08.2020	12704	532	11329	113	23	14
15.08.2020	12757	533	11377	113	23	15
16.08.2020	12809	533	11425	114	24	15
17.08.2020	12861	534	11474	114	24	15
18.08.2020	12913	535	11523	115	24	15
19.08.2020	12966	536	11572	115	24	15
20.08.2020	13018	536	11622	116	24	15
21.08.2020	13070	537	11671	117	25	15
22.08.2020	13122	538	11721	117	25	15
23.08.2020	13175	538	11771	118	25	16
24.08.2020	13227	539	11821	118	25	16
25.08.2020	13279	540	11871	119	25	16
26.08.2020	13331	541	11921	119	25	16

Table 29: Hesse - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	11919	523	10663	109	19	12
31.07.2020	11973	523	10703	108	19	12
01.08.2020	12030	524	10743	108	20	12
02.08.2020	12088	524	10785	108	20	12
03.08.2020	12148	525	10827	108	20	13
04.08.2020	12209	525	10870	108	20	13
05.08.2020	12272	526	10914	109	21	13
06.08.2020	12337	527	10960	109	21	13
07.08.2020	12404	527	11006	110	21	13
08.08.2020	12473	528	11054	111	22	14
09.08.2020	12543	529	11103	111	22	14
10.08.2020	12616	529	11153	112	23	14
11.08.2020	12691	530	11204	114	23	14
12.08.2020	12768	531	11257	115	24	15
13.08.2020	12847	531	11311	116	24	15
14.08.2020	12929	532	11366	118	25	15
15.08.2020	13012	533	11423	119	25	16
16.08.2020	13098	534	11481	121	26	16
17.08.2020	13187	534	11541	123	26	16
18.08.2020	13278	535	11603	125	27	17
19.08.2020	13372	536	11666	127	28	17
20.08.2020	13468	537	11731	129	28	18
21.08.2020	13568	538	11797	131	29	18
22.08.2020	13670	539	11866	134	30	19
23.08.2020	13775	540	11936	136	30	19
24.08.2020	13883	541	12008	139	31	19
25.08.2020	13994	542	12082	142	32	20
26.08.2020	14108	543	12158	145	33	20

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

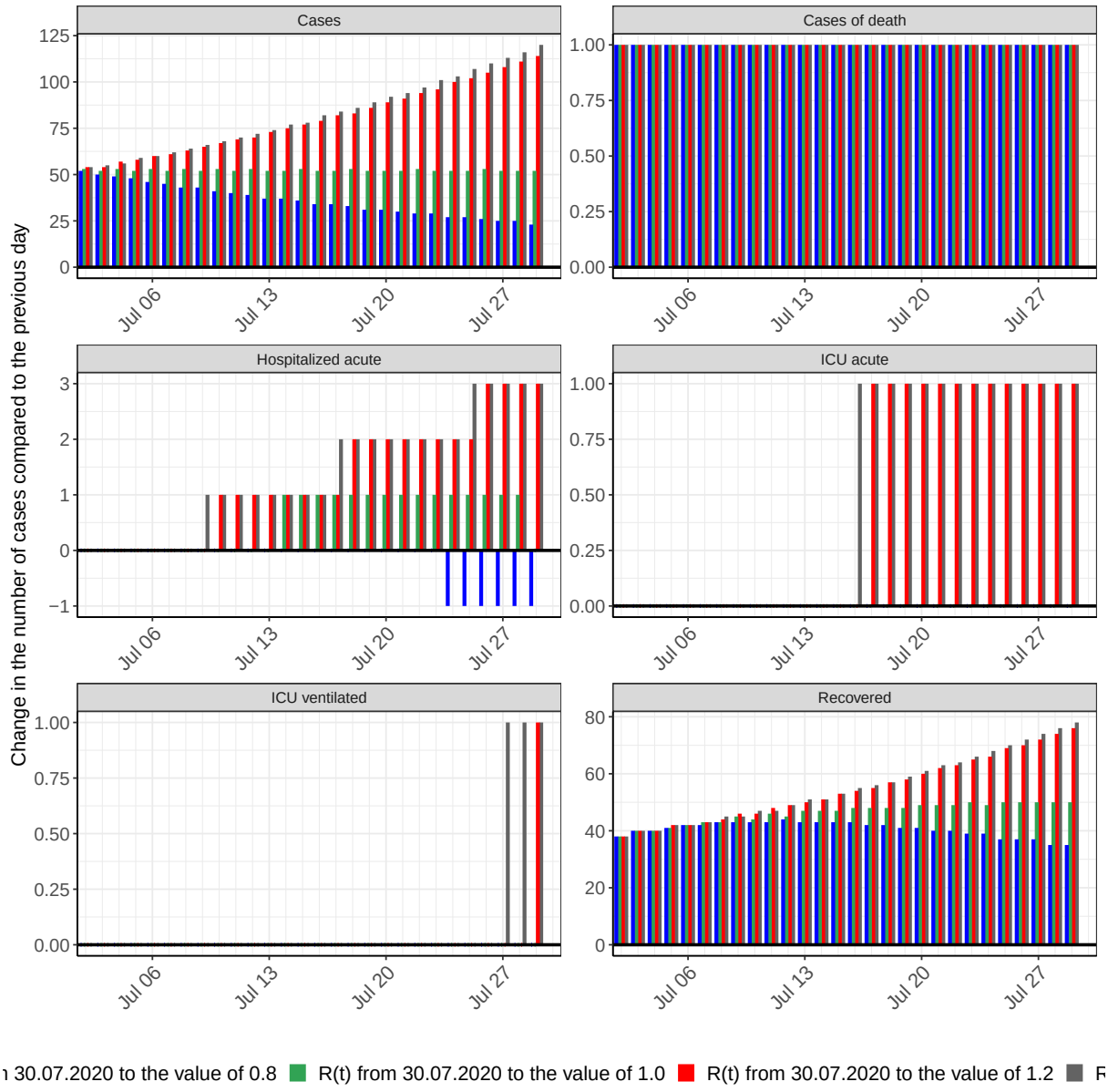


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

9 Mecklenburg-Vorpommern

9.1 Model description

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

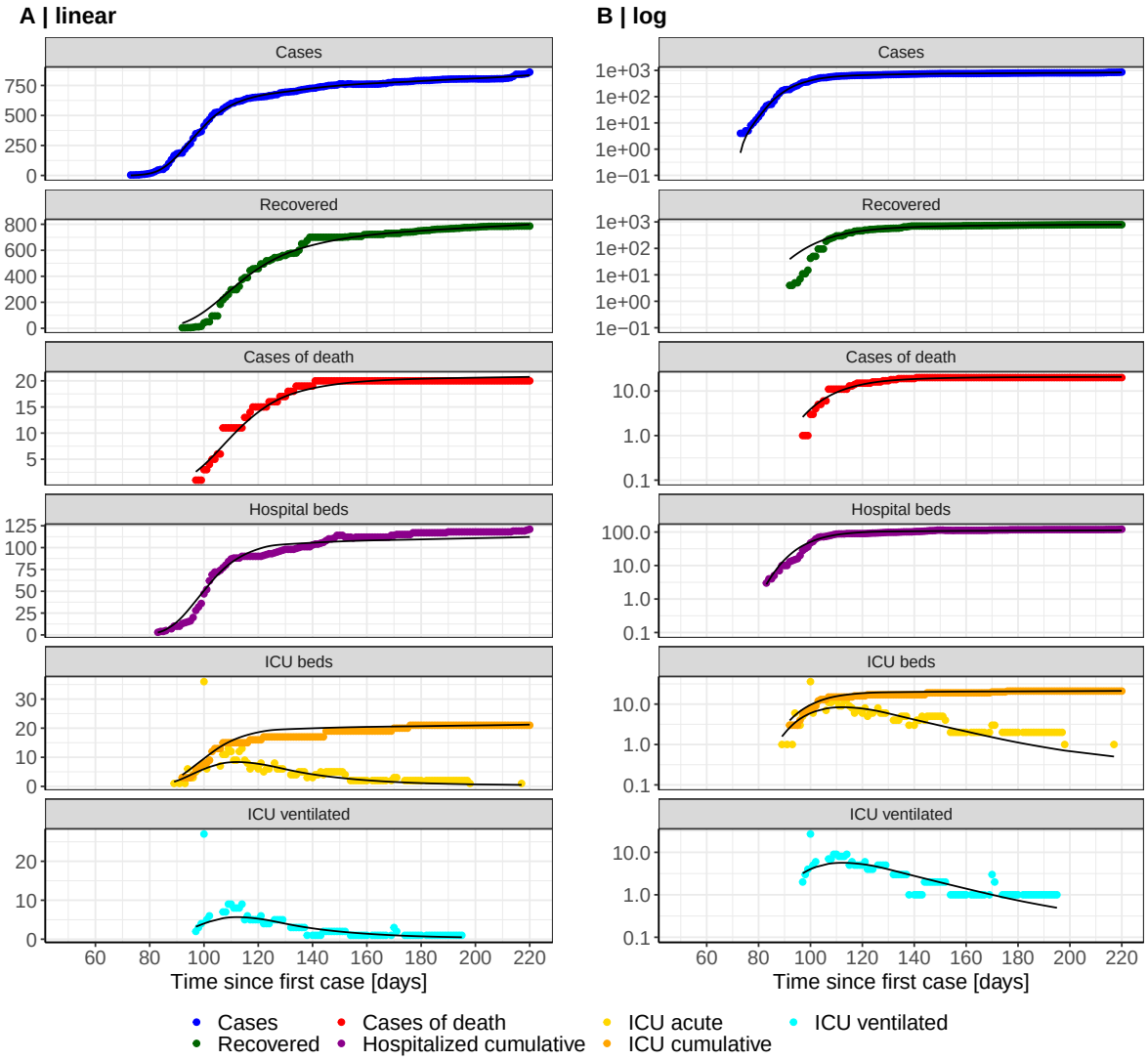


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

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

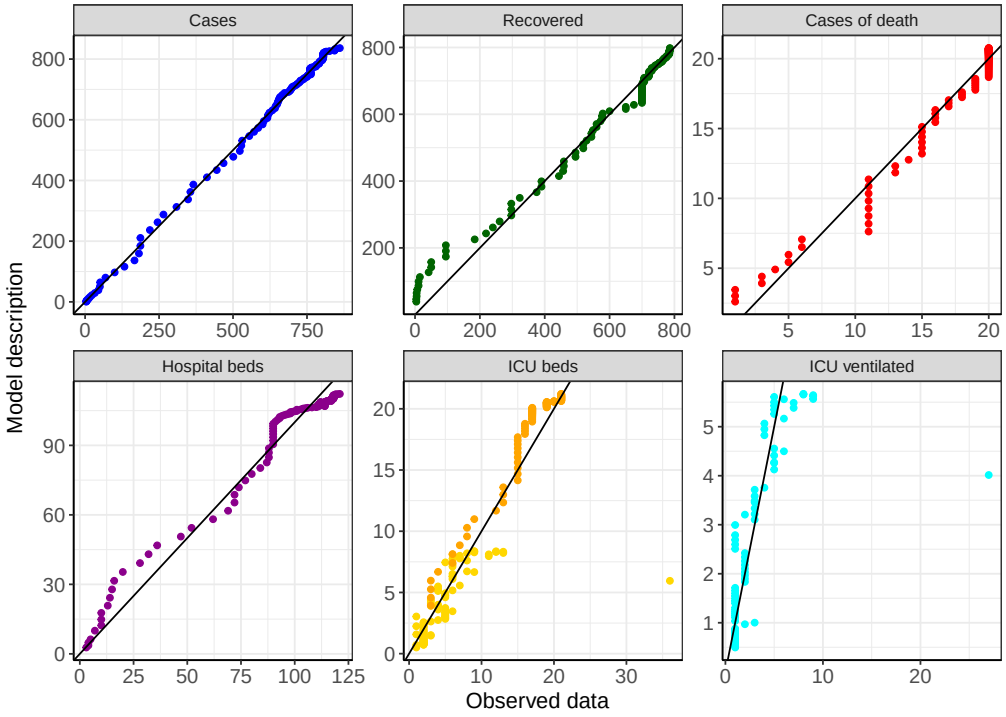


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

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

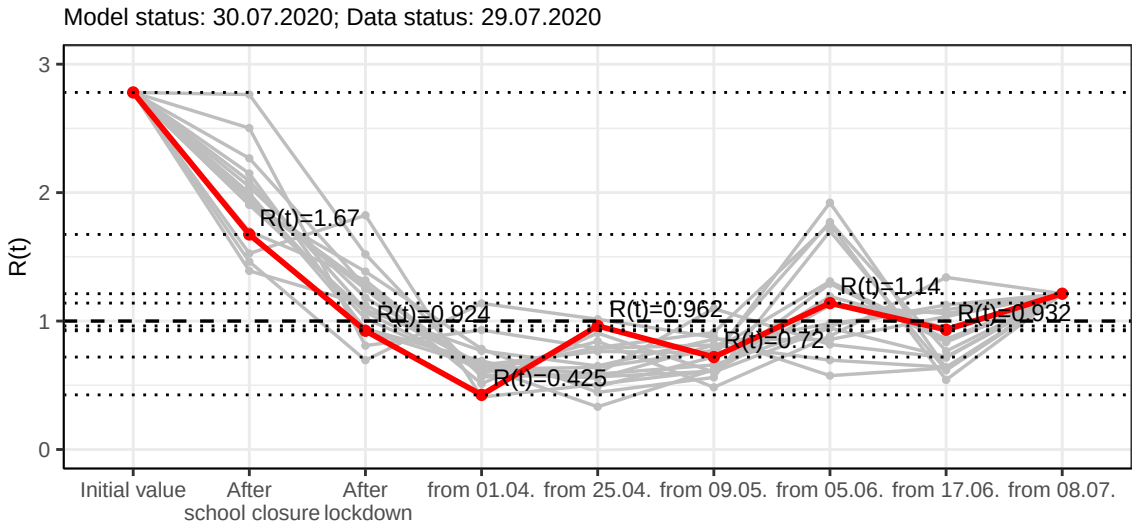


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

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

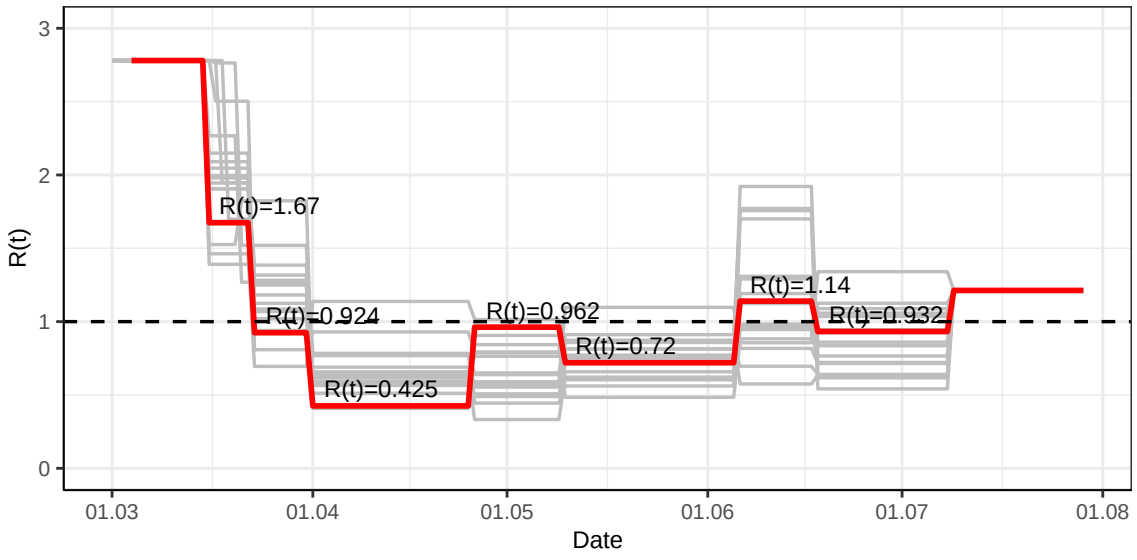


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

9.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

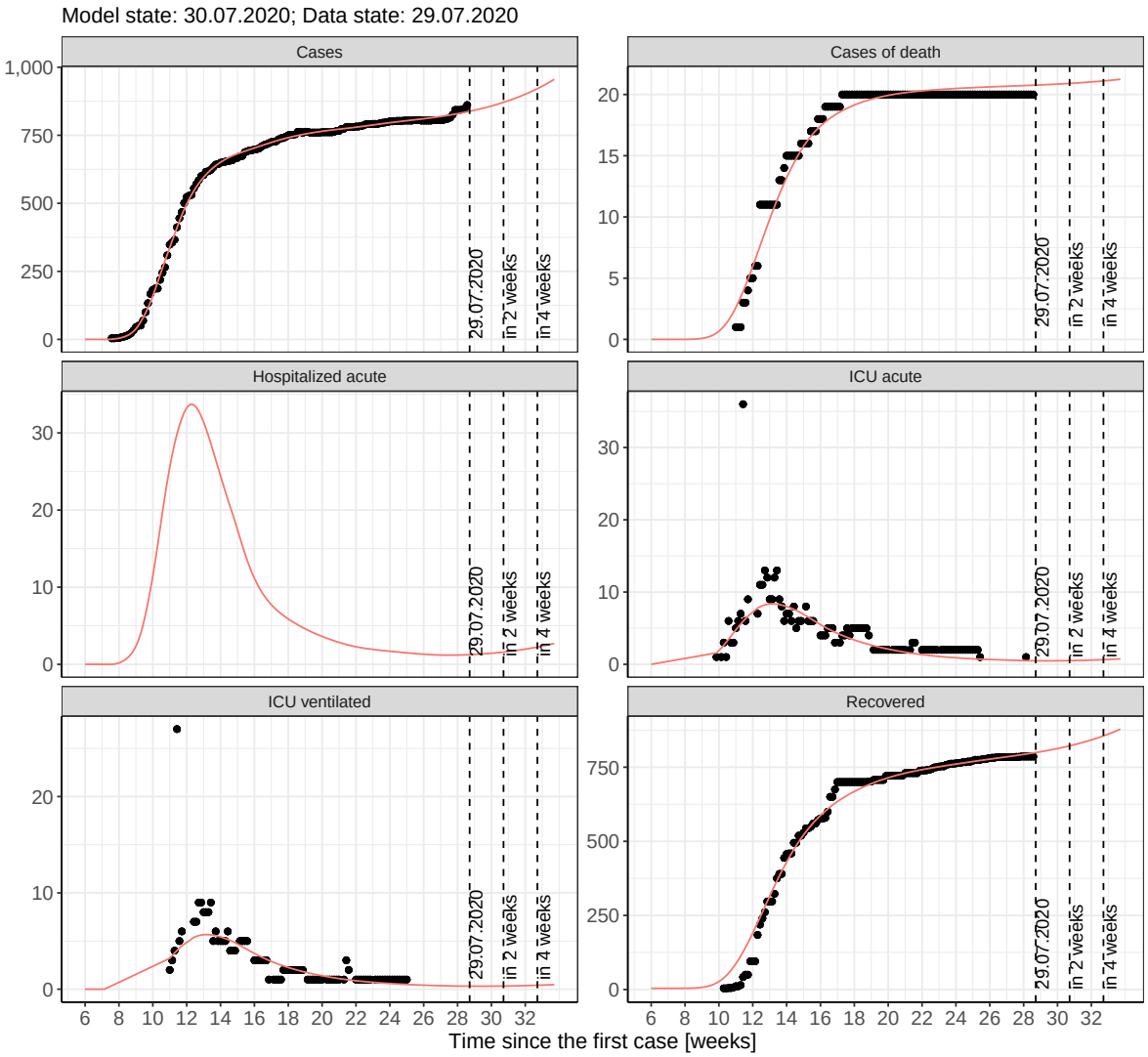


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

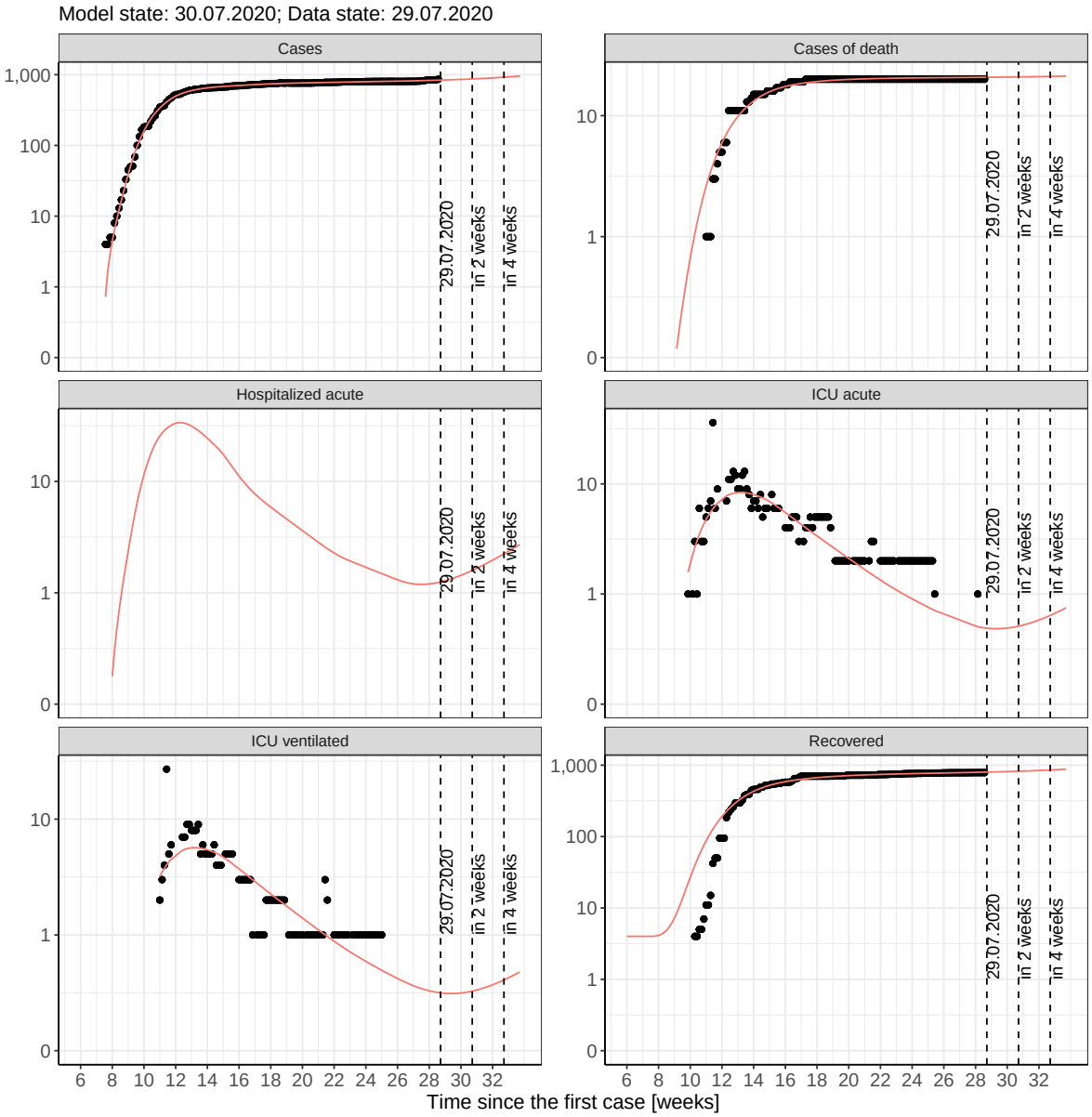


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 94 and 95 represent the model prediction for the next 4 weeks for Mecklenburg-Vorpommern on a linear (94) and a semi-logarithmic (95) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

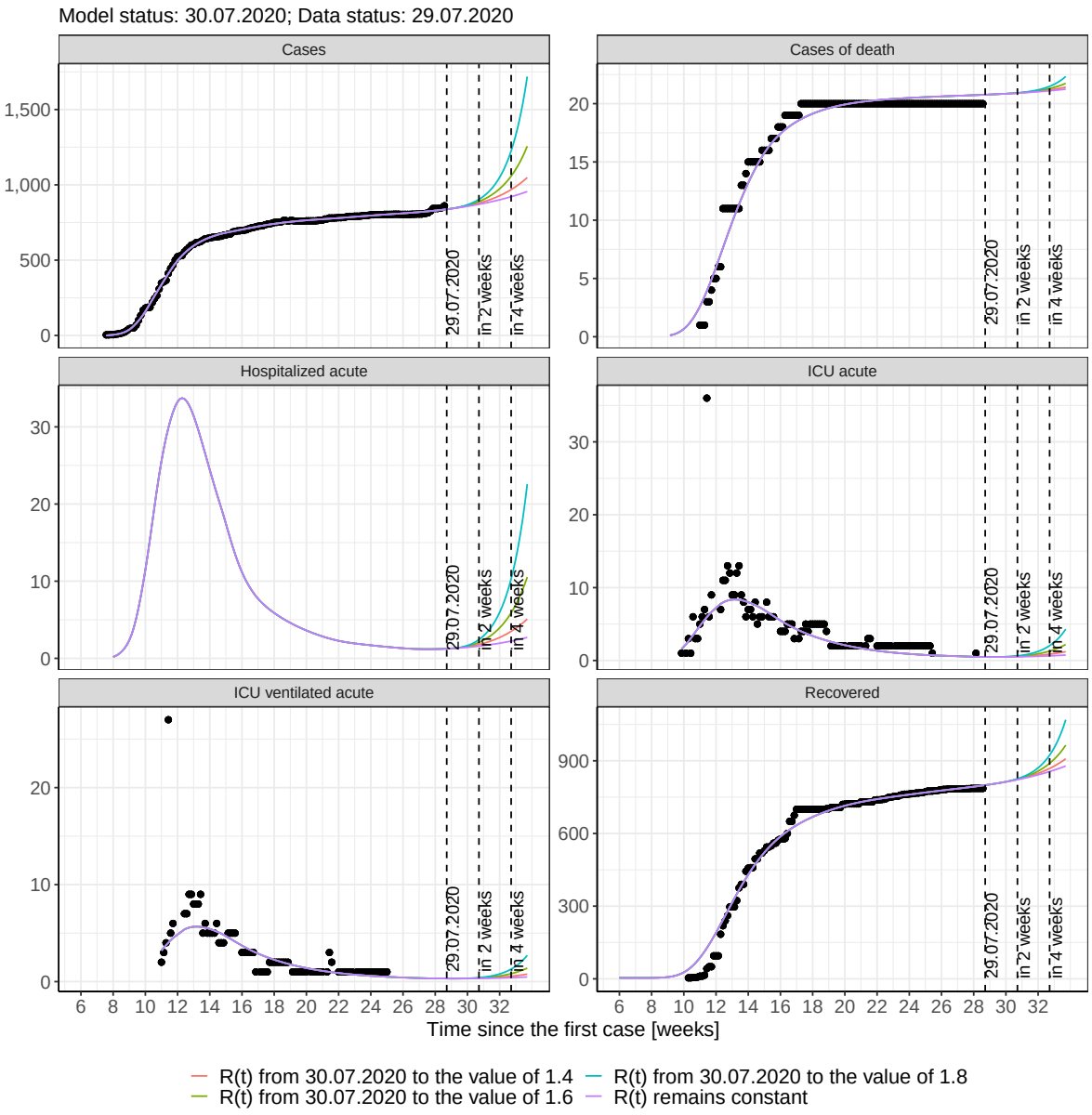


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

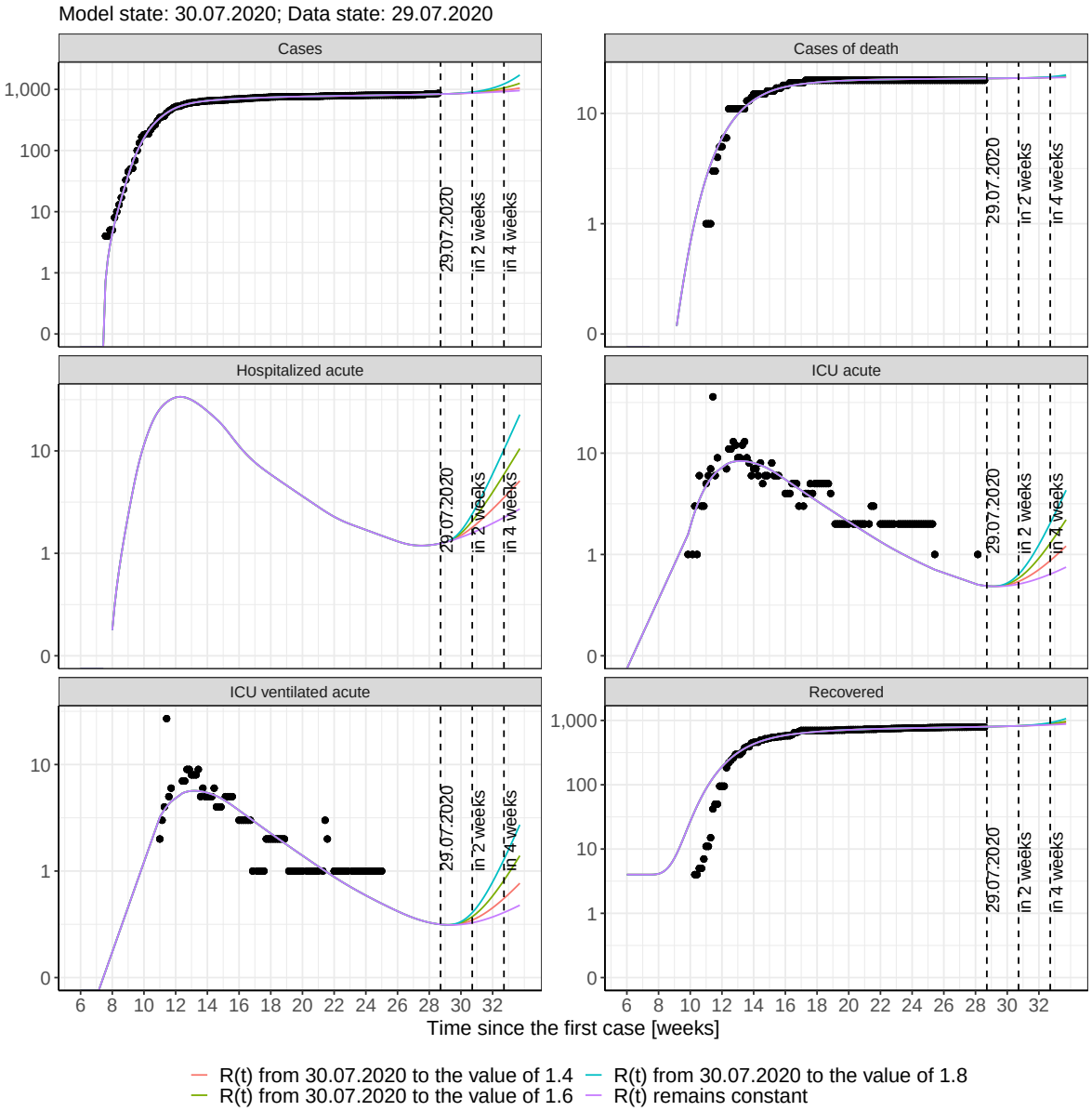


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 96 and 97 represent the model prediction for the next 16 weeks for Mecklenburg-Vorpommern on a linear (96) and a semi-logarithmic (97) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

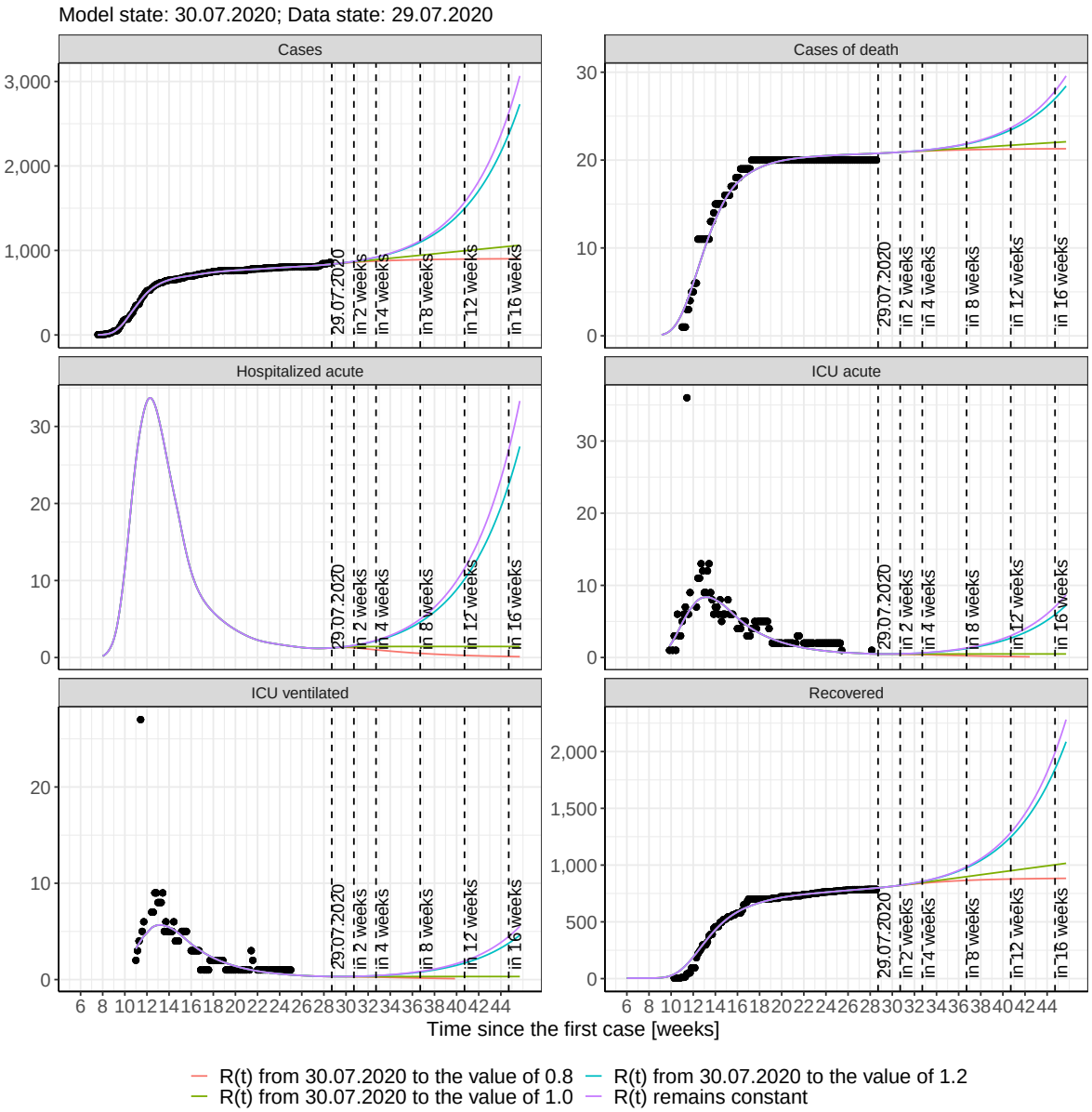


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

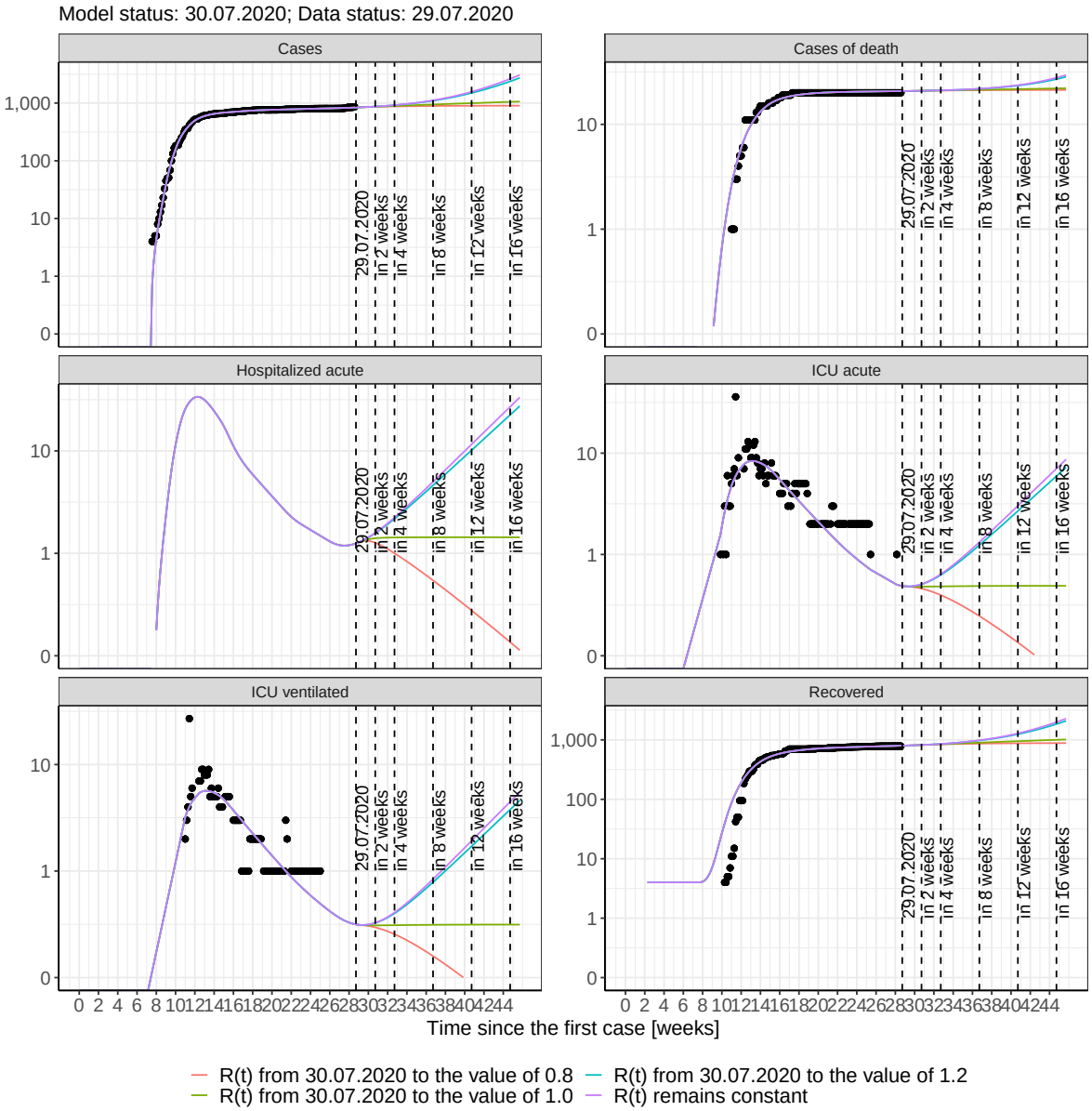


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 33) Model status from 30.07.2020; Data status: 29.07.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	840	21	801	1	0	0
31.07.2020	842	21	802	1	0	0
01.08.2020	844	21	804	1	0	0
02.08.2020	846	21	805	1	0	0
03.08.2020	848	21	807	1	0	0
04.08.2020	850	21	808	1	0	0
05.08.2020	853	21	810	1	0	0
06.08.2020	855	21	811	1	0	0
07.08.2020	858	21	813	1	0	0
08.08.2020	860	21	815	1	0	0
09.08.2020	863	21	816	1	0	0
10.08.2020	865	21	818	2	1	0
11.08.2020	868	21	820	2	1	0
12.08.2020	871	21	822	2	1	0
13.08.2020	874	21	824	2	1	0
14.08.2020	877	21	826	2	1	0
15.08.2020	880	21	828	2	1	0
16.08.2020	883	21	830	2	1	0
17.08.2020	887	21	832	2	1	0
18.08.2020	890	21	835	2	1	0
19.08.2020	893	21	837	2	1	0
20.08.2020	897	21	840	2	1	0
21.08.2020	901	21	842	2	1	0
22.08.2020	905	21	845	2	1	0
23.08.2020	909	21	847	2	1	0
24.08.2020	913	21	850	2	1	0
25.08.2020	917	21	853	2	1	0
26.08.2020	921	21	856	2	1	0

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	840	21	801	1	0	0
31.07.2020	842	21	802	1	0	0
01.08.2020	843	21	804	1	0	0
02.08.2020	845	21	805	1	0	0
03.08.2020	847	21	807	1	0	0
04.08.2020	848	21	808	1	0	0
05.08.2020	850	21	810	1	0	0
06.08.2020	852	21	811	1	0	0
07.08.2020	853	21	813	1	0	0
08.08.2020	854	21	814	1	0	0
09.08.2020	856	21	816	1	0	0
10.08.2020	857	21	817	1	0	0
11.08.2020	859	21	819	1	0	0
12.08.2020	860	21	820	1	0	0
13.08.2020	861	21	822	1	0	0
14.08.2020	862	21	823	1	0	0
15.08.2020	863	21	825	1	0	0
16.08.2020	865	21	826	1	0	0
17.08.2020	866	21	828	1	0	0
18.08.2020	867	21	829	1	0	0
19.08.2020	868	21	831	1	0	0
20.08.2020	869	21	832	1	0	0
21.08.2020	870	21	834	1	0	0
22.08.2020	871	21	835	1	0	0
23.08.2020	872	21	836	1	0	0
24.08.2020	873	21	838	1	0	0
25.08.2020	874	21	839	1	0	0
26.08.2020	874	21	840	1	0	0

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	840	21	801	1	0	0
31.07.2020	842	21	802	1	0	0
01.08.2020	844	21	804	1	0	0
02.08.2020	846	21	805	1	0	0
03.08.2020	847	21	807	1	0	0
04.08.2020	849	21	808	1	0	0
05.08.2020	851	21	810	1	0	0
06.08.2020	853	21	811	1	0	0
07.08.2020	855	21	813	1	0	0
08.08.2020	857	21	814	1	0	0
09.08.2020	859	21	816	1	0	0
10.08.2020	861	21	818	1	0	0
11.08.2020	863	21	819	1	0	0
12.08.2020	864	21	821	1	0	0
13.08.2020	866	21	823	1	0	0
14.08.2020	868	21	825	1	0	0
15.08.2020	870	21	826	1	0	0
16.08.2020	872	21	828	1	0	0
17.08.2020	874	21	830	1	0	0
18.08.2020	876	21	832	1	0	0
19.08.2020	878	21	833	1	0	0
20.08.2020	880	21	835	1	0	0
21.08.2020	881	21	837	1	0	0
22.08.2020	883	21	839	1	0	0
23.08.2020	885	21	841	1	0	0
24.08.2020	887	21	842	1	0	0
25.08.2020	889	21	844	1	0	0
26.08.2020	891	21	846	1	0	0

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	840	21	801	1	0	0
31.07.2020	842	21	802	1	0	0
01.08.2020	844	21	804	1	0	0
02.08.2020	846	21	805	1	0	0
03.08.2020	848	21	807	1	0	0
04.08.2020	850	21	808	1	0	0
05.08.2020	853	21	810	1	0	0
06.08.2020	855	21	811	1	0	0
07.08.2020	857	21	813	1	0	0
08.08.2020	860	21	815	1	0	0
09.08.2020	862	21	816	1	0	0
10.08.2020	865	21	818	2	0	0
11.08.2020	868	21	820	2	1	0
12.08.2020	871	21	822	2	1	0
13.08.2020	873	21	824	2	1	0
14.08.2020	876	21	826	2	1	0
15.08.2020	879	21	828	2	1	0
16.08.2020	882	21	830	2	1	0
17.08.2020	886	21	832	2	1	0
18.08.2020	889	21	835	2	1	0
19.08.2020	892	21	837	2	1	0
20.08.2020	896	21	839	2	1	0
21.08.2020	899	21	842	2	1	0
22.08.2020	903	21	844	2	1	0
23.08.2020	907	21	847	2	1	0
24.08.2020	911	21	849	2	1	0
25.08.2020	915	21	852	2	1	0
26.08.2020	919	21	855	2	1	0

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

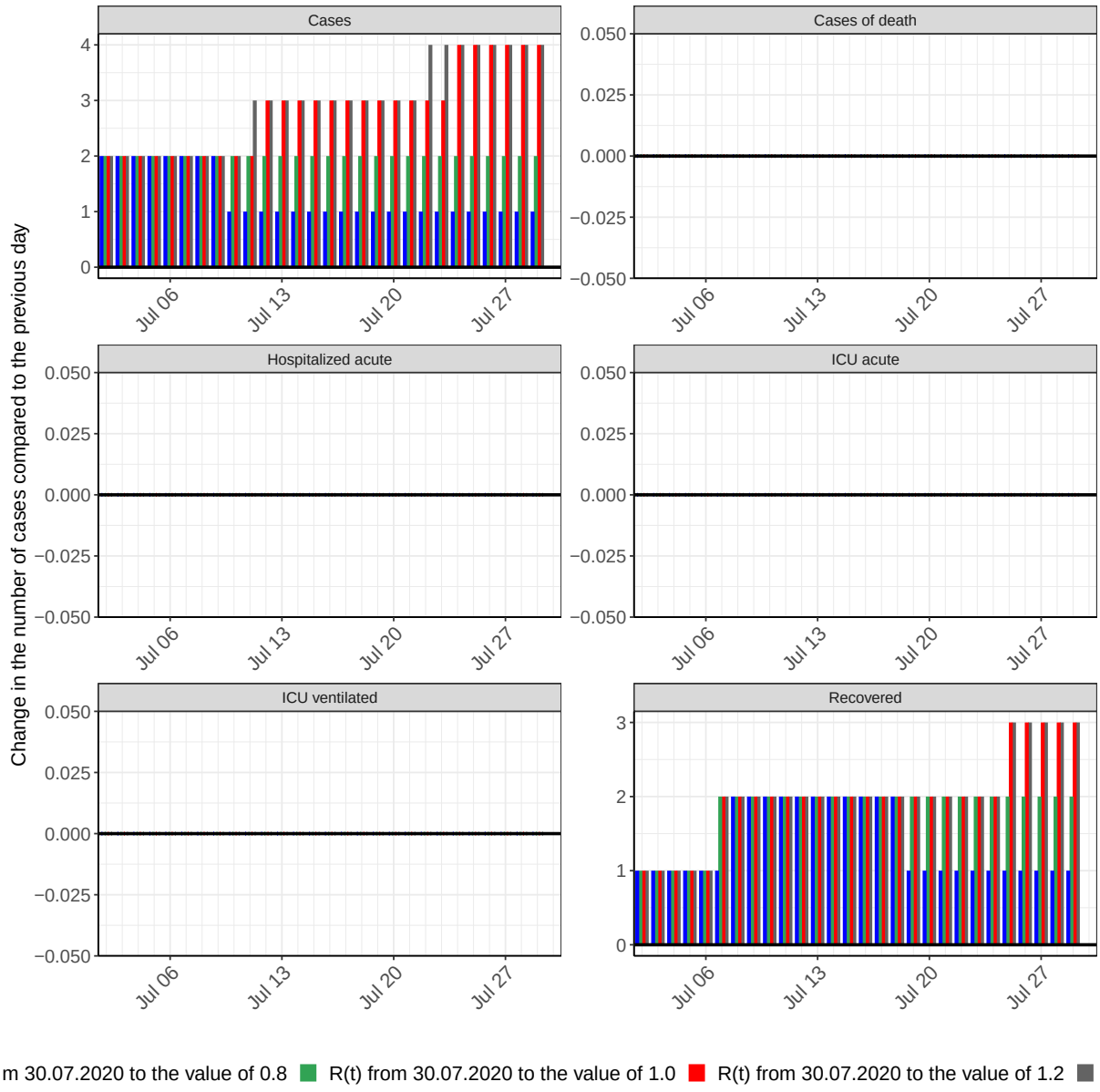


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

10 Lower Saxony

10.1 Model description

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

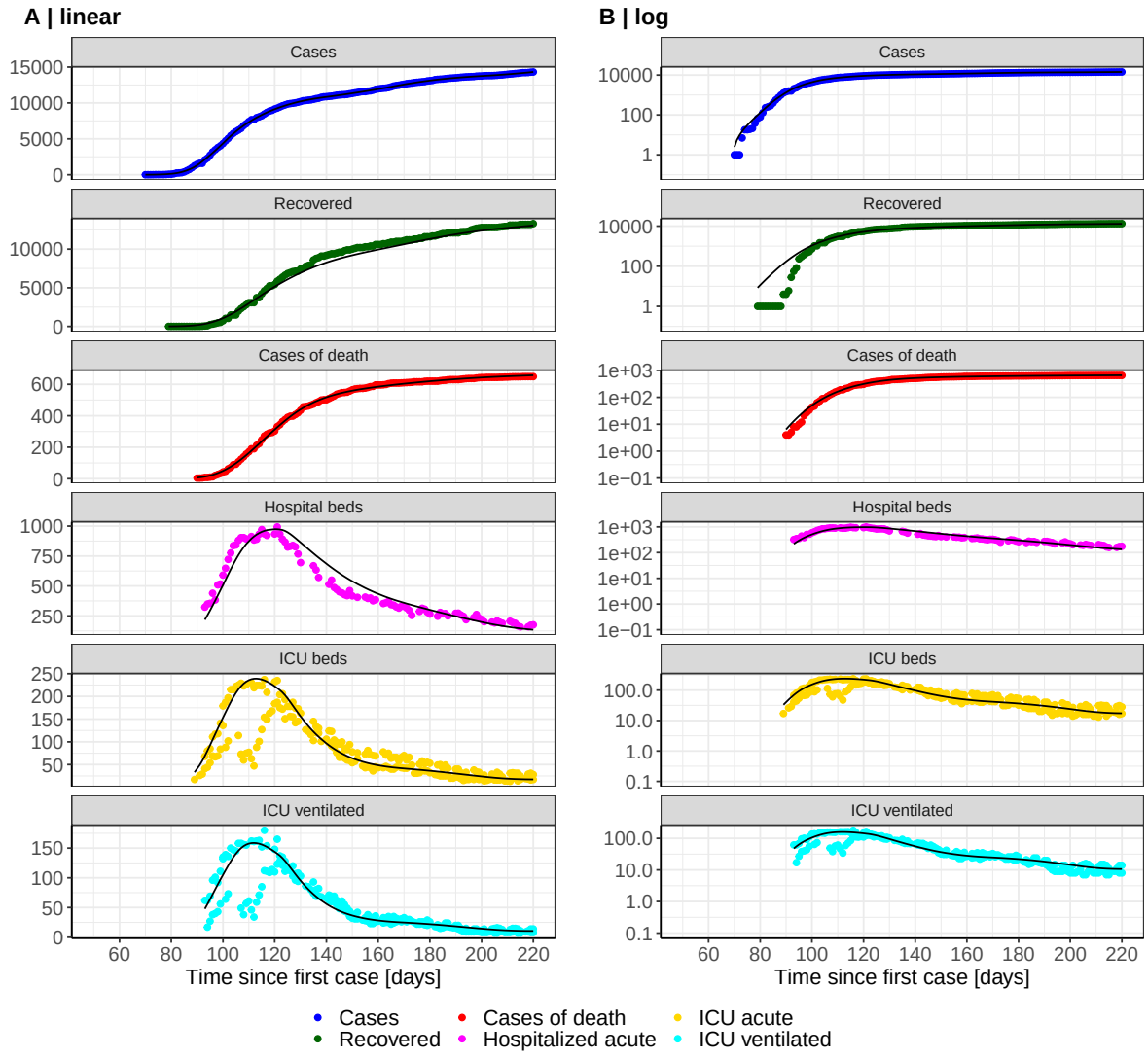


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

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

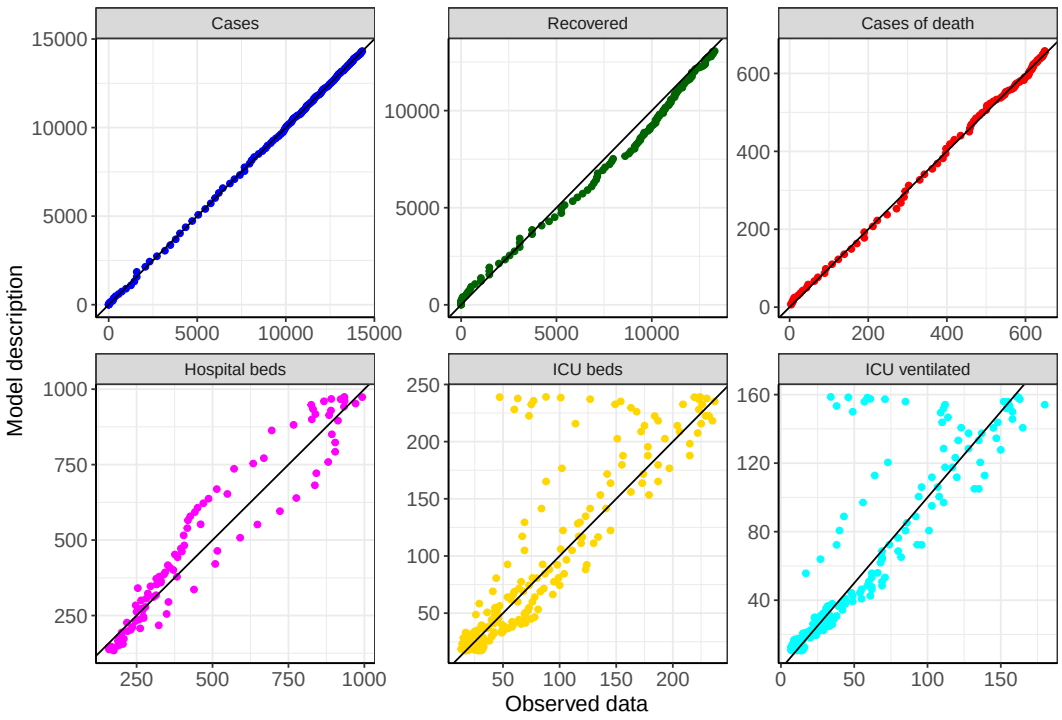


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

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

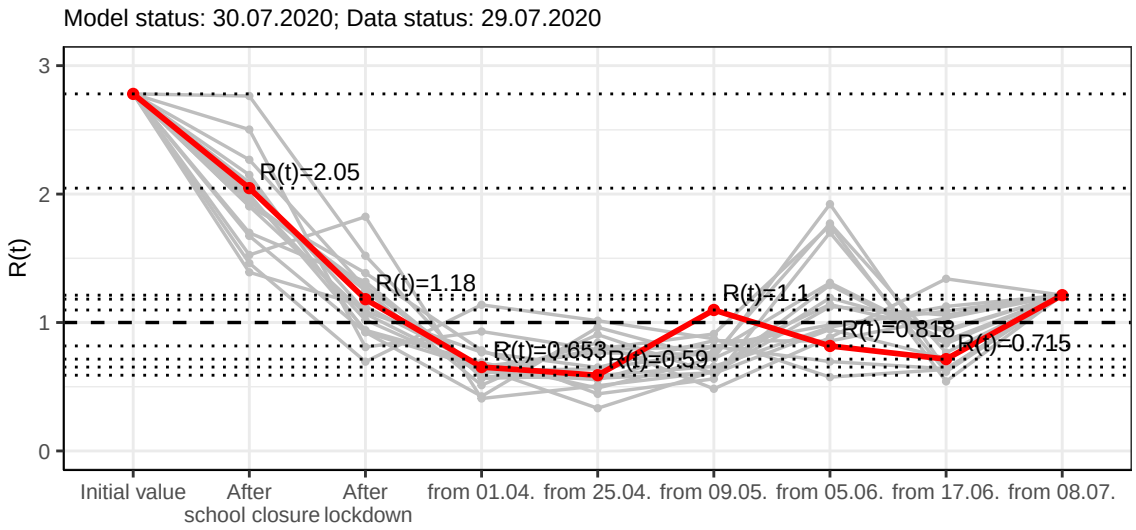


Figure 101: R(t) values before and after the NPIs for Lower Saxony

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

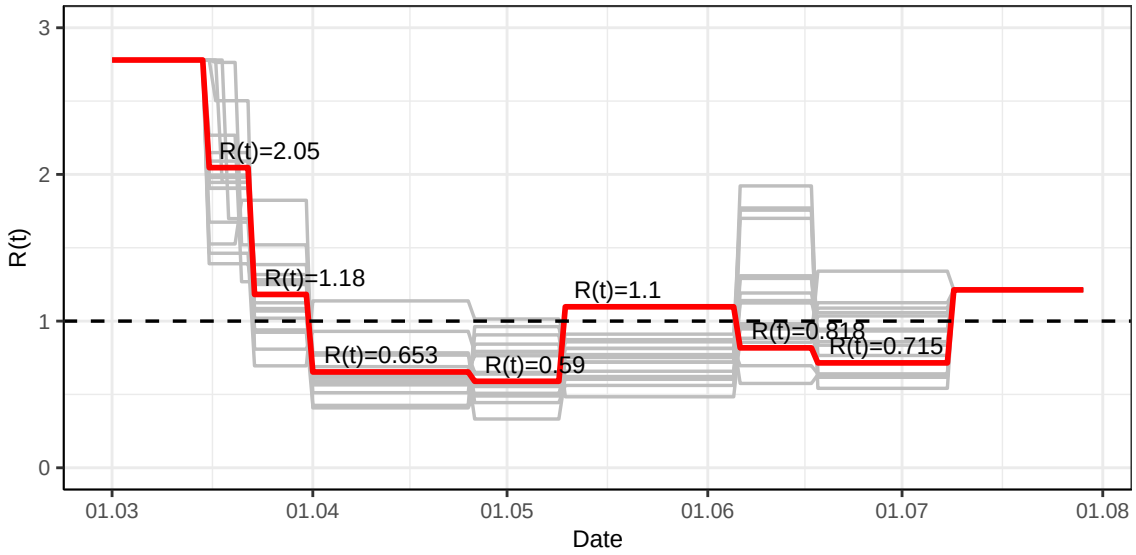


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

10.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

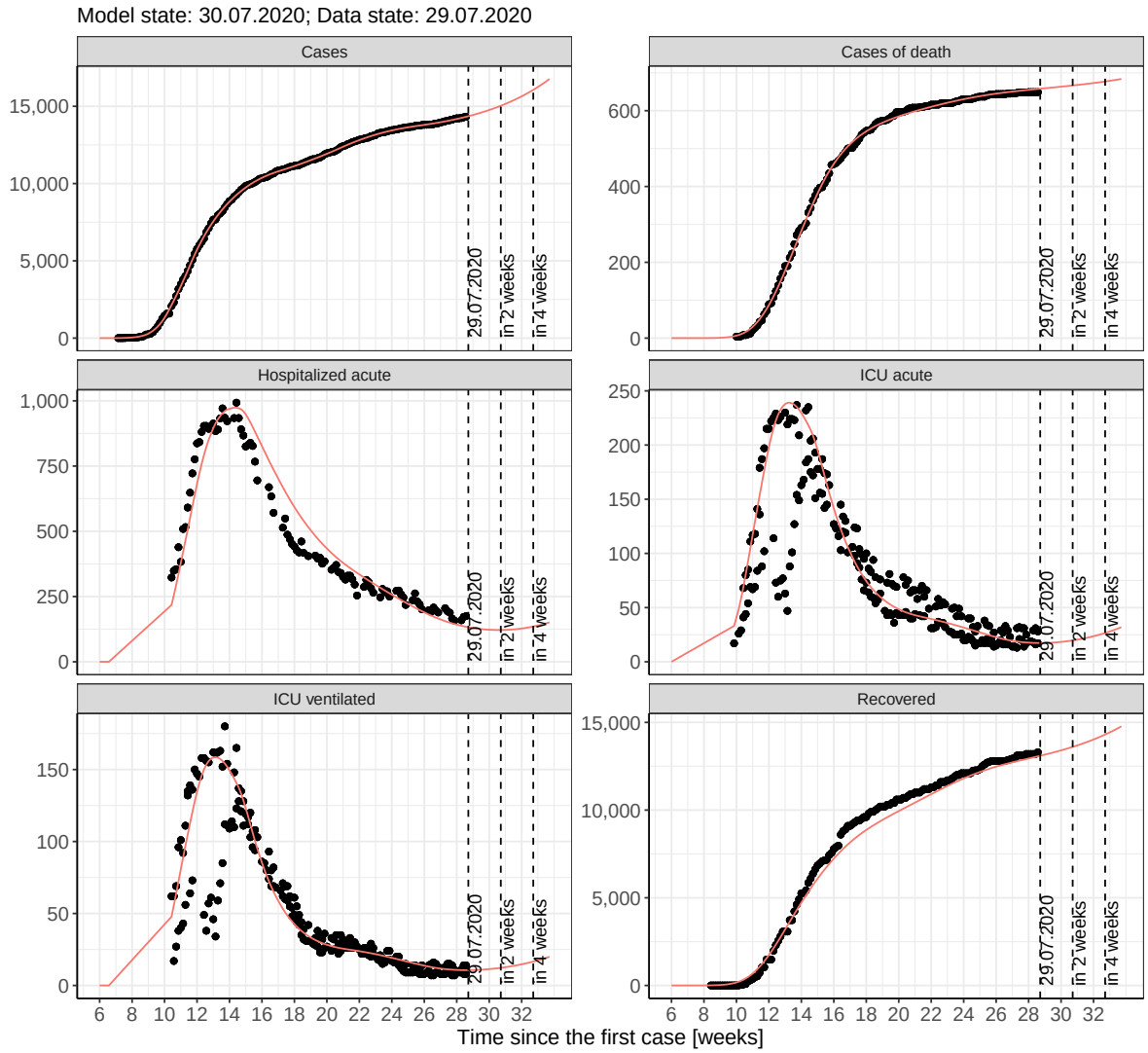


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

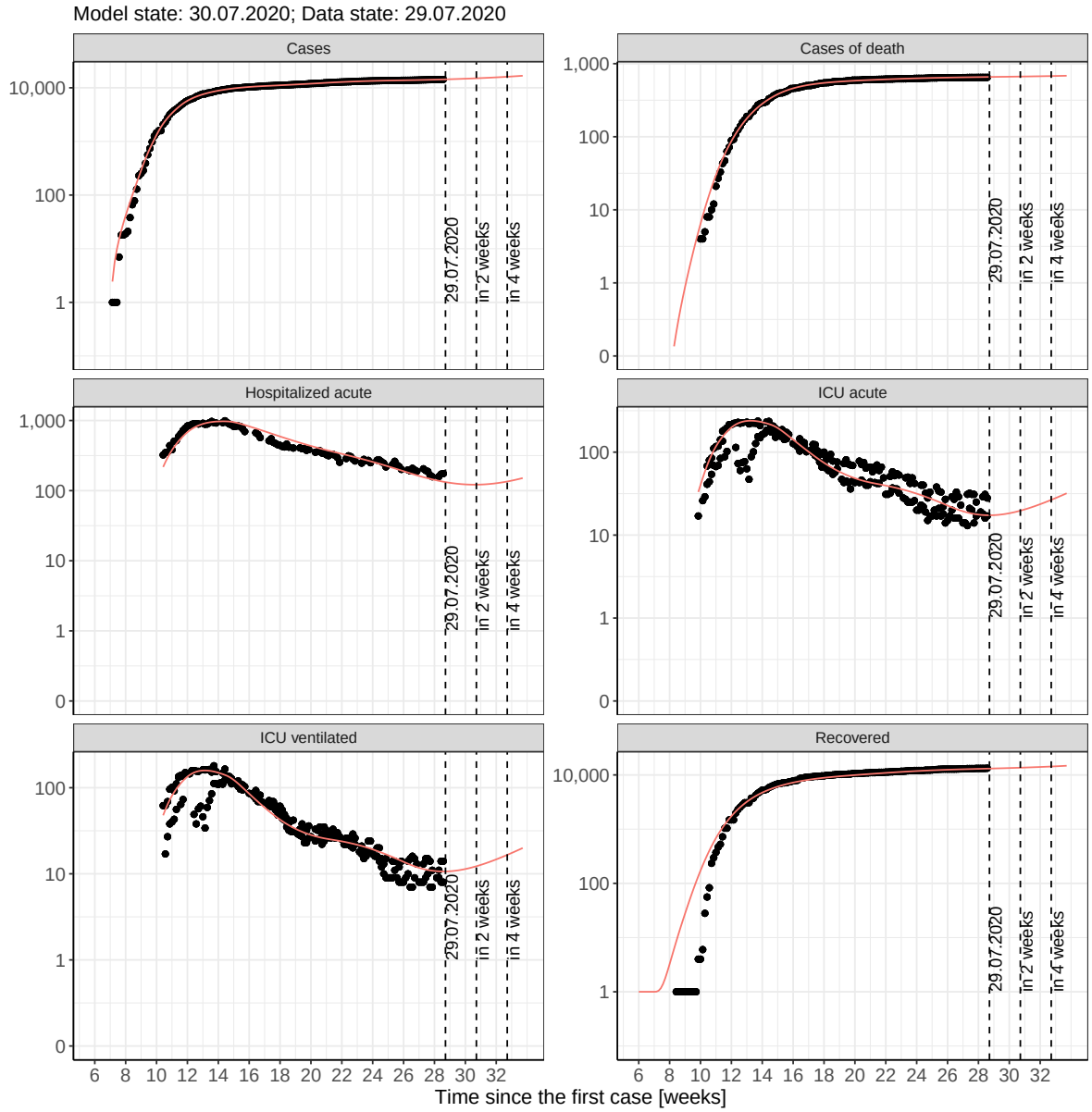


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 105 and 106 represent the model prediction for the next 4 weeks for Lower Saxony on a linear (105) and a semi-logarithmic (106) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

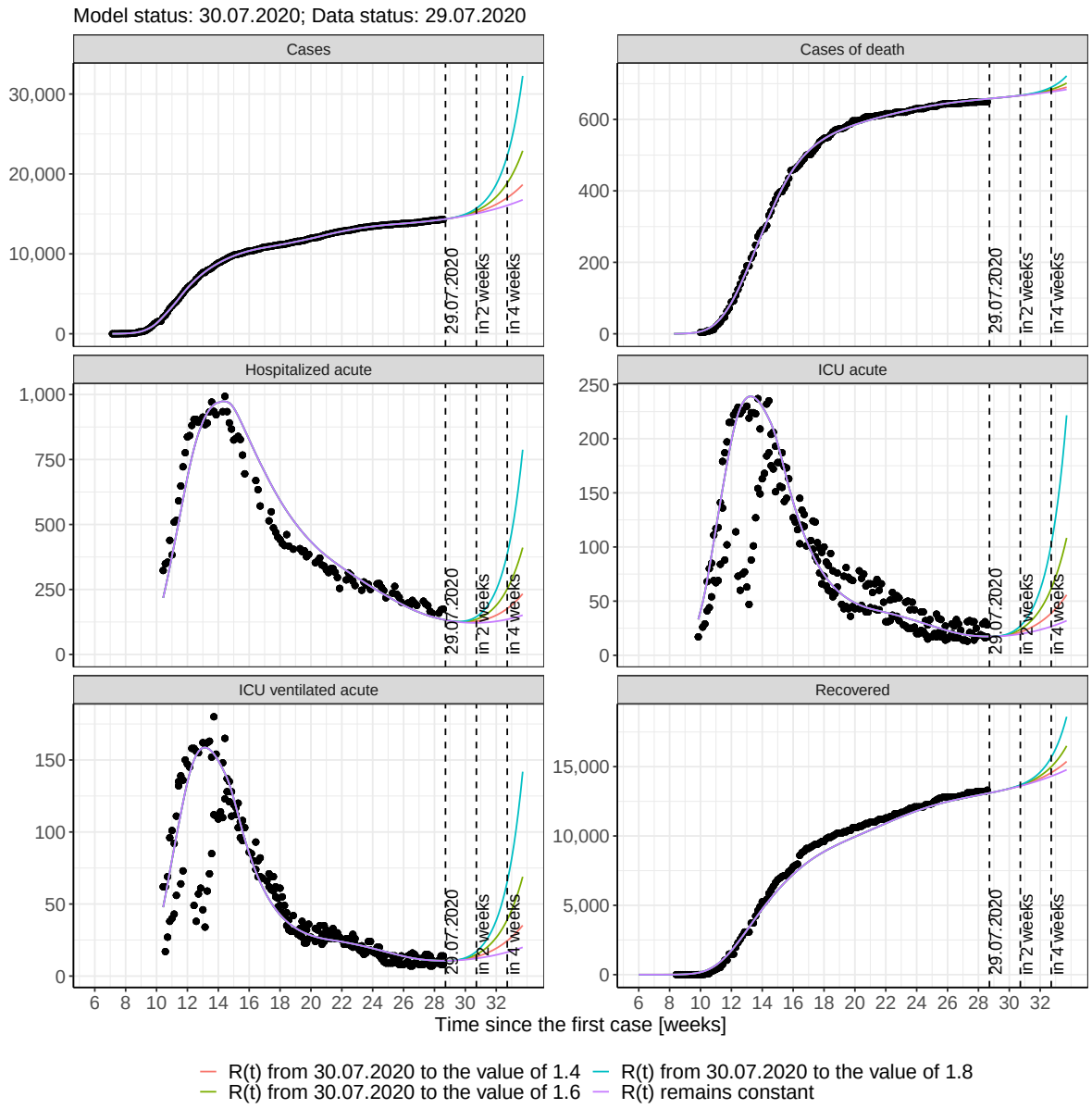


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

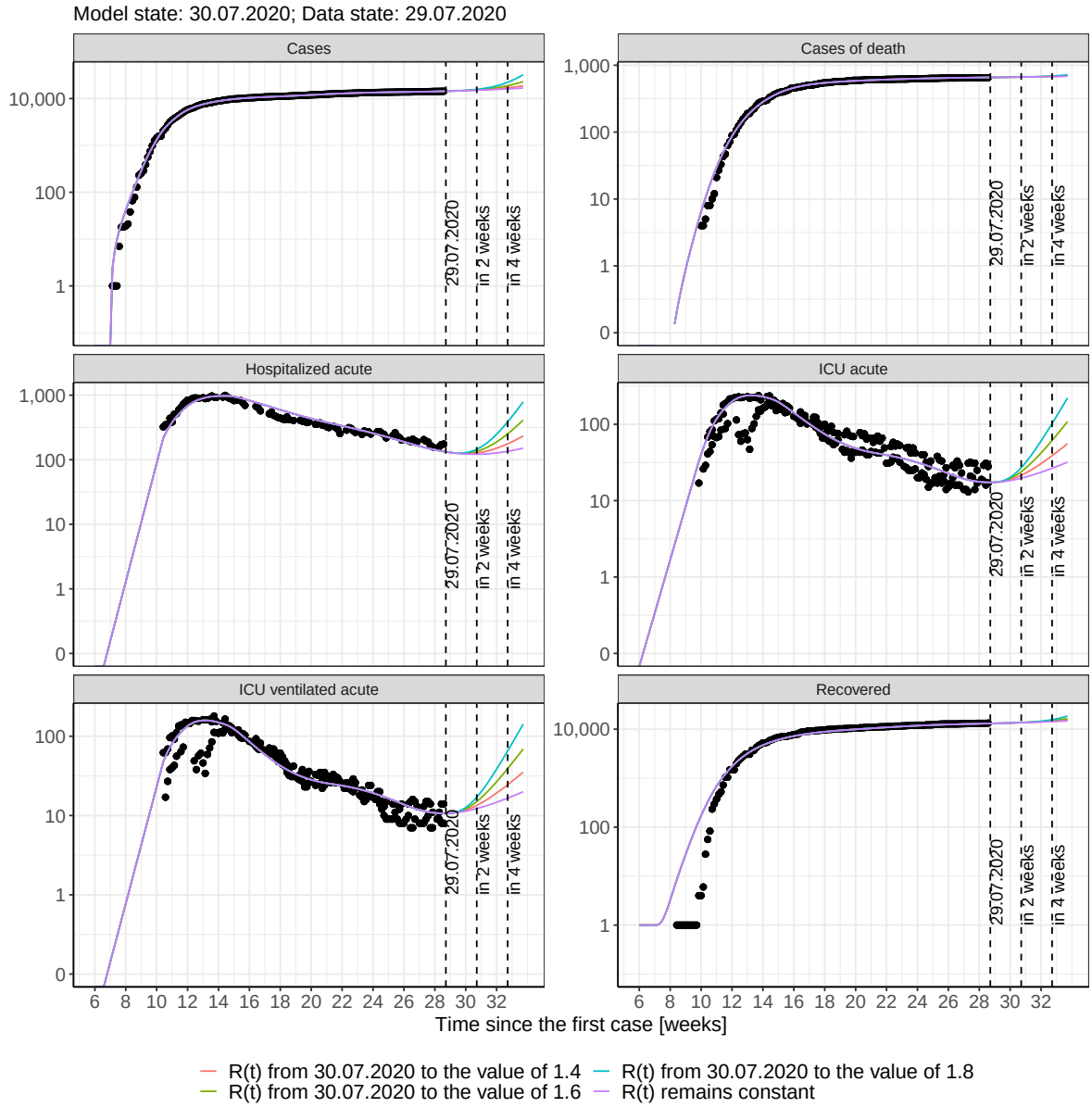


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 107 and 108 represent the model prediction for the next 16 weeks for Lower Saxony on a linear (107) and a semi-logarithmic (108) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

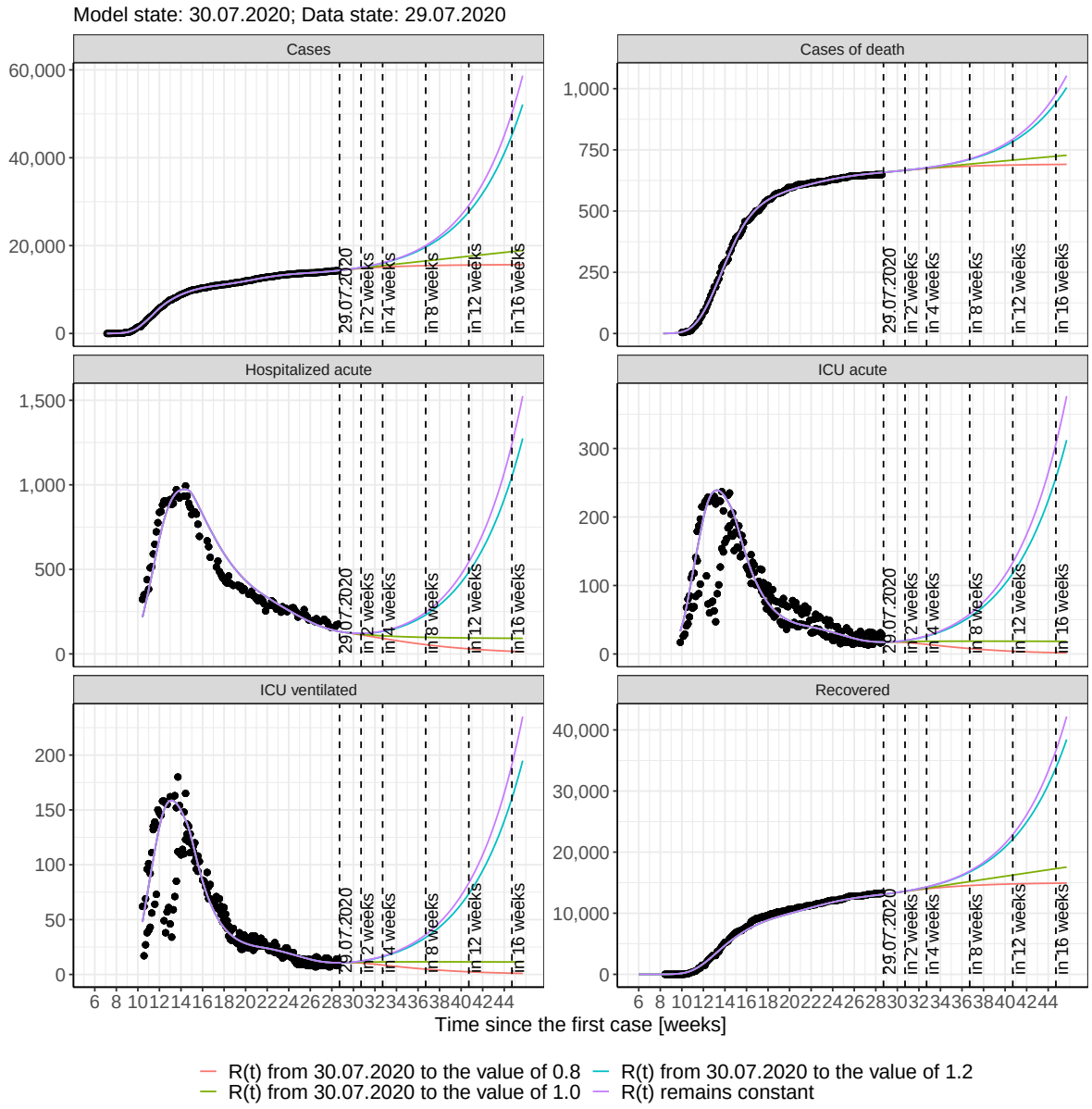


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

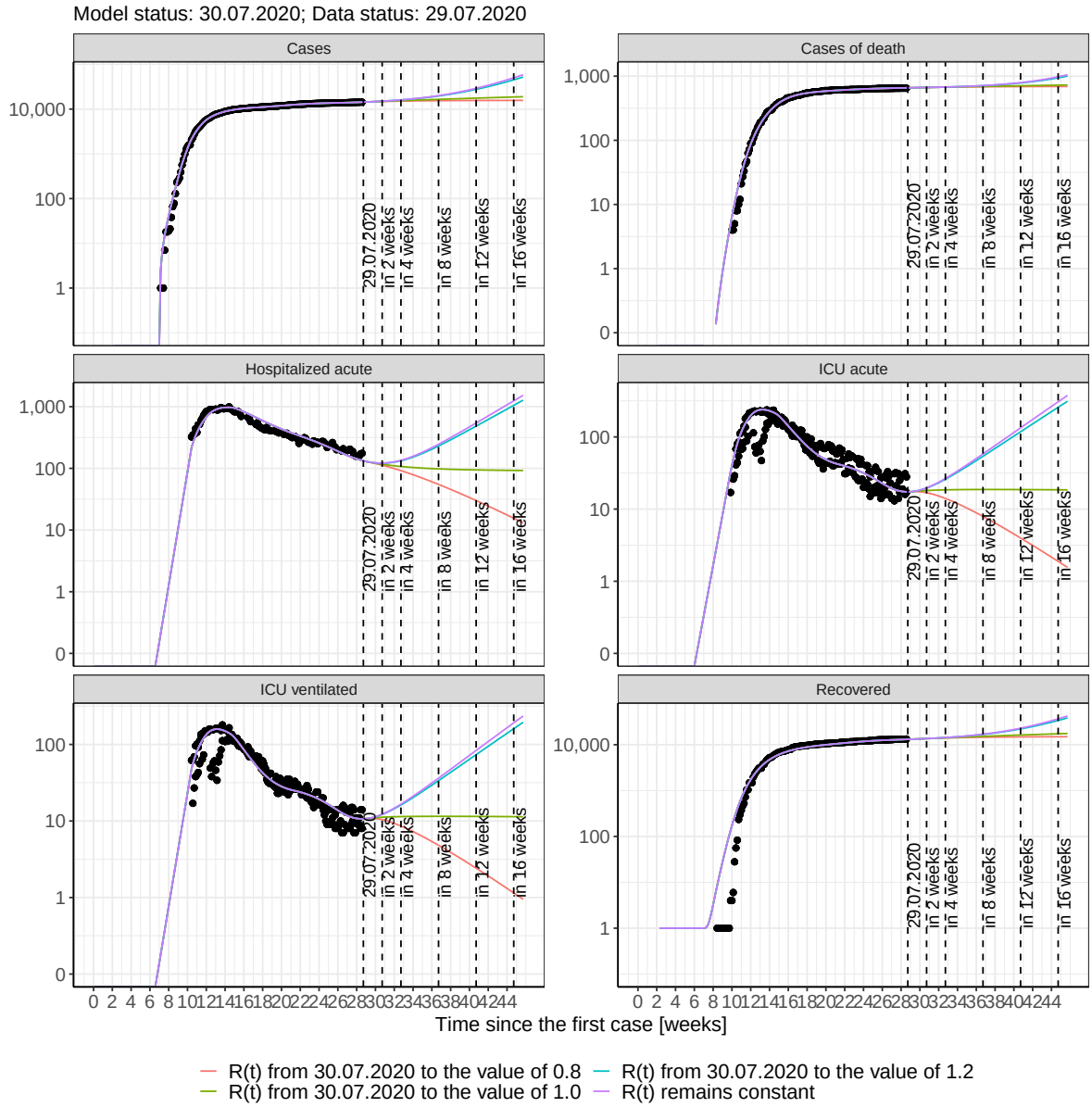


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 37) Model status from 30.07.2020; Data status: 29.07.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	14398	659	13130	131	17	11
31.07.2020	14438	659	13162	129	17	11
01.08.2020	14480	660	13195	128	17	11
02.08.2020	14523	660	13228	127	18	11
03.08.2020	14568	661	13262	126	18	11
04.08.2020	14614	662	13297	125	18	11
05.08.2020	14661	662	13332	124	18	11
06.08.2020	14709	663	13368	123	18	11
07.08.2020	14760	663	13405	123	18	11
08.08.2020	14811	664	13443	122	19	12
09.08.2020	14864	665	13481	122	19	12
10.08.2020	14919	665	13521	122	19	12
11.08.2020	14976	666	13561	122	19	12
12.08.2020	15034	667	13602	122	20	12
13.08.2020	15094	667	13644	122	20	12
14.08.2020	15156	668	13687	122	20	13
15.08.2020	15220	669	13732	123	21	13
16.08.2020	15286	669	13777	123	21	13
17.08.2020	15353	670	13824	124	22	13
18.08.2020	15423	671	13872	124	22	14
19.08.2020	15495	671	13921	125	23	14
20.08.2020	15569	672	13972	126	23	14
21.08.2020	15646	673	14024	128	24	15
22.08.2020	15724	674	14077	129	24	15
23.08.2020	15805	675	14132	130	25	15
24.08.2020	15889	675	14189	132	25	16
25.08.2020	15975	676	14247	133	26	16
26.08.2020	16064	677	14306	135	27	17

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	14397	659	13129	131	17	11
31.07.2020	14434	659	13162	129	17	11
01.08.2020	14470	660	13195	128	17	11
02.08.2020	14505	660	13228	127	17	11
03.08.2020	14539	661	13262	125	17	11
04.08.2020	14572	662	13295	124	17	11
05.08.2020	14604	662	13329	123	17	11
06.08.2020	14636	663	13364	121	17	11
07.08.2020	14666	663	13398	120	17	11
08.08.2020	14695	664	13432	118	17	11
09.08.2020	14724	665	13466	117	17	11
10.08.2020	14752	665	13500	116	17	11
11.08.2020	14779	666	13534	114	17	10
12.08.2020	14805	666	13568	113	17	10
13.08.2020	14831	667	13601	111	17	10
14.08.2020	14856	667	13634	110	17	10
15.08.2020	14880	668	13667	108	16	10
16.08.2020	14903	669	13699	107	16	10
17.08.2020	14926	669	13730	105	16	10
18.08.2020	14948	670	13762	104	16	10
19.08.2020	14970	670	13792	102	16	10
20.08.2020	14991	671	13823	101	15	9
21.08.2020	15011	671	13852	99	15	9
22.08.2020	15031	672	13881	98	15	9
23.08.2020	15050	672	13910	96	15	9
24.08.2020	15069	673	13938	95	15	9
25.08.2020	15087	673	13965	93	14	9
26.08.2020	15104	674	13992	92	14	9

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	14397	659	13129	131	17	11
31.07.2020	14436	659	13162	129	17	11
01.08.2020	14475	660	13195	128	17	11
02.08.2020	14513	660	13228	127	17	11
03.08.2020	14552	661	13262	126	18	11
04.08.2020	14591	662	13296	124	18	11
05.08.2020	14630	662	13331	123	18	11
06.08.2020	14668	663	13366	122	18	11
07.08.2020	14707	663	13401	121	18	11
08.08.2020	14746	664	13437	120	18	11
09.08.2020	14785	665	13473	119	18	11
10.08.2020	14823	665	13509	118	18	11
11.08.2020	14862	666	13546	117	18	11
12.08.2020	14901	666	13583	117	18	11
13.08.2020	14939	667	13620	116	18	11
14.08.2020	14978	668	13657	115	18	11
15.08.2020	15016	668	13694	114	18	11
16.08.2020	15055	669	13732	113	18	11
17.08.2020	15094	669	13770	113	18	11
18.08.2020	15132	670	13808	112	18	11
19.08.2020	15171	671	13846	111	18	11
20.08.2020	15210	671	13884	111	18	11
21.08.2020	15248	672	13922	110	18	11
22.08.2020	15287	673	13960	109	18	11
23.08.2020	15325	673	13998	109	18	11
24.08.2020	15364	674	14036	108	18	11
25.08.2020	15402	674	14075	108	18	11
26.08.2020	15441	675	14113	107	18	11

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	14398	659	13130	131	17	11
31.07.2020	14438	659	13162	129	17	11
01.08.2020	14480	660	13195	128	17	11
02.08.2020	14523	660	13228	127	18	11
03.08.2020	14567	661	13262	126	18	11
04.08.2020	14612	662	13297	125	18	11
05.08.2020	14659	662	13332	124	18	11
06.08.2020	14707	663	13368	123	18	11
07.08.2020	14756	663	13405	123	18	11
08.08.2020	14807	664	13442	122	19	11
09.08.2020	14859	665	13481	122	19	12
10.08.2020	14913	665	13520	122	19	12
11.08.2020	14968	666	13560	121	19	12
12.08.2020	15025	667	13601	121	20	12
13.08.2020	15083	667	13643	121	20	12
14.08.2020	15143	668	13685	122	20	13
15.08.2020	15205	669	13729	122	21	13
16.08.2020	15269	669	13774	122	21	13
17.08.2020	15334	670	13820	123	21	13
18.08.2020	15402	671	13868	124	22	14
19.08.2020	15471	671	13916	124	22	14
20.08.2020	15542	672	13966	125	23	14
21.08.2020	15616	673	14017	126	23	14
22.08.2020	15691	674	14069	127	24	15
23.08.2020	15769	674	14122	129	24	15
24.08.2020	15848	675	14177	130	25	15
25.08.2020	15930	676	14234	131	25	16
26.08.2020	16015	677	14292	133	26	16

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

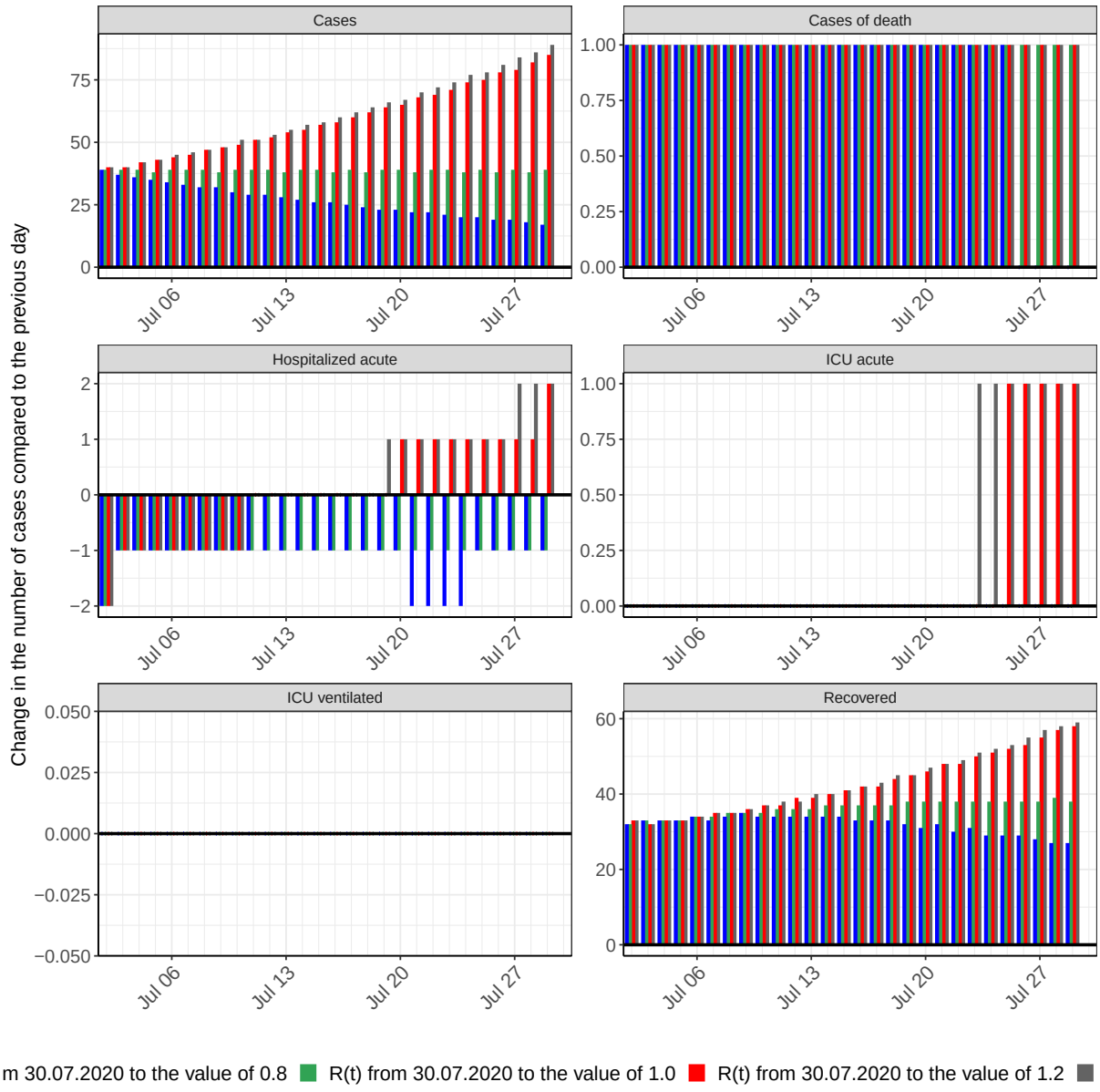


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

11 North Rhine-Westphalia

11.1 Model description

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

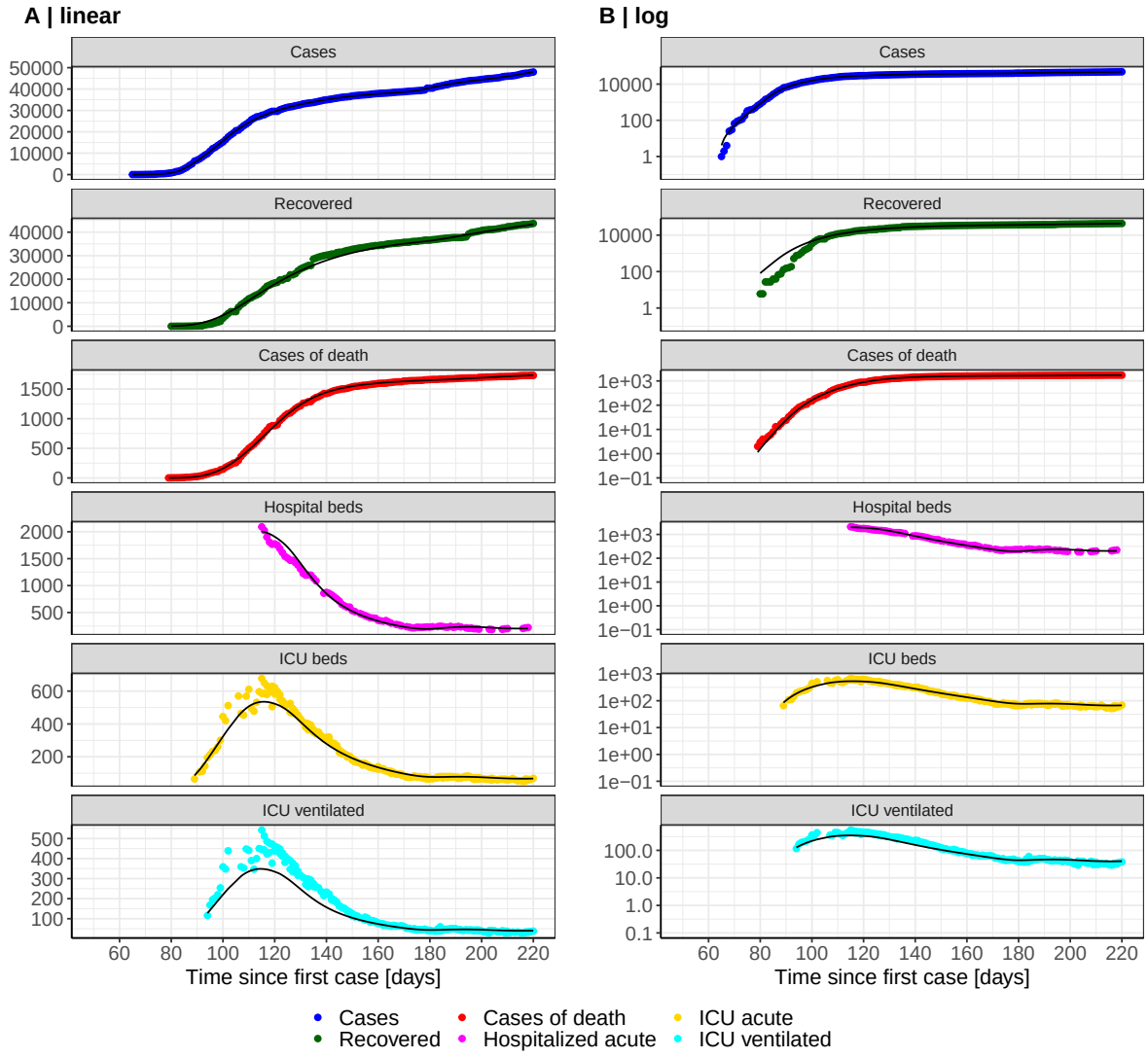


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

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

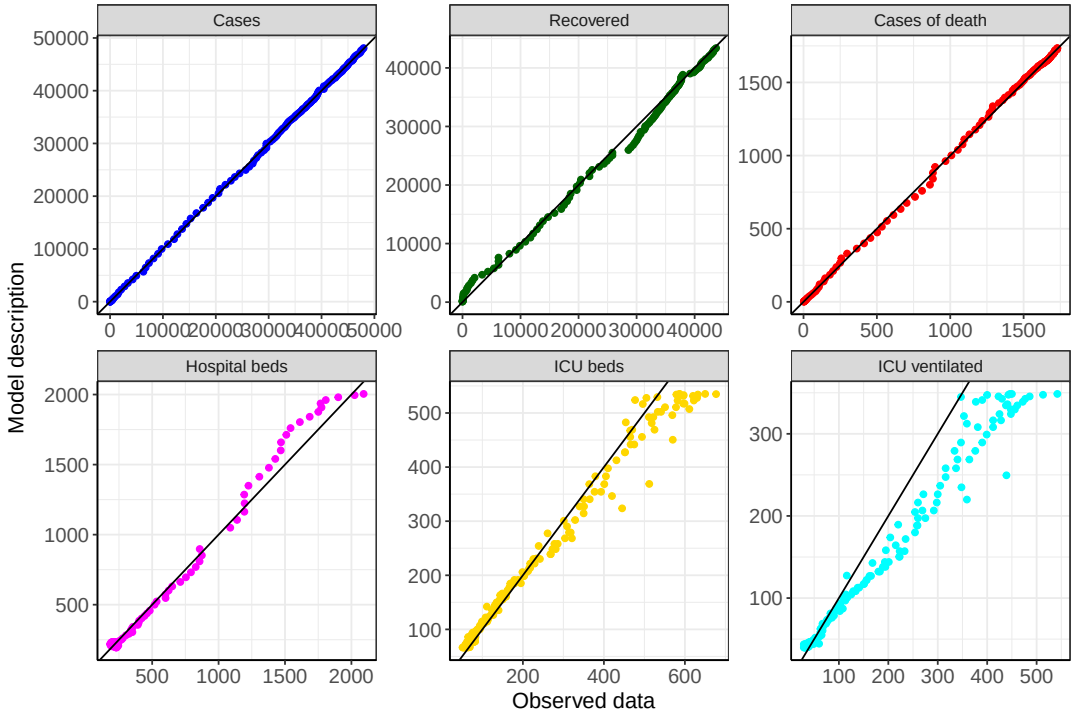


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

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

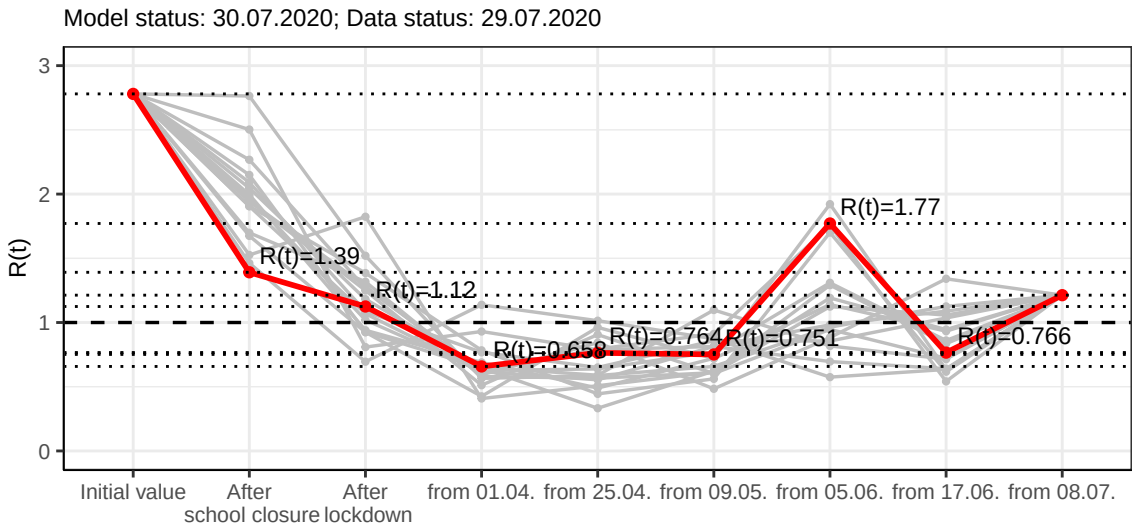


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

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

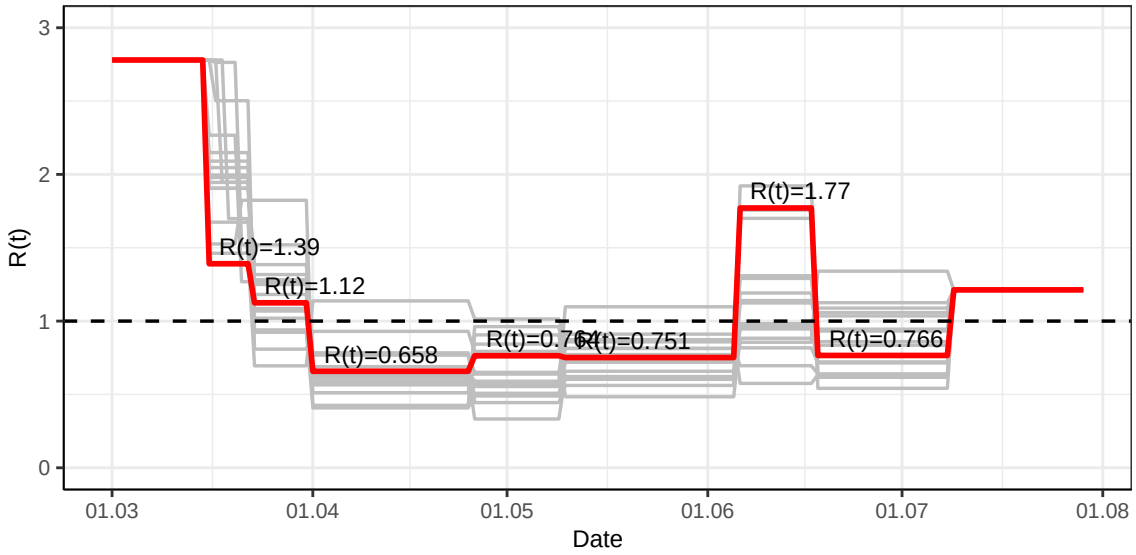


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

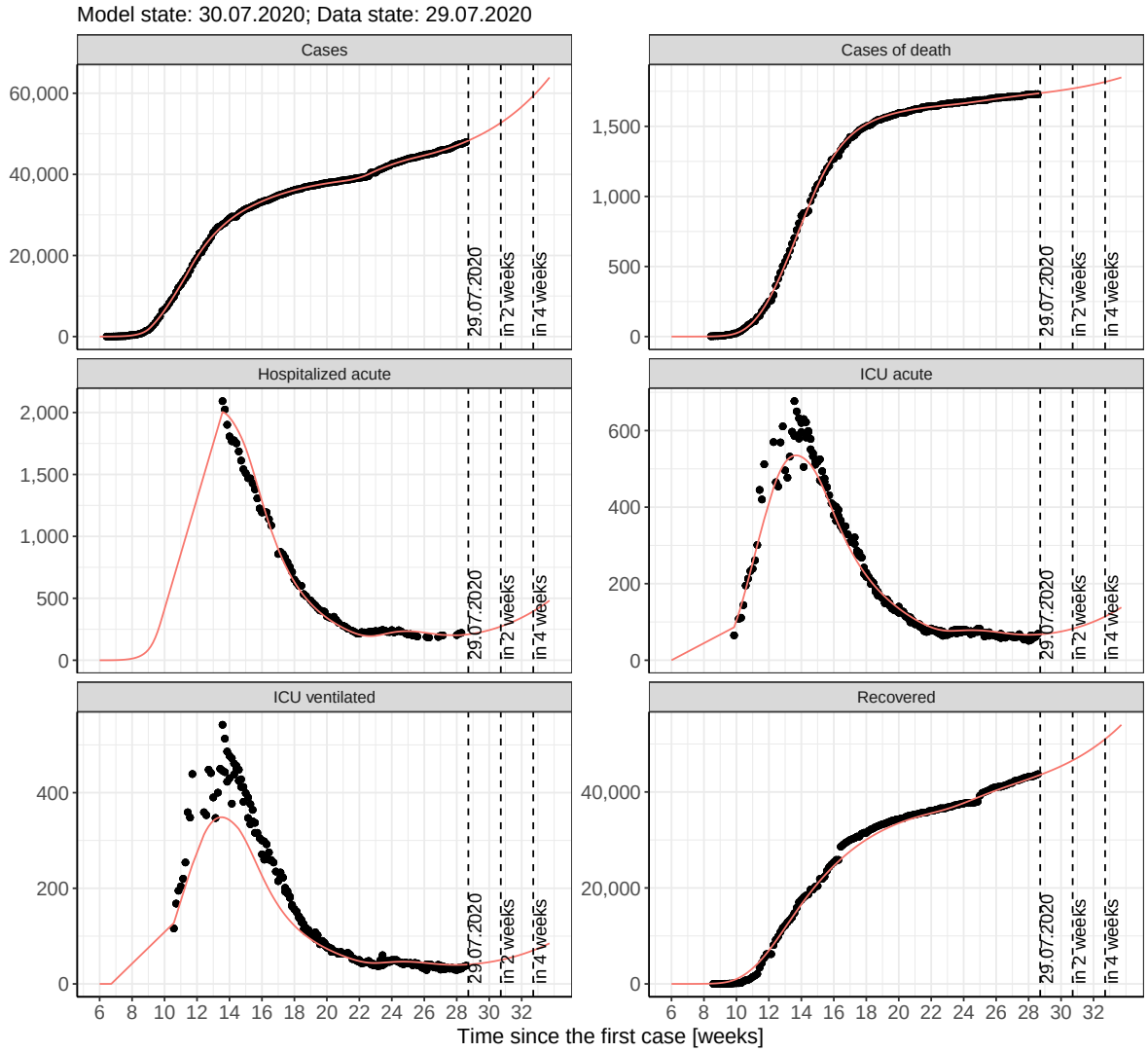


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model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

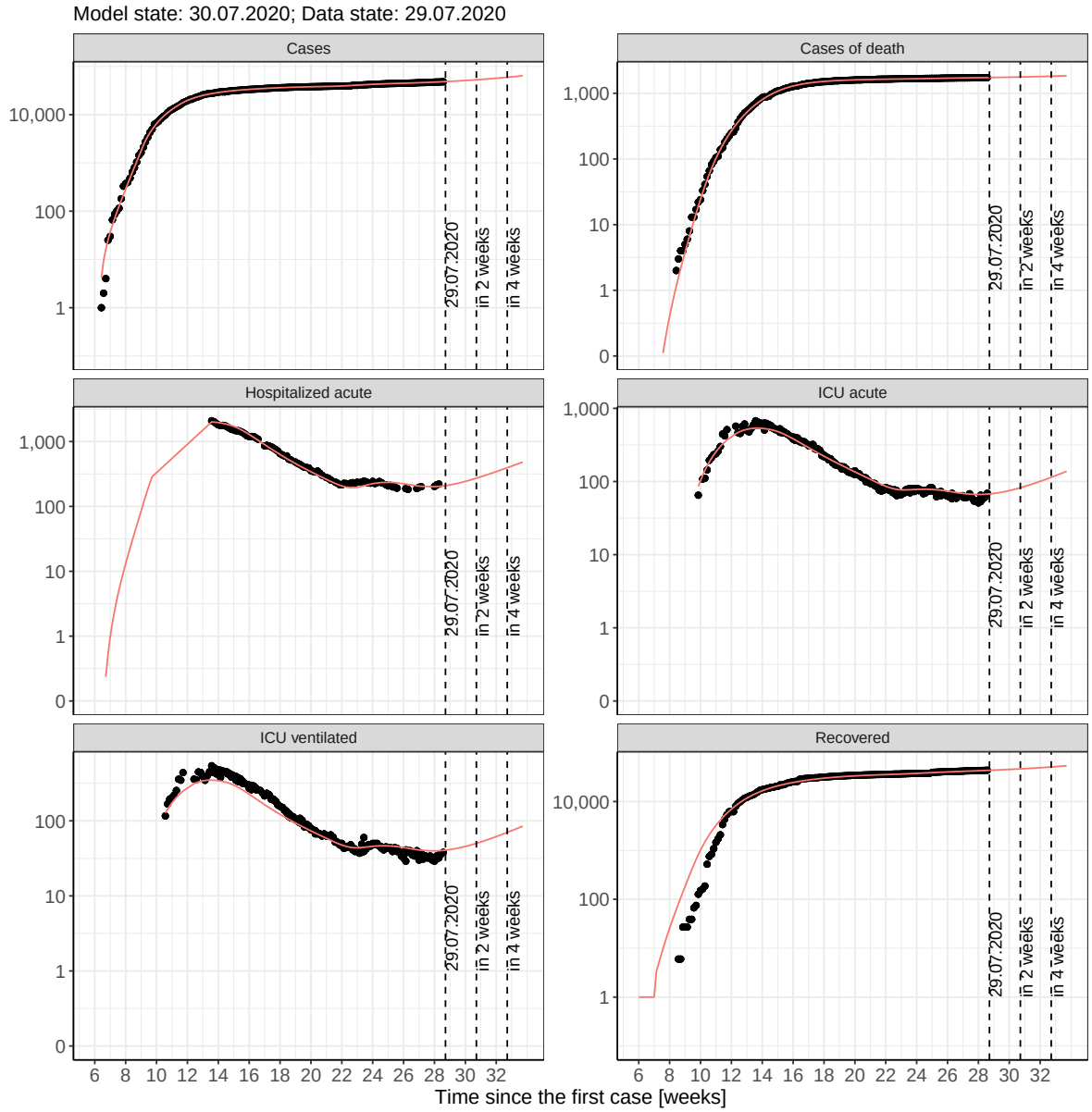


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model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

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 116 and 117 represent the model prediction for the next 4 weeks for North Rhine-Westphalia on a linear (116) and a semi-logarithmic (117) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

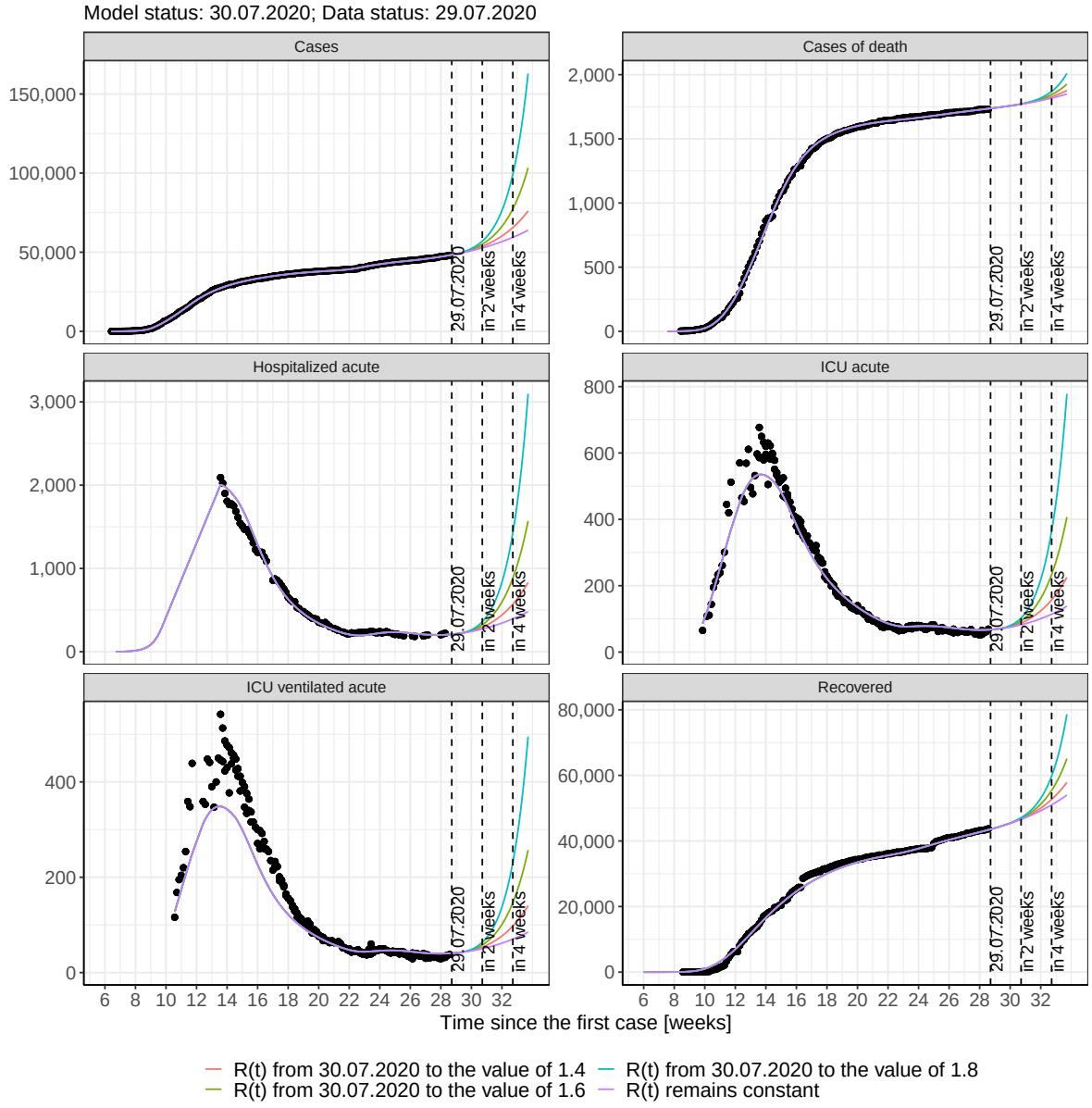


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

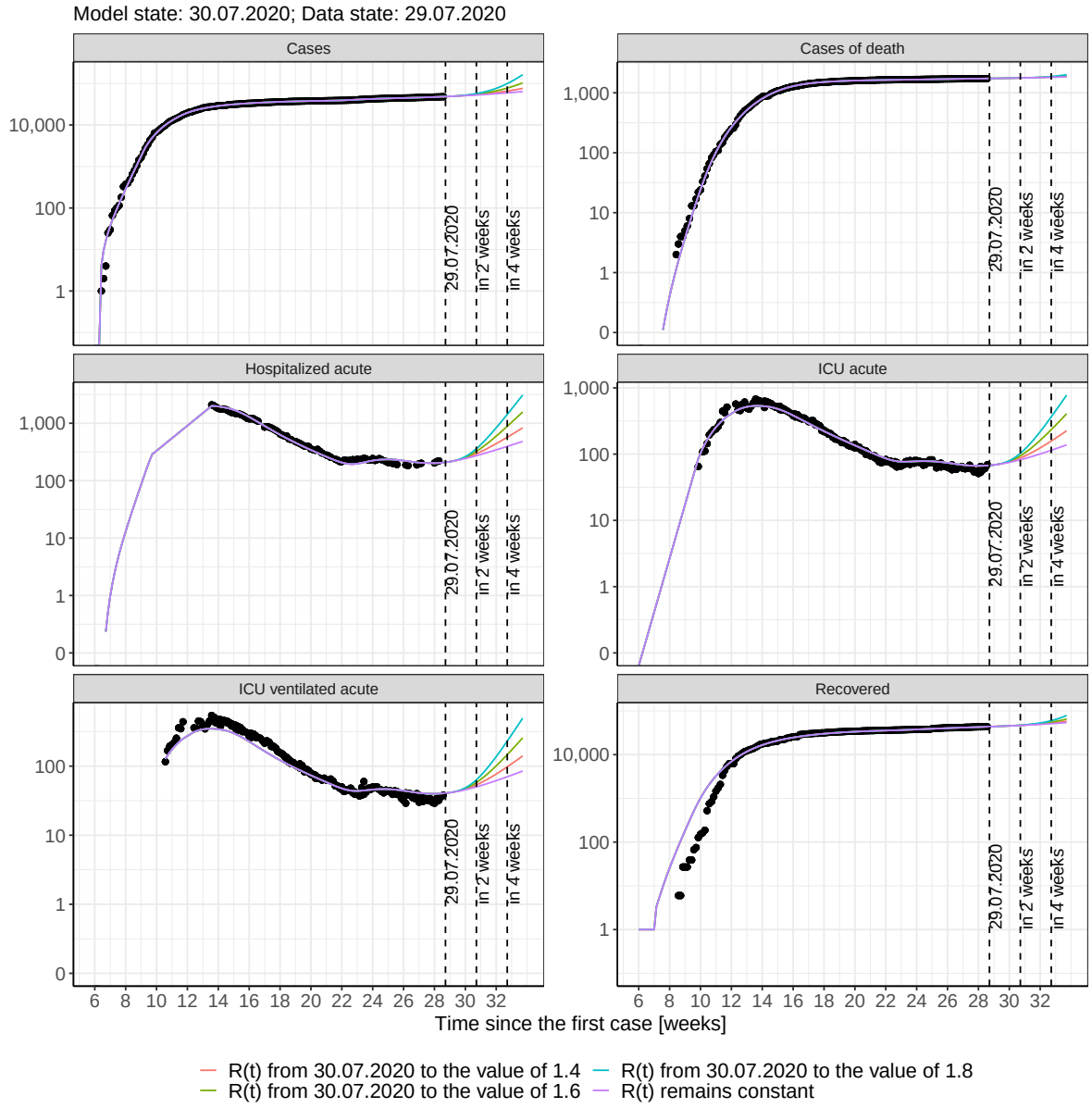


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 118 and 119 represent the model prediction for the next 16 weeks for North Rhine-Westphalia on a linear (118) and a semi-logarithmic (119) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

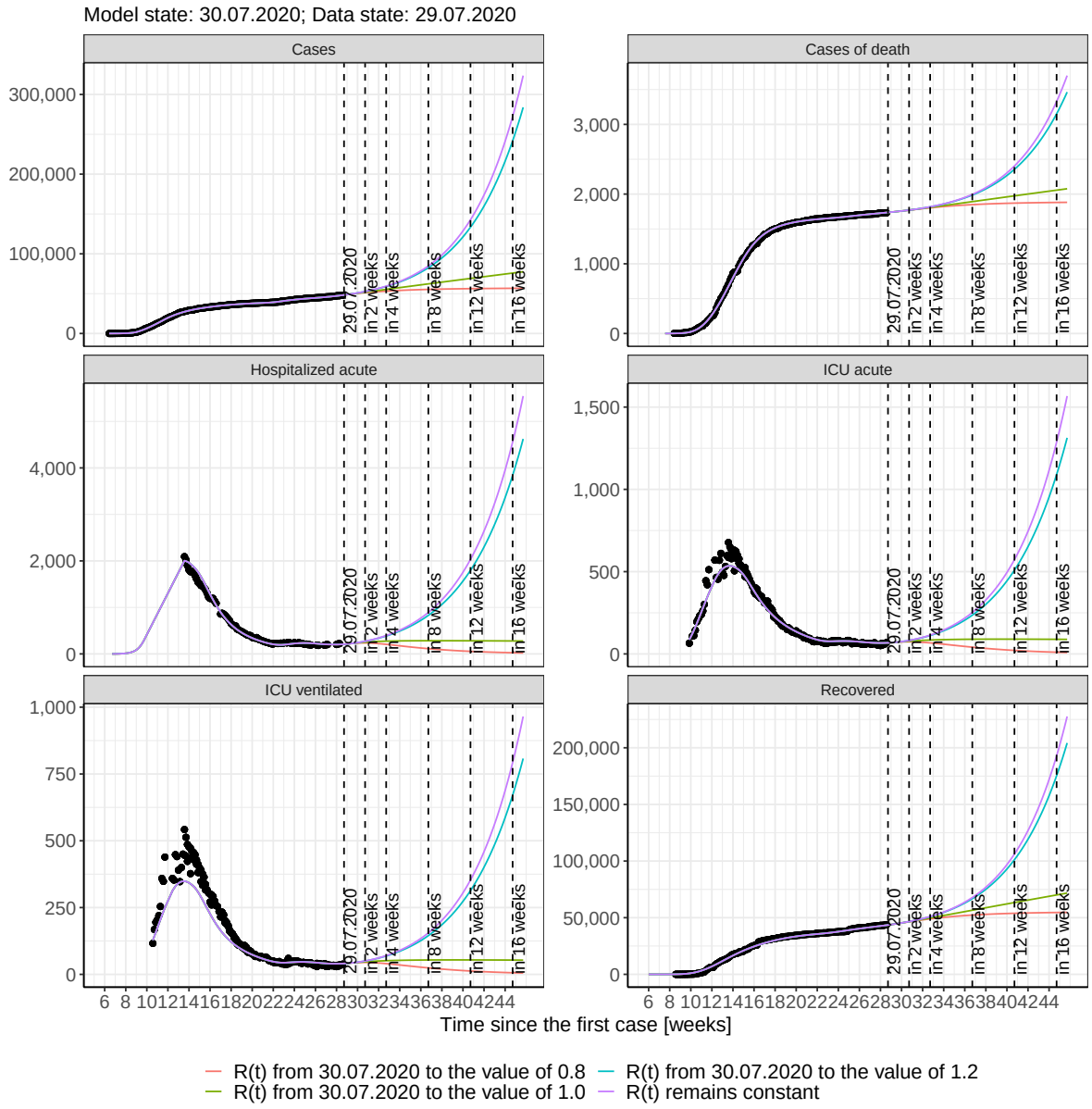


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

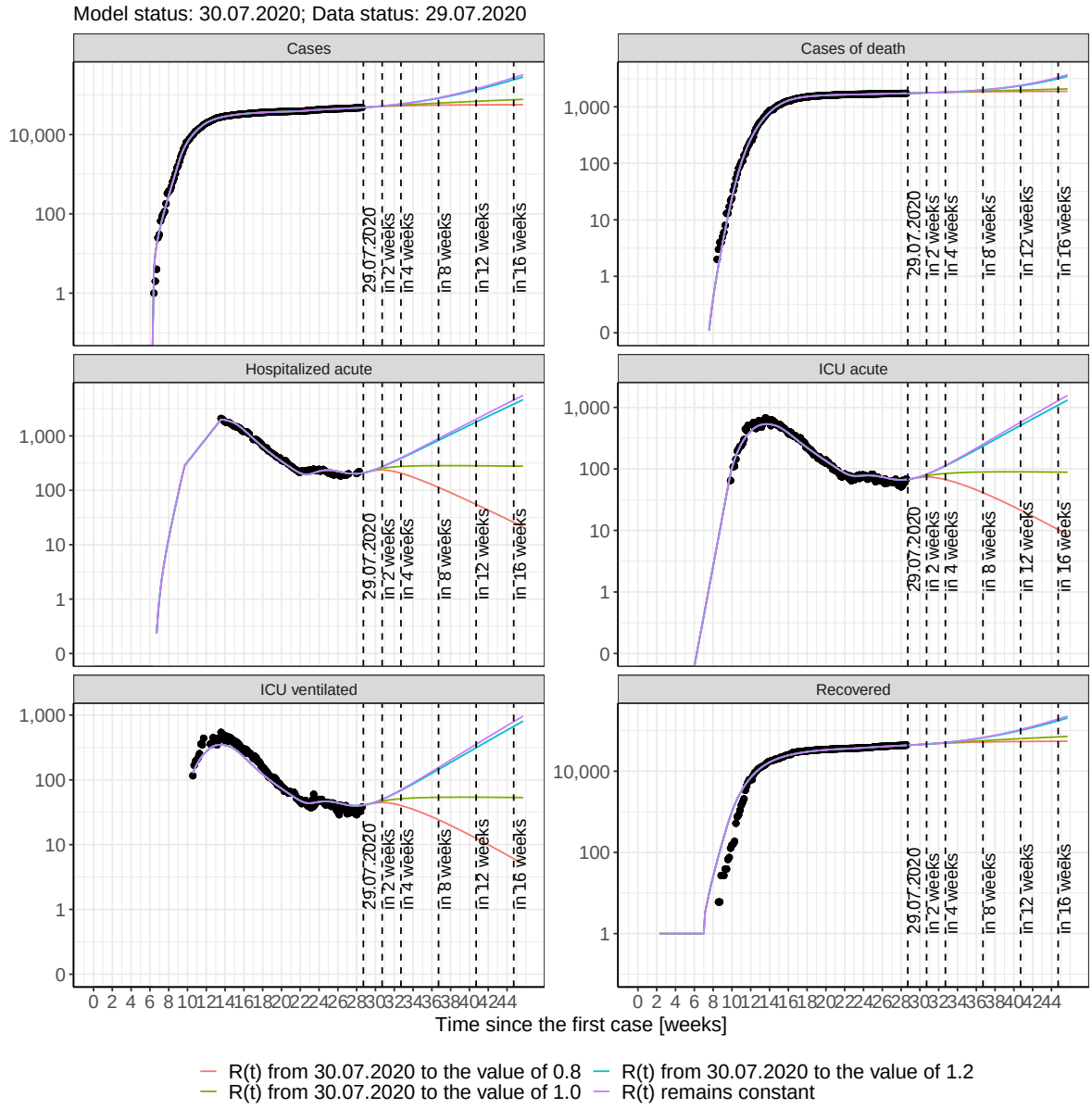


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 41) Model status from 30.07.2020; Data status: 29.07.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	48584	1739	43751	212	68	41
31.07.2020	48848	1741	43940	214	69	41
01.08.2020	49120	1743	44132	218	69	42
02.08.2020	49400	1746	44328	221	70	42
03.08.2020	49688	1748	44530	225	71	43
04.08.2020	49985	1750	44735	229	72	43
05.08.2020	50291	1752	44946	233	73	44
06.08.2020	50607	1755	45163	238	74	45
07.08.2020	50932	1757	45384	243	75	46
08.08.2020	51267	1760	45612	248	76	46
09.08.2020	51612	1762	45846	254	78	47
10.08.2020	51967	1765	46086	260	79	48
11.08.2020	52334	1767	46332	266	81	49
12.08.2020	52711	1770	46586	272	82	50
13.08.2020	53100	1773	46847	279	84	51
14.08.2020	53501	1776	47115	286	86	52
15.08.2020	53914	1779	47390	294	88	53
16.08.2020	54339	1782	47674	301	89	55
17.08.2020	54777	1785	47966	309	92	56
18.08.2020	55229	1788	48266	317	94	57
19.08.2020	55694	1791	48575	326	96	59
20.08.2020	56174	1795	48894	335	98	60
21.08.2020	56667	1798	49221	344	101	62
22.08.2020	57176	1802	49558	353	103	63
23.08.2020	57700	1806	49906	363	106	65
24.08.2020	58241	1809	50263	373	108	67
25.08.2020	58797	1813	50631	384	111	68
26.08.2020	59370	1817	51011	395	114	70

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	48577	1739	43751	212	68	41
31.07.2020	48818	1741	43939	214	69	41
01.08.2020	49053	1743	44131	217	69	42
02.08.2020	49280	1746	44326	220	70	42
03.08.2020	49502	1748	44524	223	71	43
04.08.2020	49717	1750	44724	226	71	43
05.08.2020	49925	1752	44927	229	72	43
06.08.2020	50128	1755	45131	231	72	44
07.08.2020	50325	1757	45336	233	73	44
08.08.2020	50517	1760	45542	235	73	44
09.08.2020	50703	1762	45748	236	73	44
10.08.2020	50884	1764	45954	237	74	45
11.08.2020	51059	1767	46159	237	74	45
12.08.2020	51230	1769	46364	237	74	45
13.08.2020	51396	1772	46567	236	74	45
14.08.2020	51557	1774	46768	235	74	45
15.08.2020	51713	1777	46967	234	73	44
16.08.2020	51865	1779	47164	233	73	44
17.08.2020	52012	1782	47359	231	73	44
18.08.2020	52156	1784	47550	229	72	44
19.08.2020	52295	1787	47739	227	72	43
20.08.2020	52431	1789	47925	224	71	43
21.08.2020	52562	1791	48108	222	71	43
22.08.2020	52690	1794	48288	219	70	42
23.08.2020	52814	1796	48465	216	69	42
24.08.2020	52934	1798	48638	213	69	41
25.08.2020	53052	1801	48807	209	68	41
26.08.2020	53165	1803	48973	206	67	40

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	48580	1739	43751	212	68	41
31.07.2020	48832	1741	43940	214	69	41
01.08.2020	49084	1743	44131	218	69	42
02.08.2020	49336	1746	44327	221	70	42
03.08.2020	49587	1748	44526	224	71	43
04.08.2020	49839	1750	44729	228	71	43
05.08.2020	50090	1752	44936	231	72	44
06.08.2020	50341	1755	45145	234	73	44
07.08.2020	50592	1757	45358	238	74	45
08.08.2020	50843	1760	45574	241	75	45
09.08.2020	51094	1762	45792	244	75	46
10.08.2020	51345	1764	46013	247	76	46
11.08.2020	51596	1767	46236	250	77	47
12.08.2020	51846	1770	46461	252	77	47
13.08.2020	52097	1772	46688	255	78	47
14.08.2020	52347	1775	46917	257	79	48
15.08.2020	52597	1778	47148	259	79	48
16.08.2020	52848	1780	47380	261	80	49
17.08.2020	53098	1783	47613	263	80	49
18.08.2020	53348	1786	47848	265	81	49
19.08.2020	53597	1789	48084	266	81	49
20.08.2020	53847	1792	48321	268	82	50
21.08.2020	54097	1794	48558	269	82	50
22.08.2020	54346	1797	48797	270	83	50
23.08.2020	54596	1800	49036	271	83	50
24.08.2020	54845	1803	49276	272	84	51
25.08.2020	55094	1806	49517	273	84	51
26.08.2020	55343	1809	49758	274	84	51

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	48584	1739	43751	212	68	41
31.07.2020	48847	1741	43940	214	69	41
01.08.2020	49117	1743	44132	218	69	42
02.08.2020	49395	1746	44328	221	70	42
03.08.2020	49681	1748	44529	225	71	43
04.08.2020	49976	1750	44735	229	72	43
05.08.2020	50278	1752	44946	233	73	44
06.08.2020	50589	1755	45161	238	74	45
07.08.2020	50909	1757	45383	243	75	46
08.08.2020	51238	1760	45610	248	76	46
09.08.2020	51577	1762	45842	253	78	47
10.08.2020	51925	1765	46081	259	79	48
11.08.2020	52283	1767	46326	265	80	49
12.08.2020	52651	1770	46578	271	82	50
13.08.2020	53030	1773	46836	277	83	51
14.08.2020	53420	1776	47101	284	85	52
15.08.2020	53820	1779	47374	291	87	53
16.08.2020	54232	1782	47654	298	89	54
17.08.2020	54656	1785	47942	306	91	56
18.08.2020	55091	1788	48237	314	93	57
19.08.2020	55539	1791	48541	322	95	58
20.08.2020	56000	1795	48853	330	97	59
21.08.2020	56474	1798	49174	338	99	61
22.08.2020	56961	1802	49504	347	102	62
23.08.2020	57463	1805	49843	356	104	64
24.08.2020	57978	1809	50192	366	107	65
25.08.2020	58508	1813	50550	376	109	67
26.08.2020	59053	1817	50918	386	112	69

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

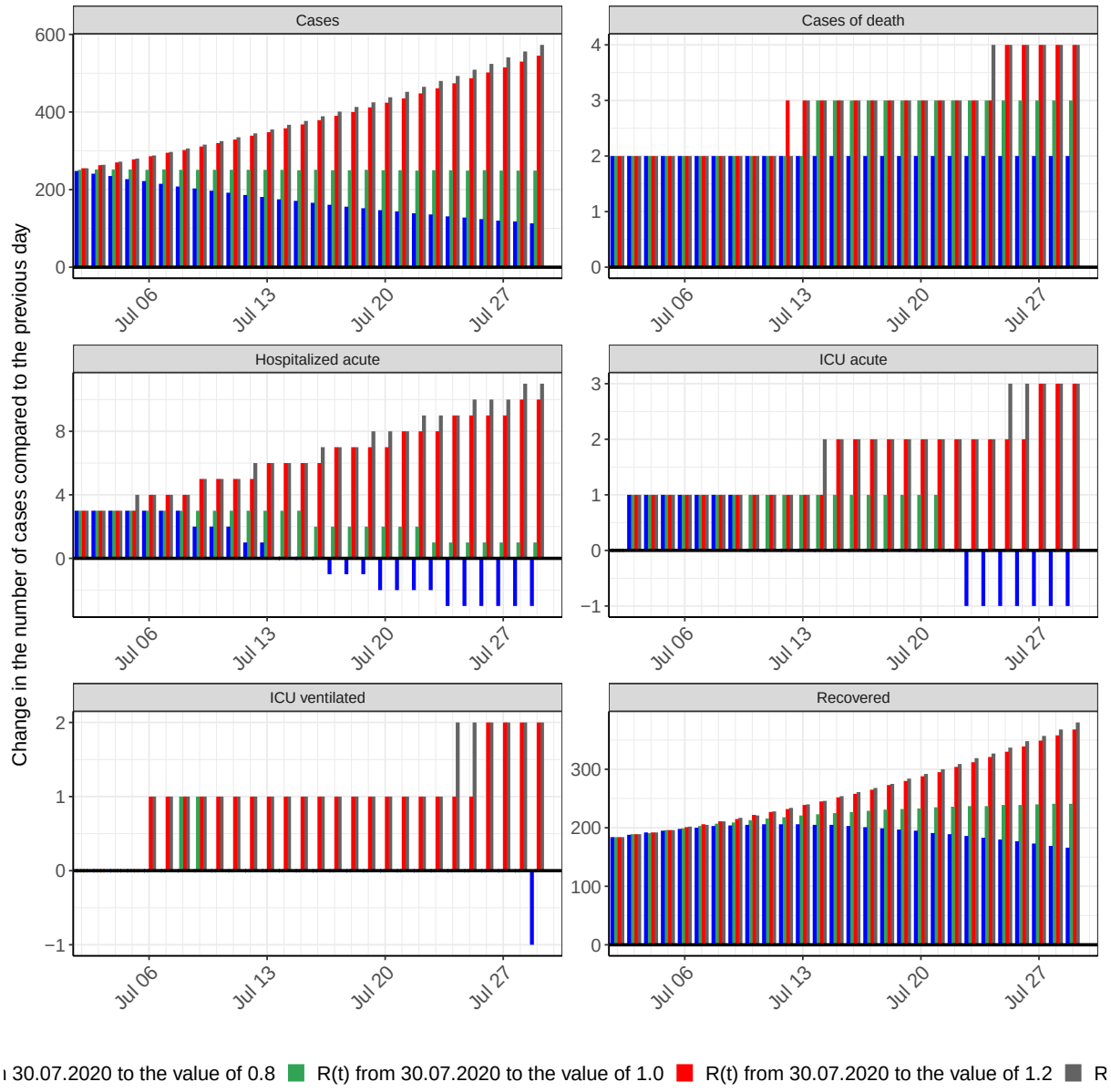


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

12 Rhineland-Palatinate

12.1 Model description

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

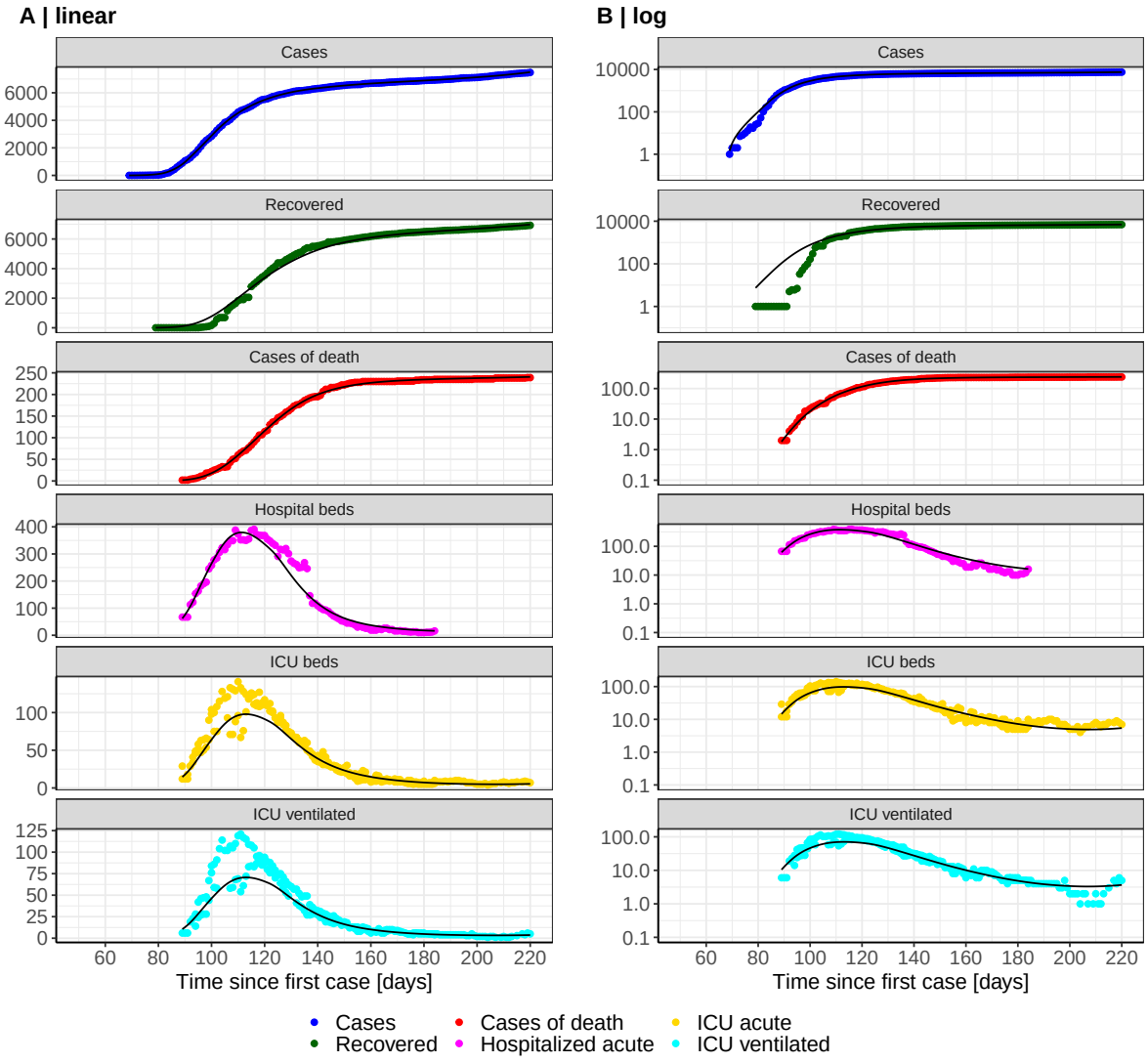


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

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

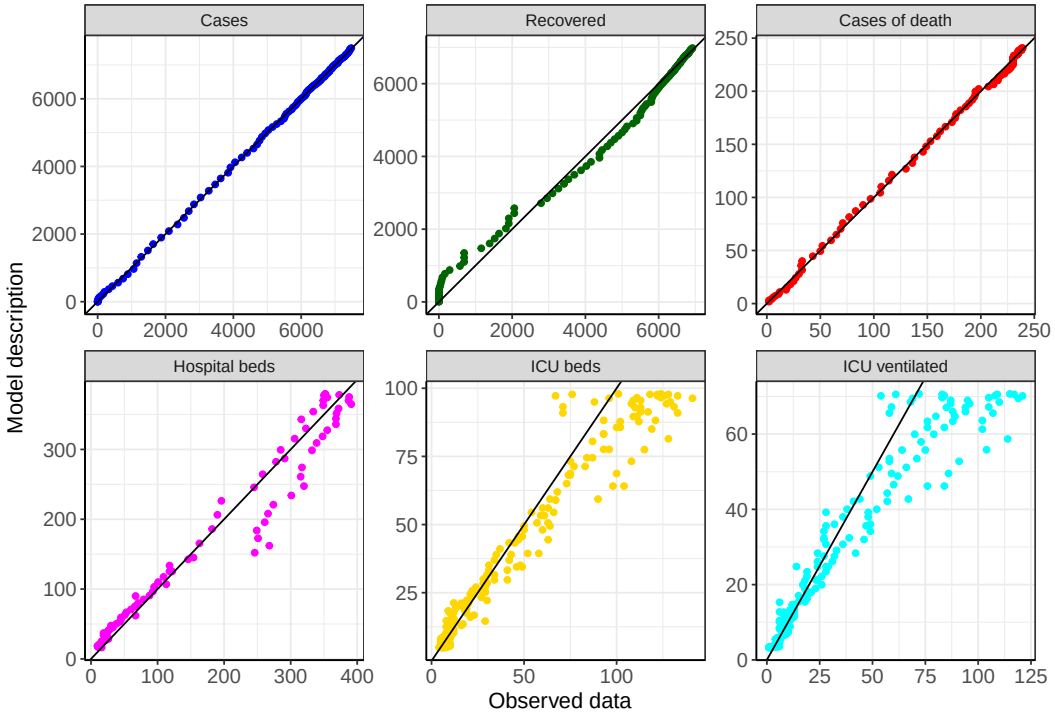


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

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

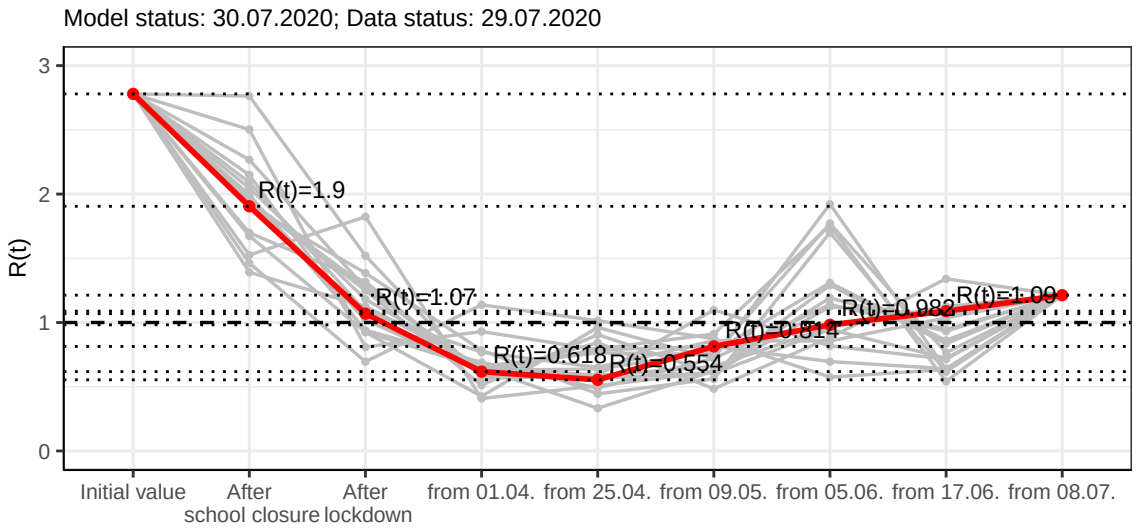


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

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

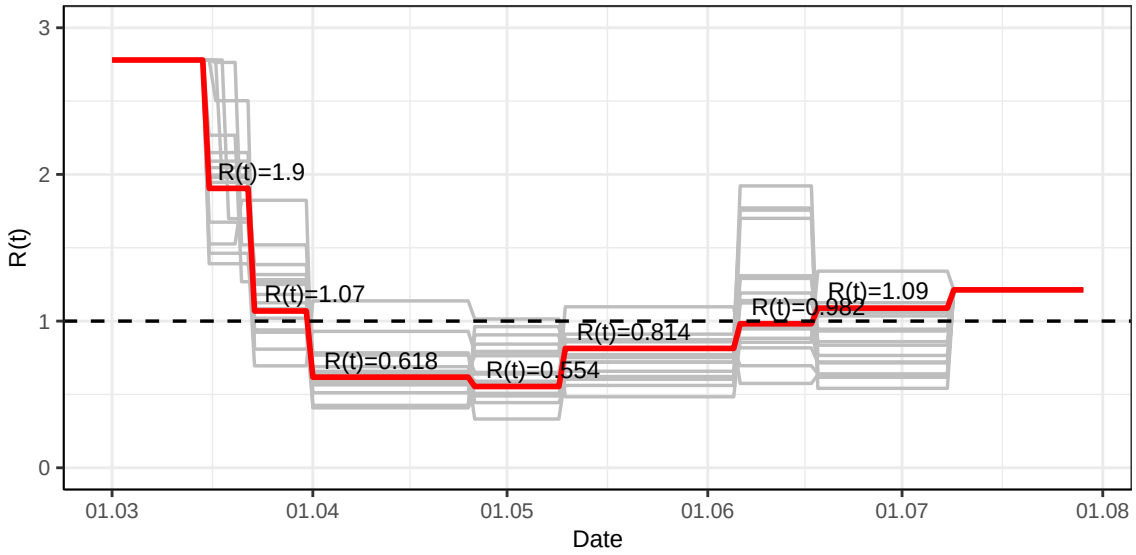


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

12.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

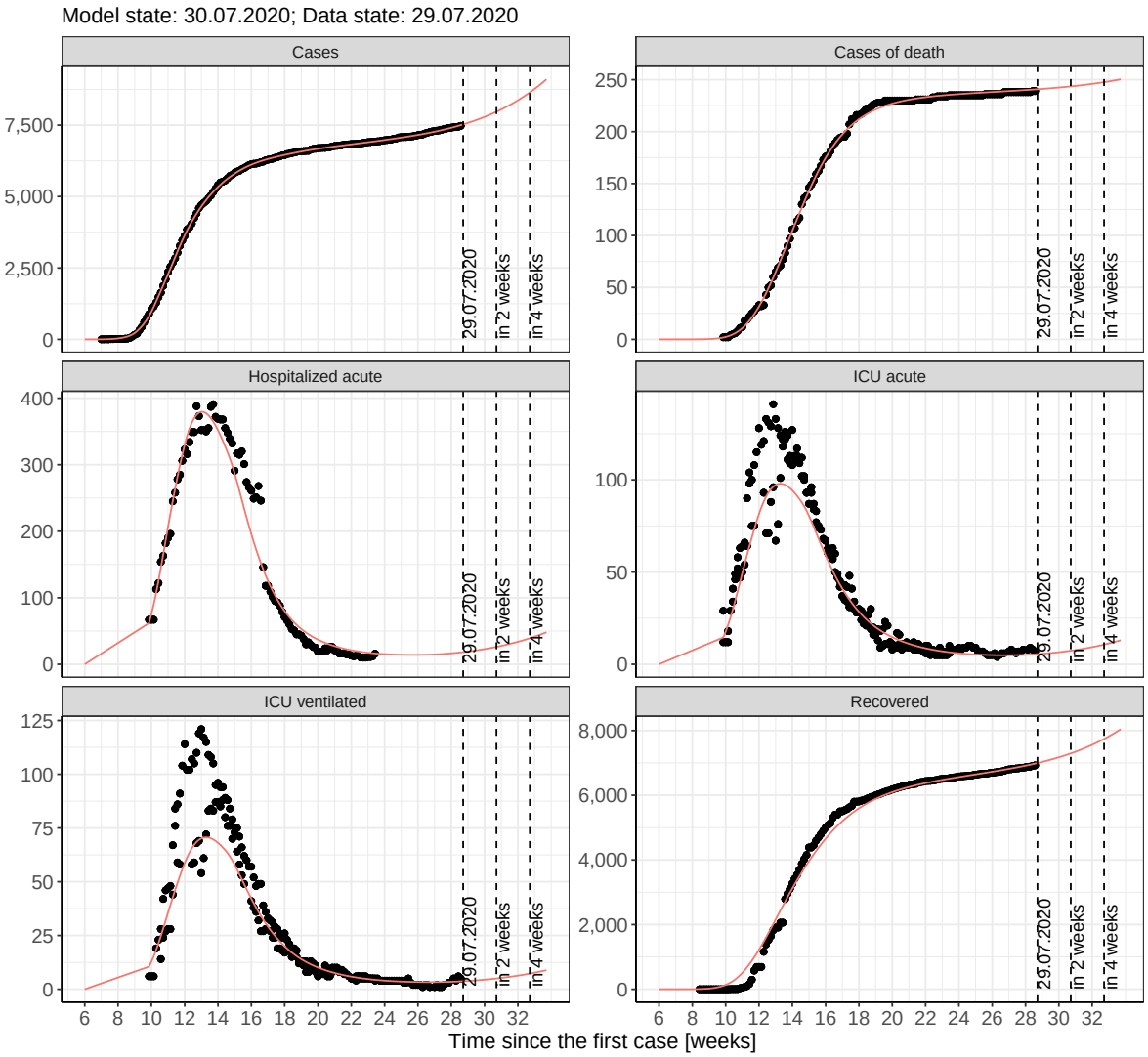


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

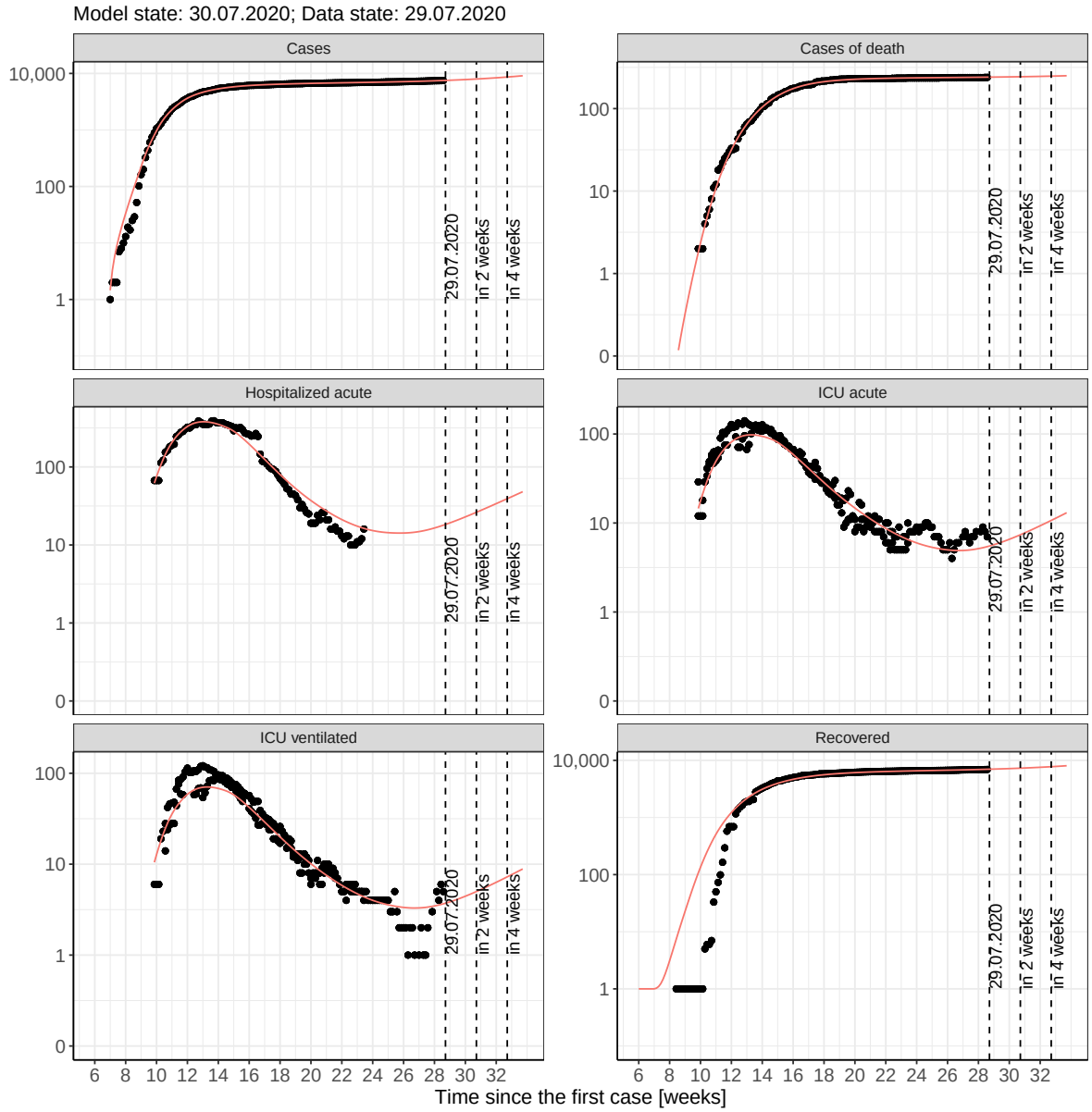


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 127 and 128 represent the model prediction for the next 4 weeks for Rhineland-Palatinate on a linear (127) and a semi-logarithmic (128) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

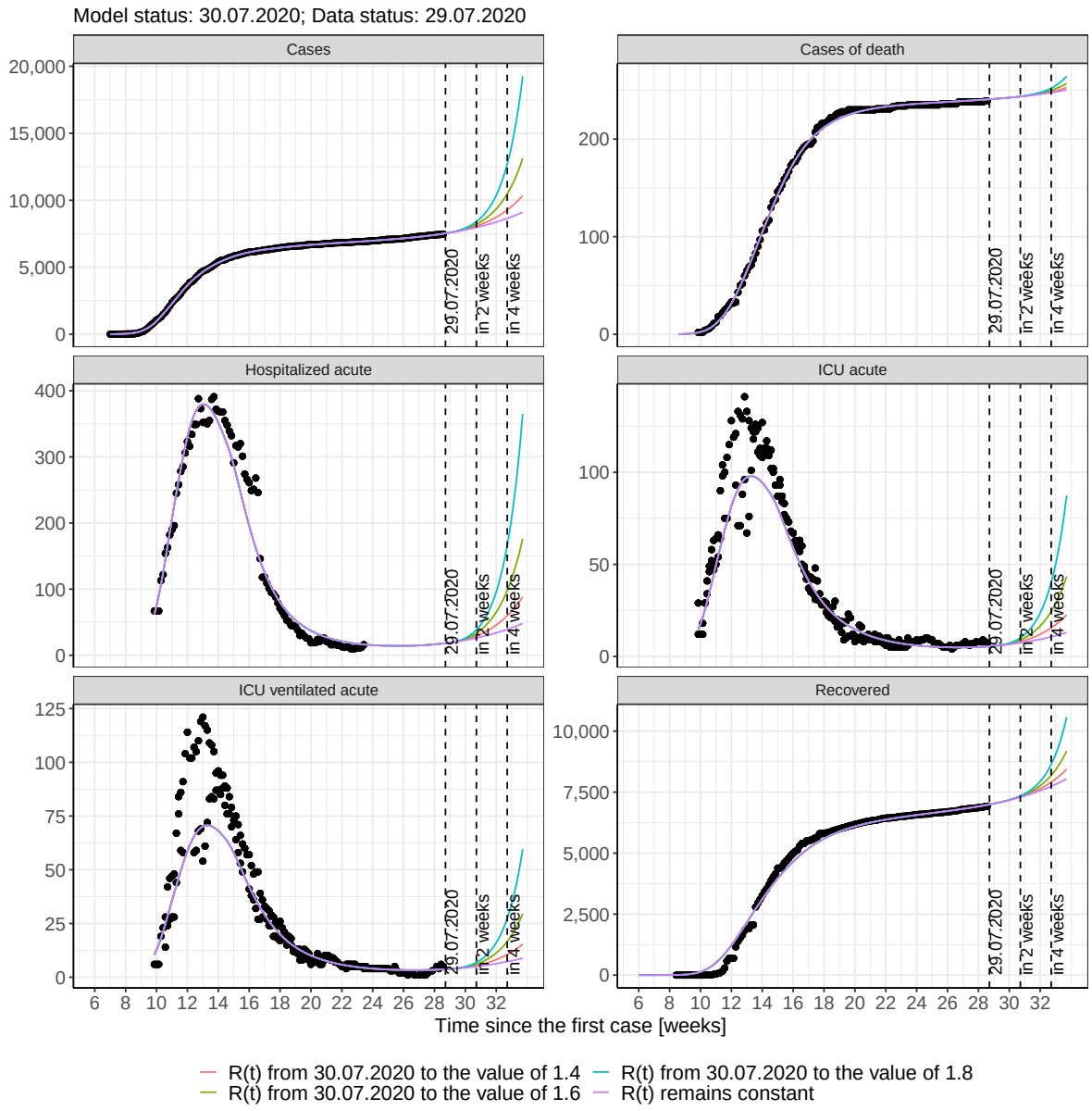


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

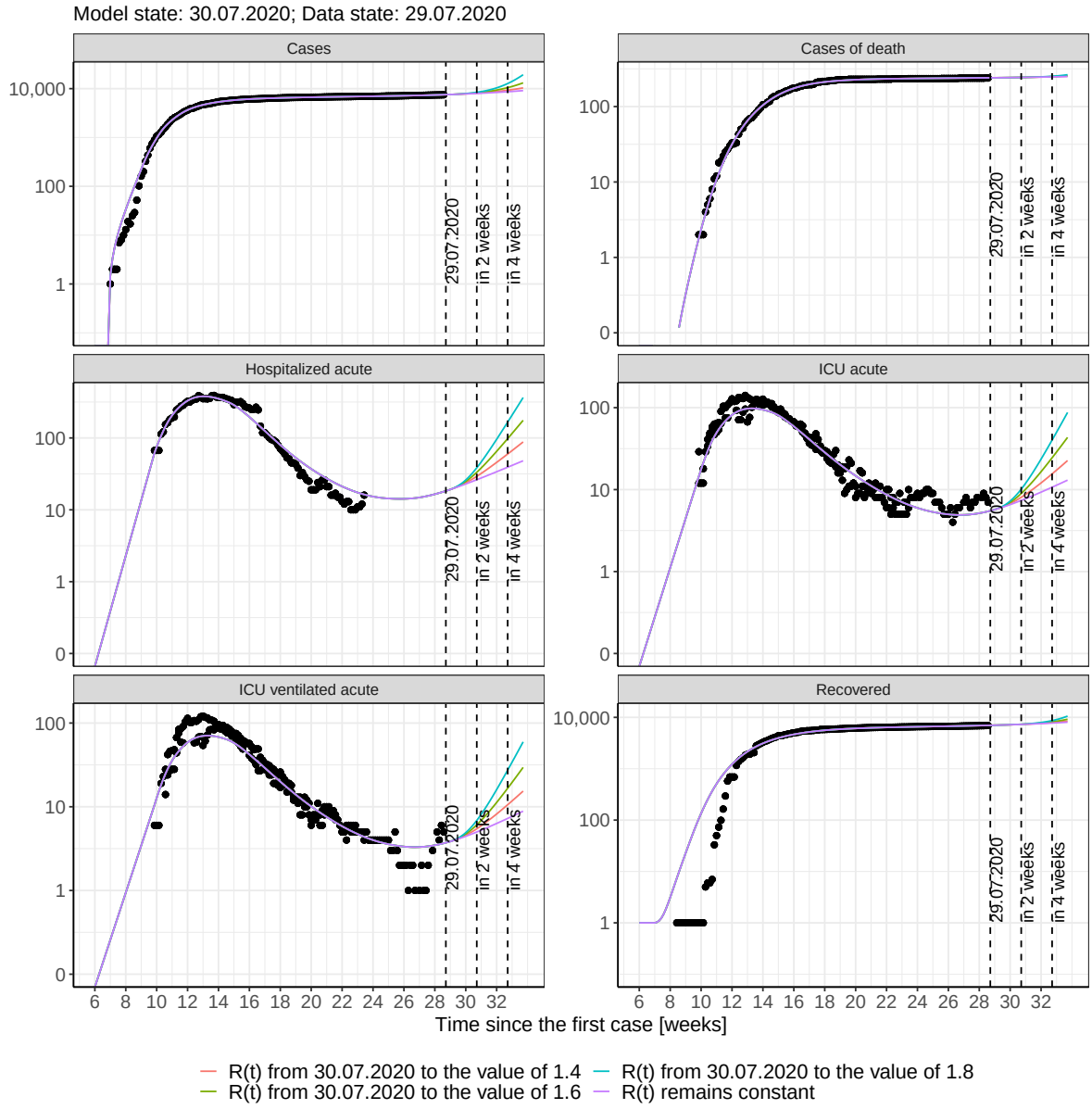


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 129 and 130 represent the model prediction for the next 16 weeks for Rhineland-Palatinate on a linear (129) and a semi-logarithmic (130) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

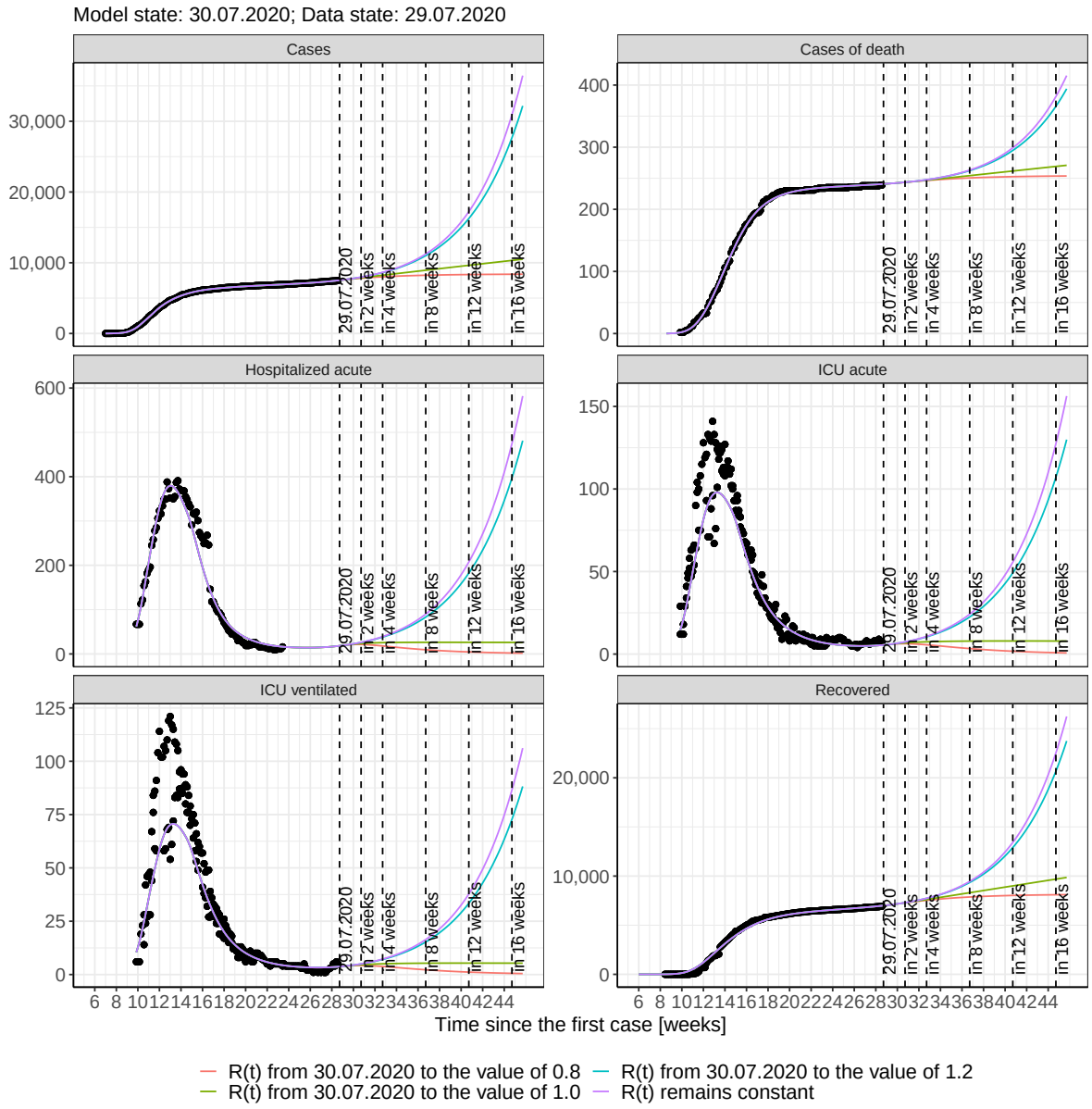


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

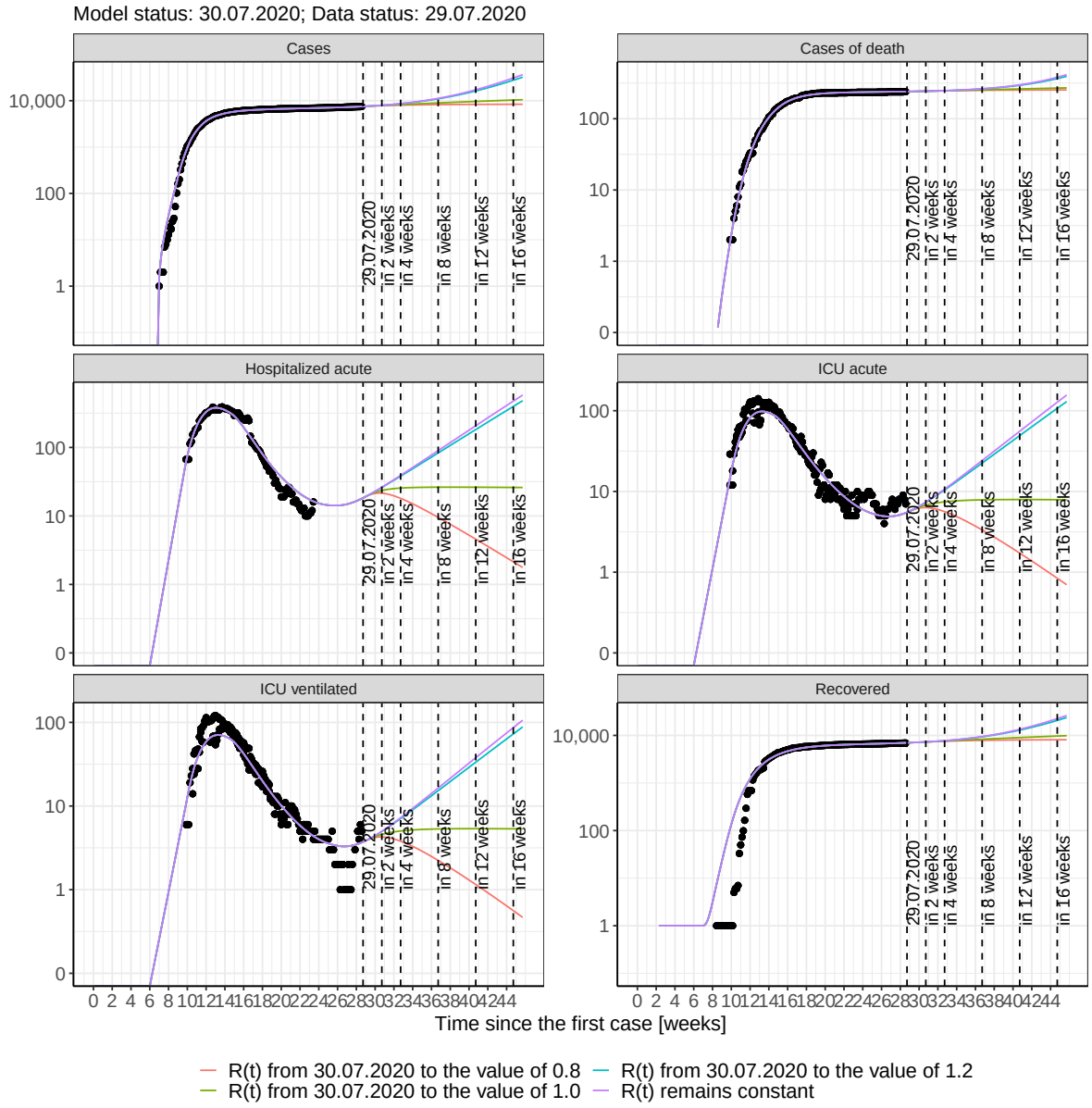


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 45) Model status from 30.07.2020; Data status: 29.07.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	7551	241	7014	19	6	4
31.07.2020	7577	241	7032	19	6	4
01.08.2020	7605	241	7050	20	6	4
02.08.2020	7633	241	7070	20	6	4
03.08.2020	7662	242	7089	21	6	4
04.08.2020	7692	242	7109	21	6	4
05.08.2020	7723	242	7130	22	6	4
06.08.2020	7755	242	7151	22	6	4
07.08.2020	7788	242	7173	23	7	4
08.08.2020	7822	243	7196	24	7	5
09.08.2020	7857	243	7219	24	7	5
10.08.2020	7893	243	7243	25	7	5
11.08.2020	7930	243	7268	26	7	5
12.08.2020	7968	244	7293	26	7	5
13.08.2020	8008	244	7319	27	8	5
14.08.2020	8048	244	7346	28	8	5
15.08.2020	8090	244	7374	29	8	5
16.08.2020	8133	245	7403	29	8	6
17.08.2020	8178	245	7432	30	8	6
18.08.2020	8223	245	7462	31	9	6
19.08.2020	8271	245	7494	32	9	6
20.08.2020	8319	246	7526	33	9	6
21.08.2020	8369	246	7559	34	9	6
22.08.2020	8421	246	7593	35	10	6
23.08.2020	8474	247	7629	36	10	7
24.08.2020	8529	247	7665	37	10	7
25.08.2020	8586	247	7702	38	10	7
26.08.2020	8644	248	7741	39	11	7

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	7550	241	7014	19	6	4
31.07.2020	7574	241	7032	19	6	4
01.08.2020	7598	241	7050	20	6	4
02.08.2020	7621	241	7069	20	6	4
03.08.2020	7643	242	7088	20	6	4
04.08.2020	7665	242	7108	21	6	4
05.08.2020	7686	242	7128	21	6	4
06.08.2020	7707	242	7148	21	6	4
07.08.2020	7727	242	7168	21	6	4
08.08.2020	7746	243	7189	21	6	4
09.08.2020	7765	243	7209	22	6	4
10.08.2020	7783	243	7230	22	6	4
11.08.2020	7801	243	7250	22	6	4
12.08.2020	7818	243	7271	21	6	4
13.08.2020	7835	244	7291	21	6	4
14.08.2020	7851	244	7311	21	6	4
15.08.2020	7867	244	7331	21	6	4
16.08.2020	7882	244	7351	21	6	4
17.08.2020	7897	245	7370	21	6	4
18.08.2020	7912	245	7390	20	6	4
19.08.2020	7926	245	7409	20	6	4
20.08.2020	7940	245	7427	20	6	4
21.08.2020	7953	245	7446	20	6	4
22.08.2020	7966	246	7464	19	6	4
23.08.2020	7979	246	7482	19	6	4
24.08.2020	7991	246	7499	19	6	4
25.08.2020	8003	246	7516	18	6	4
26.08.2020	8014	246	7533	18	6	4

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	7550	241	7014	19	6	4
31.07.2020	7576	241	7032	19	6	4
01.08.2020	7601	241	7050	20	6	4
02.08.2020	7627	241	7069	20	6	4
03.08.2020	7652	242	7089	20	6	4
04.08.2020	7678	242	7109	21	6	4
05.08.2020	7703	242	7129	21	6	4
06.08.2020	7728	242	7150	22	6	4
07.08.2020	7754	242	7171	22	6	4
08.08.2020	7779	243	7192	22	6	4
09.08.2020	7804	243	7214	23	7	4
10.08.2020	7830	243	7236	23	7	4
11.08.2020	7855	243	7258	23	7	5
12.08.2020	7881	244	7280	24	7	5
13.08.2020	7906	244	7303	24	7	5
14.08.2020	7931	244	7326	24	7	5
15.08.2020	7957	244	7349	24	7	5
16.08.2020	7982	244	7373	24	7	5
17.08.2020	8007	245	7396	24	7	5
18.08.2020	8033	245	7420	25	7	5
19.08.2020	8058	245	7444	25	7	5
20.08.2020	8083	245	7468	25	7	5
21.08.2020	8109	246	7492	25	7	5
22.08.2020	8134	246	7516	25	7	5
23.08.2020	8159	246	7540	25	7	5
24.08.2020	8184	246	7564	25	7	5
25.08.2020	8210	247	7588	25	7	5
26.08.2020	8235	247	7613	26	7	5

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	7551	241	7014	19	6	4
31.07.2020	7577	241	7032	19	6	4
01.08.2020	7605	241	7050	20	6	4
02.08.2020	7633	241	7070	20	6	4
03.08.2020	7662	242	7089	21	6	4
04.08.2020	7691	242	7109	21	6	4
05.08.2020	7722	242	7130	22	6	4
06.08.2020	7753	242	7151	22	6	4
07.08.2020	7786	242	7173	23	7	4
08.08.2020	7819	243	7196	23	7	5
09.08.2020	7853	243	7219	24	7	5
10.08.2020	7889	243	7243	25	7	5
11.08.2020	7925	243	7267	25	7	5
12.08.2020	7962	244	7292	26	7	5
13.08.2020	8000	244	7318	27	8	5
14.08.2020	8040	244	7345	27	8	5
15.08.2020	8081	244	7372	28	8	5
16.08.2020	8122	245	7401	29	8	5
17.08.2020	8165	245	7430	30	8	6
18.08.2020	8209	245	7460	31	8	6
19.08.2020	8255	245	7490	31	9	6
20.08.2020	8302	246	7522	32	9	6
21.08.2020	8350	246	7554	33	9	6
22.08.2020	8399	246	7588	34	9	6
23.08.2020	8450	247	7622	35	10	7
24.08.2020	8502	247	7658	36	10	7
25.08.2020	8556	247	7694	37	10	7
26.08.2020	8611	248	7731	38	10	7

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

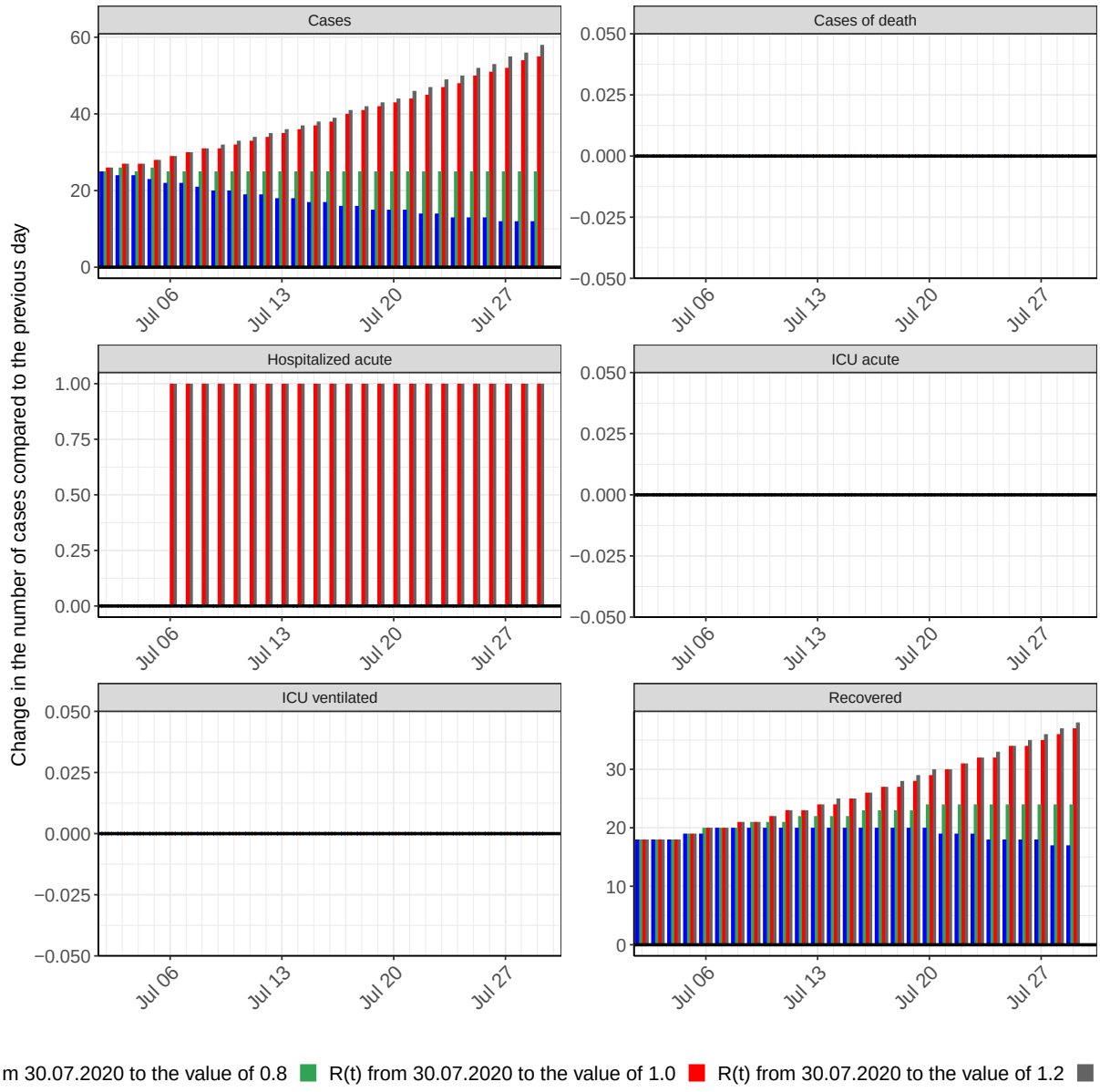


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

13 Saarland

13.1 Model description

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

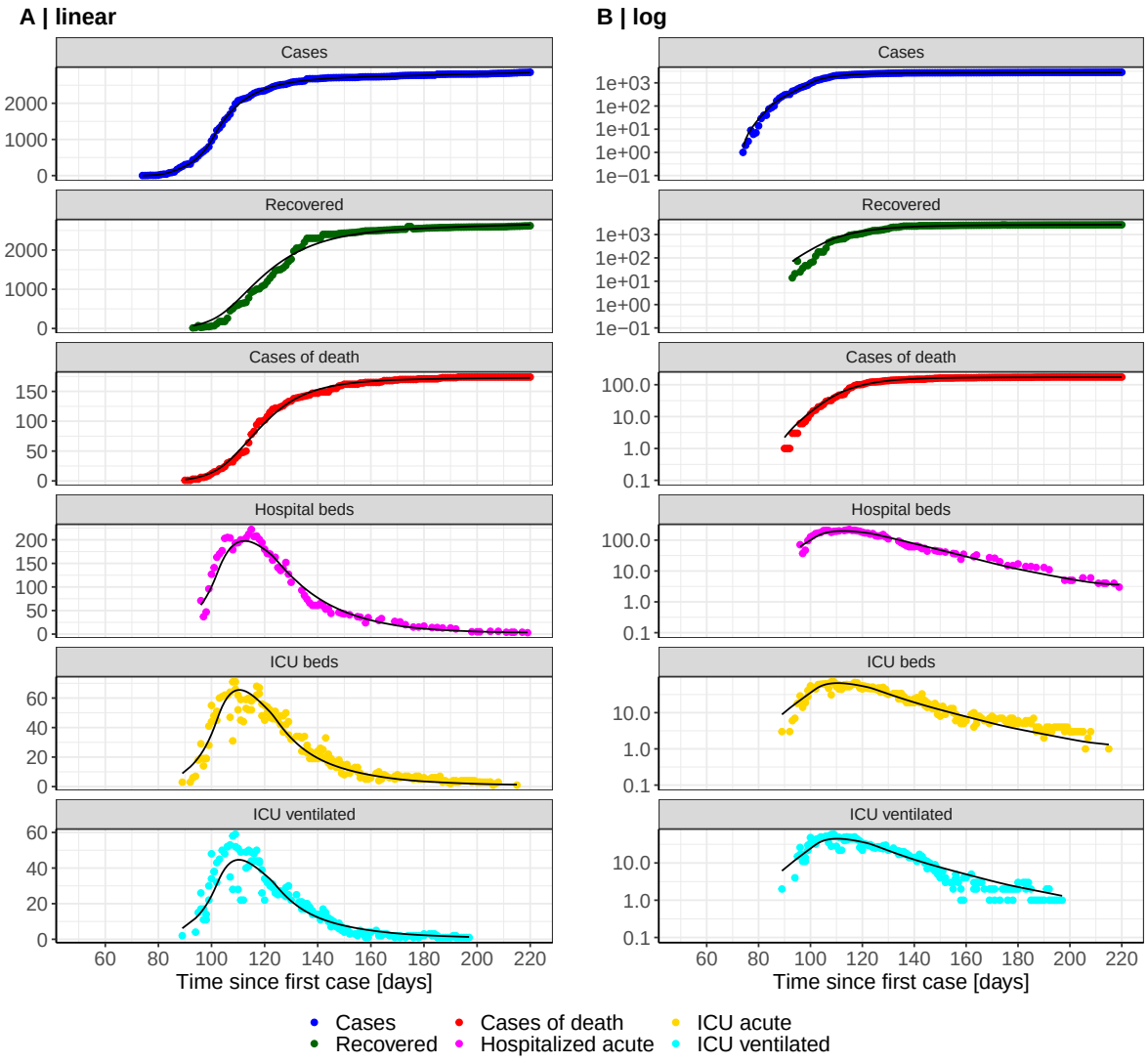


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

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

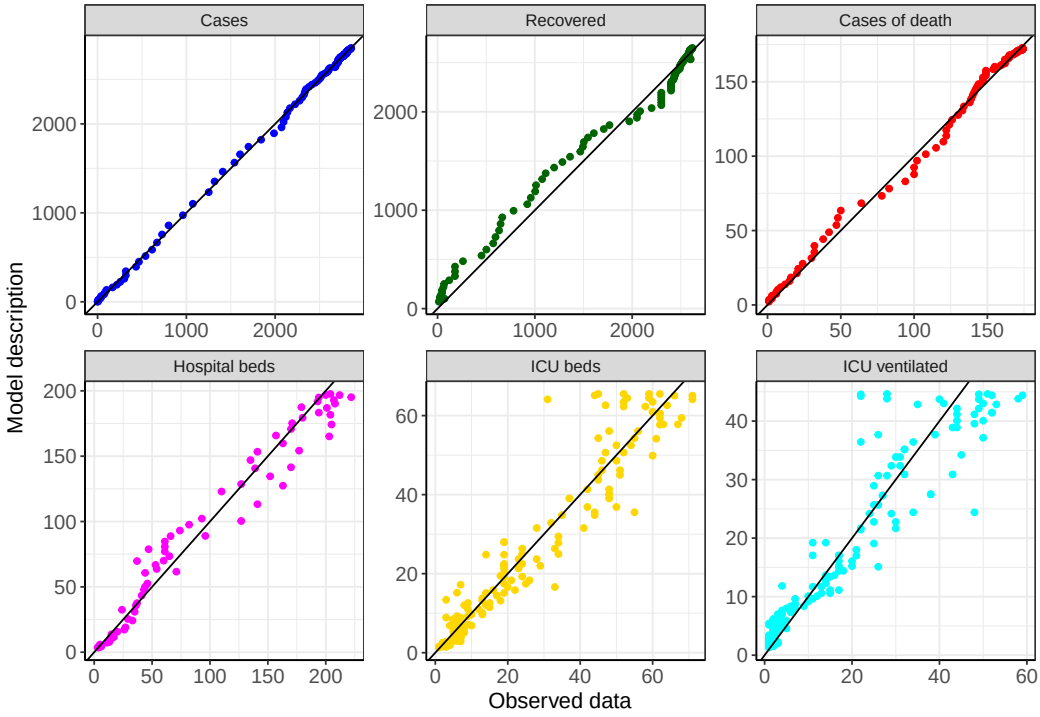


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

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

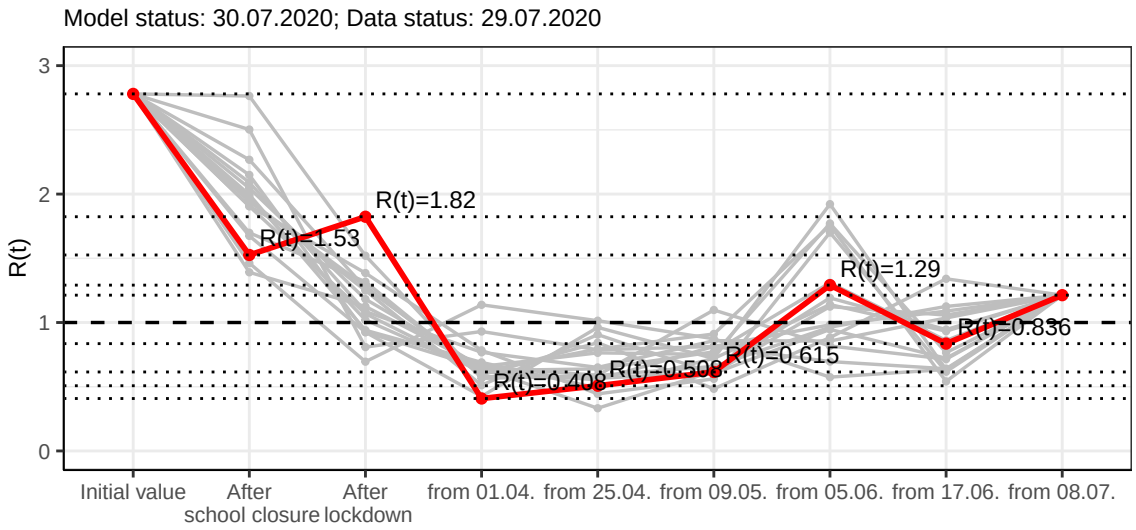


Figure 134: R(t) values before and after the NPIs for Saarland

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

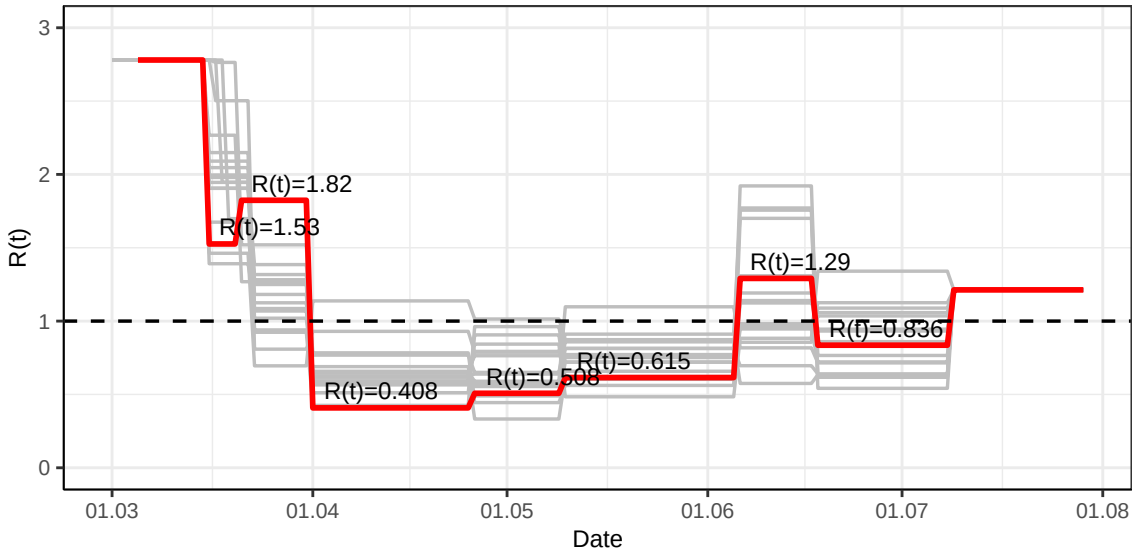


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

13.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

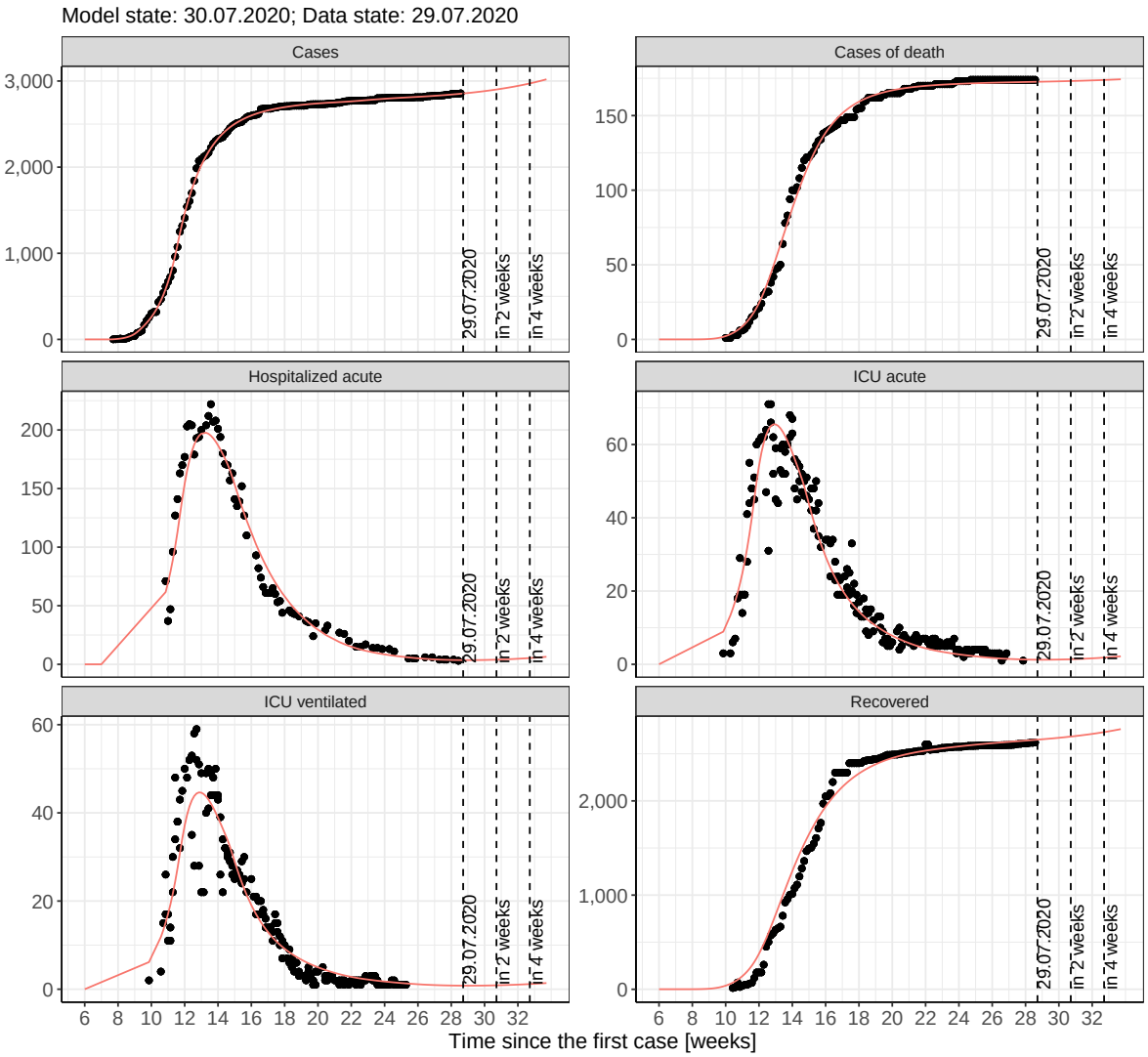


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

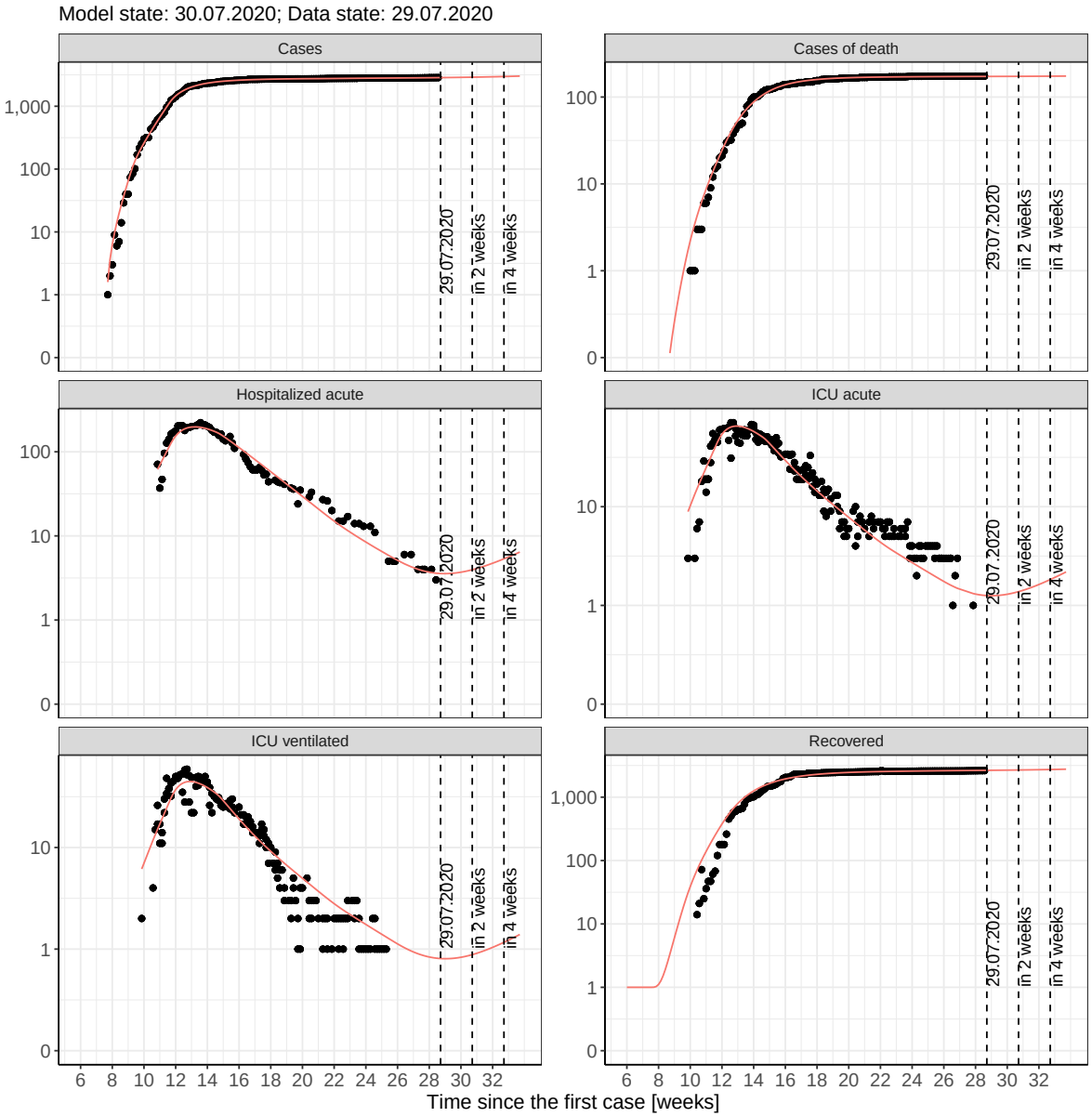


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 138 and 139 represent the model prediction for the next 4 weeks for Saarland on a linear (138) and a semi-logarithmic (139) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

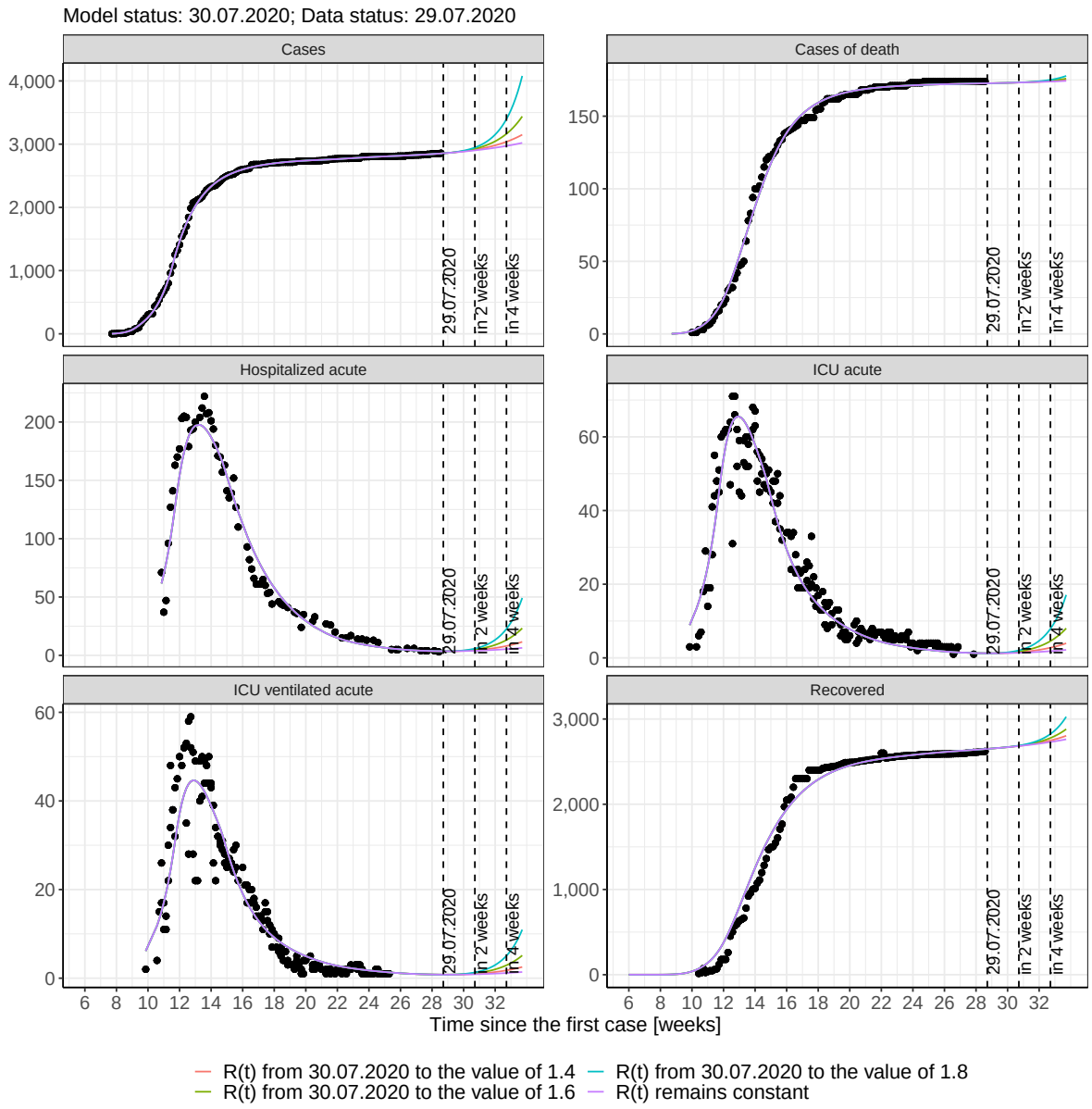


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

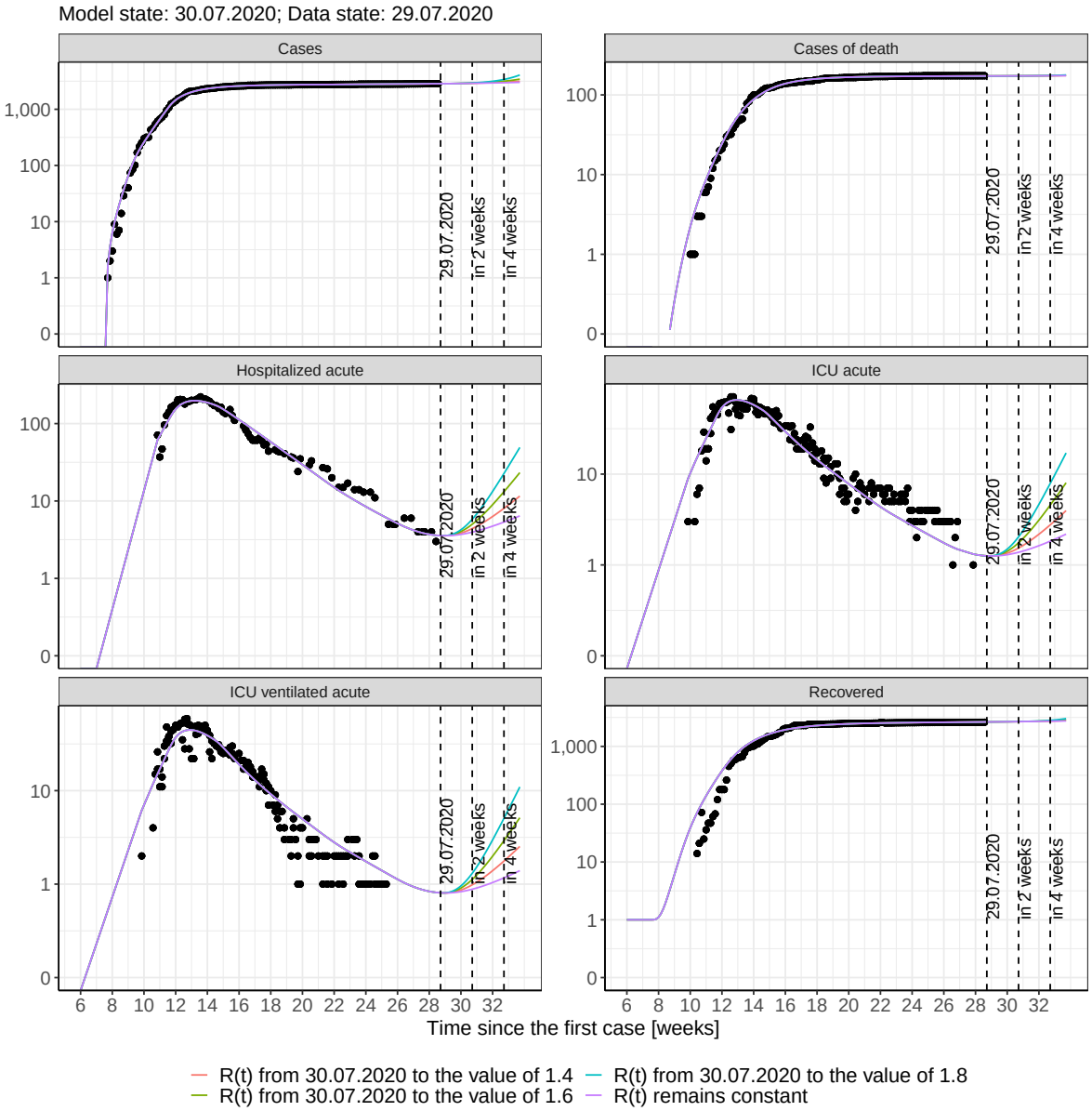


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 140 and 141 represent the model prediction for the next 16 weeks for Saarland on a linear (140) and a semi-logarithmic (141) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

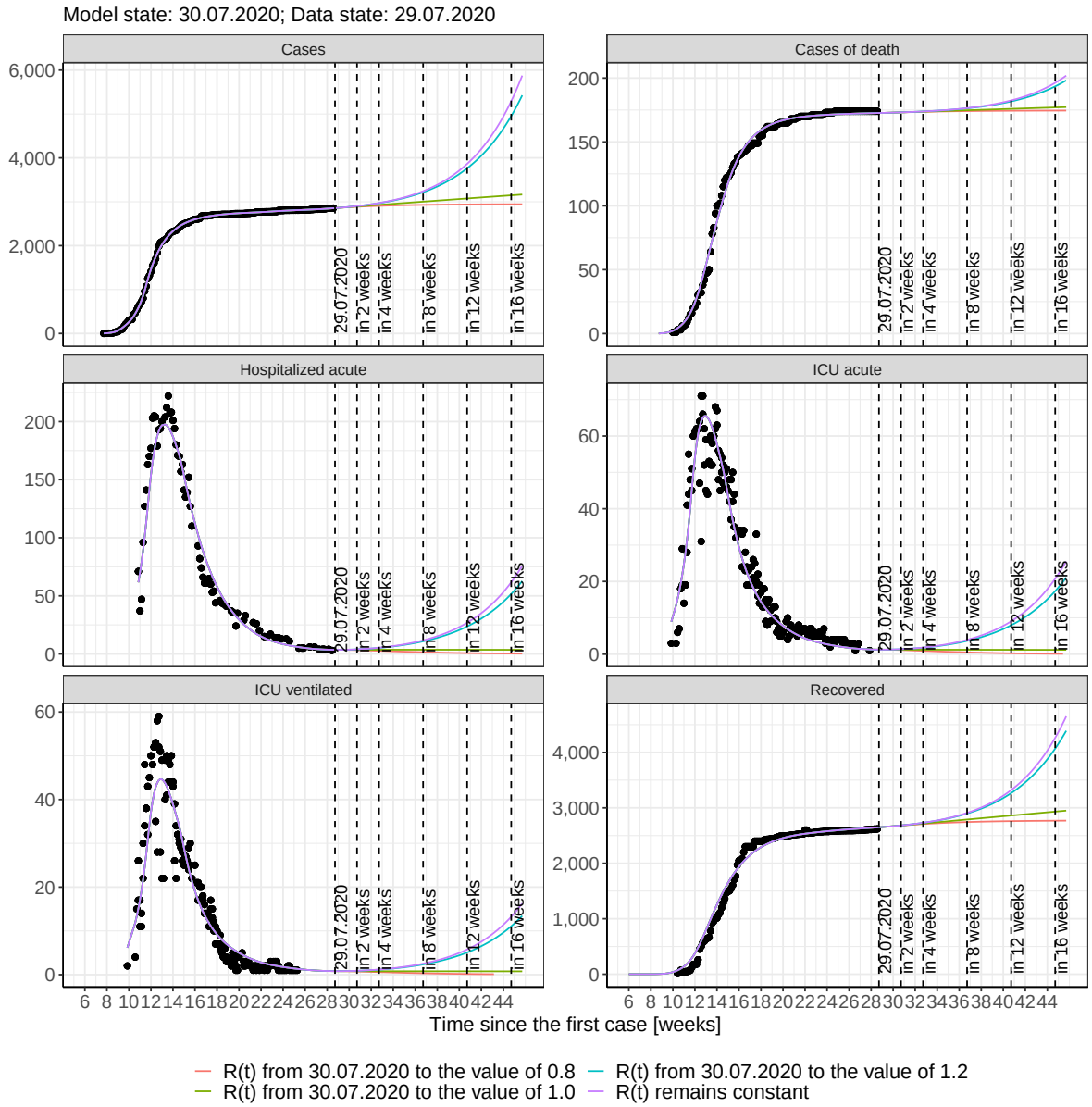


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

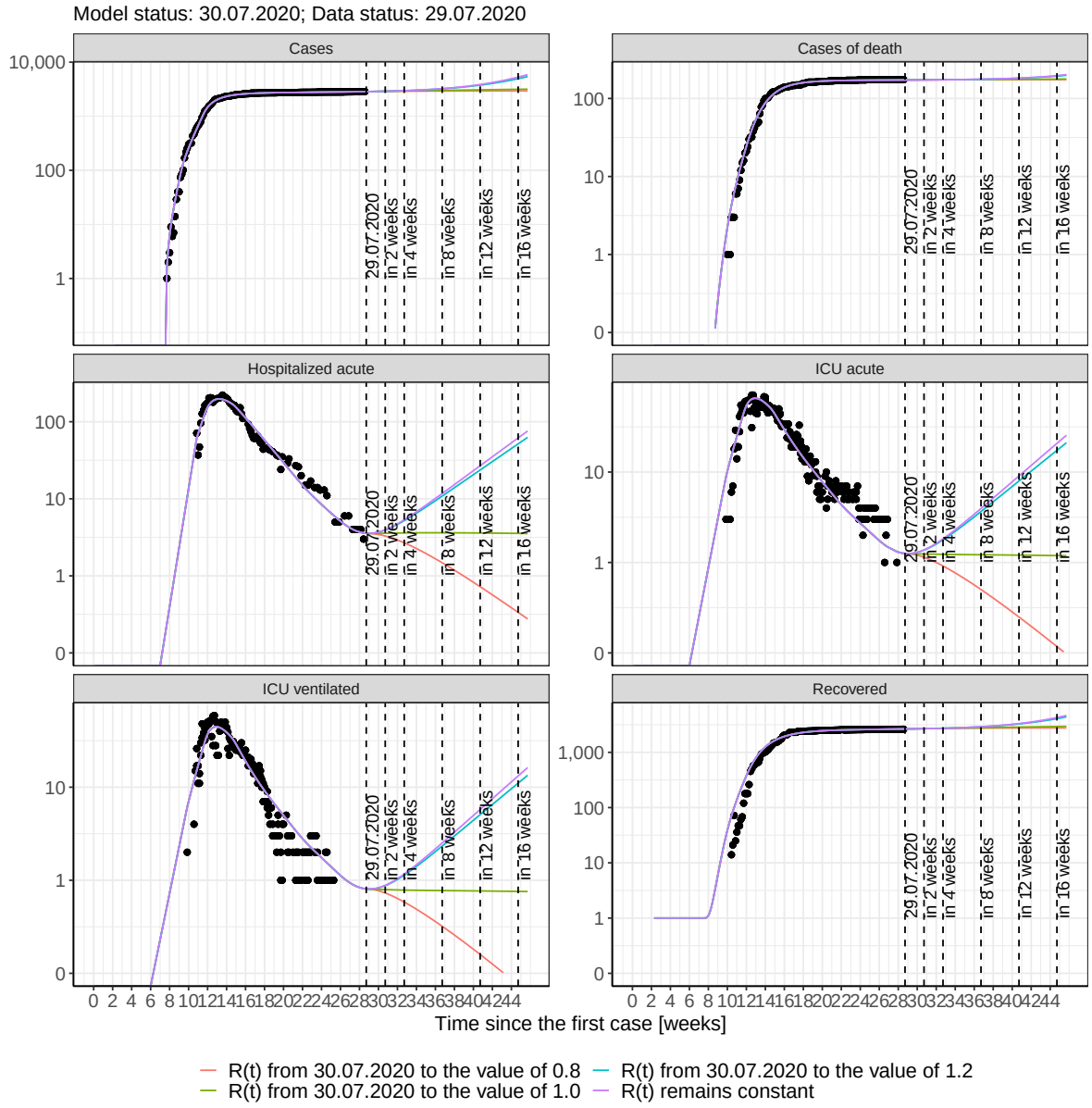


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 49) Model status from 30.07.2020; Data status: 29.07.2020.

Table 46: Saarland - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2858	173	2652	4	1	1
31.07.2020	2861	173	2654	4	1	1
01.08.2020	2864	173	2656	4	1	1
02.08.2020	2867	173	2658	4	1	1
03.08.2020	2870	173	2660	4	1	1
04.08.2020	2873	173	2663	4	1	1
05.08.2020	2876	173	2665	4	1	1
06.08.2020	2879	173	2667	4	1	1
07.08.2020	2883	173	2670	4	1	1
08.08.2020	2886	173	2672	4	1	1
09.08.2020	2890	173	2675	4	1	1
10.08.2020	2894	173	2677	4	1	1
11.08.2020	2898	173	2680	4	1	1
12.08.2020	2902	173	2683	4	1	1
13.08.2020	2906	173	2686	4	1	1
14.08.2020	2910	173	2688	4	1	1
15.08.2020	2914	173	2692	4	1	1
16.08.2020	2919	173	2694	4	1	1
17.08.2020	2924	173	2698	4	2	1
18.08.2020	2928	173	2701	4	2	1
19.08.2020	2933	173	2704	5	2	1
20.08.2020	2938	174	2708	5	2	1
21.08.2020	2944	174	2711	5	2	1
22.08.2020	2949	174	2715	5	2	1
23.08.2020	2954	174	2718	5	2	1
24.08.2020	2960	174	2722	5	2	1
25.08.2020	2966	174	2726	5	2	1
26.08.2020	2972	174	2730	5	2	1

Table 47: Saarland - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2858	173	2652	4	1	1
31.07.2020	2860	173	2654	4	1	1
01.08.2020	2863	173	2656	4	1	1
02.08.2020	2865	173	2658	4	1	1
03.08.2020	2868	173	2660	4	1	1
04.08.2020	2870	173	2663	4	1	1
05.08.2020	2872	173	2665	3	1	1
06.08.2020	2874	173	2667	3	1	1
07.08.2020	2876	173	2669	3	1	1
08.08.2020	2878	173	2672	3	1	1
09.08.2020	2880	173	2674	3	1	1
10.08.2020	2882	173	2676	3	1	1
11.08.2020	2884	173	2678	3	1	1
12.08.2020	2886	173	2680	3	1	1
13.08.2020	2888	173	2683	3	1	1
14.08.2020	2889	173	2685	3	1	1
15.08.2020	2891	173	2687	3	1	1
16.08.2020	2893	173	2689	3	1	1
17.08.2020	2894	173	2691	3	1	1
18.08.2020	2896	173	2693	3	1	1
19.08.2020	2897	173	2695	3	1	1
20.08.2020	2899	173	2697	3	1	1
21.08.2020	2900	173	2699	3	1	1
22.08.2020	2901	173	2701	3	1	1
23.08.2020	2903	173	2703	3	1	1
24.08.2020	2904	174	2705	3	1	1
25.08.2020	2905	174	2707	3	1	1
26.08.2020	2906	174	2708	3	1	1

Table 48: Saarland - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2858	173	2652	4	1	1
31.07.2020	2861	173	2654	4	1	1
01.08.2020	2863	173	2656	4	1	1
02.08.2020	2866	173	2658	4	1	1
03.08.2020	2869	173	2660	4	1	1
04.08.2020	2871	173	2663	4	1	1
05.08.2020	2874	173	2665	4	1	1
06.08.2020	2877	173	2667	4	1	1
07.08.2020	2879	173	2670	4	1	1
08.08.2020	2882	173	2672	4	1	1
09.08.2020	2884	173	2674	4	1	1
10.08.2020	2887	173	2677	4	1	1
11.08.2020	2890	173	2679	4	1	1
12.08.2020	2892	173	2682	4	1	1
13.08.2020	2895	173	2684	4	1	1
14.08.2020	2898	173	2686	4	1	1
15.08.2020	2900	173	2689	4	1	1
16.08.2020	2903	173	2691	4	1	1
17.08.2020	2906	173	2694	4	1	1
18.08.2020	2908	173	2696	4	1	1
19.08.2020	2911	173	2699	4	1	1
20.08.2020	2914	173	2702	4	1	1
21.08.2020	2916	173	2704	4	1	1
22.08.2020	2919	174	2707	4	1	1
23.08.2020	2922	174	2709	4	1	1
24.08.2020	2924	174	2712	4	1	1
25.08.2020	2927	174	2714	4	1	1
26.08.2020	2930	174	2717	4	1	1

Table 49: Saarland - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2858	173	2652	4	1	1
31.07.2020	2861	173	2654	4	1	1
01.08.2020	2864	173	2656	4	1	1
02.08.2020	2867	173	2658	4	1	1
03.08.2020	2870	173	2660	4	1	1
04.08.2020	2873	173	2663	4	1	1
05.08.2020	2876	173	2665	4	1	1
06.08.2020	2879	173	2667	4	1	1
07.08.2020	2883	173	2670	4	1	1
08.08.2020	2886	173	2672	4	1	1
09.08.2020	2890	173	2675	4	1	1
10.08.2020	2893	173	2677	4	1	1
11.08.2020	2897	173	2680	4	1	1
12.08.2020	2901	173	2683	4	1	1
13.08.2020	2905	173	2686	4	1	1
14.08.2020	2909	173	2688	4	1	1
15.08.2020	2913	173	2691	4	1	1
16.08.2020	2918	173	2694	4	1	1
17.08.2020	2922	173	2697	4	1	1
18.08.2020	2927	173	2701	4	2	1
19.08.2020	2932	173	2704	4	2	1
20.08.2020	2936	174	2707	5	2	1
21.08.2020	2942	174	2711	5	2	1
22.08.2020	2947	174	2714	5	2	1
23.08.2020	2952	174	2718	5	2	1
24.08.2020	2957	174	2722	5	2	1
25.08.2020	2963	174	2725	5	2	1
26.08.2020	2969	174	2729	5	2	1

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

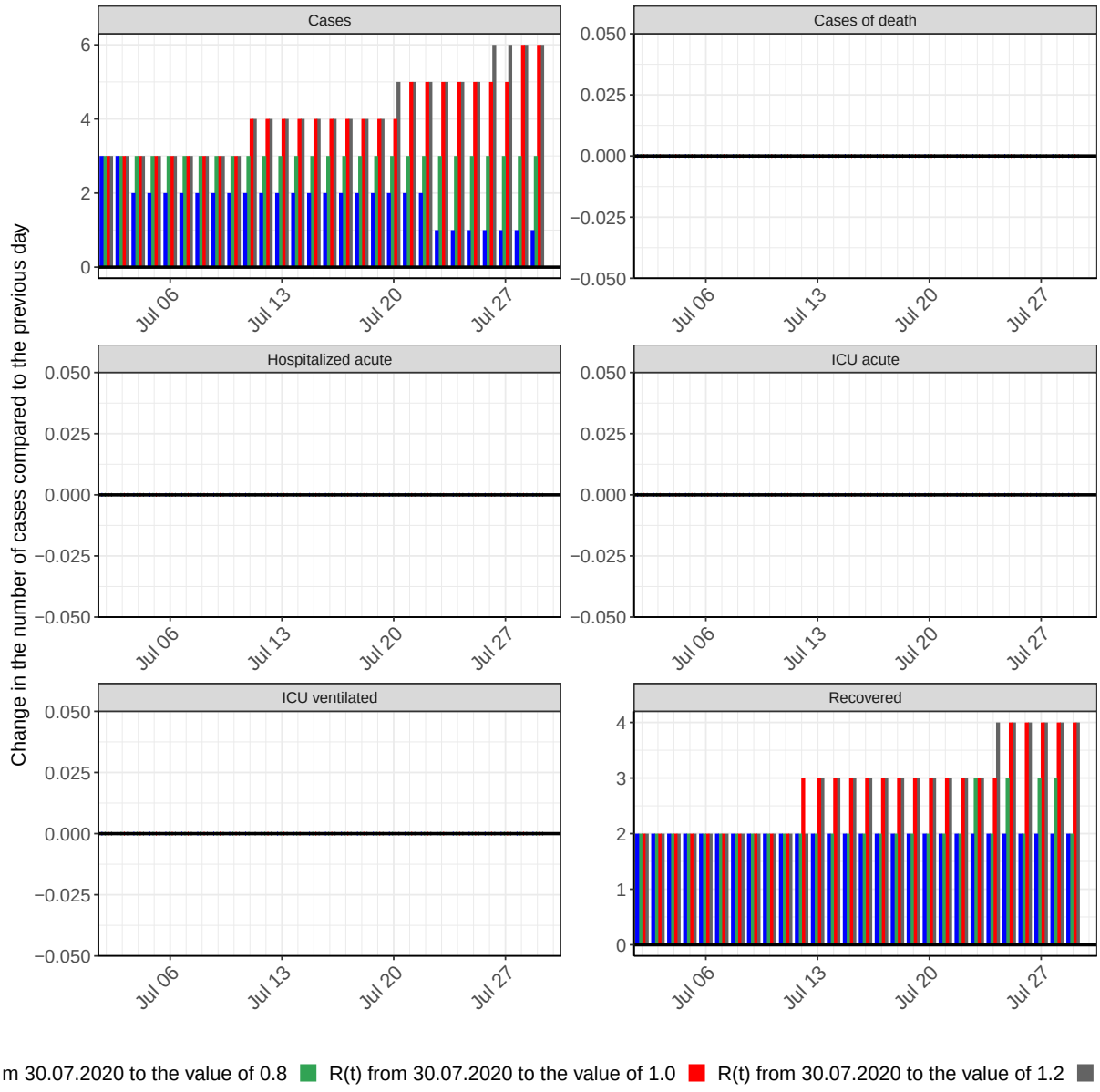


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

14 Saxony

14.1 Model description

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

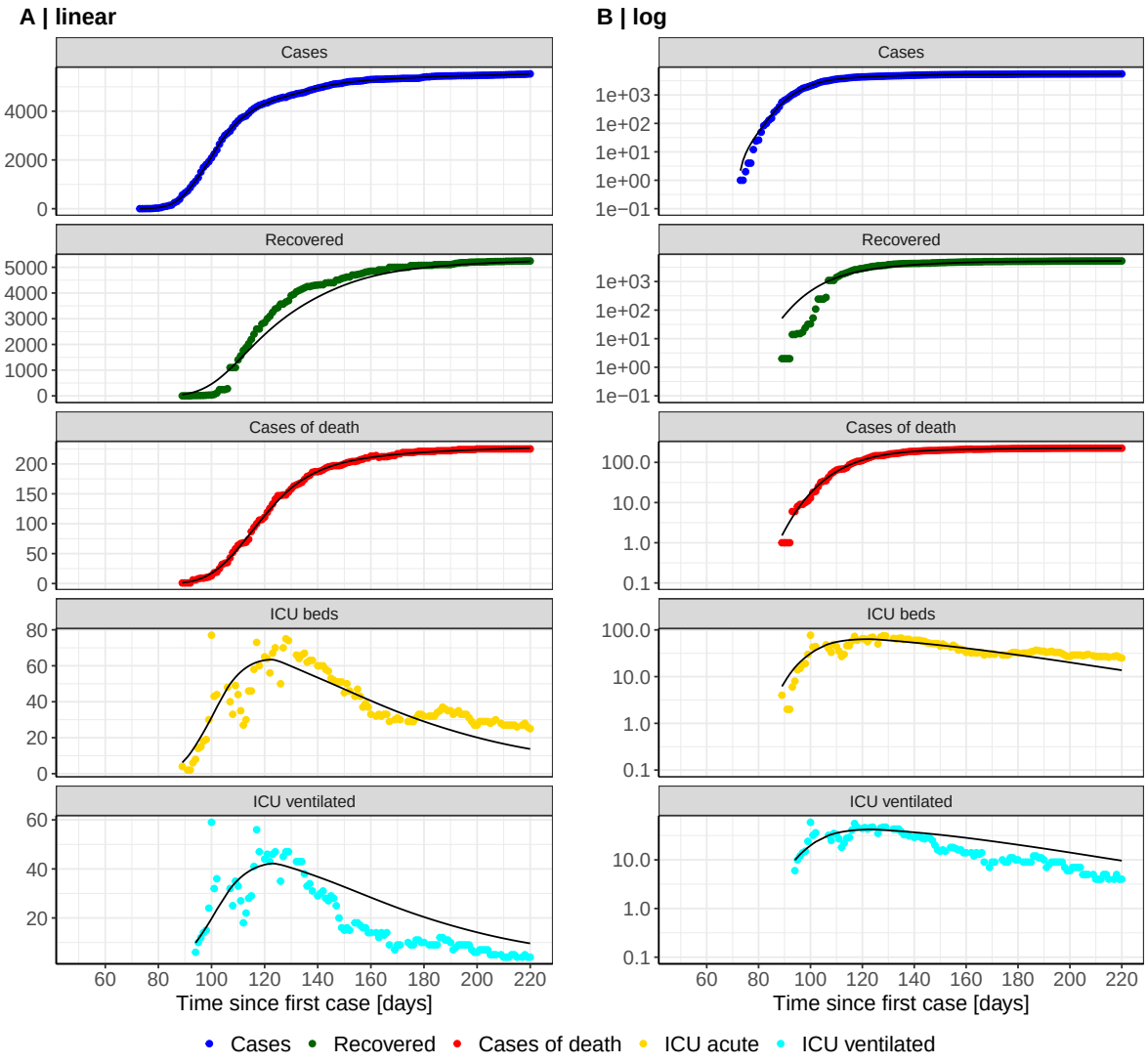


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

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

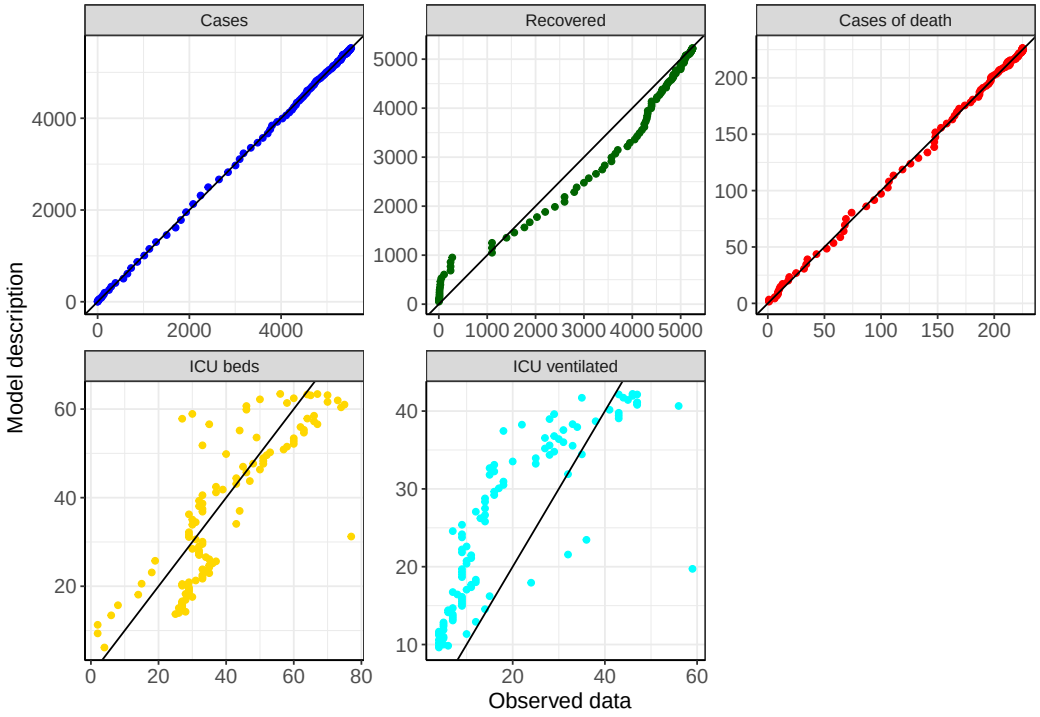


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

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

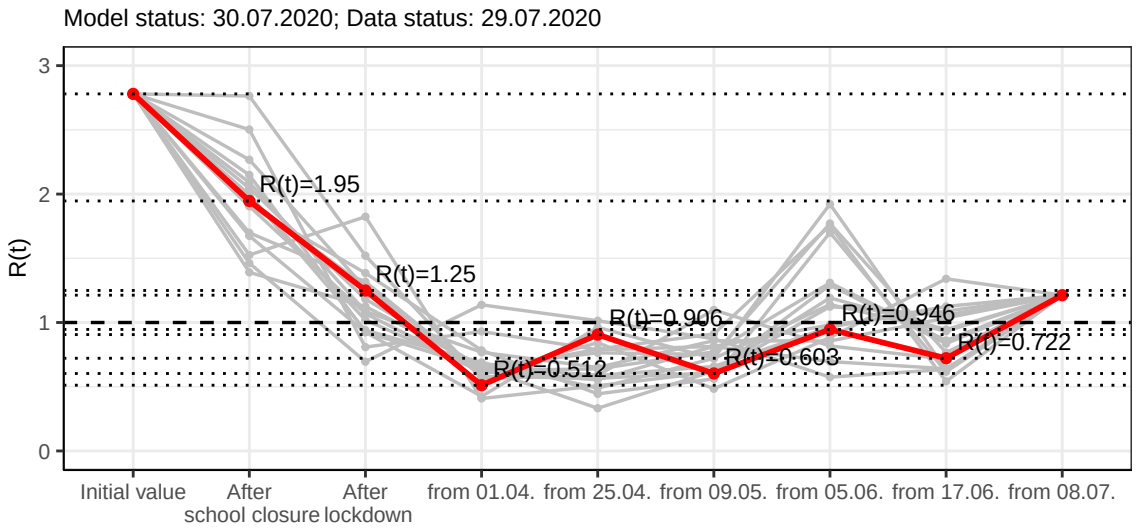


Figure 145: R(t) values before and after the NPIs for Saxony

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

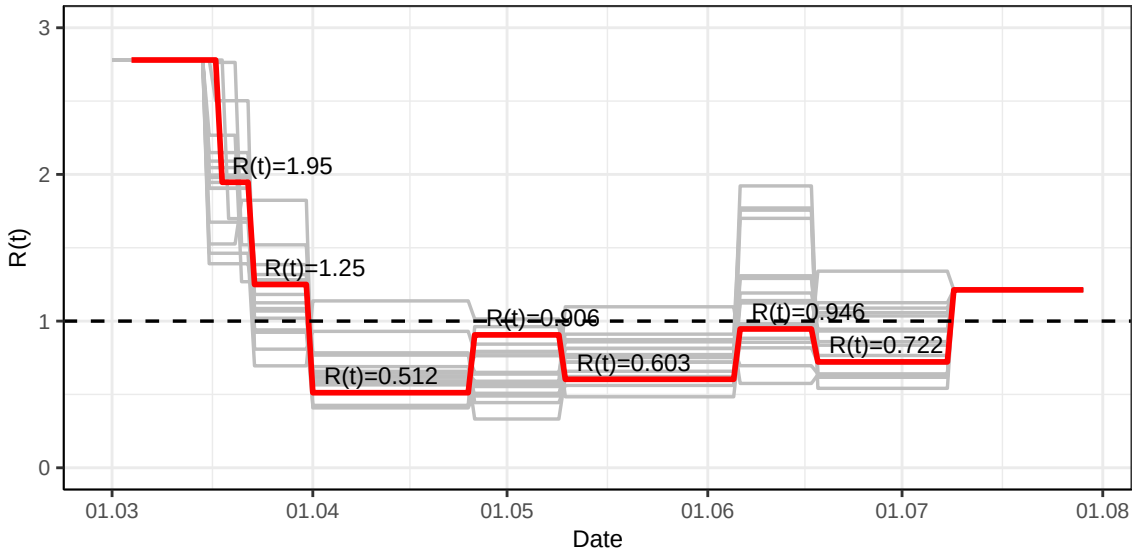


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

14.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

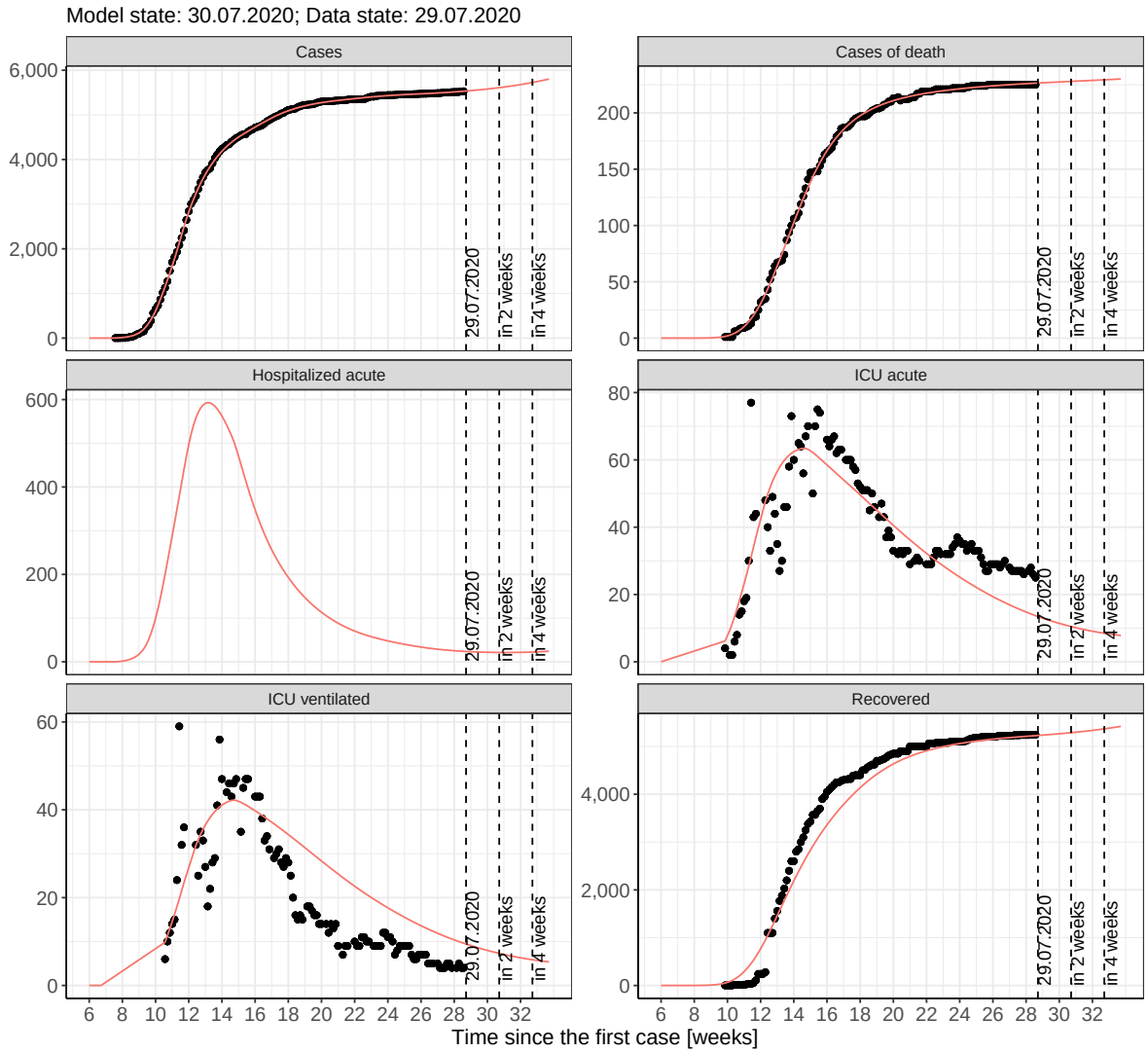


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

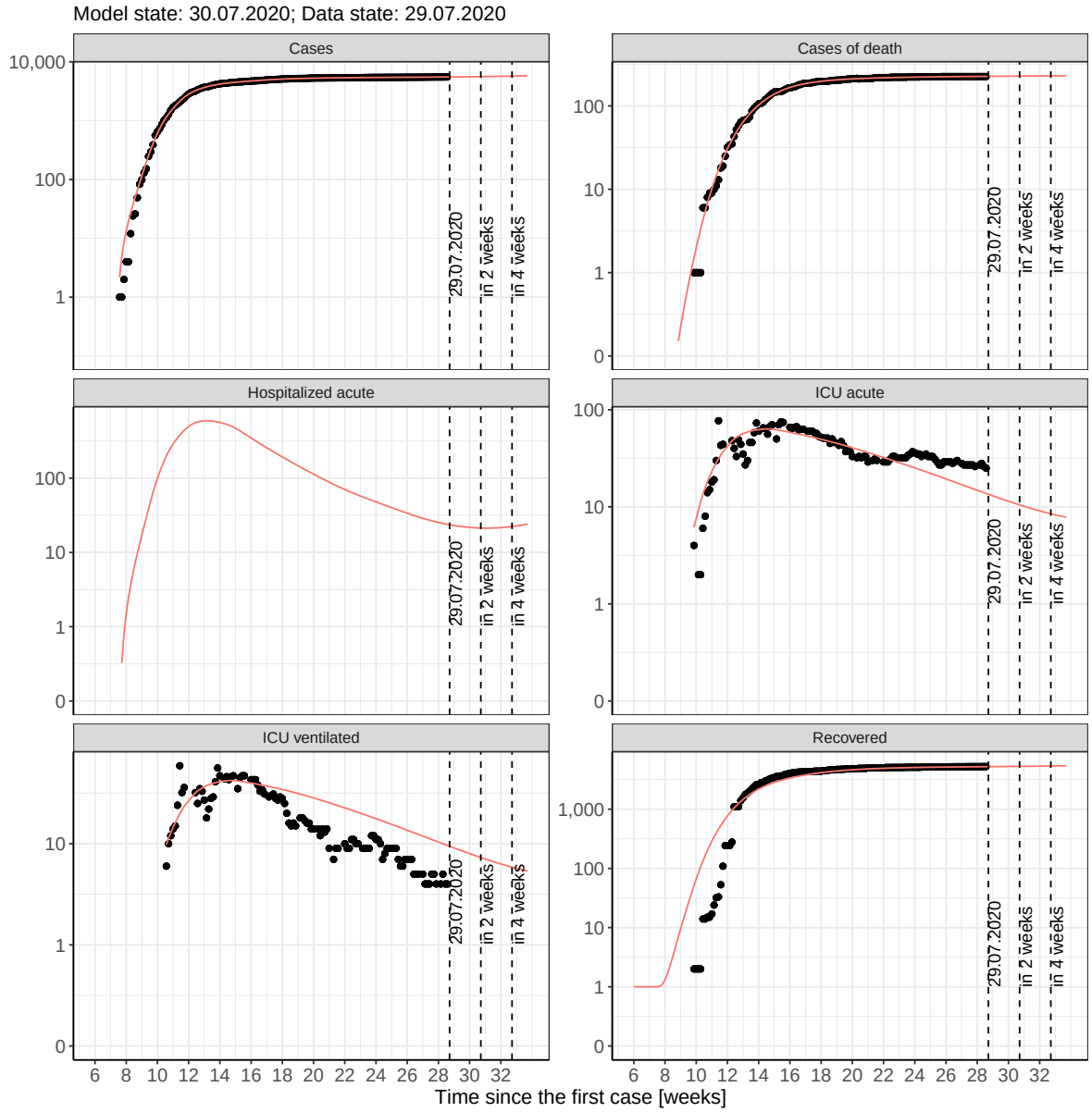


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 149 and 150 represent the model prediction for the next 4 weeks for Saxony on a linear (149) and a semi-logarithmic (150) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

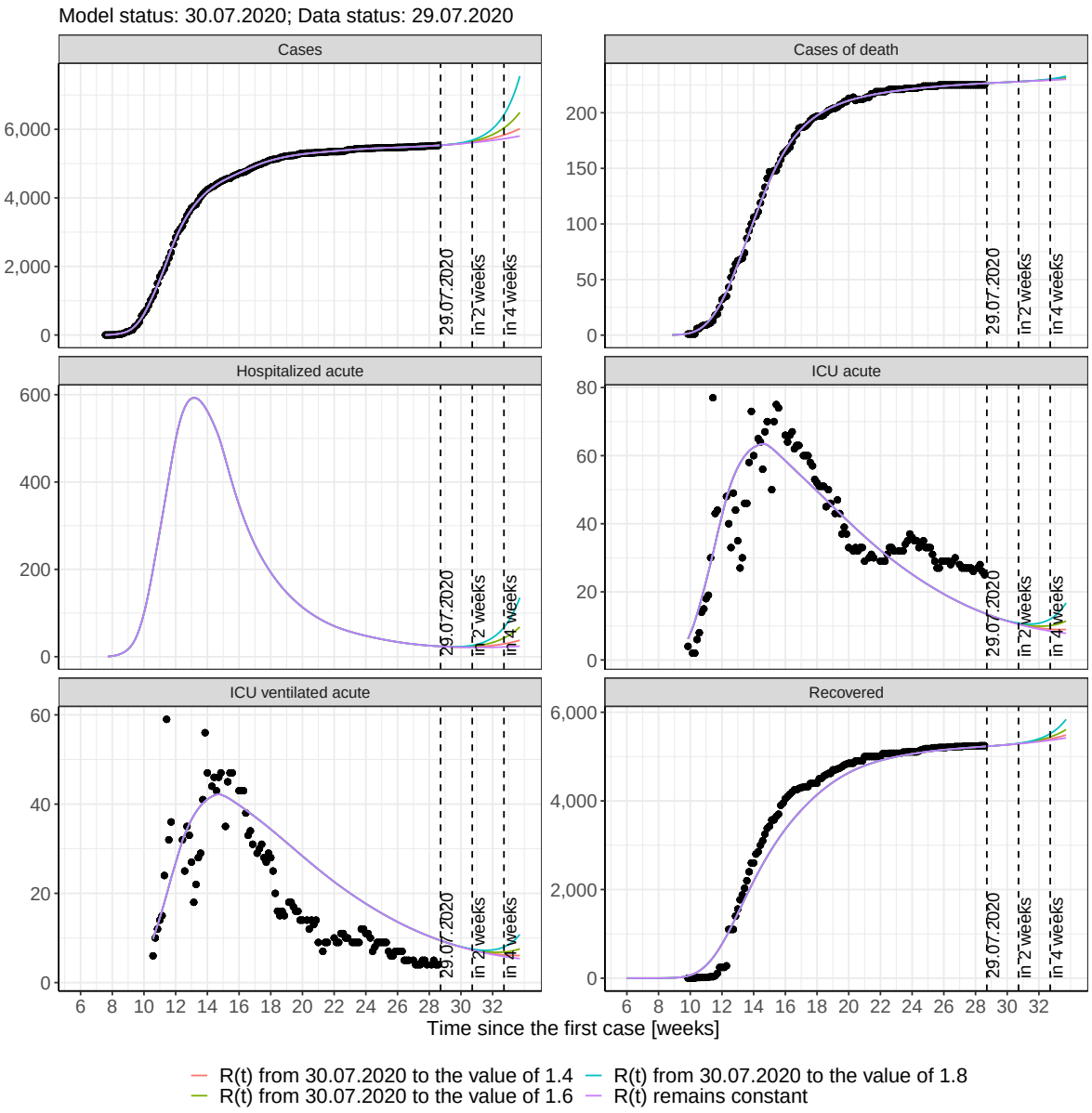


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

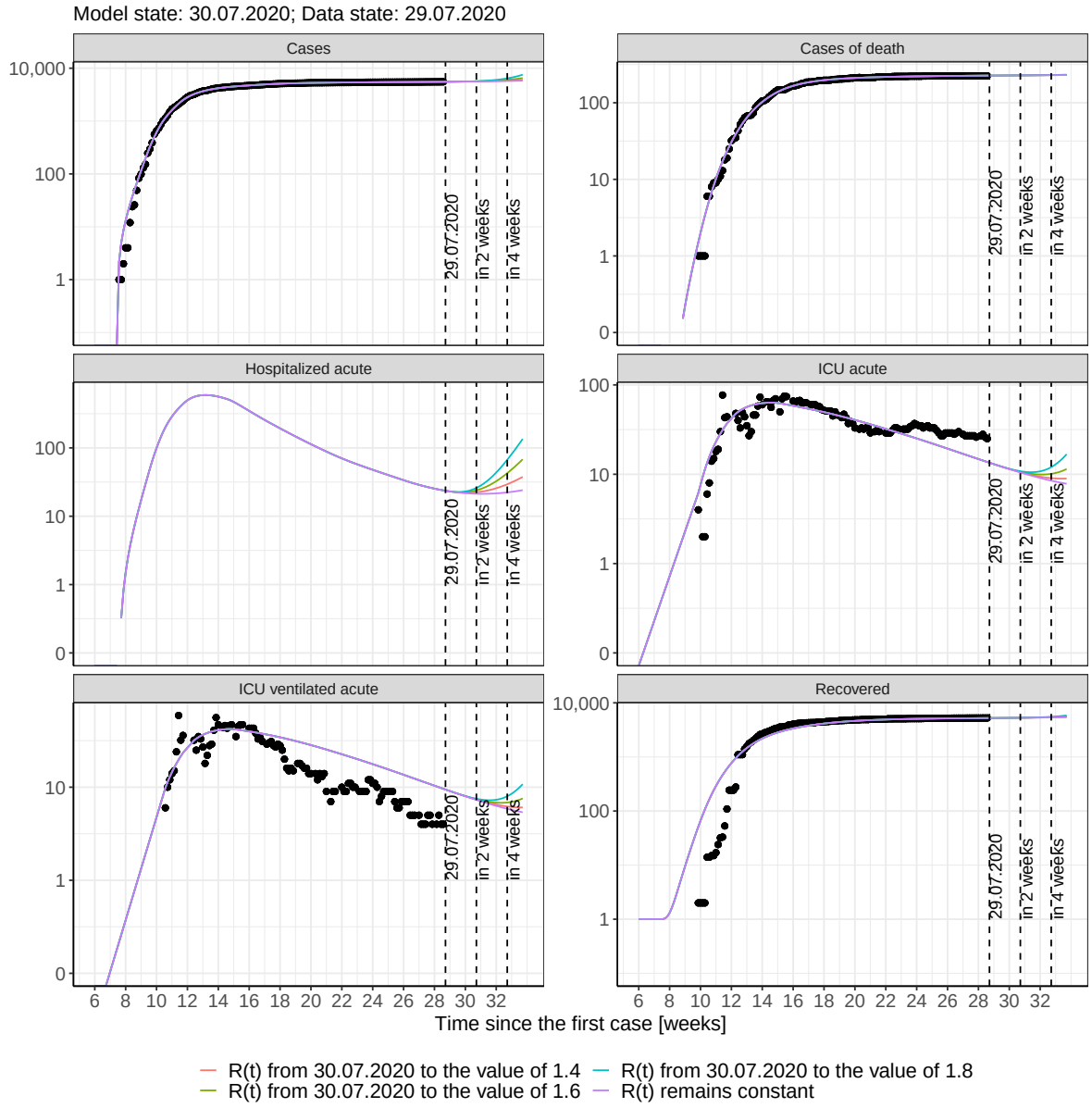


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 151 and 152 represent the model prediction for the next 16 weeks for Saxony on a linear (151) and a semi-logarithmic (152) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

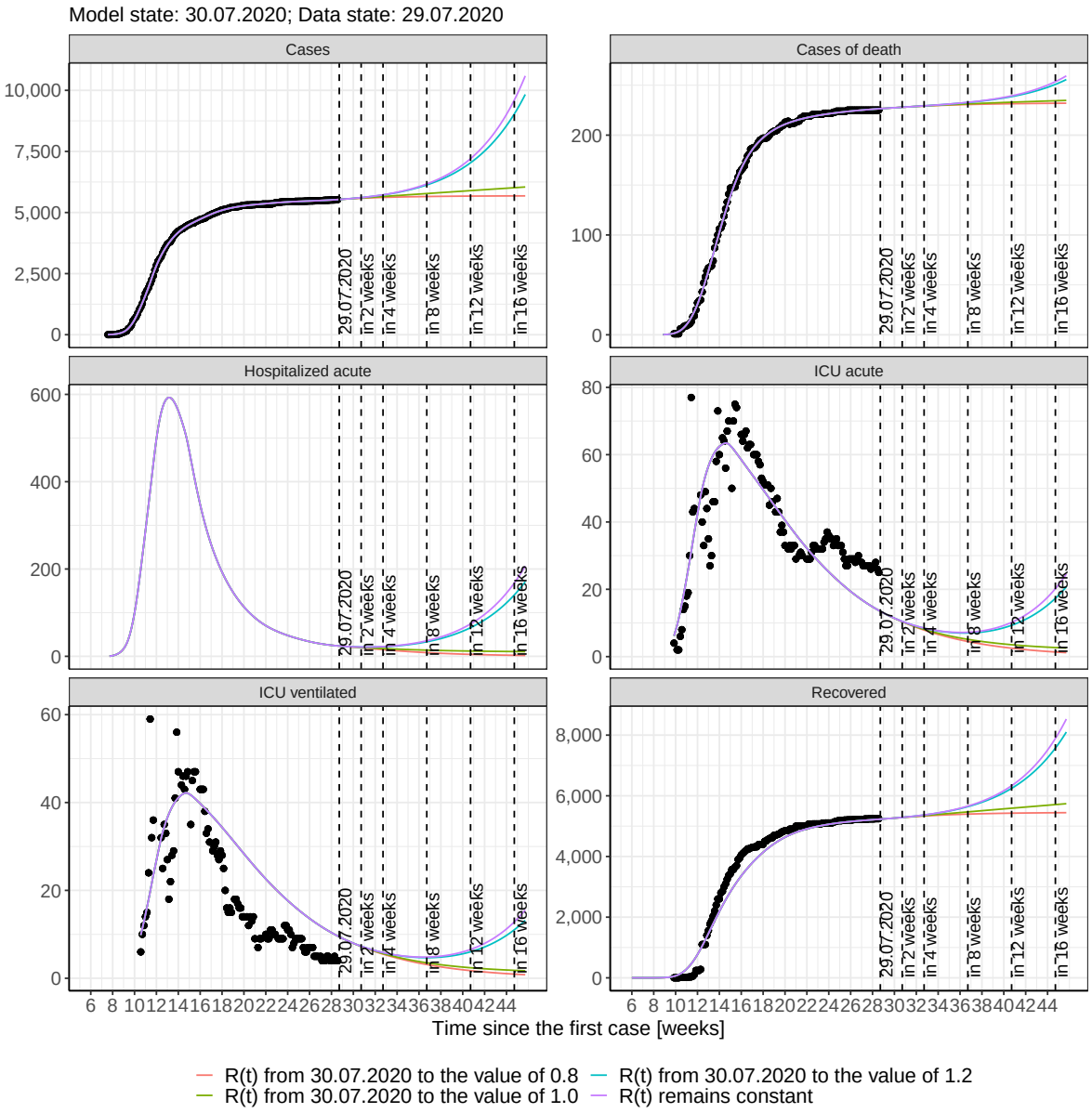


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

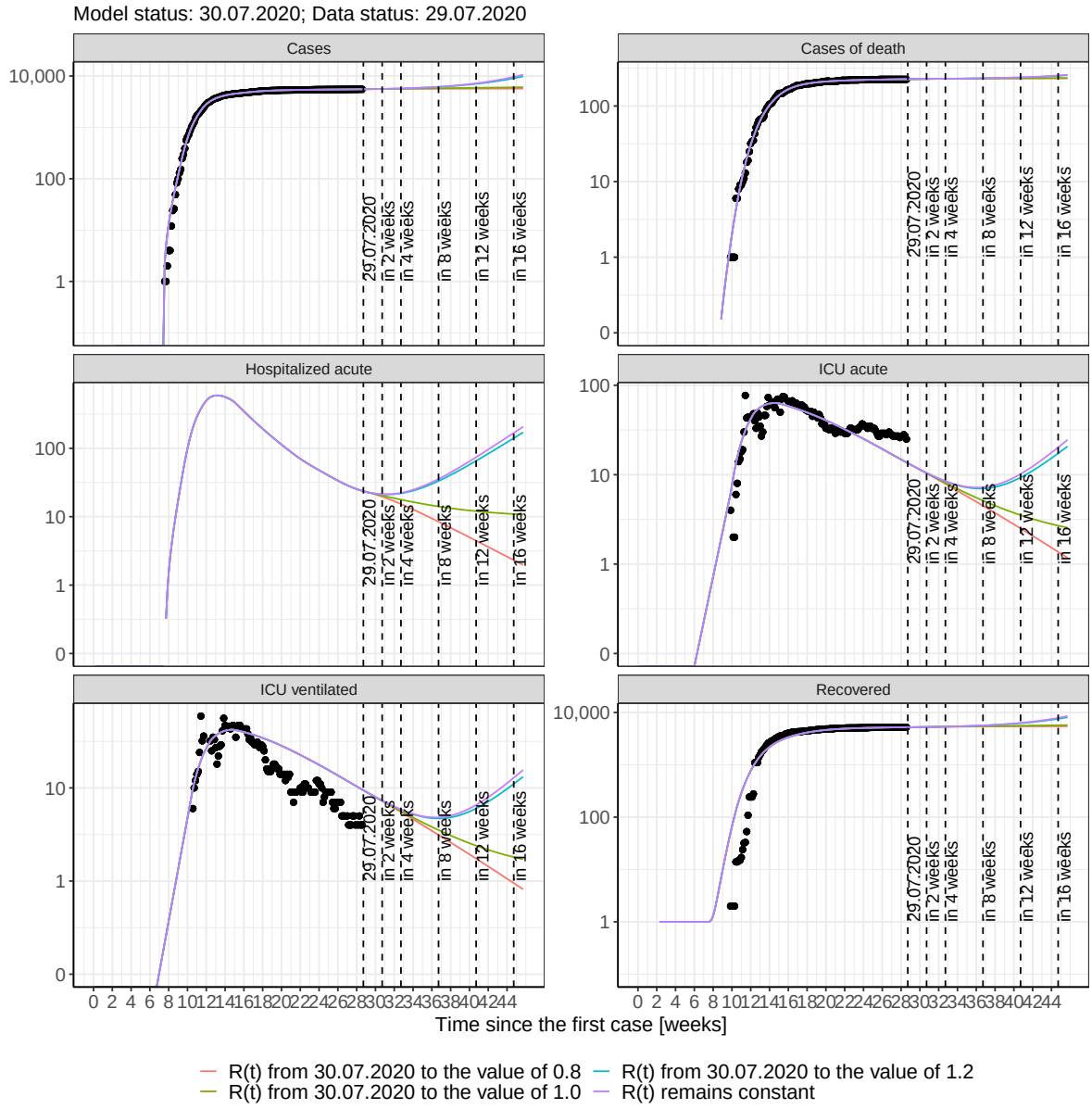


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 53) Model status from 30.07.2020; Data status: 29.07.2020.

Table 50: Saxony - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5539	227	5234	23	13	9
31.07.2020	5543	227	5238	23	13	9
01.08.2020	5548	227	5242	23	13	9
02.08.2020	5553	227	5245	23	12	9
03.08.2020	5558	227	5249	22	12	9
04.08.2020	5563	227	5253	22	12	8
05.08.2020	5568	227	5258	22	12	8
06.08.2020	5573	227	5262	22	12	8
07.08.2020	5579	227	5266	22	11	8
08.08.2020	5585	228	5270	22	11	8
09.08.2020	5591	228	5275	22	11	8
10.08.2020	5597	228	5279	21	11	8
11.08.2020	5603	228	5284	21	11	7
12.08.2020	5610	228	5288	21	10	7
13.08.2020	5616	228	5293	21	10	7
14.08.2020	5623	228	5298	21	10	7
15.08.2020	5630	228	5303	21	10	7
16.08.2020	5638	228	5308	21	10	7
17.08.2020	5646	228	5314	21	10	7
18.08.2020	5653	229	5319	21	10	7
19.08.2020	5661	229	5325	21	9	7
20.08.2020	5670	229	5330	22	9	6
21.08.2020	5678	229	5336	22	9	6
22.08.2020	5687	229	5342	22	9	6
23.08.2020	5696	229	5348	22	9	6
24.08.2020	5706	229	5355	22	9	6
25.08.2020	5715	229	5361	22	9	6
26.08.2020	5725	229	5368	22	8	6

Table 51: Saxony - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5538	227	5234	23	13	9
31.07.2020	5543	227	5238	23	13	9
01.08.2020	5547	227	5242	23	13	9
02.08.2020	5550	227	5245	23	12	9
03.08.2020	5554	227	5249	22	12	9
04.08.2020	5558	227	5253	22	12	8
05.08.2020	5562	227	5257	22	12	8
06.08.2020	5565	227	5261	21	12	8
07.08.2020	5569	227	5265	21	11	8
08.08.2020	5572	228	5269	21	11	8
09.08.2020	5575	228	5273	21	11	8
10.08.2020	5578	228	5277	20	11	8
11.08.2020	5581	228	5281	20	11	7
12.08.2020	5584	228	5285	20	10	7
13.08.2020	5587	228	5289	19	10	7
14.08.2020	5590	228	5292	19	10	7
15.08.2020	5592	228	5296	19	10	7
16.08.2020	5595	228	5300	18	10	7
17.08.2020	5598	228	5304	18	9	7
18.08.2020	5600	228	5307	18	9	6
19.08.2020	5602	229	5311	17	9	6
20.08.2020	5605	229	5314	17	9	6
21.08.2020	5607	229	5318	17	9	6
22.08.2020	5609	229	5321	17	9	6
23.08.2020	5612	229	5324	16	8	6
24.08.2020	5614	229	5328	16	8	6
25.08.2020	5616	229	5331	16	8	6
26.08.2020	5618	229	5334	15	8	6

Table 52: Saxony - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5538	227	5234	23	13	9
31.07.2020	5543	227	5238	23	13	9
01.08.2020	5547	227	5242	23	13	9
02.08.2020	5552	227	5245	23	12	9
03.08.2020	5556	227	5249	22	12	9
04.08.2020	5560	227	5253	22	12	8
05.08.2020	5564	227	5257	22	12	8
06.08.2020	5569	227	5261	22	12	8
07.08.2020	5573	227	5266	21	11	8
08.08.2020	5578	228	5270	21	11	8
09.08.2020	5582	228	5274	21	11	8
10.08.2020	5586	228	5278	21	11	8
11.08.2020	5590	228	5282	21	11	7
12.08.2020	5595	228	5286	20	10	7
13.08.2020	5599	228	5291	20	10	7
14.08.2020	5604	228	5295	20	10	7
15.08.2020	5608	228	5299	20	10	7
16.08.2020	5612	228	5303	20	10	7
17.08.2020	5616	228	5308	19	9	7
18.08.2020	5621	229	5312	19	9	7
19.08.2020	5625	229	5316	19	9	6
20.08.2020	5629	229	5321	19	9	6
21.08.2020	5634	229	5325	19	9	6
22.08.2020	5638	229	5330	18	9	6
23.08.2020	5642	229	5334	18	9	6
24.08.2020	5647	229	5338	18	8	6
25.08.2020	5651	229	5343	18	8	6
26.08.2020	5655	229	5347	18	8	6

Table 53: Saxony - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	5539	227	5234	23	13	9
31.07.2020	5543	227	5238	23	13	9
01.08.2020	5548	227	5242	23	13	9
02.08.2020	5552	227	5245	23	12	9
03.08.2020	5558	227	5249	22	12	9
04.08.2020	5562	227	5253	22	12	8
05.08.2020	5568	227	5258	22	12	8
06.08.2020	5573	227	5262	22	12	8
07.08.2020	5579	227	5266	22	11	8
08.08.2020	5584	228	5270	22	11	8
09.08.2020	5590	228	5275	21	11	8
10.08.2020	5596	228	5279	21	11	8
11.08.2020	5602	228	5284	21	11	7
12.08.2020	5609	228	5288	21	10	7
13.08.2020	5615	228	5293	21	10	7
14.08.2020	5622	228	5298	21	10	7
15.08.2020	5629	228	5303	21	10	7
16.08.2020	5636	228	5308	21	10	7
17.08.2020	5643	228	5313	21	10	7
18.08.2020	5651	229	5319	21	9	7
19.08.2020	5659	229	5324	21	9	6
20.08.2020	5667	229	5330	21	9	6
21.08.2020	5675	229	5336	21	9	6
22.08.2020	5683	229	5341	21	9	6
23.08.2020	5692	229	5347	22	9	6
24.08.2020	5701	229	5354	22	9	6
25.08.2020	5710	229	5360	22	9	6
26.08.2020	5720	229	5366	22	8	6

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

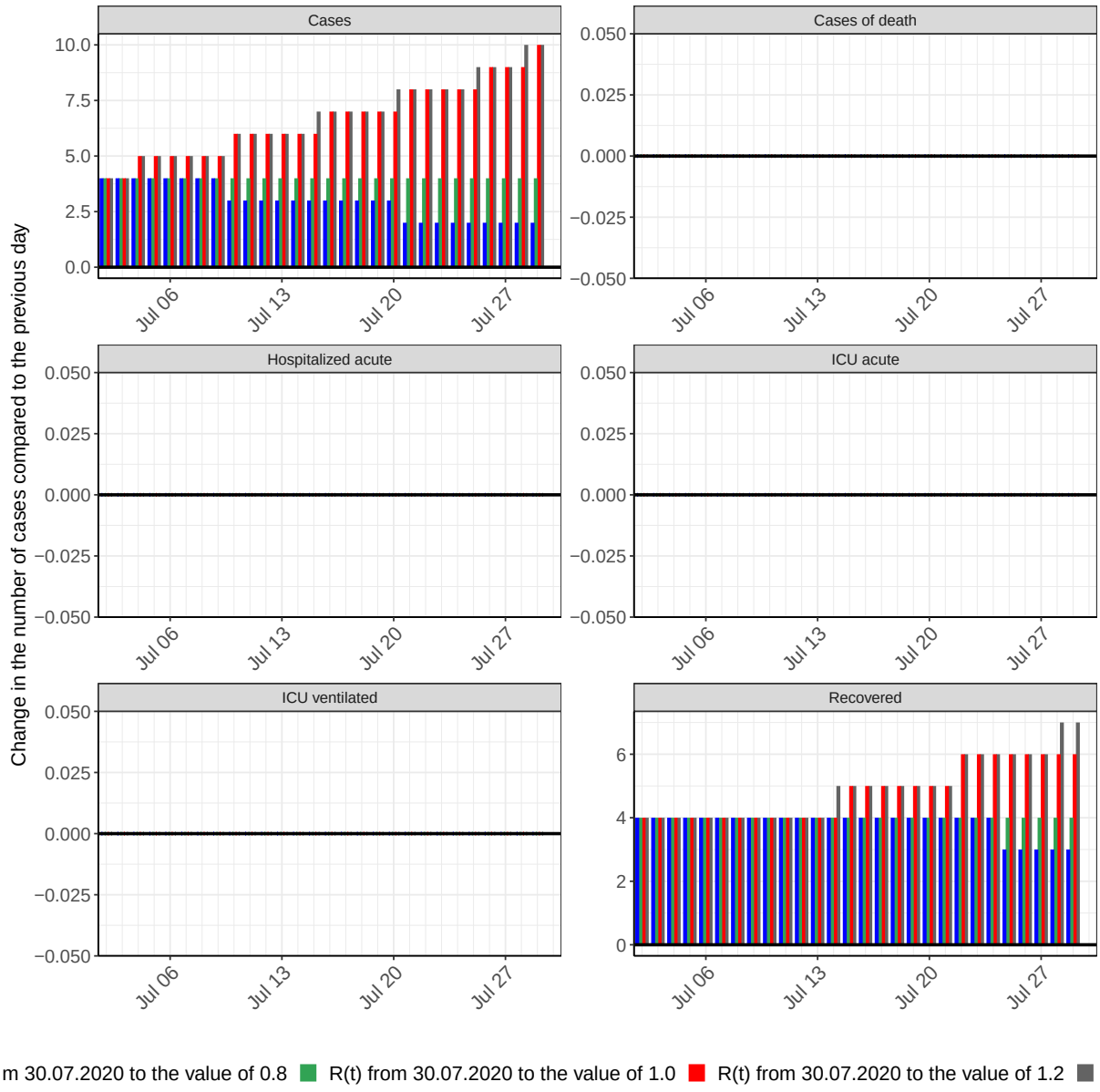


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

15 Saxony-Anhalt

15.1 Model description

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

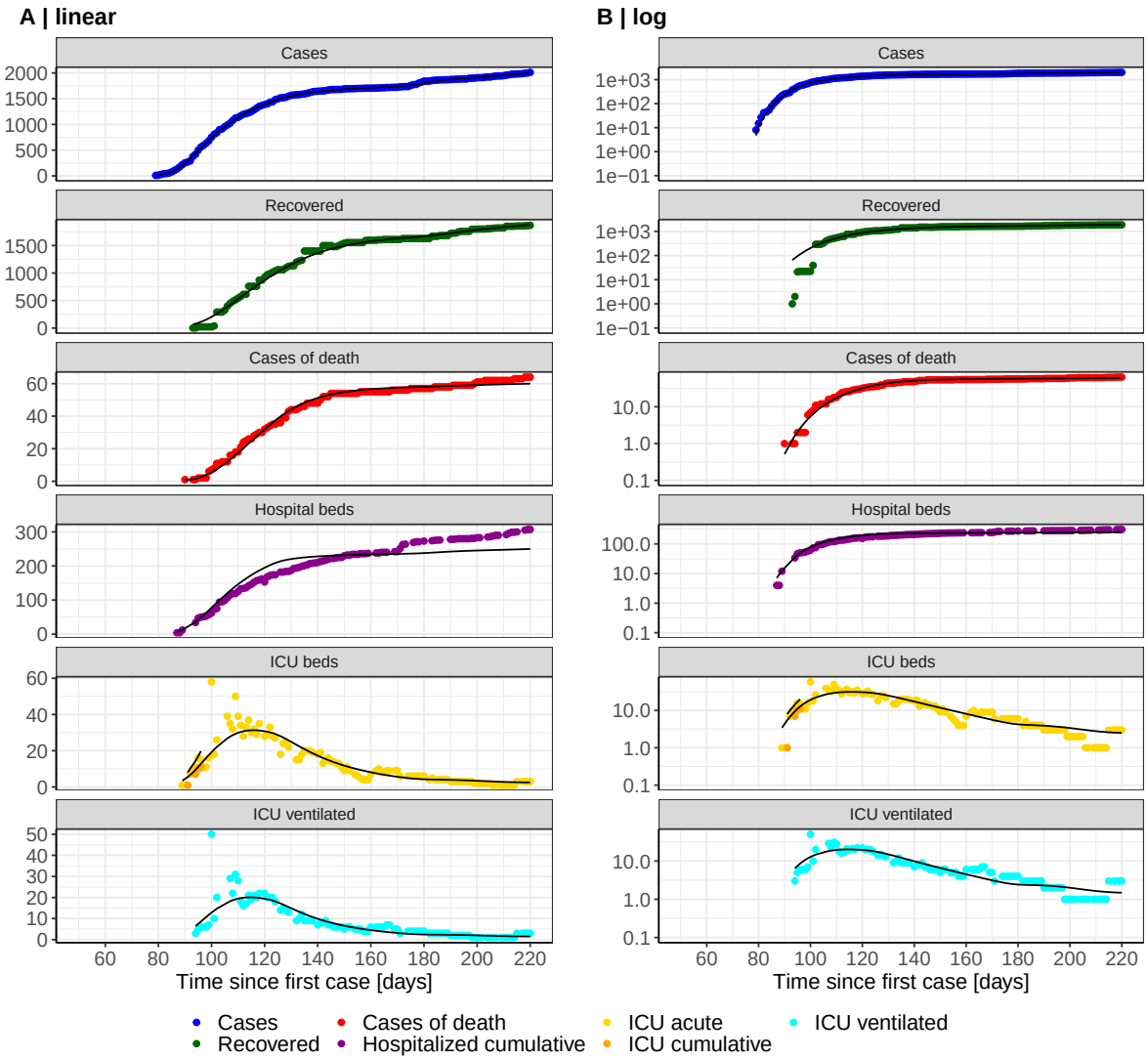


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

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

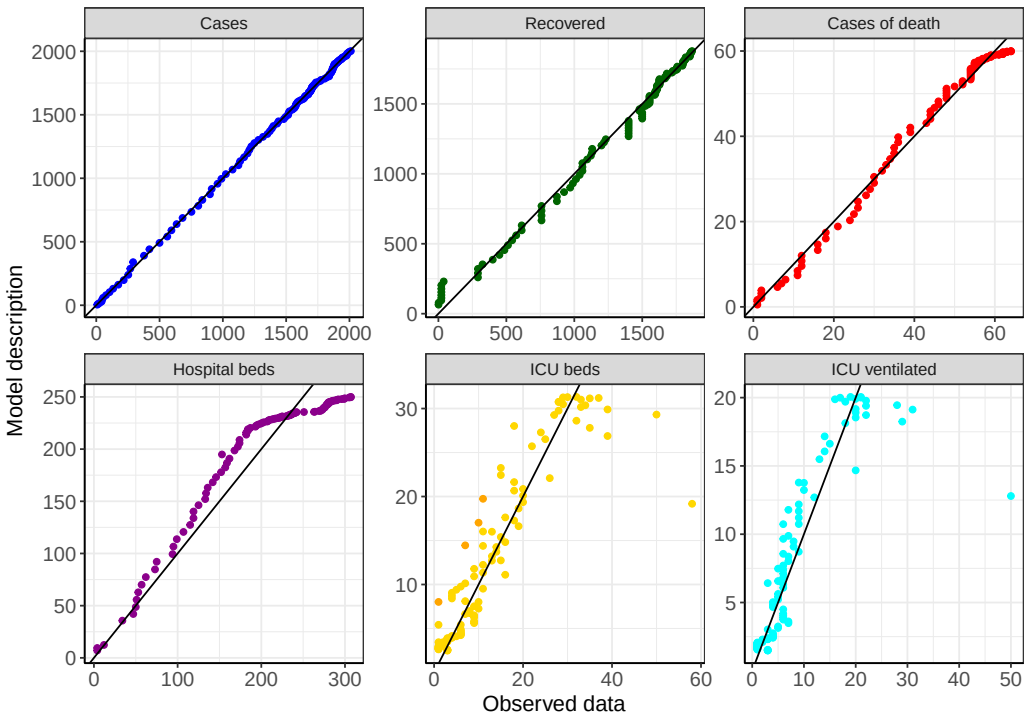


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

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

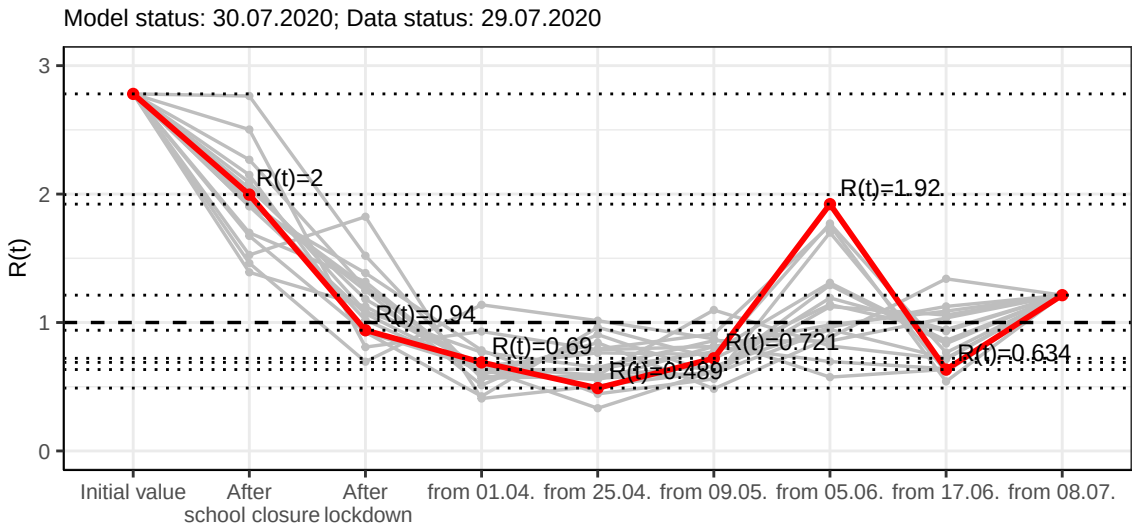


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

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

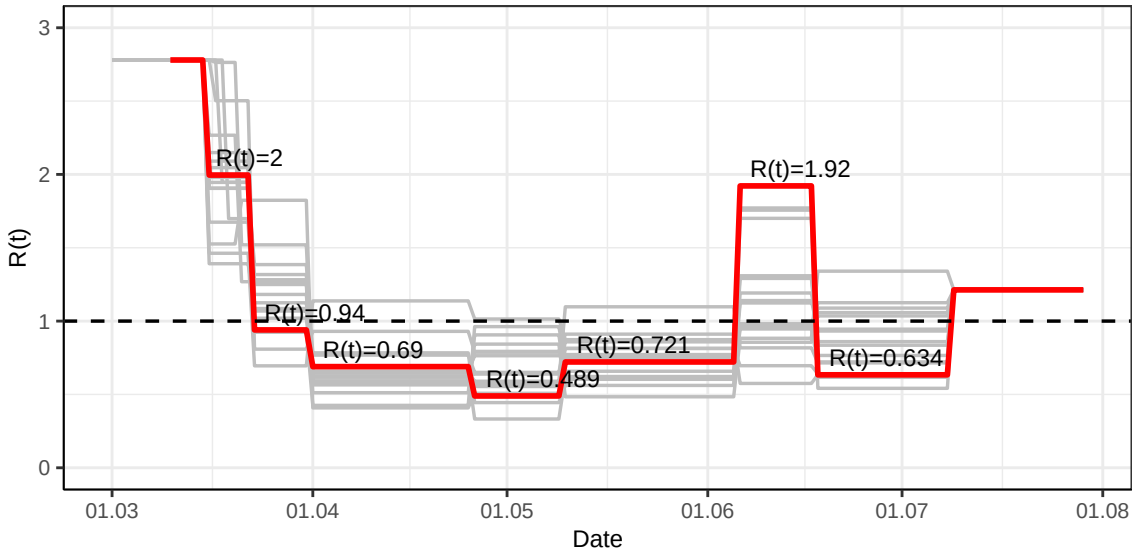


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

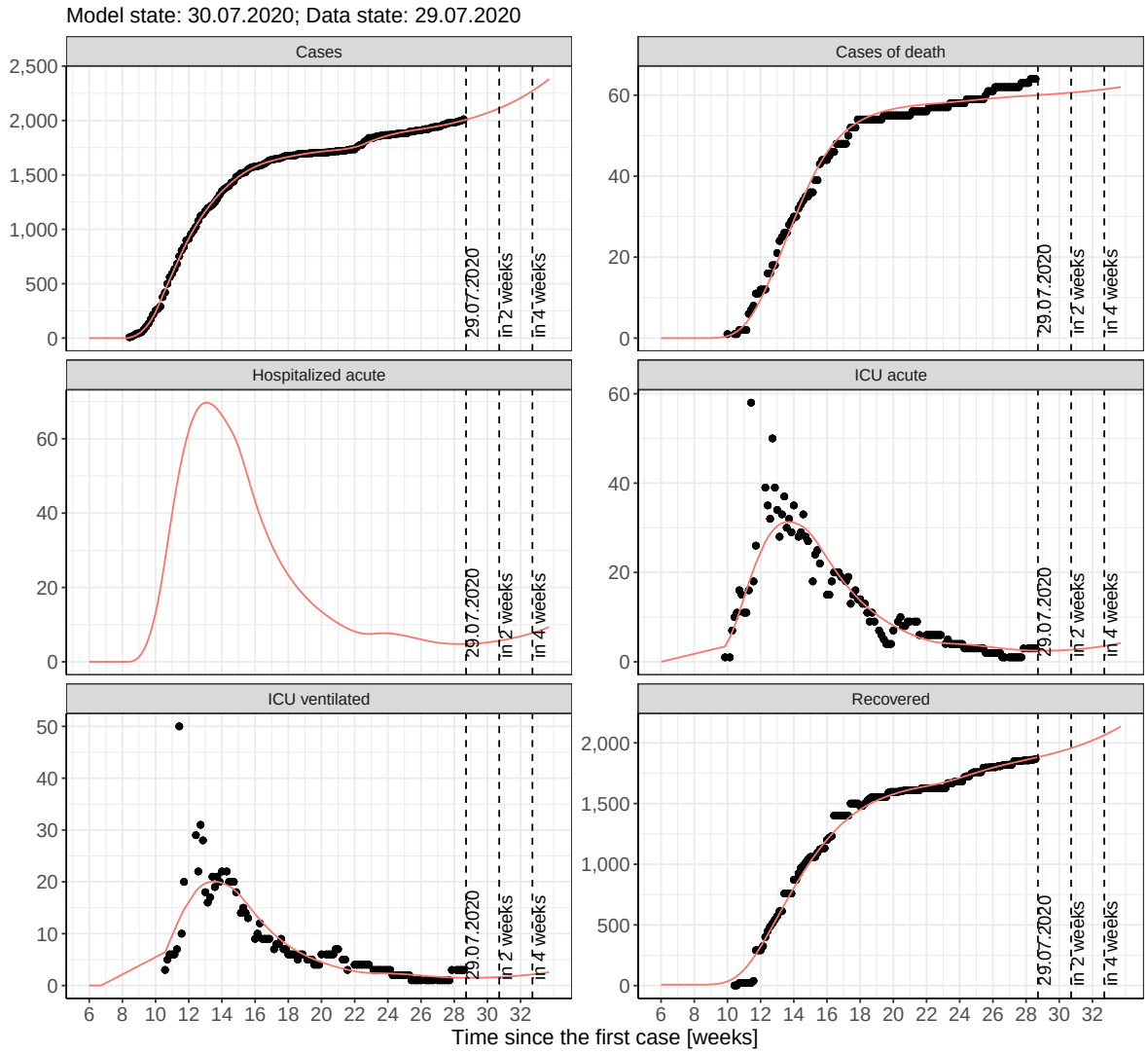


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

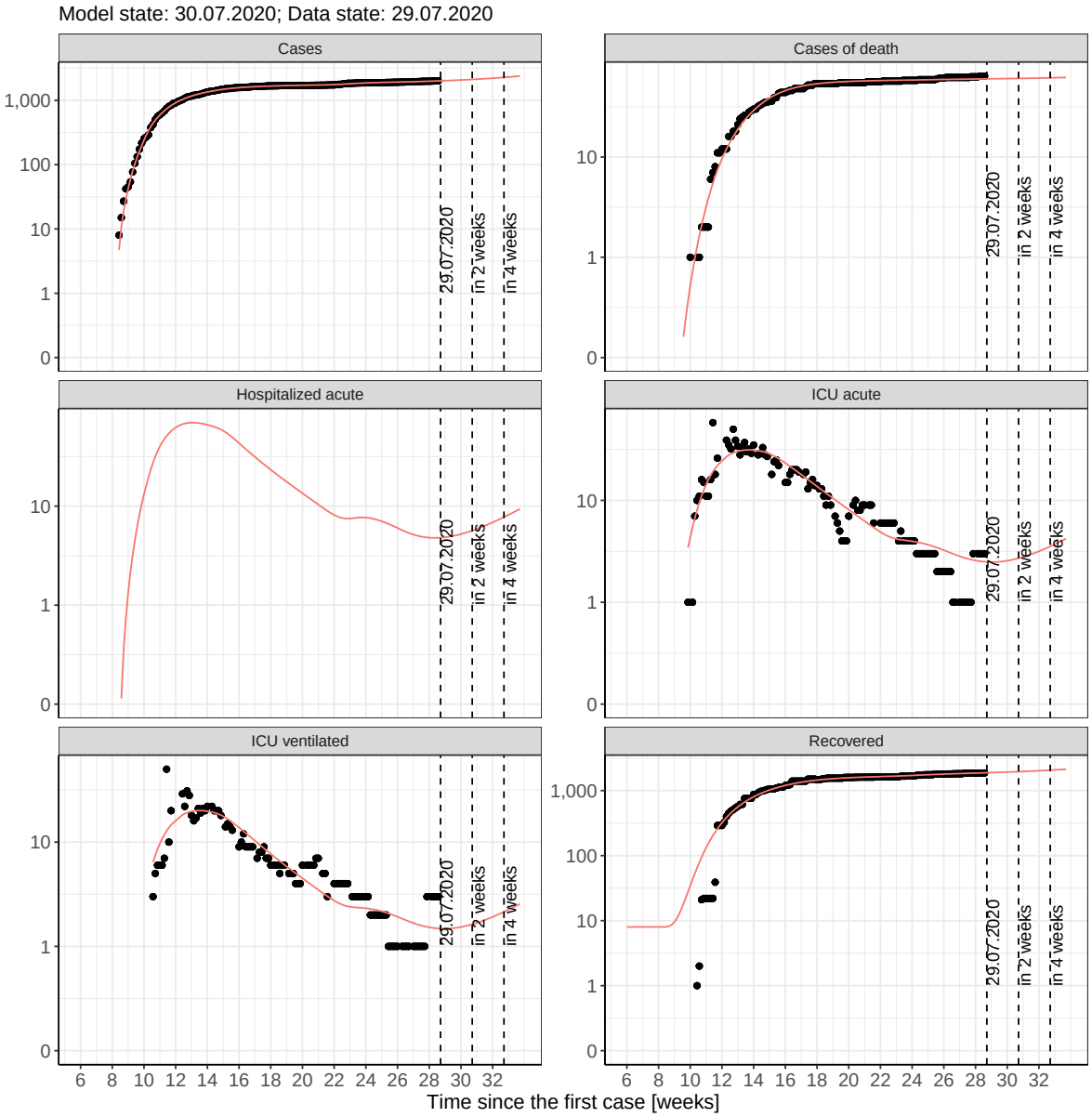


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 160 and 161 represent the model prediction for the next 4 weeks for Saxony-Anhalt on a linear (160) and a semi-logarithmic (161) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

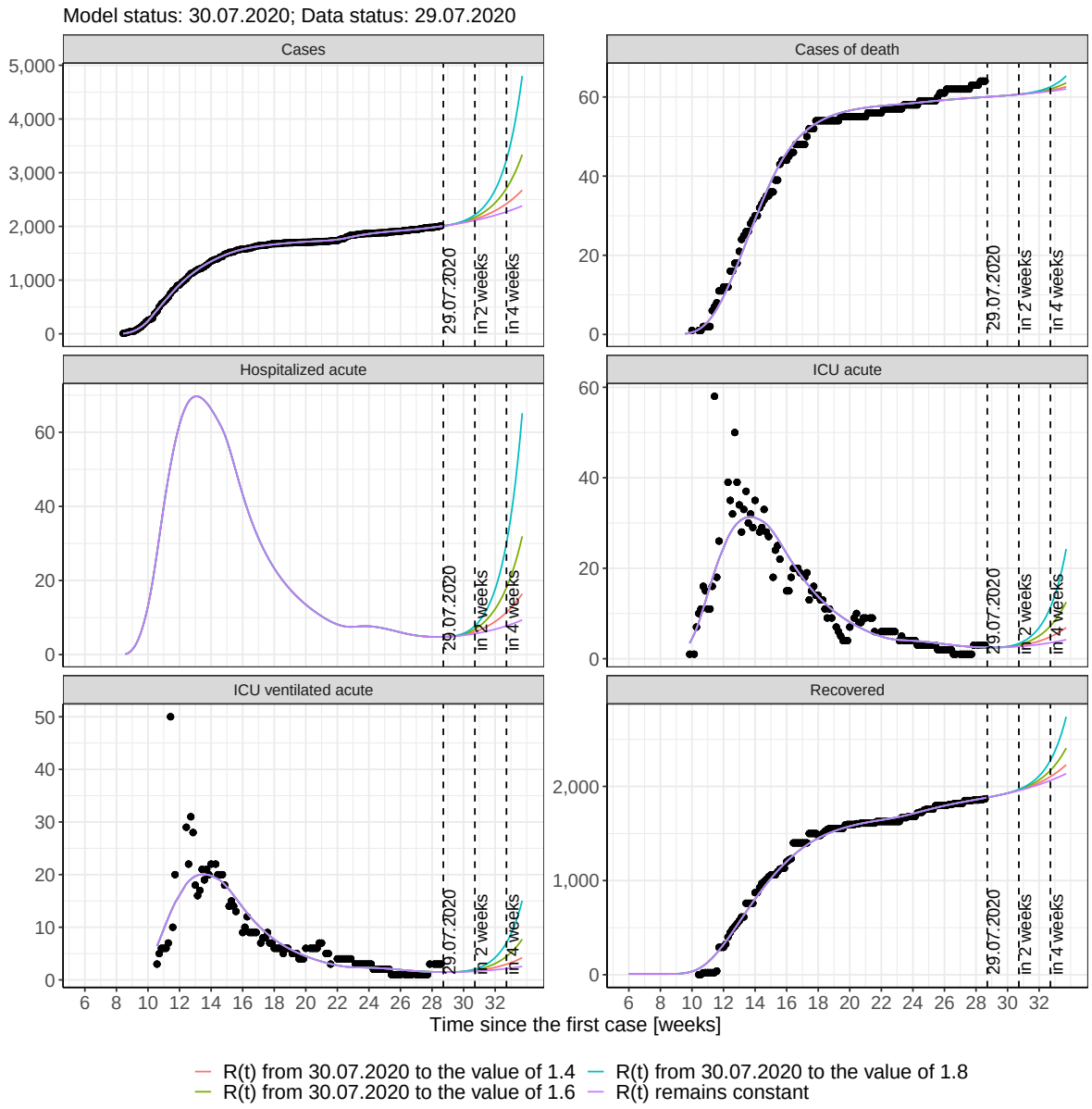


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

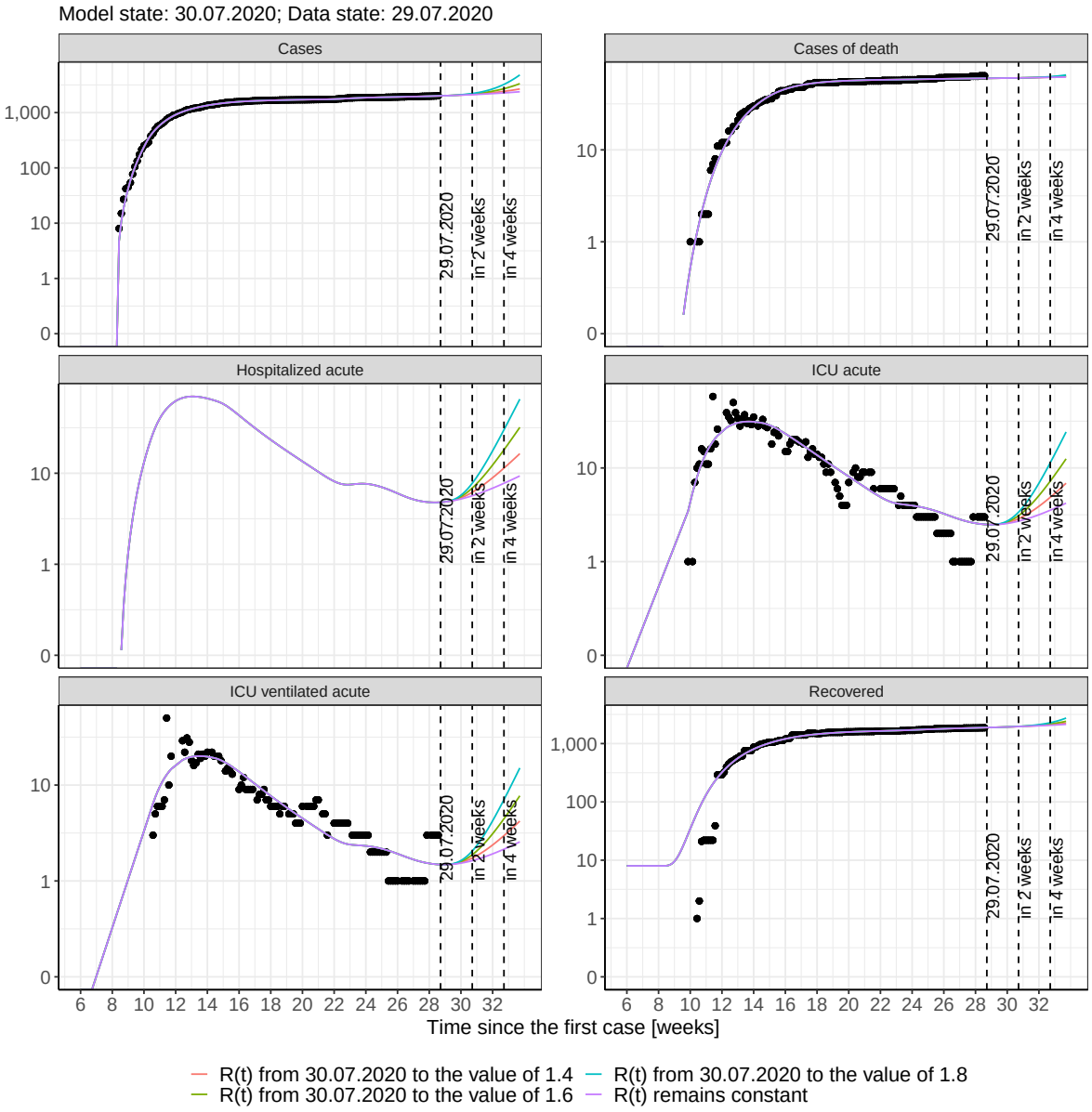


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 162 and 163 represent the model prediction for the next 16 weeks for Saxony-Anhalt on a linear (162) and a semi-logarithmic (163) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

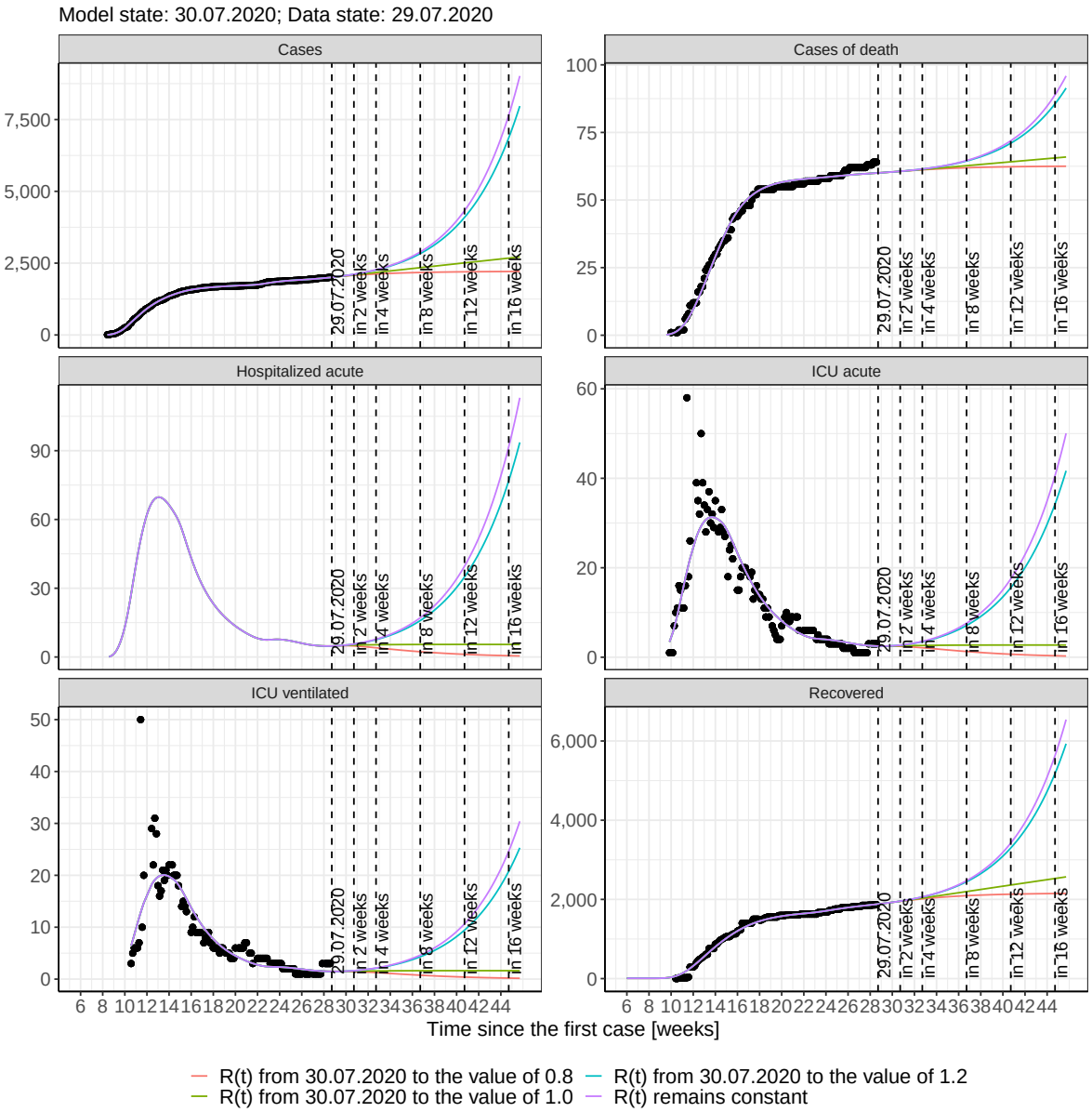


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

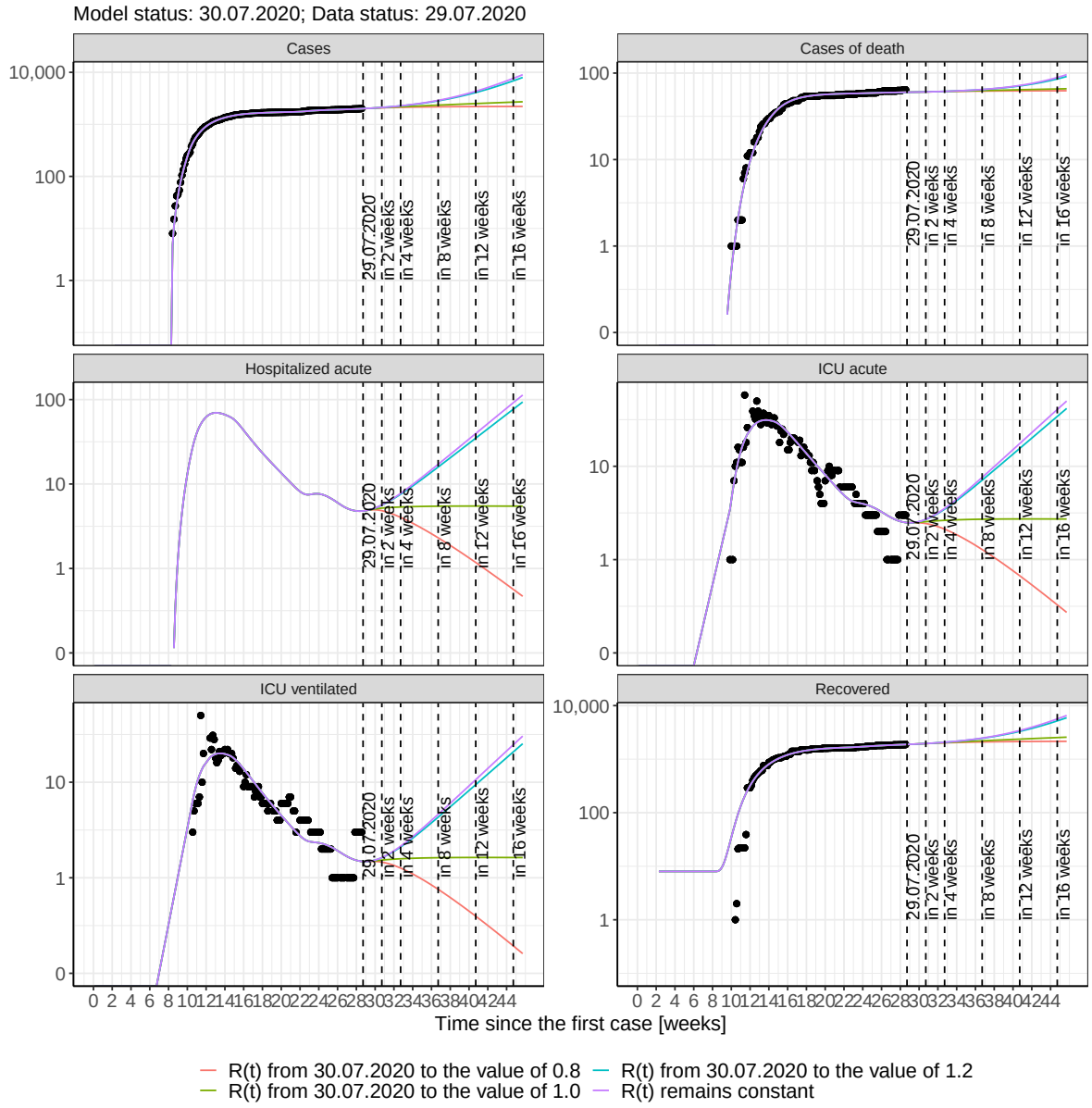


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 57) Model status from 30.07.2020; Data status: 29.07.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2014	60	1887	5	2	1
31.07.2020	2020	60	1891	5	2	1
01.08.2020	2026	60	1896	5	2	1
02.08.2020	2033	60	1901	5	2	1
03.08.2020	2040	60	1906	5	2	1
04.08.2020	2047	60	1911	5	3	1
05.08.2020	2054	60	1916	5	3	2
06.08.2020	2062	60	1921	5	3	2
07.08.2020	2070	60	1927	5	3	2
08.08.2020	2078	60	1932	5	3	2
09.08.2020	2086	60	1938	5	3	2
10.08.2020	2094	61	1944	5	3	2
11.08.2020	2103	61	1950	6	3	2
12.08.2020	2112	61	1956	6	3	2
13.08.2020	2122	61	1962	6	3	2
14.08.2020	2131	61	1969	6	3	2
15.08.2020	2141	61	1976	6	3	2
16.08.2020	2151	61	1982	6	3	2
17.08.2020	2162	61	1990	6	3	2
18.08.2020	2173	61	1997	6	3	2
19.08.2020	2184	61	2004	7	3	2
20.08.2020	2195	61	2012	7	3	2
21.08.2020	2207	61	2020	7	3	2
22.08.2020	2219	61	2028	7	3	2
23.08.2020	2232	61	2036	7	3	2
24.08.2020	2245	61	2045	7	3	2
25.08.2020	2258	61	2054	8	3	2
26.08.2020	2272	61	2063	8	4	2

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2014	60	1887	5	2	1
31.07.2020	2019	60	1891	5	2	1
01.08.2020	2025	60	1896	5	2	1
02.08.2020	2030	60	1901	5	2	1
03.08.2020	2036	60	1906	5	2	1
04.08.2020	2041	60	1911	5	2	1
05.08.2020	2046	60	1916	5	2	1
06.08.2020	2050	60	1921	5	2	1
07.08.2020	2055	60	1926	5	2	1
08.08.2020	2060	60	1931	5	2	1
09.08.2020	2064	60	1936	5	2	1
10.08.2020	2068	61	1941	5	2	1
11.08.2020	2073	61	1946	5	2	1
12.08.2020	2077	61	1951	5	2	1
13.08.2020	2081	61	1956	5	2	1
14.08.2020	2085	61	1960	5	2	1
15.08.2020	2088	61	1965	5	2	1
16.08.2020	2092	61	1970	5	2	1
17.08.2020	2096	61	1975	5	2	1
18.08.2020	2099	61	1979	5	2	1
19.08.2020	2102	61	1984	4	2	1
20.08.2020	2106	61	1988	4	2	1
21.08.2020	2109	61	1993	4	2	1
22.08.2020	2112	61	1997	4	2	1
23.08.2020	2115	61	2002	4	2	1
24.08.2020	2118	61	2006	4	2	1
25.08.2020	2120	61	2010	4	2	1
26.08.2020	2123	61	2014	4	2	1

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2014	60	1887	5	2	1
31.07.2020	2020	60	1891	5	2	1
01.08.2020	2026	60	1896	5	2	1
02.08.2020	2032	60	1901	5	2	1
03.08.2020	2038	60	1906	5	2	1
04.08.2020	2044	60	1911	5	2	1
05.08.2020	2050	60	1916	5	2	1
06.08.2020	2056	60	1921	5	3	2
07.08.2020	2062	60	1926	5	3	2
08.08.2020	2068	60	1932	5	3	2
09.08.2020	2074	60	1937	5	3	2
10.08.2020	2080	61	1942	5	3	2
11.08.2020	2086	61	1948	5	3	2
12.08.2020	2092	61	1953	5	3	2
13.08.2020	2098	61	1958	5	3	2
14.08.2020	2104	61	1964	5	3	2
15.08.2020	2110	61	1970	5	3	2
16.08.2020	2116	61	1975	5	3	2
17.08.2020	2122	61	1981	5	3	2
18.08.2020	2128	61	1987	5	3	2
19.08.2020	2134	61	1992	5	3	2
20.08.2020	2140	61	1998	5	3	2
21.08.2020	2146	61	2004	5	3	2
22.08.2020	2152	61	2010	5	3	2
23.08.2020	2158	61	2015	5	3	2
24.08.2020	2163	61	2021	5	3	2
25.08.2020	2169	61	2027	5	3	2
26.08.2020	2175	61	2033	5	3	2

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	2014	60	1887	5	2	1
31.07.2020	2020	60	1891	5	2	1
01.08.2020	2026	60	1896	5	2	1
02.08.2020	2033	60	1901	5	2	1
03.08.2020	2040	60	1906	5	2	1
04.08.2020	2047	60	1911	5	3	1
05.08.2020	2054	60	1916	5	3	2
06.08.2020	2062	60	1921	5	3	2
07.08.2020	2069	60	1927	5	3	2
08.08.2020	2077	60	1932	5	3	2
09.08.2020	2085	60	1938	5	3	2
10.08.2020	2094	61	1944	5	3	2
11.08.2020	2102	61	1950	6	3	2
12.08.2020	2111	61	1956	6	3	2
13.08.2020	2120	61	1962	6	3	2
14.08.2020	2129	61	1968	6	3	2
15.08.2020	2139	61	1975	6	3	2
16.08.2020	2149	61	1982	6	3	2
17.08.2020	2159	61	1989	6	3	2
18.08.2020	2169	61	1996	6	3	2
19.08.2020	2180	61	2003	6	3	2
20.08.2020	2191	61	2011	7	3	2
21.08.2020	2203	61	2019	7	3	2
22.08.2020	2214	61	2027	7	3	2
23.08.2020	2226	61	2035	7	3	2
24.08.2020	2239	61	2043	7	3	2
25.08.2020	2252	61	2052	7	3	2
26.08.2020	2265	61	2061	8	3	2

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

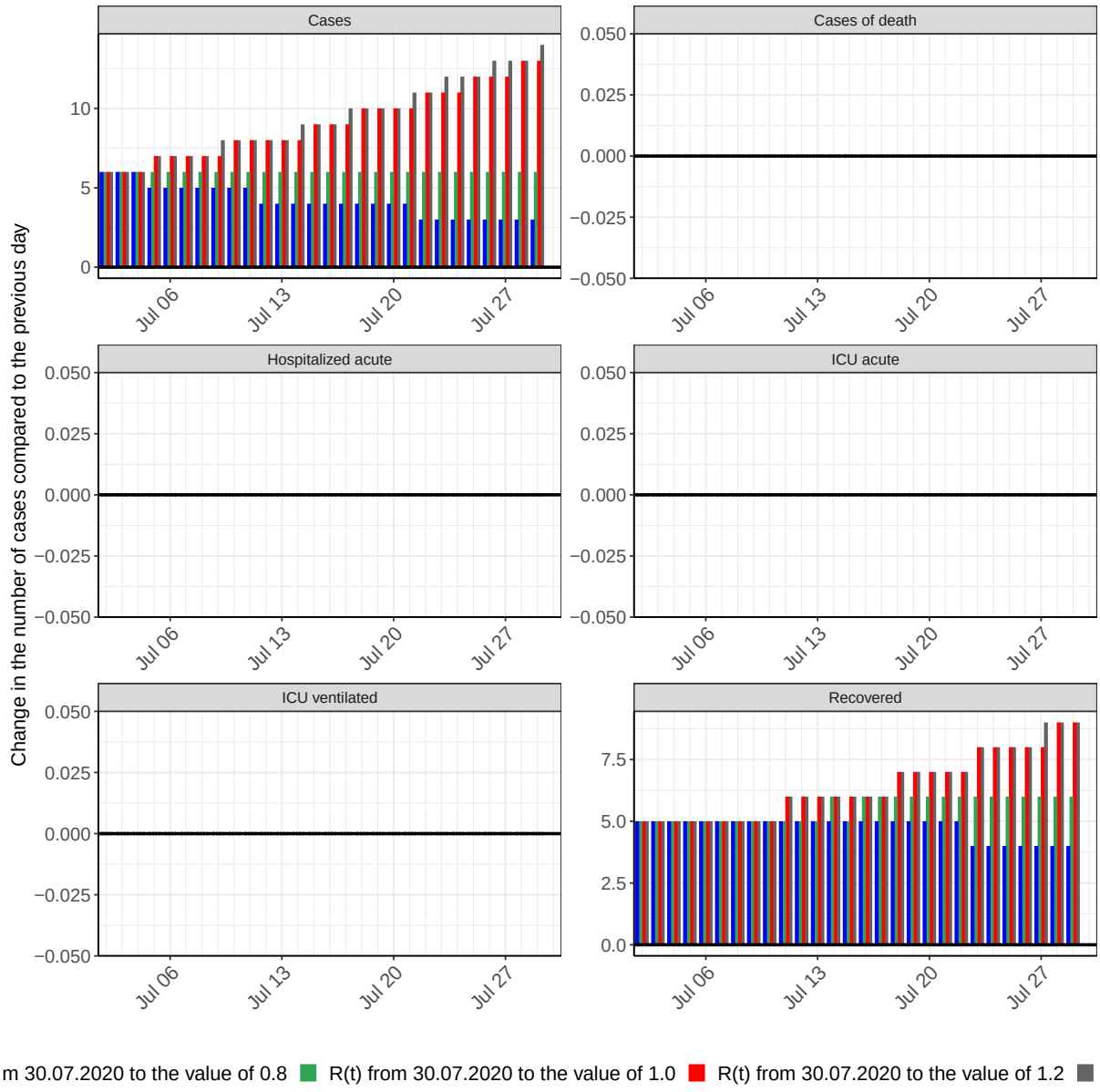


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

16 Schleswig-Holstein

16.1 Model description

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

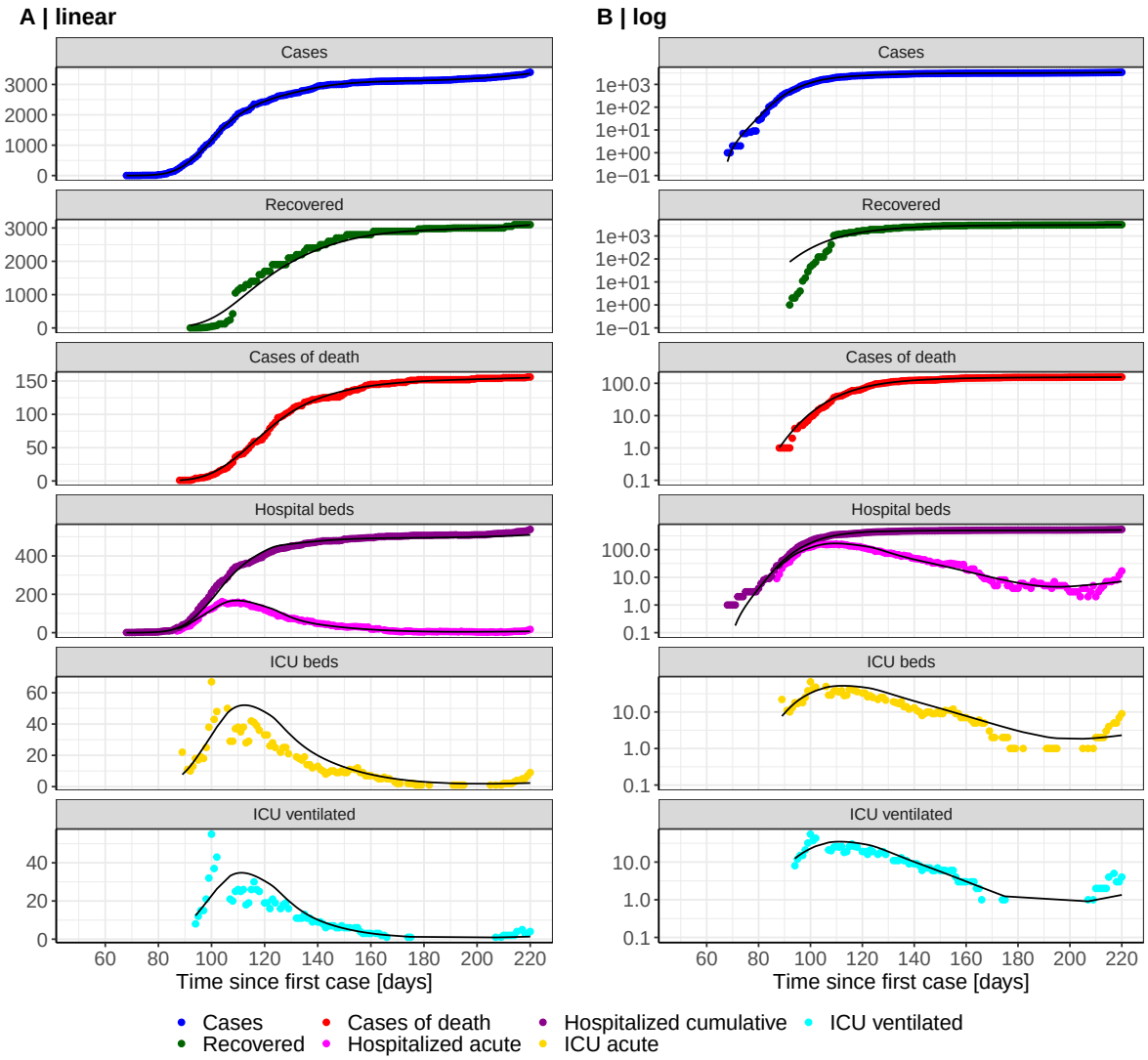


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

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

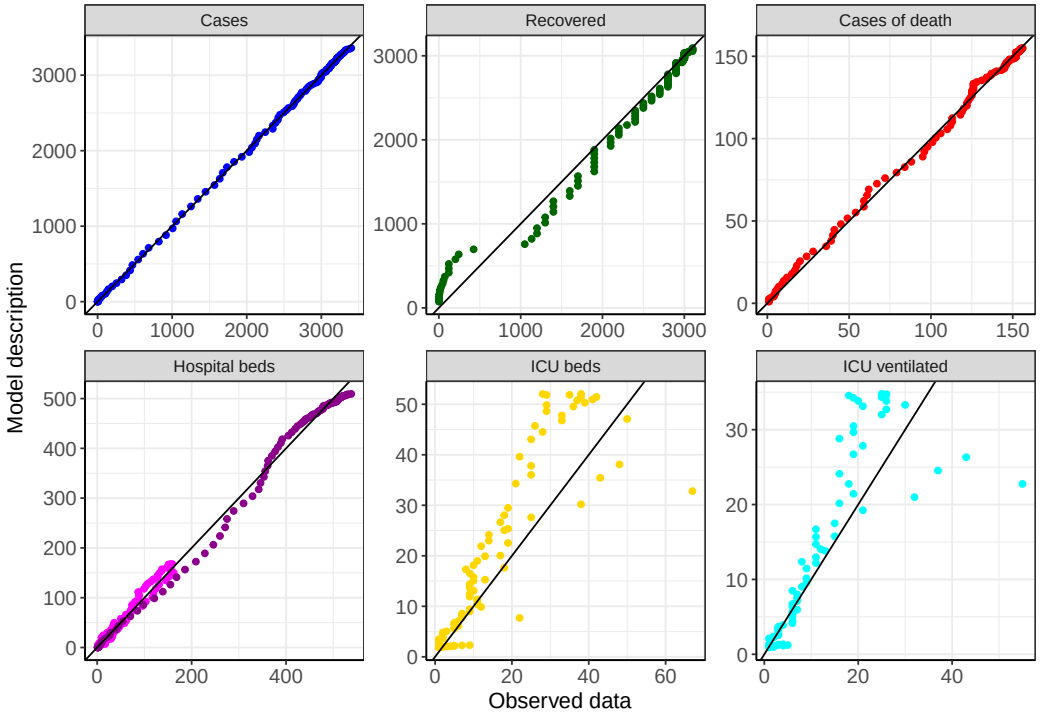


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

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

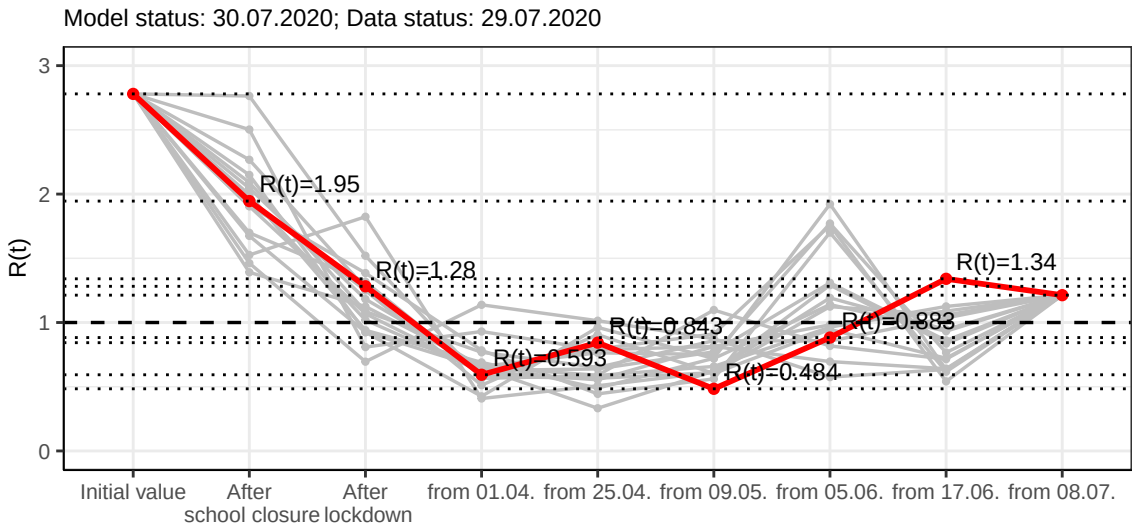


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

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

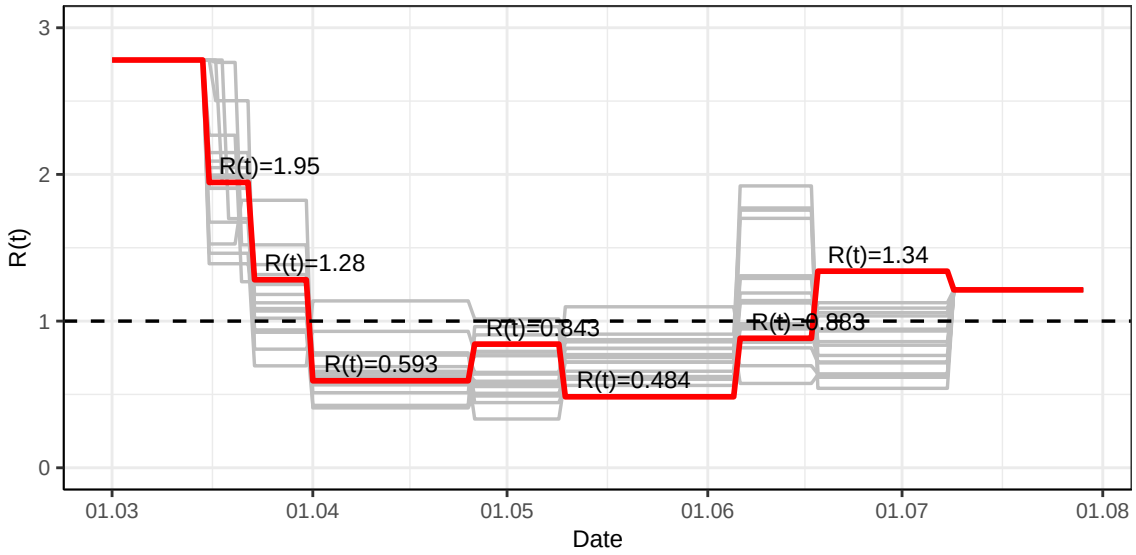


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

16.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

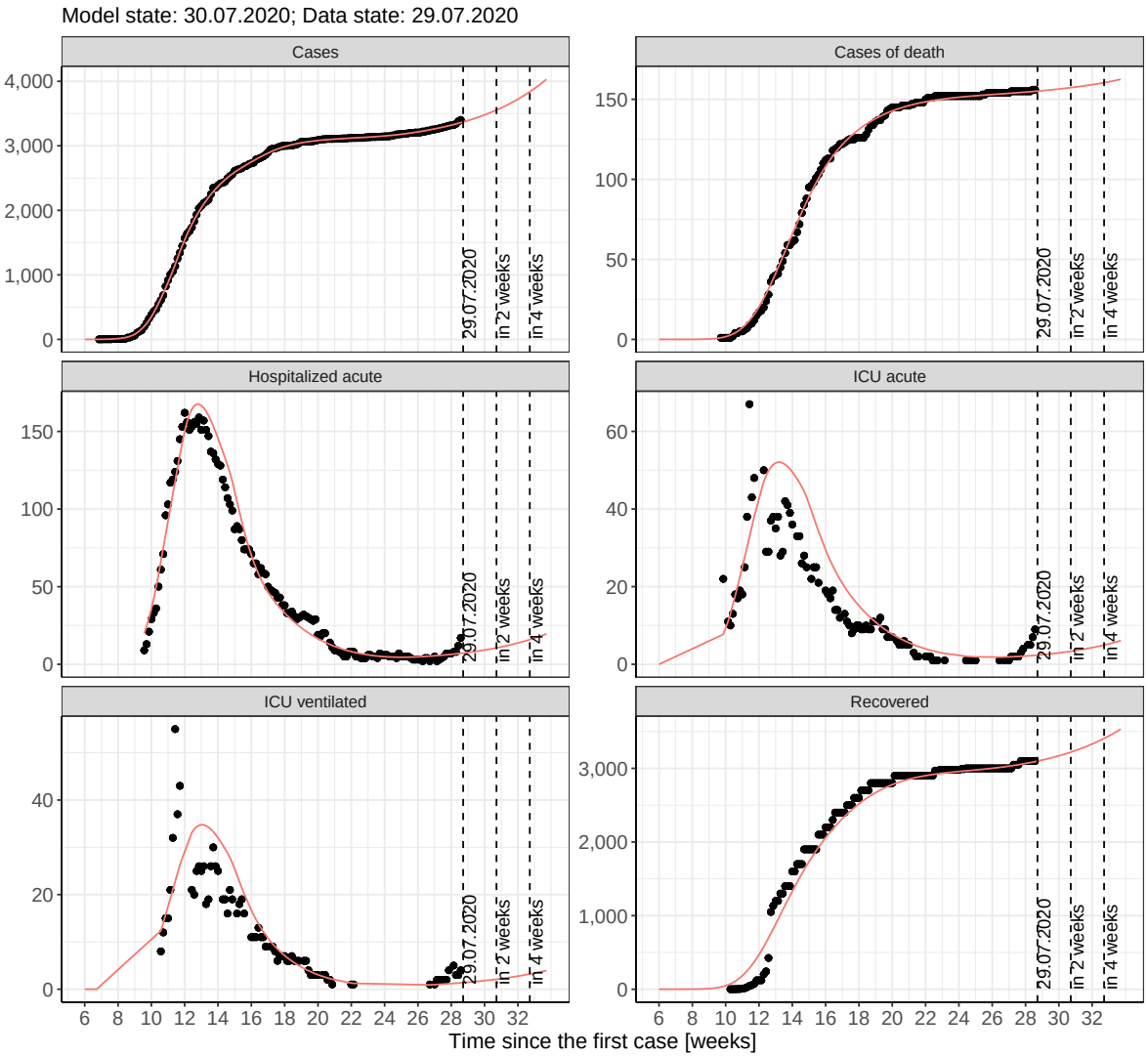


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

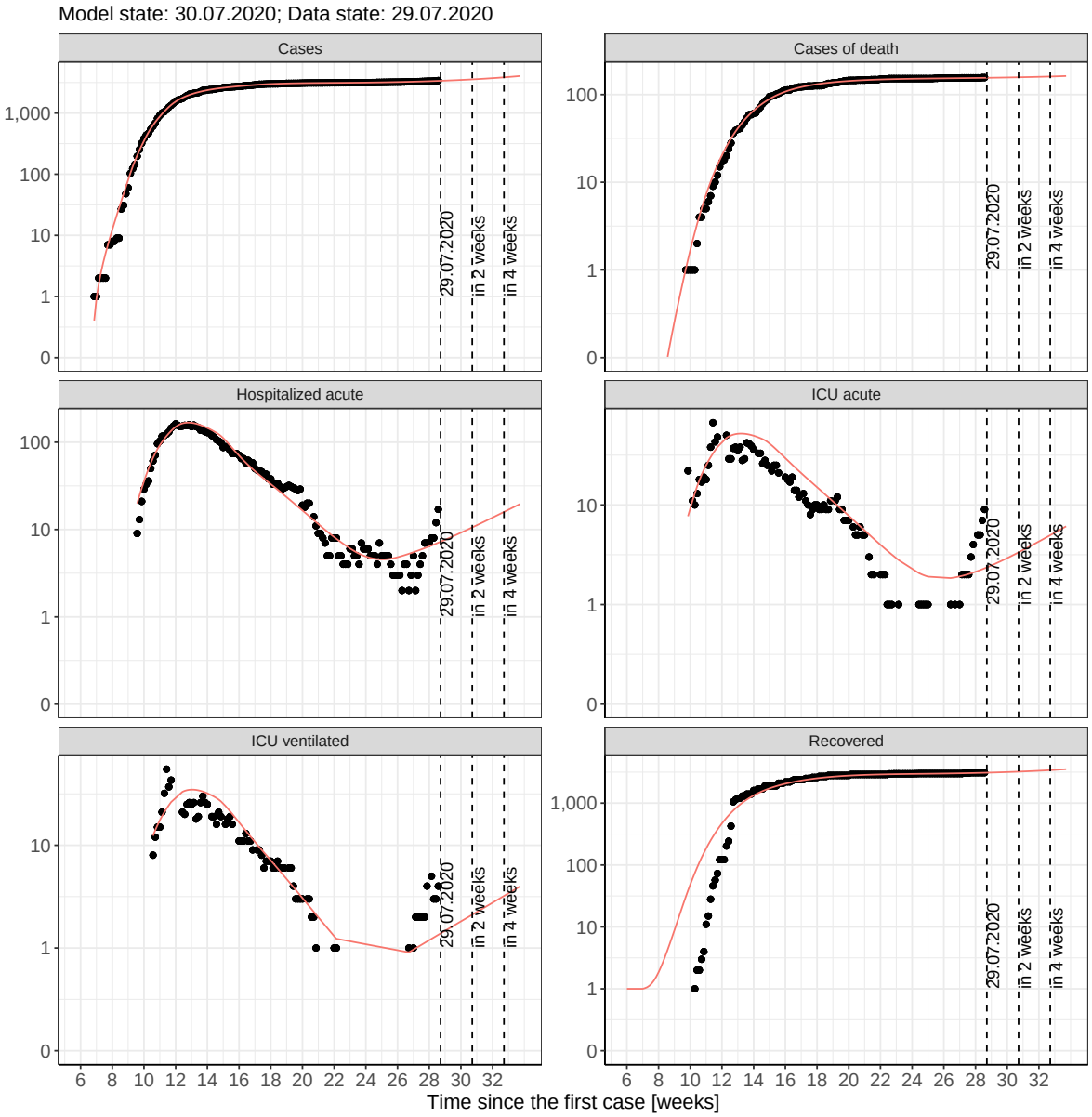


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 171 and 172 represent the model prediction for the next 4 weeks for Schleswig-Holstein on a linear (171) and a semi-logarithmic (172) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

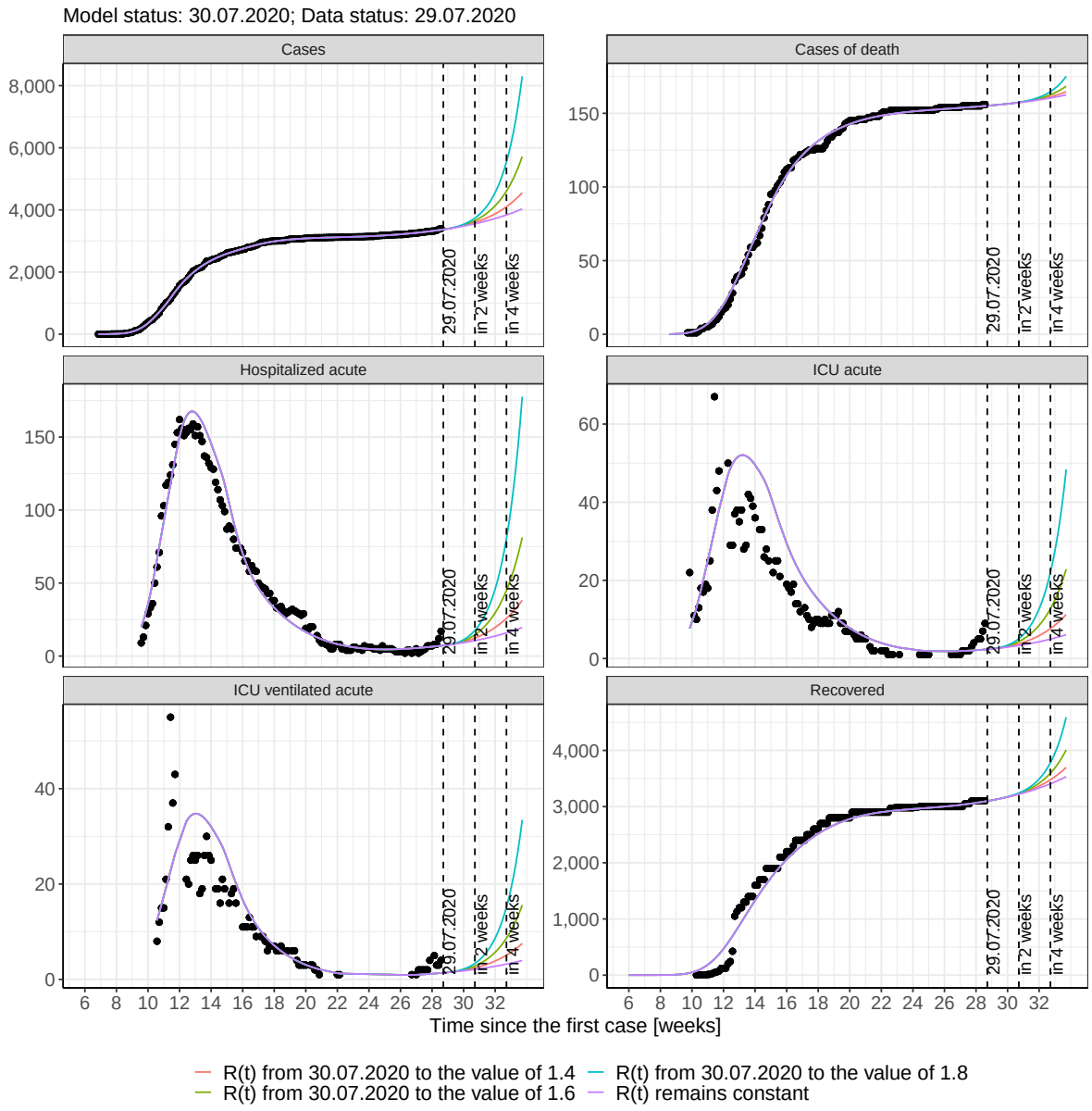


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

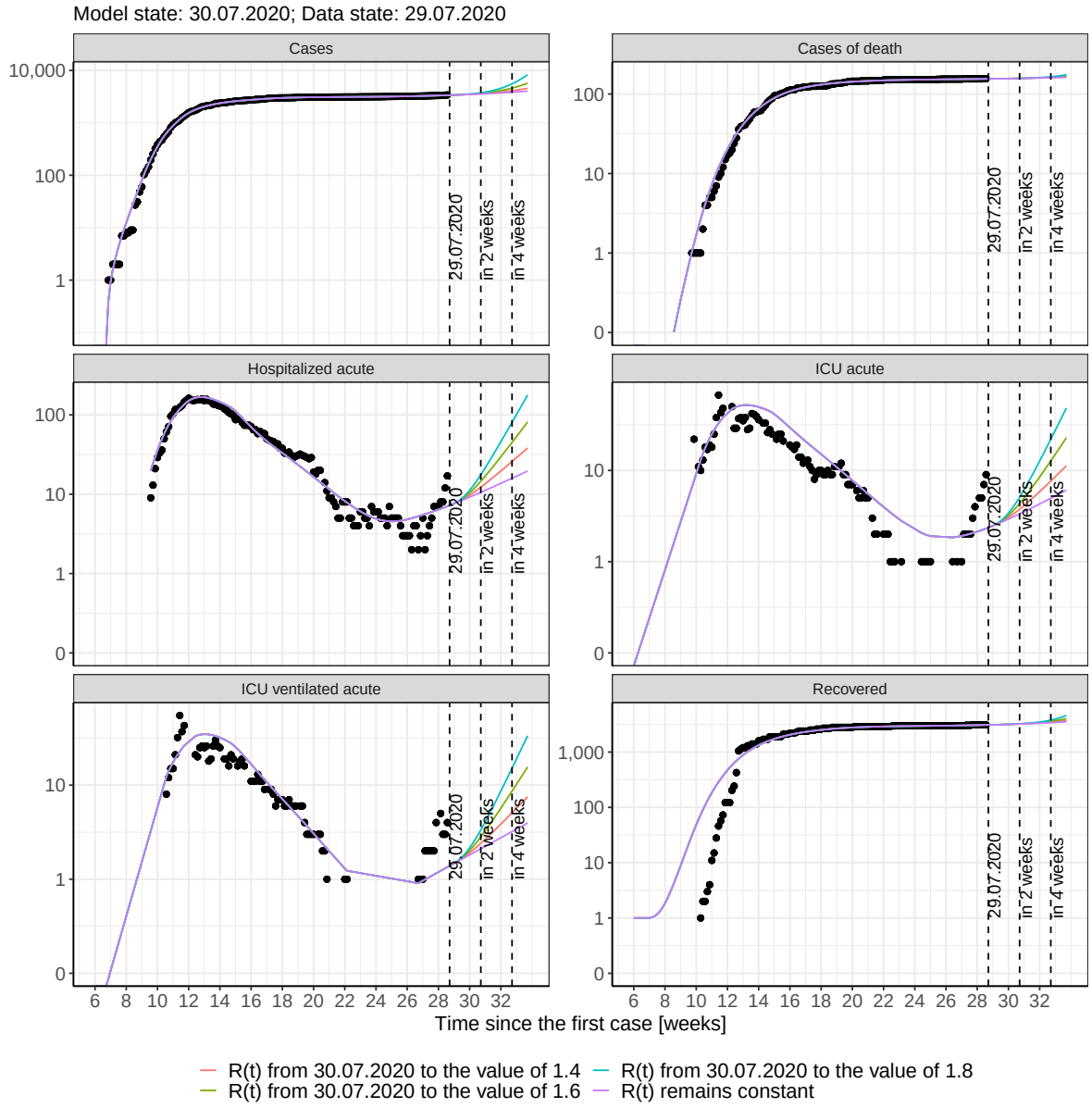


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 173 and 174 represent the model prediction for the next 16 weeks for Schleswig-Holstein on a linear (173) and a semi-logarithmic (174) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

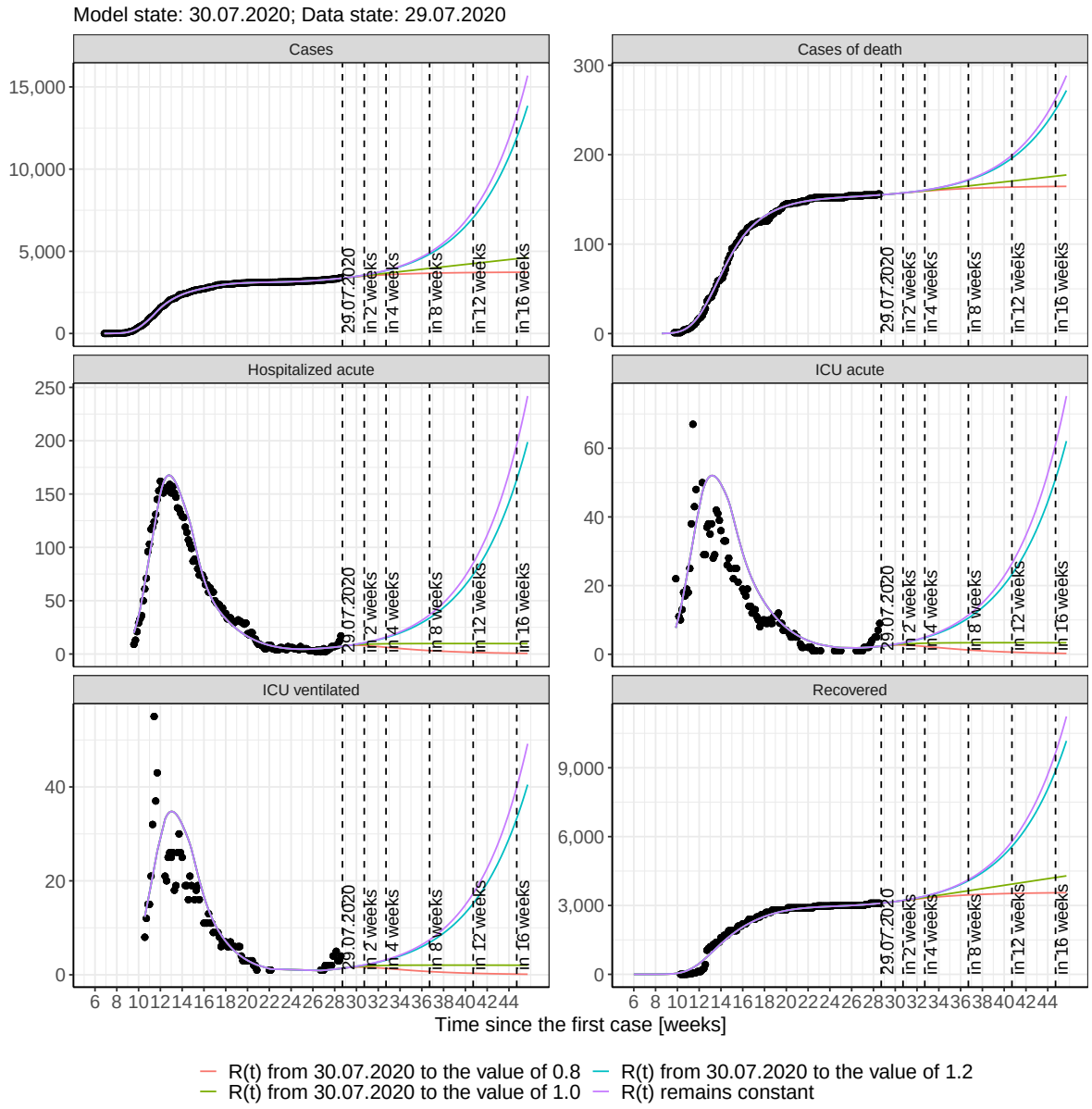


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

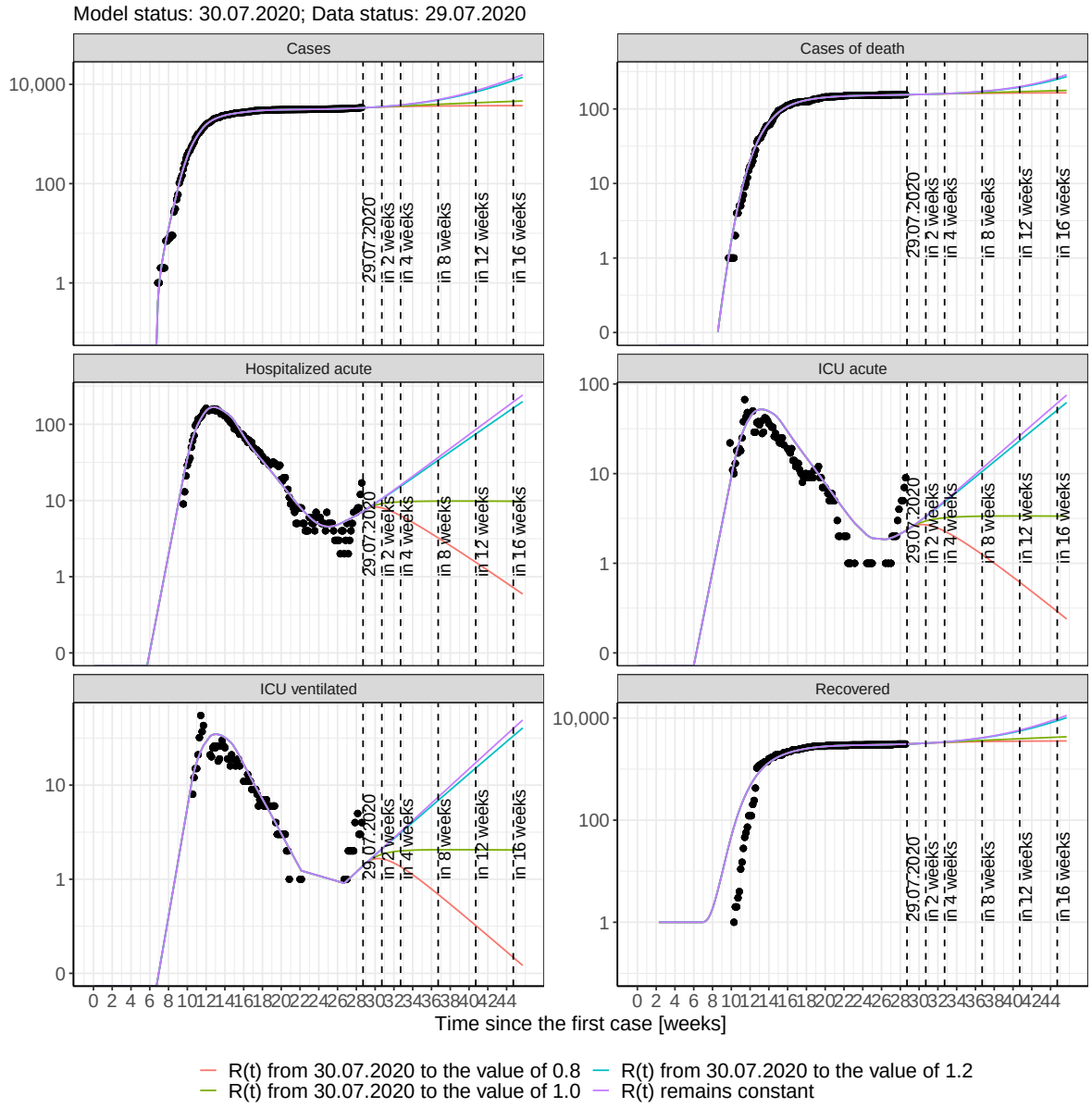


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 61) Model status from 30.07.2020; Data status: 29.07.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3380	155	3106	7	2	1
31.07.2020	3392	155	3113	8	2	1
01.08.2020	3403	156	3121	8	3	2
02.08.2020	3415	156	3128	8	3	2
03.08.2020	3427	156	3136	8	3	2
04.08.2020	3440	156	3145	8	3	2
05.08.2020	3452	156	3153	9	3	2
06.08.2020	3466	156	3162	9	3	2
07.08.2020	3480	156	3171	9	3	2
08.08.2020	3494	157	3180	9	3	2
09.08.2020	3508	157	3190	10	3	2
10.08.2020	3523	157	3200	10	3	2
11.08.2020	3539	157	3210	10	3	2
12.08.2020	3555	157	3220	11	3	2
13.08.2020	3571	157	3231	11	3	2
14.08.2020	3588	158	3242	11	4	2
15.08.2020	3606	158	3254	12	4	2
16.08.2020	3624	158	3266	12	4	2
17.08.2020	3642	158	3278	12	4	2
18.08.2020	3662	158	3290	13	4	3
19.08.2020	3681	159	3304	13	4	3
20.08.2020	3702	159	3317	13	4	3
21.08.2020	3723	159	3331	14	4	3
22.08.2020	3744	159	3345	14	4	3
23.08.2020	3767	160	3360	15	5	3
24.08.2020	3790	160	3375	15	5	3
25.08.2020	3813	160	3390	15	5	3
26.08.2020	3838	160	3406	16	5	3

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3380	155	3106	7	2	1
31.07.2020	3390	155	3113	8	2	1
01.08.2020	3400	156	3121	8	3	2
02.08.2020	3410	156	3128	8	3	2
03.08.2020	3419	156	3136	8	3	2
04.08.2020	3428	156	3144	8	3	2
05.08.2020	3437	156	3152	8	3	2
06.08.2020	3446	156	3160	8	3	2
07.08.2020	3454	156	3169	8	3	2
08.08.2020	3462	157	3177	8	3	2
09.08.2020	3470	157	3186	8	3	2
10.08.2020	3478	157	3194	8	3	2
11.08.2020	3485	157	3202	8	3	2
12.08.2020	3492	157	3211	8	3	2
13.08.2020	3499	157	3219	8	3	2
14.08.2020	3506	157	3228	8	3	2
15.08.2020	3512	158	3236	8	3	2
16.08.2020	3519	158	3244	8	3	2
17.08.2020	3525	158	3252	7	3	2
18.08.2020	3531	158	3260	7	3	2
19.08.2020	3537	158	3268	7	3	2
20.08.2020	3543	158	3276	7	2	2
21.08.2020	3548	159	3283	7	2	1
22.08.2020	3554	159	3291	7	2	1
23.08.2020	3559	159	3298	7	2	1
24.08.2020	3564	159	3306	7	2	1
25.08.2020	3569	159	3313	6	2	1
26.08.2020	3574	159	3320	6	2	1

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3380	155	3106	7	2	1
31.07.2020	3391	155	3113	8	2	1
01.08.2020	3401	156	3121	8	3	2
02.08.2020	3412	156	3128	8	3	2
03.08.2020	3423	156	3136	8	3	2
04.08.2020	3433	156	3144	8	3	2
05.08.2020	3444	156	3153	8	3	2
06.08.2020	3454	156	3161	9	3	2
07.08.2020	3465	156	3170	9	3	2
08.08.2020	3476	157	3178	9	3	2
09.08.2020	3486	157	3187	9	3	2
10.08.2020	3497	157	3196	9	3	2
11.08.2020	3508	157	3206	9	3	2
12.08.2020	3518	157	3215	9	3	2
13.08.2020	3529	157	3224	9	3	2
14.08.2020	3539	158	3234	9	3	2
15.08.2020	3550	158	3244	9	3	2
16.08.2020	3561	158	3253	9	3	2
17.08.2020	3571	158	3263	9	3	2
18.08.2020	3582	158	3273	9	3	2
19.08.2020	3592	158	3283	9	3	2
20.08.2020	3603	159	3293	9	3	2
21.08.2020	3614	159	3302	9	3	2
22.08.2020	3624	159	3313	10	3	2
23.08.2020	3635	159	3323	10	3	2
24.08.2020	3645	159	3333	10	3	2
25.08.2020	3656	160	3343	10	3	2
26.08.2020	3666	160	3353	10	3	2

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3380	155	3106	7	2	1
31.07.2020	3391	155	3113	8	2	1
01.08.2020	3403	156	3121	8	3	2
02.08.2020	3415	156	3128	8	3	2
03.08.2020	3427	156	3136	8	3	2
04.08.2020	3439	156	3144	8	3	2
05.08.2020	3452	156	3153	9	3	2
06.08.2020	3465	156	3162	9	3	2
07.08.2020	3479	156	3171	9	3	2
08.08.2020	3492	157	3180	9	3	2
09.08.2020	3507	157	3190	10	3	2
10.08.2020	3522	157	3199	10	3	2
11.08.2020	3537	157	3210	10	3	2
12.08.2020	3552	157	3220	10	3	2
13.08.2020	3568	157	3231	11	3	2
14.08.2020	3585	158	3242	11	3	2
15.08.2020	3602	158	3253	11	4	2
16.08.2020	3619	158	3265	12	4	2
17.08.2020	3637	158	3277	12	4	2
18.08.2020	3656	158	3289	12	4	2
19.08.2020	3675	159	3302	13	4	3
20.08.2020	3694	159	3315	13	4	3
21.08.2020	3714	159	3329	13	4	3
22.08.2020	3735	159	3343	14	4	3
23.08.2020	3757	160	3357	14	4	3
24.08.2020	3778	160	3372	15	5	3
25.08.2020	3801	160	3387	15	5	3
26.08.2020	3824	160	3402	15	5	3

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

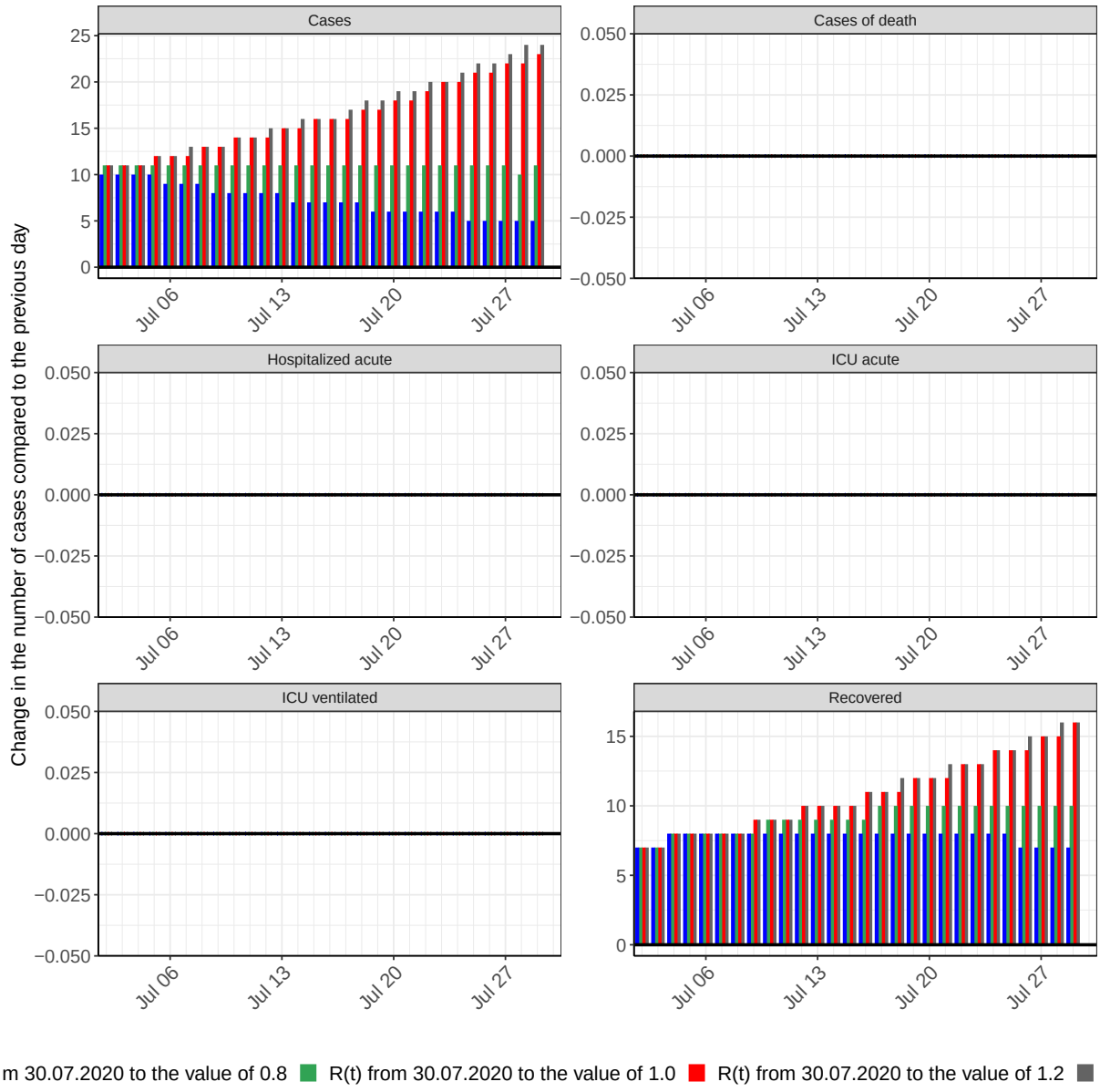


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

17 Thuringia

17.1 Model description

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

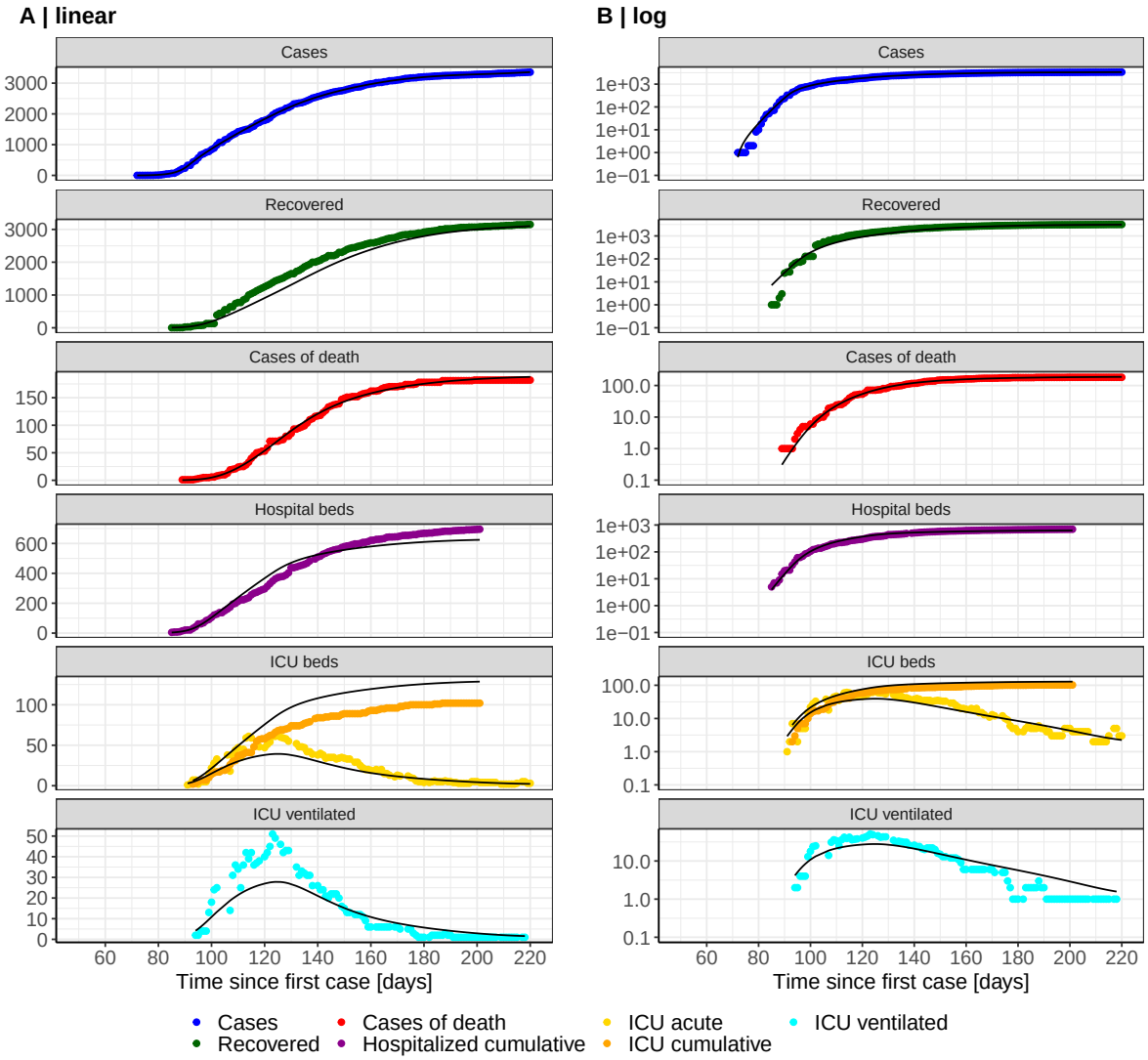


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

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

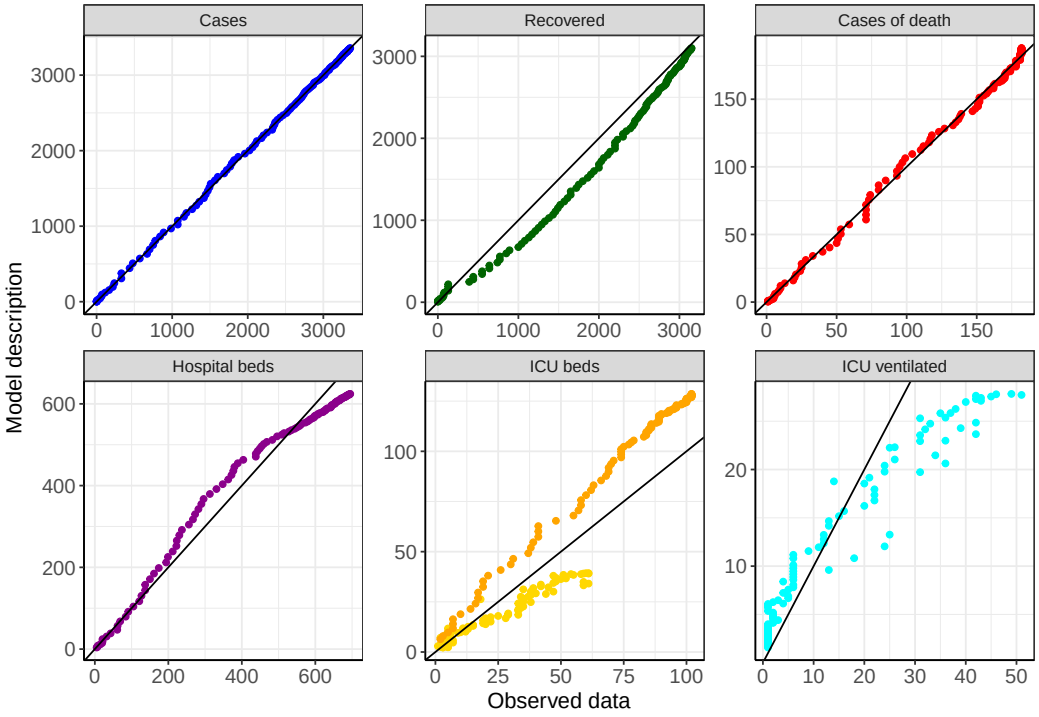


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

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

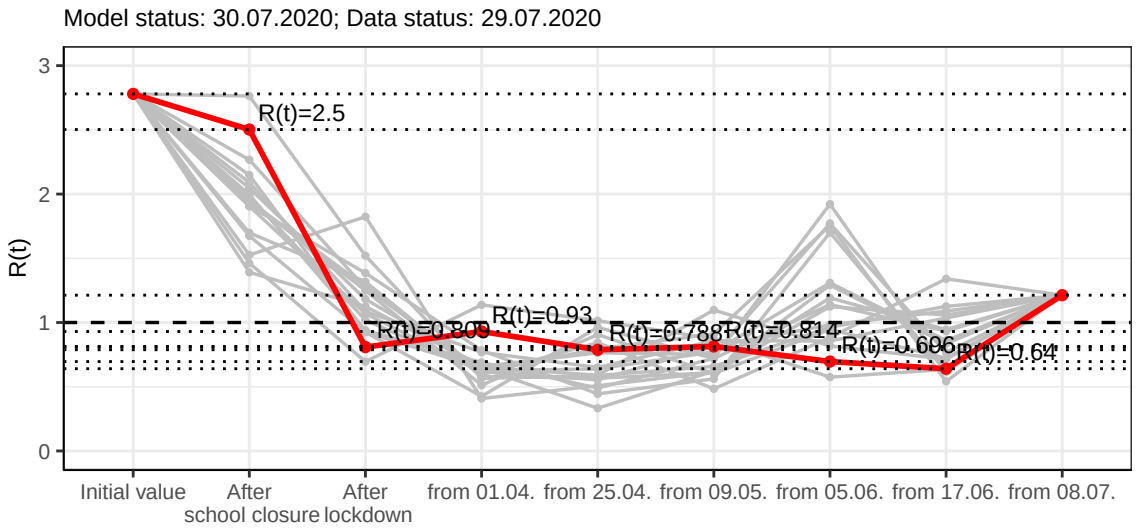


Figure 178: R(t) values before and after the NPIs for Thuringia

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

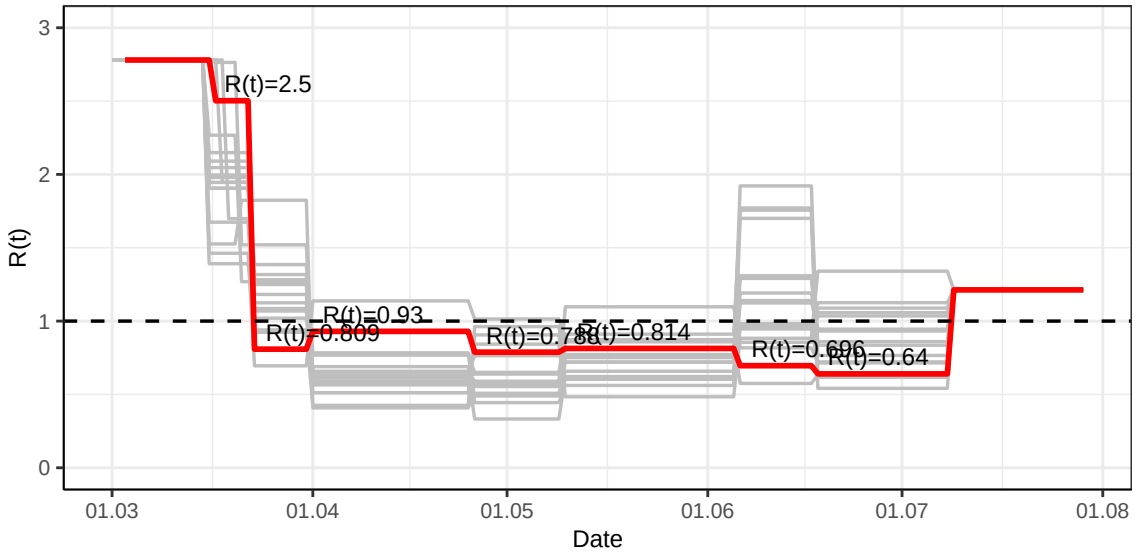


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

17.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

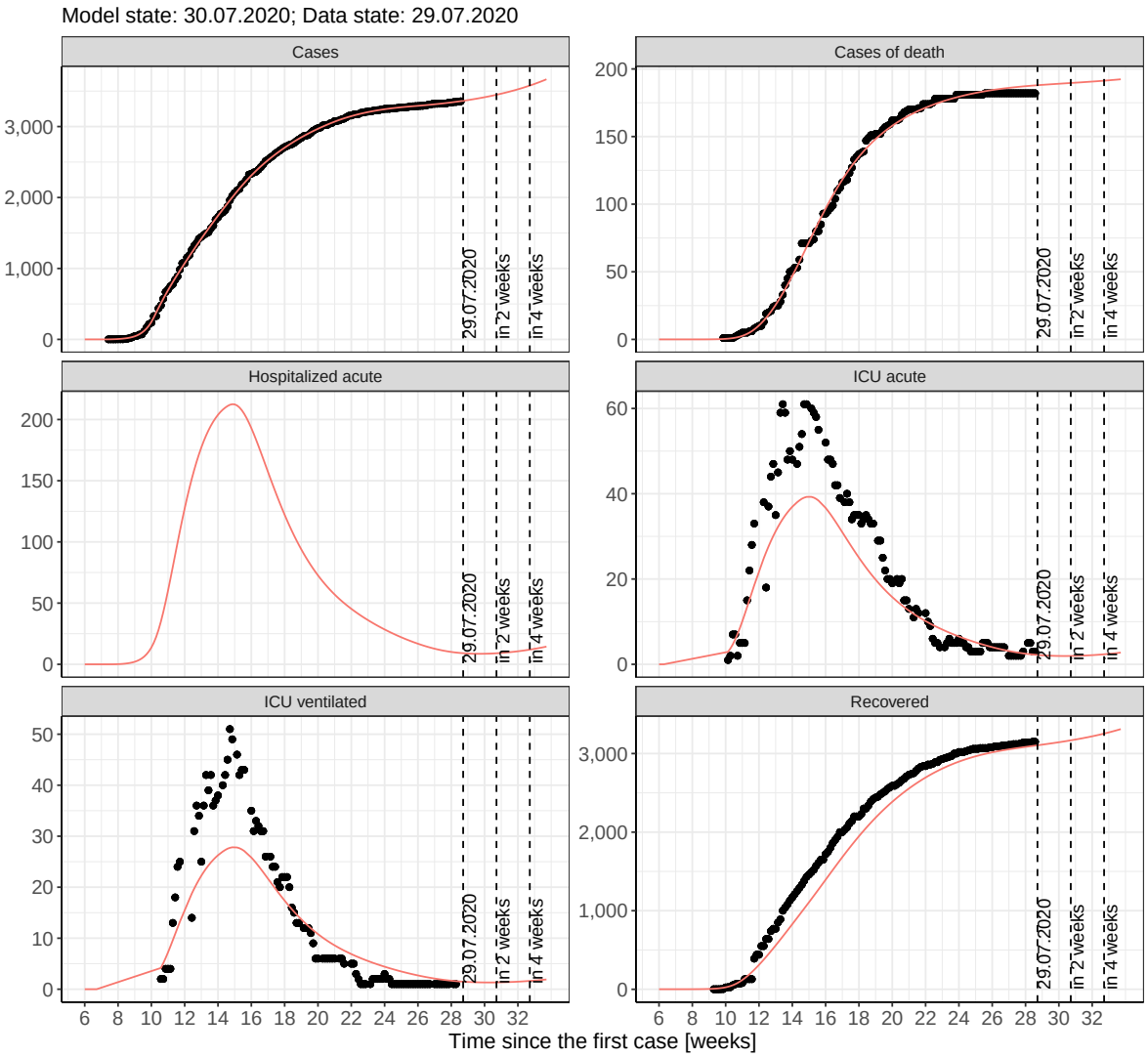


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

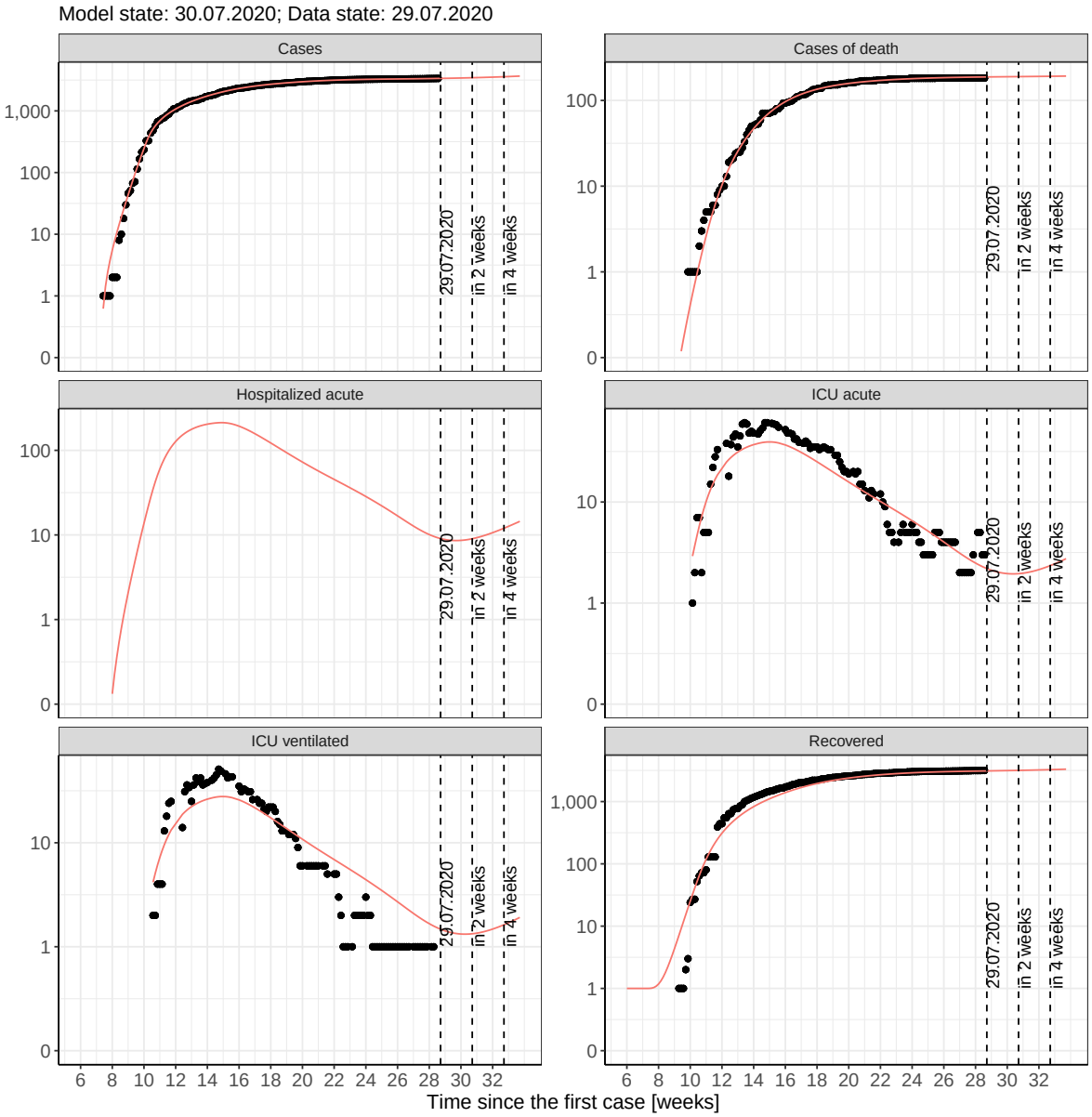


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 182 and 183 represent the model prediction for the next 4 weeks for Thuringia on a linear (182) and a semi-logarithmic (183) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

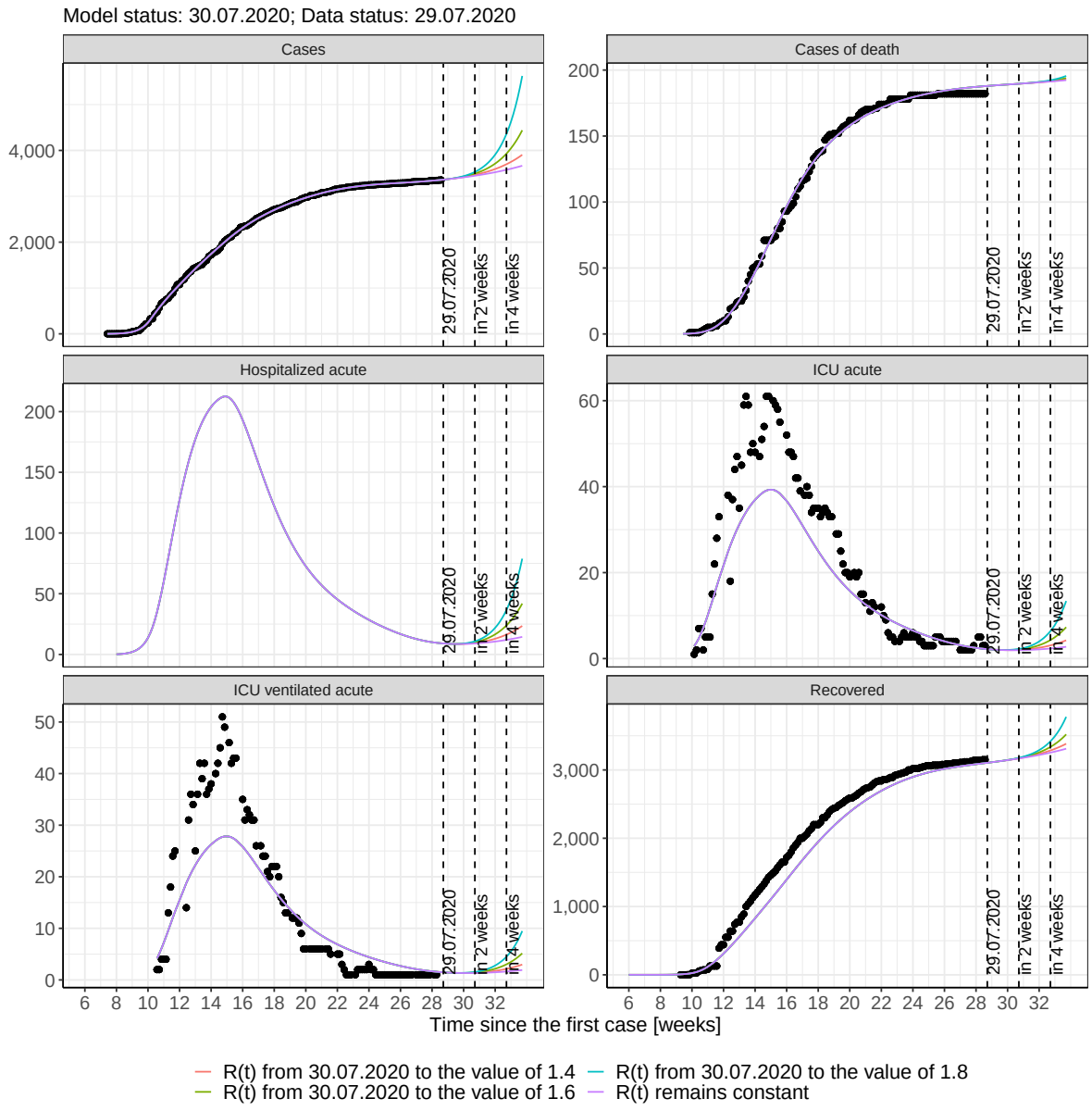


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

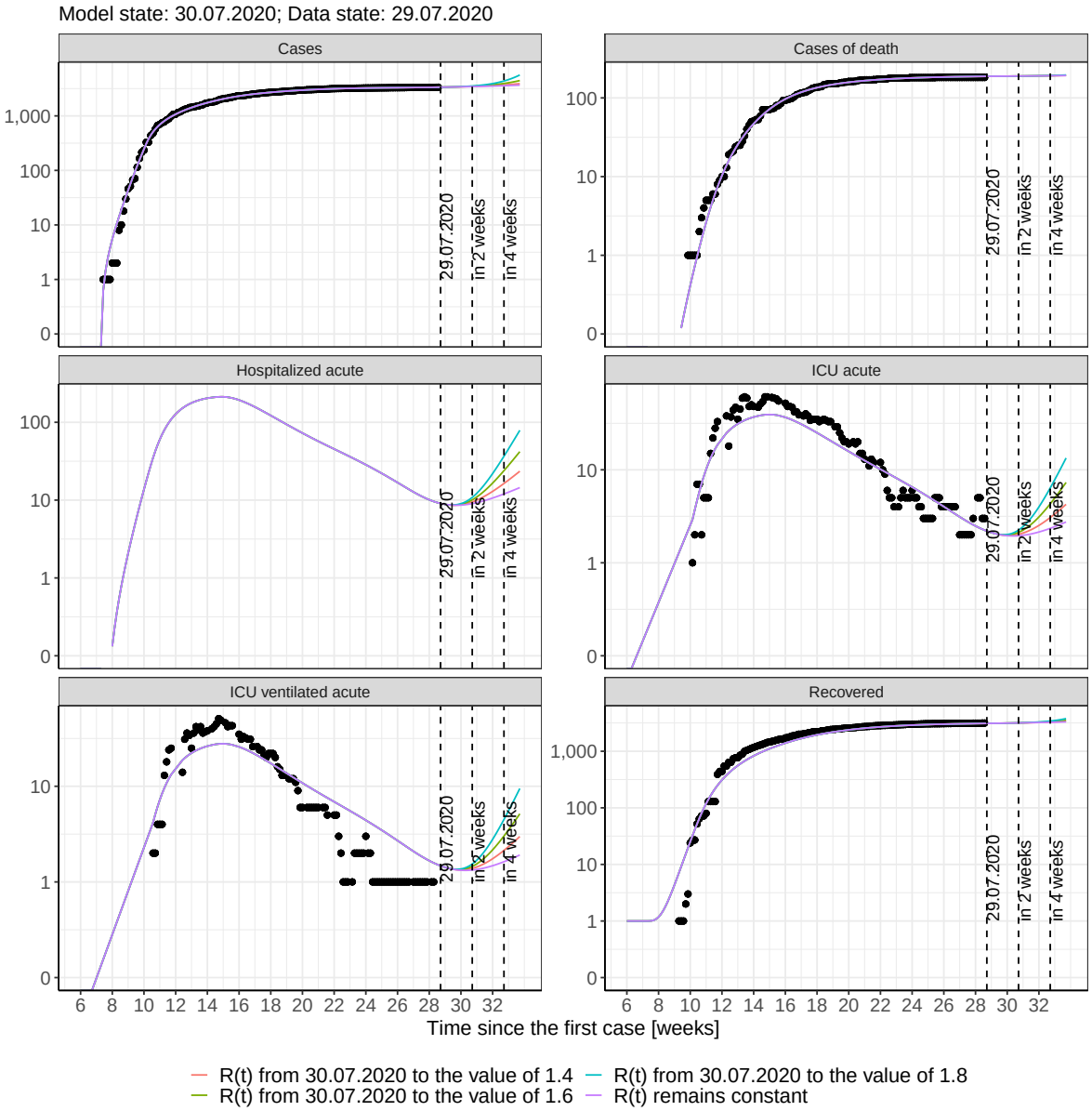


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 184 and 185 represent the model prediction for the next 16 weeks for Thuringia on a linear (184) and a semi-logarithmic (185) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

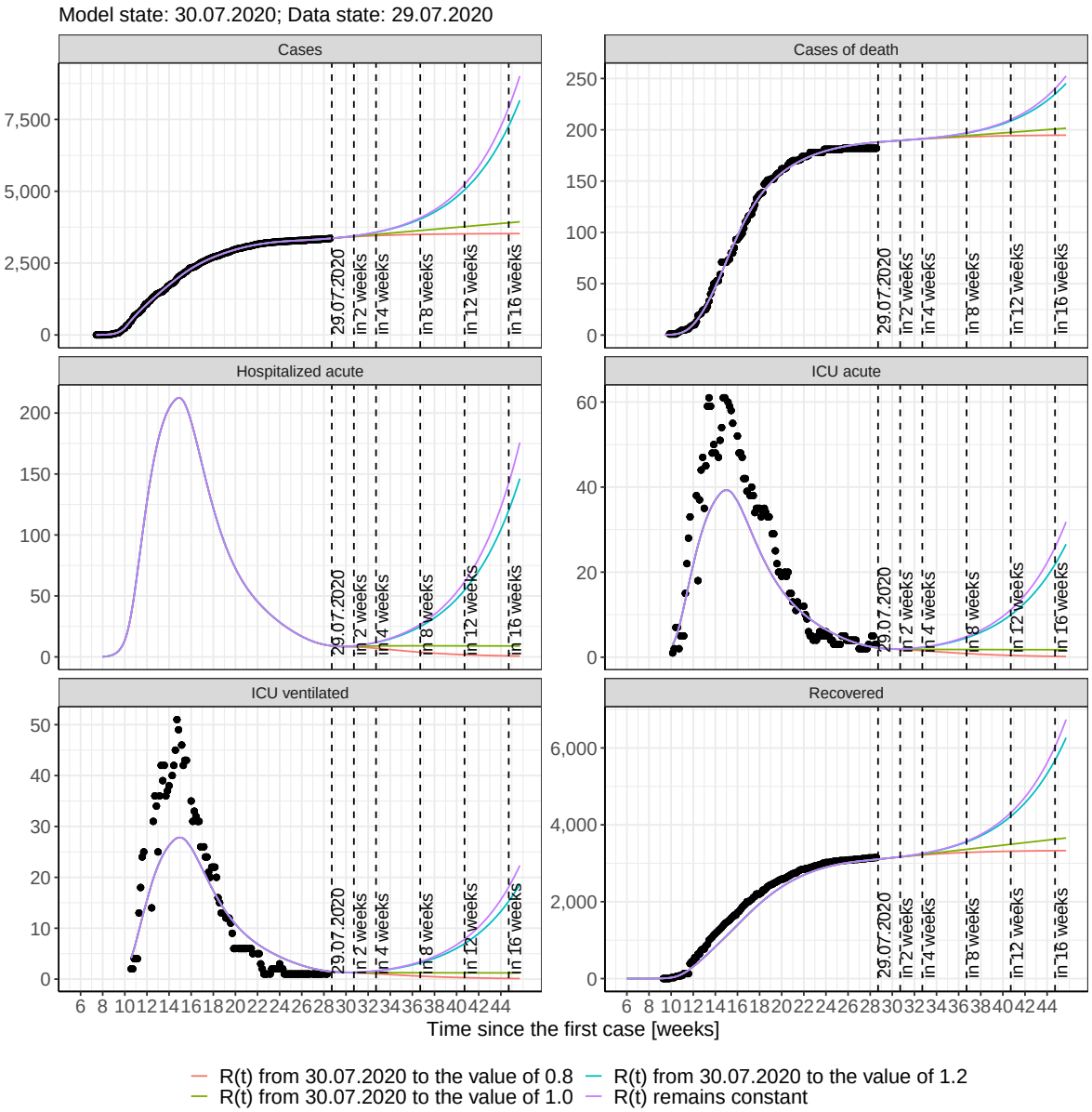


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

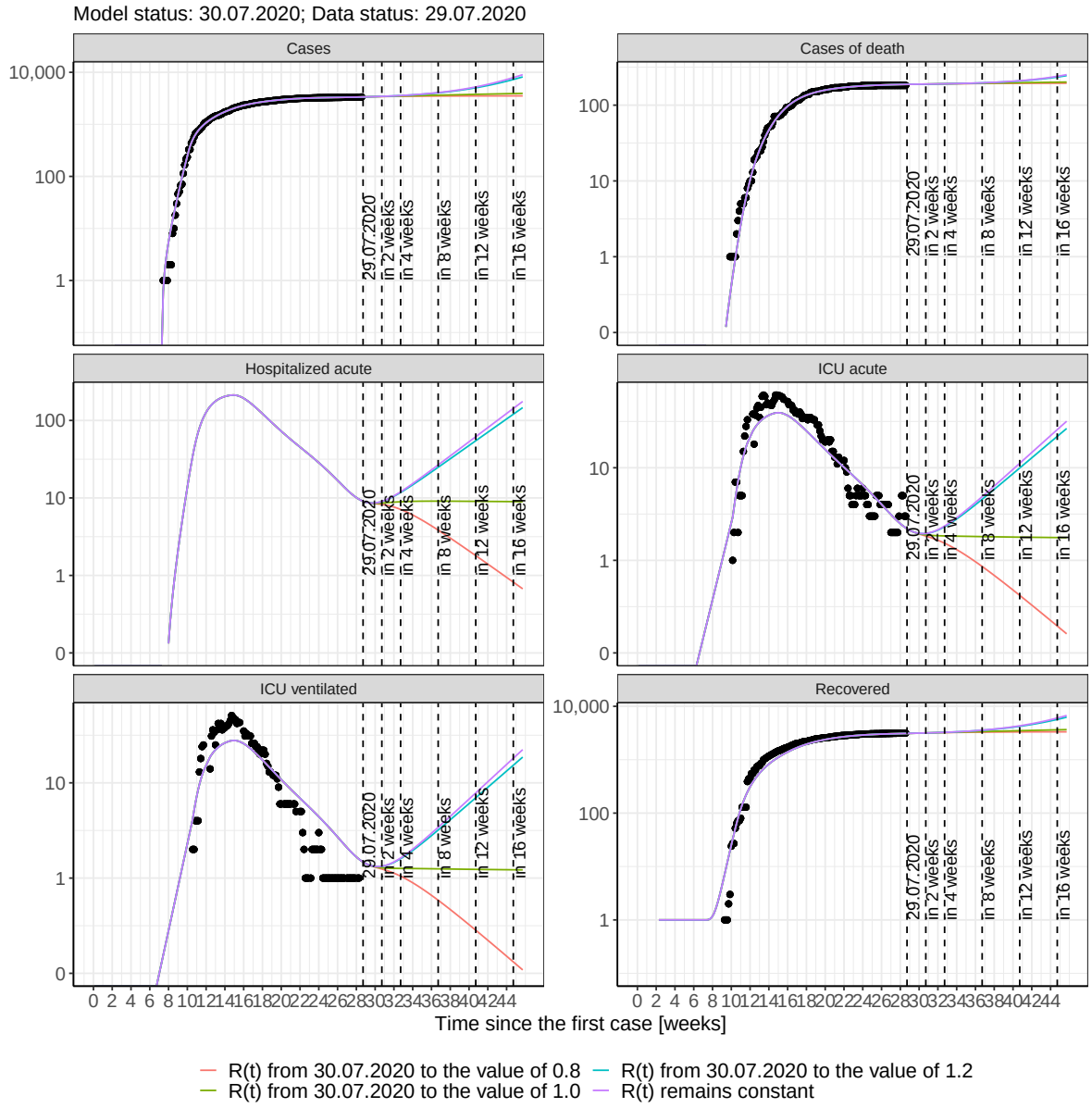


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 65) Model status from 30.07.2020; Data status: 29.07.2020.

Table 62: Thuringia - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3368	188	3109	9	2	1
31.07.2020	3373	188	3113	9	2	1
01.08.2020	3378	188	3118	9	2	1
02.08.2020	3384	188	3122	9	2	1
03.08.2020	3389	189	3126	9	2	1
04.08.2020	3395	189	3130	9	2	1
05.08.2020	3401	189	3135	9	2	1
06.08.2020	3407	189	3139	9	2	1
07.08.2020	3414	189	3144	9	2	1
08.08.2020	3420	189	3148	9	2	1
09.08.2020	3427	189	3153	9	2	1
10.08.2020	3434	189	3158	9	2	1
11.08.2020	3441	190	3163	9	2	1
12.08.2020	3448	190	3168	9	2	1
13.08.2020	3456	190	3173	9	2	1
14.08.2020	3464	190	3178	9	2	1
15.08.2020	3472	190	3184	9	2	1
16.08.2020	3480	190	3189	10	2	1
17.08.2020	3488	190	3195	10	2	1
18.08.2020	3497	190	3201	10	2	1
19.08.2020	3506	190	3207	10	2	1
20.08.2020	3516	191	3213	10	2	1
21.08.2020	3525	191	3219	11	2	1
22.08.2020	3535	191	3226	11	2	2
23.08.2020	3545	191	3233	11	2	2
24.08.2020	3556	191	3240	11	2	2
25.08.2020	3567	191	3247	12	2	2
26.08.2020	3578	191	3254	12	2	2

Table 63: Thuringia - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3368	188	3109	9	2	1
31.07.2020	3372	188	3113	9	2	1
01.08.2020	3377	188	3117	9	2	1
02.08.2020	3382	188	3122	9	2	1
03.08.2020	3386	189	3126	9	2	1
04.08.2020	3390	189	3130	9	2	1
05.08.2020	3394	189	3134	9	2	1
06.08.2020	3398	189	3139	8	2	1
07.08.2020	3402	189	3143	8	2	1
08.08.2020	3406	189	3147	8	2	1
09.08.2020	3409	189	3151	8	2	1
10.08.2020	3413	189	3156	8	2	1
11.08.2020	3416	189	3160	8	2	1
12.08.2020	3419	190	3164	8	2	1
13.08.2020	3422	190	3168	8	2	1
14.08.2020	3426	190	3172	8	2	1
15.08.2020	3429	190	3176	8	2	1
16.08.2020	3432	190	3180	8	2	1
17.08.2020	3434	190	3184	8	2	1
18.08.2020	3437	190	3188	8	2	1
19.08.2020	3440	190	3191	8	2	1
20.08.2020	3443	190	3195	8	2	1
21.08.2020	3445	191	3198	8	2	1
22.08.2020	3448	191	3202	8	2	1
23.08.2020	3450	191	3206	7	2	1
24.08.2020	3452	191	3209	7	2	1
25.08.2020	3455	191	3212	7	2	1
26.08.2020	3457	191	3216	7	2	1

Table 64: Thuringia - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3368	188	3109	9	2	1
31.07.2020	3373	188	3113	9	2	1
01.08.2020	3378	188	3117	9	2	1
02.08.2020	3383	188	3122	9	2	1
03.08.2020	3387	189	3126	9	2	1
04.08.2020	3392	189	3130	9	2	1
05.08.2020	3397	189	3134	9	2	1
06.08.2020	3402	189	3139	9	2	1
07.08.2020	3407	189	3143	9	2	1
08.08.2020	3412	189	3148	9	2	1
09.08.2020	3417	189	3152	9	2	1
10.08.2020	3422	189	3157	9	2	1
11.08.2020	3426	189	3161	9	2	1
12.08.2020	3431	190	3166	9	2	1
13.08.2020	3436	190	3170	9	2	1
14.08.2020	3441	190	3175	9	2	1
15.08.2020	3446	190	3179	9	2	1
16.08.2020	3451	190	3184	9	2	1
17.08.2020	3456	190	3188	9	2	1
18.08.2020	3460	190	3193	9	2	1
19.08.2020	3465	190	3198	9	2	1
20.08.2020	3470	190	3202	9	2	1
21.08.2020	3475	191	3207	9	2	1
22.08.2020	3480	191	3212	9	2	1
23.08.2020	3485	191	3216	9	2	1
24.08.2020	3490	191	3221	9	2	1
25.08.2020	3494	191	3226	9	2	1
26.08.2020	3499	191	3230	9	2	1

Table 65: Thuringia - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	3368	188	3109	9	2	1
31.07.2020	3373	188	3113	9	2	1
01.08.2020	3378	188	3118	9	2	1
02.08.2020	3384	188	3122	9	2	1
03.08.2020	3389	189	3126	9	2	1
04.08.2020	3395	189	3130	9	2	1
05.08.2020	3401	189	3135	9	2	1
06.08.2020	3407	189	3139	9	2	1
07.08.2020	3413	189	3144	9	2	1
08.08.2020	3420	189	3148	9	2	1
09.08.2020	3426	189	3153	9	2	1
10.08.2020	3433	189	3158	9	2	1
11.08.2020	3440	190	3163	9	2	1
12.08.2020	3447	190	3168	9	2	1
13.08.2020	3454	190	3173	9	2	1
14.08.2020	3462	190	3178	9	2	1
15.08.2020	3470	190	3184	9	2	1
16.08.2020	3478	190	3189	10	2	1
17.08.2020	3486	190	3195	10	2	1
18.08.2020	3494	190	3200	10	2	1
19.08.2020	3503	190	3206	10	2	1
20.08.2020	3512	191	3212	10	2	1
21.08.2020	3521	191	3218	11	2	1
22.08.2020	3531	191	3225	11	2	1
23.08.2020	3541	191	3231	11	2	2
24.08.2020	3551	191	3238	11	2	2
25.08.2020	3561	191	3245	11	2	2
26.08.2020	3572	191	3252	12	2	2

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

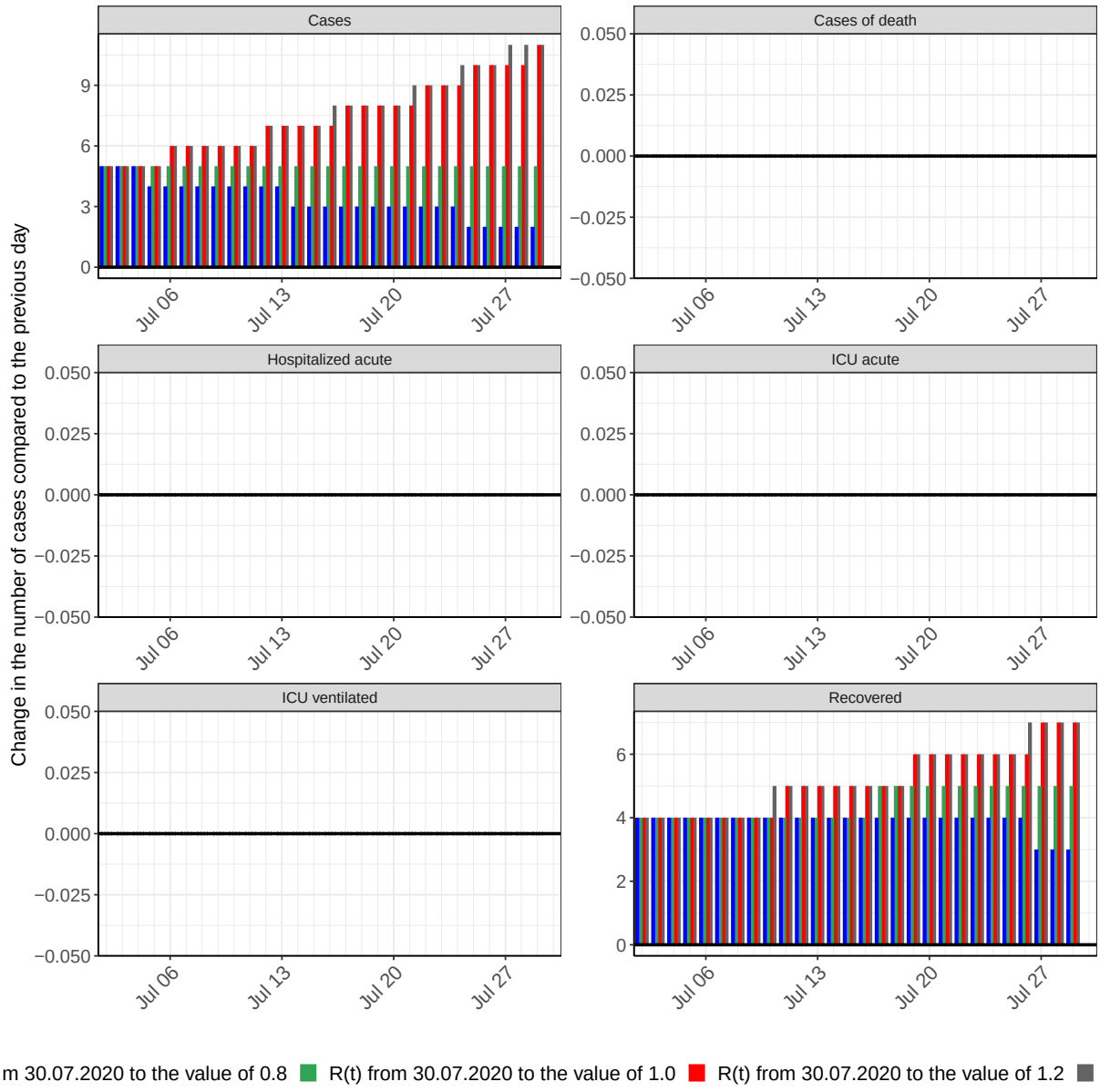


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

18 Germany

18.1 Model description

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

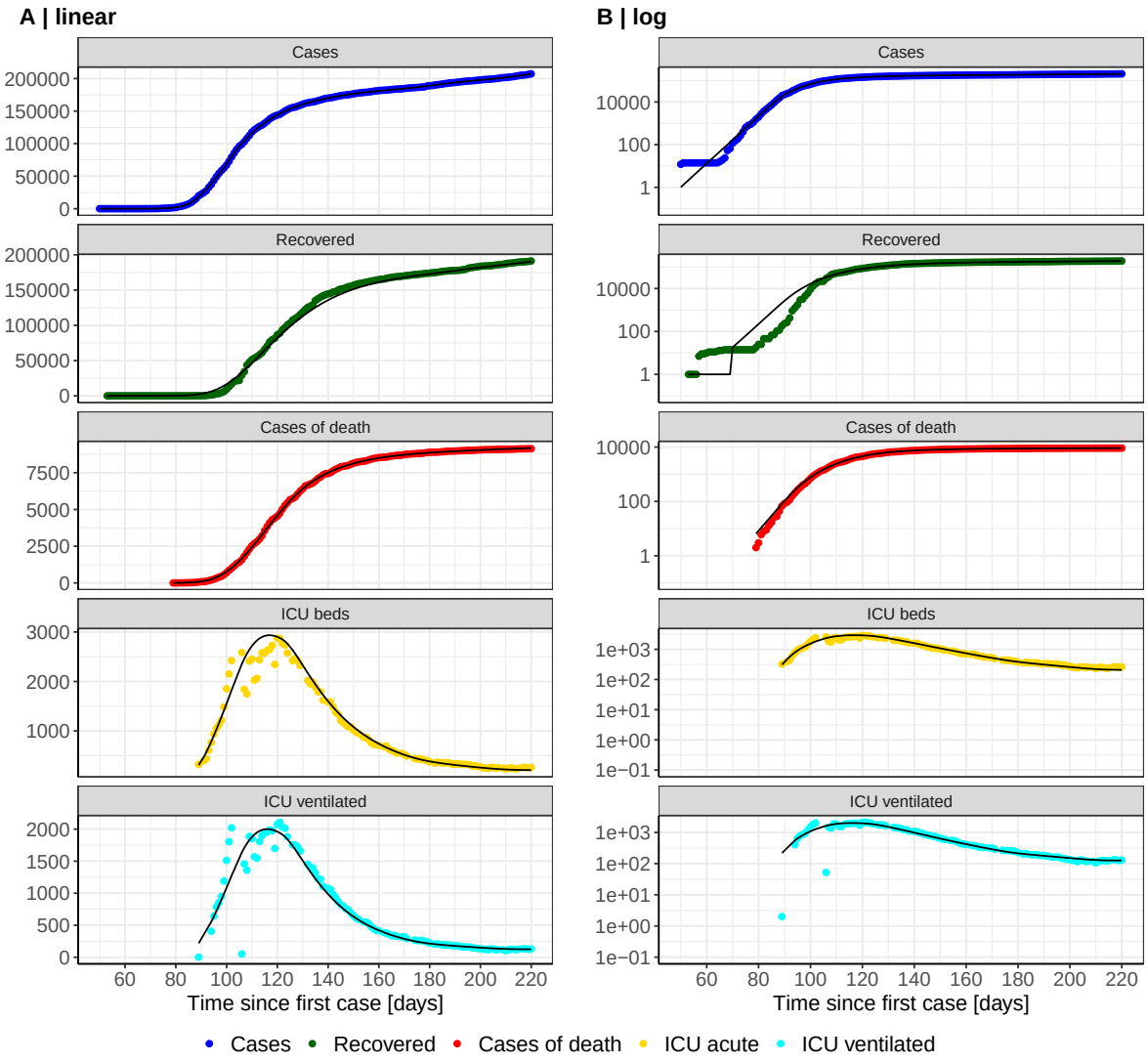


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

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

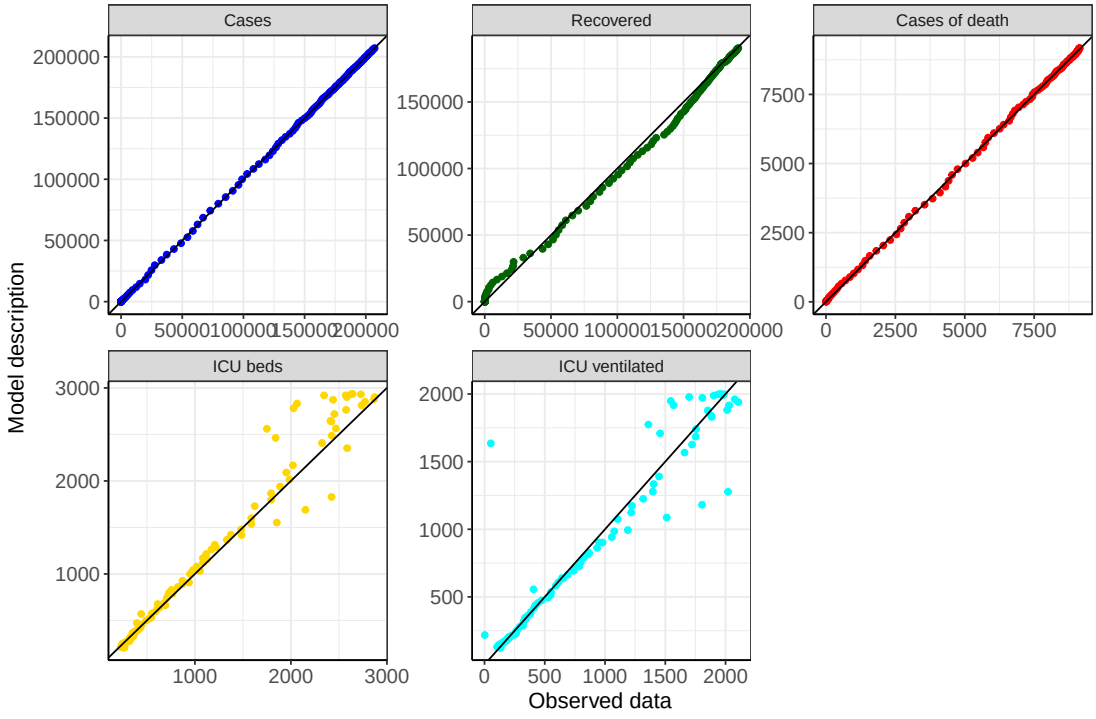


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

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

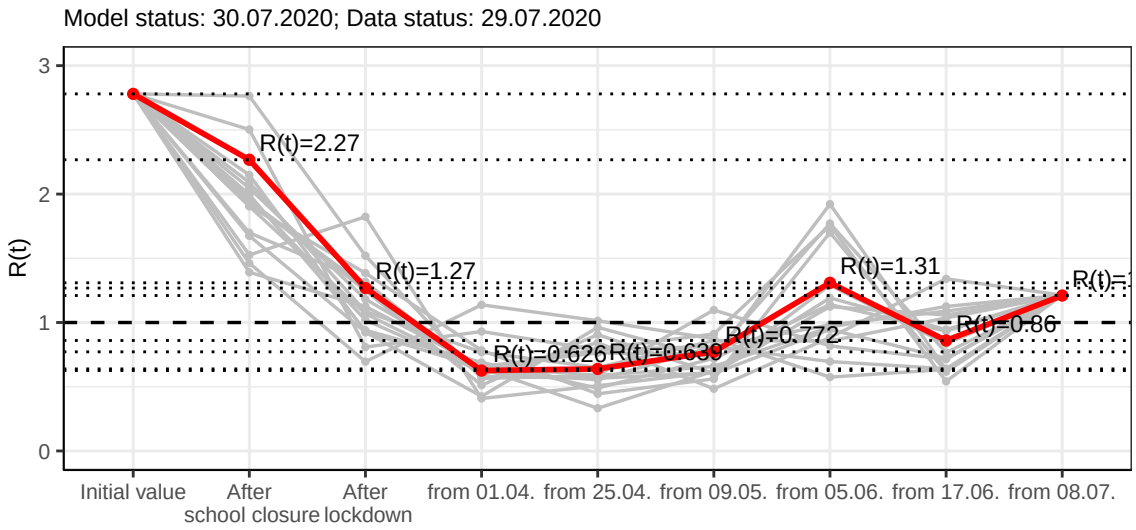


Figure 189: R(t) values before and after the NPIs for Germany

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

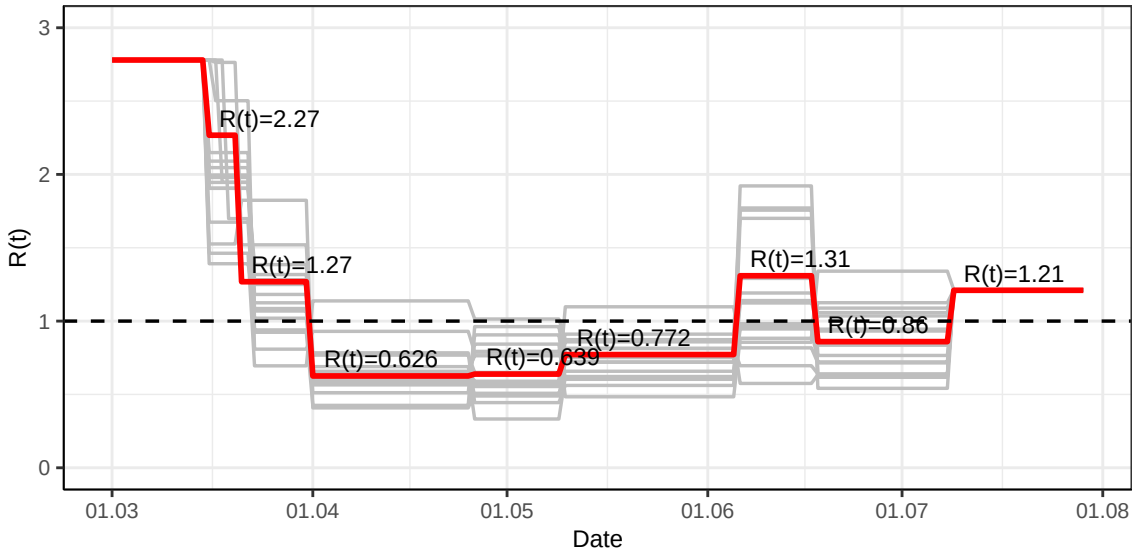


Figure 190: R(t) values over time for Germany

18.2 Model predictions

18.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.21)

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.

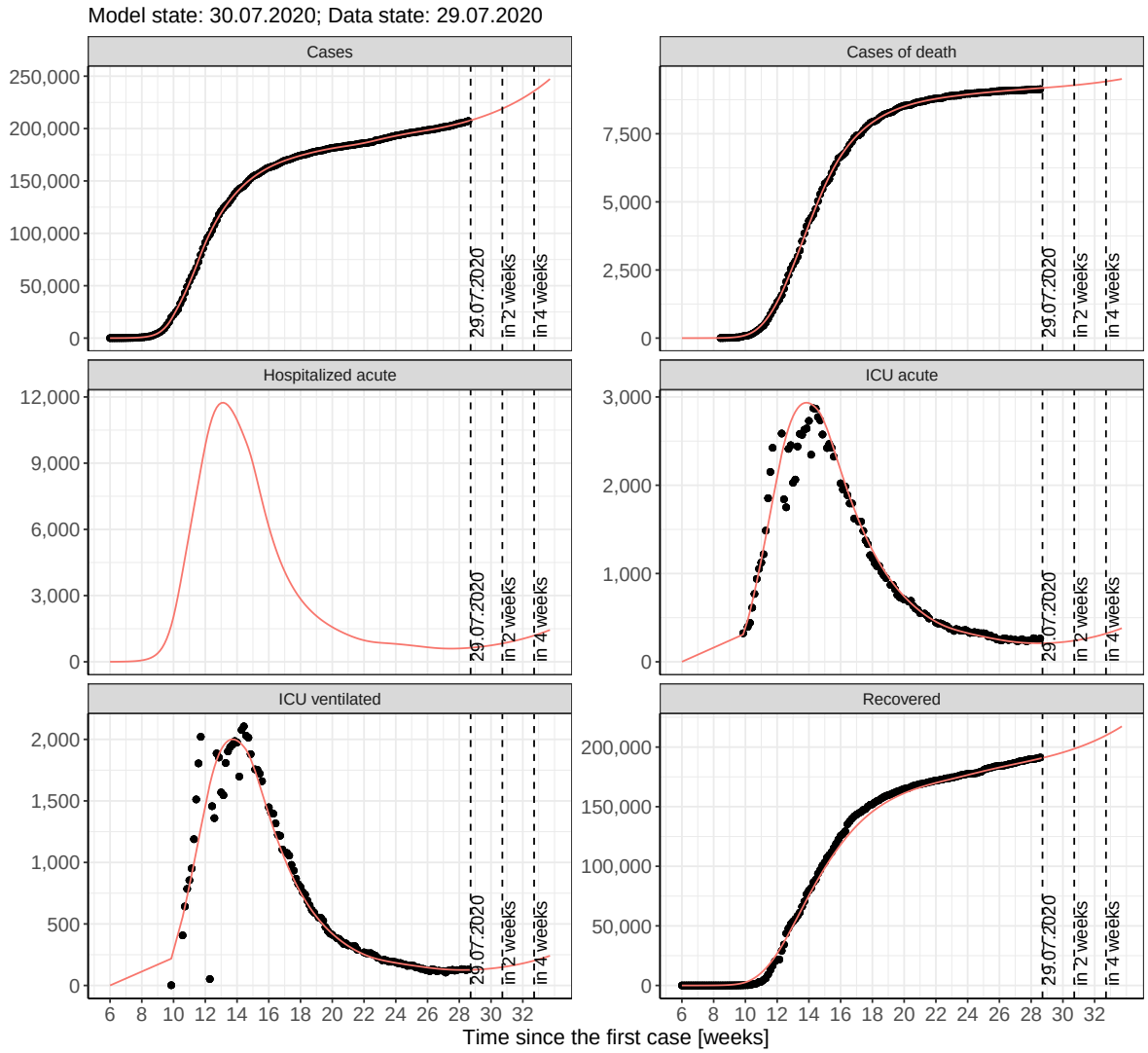


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

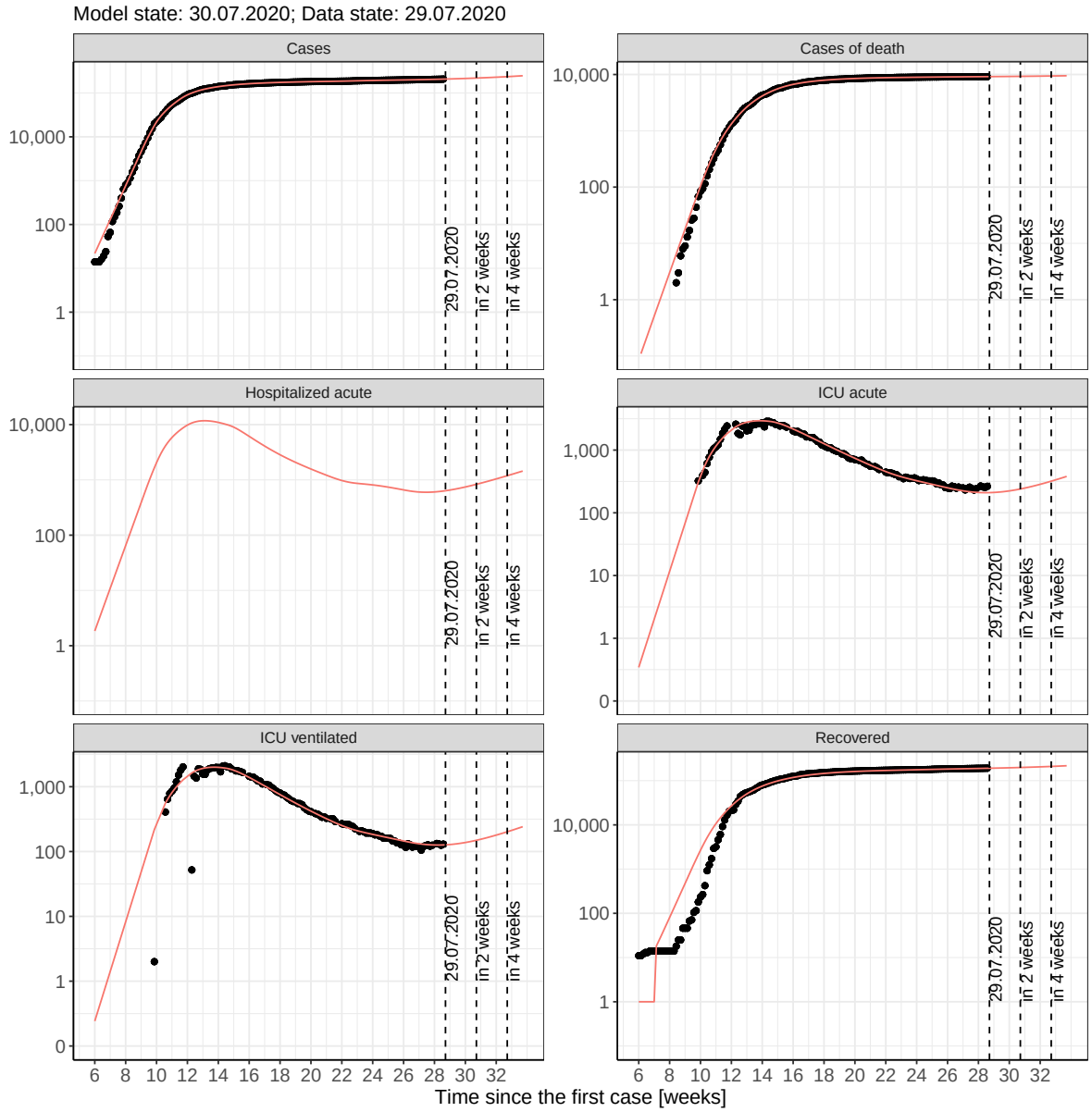


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 30.07.2020

Fig. 193 and 194 represent the model prediction for the next 4 weeks for Germany on a linear (193) and a semi-logarithmic (194) scale. In this simulation different scenarios of the possible development (R(t) = 1.4, 1.6, 1.8 and staying the same) from 30.07.2020 were tested.

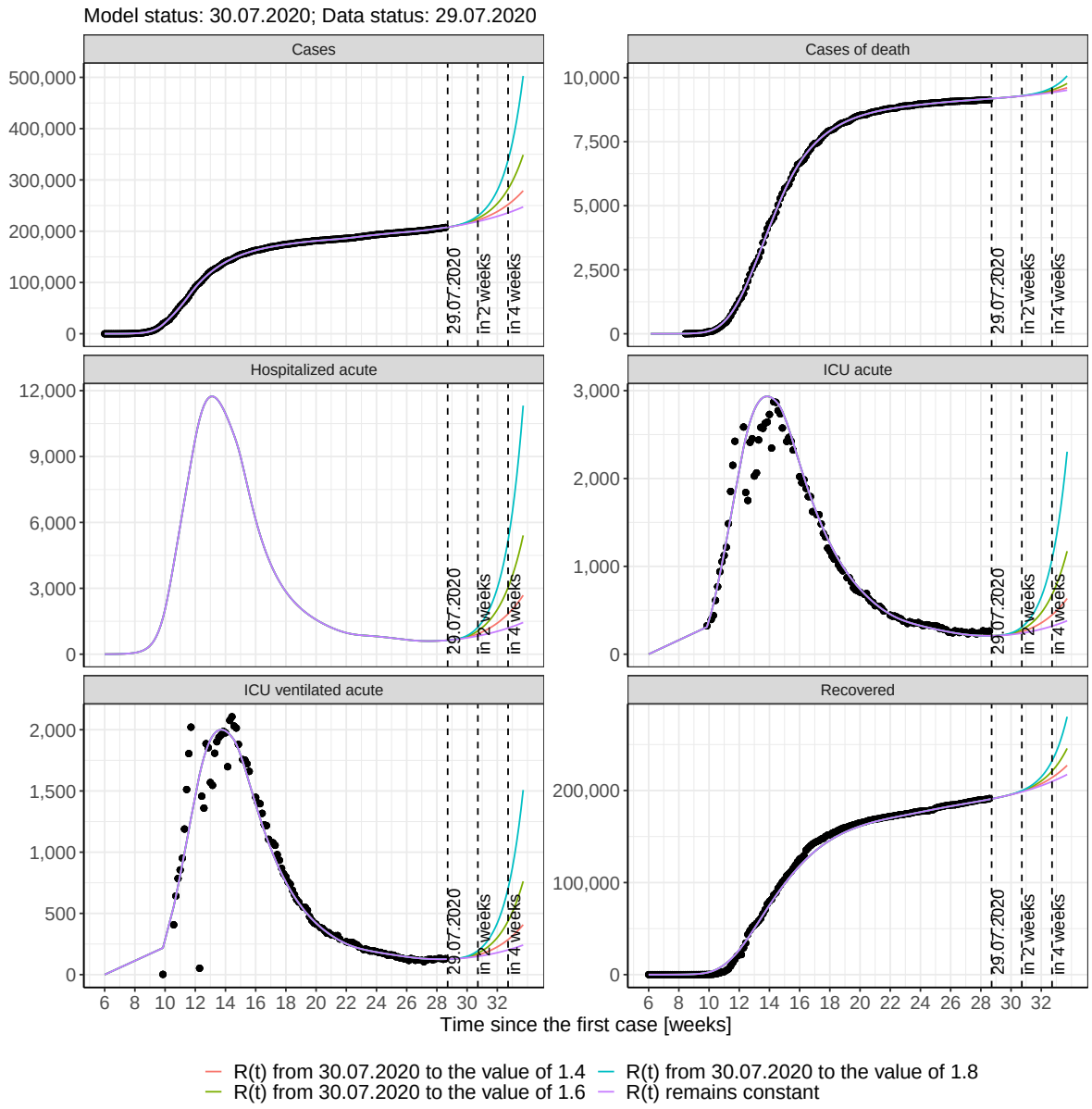


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

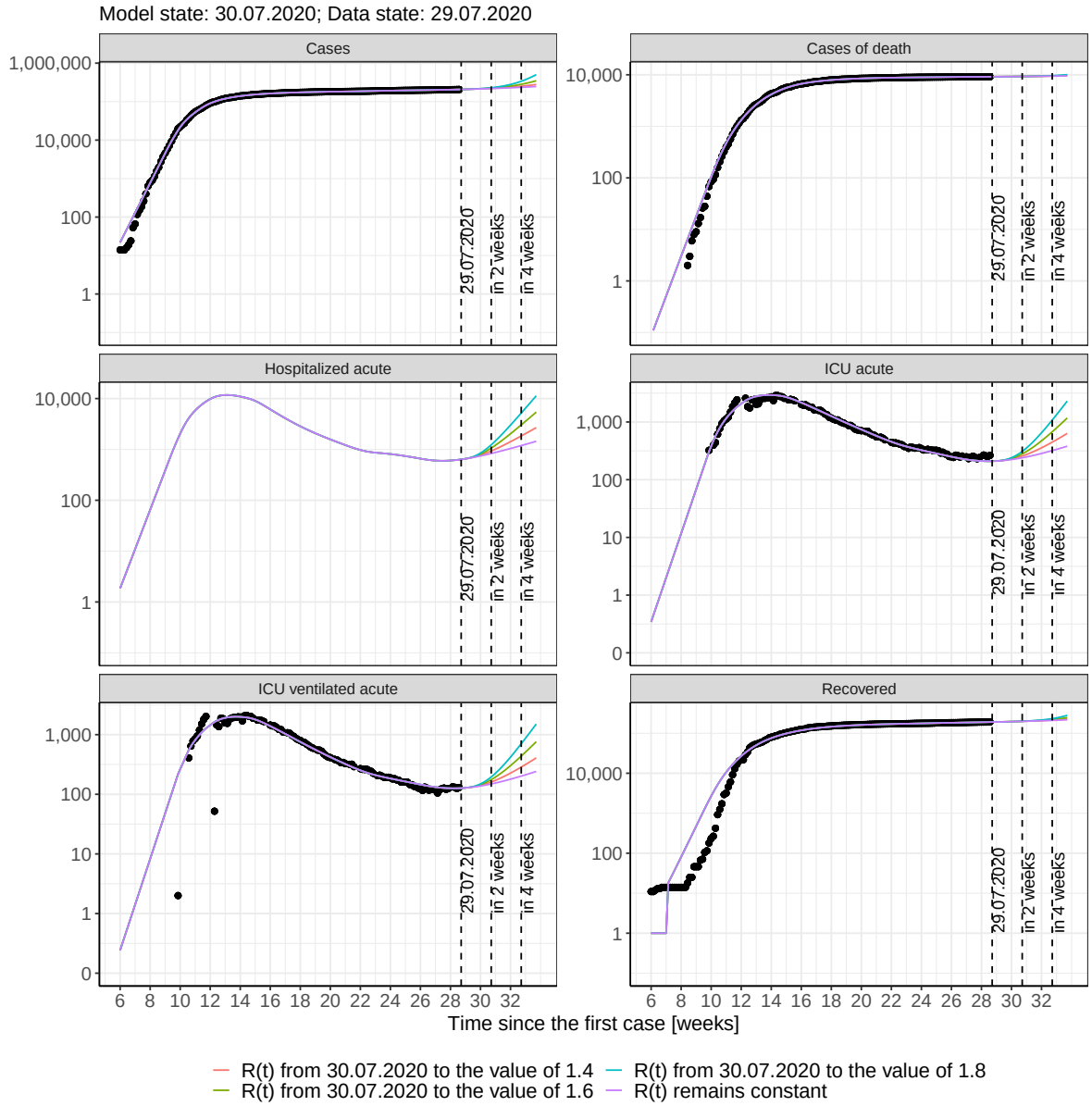


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 30.07.2020. Points: Reported case numbers; Lines: Model predictions.

Fig. 195 and 196 represent the model prediction for the next 16 weeks for Germany on a linear (195) and a semi-logarithmic (196) scale. In this simulation different scenarios of the possible course from the 30.07.2020 were tested.

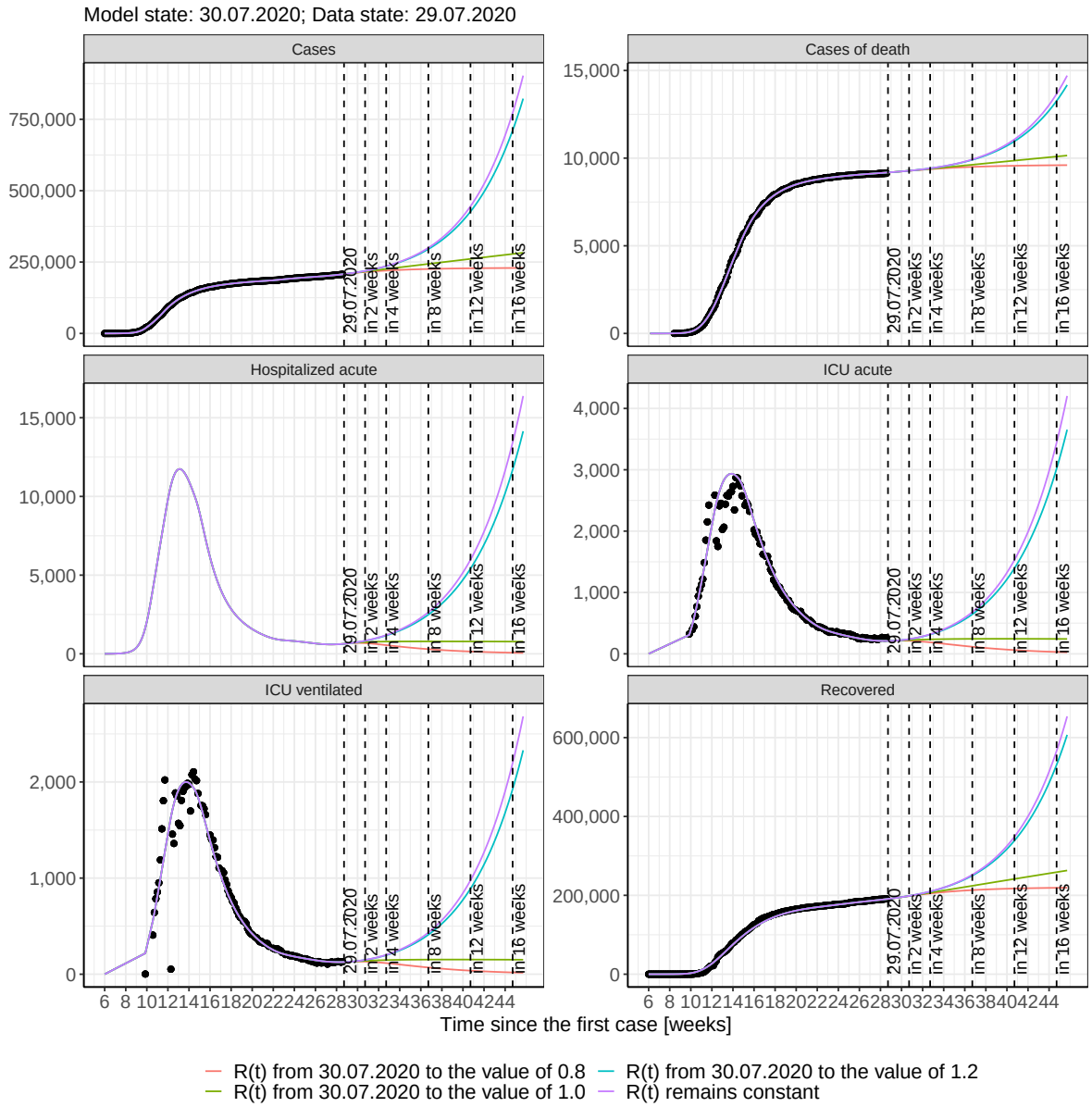


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 30.07.2020. Points: reported case numbers; lines: model prediction.

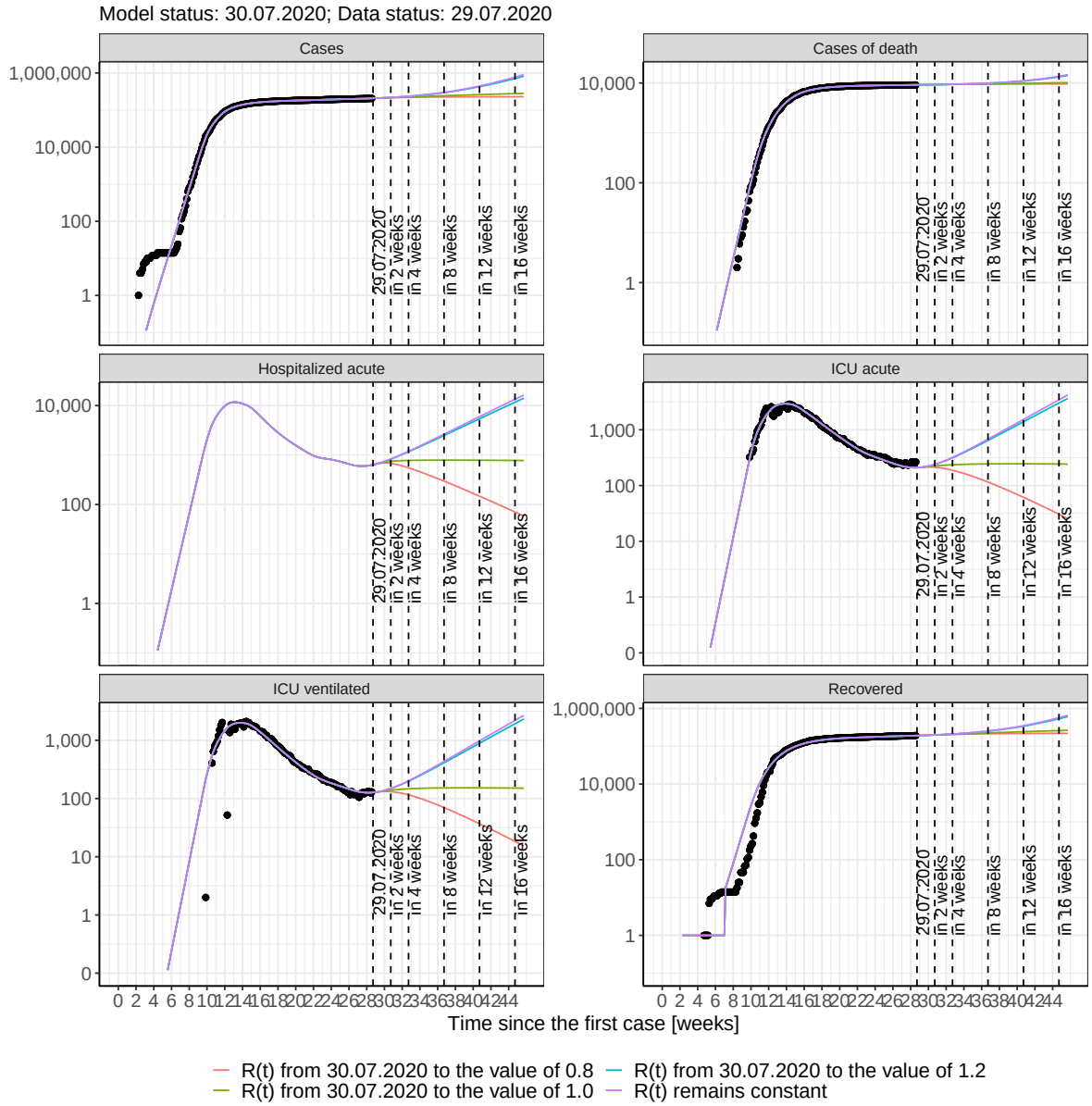


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 30.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 30.07.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 30.07.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 30.07.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 30.07.2020 (Tab. 69) Model status from 30.07.2020; Data status: 29.07.2020.

Table 66: Germany - R(t) remains unchanged after the 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	208480	9188	191380	645	210	127
31.07.2020	209150	9194	191850	655	211	128
01.08.2020	209840	9201	192340	665	212	129
02.08.2020	210560	9208	192840	676	213	130
03.08.2020	211290	9215	193350	688	215	131
04.08.2020	212050	9221	193870	701	217	133
05.08.2020	212830	9228	194410	715	219	134
06.08.2020	213630	9236	194960	729	221	136
07.08.2020	214460	9243	195520	744	223	138
08.08.2020	215320	9250	196100	760	226	140
09.08.2020	216190	9258	196690	777	229	142
10.08.2020	217100	9266	197300	794	232	144
11.08.2020	218030	9274	197930	812	236	147
12.08.2020	218990	9282	198580	831	240	149
13.08.2020	219980	9290	199240	851	244	152
14.08.2020	221000	9298	199920	872	248	155
15.08.2020	222050	9307	200620	893	252	158
16.08.2020	223130	9316	201340	916	257	161
17.08.2020	224240	9325	202090	939	262	164
18.08.2020	225390	9334	202850	963	267	168
19.08.2020	226570	9344	203630	988	273	171
20.08.2020	227780	9354	204440	1014	279	175
21.08.2020	229030	9364	205270	1041	285	179
22.08.2020	230320	9375	206130	1069	291	183
23.08.2020	231650	9385	207010	1098	298	188
24.08.2020	233020	9396	207920	1127	305	192
25.08.2020	234430	9408	208850	1158	312	197
26.08.2020	235880	9419	209820	1190	319	202

Table 67: Germany - R(t) takes on the value of 0.8 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	208460	9188	191380	645	210	127
31.07.2020	209070	9194	191850	654	211	128
01.08.2020	209670	9201	192340	663	212	129
02.08.2020	210250	9208	192830	672	213	130
03.08.2020	210820	9214	193330	679	213	130
04.08.2020	211370	9221	193840	685	214	131
05.08.2020	211900	9228	194360	690	215	132
06.08.2020	212420	9235	194880	692	215	132
07.08.2020	212930	9242	195400	694	215	132
08.08.2020	213410	9249	195930	693	215	132
09.08.2020	213890	9256	196450	692	215	132
10.08.2020	214350	9264	196980	689	214	132
11.08.2020	214800	9271	197500	685	214	132
12.08.2020	215240	9278	198020	680	213	131
13.08.2020	215660	9285	198540	674	212	131
14.08.2020	216070	9292	199050	667	211	130
15.08.2020	216470	9299	199560	660	209	129
16.08.2020	216860	9306	200070	651	208	128
17.08.2020	217240	9313	200560	643	206	127
18.08.2020	217600	9320	201060	634	205	126
19.08.2020	217960	9326	201540	624	203	125
20.08.2020	218310	9333	202020	614	201	124
21.08.2020	218640	9340	202490	604	199	123
22.08.2020	218970	9346	202950	594	197	121
23.08.2020	219290	9353	203400	584	195	120
24.08.2020	219600	9359	203840	573	192	119
25.08.2020	219900	9365	204280	563	190	117
26.08.2020	220190	9371	204700	552	188	116

Table 68: Germany - R(t) takes on the value of 1.0 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	208470	9188	191380	645	210	127
31.07.2020	209110	9194	191850	654	211	128
01.08.2020	209750	9201	192340	664	212	129
02.08.2020	210400	9208	192840	674	213	130
03.08.2020	211040	9214	193340	683	214	131
04.08.2020	211680	9221	193860	693	215	132
05.08.2020	212320	9228	194380	701	216	133
06.08.2020	212970	9235	194910	709	218	134
07.08.2020	213610	9242	195460	717	219	135
08.08.2020	214250	9250	196000	723	220	136
09.08.2020	214890	9257	196560	730	221	136
10.08.2020	215530	9264	197120	735	222	137
11.08.2020	216170	9272	197690	740	223	138
12.08.2020	216810	9280	198270	745	224	139
13.08.2020	217450	9287	198850	749	225	140
14.08.2020	218090	9295	199430	753	226	140
15.08.2020	218730	9302	200020	756	227	141
16.08.2020	219370	9310	200610	760	228	142
17.08.2020	220010	9318	201210	762	229	142
18.08.2020	220650	9326	201810	765	230	143
19.08.2020	221290	9334	202410	767	231	144
20.08.2020	221930	9342	203020	769	232	144
21.08.2020	222570	9350	203620	771	232	145
22.08.2020	223210	9358	204230	773	233	145
23.08.2020	223840	9366	204850	774	234	146
24.08.2020	224480	9374	205460	776	234	146
25.08.2020	225120	9382	206080	777	235	146
26.08.2020	225760	9390	206690	778	236	147

Table 69: Germany - R(t) takes on the value of 1.2 after 30.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
30.07.2020	208480	9188	191380	645	210	127
31.07.2020	209150	9194	191850	655	211	128
01.08.2020	209840	9201	192340	665	212	129
02.08.2020	210550	9208	192840	676	213	130
03.08.2020	211280	9215	193350	688	215	131
04.08.2020	212030	9221	193870	701	217	133
05.08.2020	212800	9228	194410	714	219	134
06.08.2020	213600	9236	194950	728	221	136
07.08.2020	214420	9243	195520	743	223	138
08.08.2020	215260	9250	196090	758	226	140
09.08.2020	216120	9258	196690	774	229	142
10.08.2020	217010	9266	197300	791	232	144
11.08.2020	217930	9273	197920	809	235	146
12.08.2020	218870	9282	198560	827	239	149
13.08.2020	219840	9290	199220	846	243	151
14.08.2020	220840	9298	199890	865	247	154
15.08.2020	221860	9307	200590	886	251	157
16.08.2020	222910	9316	201300	907	256	160
17.08.2020	224000	9325	202040	929	260	163
18.08.2020	225110	9334	202790	952	265	166
19.08.2020	226260	9344	203570	975	271	170
20.08.2020	227440	9353	204360	1000	276	173
21.08.2020	228650	9363	205180	1025	282	177
22.08.2020	229900	9374	206020	1051	288	181
23.08.2020	231180	9384	206890	1078	294	185
24.08.2020	232500	9395	207780	1106	300	189
25.08.2020	233860	9406	208690	1135	307	194
26.08.2020	235250	9418	209630	1164	314	198

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 30.07.2020

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

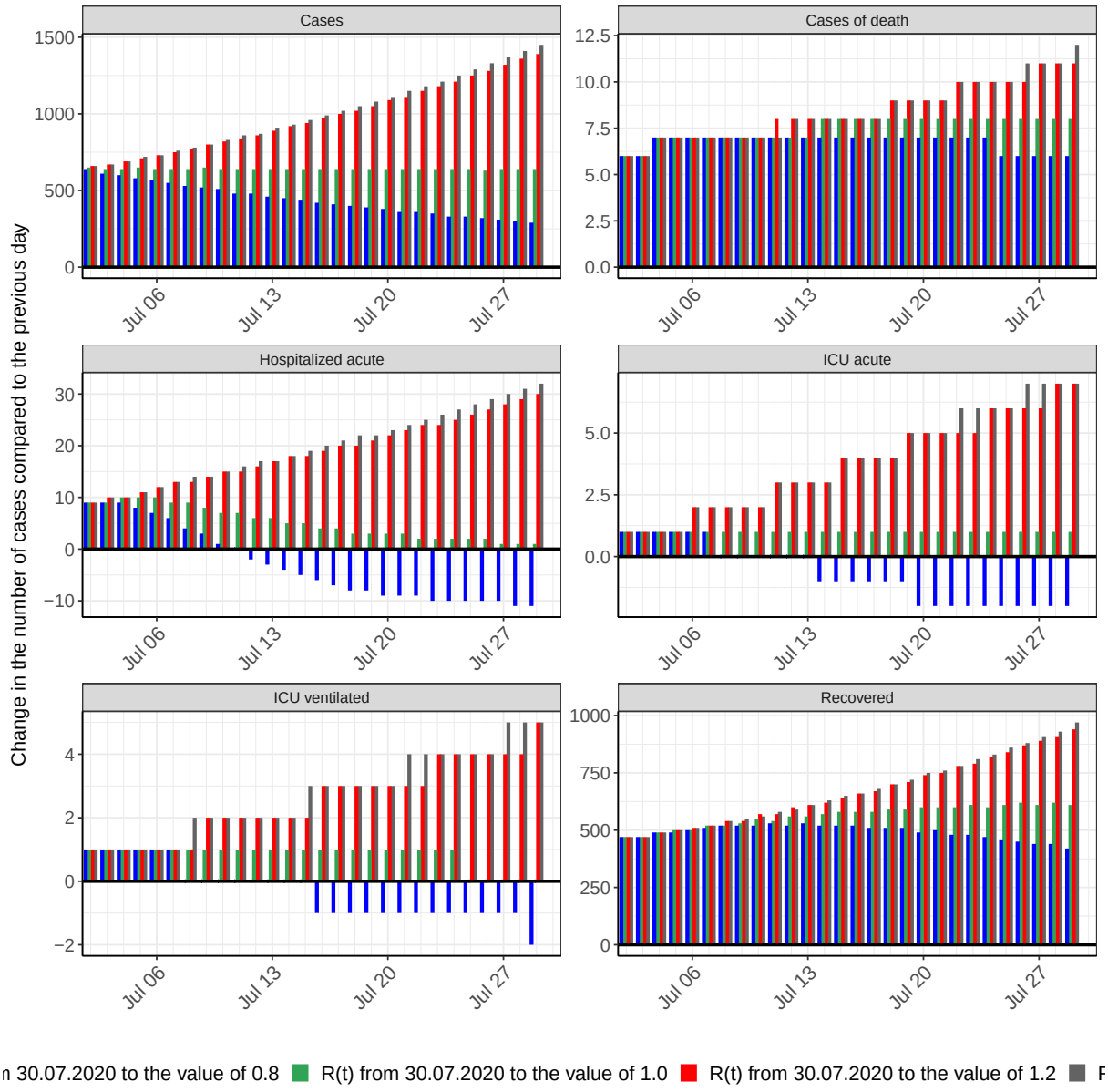


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany