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

Christiane Dings[1], Katharina Götz[1], Katharina Och[1], Iryna Sihinevich[1], Dr. Dominik Selzer[1], Quirin Werthner[1], Lukas Kovar[1], Fatima Marok[1], Christina Schräpel[1], Laura Fuhr[1], Denise Türk[1], Hannah Britz[1], Professor Dr. Sigrun Smola[2], Professor Dr. Thomas Volk[3], Professor Dr. Sascha Kreuer[3], Dr. Jürgen Rissland[2], Professor Dr. Thorsten Lehr[1]

[1]Clinical Pharmacy, Saarland University
[2]Institute of Virology, Saarland University Medical Center
[3]Clinic for Anaesthesiology, Intensive Care Medicine and Pain Therapy, Saarland University Medical Center

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Lead:
Professor Dr. Thorsten Lehr
Clinical Pharmacy, Saarland University
Campus C2 2, 66123 Saarbrücken
thorsten.lehr@mx.uni-saarland.de
www.clinicalpharmacy.me
www.covid-simulator.com

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 29.05.2020, there was a further increase of R(t) by approx. 31% from 0.71 to 0.93 in the national average.
  - The current R(t) values are estimated to be less than 1 for all federal states, with the exception of those with known "corona hotspots" (Berlin, Brandenburg, North Rhine-Westphalia, Saxony-Anhalt) and Saarland.

- Forecasts with different assumptions of R0, including the lifting of intervention measures, are presented for each state.
  - Assuming that the reproductive rate R(t) in the federal states remains below 1, the hospital bed capacity appears to be sufficient in all federal states.
  - If the reproductive number increases immediately to R(t)=1.2, the maximum bed capacity can be expected to be reached within the next ten to twelve weeks in some federal states, with this time being earlier in federal states with a higher current R(t) value. If the R(t) value was to rise more sharply to, for example, 1.8, it would be expected that the maximum bed capacity would be reached much earlier.
- Many epidemiological models for COVID-19 are currently being published.
  - Our model differs in the ammount of the data avaliable and the modeling approach. To the best of our knowledge, we are the only ones to use all available data (COVID-19 cases, recovered, deceased, outpatients, ventilated and non-ventilated intensive care patients) from the individual German federal states. Furthermore, for the establishment of the hospital stay (incl. length of stay) and its outcome (survival, death), we were able to rely on a constantly expanding internal data set of more than 3000 completed COVID-19 patient cases in Germany. This allows a realistic representation of the inpatient and intensive care situation in German hospitals.
  - Our model can be successfully transferred to other countries (e.g. USA, France, Italy), where it also shows excellent descriptive properties (results on demand). This shows that the structure of our model is valid and generic. An application to other countries is possible without any problems if the corresponding data is available.
- The Robert Koch Institute (RKI) publishes regular updates on the current R0 figures in Germany and the federal states. The method of calculating the R0 number of the RKI differs significantly from our model approach. The RKI only considers new infections in the last 8 days, whereas our model considers the complete data set (extent and also other data, such as hospital stays, deceased, convalescence). Due to the short time period of the RKI data considered, their R0 value is more susceptible to changes and fluctuations in reporting and also sensitive in the range of small numbers of new infections. The R0 value of the RKI therefore fluctuates more over time compared to the R(t) value calculated by our model. Still by comparing the R0 values calculated by the RKI and our calculated R(t) values, a large agreement could be found over a long period of time (results on demand).

Changes in the document

Changes compared to the report of 25.06.2020

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

Changes compared to the report of 18.06.2020

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

Changes compared to the report of 11.06.2020

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

Changes compared to the report of 04.06.2020

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

Changes compared to the report dated 28.05.2020

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

Changes compared to the report dated 19.05.2020

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

Changes compared to the report dated 08.05.2020

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

Changes compared to the report dated 05.05.2020

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

Changes compared to the report dated 24.04.2020

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

Changes compared to the report dated 21.04.2020

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

Changes in comparison to the report from 15.04.2020

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

Changes compared to the report of 11.04.2020

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

Contents

1 Overview of the modeling

1.1 Question

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

1.2 Objectives

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

1.3 Target group

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

1.4 Methods

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

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

1.5 Model structure

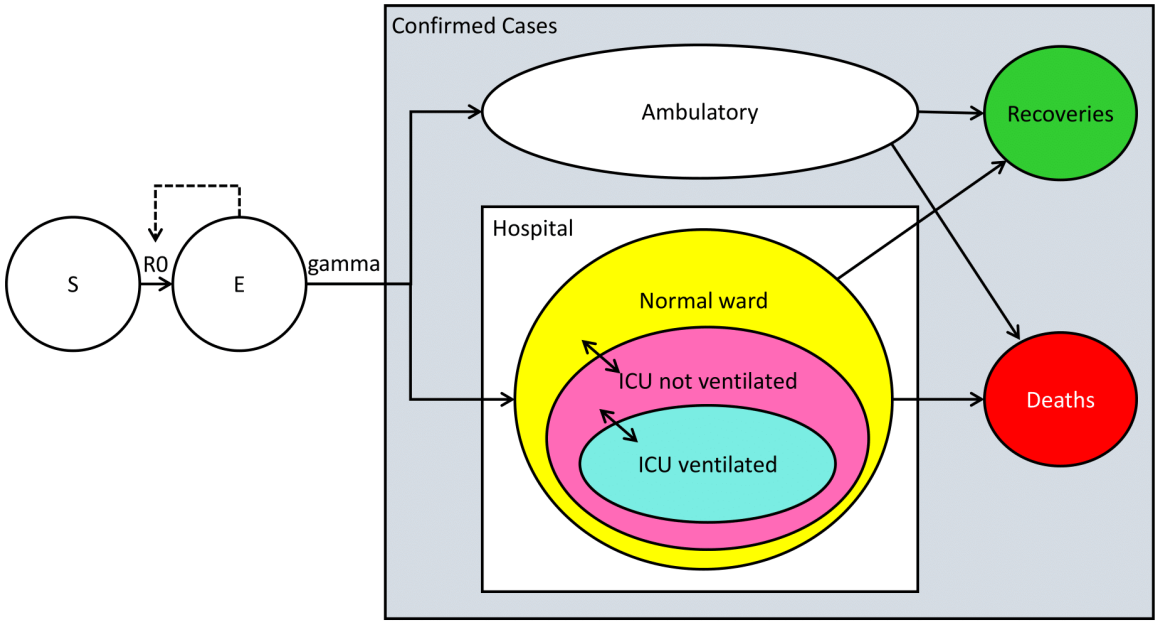
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected,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

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

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

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

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



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

Figure 1: SEIR/D Model - Model structure

1.6 Model results

1.6.1 Description of the data

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

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

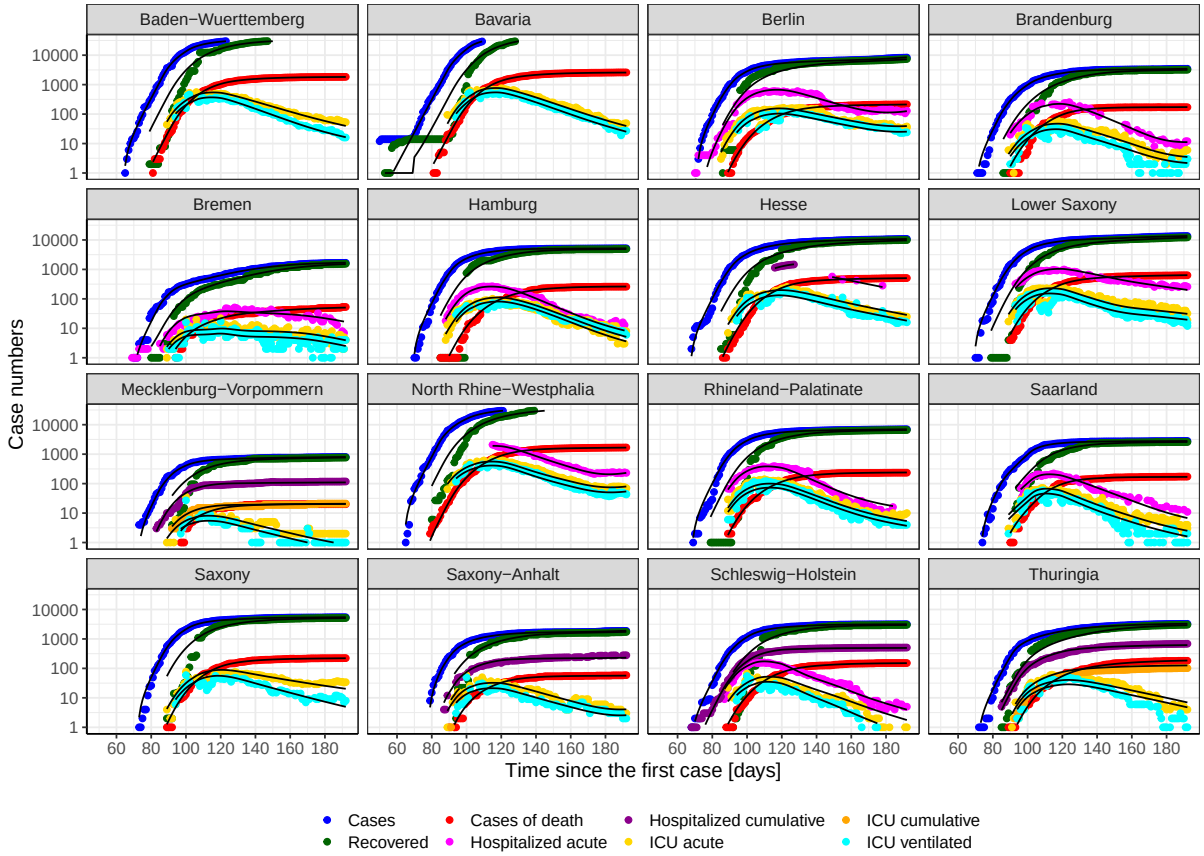


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

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

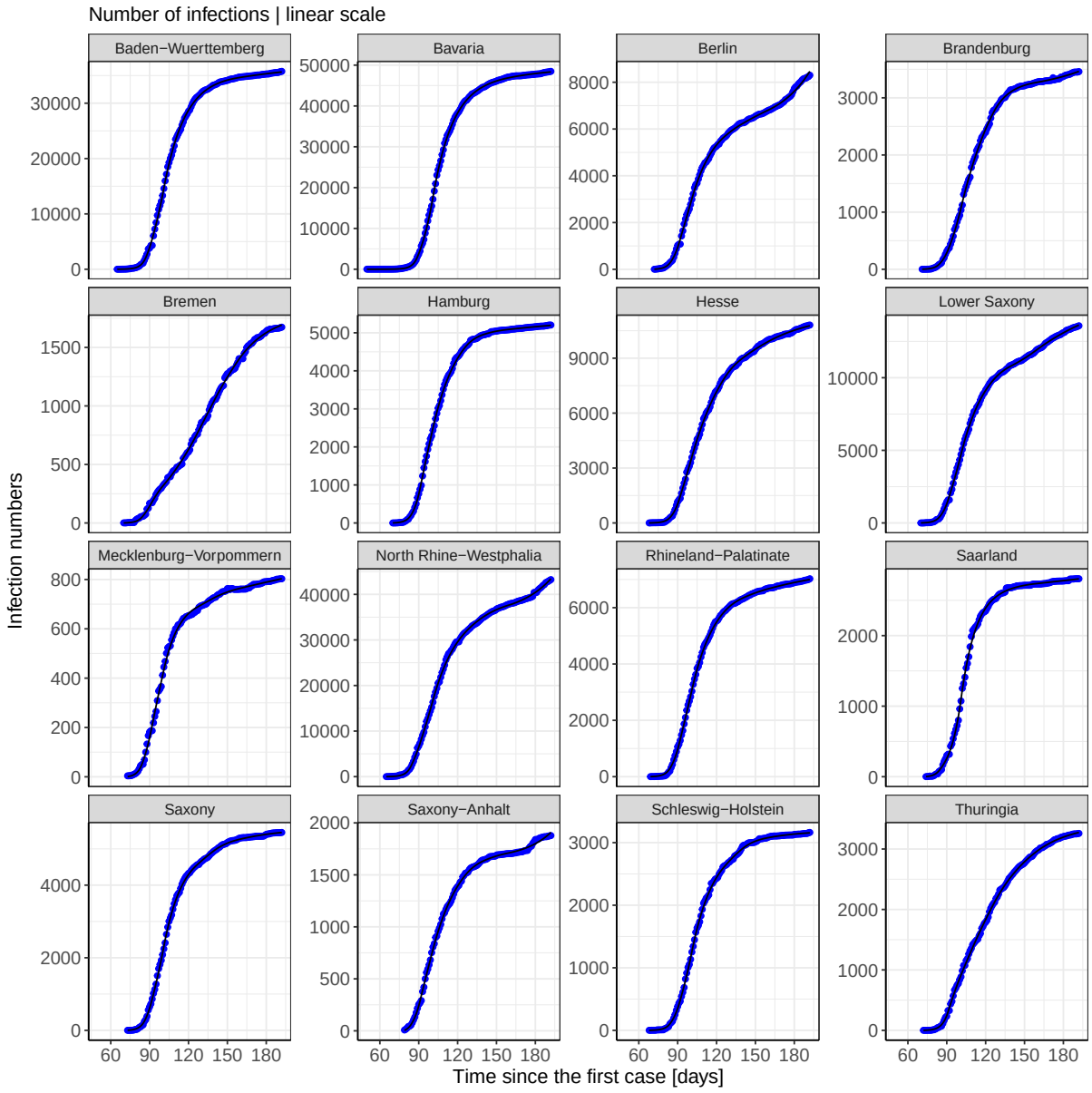


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

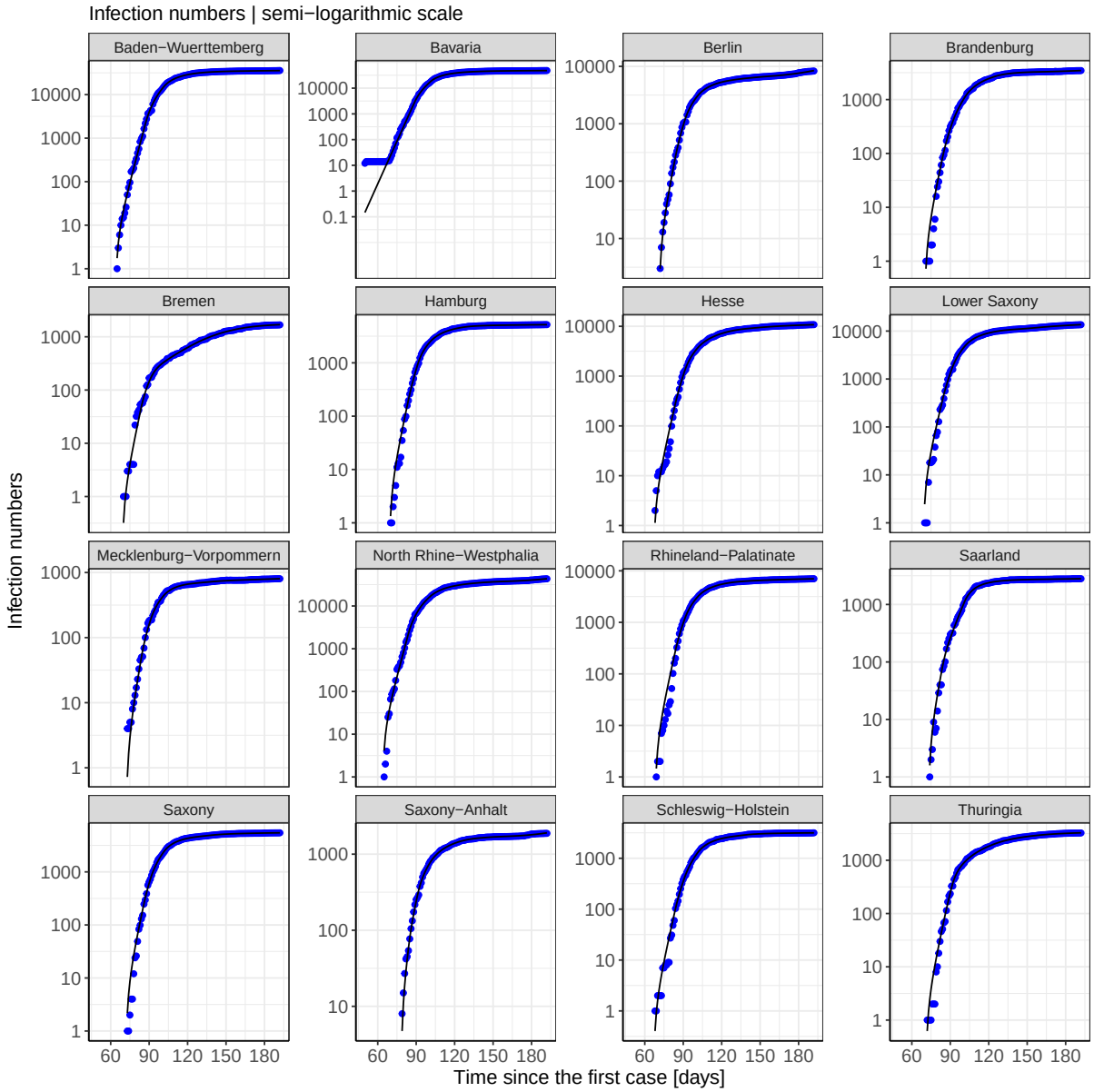


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

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

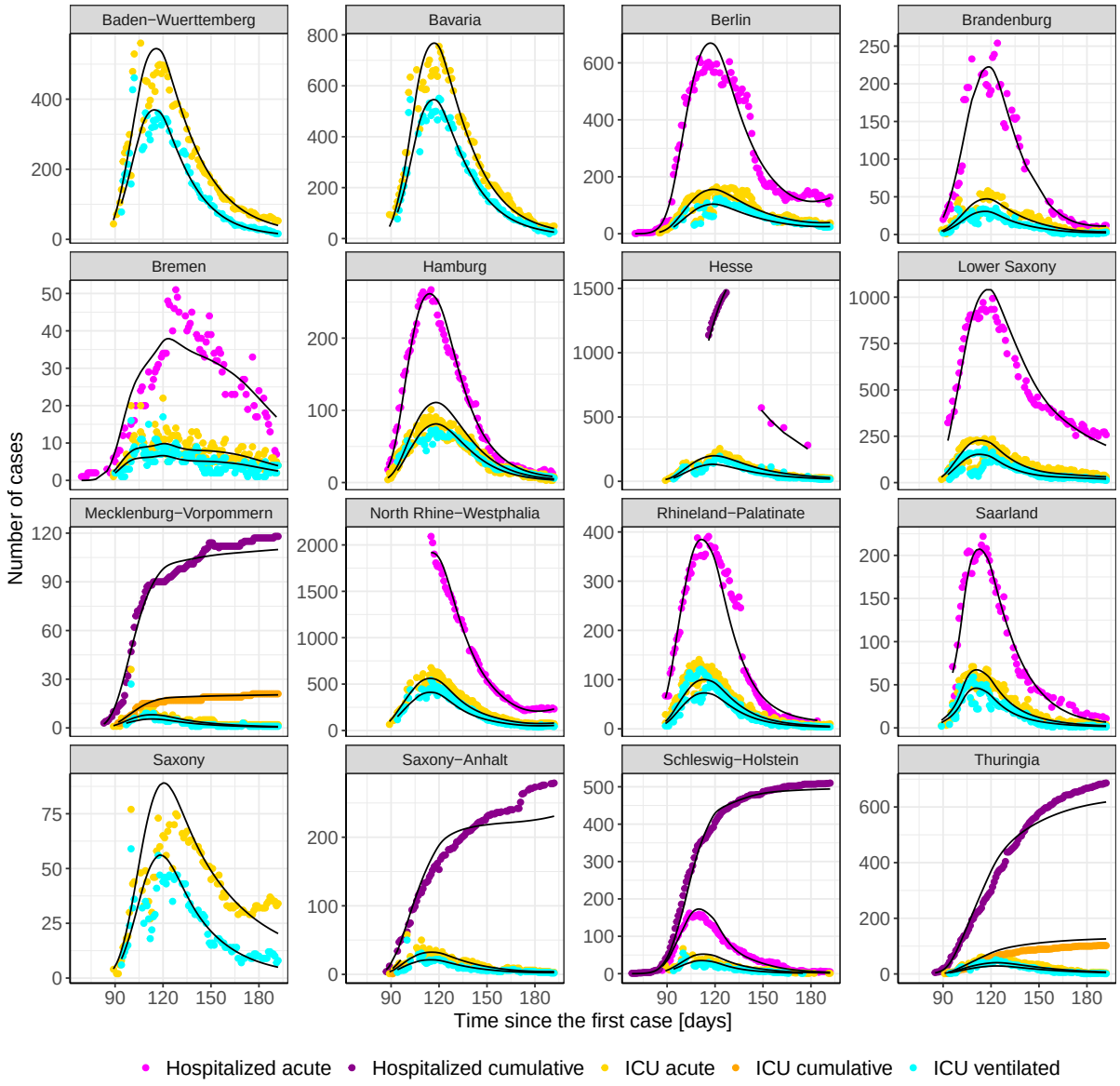


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

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

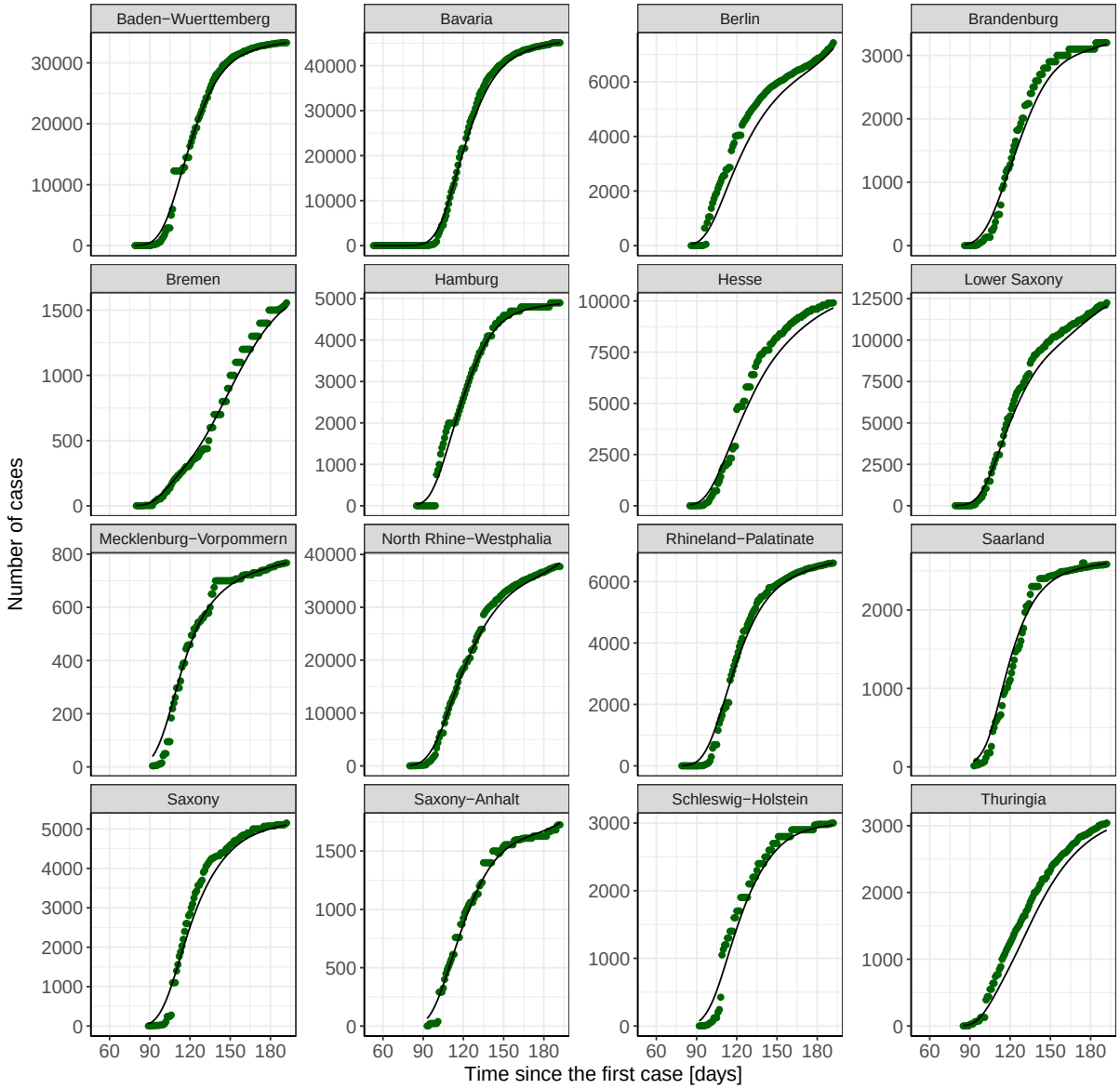


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

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

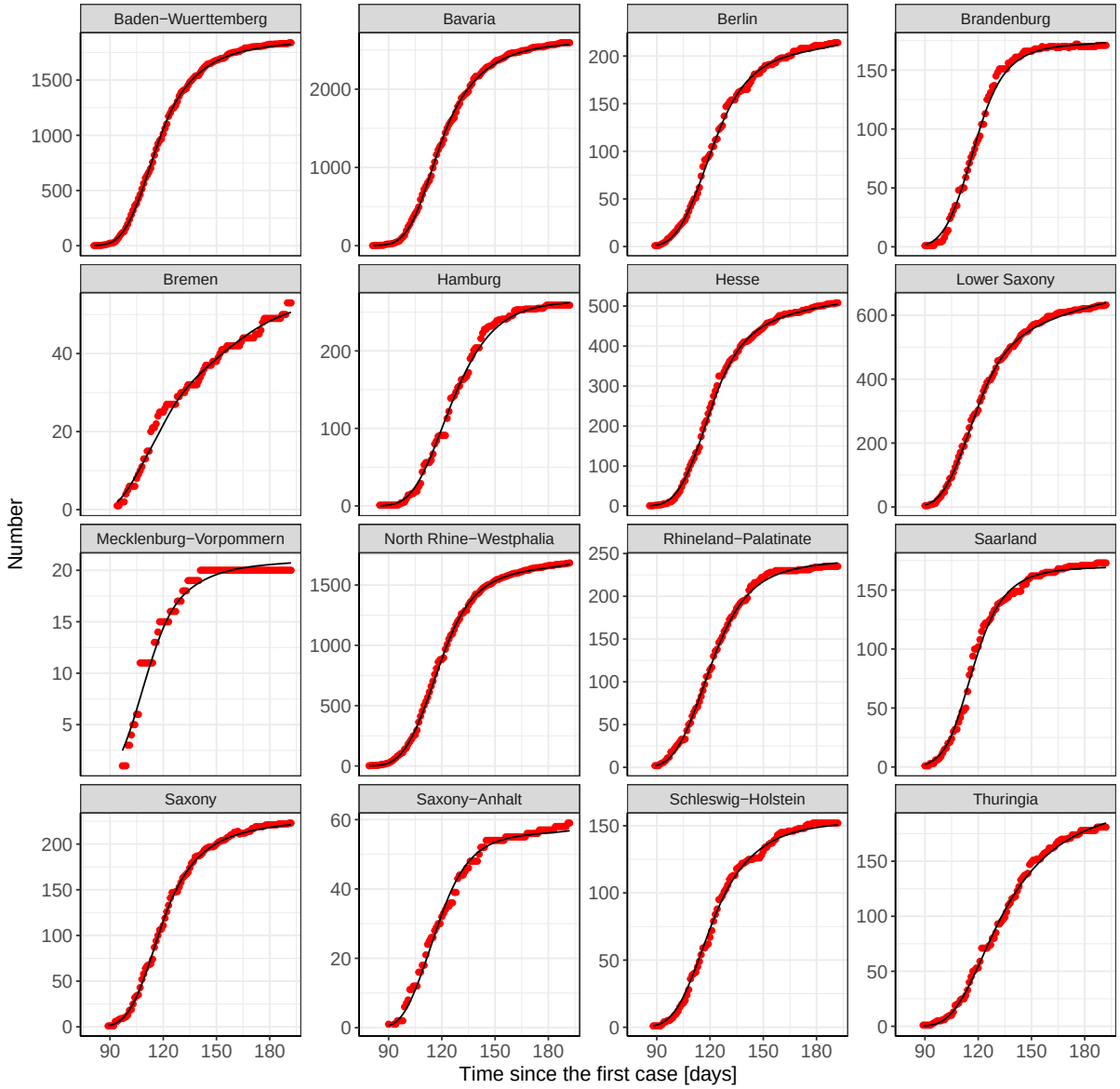


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

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

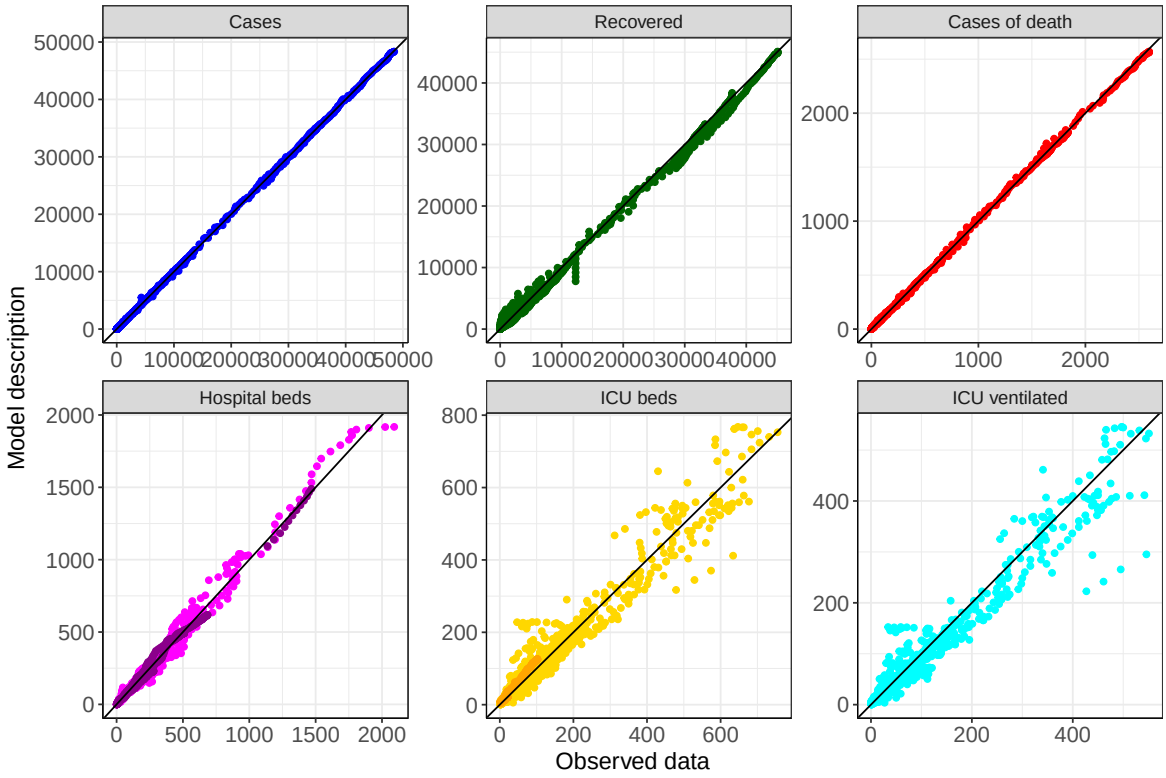


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

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

The influences of NPIs and other events were systematically investigated and incorporated into the model. Investigations of influencing factors on R(t) revealed the following statistically significant effects: school closure, lockdown, a "2nd stage" of the lockdown since 01.04.2020 and changes on 25.04.2020, 09.05.2020 and 29.05.2020. The effects vary slightly in each federal state (see Table 1, figures [9] and [10]), while the exact causes are not clear. It can be assumed that the geographical situation of the federal states ("rural" states vs. "urban" states, border region, mentality) as well as local policies play a role. Five days after the school reopening on 04.05.2020, the R(t) value increased by approx. 11.6% to 0.71 on a national average. In general, the safety measures taken appear to be effective in keeping R(t) at a stable level below 1, with the exception of the federal states with known "corona hotspots". The factors influencing R(t) are listed in detail below:

- School closures: Reduction of R(t) on average by approx. 31% from 2.78 to 1.92 (p-value < 0.001)
- Lockdown (on 23.03.2020): Further reduction of R(t) on average by approx. 43% from 1.92 to 1.1 (p-value < 0.001)
- "2nd stage" of the lockdown (on 01.04.2020): Further reduction R(t) on average by approx. 42% from 1.1 to 0.64 (p-value < 0.001)
- From 09.05.2020: A slight increase of R(t) by about 11% to 0.71 (p-value < 0.001).
- From 29.05.2010: A further increase of R(t) by approx. 31% from 0.71 to 0.93 (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 29.05.
Baden-Wuerttemberg	2.78	1.68	1.32	0.58	0.57	0.59	0.91
Bavaria	2.78	2.75	1.52	0.56	0.59	0.65	0.82
Berlin	2.78	1.97	1.03	0.62	0.78	0.92	1.26
Brandenburg	2.78	1.90	1.39	0.78	0.45	0.52	1.16
Bremen	2.78	1.46	0.69	1.14	1.00	0.89	0.72
Hamburg	2.78	2.15	0.92	0.64	0.35	0.59	0.94
Hesse	2.78	2.10	1.08	0.77	0.63	0.89	0.83
Mecklenburg-Vorpommern	2.78	1.67	0.92	0.43	0.96	0.72	0.97
Lower Saxony	2.78	2.04	1.18	0.65	0.58	1.13	0.90
North Rhine-Westphalia	2.78	1.40	1.12	0.66	0.76	0.73	1.27
Rhineland-Palatinate	2.78	1.91	1.07	0.62	0.55	0.81	0.91
Saarland	2.78	1.53	1.82	0.41	0.51	0.59	1.01
Saxony	2.78	1.96	1.24	0.52	0.89	0.59	0.82
Saxony-Anhalt	2.78	1.99	0.94	0.69	0.50	0.70	1.32
Schleswig-Holstein	2.78	1.95	1.28	0.59	0.84	0.48	0.77
Thuringia	2.78	2.50	0.81	0.93	0.79	0.82	0.76
Germany	2.78	2.28	1.27	0.63	0.64	0.76	1.05

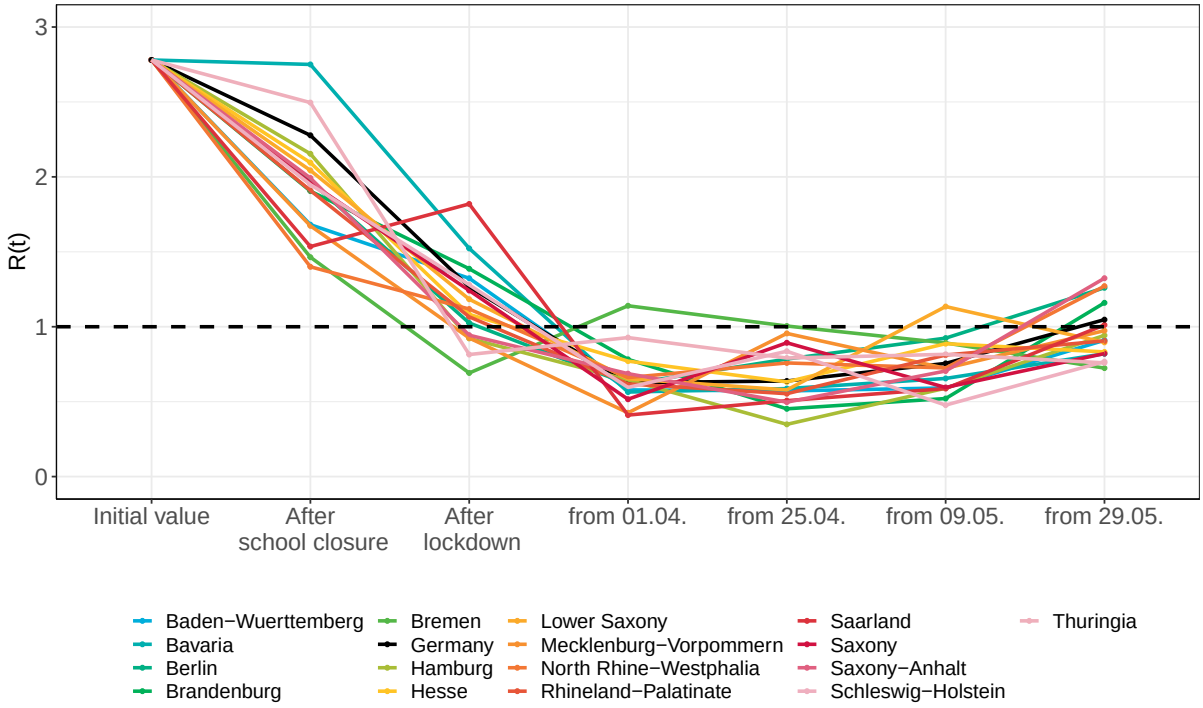


Figure 9: R(t) distribution before and after NPIs

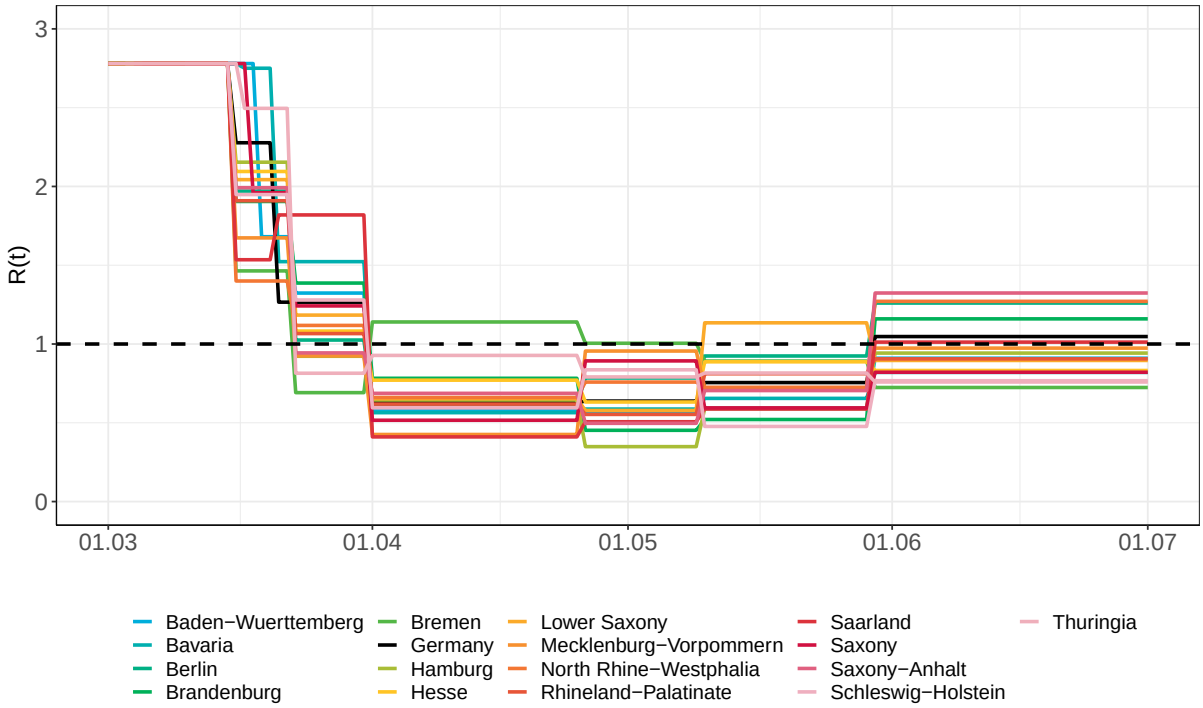


Figure 10: R(t) over time

2 Baden-Wuerttemberg

2.1 Model description

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

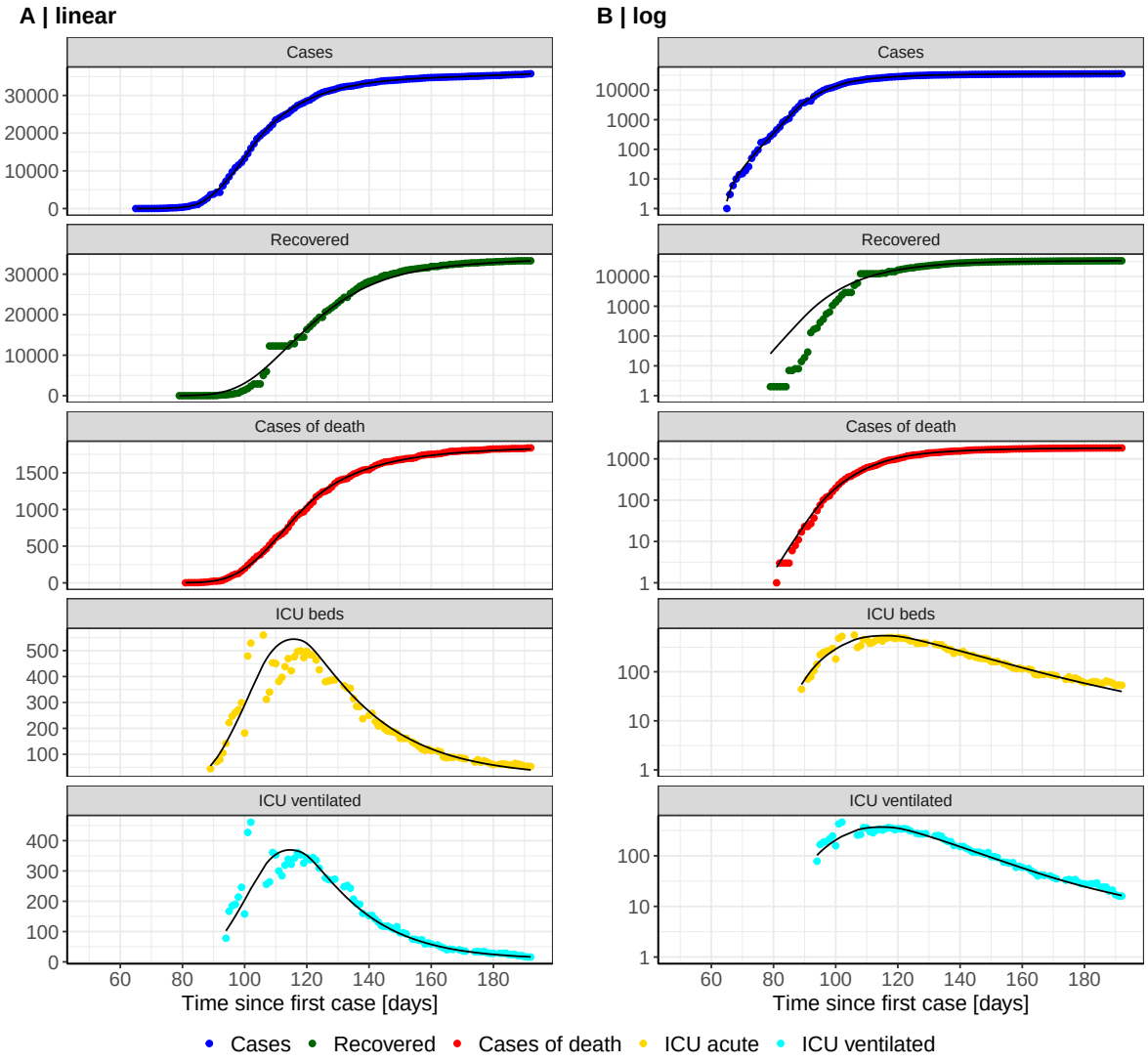


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

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

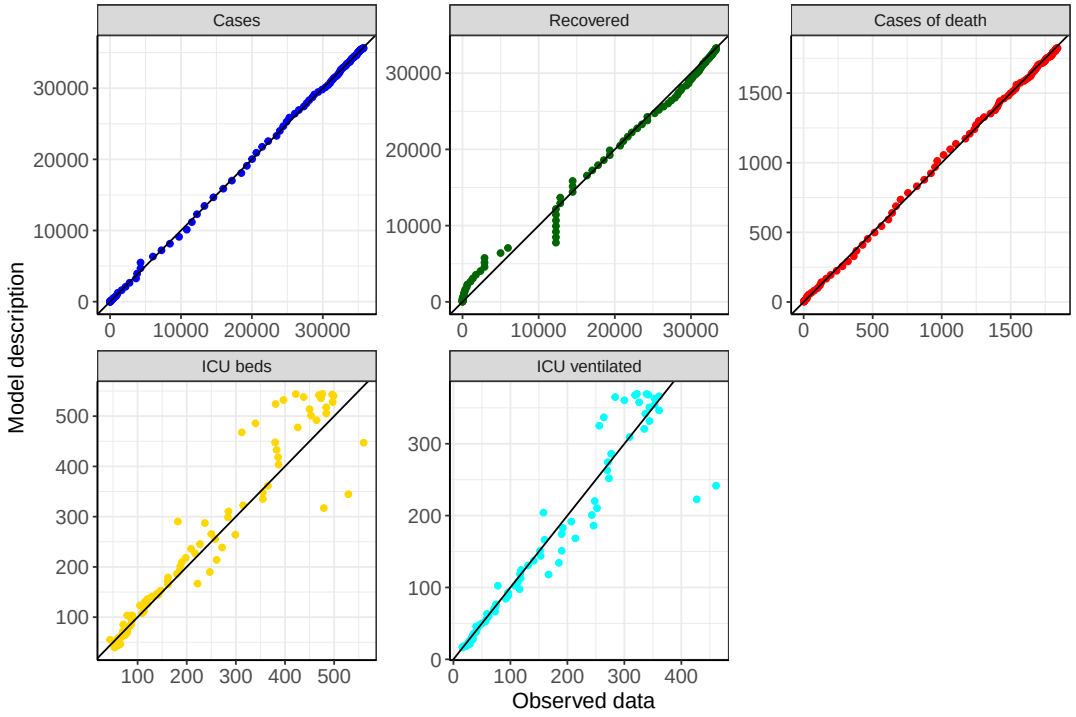


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

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

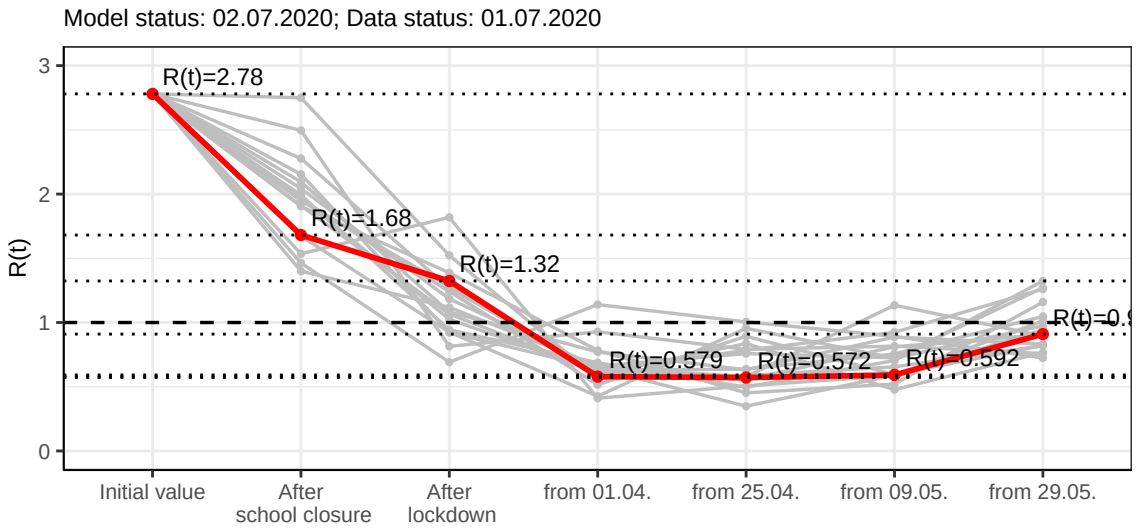


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

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

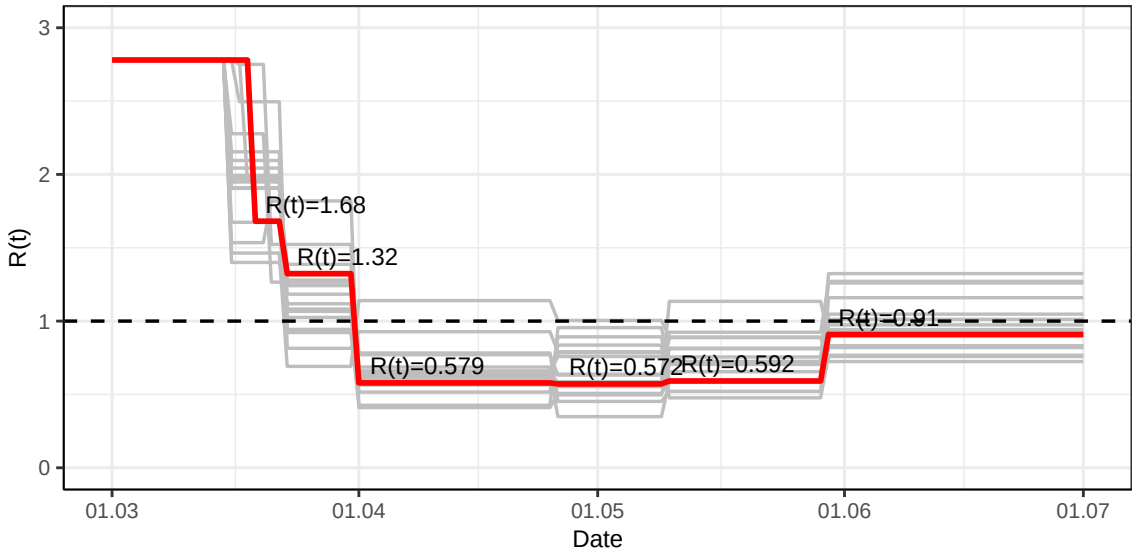


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

2.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.91)

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.

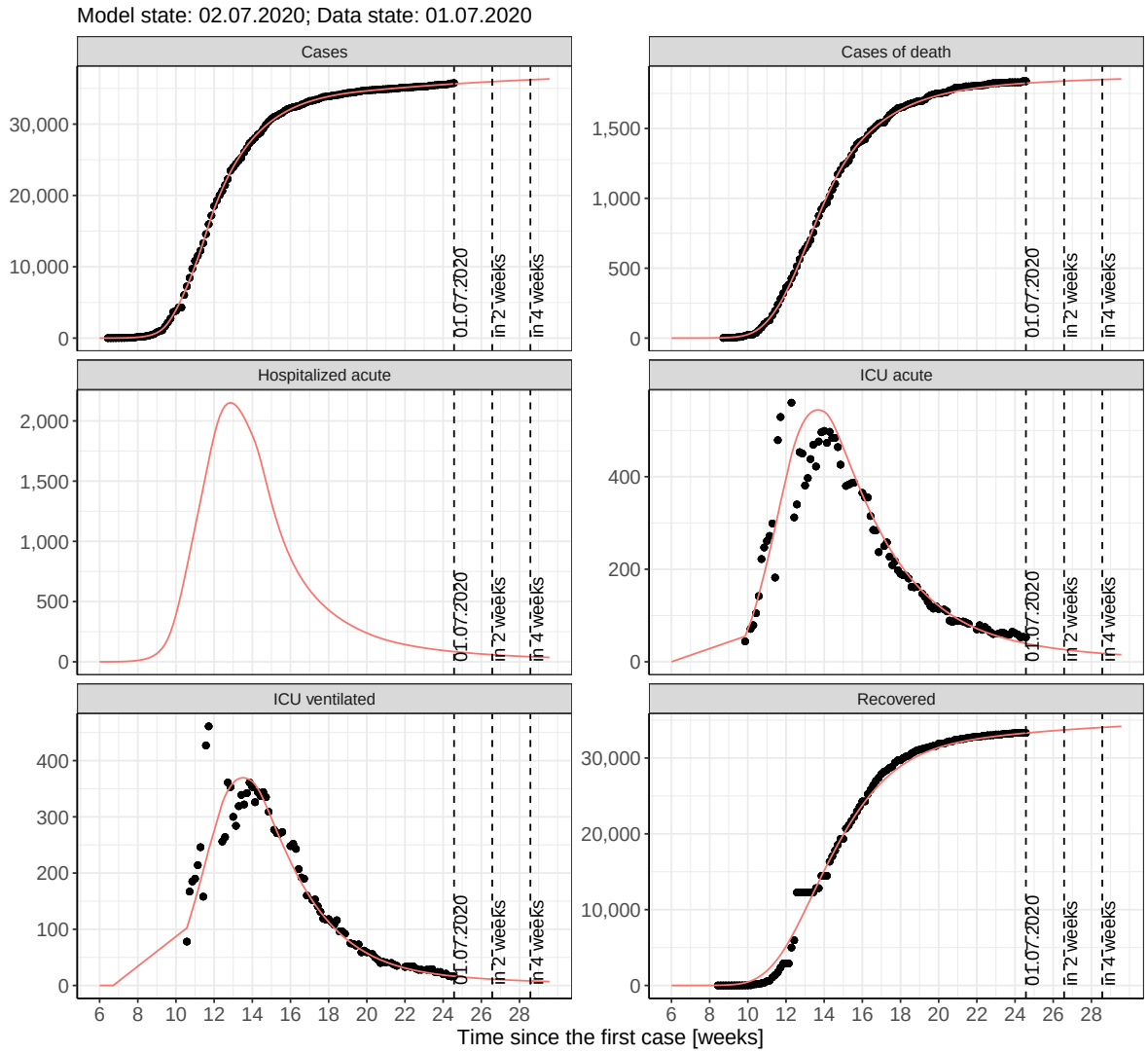


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

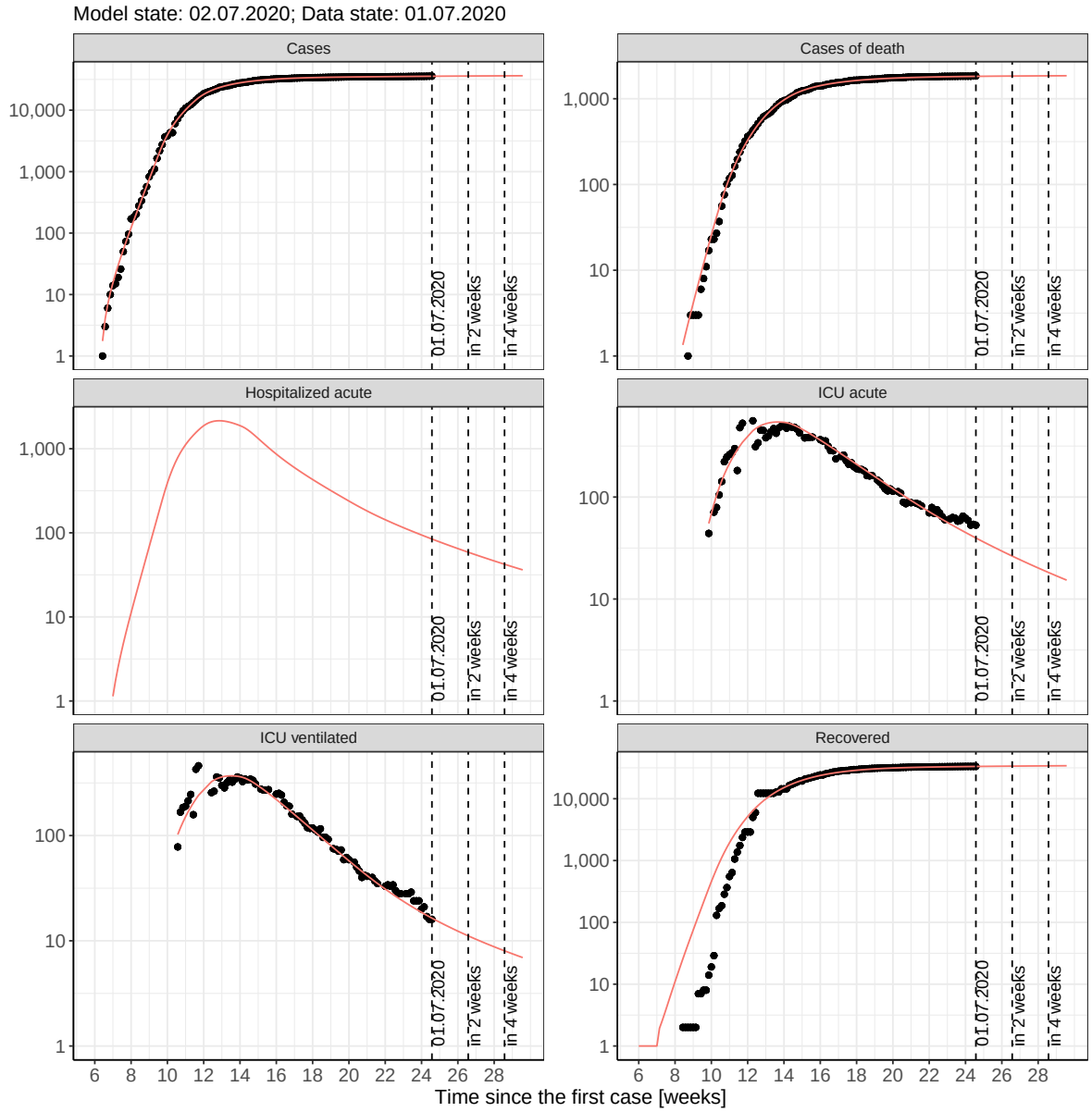


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

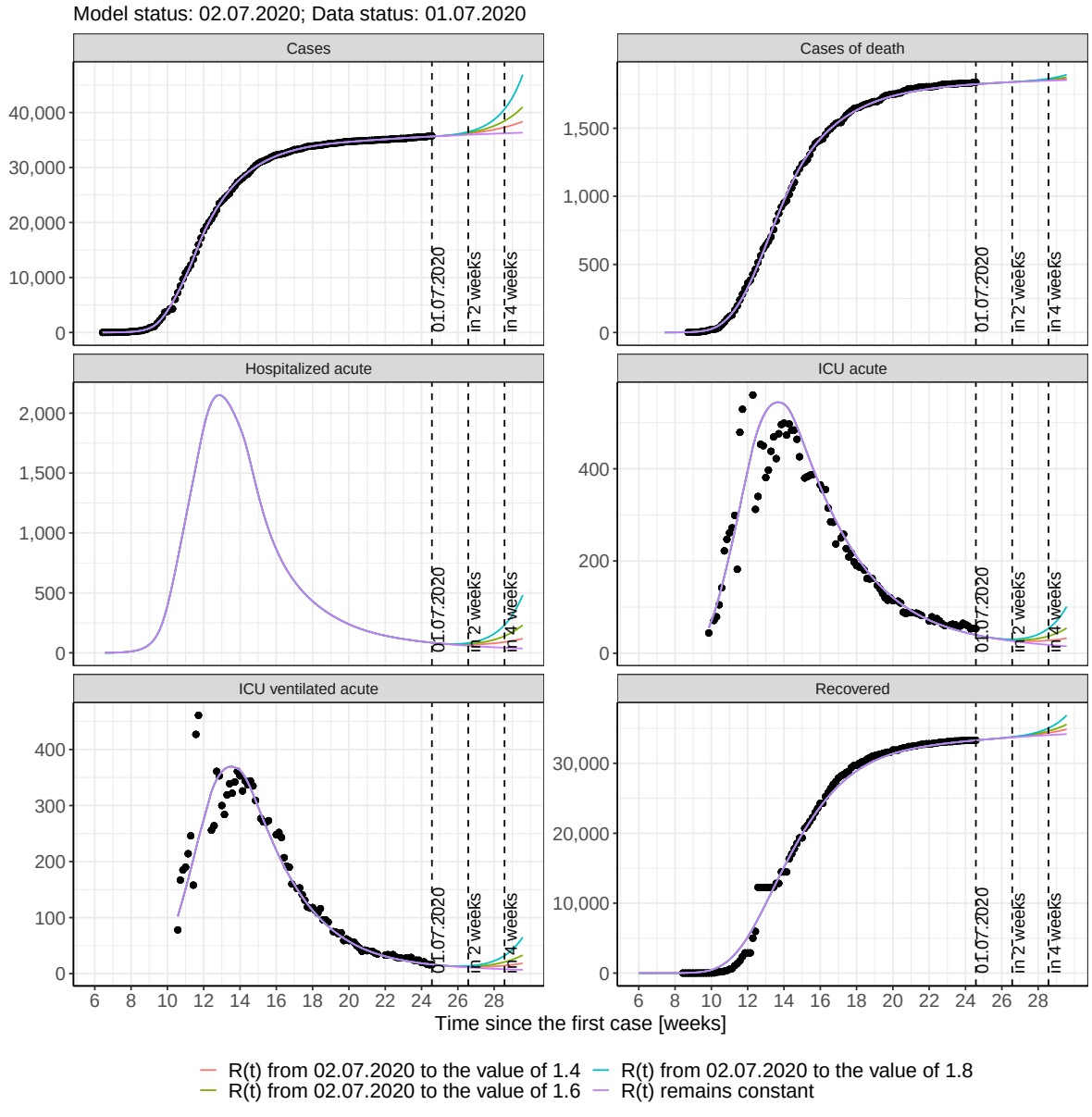


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

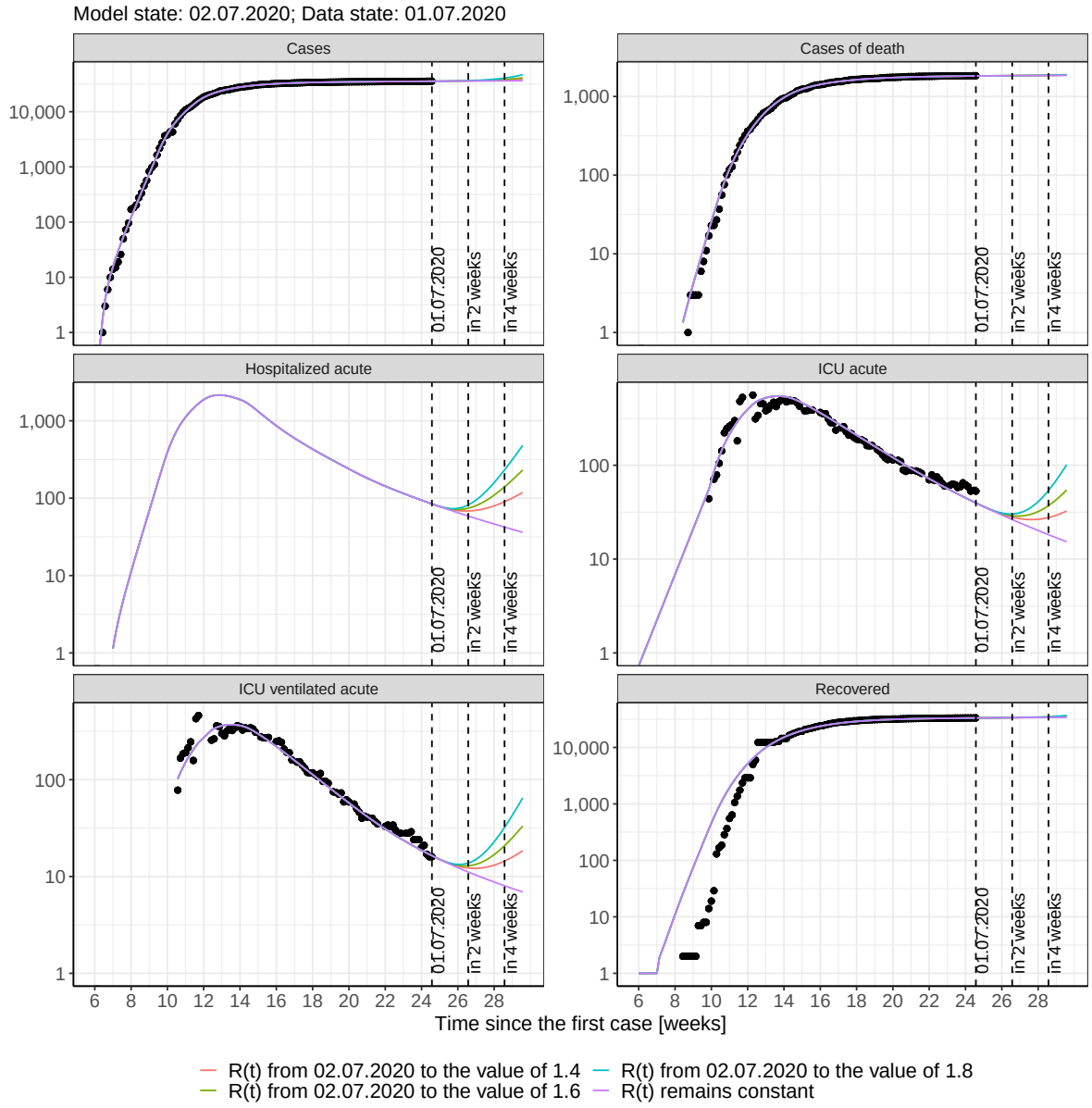


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

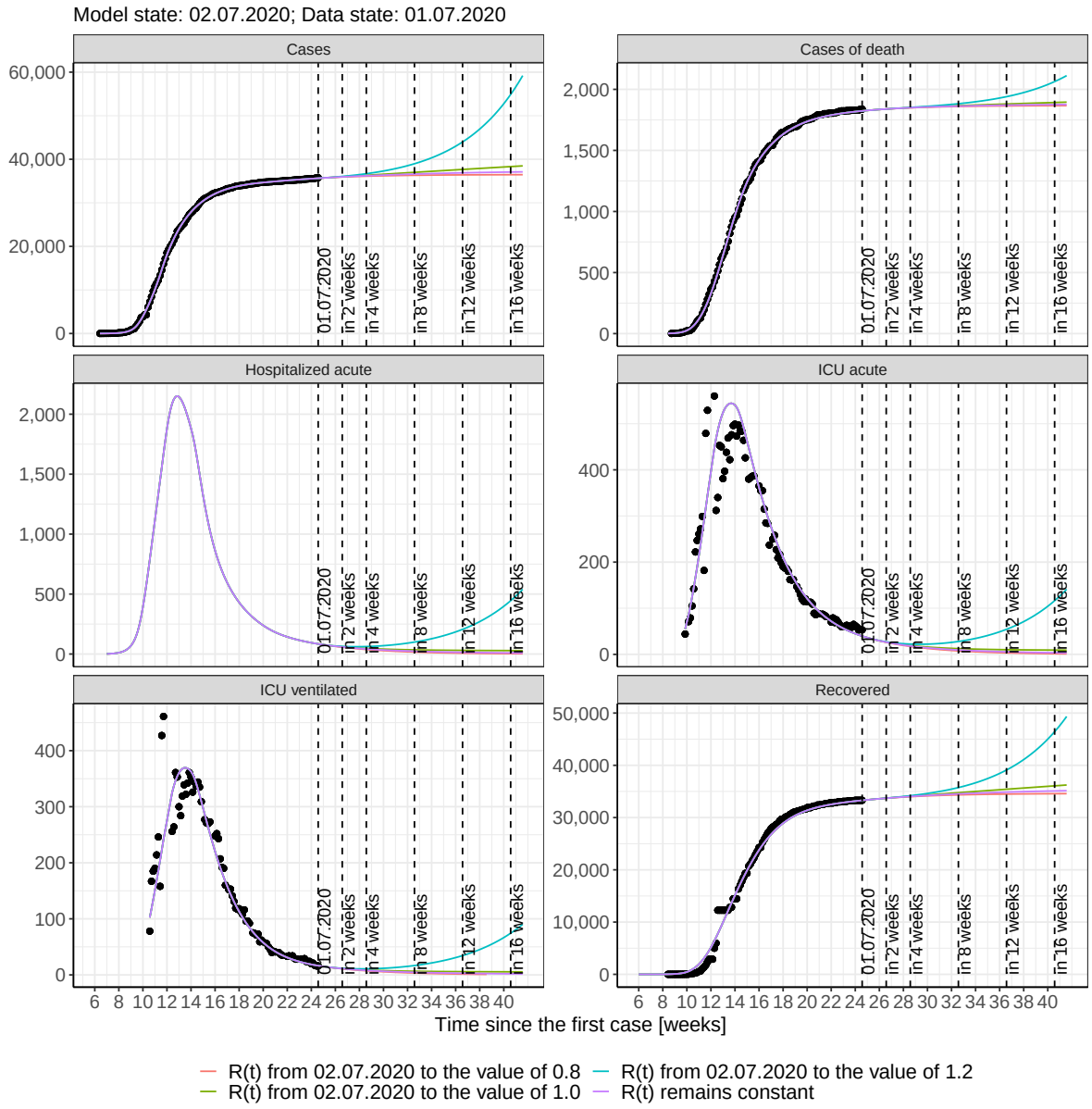


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

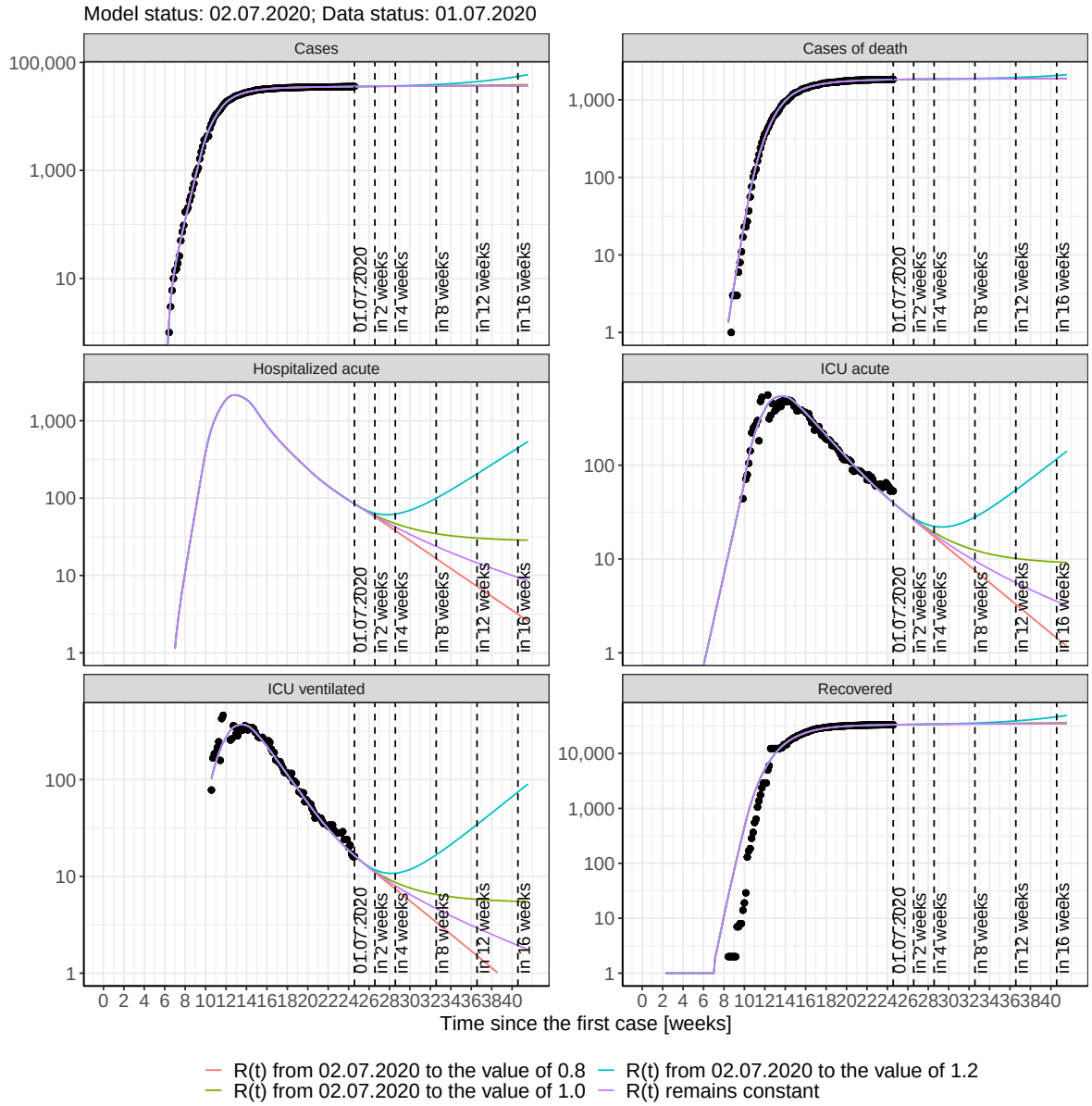


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 5) Model status from 02.07.2020; Data status: 01.07.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	35666	1825	33325	82	38	16
03.07.2020	35690	1826	33357	80	37	15
04.07.2020	35714	1827	33389	78	36	15
05.07.2020	35737	1828	33421	76	35	15
06.07.2020	35760	1830	33451	74	34	14
07.07.2020	35783	1831	33482	72	33	14
08.07.2020	35806	1832	33511	70	32	13
09.07.2020	35828	1833	33541	68	31	13
10.07.2020	35850	1834	33569	67	30	13
11.07.2020	35871	1835	33597	65	30	12
12.07.2020	35893	1836	33625	63	29	12
13.07.2020	35914	1837	33652	62	28	12
14.07.2020	35935	1838	33679	60	27	11
15.07.2020	35955	1839	33706	59	26	11
16.07.2020	35975	1840	33732	57	26	11
17.07.2020	35995	1841	33757	56	25	11
18.07.2020	36015	1842	33783	55	24	10
19.07.2020	36034	1842	33807	53	24	10
20.07.2020	36054	1843	33832	52	23	10
21.07.2020	36073	1844	33856	51	22	10
22.07.2020	36091	1845	33880	50	22	9
23.07.2020	36110	1845	33903	49	21	9
24.07.2020	36128	1846	33926	47	21	9
25.07.2020	36146	1847	33949	46	20	9
26.07.2020	36164	1848	33971	45	20	9
27.07.2020	36181	1848	33993	44	19	8
28.07.2020	36198	1849	34015	43	19	8
29.07.2020	36215	1850	34037	42	18	8

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	35666	1825	33325	82	38	16
03.07.2020	35689	1826	33357	80	37	15
04.07.2020	35712	1827	33389	78	36	15
05.07.2020	35734	1828	33421	76	35	15
06.07.2020	35756	1830	33451	74	34	14
07.07.2020	35777	1831	33481	72	33	14
08.07.2020	35797	1832	33511	70	32	13
09.07.2020	35817	1833	33540	68	31	13
10.07.2020	35836	1834	33568	66	30	13
11.07.2020	35855	1835	33596	64	29	12
12.07.2020	35873	1836	33623	62	29	12
13.07.2020	35890	1837	33649	61	28	12
14.07.2020	35908	1838	33675	59	27	11
15.07.2020	35924	1839	33701	57	26	11
16.07.2020	35940	1840	33726	56	25	11
17.07.2020	35956	1840	33750	54	25	10
18.07.2020	35971	1841	33774	53	24	10
19.07.2020	35986	1842	33797	51	23	10
20.07.2020	36000	1843	33819	50	23	10
21.07.2020	36014	1844	33841	48	22	9
22.07.2020	36028	1844	33863	47	21	9
23.07.2020	36041	1845	33884	45	21	9
24.07.2020	36054	1846	33904	44	20	9
25.07.2020	36066	1846	33924	43	19	8
26.07.2020	36078	1847	33943	42	19	8
27.07.2020	36090	1848	33962	40	18	8
28.07.2020	36101	1848	33981	39	18	8
29.07.2020	36113	1849	33999	38	17	7

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	35666	1825	33325	82	38	16
03.07.2020	35691	1826	33357	80	37	15
04.07.2020	35715	1827	33389	78	36	15
05.07.2020	35740	1828	33421	76	35	15
06.07.2020	35764	1830	33452	74	34	14
07.07.2020	35789	1831	33482	72	33	14
08.07.2020	35813	1832	33512	70	32	13
09.07.2020	35838	1833	33541	69	31	13
10.07.2020	35862	1834	33570	67	30	13
11.07.2020	35887	1835	33599	66	30	12
12.07.2020	35911	1836	33627	64	29	12
13.07.2020	35935	1837	33655	63	28	12
14.07.2020	35960	1838	33683	61	27	12
15.07.2020	35984	1839	33710	60	27	11
16.07.2020	36009	1840	33737	59	26	11
17.07.2020	36033	1841	33764	58	25	11
18.07.2020	36057	1842	33791	57	25	11
19.07.2020	36082	1842	33817	56	24	10
20.07.2020	36106	1843	33844	55	23	10
21.07.2020	36130	1844	33870	54	23	10
22.07.2020	36155	1845	33896	53	22	10
23.07.2020	36179	1846	33922	52	22	10
24.07.2020	36203	1846	33947	51	21	9
25.07.2020	36227	1847	33973	50	21	9
26.07.2020	36252	1848	33998	49	20	9
27.07.2020	36276	1849	34024	48	20	9
28.07.2020	36300	1849	34049	48	20	9
29.07.2020	36324	1850	34074	47	19	9

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	35667	1825	33325	82	38	16
03.07.2020	35692	1826	33357	80	37	15
04.07.2020	35718	1827	33389	78	36	15
05.07.2020	35746	1828	33421	76	35	15
06.07.2020	35773	1830	33452	74	34	14
07.07.2020	35802	1831	33482	73	33	14
08.07.2020	35831	1832	33513	71	32	13
09.07.2020	35862	1833	33543	70	31	13
10.07.2020	35893	1834	33572	68	31	13
11.07.2020	35925	1835	33602	67	30	13
12.07.2020	35958	1836	33632	66	29	12
13.07.2020	35992	1837	33661	65	28	12
14.07.2020	36027	1838	33691	64	28	12
15.07.2020	36062	1839	33721	64	27	12
16.07.2020	36099	1840	33751	63	27	12
17.07.2020	36137	1841	33782	63	26	11
18.07.2020	36176	1842	33812	62	26	11
19.07.2020	36216	1843	33843	62	25	11
20.07.2020	36257	1844	33875	62	25	11
21.07.2020	36300	1845	33907	61	24	11
22.07.2020	36343	1846	33939	61	24	11
23.07.2020	36388	1846	33972	61	24	11
24.07.2020	36434	1847	34006	61	23	11
25.07.2020	36482	1848	34040	61	23	11
26.07.2020	36531	1849	34075	61	23	11
27.07.2020	36581	1850	34111	62	23	11
28.07.2020	36632	1851	34148	62	22	11
29.07.2020	36685	1852	34185	62	22	11

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

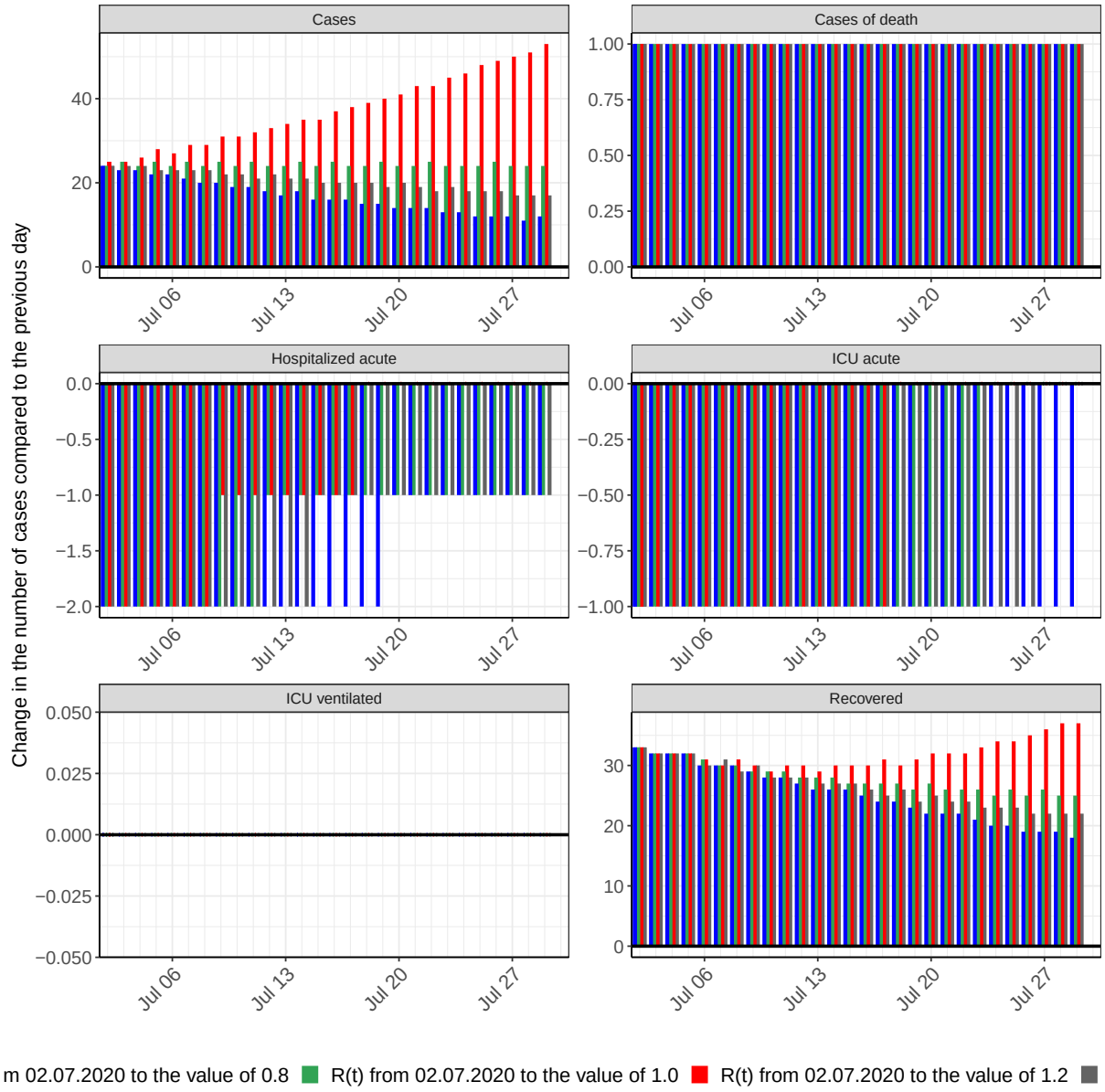


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

3 Bavaria

3.1 Model description

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

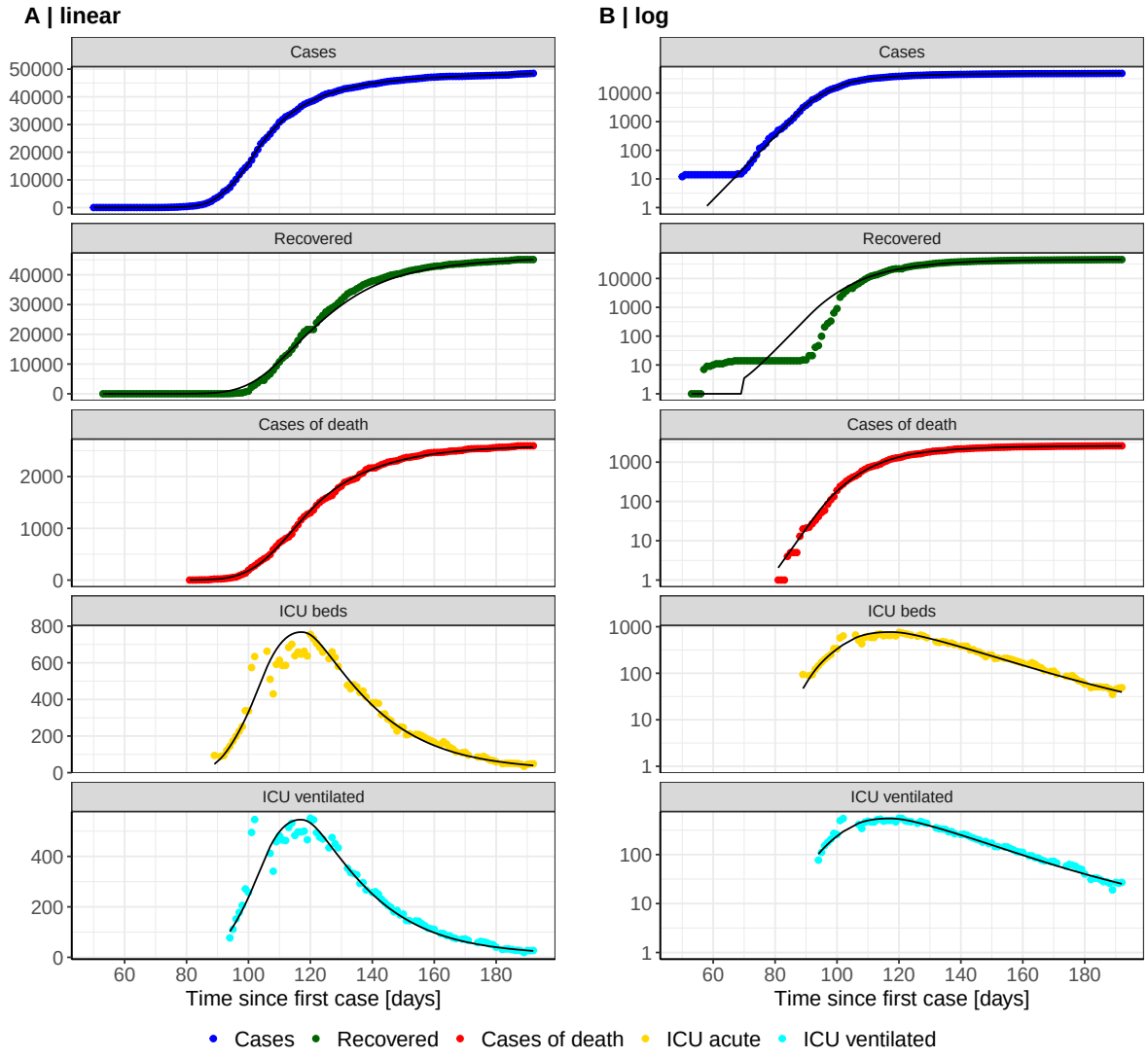


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

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

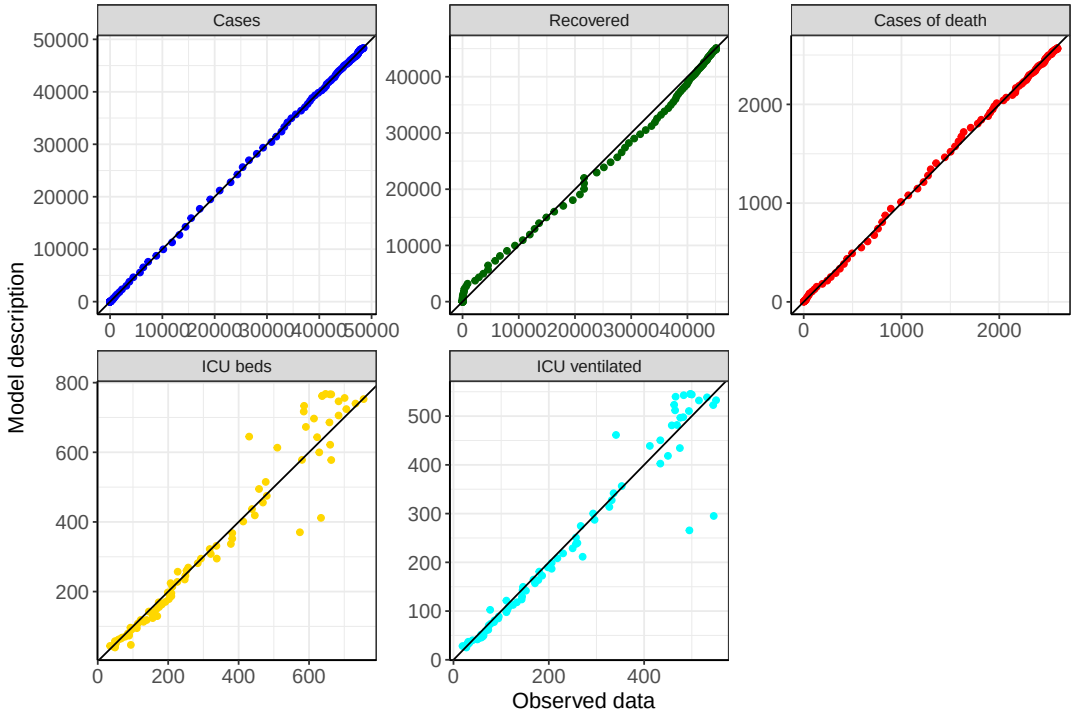


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

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

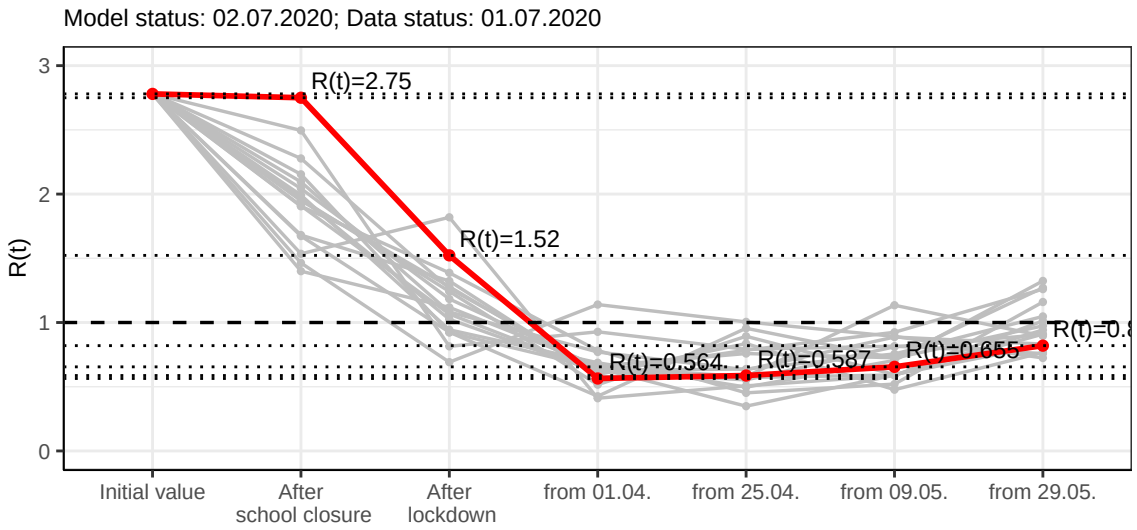


Figure 24: R(t) values before and after the NPIs for Bavaria

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

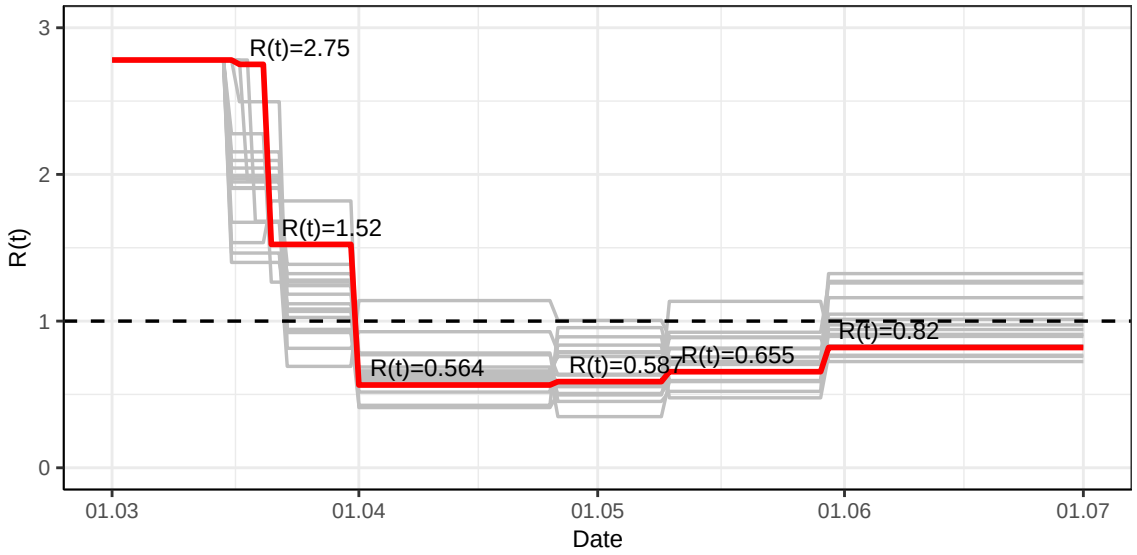


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

3.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.82)

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.

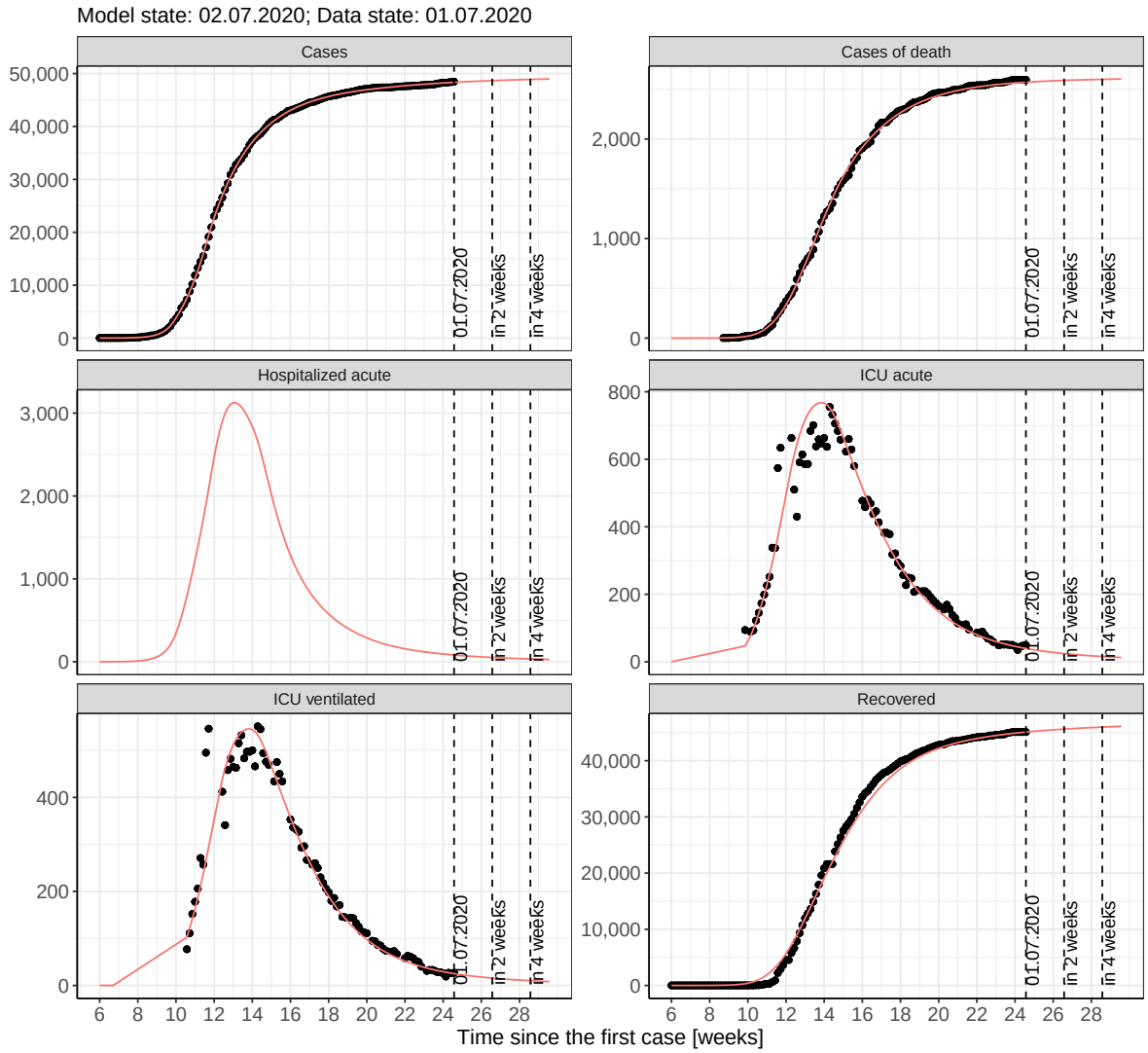


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

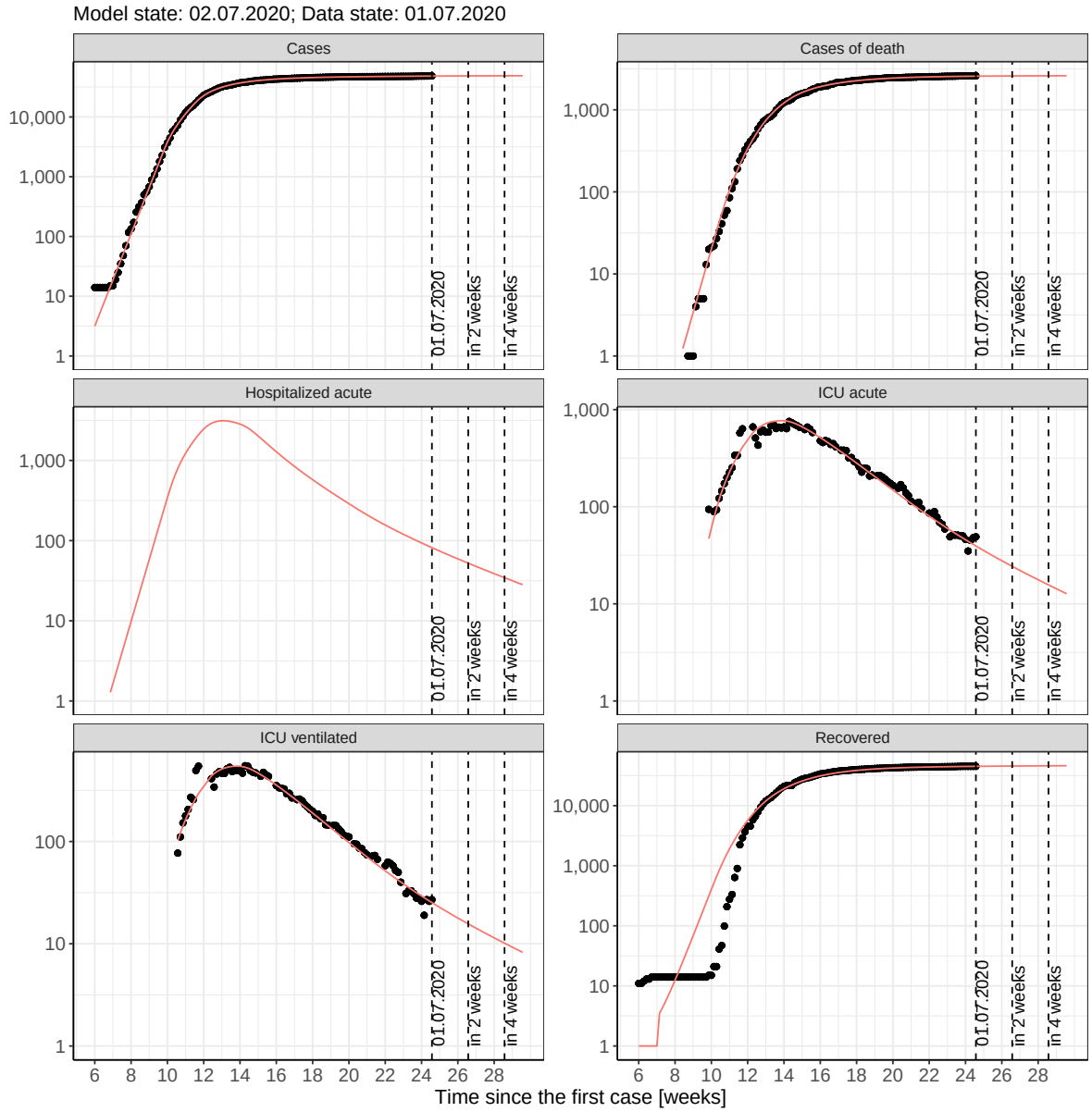


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

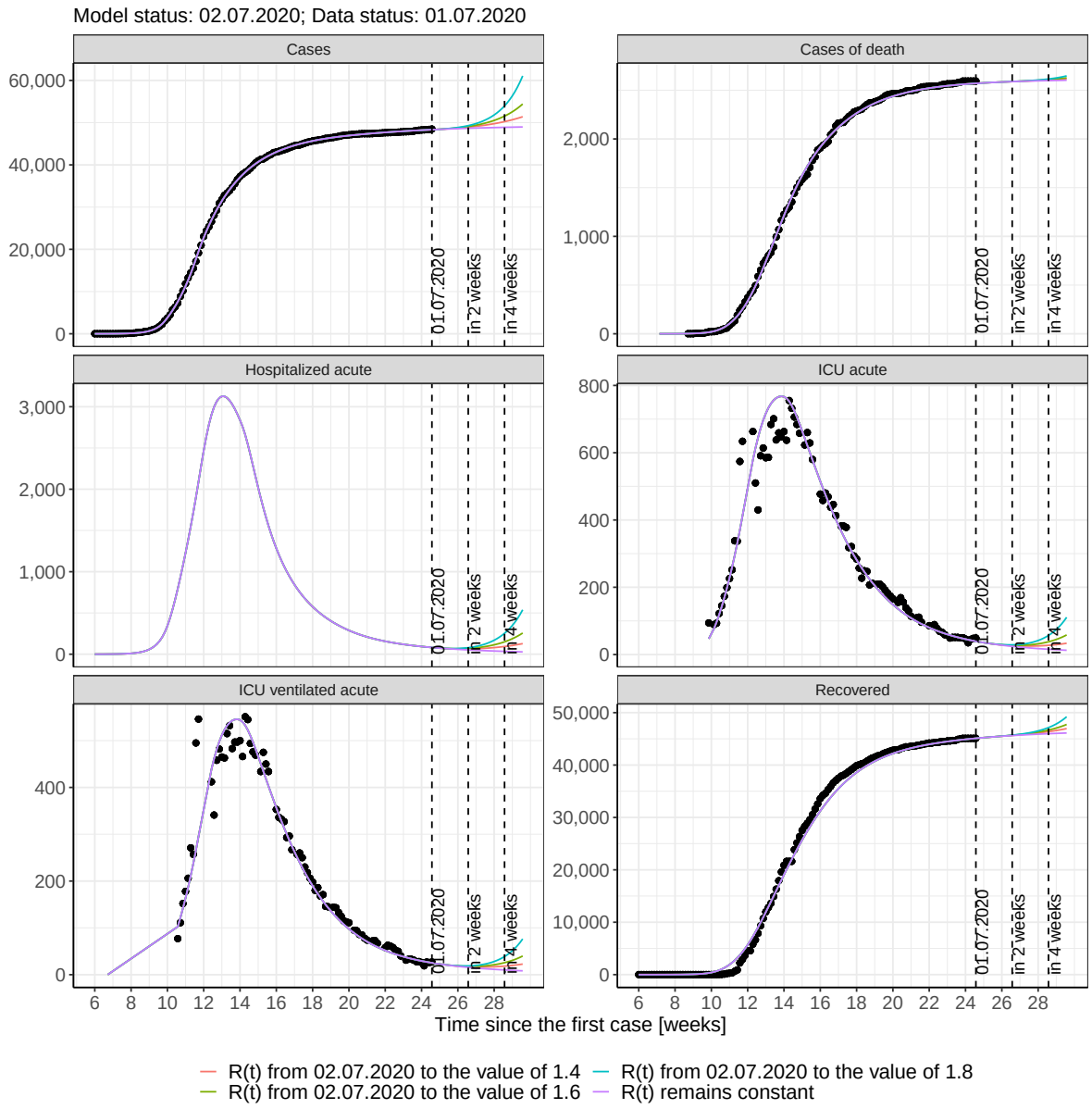


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

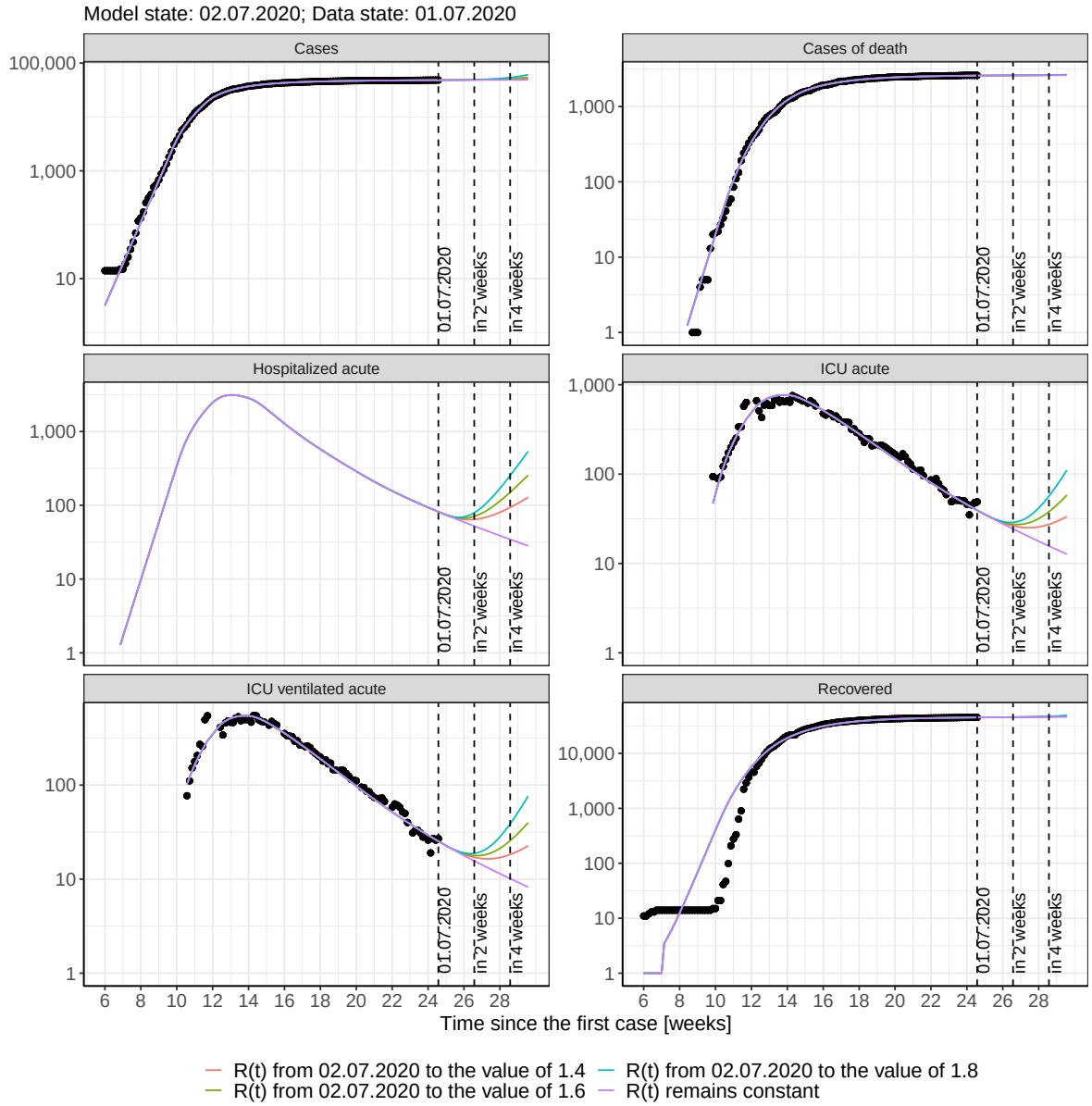


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

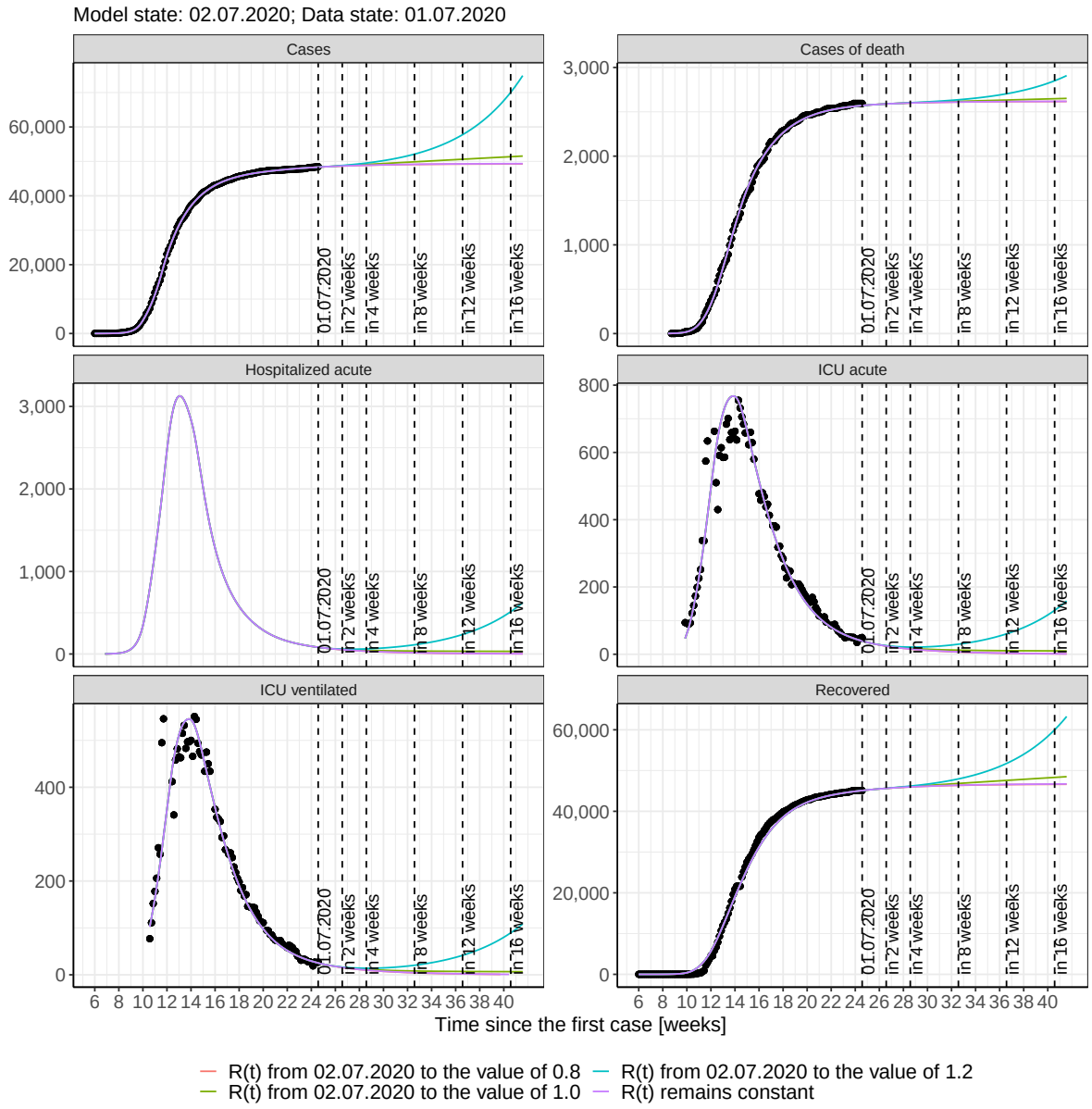


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

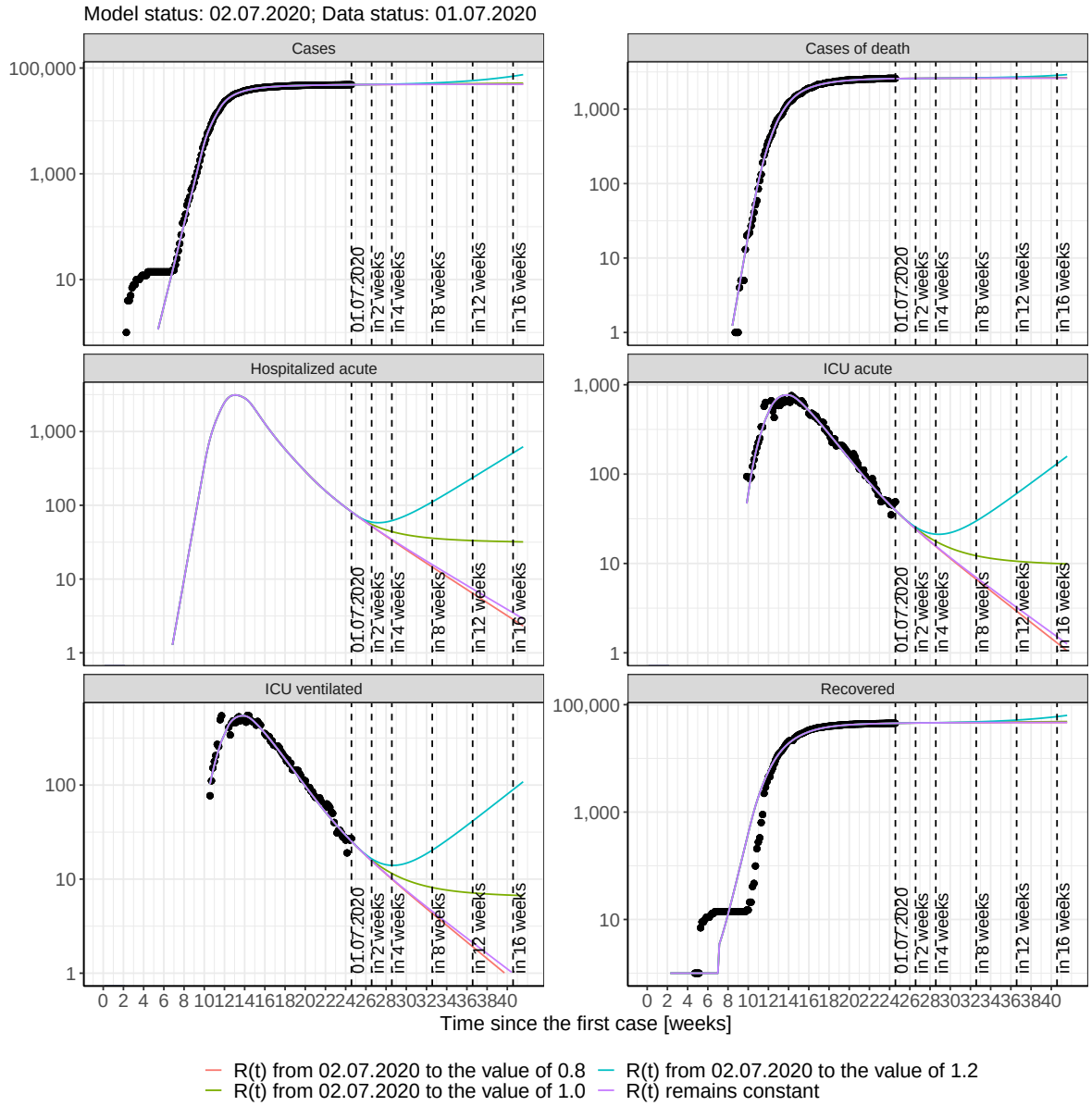


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 9) Model status from 02.07.2020; Data status: 01.07.2020.

Table 6: Bavaria - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	48363	2572	45145	79	38	24
03.07.2020	48389	2574	45189	77	37	24
04.07.2020	48416	2575	45232	74	35	23
05.07.2020	48441	2577	45273	72	34	22
06.07.2020	48466	2578	45313	69	33	21
07.07.2020	48490	2580	45352	67	32	20
08.07.2020	48513	2581	45390	65	31	20
09.07.2020	48536	2582	45427	63	30	19
10.07.2020	48559	2583	45463	61	29	18
11.07.2020	48580	2584	45498	59	28	18
12.07.2020	48602	2586	45532	57	27	17
13.07.2020	48622	2587	45564	56	26	17
14.07.2020	48642	2588	45596	54	25	16
15.07.2020	48662	2589	45628	52	24	16
16.07.2020	48681	2590	45658	51	24	15
17.07.2020	48700	2590	45687	49	23	15
18.07.2020	48718	2591	45716	48	22	14
19.07.2020	48735	2592	45744	46	21	14
20.07.2020	48753	2593	45771	45	21	13
21.07.2020	48769	2594	45797	44	20	13
22.07.2020	48786	2595	45823	42	19	13
23.07.2020	48801	2595	45848	41	19	12
24.07.2020	48817	2596	45872	40	18	12
25.07.2020	48832	2597	45896	39	18	11
26.07.2020	48847	2597	45919	38	17	11
27.07.2020	48861	2598	45942	37	17	11
28.07.2020	48875	2599	45964	35	16	10
29.07.2020	48889	2599	45985	34	16	10

Table 7: Bavaria - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	48363	2572	45145	79	38	24
03.07.2020	48389	2574	45189	77	37	24
04.07.2020	48415	2575	45232	74	35	23
05.07.2020	48440	2577	45273	72	34	22
06.07.2020	48465	2578	45313	69	33	21
07.07.2020	48489	2580	45352	67	32	20
08.07.2020	48512	2581	45390	65	31	20
09.07.2020	48534	2582	45427	63	30	19
10.07.2020	48556	2583	45463	61	29	18
11.07.2020	48577	2584	45497	59	28	18
12.07.2020	48598	2586	45531	57	27	17
13.07.2020	48618	2587	45564	55	26	17
14.07.2020	48637	2588	45596	54	25	16
15.07.2020	48656	2589	45627	52	24	16
16.07.2020	48674	2590	45657	50	24	15
17.07.2020	48692	2590	45686	49	23	15
18.07.2020	48709	2591	45714	47	22	14
19.07.2020	48726	2592	45742	46	21	14
20.07.2020	48742	2593	45769	44	21	13
21.07.2020	48758	2594	45795	43	20	13
22.07.2020	48774	2594	45820	42	19	12
23.07.2020	48789	2595	45844	41	19	12
24.07.2020	48803	2596	45868	39	18	12
25.07.2020	48817	2597	45891	38	18	11
26.07.2020	48831	2597	45914	37	17	11
27.07.2020	48844	2598	45936	36	17	11
28.07.2020	48857	2598	45957	35	16	10
29.07.2020	48870	2599	45978	34	16	10

Table 8: Bavaria - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	48363	2572	45145	79	38	24
03.07.2020	48391	2574	45189	77	37	24
04.07.2020	48419	2575	45232	74	35	23
05.07.2020	48447	2577	45273	72	34	22
06.07.2020	48474	2578	45313	70	33	21
07.07.2020	48502	2580	45353	68	32	20
08.07.2020	48530	2581	45391	66	31	20
09.07.2020	48558	2582	45429	64	30	19
10.07.2020	48585	2583	45465	62	29	19
11.07.2020	48613	2584	45501	61	28	18
12.07.2020	48641	2586	45536	59	27	17
13.07.2020	48669	2587	45570	58	26	17
14.07.2020	48696	2588	45604	56	26	16
15.07.2020	48724	2589	45637	55	25	16
16.07.2020	48752	2590	45670	54	24	16
17.07.2020	48779	2591	45702	53	23	15
18.07.2020	48807	2592	45734	52	23	15
19.07.2020	48835	2592	45765	51	22	14
20.07.2020	48862	2593	45796	50	22	14
21.07.2020	48890	2594	45827	49	21	14
22.07.2020	48917	2595	45857	48	21	13
23.07.2020	48945	2596	45887	48	20	13
24.07.2020	48973	2597	45917	47	20	13
25.07.2020	49000	2597	45947	46	19	12
26.07.2020	49028	2598	45976	46	19	12
27.07.2020	49055	2599	46005	45	18	12
28.07.2020	49083	2600	46034	45	18	12
29.07.2020	49110	2600	46063	44	18	12

Table 9: Bavaria - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	48363	2572	45145	79	38	24
03.07.2020	48392	2574	45189	77	37	24
04.07.2020	48422	2575	45232	74	35	23
05.07.2020	48453	2577	45273	72	34	22
06.07.2020	48485	2578	45314	70	33	21
07.07.2020	48517	2580	45353	68	32	21
08.07.2020	48551	2581	45392	66	31	20
09.07.2020	48585	2582	45430	65	30	19
10.07.2020	48620	2583	45468	63	29	19
11.07.2020	48657	2584	45505	62	28	18
12.07.2020	48694	2586	45541	61	28	18
13.07.2020	48733	2587	45578	60	27	17
14.07.2020	48772	2588	45614	60	26	17
15.07.2020	48813	2589	45650	59	26	16
16.07.2020	48855	2590	45686	59	25	16
17.07.2020	48898	2591	45722	58	24	16
18.07.2020	48942	2592	45758	58	24	16
19.07.2020	48987	2593	45795	58	24	15
20.07.2020	49034	2594	45832	58	23	15
21.07.2020	49082	2595	45869	58	23	15
22.07.2020	49132	2596	45906	58	22	15
23.07.2020	49183	2597	45945	59	22	14
24.07.2020	49235	2598	45984	59	22	14
25.07.2020	49289	2598	46023	59	22	14
26.07.2020	49344	2599	46063	60	22	14
27.07.2020	49401	2600	46104	60	21	14
28.07.2020	49459	2601	46146	61	21	14
29.07.2020	49519	2602	46189	62	21	14

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

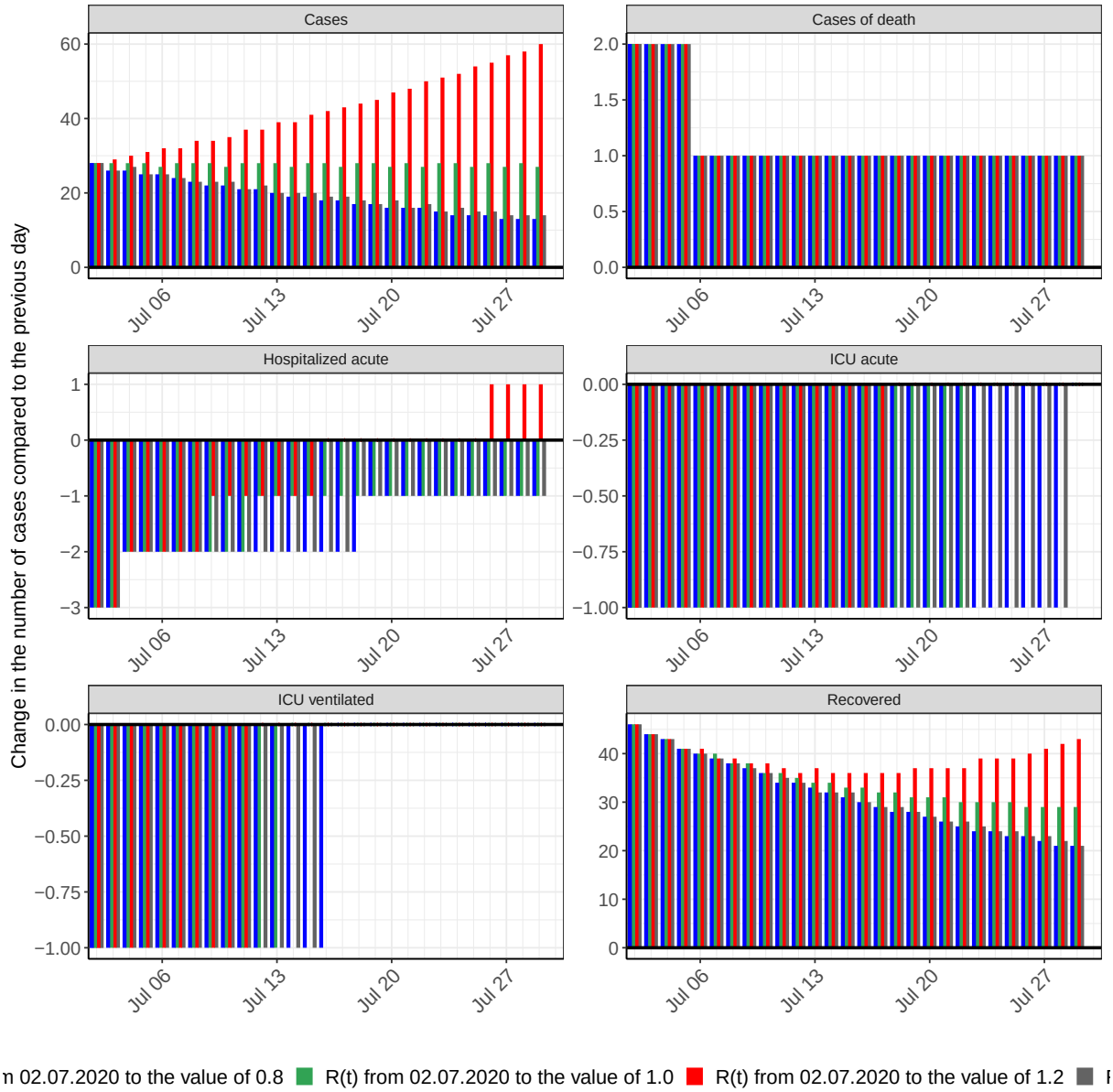


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

4 Berlin

4.1 Model description

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

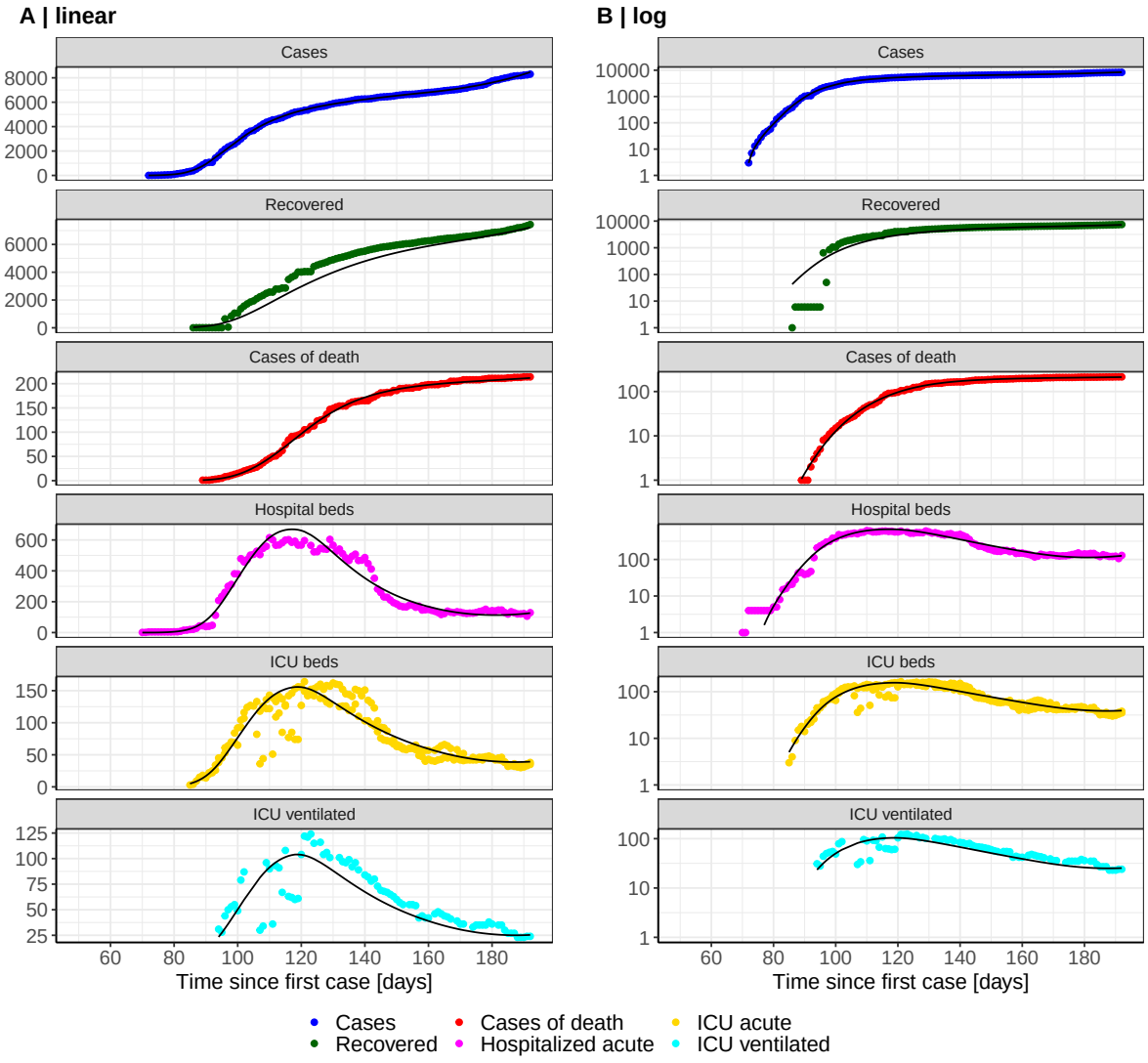


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

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

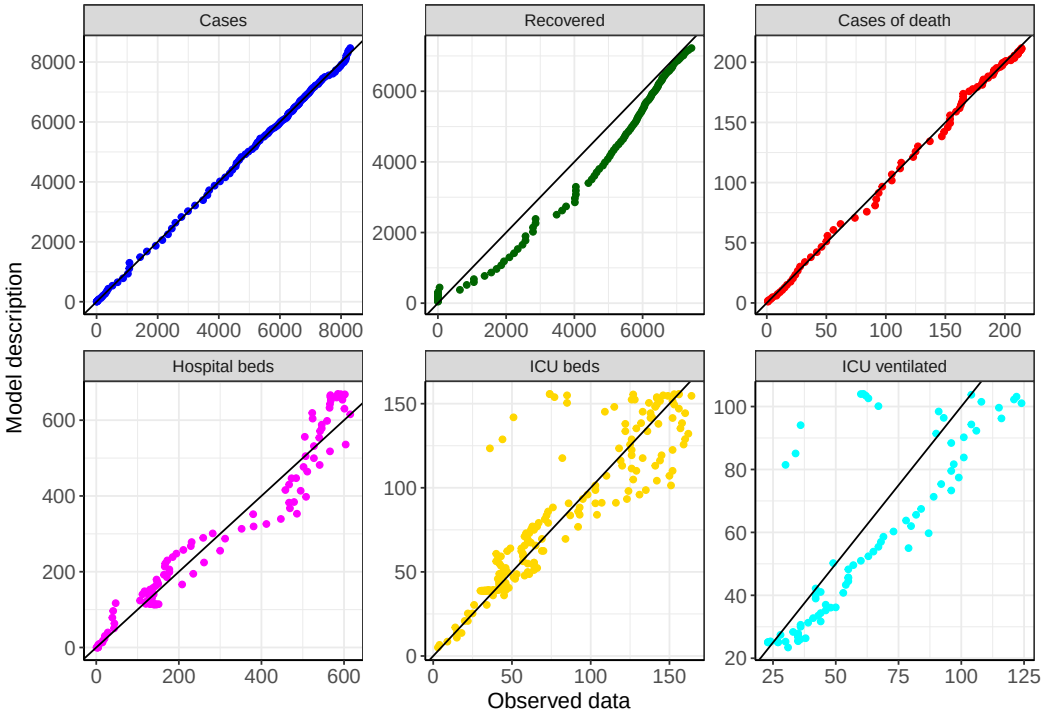


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

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

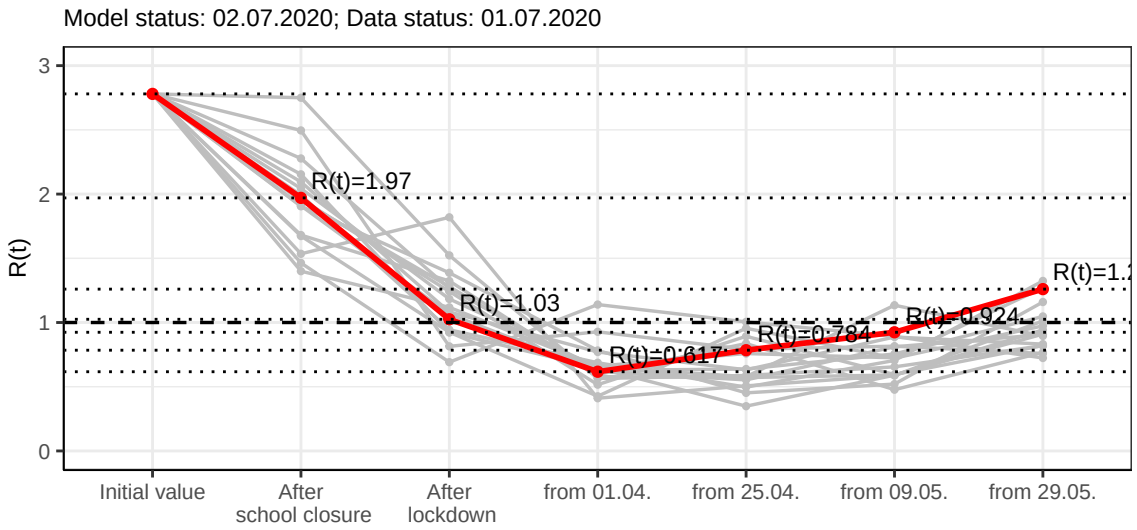


Figure 35: R(t) values before and after the NPIs for Berlin

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

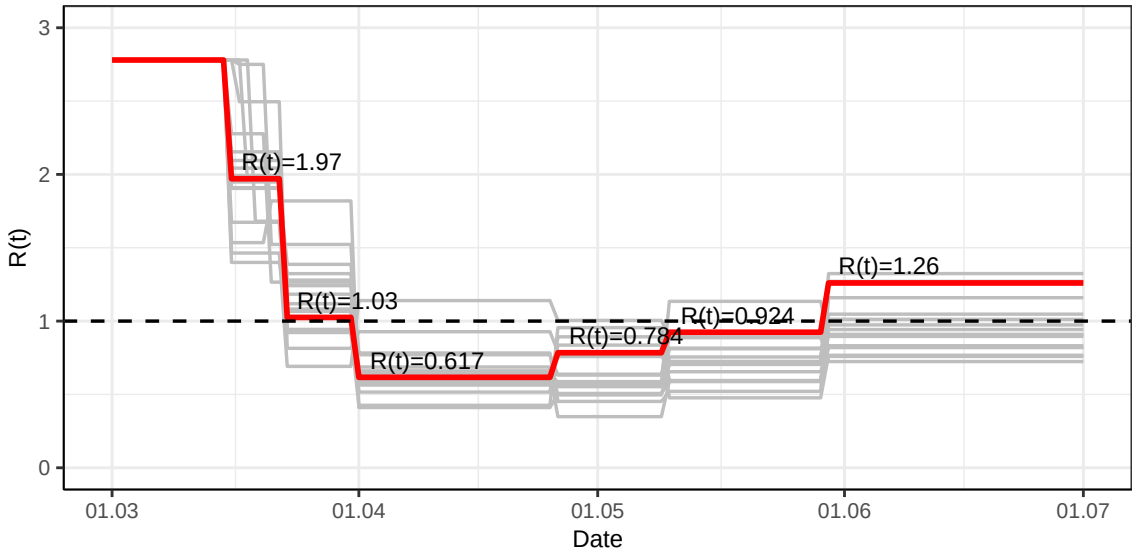


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.26)

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.

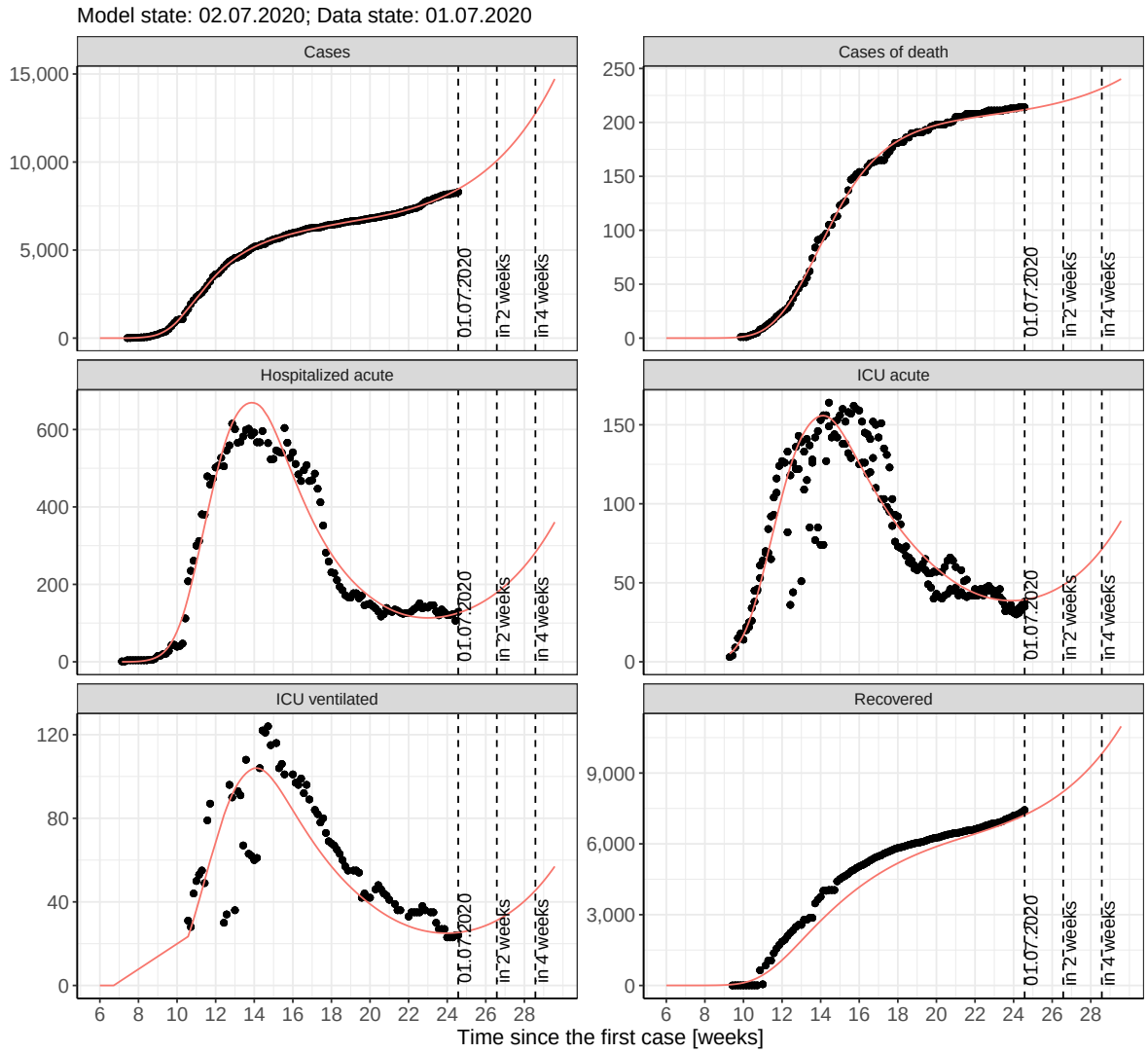


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

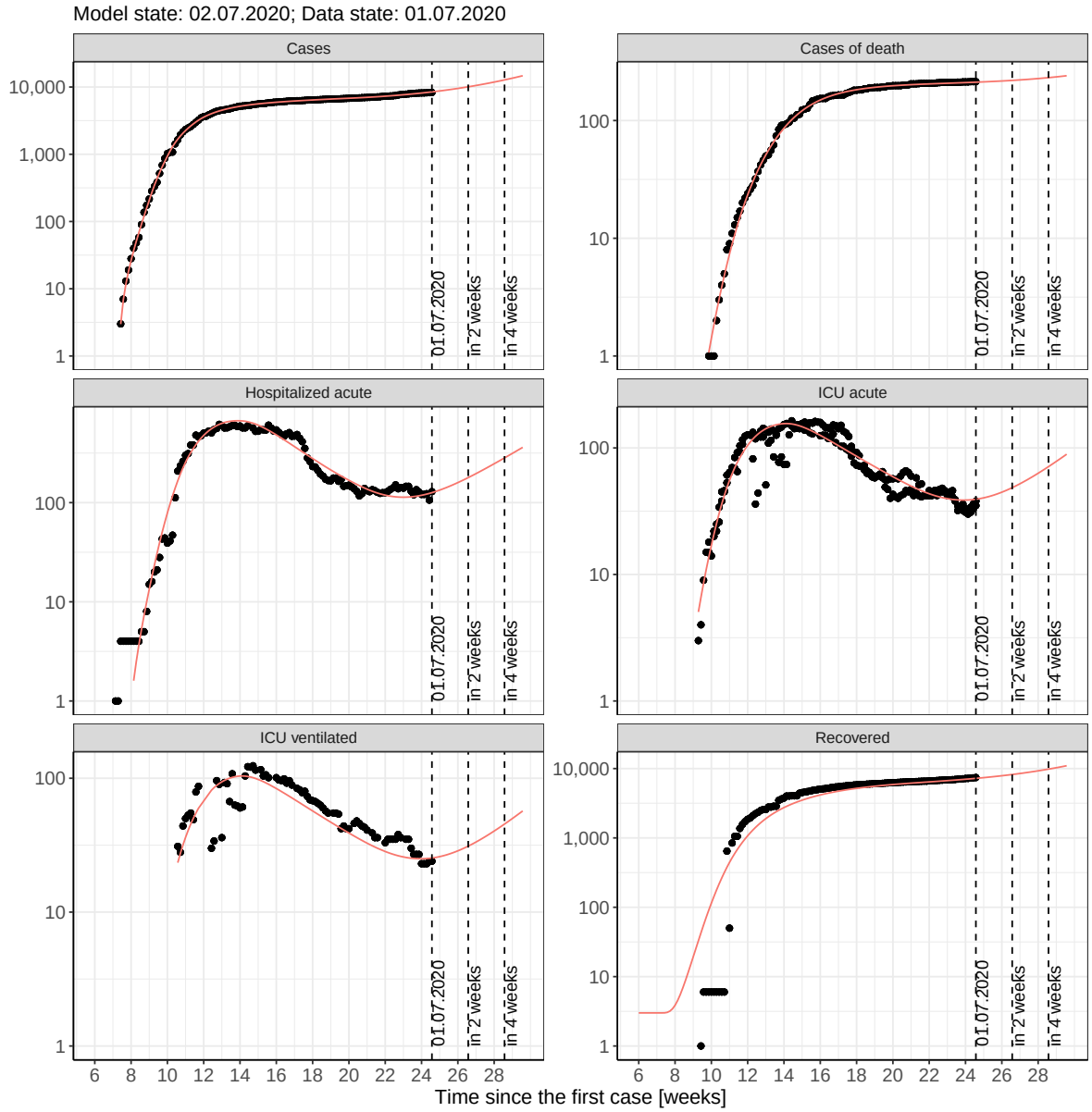


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

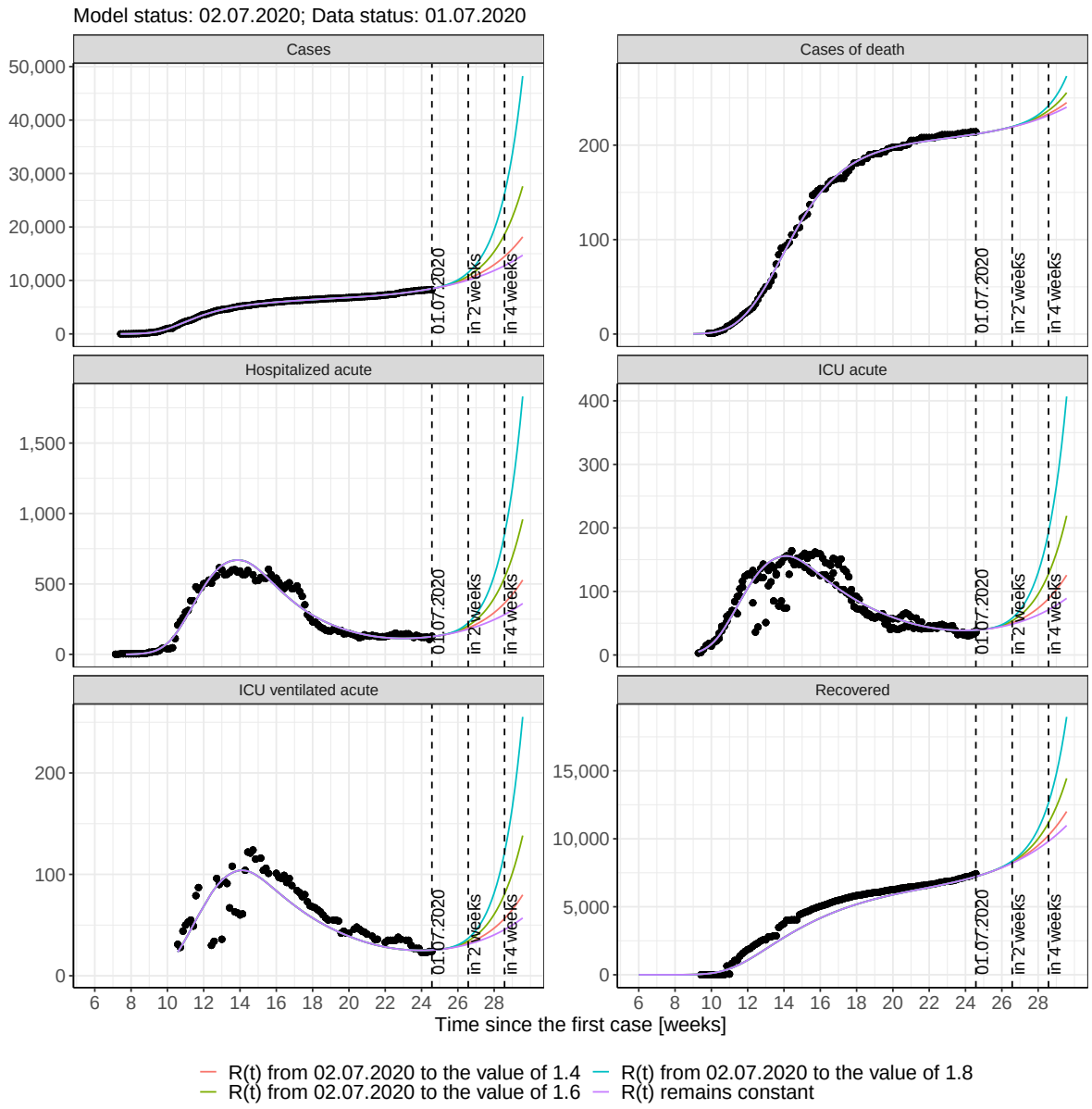


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

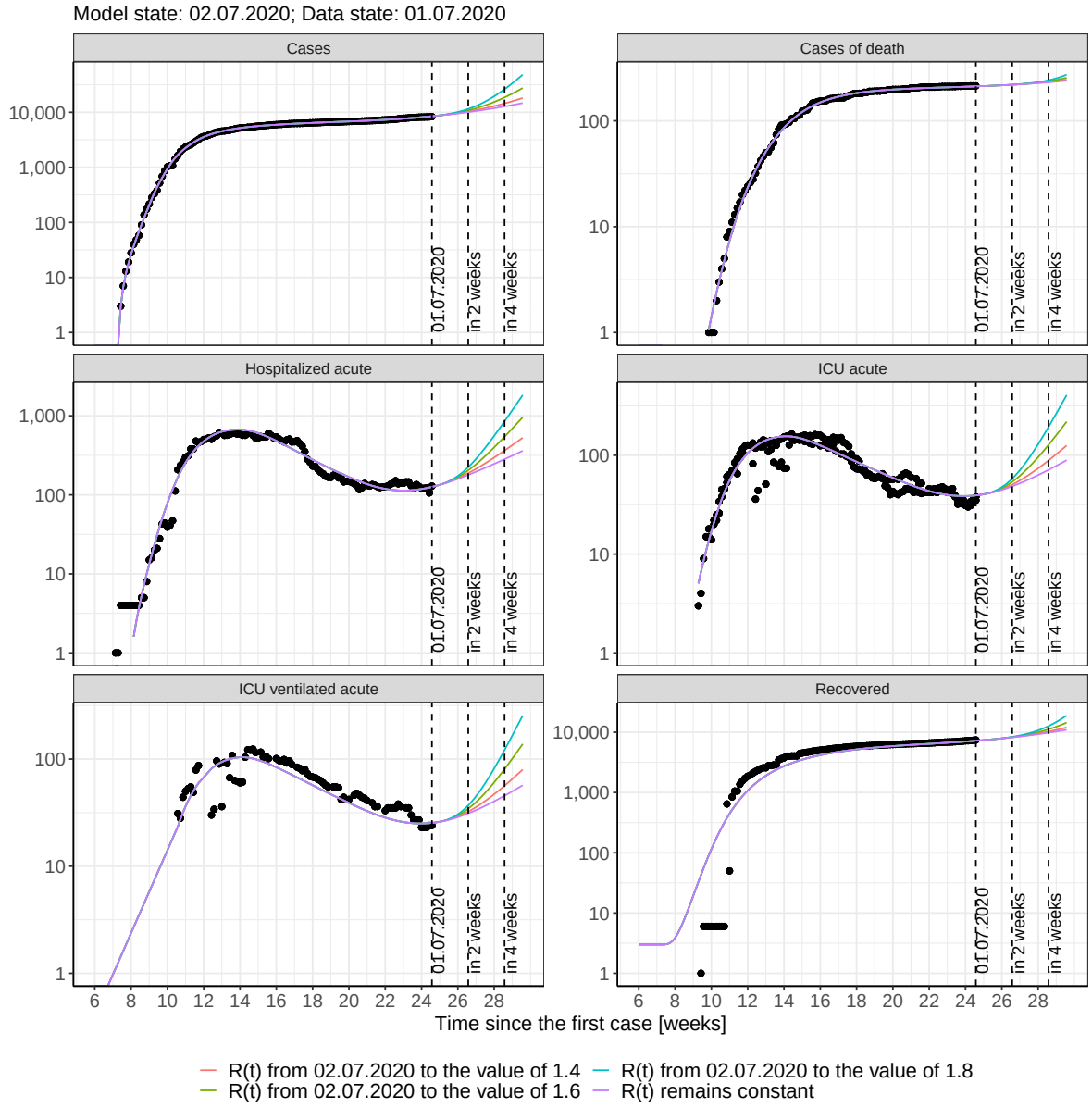


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

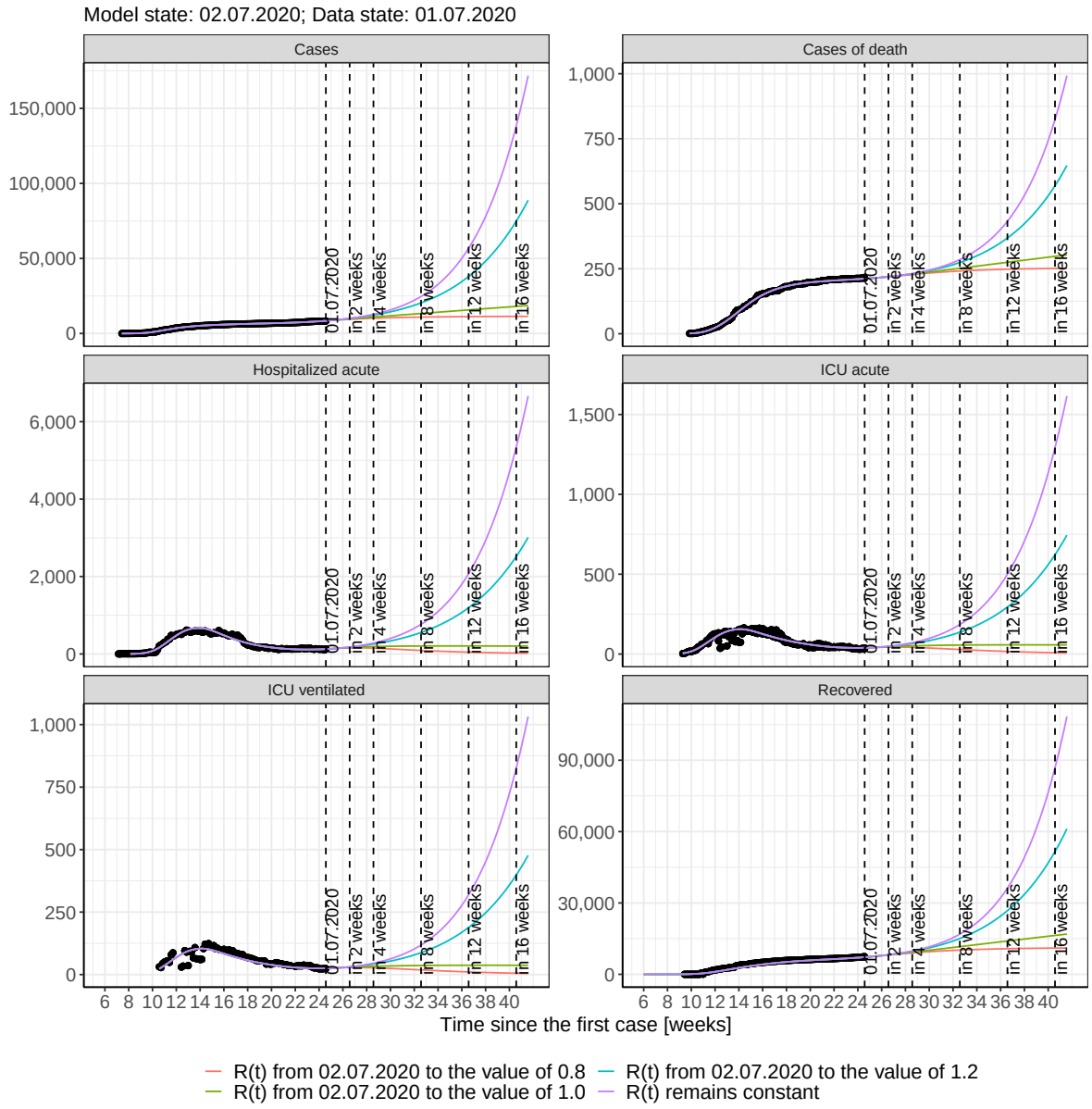


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

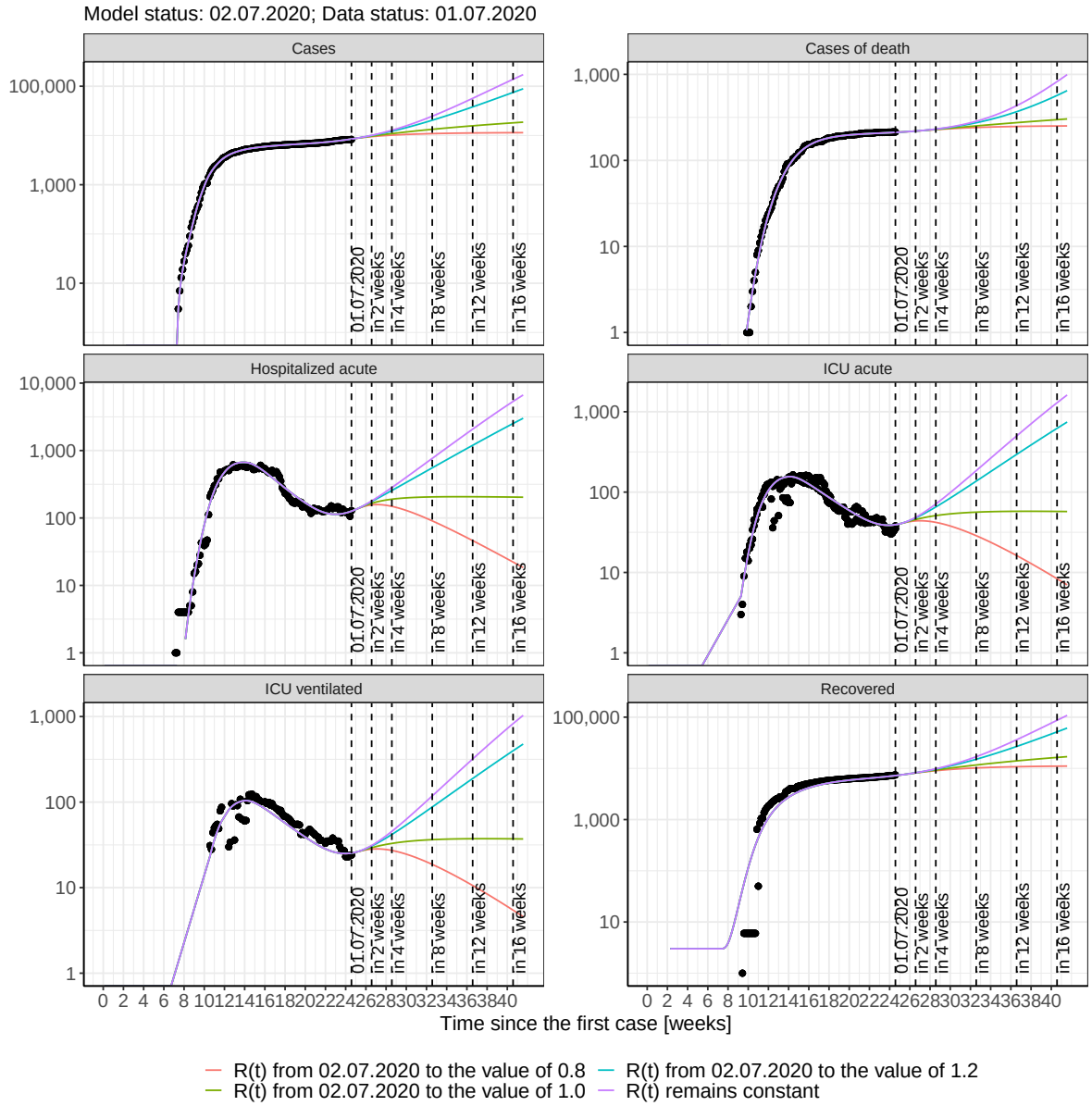


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 13) Model status from 02.07.2020; Data status: 01.07.2020.

Table 10: Berlin - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	8556	212	7279	128	40	26
03.07.2020	8649	213	7337	131	40	26
04.07.2020	8745	213	7397	134	40	26
05.07.2020	8845	214	7459	137	41	26
06.07.2020	8949	214	7523	140	41	27
07.07.2020	9056	215	7589	143	42	27
08.07.2020	9168	215	7658	147	42	27
09.07.2020	9284	216	7728	151	43	28
10.07.2020	9404	216	7802	155	44	28
11.07.2020	9529	217	7878	159	45	29
12.07.2020	9658	217	7956	164	46	29
13.07.2020	9792	218	8037	169	46	30
14.07.2020	9931	219	8121	174	47	30
15.07.2020	10076	219	8208	179	49	31
16.07.2020	10225	220	8298	184	50	32
17.07.2020	10380	221	8392	190	51	33
18.07.2020	10542	221	8488	196	52	33
19.07.2020	10709	222	8589	202	53	34
20.07.2020	10882	223	8693	209	55	35
21.07.2020	11062	224	8800	216	56	36
22.07.2020	11248	225	8912	223	58	37
23.07.2020	11441	225	9027	231	60	38
24.07.2020	11642	226	9147	238	61	39
25.07.2020	11850	227	9271	247	63	40
26.07.2020	12066	228	9400	255	65	42
27.07.2020	12289	229	9533	264	67	43
28.07.2020	12522	230	9672	273	69	44
29.07.2020	12762	231	9815	283	71	45

Table 11: Berlin - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	8553	212	7279	128	40	26
03.07.2020	8637	213	7337	131	40	26
04.07.2020	8719	213	7397	134	40	26
05.07.2020	8798	214	7458	136	41	26
06.07.2020	8876	214	7521	139	41	26
07.07.2020	8950	215	7585	142	41	27
08.07.2020	9023	215	7650	144	42	27
09.07.2020	9094	216	7716	147	42	27
10.07.2020	9163	216	7784	149	43	27
11.07.2020	9230	217	7851	151	43	28
12.07.2020	9295	217	7919	153	43	28
13.07.2020	9358	218	7987	154	43	28
14.07.2020	9419	219	8055	155	44	28
15.07.2020	9479	219	8123	156	44	28
16.07.2020	9537	220	8191	157	44	28
17.07.2020	9593	220	8259	158	44	28
18.07.2020	9648	221	8326	158	44	28
19.07.2020	9700	222	8392	158	44	28
20.07.2020	9752	222	8458	158	44	28
21.07.2020	9802	223	8523	157	44	28
22.07.2020	9851	223	8587	157	44	28
23.07.2020	9898	224	8650	156	44	28
24.07.2020	9944	225	8713	155	43	28
25.07.2020	9989	225	8774	154	43	28
26.07.2020	10032	226	8835	153	43	28
27.07.2020	10074	227	8894	152	43	28
28.07.2020	10115	227	8953	150	42	27
29.07.2020	10155	228	9010	149	42	27

Table 12: Berlin - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	8554	212	7279	128	40	26
03.07.2020	8642	213	7337	131	40	26
04.07.2020	8730	213	7397	134	40	26
05.07.2020	8818	214	7458	137	41	26
06.07.2020	8905	214	7522	139	41	26
07.07.2020	8993	215	7587	142	42	27
08.07.2020	9081	215	7653	145	42	27
09.07.2020	9168	216	7721	148	43	27
10.07.2020	9256	216	7791	151	43	28
11.07.2020	9344	217	7862	154	44	28
12.07.2020	9431	217	7934	157	44	28
13.07.2020	9519	218	8007	160	45	29
14.07.2020	9606	219	8081	162	45	29
15.07.2020	9694	219	8156	165	46	29
16.07.2020	9782	220	8232	167	46	30
17.07.2020	9869	220	8309	170	47	30
18.07.2020	9956	221	8386	172	47	30
19.07.2020	10044	222	8464	174	47	30
20.07.2020	10131	222	8543	176	48	31
21.07.2020	10218	223	8623	178	48	31
22.07.2020	10305	224	8703	180	49	31
23.07.2020	10393	225	8783	181	49	32
24.07.2020	10480	225	8864	183	49	32
25.07.2020	10567	226	8945	185	50	32
26.07.2020	10654	227	9027	186	50	32
27.07.2020	10741	228	9109	187	50	32
28.07.2020	10828	228	9191	189	51	33
29.07.2020	10915	229	9274	190	51	33

Table 13: Berlin - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	8555	212	7279	128	40	26
03.07.2020	8647	213	7337	131	40	26
04.07.2020	8741	213	7397	134	40	26
05.07.2020	8838	214	7459	137	41	26
06.07.2020	8938	214	7523	140	41	27
07.07.2020	9041	215	7589	143	42	27
08.07.2020	9147	215	7657	147	42	27
09.07.2020	9255	216	7727	150	43	28
10.07.2020	9367	216	7799	154	44	28
11.07.2020	9482	217	7874	158	44	29
12.07.2020	9600	217	7950	162	45	29
13.07.2020	9722	218	8030	166	46	30
14.07.2020	9847	219	8111	171	47	30
15.07.2020	9975	219	8195	175	48	31
16.07.2020	10107	220	8282	180	49	31
17.07.2020	10243	221	8370	185	50	32
18.07.2020	10383	221	8462	190	51	33
19.07.2020	10527	222	8556	195	52	33
20.07.2020	10675	223	8654	200	53	34
21.07.2020	10827	224	8753	206	54	35
22.07.2020	10984	224	8856	211	55	35
23.07.2020	11144	225	8962	217	57	36
24.07.2020	11310	226	9071	223	58	37
25.07.2020	11480	227	9183	229	59	38
26.07.2020	11655	228	9298	236	61	39
27.07.2020	11835	229	9416	242	62	40
28.07.2020	12020	230	9538	249	64	41
29.07.2020	12210	231	9663	256	65	42

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

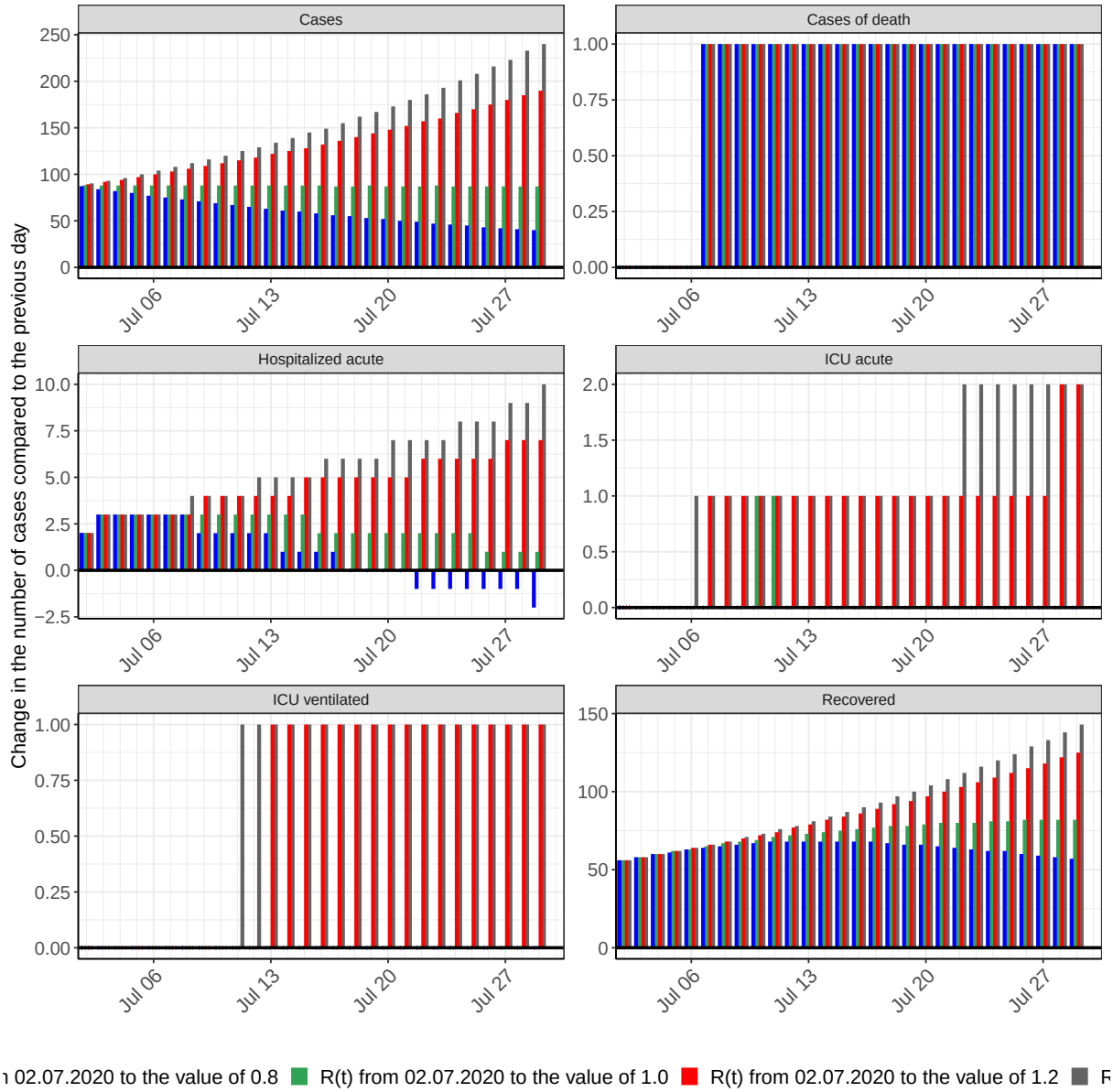


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

5 Brandenburg

5.1 Model description

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

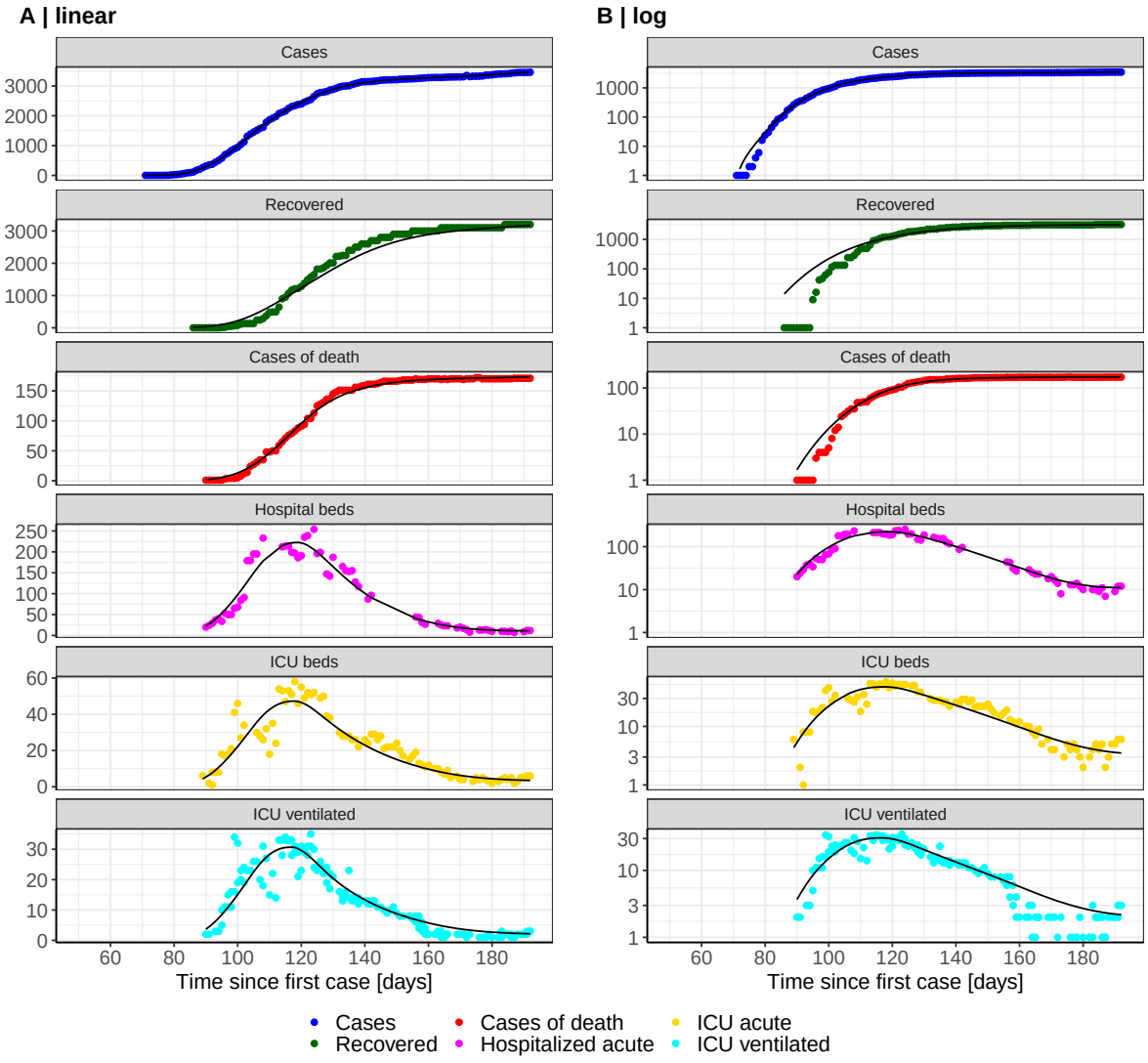


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

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

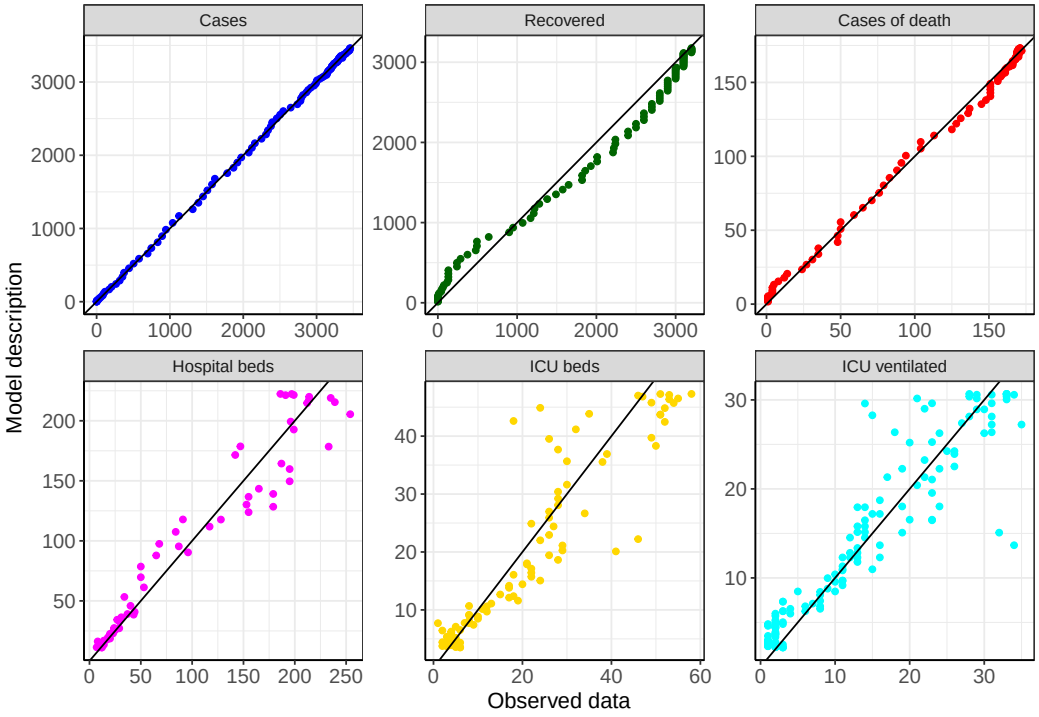


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

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

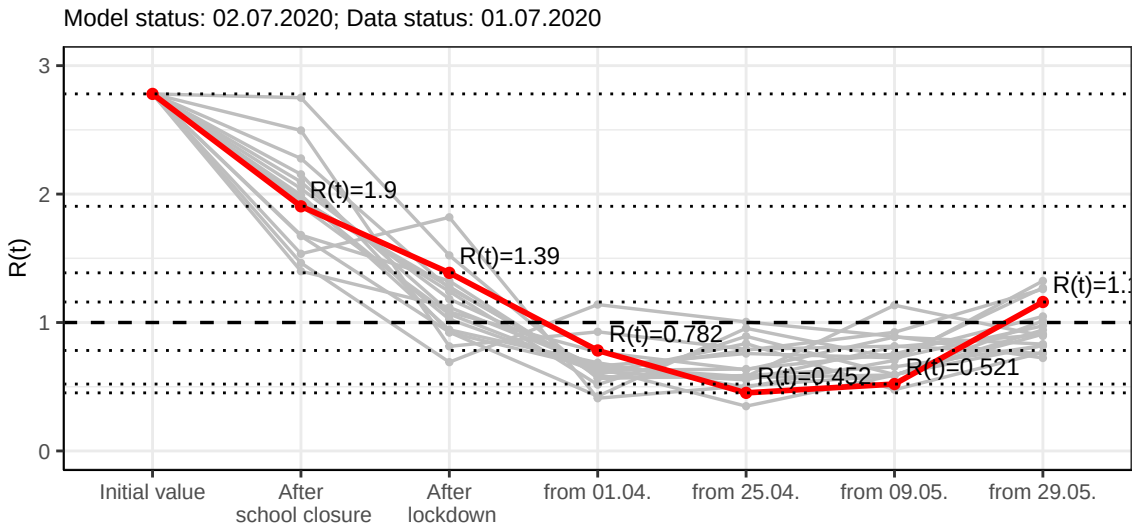


Figure 46: R(t) values before and after the NPIs for Brandenburg

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

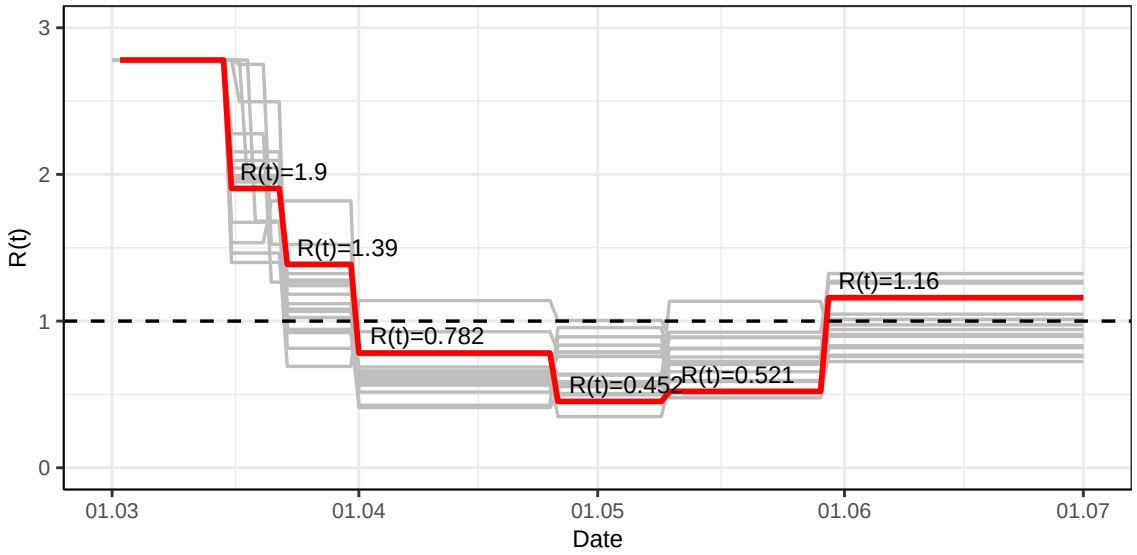


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

5.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.16)

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.

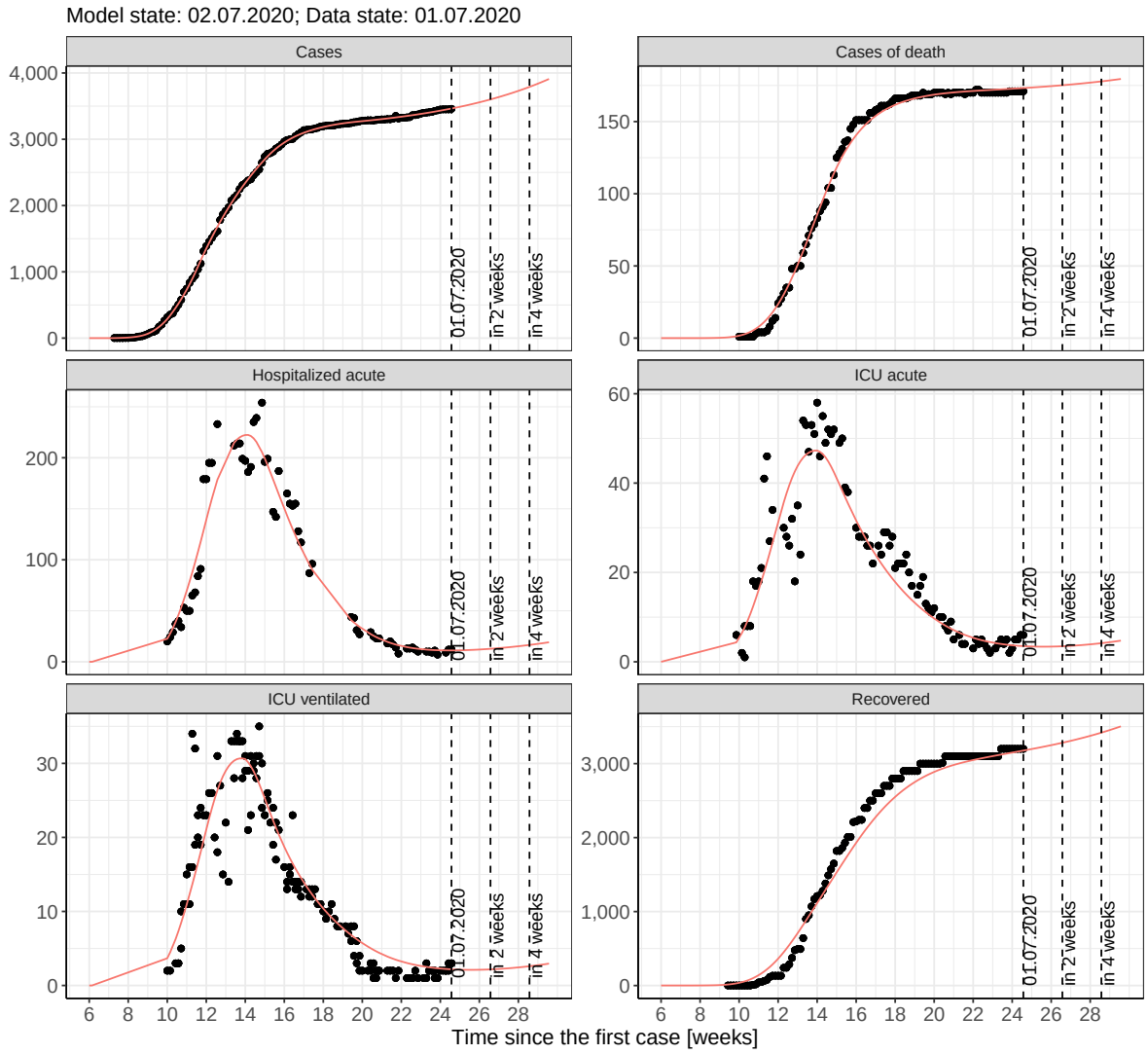


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

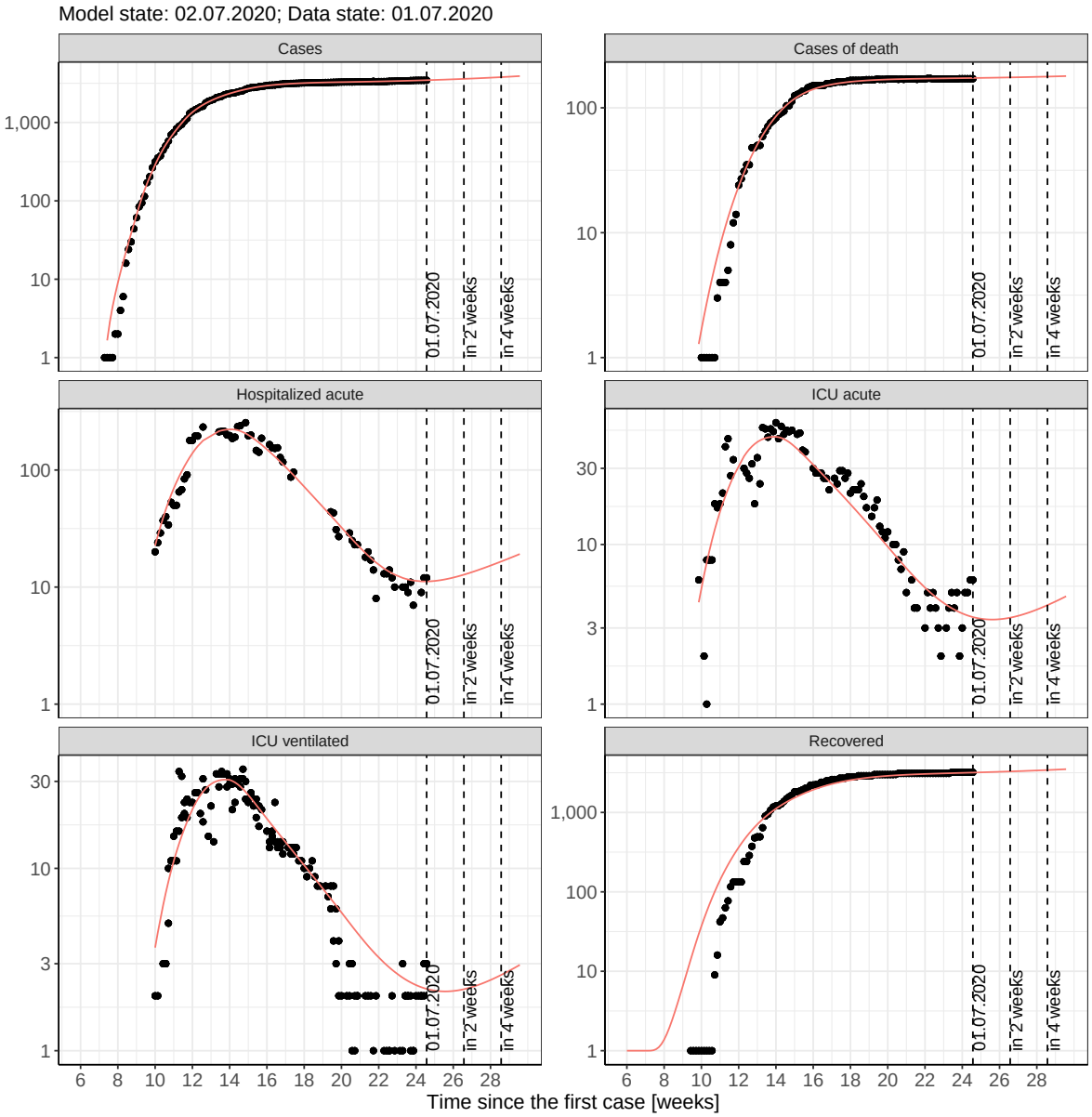


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

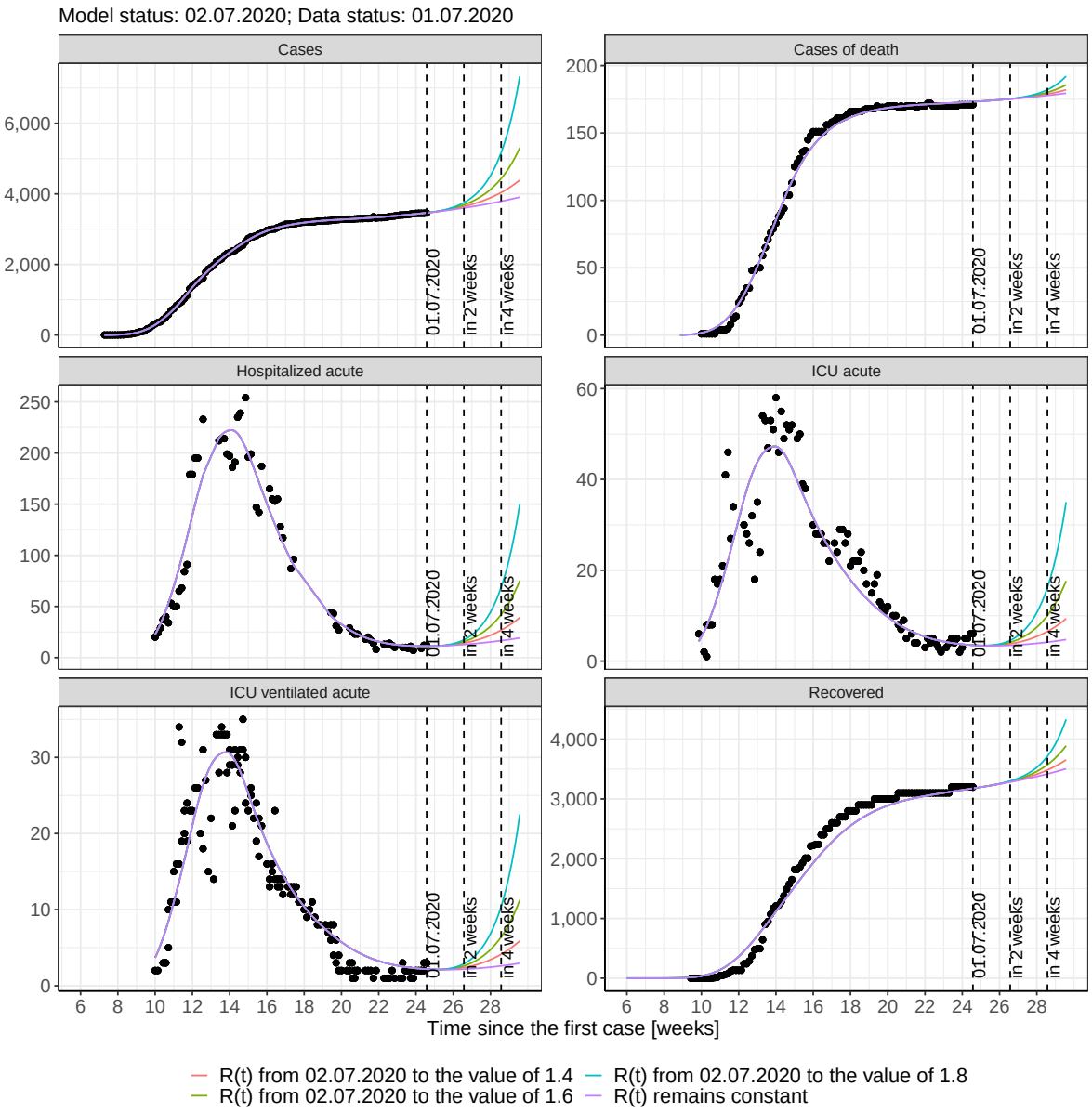


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

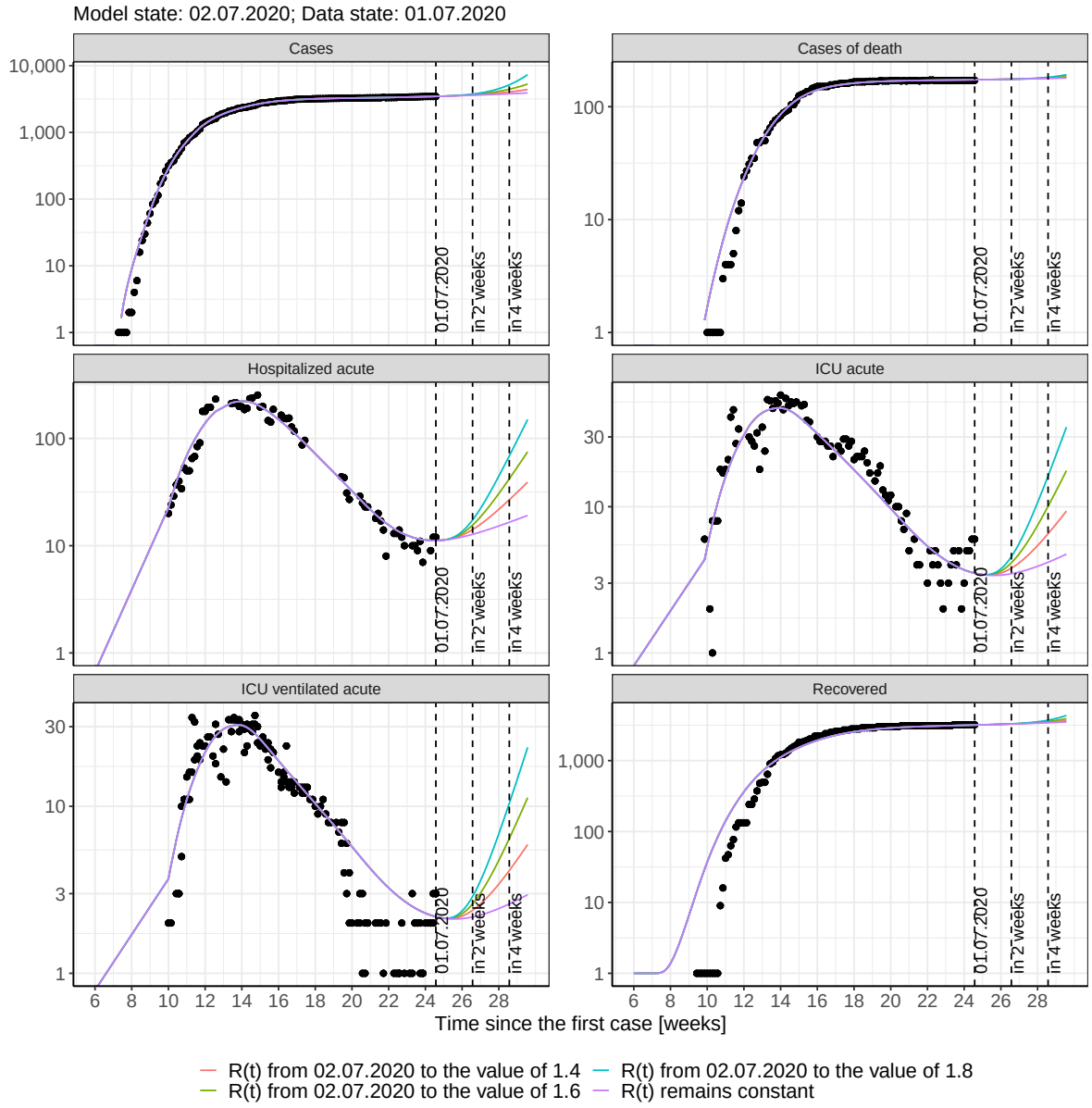


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

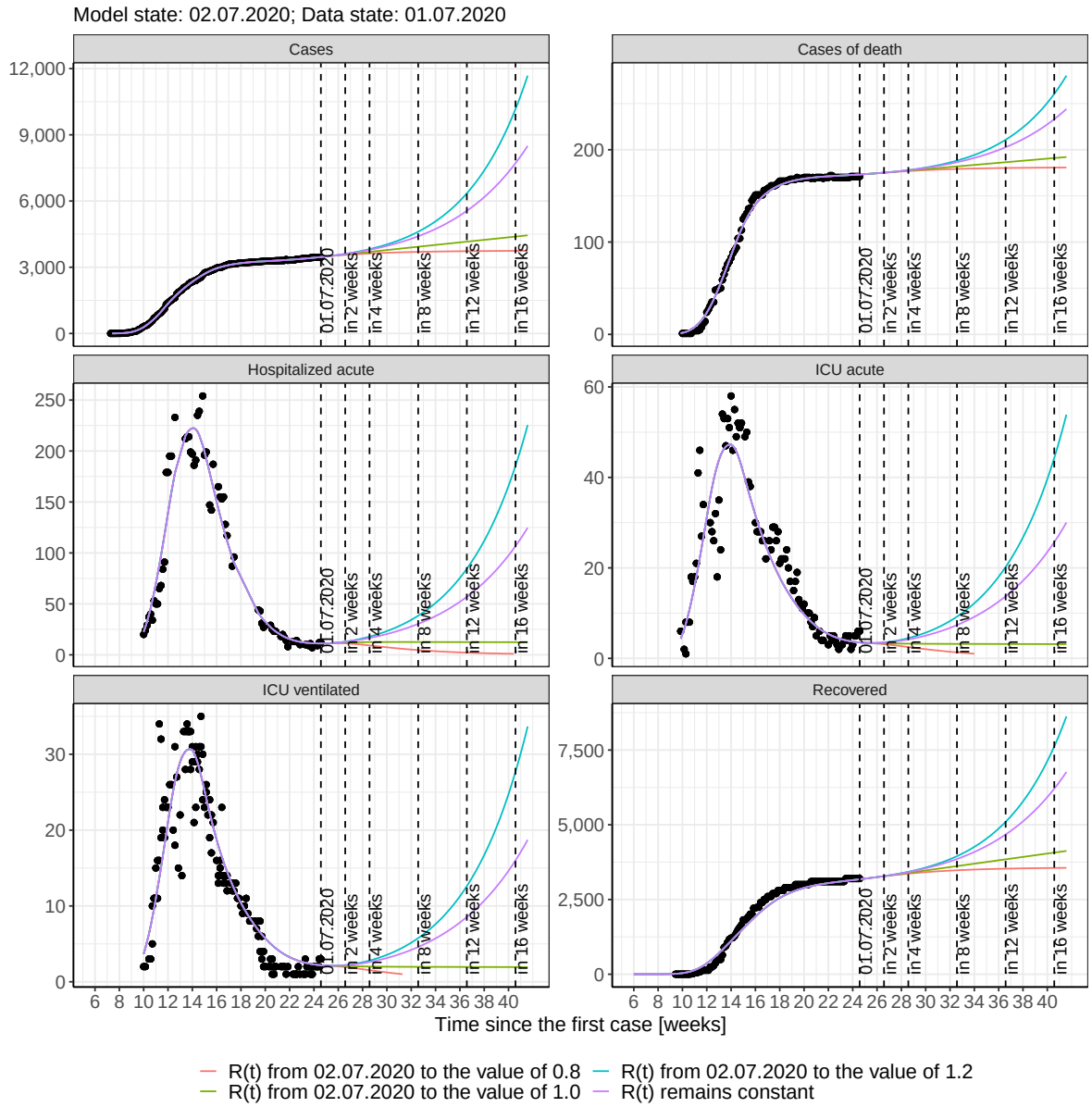


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

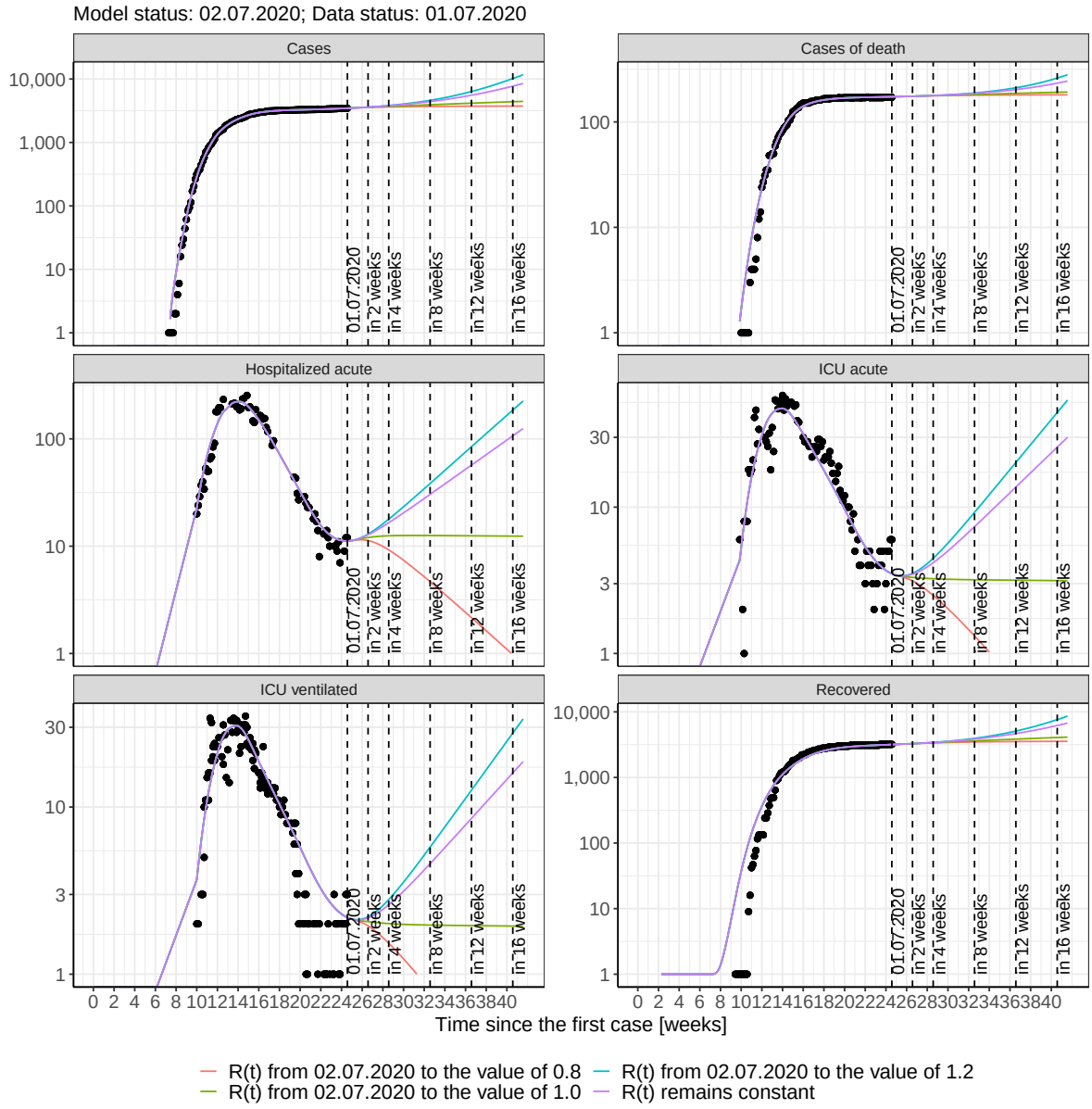


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 17) Model status from 02.07.2020; Data status: 01.07.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3472	173	3184	11	3	2
03.07.2020	3481	173	3191	11	3	2
04.07.2020	3490	174	3198	11	3	2
05.07.2020	3499	174	3205	11	3	2
06.07.2020	3508	174	3212	11	3	2
07.07.2020	3517	174	3219	12	3	2
08.07.2020	3527	174	3227	12	3	2
09.07.2020	3537	174	3234	12	3	2
10.07.2020	3547	174	3242	12	3	2
11.07.2020	3557	175	3250	12	3	2
12.07.2020	3568	175	3258	12	3	2
13.07.2020	3579	175	3266	12	3	2
14.07.2020	3590	175	3274	13	3	2
15.07.2020	3601	175	3282	13	3	2
16.07.2020	3613	175	3291	13	4	2
17.07.2020	3625	176	3300	13	4	2
18.07.2020	3637	176	3308	13	4	2
19.07.2020	3649	176	3317	14	4	2
20.07.2020	3662	176	3327	14	4	2
21.07.2020	3675	176	3336	14	4	2
22.07.2020	3688	176	3346	14	4	2
23.07.2020	3702	177	3356	15	4	2
24.07.2020	3716	177	3366	15	4	2
25.07.2020	3730	177	3376	15	4	2
26.07.2020	3744	177	3386	16	4	2
27.07.2020	3759	177	3397	16	4	3
28.07.2020	3774	178	3408	16	4	3
29.07.2020	3790	178	3419	17	4	3

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3472	173	3184	11	3	2
03.07.2020	3480	173	3191	11	3	2
04.07.2020	3488	174	3198	11	3	2
05.07.2020	3495	174	3205	11	3	2
06.07.2020	3502	174	3212	11	3	2
07.07.2020	3510	174	3219	11	3	2
08.07.2020	3517	174	3226	11	3	2
09.07.2020	3523	174	3233	11	3	2
10.07.2020	3530	174	3241	11	3	2
11.07.2020	3536	175	3248	11	3	2
12.07.2020	3542	175	3255	11	3	2
13.07.2020	3548	175	3262	11	3	2
14.07.2020	3554	175	3269	11	3	2
15.07.2020	3560	175	3276	11	3	2
16.07.2020	3565	175	3283	11	3	2
17.07.2020	3571	175	3290	11	3	2
18.07.2020	3576	176	3297	11	3	2
19.07.2020	3581	176	3304	11	3	2
20.07.2020	3586	176	3310	11	3	2
21.07.2020	3591	176	3317	11	3	2
22.07.2020	3595	176	3323	10	3	2
23.07.2020	3600	176	3330	10	3	2
24.07.2020	3604	176	3336	10	3	2
25.07.2020	3608	176	3342	10	3	2
26.07.2020	3613	177	3348	10	3	2
27.07.2020	3617	177	3354	10	3	2
28.07.2020	3621	177	3359	9	3	2
29.07.2020	3624	177	3365	9	2	2

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3472	173	3184	11	3	2
03.07.2020	3480	173	3191	11	3	2
04.07.2020	3489	174	3198	11	3	2
05.07.2020	3497	174	3205	11	3	2
06.07.2020	3505	174	3212	11	3	2
07.07.2020	3514	174	3219	11	3	2
08.07.2020	3522	174	3226	12	3	2
09.07.2020	3530	174	3234	12	3	2
10.07.2020	3539	174	3241	12	3	2
11.07.2020	3547	175	3249	12	3	2
12.07.2020	3555	175	3256	12	3	2
13.07.2020	3564	175	3264	12	3	2
14.07.2020	3572	175	3272	12	3	2
15.07.2020	3580	175	3279	12	3	2
16.07.2020	3589	175	3287	12	3	2
17.07.2020	3597	175	3295	12	3	2
18.07.2020	3605	176	3303	12	3	2
19.07.2020	3614	176	3311	12	3	2
20.07.2020	3622	176	3318	12	3	2
21.07.2020	3630	176	3326	12	3	2
22.07.2020	3639	176	3334	12	3	2
23.07.2020	3647	176	3342	12	3	2
24.07.2020	3655	177	3350	12	3	2
25.07.2020	3664	177	3358	12	3	2
26.07.2020	3672	177	3366	12	3	2
27.07.2020	3680	177	3374	12	3	2
28.07.2020	3689	177	3382	12	3	2
29.07.2020	3697	177	3390	12	3	2

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3472	173	3184	11	3	2
03.07.2020	3481	173	3191	11	3	2
04.07.2020	3490	174	3198	11	3	2
05.07.2020	3499	174	3205	11	3	2
06.07.2020	3508	174	3212	11	3	2
07.07.2020	3518	174	3219	12	3	2
08.07.2020	3528	174	3227	12	3	2
09.07.2020	3539	174	3234	12	3	2
10.07.2020	3549	174	3242	12	3	2
11.07.2020	3560	175	3250	12	3	2
12.07.2020	3572	175	3258	12	3	2
13.07.2020	3583	175	3266	13	3	2
14.07.2020	3595	175	3275	13	3	2
15.07.2020	3607	175	3283	13	4	2
16.07.2020	3620	175	3292	13	4	2
17.07.2020	3633	176	3301	13	4	2
18.07.2020	3646	176	3310	14	4	2
19.07.2020	3660	176	3319	14	4	2
20.07.2020	3674	176	3329	14	4	2
21.07.2020	3688	176	3339	15	4	2
22.07.2020	3703	176	3349	15	4	2
23.07.2020	3719	177	3359	15	4	2
24.07.2020	3735	177	3370	16	4	3
25.07.2020	3751	177	3381	16	4	3
26.07.2020	3768	177	3392	17	4	3
27.07.2020	3785	178	3404	17	4	3
28.07.2020	3802	178	3416	17	4	3
29.07.2020	3821	178	3428	18	4	3

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

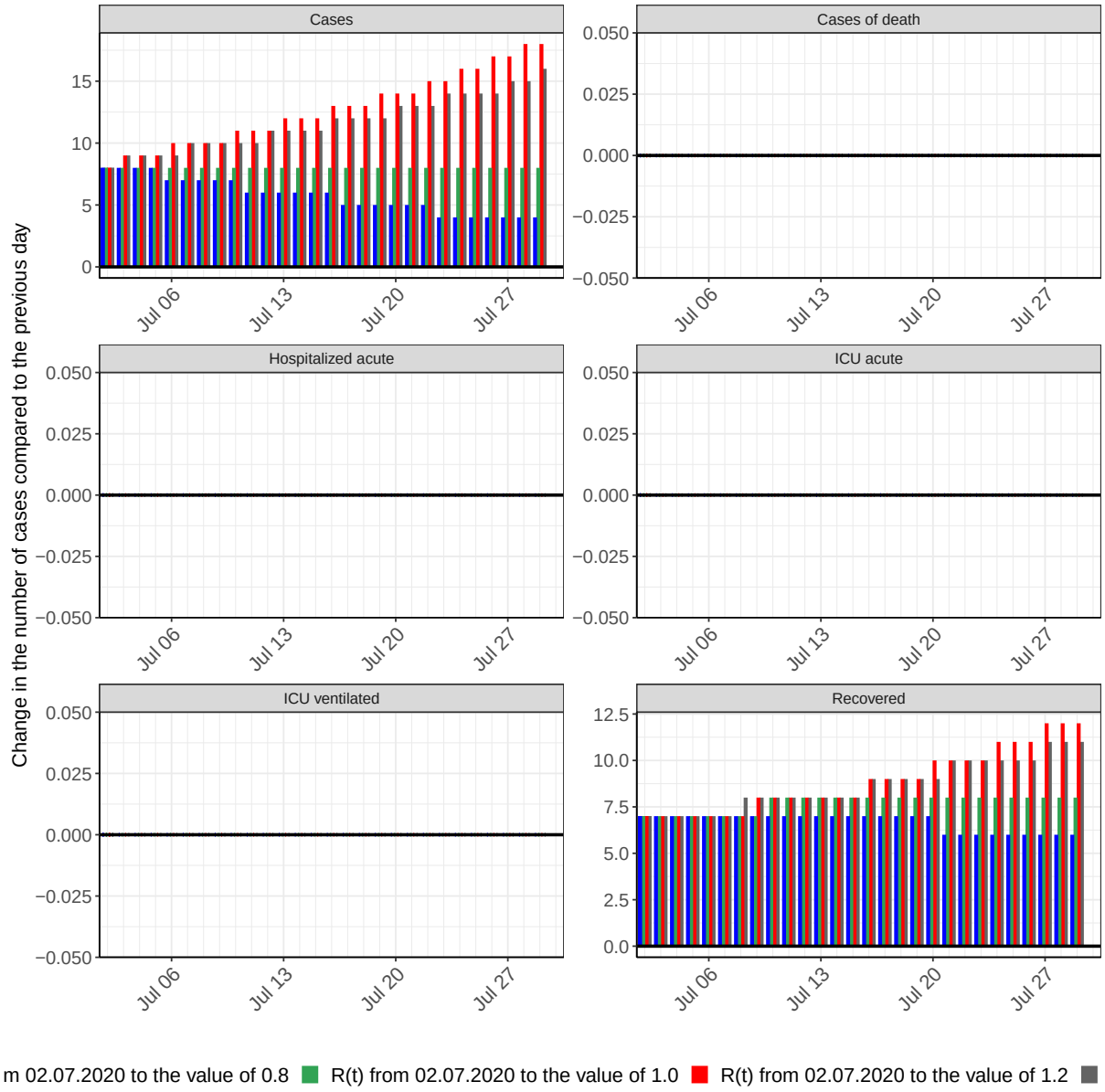


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

6 Bremen

6.1 Model description

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

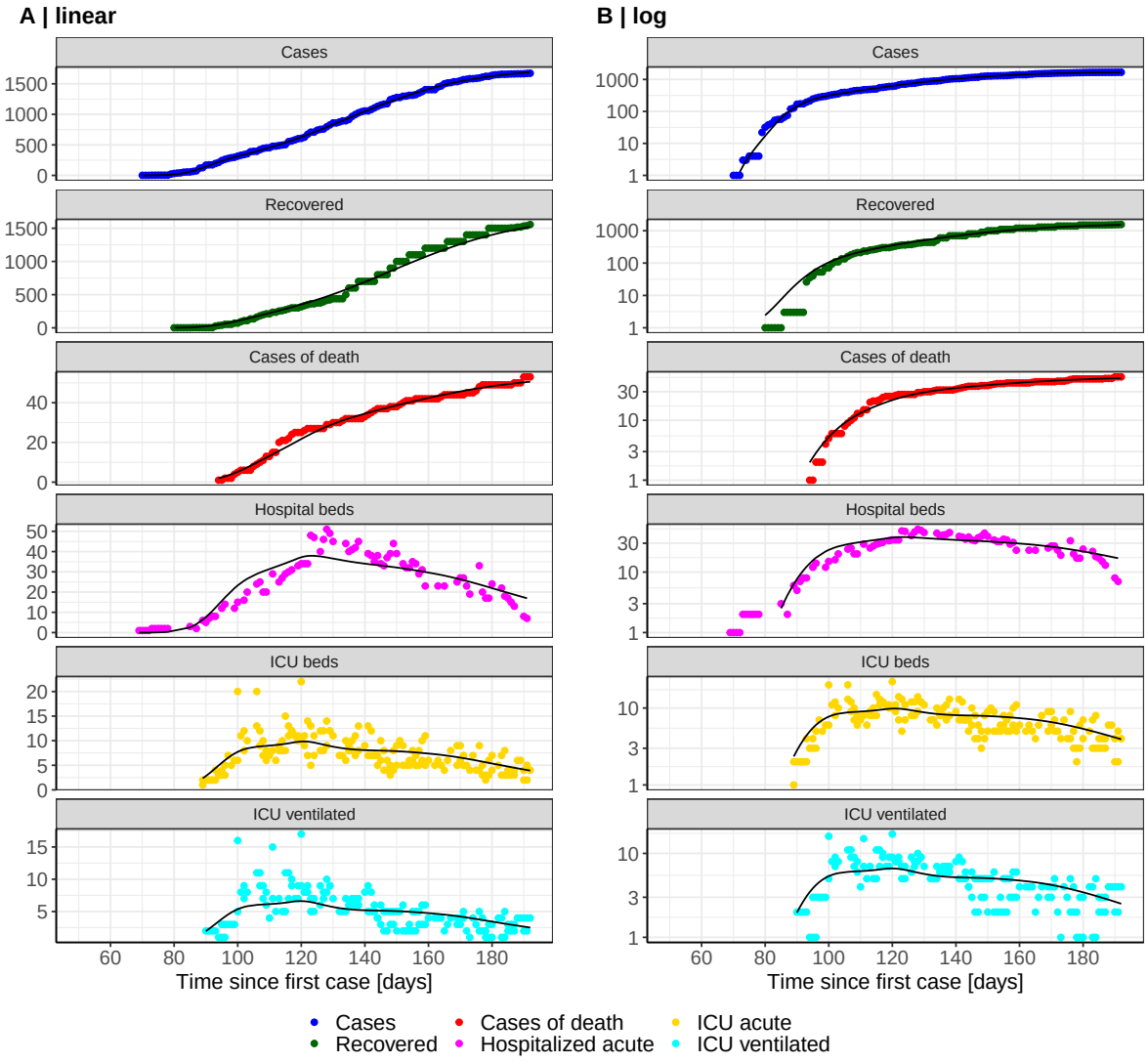


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

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

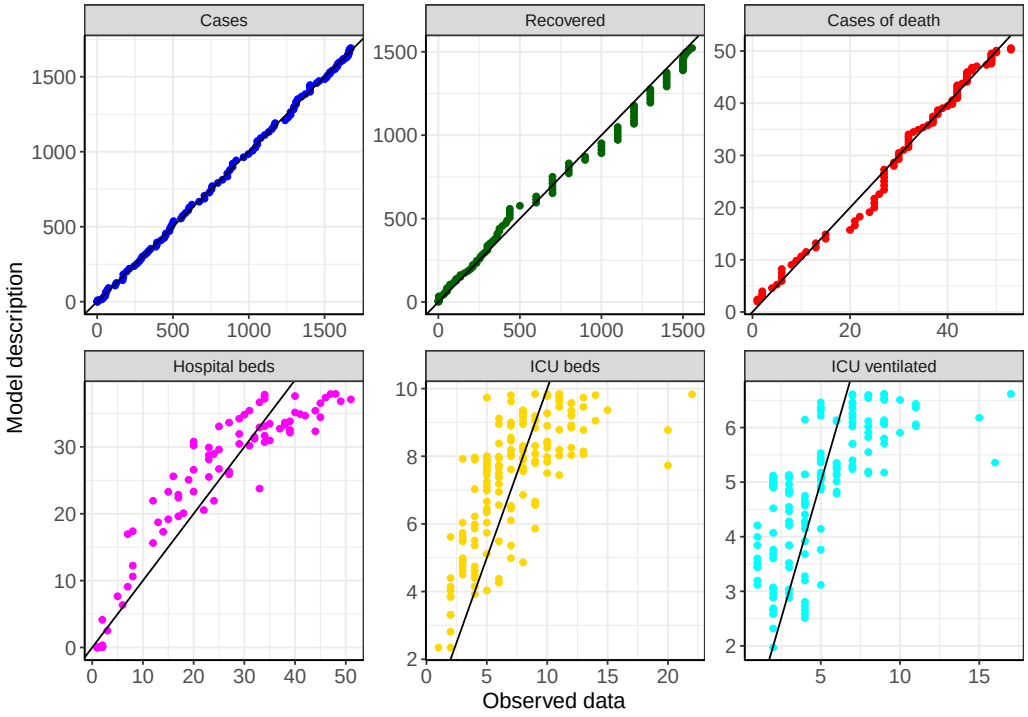


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

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

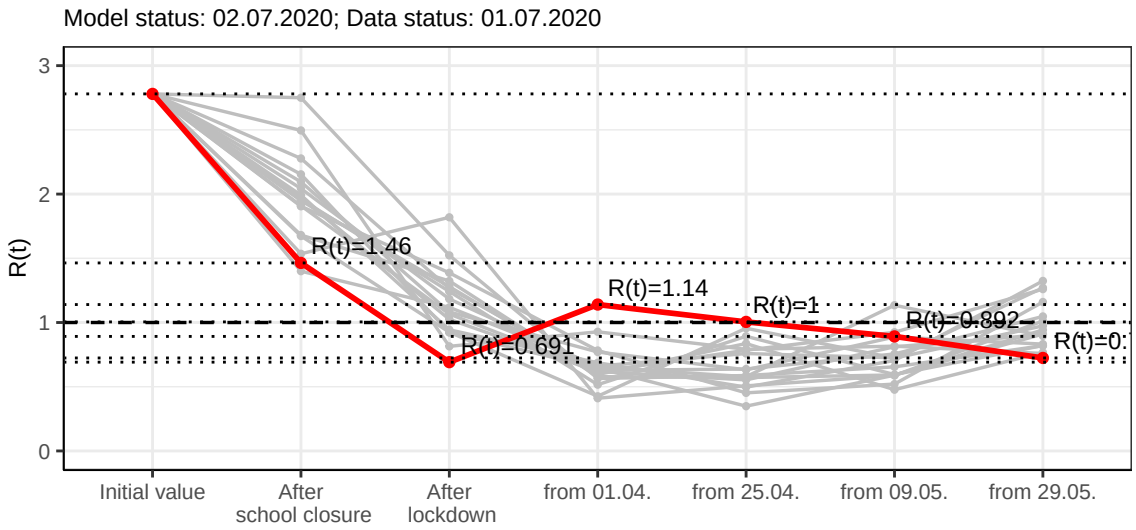


Figure 57: R(t) values before and after the NPIs for Bremen

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

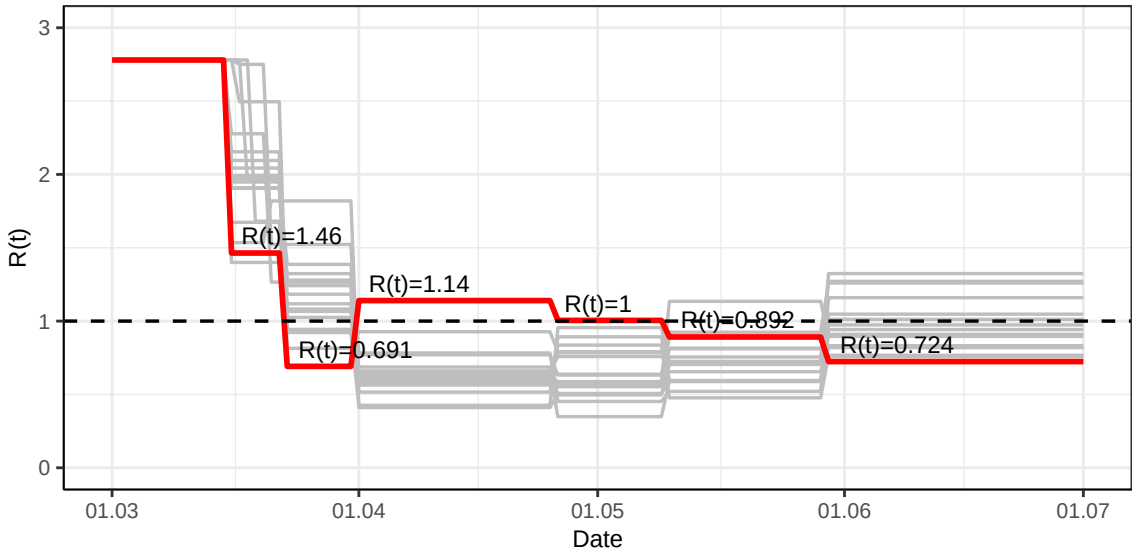


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

6.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.72)

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.

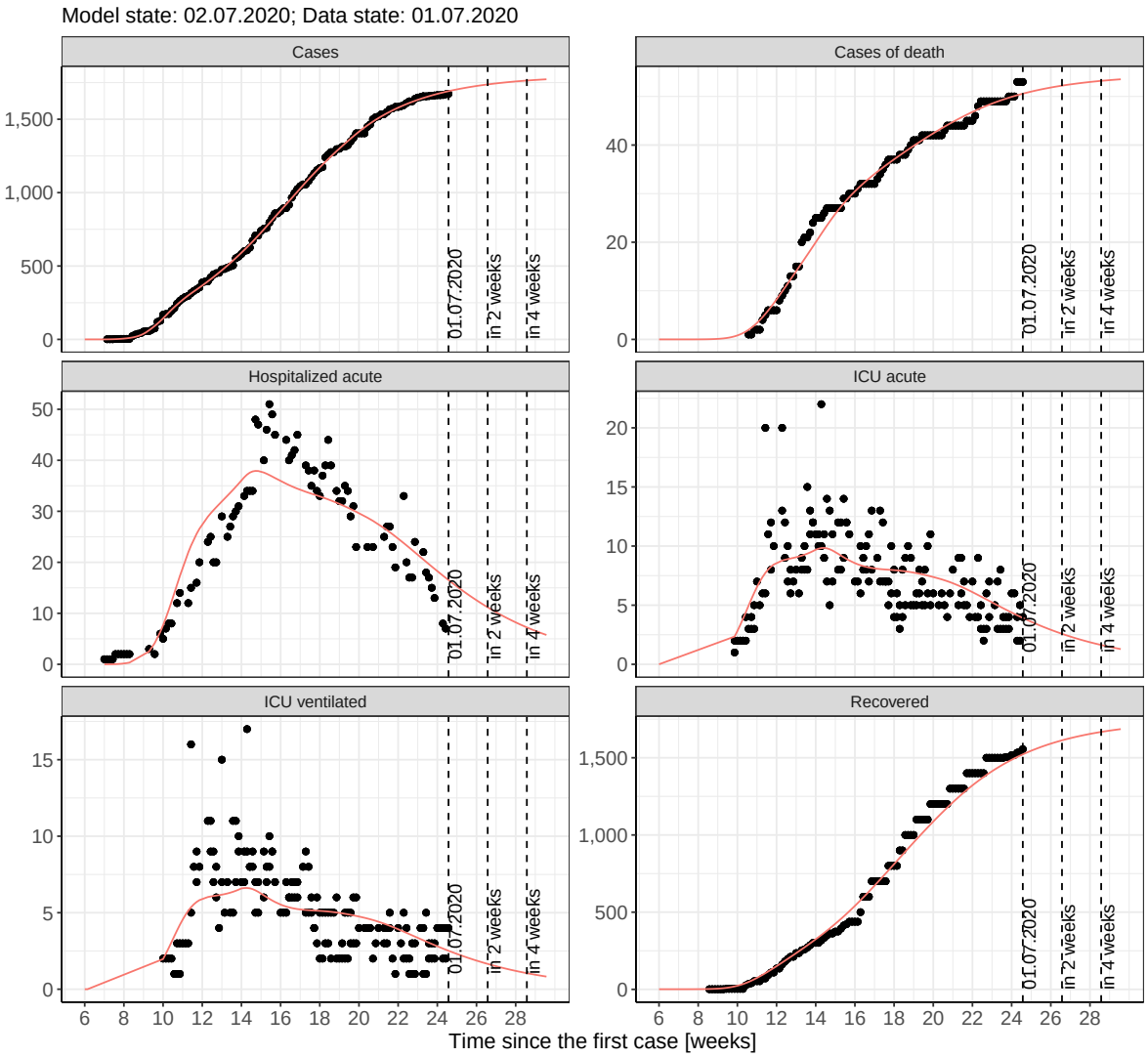


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

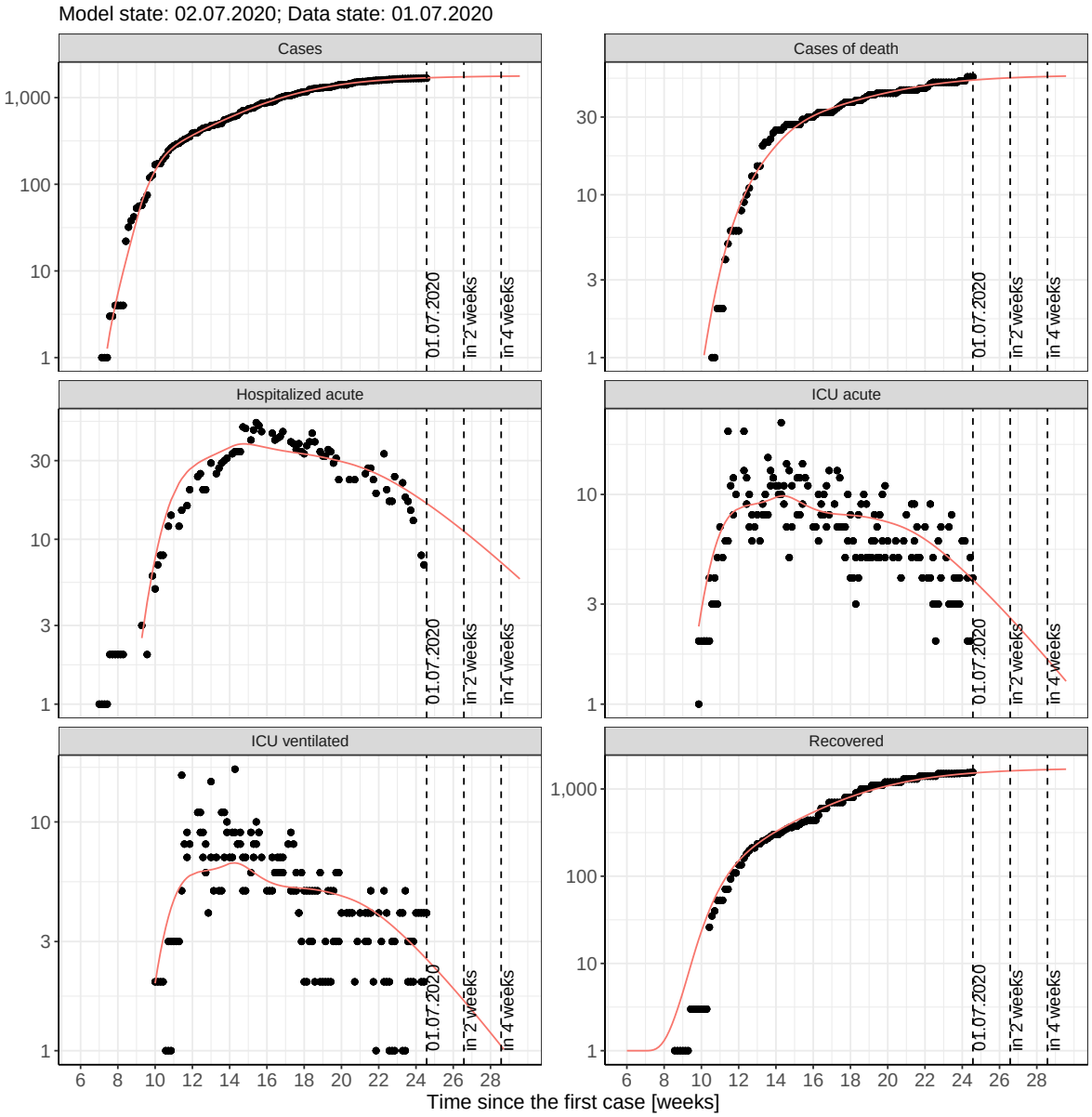


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

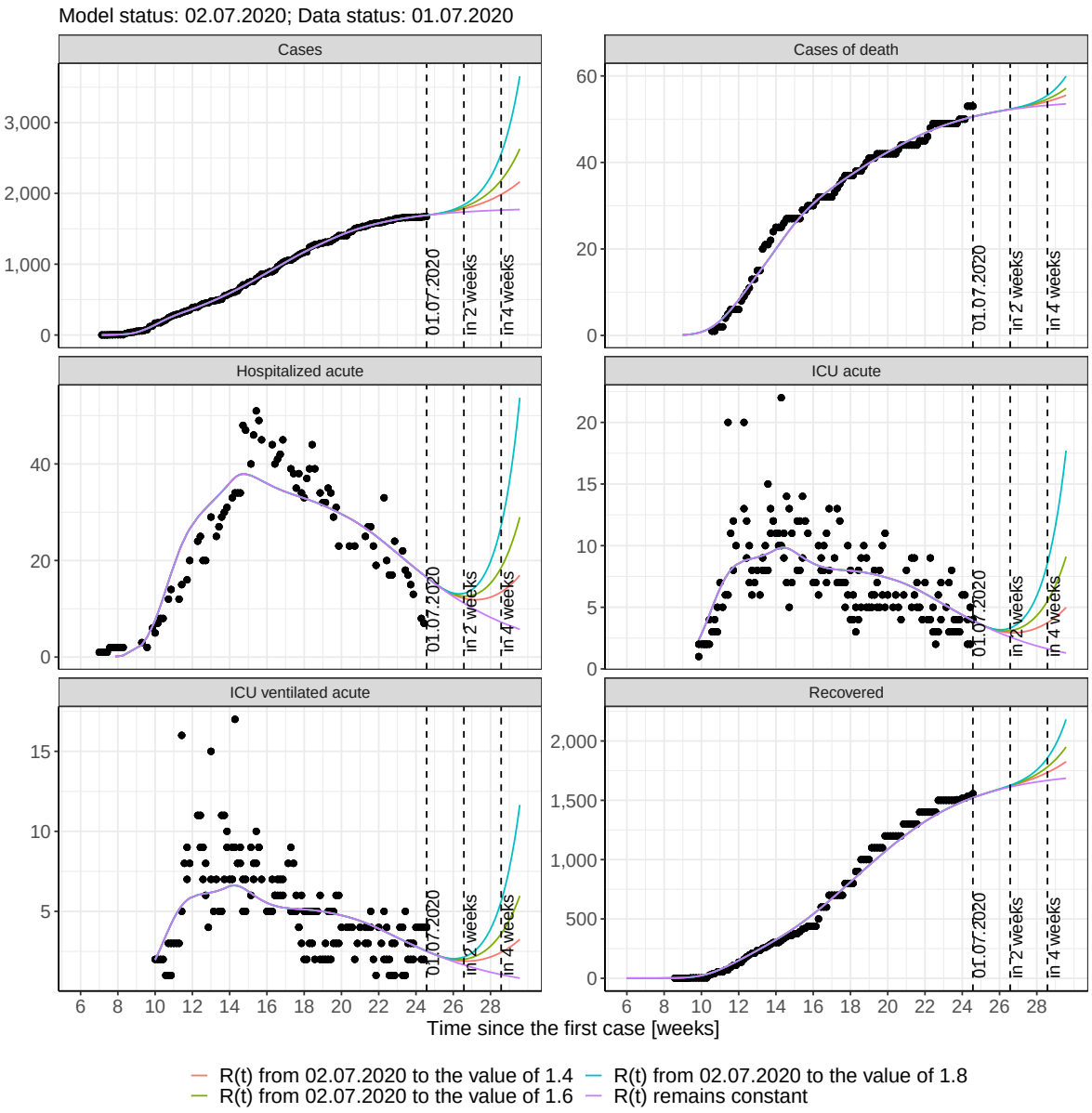


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

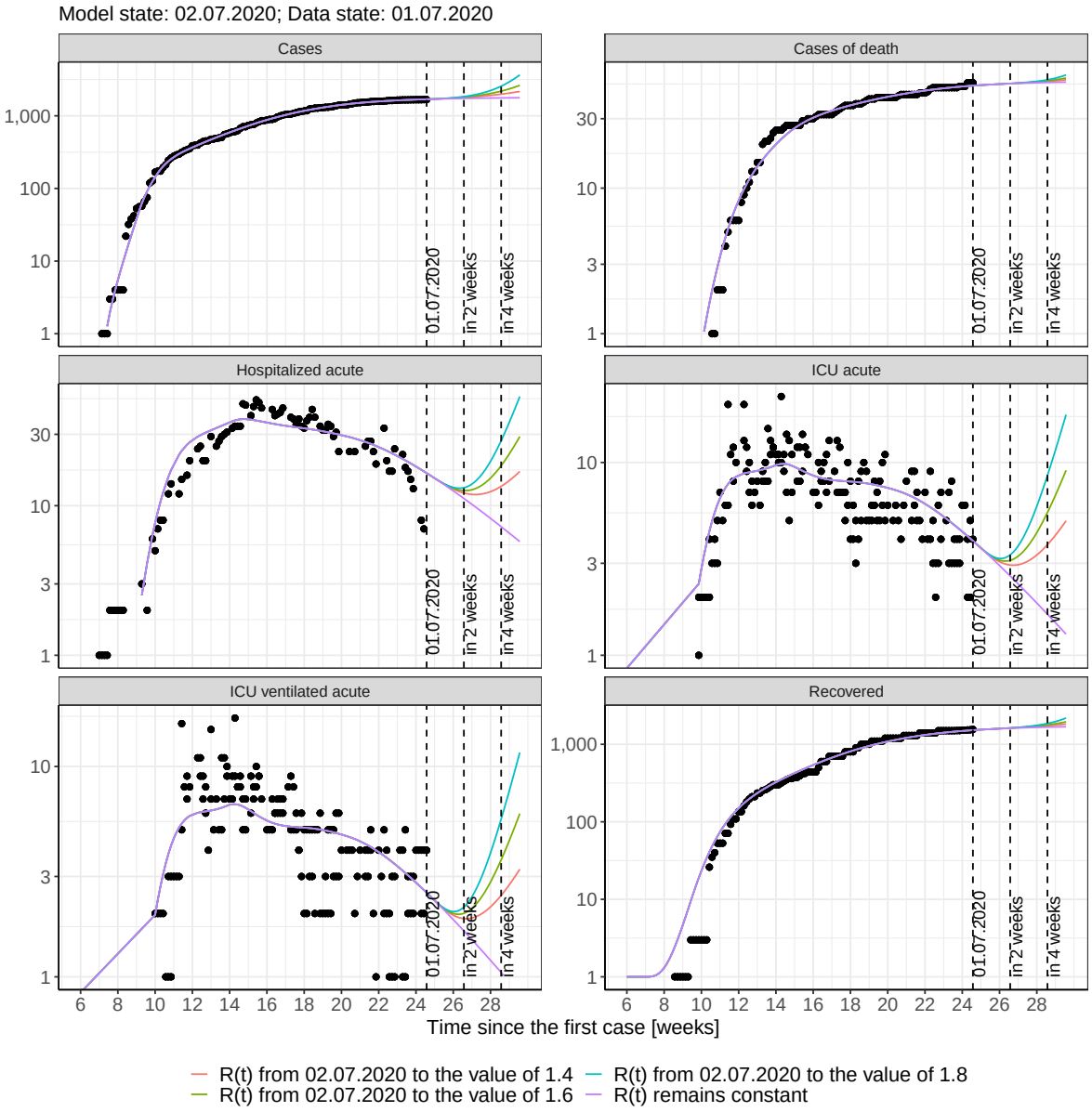


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

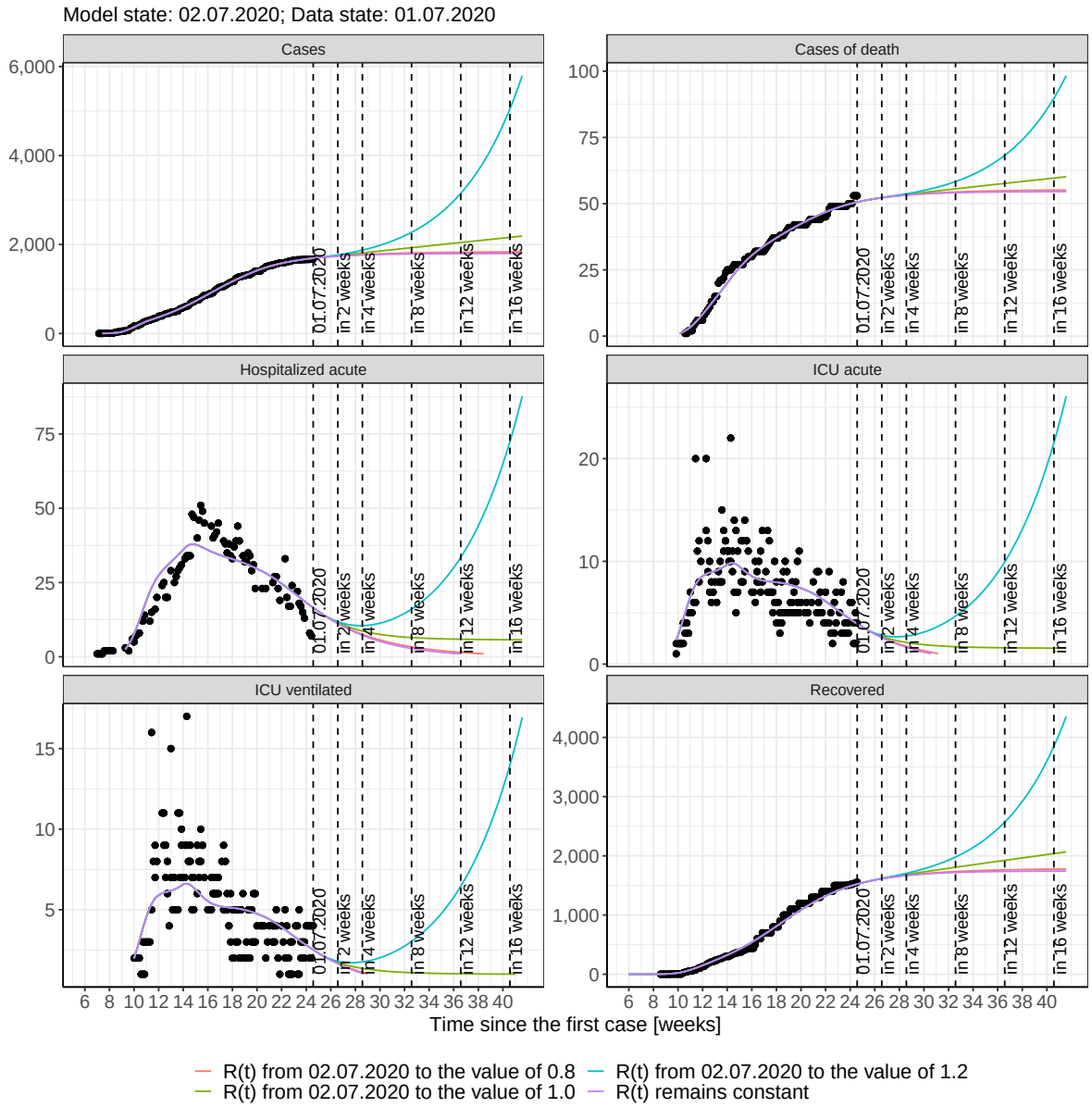


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

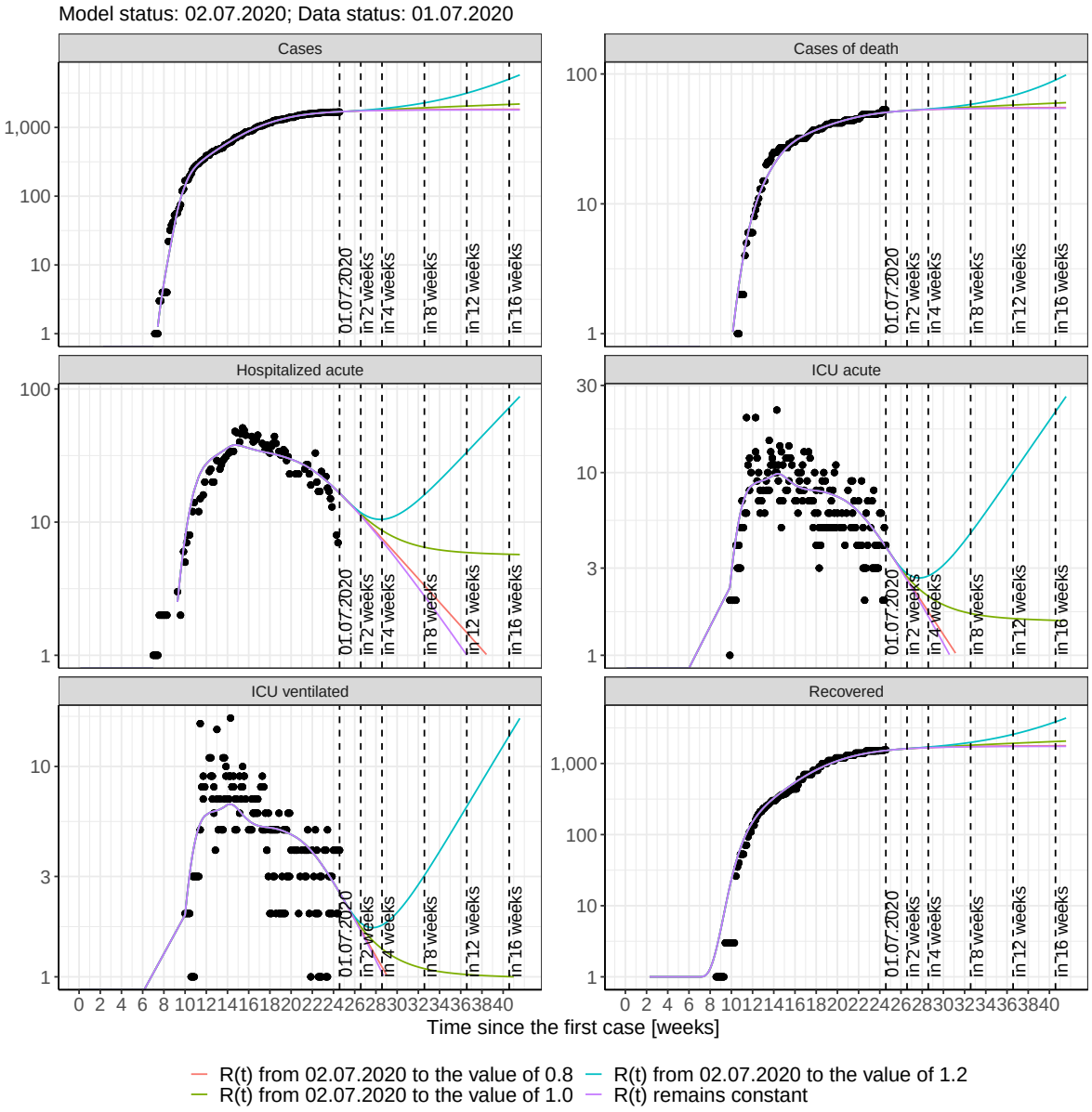


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 21) Model status from 02.07.2020; Data status: 01.07.2020.

Table 18: Bremen - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1695	51	1530	16	4	2
03.07.2020	1700	51	1538	16	4	2
04.07.2020	1703	51	1546	15	4	2
05.07.2020	1707	51	1553	15	3	2
06.07.2020	1711	51	1560	14	3	2
07.07.2020	1714	51	1567	14	3	2
08.07.2020	1717	52	1573	14	3	2
09.07.2020	1721	52	1580	13	3	2
10.07.2020	1724	52	1586	13	3	2
11.07.2020	1727	52	1591	13	3	2
12.07.2020	1729	52	1597	12	3	2
13.07.2020	1732	52	1602	12	3	2
14.07.2020	1735	52	1608	12	3	2
15.07.2020	1737	52	1613	11	3	2
16.07.2020	1740	52	1618	11	2	2
17.07.2020	1742	52	1622	11	2	2
18.07.2020	1744	52	1627	10	2	2
19.07.2020	1746	53	1631	10	2	1
20.07.2020	1748	53	1636	10	2	1
21.07.2020	1750	53	1640	9	2	1
22.07.2020	1752	53	1644	9	2	1
23.07.2020	1754	53	1647	9	2	1
24.07.2020	1756	53	1651	8	2	1
25.07.2020	1758	53	1655	8	2	1
26.07.2020	1759	53	1658	8	2	1
27.07.2020	1761	53	1661	8	2	1
28.07.2020	1762	53	1664	7	2	1
29.07.2020	1764	53	1667	7	2	1

Table 19: Bremen - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1695	51	1530	16	4	2
03.07.2020	1700	51	1538	16	4	2
04.07.2020	1704	51	1546	15	4	2
05.07.2020	1707	51	1553	15	3	2
06.07.2020	1711	51	1560	14	3	2
07.07.2020	1715	51	1567	14	3	2
08.07.2020	1718	52	1573	14	3	2
09.07.2020	1722	52	1580	13	3	2
10.07.2020	1725	52	1586	13	3	2
11.07.2020	1728	52	1592	13	3	2
12.07.2020	1732	52	1597	12	3	2
13.07.2020	1735	52	1603	12	3	2
14.07.2020	1738	52	1608	12	3	2
15.07.2020	1740	52	1613	11	3	2
16.07.2020	1743	52	1618	11	3	2
17.07.2020	1746	52	1623	11	2	2
18.07.2020	1749	52	1628	10	2	2
19.07.2020	1751	53	1633	10	2	1
20.07.2020	1754	53	1637	10	2	1
21.07.2020	1756	53	1641	9	2	1
22.07.2020	1759	53	1646	9	2	1
23.07.2020	1761	53	1650	9	2	1
24.07.2020	1763	53	1653	9	2	1
25.07.2020	1765	53	1657	8	2	1
26.07.2020	1768	53	1661	8	2	1
27.07.2020	1770	53	1664	8	2	1
28.07.2020	1772	53	1668	8	2	1
29.07.2020	1773	53	1671	8	2	1

Table 20: Bremen - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1696	51	1530	16	4	2
03.07.2020	1700	51	1538	16	4	2
04.07.2020	1704	51	1546	15	4	2
05.07.2020	1708	51	1553	15	3	2
06.07.2020	1713	51	1560	14	3	2
07.07.2020	1717	51	1567	14	3	2
08.07.2020	1721	52	1573	14	3	2
09.07.2020	1725	52	1580	13	3	2
10.07.2020	1730	52	1586	13	3	2
11.07.2020	1734	52	1592	13	3	2
12.07.2020	1738	52	1598	12	3	2
13.07.2020	1742	52	1604	12	3	2
14.07.2020	1747	52	1610	12	3	2
15.07.2020	1751	52	1615	11	3	2
16.07.2020	1755	52	1620	11	3	2
17.07.2020	1760	52	1626	11	3	2
18.07.2020	1764	53	1631	11	3	2
19.07.2020	1768	53	1636	10	2	2
20.07.2020	1772	53	1641	10	2	2
21.07.2020	1776	53	1646	10	2	2
22.07.2020	1781	53	1651	10	2	2
23.07.2020	1785	53	1656	10	2	1
24.07.2020	1789	53	1661	9	2	1
25.07.2020	1794	53	1666	9	2	1
26.07.2020	1798	53	1671	9	2	1
27.07.2020	1802	53	1675	9	2	1
28.07.2020	1806	53	1680	9	2	1
29.07.2020	1810	53	1685	9	2	1

Table 21: Bremen - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1696	51	1530	16	4	2
03.07.2020	1700	51	1538	16	4	2
04.07.2020	1705	51	1546	15	4	2
05.07.2020	1709	51	1553	15	4	2
06.07.2020	1714	51	1560	14	3	2
07.07.2020	1719	51	1567	14	3	2
08.07.2020	1724	52	1574	14	3	2
09.07.2020	1730	52	1580	13	3	2
10.07.2020	1735	52	1586	13	3	2
11.07.2020	1741	52	1593	13	3	2
12.07.2020	1746	52	1599	13	3	2
13.07.2020	1752	52	1605	12	3	2
14.07.2020	1758	52	1611	12	3	2
15.07.2020	1765	52	1617	12	3	2
16.07.2020	1771	52	1623	12	3	2
17.07.2020	1778	52	1629	11	3	2
18.07.2020	1784	53	1635	11	3	2
19.07.2020	1792	53	1641	11	3	2
20.07.2020	1799	53	1647	11	3	2
21.07.2020	1806	53	1653	11	3	2
22.07.2020	1814	53	1659	11	3	2
23.07.2020	1822	53	1665	11	3	2
24.07.2020	1830	53	1672	11	3	2
25.07.2020	1838	53	1678	11	3	2
26.07.2020	1846	53	1684	11	3	2
27.07.2020	1855	53	1691	10	3	2
28.07.2020	1864	54	1698	10	3	2
29.07.2020	1874	54	1704	10	3	2

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

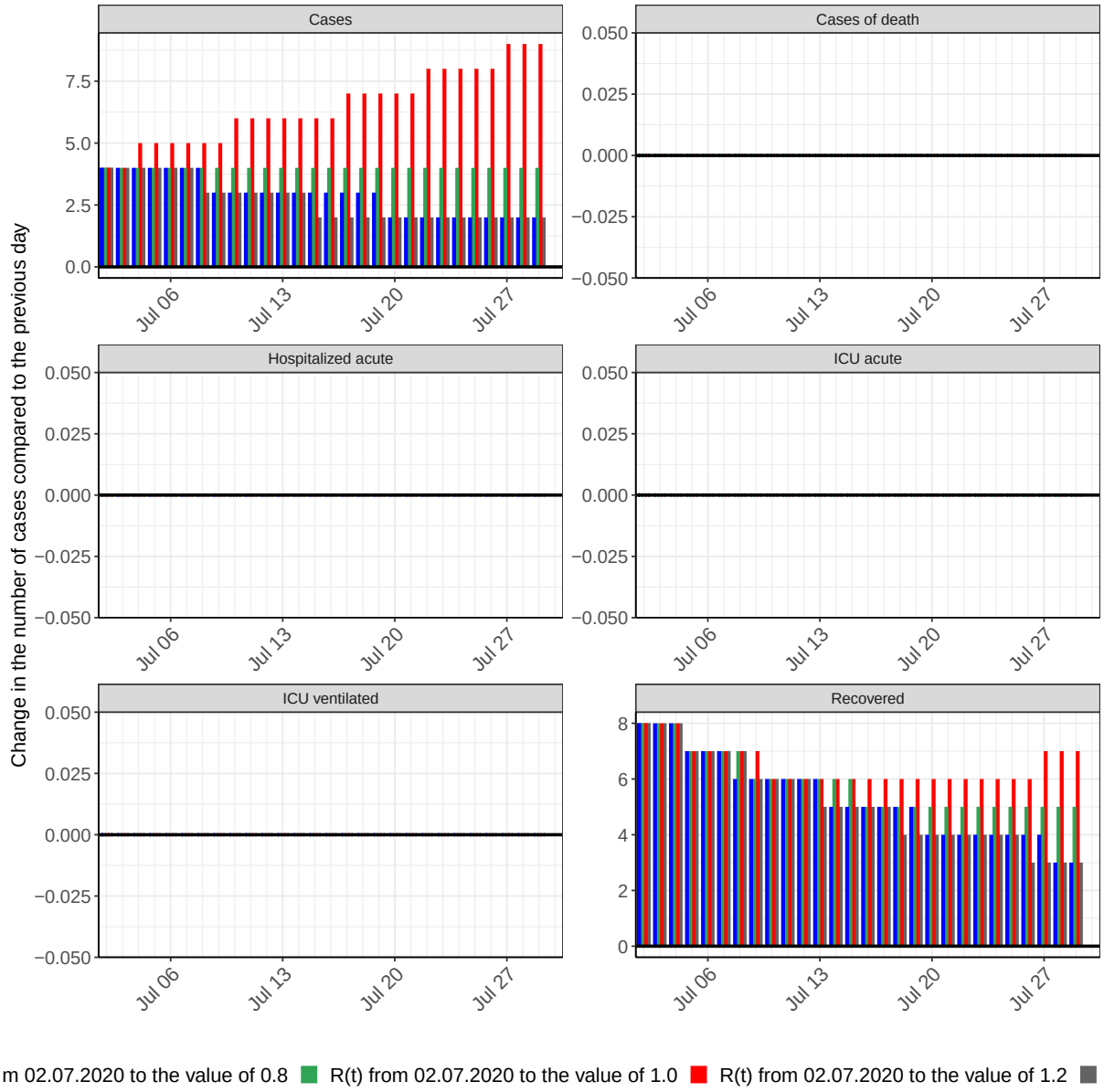


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

7 Hamburg

7.1 Model description

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

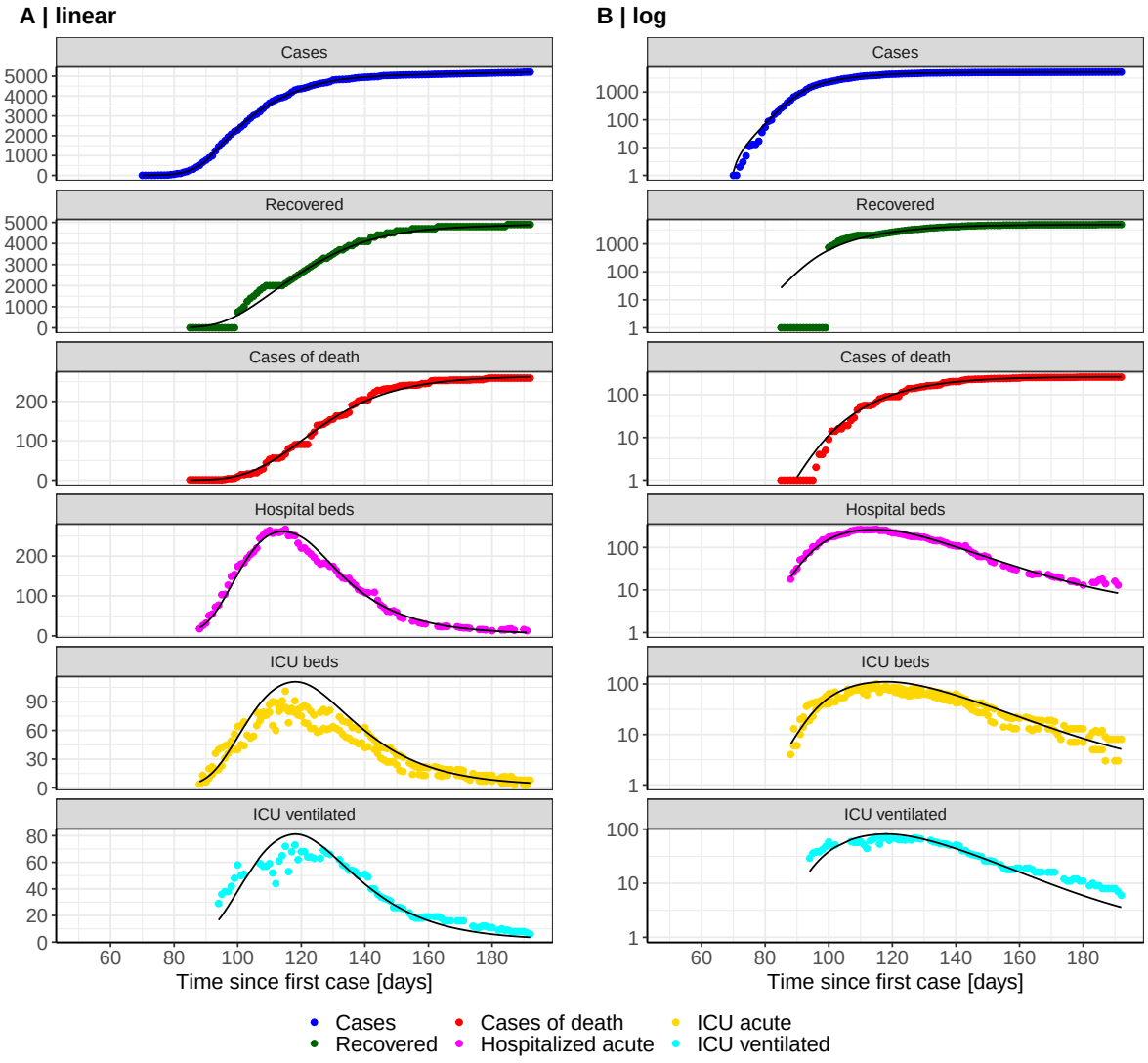


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

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

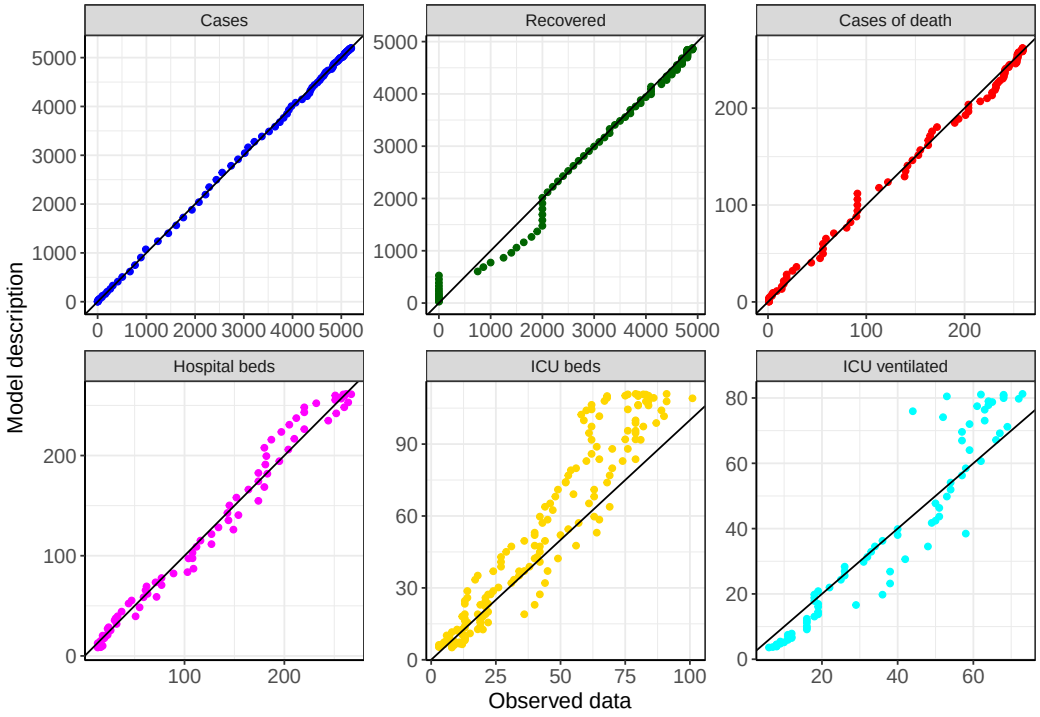


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

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

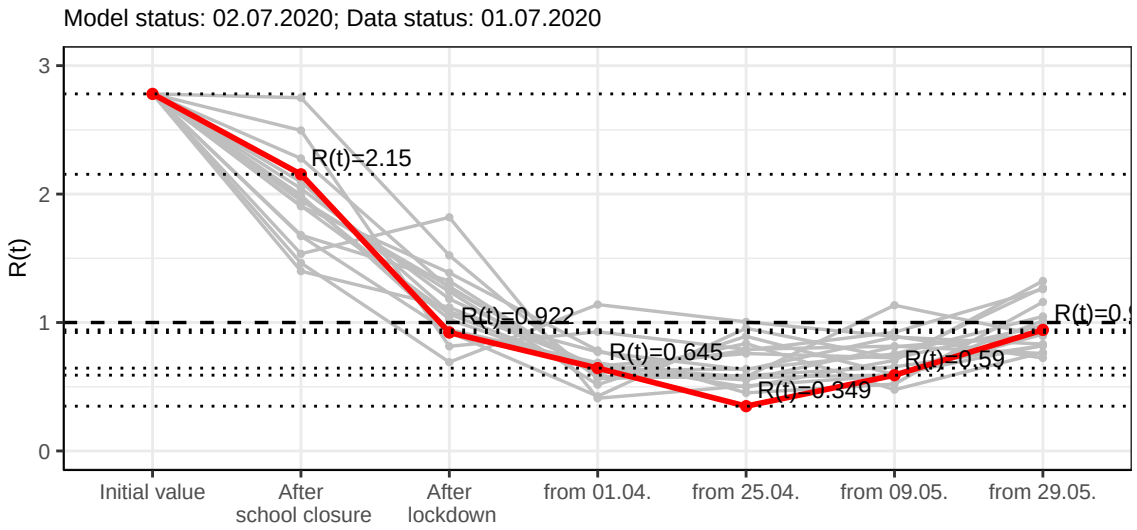


Figure 68: R(t) values before and after the NPIs for Hamburg

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

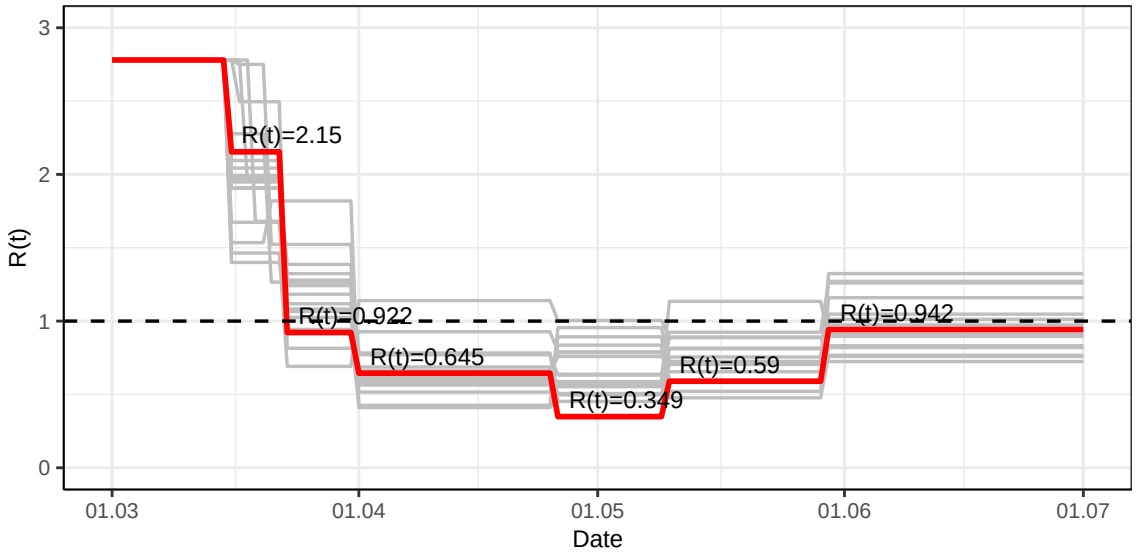


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

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

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.

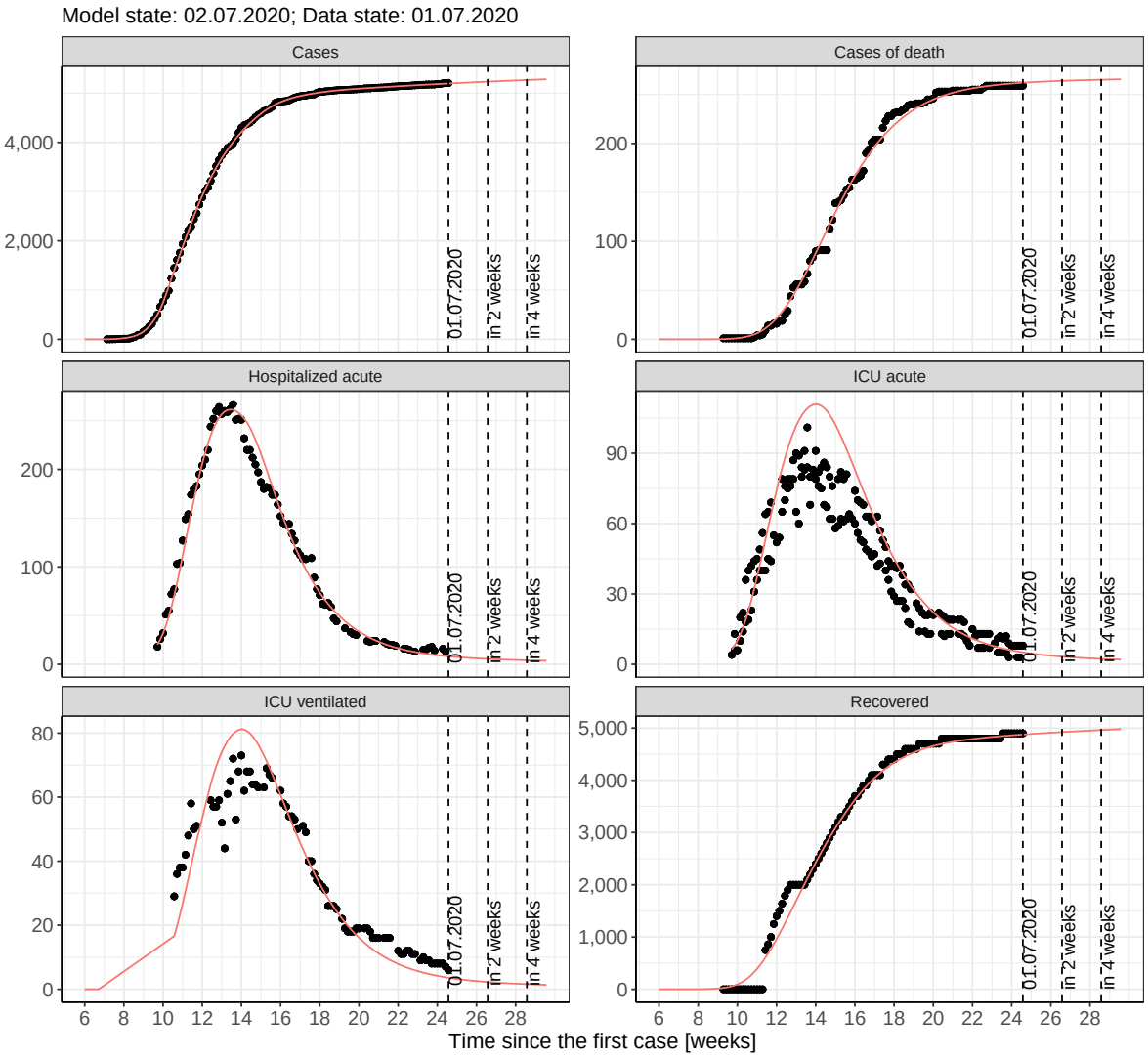


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

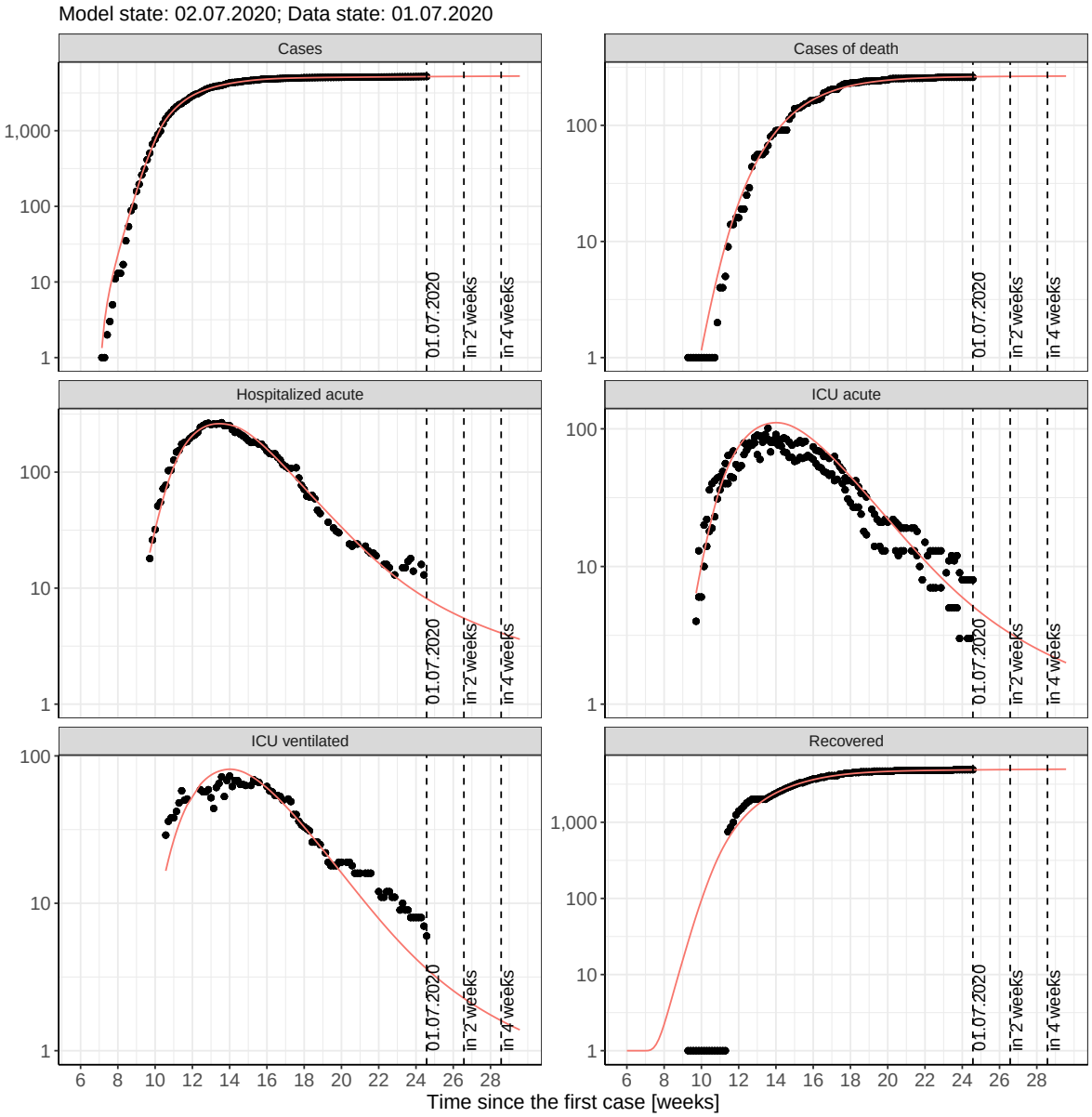


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

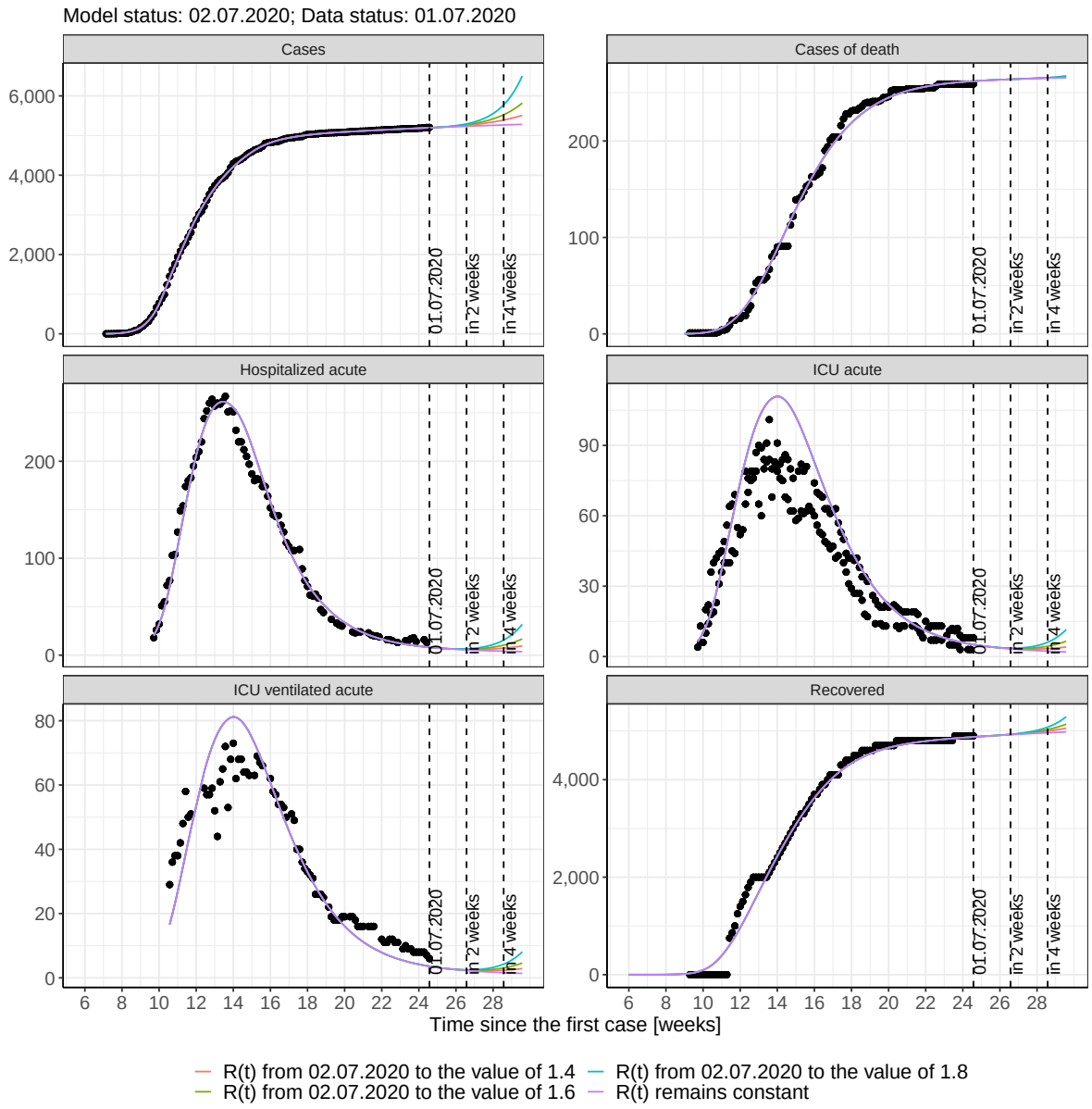


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

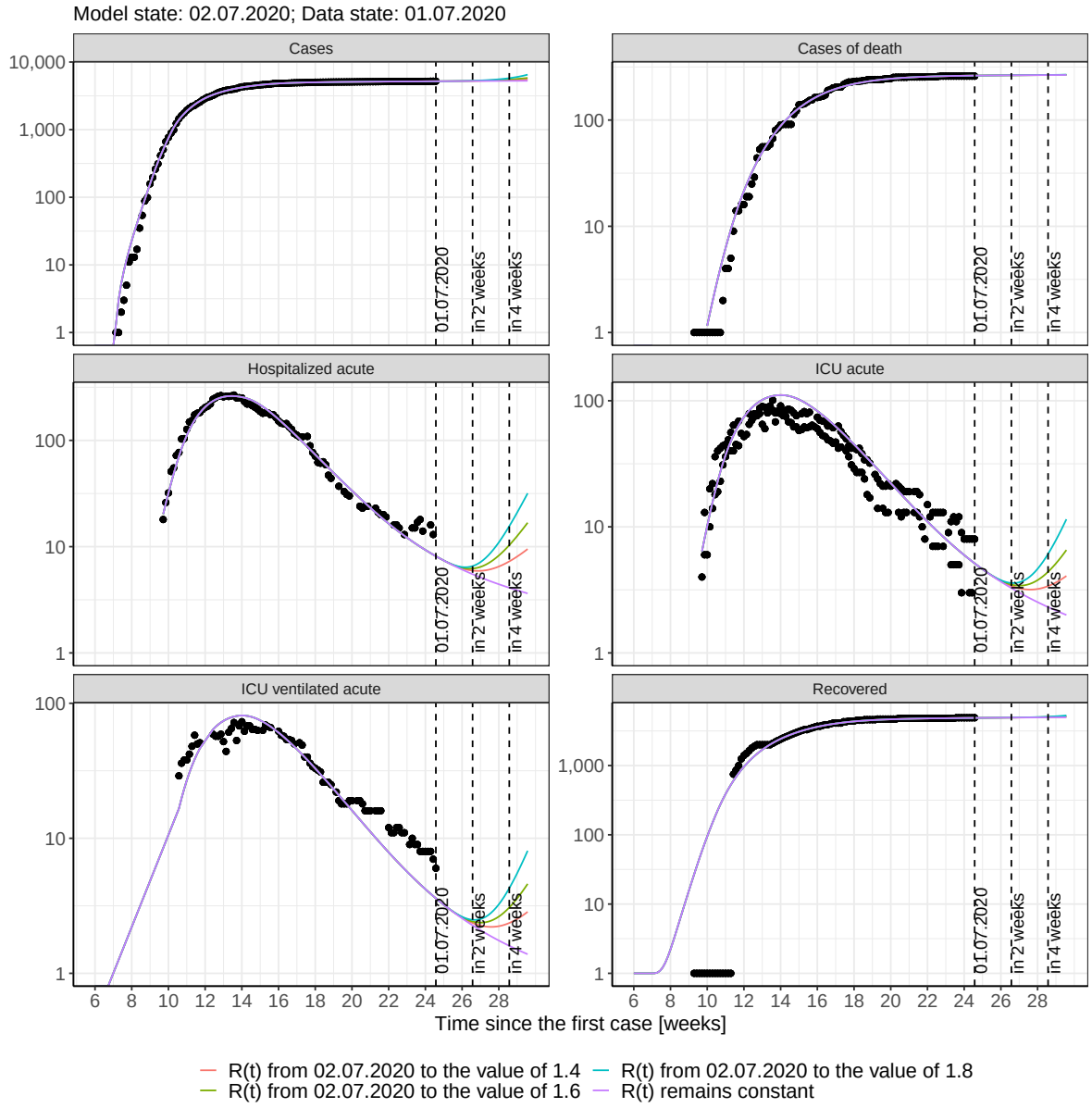


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

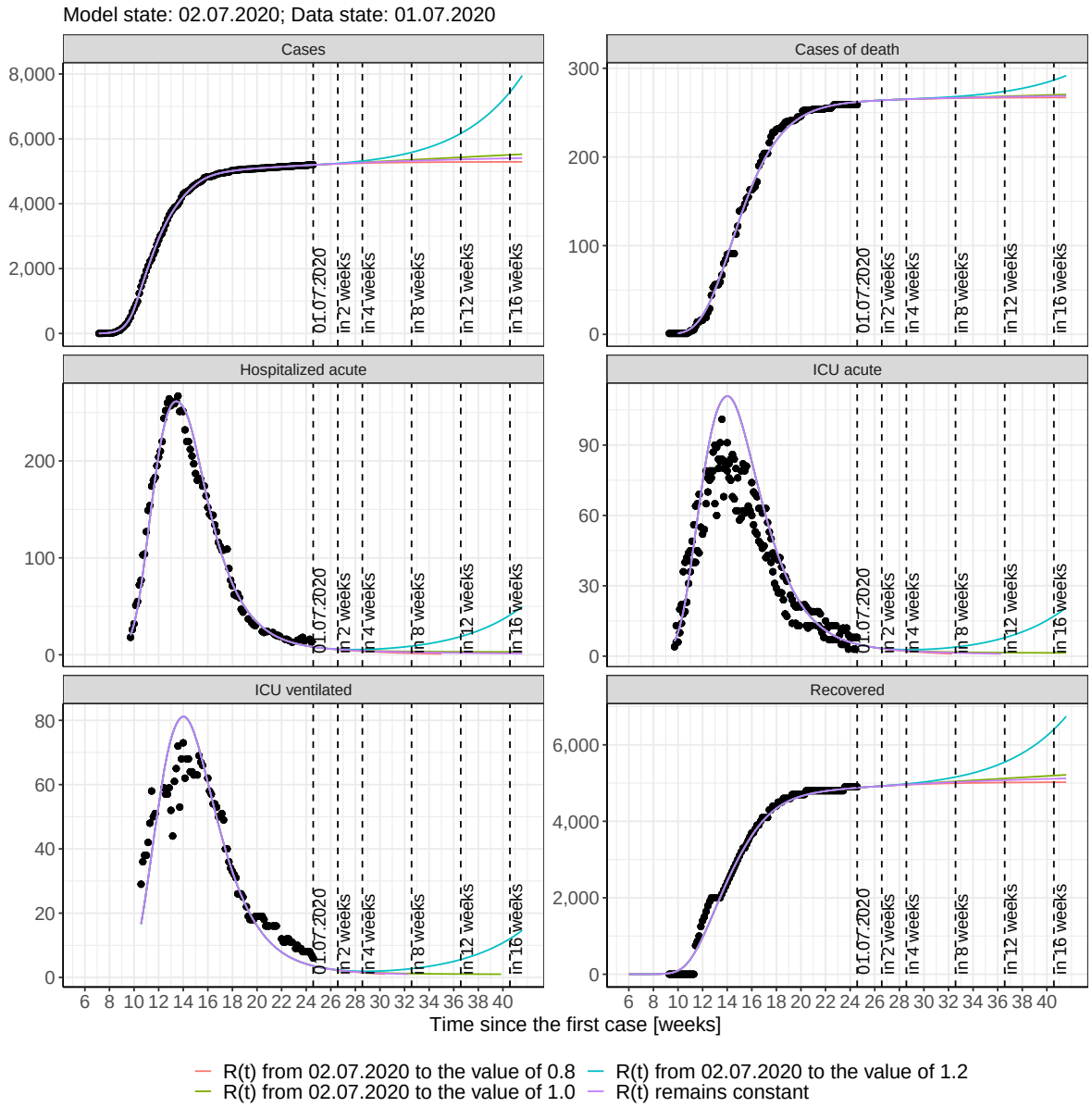


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

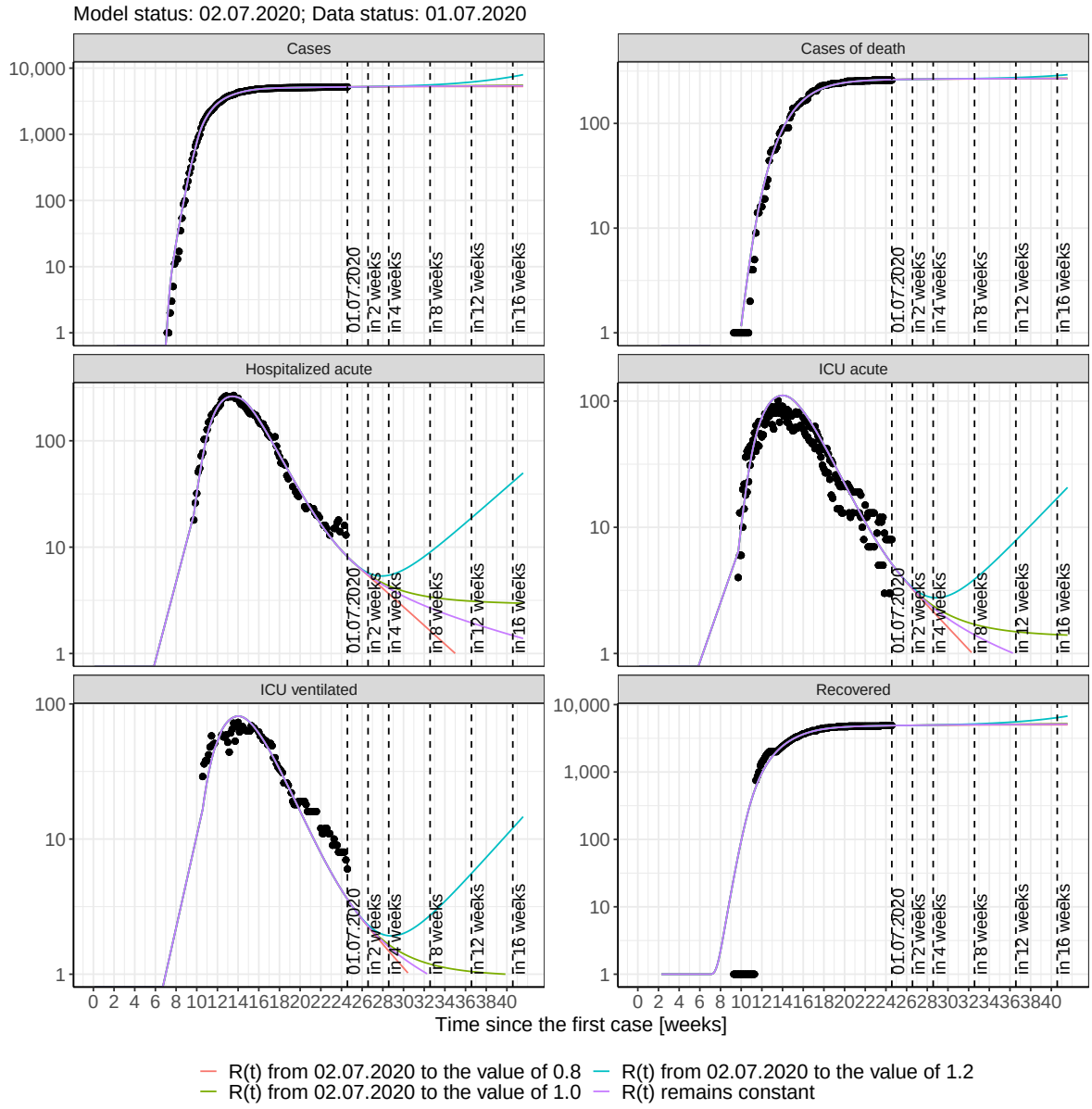


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 25) Model status from 02.07.2020; Data status: 01.07.2020.

Table 22: Hamburg - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5199	262	4880	8	5	3
03.07.2020	5202	262	4884	8	5	3
04.07.2020	5204	263	4887	7	5	3
05.07.2020	5207	263	4891	7	4	3
06.07.2020	5210	263	4894	7	4	3
07.07.2020	5213	263	4898	7	4	3
08.07.2020	5215	263	4901	7	4	3
09.07.2020	5218	263	4904	6	4	3
10.07.2020	5221	263	4907	6	4	3
11.07.2020	5223	263	4910	6	4	3
12.07.2020	5226	264	4914	6	4	2
13.07.2020	5228	264	4917	6	3	2
14.07.2020	5231	264	4920	6	3	2
15.07.2020	5234	264	4923	6	3	2
16.07.2020	5236	264	4926	5	3	2
17.07.2020	5238	264	4929	5	3	2
18.07.2020	5241	264	4932	5	3	2
19.07.2020	5243	264	4935	5	3	2
20.07.2020	5246	264	4938	5	3	2
21.07.2020	5248	264	4940	5	3	2
22.07.2020	5251	265	4943	5	3	2
23.07.2020	5253	265	4946	5	3	2
24.07.2020	5255	265	4949	5	3	2
25.07.2020	5258	265	4951	4	3	2
26.07.2020	5260	265	4954	4	2	2
27.07.2020	5262	265	4957	4	2	2
28.07.2020	5264	265	4959	4	2	2
29.07.2020	5267	265	4962	4	2	2

Table 23: Hamburg - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5199	262	4880	8	5	3
03.07.2020	5202	262	4884	8	5	3
04.07.2020	5204	263	4887	7	5	3
05.07.2020	5207	263	4891	7	4	3
06.07.2020	5209	263	4894	7	4	3
07.07.2020	5212	263	4897	7	4	3
08.07.2020	5214	263	4901	7	4	3
09.07.2020	5216	263	4904	6	4	3
10.07.2020	5218	263	4907	6	4	3
11.07.2020	5221	263	4910	6	4	3
12.07.2020	5223	264	4913	6	4	2
13.07.2020	5225	264	4916	6	3	2
14.07.2020	5227	264	4919	6	3	2
15.07.2020	5229	264	4922	5	3	2
16.07.2020	5231	264	4925	5	3	2
17.07.2020	5232	264	4928	5	3	2
18.07.2020	5234	264	4930	5	3	2
19.07.2020	5236	264	4933	5	3	2
20.07.2020	5238	264	4936	5	3	2
21.07.2020	5239	264	4938	5	3	2
22.07.2020	5241	265	4941	4	3	2
23.07.2020	5242	265	4943	4	3	2
24.07.2020	5244	265	4945	4	2	2
25.07.2020	5245	265	4948	4	2	2
26.07.2020	5247	265	4950	4	2	2
27.07.2020	5248	265	4952	4	2	2
28.07.2020	5249	265	4954	4	2	2
29.07.2020	5251	265	4956	4	2	1

Table 24: Hamburg - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5199	262	4880	8	5	3
03.07.2020	5202	262	4884	8	5	3
04.07.2020	5204	263	4887	7	5	3
05.07.2020	5207	263	4891	7	4	3
06.07.2020	5210	263	4894	7	4	3
07.07.2020	5213	263	4898	7	4	3
08.07.2020	5216	263	4901	7	4	3
09.07.2020	5219	263	4904	6	4	3
10.07.2020	5222	263	4907	6	4	3
11.07.2020	5224	263	4911	6	4	3
12.07.2020	5227	264	4914	6	4	2
13.07.2020	5230	264	4917	6	3	2
14.07.2020	5233	264	4920	6	3	2
15.07.2020	5236	264	4923	6	3	2
16.07.2020	5238	264	4926	5	3	2
17.07.2020	5241	264	4929	5	3	2
18.07.2020	5244	264	4932	5	3	2
19.07.2020	5247	264	4936	5	3	2
20.07.2020	5250	264	4938	5	3	2
21.07.2020	5253	264	4942	5	3	2
22.07.2020	5255	265	4944	5	3	2
23.07.2020	5258	265	4947	5	3	2
24.07.2020	5261	265	4950	5	3	2
25.07.2020	5264	265	4953	5	3	2
26.07.2020	5267	265	4956	5	3	2
27.07.2020	5270	265	4959	4	2	2
28.07.2020	5272	265	4962	4	2	2
29.07.2020	5275	265	4965	4	2	2

Table 25: Hamburg - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5199	262	4880	8	5	3
03.07.2020	5202	262	4884	8	5	3
04.07.2020	5205	263	4887	7	5	3
05.07.2020	5208	263	4891	7	4	3
06.07.2020	5211	263	4894	7	4	3
07.07.2020	5214	263	4898	7	4	3
08.07.2020	5218	263	4901	7	4	3
09.07.2020	5222	263	4904	6	4	3
10.07.2020	5225	263	4908	6	4	3
11.07.2020	5229	263	4911	6	4	3
12.07.2020	5233	264	4914	6	4	2
13.07.2020	5236	264	4918	6	4	2
14.07.2020	5241	264	4921	6	3	2
15.07.2020	5245	264	4925	6	3	2
16.07.2020	5249	264	4928	6	3	2
17.07.2020	5253	264	4932	6	3	2
18.07.2020	5258	264	4935	6	3	2
19.07.2020	5263	264	4938	5	3	2
20.07.2020	5267	264	4942	5	3	2
21.07.2020	5272	264	4946	5	3	2
22.07.2020	5277	265	4950	5	3	2
23.07.2020	5283	265	4953	5	3	2
24.07.2020	5288	265	4957	5	3	2
25.07.2020	5293	265	4961	5	3	2
26.07.2020	5299	265	4965	5	3	2
27.07.2020	5305	265	4969	5	3	2
28.07.2020	5311	265	4974	5	3	2
29.07.2020	5317	265	4978	5	3	2

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

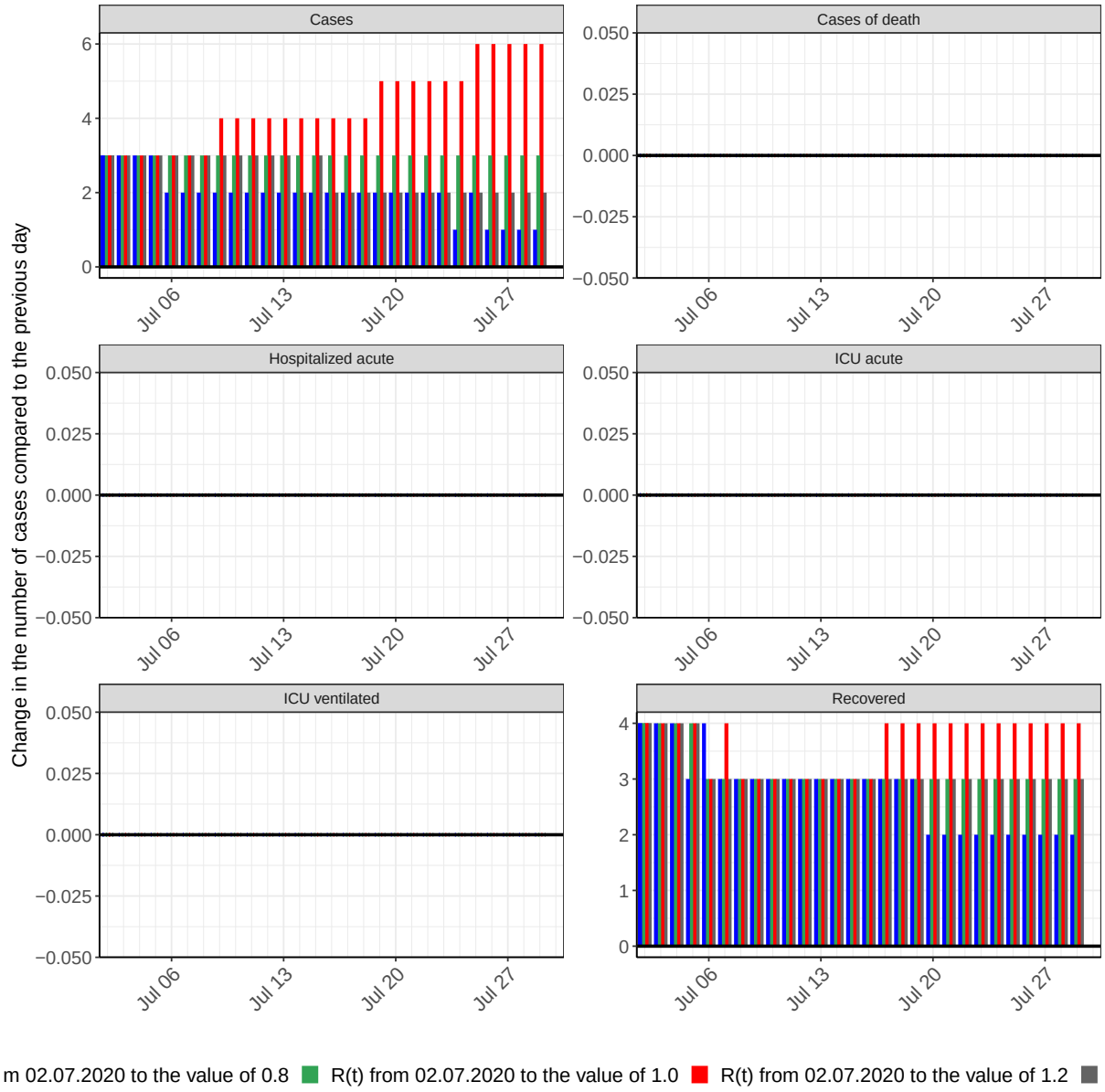


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

8 Hesse

8.1 Model description

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

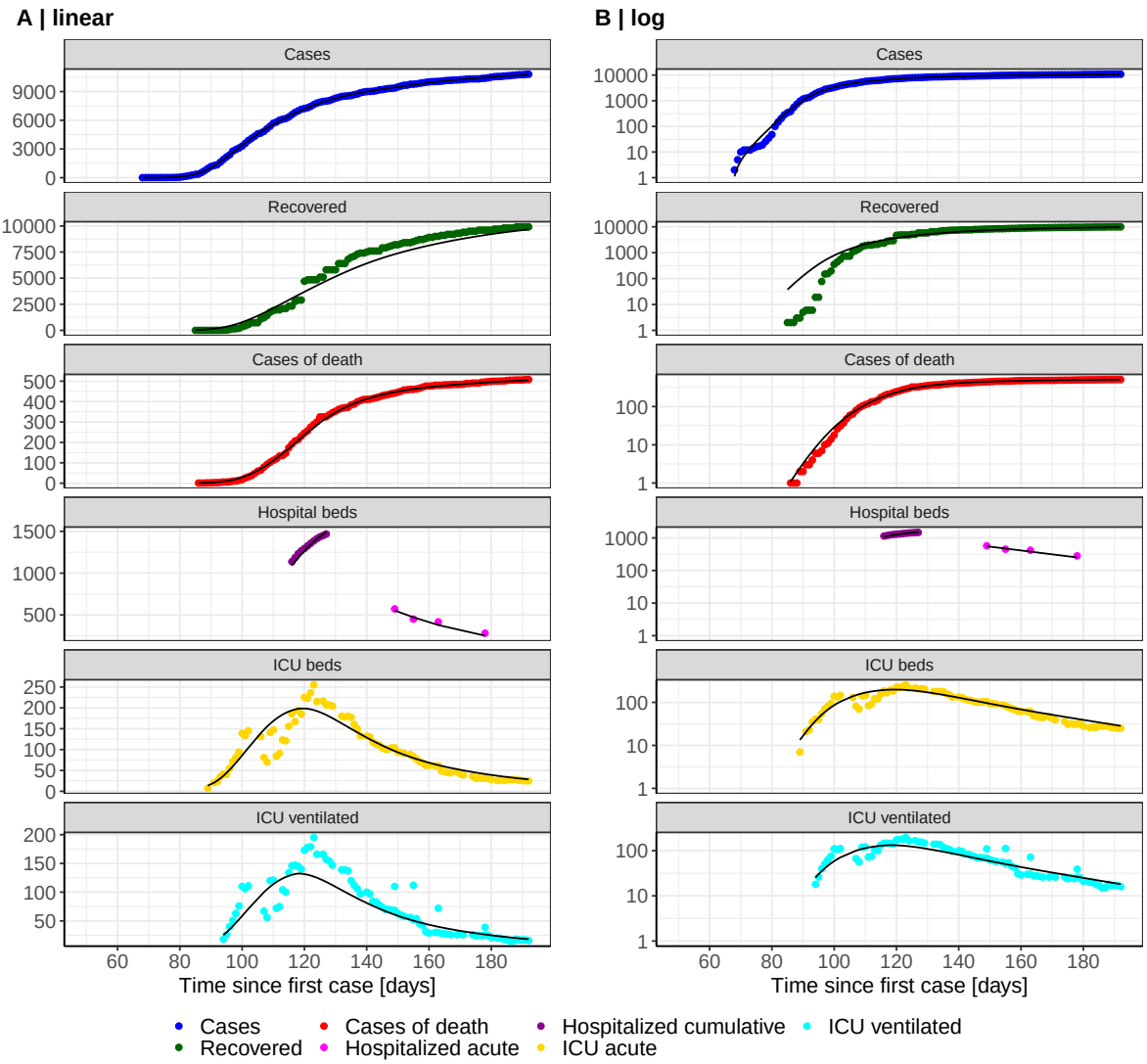


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

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

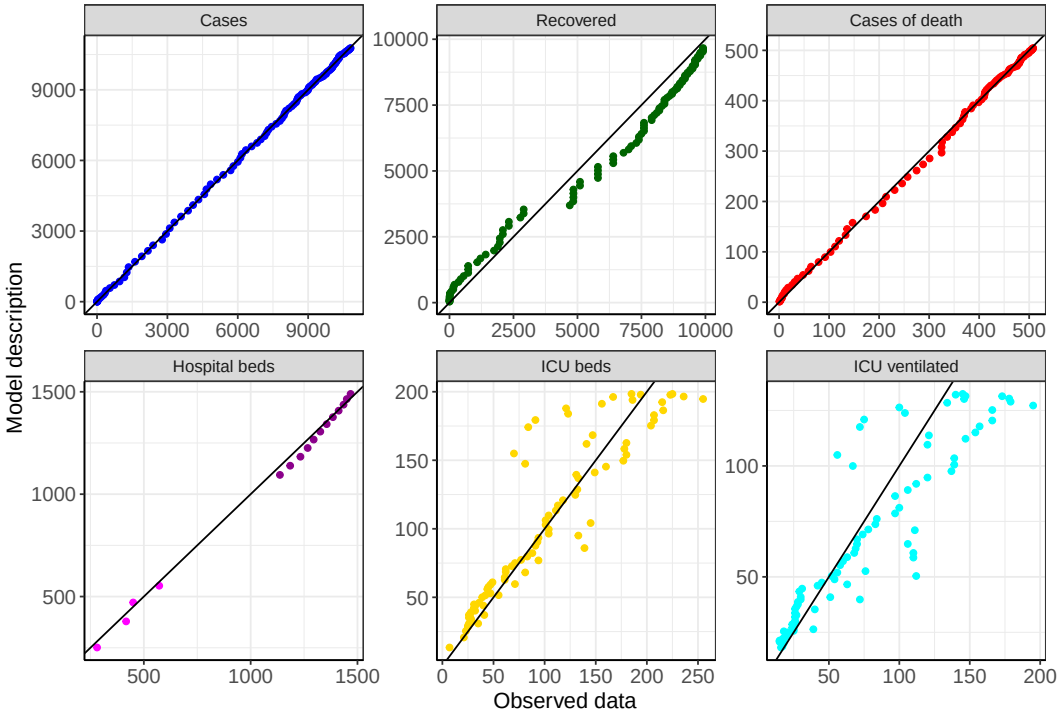


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

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

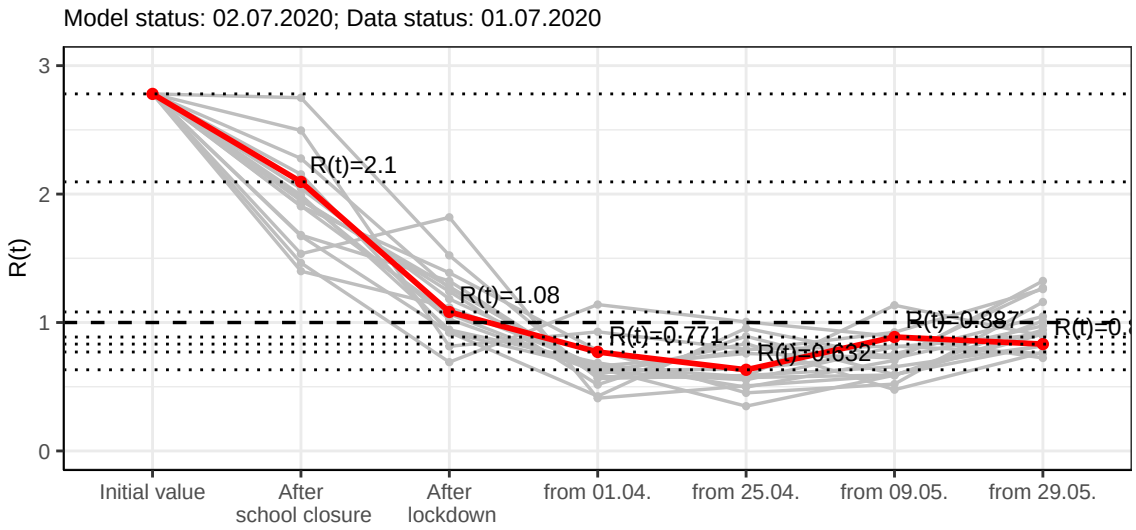


Figure 79: R(t) values before and after the NPIs for Hesse

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

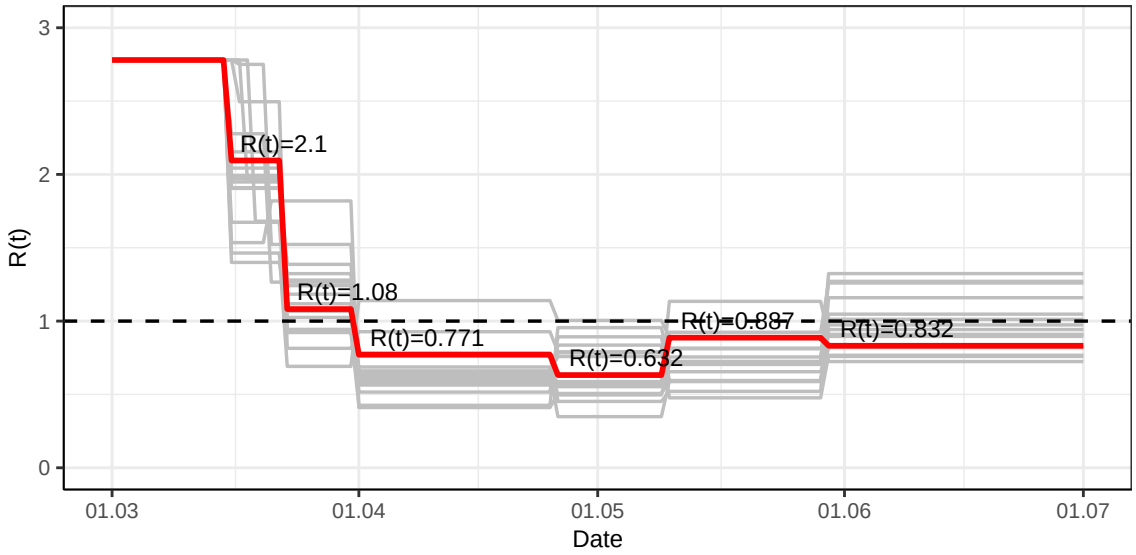


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

8.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.83)

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.

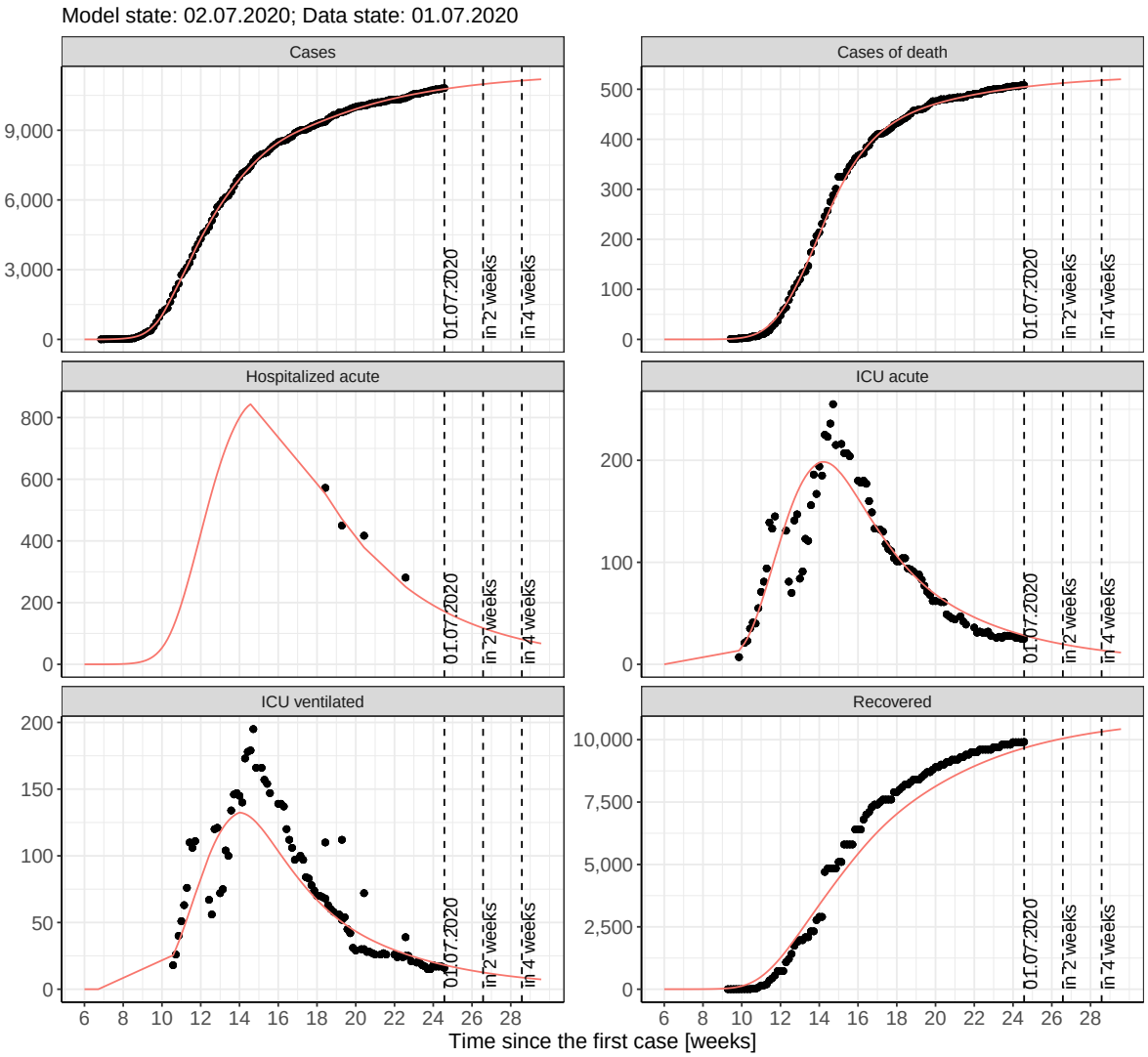


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

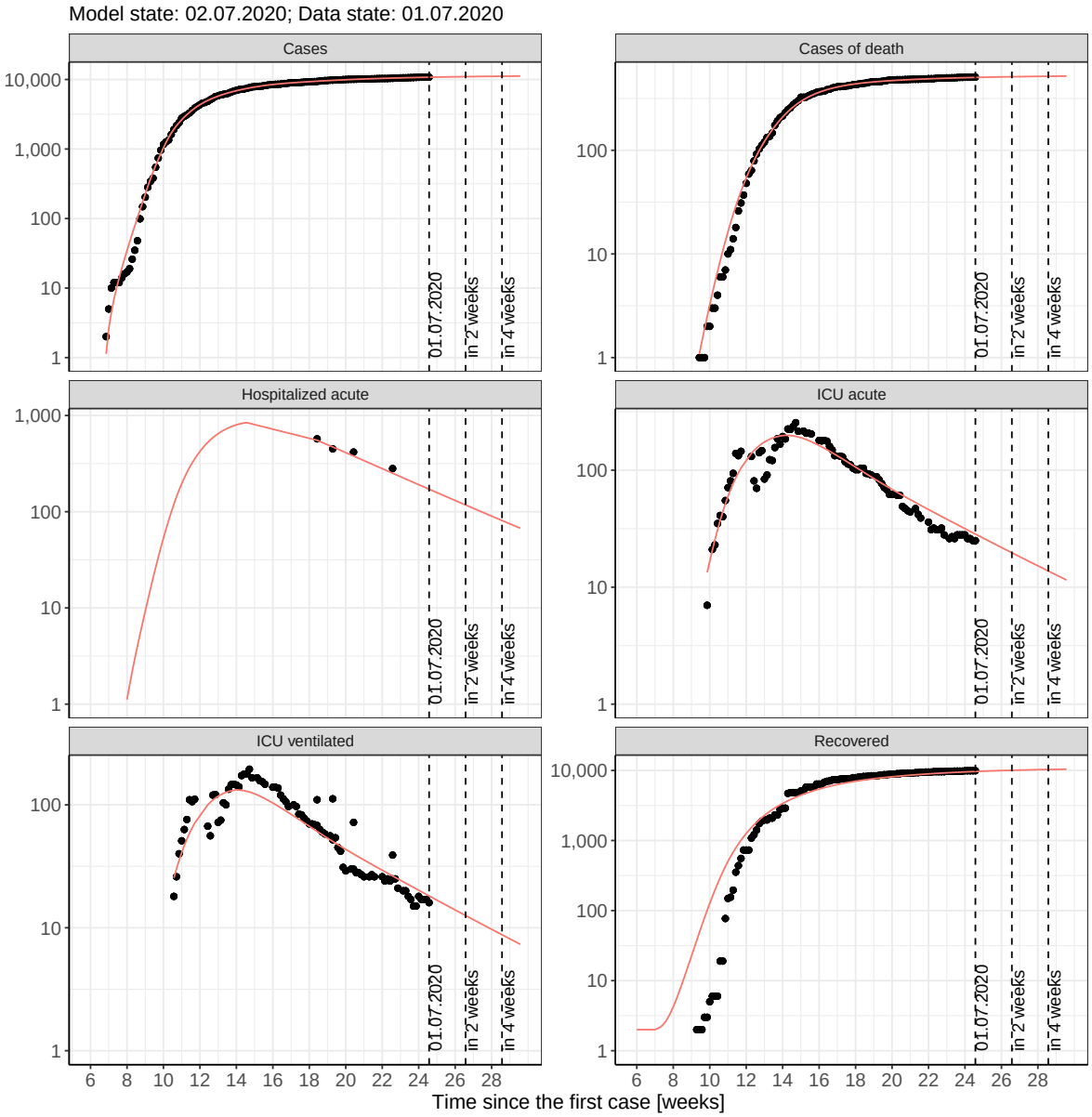


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

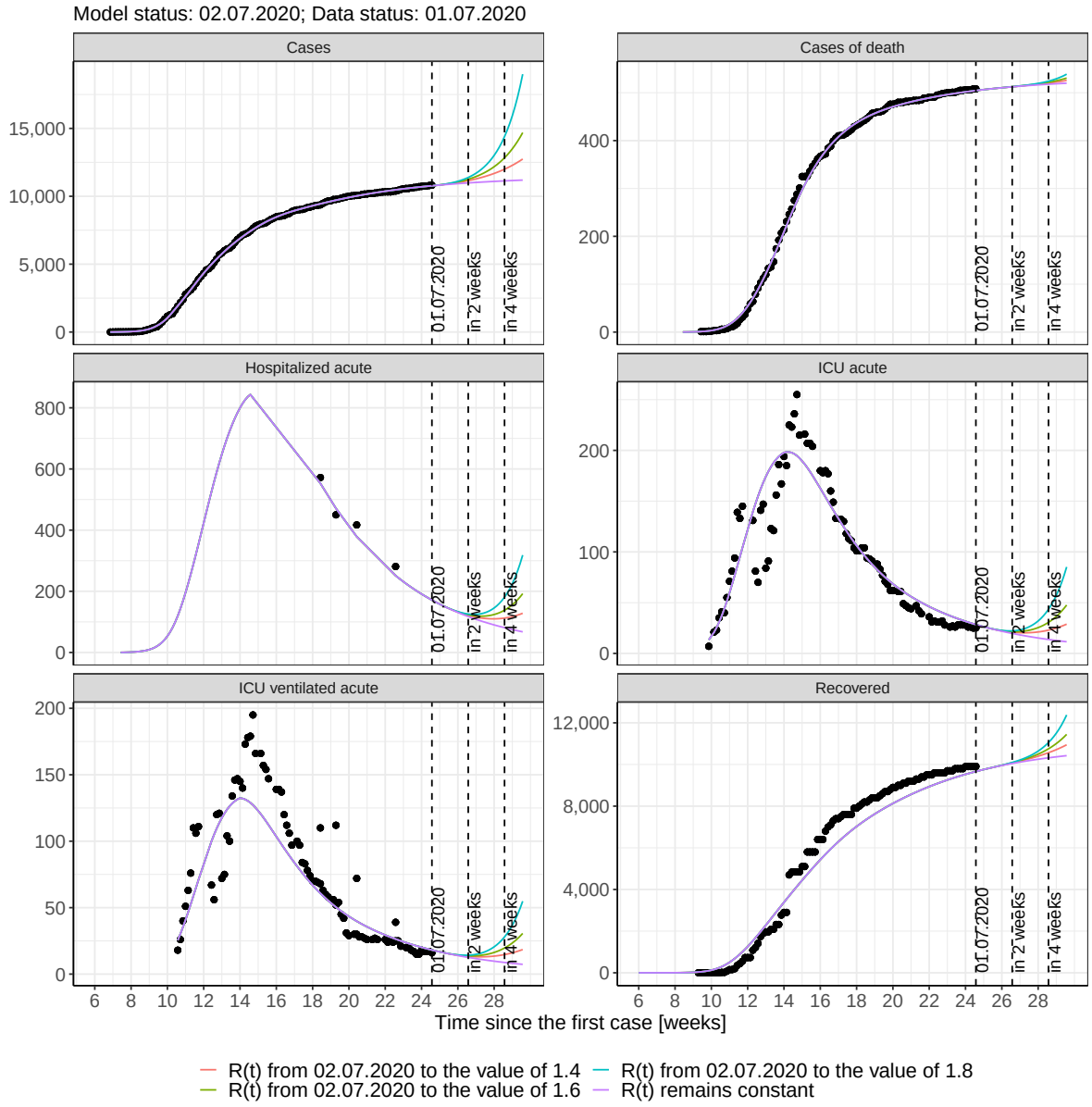


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

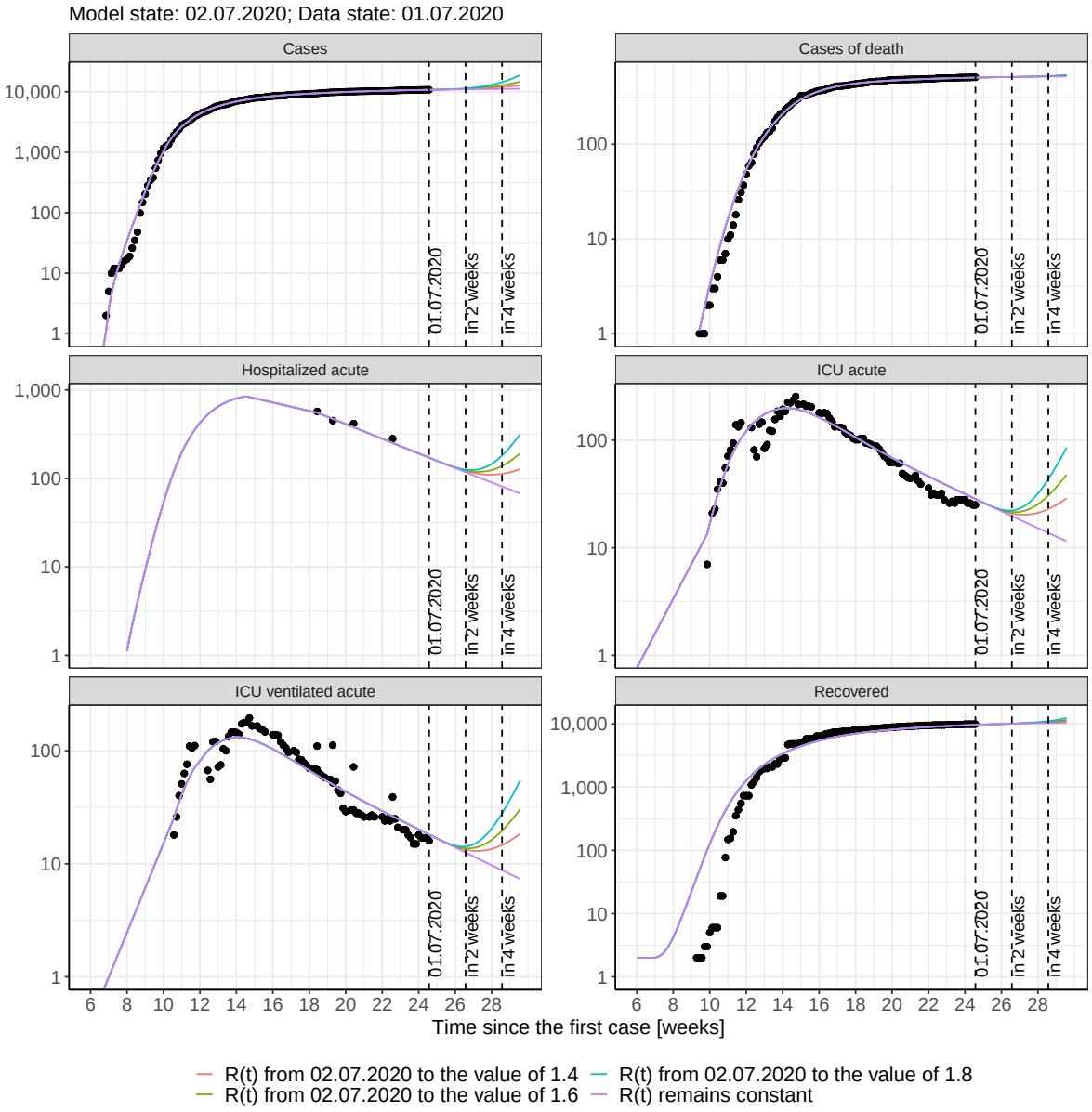


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

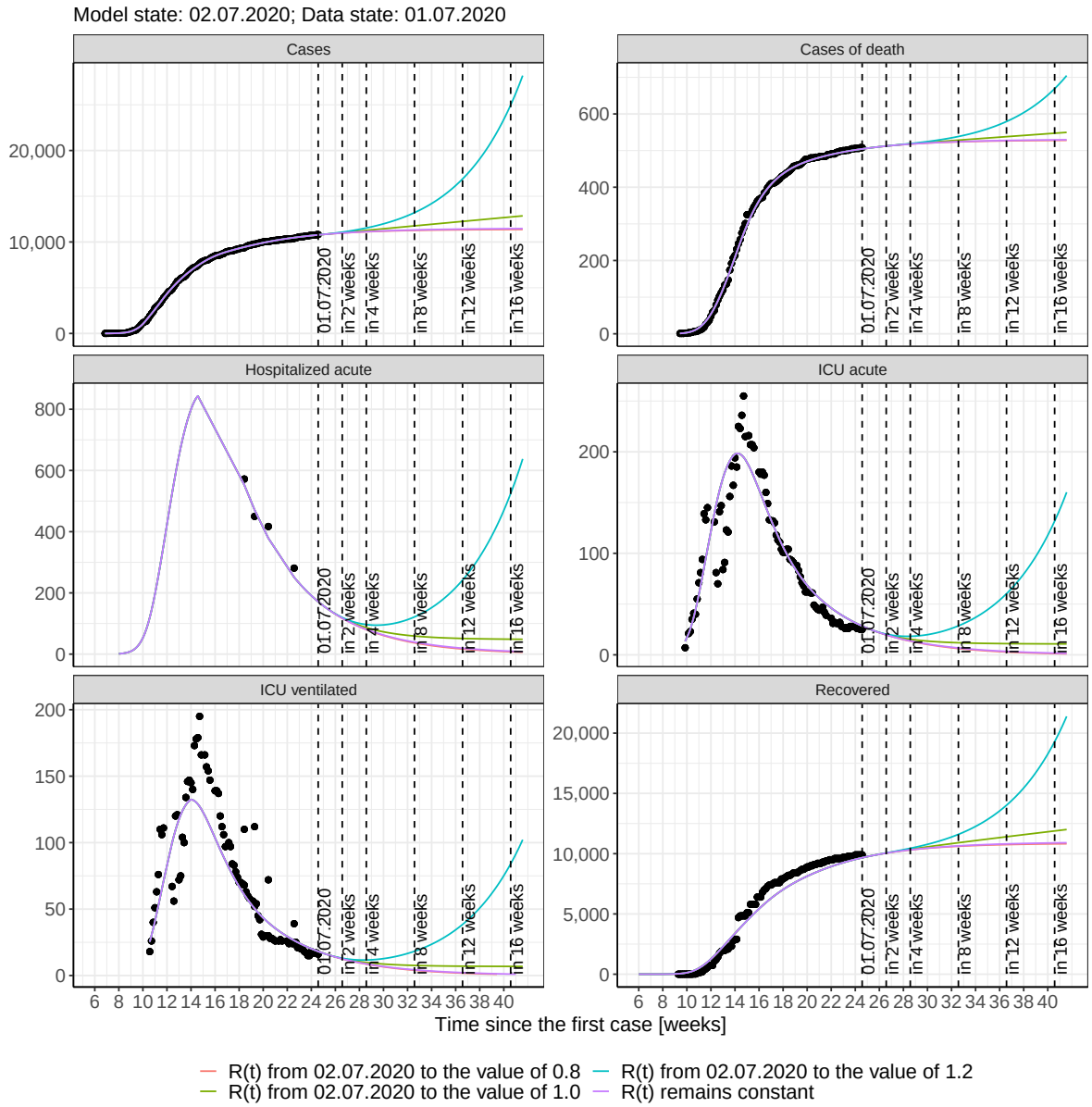


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

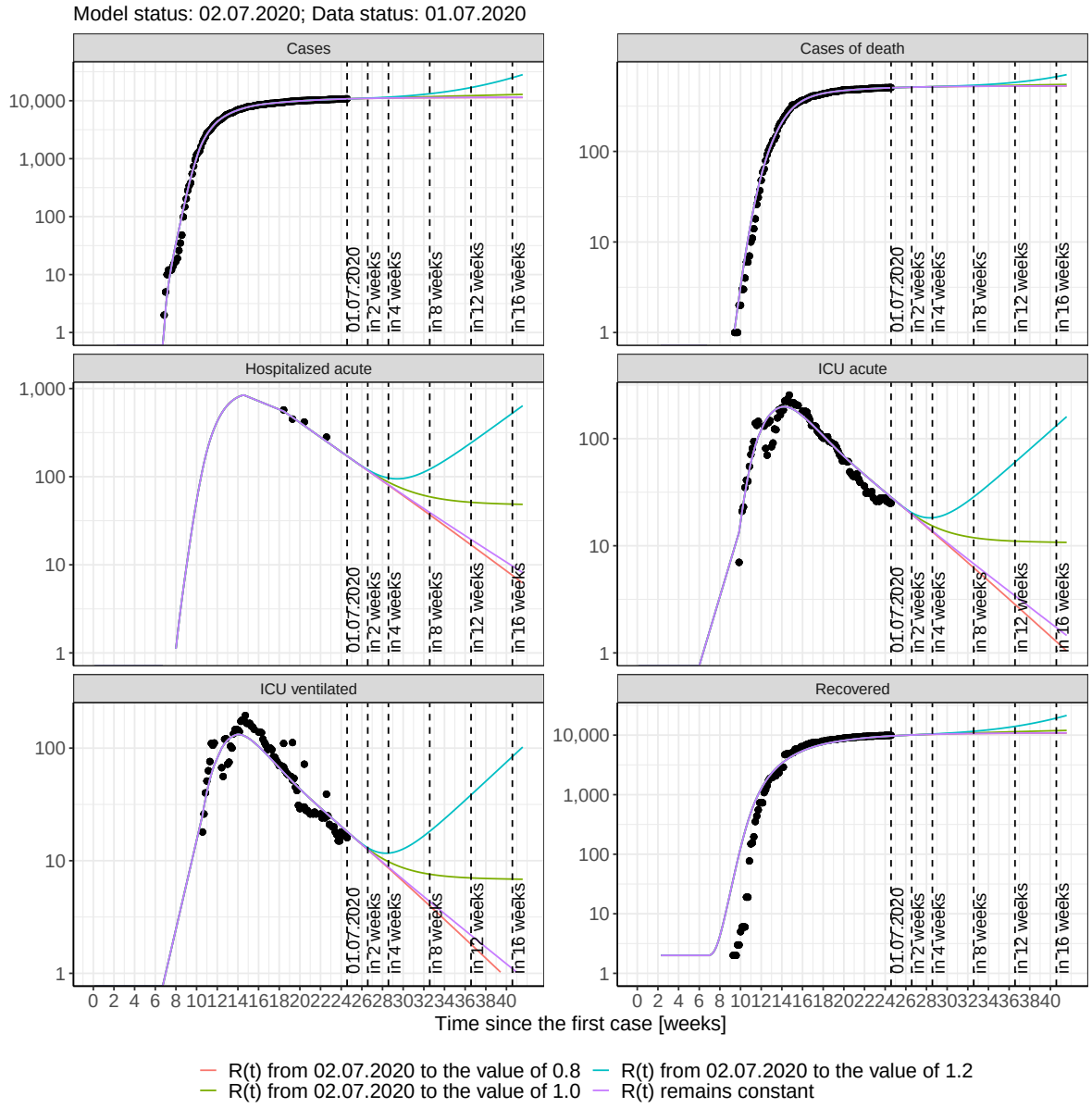


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 29) Model status from 02.07.2020; Data status: 01.07.2020.

Table 26: Hesse - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	10791	505	9696	167	28	18
03.07.2020	10808	506	9728	162	27	17
04.07.2020	10824	506	9758	158	26	17
05.07.2020	10841	507	9788	154	26	16
06.07.2020	10857	508	9817	150	25	16
07.07.2020	10872	508	9845	146	24	15
08.07.2020	10887	509	9873	142	24	15
09.07.2020	10902	509	9900	138	23	15
10.07.2020	10917	510	9926	134	22	14
11.07.2020	10931	510	9952	131	22	14
12.07.2020	10945	511	9977	127	21	14
13.07.2020	10958	511	10001	124	21	13
14.07.2020	10971	512	10025	121	20	13
15.07.2020	10984	512	10048	118	20	13
16.07.2020	10996	513	10071	114	19	12
17.07.2020	11009	513	10093	111	19	12
18.07.2020	11021	514	10115	108	18	12
19.07.2020	11032	514	10136	106	18	11
20.07.2020	11044	515	10156	103	17	11
21.07.2020	11055	515	10176	100	17	11
22.07.2020	11065	515	10196	97	16	10
23.07.2020	11076	516	10215	95	16	10
24.07.2020	11086	516	10234	92	16	10
25.07.2020	11096	516	10252	90	15	10
26.07.2020	11106	517	10270	88	15	9
27.07.2020	11116	517	10287	85	14	9
28.07.2020	11125	517	10304	83	14	9
29.07.2020	11134	518	10320	81	14	9

Table 27: Hesse - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	10790	505	9696	167	28	18
03.07.2020	10807	506	9728	162	27	17
04.07.2020	10824	506	9758	158	26	17
05.07.2020	10840	507	9788	154	26	16
06.07.2020	10856	508	9817	150	25	16
07.07.2020	10871	508	9845	146	24	15
08.07.2020	10886	509	9873	142	24	15
09.07.2020	10900	509	9900	138	23	15
10.07.2020	10914	510	9926	134	22	14
11.07.2020	10927	510	9951	131	22	14
12.07.2020	10941	511	9976	127	21	14
13.07.2020	10953	511	10001	124	21	13
14.07.2020	10966	512	10024	121	20	13
15.07.2020	10978	512	10047	117	20	13
16.07.2020	10989	513	10070	114	19	12
17.07.2020	11001	513	10092	111	19	12
18.07.2020	11012	514	10113	108	18	12
19.07.2020	11023	514	10134	105	18	11
20.07.2020	11033	514	10154	102	17	11
21.07.2020	11043	515	10174	100	17	11
22.07.2020	11053	515	10193	97	16	10
23.07.2020	11063	516	10211	94	16	10
24.07.2020	11072	516	10229	92	15	10
25.07.2020	11081	516	10247	89	15	10
26.07.2020	11090	517	10264	87	15	9
27.07.2020	11098	517	10281	85	14	9
28.07.2020	11107	517	10297	82	14	9
29.07.2020	11115	518	10313	80	13	9

Table 28: Hesse - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	10791	505	9696	167	28	18
03.07.2020	10808	506	9728	162	27	17
04.07.2020	10826	506	9758	158	26	17
05.07.2020	10844	507	9788	154	26	16
06.07.2020	10862	508	9817	150	25	16
07.07.2020	10880	508	9846	146	24	16
08.07.2020	10897	509	9873	142	24	15
09.07.2020	10915	509	9901	138	23	15
10.07.2020	10933	510	9927	135	23	14
11.07.2020	10950	510	9954	131	22	14
12.07.2020	10968	511	9979	128	21	14
13.07.2020	10986	511	10005	125	21	13
14.07.2020	11004	512	10030	121	20	13
15.07.2020	11021	512	10054	118	20	13
16.07.2020	11039	513	10078	116	20	12
17.07.2020	11057	513	10102	113	19	12
18.07.2020	11074	514	10125	110	19	12
19.07.2020	11092	514	10148	107	18	12
20.07.2020	11110	515	10171	105	18	11
21.07.2020	11128	515	10194	103	18	11
22.07.2020	11145	515	10216	100	17	11
23.07.2020	11163	516	10238	98	17	11
24.07.2020	11181	516	10260	96	17	11
25.07.2020	11198	517	10282	94	16	10
26.07.2020	11216	517	10303	92	16	10
27.07.2020	11234	518	10324	90	16	10
28.07.2020	11251	518	10345	88	16	10
29.07.2020	11269	518	10366	87	15	10

Table 29: Hesse - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	10791	505	9696	167	28	18
03.07.2020	10810	506	9728	162	27	17
04.07.2020	10829	506	9758	158	26	17
05.07.2020	10848	507	9788	154	26	16
06.07.2020	10868	508	9817	150	25	16
07.07.2020	10889	508	9846	146	24	16
08.07.2020	10911	509	9874	142	24	15
09.07.2020	10933	509	9902	138	23	15
10.07.2020	10955	510	9929	135	23	14
11.07.2020	10978	510	9956	132	22	14
12.07.2020	11002	511	9983	128	22	14
13.07.2020	11027	511	10009	125	21	14
14.07.2020	11052	512	10036	122	21	13
15.07.2020	11078	512	10062	120	20	13
16.07.2020	11105	513	10088	117	20	13
17.07.2020	11133	513	10114	115	20	13
18.07.2020	11161	514	10141	112	19	12
19.07.2020	11190	514	10167	110	19	12
20.07.2020	11220	515	10194	108	19	12
21.07.2020	11251	515	10220	106	19	12
22.07.2020	11283	516	10247	105	19	12
23.07.2020	11315	516	10275	103	18	12
24.07.2020	11349	517	10302	102	18	12
25.07.2020	11383	517	10330	100	18	12
26.07.2020	11419	518	10358	99	18	12
27.07.2020	11455	518	10387	98	18	12
28.07.2020	11493	519	10416	97	18	12
29.07.2020	11532	519	10446	97	18	12

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

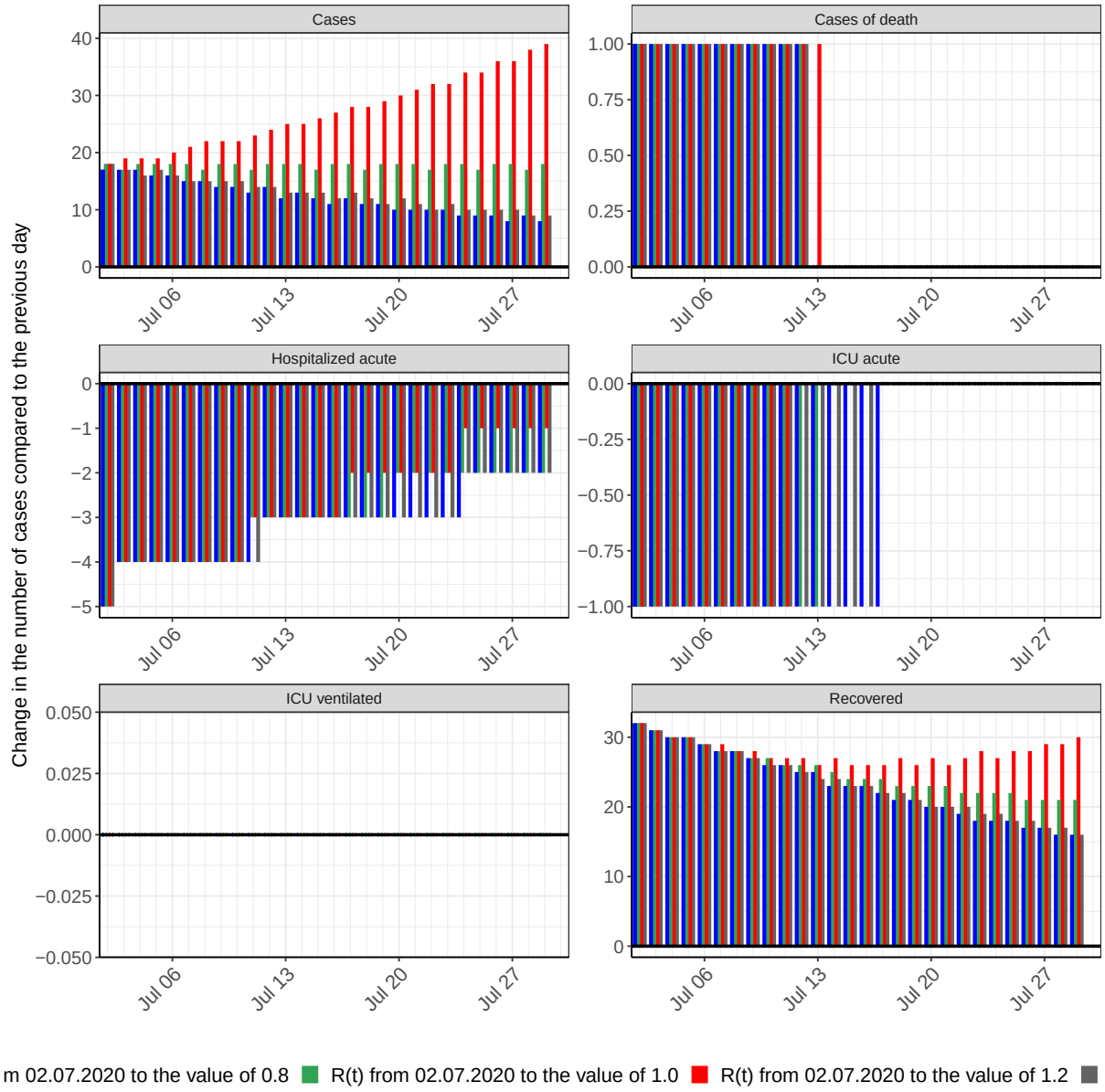


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

9 Mecklenburg-Vorpommern

9.1 Model description

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

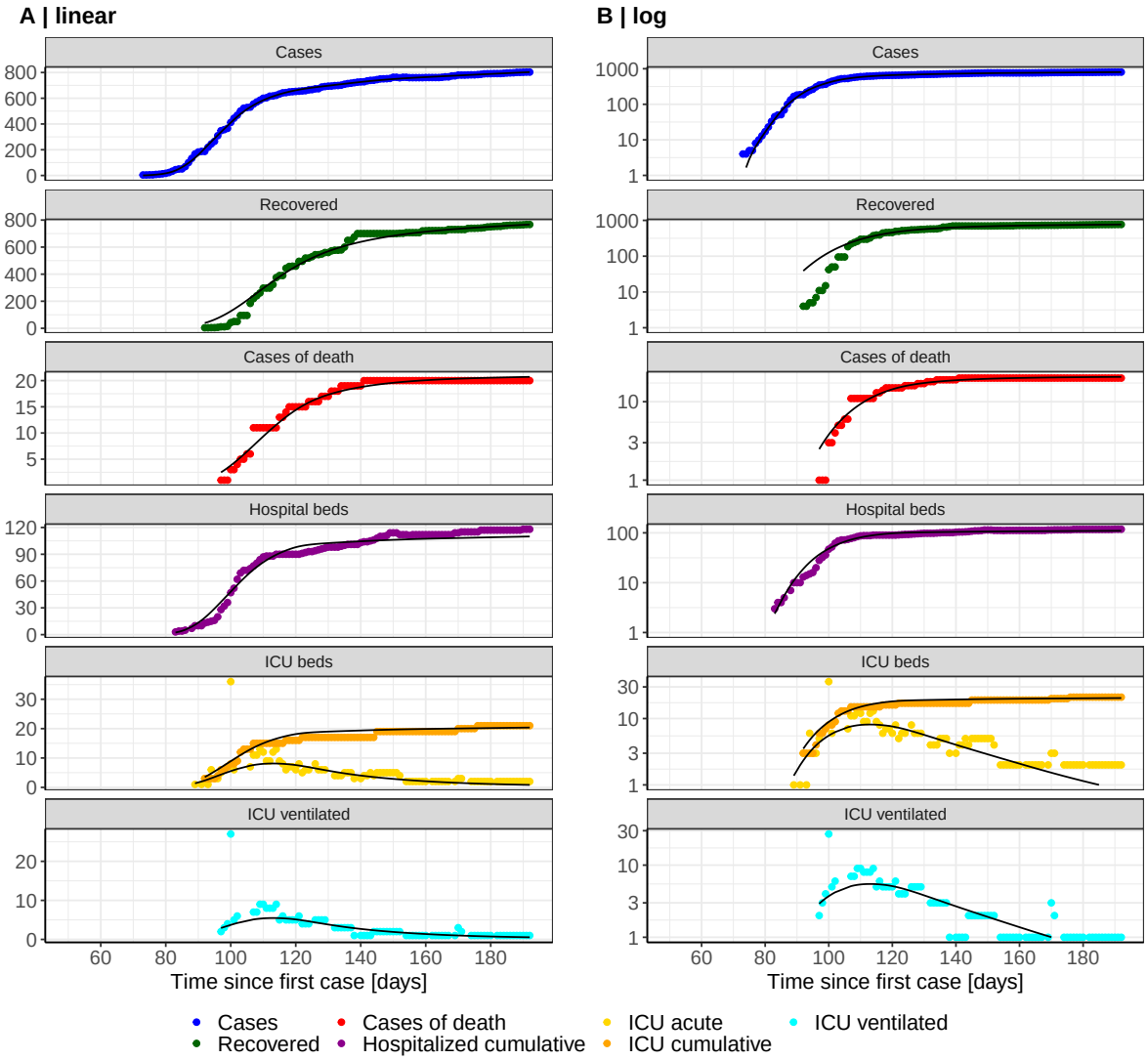


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

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

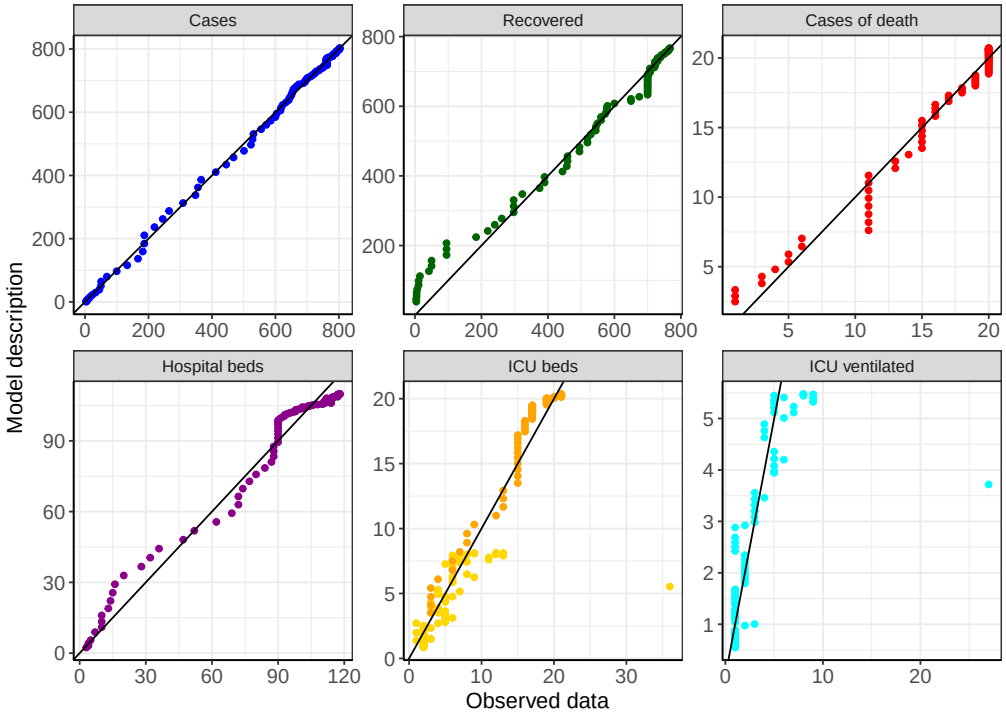


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

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

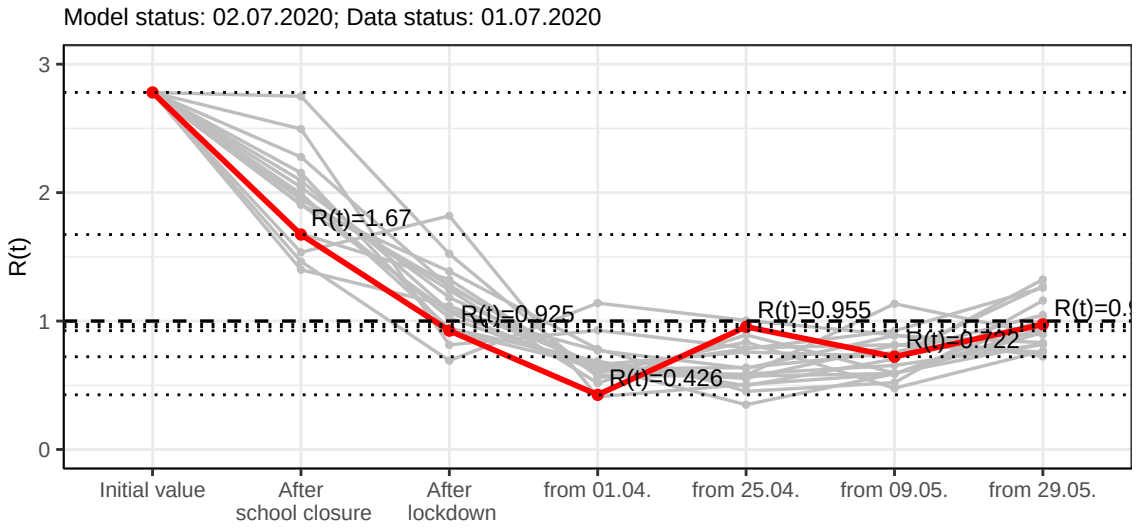


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

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

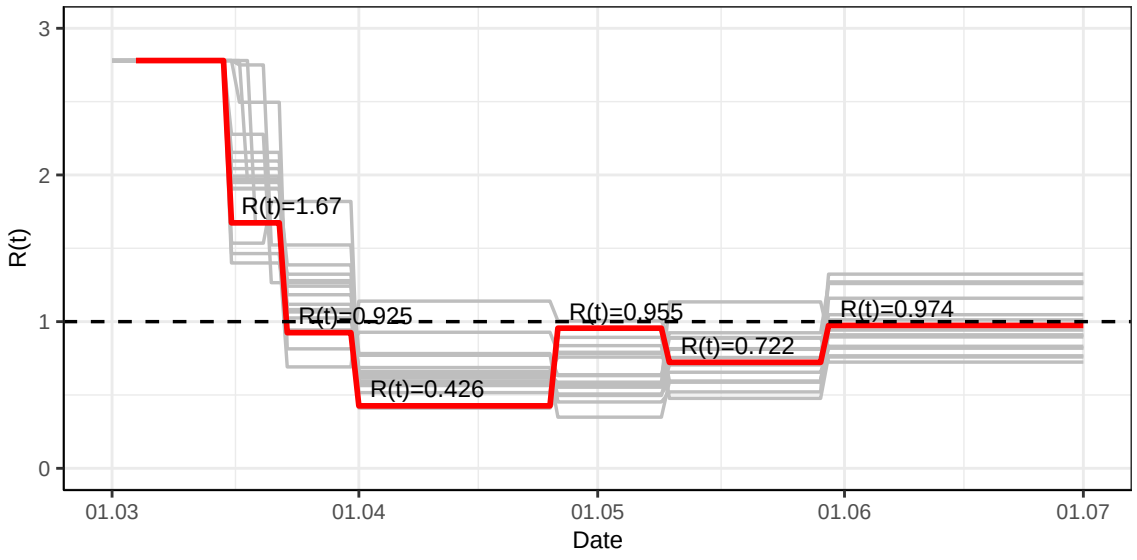


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

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

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.

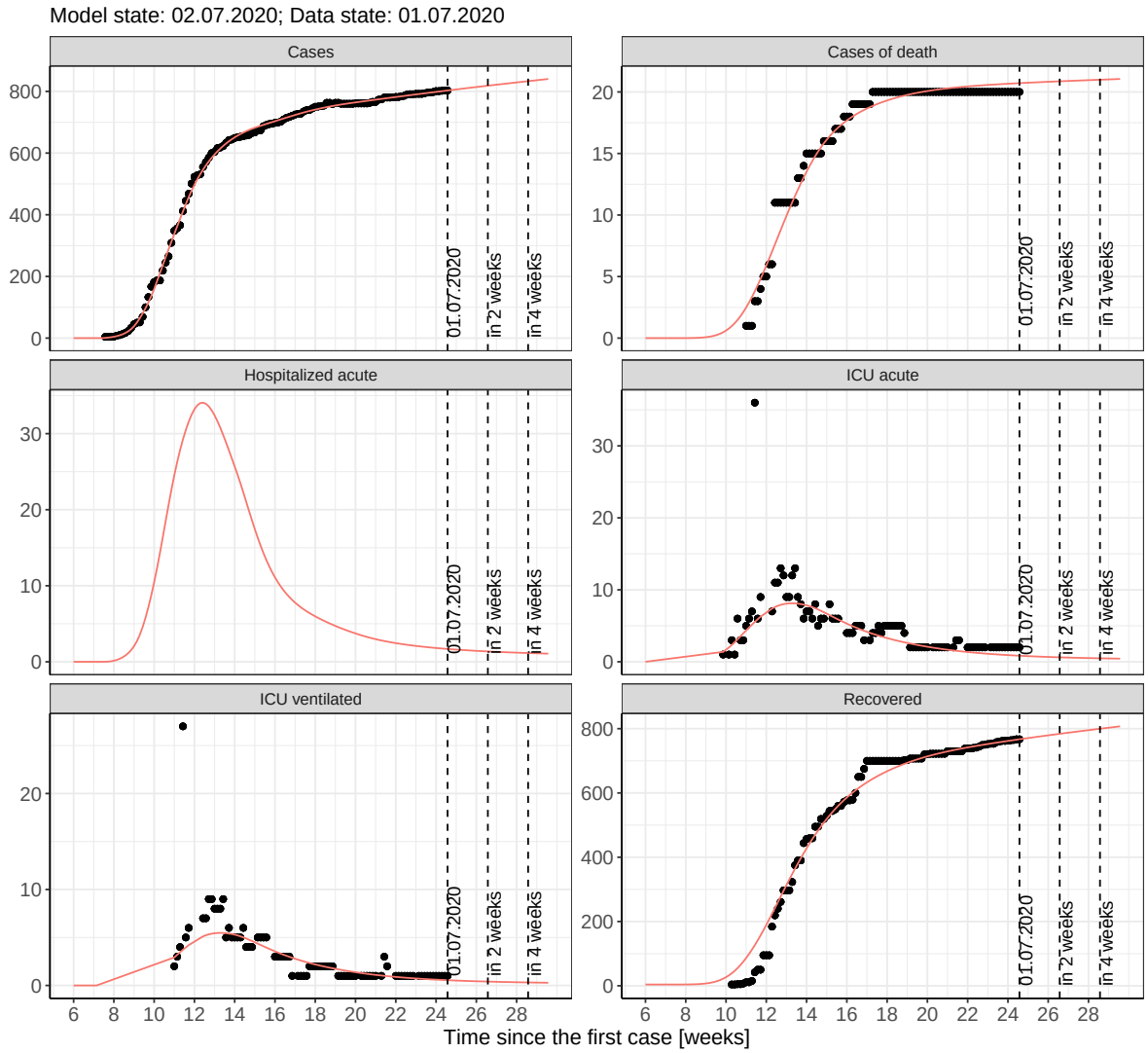


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

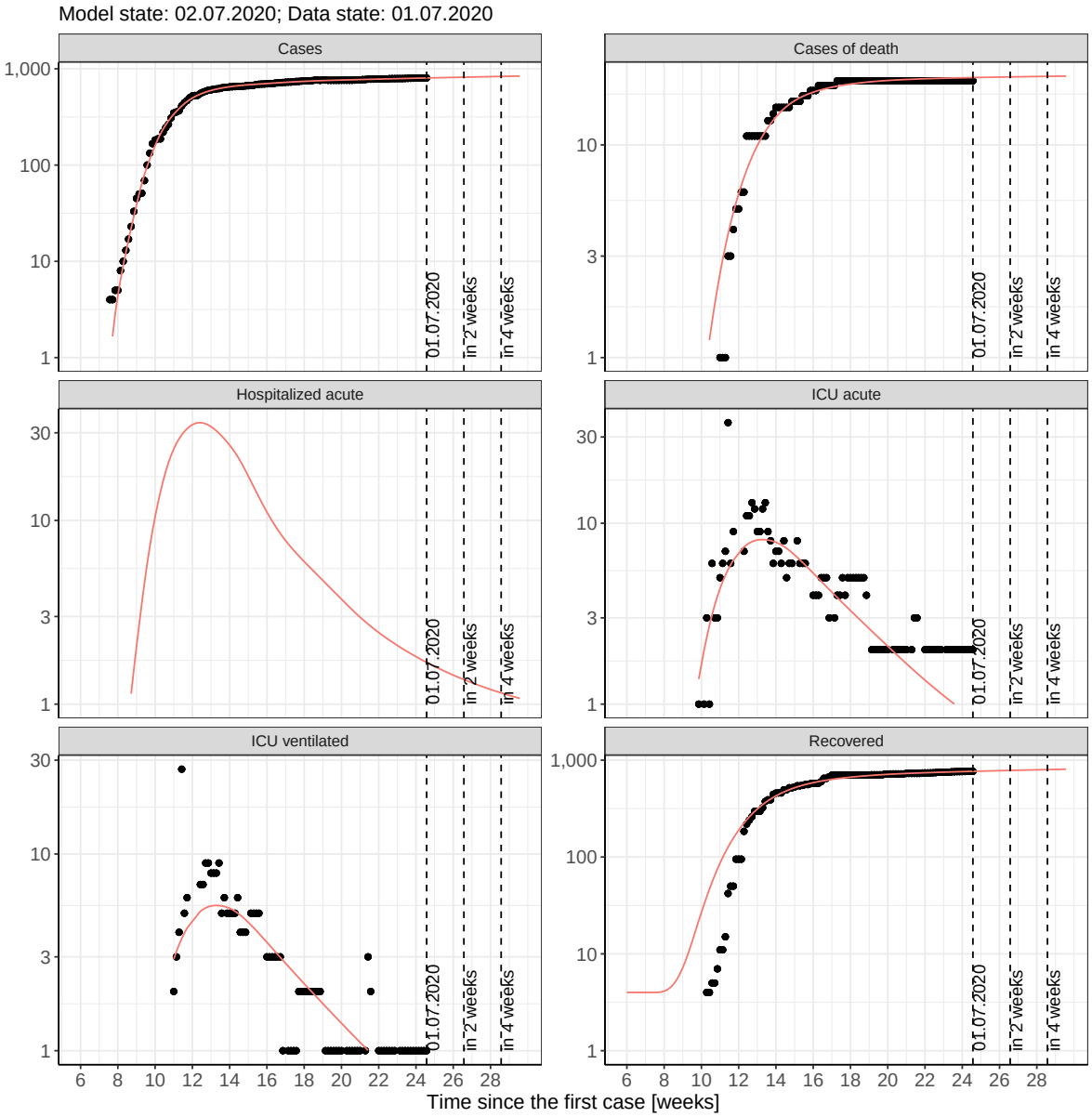


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

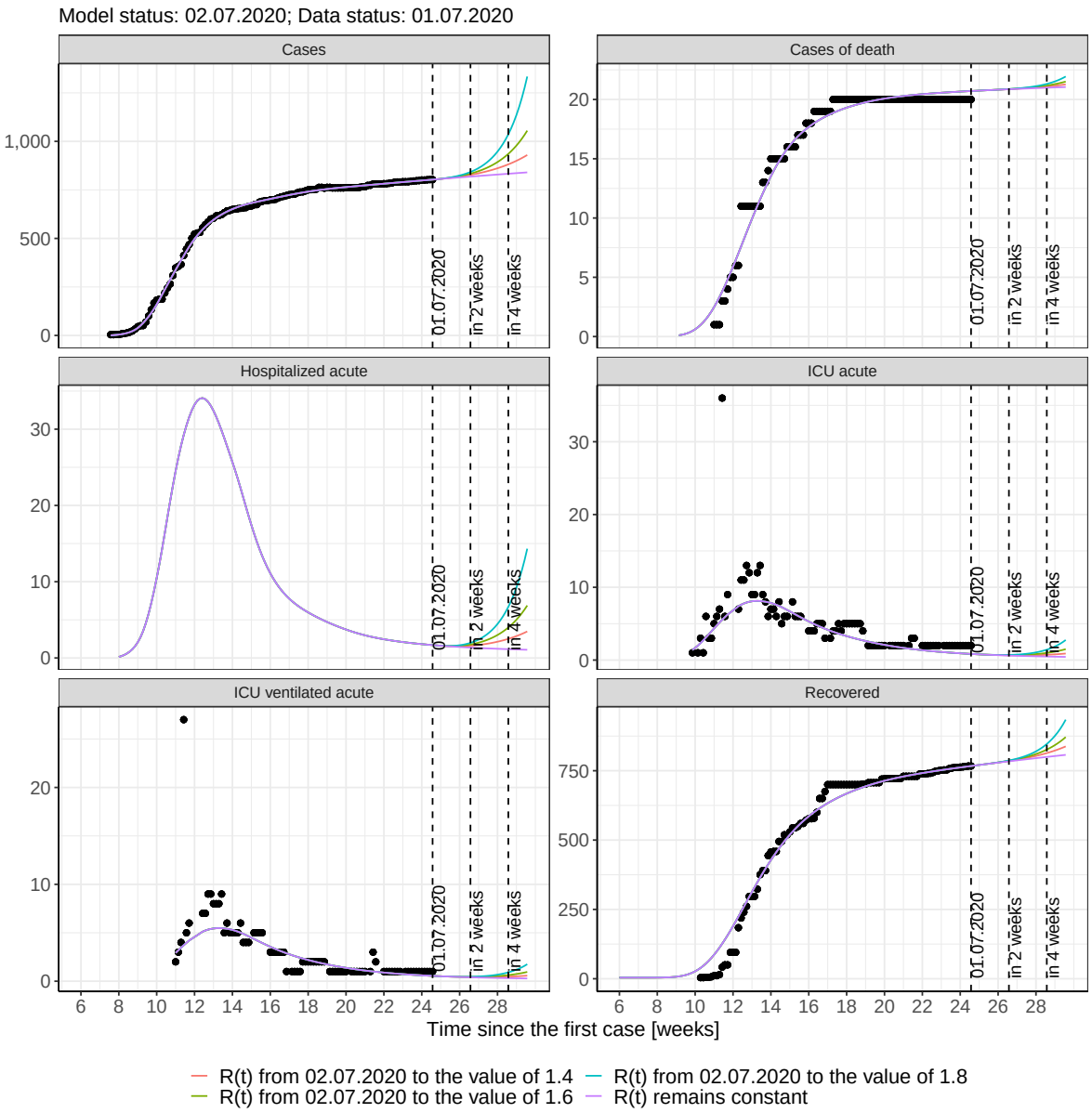


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

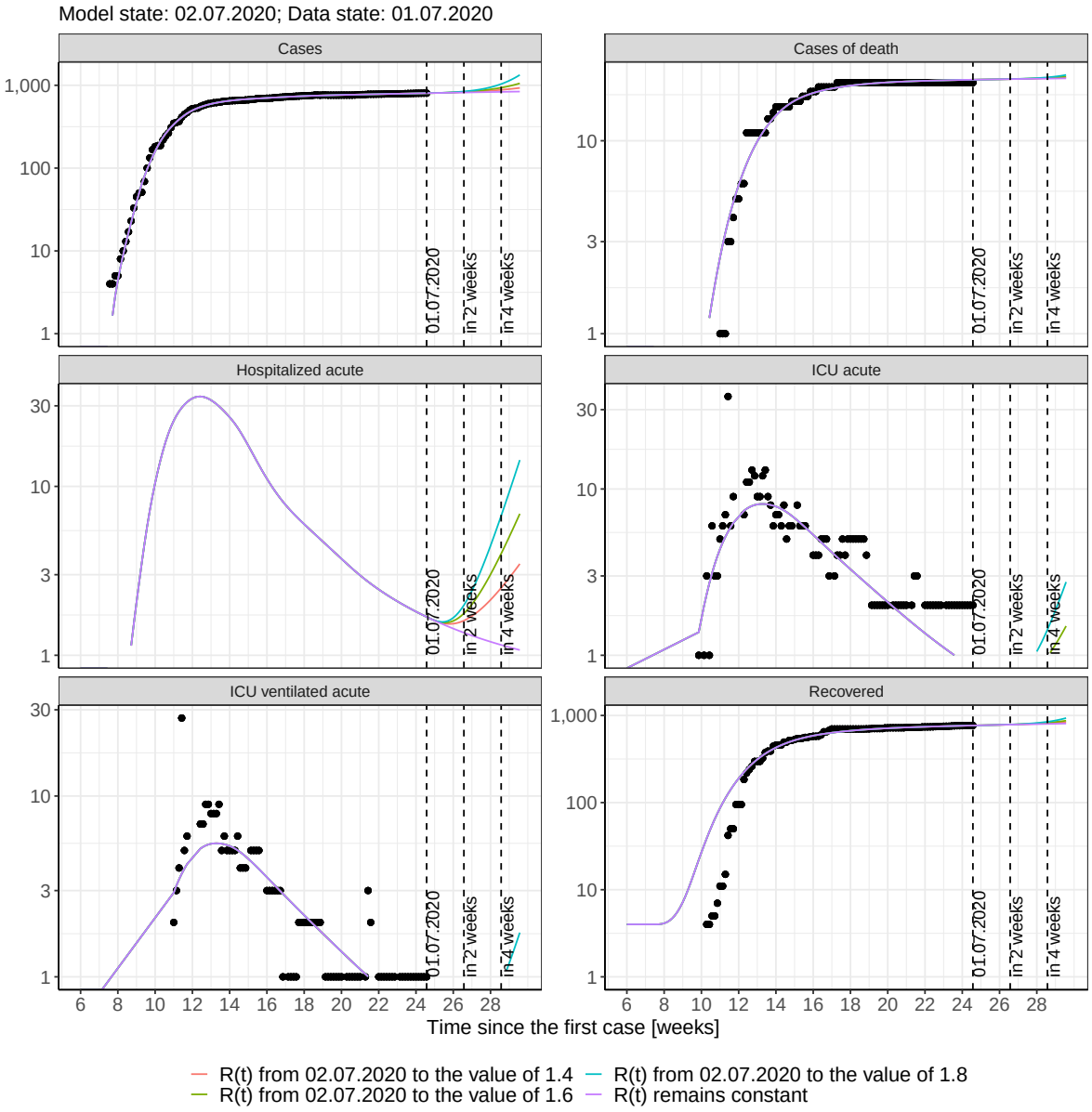


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

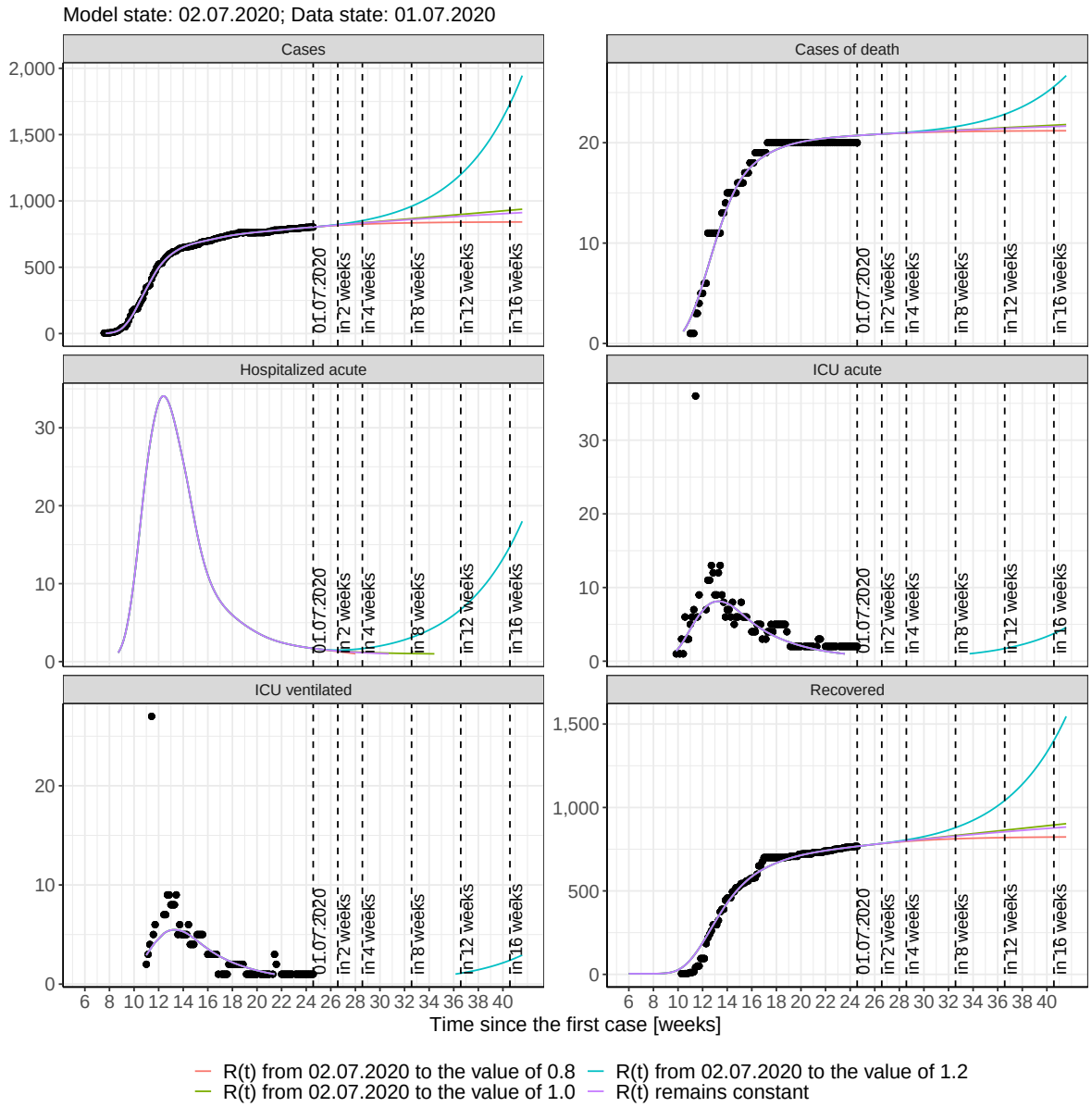


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

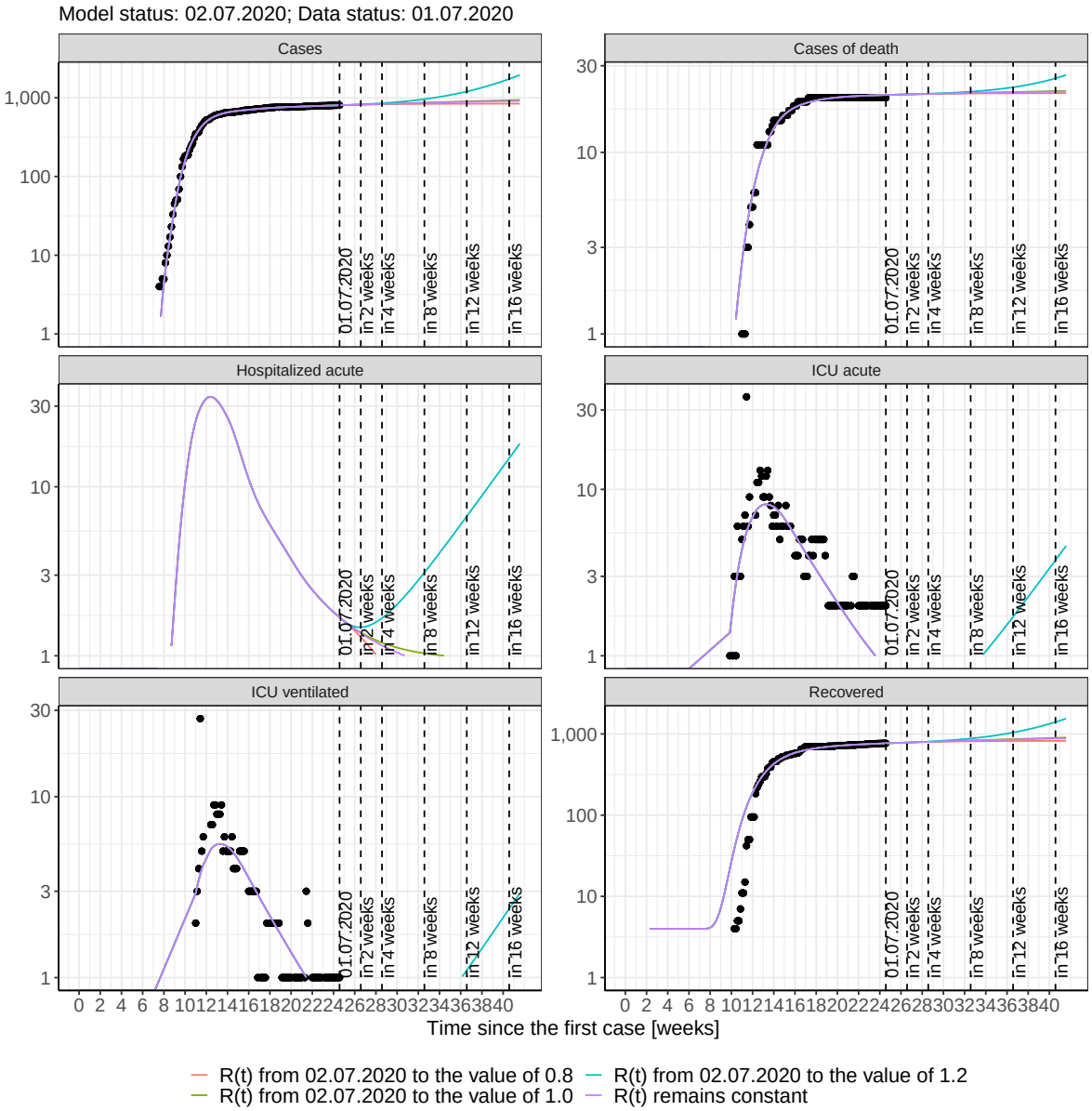


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 33) Model status from 02.07.2020; Data status: 01.07.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	804	21	768	2	1	1
03.07.2020	805	21	770	2	1	1
04.07.2020	806	21	771	2	1	1
05.07.2020	808	21	772	2	1	0
06.07.2020	809	21	773	2	1	0
07.07.2020	810	21	774	2	1	0
08.07.2020	811	21	776	2	1	0
09.07.2020	812	21	777	1	1	0
10.07.2020	813	21	778	1	1	0
11.07.2020	814	21	779	1	1	0
12.07.2020	815	21	780	1	1	0
13.07.2020	816	21	782	1	1	0
14.07.2020	817	21	783	1	1	0
15.07.2020	818	21	784	1	1	0
16.07.2020	820	21	785	1	1	0
17.07.2020	821	21	786	1	1	0
18.07.2020	822	21	787	1	1	0
19.07.2020	823	21	789	1	1	0
20.07.2020	824	21	790	1	1	0
21.07.2020	825	21	791	1	1	0
22.07.2020	826	21	792	1	1	0
23.07.2020	827	21	793	1	1	0
24.07.2020	828	21	794	1	1	0
25.07.2020	829	21	795	1	1	0
26.07.2020	830	21	796	1	1	0
27.07.2020	831	21	798	1	1	0
28.07.2020	832	21	799	1	0	0
29.07.2020	833	21	800	1	0	0

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	804	21	768	2	1	1
03.07.2020	805	21	770	2	1	1
04.07.2020	806	21	771	2	1	1
05.07.2020	807	21	772	2	1	0
06.07.2020	808	21	773	2	1	0
07.07.2020	809	21	774	2	1	0
08.07.2020	810	21	776	1	1	0
09.07.2020	811	21	777	1	1	0
10.07.2020	812	21	778	1	1	0
11.07.2020	813	21	779	1	1	0
12.07.2020	814	21	780	1	1	0
13.07.2020	815	21	781	1	1	0
14.07.2020	815	21	782	1	1	0
15.07.2020	816	21	784	1	1	0
16.07.2020	817	21	785	1	1	0
17.07.2020	818	21	786	1	1	0
18.07.2020	818	21	787	1	1	0
19.07.2020	819	21	788	1	1	0
20.07.2020	820	21	789	1	1	0
21.07.2020	820	21	790	1	1	0
22.07.2020	821	21	791	1	1	0
23.07.2020	822	21	792	1	1	0
24.07.2020	822	21	792	1	0	0
25.07.2020	823	21	793	1	0	0
26.07.2020	823	21	794	1	0	0
27.07.2020	824	21	795	1	0	0
28.07.2020	824	21	796	1	0	0
29.07.2020	825	21	797	1	0	0

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	804	21	768	2	1	1
03.07.2020	805	21	770	2	1	1
04.07.2020	806	21	771	2	1	1
05.07.2020	808	21	772	2	1	0
06.07.2020	809	21	773	2	1	0
07.07.2020	810	21	774	2	1	0
08.07.2020	811	21	776	2	1	0
09.07.2020	812	21	777	1	1	0
10.07.2020	813	21	778	1	1	0
11.07.2020	814	21	779	1	1	0
12.07.2020	815	21	780	1	1	0
13.07.2020	817	21	782	1	1	0
14.07.2020	818	21	783	1	1	0
15.07.2020	819	21	784	1	1	0
16.07.2020	820	21	785	1	1	0
17.07.2020	821	21	786	1	1	0
18.07.2020	822	21	788	1	1	0
19.07.2020	823	21	789	1	1	0
20.07.2020	825	21	790	1	1	0
21.07.2020	826	21	791	1	1	0
22.07.2020	827	21	792	1	1	0
23.07.2020	828	21	793	1	1	0
24.07.2020	829	21	795	1	1	0
25.07.2020	830	21	796	1	1	0
26.07.2020	831	21	797	1	1	0
27.07.2020	833	21	798	1	1	0
28.07.2020	834	21	799	1	1	0
29.07.2020	835	21	800	1	0	0

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	804	21	768	2	1	1
03.07.2020	805	21	770	2	1	1
04.07.2020	807	21	771	2	1	1
05.07.2020	808	21	772	2	1	0
06.07.2020	809	21	773	2	1	0
07.07.2020	810	21	774	2	1	0
08.07.2020	812	21	776	2	1	0
09.07.2020	813	21	777	2	1	0
10.07.2020	815	21	778	1	1	0
11.07.2020	816	21	779	1	1	0
12.07.2020	818	21	781	1	1	0
13.07.2020	819	21	782	1	1	0
14.07.2020	821	21	783	1	1	0
15.07.2020	823	21	785	1	1	0
16.07.2020	824	21	786	1	1	0
17.07.2020	826	21	787	1	1	0
18.07.2020	828	21	789	1	1	0
19.07.2020	830	21	790	1	1	0
20.07.2020	832	21	791	2	1	0
21.07.2020	834	21	793	2	1	0
22.07.2020	836	21	794	2	1	0
23.07.2020	838	21	796	2	1	0
24.07.2020	840	21	797	2	1	0
25.07.2020	842	21	799	2	1	0
26.07.2020	844	21	801	2	1	0
27.07.2020	847	21	802	2	1	0
28.07.2020	849	21	804	2	1	0
29.07.2020	852	21	806	2	1	0

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

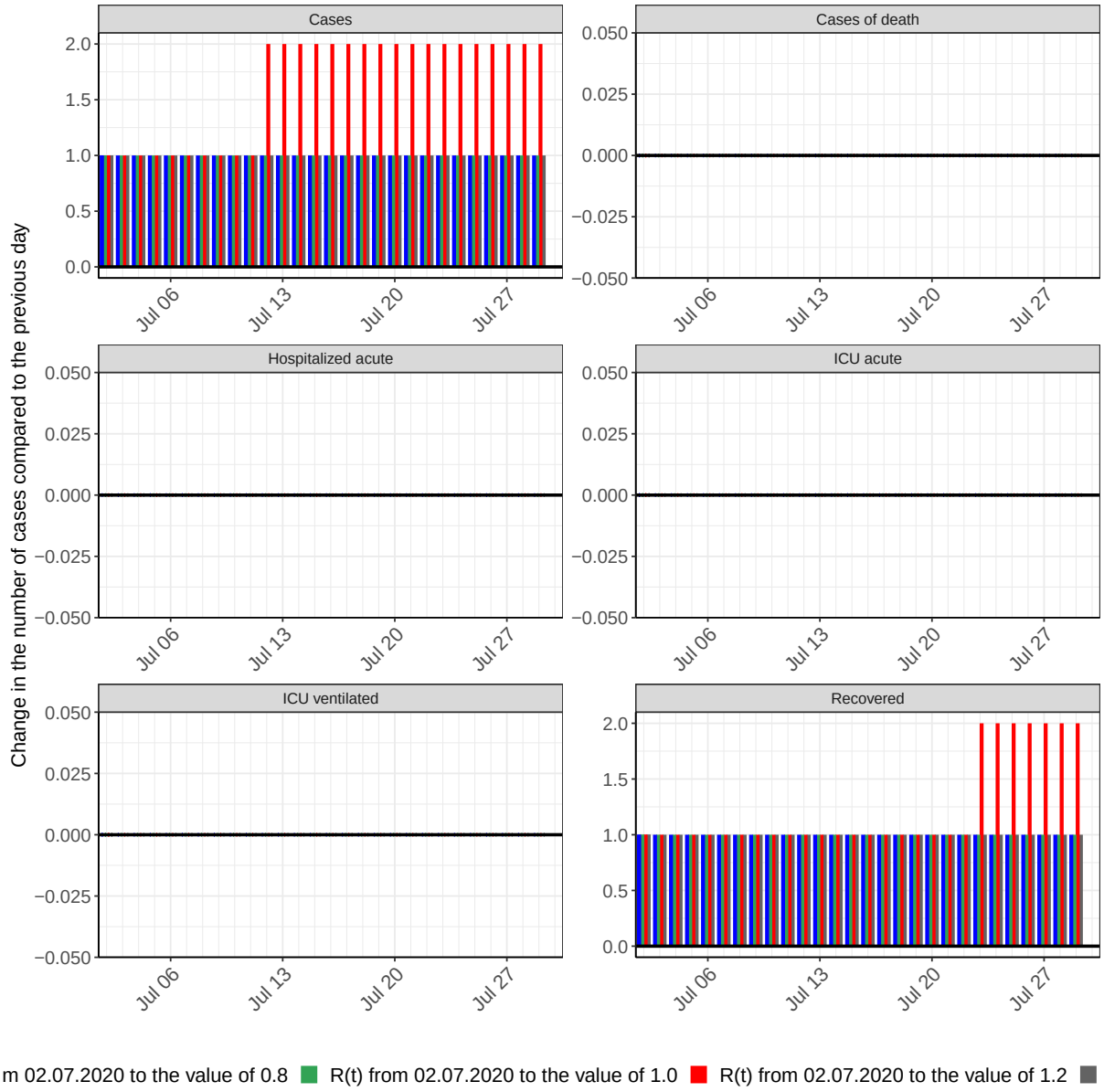


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

10 Lower Saxony

10.1 Model description

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

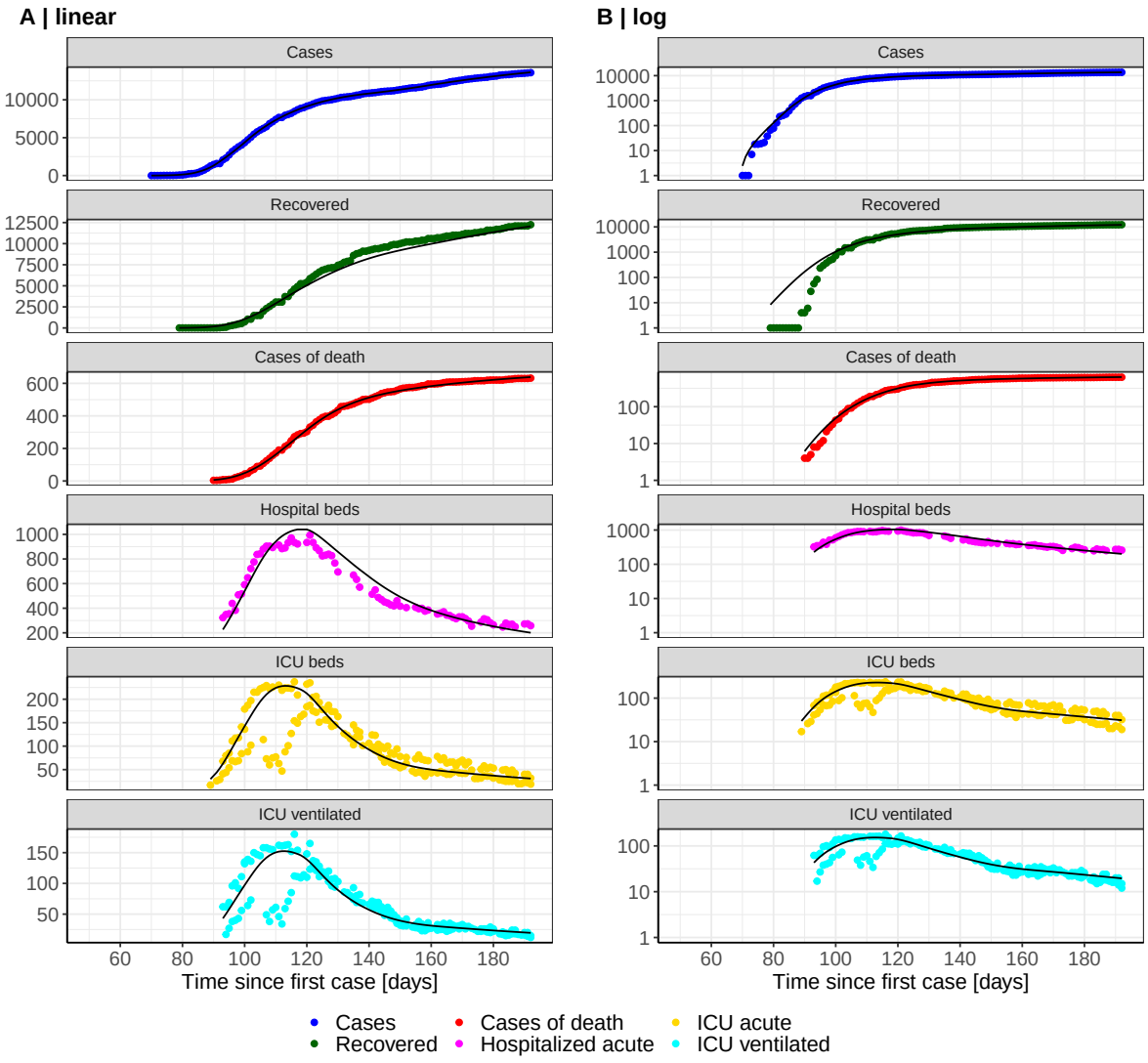


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

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

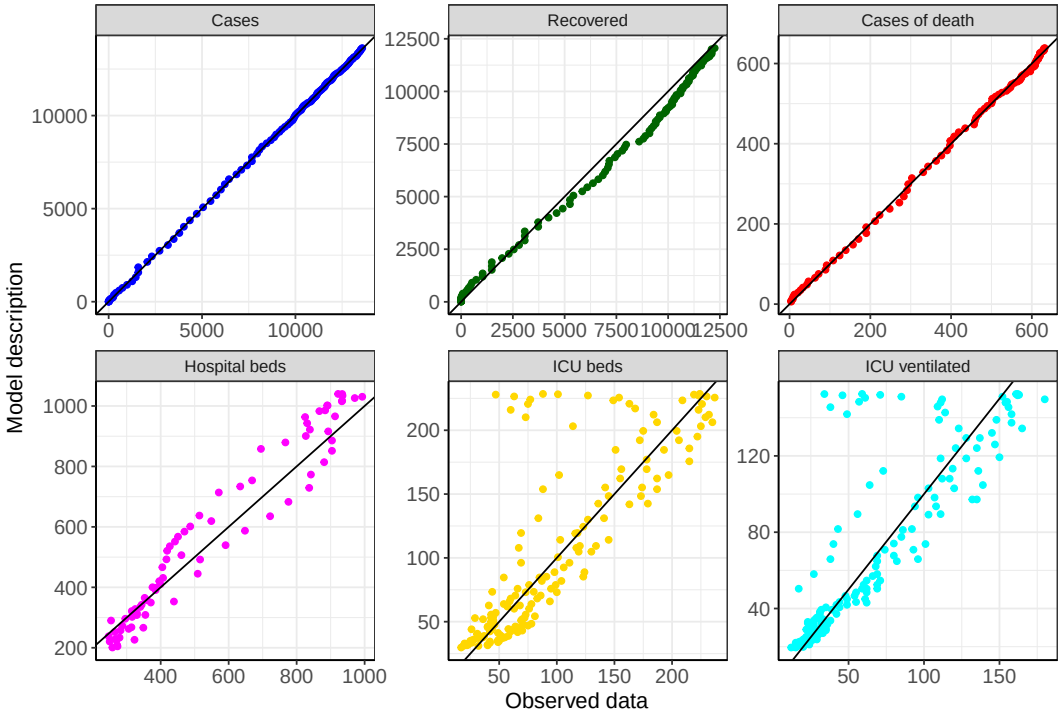


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

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

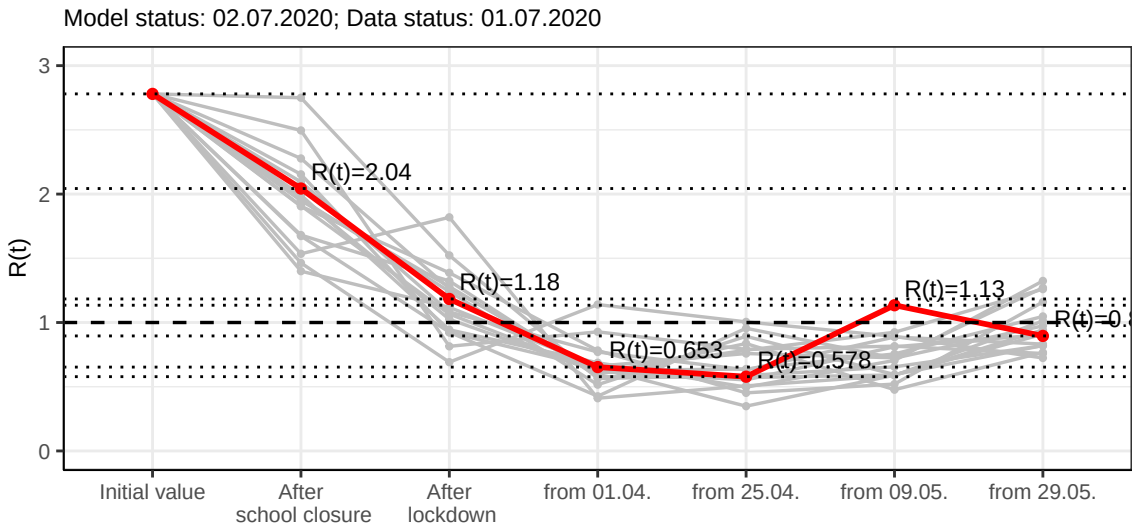


Figure 101: R(t) values before and after the NPIs for Lower Saxony

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

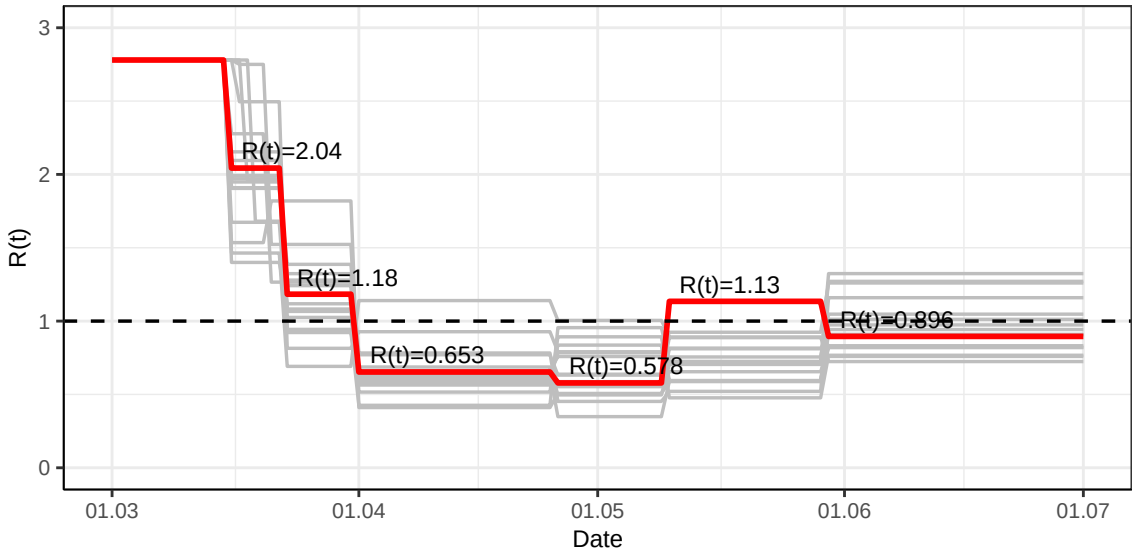


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

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

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.

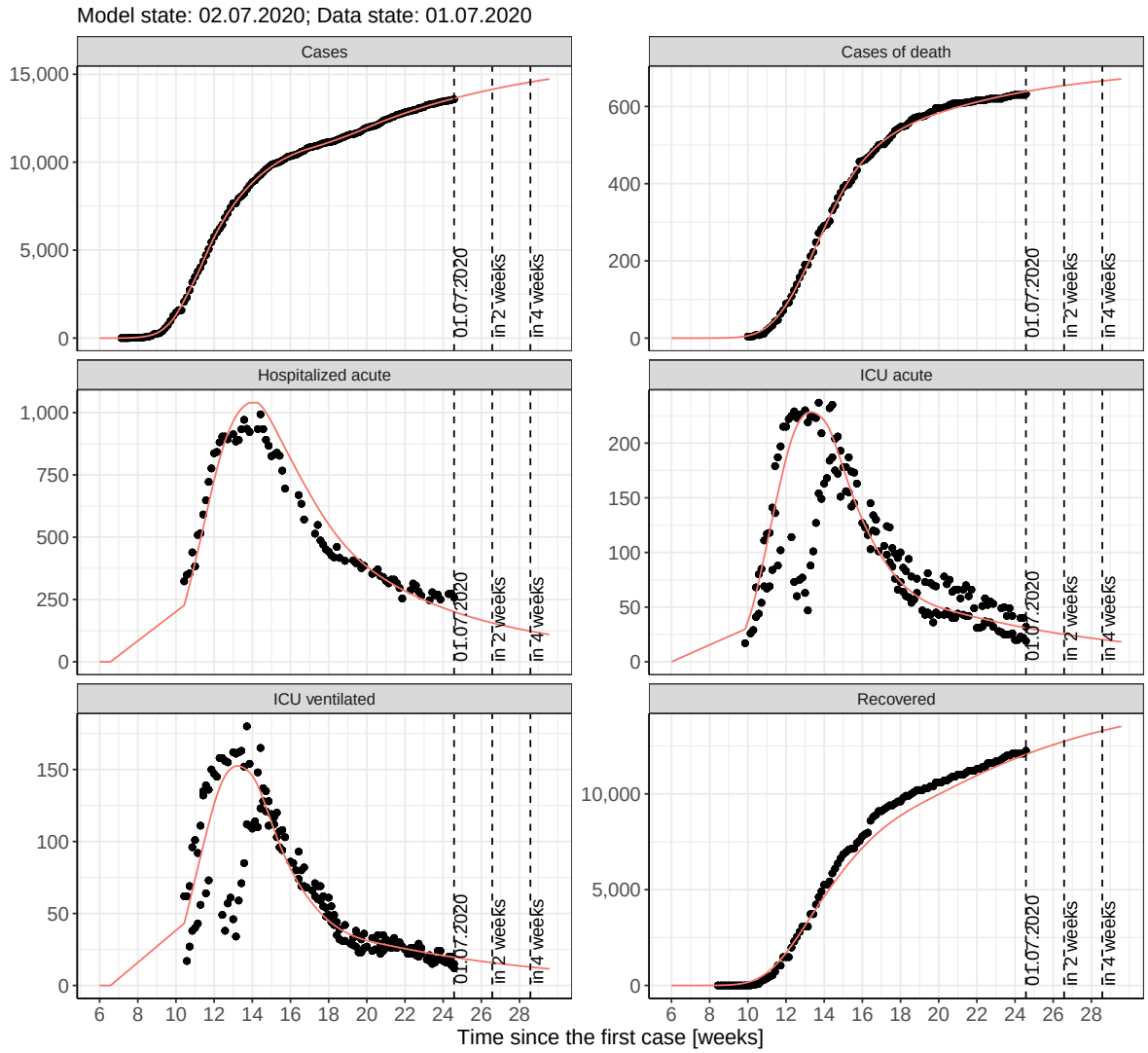


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

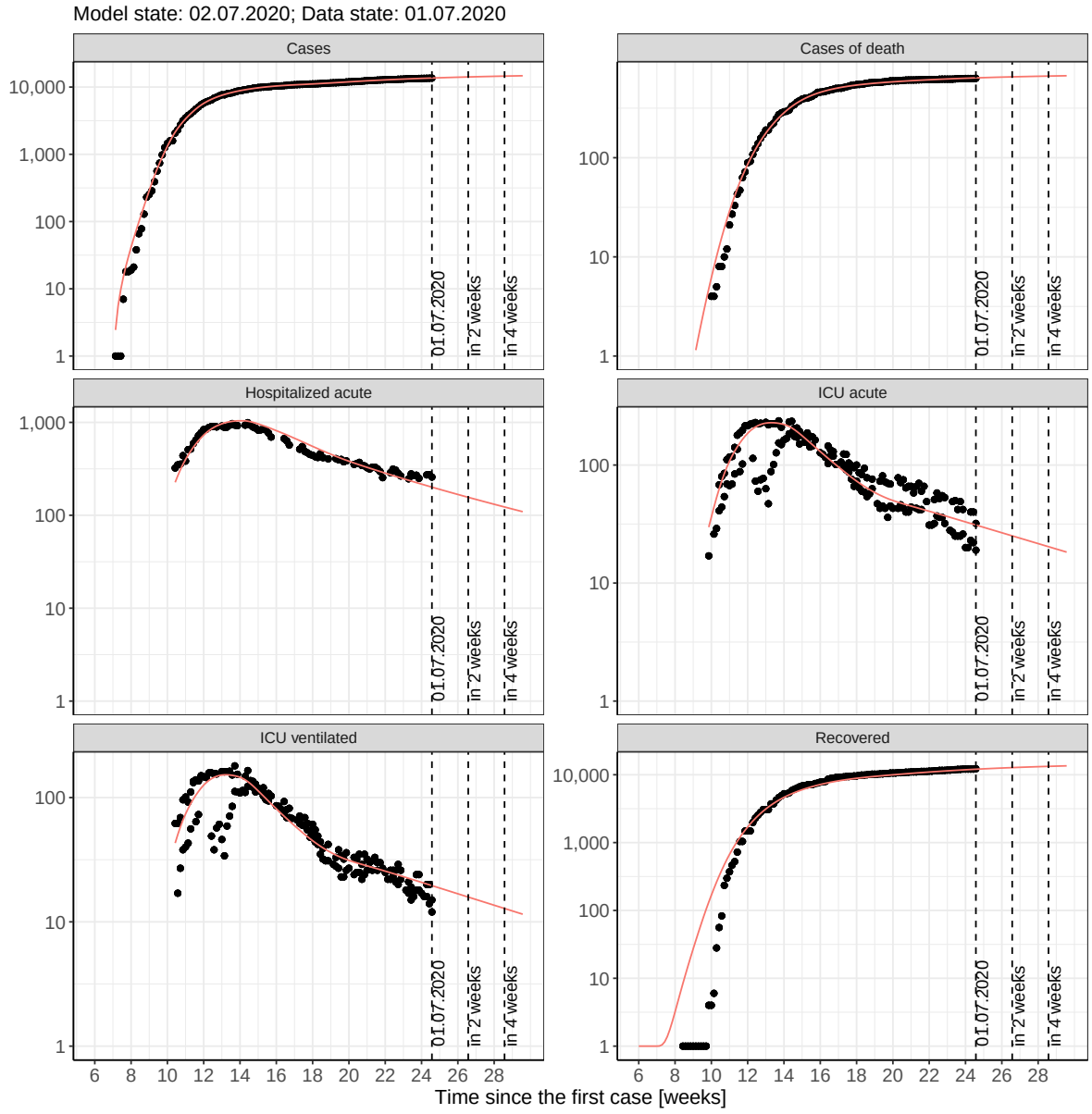


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

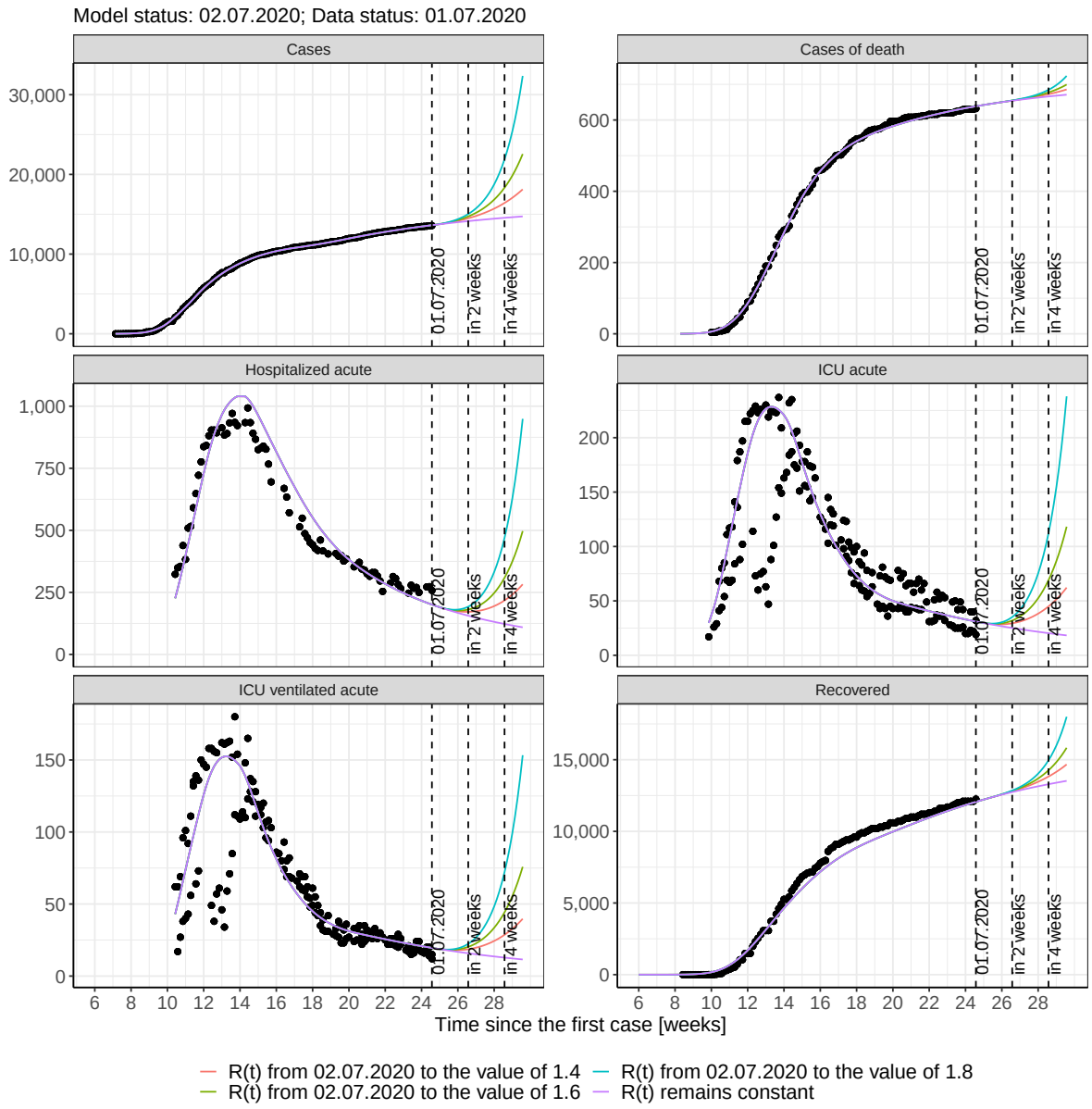


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

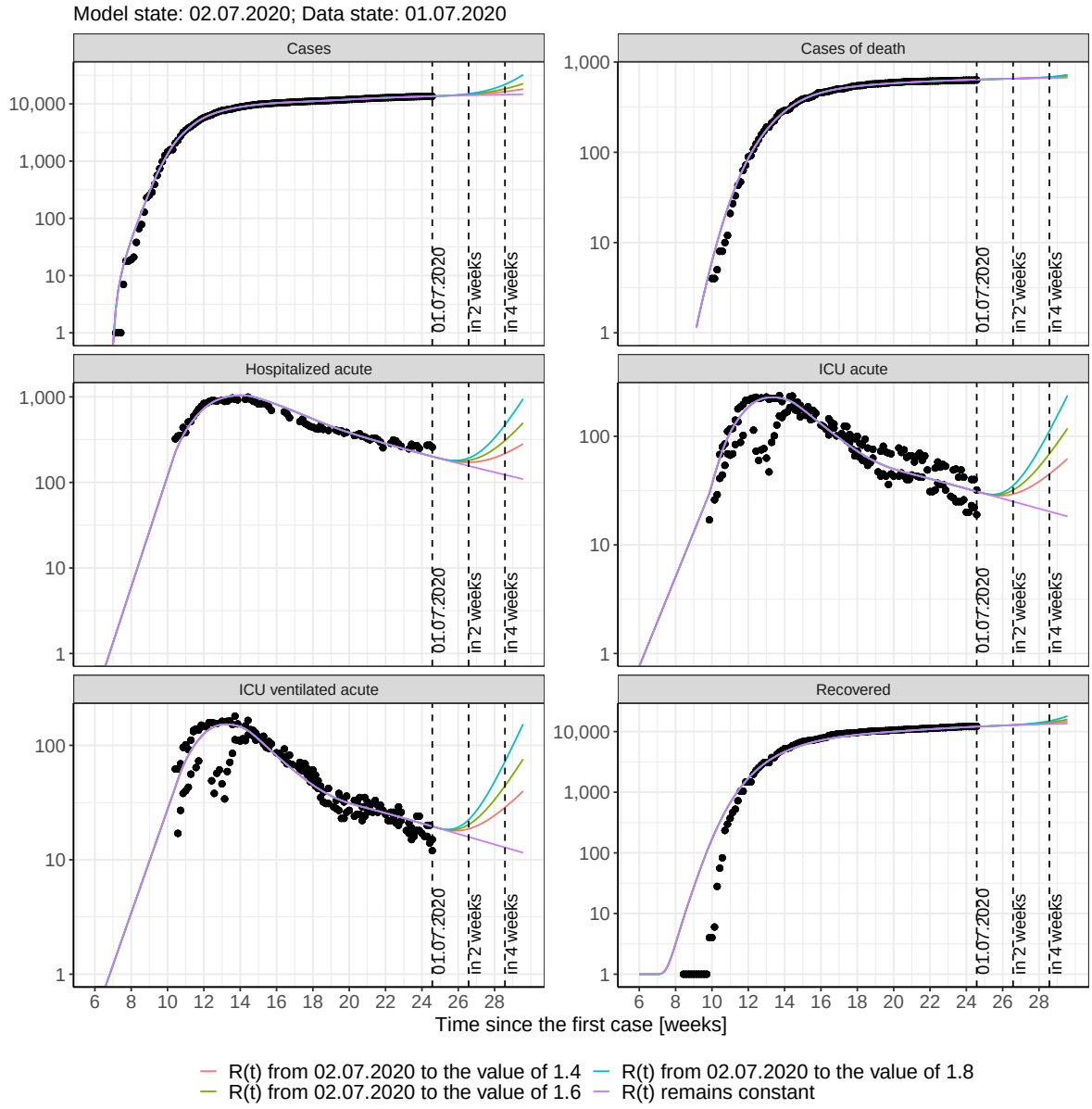


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

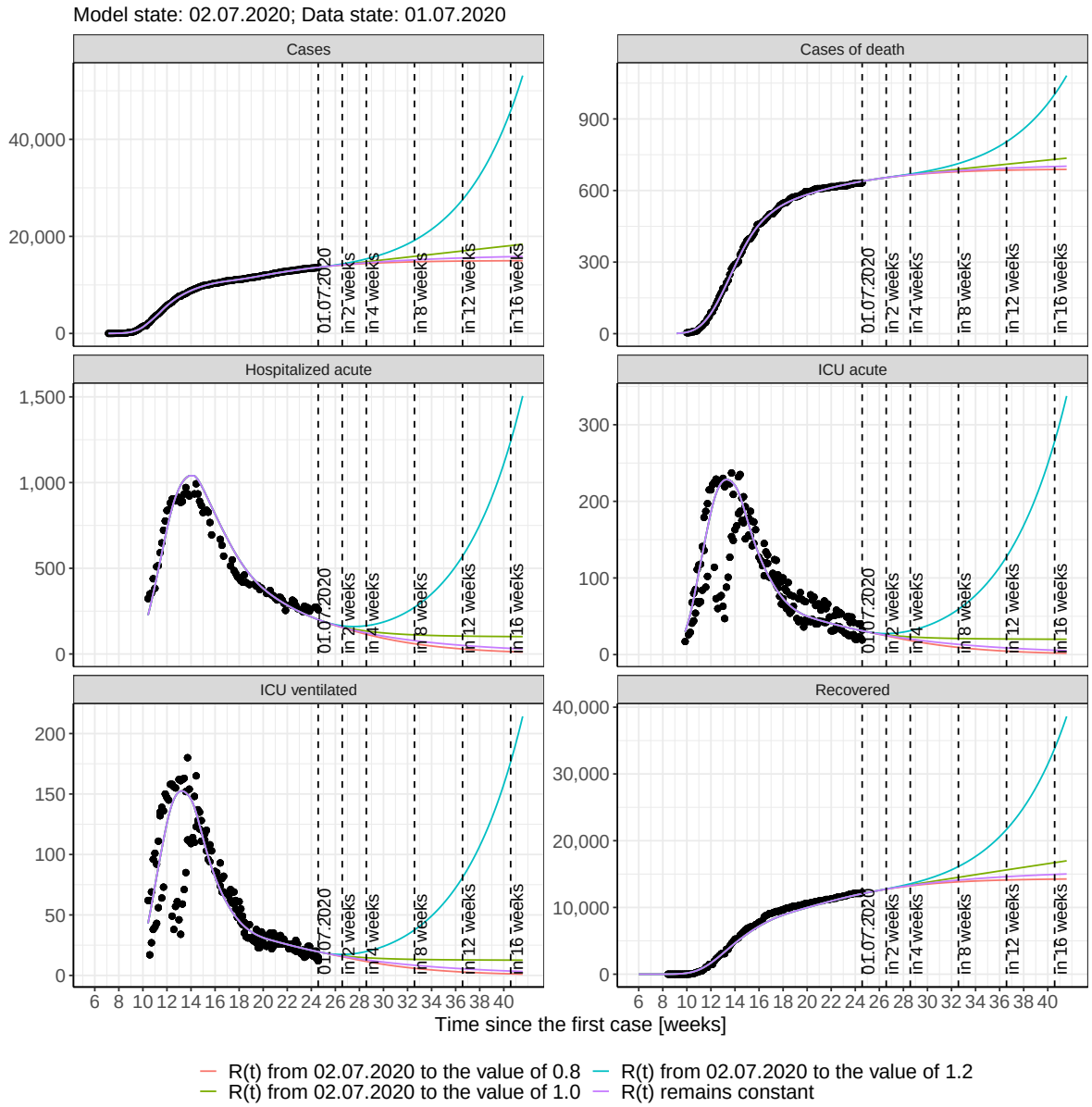


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

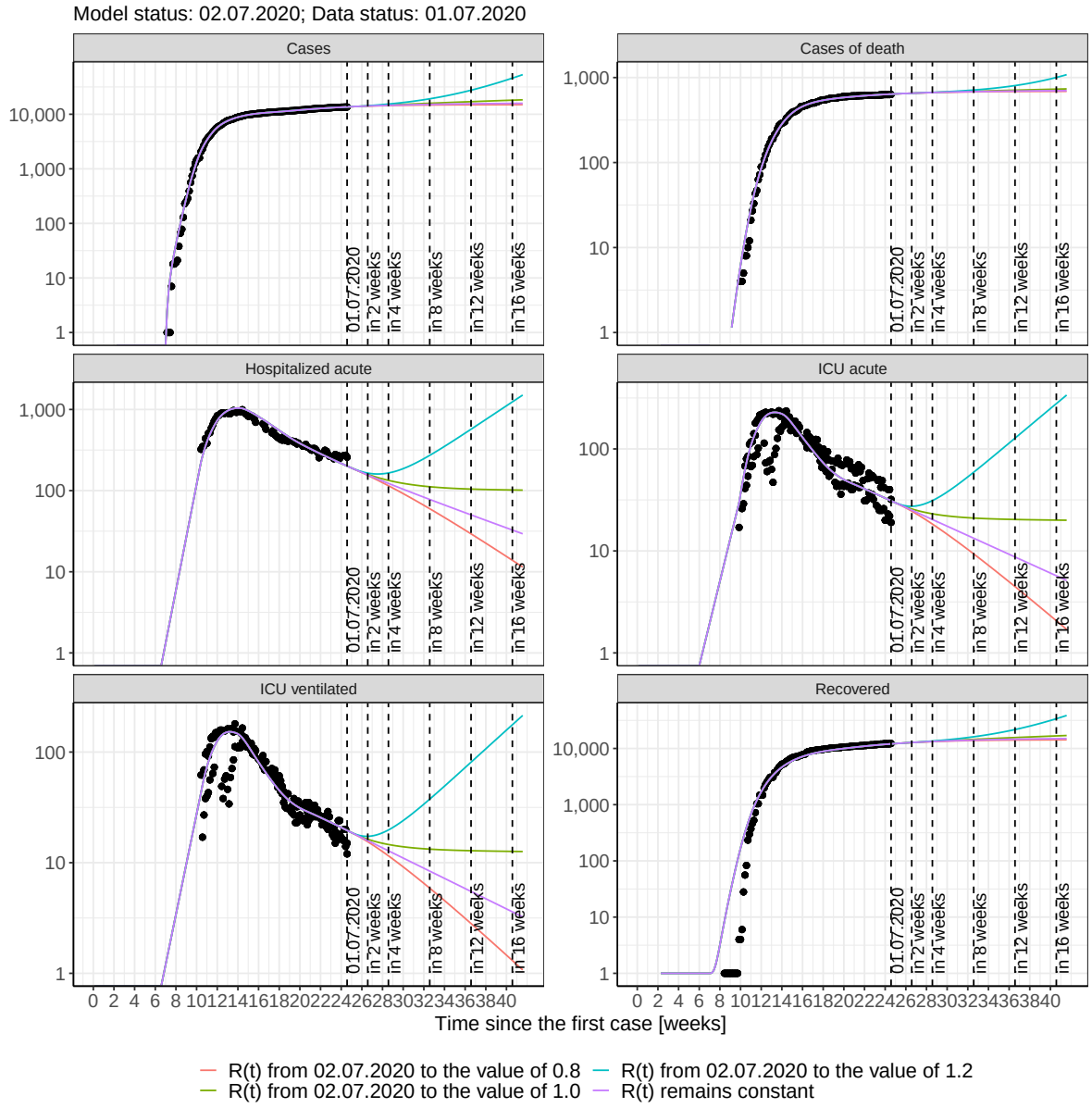


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 37) Model status from 02.07.2020; Data status: 01.07.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	13667	640	12113	197	31	19
03.07.2020	13707	641	12166	194	30	19
04.07.2020	13746	642	12218	190	30	19
05.07.2020	13784	643	12269	187	29	18
06.07.2020	13822	645	12319	183	29	18
07.07.2020	13860	646	12369	180	28	18
08.07.2020	13896	647	12418	177	28	18
09.07.2020	13933	648	12466	174	28	17
10.07.2020	13968	649	12514	171	27	17
11.07.2020	14003	650	12561	168	27	17
12.07.2020	14038	651	12607	165	26	17
13.07.2020	14072	652	12652	162	26	16
14.07.2020	14106	653	12697	159	25	16
15.07.2020	14139	654	12741	156	25	16
16.07.2020	14171	655	12784	153	25	16
17.07.2020	14203	656	12827	151	24	15
18.07.2020	14235	657	12869	148	24	15
19.07.2020	14266	658	12910	146	24	15
20.07.2020	14297	659	12951	143	23	15
21.07.2020	14327	660	12991	141	23	14
22.07.2020	14357	660	13031	138	23	14
23.07.2020	14386	661	13070	136	22	14
24.07.2020	14415	662	13108	134	22	14
25.07.2020	14443	663	13146	131	22	14
26.07.2020	14471	664	13183	129	21	13
27.07.2020	14499	665	13219	127	21	13
28.07.2020	14526	665	13255	125	21	13
29.07.2020	14553	666	13291	123	20	13

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	13667	640	12113	197	31	19
03.07.2020	13706	641	12166	194	30	19
04.07.2020	13743	642	12218	190	30	19
05.07.2020	13780	643	12269	187	29	18
06.07.2020	13816	645	12319	183	29	18
07.07.2020	13850	646	12369	180	28	18
08.07.2020	13884	647	12417	176	28	18
09.07.2020	13917	648	12465	173	27	17
10.07.2020	13949	649	12512	170	27	17
11.07.2020	13979	650	12558	167	26	17
12.07.2020	14009	651	12604	163	26	16
13.07.2020	14038	652	12648	160	25	16
14.07.2020	14067	653	12691	157	25	16
15.07.2020	14094	654	12734	154	25	15
16.07.2020	14121	655	12776	151	24	15
17.07.2020	14147	656	12816	148	24	15
18.07.2020	14172	657	12856	145	23	15
19.07.2020	14197	658	12895	142	23	14
20.07.2020	14221	659	12933	139	22	14
21.07.2020	14244	659	12970	136	22	14
22.07.2020	14266	660	13007	134	21	13
23.07.2020	14288	661	13042	131	21	13
24.07.2020	14309	662	13077	128	20	13
25.07.2020	14330	663	13110	125	20	13
26.07.2020	14350	663	13143	123	20	12
27.07.2020	14369	664	13175	120	19	12
28.07.2020	14388	665	13207	117	19	12
29.07.2020	14407	665	13237	115	18	12

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	13667	640	12113	197	31	19
03.07.2020	13708	641	12166	194	30	19
04.07.2020	13749	642	12218	190	30	19
05.07.2020	13789	643	12269	187	29	18
06.07.2020	13830	645	12320	183	29	18
07.07.2020	13870	646	12370	180	28	18
08.07.2020	13911	647	12419	177	28	18
09.07.2020	13951	648	12468	174	28	17
10.07.2020	13992	649	12516	171	27	17
11.07.2020	14032	650	12563	169	27	17
12.07.2020	14073	651	12611	166	27	17
13.07.2020	14113	652	12657	163	26	17
14.07.2020	14153	653	12704	161	26	16
15.07.2020	14194	654	12749	159	26	16
16.07.2020	14234	655	12795	156	26	16
17.07.2020	14275	656	12840	154	25	16
18.07.2020	14315	657	12885	152	25	16
19.07.2020	14355	658	12929	150	25	16
20.07.2020	14396	659	12974	148	25	16
21.07.2020	14436	660	13018	146	24	15
22.07.2020	14477	661	13061	145	24	15
23.07.2020	14517	662	13105	143	24	15
24.07.2020	14557	663	13148	141	24	15
25.07.2020	14598	663	13191	140	24	15
26.07.2020	14638	664	13234	138	24	15
27.07.2020	14678	665	13277	137	23	15
28.07.2020	14718	666	13319	135	23	15
29.07.2020	14759	667	13362	134	23	15

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	13668	640	12113	197	31	19
03.07.2020	13710	641	12166	194	30	19
04.07.2020	13754	642	12218	190	30	19
05.07.2020	13799	643	12269	187	29	18
06.07.2020	13845	645	12320	184	29	18
07.07.2020	13892	646	12370	181	29	18
08.07.2020	13941	647	12420	178	28	18
09.07.2020	13991	648	12470	176	28	18
10.07.2020	14043	649	12520	173	28	18
11.07.2020	14096	650	12569	171	28	17
12.07.2020	14150	651	12619	169	28	17
13.07.2020	14207	652	12668	167	27	17
14.07.2020	14264	653	12718	166	27	17
15.07.2020	14324	654	12768	164	27	17
16.07.2020	14385	655	12818	163	27	17
17.07.2020	14448	656	12869	162	28	17
18.07.2020	14512	657	12921	162	28	17
19.07.2020	14579	658	12973	161	28	18
20.07.2020	14647	659	13026	161	28	18
21.07.2020	14718	660	13079	160	28	18
22.07.2020	14790	662	13134	160	28	18
23.07.2020	14865	663	13189	160	29	18
24.07.2020	14941	664	13246	161	29	18
25.07.2020	15020	665	13303	161	29	19
26.07.2020	15101	666	13362	162	30	19
27.07.2020	15185	667	13422	163	30	19
28.07.2020	15271	668	13483	164	31	19
29.07.2020	15359	669	13546	165	31	20

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

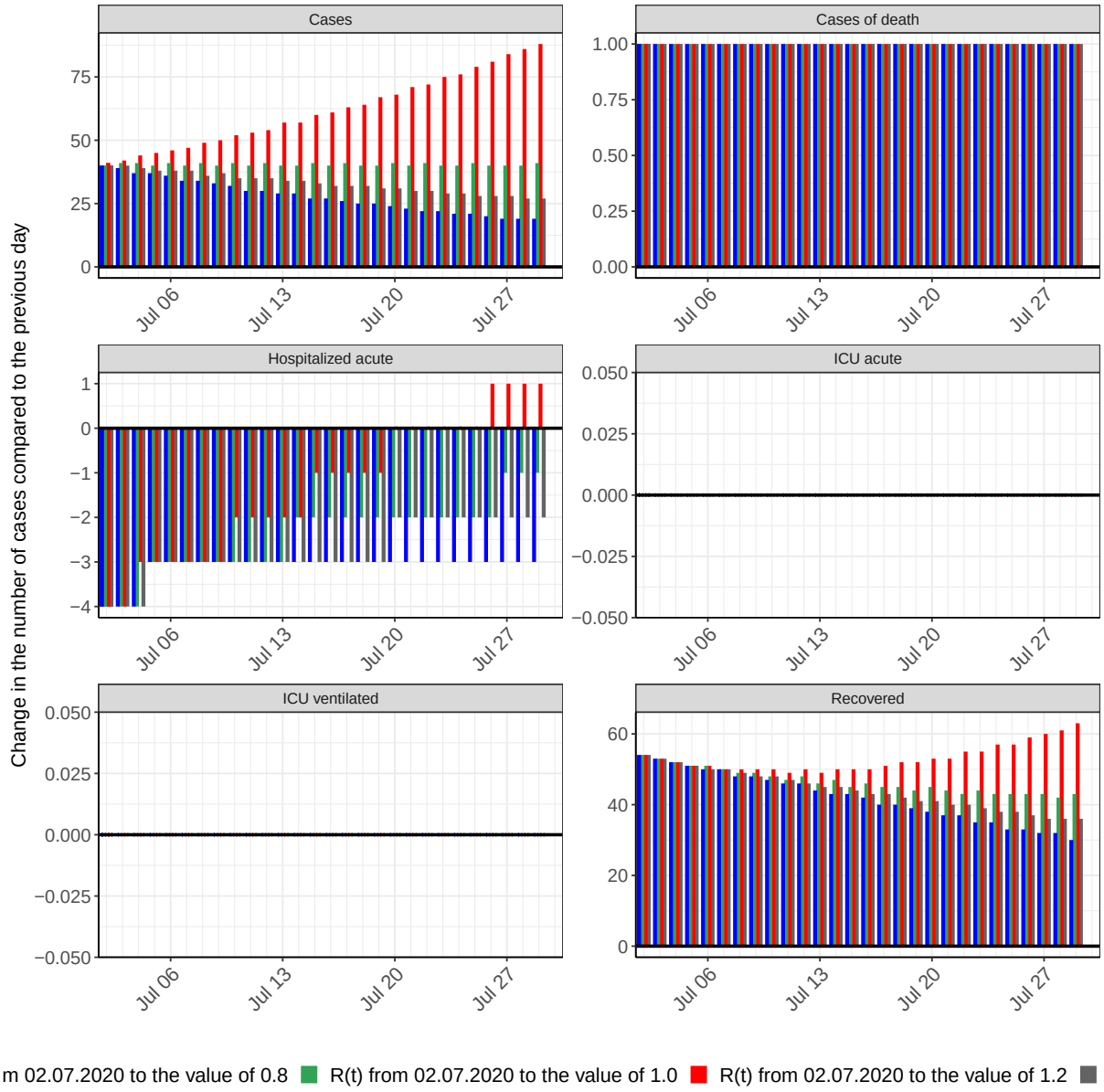


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

11 North Rhine-Westphalia

11.1 Model description

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

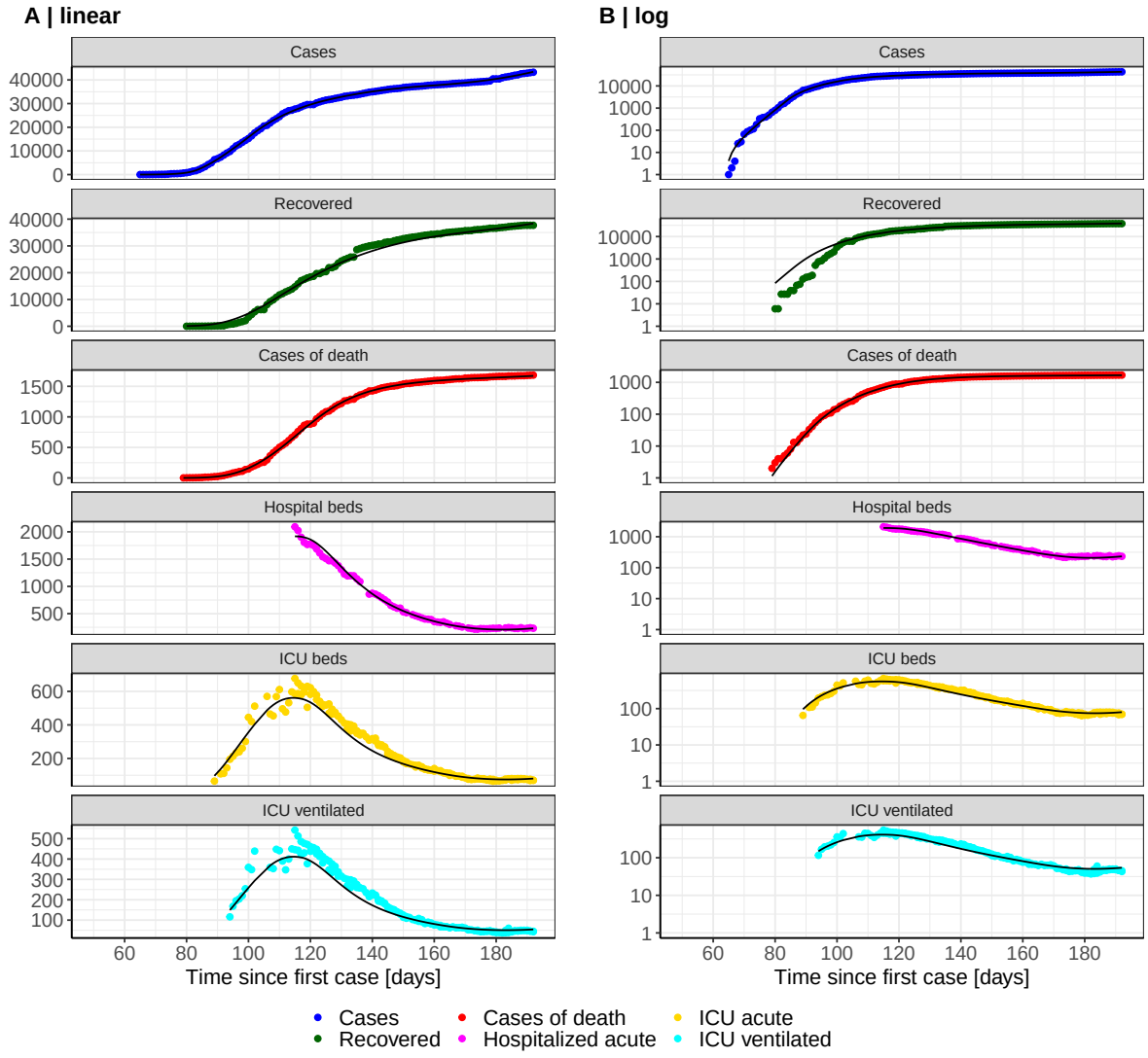


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

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

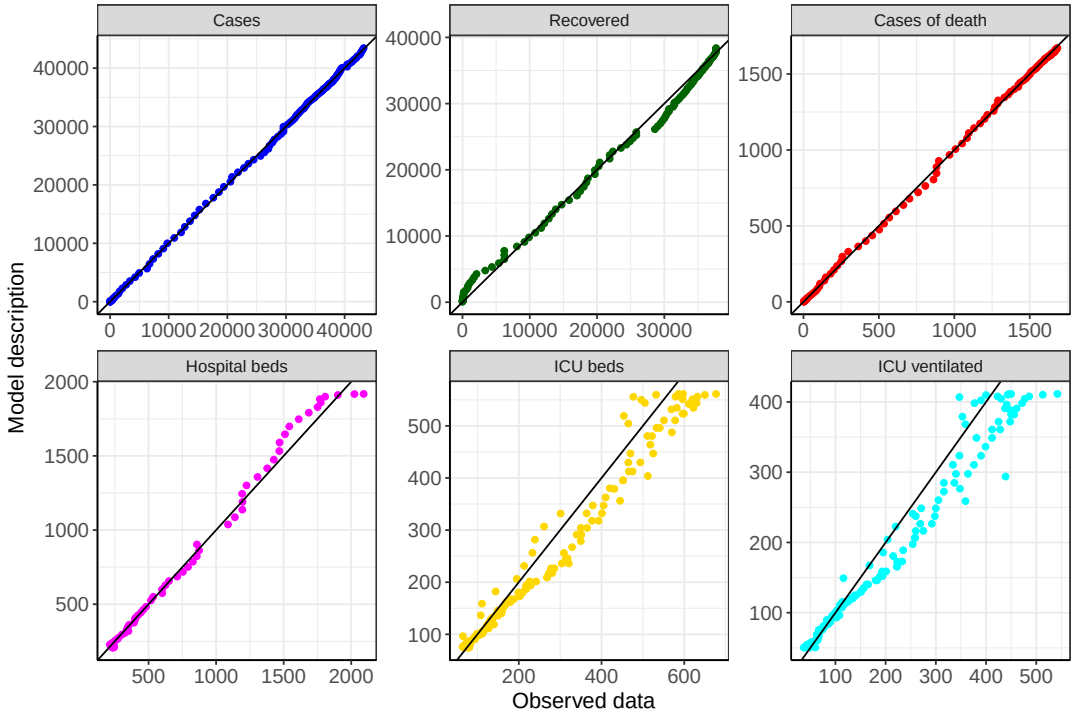


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

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

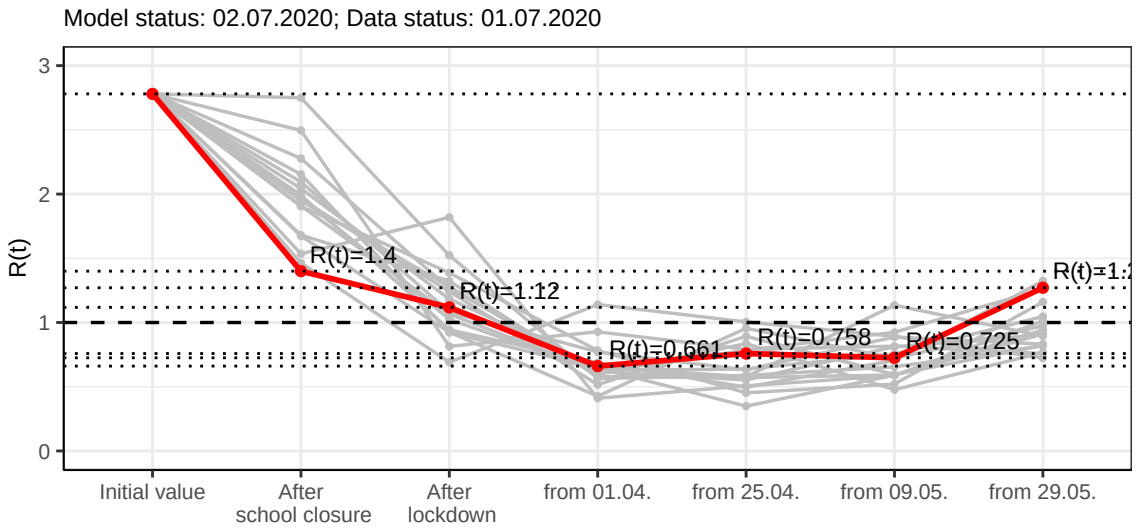


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

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

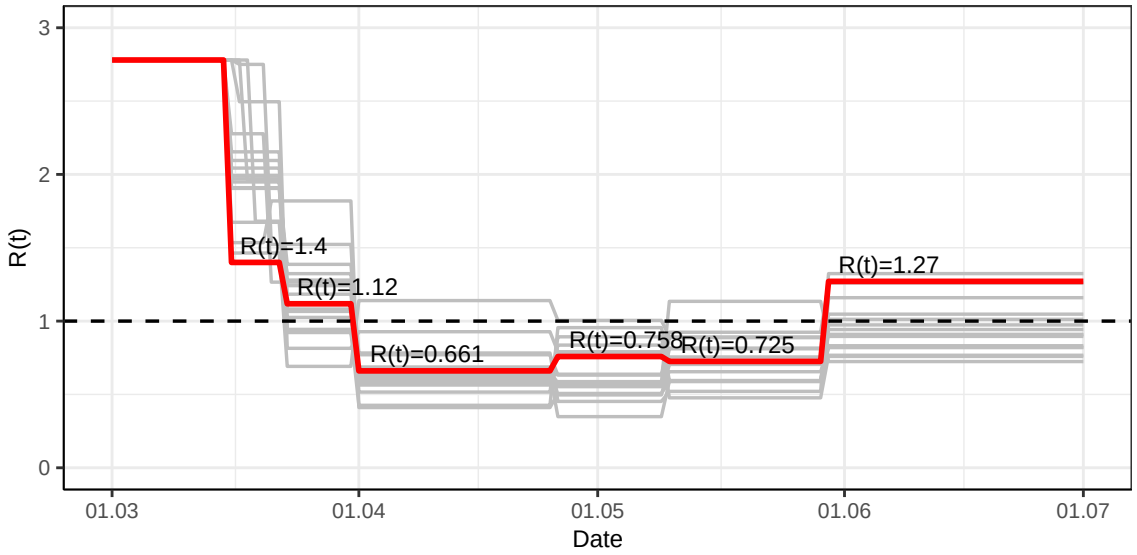


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.27)

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.

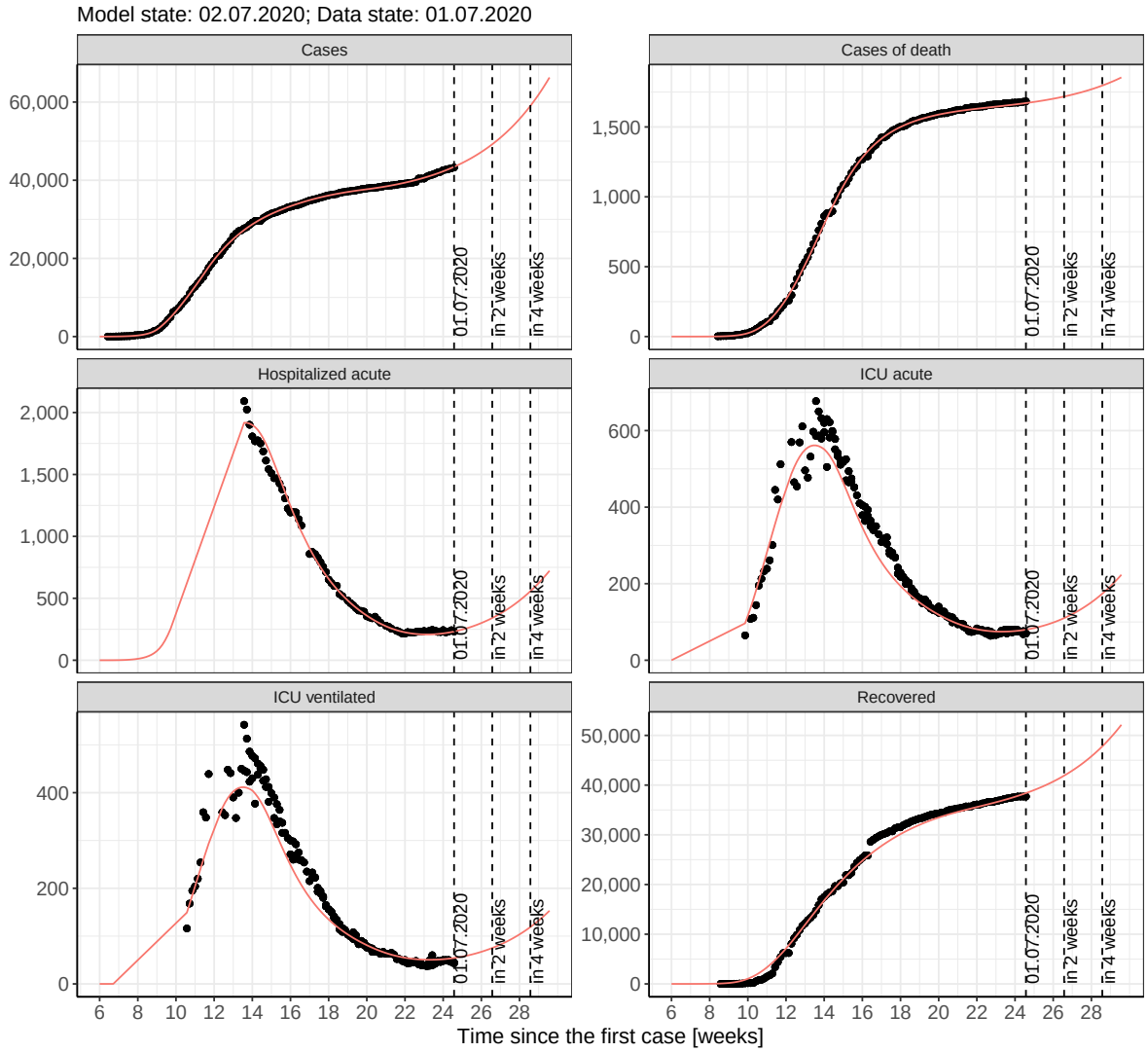


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model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

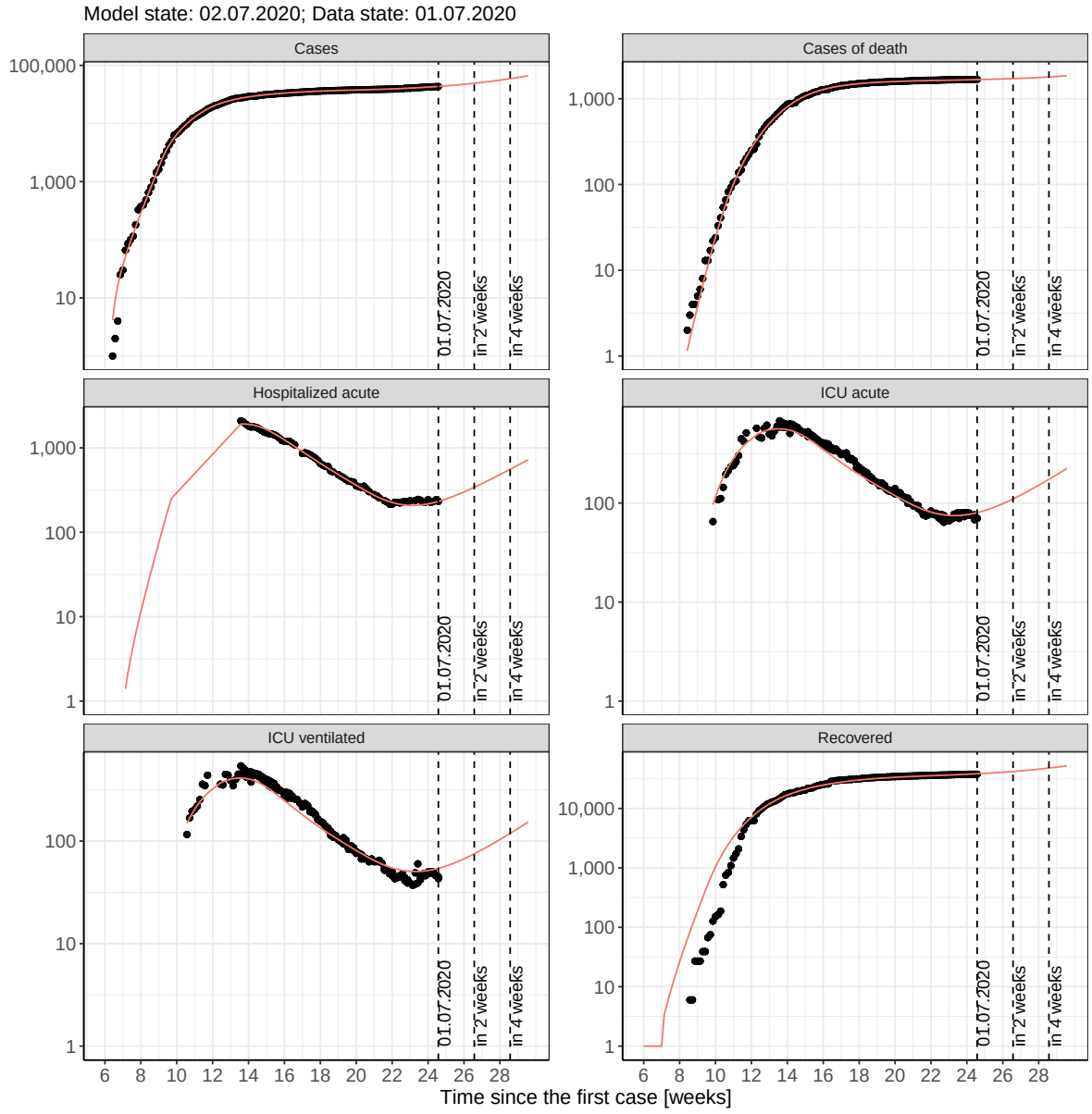


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model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

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

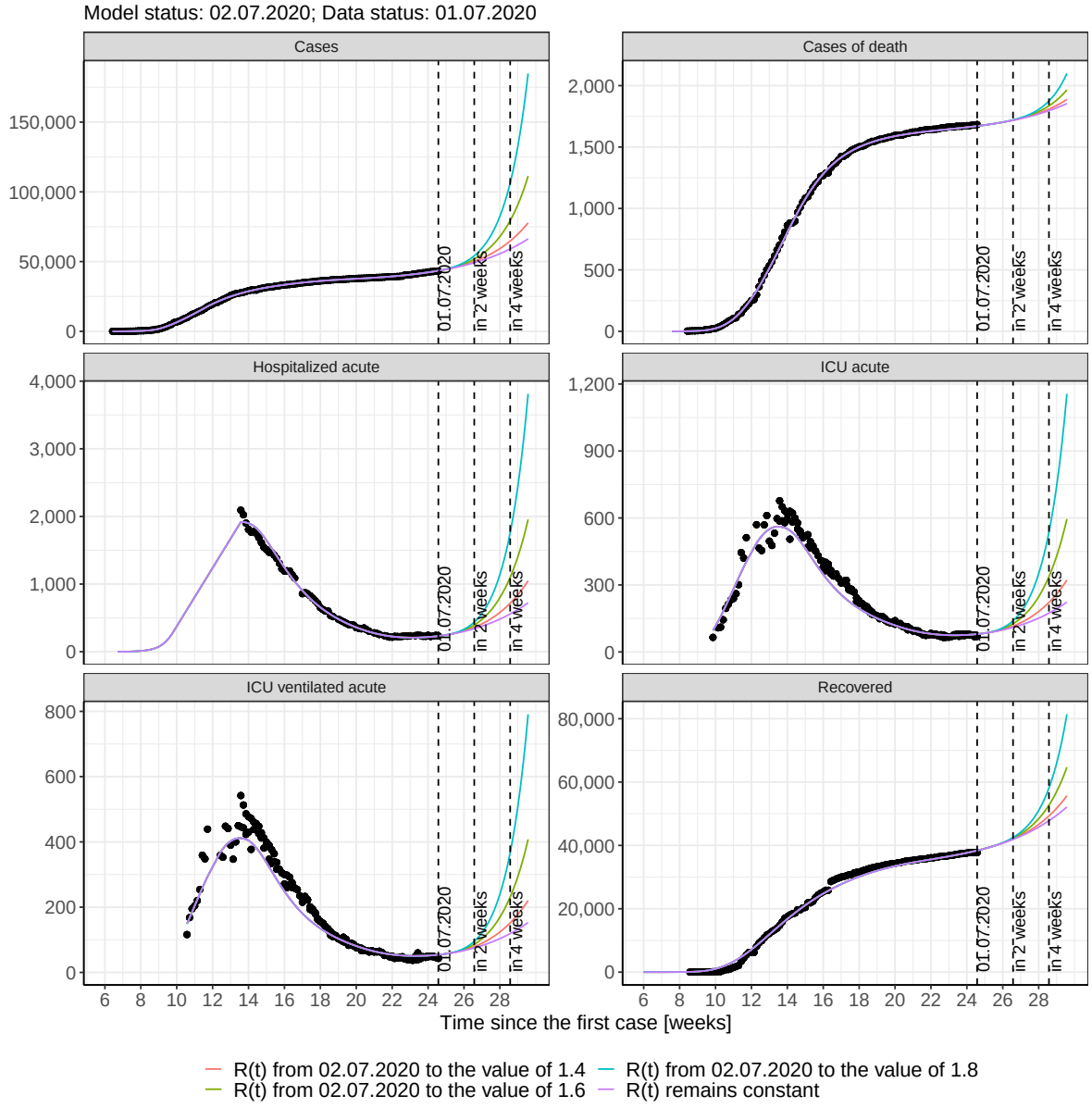


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

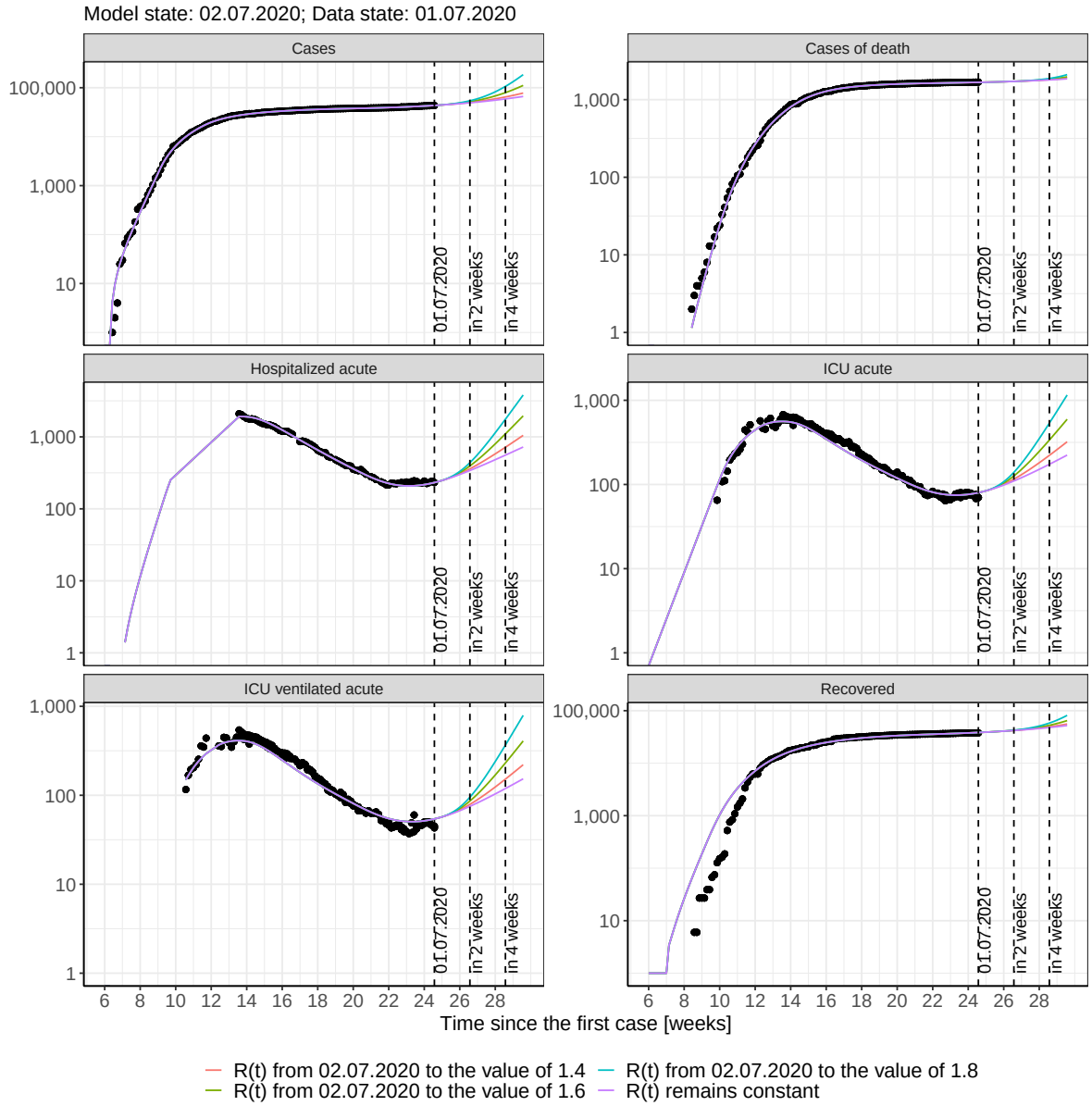


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

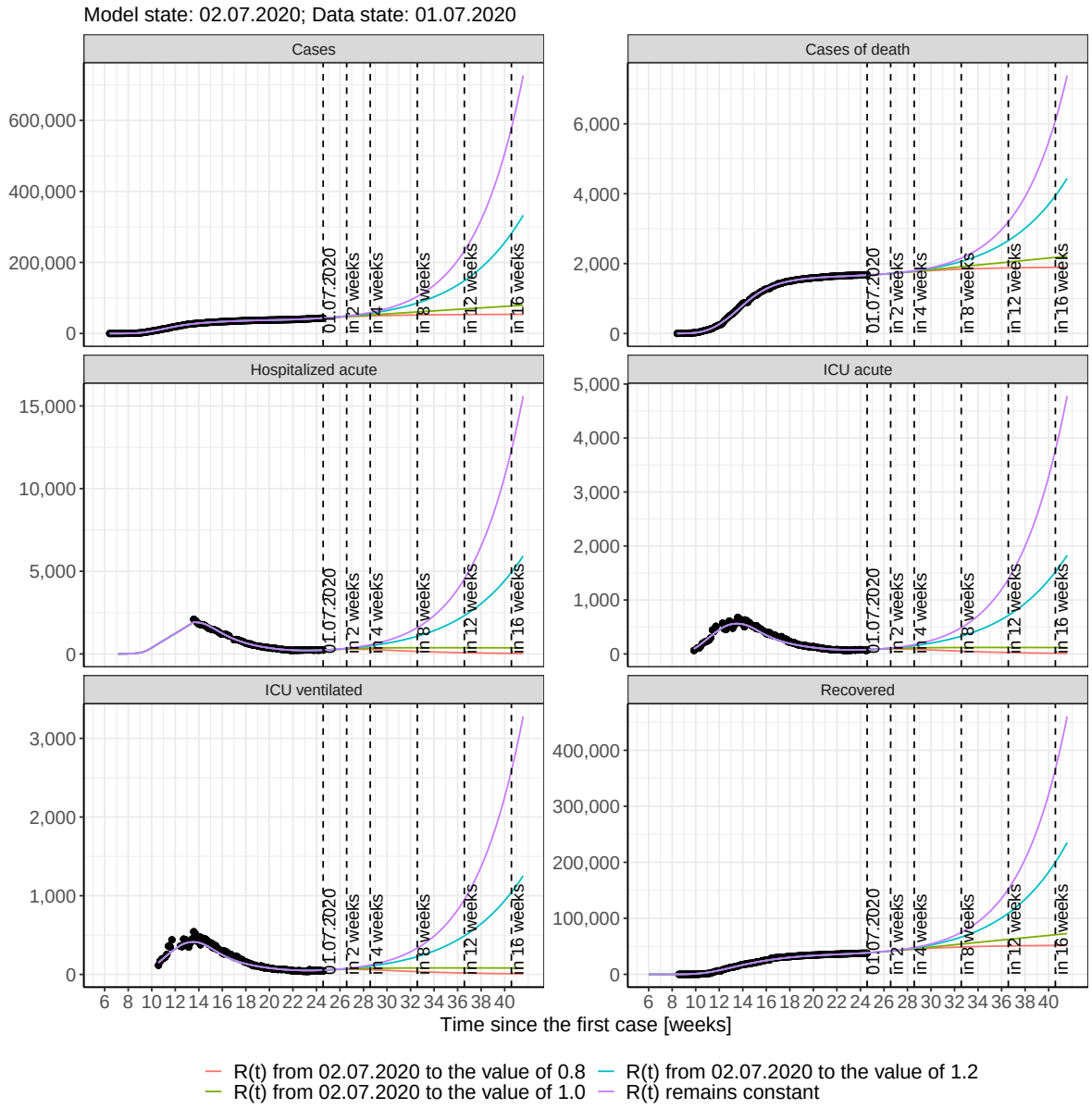


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

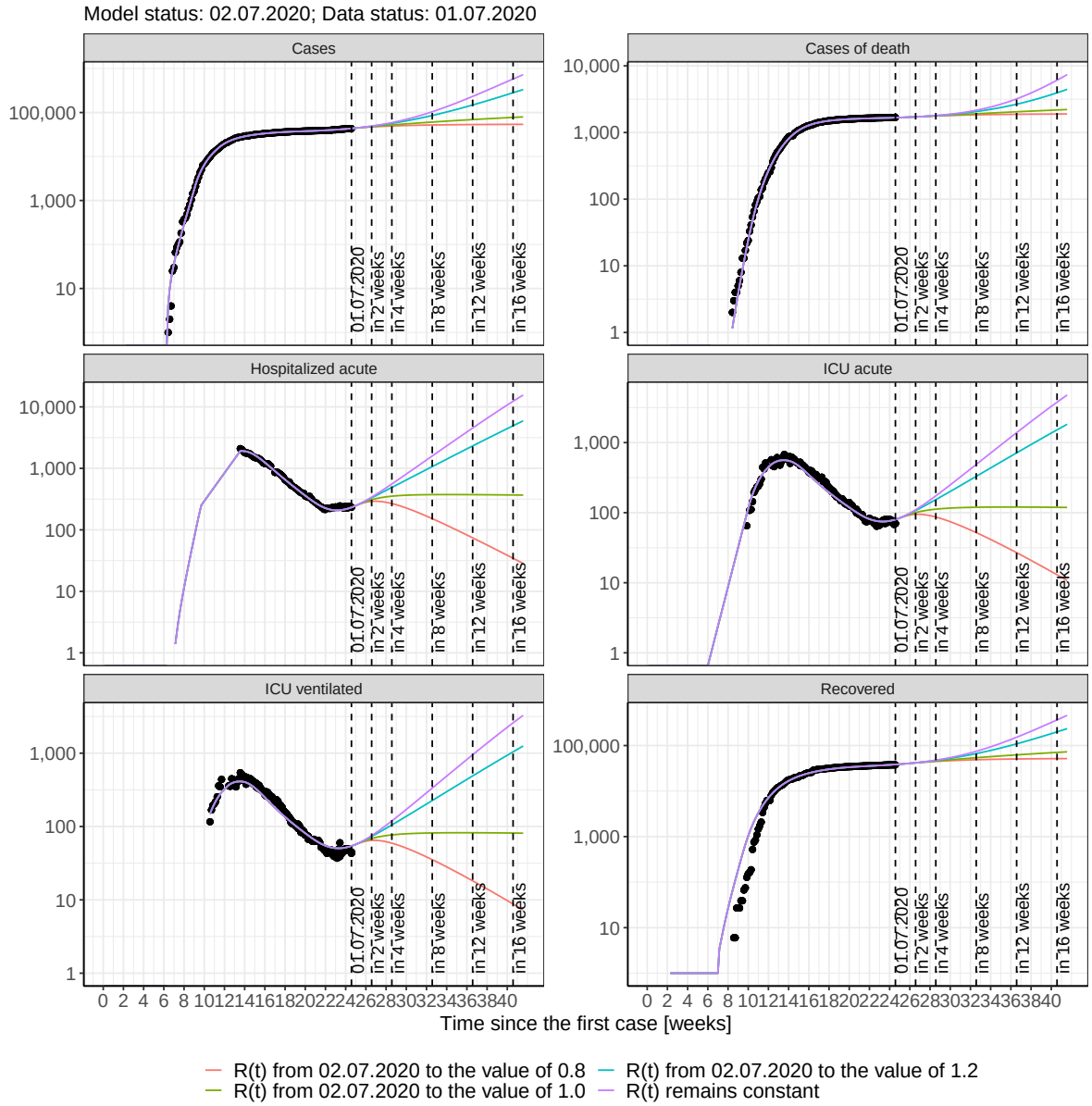


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 41) Model status from 02.07.2020; Data status: 01.07.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	43750	1674	38585	237	81	55
03.07.2020	44079	1676	38790	242	83	56
04.07.2020	44422	1679	39002	248	84	57
05.07.2020	44778	1682	39222	254	86	58
06.07.2020	45148	1685	39449	260	87	59
07.07.2020	45532	1688	39684	267	89	61
08.07.2020	45931	1691	39928	275	91	62
09.07.2020	46346	1695	40180	283	94	64
10.07.2020	46777	1698	40442	291	96	65
11.07.2020	47224	1702	40713	300	98	67
12.07.2020	47689	1706	40995	310	101	69
13.07.2020	48173	1710	41287	320	104	71
14.07.2020	48675	1714	41589	330	107	73
15.07.2020	49196	1718	41904	341	110	75
16.07.2020	49738	1722	42230	352	113	77
17.07.2020	50301	1727	42568	364	117	80
18.07.2020	50886	1731	42919	377	120	82
19.07.2020	51493	1736	43284	390	124	85
20.07.2020	52124	1741	43662	404	128	88
21.07.2020	52780	1746	44055	418	132	91
22.07.2020	53461	1752	44463	433	137	94
23.07.2020	54168	1758	44887	449	142	97
24.07.2020	54903	1763	45327	465	146	100
25.07.2020	55667	1769	45784	482	151	104
26.07.2020	56460	1776	46258	500	157	107
27.07.2020	57284	1782	46751	518	162	111
28.07.2020	58140	1789	47263	537	168	115
29.07.2020	59029	1796	47794	557	174	119

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	43739	1674	38585	237	81	55
03.07.2020	44037	1676	38790	242	82	56
04.07.2020	44327	1679	39001	247	84	57
05.07.2020	44608	1682	39218	253	85	58
06.07.2020	44881	1685	39441	258	87	59
07.07.2020	45147	1688	39668	264	88	60
08.07.2020	45405	1691	39900	269	90	61
09.07.2020	45656	1695	40135	273	91	62
10.07.2020	45899	1698	40373	278	92	63
11.07.2020	46136	1702	40613	281	93	63
12.07.2020	46366	1705	40854	284	93	64
13.07.2020	46589	1709	41096	287	94	64
14.07.2020	46806	1712	41338	289	94	65
15.07.2020	47017	1716	41580	291	95	65
16.07.2020	47221	1720	41822	292	95	65
17.07.2020	47420	1724	42061	292	95	65
18.07.2020	47614	1728	42299	292	95	65
19.07.2020	47801	1731	42535	292	94	65
20.07.2020	47984	1735	42768	291	94	64
21.07.2020	48161	1739	42999	289	94	64
22.07.2020	48333	1743	43226	288	93	64
23.07.2020	48501	1746	43451	286	92	63
24.07.2020	48663	1750	43671	283	92	63
25.07.2020	48821	1754	43889	281	91	62
26.07.2020	48974	1758	44102	278	90	61
27.07.2020	49123	1761	44311	275	89	61
28.07.2020	49268	1765	44517	271	88	60
29.07.2020	49409	1768	44719	268	87	59

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	43743	1674	38585	237	81	55
03.07.2020	44054	1676	38790	242	83	56
04.07.2020	44365	1679	39002	247	84	57
05.07.2020	44676	1682	39220	253	86	58
06.07.2020	44987	1685	39444	259	87	59
07.07.2020	45298	1688	39674	265	89	60
08.07.2020	45608	1691	39911	271	90	61
09.07.2020	45919	1695	40153	277	92	63
10.07.2020	46229	1698	40400	283	93	64
11.07.2020	46539	1702	40652	289	95	65
12.07.2020	46849	1705	40908	294	96	66
13.07.2020	47159	1709	41169	299	98	67
14.07.2020	47469	1713	41433	304	99	68
15.07.2020	47778	1717	41701	309	100	69
16.07.2020	48088	1721	41972	314	102	69
17.07.2020	48397	1725	42246	318	103	70
18.07.2020	48707	1729	42523	322	104	71
19.07.2020	49016	1733	42803	326	105	72
20.07.2020	49325	1737	43084	329	106	72
21.07.2020	49634	1742	43368	333	107	73
22.07.2020	49943	1746	43653	336	108	74
23.07.2020	50251	1750	43940	339	108	74
24.07.2020	50560	1755	44229	341	109	75
25.07.2020	50868	1759	44519	344	110	75
26.07.2020	51177	1764	44810	346	110	76
27.07.2020	51485	1768	45102	349	111	76
28.07.2020	51793	1773	45395	351	112	76
29.07.2020	52101	1778	45690	353	112	77

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	43748	1674	38585	237	81	55
03.07.2020	44073	1676	38790	242	83	56
04.07.2020	44407	1679	39002	248	84	57
05.07.2020	44750	1682	39221	254	86	58
06.07.2020	45104	1685	39448	260	87	59
07.07.2020	45467	1688	39681	267	89	61
08.07.2020	45841	1691	39923	274	91	62
09.07.2020	46225	1695	40173	281	93	63
10.07.2020	46621	1698	40430	289	95	65
11.07.2020	47027	1702	40696	297	97	66
12.07.2020	47446	1706	40970	305	100	68
13.07.2020	47876	1709	41253	314	102	70
14.07.2020	48318	1713	41545	323	105	71
15.07.2020	48773	1718	41846	332	107	73
16.07.2020	49241	1722	42155	341	110	75
17.07.2020	49723	1726	42475	351	113	77
18.07.2020	50218	1731	42803	361	115	79
19.07.2020	50727	1735	43142	371	118	81
20.07.2020	51251	1740	43491	381	121	83
21.07.2020	51789	1745	43850	392	125	85
22.07.2020	52343	1750	44219	403	128	87
23.07.2020	52913	1755	44600	415	131	90
24.07.2020	53498	1761	44991	426	135	92
25.07.2020	54101	1766	45394	438	138	95
26.07.2020	54720	1772	45809	451	142	97
27.07.2020	55358	1778	46236	463	146	100
28.07.2020	56013	1784	46675	476	149	102
29.07.2020	56687	1790	47126	490	154	105

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

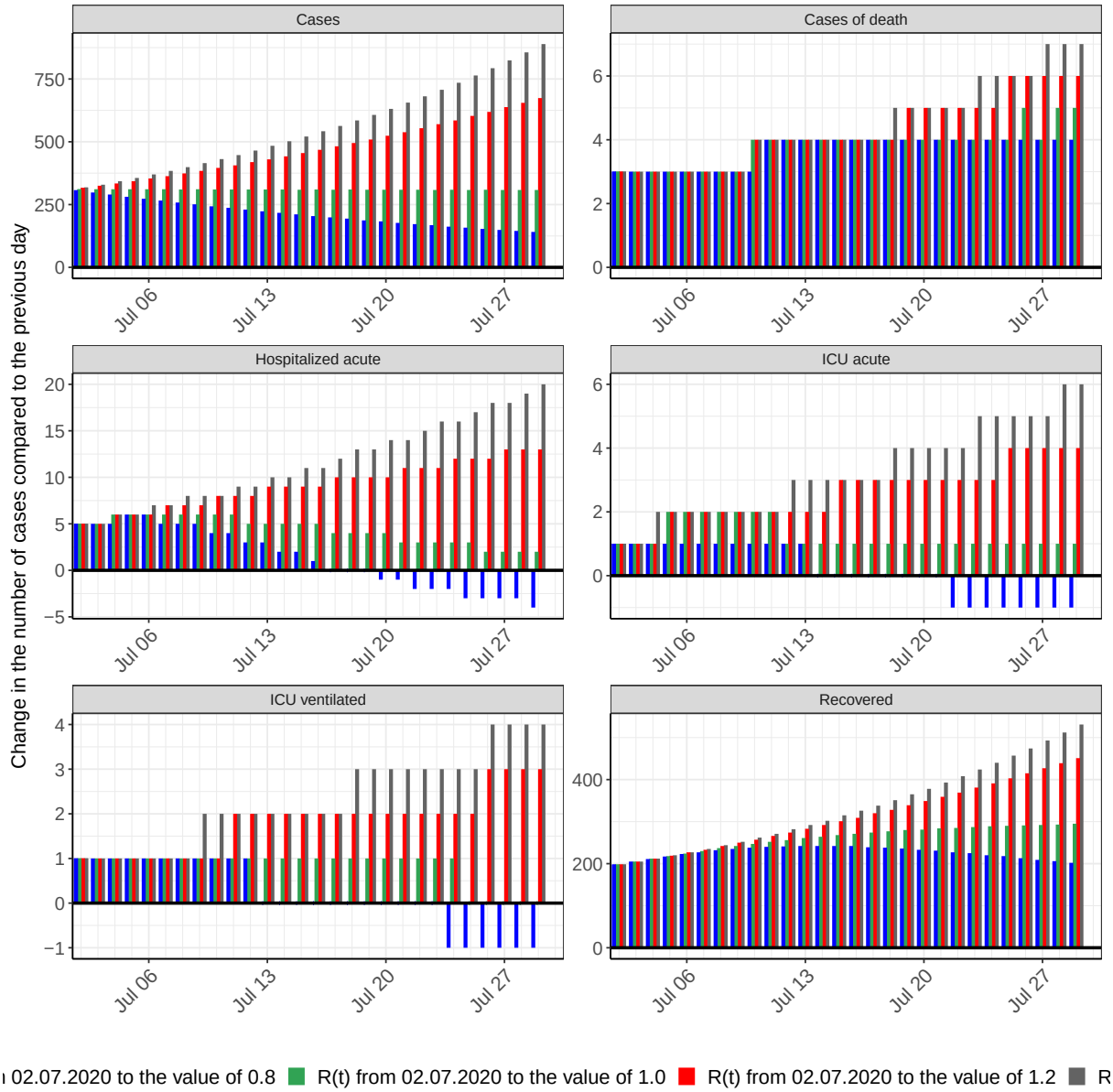


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

12 Rhineland-Palatinate

12.1 Model description

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

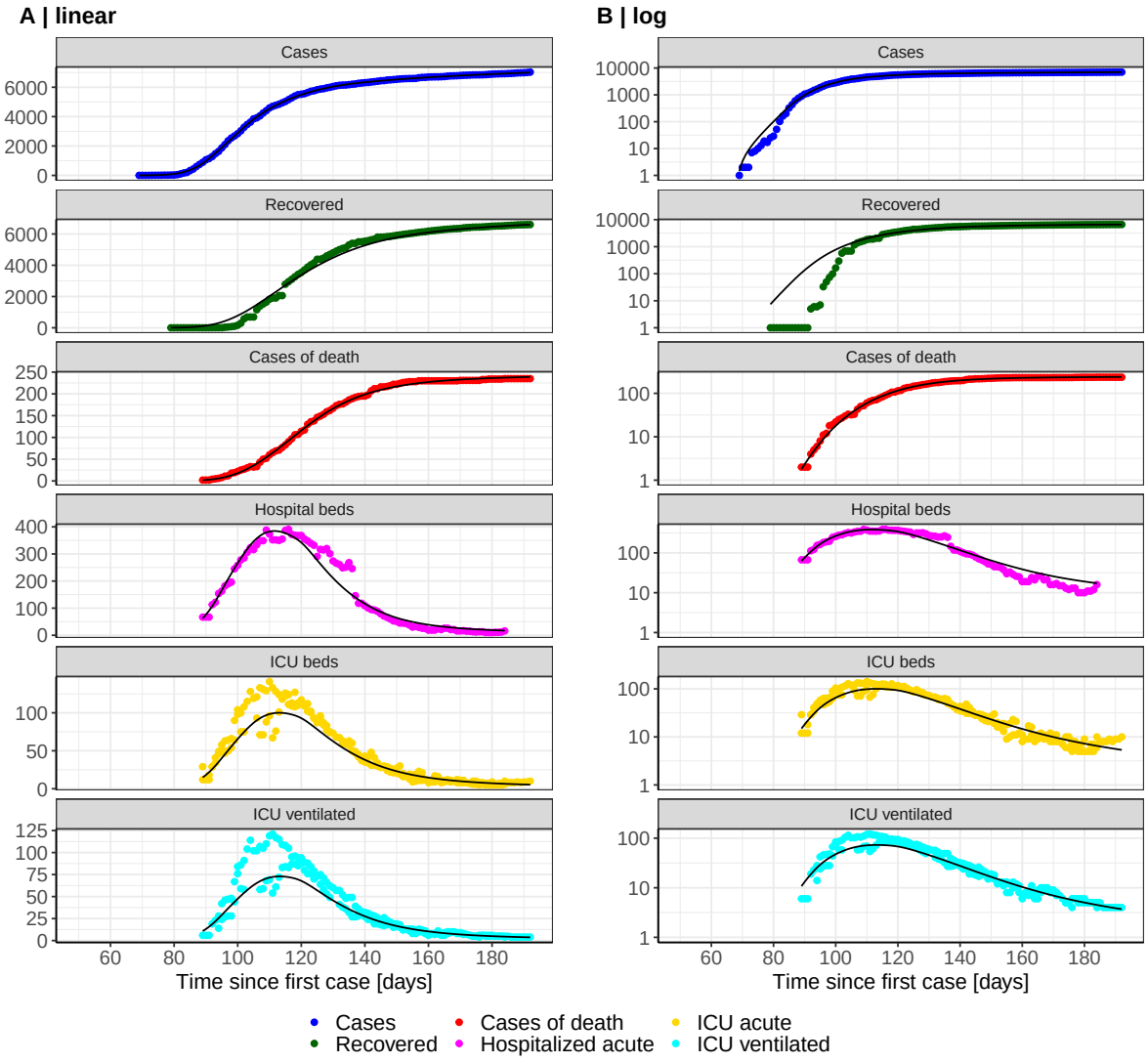


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

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

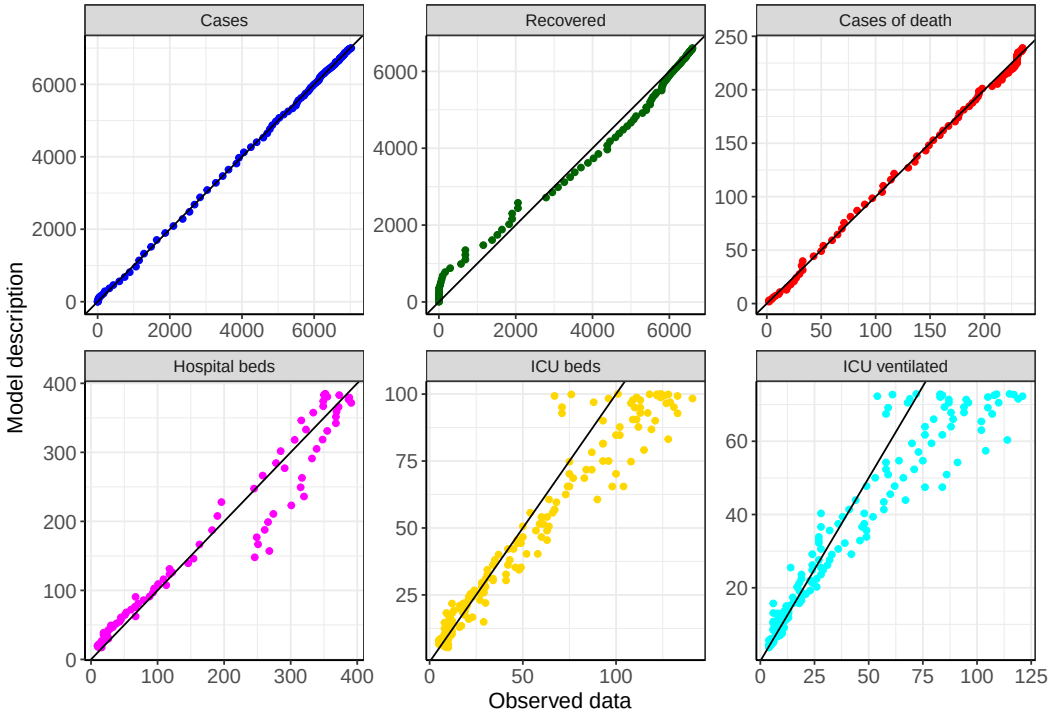


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

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

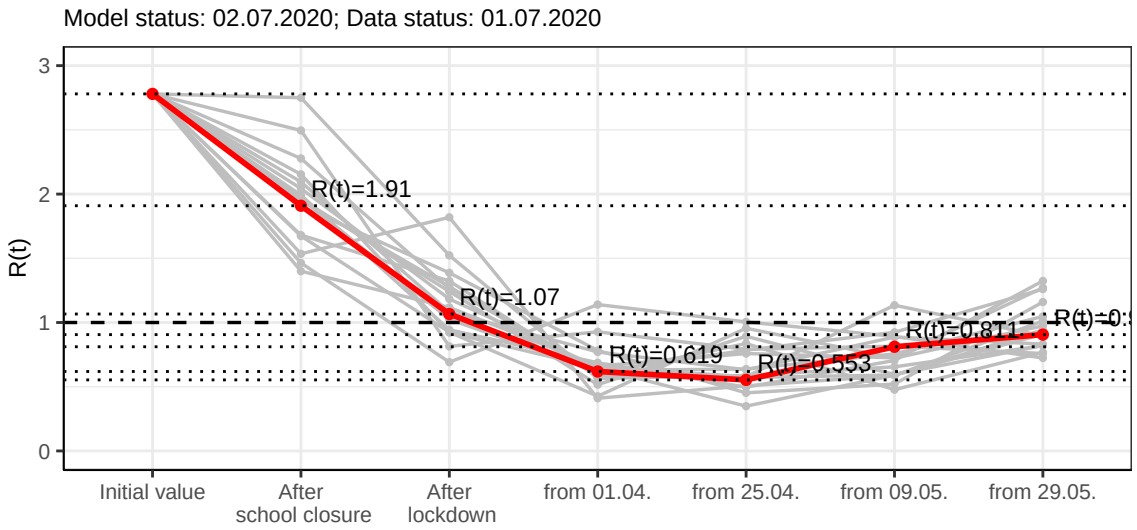


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

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

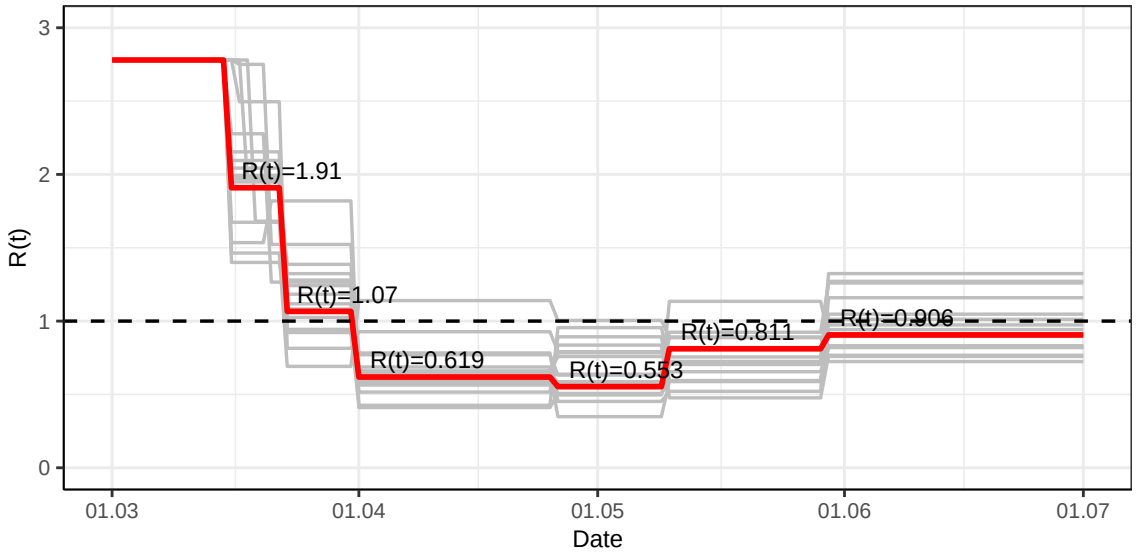


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

12.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.91)

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.

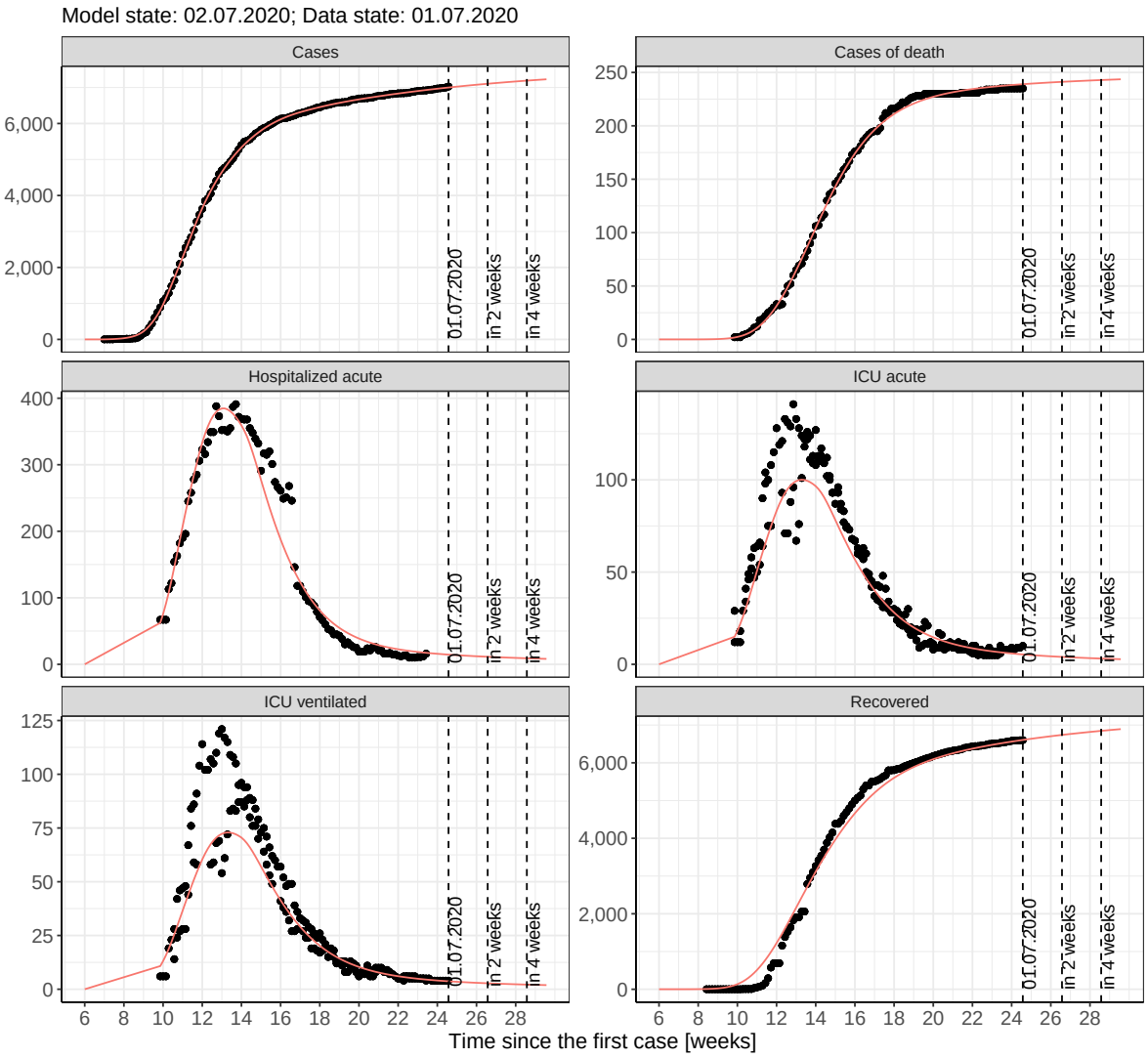


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

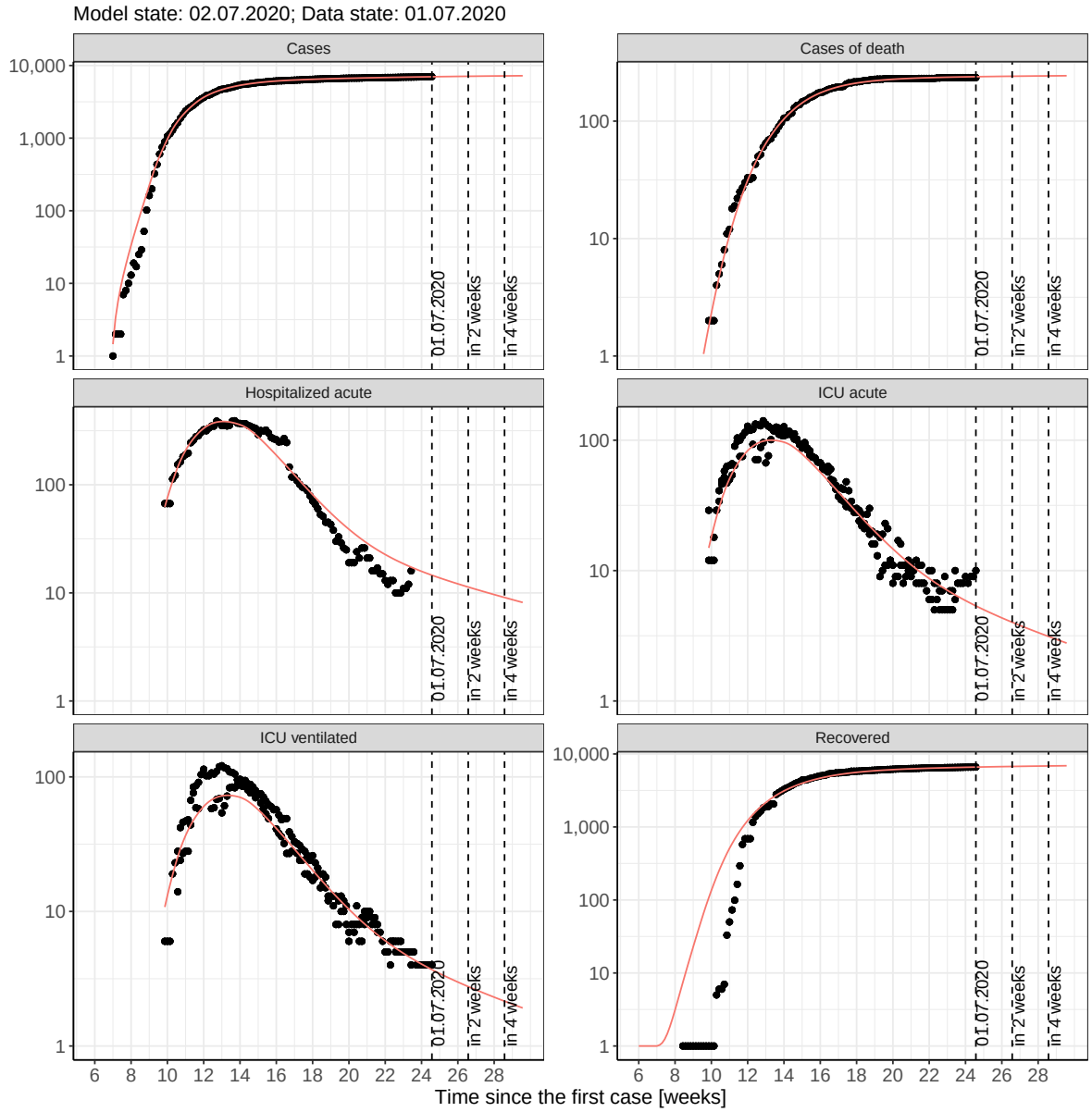


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

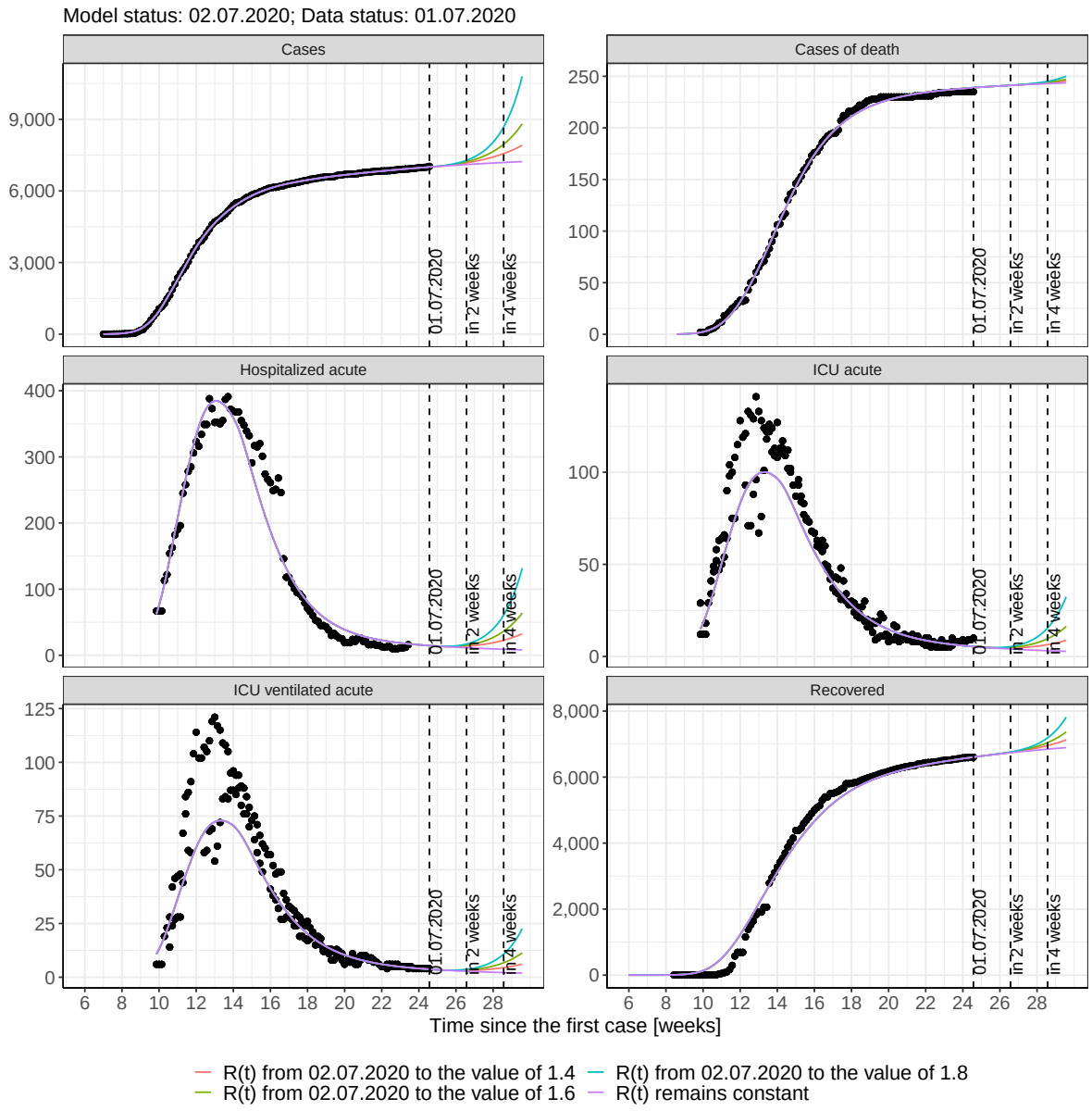


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

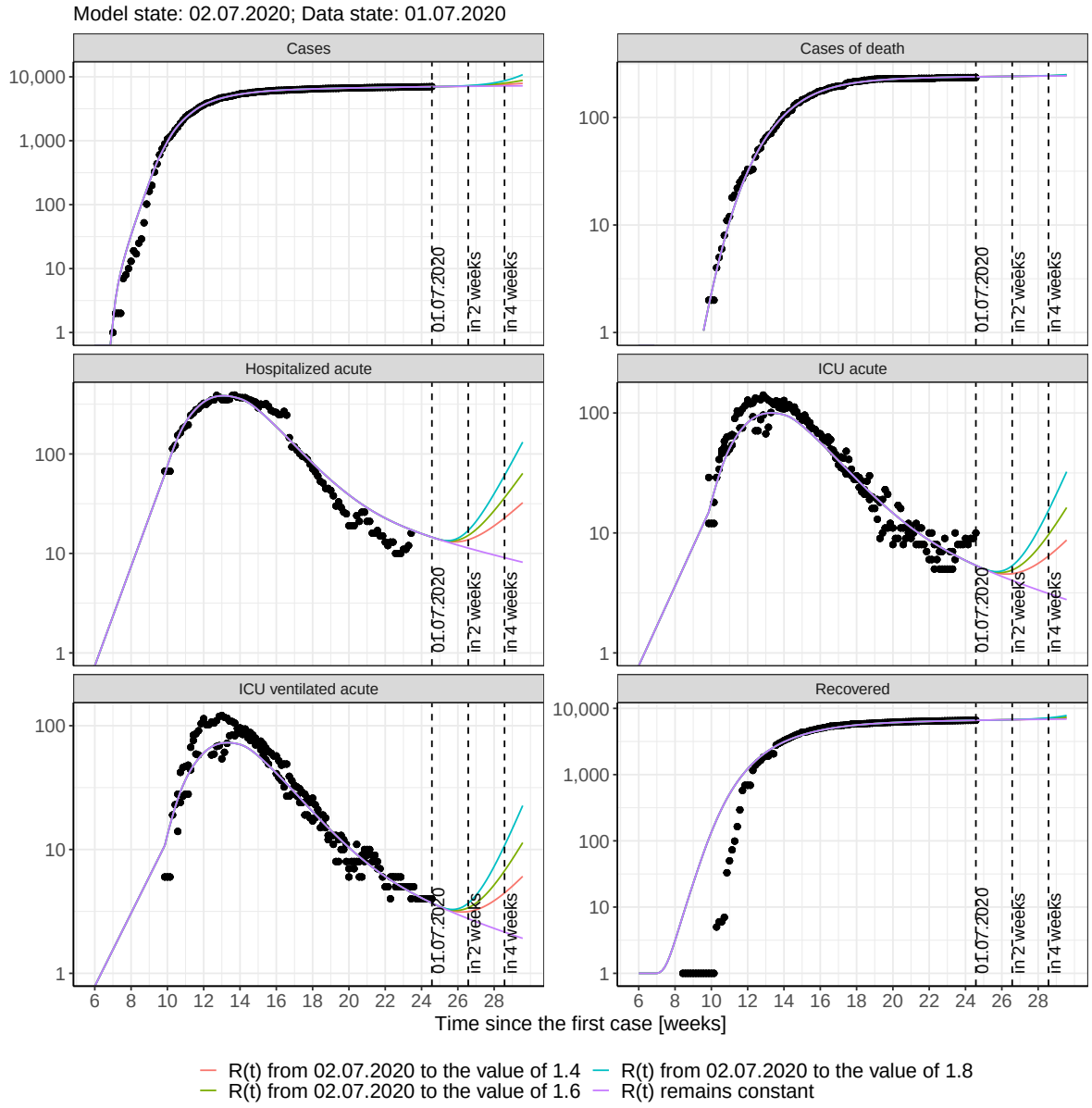


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

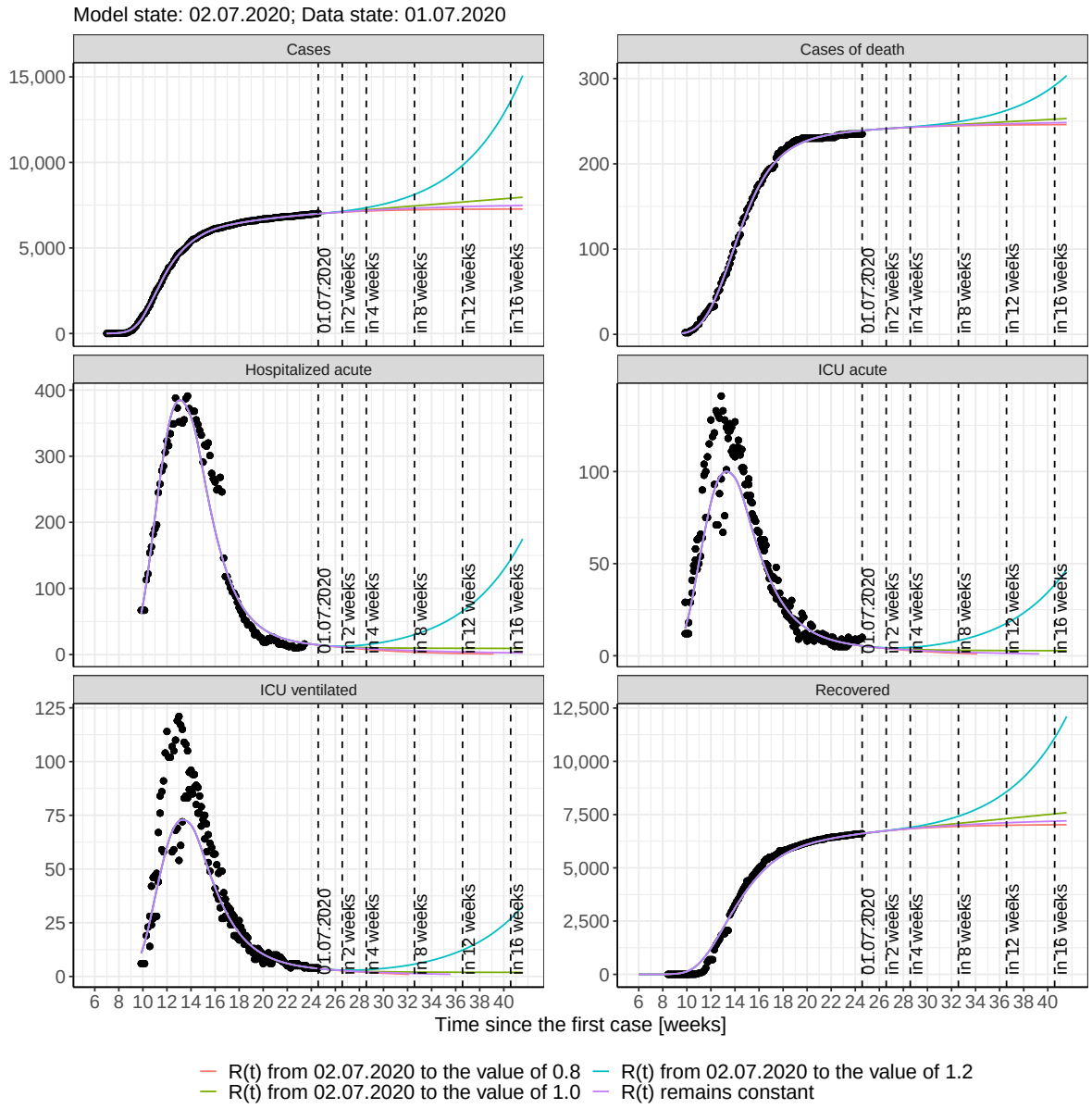


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

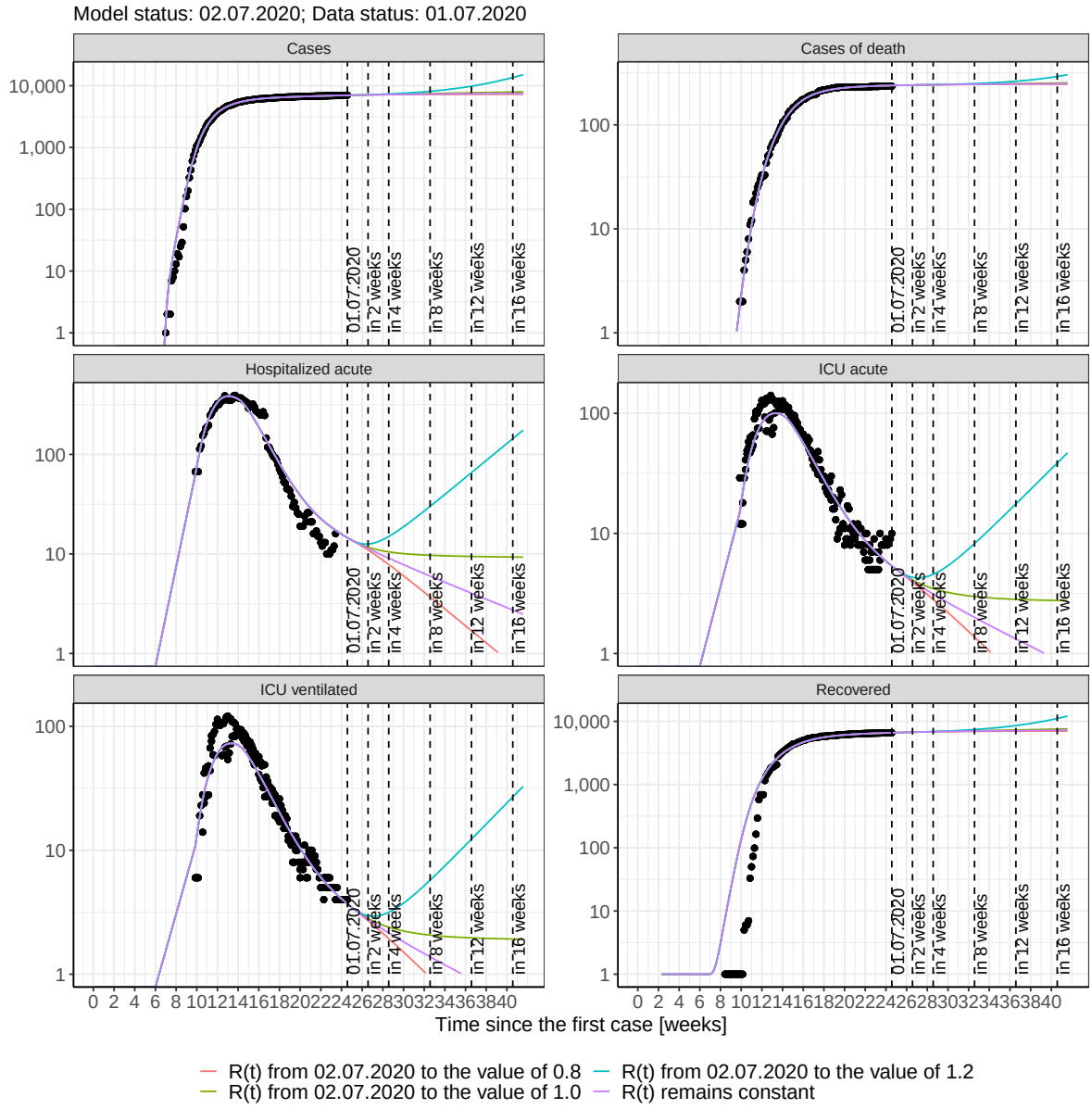


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 45) Model status from 02.07.2020; Data status: 01.07.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	7008	239	6616	14	5	4
03.07.2020	7016	239	6627	14	5	4
04.07.2020	7024	240	6637	14	5	3
05.07.2020	7032	240	6647	13	5	3
06.07.2020	7040	240	6657	13	5	3
07.07.2020	7048	240	6666	13	5	3
08.07.2020	7055	240	6676	13	5	3
09.07.2020	7062	240	6685	13	5	3
10.07.2020	7070	240	6695	12	4	3
11.07.2020	7077	241	6704	12	4	3
12.07.2020	7084	241	6713	12	4	3
13.07.2020	7091	241	6722	12	4	3
14.07.2020	7098	241	6730	12	4	3
15.07.2020	7105	241	6739	11	4	3
16.07.2020	7112	241	6747	11	4	3
17.07.2020	7118	241	6756	11	4	3
18.07.2020	7125	242	6764	11	4	3
19.07.2020	7131	242	6772	11	4	3
20.07.2020	7138	242	6780	10	4	3
21.07.2020	7144	242	6788	10	4	2
22.07.2020	7150	242	6795	10	4	2
23.07.2020	7156	242	6803	10	3	2
24.07.2020	7162	242	6810	10	3	2
25.07.2020	7168	242	6818	10	3	2
26.07.2020	7174	243	6825	9	3	2
27.07.2020	7180	243	6832	9	3	2
28.07.2020	7186	243	6840	9	3	2
29.07.2020	7191	243	6846	9	3	2

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	7008	239	6616	14	5	4
03.07.2020	7016	239	6627	14	5	4
04.07.2020	7024	240	6637	14	5	3
05.07.2020	7031	240	6647	13	5	3
06.07.2020	7038	240	6657	13	5	3
07.07.2020	7046	240	6666	13	5	3
08.07.2020	7052	240	6676	13	5	3
09.07.2020	7059	240	6685	12	4	3
10.07.2020	7065	240	6694	12	4	3
11.07.2020	7072	241	6703	12	4	3
12.07.2020	7078	241	6712	12	4	3
13.07.2020	7084	241	6721	11	4	3
14.07.2020	7089	241	6729	11	4	3
15.07.2020	7095	241	6737	11	4	3
16.07.2020	7100	241	6745	11	4	3
17.07.2020	7106	241	6753	10	4	3
18.07.2020	7111	242	6761	10	4	3
19.07.2020	7116	242	6768	10	4	2
20.07.2020	7120	242	6776	10	4	2
21.07.2020	7125	242	6783	10	3	2
22.07.2020	7130	242	6790	9	3	2
23.07.2020	7134	242	6797	9	3	2
24.07.2020	7138	242	6803	9	3	2
25.07.2020	7143	242	6810	9	3	2
26.07.2020	7147	242	6816	8	3	2
27.07.2020	7151	243	6822	8	3	2
28.07.2020	7154	243	6828	8	3	2
29.07.2020	7158	243	6834	8	3	2

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	7008	239	6616	14	5	4
03.07.2020	7017	239	6627	14	5	4
04.07.2020	7025	240	6637	14	5	3
05.07.2020	7033	240	6647	14	5	3
06.07.2020	7041	240	6657	13	5	3
07.07.2020	7050	240	6667	13	5	3
08.07.2020	7058	240	6676	13	5	3
09.07.2020	7066	240	6686	13	5	3
10.07.2020	7074	240	6695	12	4	3
11.07.2020	7082	241	6704	12	4	3
12.07.2020	7090	241	6714	12	4	3
13.07.2020	7099	241	6722	12	4	3
14.07.2020	7107	241	6732	12	4	3
15.07.2020	7115	241	6740	12	4	3
16.07.2020	7123	241	6749	12	4	3
17.07.2020	7131	241	6758	11	4	3
18.07.2020	7140	242	6767	11	4	3
19.07.2020	7148	242	6775	11	4	3
20.07.2020	7156	242	6784	11	4	3
21.07.2020	7164	242	6793	11	4	3
22.07.2020	7172	242	6801	11	4	3
23.07.2020	7180	242	6810	11	4	3
24.07.2020	7189	242	6818	11	4	3
25.07.2020	7197	242	6826	11	4	2
26.07.2020	7205	243	6835	11	4	2
27.07.2020	7213	243	6843	11	4	2
28.07.2020	7221	243	6852	11	4	2
29.07.2020	7230	243	6860	10	3	2

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	7008	239	6616	14	5	4
03.07.2020	7017	239	6627	14	5	4
04.07.2020	7026	240	6637	14	5	3
05.07.2020	7035	240	6647	14	5	3
06.07.2020	7044	240	6657	13	5	3
07.07.2020	7054	240	6667	13	5	3
08.07.2020	7064	240	6676	13	5	3
09.07.2020	7074	240	6686	13	5	3
10.07.2020	7084	240	6696	13	5	3
11.07.2020	7095	241	6706	13	4	3
12.07.2020	7106	241	6715	13	4	3
13.07.2020	7118	241	6725	13	4	3
14.07.2020	7129	241	6734	13	4	3
15.07.2020	7141	241	6744	13	4	3
16.07.2020	7154	241	6754	13	4	3
17.07.2020	7166	242	6764	13	4	3
18.07.2020	7180	242	6774	13	4	3
19.07.2020	7193	242	6784	13	4	3
20.07.2020	7207	242	6795	13	4	3
21.07.2020	7221	242	6805	13	4	3
22.07.2020	7236	242	6816	13	4	3
23.07.2020	7251	242	6827	14	4	3
24.07.2020	7266	242	6838	14	4	3
25.07.2020	7282	243	6850	14	4	3
26.07.2020	7299	243	6861	14	4	3
27.07.2020	7316	243	6873	14	4	3
28.07.2020	7333	243	6885	15	5	3
29.07.2020	7351	243	6898	15	5	3

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

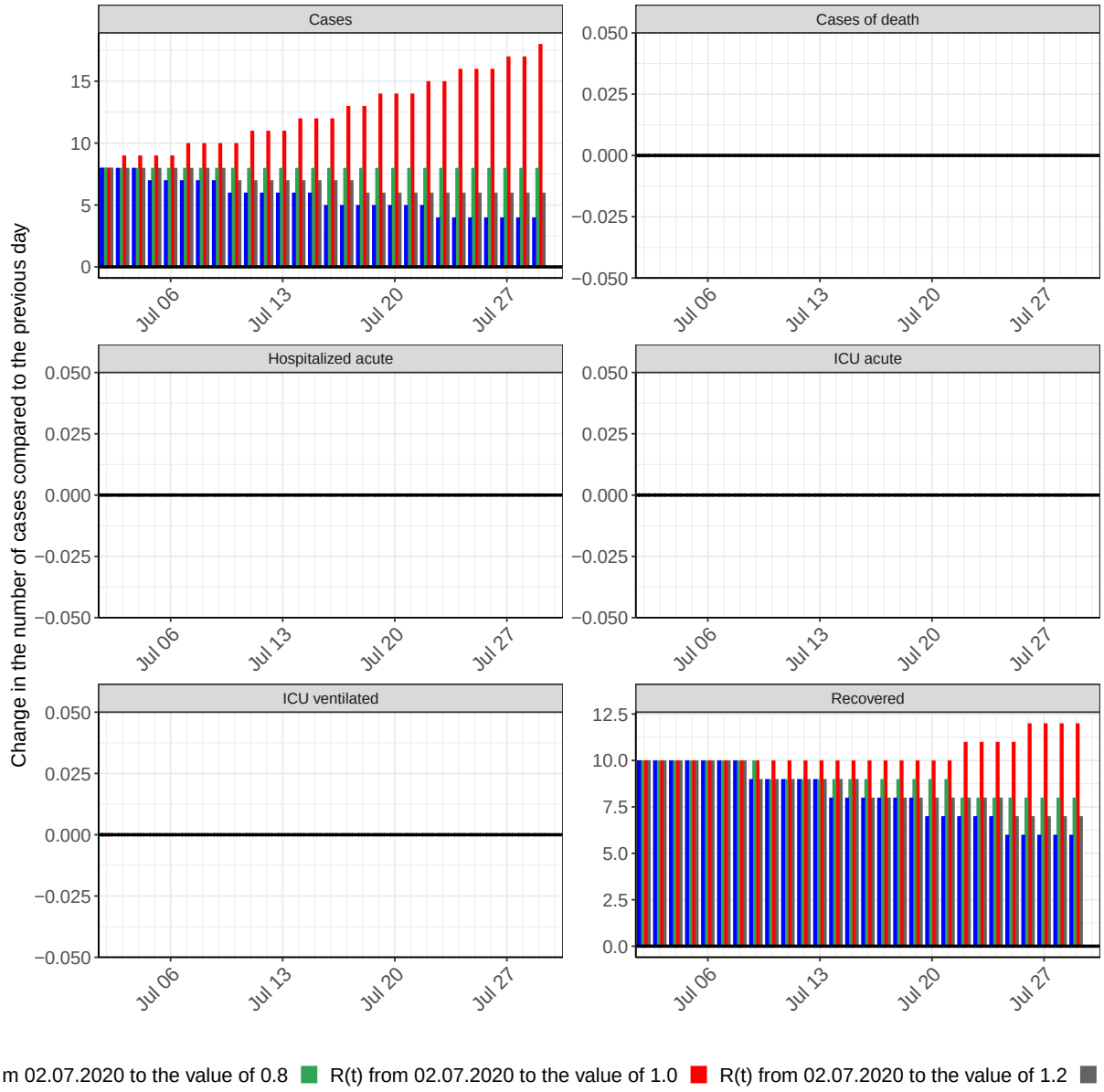


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

13 Saarland

13.1 Model description

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

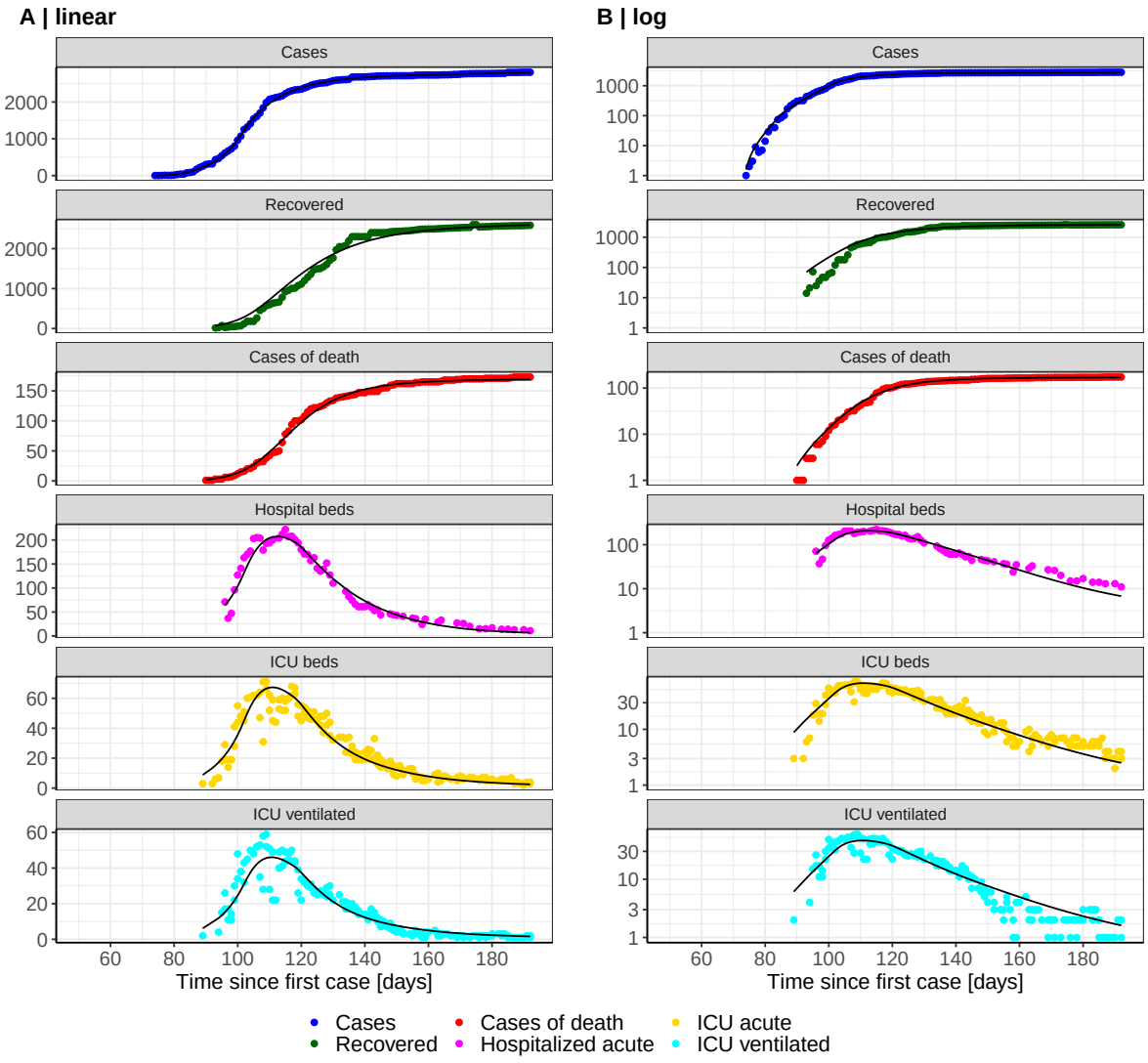


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

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

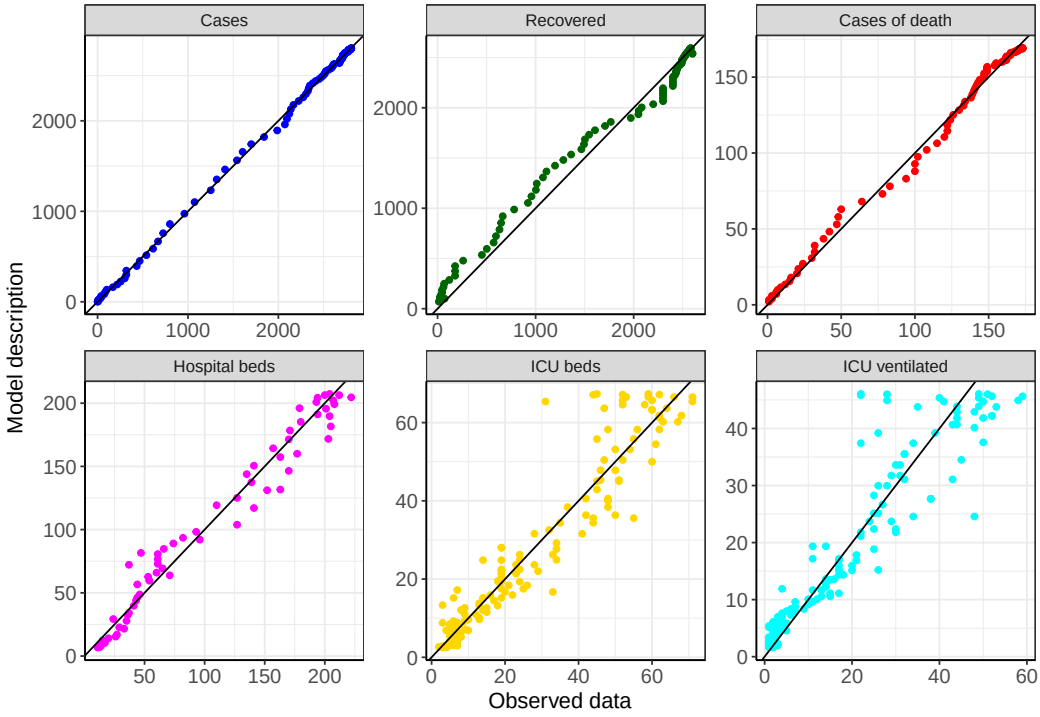


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

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

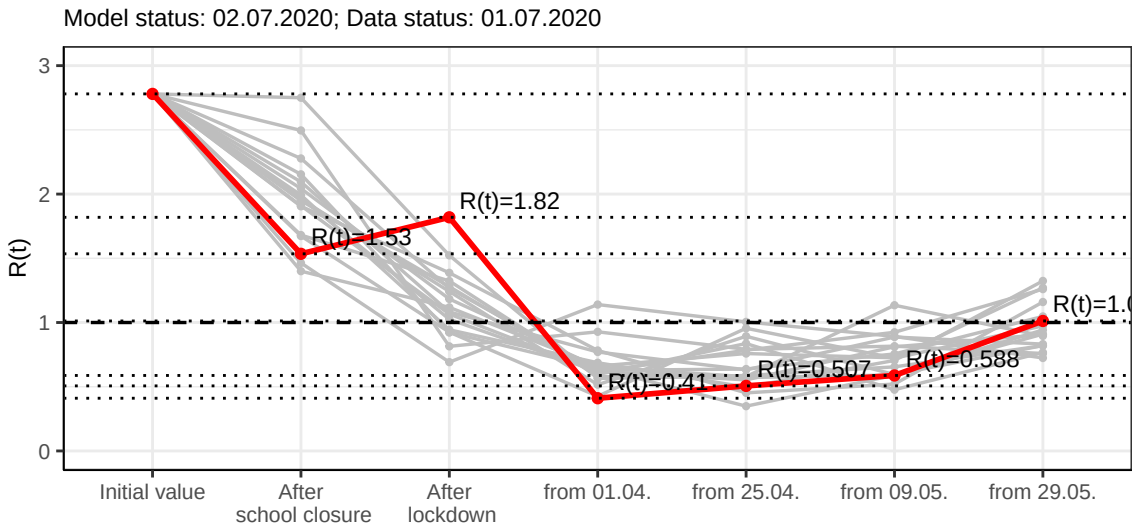


Figure 134: R(t) values before and after the NPIs for Saarland

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

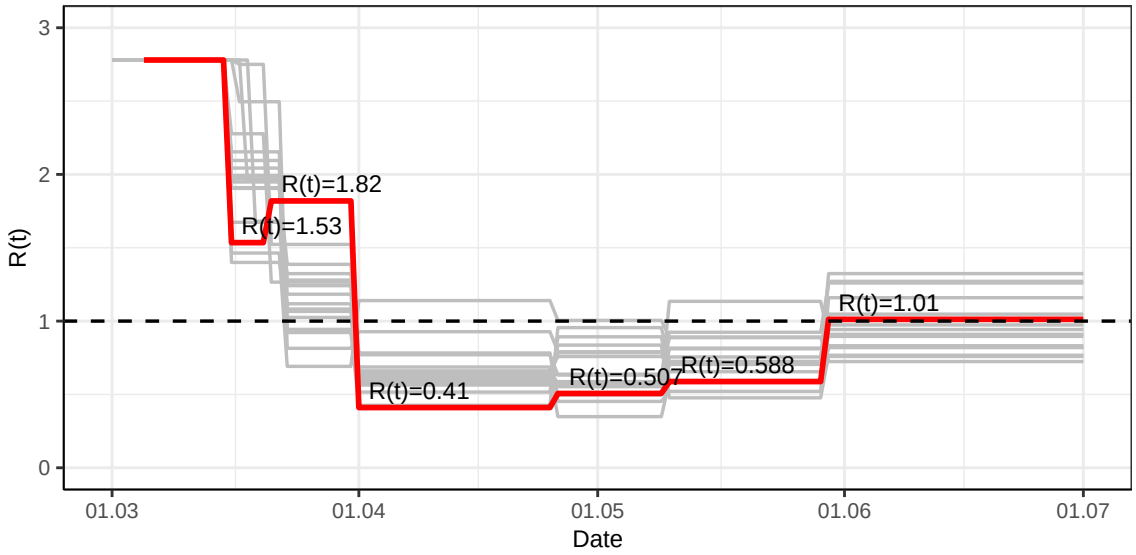


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

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

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.

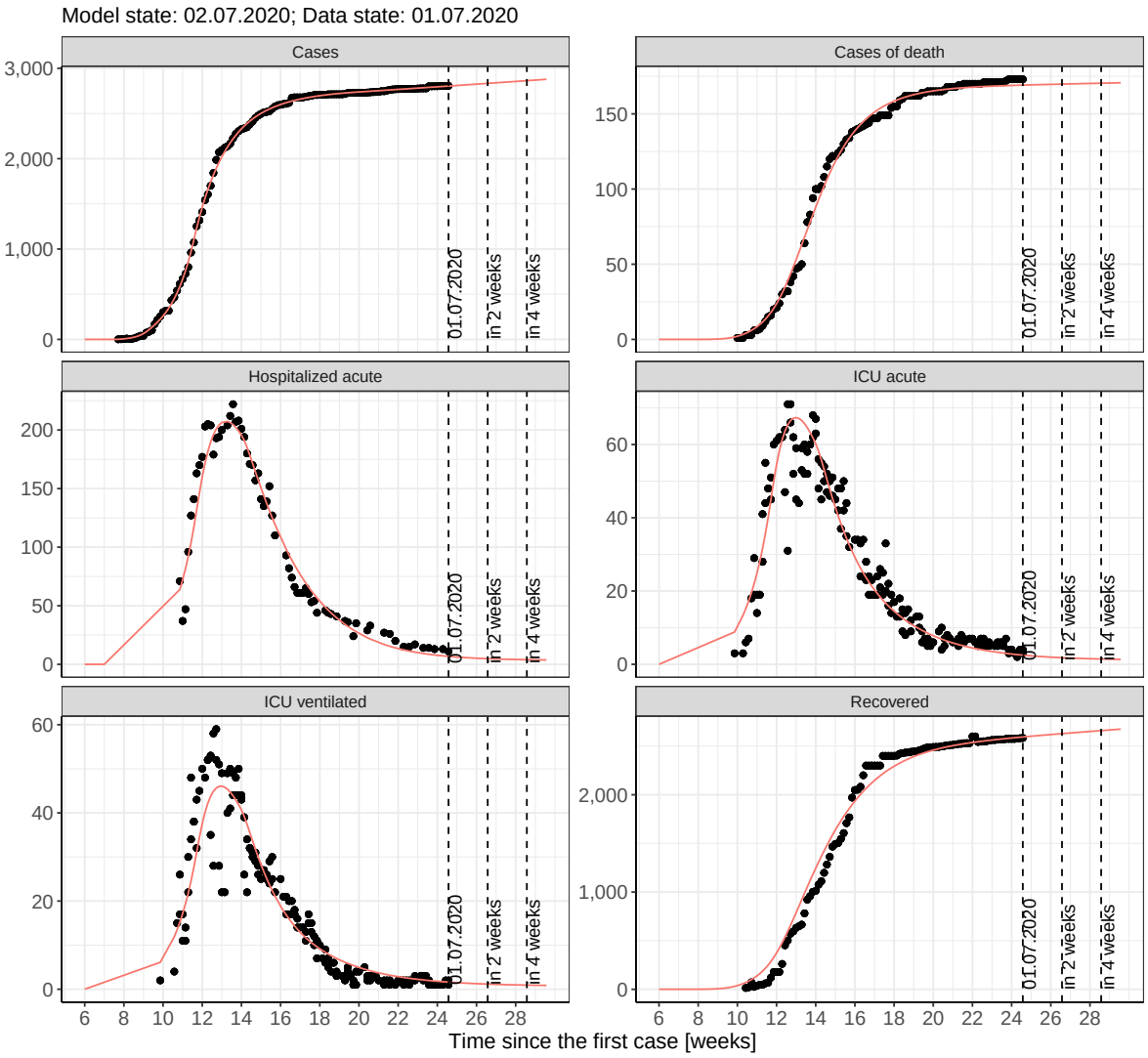


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

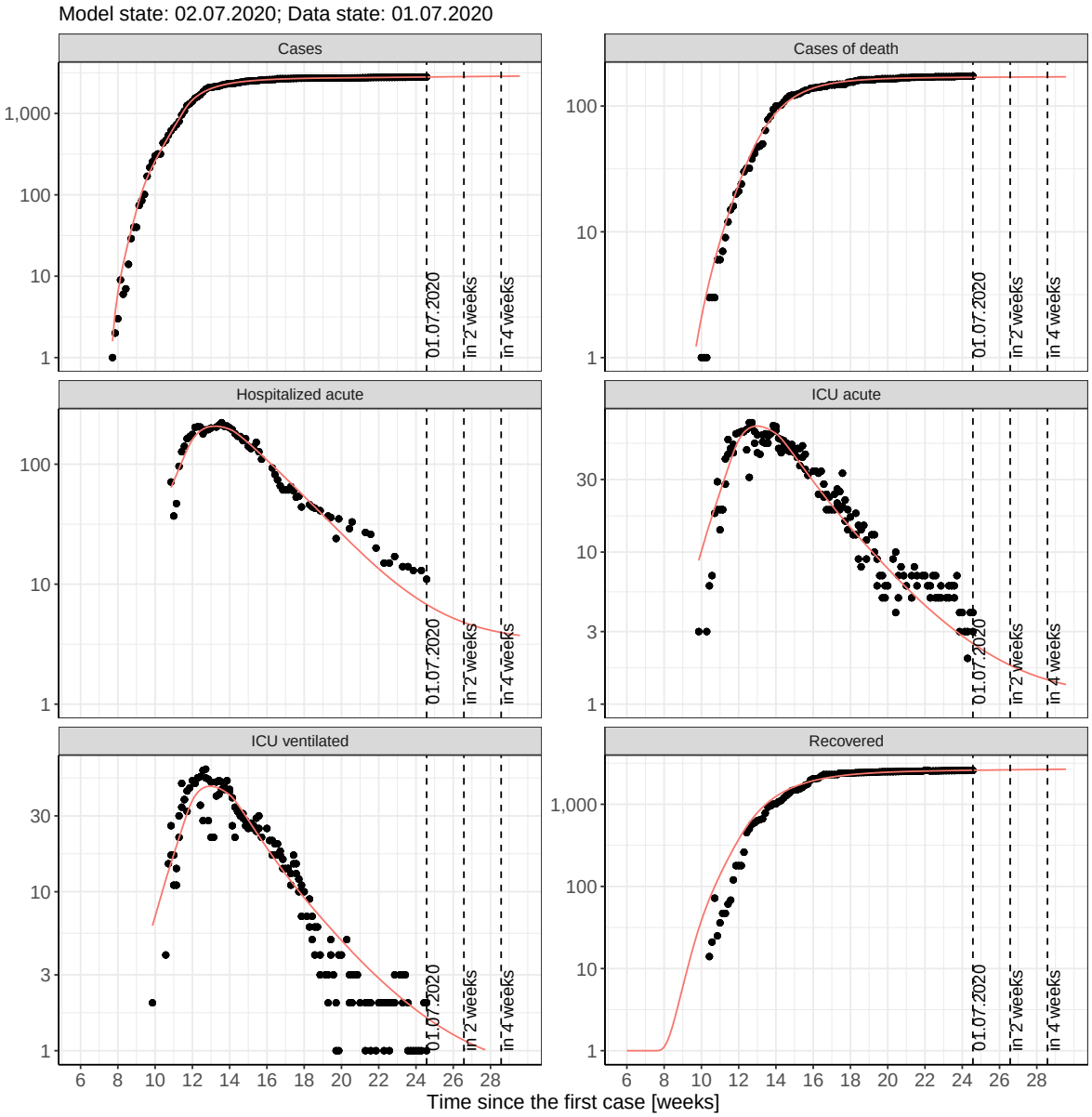


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

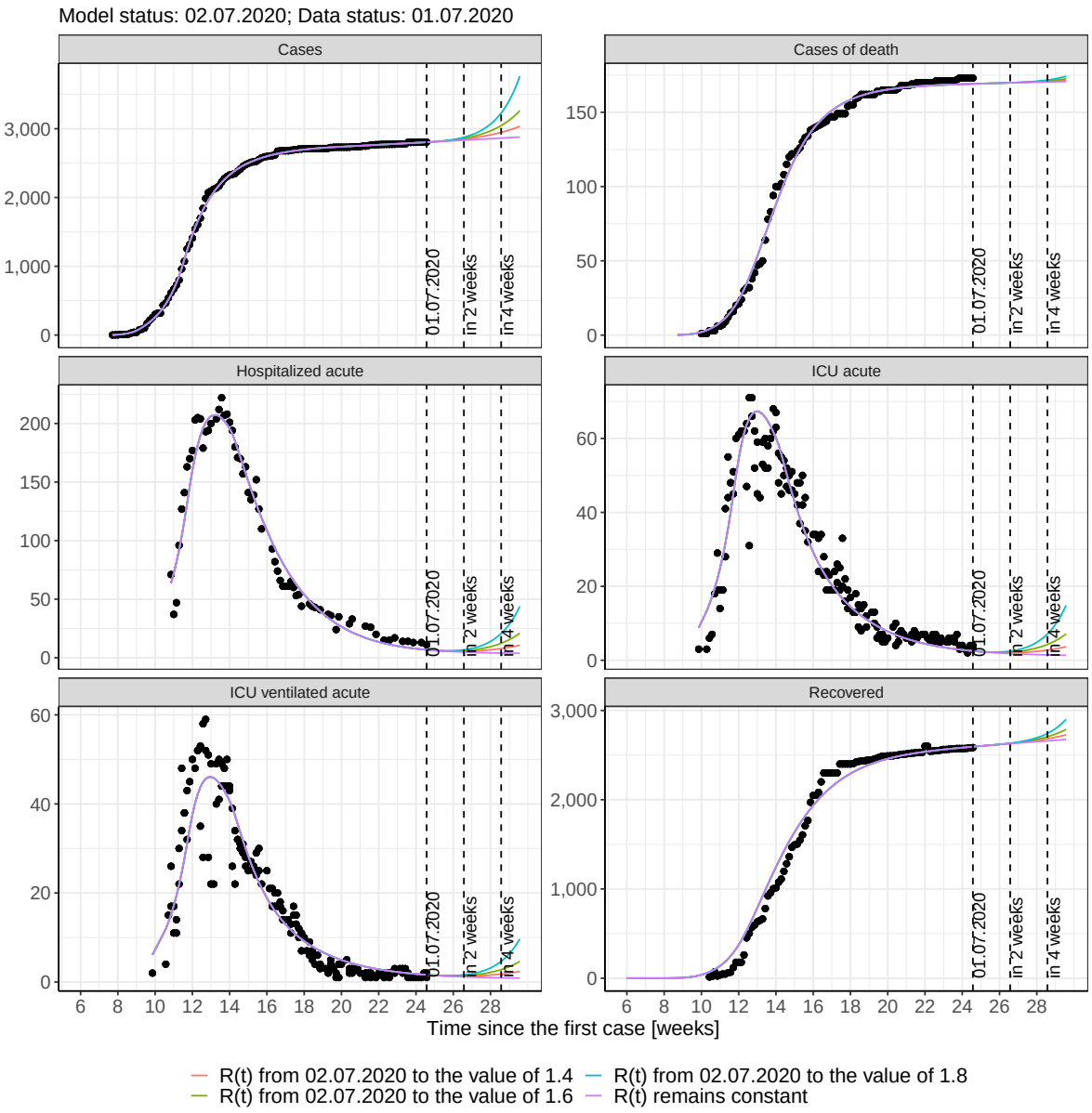


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

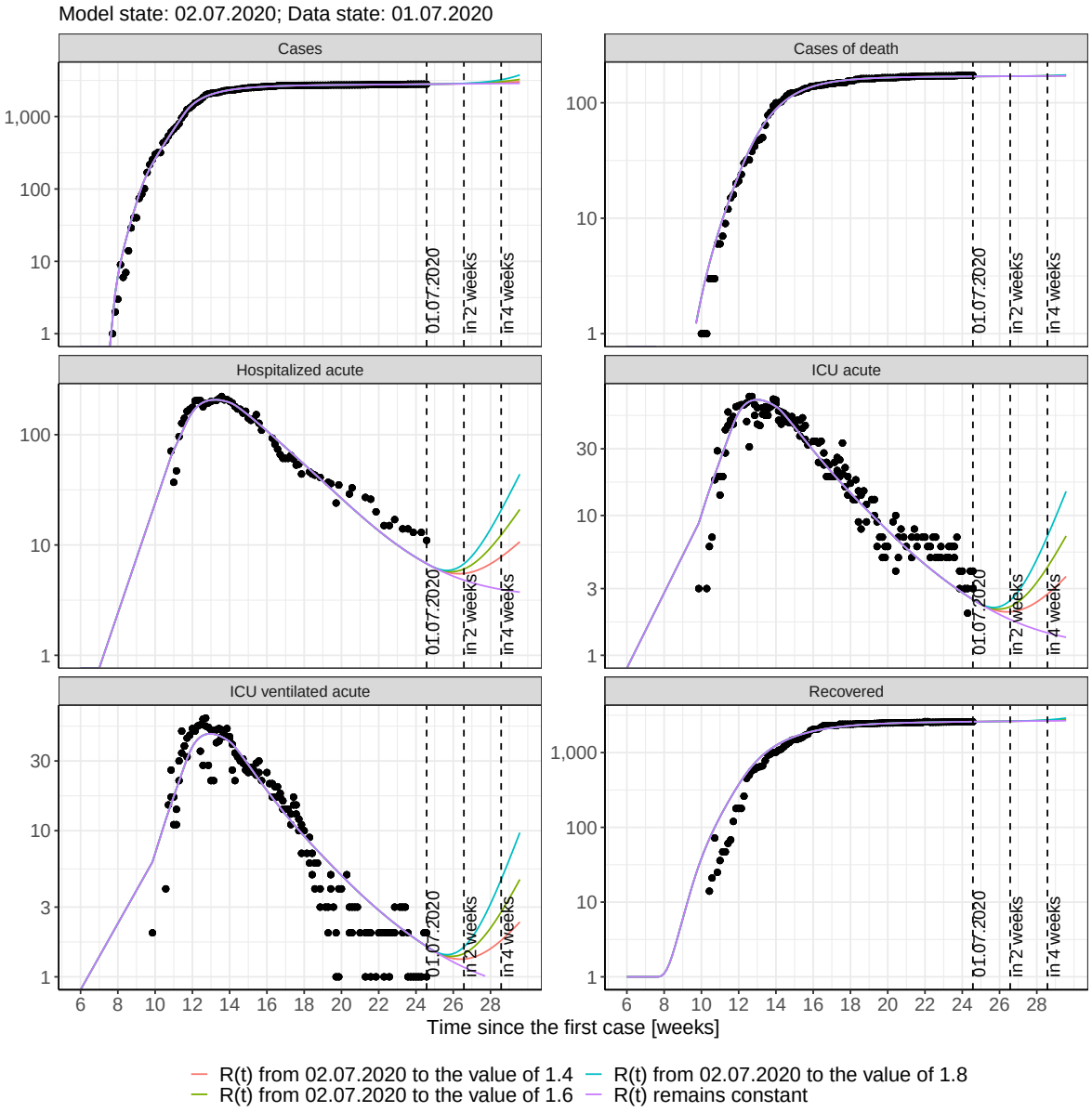


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

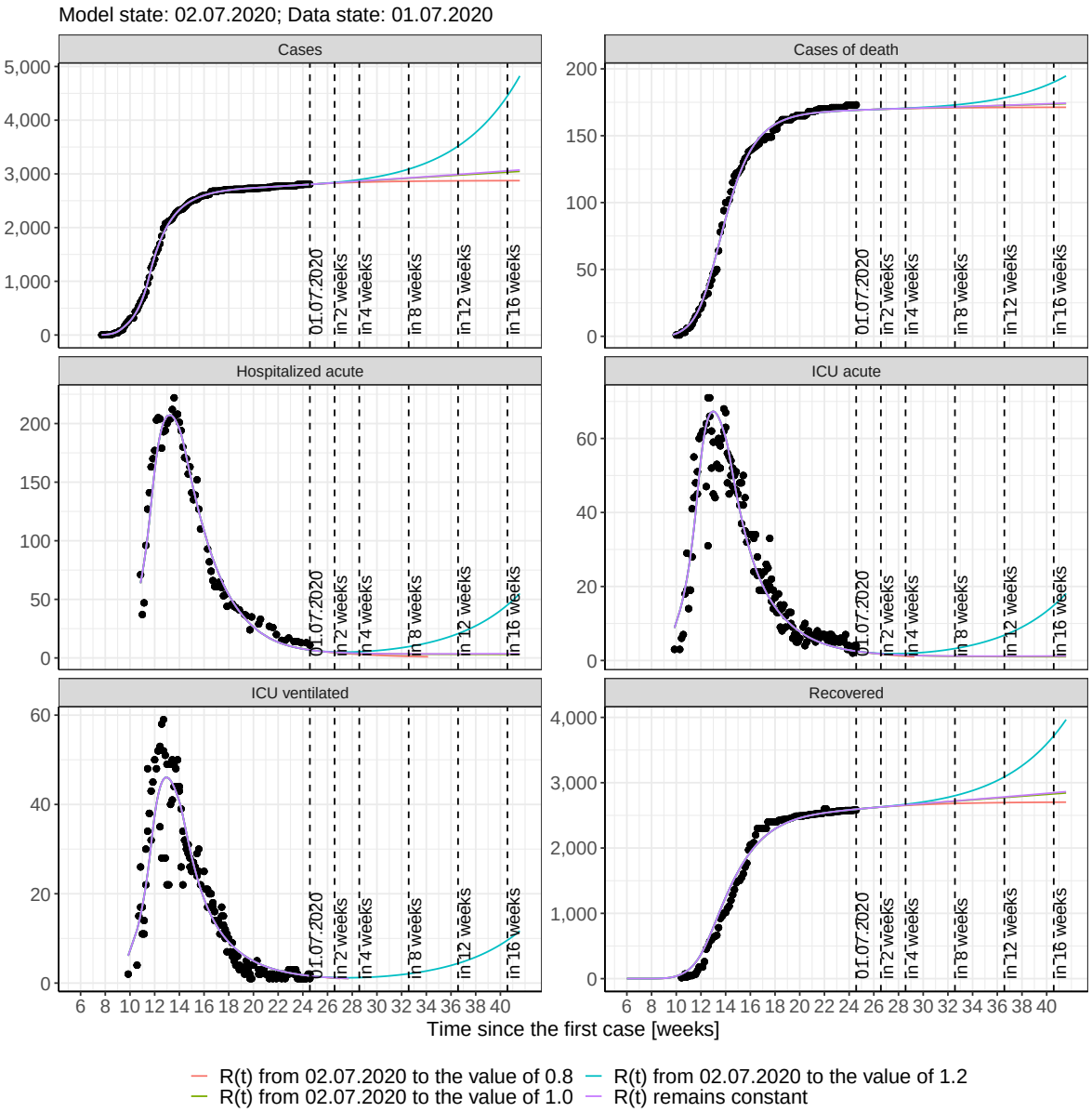


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

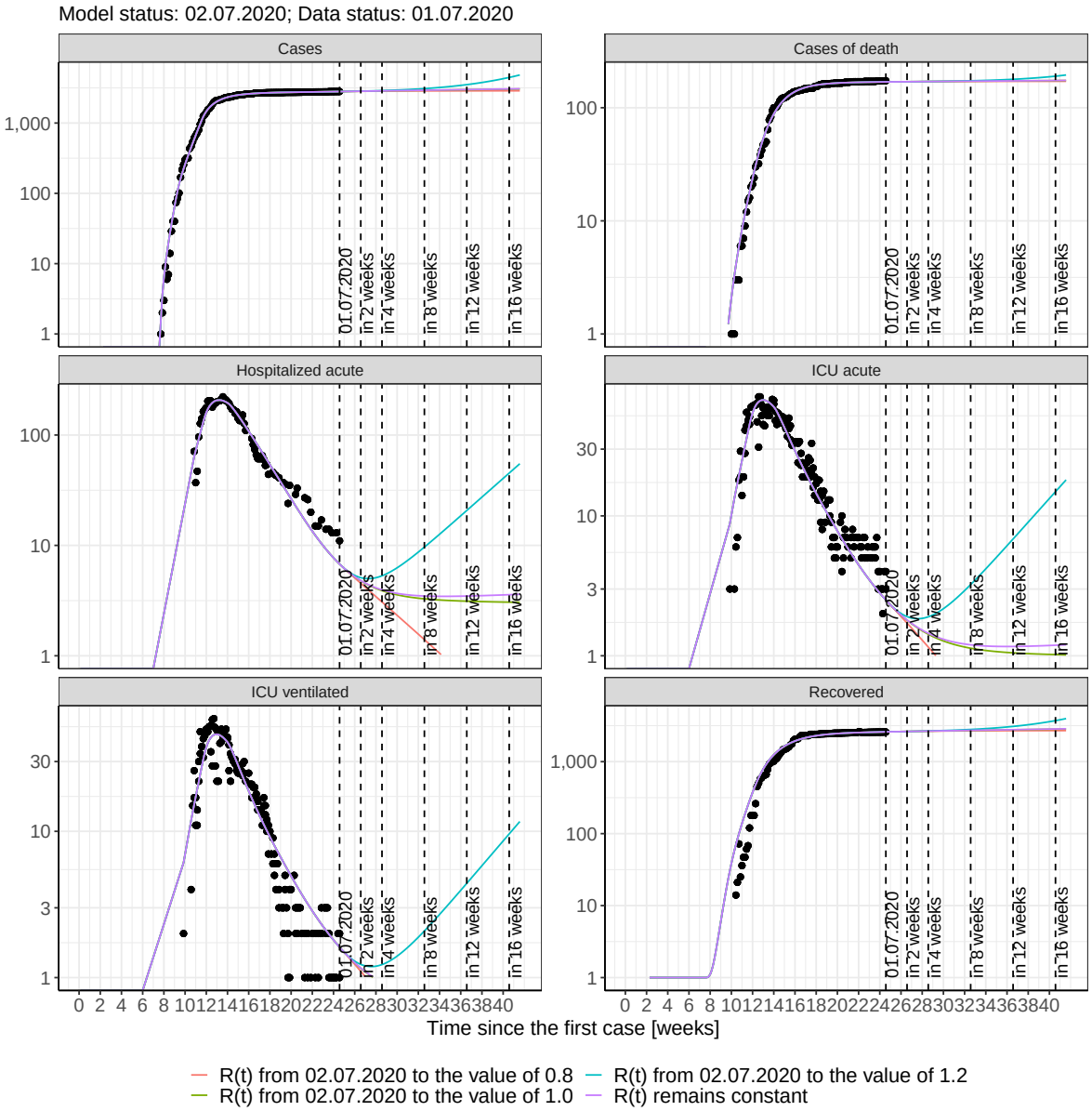


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 49) Model status from 02.07.2020; Data status: 01.07.2020.

Table 46: Saarland - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	2806	169	2597	7	2	2
03.07.2020	2808	169	2599	6	2	2
04.07.2020	2810	169	2602	6	2	1
05.07.2020	2812	169	2604	6	2	1
06.07.2020	2814	169	2607	6	2	1
07.07.2020	2817	169	2609	6	2	1
08.07.2020	2819	169	2612	6	2	1
09.07.2020	2821	170	2614	5	2	1
10.07.2020	2823	170	2616	5	2	1
11.07.2020	2825	170	2619	5	2	1
12.07.2020	2827	170	2621	5	2	1
13.07.2020	2829	170	2624	5	2	1
14.07.2020	2831	170	2626	5	2	1
15.07.2020	2834	170	2628	5	2	1
16.07.2020	2836	170	2630	5	2	1
17.07.2020	2838	170	2633	5	2	1
18.07.2020	2840	170	2635	5	2	1
19.07.2020	2842	170	2637	4	2	1
20.07.2020	2844	170	2640	4	2	1
21.07.2020	2846	170	2642	4	2	1
22.07.2020	2848	170	2644	4	2	1
23.07.2020	2851	170	2646	4	2	1
24.07.2020	2853	170	2648	4	2	1
25.07.2020	2855	170	2651	4	2	1
26.07.2020	2857	170	2653	4	2	1
27.07.2020	2859	170	2655	4	1	1
28.07.2020	2862	170	2657	4	1	1
29.07.2020	2864	170	2660	4	1	1

Table 47: Saarland - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	2806	169	2597	7	2	2
03.07.2020	2808	169	2599	6	2	2
04.07.2020	2810	169	2602	6	2	1
05.07.2020	2812	169	2604	6	2	1
06.07.2020	2814	169	2607	6	2	1
07.07.2020	2816	169	2609	6	2	1
08.07.2020	2817	169	2612	6	2	1
09.07.2020	2819	170	2614	5	2	1
10.07.2020	2821	170	2616	5	2	1
11.07.2020	2822	170	2618	5	2	1
12.07.2020	2824	170	2621	5	2	1
13.07.2020	2825	170	2623	5	2	1
14.07.2020	2827	170	2625	5	2	1
15.07.2020	2828	170	2627	5	2	1
16.07.2020	2830	170	2629	4	2	1
17.07.2020	2831	170	2631	4	2	1
18.07.2020	2832	170	2633	4	2	1
19.07.2020	2833	170	2635	4	2	1
20.07.2020	2835	170	2637	4	1	1
21.07.2020	2836	170	2639	4	1	1
22.07.2020	2837	170	2641	4	1	1
23.07.2020	2838	170	2643	4	1	1
24.07.2020	2839	170	2644	4	1	1
25.07.2020	2840	170	2646	3	1	1
26.07.2020	2841	170	2648	3	1	1
27.07.2020	2842	170	2649	3	1	1
28.07.2020	2843	170	2651	3	1	1
29.07.2020	2844	170	2652	3	1	1

Table 48: Saarland - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	2806	169	2597	7	2	2
03.07.2020	2808	169	2599	6	2	2
04.07.2020	2810	169	2602	6	2	1
05.07.2020	2812	169	2604	6	2	1
06.07.2020	2814	169	2607	6	2	1
07.07.2020	2816	169	2609	6	2	1
08.07.2020	2819	169	2612	6	2	1
09.07.2020	2821	170	2614	5	2	1
10.07.2020	2823	170	2616	5	2	1
11.07.2020	2825	170	2619	5	2	1
12.07.2020	2827	170	2621	5	2	1
13.07.2020	2829	170	2624	5	2	1
14.07.2020	2831	170	2626	5	2	1
15.07.2020	2833	170	2628	5	2	1
16.07.2020	2835	170	2630	5	2	1
17.07.2020	2837	170	2633	5	2	1
18.07.2020	2839	170	2635	5	2	1
19.07.2020	2842	170	2637	4	2	1
20.07.2020	2844	170	2639	4	2	1
21.07.2020	2846	170	2642	4	2	1
22.07.2020	2848	170	2644	4	2	1
23.07.2020	2850	170	2646	4	2	1
24.07.2020	2852	170	2648	4	2	1
25.07.2020	2854	170	2650	4	2	1
26.07.2020	2856	170	2652	4	1	1
27.07.2020	2858	170	2655	4	1	1
28.07.2020	2860	170	2657	4	1	1
29.07.2020	2862	170	2659	4	1	1

Table 49: Saarland - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	2806	169	2597	7	2	2
03.07.2020	2808	169	2599	6	2	2
04.07.2020	2811	169	2602	6	2	1
05.07.2020	2813	169	2604	6	2	1
06.07.2020	2815	169	2607	6	2	1
07.07.2020	2818	169	2609	6	2	1
08.07.2020	2820	169	2612	6	2	1
09.07.2020	2823	170	2614	6	2	1
10.07.2020	2825	170	2617	5	2	1
11.07.2020	2828	170	2619	5	2	1
12.07.2020	2831	170	2622	5	2	1
13.07.2020	2834	170	2624	5	2	1
14.07.2020	2837	170	2626	5	2	1
15.07.2020	2840	170	2629	5	2	1
16.07.2020	2843	170	2632	5	2	1
17.07.2020	2846	170	2634	5	2	1
18.07.2020	2850	170	2637	5	2	1
19.07.2020	2853	170	2639	5	2	1
20.07.2020	2856	170	2642	5	2	1
21.07.2020	2860	170	2645	5	2	1
22.07.2020	2864	170	2648	5	2	1
23.07.2020	2868	170	2650	5	2	1
24.07.2020	2872	170	2653	5	2	1
25.07.2020	2876	170	2656	5	2	1
26.07.2020	2880	170	2659	5	2	1
27.07.2020	2884	170	2662	5	2	1
28.07.2020	2888	170	2665	5	2	1
29.07.2020	2893	171	2669	5	2	1

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

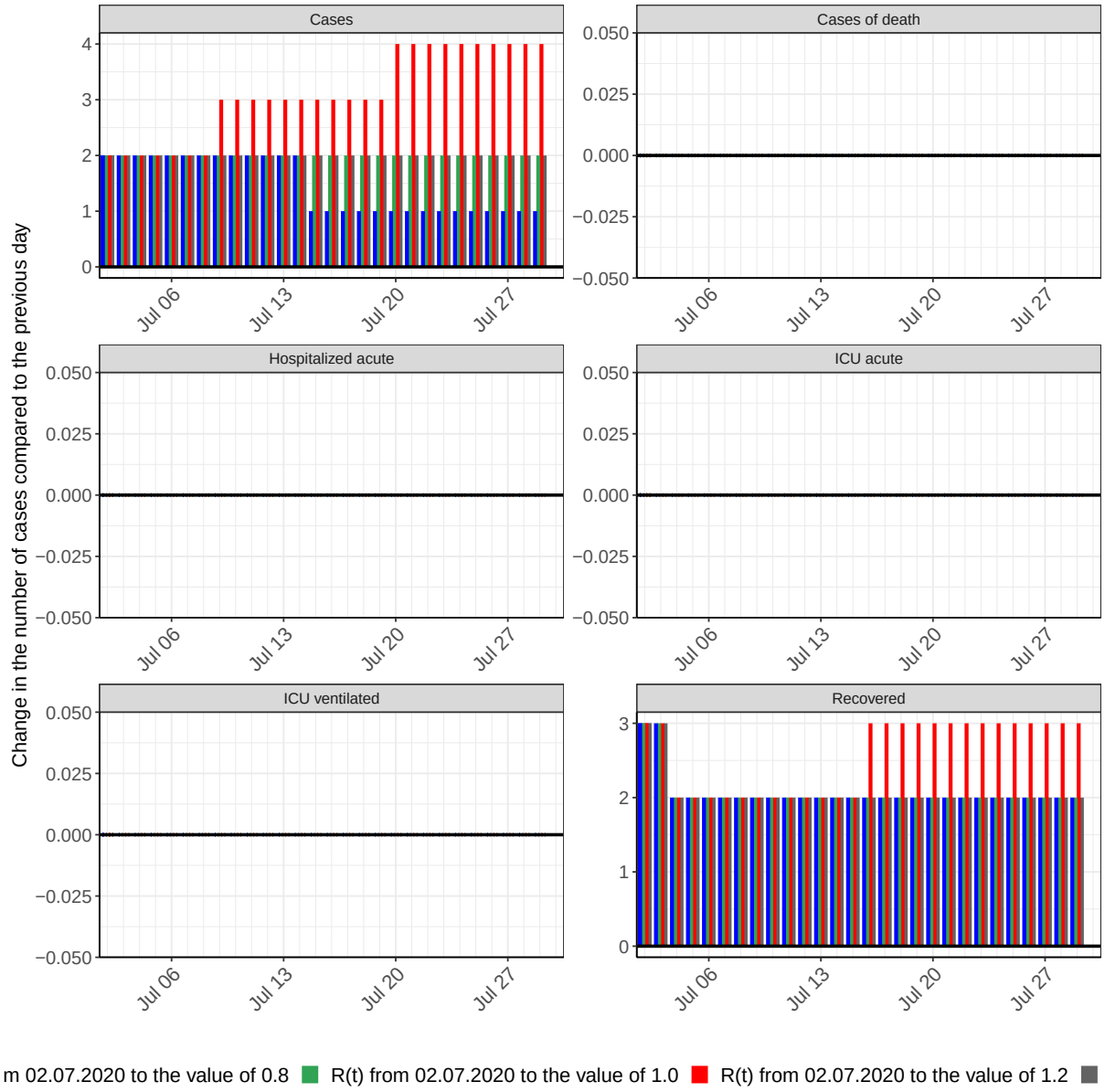


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

14 Saxony

14.1 Model description

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

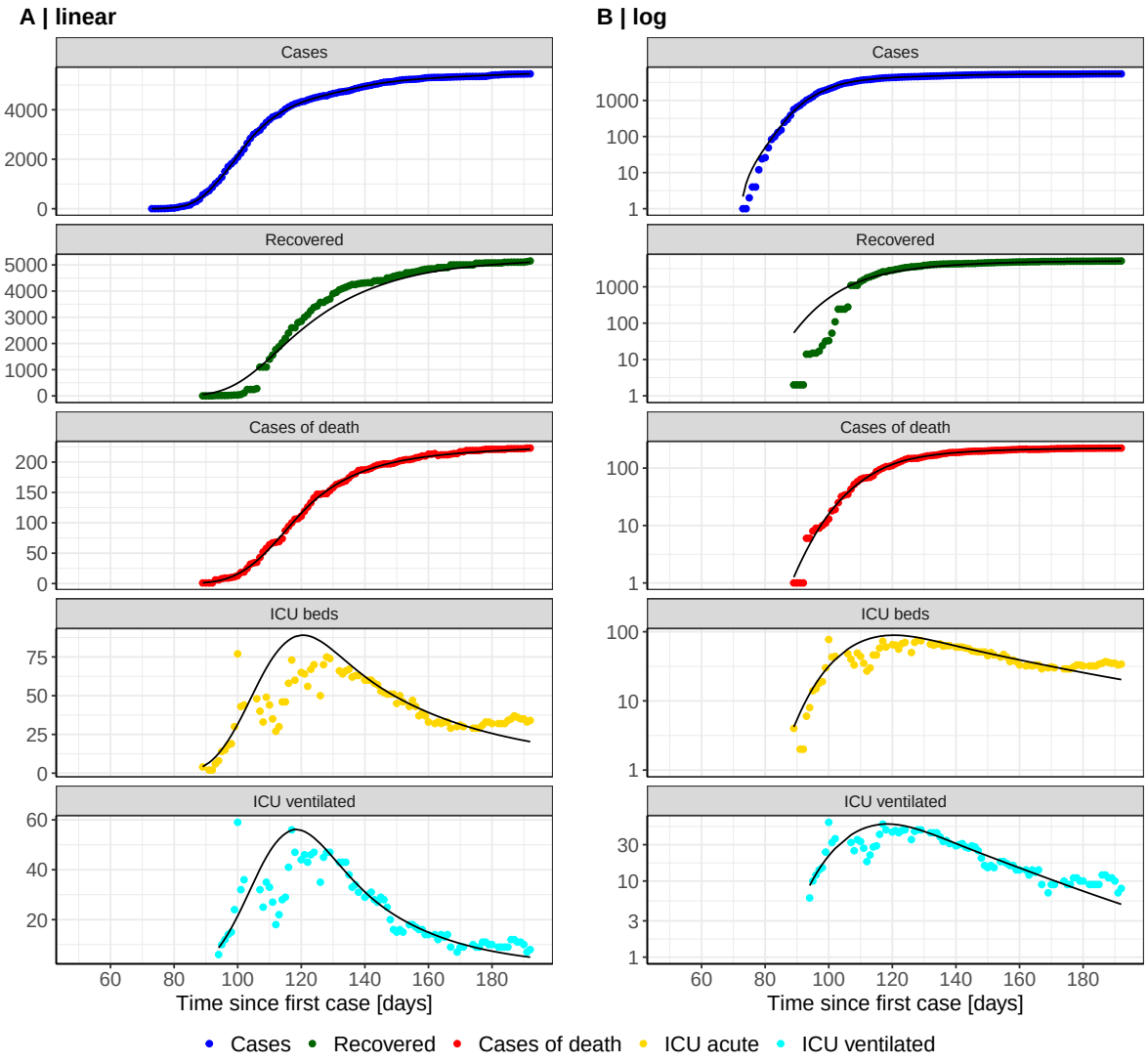


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

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

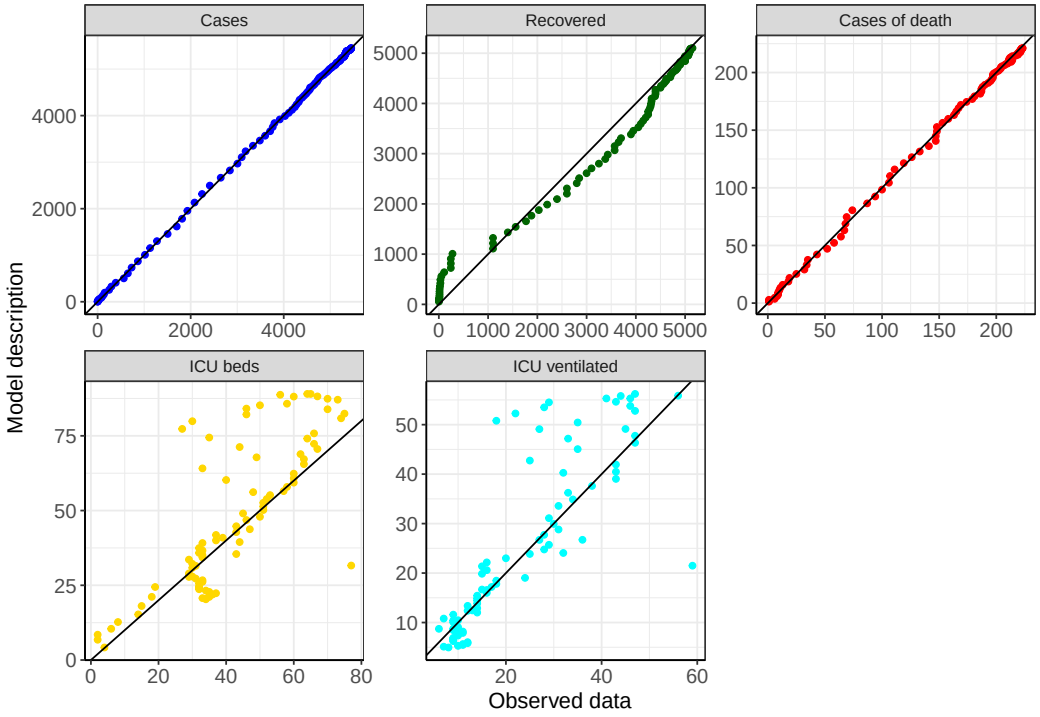


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

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

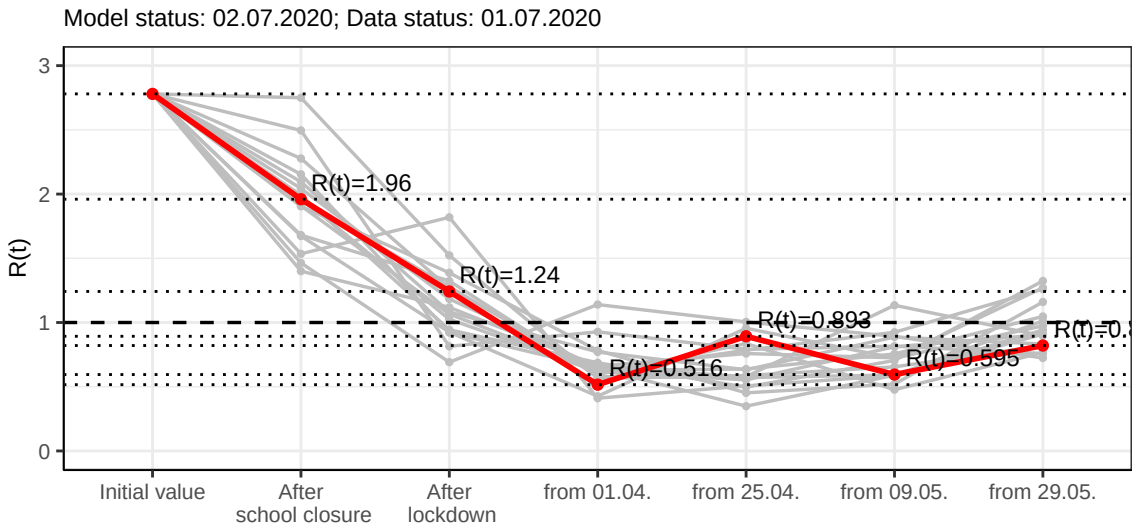


Figure 145: R(t) values before and after the NPIs for Saxony

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

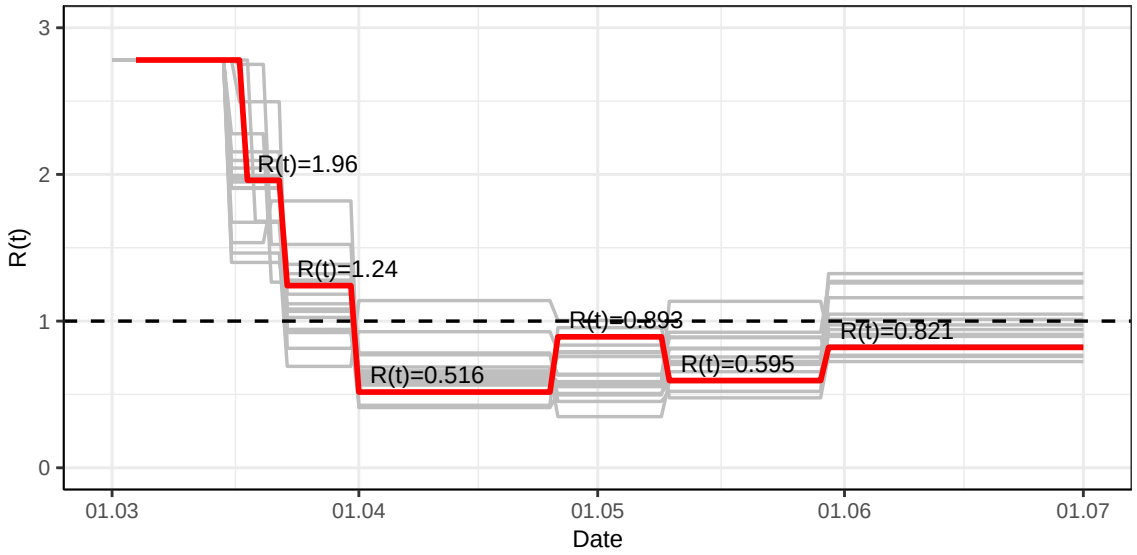


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

14.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 0.82)

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.

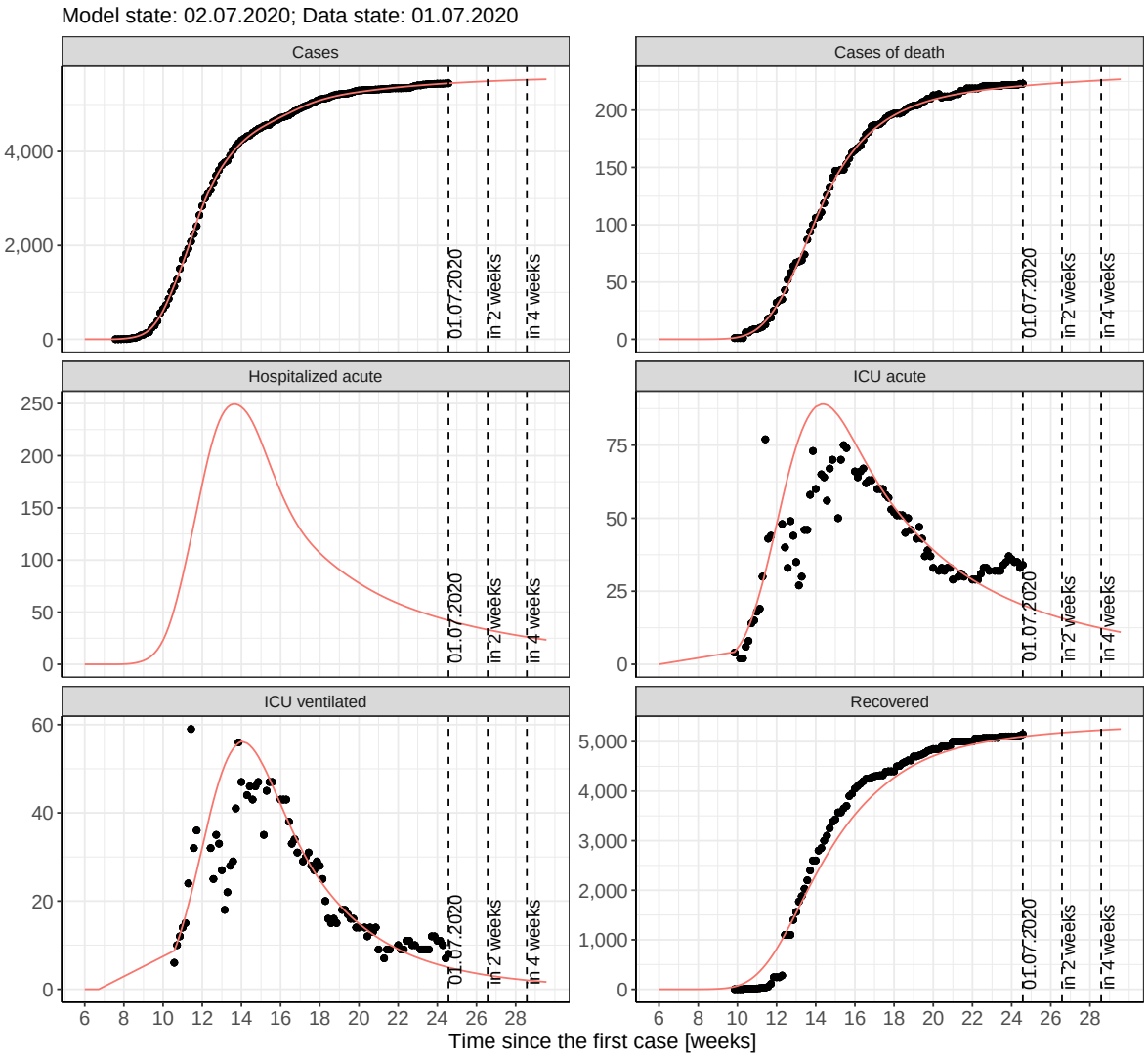


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

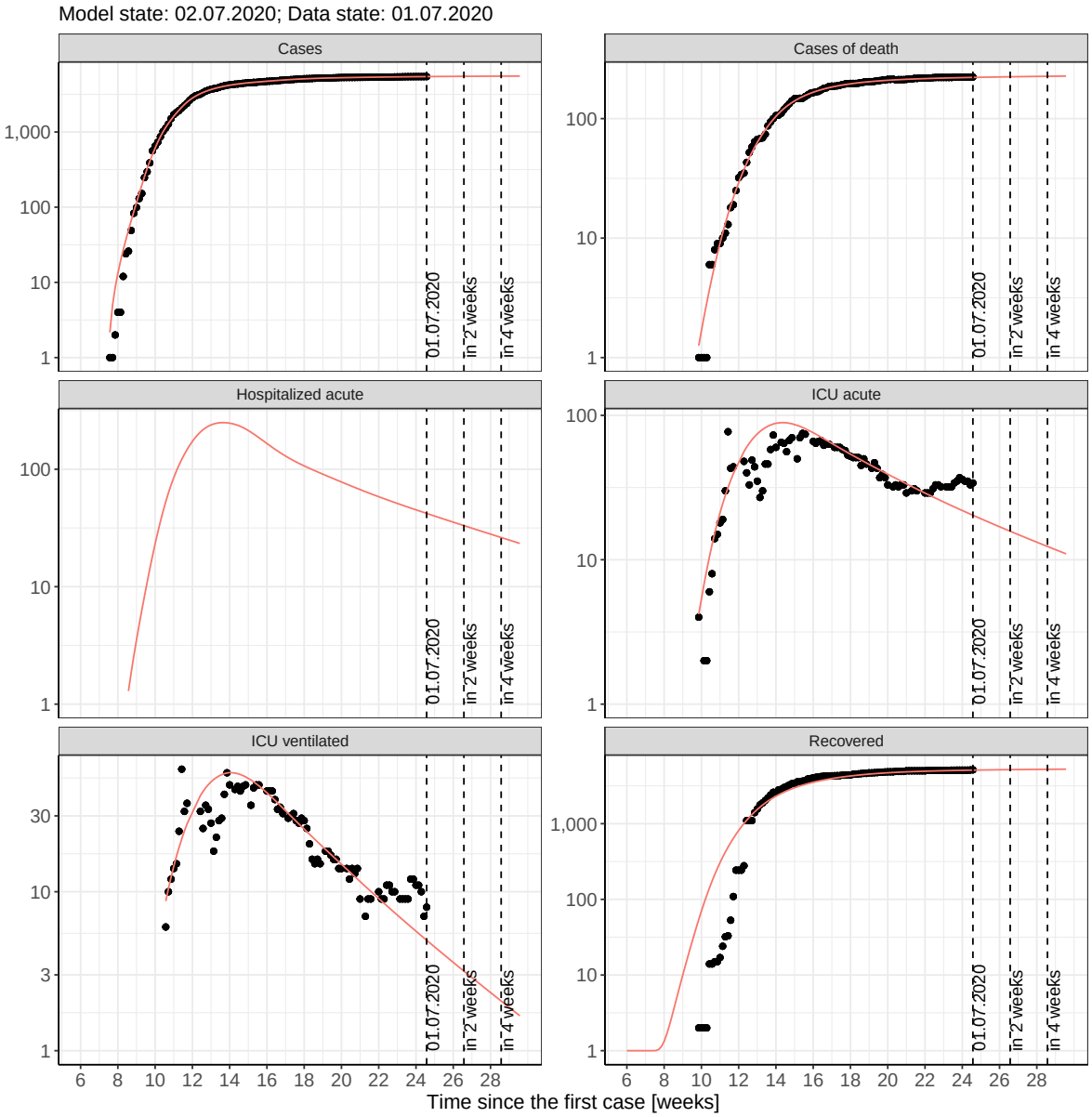


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

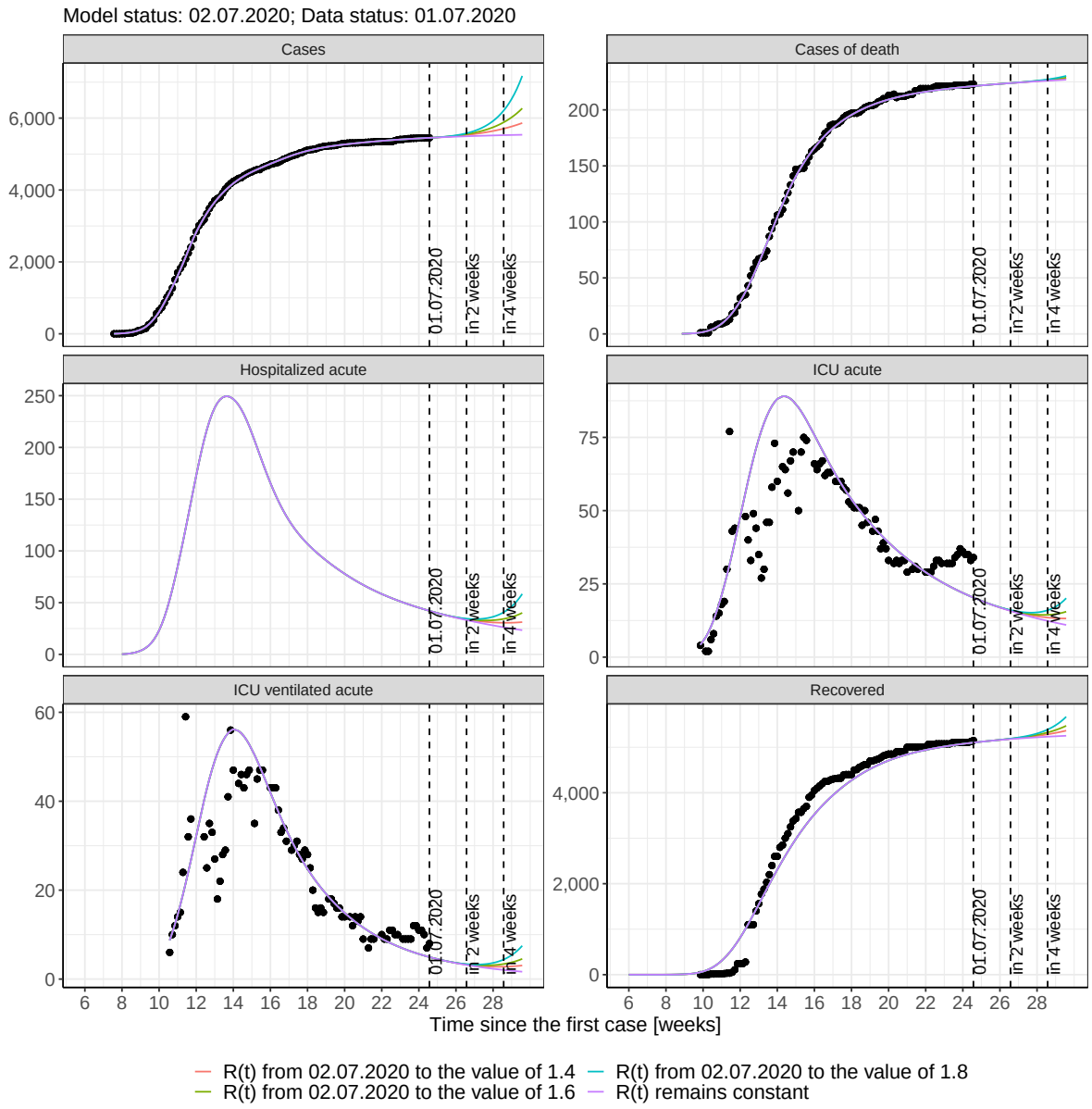


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

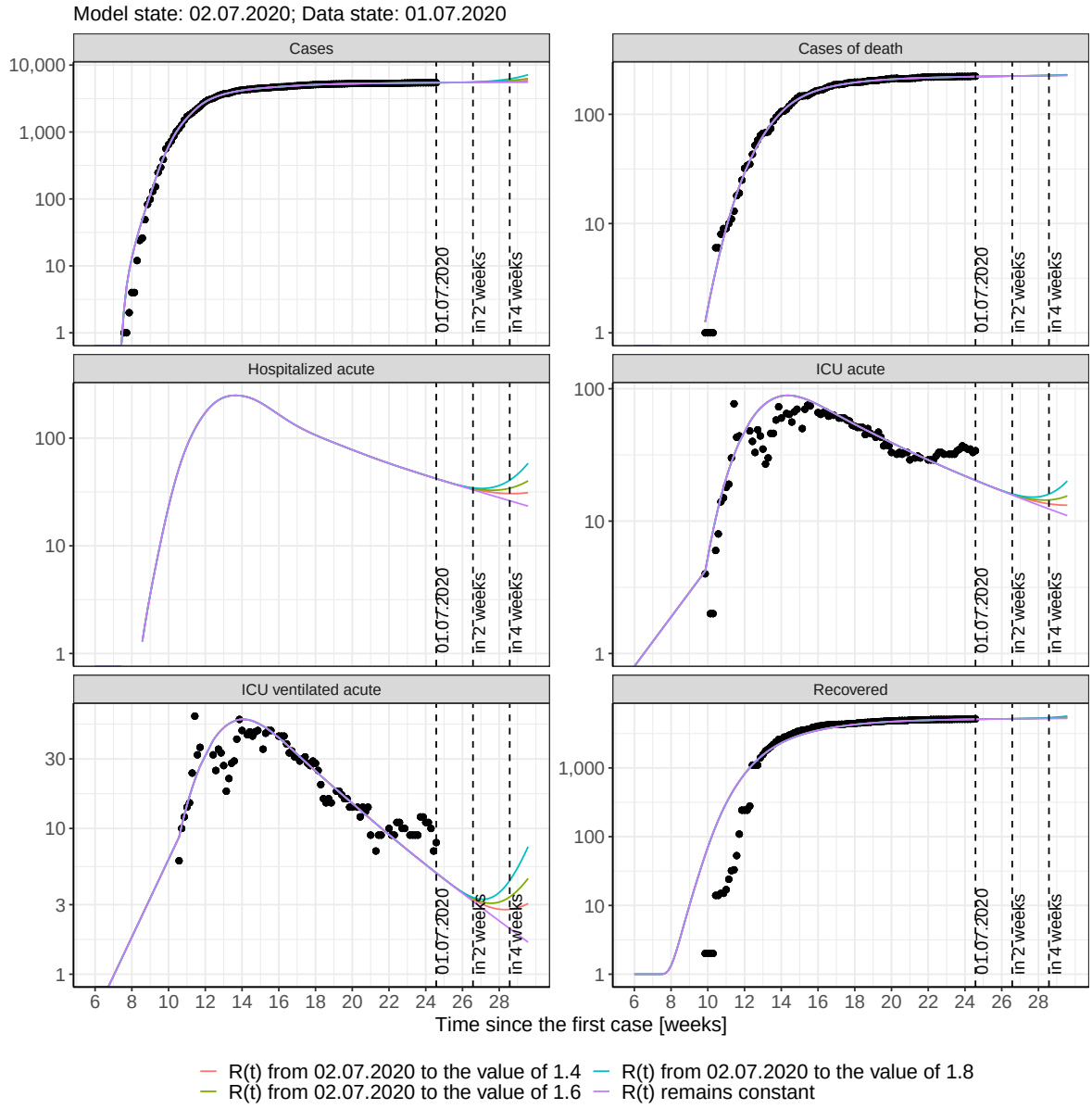


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

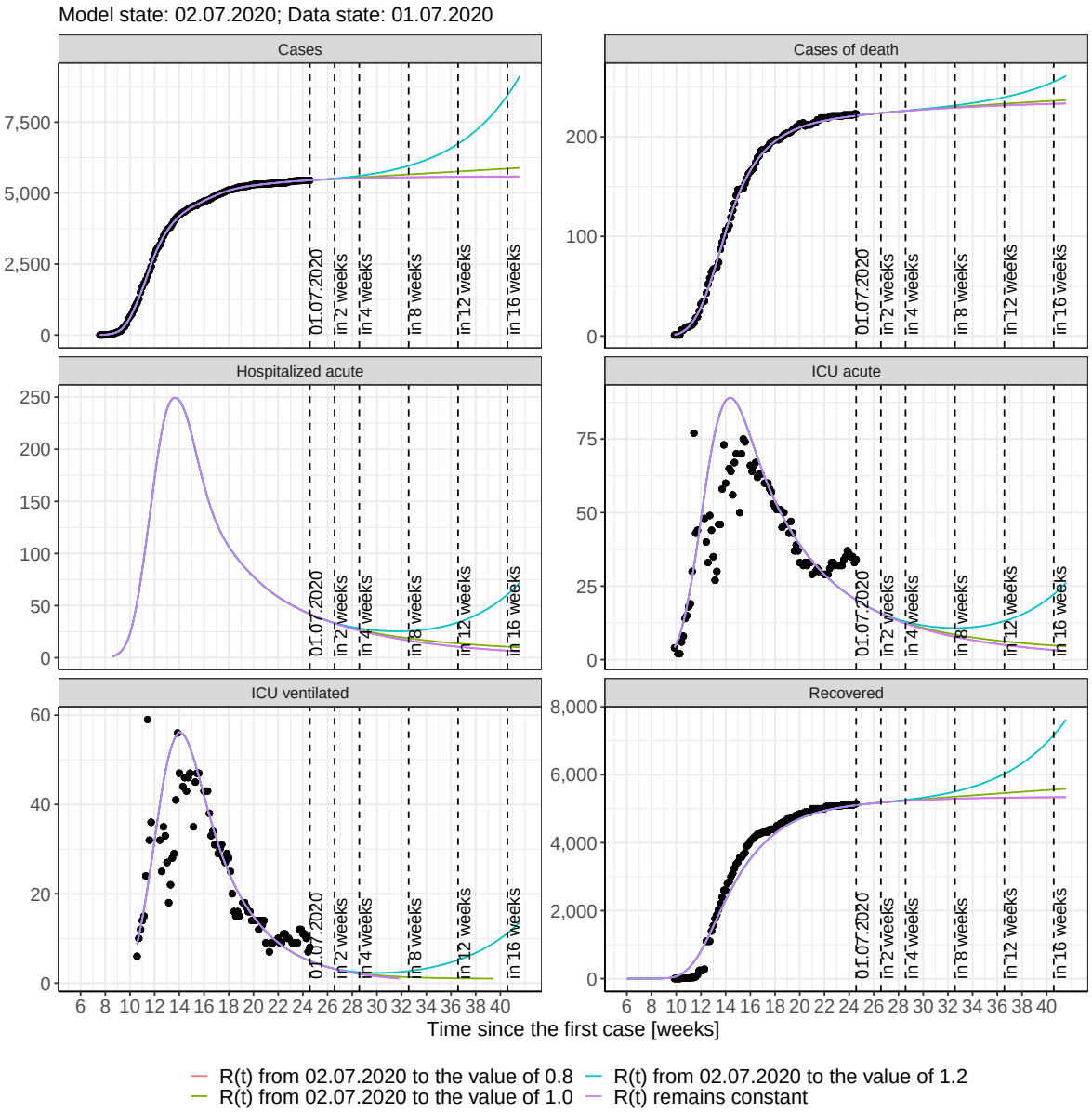


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

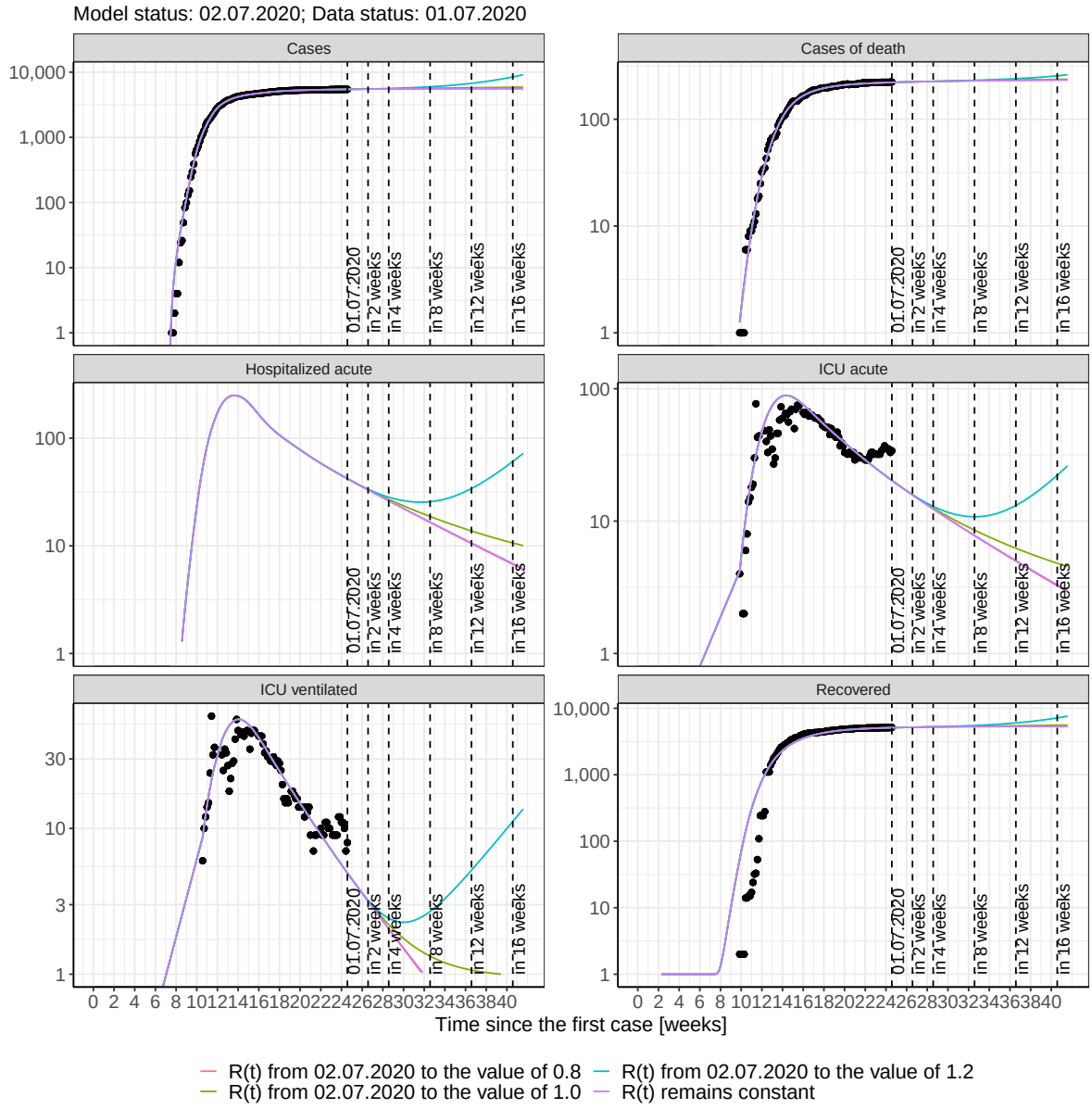


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 53) Model status from 02.07.2020; Data status: 01.07.2020.

Table 50: Saxony - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5455	221	5109	41	20	5
03.07.2020	5459	222	5115	41	20	5
04.07.2020	5462	222	5121	40	19	4
05.07.2020	5466	222	5127	39	19	4
06.07.2020	5469	222	5133	39	19	4
07.07.2020	5472	222	5139	38	18	4
08.07.2020	5475	223	5144	37	18	4
09.07.2020	5478	223	5150	37	18	4
10.07.2020	5481	223	5155	36	17	4
11.07.2020	5484	223	5160	35	17	4
12.07.2020	5487	223	5165	35	17	3
13.07.2020	5490	224	5170	34	16	3
14.07.2020	5492	224	5175	34	16	3
15.07.2020	5495	224	5179	33	16	3
16.07.2020	5498	224	5184	33	15	3
17.07.2020	5500	224	5188	32	15	3
18.07.2020	5502	224	5192	31	15	3
19.07.2020	5505	225	5196	31	15	3
20.07.2020	5507	225	5200	30	14	3
21.07.2020	5509	225	5204	30	14	3
22.07.2020	5512	225	5208	29	14	3
23.07.2020	5514	225	5212	29	14	2
24.07.2020	5516	225	5216	28	13	2
25.07.2020	5518	225	5219	28	13	2
26.07.2020	5520	226	5222	28	13	2
27.07.2020	5522	226	5226	27	13	2
28.07.2020	5524	226	5229	27	13	2
29.07.2020	5525	226	5232	26	12	2

Table 51: Saxony - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5455	221	5109	41	20	5
03.07.2020	5459	222	5115	41	20	5
04.07.2020	5462	222	5121	40	19	4
05.07.2020	5466	222	5127	39	19	4
06.07.2020	5469	222	5133	39	19	4
07.07.2020	5472	222	5139	38	18	4
08.07.2020	5475	223	5144	37	18	4
09.07.2020	5478	223	5150	37	18	4
10.07.2020	5481	223	5155	36	17	4
11.07.2020	5484	223	5160	35	17	4
12.07.2020	5486	223	5165	35	17	3
13.07.2020	5489	224	5170	34	16	3
14.07.2020	5492	224	5174	34	16	3
15.07.2020	5494	224	5179	33	16	3
16.07.2020	5497	224	5184	33	15	3
17.07.2020	5499	224	5188	32	15	3
18.07.2020	5501	224	5192	31	15	3
19.07.2020	5504	225	5196	31	15	3
20.07.2020	5506	225	5200	30	14	3
21.07.2020	5508	225	5204	30	14	3
22.07.2020	5510	225	5208	29	14	3
23.07.2020	5512	225	5211	29	14	2
24.07.2020	5514	225	5215	28	13	2
25.07.2020	5516	225	5218	28	13	2
26.07.2020	5518	226	5222	28	13	2
27.07.2020	5519	226	5225	27	13	2
28.07.2020	5521	226	5228	27	13	2
29.07.2020	5523	226	5231	26	12	2

Table 52: Saxony - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5455	221	5109	41	20	5
03.07.2020	5459	222	5115	41	20	5
04.07.2020	5463	222	5121	40	19	4
05.07.2020	5466	222	5127	39	19	4
06.07.2020	5470	222	5133	39	19	4
07.07.2020	5474	222	5139	38	18	4
08.07.2020	5477	223	5145	37	18	4
09.07.2020	5481	223	5150	37	18	4
10.07.2020	5485	223	5155	36	17	4
11.07.2020	5488	223	5161	36	17	4
12.07.2020	5492	223	5166	35	17	3
13.07.2020	5496	224	5171	34	16	3
14.07.2020	5500	224	5176	34	16	3
15.07.2020	5503	224	5180	33	16	3
16.07.2020	5507	224	5185	33	16	3
17.07.2020	5511	224	5190	32	15	3
18.07.2020	5514	224	5195	32	15	3
19.07.2020	5518	225	5199	31	15	3
20.07.2020	5522	225	5204	31	15	3
21.07.2020	5526	225	5208	30	14	3
22.07.2020	5529	225	5213	30	14	3
23.07.2020	5533	225	5217	29	14	3
24.07.2020	5536	225	5221	29	14	2
25.07.2020	5540	226	5226	29	13	2
26.07.2020	5544	226	5230	28	13	2
27.07.2020	5548	226	5234	28	13	2
28.07.2020	5551	226	5238	27	13	2
29.07.2020	5555	226	5243	27	13	2

Table 53: Saxony - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	5455	221	5109	41	20	5
03.07.2020	5459	222	5115	41	20	5
04.07.2020	5463	222	5121	40	19	4
05.07.2020	5467	222	5128	39	19	4
06.07.2020	5471	222	5133	39	19	4
07.07.2020	5476	222	5139	38	18	4
08.07.2020	5480	223	5145	37	18	4
09.07.2020	5485	223	5150	37	18	4
10.07.2020	5490	223	5156	36	17	4
11.07.2020	5494	223	5161	36	17	4
12.07.2020	5499	223	5166	35	17	4
13.07.2020	5504	224	5172	35	16	3
14.07.2020	5510	224	5177	34	16	3
15.07.2020	5515	224	5182	34	16	3
16.07.2020	5521	224	5187	33	16	3
17.07.2020	5526	224	5193	33	15	3
18.07.2020	5532	224	5198	32	15	3
19.07.2020	5538	225	5203	32	15	3
20.07.2020	5545	225	5208	31	15	3
21.07.2020	5551	225	5214	31	14	3
22.07.2020	5558	225	5219	31	14	3
23.07.2020	5565	225	5225	30	14	3
24.07.2020	5572	225	5230	30	14	3
25.07.2020	5579	226	5236	30	14	3
26.07.2020	5586	226	5242	29	13	3
27.07.2020	5594	226	5248	29	13	2
28.07.2020	5602	226	5254	29	13	2
29.07.2020	5610	226	5260	28	13	2

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

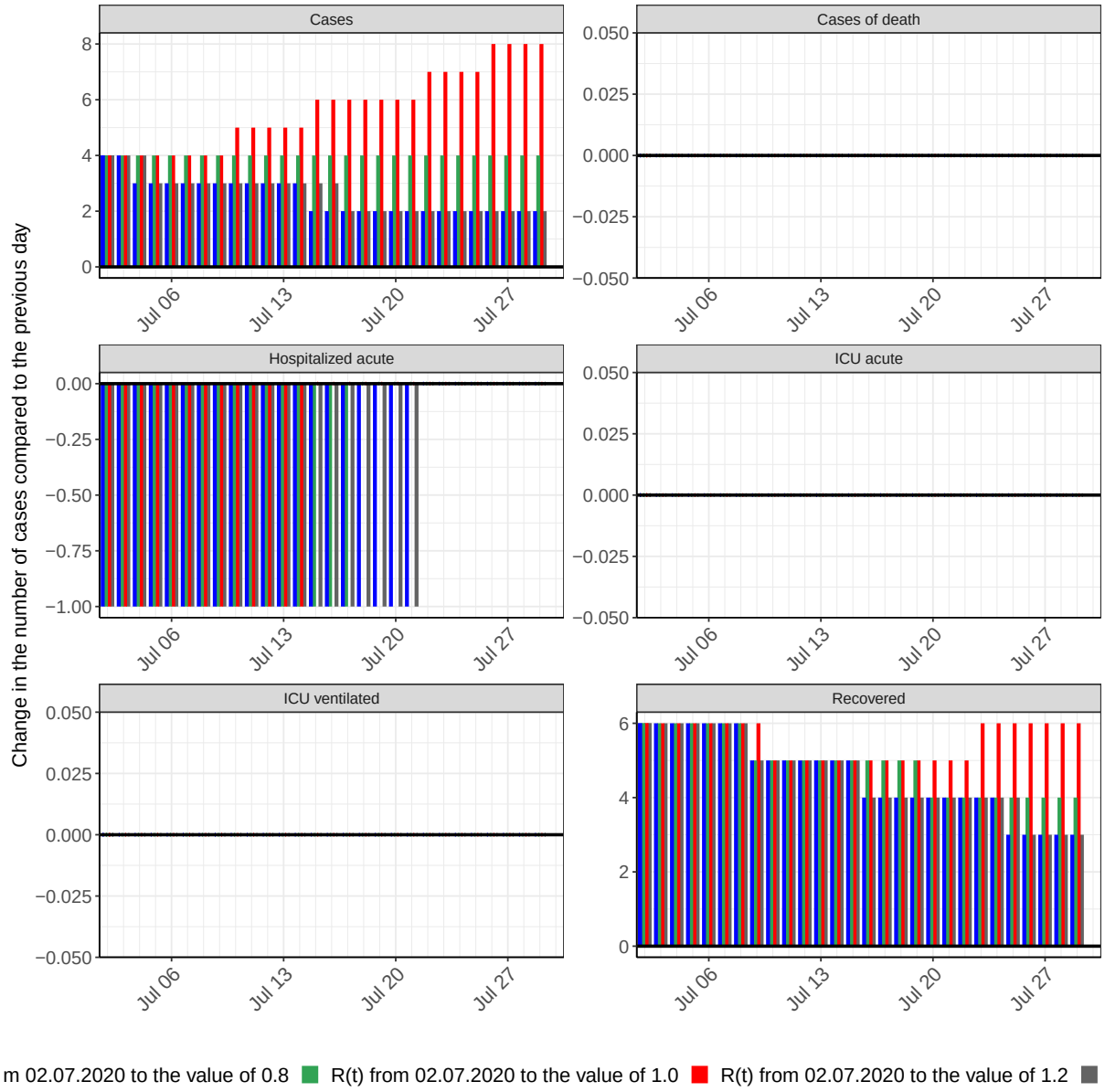


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

15 Saxony-Anhalt

15.1 Model description

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

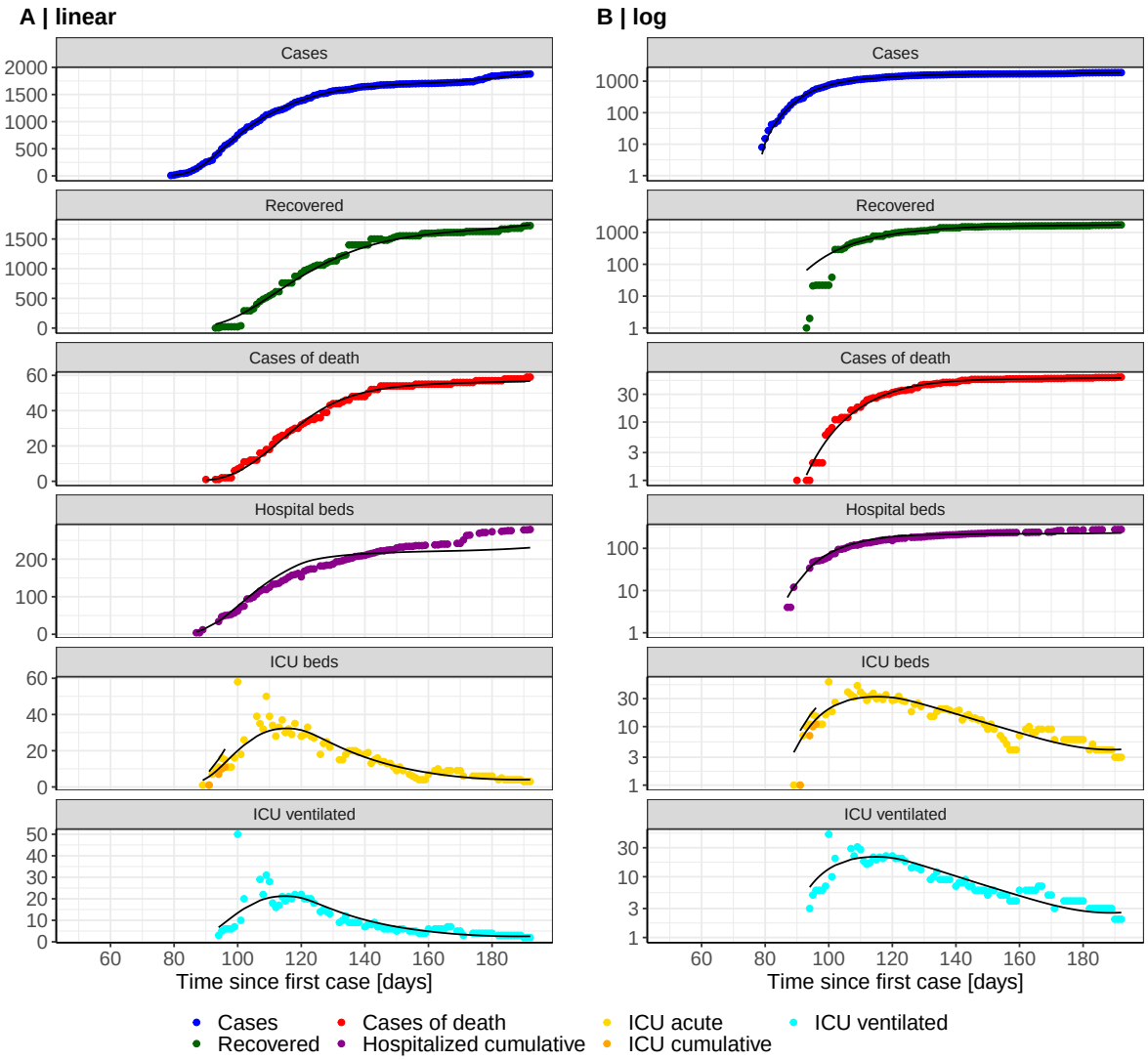


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

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

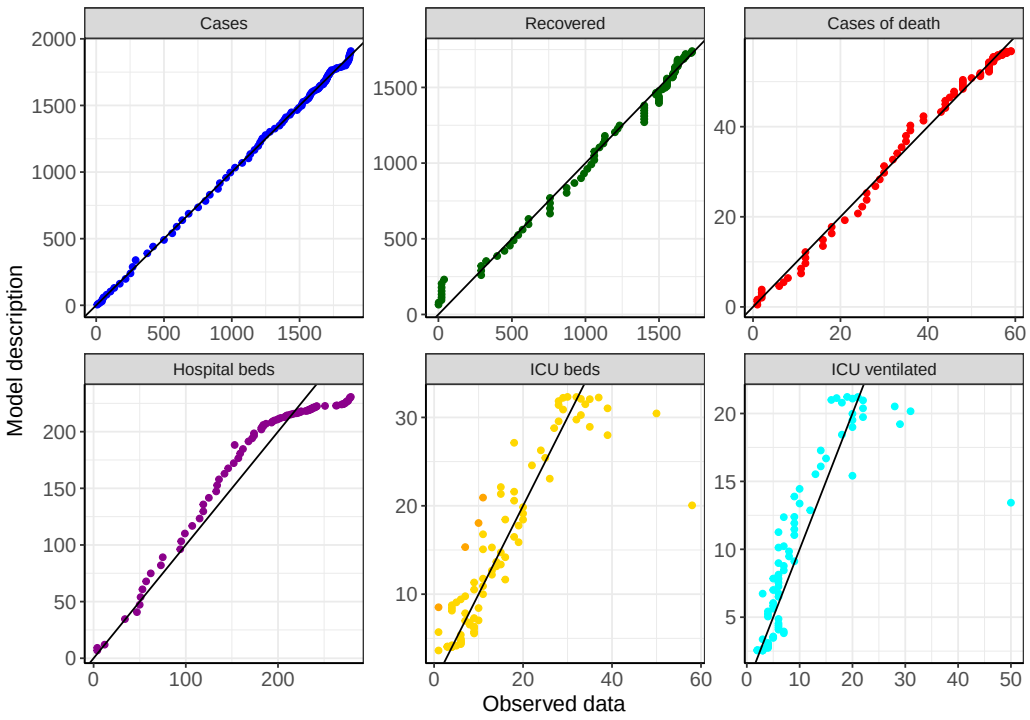


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

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

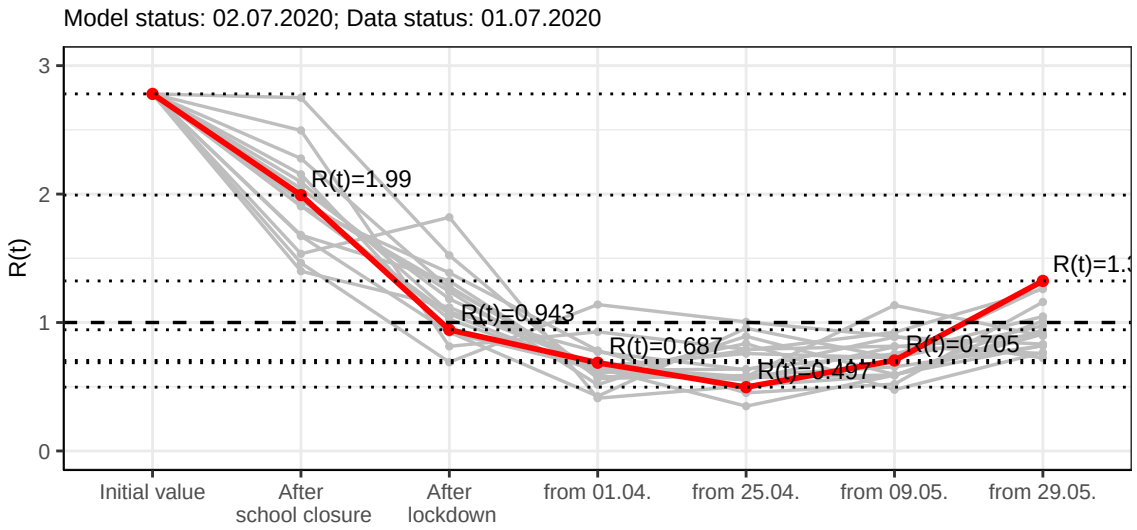


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

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

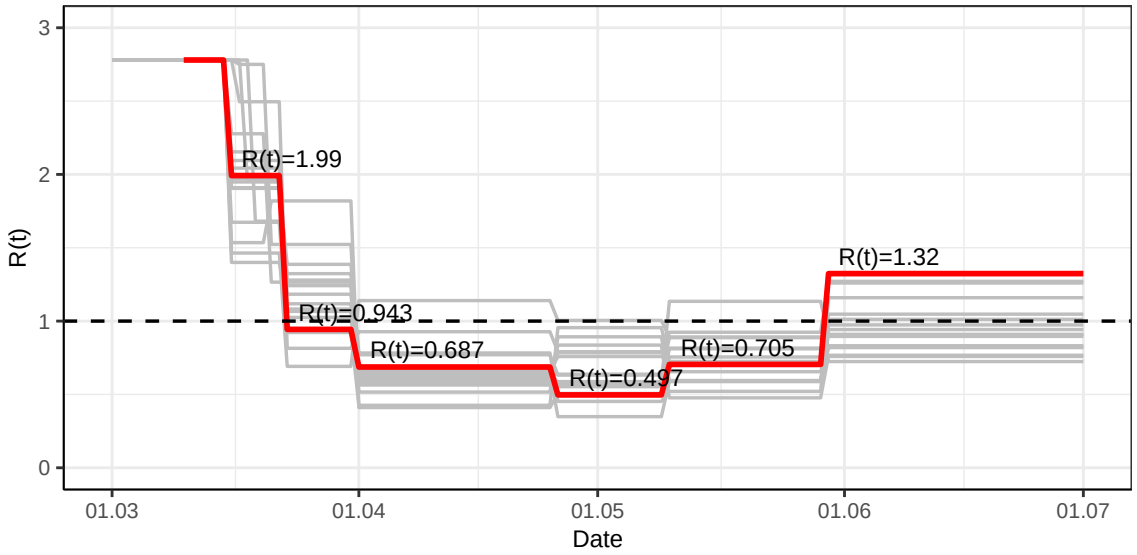


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.32)

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.

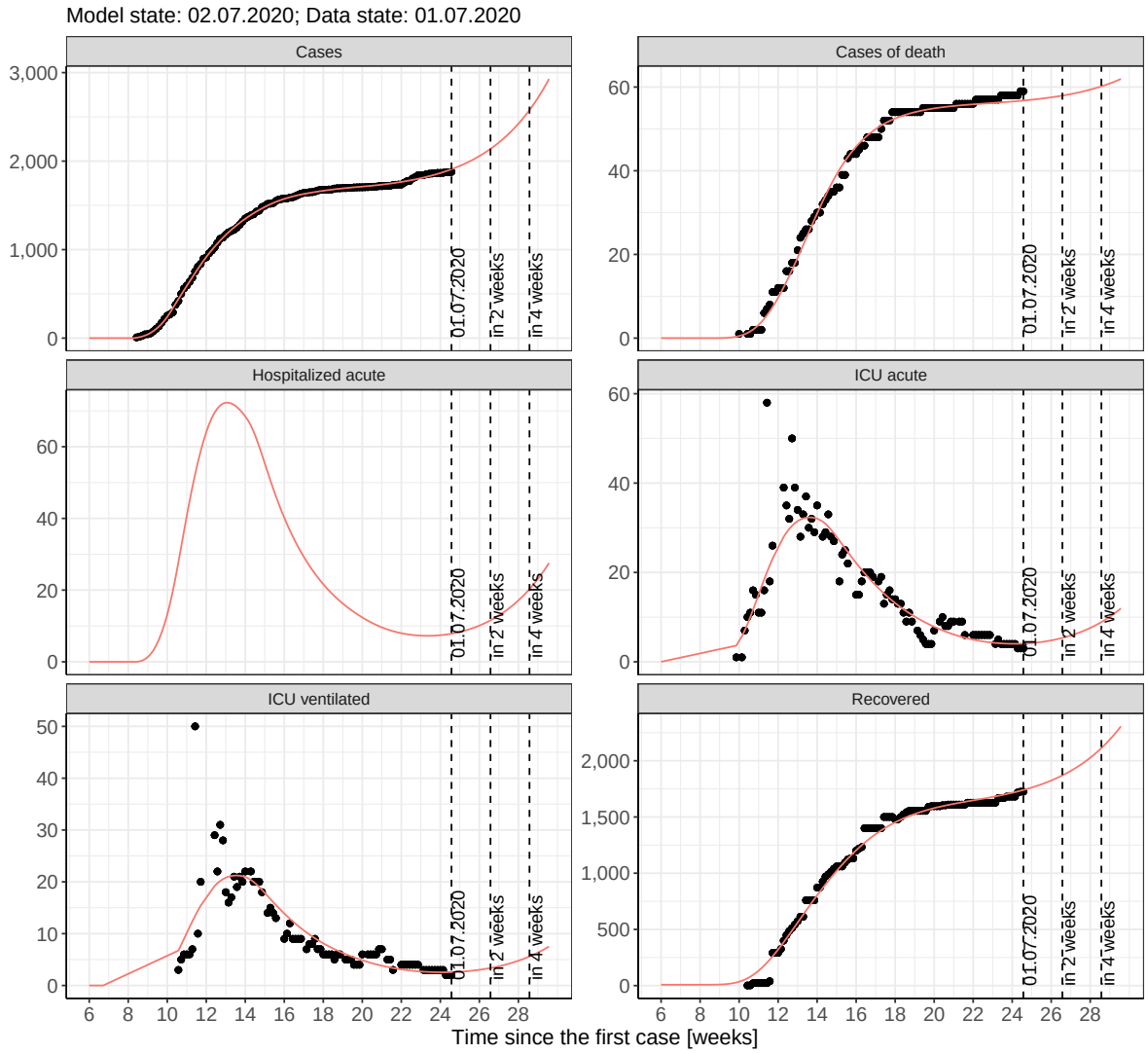


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

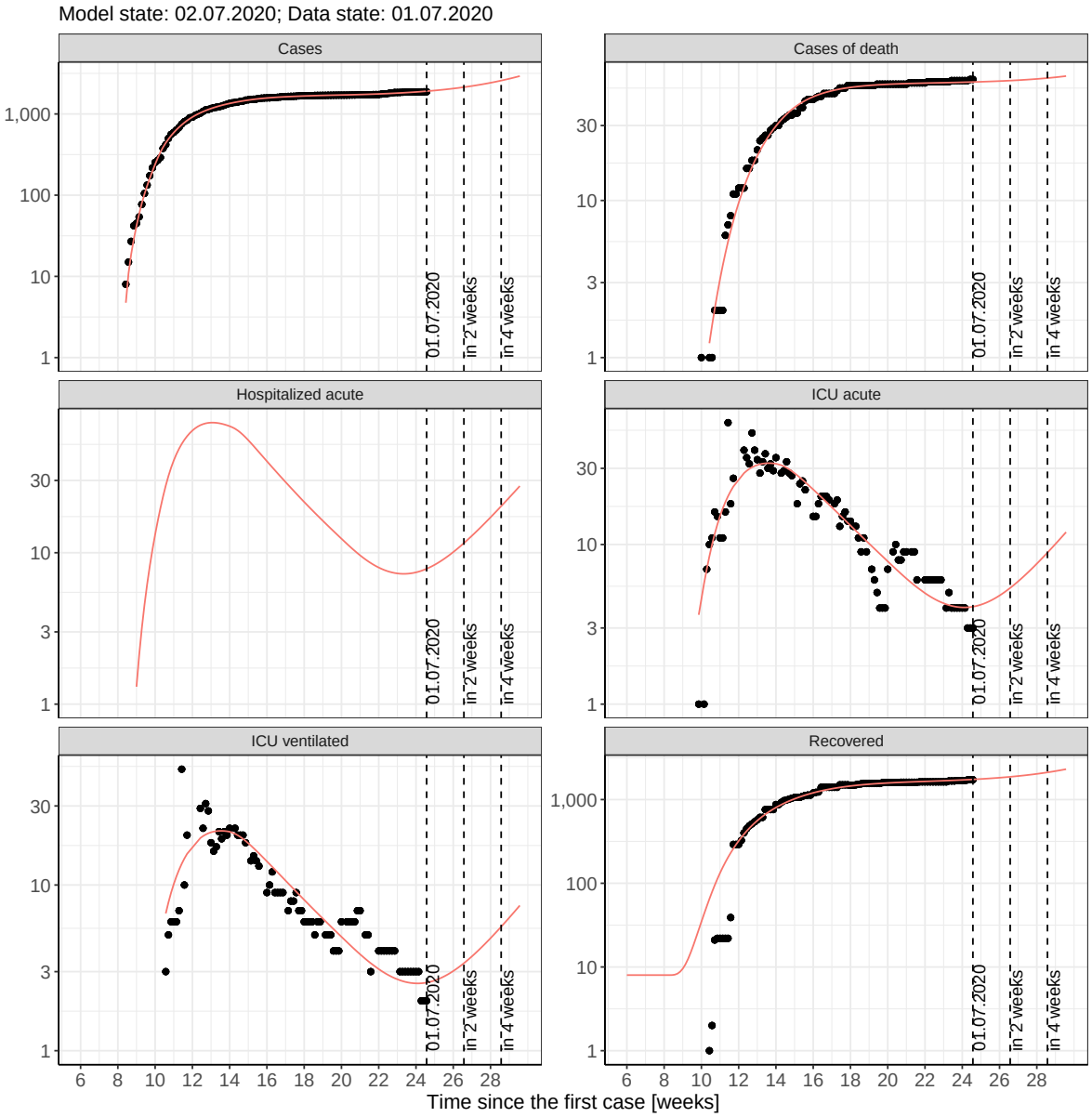


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

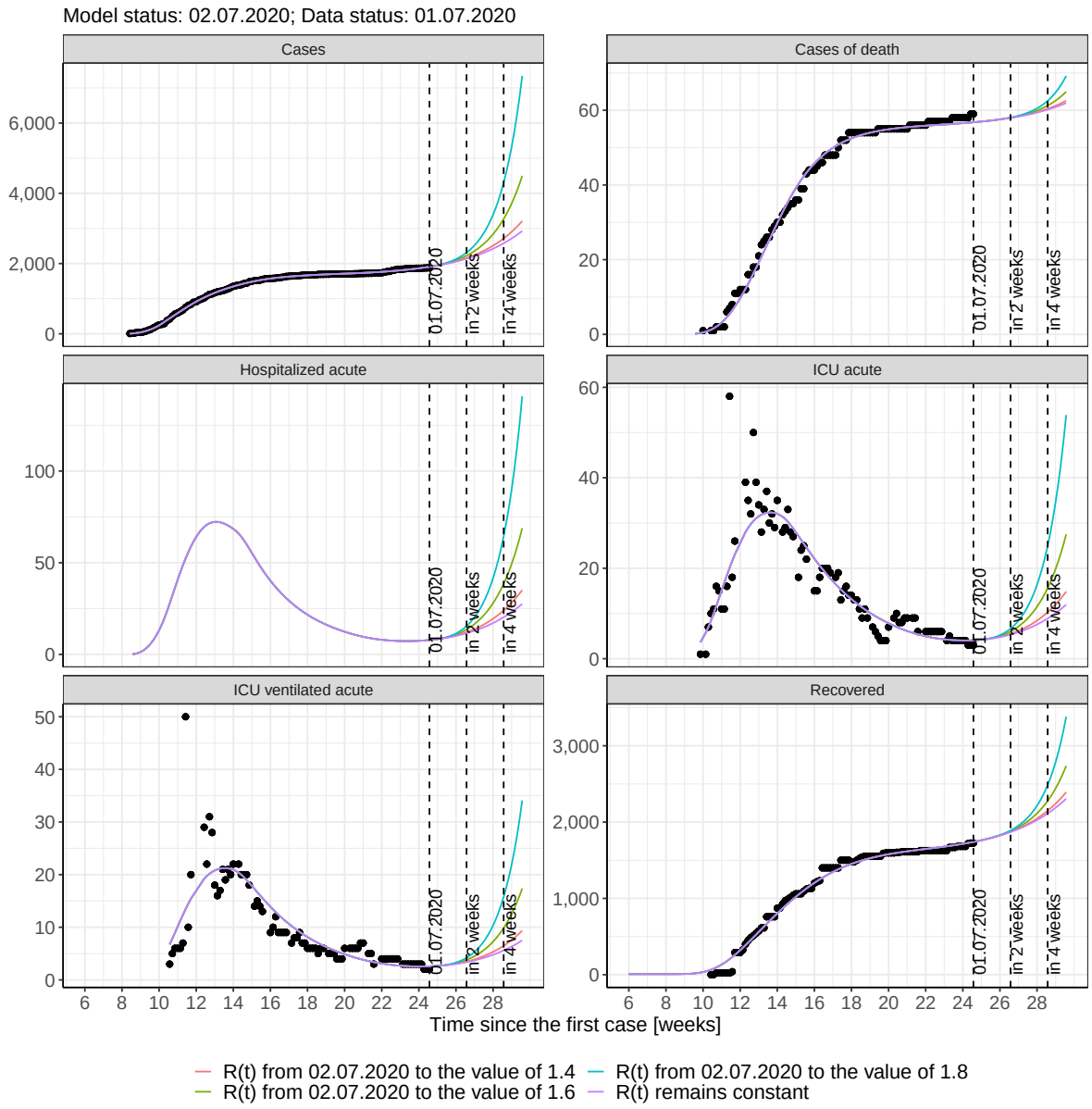


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

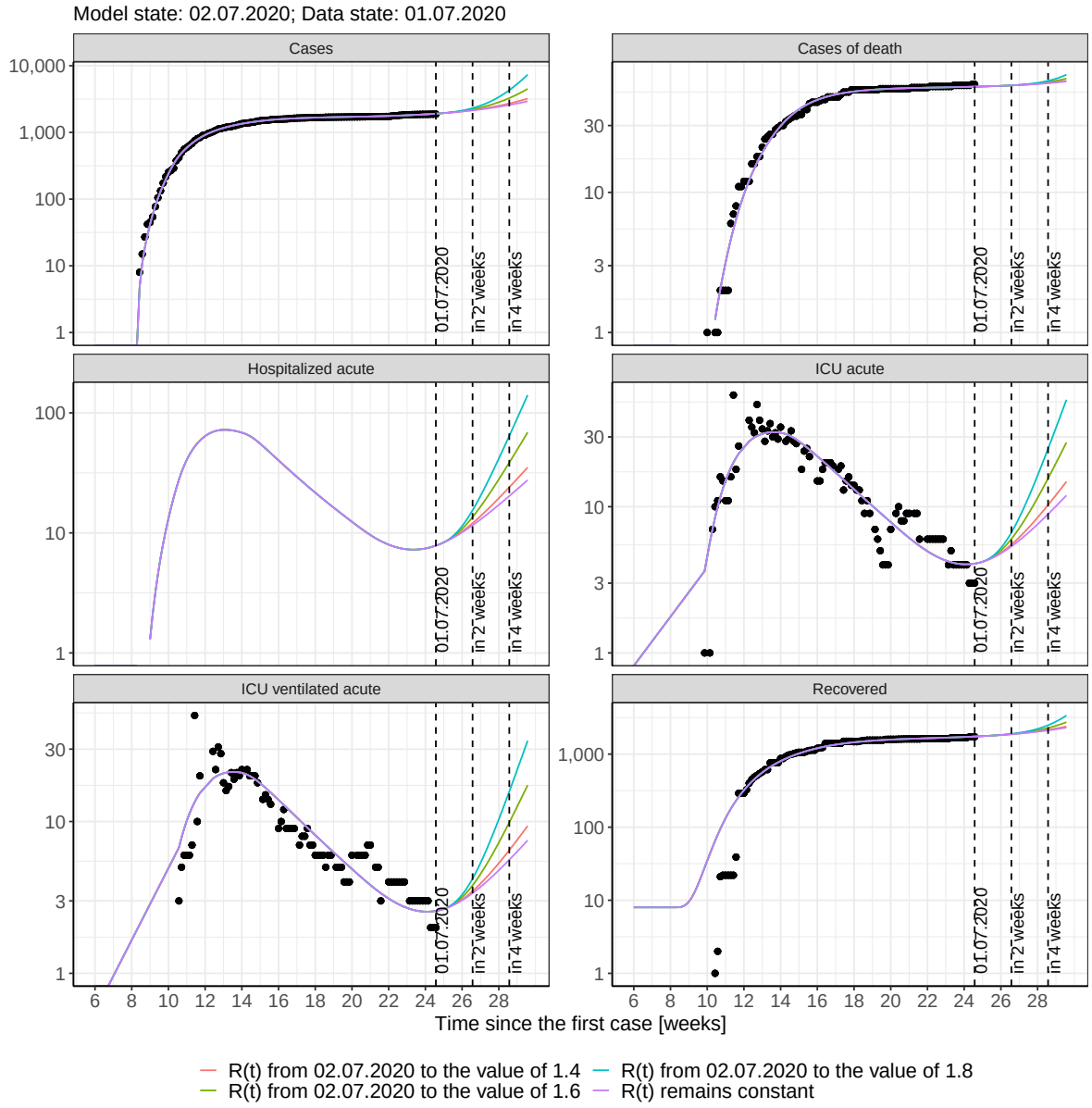


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

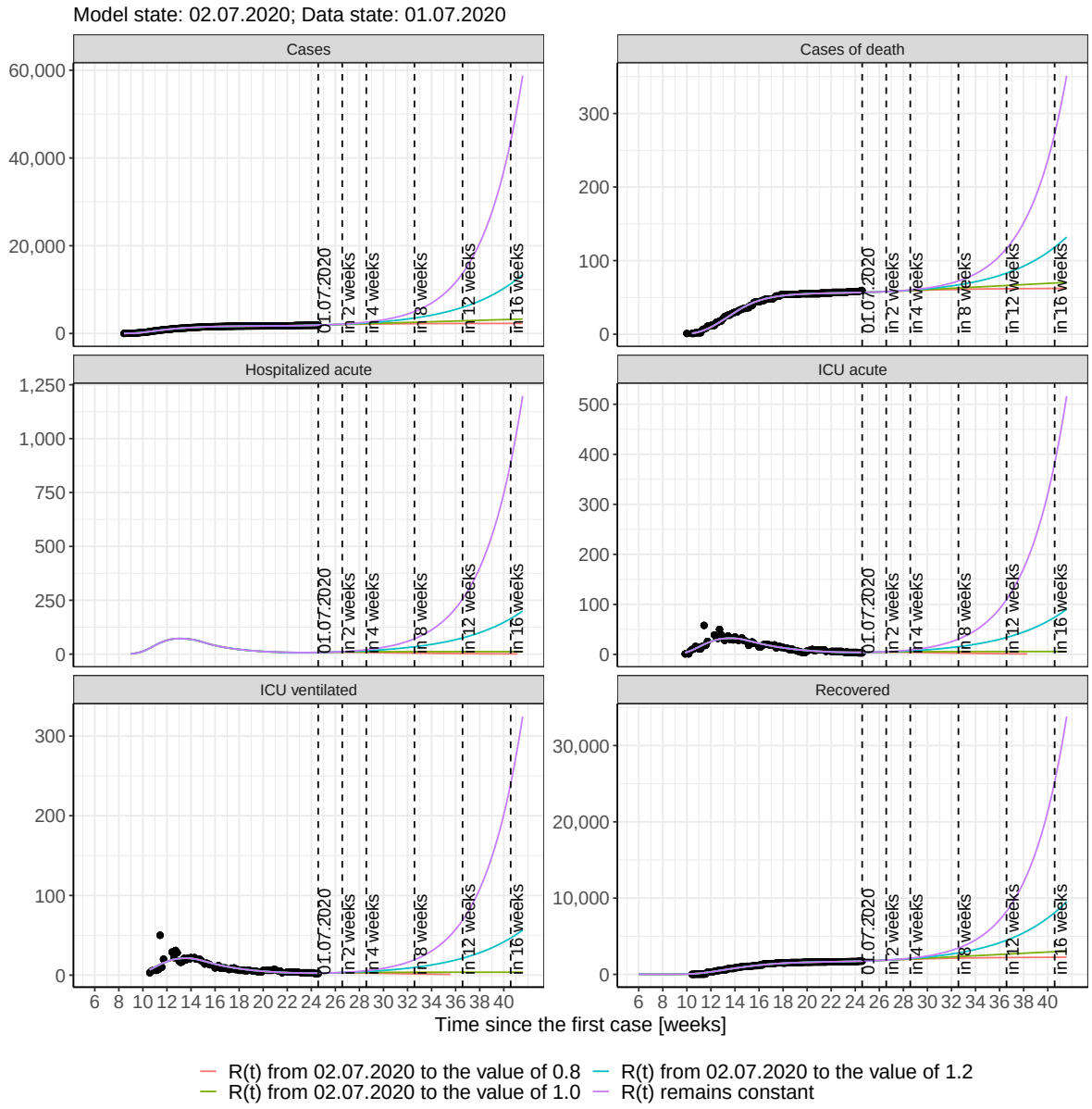


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

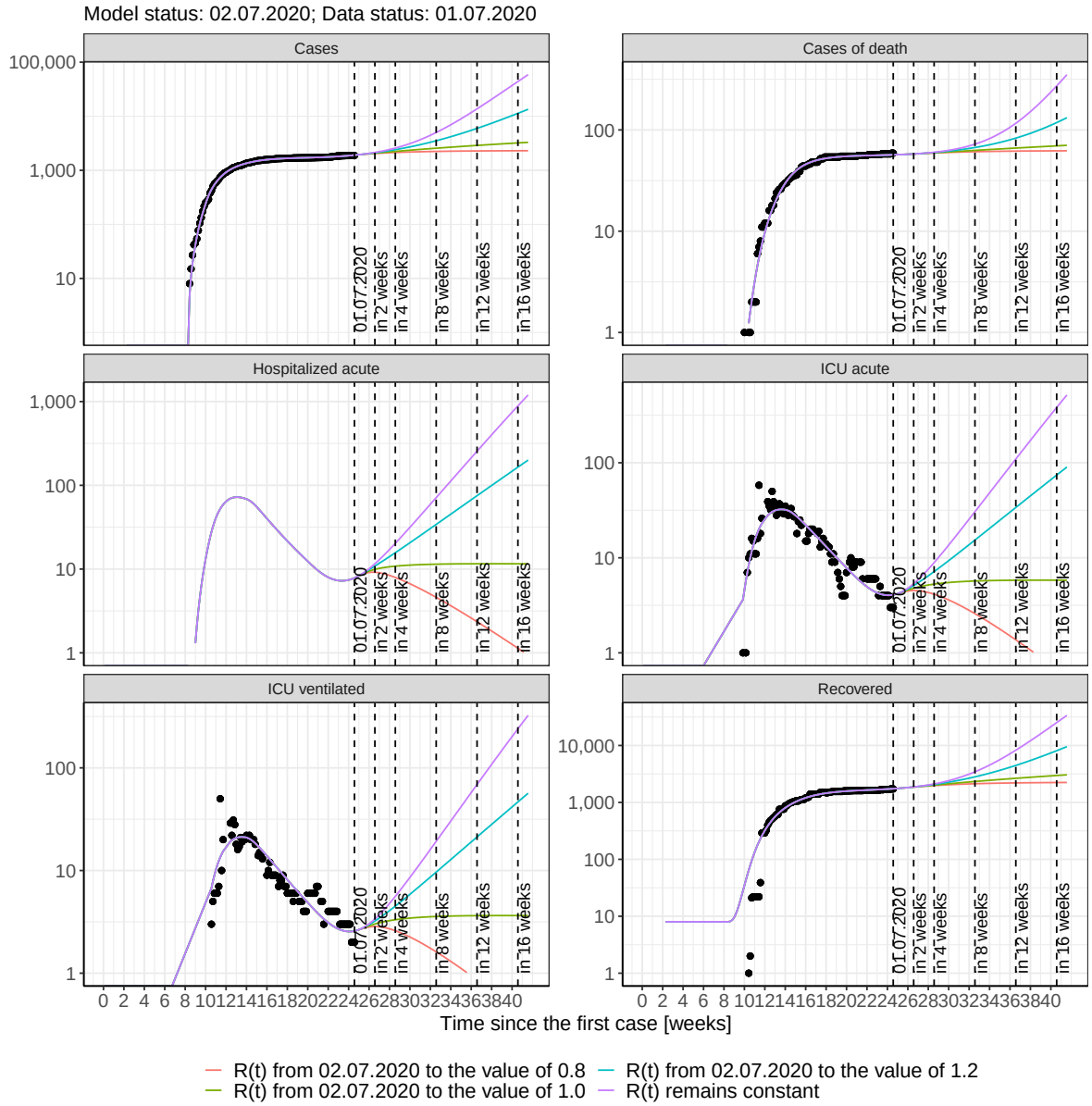


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 57) Model status from 02.07.2020; Data status: 01.07.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1920	57	1747	8	4	3
03.07.2020	1933	57	1754	8	4	3
04.07.2020	1946	57	1762	8	4	3
05.07.2020	1959	57	1770	9	4	3
06.07.2020	1974	57	1778	9	4	3
07.07.2020	1989	57	1786	9	4	3
08.07.2020	2005	57	1795	9	4	3
09.07.2020	2021	57	1804	9	5	3
10.07.2020	2039	57	1814	10	5	3
11.07.2020	2057	58	1824	10	5	3
12.07.2020	2076	58	1835	10	5	3
13.07.2020	2096	58	1846	11	5	3
14.07.2020	2116	58	1858	11	5	3
15.07.2020	2138	58	1870	12	5	3
16.07.2020	2161	58	1883	12	6	3
17.07.2020	2185	58	1896	12	6	4
18.07.2020	2210	58	1910	13	6	4
19.07.2020	2236	58	1924	13	6	4
20.07.2020	2264	59	1940	14	6	4
21.07.2020	2292	59	1955	15	7	4
22.07.2020	2323	59	1972	15	7	4
23.07.2020	2354	59	1990	16	7	4
24.07.2020	2387	59	2008	16	7	5
25.07.2020	2422	59	2027	17	8	5
26.07.2020	2458	60	2047	18	8	5
27.07.2020	2496	60	2068	19	8	5
28.07.2020	2535	60	2090	19	9	5
29.07.2020	2577	60	2113	20	9	6

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1920	57	1747	8	4	3
03.07.2020	1931	57	1754	8	4	3
04.07.2020	1942	57	1762	8	4	3
05.07.2020	1952	57	1769	8	4	3
06.07.2020	1962	57	1777	9	4	3
07.07.2020	1972	57	1786	9	4	3
08.07.2020	1982	57	1794	9	4	3
09.07.2020	1992	57	1803	9	4	3
10.07.2020	2001	57	1811	9	4	3
11.07.2020	2010	58	1820	9	4	3
12.07.2020	2018	58	1829	9	4	3
13.07.2020	2027	58	1838	9	5	3
14.07.2020	2035	58	1847	9	5	3
15.07.2020	2043	58	1856	9	5	3
16.07.2020	2051	58	1865	9	5	3
17.07.2020	2058	58	1874	9	5	3
18.07.2020	2066	58	1883	9	5	3
19.07.2020	2073	58	1892	9	4	3
20.07.2020	2080	58	1900	9	4	3
21.07.2020	2086	58	1909	9	4	3
22.07.2020	2093	59	1918	9	4	3
23.07.2020	2099	59	1926	9	4	3
24.07.2020	2105	59	1934	9	4	3
25.07.2020	2111	59	1943	8	4	3
26.07.2020	2117	59	1951	8	4	3
27.07.2020	2122	59	1959	8	4	3
28.07.2020	2128	59	1966	8	4	3
29.07.2020	2133	59	1974	8	4	3

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1920	57	1747	8	4	3
03.07.2020	1931	57	1754	8	4	3
04.07.2020	1943	57	1762	8	4	3
05.07.2020	1955	57	1770	8	4	3
06.07.2020	1966	57	1778	9	4	3
07.07.2020	1978	57	1786	9	4	3
08.07.2020	1990	57	1794	9	4	3
09.07.2020	2002	57	1803	9	4	3
10.07.2020	2013	57	1812	9	5	3
11.07.2020	2025	58	1822	9	5	3
12.07.2020	2037	58	1831	10	5	3
13.07.2020	2048	58	1841	10	5	3
14.07.2020	2060	58	1850	10	5	3
15.07.2020	2072	58	1860	10	5	3
16.07.2020	2083	58	1871	10	5	3
17.07.2020	2095	58	1881	10	5	3
18.07.2020	2107	58	1891	10	5	3
19.07.2020	2118	58	1902	10	5	3
20.07.2020	2130	58	1912	10	5	3
21.07.2020	2142	59	1923	10	5	3
22.07.2020	2153	59	1934	10	5	3
23.07.2020	2165	59	1945	11	5	3
24.07.2020	2177	59	1956	11	5	3
25.07.2020	2188	59	1966	11	5	3
26.07.2020	2200	59	1978	11	5	3
27.07.2020	2212	59	1989	11	5	3
28.07.2020	2223	59	2000	11	5	3
29.07.2020	2235	59	2011	11	5	3

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	1920	57	1747	8	4	3
03.07.2020	1932	57	1754	8	4	3
04.07.2020	1945	57	1762	8	4	3
05.07.2020	1958	57	1770	9	4	3
06.07.2020	1971	57	1778	9	4	3
07.07.2020	1985	57	1786	9	4	3
08.07.2020	1999	57	1795	9	4	3
09.07.2020	2013	57	1804	9	5	3
10.07.2020	2028	57	1814	10	5	3
11.07.2020	2043	58	1823	10	5	3
12.07.2020	2059	58	1833	10	5	3
13.07.2020	2075	58	1844	10	5	3
14.07.2020	2092	58	1855	11	5	3
15.07.2020	2109	58	1866	11	5	3
16.07.2020	2127	58	1878	11	5	3
17.07.2020	2145	58	1890	11	5	3
18.07.2020	2164	58	1902	12	5	3
19.07.2020	2183	58	1915	12	6	4
20.07.2020	2203	59	1928	12	6	4
21.07.2020	2223	59	1941	13	6	4
22.07.2020	2244	59	1955	13	6	4
23.07.2020	2266	59	1970	13	6	4
24.07.2020	2288	59	1984	14	6	4
25.07.2020	2311	59	2000	14	6	4
26.07.2020	2334	59	2016	14	7	4
27.07.2020	2358	60	2032	15	7	4
28.07.2020	2383	60	2048	15	7	4
29.07.2020	2409	60	2066	16	7	4

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

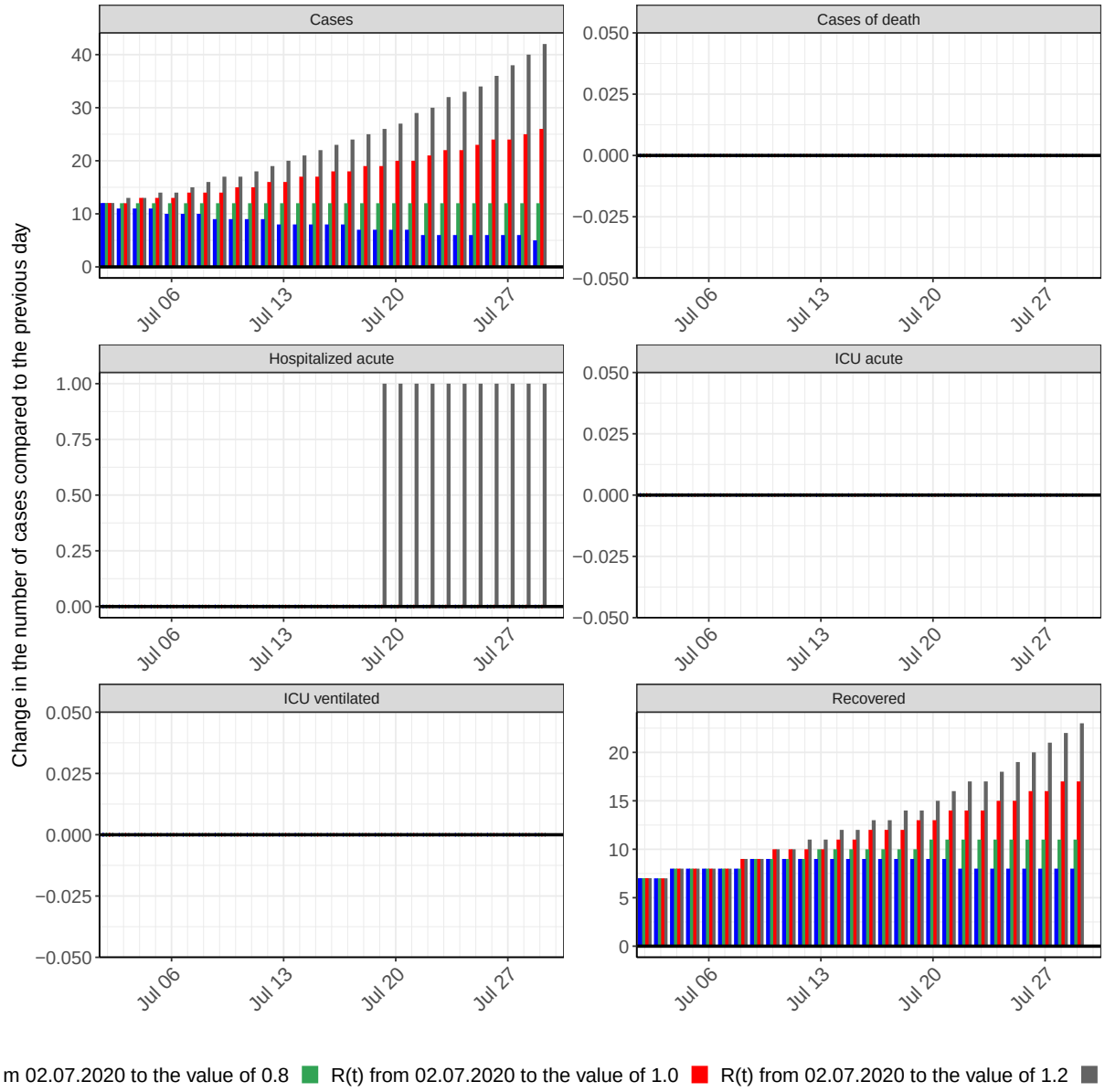


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

16 Schleswig-Holstein

16.1 Model description

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

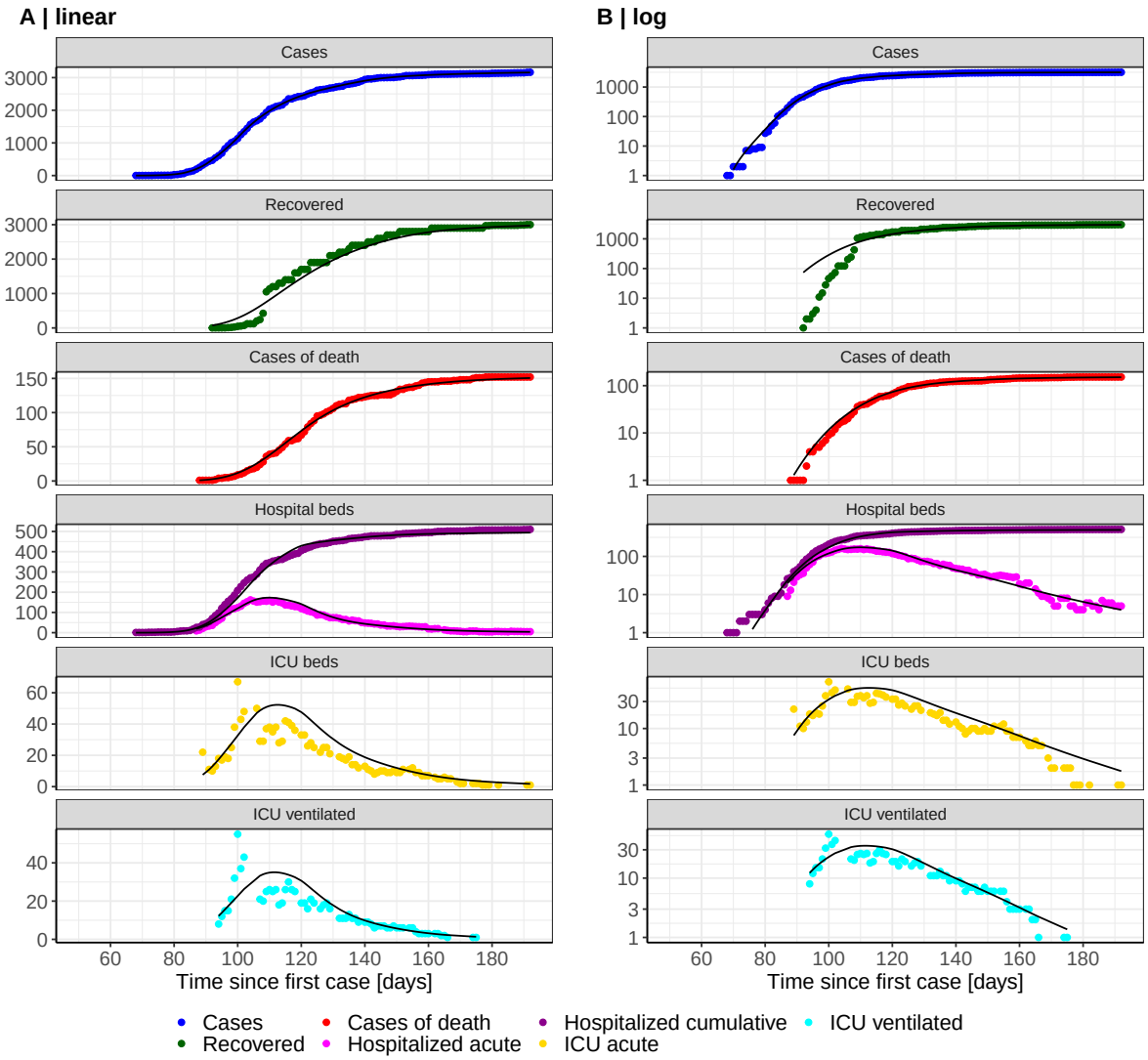


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

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

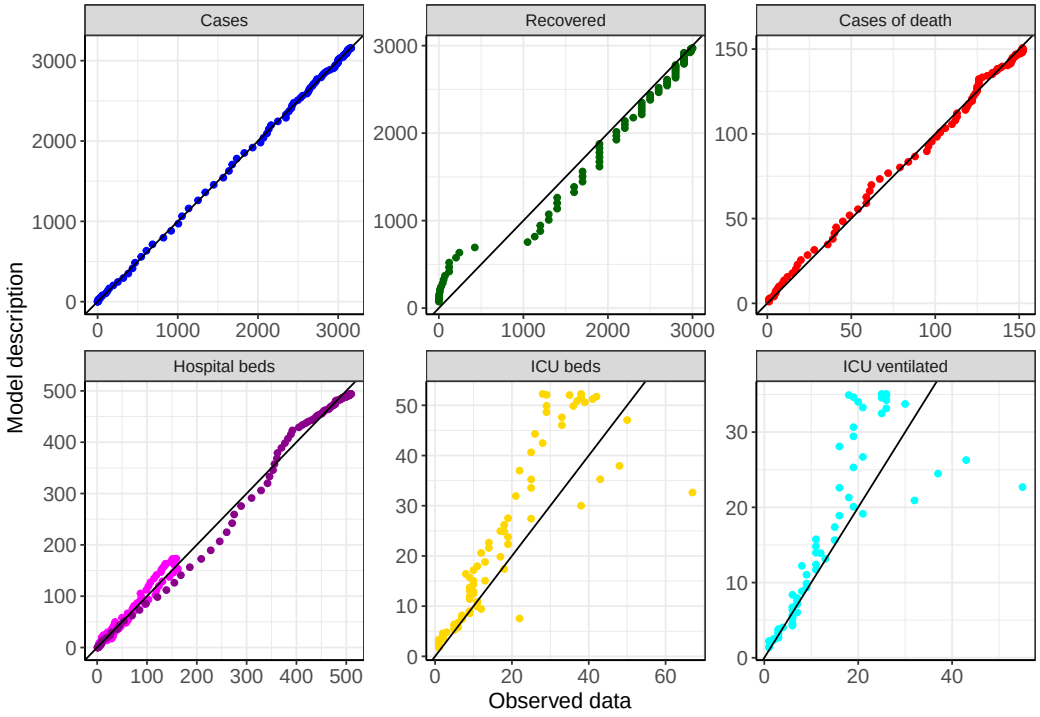


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

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

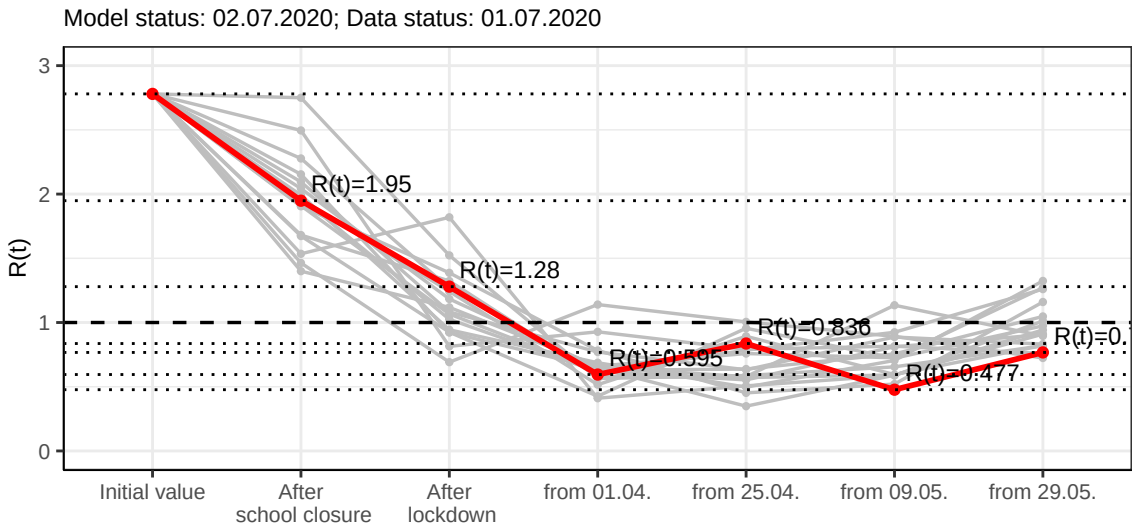


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

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

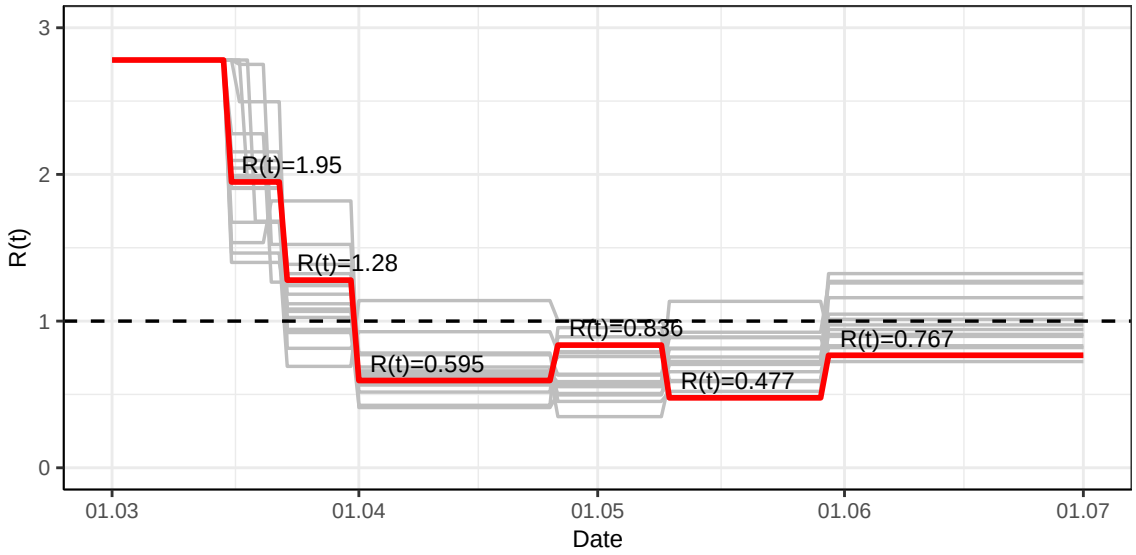


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

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

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.

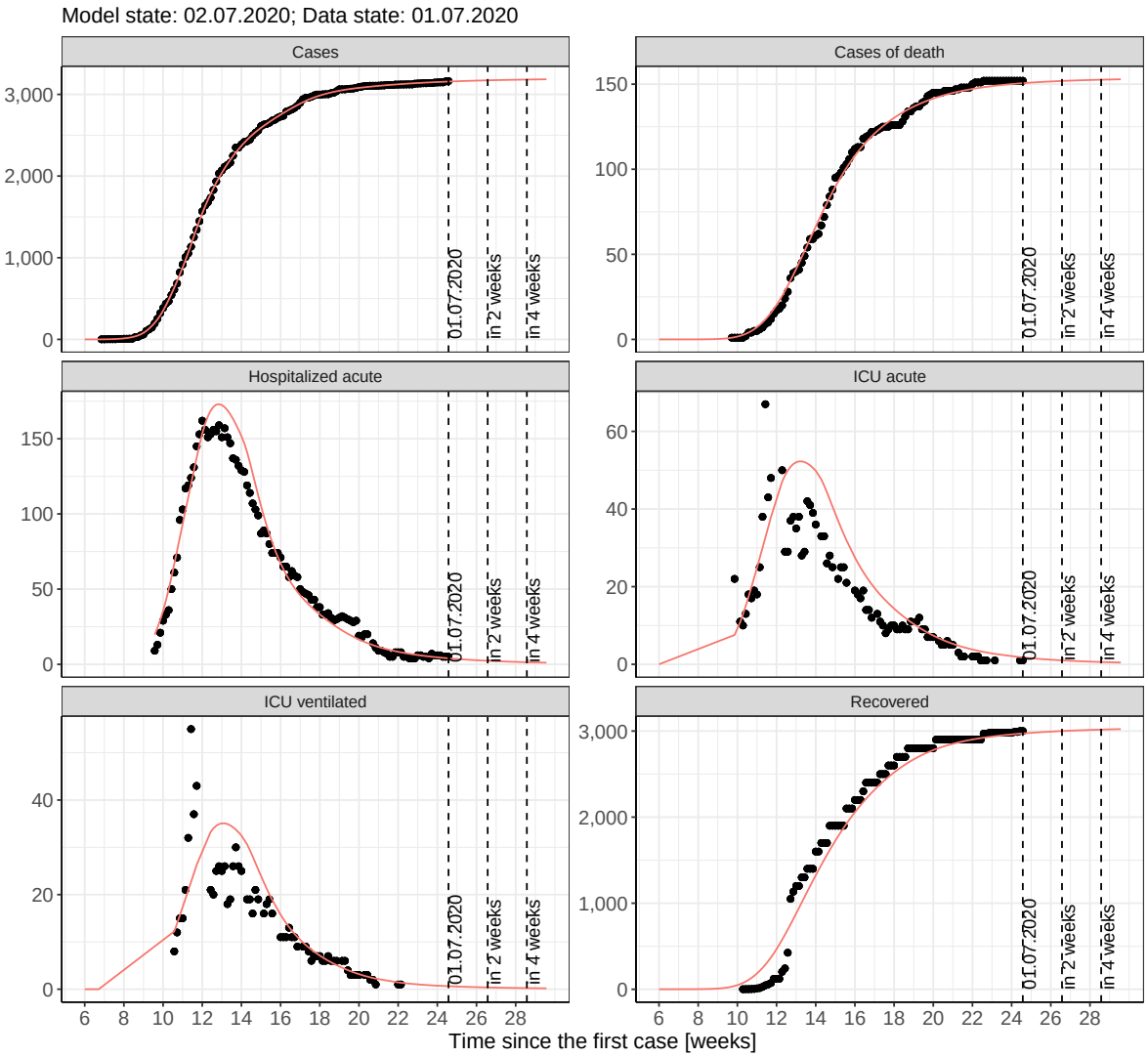


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

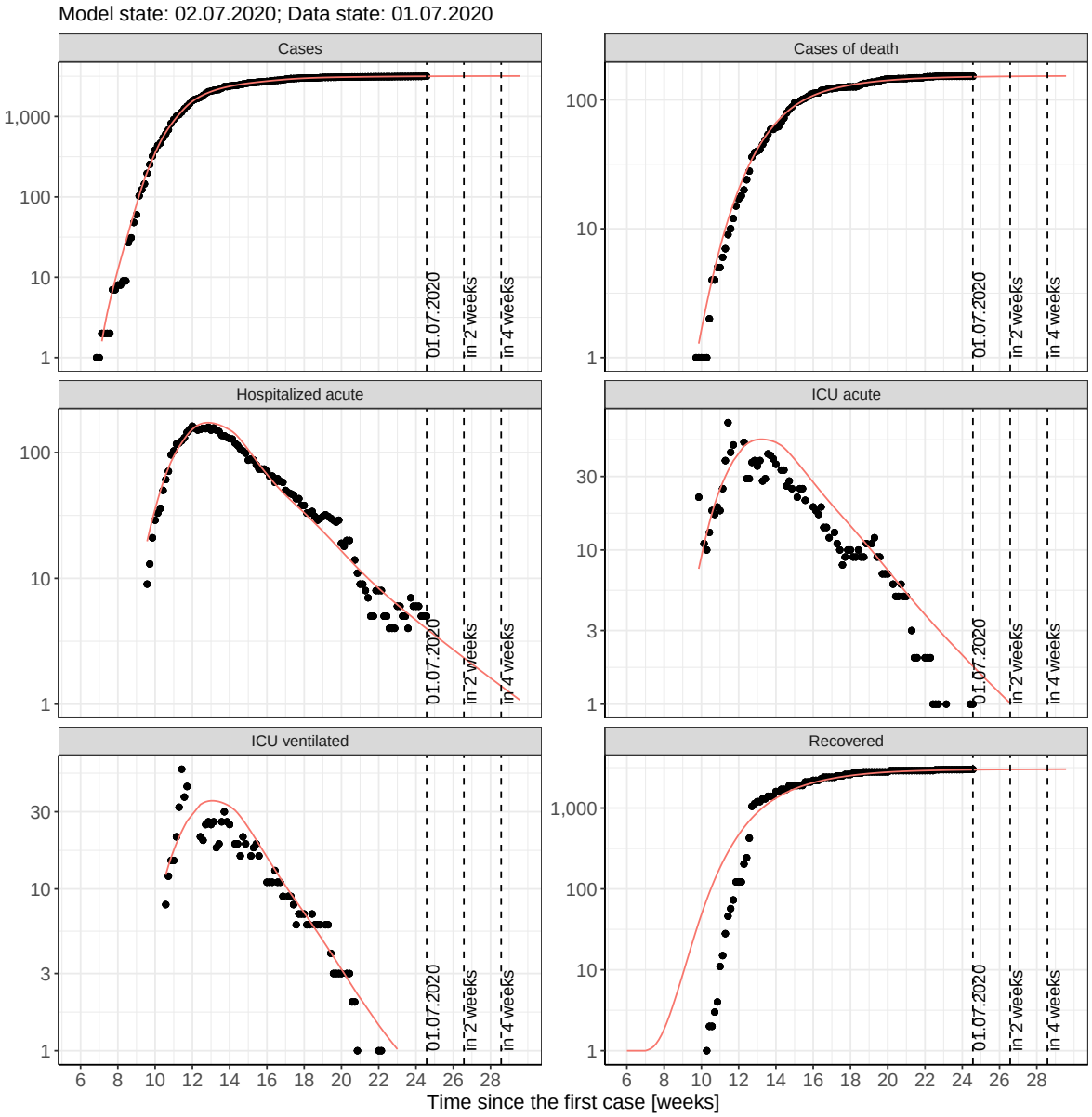


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

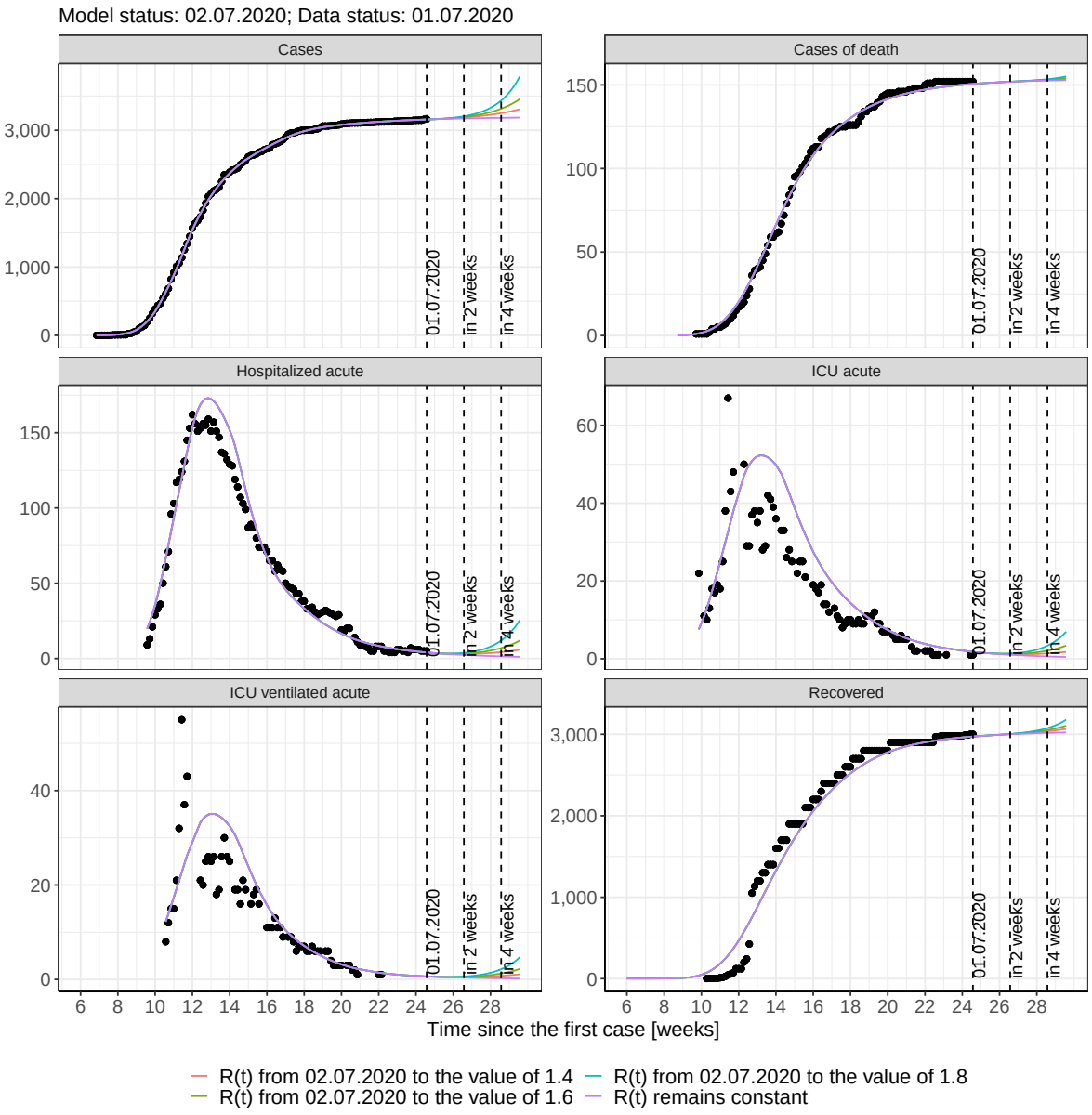


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

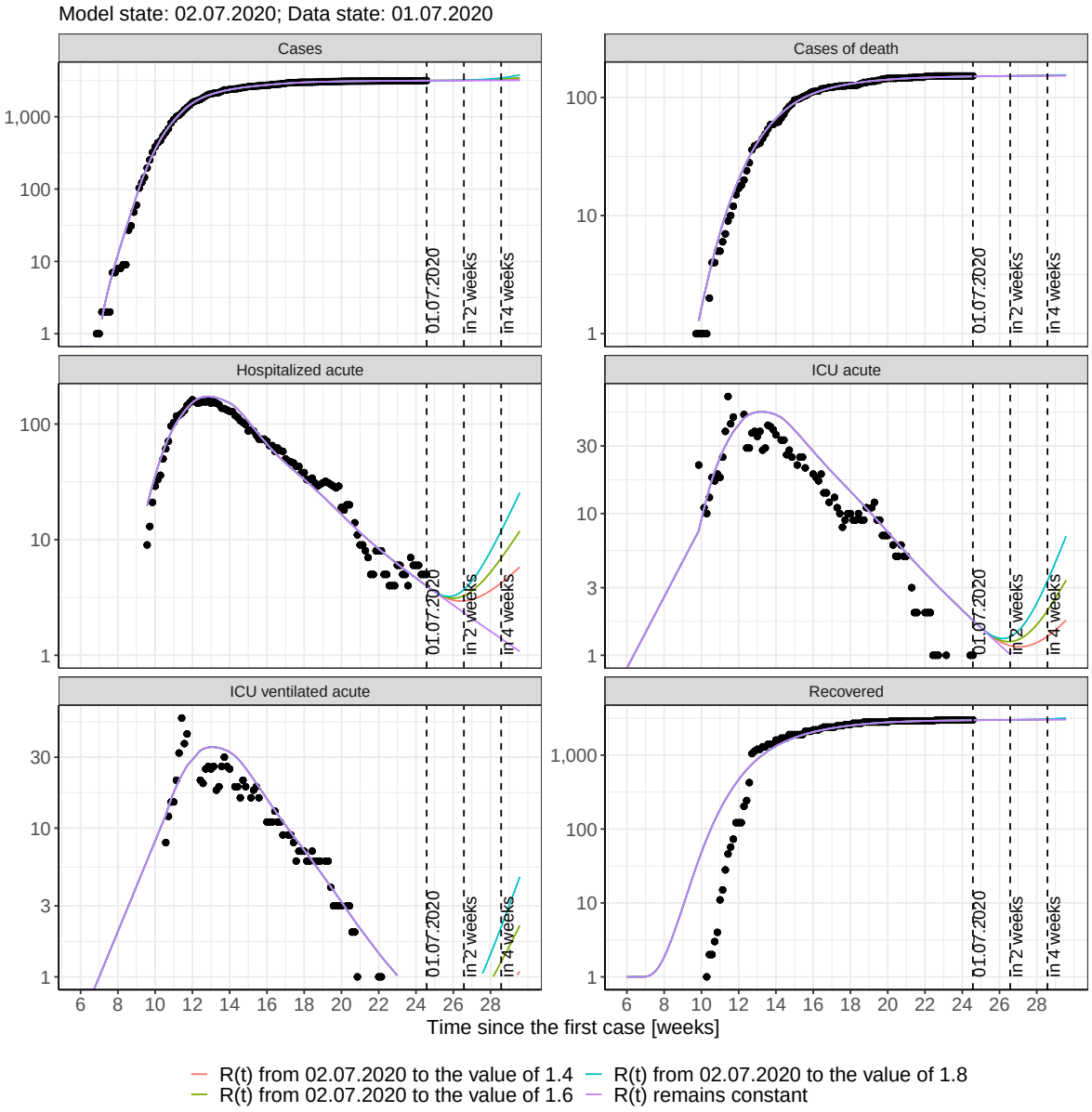


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

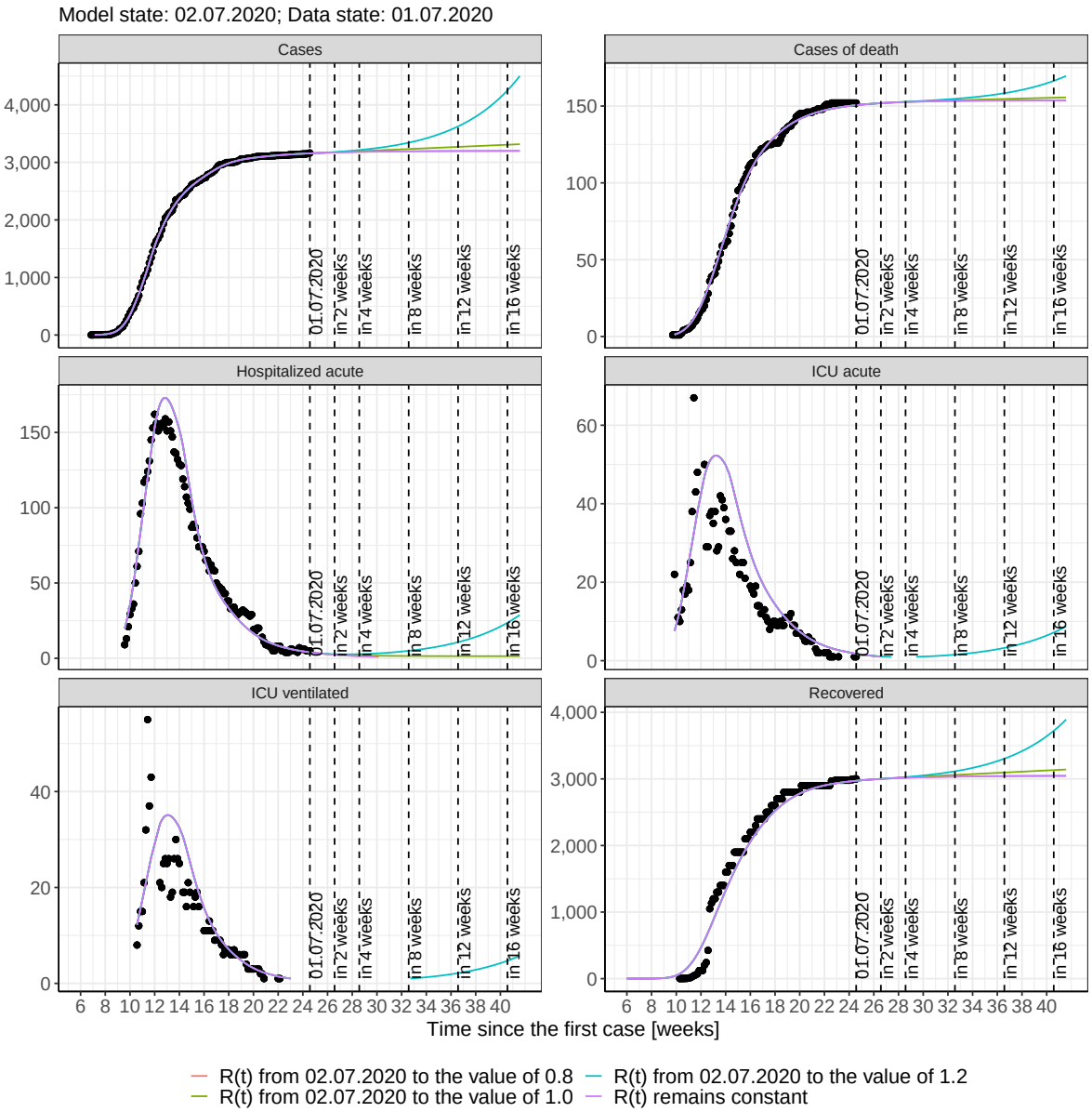


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

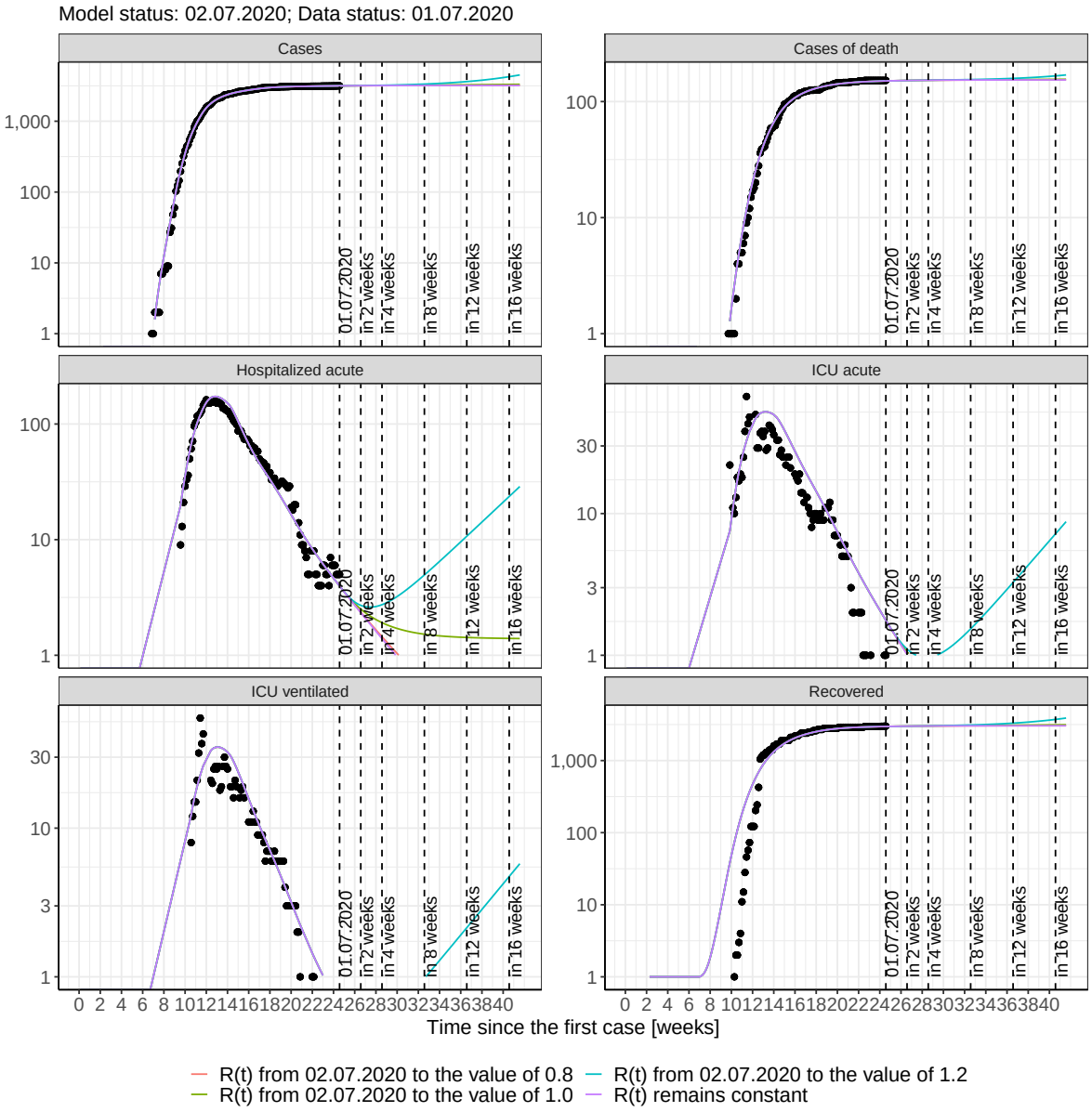


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 61) Model status from 02.07.2020; Data status: 01.07.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3158	151	2975	4	2	1
03.07.2020	3160	151	2977	4	2	1
04.07.2020	3161	151	2979	4	2	1
05.07.2020	3162	151	2982	3	2	1
06.07.2020	3163	151	2984	3	1	1
07.07.2020	3164	151	2986	3	1	1
08.07.2020	3165	151	2988	3	1	0
09.07.2020	3166	151	2990	3	1	0
10.07.2020	3167	152	2992	3	1	0
11.07.2020	3168	152	2994	3	1	0
12.07.2020	3169	152	2995	3	1	0
13.07.2020	3170	152	2997	3	1	0
14.07.2020	3171	152	2998	2	1	0
15.07.2020	3172	152	3000	2	1	0
16.07.2020	3173	152	3002	2	1	0
17.07.2020	3174	152	3003	2	1	0
18.07.2020	3174	152	3004	2	1	0
19.07.2020	3175	152	3006	2	1	0
20.07.2020	3176	152	3007	2	1	0
21.07.2020	3177	152	3008	2	1	0
22.07.2020	3177	152	3010	2	1	0
23.07.2020	3178	152	3011	2	1	0
24.07.2020	3179	152	3012	2	1	0
25.07.2020	3179	152	3013	2	1	0
26.07.2020	3180	152	3014	2	1	0
27.07.2020	3180	153	3015	1	1	0
28.07.2020	3181	153	3016	1	1	0
29.07.2020	3182	153	3017	1	1	0

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3158	151	2975	4	2	1
03.07.2020	3160	151	2977	4	2	1
04.07.2020	3161	151	2979	4	2	1
05.07.2020	3162	151	2982	3	2	1
06.07.2020	3163	151	2984	3	1	1
07.07.2020	3164	151	2986	3	1	1
08.07.2020	3166	151	2988	3	1	0
09.07.2020	3167	151	2990	3	1	0
10.07.2020	3168	152	2992	3	1	0
11.07.2020	3169	152	2994	3	1	0
12.07.2020	3170	152	2995	3	1	0
13.07.2020	3171	152	2997	3	1	0
14.07.2020	3172	152	2998	2	1	0
15.07.2020	3172	152	3000	2	1	0
16.07.2020	3173	152	3002	2	1	0
17.07.2020	3174	152	3003	2	1	0
18.07.2020	3175	152	3004	2	1	0
19.07.2020	3176	152	3006	2	1	0
20.07.2020	3177	152	3007	2	1	0
21.07.2020	3178	152	3008	2	1	0
22.07.2020	3178	152	3010	2	1	0
23.07.2020	3179	152	3011	2	1	0
24.07.2020	3180	152	3012	2	1	0
25.07.2020	3180	152	3013	2	1	0
26.07.2020	3181	152	3014	2	1	0
27.07.2020	3182	153	3015	2	1	0
28.07.2020	3182	153	3016	1	1	0
29.07.2020	3183	153	3017	1	1	0

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3158	151	2975	4	2	1
03.07.2020	3160	151	2977	4	2	1
04.07.2020	3161	151	2979	4	2	1
05.07.2020	3162	151	2982	3	2	1
06.07.2020	3164	151	2984	3	1	1
07.07.2020	3165	151	2986	3	1	1
08.07.2020	3166	151	2988	3	1	0
09.07.2020	3168	151	2990	3	1	0
10.07.2020	3169	152	2992	3	1	0
11.07.2020	3170	152	2994	3	1	0
12.07.2020	3172	152	2996	3	1	0
13.07.2020	3173	152	2997	3	1	0
14.07.2020	3174	152	2999	3	1	0
15.07.2020	3176	152	3001	3	1	0
16.07.2020	3177	152	3002	2	1	0
17.07.2020	3178	152	3004	2	1	0
18.07.2020	3180	152	3006	2	1	0
19.07.2020	3181	152	3007	2	1	0
20.07.2020	3183	152	3009	2	1	0
21.07.2020	3184	152	3010	2	1	0
22.07.2020	3185	152	3012	2	1	0
23.07.2020	3187	152	3013	2	1	0
24.07.2020	3188	152	3014	2	1	0
25.07.2020	3189	152	3016	2	1	0
26.07.2020	3191	153	3017	2	1	0
27.07.2020	3192	153	3019	2	1	0
28.07.2020	3193	153	3020	2	1	0
29.07.2020	3195	153	3022	2	1	0

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3158	151	2975	4	2	1
03.07.2020	3160	151	2977	4	2	1
04.07.2020	3161	151	2980	4	2	1
05.07.2020	3163	151	2982	3	2	1
06.07.2020	3164	151	2984	3	1	1
07.07.2020	3166	151	2986	3	1	1
08.07.2020	3167	151	2988	3	1	0
09.07.2020	3169	151	2990	3	1	0
10.07.2020	3171	152	2992	3	1	0
11.07.2020	3173	152	2994	3	1	0
12.07.2020	3174	152	2996	3	1	0
13.07.2020	3176	152	2998	3	1	0
14.07.2020	3178	152	2999	3	1	0
15.07.2020	3180	152	3001	3	1	0
16.07.2020	3182	152	3003	3	1	0
17.07.2020	3184	152	3005	3	1	0
18.07.2020	3186	152	3007	3	1	0
19.07.2020	3189	152	3008	3	1	0
20.07.2020	3191	152	3010	3	1	0
21.07.2020	3193	152	3012	3	1	0
22.07.2020	3196	152	3014	3	1	0
23.07.2020	3198	152	3016	3	1	0
24.07.2020	3201	152	3018	3	1	0
25.07.2020	3203	153	3020	3	1	0
26.07.2020	3206	153	3022	3	1	0
27.07.2020	3209	153	3024	3	1	0
28.07.2020	3212	153	3026	3	1	0
29.07.2020	3215	153	3028	3	1	0

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

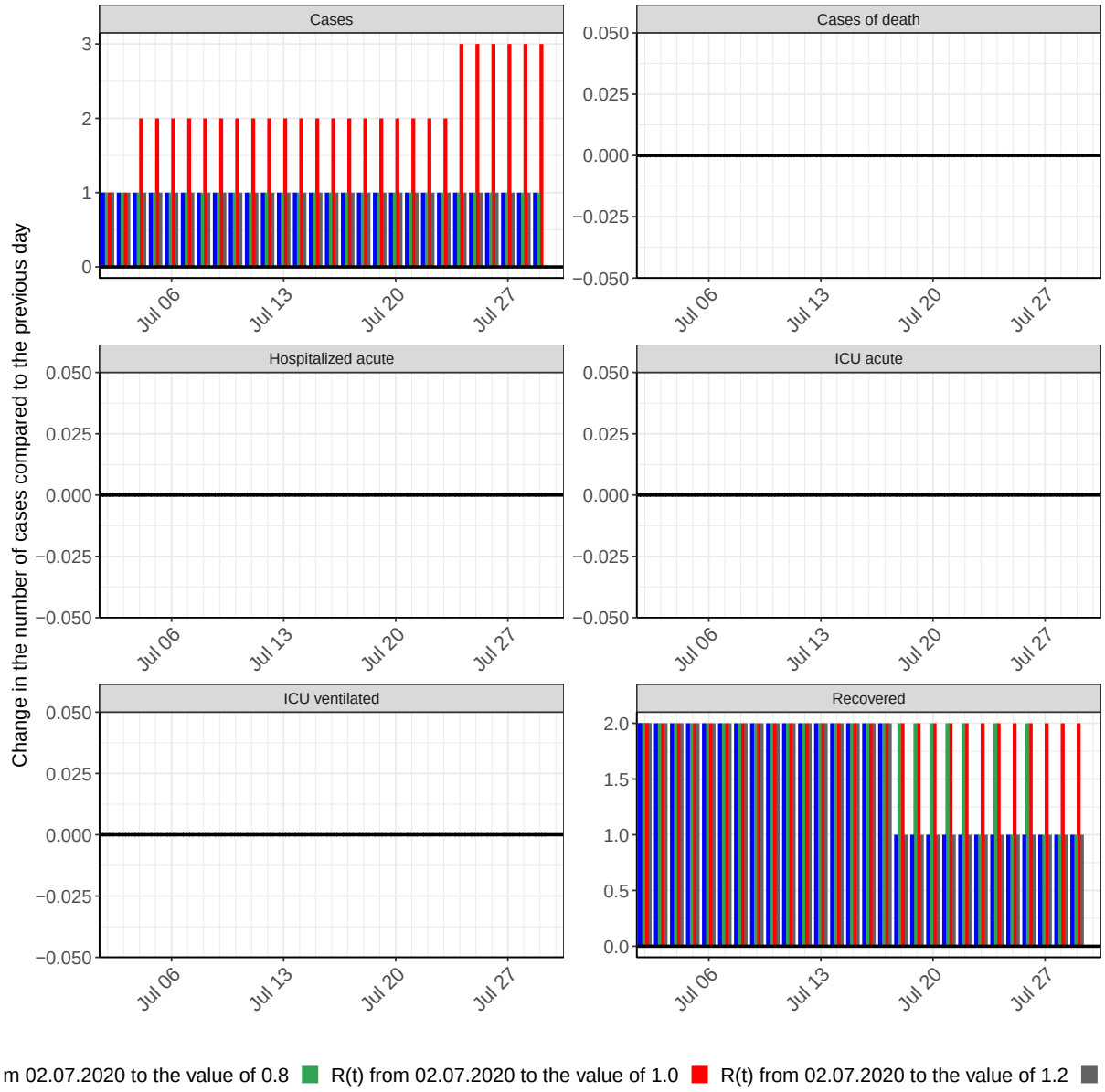


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

17 Thuringia

17.1 Model description

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

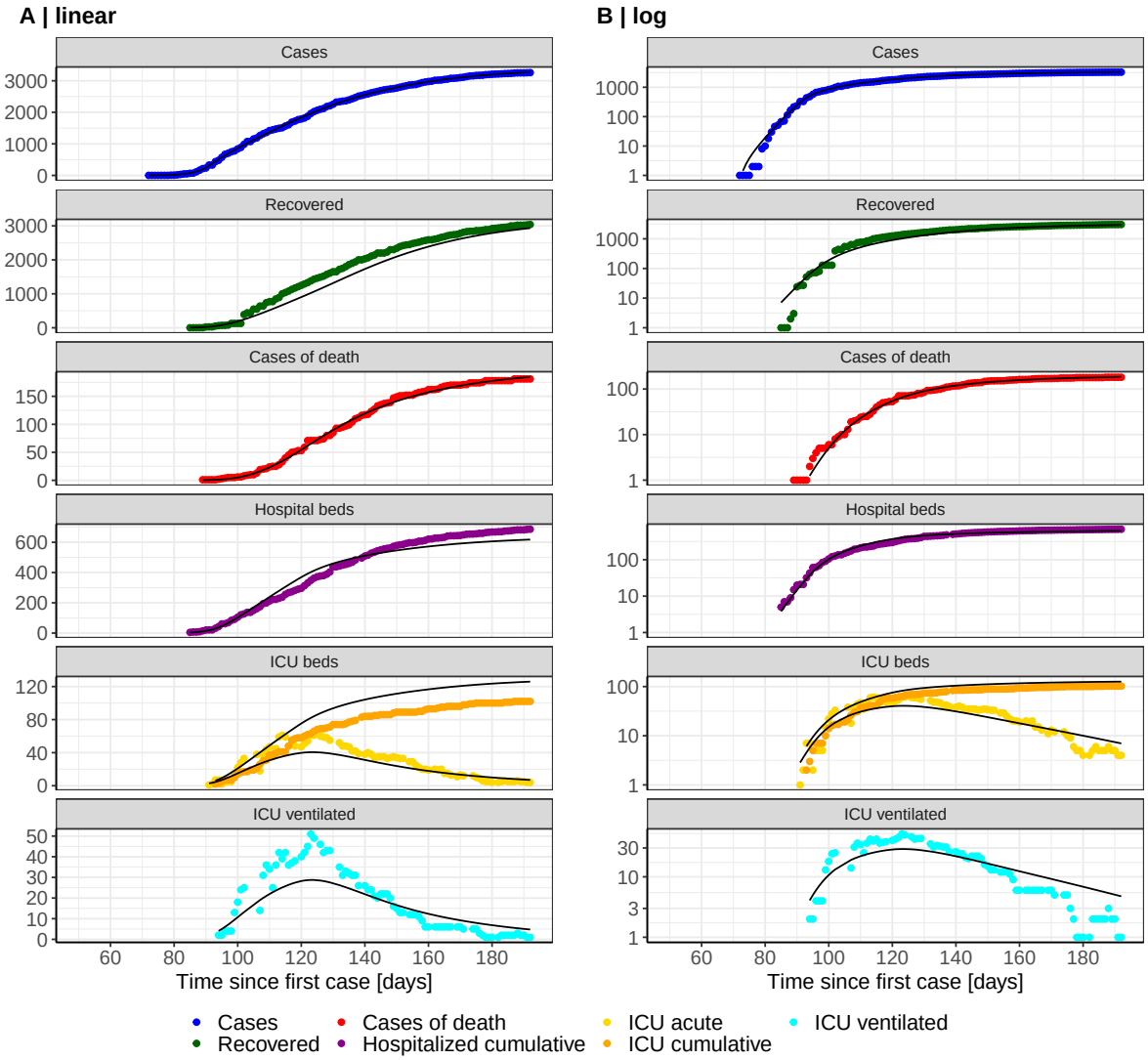


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

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

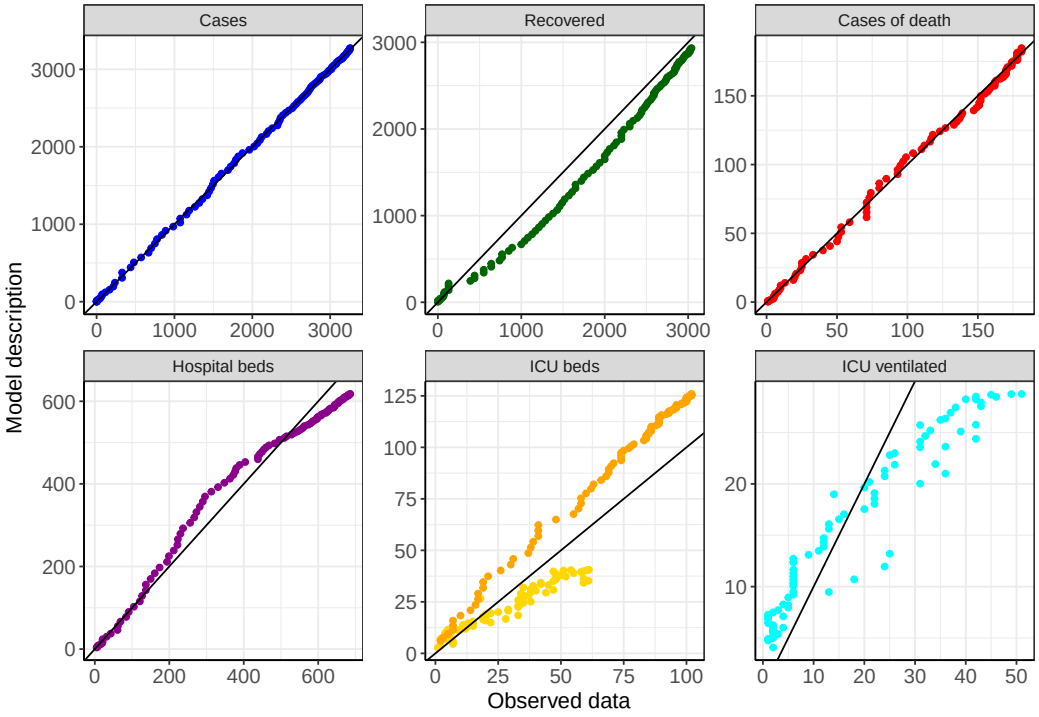


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

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

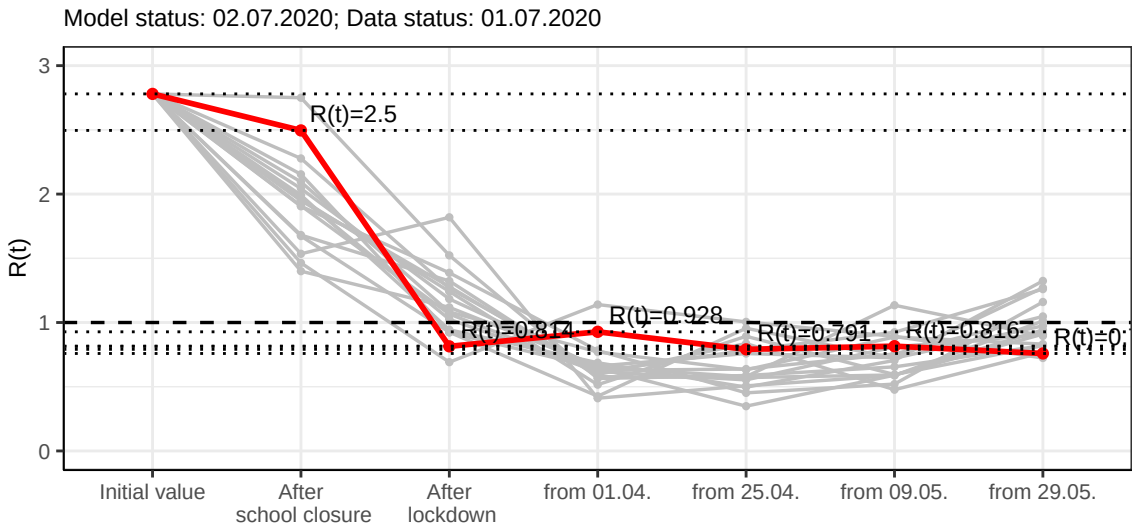


Figure 178: R(t) values before and after the NPIs for Thuringia

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

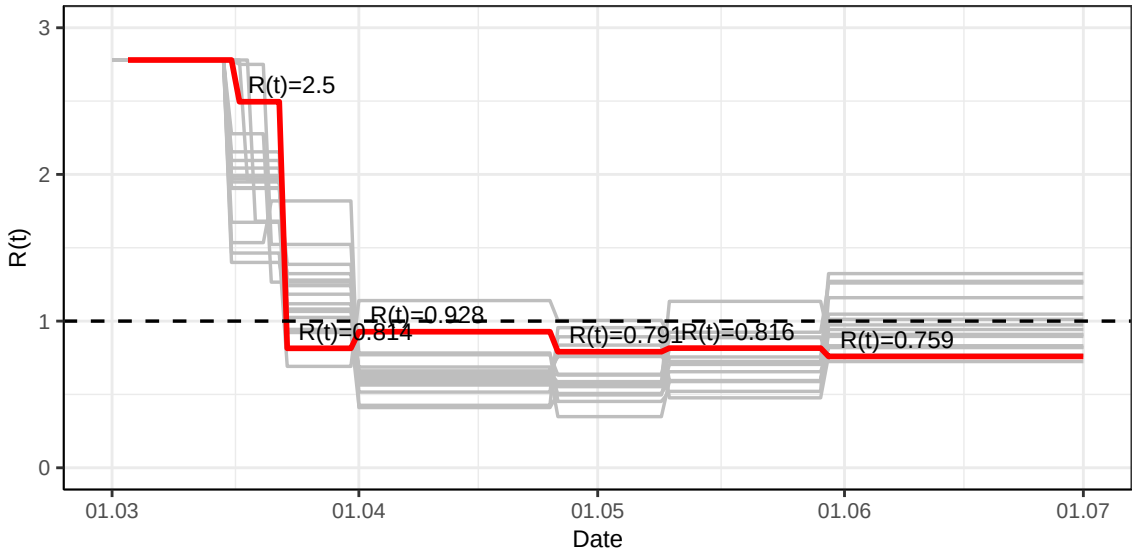


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

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

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.

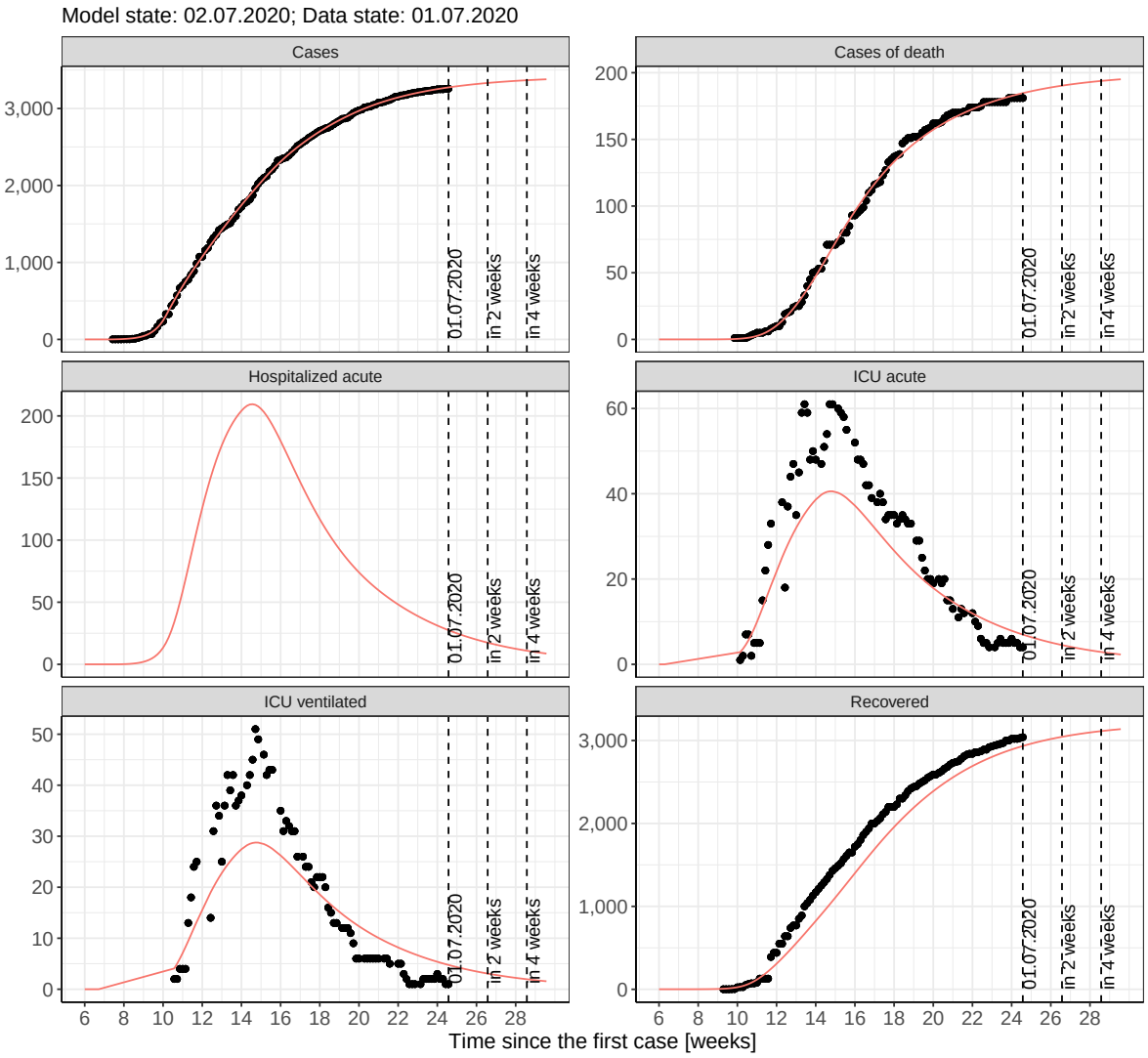


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

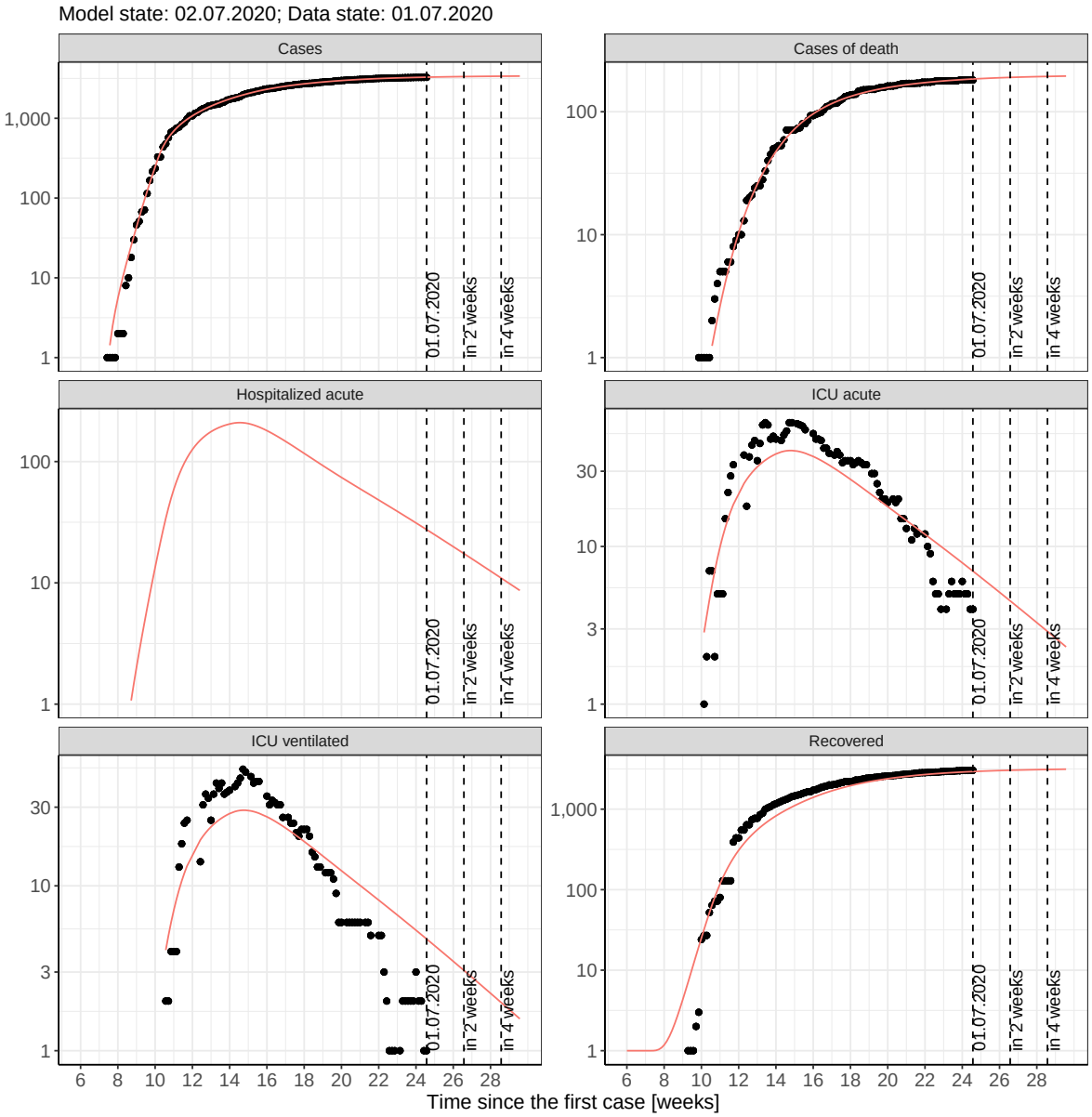


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

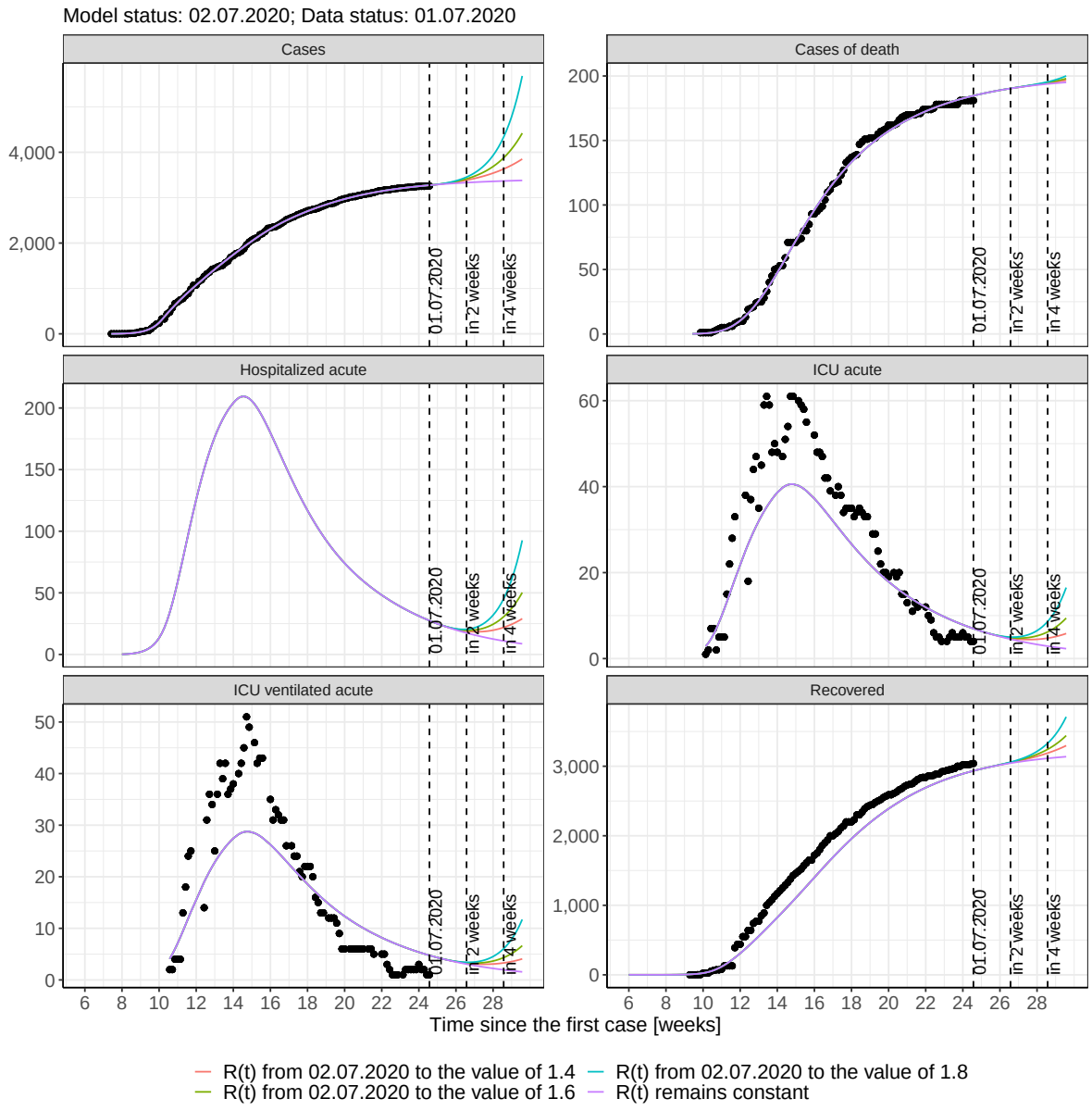


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

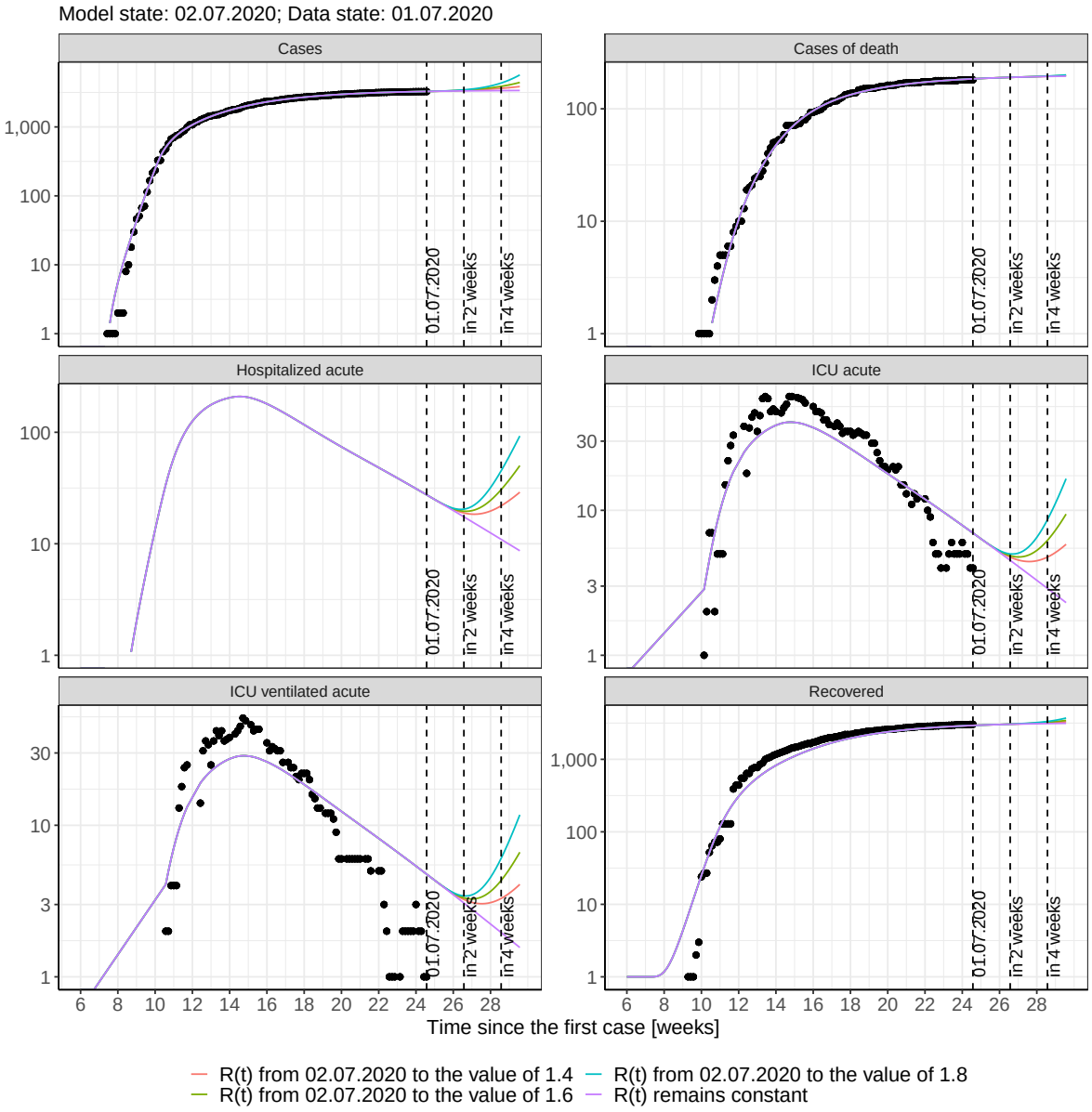


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

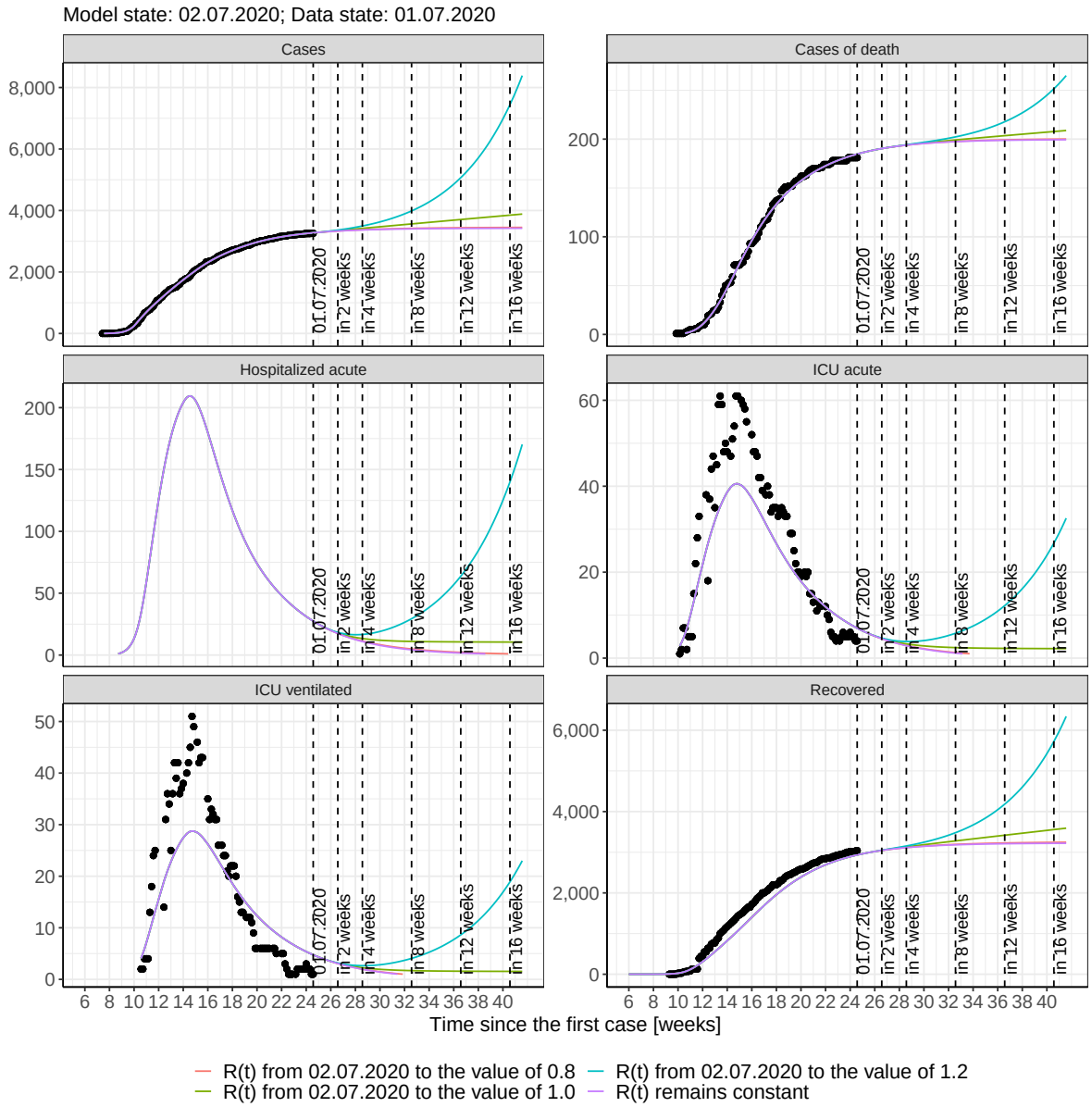


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

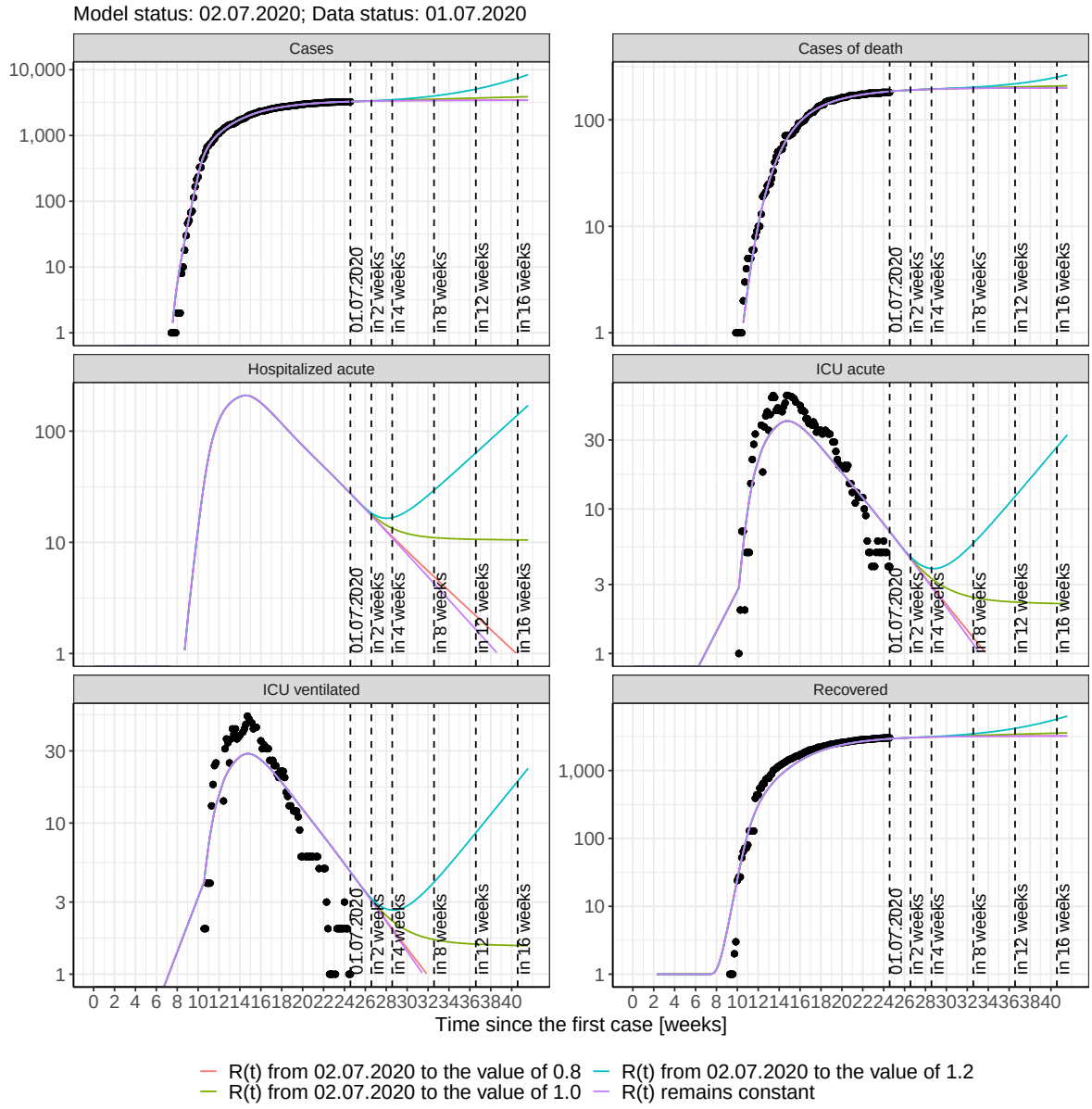


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 65) Model status from 02.07.2020; Data status: 01.07.2020.

Table 62: Thuringia - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3279	185	2943	27	7	5
03.07.2020	3284	186	2953	26	7	4
04.07.2020	3289	186	2962	25	6	4
05.07.2020	3294	187	2971	24	6	4
06.07.2020	3298	187	2979	23	6	4
07.07.2020	3302	187	2988	23	6	4
08.07.2020	3306	188	2996	22	6	4
09.07.2020	3310	188	3003	21	5	4
10.07.2020	3314	189	3011	21	5	4
11.07.2020	3318	189	3018	20	5	3
12.07.2020	3322	189	3025	19	5	3
13.07.2020	3325	190	3032	19	5	3
14.07.2020	3328	190	3038	18	5	3
15.07.2020	3332	190	3044	17	5	3
16.07.2020	3335	191	3050	17	4	3
17.07.2020	3338	191	3056	16	4	3
18.07.2020	3341	191	3062	16	4	3
19.07.2020	3344	191	3068	15	4	3
20.07.2020	3346	192	3073	15	4	3
21.07.2020	3349	192	3078	14	4	3
22.07.2020	3352	192	3083	14	4	2
23.07.2020	3354	193	3088	13	4	2
24.07.2020	3356	193	3092	13	3	2
25.07.2020	3359	193	3097	13	3	2
26.07.2020	3361	193	3101	12	3	2
27.07.2020	3363	193	3106	12	3	2
28.07.2020	3365	194	3110	11	3	2
29.07.2020	3367	194	3113	11	3	2

Table 63: Thuringia - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3279	185	2943	27	7	5
03.07.2020	3284	186	2953	26	7	4
04.07.2020	3289	186	2962	25	6	4
05.07.2020	3294	187	2971	24	6	4
06.07.2020	3298	187	2979	23	6	4
07.07.2020	3303	187	2988	23	6	4
08.07.2020	3307	188	2996	22	6	4
09.07.2020	3311	188	3003	21	5	4
10.07.2020	3315	189	3011	21	5	4
11.07.2020	3319	189	3018	20	5	3
12.07.2020	3323	189	3025	19	5	3
13.07.2020	3327	190	3032	19	5	3
14.07.2020	3330	190	3038	18	5	3
15.07.2020	3334	190	3045	18	5	3
16.07.2020	3337	191	3051	17	4	3
17.07.2020	3341	191	3057	16	4	3
18.07.2020	3344	191	3063	16	4	3
19.07.2020	3347	191	3068	15	4	3
20.07.2020	3350	192	3074	15	4	3
21.07.2020	3353	192	3079	14	4	3
22.07.2020	3356	192	3084	14	4	2
23.07.2020	3359	193	3089	14	4	2
24.07.2020	3362	193	3094	13	3	2
25.07.2020	3364	193	3099	13	3	2
26.07.2020	3367	193	3103	12	3	2
27.07.2020	3369	193	3108	12	3	2
28.07.2020	3372	194	3112	12	3	2
29.07.2020	3374	194	3116	11	3	2

Table 64: Thuringia - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3279	185	2943	27	7	5
03.07.2020	3284	186	2953	26	7	4
04.07.2020	3290	186	2962	25	6	4
05.07.2020	3295	187	2971	24	6	4
06.07.2020	3300	187	2979	23	6	4
07.07.2020	3305	187	2988	23	6	4
08.07.2020	3310	188	2996	22	6	4
09.07.2020	3316	188	3004	21	5	4
10.07.2020	3321	189	3011	21	5	4
11.07.2020	3326	189	3019	20	5	4
12.07.2020	3331	189	3026	19	5	3
13.07.2020	3336	190	3033	19	5	3
14.07.2020	3342	190	3040	18	5	3
15.07.2020	3347	190	3047	18	5	3
16.07.2020	3352	191	3053	17	4	3
17.07.2020	3357	191	3060	17	4	3
18.07.2020	3362	191	3066	17	4	3
19.07.2020	3367	192	3073	16	4	3
20.07.2020	3373	192	3079	16	4	3
21.07.2020	3378	192	3085	15	4	3
22.07.2020	3383	192	3091	15	4	3
23.07.2020	3388	193	3097	15	4	3
24.07.2020	3393	193	3103	15	4	2
25.07.2020	3398	193	3109	14	4	2
26.07.2020	3404	193	3114	14	4	2
27.07.2020	3409	194	3120	14	3	2
28.07.2020	3414	194	3126	14	3	2
29.07.2020	3419	194	3131	13	3	2

Table 65: Thuringia - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	3279	185	2943	27	7	5
03.07.2020	3285	186	2953	26	7	4
04.07.2020	3290	186	2962	25	6	4
05.07.2020	3296	187	2971	24	6	4
06.07.2020	3302	187	2979	23	6	4
07.07.2020	3308	187	2988	23	6	4
08.07.2020	3314	188	2996	22	6	4
09.07.2020	3321	188	3004	21	5	4
10.07.2020	3327	189	3012	21	5	4
11.07.2020	3334	189	3019	20	5	4
12.07.2020	3341	189	3027	20	5	3
13.07.2020	3348	190	3034	19	5	3
14.07.2020	3356	190	3042	19	5	3
15.07.2020	3363	190	3049	18	5	3
16.07.2020	3371	191	3056	18	5	3
17.07.2020	3379	191	3064	18	4	3
18.07.2020	3388	191	3071	17	4	3
19.07.2020	3396	192	3078	17	4	3
20.07.2020	3405	192	3085	17	4	3
21.07.2020	3414	192	3093	17	4	3
22.07.2020	3423	192	3100	17	4	3
23.07.2020	3433	193	3107	17	4	3
24.07.2020	3442	193	3115	16	4	3
25.07.2020	3453	193	3123	16	4	3
26.07.2020	3463	193	3130	16	4	3
27.07.2020	3474	194	3138	16	4	3
28.07.2020	3485	194	3146	17	4	3
29.07.2020	3496	194	3154	17	4	3

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

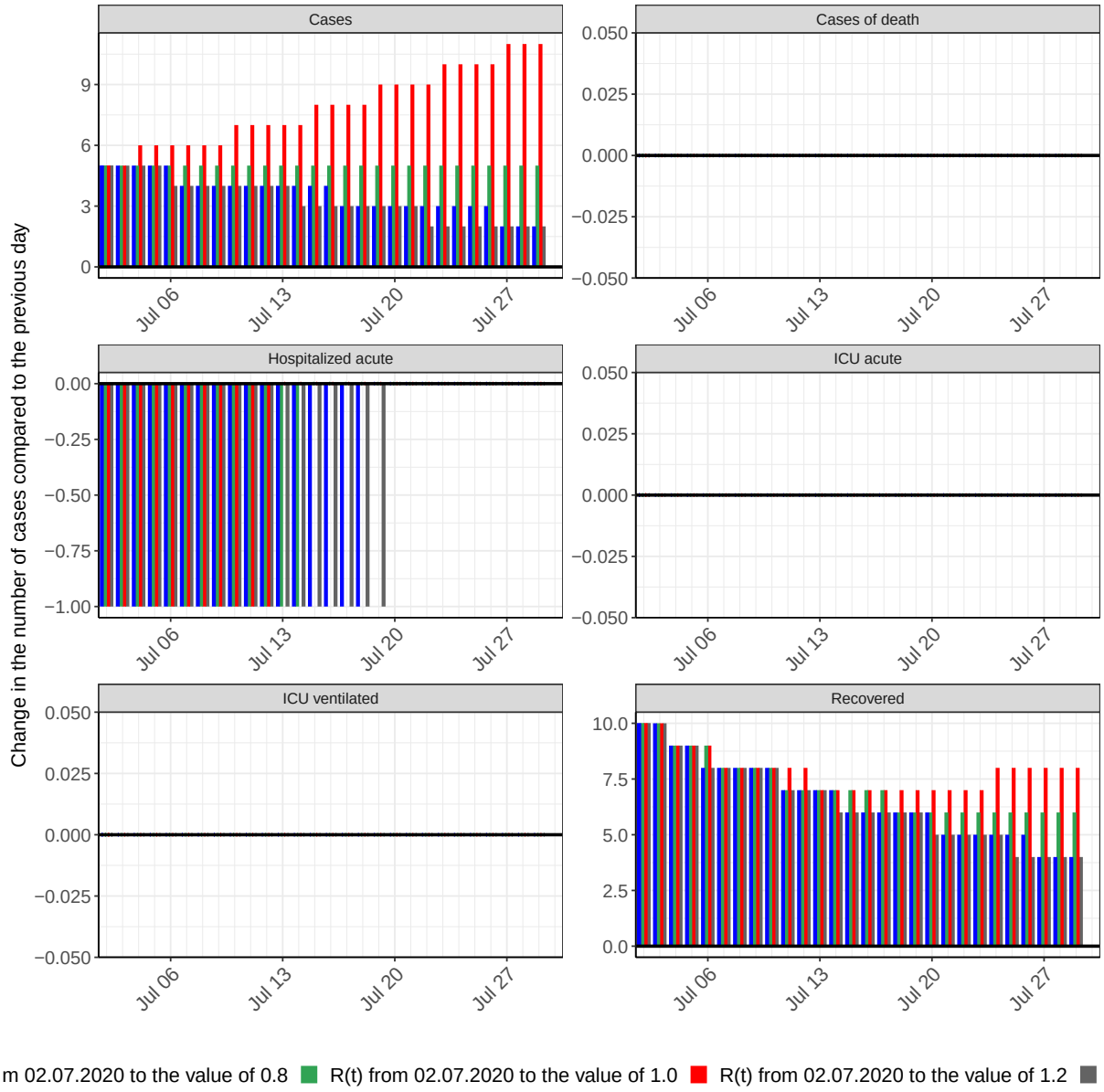


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

18 Germany

18.1 Model description

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

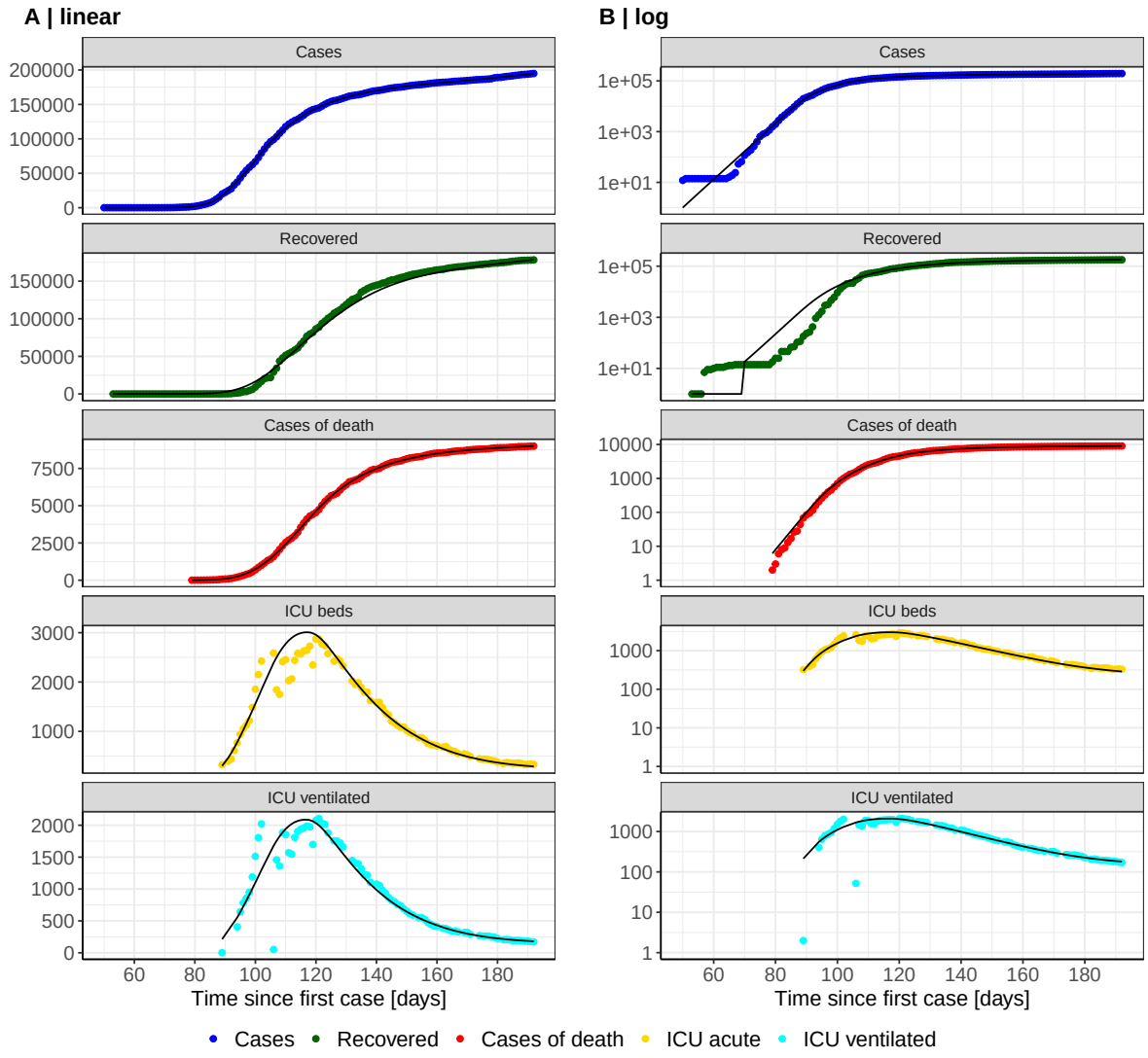


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

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

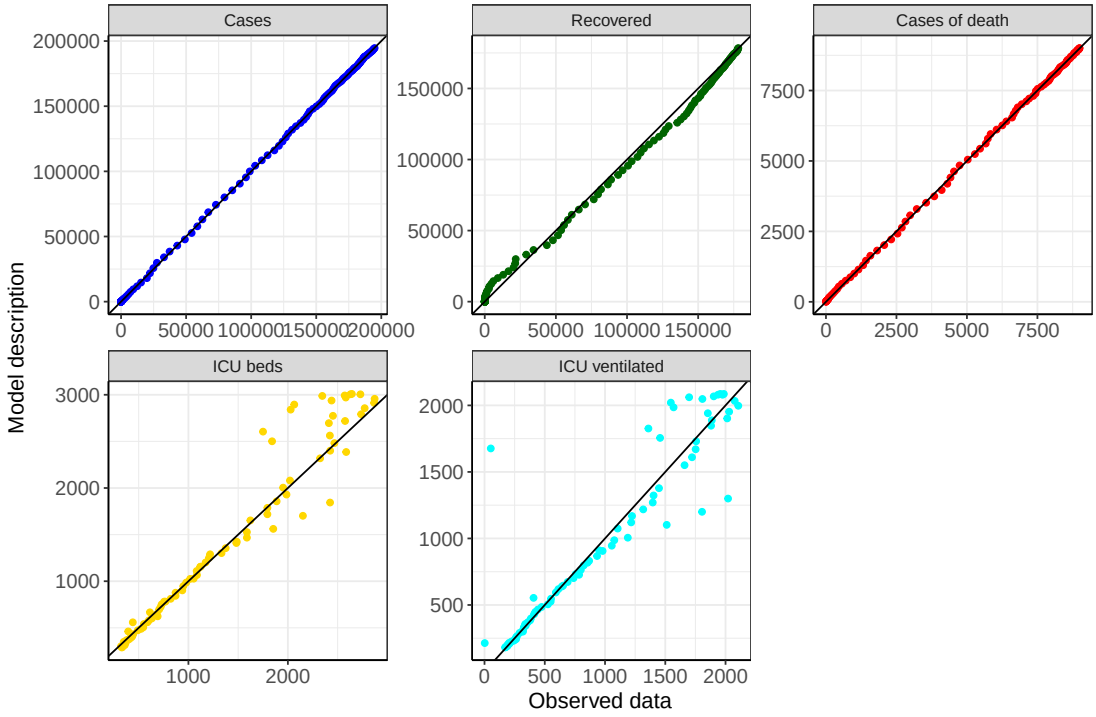


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

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

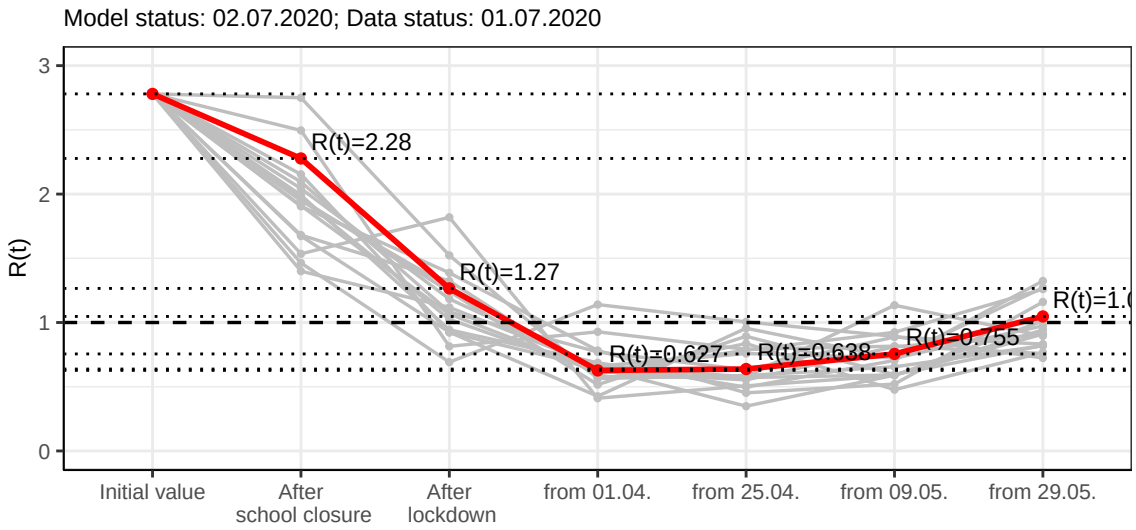


Figure 189: R(t) values before and after the NPIs for Germany

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

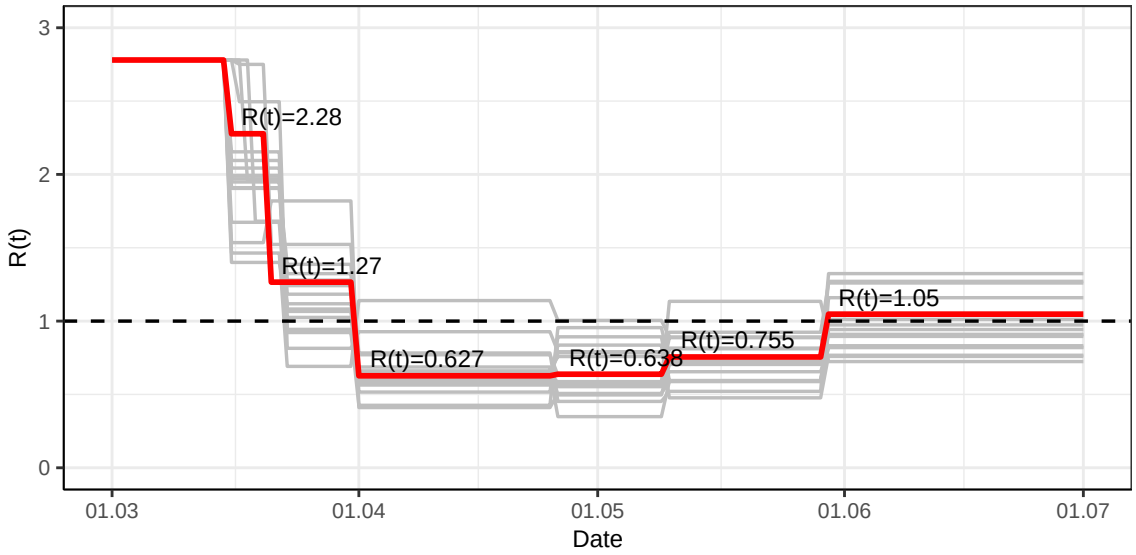


Figure 190: R(t) values over time for Germany

18.2 Model predictions

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

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.

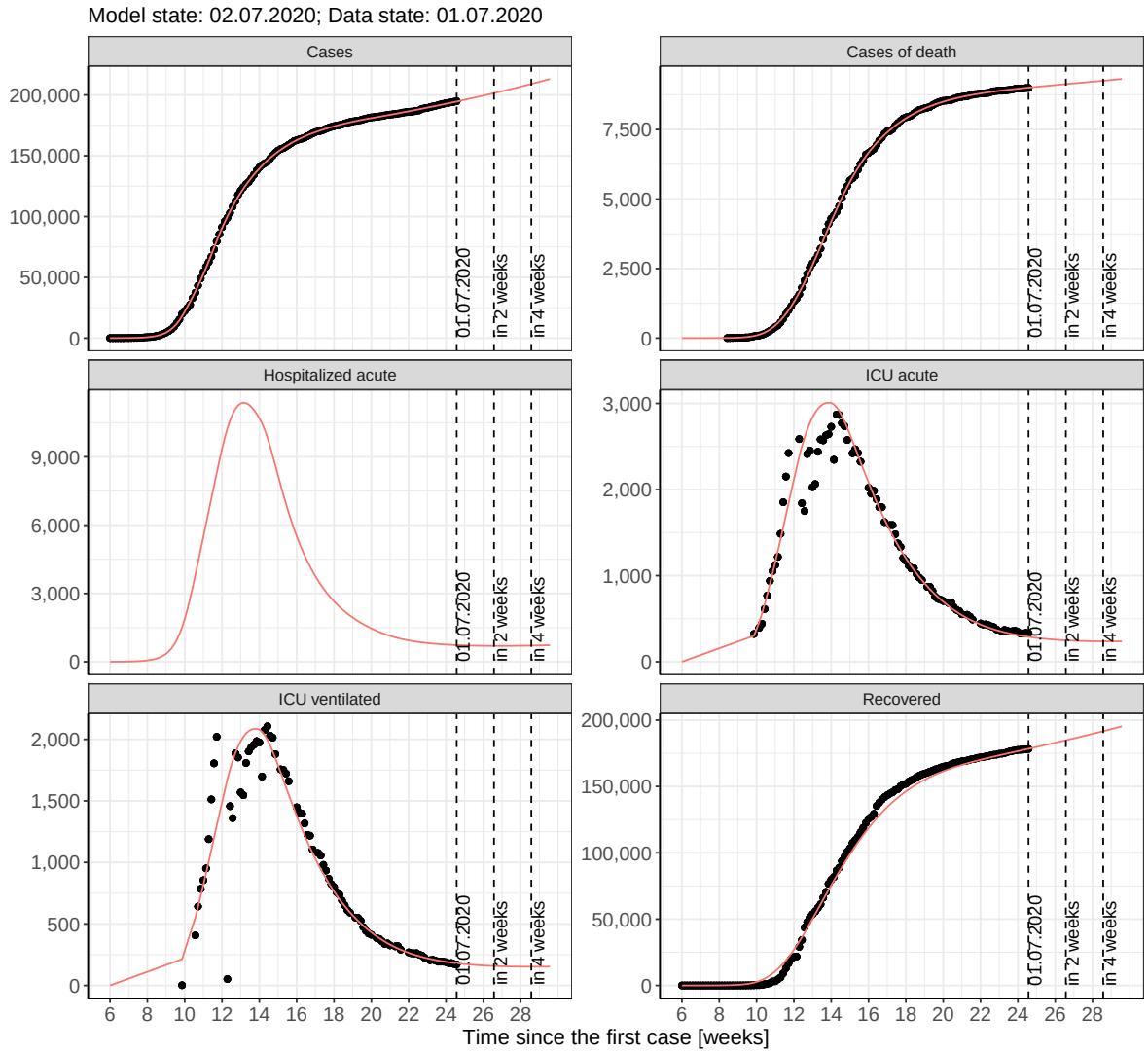


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

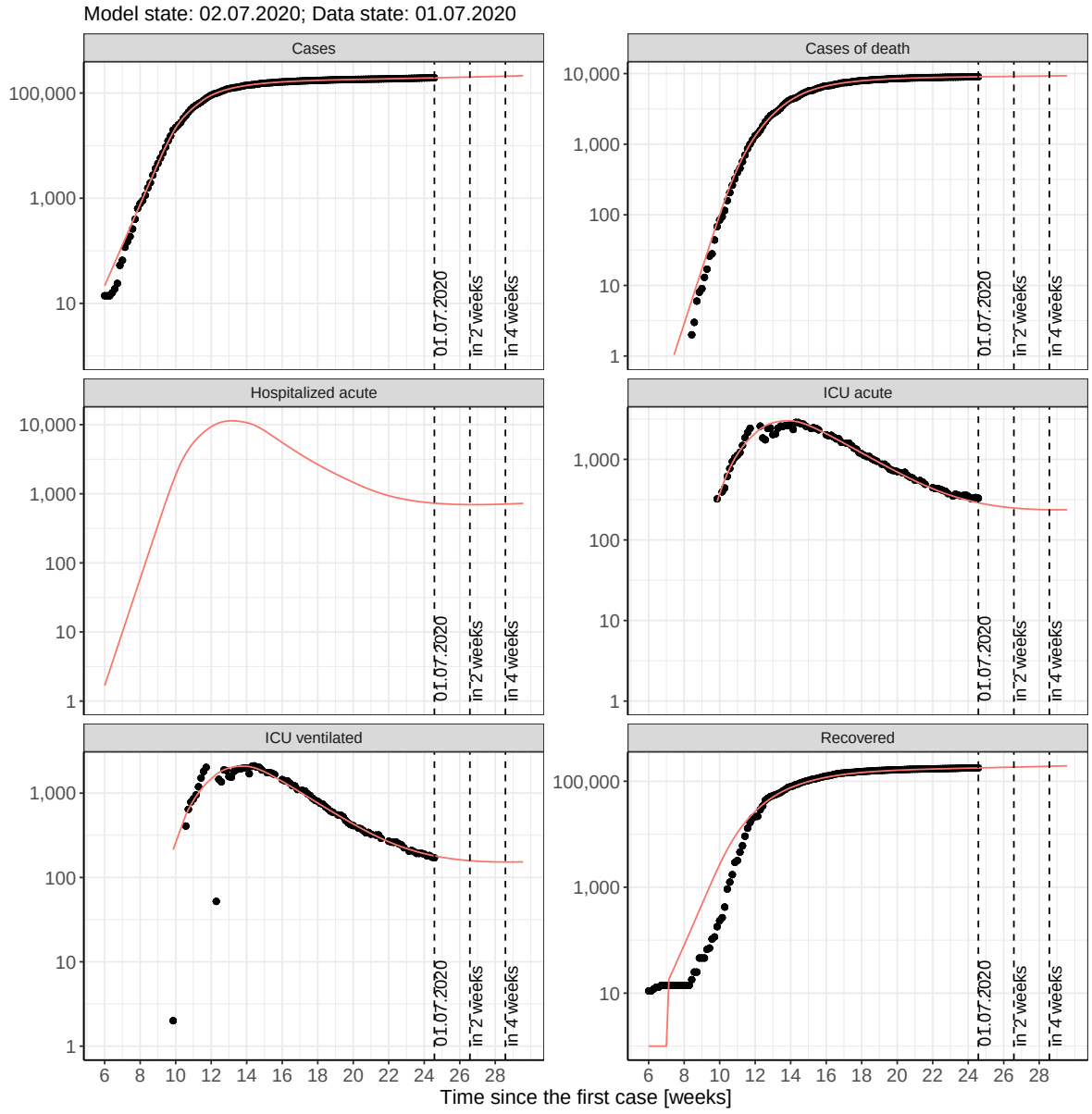


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 02.07.2020

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 02.07.2020 were tested.

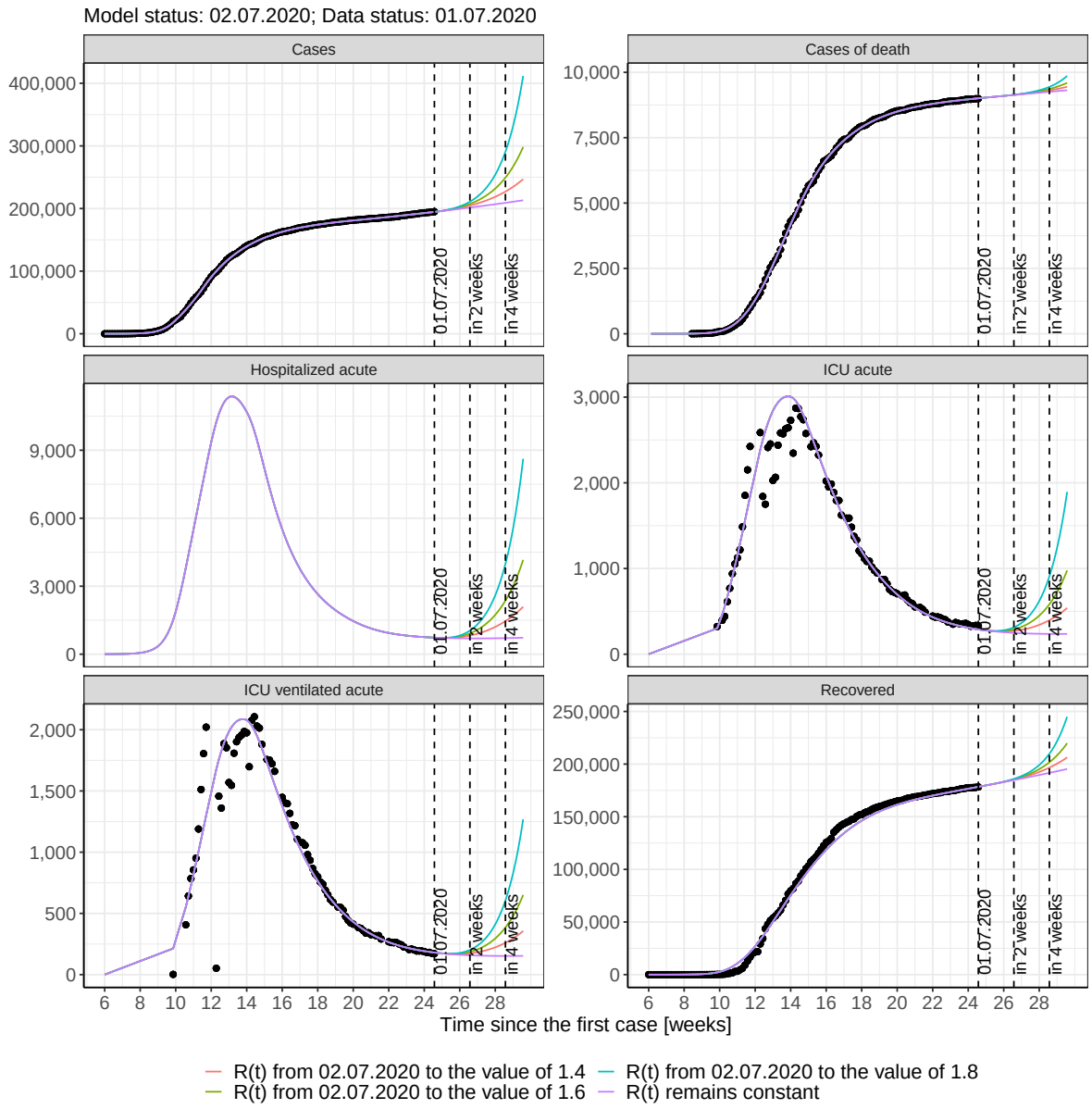


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

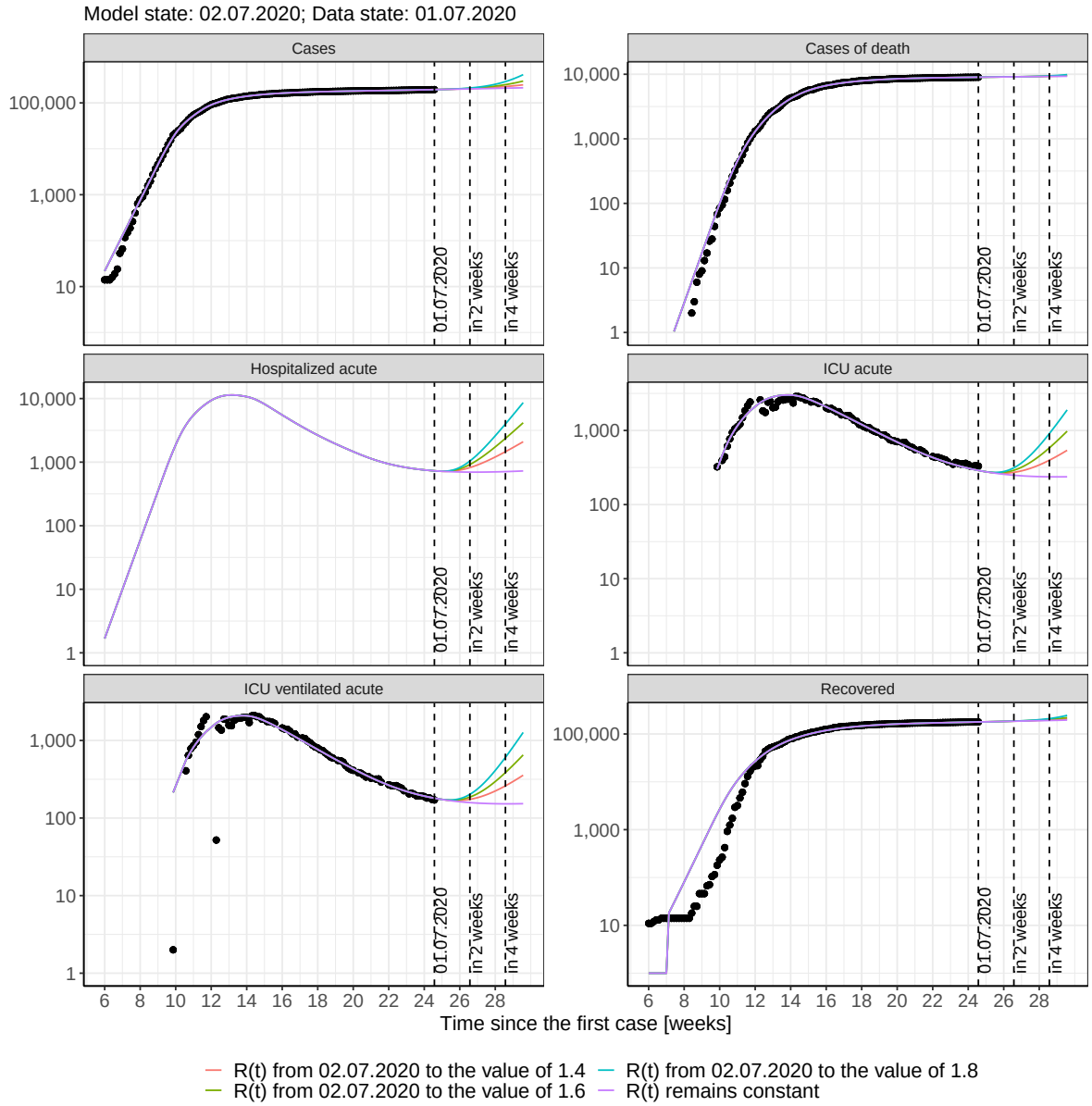


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 02.07.2020. Points: Reported case numbers; Lines: Model predictions.

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 02.07.2020 were tested.

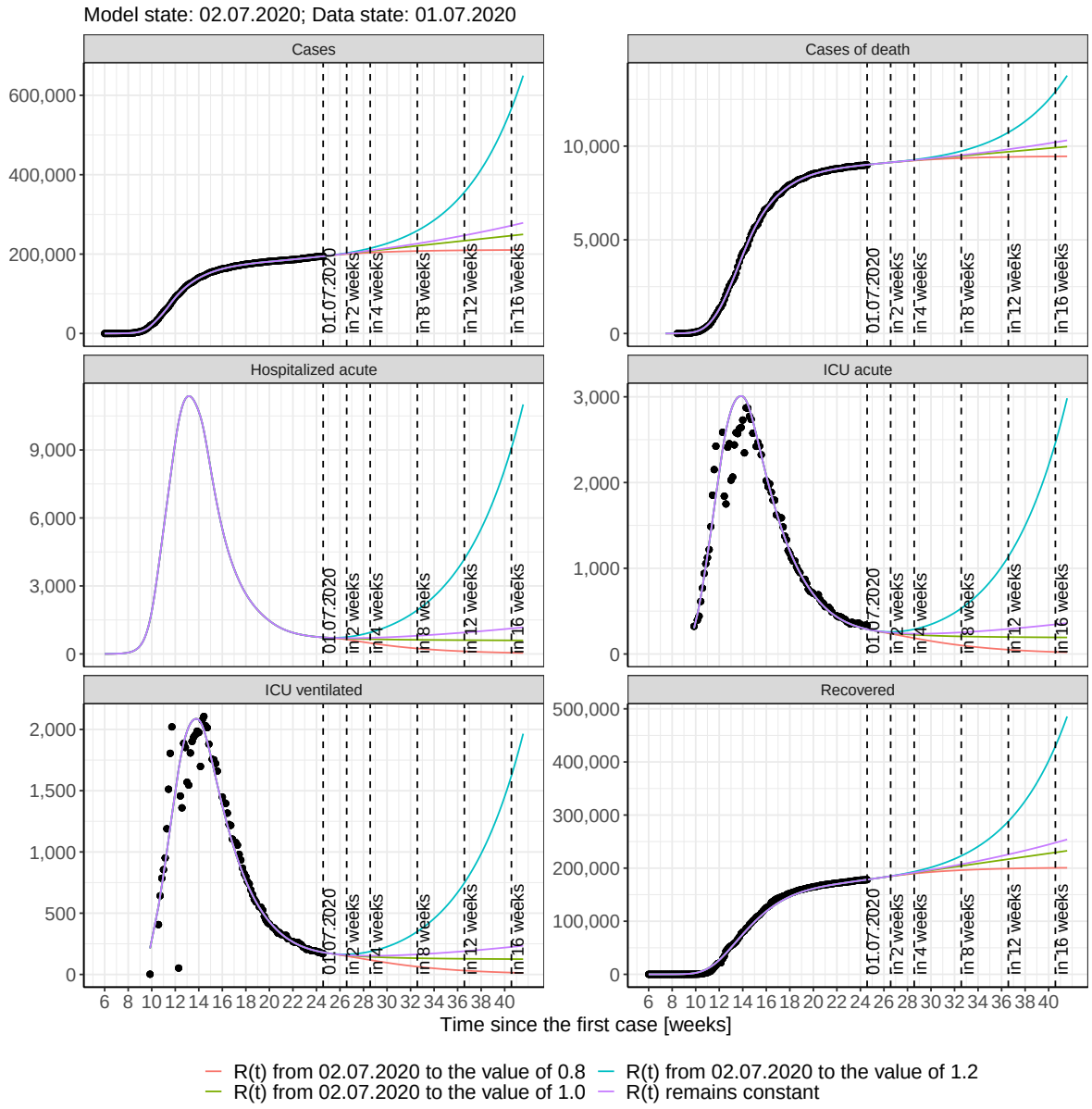


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 02.07.2020. Points: reported case numbers; lines: model prediction.

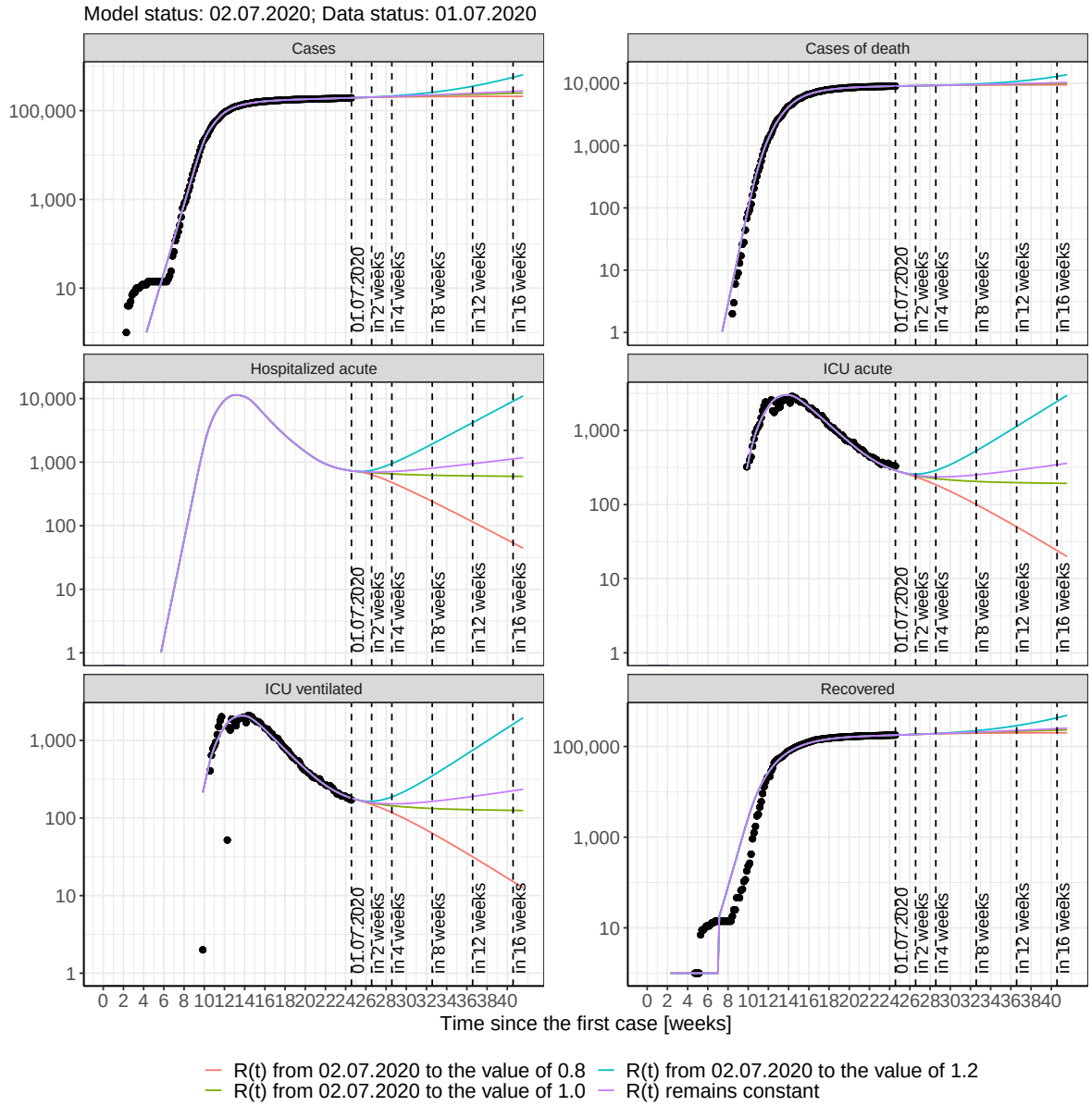


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 02.07.2020. Points: reported case numbers;lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 02.07.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 02.07.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 02.07.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 02.07.2020 (Tab. 69) Model status from 02.07.2020; Data status: 01.07.2020.

Table 66: Germany - R(t) remains unchanged after the 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	195090	9016	178860	726	285	178
03.07.2020	195570	9025	179310	721	281	176
04.07.2020	196050	9035	179760	717	277	174
05.07.2020	196530	9044	180210	714	274	172
06.07.2020	197020	9053	180660	711	270	170
07.07.2020	197510	9062	181120	708	267	168
08.07.2020	198000	9071	181570	706	264	166
09.07.2020	198490	9080	182030	703	262	165
10.07.2020	198990	9088	182490	702	259	164
11.07.2020	199500	9097	182950	700	257	162
12.07.2020	200000	9106	183420	699	254	161
13.07.2020	200510	9115	183880	698	252	160
14.07.2020	201020	9123	184350	697	251	159
15.07.2020	201540	9132	184820	697	249	158
16.07.2020	202060	9141	185290	696	247	157
17.07.2020	202580	9149	185770	696	246	157
18.07.2020	203100	9158	186240	696	245	156
19.07.2020	203630	9166	186720	697	243	155
20.07.2020	204160	9175	187210	697	242	155
21.07.2020	204700	9184	187690	698	241	154
22.07.2020	205240	9192	188180	699	240	154
23.07.2020	205780	9201	188670	700	240	153
24.07.2020	206330	9210	189160	701	239	153
25.07.2020	206880	9218	189660	702	238	153
26.07.2020	207430	9227	190160	704	238	153
27.07.2020	207980	9236	190660	706	238	153
28.07.2020	208540	9245	191160	707	237	152
29.07.2020	209110	9254	191670	709	237	152

Table 67: Germany - R(t) takes on the value of 0.8 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	195080	9016	178860	726	285	178
03.07.2020	195530	9025	179310	721	281	176
04.07.2020	195970	9035	179760	717	277	173
05.07.2020	196400	9044	180210	712	273	171
06.07.2020	196810	9053	180660	707	270	169
07.07.2020	197220	9062	181110	701	266	167
08.07.2020	197610	9071	181550	695	262	165
09.07.2020	197990	9080	182000	688	259	163
10.07.2020	198360	9088	182440	681	255	161
11.07.2020	198720	9097	182880	673	252	159
12.07.2020	199070	9105	183310	664	248	157
13.07.2020	199410	9114	183750	655	244	155
14.07.2020	199740	9122	184170	645	241	152
15.07.2020	200060	9130	184590	635	237	150
16.07.2020	200370	9138	185010	624	233	148
17.07.2020	200670	9146	185420	614	230	146
18.07.2020	200960	9154	185820	603	226	143
19.07.2020	201250	9162	186220	592	222	141
20.07.2020	201530	9169	186610	580	219	139
21.07.2020	201800	9177	186990	569	215	136
22.07.2020	202060	9184	187370	558	211	134
23.07.2020	202310	9191	187730	546	207	132
24.07.2020	202560	9198	188090	535	204	129
25.07.2020	202800	9205	188450	524	200	127
26.07.2020	203030	9212	188790	513	196	125
27.07.2020	203260	9218	189130	501	193	122
28.07.2020	203480	9225	189460	490	189	120
29.07.2020	203690	9231	189790	479	185	118

Table 68: Germany - R(t) takes on the value of 1.0 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	195090	9016	178860	726	285	178
03.07.2020	195560	9025	179310	721	281	176
04.07.2020	196030	9035	179760	717	277	174
05.07.2020	196500	9044	180210	714	273	172
06.07.2020	196980	9053	180660	710	270	170
07.07.2020	197450	9062	181120	707	267	168
08.07.2020	197920	9071	181570	703	264	166
09.07.2020	198390	9080	182020	700	261	165
10.07.2020	198860	9088	182480	697	258	163
11.07.2020	199330	9097	182940	694	256	162
12.07.2020	199800	9106	183390	692	253	160
13.07.2020	200270	9114	183850	689	251	159
14.07.2020	200750	9123	184310	686	249	158
15.07.2020	201220	9132	184770	683	246	156
16.07.2020	201690	9140	185230	681	244	155
17.07.2020	202160	9149	185690	678	242	154
18.07.2020	202630	9157	186150	676	240	153
19.07.2020	203100	9166	186610	673	239	152
20.07.2020	203570	9174	187080	671	237	151
21.07.2020	204030	9182	187540	669	235	150
22.07.2020	204500	9191	188000	667	234	149
23.07.2020	204970	9199	188460	665	232	148
24.07.2020	205440	9207	188930	662	231	148
25.07.2020	205910	9216	189390	660	229	147
26.07.2020	206380	9224	189850	659	228	146
27.07.2020	206850	9232	190310	657	227	145
28.07.2020	207320	9240	190780	655	226	145
29.07.2020	207780	9248	191240	653	225	144

Table 69: Germany - R(t) takes on the value of 1.2 after 02.07.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
02.07.2020	195090	9016	178860	726	285	178
03.07.2020	195590	9025	179310	721	281	176
04.07.2020	196090	9035	179760	718	277	174
05.07.2020	196620	9044	180210	715	274	172
06.07.2020	197150	9053	180670	713	271	170
07.07.2020	197700	9062	181130	712	268	169
08.07.2020	198270	9071	181590	713	265	167
09.07.2020	198860	9080	182050	714	263	166
10.07.2020	199460	9089	182530	716	262	165
11.07.2020	200070	9098	183000	720	260	165
12.07.2020	200710	9106	183490	724	259	164
13.07.2020	201360	9115	183980	730	258	164
14.07.2020	202040	9124	184480	737	258	164
15.07.2020	202730	9133	184990	744	258	164
16.07.2020	203440	9142	185500	753	258	165
17.07.2020	204170	9152	186030	762	259	165
18.07.2020	204920	9161	186570	773	260	166
19.07.2020	205700	9170	187120	785	261	167
20.07.2020	206490	9180	187680	797	262	168
21.07.2020	207310	9189	188260	810	264	170
22.07.2020	208150	9199	188840	824	266	171
23.07.2020	209020	9209	189450	839	268	173
24.07.2020	209910	9219	190060	855	271	175
25.07.2020	210830	9230	190690	872	274	177
26.07.2020	211770	9240	191340	890	277	179
27.07.2020	212740	9251	192010	908	281	182
28.07.2020	213730	9262	192690	928	285	184
29.07.2020	214760	9273	193390	948	289	187

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 02.07.2020

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

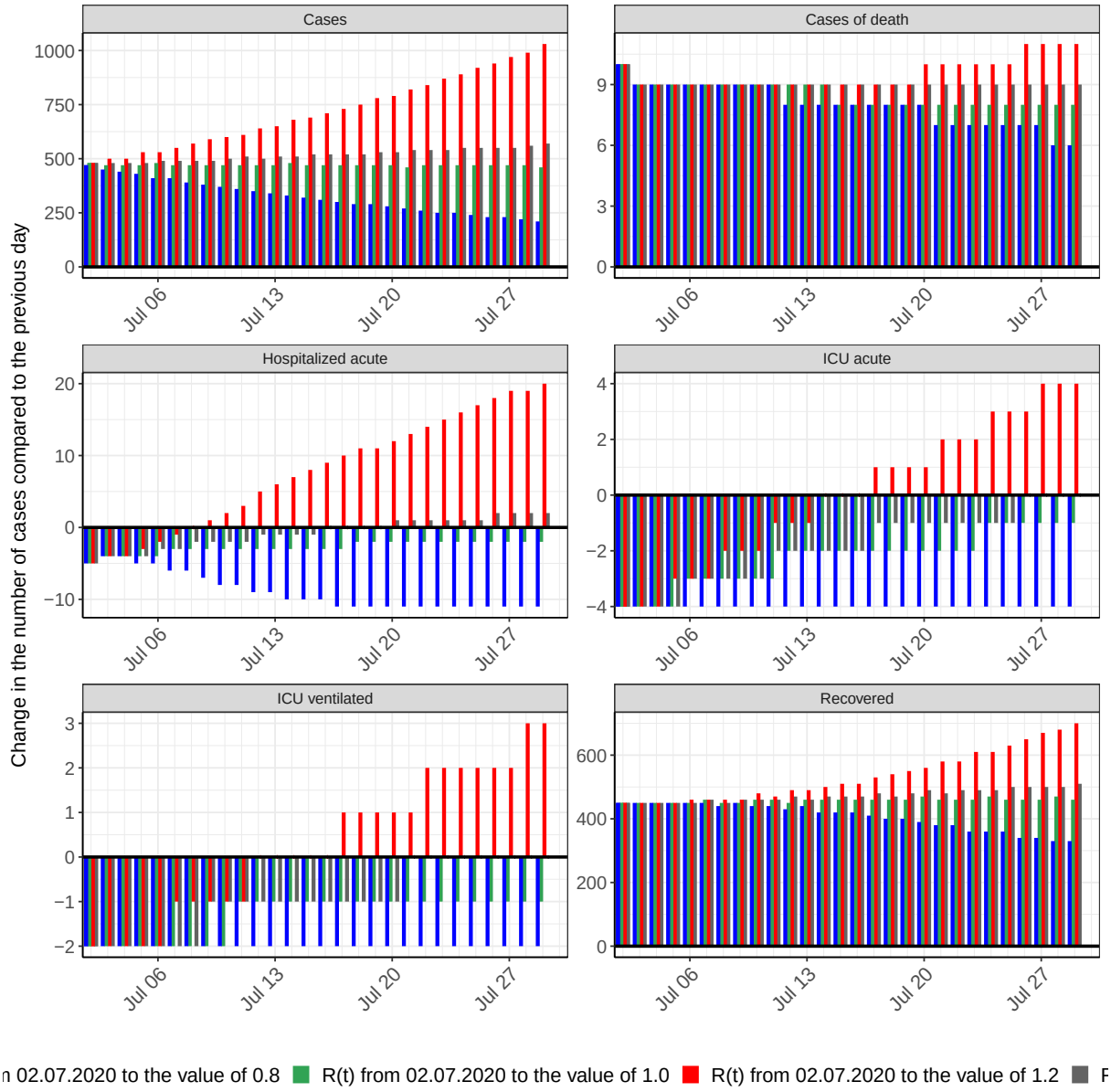


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany