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

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Summary

Aims

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

Results

- A modified infection model (Susceptible - Exposed - Infectious - Recovered - Death; SEIRD) has been developed and adapted to the respective situation of each federal state. The model shows an excellent descriptive characteristic of COVID-19 case numbers, occupancy of inpatient beds, intensive care beds (ventilated and non-ventilated), deaths and recoveries in all 16 German federal states.
- The influence of non-pharmaceutical interventions (NPI) on R(t) was investigated:
  - At the beginning of the infection the R(t) value in Germany lies on average at 2.78.
  - School closure, lockdown (on 23.03.2020) and a subsequent lockdown (on 01.04.2020) have a significant effect ($p<0.001$) on the reduction of R(t). Due to the close alignment of NPIs, it cannot be ruled out that the effect of another NPI is overlapped. The reproduction number R(t) decreases from the initial value of $R(t) = 2.78$ to $R(t) = 0.636$ on a national average on 01.04.2020.
  - Subsequently, in April, even slighter but statistically significant ($p<0.001$) changes of R(t) occurred. On 25.04.2020, 5 days after opening of shops (20.04.2020), state specific R(t) changes were observed.
  - On 06.05.2020 (two days after school reopening on 04.05.2020), there was a small increase of R(t) by 13% on average to 0.716. After 05.06.2020, there was a further increase of R(t) by approx. 51% from 0.716 to 1.08 on a national average with subsequent reduction of R(t) after 17.06.2020 by about 21% from 1.08 to 0.857.
  - On 12.07.2020, a new increase of R(t) by approx. 55% from 0.857 to 1.33 on average can be observed, followed by reduction of R(t) after 09.08.2020 by about 21% from 1.33 to 1.05 on a national average.

  - On 19.08.2020, a reduction of R(t) by approx. 10% from 1.05 to 0.946 on average can be observed, followed by an increase of R(t) after 04.09.2020 by 30% from 0.946 to 1.23.
  - Following the relaxation of NPIs nationwide, a general increase in infections has been observed. The R(t) changes in June seem to depict emergence of the local "corona hotspots" in some federal states (e.g. North Rhine-Westphalia, Berlin, Brandenburg, Saxony-Anhalt) followed by containment of this local outbreaks. In the time period from July to August, however, the rising number of positively tested individuals among incoming travellers have also played an increasingly important role. In September, a renewed increase in the number of cases with the state-specific R(t) value above 1.0 is observed. Smaller outbreaks in various districts increasingly contribute to the rising case numbers.
  - The current R(t) values are estimated at 1.23 on a national average and lie above 1.0 for all of 16 federal states.

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

Changes in the document

Changes compared to the report of 23.09.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 06.10.2020. A further effect on R(t) on 04.09 was estimated (p-value < 0.001).

Changes compared to the report of 10.09.2020

Compared to the last report, the database has been expanded and the model has been estimated with new data up to 22.09.2020. A further effect on R(t) on 18.08 was estimated (p-value < 0.001).

Changes compared to the report of 27.08.2020

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

Changes compared to the report of 13.08.2020

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

Changes compared to the report of 30.07.2020

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

Changes compared to the report of 16.07.2020

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

Changes compared to the report of 02.07.2020

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

Changes compared to the report of 25.06.2020

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

Changes compared to the report of 18.06.2020

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

Changes compared to the report of 11.06.2020

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

Changes compared to the report of 04.06.2020

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

Changes compared to the report dated 28.05.2020

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

Changes compared to the report dated 19.05.2020

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

Changes compared to the report dated 08.05.2020

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

Changes compared to the report dated 05.05.2020

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

Changes compared to the report dated 24.04.2020

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

Changes compared to the report dated 21.04.2020

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

Changes in comparison to the report from 15.04.2020

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

Changes compared to the report of 11.04.2020

The model was updated with new data up to and including 14.04.2020. Based on available data, the lengths of stay in hospital and ICU were adjusted and reduced for COVID patients (hospital 5-10 days, ICU 5 days). This was also necessary, as otherwise the hospital and ICU beds would be overestimated. Here, the data show a saturation. Easter holidays were detected as another effect on R0. Since the beginning of the holidays, R0

has decreased by a further ~35% and is now below 1 in all federal states (average 0.69). The other effect sizes remain unaffected by this.

Contents

1 Overview of the modeling

1.1 Question

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

1.2 Objectives

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

1.3 Target group

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

1.4 Methods

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

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

1.5 Model structure

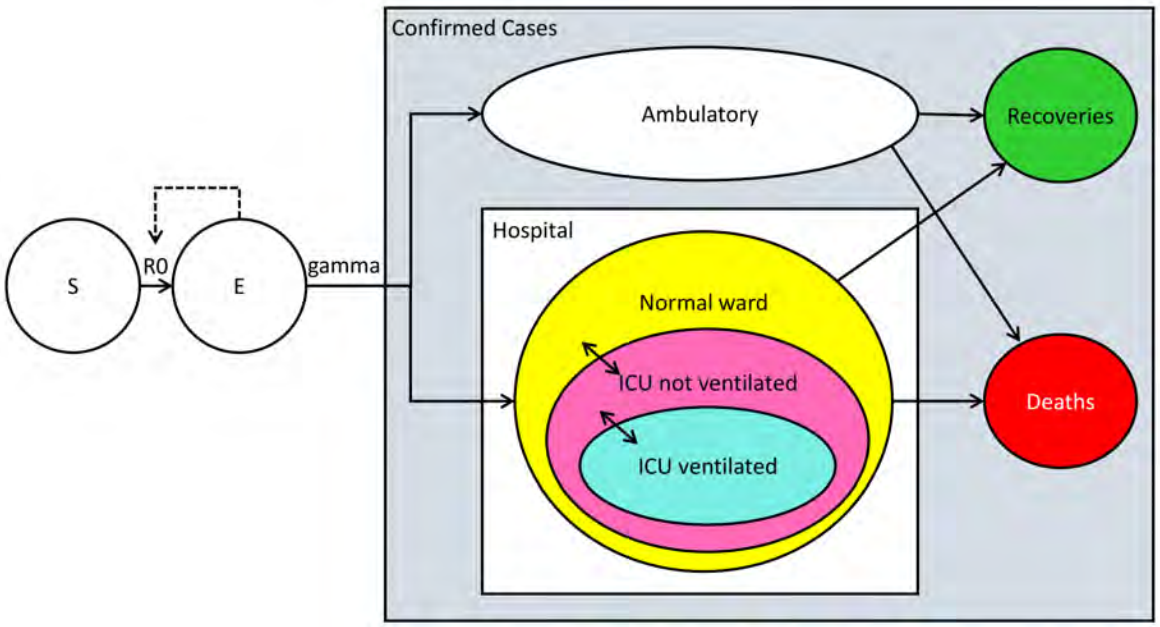
The developed model is based on a classical SEIR model, which in mathematical epidemiology describes the spread of infections within a population. In this classical model, an individual can pass through four disease-relevant stages: *Stage S:* People who can be infected, *Stage E:* People who are infected,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

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

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

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

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



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

Figure 1: SEIR/D Model - Model structure

1.6 Model results

1.6.1 Description of the data

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

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

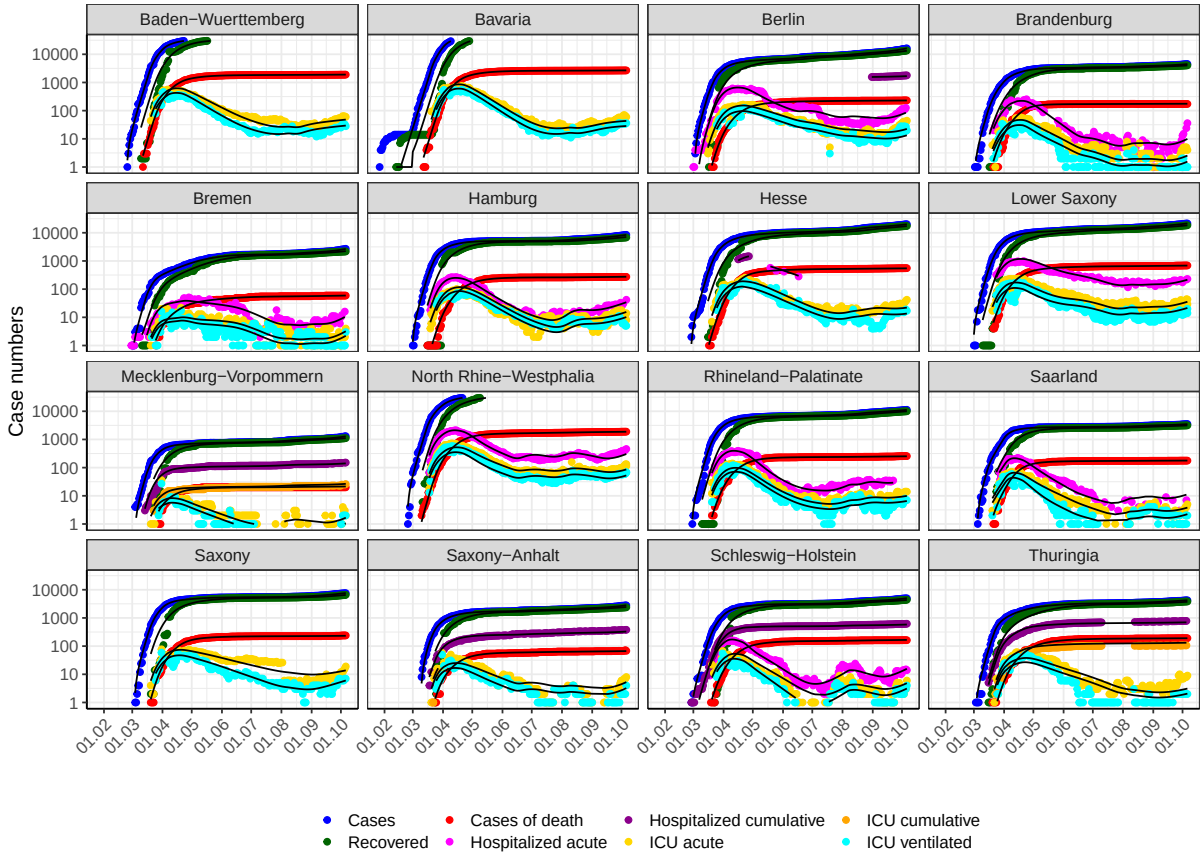


Figure 2: Germany by federal states - model description of case numbers.
Points: Reported case numbers - Lines: Model description

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

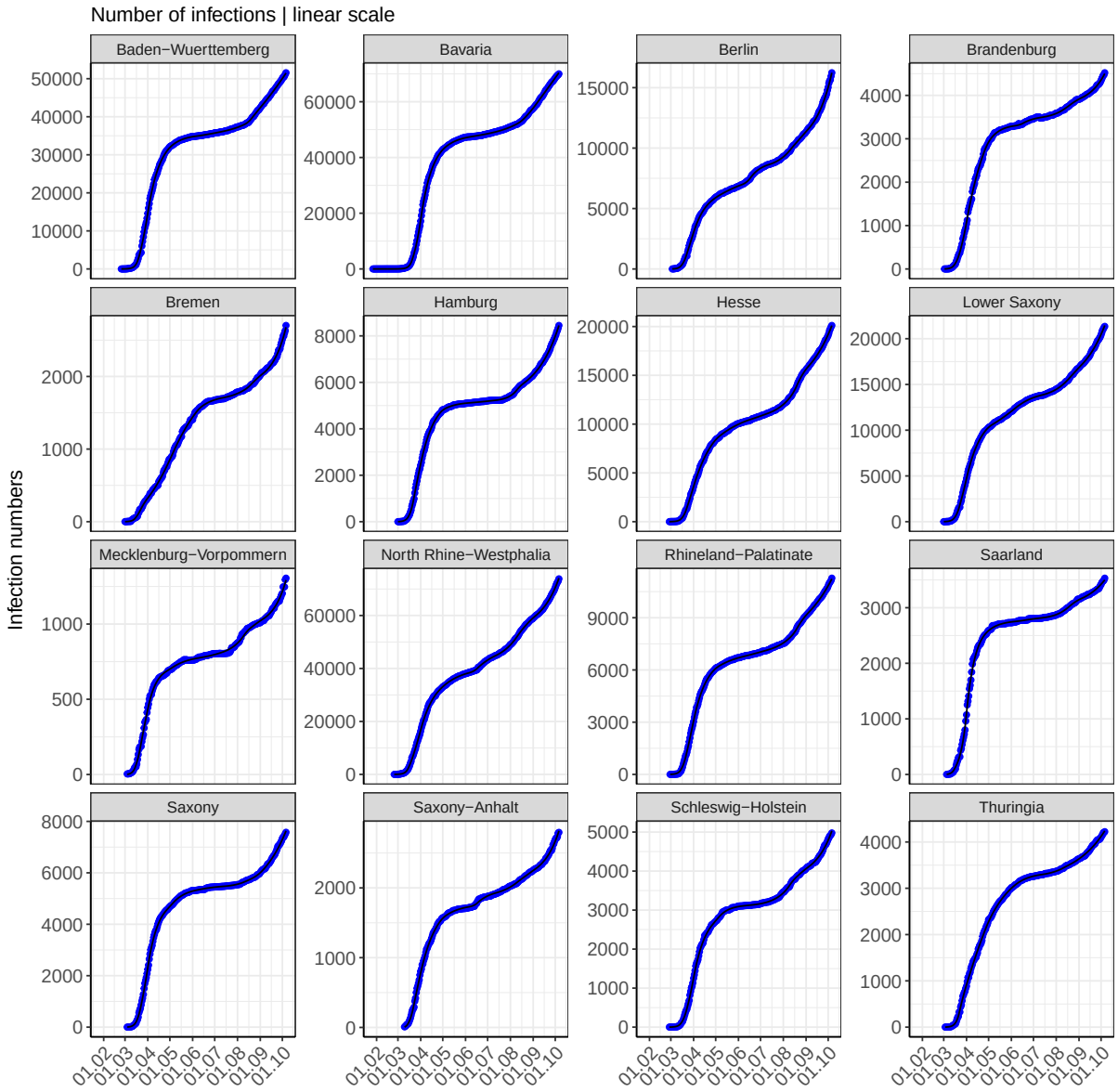


Figure 3: Germany by federal states - model description of the infection cases.
Points: Reported cases of infection - Lines: Model description

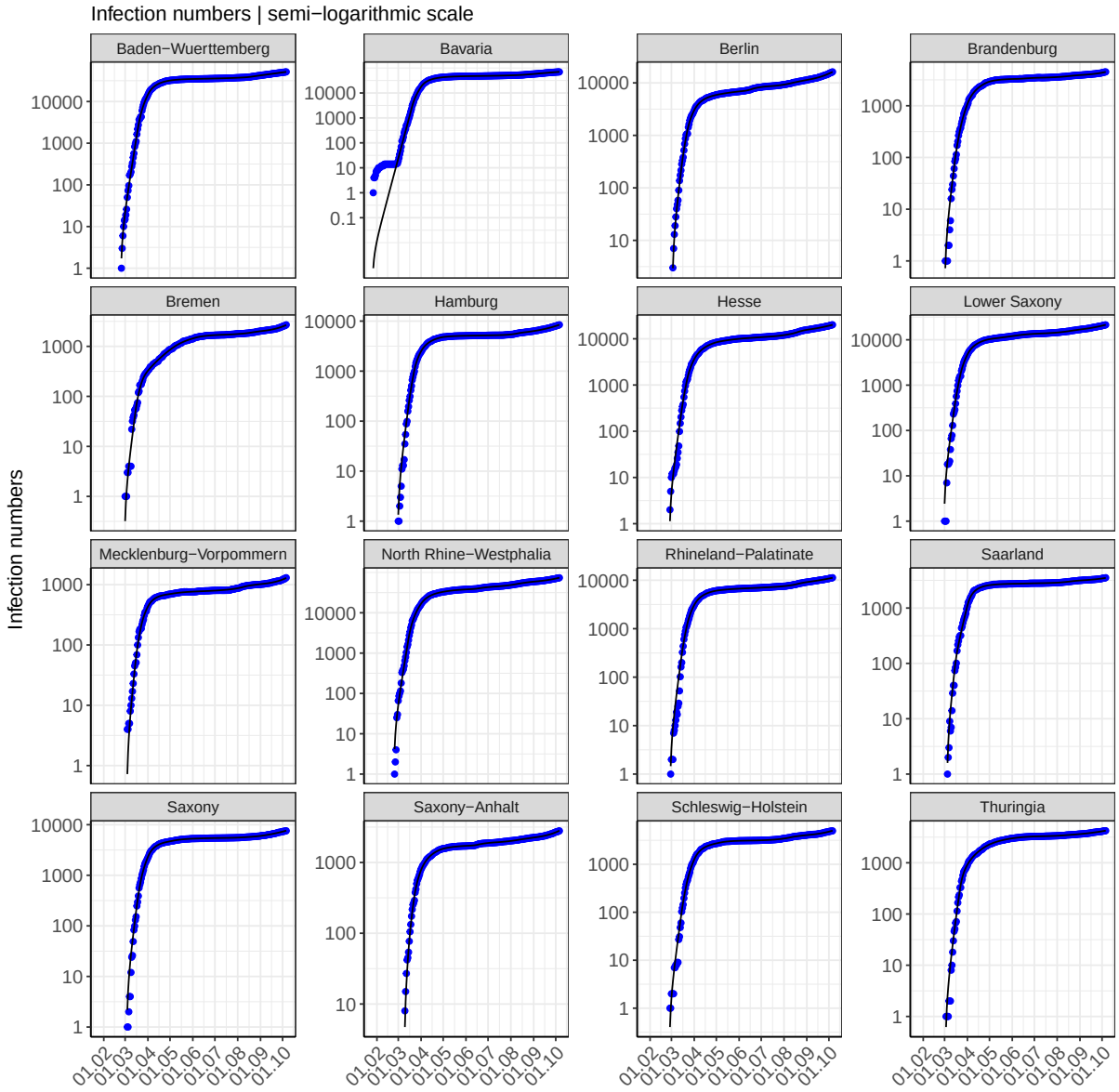


Figure 4: Germany by federal states - model description of infection cases.
Points: Reported cases of infection - Lines: Model description

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

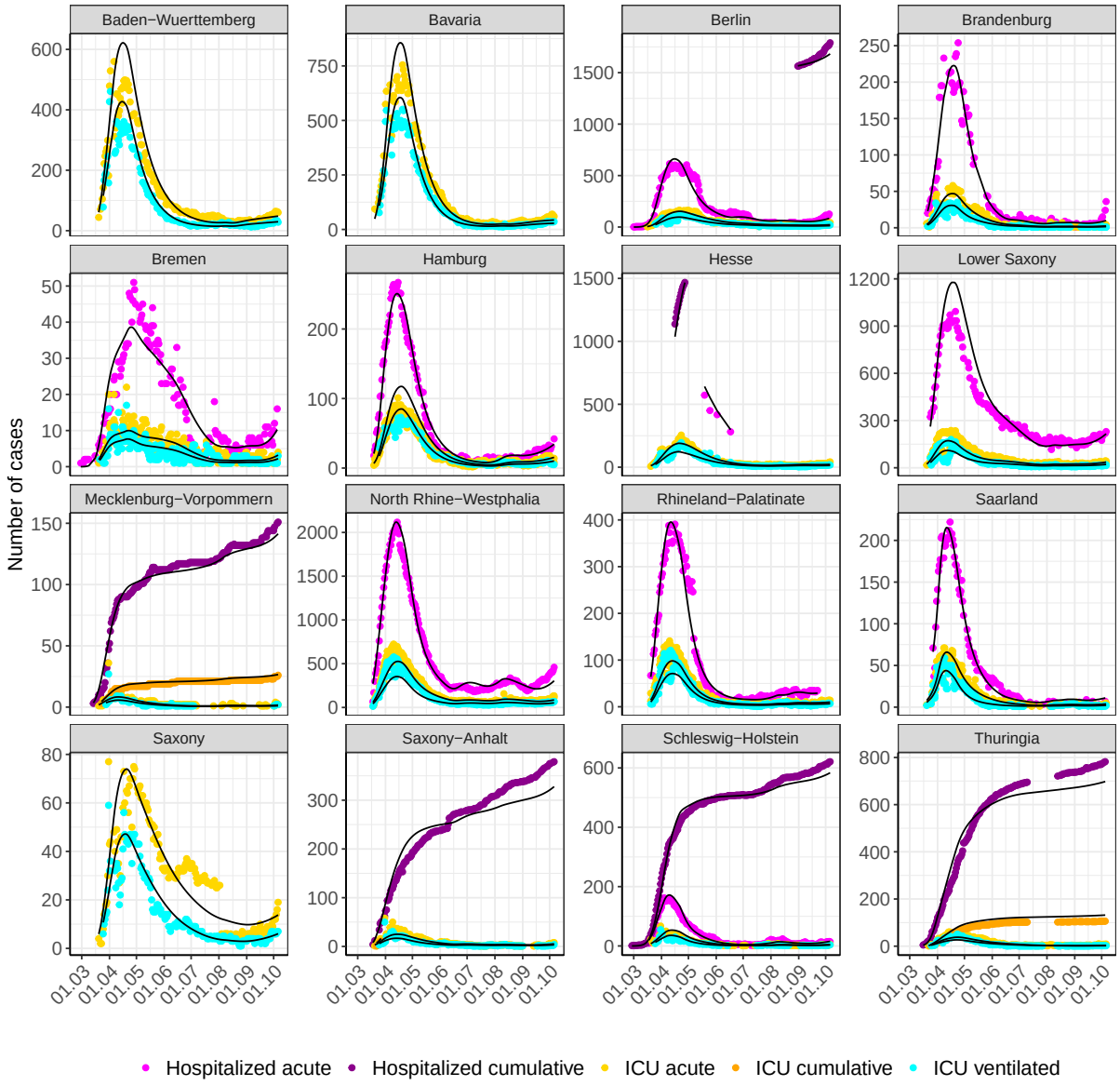


Figure 5: Germany by federal states - model description of the hospital and ICU occupancy. Points: Reported occupancy - Lines: Model description

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

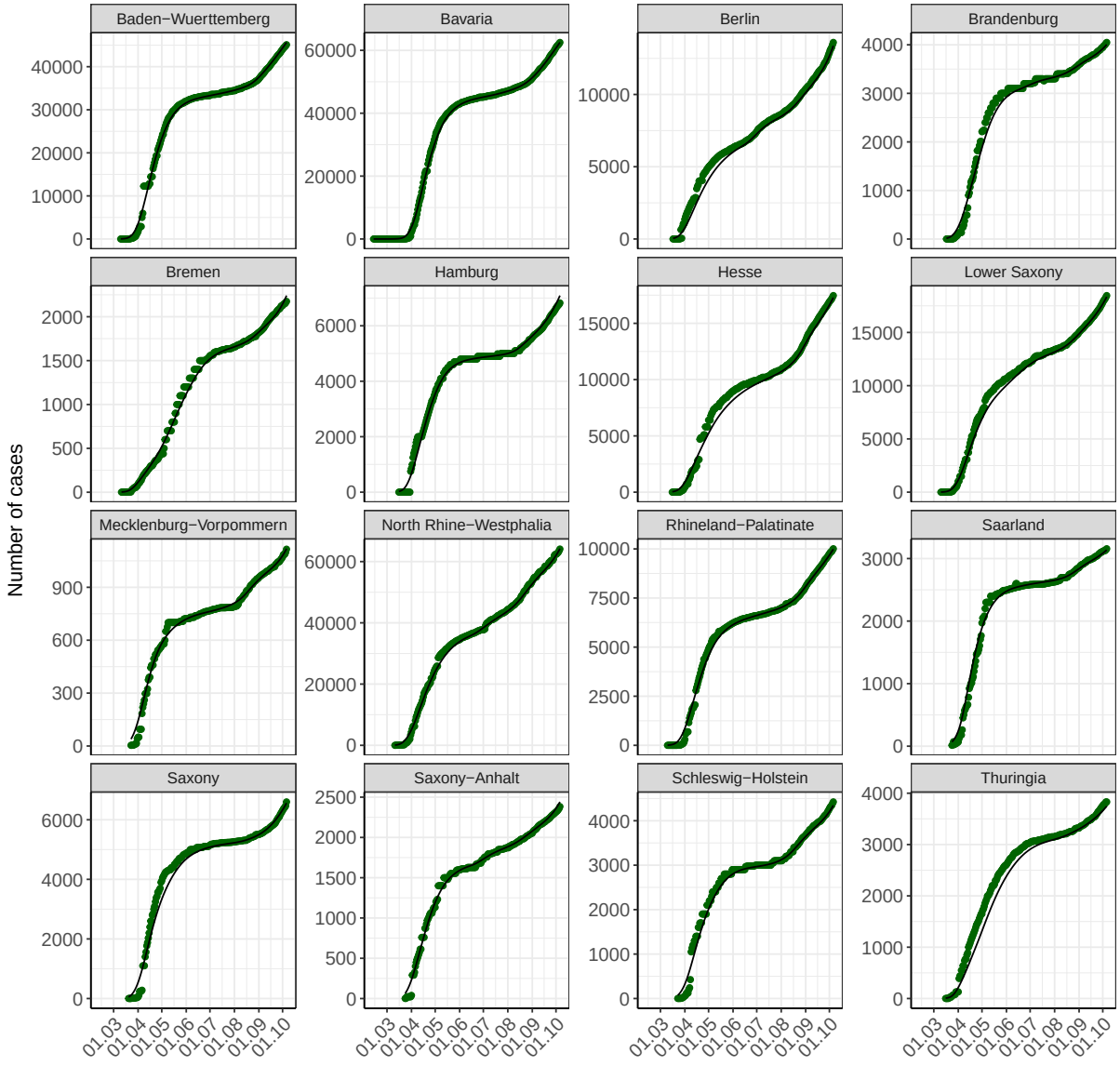


Figure 6: Germany by federal states - model description of patients recovered from COVID-19.
Points: Reported numbers - Lines: Model description

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

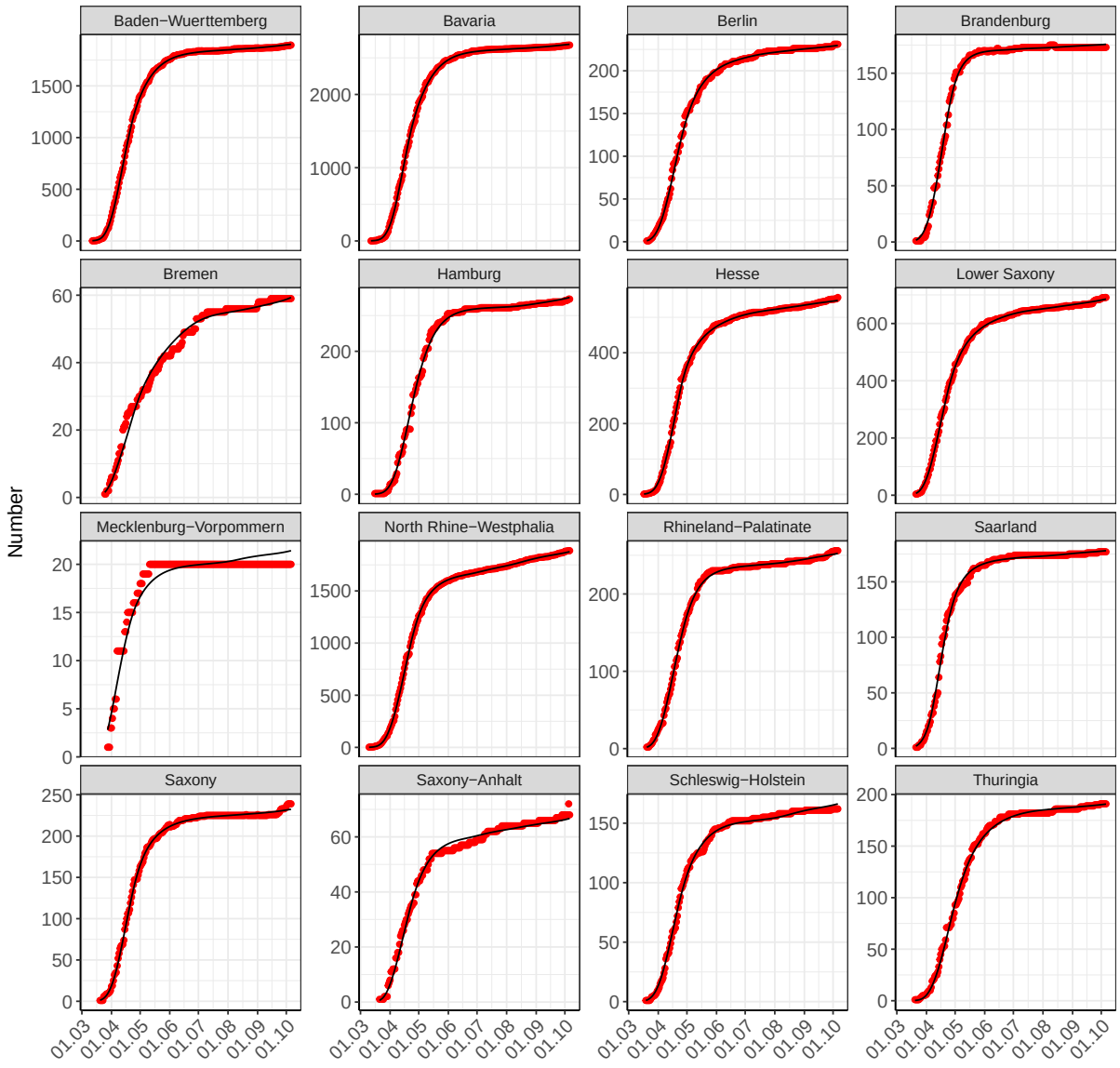


Figure 7: Germany by federal states - model description of deaths.
Points: Reported deaths - Lines: Model description

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

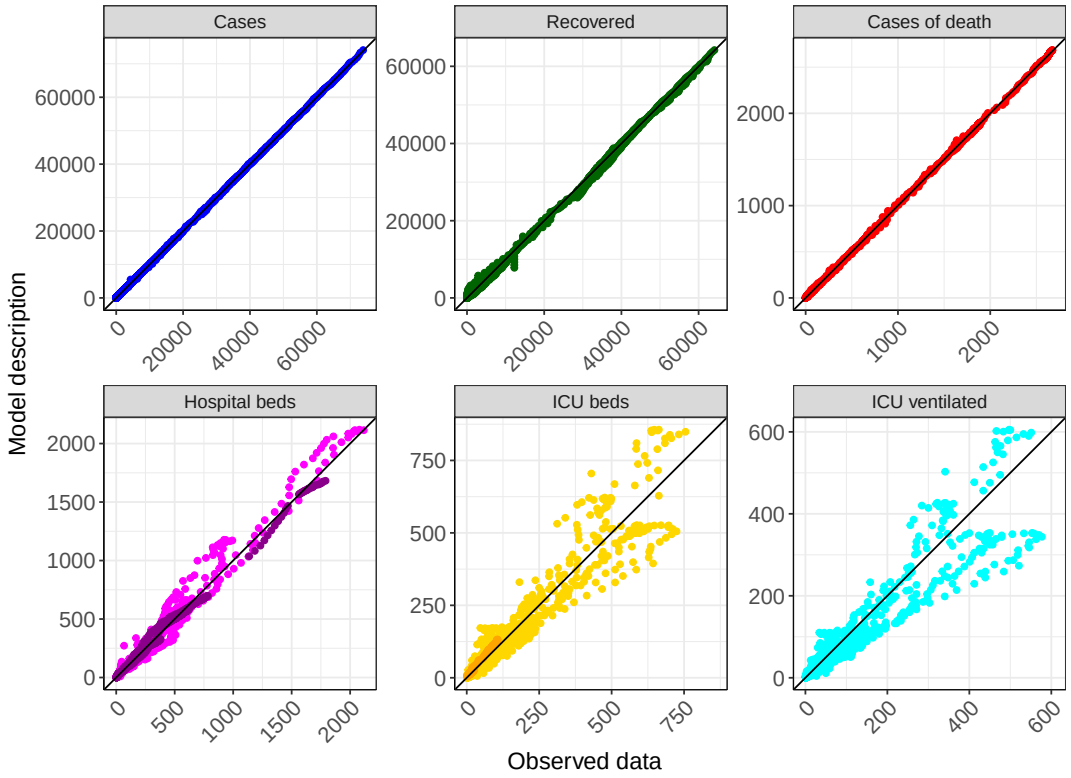


Figure 8: Germany - Goodness-of-fit plot: reported data vs. model description

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

The influences of NPIs and other events were systematically investigated and incorporated into the model. Investigations of influencing factors on R(t) revealed the following statistically significant effects: school closure, lockdown, a "2nd stage" of the lockdown since 01.04.2020 and changes on 25.04.2020, 06.05.2020, 05.06.2020, 17.06.2020, 12.07.2020, 09.08.2020, 19.08.2020 and 04.09.2020. The effects vary slightly in each federal state (see Table 1, figures [9] and [10]), while the exact causes are not clear. It can be assumed that the geographical situation of the federal states ("rural" states vs. "urban" states, border region, mentality) as well as local policies play a role. Two days after the school reopening on 04.05.2020, the R(t) value increased by approx. 13% to 0.716 on a national average. In general, the safety measures taken appear to have been effective in keeping R(t) at a stable level below 1, with the exception of the federal states with known "corona hotspots". Since the beginning of the easing of the NPIs and especially since the beginning of the current holiday season (high incidence among incoming travellers) a new increase of the R(t) value has been observed. In addition, smaller local outbreaks are also playing an increasingly important role. The factors influencing R(t) are listed in detail below:

- School closures: Reduction of R(t) on average by approx. 31% from 2.78 to 1.92 (p-value < 0.001)
- Lockdown (on 23.03.2020): 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): Reduction R(t) on average by approx. 42% from 1.1 to 0.636 (p-value < 0.001)
- From 06.05.2020: Increase of R(t) by 13% to 0.716 (p-value < 0.001).
- From 05.06.2020: Increase of R(t) by 51% from 0.716 to 1.08 (p-value < 0.001).
- From 17.06.2020: Reduction of R(t) by 21% from 1.08 to 0.857 (p-value < 0.001).
- From 12.07.2020: Increase of R(t) by 55% from 0.857 to 1.33 (p-value < 0.001).
- From 09.08.2020: Reduction of R(t) by 21% from 1.33 to 1.05 (p-value < 0.001).
- From 19.08.2020: Reduction of R(t) by 10% from 1.05 to 0.946 (p-value < 0.001).
- From 04.09.2020: Increase of R(t) by 30% from 0.946 to 1.23 (p-value < 0.001).

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

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

Federal state	Initial value	School closures	Lockdown	From 01.04.	From 25.04.	From 06.05.	From 05.06.	From 17.06.	From 12.07.	From 09.08.	From 19.08.	From 04.09.
Baden-Wuerttemberg	2.78	1.75	1.30	0.59	0.55	0.60	1.16	1.06	1.20	1.71	1.00	1.05
Bavaria	2.78	2.79	1.51	0.57	0.56	0.67	0.94	1.13	1.18	1.48	1.13	1.01
Berlin	2.78	1.99	1.01	0.62	0.78	0.90	1.79	0.58	1.33	0.95	1.01	1.31
Brandenburg	2.78	1.91	1.38	0.78	0.44	0.53	1.81	0.64	1.35	1.14	0.80	1.31
Bremen	2.78	1.46	0.70	1.13	1.05	0.88	0.55	0.67	1.28	1.41	0.88	1.37
Hamburg	2.78	2.14	0.93	0.64	0.29	0.60	1.07	1.07	1.58	0.64	1.20	1.22
Hesse	2.78	2.09	1.09	0.77	0.60	0.85	0.84	1.04	1.29	1.44	0.70	1.19
Mecklenburg-Vorpommern	2.78	1.68	0.92	0.43	1.01	0.71	1.01	1.17	1.35	0.57	0.90	1.39
Lower Saxony	2.78	2.06	1.17	0.66	0.49	1.07	0.82	0.75	1.30	1.20	0.96	1.21
North Rhine-Westphalia	2.78	1.37	1.14	0.65	0.76	0.76	1.77	0.80	1.28	0.85	0.85	1.28
Rhineland-Palatinate	2.78	1.90	1.07	0.62	0.50	0.80	1.02	1.04	1.28	1.44	0.78	1.15
Saarland	2.78	1.52	1.83	0.40	0.52	0.59	1.29	0.91	1.42	1.24	0.72	1.24
Saxony	2.78	1.93	1.26	0.51	0.96	0.63	0.88	0.77	1.41	1.10	1.36	1.19
Saxony-Anhalt	2.78	2.00	0.94	0.69	0.47	0.69	2.01	0.66	1.26	0.93	1.00	1.33
Schleswig-Holstein	2.78	1.94	1.29	0.59	0.92	0.50	0.82	1.36	1.36	0.68	0.90	1.30
Thuringia	2.78	2.51	0.80	0.93	0.78	0.81	0.68	0.66	1.32	0.99	1.17	1.16
Germany	2.78	2.19	1.29	0.62	0.64	0.76	1.33	0.88	1.26	1.20	0.96	1.16

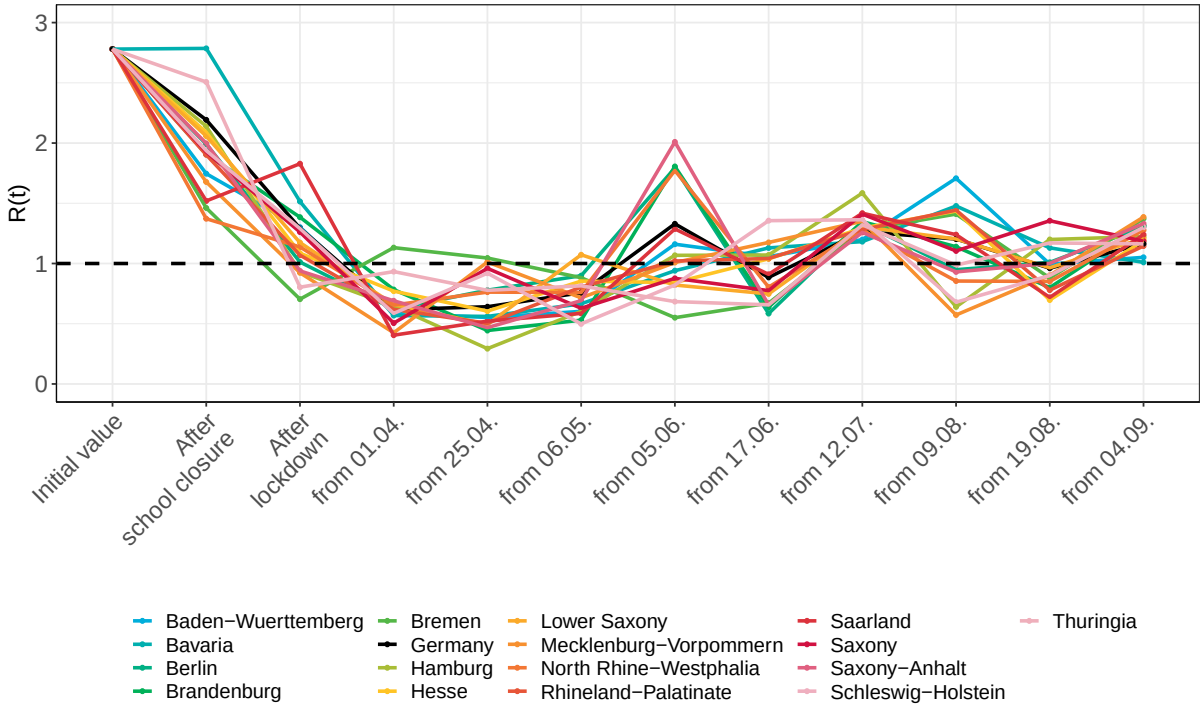


Figure 9: R(t) distribution before and after NPIs

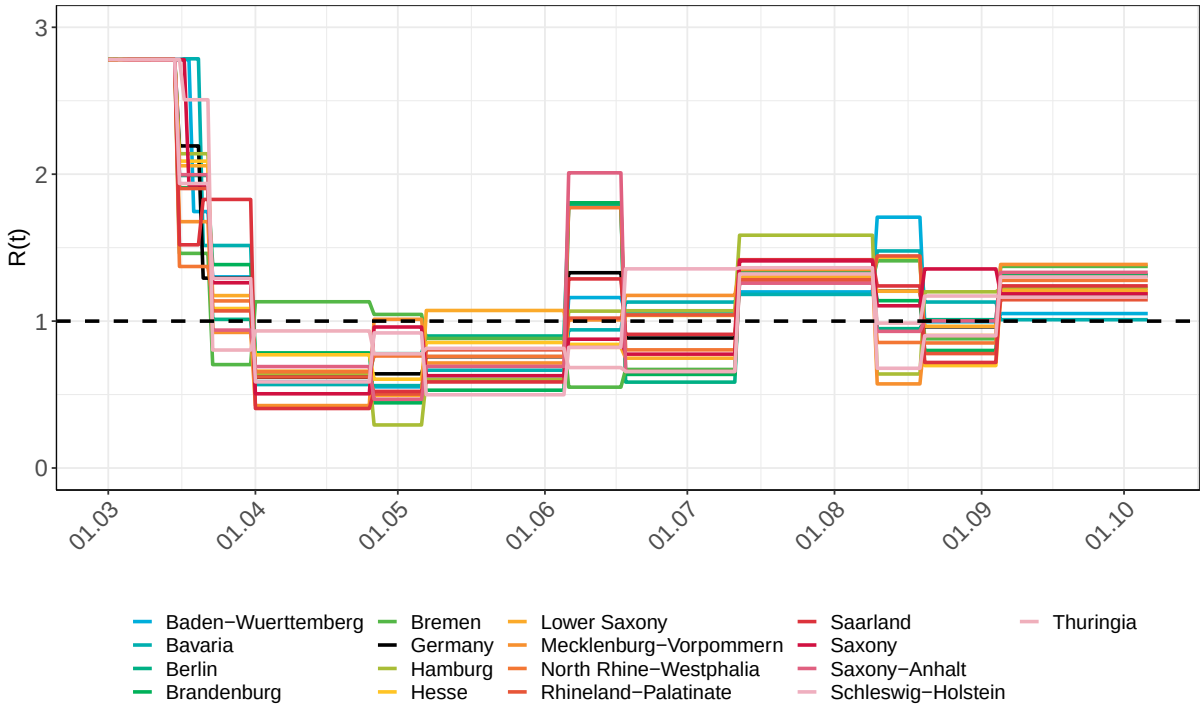


Figure 10: R(t) over time

2 Baden-Wuerttemberg

2.1 Model description

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

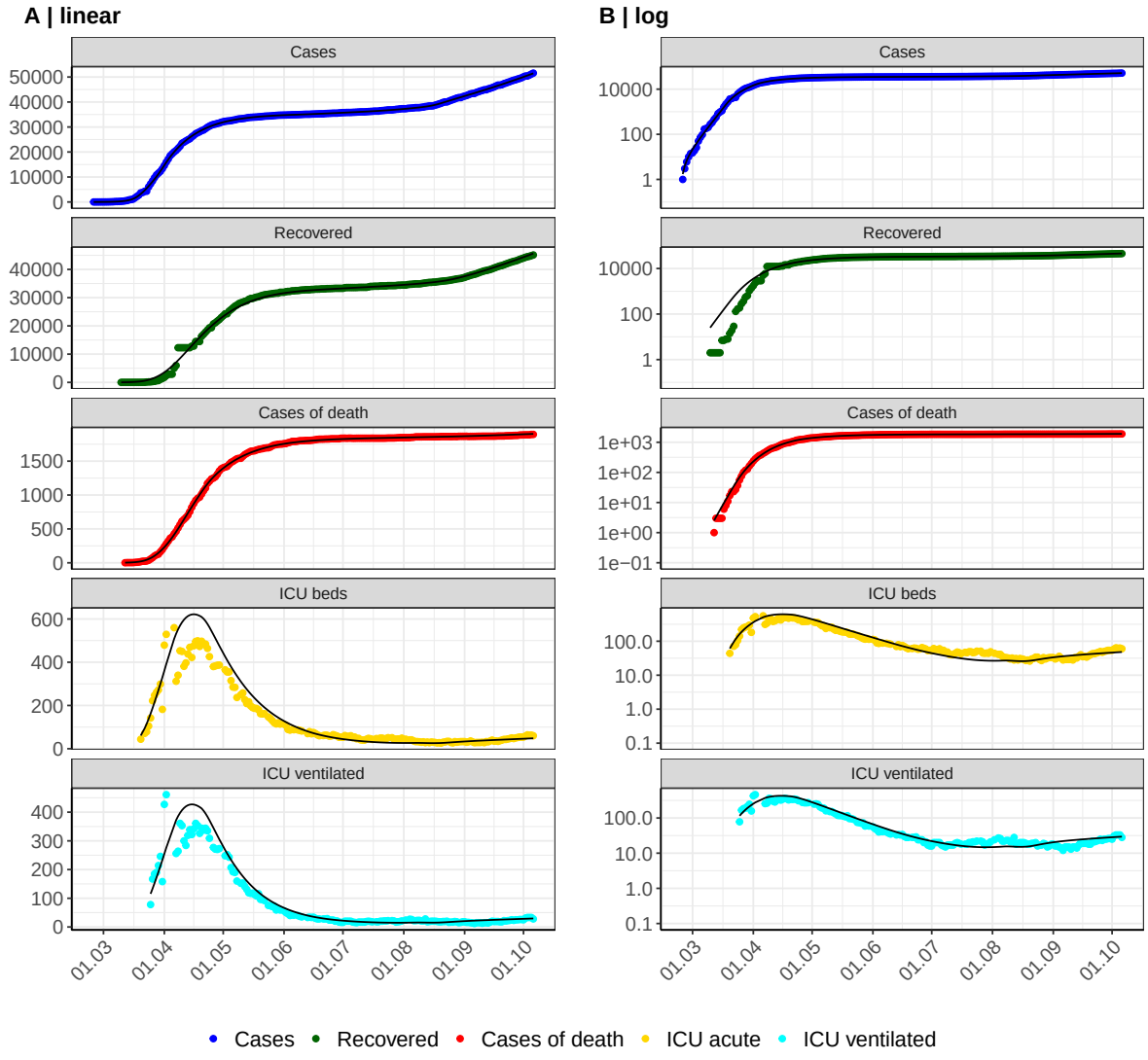


Figure 11: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Baden-Wuerttemberg. Points: reported data; lines: model description.

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

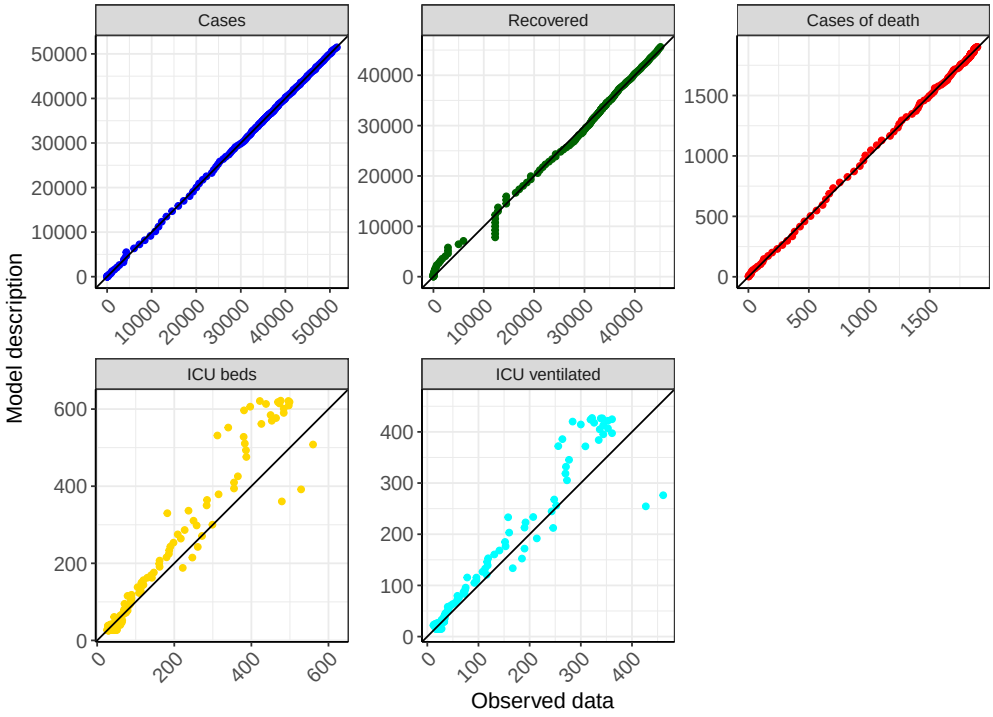


Figure 12: Goodness-of-fit plots for Baden-Wuerttemberg. Lines: lines of identity.

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

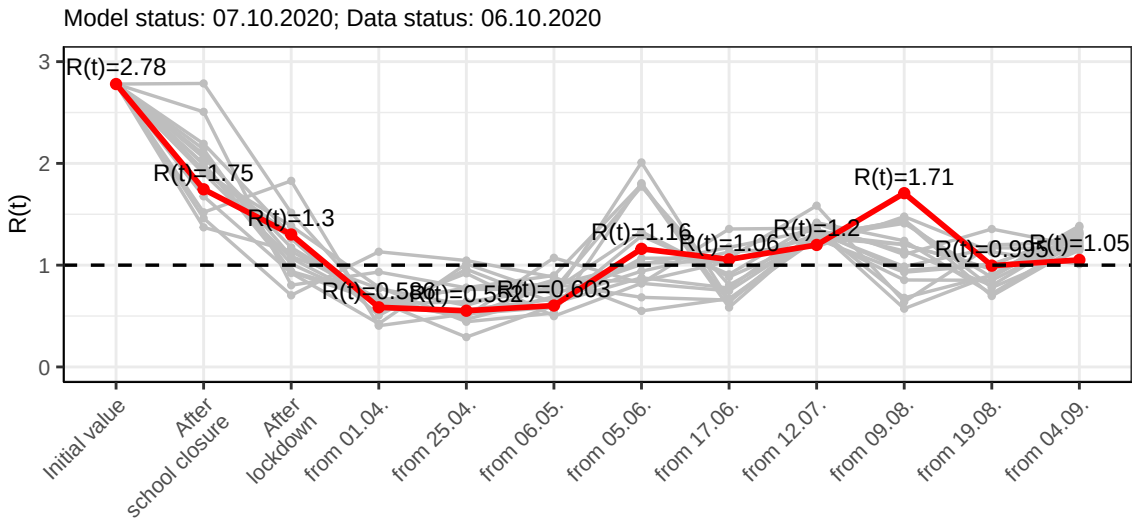


Figure 13: R(t) values before and after the NPIs for Baden-Wuerttemberg

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

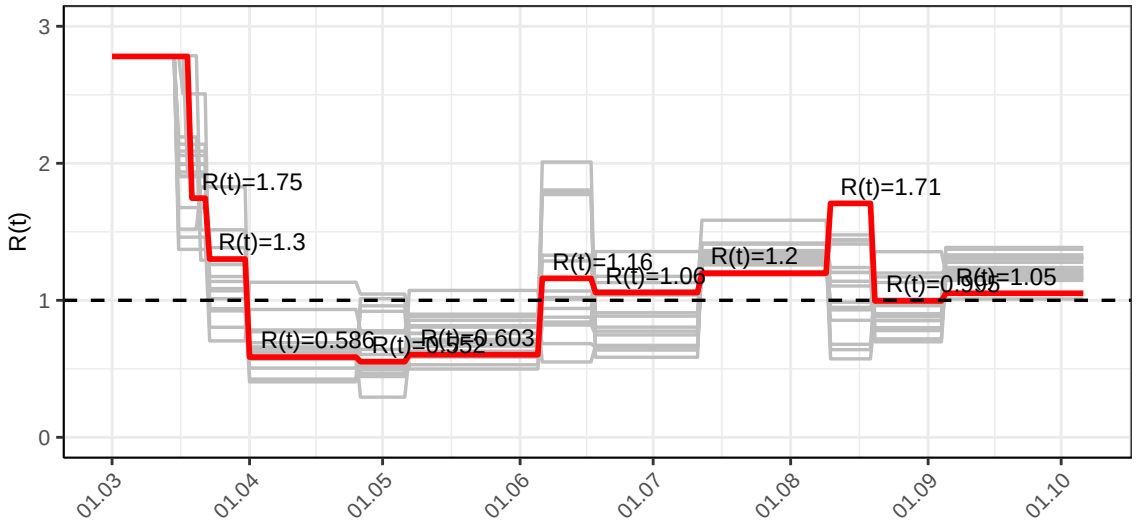


Figure 14: R(t) values over time for Baden-Wuerttemberg

2.2 Model predictions

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

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.

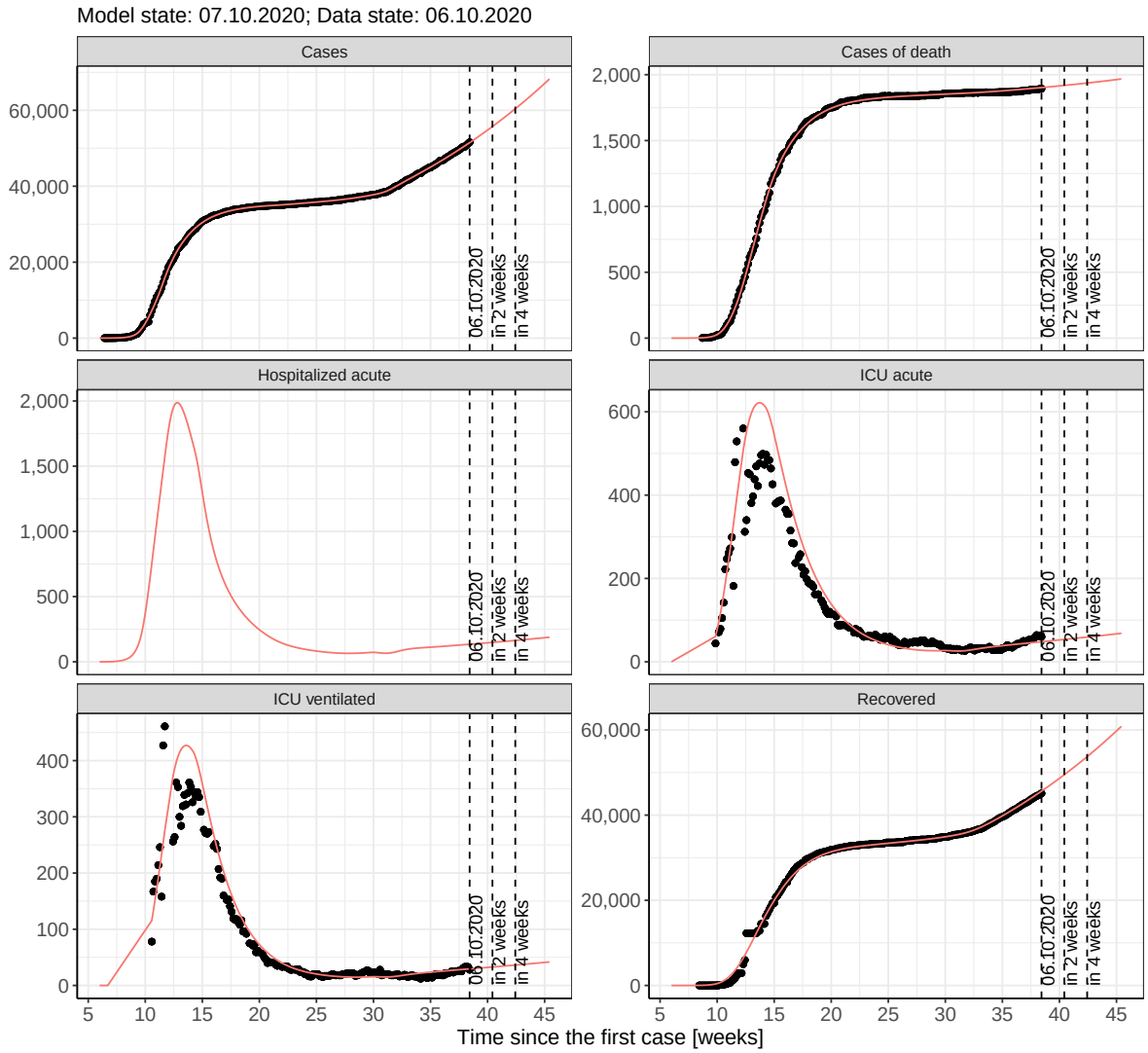


Figure 15: Representation of the model predictions for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

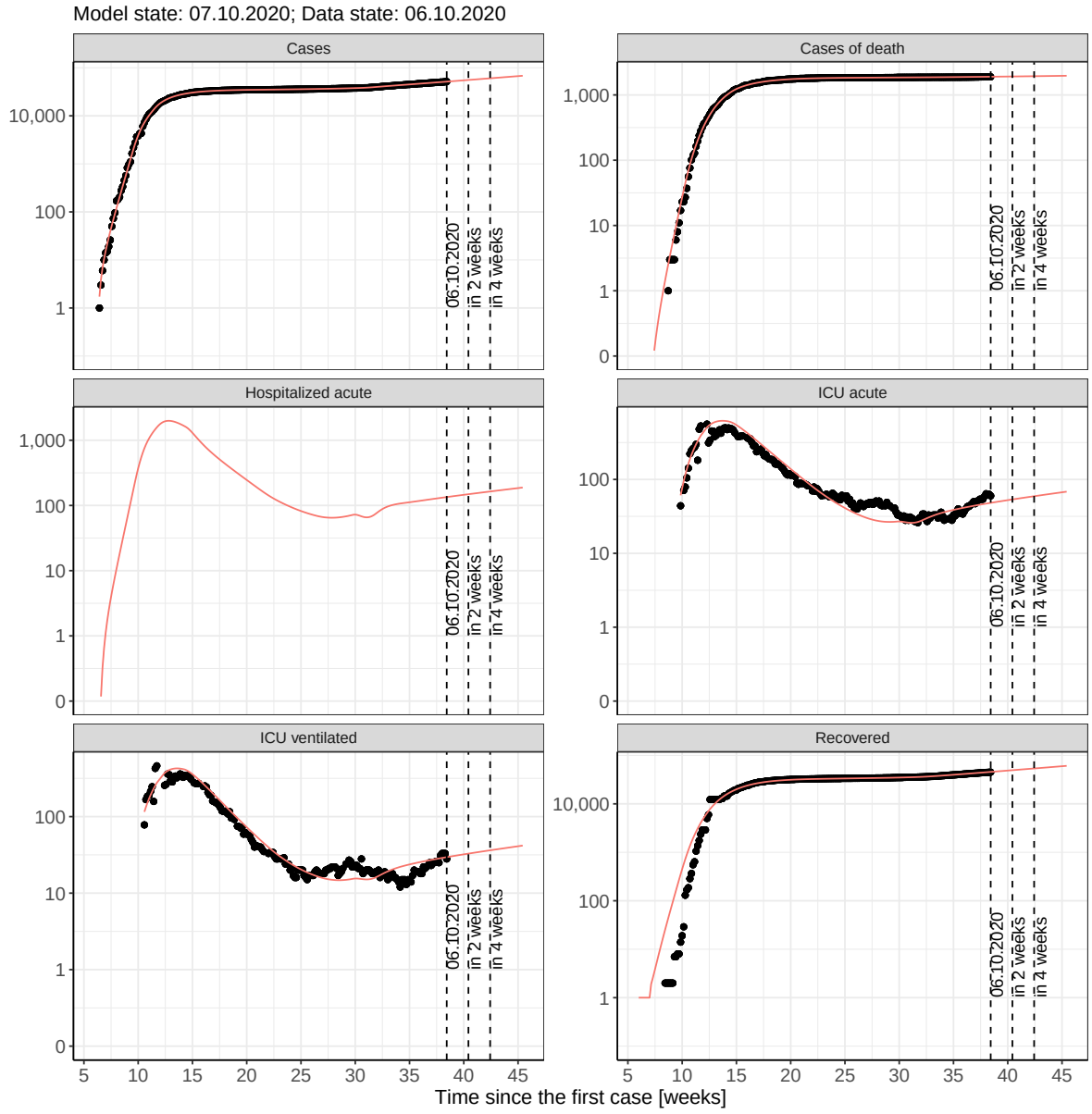


Figure 16: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

2.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

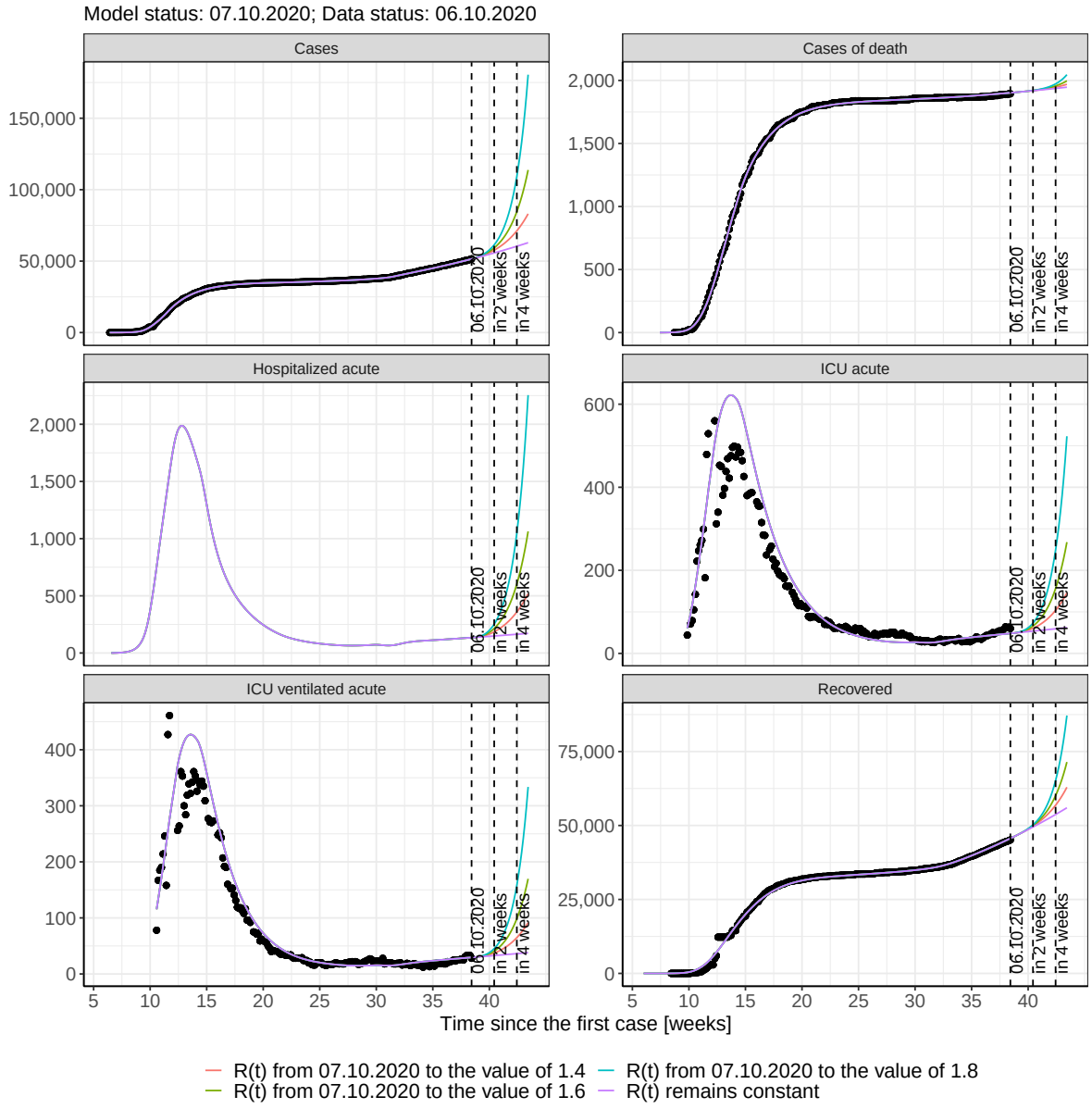


Figure 17: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

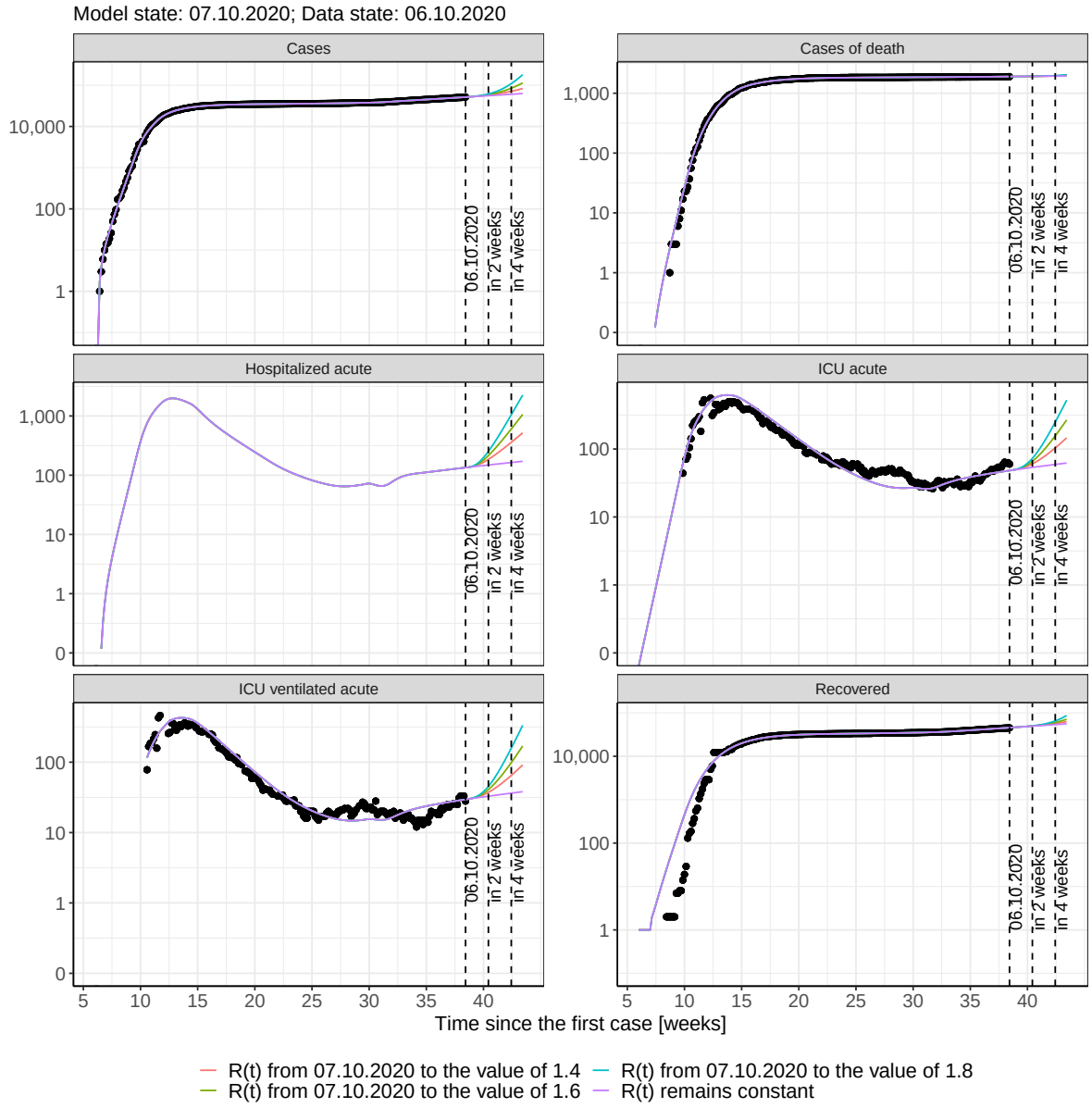


Figure 18: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

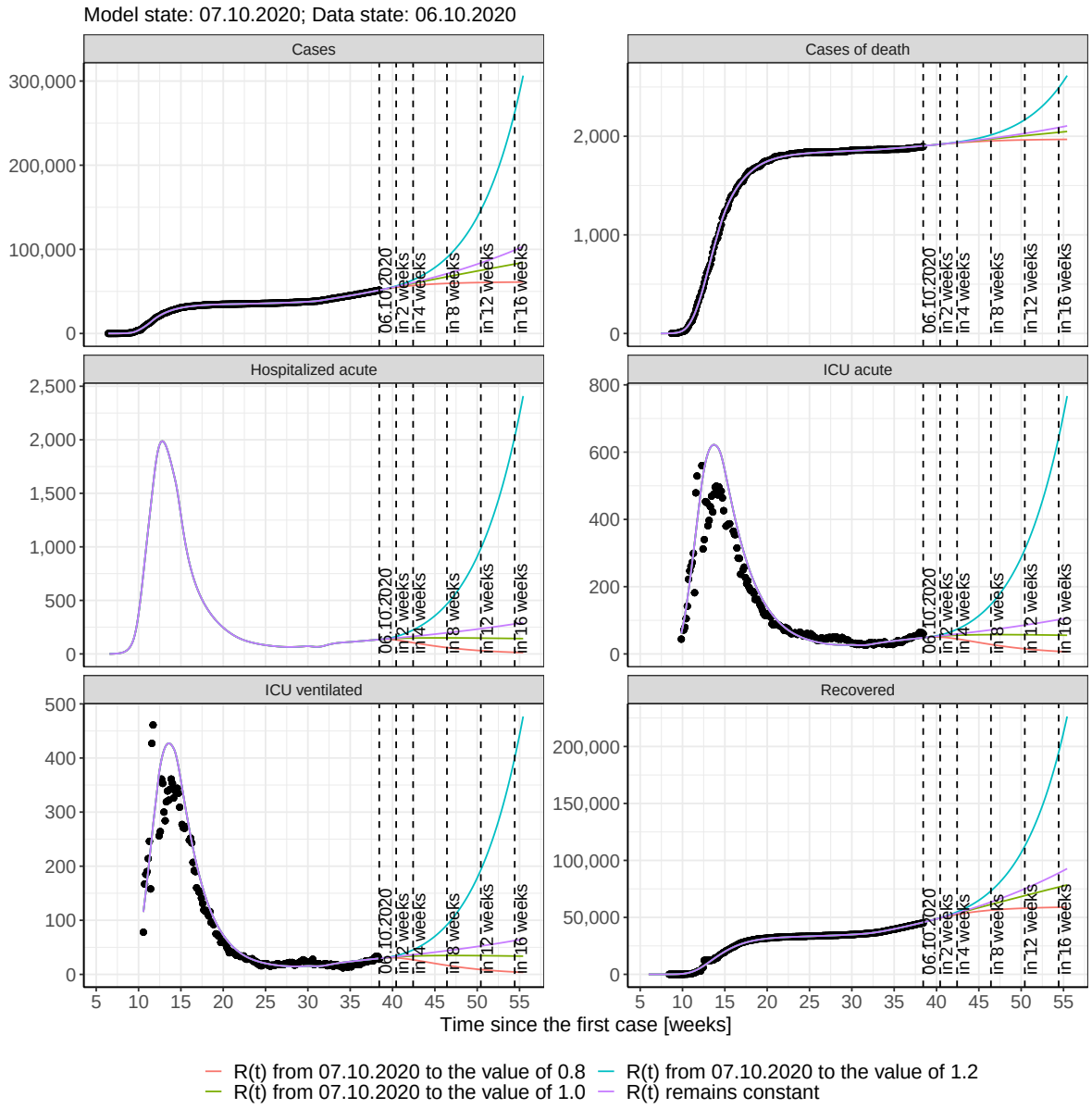


Figure 19: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

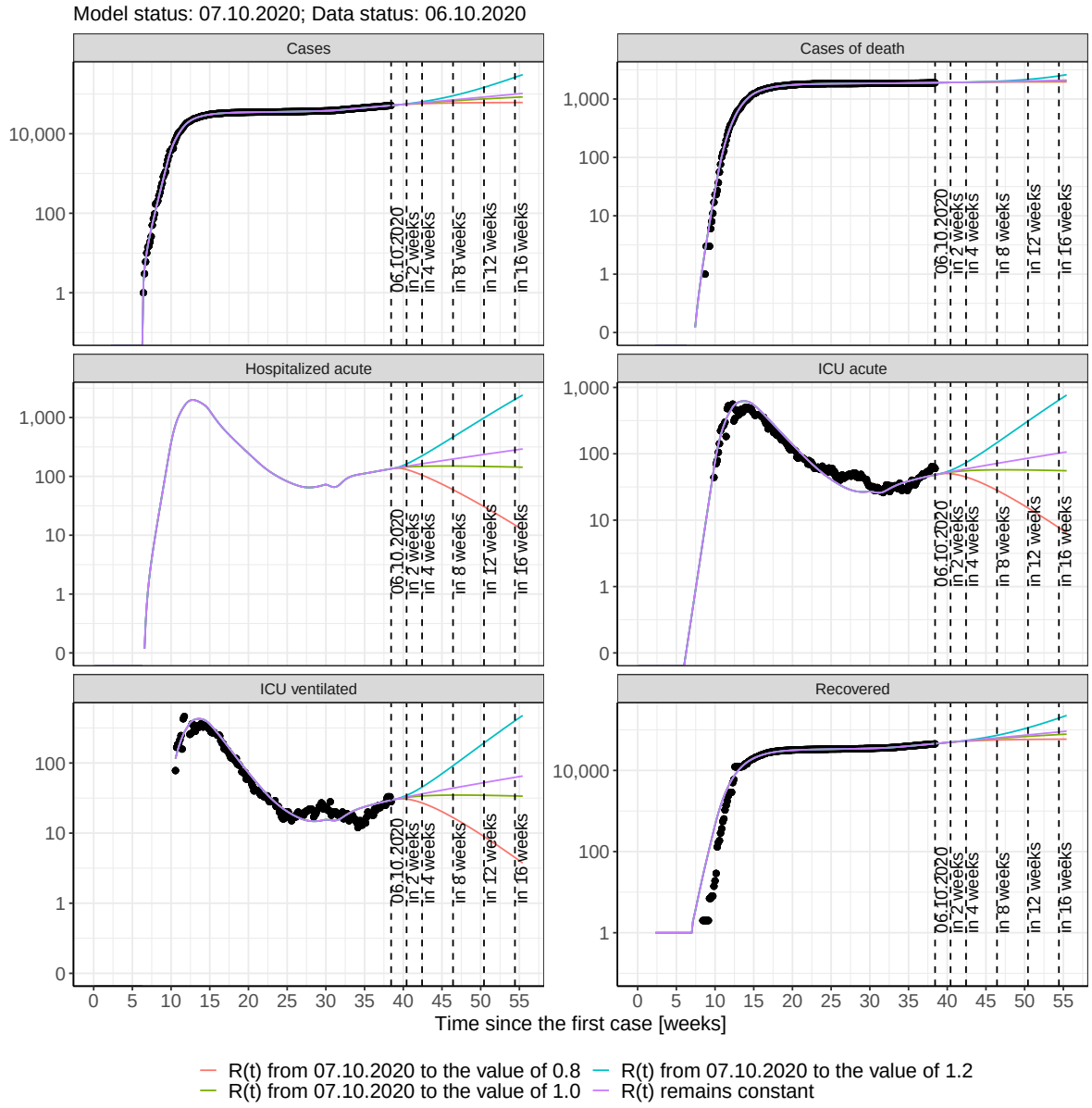


Figure 20: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Baden-Wuerttemberg assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 2); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 3); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 4); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 5) Model status from 07.10.2020; Data status: 06.10.2020.

Table 2: Baden-Wuerttemberg - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	51766	1903	45899	136	49	30
08.10.2020	52060	1904	46165	136	49	30
09.10.2020	52355	1906	46432	138	49	30
10.10.2020	52652	1907	46701	138	50	30
11.10.2020	52951	1908	46972	140	50	31
12.10.2020	53252	1909	47245	141	51	31
13.10.2020	53555	1910	47520	142	51	31
14.10.2020	53860	1911	47796	143	51	31
15.10.2020	54167	1913	48074	144	52	32
16.10.2020	54476	1914	48354	145	52	32
17.10.2020	54787	1915	48636	146	52	32
18.10.2020	55101	1916	48920	147	53	32
19.10.2020	55416	1918	49206	148	53	33
20.10.2020	55733	1919	49494	149	54	33
21.10.2020	56053	1920	49783	150	54	33
22.10.2020	56374	1921	50074	151	54	33
23.10.2020	56698	1922	50368	152	55	34
24.10.2020	57023	1924	50663	153	55	34
25.10.2020	57351	1925	50960	154	56	34
26.10.2020	57681	1926	51260	155	56	34
27.10.2020	58013	1928	51561	156	56	35
28.10.2020	58348	1929	51864	157	57	35
29.10.2020	58684	1930	52169	158	57	35
30.10.2020	59023	1932	52476	159	58	35
31.10.2020	59364	1933	52786	160	58	36
01.11.2020	59707	1934	53097	162	58	36
02.11.2020	60052	1936	53410	163	59	36
03.11.2020	60400	1937	53726	164	59	36

Table 3: Baden-Wuerttemberg - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	51761	1903	45899	136	49	30
08.10.2020	52039	1904	46165	136	49	30
09.10.2020	52309	1906	46431	137	49	30
10.10.2020	52571	1907	46699	138	50	30
11.10.2020	52826	1908	46968	138	50	31
12.10.2020	53073	1909	47237	138	50	31
13.10.2020	53313	1910	47506	138	50	31
14.10.2020	53546	1911	47774	137	50	31
15.10.2020	53773	1912	48041	137	50	31
16.10.2020	53993	1914	48306	136	50	31
17.10.2020	54207	1915	48570	135	50	31
18.10.2020	54414	1916	48831	133	50	31
19.10.2020	54616	1917	49089	132	50	31
20.10.2020	54812	1918	49345	130	50	31
21.10.2020	55002	1919	49597	129	50	30
22.10.2020	55187	1920	49846	127	50	30
23.10.2020	55366	1922	50090	125	49	30
24.10.2020	55541	1923	50331	124	49	30
25.10.2020	55710	1924	50568	122	49	30
26.10.2020	55874	1925	50800	120	48	29
27.10.2020	56034	1926	51028	118	48	29
28.10.2020	56189	1927	51252	116	48	29
29.10.2020	56340	1928	51471	114	47	29
30.10.2020	56486	1929	51685	113	47	28
31.10.2020	56628	1930	51895	111	46	28
01.11.2020	56766	1931	52100	109	46	28
02.11.2020	56900	1932	52300	107	45	27
03.11.2020	57031	1933	52496	105	45	27

Table 4: Baden-Wuerttemberg - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	51765	1903	45899	136	49	30
08.10.2020	52055	1904	46165	136	49	30
09.10.2020	52345	1906	46432	137	49	30
10.10.2020	52635	1907	46701	138	50	30
11.10.2020	52924	1908	46971	139	50	31
12.10.2020	53213	1909	47243	140	50	31
13.10.2020	53502	1910	47516	141	51	31
14.10.2020	53791	1911	47791	141	51	31
15.10.2020	54079	1913	48067	142	51	31
16.10.2020	54368	1914	48344	143	52	32
17.10.2020	54656	1915	48621	143	52	32
18.10.2020	54944	1916	48900	144	52	32
19.10.2020	55231	1917	49180	144	53	32
20.10.2020	55519	1919	49460	145	53	32
21.10.2020	55806	1920	49741	145	53	32
22.10.2020	56093	1921	50022	145	53	33
23.10.2020	56380	1922	50304	146	54	33
24.10.2020	56667	1924	50586	146	54	33
25.10.2020	56953	1925	50869	146	54	33
26.10.2020	57239	1926	51152	147	54	33
27.10.2020	57525	1927	51436	147	54	33
28.10.2020	57811	1928	51719	147	55	33
29.10.2020	58097	1930	52003	147	55	33
30.10.2020	58382	1931	52287	147	55	34
31.10.2020	58667	1932	52571	148	55	34
01.11.2020	58952	1933	52855	148	55	34
02.11.2020	59237	1935	53139	148	55	34
03.11.2020	59521	1936	53423	148	56	34

Table 5: Baden-Wuerttemberg - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	51769	1903	45899	136	49	30
08.10.2020	52072	1904	46165	137	49	30
09.10.2020	52383	1906	46432	138	49	30
10.10.2020	52703	1907	46702	139	50	31
11.10.2020	53032	1908	46974	140	50	31
12.10.2020	53370	1909	47250	142	51	31
13.10.2020	53718	1910	47528	144	51	31
14.10.2020	54075	1911	47810	146	52	32
15.10.2020	54443	1913	48096	148	52	32
16.10.2020	54821	1914	48386	151	53	33
17.10.2020	55209	1915	48680	153	54	33
18.10.2020	55608	1916	48980	156	55	34
19.10.2020	56019	1918	49286	159	55	34
20.10.2020	56441	1919	49597	162	56	35
21.10.2020	56875	1920	49915	166	57	35
22.10.2020	57321	1922	50239	169	58	36
23.10.2020	57780	1923	50571	173	59	36
24.10.2020	58251	1924	50910	177	60	37
25.10.2020	58736	1926	51257	181	61	38
26.10.2020	59234	1927	51612	185	62	38
27.10.2020	59746	1929	51975	189	64	39
28.10.2020	60272	1930	52348	194	65	40
29.10.2020	60814	1932	52729	198	66	41
30.10.2020	61370	1934	53121	203	67	42
31.10.2020	61942	1935	53523	208	69	42
01.11.2020	62530	1937	53935	213	70	43
02.11.2020	63134	1939	54358	218	72	44
03.11.2020	63755	1940	54792	224	73	45

2.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

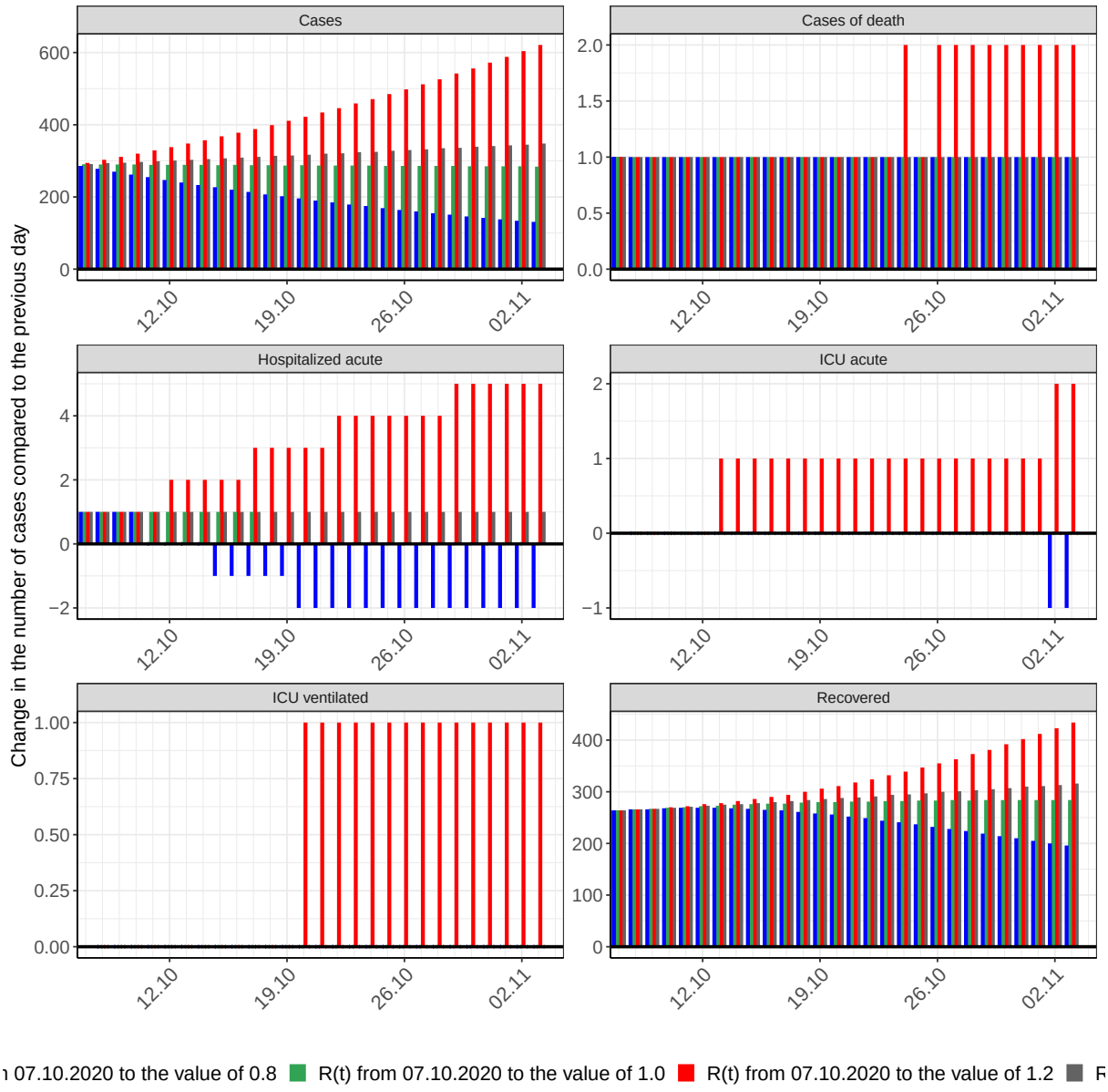


Figure 21: Simulation of daily new cases for the next 4 weeks - Baden-Wuerttemberg

3 Bavaria

3.1 Model description

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

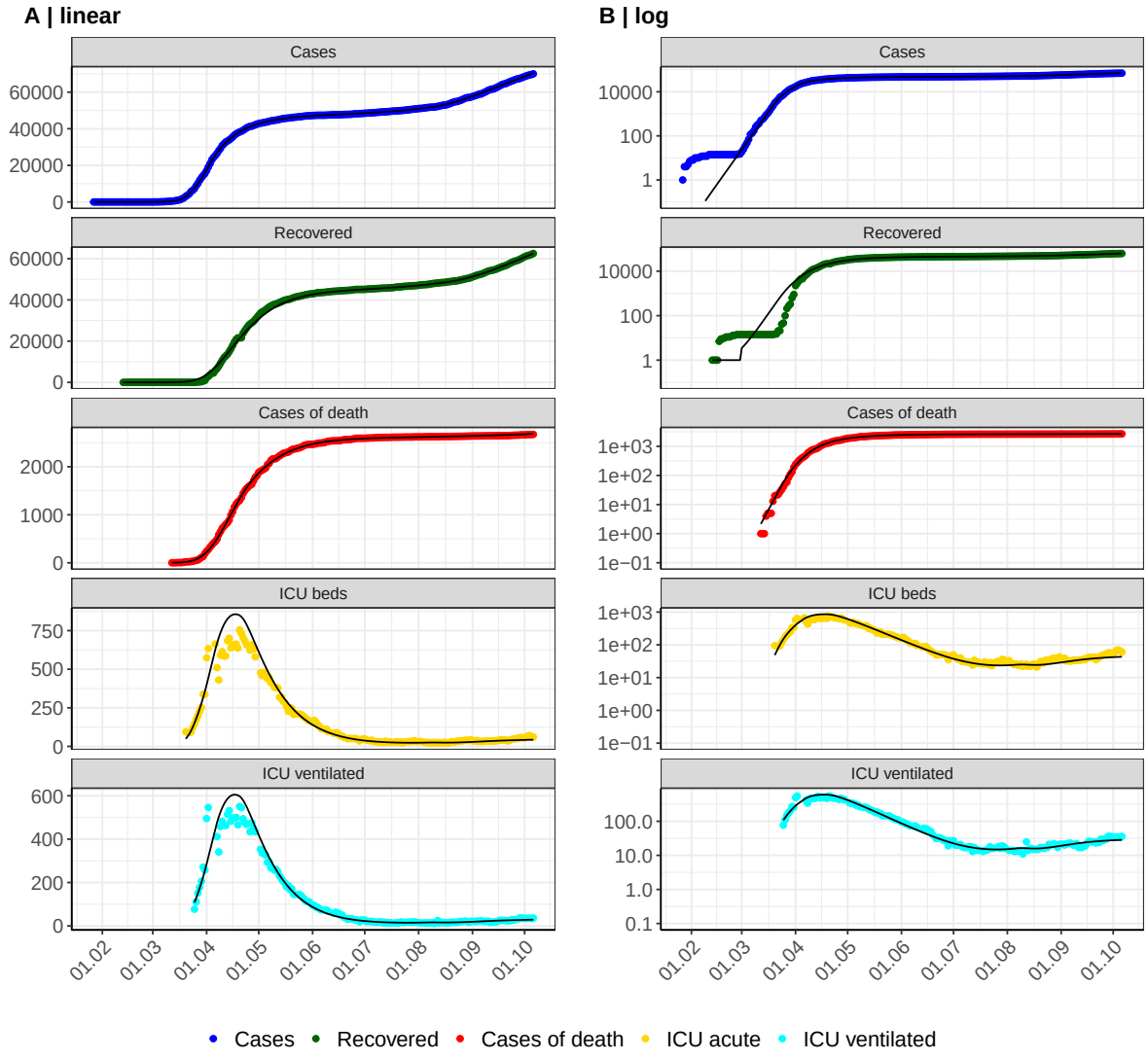


Figure 22: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bavaria. Points: reported data; lines: model description.

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

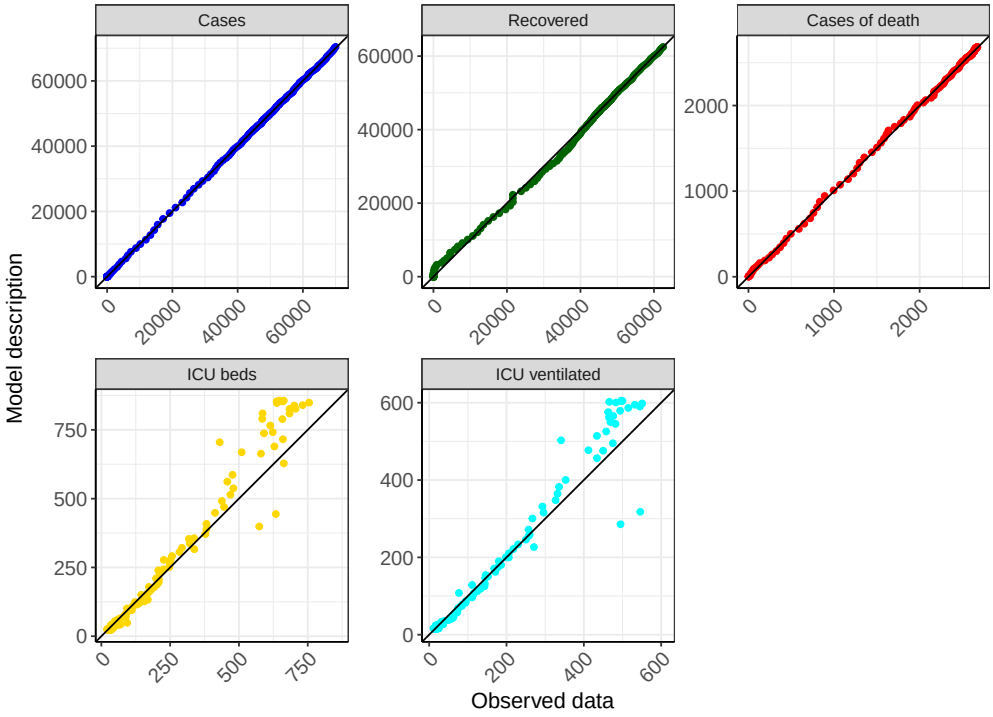


Figure 23: Goodness-of-fit plots for Bavaria. Lines: lines of identity.

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

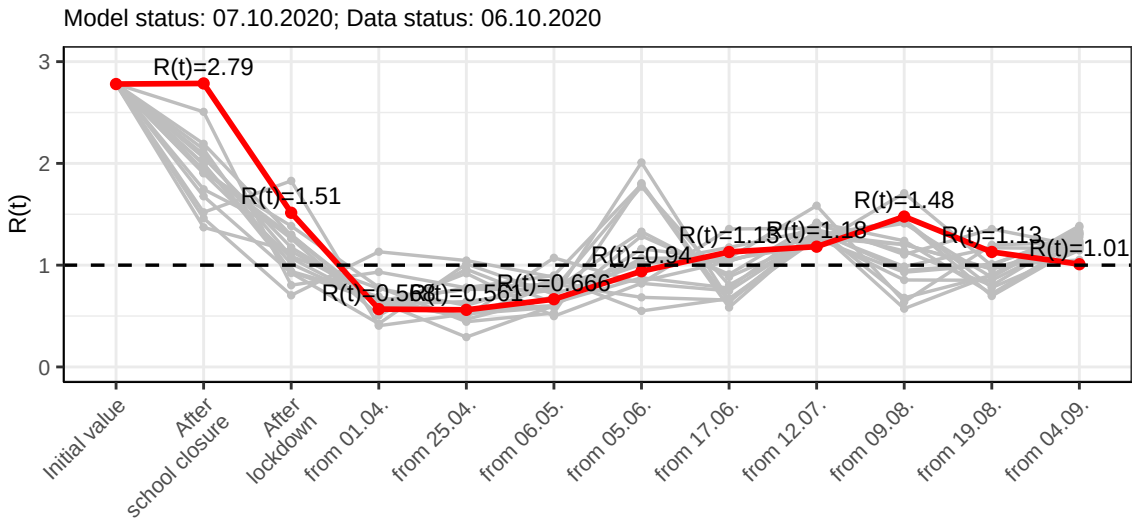


Figure 24: R(t) values before and after the NPIs for Bavaria

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

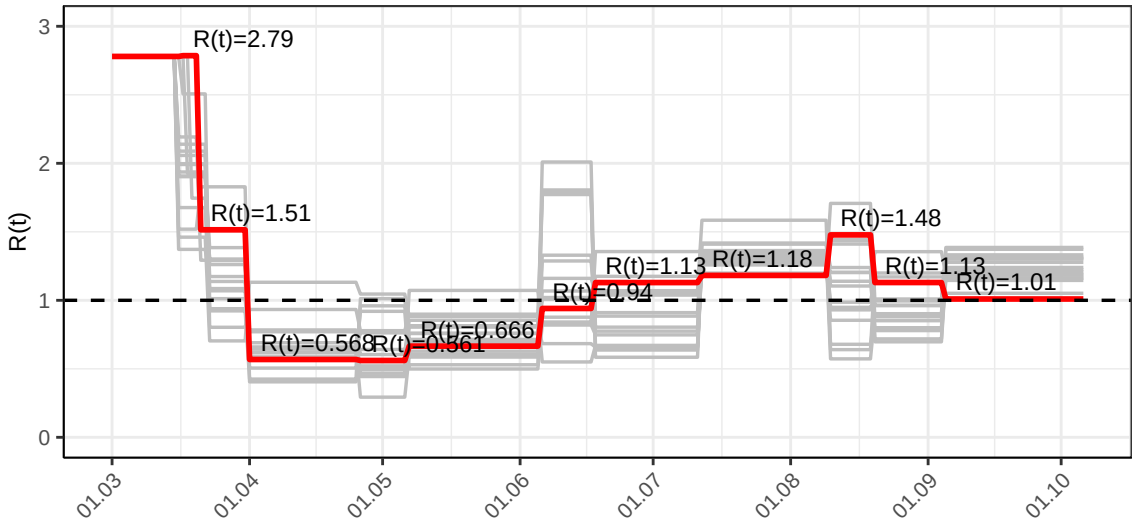


Figure 25: R(t) values over time for Bavaria

3.2 Model predictions

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

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.

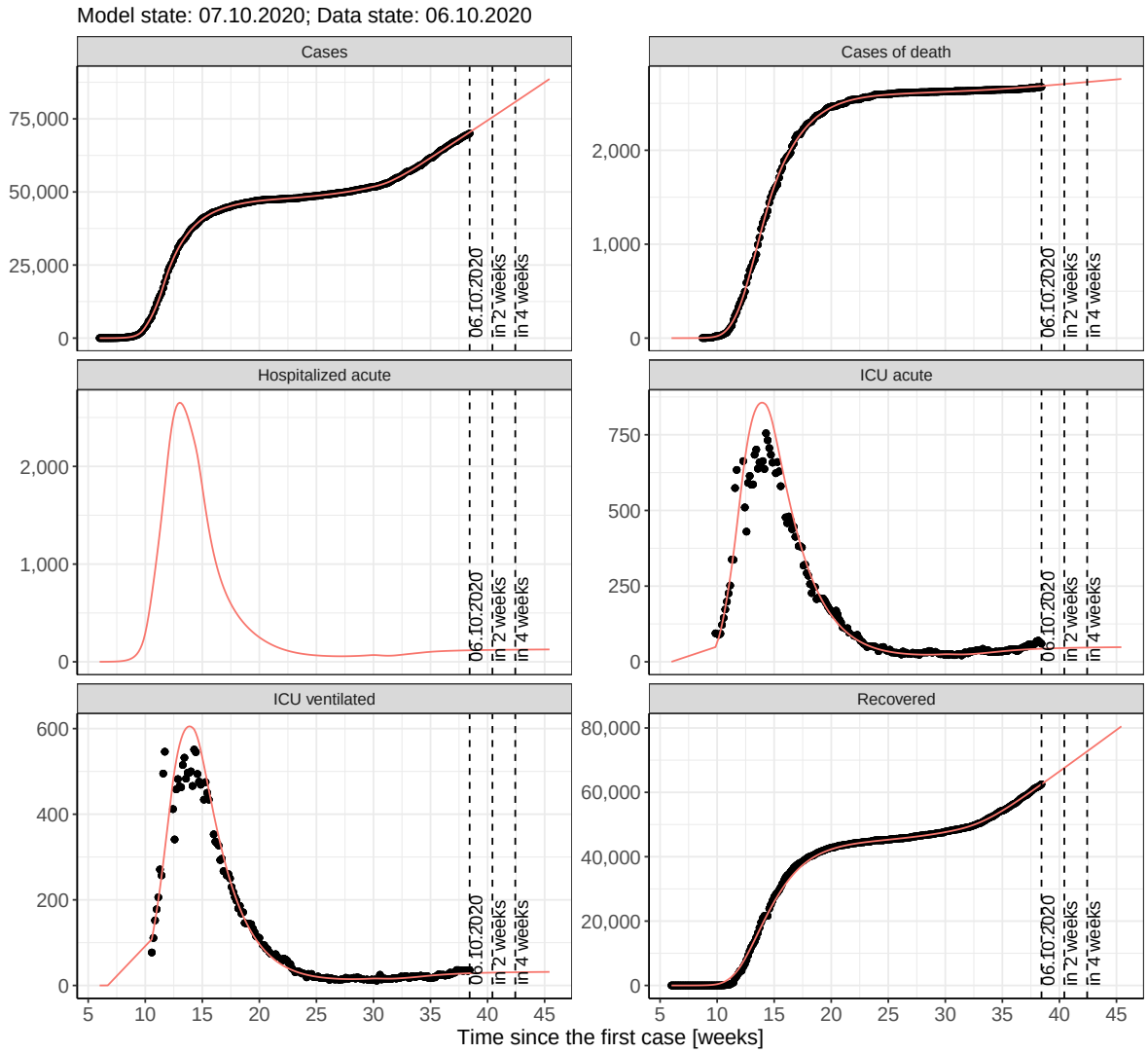


Figure 26: Representation of the model predictions for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

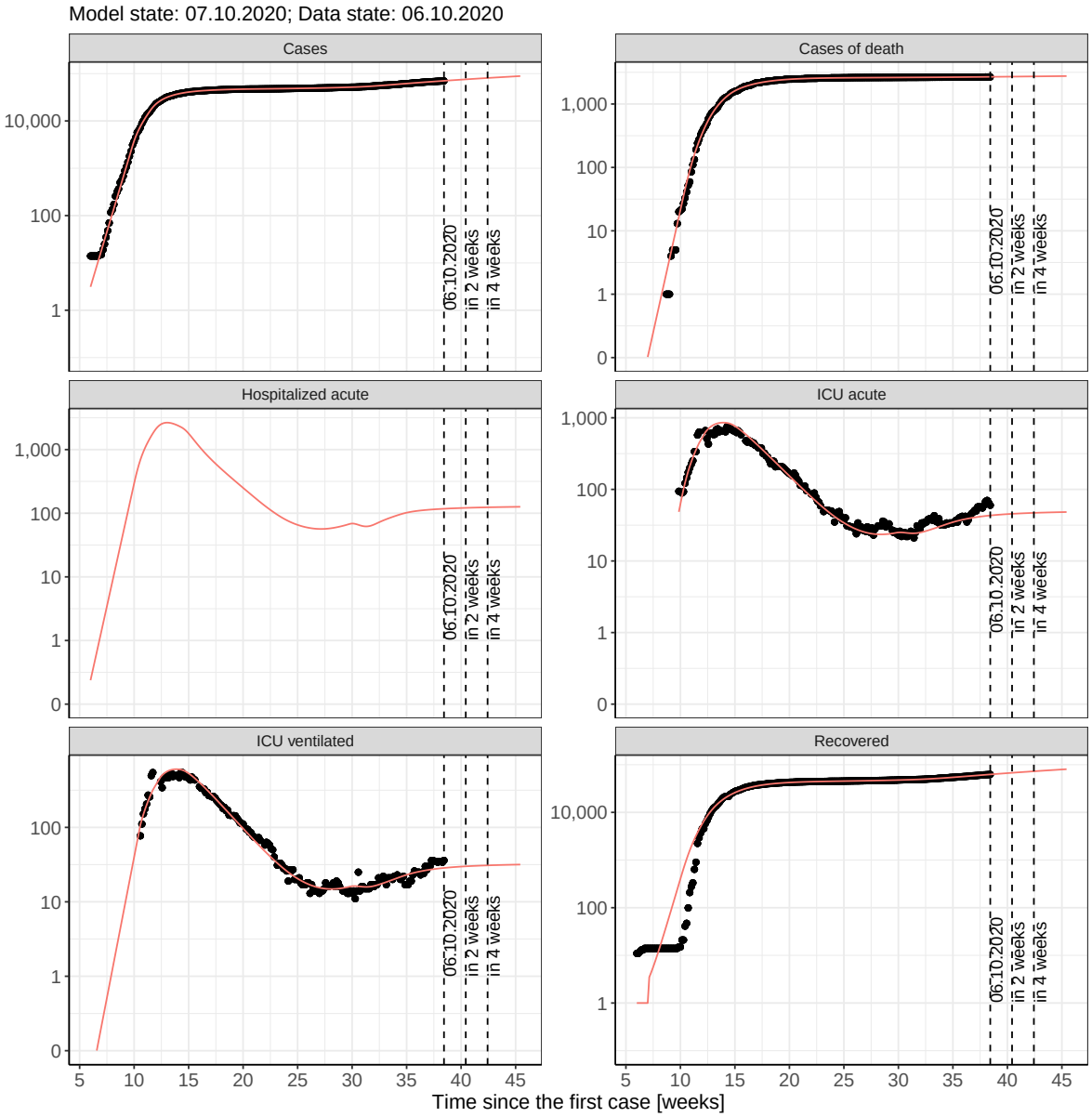


Figure 27: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

3.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

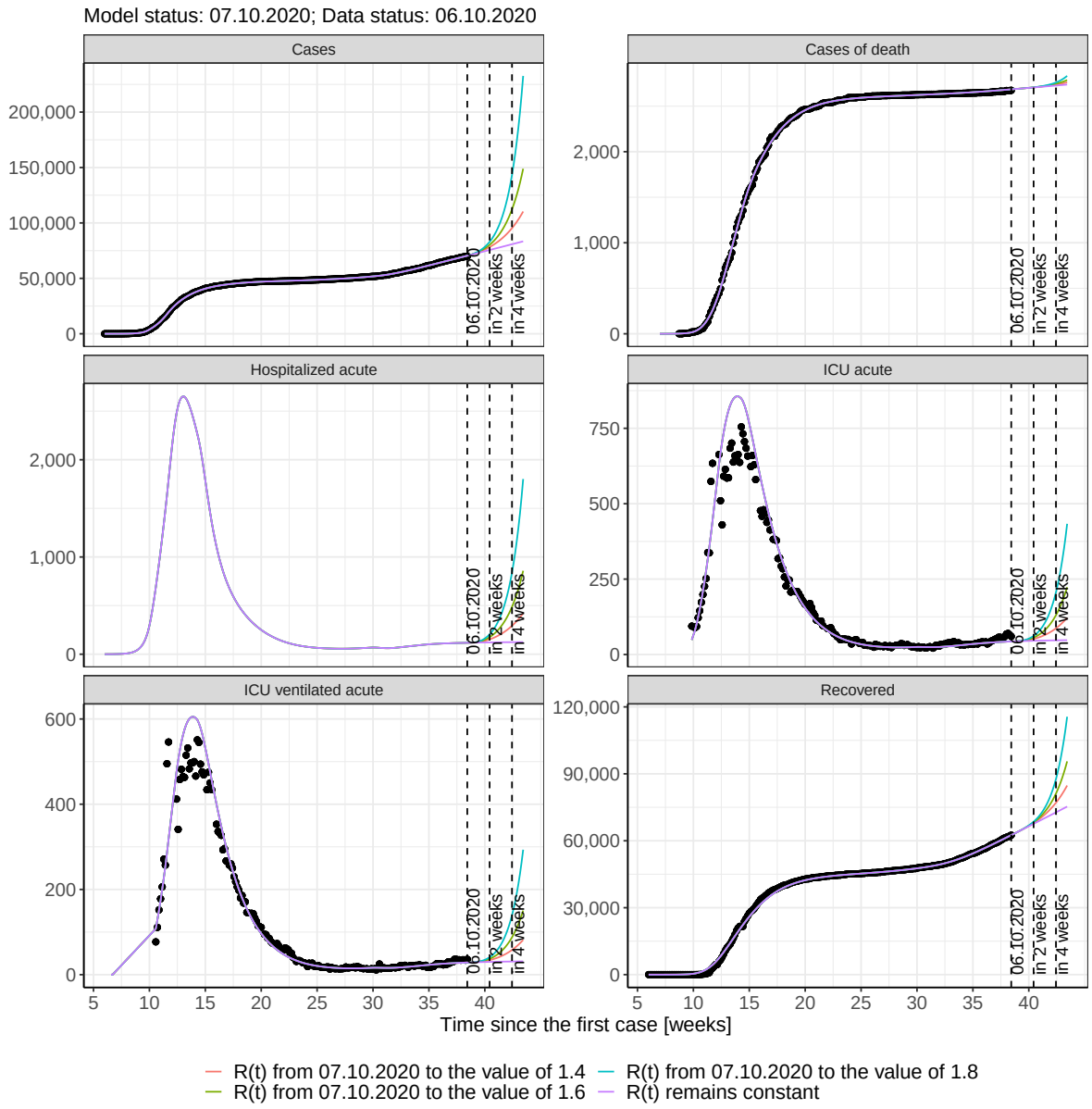


Figure 28: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

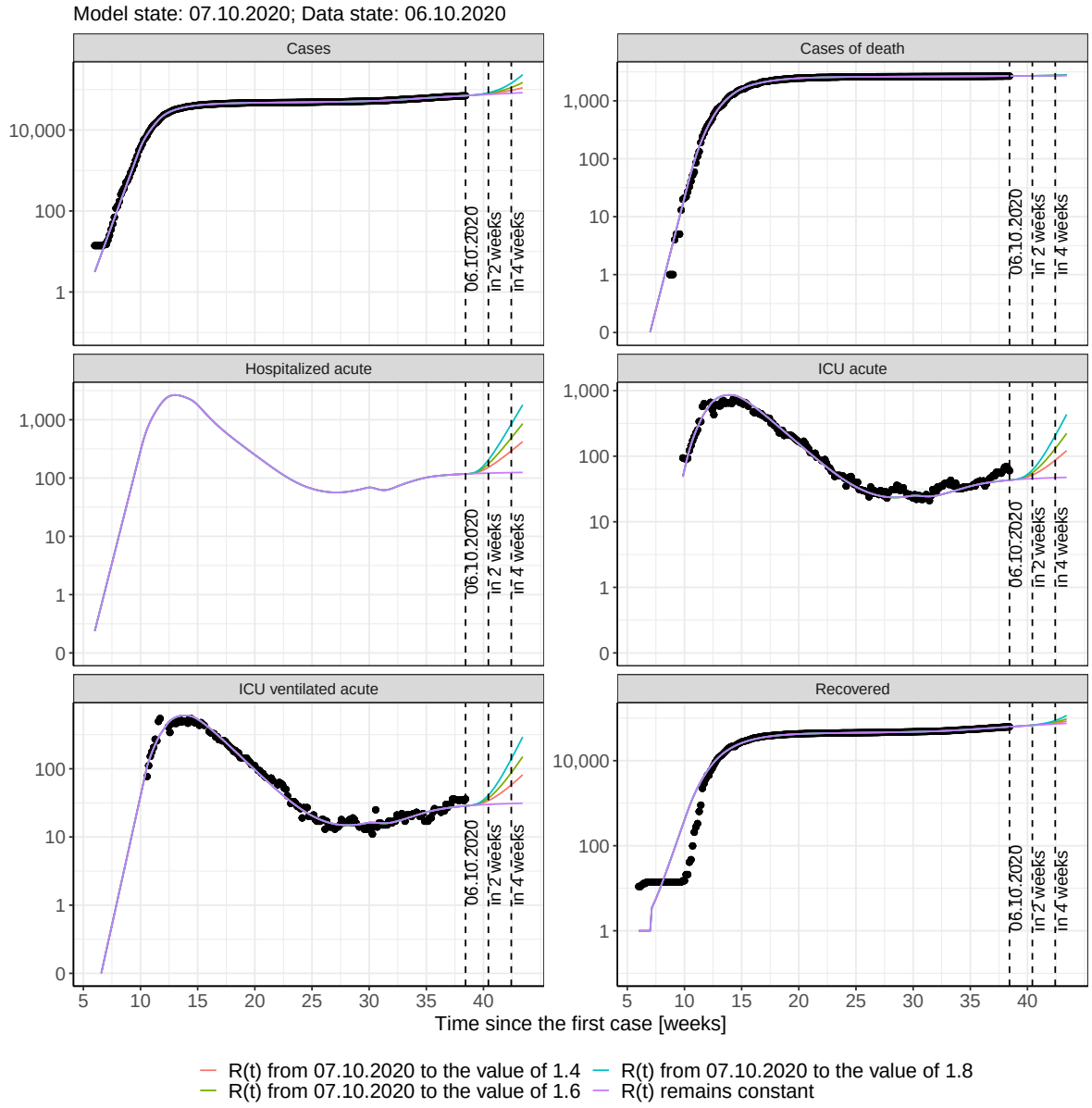


Figure 29: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

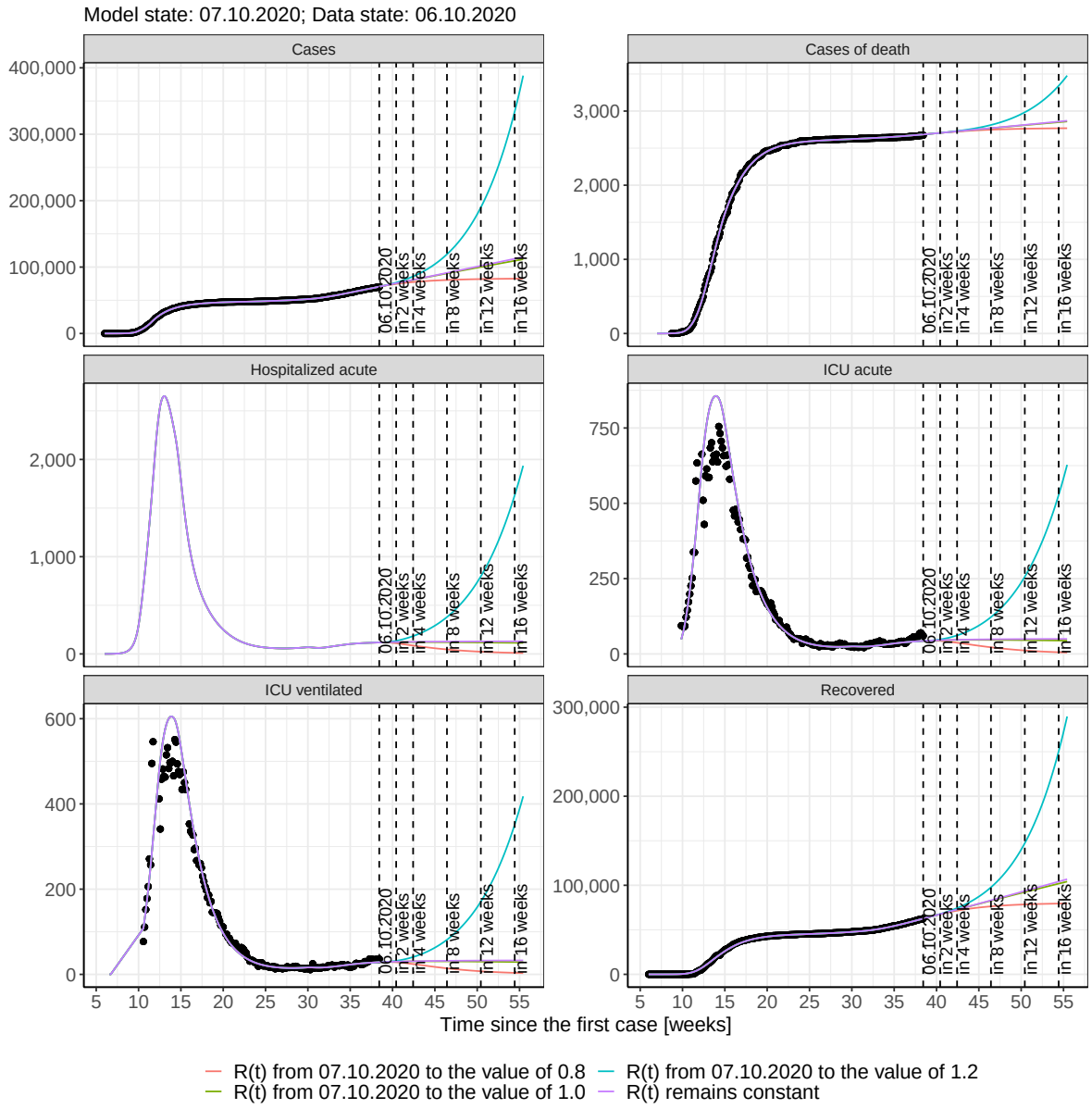


Figure 30: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

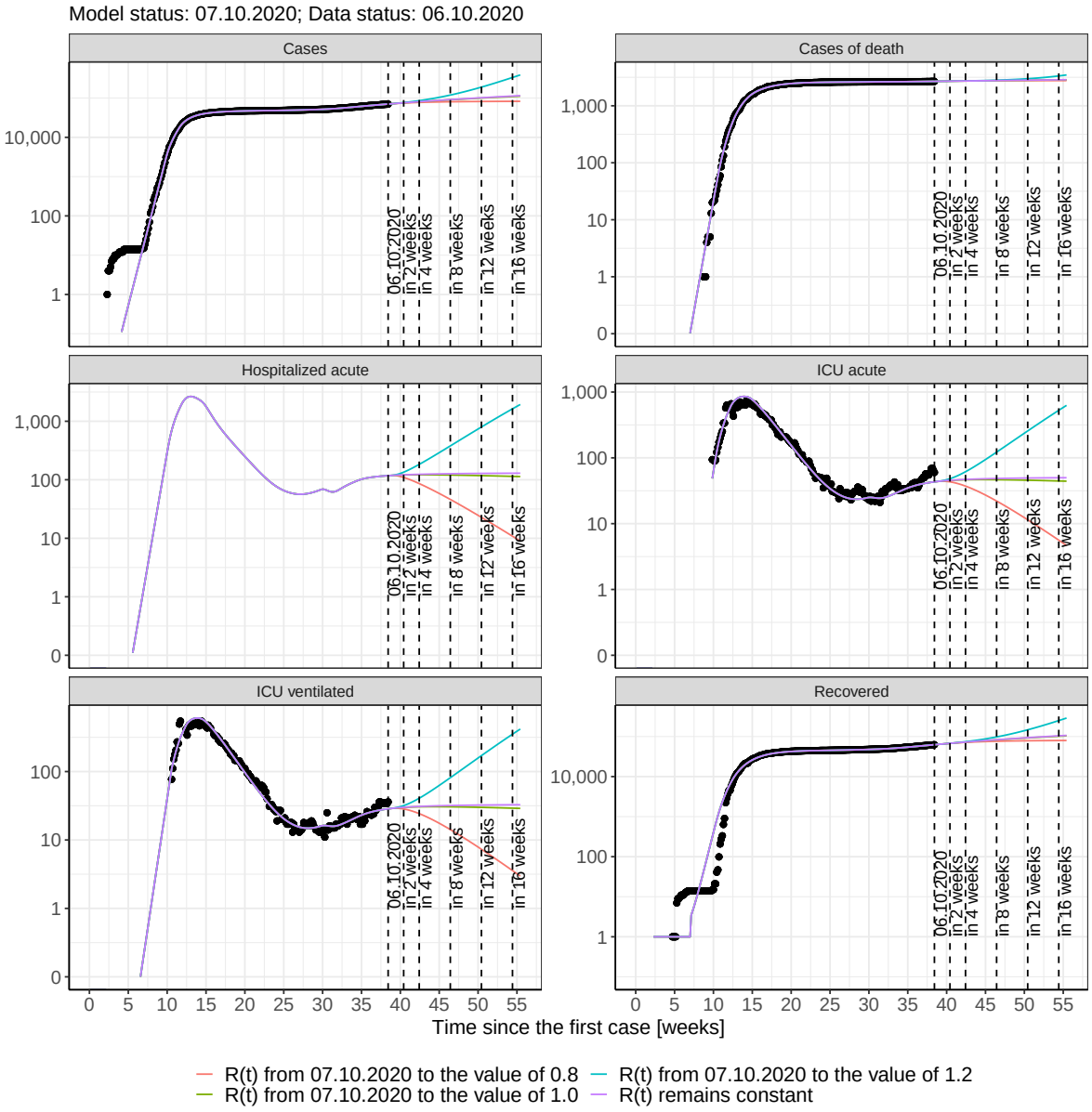


Figure 31: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bavaria assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 6); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 7); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 8); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 9) Model status from 07.10.2020; Data status: 06.10.2020.

Table 6: Bavaria - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	70786	2686	62877	118	43	29
08.10.2020	71154	2688	63237	118	44	29
09.10.2020	71522	2689	63598	119	44	29
10.10.2020	71890	2691	63959	119	44	29
11.10.2020	72258	2692	64320	119	44	29
12.10.2020	72627	2694	64683	119	44	29
13.10.2020	72996	2695	65045	120	45	29
14.10.2020	73365	2697	65408	120	45	29
15.10.2020	73734	2698	65771	120	45	30
16.10.2020	74103	2700	66135	120	45	30
17.10.2020	74473	2701	66499	121	45	30
18.10.2020	74842	2702	66863	121	45	30
19.10.2020	75212	2704	67227	121	45	30
20.10.2020	75582	2706	67592	121	46	30
21.10.2020	75953	2707	67957	122	46	30
22.10.2020	76323	2708	68323	122	46	30
23.10.2020	76694	2710	68688	122	46	30
24.10.2020	77065	2712	69054	122	46	30
25.10.2020	77436	2713	69421	122	46	30
26.10.2020	77807	2714	69787	123	46	30
27.10.2020	78178	2716	70154	123	46	30
28.10.2020	78550	2718	70521	123	46	31
29.10.2020	78922	2719	70888	123	47	31
30.10.2020	79293	2721	71255	123	47	31
31.10.2020	79665	2722	71623	123	47	31
01.11.2020	80038	2724	71990	124	47	31
02.11.2020	80410	2725	72358	124	47	31
03.11.2020	80783	2727	72727	124	47	31

Table 7: Bavaria - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	70781	2686	62877	118	43	29
08.10.2020	71132	2688	63237	118	44	29
09.10.2020	71474	2689	63597	118	44	29
10.10.2020	71806	2691	63957	118	44	29
11.10.2020	72128	2692	64316	118	44	29
12.10.2020	72441	2694	64674	118	44	29
13.10.2020	72745	2695	65031	118	44	29
14.10.2020	73040	2697	65385	117	44	29
15.10.2020	73326	2698	65736	116	44	29
16.10.2020	73605	2700	66085	115	44	29
17.10.2020	73875	2701	66429	114	44	29
18.10.2020	74138	2702	66770	113	44	29
19.10.2020	74393	2704	67106	111	43	29
20.10.2020	74640	2705	67437	110	43	28
21.10.2020	74881	2707	67764	108	43	28
22.10.2020	75114	2708	68085	107	43	28
23.10.2020	75341	2709	68401	105	42	28
24.10.2020	75562	2711	68711	103	42	27
25.10.2020	75776	2712	69015	102	42	27
26.10.2020	75983	2714	69313	100	41	27
27.10.2020	76185	2715	69605	98	41	27
28.10.2020	76381	2716	69891	96	40	26
29.10.2020	76572	2717	70170	95	40	26
30.10.2020	76756	2719	70444	93	39	26
31.10.2020	76936	2720	70711	91	39	25
01.11.2020	77110	2721	70972	89	38	25
02.11.2020	77280	2722	71227	88	38	25
03.11.2020	77444	2724	71476	86	37	24

Table 8: Bavaria - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	70786	2686	62877	118	43	29
08.10.2020	71153	2688	63237	118	44	29
09.10.2020	71519	2689	63598	119	44	29
10.10.2020	71886	2691	63959	119	44	29
11.10.2020	72252	2692	64320	119	44	29
12.10.2020	72618	2694	64682	119	44	29
13.10.2020	72983	2695	65044	120	45	29
14.10.2020	73349	2697	65407	120	45	29
15.10.2020	73714	2698	65769	120	45	30
16.10.2020	74078	2700	66132	120	45	30
17.10.2020	74443	2701	66495	120	45	30
18.10.2020	74807	2702	66858	121	45	30
19.10.2020	75170	2704	67221	121	45	30
20.10.2020	75534	2706	67584	121	45	30
21.10.2020	75897	2707	67948	121	46	30
22.10.2020	76260	2708	68311	121	46	30
23.10.2020	76622	2710	68674	121	46	30
24.10.2020	76984	2712	69037	121	46	30
25.10.2020	77346	2713	69400	121	46	30
26.10.2020	77708	2714	69762	121	46	30
27.10.2020	78069	2716	70125	121	46	30
28.10.2020	78430	2718	70487	121	46	30
29.10.2020	78790	2719	70850	122	46	30
30.10.2020	79151	2720	71212	122	46	30
31.10.2020	79511	2722	71574	122	46	30
01.11.2020	79870	2724	71935	122	46	30
02.11.2020	80230	2725	72297	122	46	30
03.11.2020	80589	2726	72658	122	46	31

Table 9: Bavaria - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	70791	2686	62877	118	43	29
08.10.2020	71174	2688	63237	118	44	29
09.10.2020	71568	2689	63598	119	44	29
10.10.2020	71973	2691	63961	119	44	29
11.10.2020	72389	2692	64324	120	44	29
12.10.2020	72817	2694	64690	121	45	29
13.10.2020	73256	2695	65059	122	45	30
14.10.2020	73708	2697	65431	123	45	30
15.10.2020	74173	2698	65806	125	46	30
16.10.2020	74651	2700	66186	126	46	30
17.10.2020	75142	2701	66571	128	47	31
18.10.2020	75647	2703	66961	130	47	31
19.10.2020	76165	2704	67357	132	48	31
20.10.2020	76699	2706	67760	135	48	32
21.10.2020	77247	2707	68170	137	49	32
22.10.2020	77811	2709	68588	140	50	33
23.10.2020	78390	2711	69015	143	50	33
24.10.2020	78985	2712	69450	146	51	34
25.10.2020	79597	2714	69894	149	52	34
26.10.2020	80226	2716	70349	152	53	35
27.10.2020	80873	2718	70814	156	54	35
28.10.2020	81537	2719	71290	159	55	36
29.10.2020	82220	2721	71777	163	56	37
30.10.2020	82922	2723	72276	167	57	38
31.10.2020	83644	2725	72788	171	58	38
01.11.2020	84386	2727	73313	175	59	39
02.11.2020	85148	2729	73851	179	60	40
03.11.2020	85931	2731	74403	183	62	41

3.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

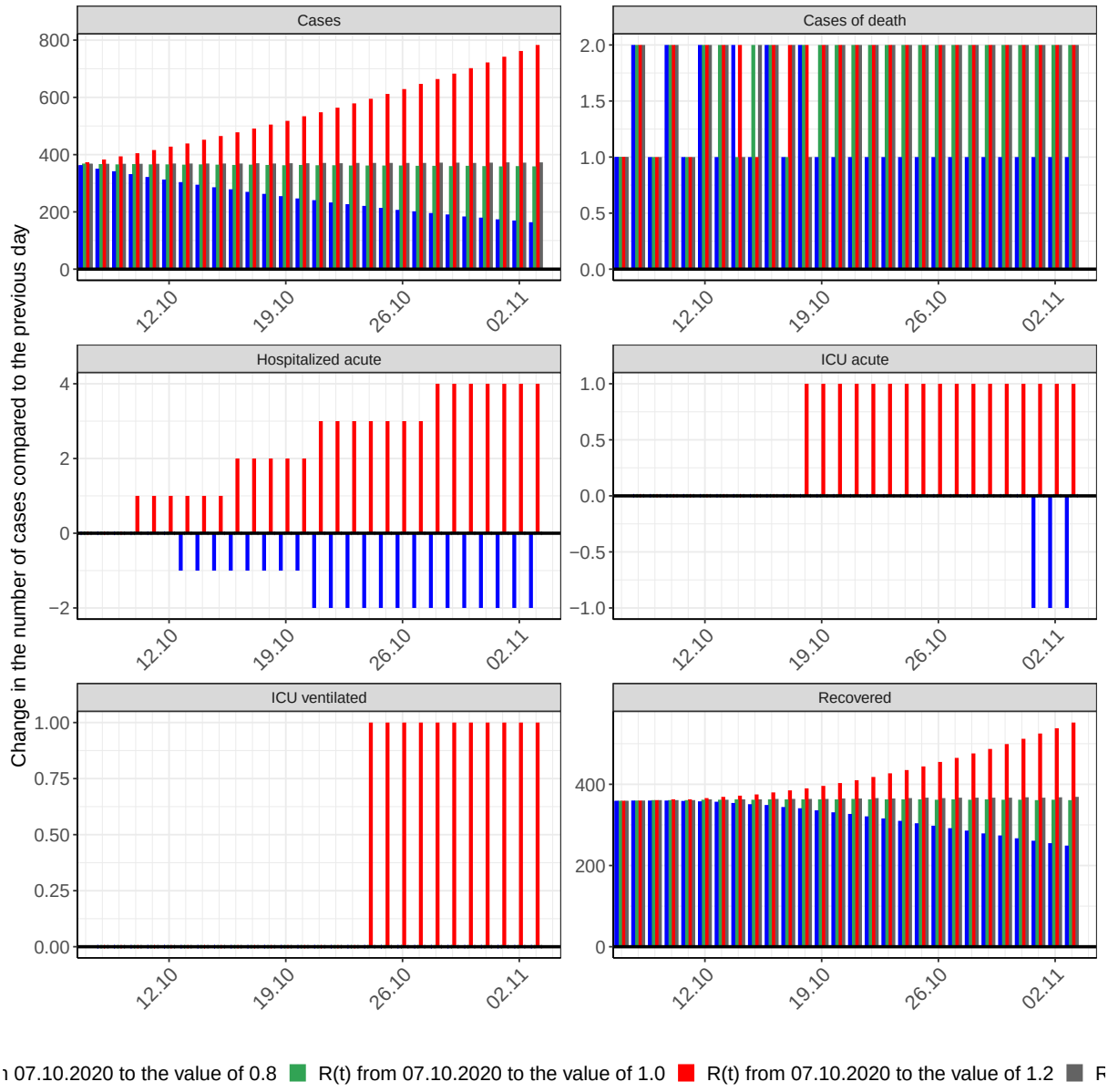


Figure 32: Simulation of daily new cases for the next 4 weeks - Bavaria

4 Berlin

4.1 Model description

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

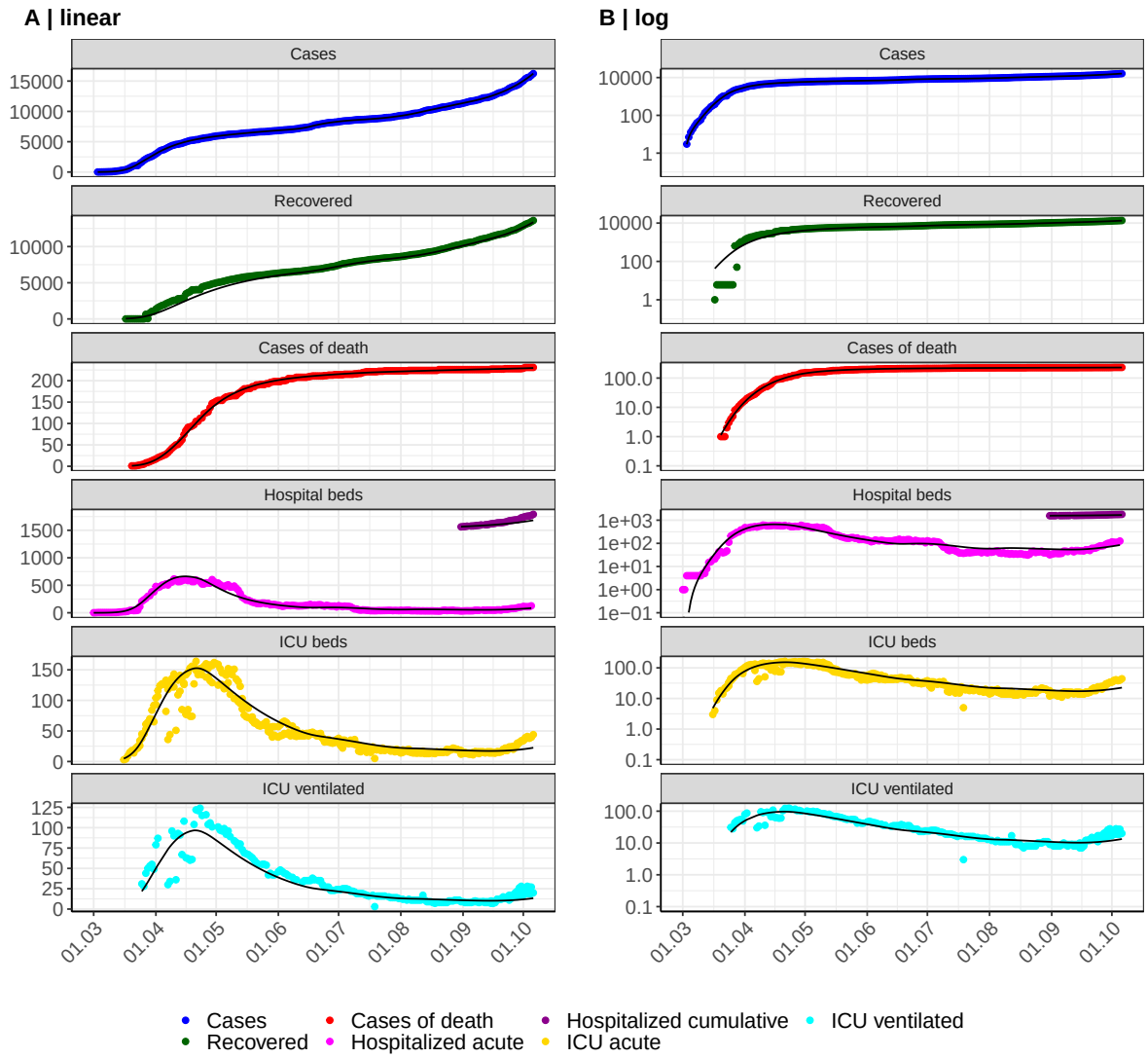


Figure 33: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Berlin. Points: reported data; lines: model description.

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

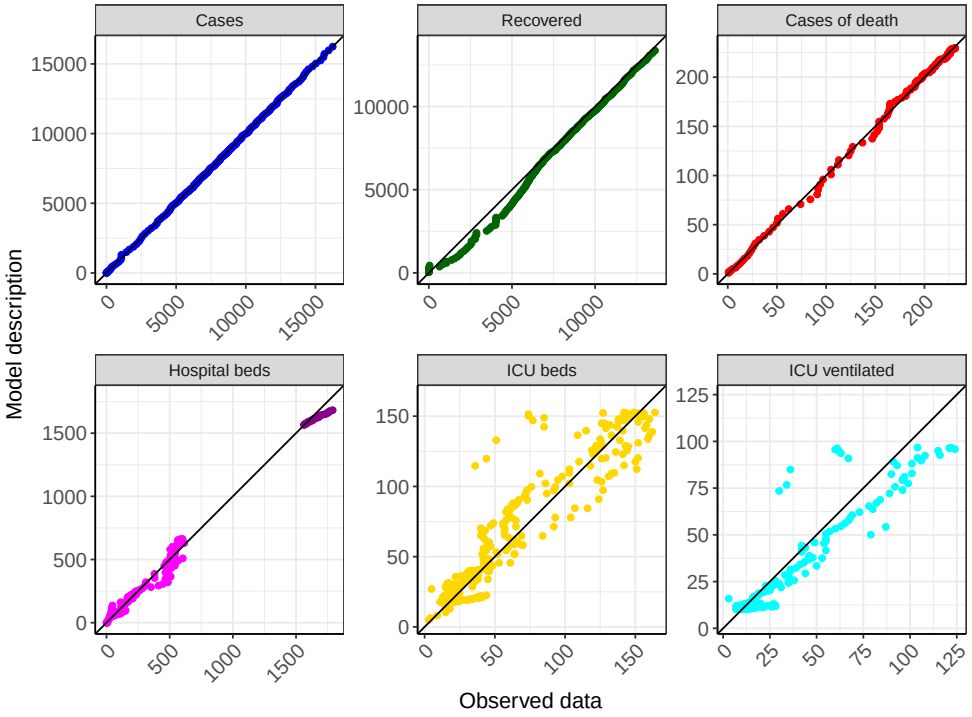


Figure 34: Goodness-of-fit plots for Berlin. Lines: lines of identity.

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

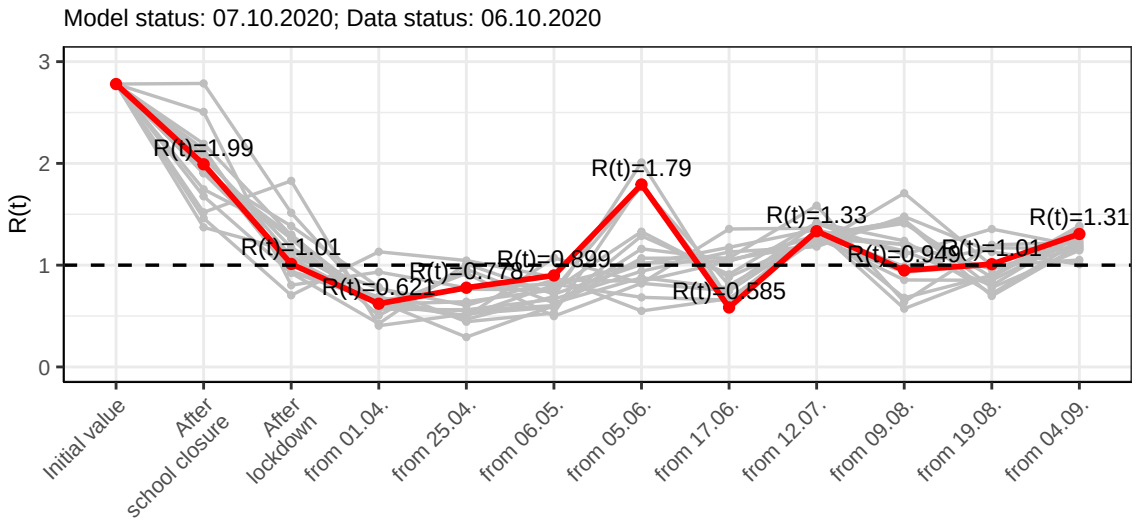


Figure 35: R(t) values before and after the NPIs for Berlin

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

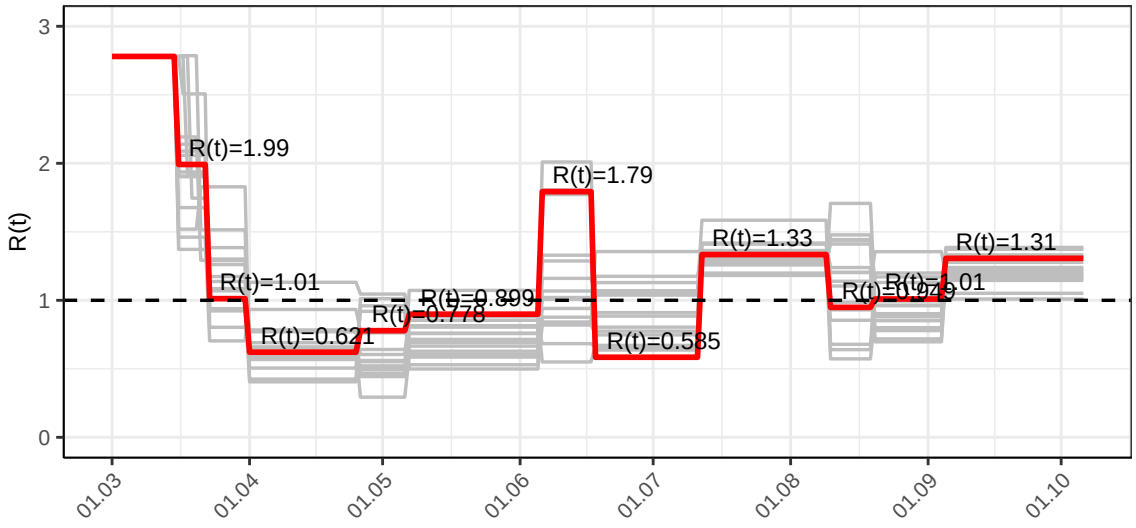


Figure 36: R(t) values over time for Berlin

4.2 Model predictions

4.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.31)

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.

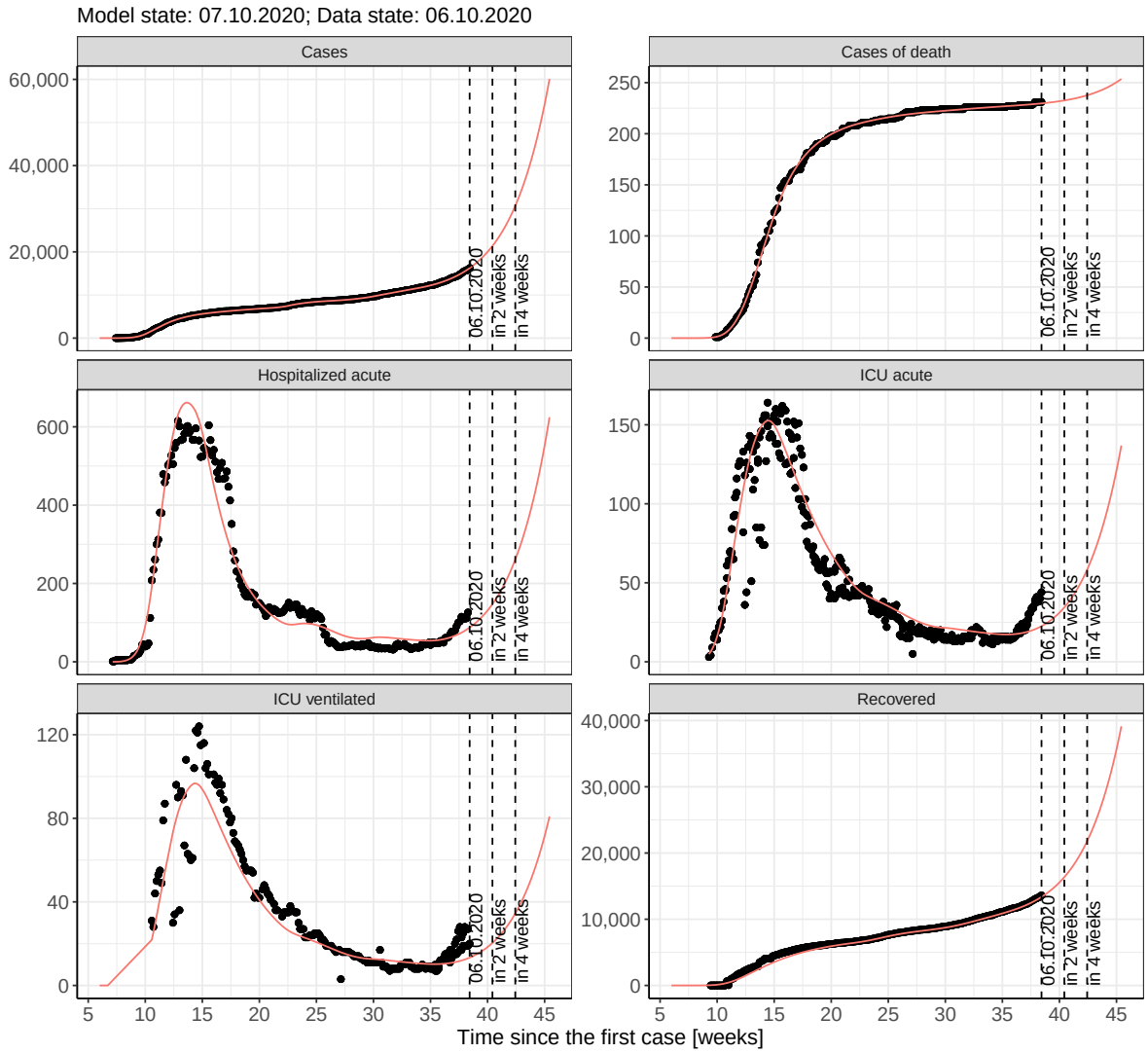


Figure 37: Representation of the model predictions for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

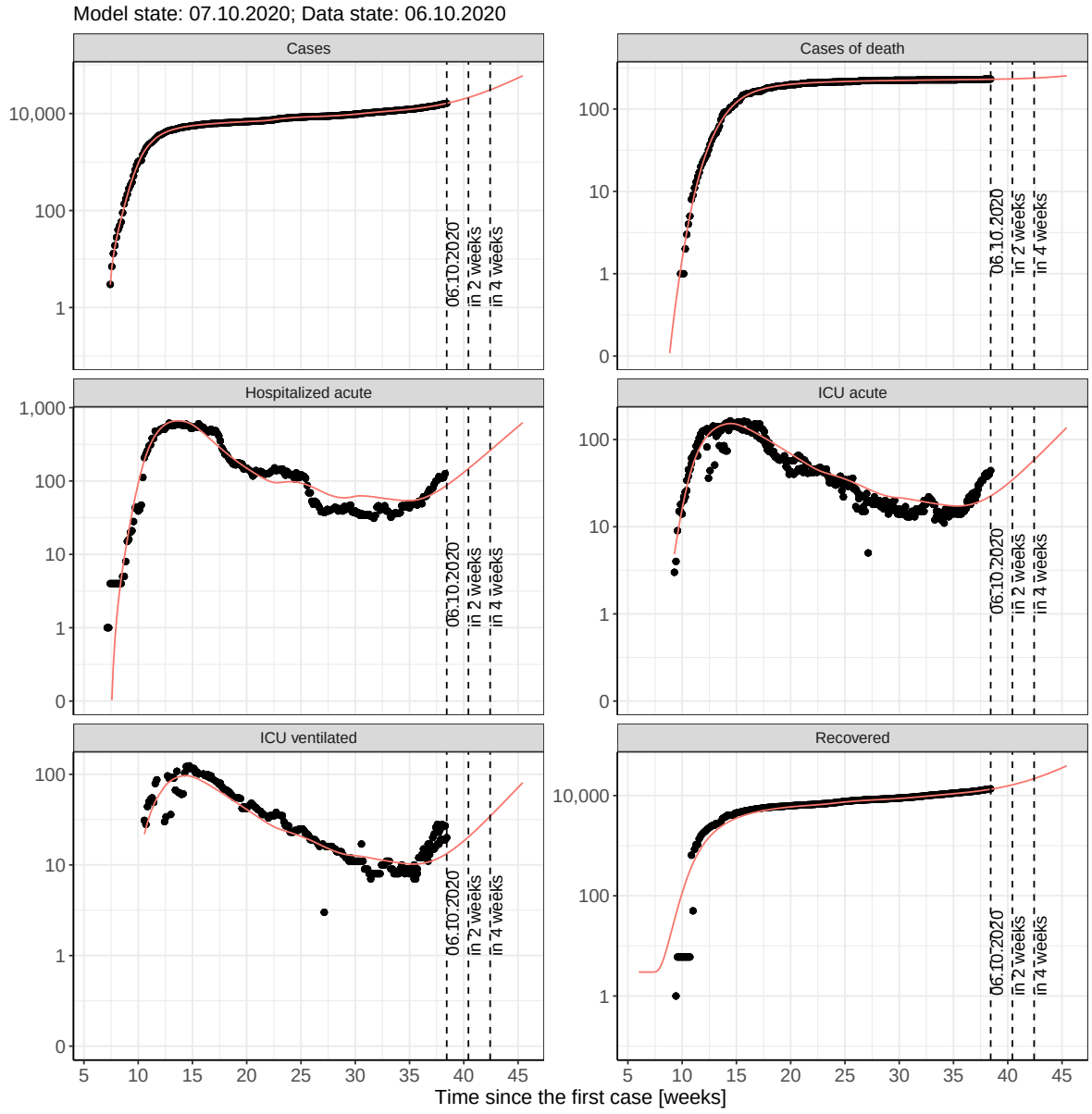


Figure 38: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

4.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

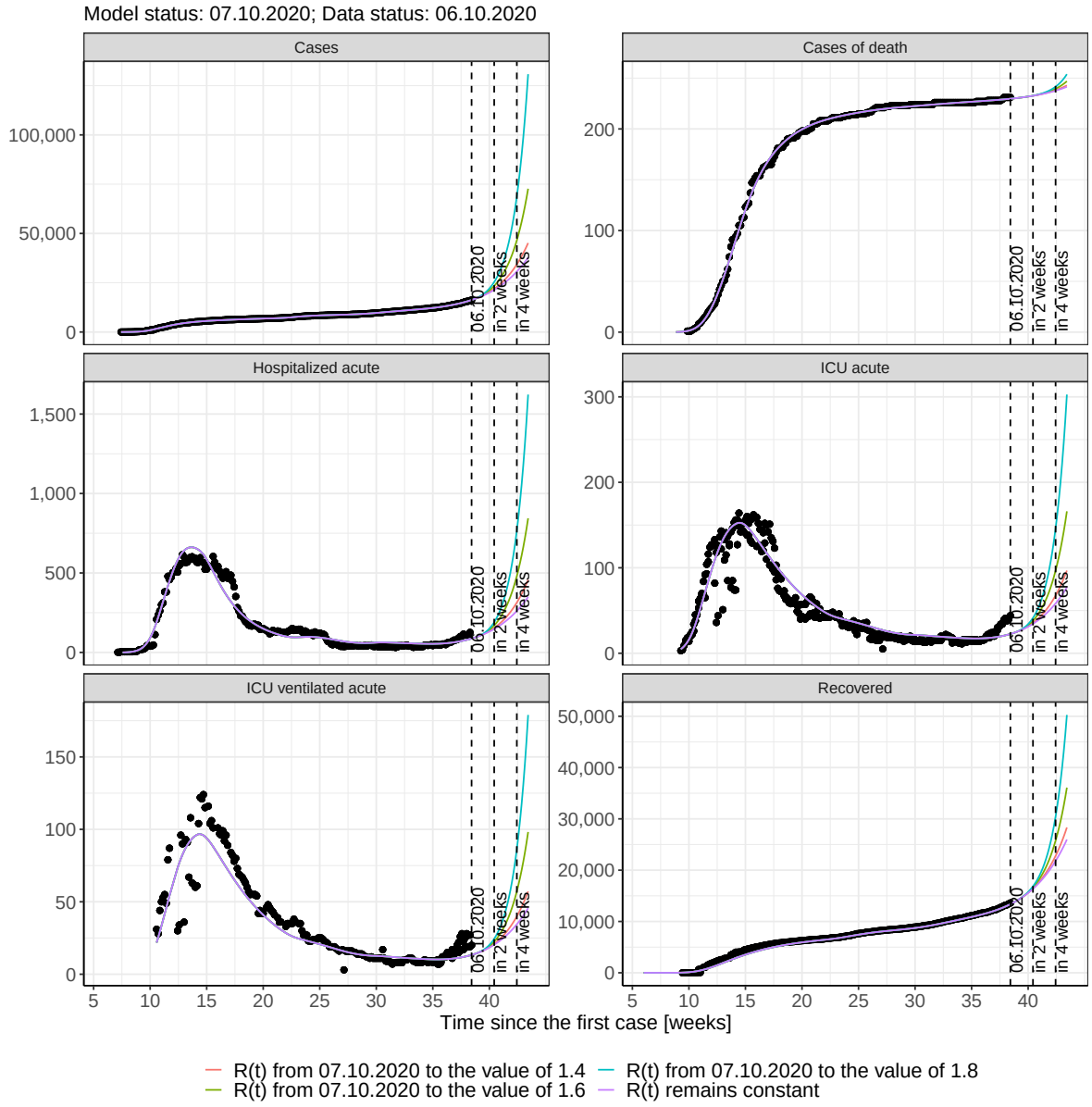


Figure 39: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

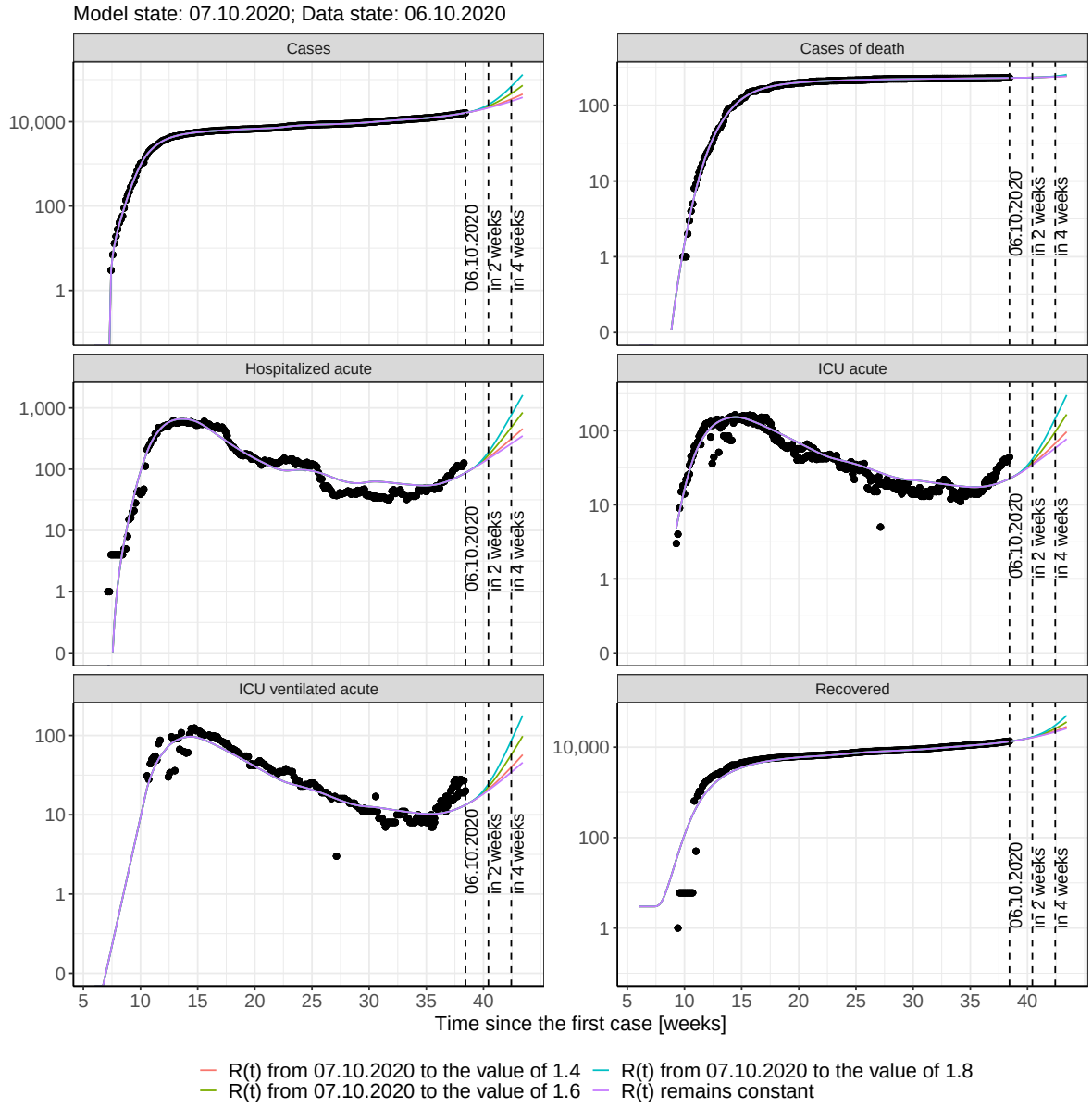


Figure 40: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

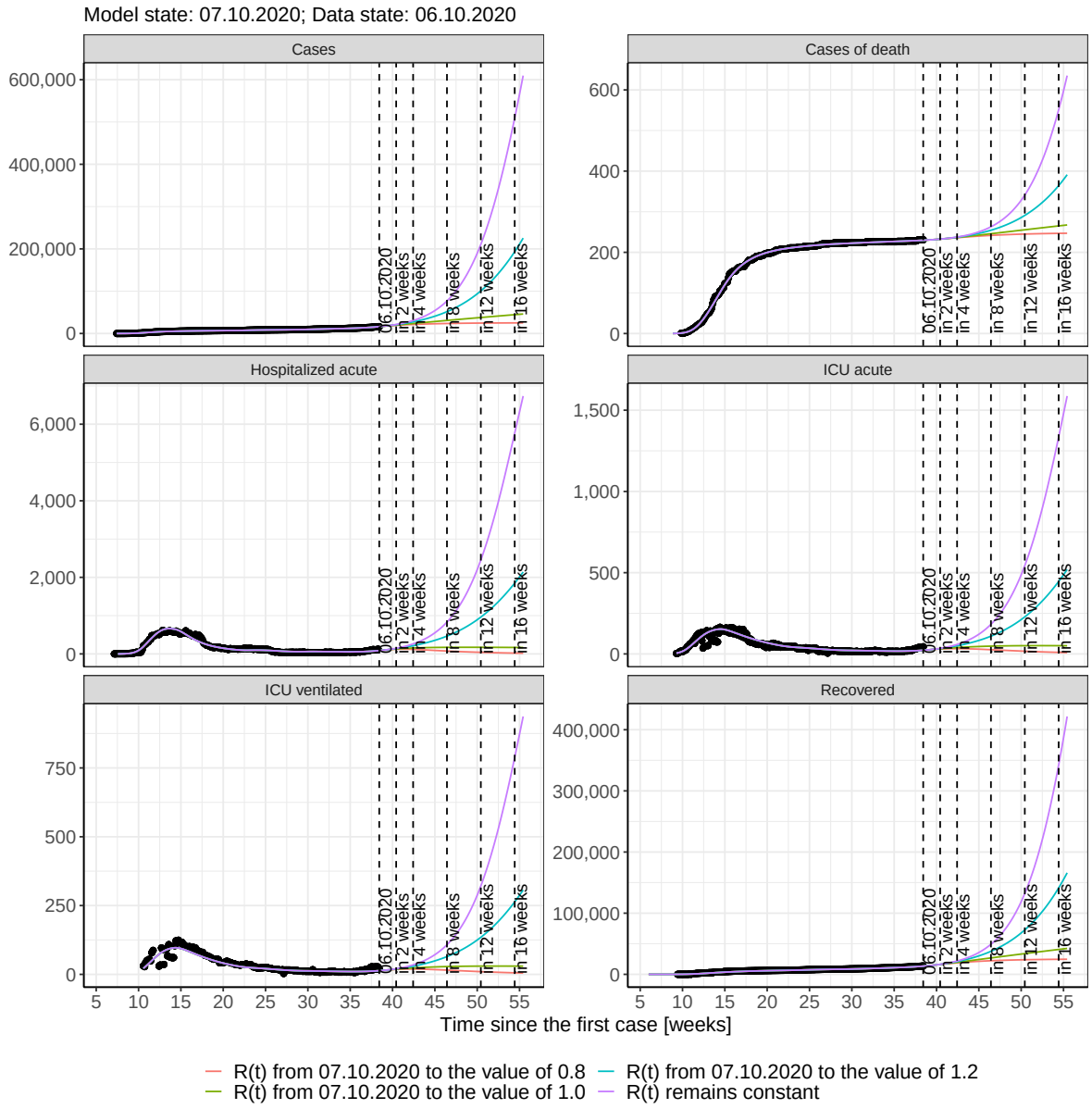


Figure 41: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

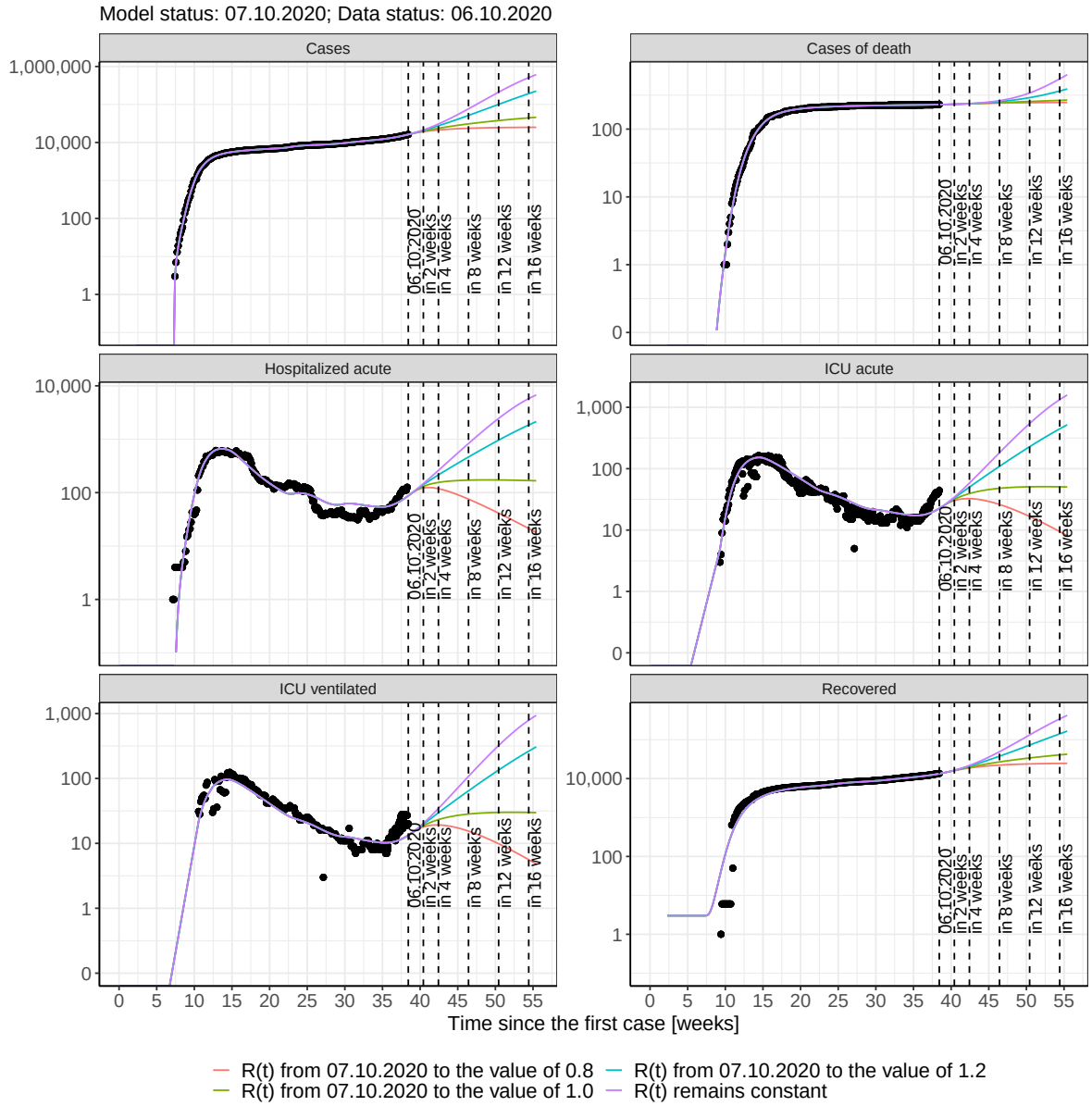


Figure 42: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Berlin assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 10); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 11); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 12); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 13) Model status from 07.10.2020; Data status: 06.10.2020.

Table 10: Berlin - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	16509	230	13529	90	23	14
08.10.2020	16794	230	13696	94	24	14
09.10.2020	17092	230	13870	97	24	14
10.10.2020	17403	230	14052	101	25	15
11.10.2020	17728	231	14242	104	26	15
12.10.2020	18067	231	14439	108	27	16
13.10.2020	18420	231	14646	112	27	16
14.10.2020	18789	231	14861	117	28	17
15.10.2020	19175	231	15086	121	29	17
16.10.2020	19577	232	15320	126	30	18
17.10.2020	19996	232	15565	131	31	18
18.10.2020	20434	232	15820	136	32	19
19.10.2020	20890	232	16086	142	33	20
20.10.2020	21367	233	16364	147	34	20
21.10.2020	21864	233	16654	153	36	21
22.10.2020	22383	233	16956	160	37	22
23.10.2020	22925	233	17272	166	38	23
24.10.2020	23490	234	17601	173	40	23
25.10.2020	24079	234	17945	180	41	24
26.10.2020	24694	234	18303	188	43	25
27.10.2020	25335	235	18678	196	44	26
28.10.2020	26005	235	19068	204	46	27
29.10.2020	26703	236	19475	212	48	28
30.10.2020	27431	236	19900	221	50	29
31.10.2020	28190	236	20344	231	52	31
01.11.2020	28982	237	20807	240	54	32
02.11.2020	29808	237	21289	250	56	33
03.11.2020	30669	238	21793	261	58	34

Table 11: Berlin - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	16499	230	13528	90	23	14
08.10.2020	16755	230	13695	94	24	14
09.10.2020	17004	230	13869	97	24	14
10.10.2020	17246	230	14049	100	25	15
11.10.2020	17480	231	14234	103	26	15
12.10.2020	17708	231	14424	106	26	16
13.10.2020	17930	231	14619	109	27	16
14.10.2020	18145	231	14817	112	27	16
15.10.2020	18354	231	15019	114	28	17
16.10.2020	18557	232	15223	116	28	17
17.10.2020	18754	232	15429	118	29	17
18.10.2020	18945	232	15636	120	29	17
19.10.2020	19131	232	15843	121	30	18
20.10.2020	19311	232	16051	122	30	18
21.10.2020	19487	233	16258	123	31	18
22.10.2020	19657	233	16464	124	31	18
23.10.2020	19822	233	16668	124	31	18
24.10.2020	19983	233	16871	124	32	19
25.10.2020	20139	234	17072	125	32	19
26.10.2020	20290	234	17271	124	32	19
27.10.2020	20437	234	17467	124	32	19
28.10.2020	20580	234	17661	124	32	19
29.10.2020	20719	235	17851	123	32	19
30.10.2020	20854	235	18038	122	32	19
31.10.2020	20984	235	18222	122	32	19
01.11.2020	21111	235	18403	121	33	19
02.11.2020	21235	236	18580	120	33	19
03.11.2020	21355	236	18753	119	33	19

Table 12: Berlin - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	16503	230	13528	90	23	14
08.10.2020	16770	230	13696	94	24	14
09.10.2020	17037	230	13869	97	24	14
10.10.2020	17304	230	14050	100	25	15
11.10.2020	17571	231	14237	104	26	15
12.10.2020	17837	231	14430	107	26	16
13.10.2020	18104	231	14629	110	27	16
14.10.2020	18370	231	14833	113	28	16
15.10.2020	18636	231	15043	117	28	17
16.10.2020	18902	232	15258	120	29	17
17.10.2020	19167	232	15477	123	30	18
18.10.2020	19432	232	15700	125	30	18
19.10.2020	19697	232	15927	128	31	18
20.10.2020	19962	233	16157	131	32	19
21.10.2020	20227	233	16391	133	32	19
22.10.2020	20491	233	16628	135	33	19
23.10.2020	20755	233	16867	138	34	20
24.10.2020	21019	234	17108	140	34	20
25.10.2020	21283	234	17352	142	35	20
26.10.2020	21546	234	17597	143	35	21
27.10.2020	21810	234	17845	145	36	21
28.10.2020	22073	235	18094	147	36	21
29.10.2020	22335	235	18344	149	37	22
30.10.2020	22598	235	18595	150	37	22
31.10.2020	22860	236	18848	151	38	22
01.11.2020	23122	236	19101	153	38	23
02.11.2020	23384	236	19355	154	39	23
03.11.2020	23645	236	19611	155	39	23

Table 13: Berlin - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	16507	230	13528	90	23	14
08.10.2020	16786	230	13696	94	24	14
09.10.2020	17072	230	13870	97	24	14
10.10.2020	17367	230	14051	100	25	15
11.10.2020	17671	231	14240	104	26	15
12.10.2020	17982	231	14436	108	26	16
13.10.2020	18303	231	14640	112	27	16
14.10.2020	18632	231	14851	116	28	17
15.10.2020	18971	231	15070	120	29	17
16.10.2020	19319	232	15297	124	30	18
17.10.2020	19677	232	15532	128	31	18
18.10.2020	20045	232	15775	132	31	19
19.10.2020	20423	232	16026	136	32	19
20.10.2020	20811	233	16285	141	33	20
21.10.2020	21211	233	16553	145	34	20
22.10.2020	21621	233	16830	150	35	21
23.10.2020	22043	233	17115	155	36	22
24.10.2020	22477	234	17408	160	37	22
25.10.2020	22923	234	17711	165	39	23
26.10.2020	23381	234	18024	170	40	23
27.10.2020	23852	235	18345	175	41	24
28.10.2020	24335	235	18676	180	42	25
29.10.2020	24833	235	19017	186	43	26
30.10.2020	25344	236	19368	191	45	26
31.10.2020	25869	236	19729	197	46	27
01.11.2020	26408	236	20100	203	47	28
02.11.2020	26962	237	20482	209	49	29
03.11.2020	27532	237	20875	215	50	30

4.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

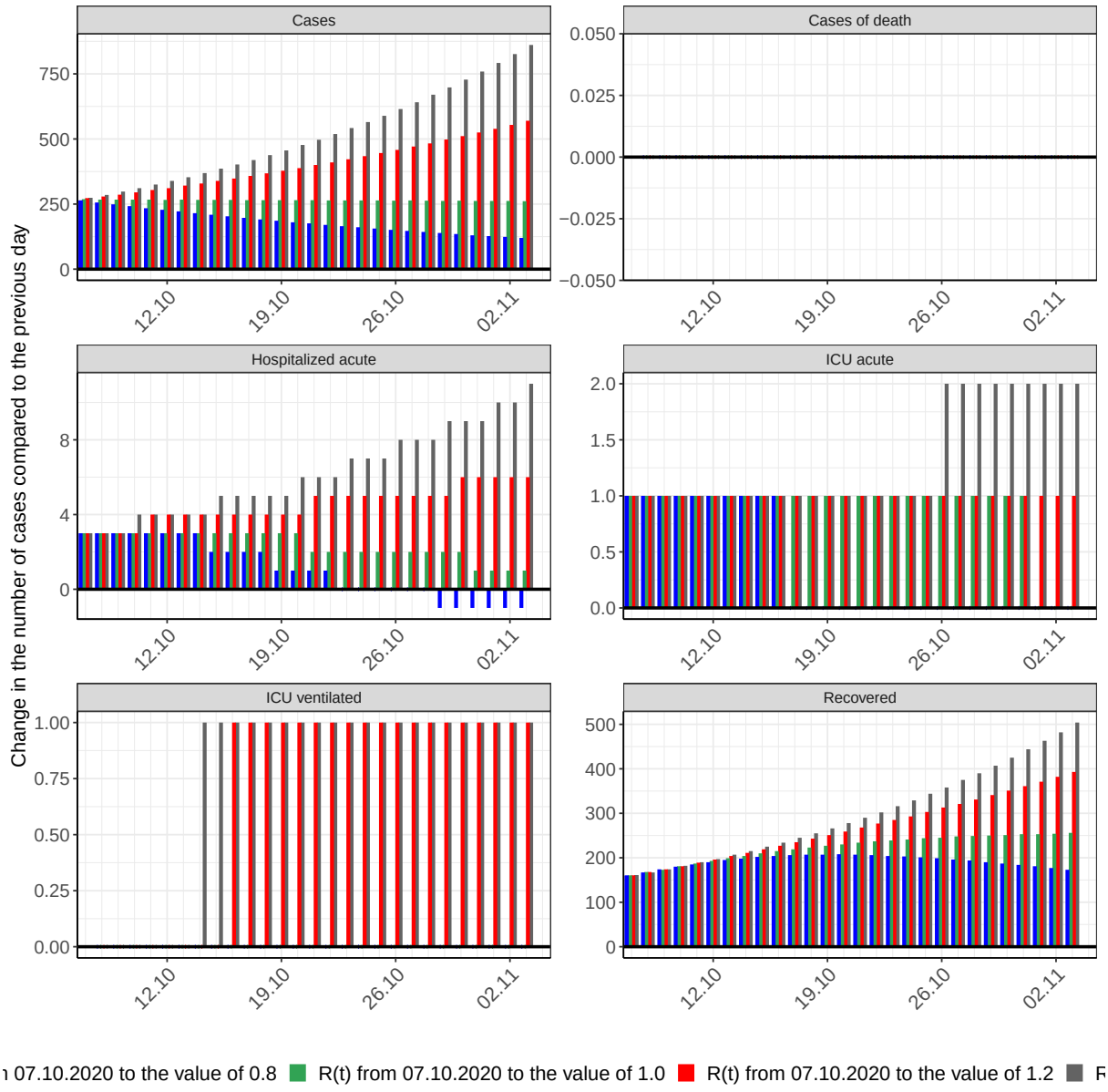


Figure 43: Simulation of daily new cases for the next 4 weeks - Berlin

5 Brandenburg

5.1 Model description

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

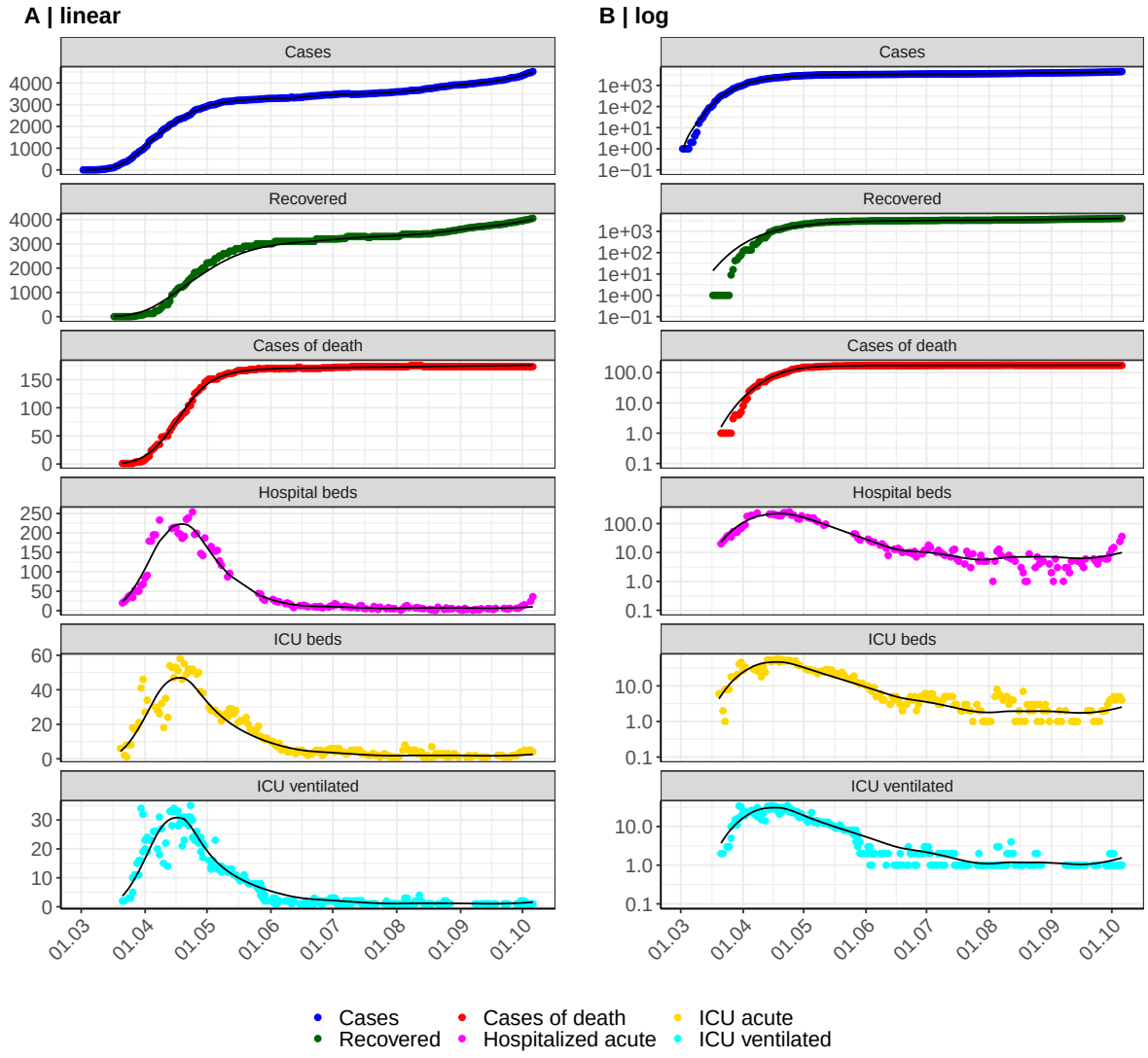


Figure 44: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Brandenburg. Points: reported data; lines: model description.

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

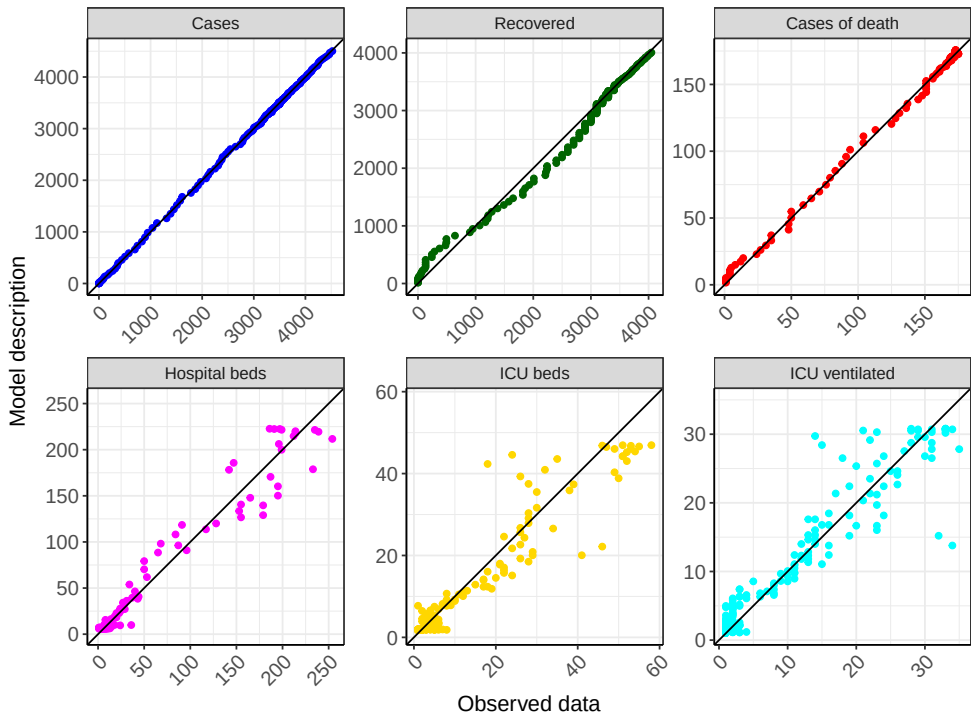


Figure 45: Goodness-of-fit plots for Brandenburg. Lines: lines of identity.

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

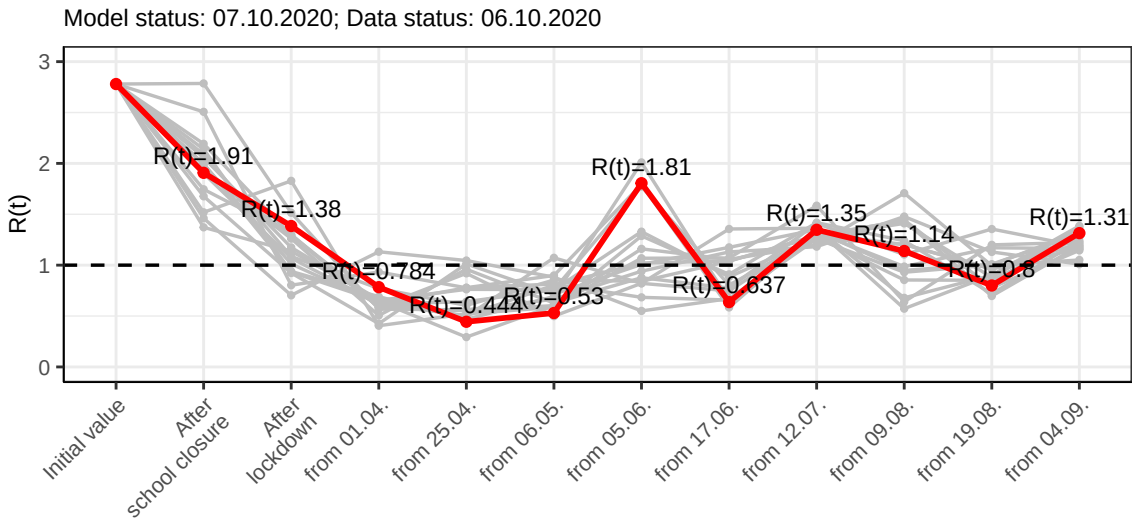


Figure 46: R(t) values before and after the NPIs for Brandenburg

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

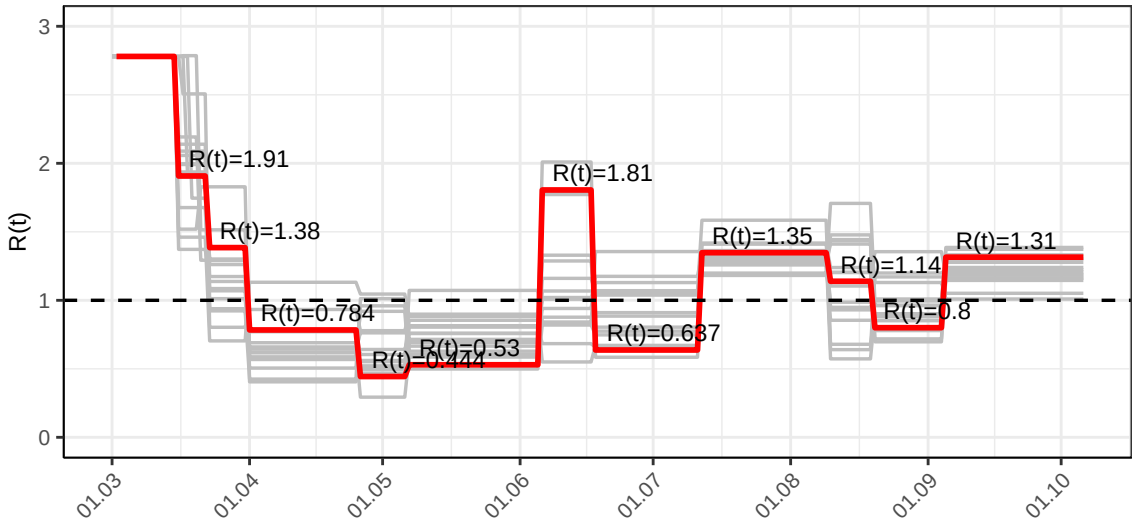


Figure 47: R(t) values over time for Brandenburg

5.2 Model predictions

5.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.31)

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.

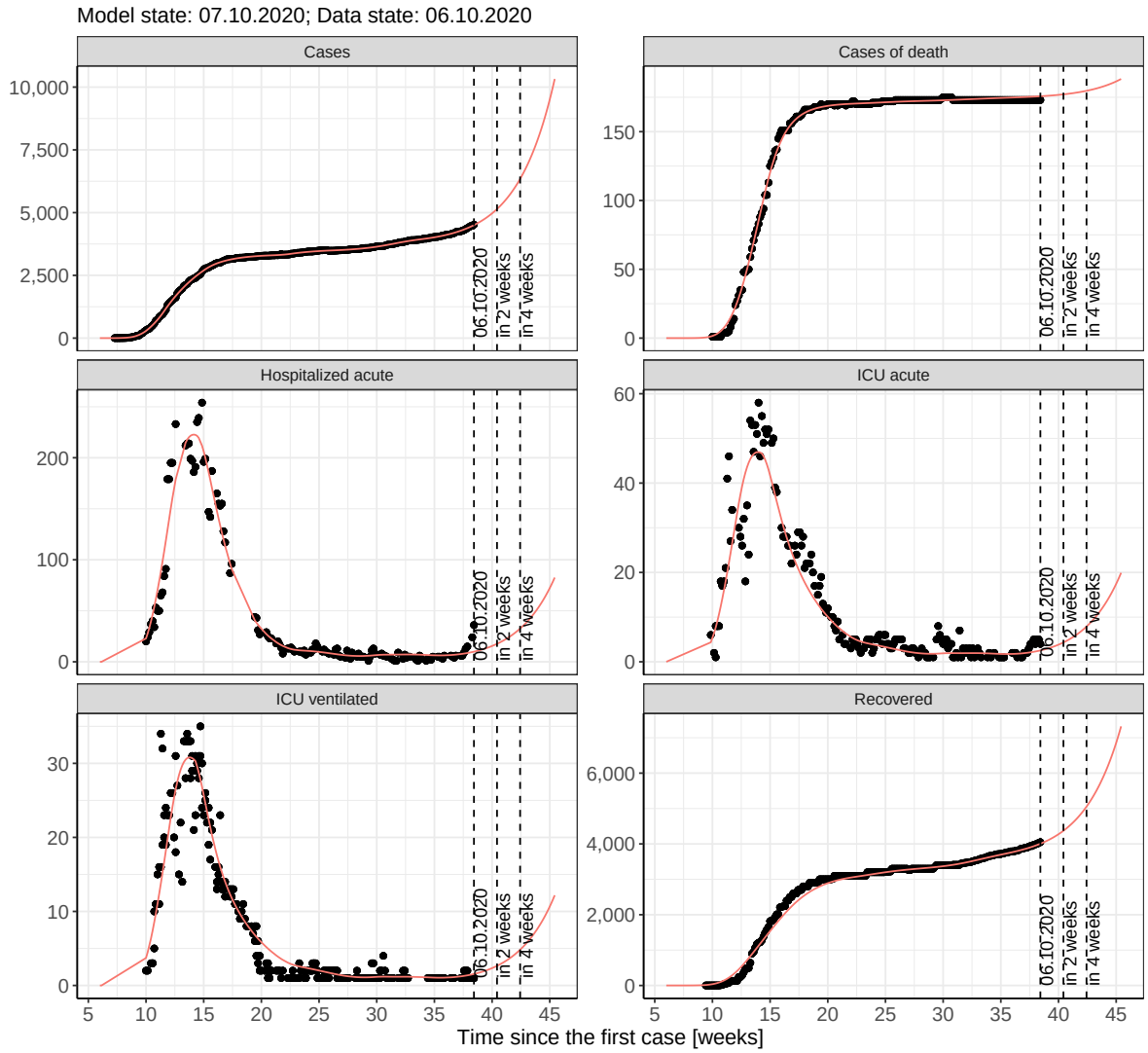


Figure 48: Representation of the model predictions for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

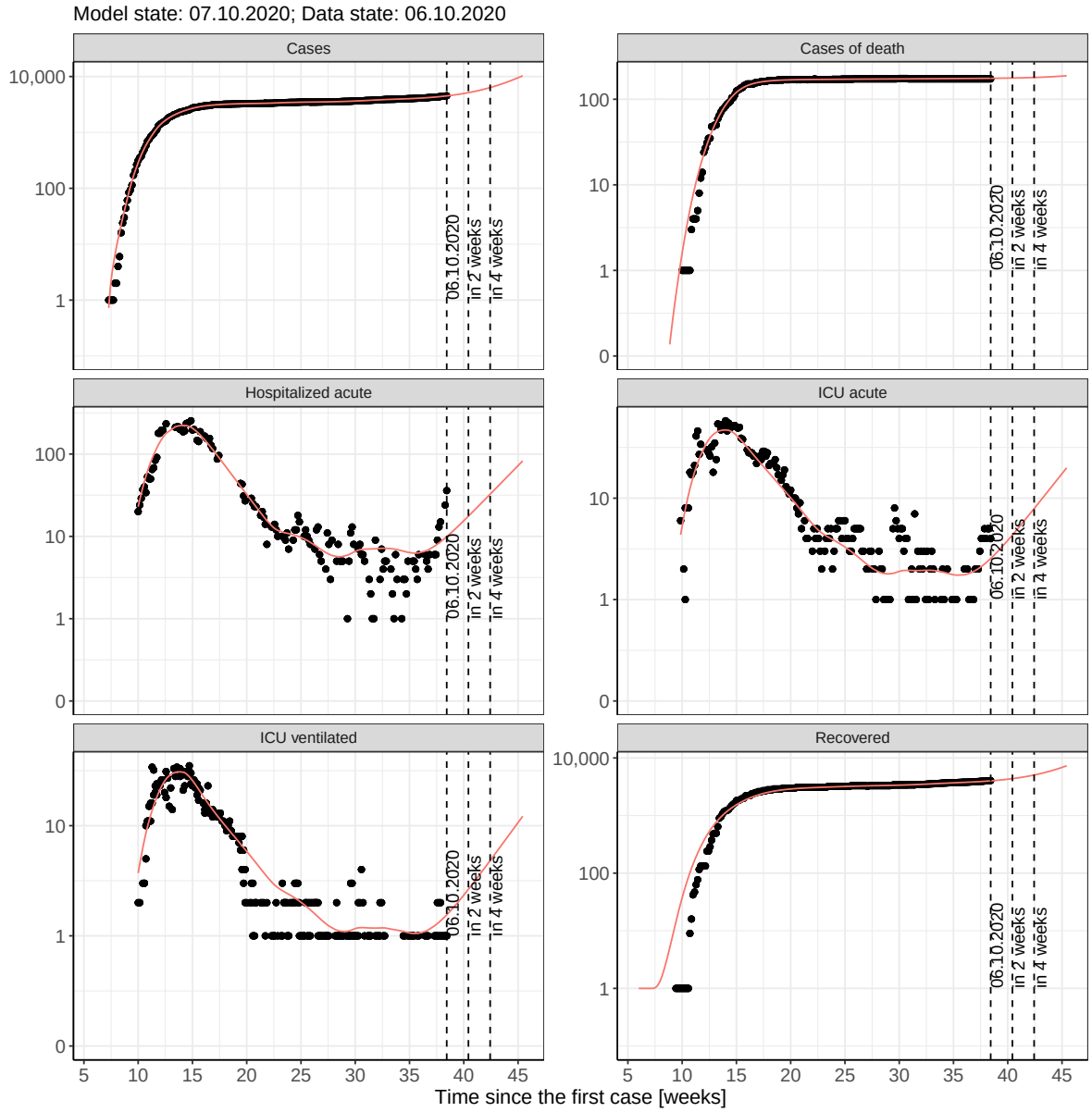


Figure 49: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

5.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

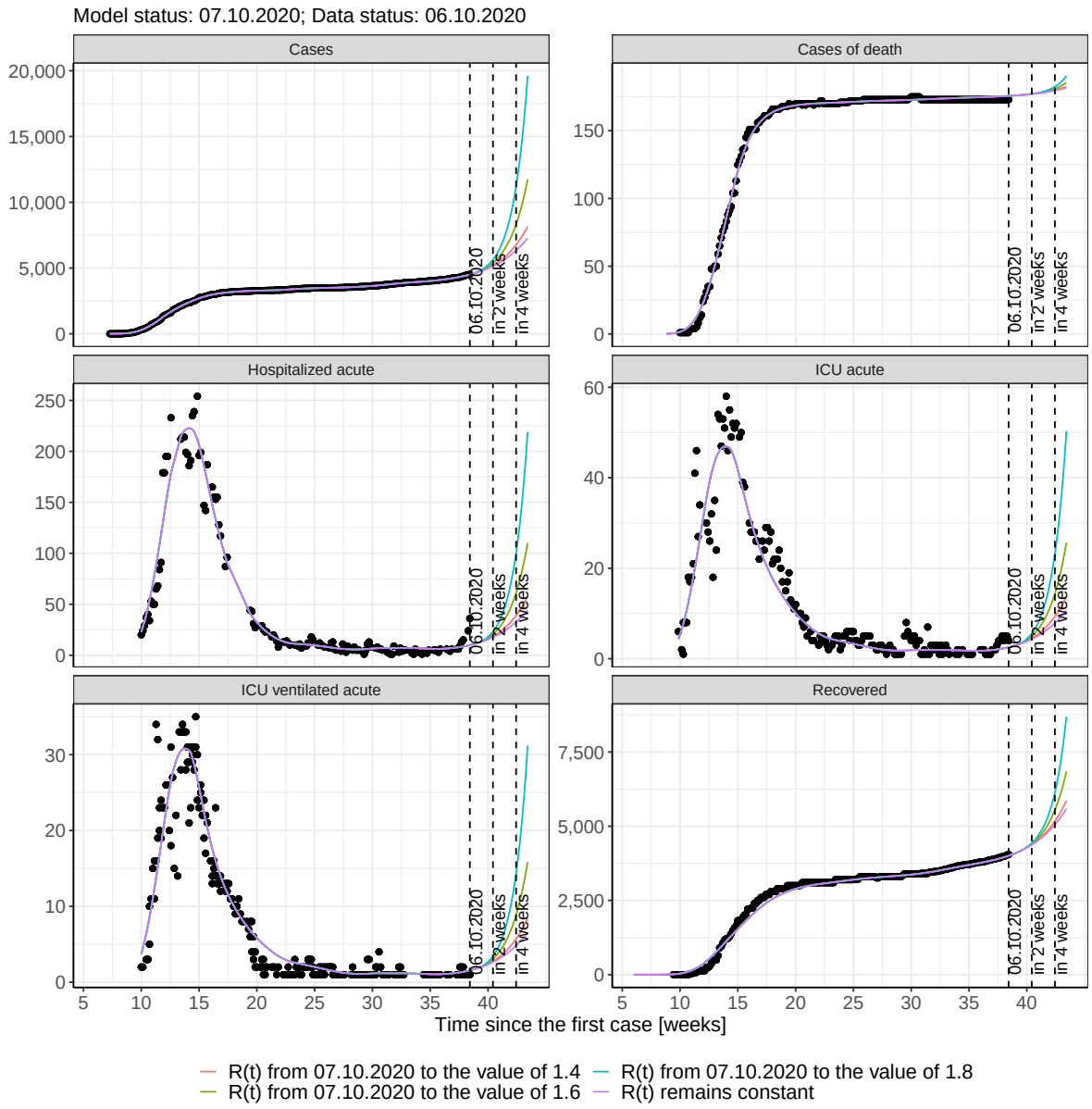


Figure 50: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

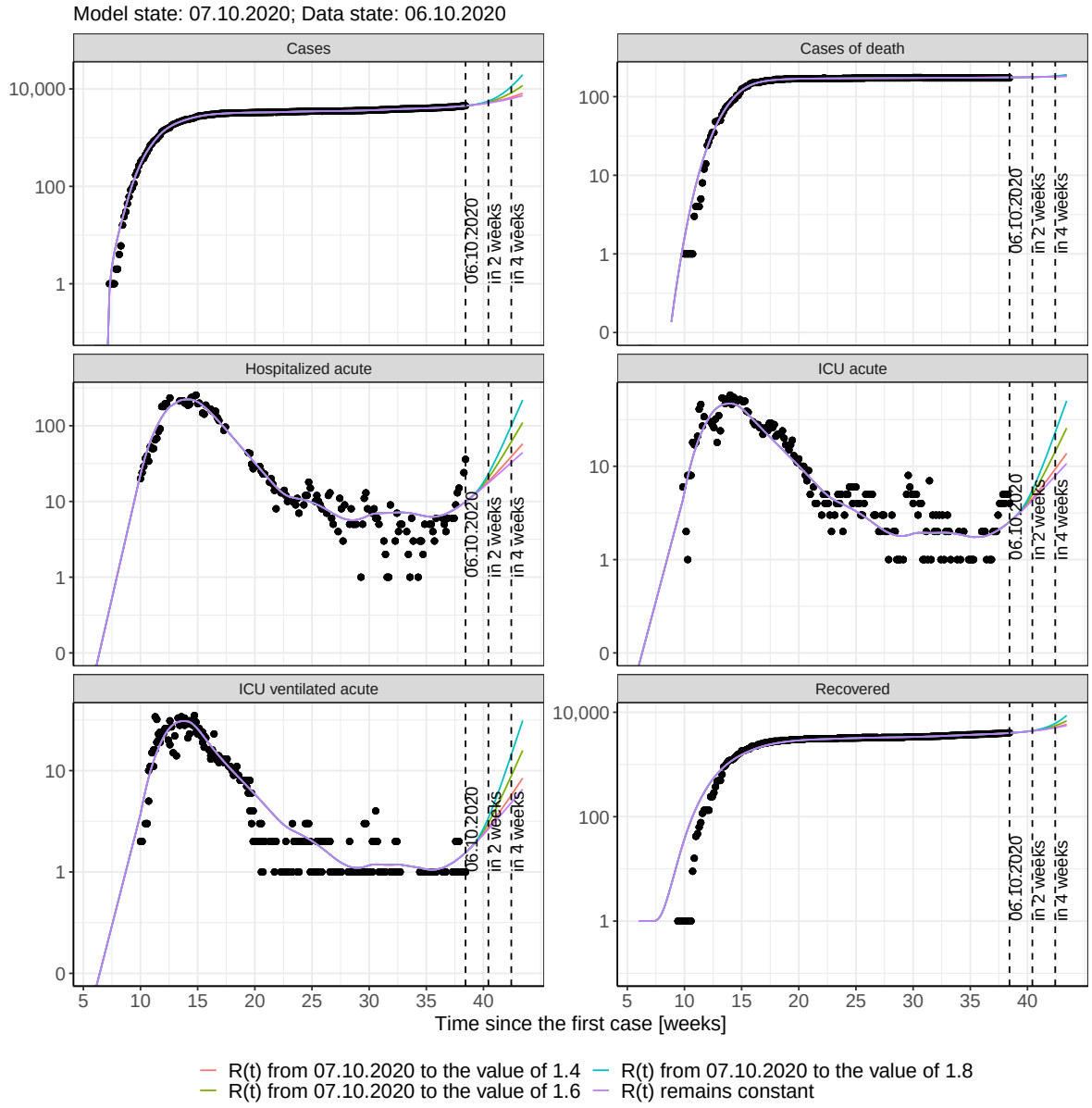


Figure 51: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

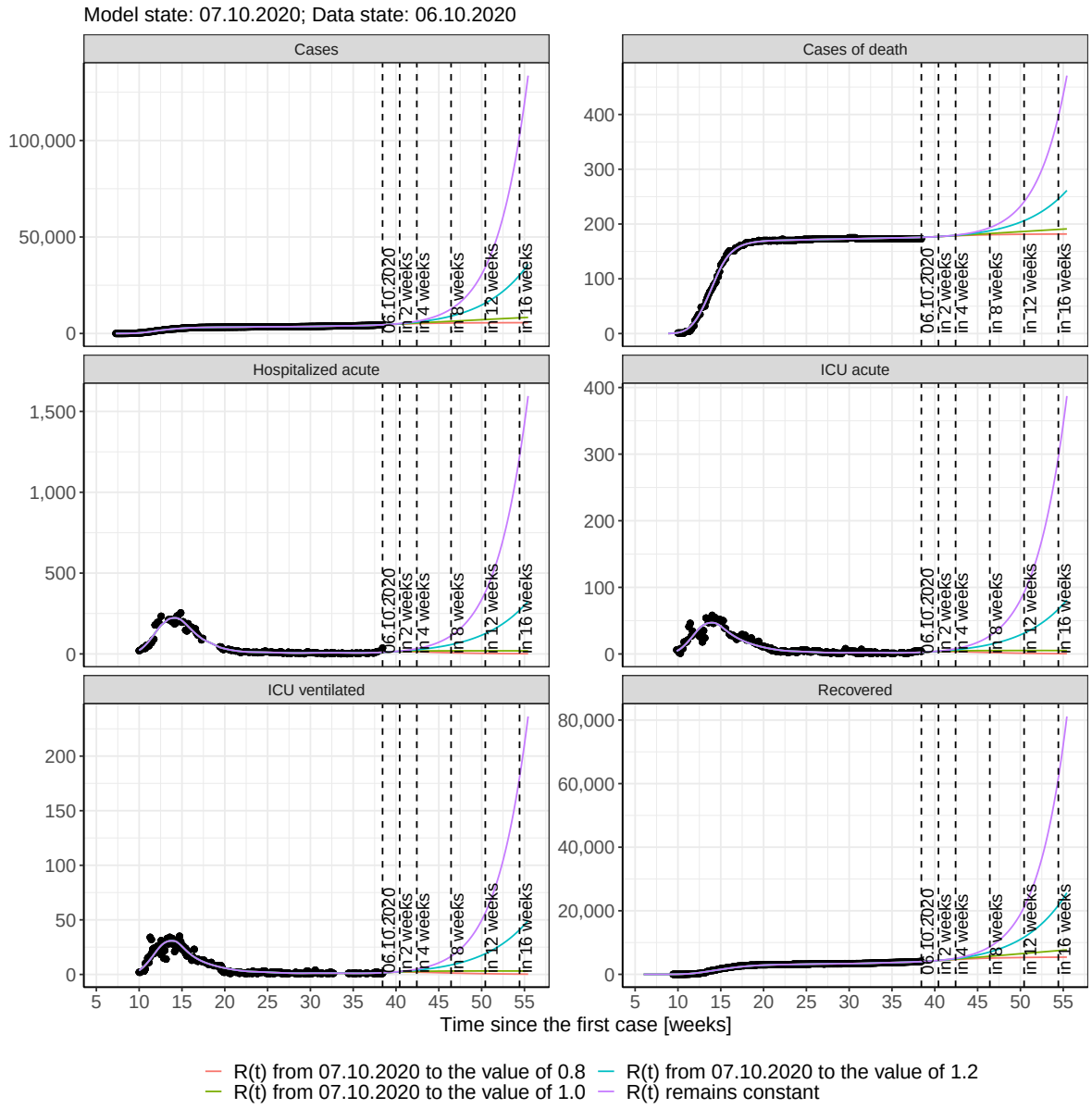


Figure 52: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

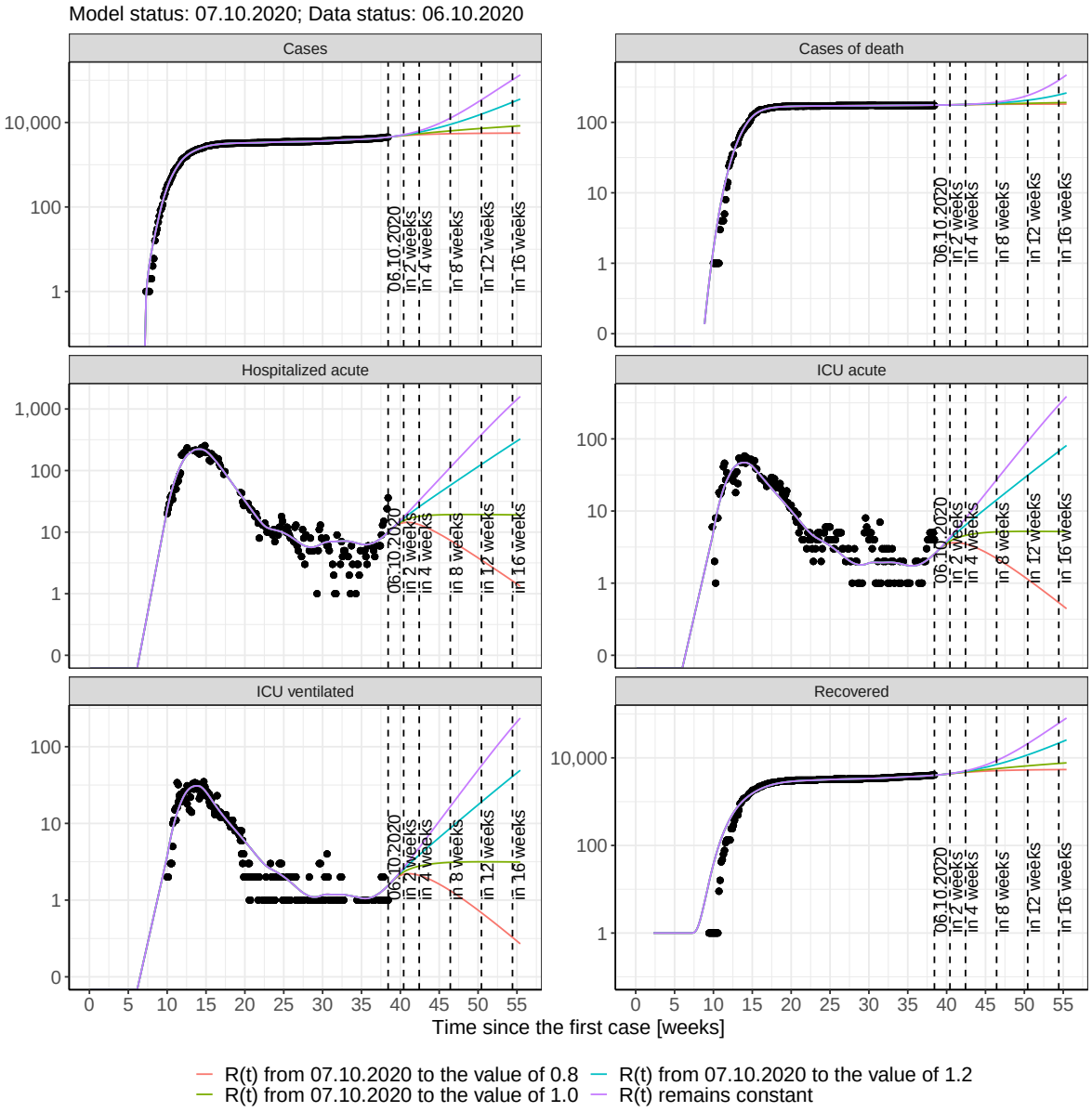


Figure 53: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Brandenburg assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 14); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 15); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 16); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 17) Model status from 07.10.2020; Data status: 06.10.2020.

Table 14: Brandenburg - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4536	176	4025	10	3	2
08.10.2020	4571	176	4046	11	3	2
09.10.2020	4608	176	4067	11	3	2
10.10.2020	4647	176	4089	12	3	2
11.10.2020	4687	176	4112	12	3	2
12.10.2020	4729	176	4136	13	3	2
13.10.2020	4773	176	4162	13	3	2
14.10.2020	4819	176	4188	14	3	2
15.10.2020	4867	177	4215	14	4	2
16.10.2020	4918	177	4244	15	4	2
17.10.2020	4970	177	4274	15	4	2
18.10.2020	5026	177	4306	16	4	2
19.10.2020	5083	177	4338	17	4	3
20.10.2020	5144	177	4373	18	4	3
21.10.2020	5206	177	4409	18	5	3
22.10.2020	5272	177	4446	19	5	3
23.10.2020	5341	178	4485	20	5	3
24.10.2020	5413	178	4526	21	5	3
25.10.2020	5488	178	4569	22	5	3
26.10.2020	5567	178	4614	23	6	3
27.10.2020	5649	178	4661	24	6	4
28.10.2020	5735	178	4710	25	6	4
29.10.2020	5825	179	4761	26	6	4
30.10.2020	5919	179	4814	27	7	4
31.10.2020	6018	179	4870	28	7	4
01.11.2020	6120	179	4929	30	7	4
02.11.2020	6228	179	4990	31	8	5
03.11.2020	6340	180	5054	33	8	5

Table 15: Brandenburg - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4535	176	4025	10	3	2
08.10.2020	4566	176	4046	11	3	2
09.10.2020	4597	176	4067	11	3	2
10.10.2020	4627	176	4089	12	3	2
11.10.2020	4656	176	4111	12	3	2
12.10.2020	4684	176	4134	12	3	2
13.10.2020	4711	176	4158	13	3	2
14.10.2020	4738	176	4182	13	3	2
15.10.2020	4764	176	4207	13	3	2
16.10.2020	4789	177	4232	14	3	2
17.10.2020	4813	177	4257	14	3	2
18.10.2020	4837	177	4282	14	3	2
19.10.2020	4860	177	4308	14	4	2
20.10.2020	4882	177	4333	14	4	2
21.10.2020	4904	177	4359	14	4	2
22.10.2020	4925	177	4384	14	4	2
23.10.2020	4945	177	4409	14	4	2
24.10.2020	4965	177	4434	14	4	2
25.10.2020	4985	178	4459	14	4	2
26.10.2020	5003	178	4483	14	4	2
27.10.2020	5022	178	4507	14	4	2
28.10.2020	5039	178	4531	14	4	2
29.10.2020	5057	178	4555	14	4	2
30.10.2020	5073	178	4578	14	4	2
31.10.2020	5090	178	4600	14	4	2
01.11.2020	5106	178	4623	14	4	2
02.11.2020	5121	178	4644	13	4	2
03.11.2020	5136	178	4666	13	3	2

Table 16: Brandenburg - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4535	176	4025	10	3	2
08.10.2020	4568	176	4046	11	3	2
09.10.2020	4601	176	4067	11	3	2
10.10.2020	4634	176	4089	12	3	2
11.10.2020	4667	176	4112	12	3	2
12.10.2020	4700	176	4135	12	3	2
13.10.2020	4733	176	4159	13	3	2
14.10.2020	4766	176	4184	13	3	2
15.10.2020	4798	176	4210	14	3	2
16.10.2020	4831	177	4236	14	3	2
17.10.2020	4864	177	4263	14	4	2
18.10.2020	4897	177	4290	15	4	2
19.10.2020	4930	177	4318	15	4	2
20.10.2020	4963	177	4346	15	4	2
21.10.2020	4996	177	4375	16	4	2
22.10.2020	5028	177	4404	16	4	2
23.10.2020	5061	177	4434	16	4	2
24.10.2020	5094	178	4463	16	4	2
25.10.2020	5127	178	4493	17	4	3
26.10.2020	5160	178	4524	17	4	3
27.10.2020	5192	178	4554	17	4	3
28.10.2020	5225	178	4585	17	4	3
29.10.2020	5258	178	4616	17	4	3
30.10.2020	5291	178	4647	18	4	3
31.10.2020	5324	178	4678	18	4	3
01.11.2020	5356	179	4709	18	5	3
02.11.2020	5389	179	4740	18	5	3
03.11.2020	5422	179	4772	18	5	3

Table 17: Brandenburg - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4536	176	4025	10	3	2
08.10.2020	4570	176	4046	11	3	2
09.10.2020	4605	176	4067	11	3	2
10.10.2020	4642	176	4089	12	3	2
11.10.2020	4679	176	4112	12	3	2
12.10.2020	4718	176	4136	13	3	2
13.10.2020	4757	176	4161	13	3	2
14.10.2020	4798	176	4187	13	3	2
15.10.2020	4840	176	4213	14	3	2
16.10.2020	4883	177	4241	15	4	2
17.10.2020	4928	177	4270	15	4	2
18.10.2020	4973	177	4300	16	4	2
19.10.2020	5020	177	4330	16	4	2
20.10.2020	5068	177	4362	17	4	3
21.10.2020	5118	177	4395	17	4	3
22.10.2020	5169	177	4429	18	4	3
23.10.2020	5222	177	4464	18	5	3
24.10.2020	5276	178	4500	19	5	3
25.10.2020	5331	178	4538	20	5	3
26.10.2020	5388	178	4576	20	5	3
27.10.2020	5447	178	4616	21	5	3
28.10.2020	5508	178	4657	22	5	3
29.10.2020	5570	178	4699	22	5	3
30.10.2020	5634	179	4742	23	6	3
31.10.2020	5700	179	4787	24	6	4
01.11.2020	5768	179	4833	24	6	4
02.11.2020	5837	179	4880	25	6	4
03.11.2020	5909	179	4929	26	6	4

5.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

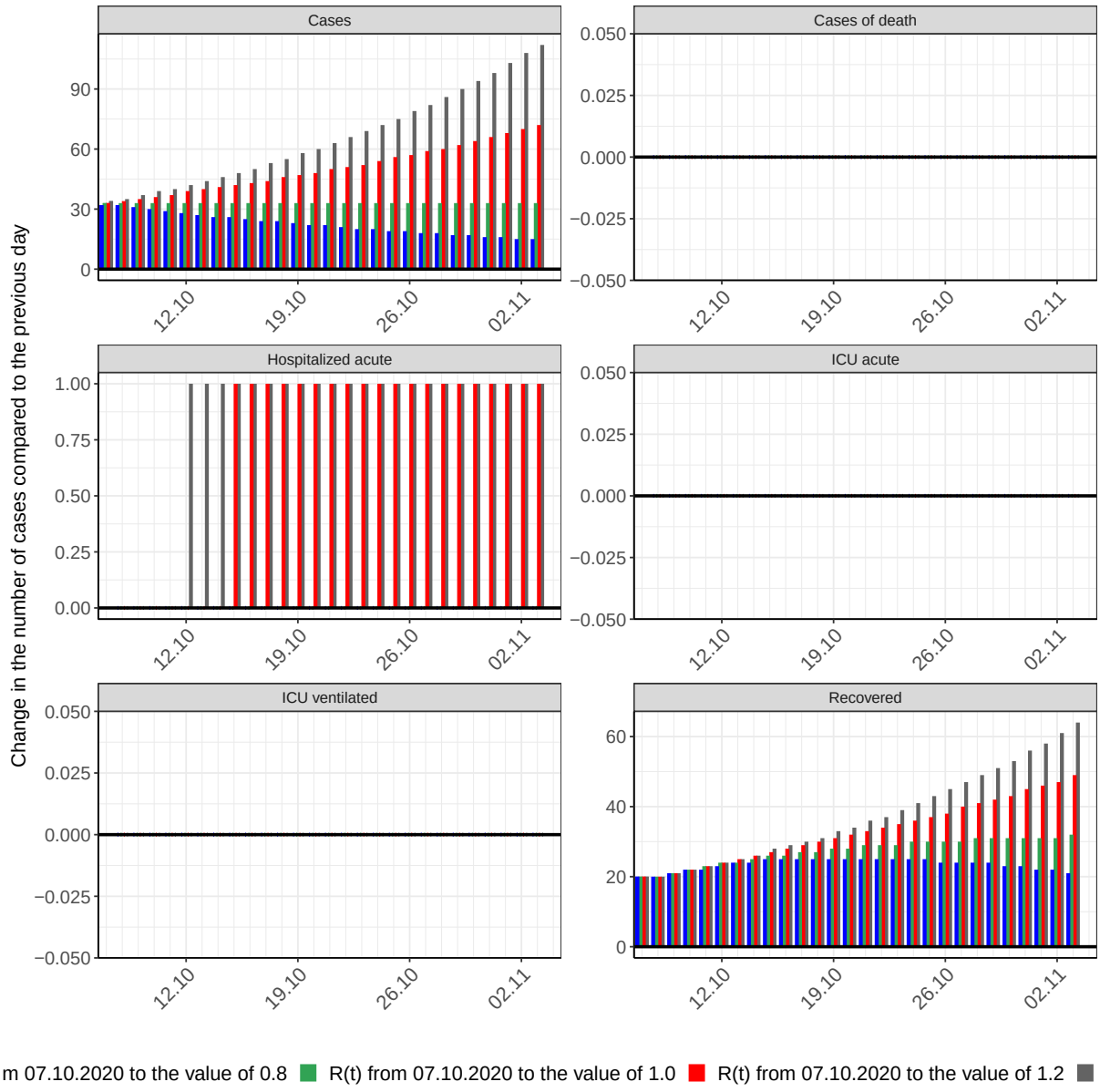


Figure 54: Simulation of daily new cases for the next 4 weeks - Brandenburg

6 Bremen

6.1 Model description

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

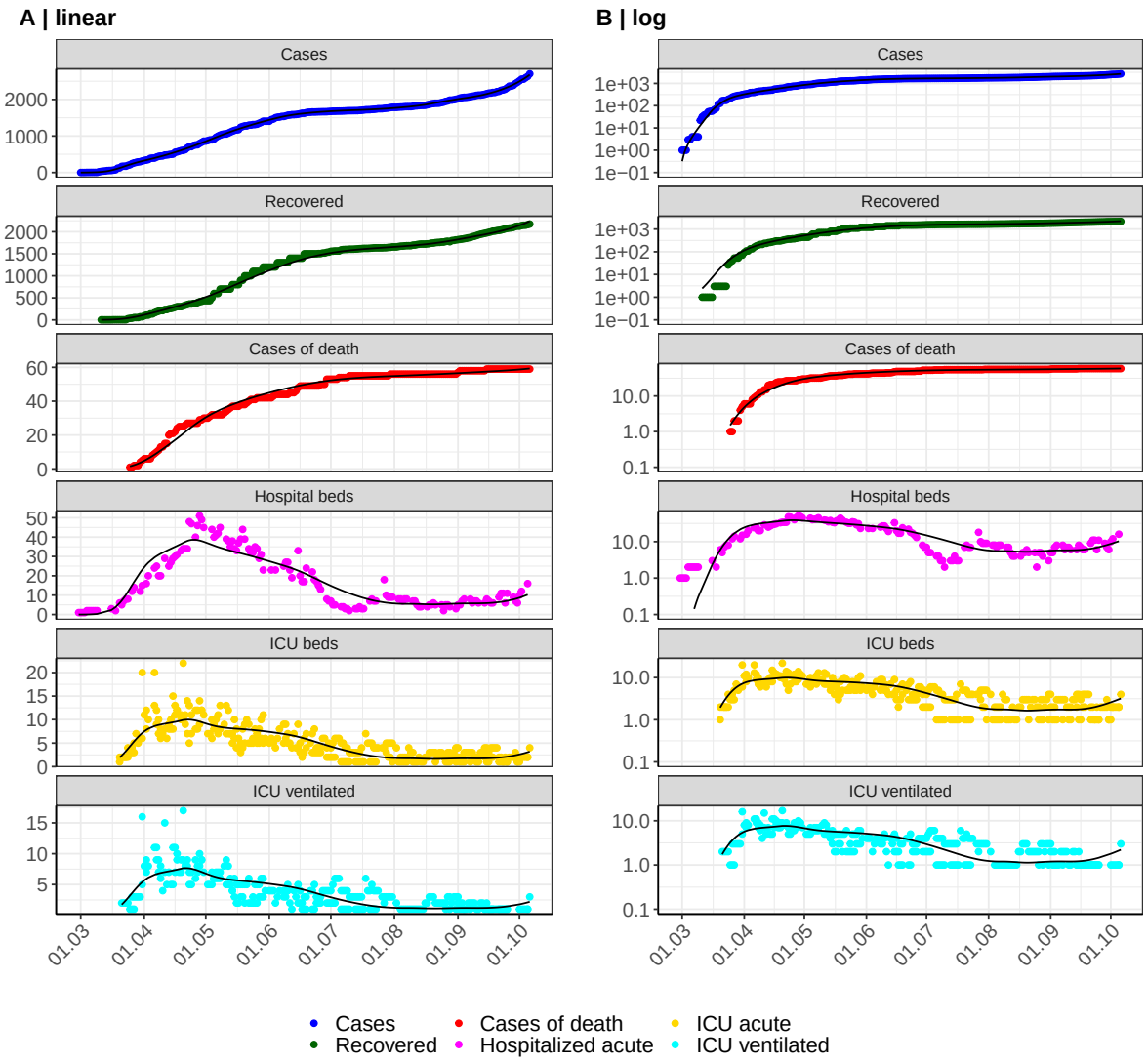


Figure 55: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Bremen. Points: reported data; lines: model description.

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

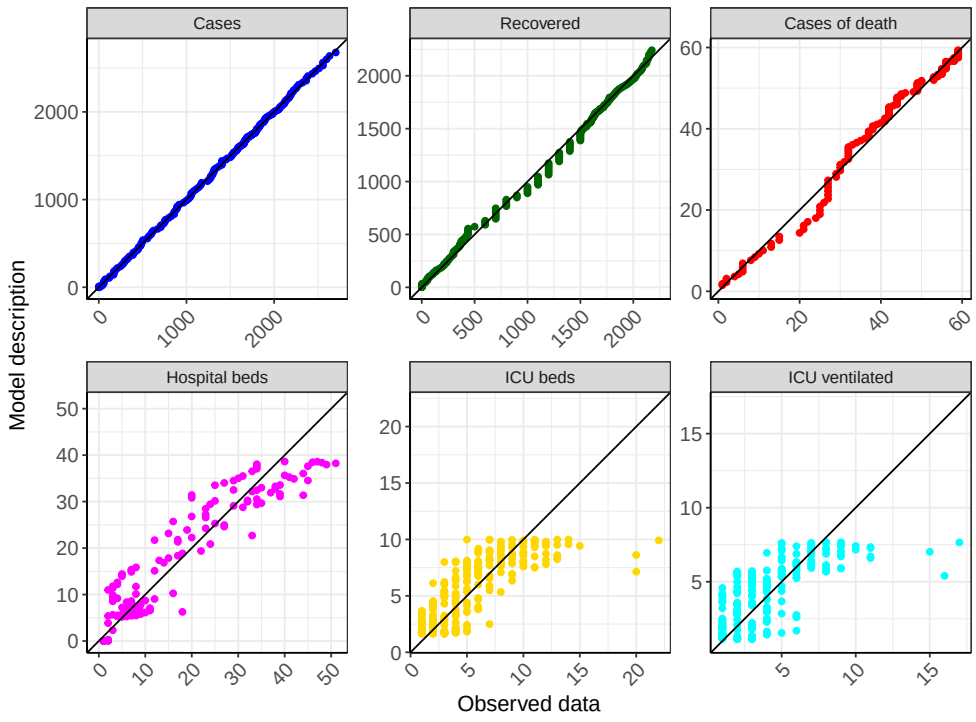


Figure 56: Goodness-of-fit plots for Bremen. Lines: lines of identity.

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

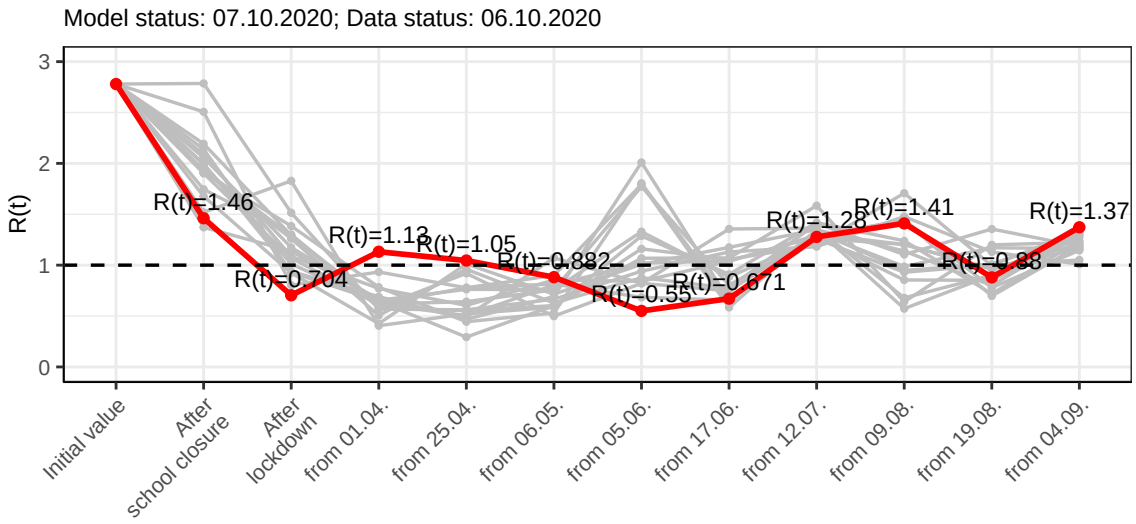


Figure 57: R(t) values before and after the NPIs for Bremen

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

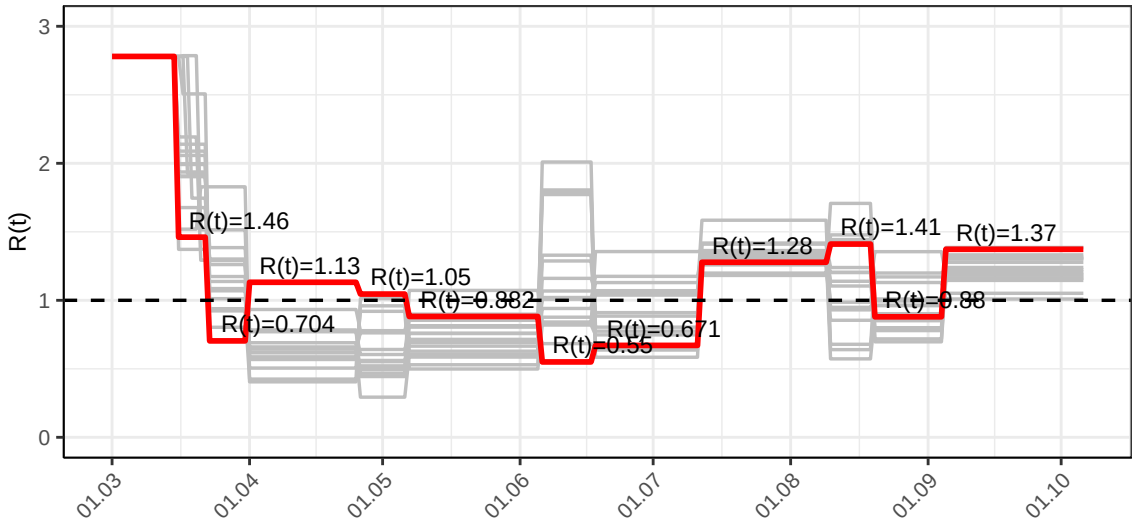


Figure 58: R(t) values over time for Bremen

6.2 Model predictions

6.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.37)

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.

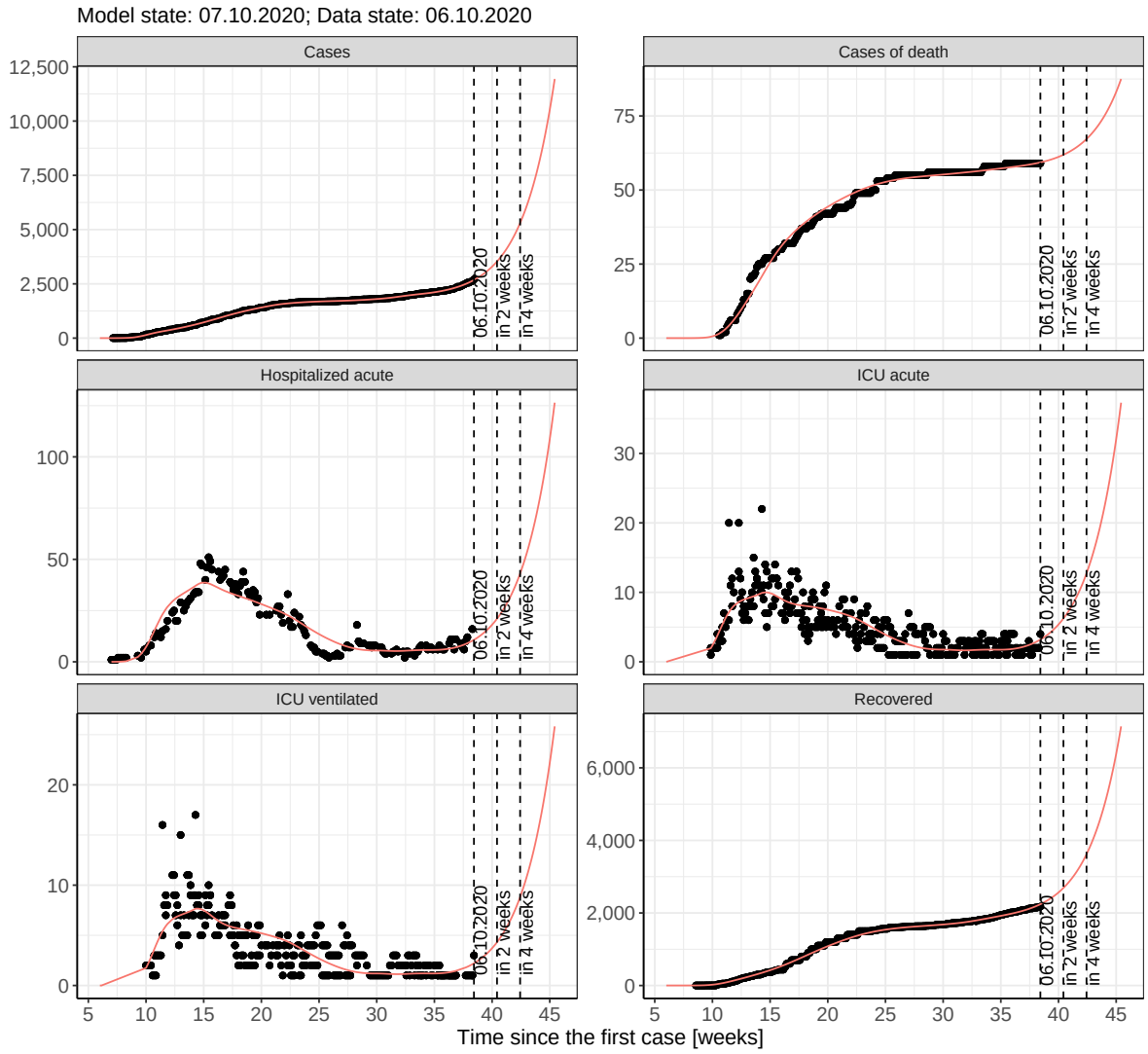


Figure 59: Representation of the model predictions for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

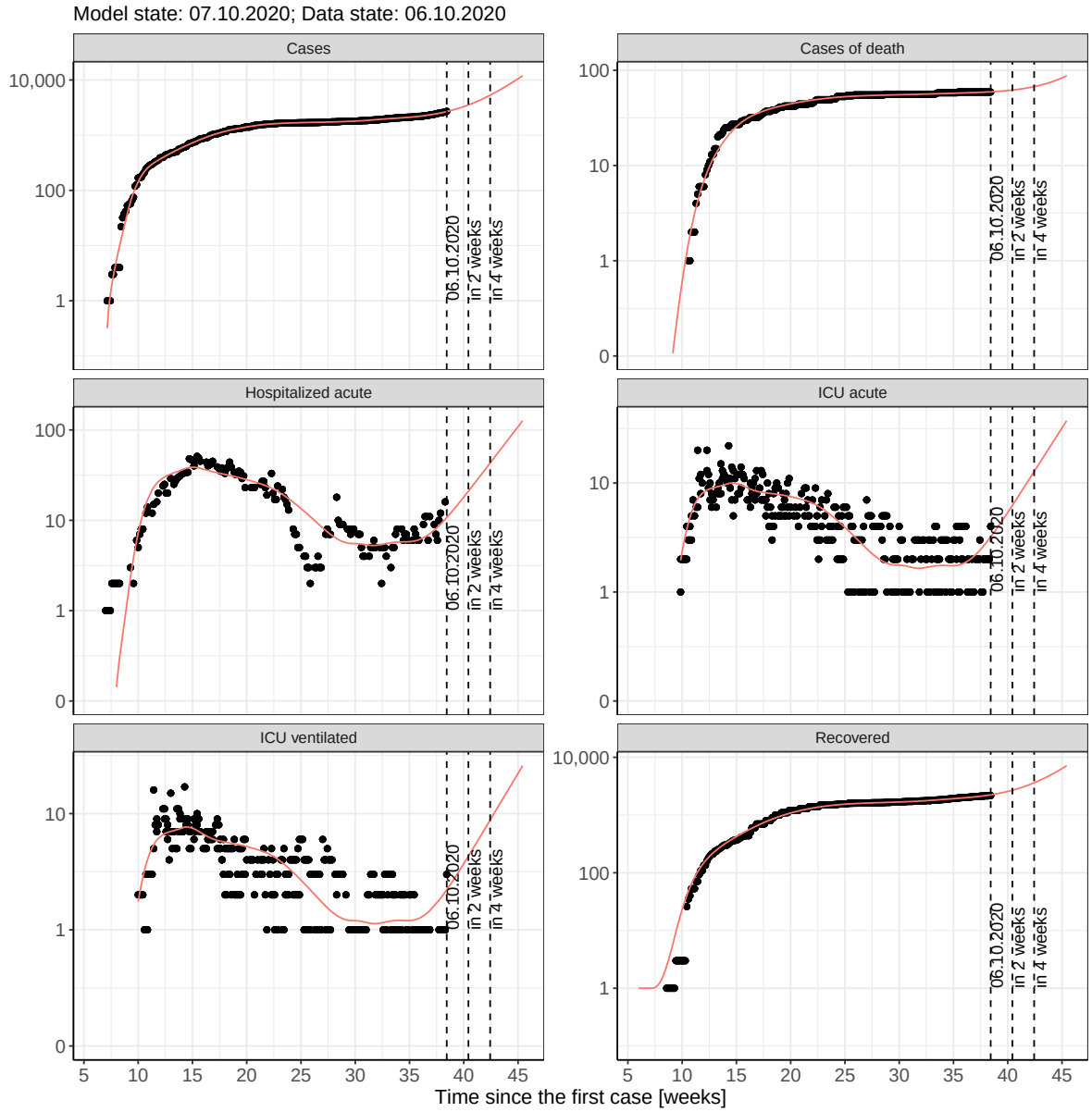


Figure 60: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

6.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

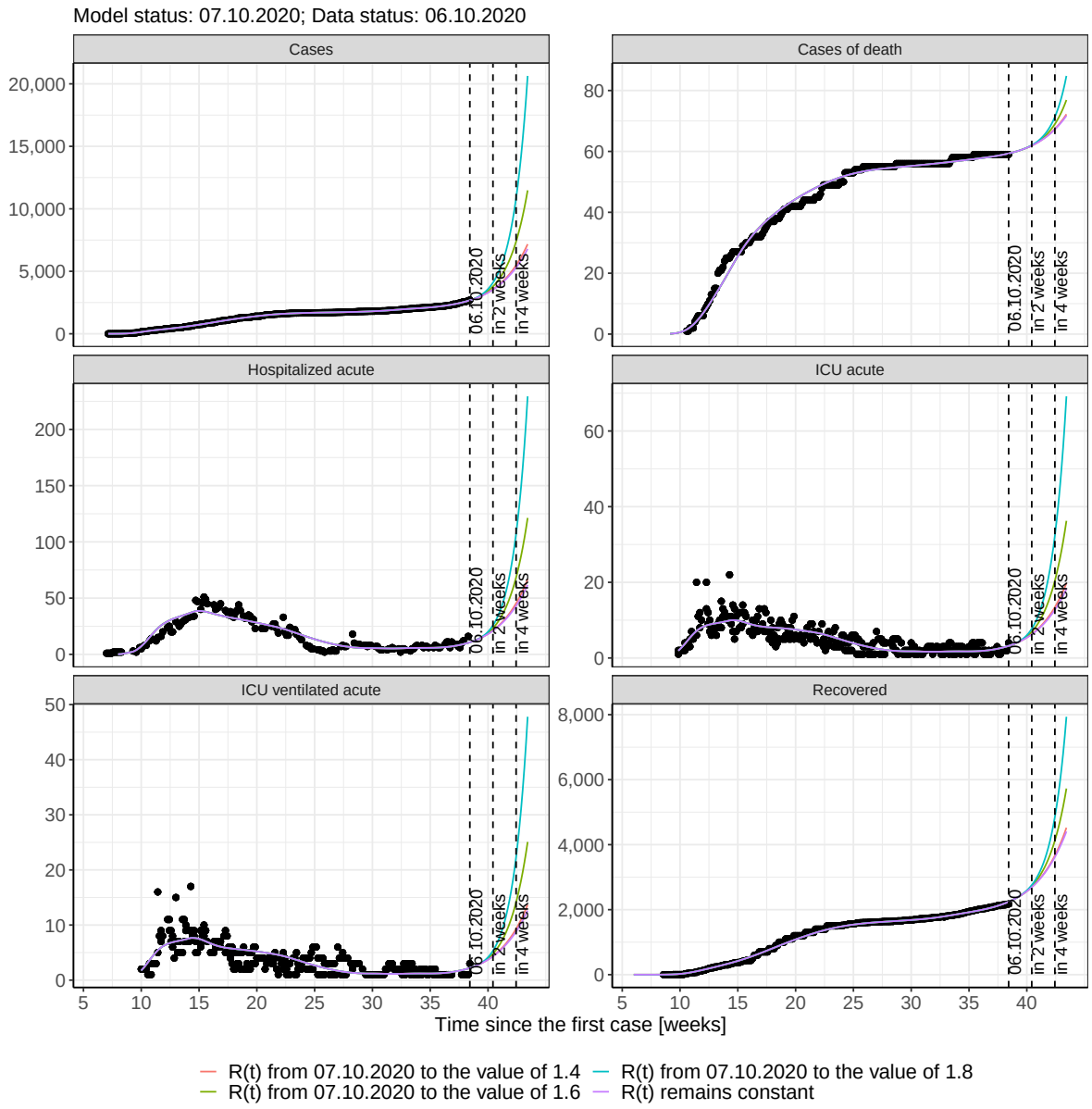


Figure 61: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

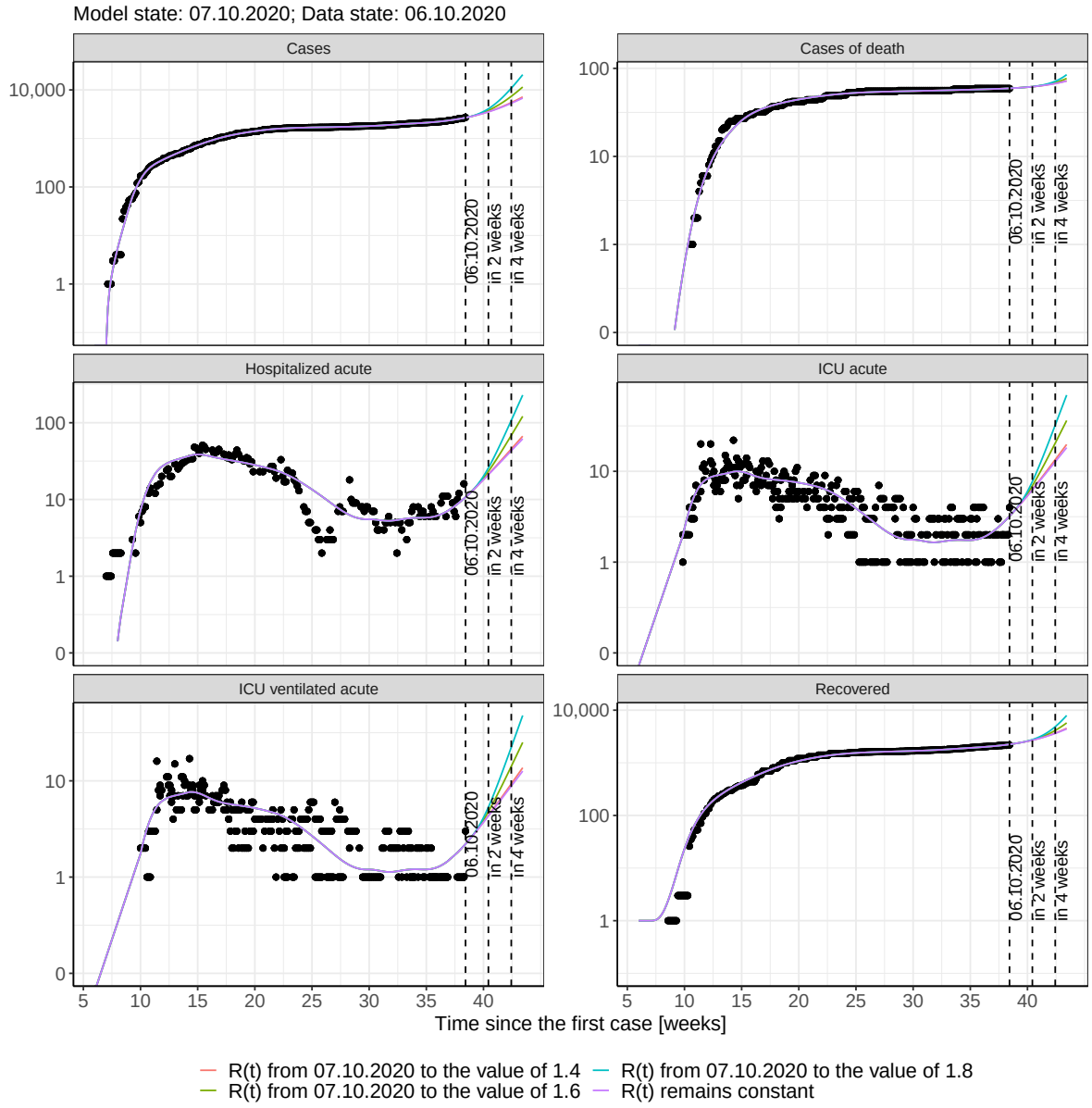


Figure 62: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

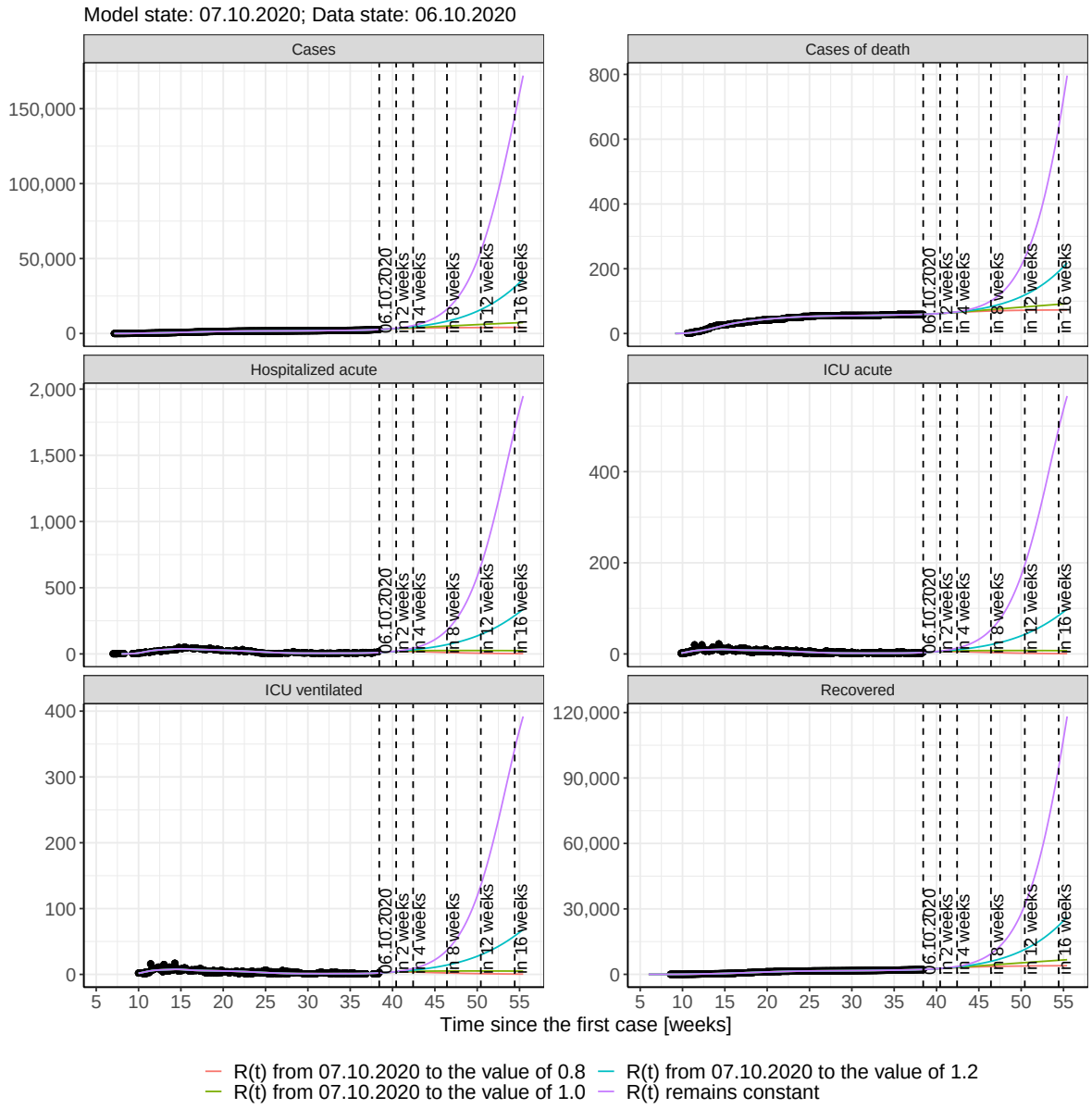


Figure 63: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

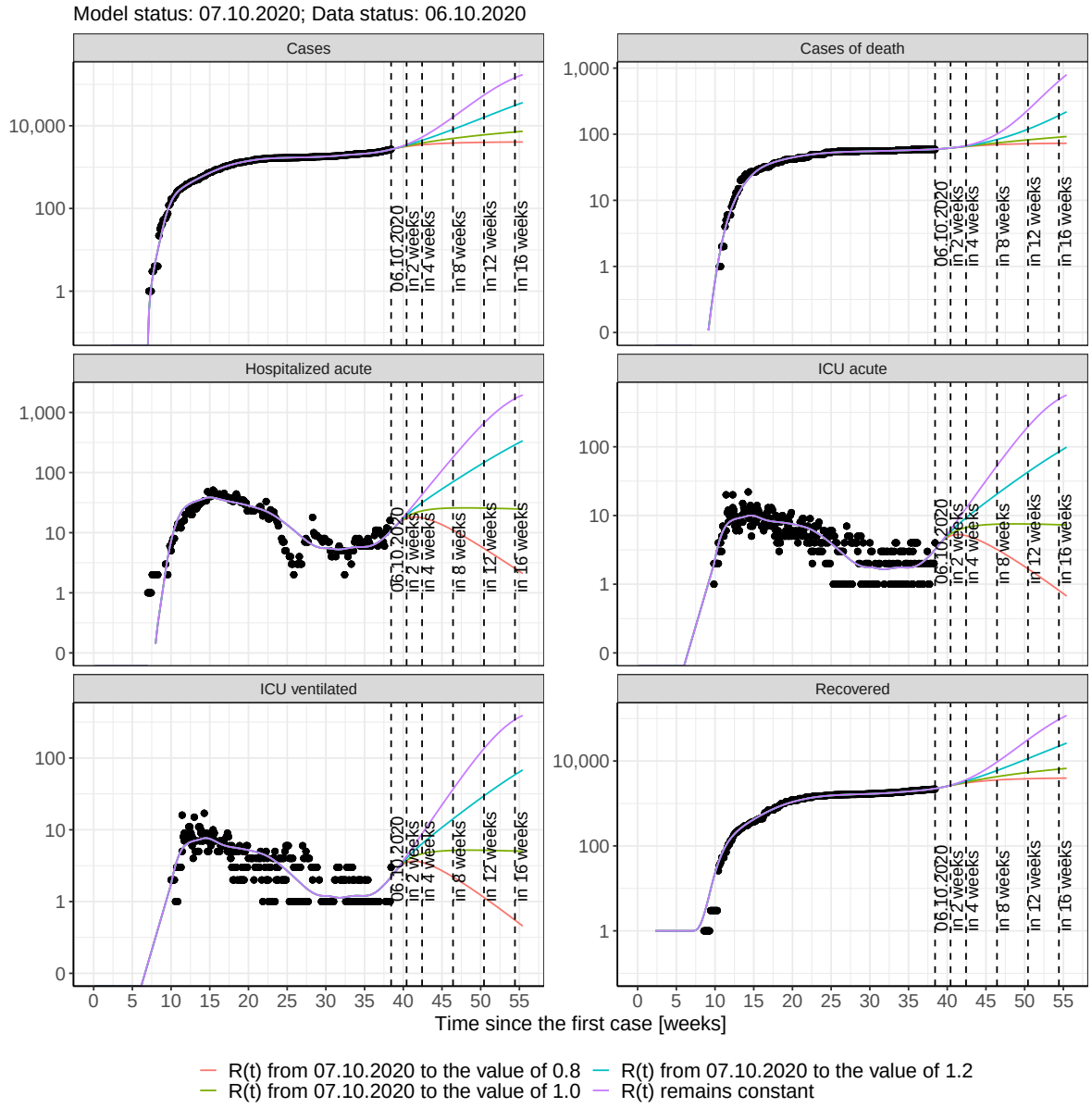


Figure 64: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Bremen assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 18); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 19); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 20); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 21) Model status from 07.10.2020; Data status: 06.10.2020.

Table 18: Bremen - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2720	59	2264	11	3	2
08.10.2020	2765	60	2287	12	3	2
09.10.2020	2812	60	2312	12	4	3
10.10.2020	2862	60	2338	13	4	3
11.10.2020	2914	60	2366	13	4	3
12.10.2020	2970	60	2395	14	4	3
13.10.2020	3028	60	2425	15	4	3
14.10.2020	3089	61	2458	16	5	3
15.10.2020	3154	61	2492	16	5	3
16.10.2020	3222	61	2527	17	5	4
17.10.2020	3293	61	2565	18	5	4
18.10.2020	3369	61	2604	19	6	4
19.10.2020	3448	62	2646	20	6	4
20.10.2020	3532	62	2690	21	6	4
21.10.2020	3620	62	2736	22	7	5
22.10.2020	3713	62	2785	23	7	5
23.10.2020	3811	63	2836	24	7	5
24.10.2020	3914	63	2890	26	8	5
25.10.2020	4023	63	2947	27	8	6
26.10.2020	4137	64	3007	29	8	6
27.10.2020	4258	64	3070	30	9	6
28.10.2020	4384	64	3137	32	9	6
29.10.2020	4518	65	3207	33	10	7
30.10.2020	4659	65	3281	35	10	7
31.10.2020	4807	66	3359	37	11	8
01.11.2020	4963	66	3441	39	11	8
02.11.2020	5127	67	3527	41	12	8
03.11.2020	5300	67	3618	43	13	9

Table 19: Bremen - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2719	59	2264	11	3	2
08.10.2020	2758	60	2287	12	3	2
09.10.2020	2797	60	2312	12	4	3
10.10.2020	2834	60	2338	13	4	3
11.10.2020	2870	60	2364	13	4	3
12.10.2020	2906	60	2392	14	4	3
13.10.2020	2940	60	2421	14	4	3
14.10.2020	2973	61	2450	15	4	3
15.10.2020	3006	61	2480	15	5	3
16.10.2020	3037	61	2510	16	5	3
17.10.2020	3067	61	2540	16	5	3
18.10.2020	3097	61	2571	17	5	3
19.10.2020	3126	62	2602	17	5	3
20.10.2020	3154	62	2633	17	5	4
21.10.2020	3181	62	2664	17	5	4
22.10.2020	3207	62	2696	18	5	4
23.10.2020	3233	62	2726	18	5	4
24.10.2020	3258	63	2757	18	5	4
25.10.2020	3282	63	2787	18	5	4
26.10.2020	3305	63	2818	18	5	4
27.10.2020	3328	63	2847	18	5	4
28.10.2020	3350	64	2877	18	5	4
29.10.2020	3372	64	2906	18	5	4
30.10.2020	3392	64	2934	18	5	4
31.10.2020	3413	64	2962	18	5	4
01.11.2020	3432	65	2990	18	5	4
02.11.2020	3452	65	3016	18	5	4
03.11.2020	3470	65	3043	18	5	4

Table 20: Bremen - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2719	59	2264	11	3	2
08.10.2020	2761	60	2287	12	3	2
09.10.2020	2802	60	2312	12	4	3
10.10.2020	2843	60	2338	13	4	3
11.10.2020	2884	60	2365	13	4	3
12.10.2020	2926	60	2393	14	4	3
13.10.2020	2967	60	2422	15	4	3
14.10.2020	3008	61	2452	15	4	3
15.10.2020	3049	61	2483	16	5	3
16.10.2020	3090	61	2515	16	5	3
17.10.2020	3131	61	2548	17	5	3
18.10.2020	3172	61	2581	17	5	4
19.10.2020	3214	62	2615	18	5	4
20.10.2020	3254	62	2650	18	5	4
21.10.2020	3296	62	2685	19	6	4
22.10.2020	3336	62	2721	19	6	4
23.10.2020	3377	63	2757	20	6	4
24.10.2020	3418	63	2794	20	6	4
25.10.2020	3459	63	2831	20	6	4
26.10.2020	3500	63	2868	21	6	4
27.10.2020	3541	64	2906	21	6	4
28.10.2020	3581	64	2944	21	6	4
29.10.2020	3622	64	2982	22	6	4
30.10.2020	3663	64	3020	22	6	4
31.10.2020	3703	65	3059	22	6	4
01.11.2020	3744	65	3097	23	7	5
02.11.2020	3785	65	3136	23	7	5
03.11.2020	3825	66	3175	23	7	5

Table 21: Bremen - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2720	59	2264	11	3	2
08.10.2020	2763	60	2287	12	3	2
09.10.2020	2807	60	2312	12	4	3
10.10.2020	2853	60	2338	13	4	3
11.10.2020	2900	60	2366	13	4	3
12.10.2020	2948	60	2394	14	4	3
13.10.2020	2998	60	2424	15	4	3
14.10.2020	3049	61	2455	15	5	3
15.10.2020	3101	61	2488	16	5	3
16.10.2020	3155	61	2521	17	5	3
17.10.2020	3210	61	2556	17	5	4
18.10.2020	3267	61	2593	18	5	4
19.10.2020	3326	62	2630	19	6	4
20.10.2020	3386	62	2670	20	6	4
21.10.2020	3448	62	2710	20	6	4
22.10.2020	3511	62	2752	21	6	4
23.10.2020	3577	63	2795	22	6	4
24.10.2020	3644	63	2840	23	7	5
25.10.2020	3713	63	2886	24	7	5
26.10.2020	3784	64	2934	24	7	5
27.10.2020	3857	64	2983	25	7	5
28.10.2020	3932	64	3033	26	8	5
29.10.2020	4009	64	3086	27	8	5
30.10.2020	4088	65	3139	28	8	6
31.10.2020	4170	65	3195	29	8	6
01.11.2020	4254	66	3252	30	9	6
02.11.2020	4340	66	3310	31	9	6
03.11.2020	4428	66	3371	32	9	6

6.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

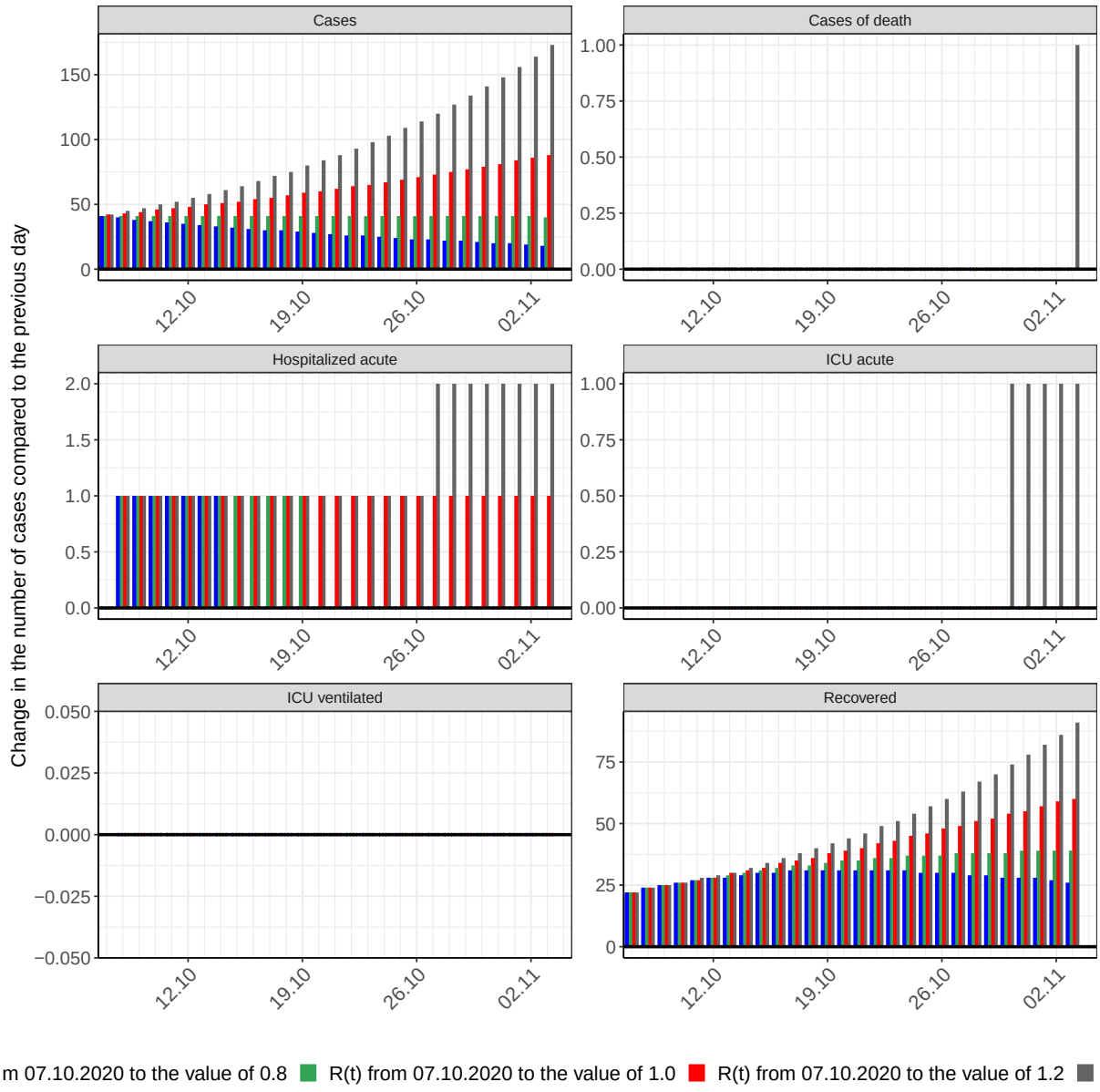


Figure 65: Simulation of daily new cases for the next 4 weeks - Bremen

7 Hamburg

7.1 Model description

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

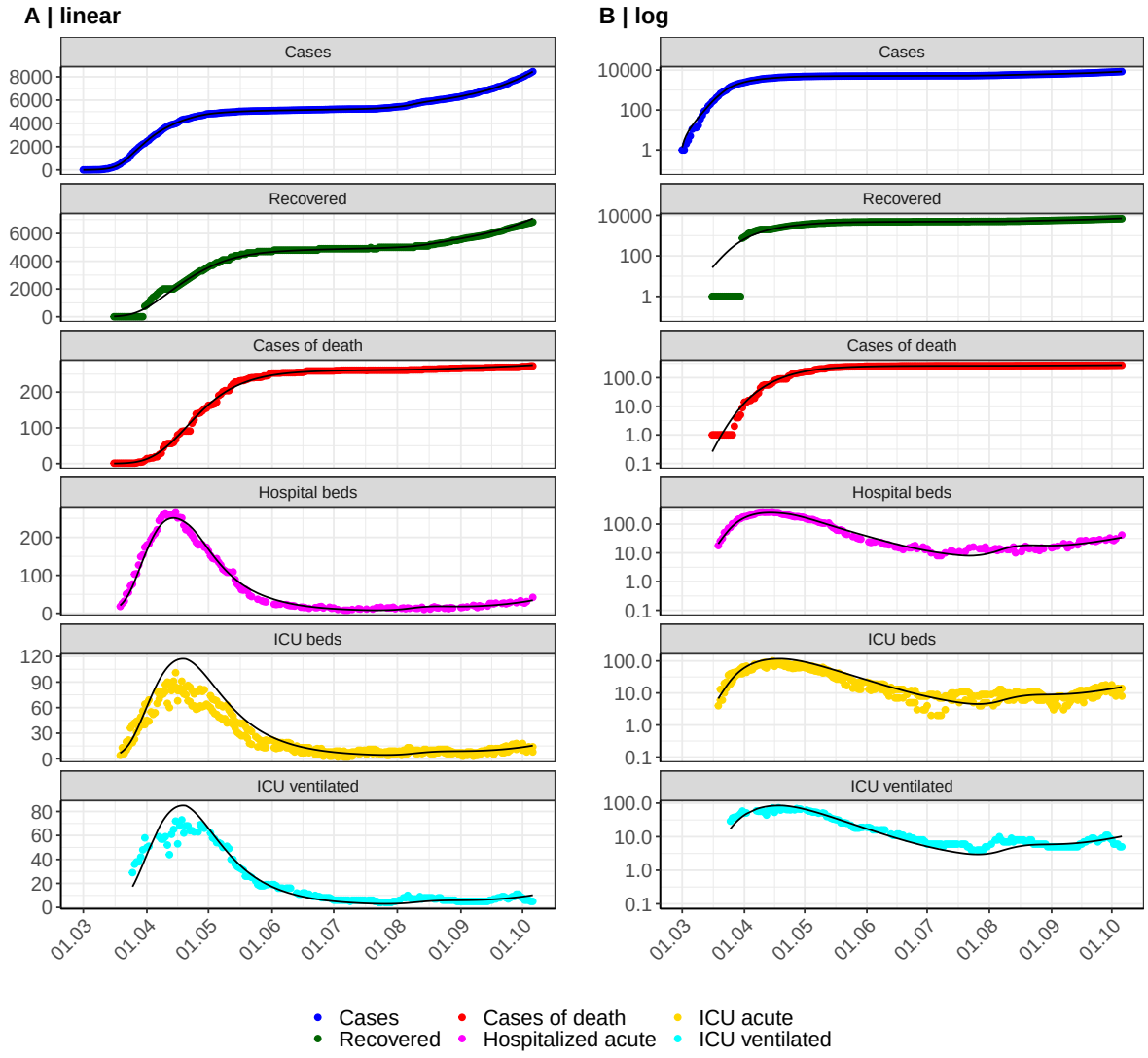


Figure 66: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hamburg. Points: reported data; lines: model description.

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

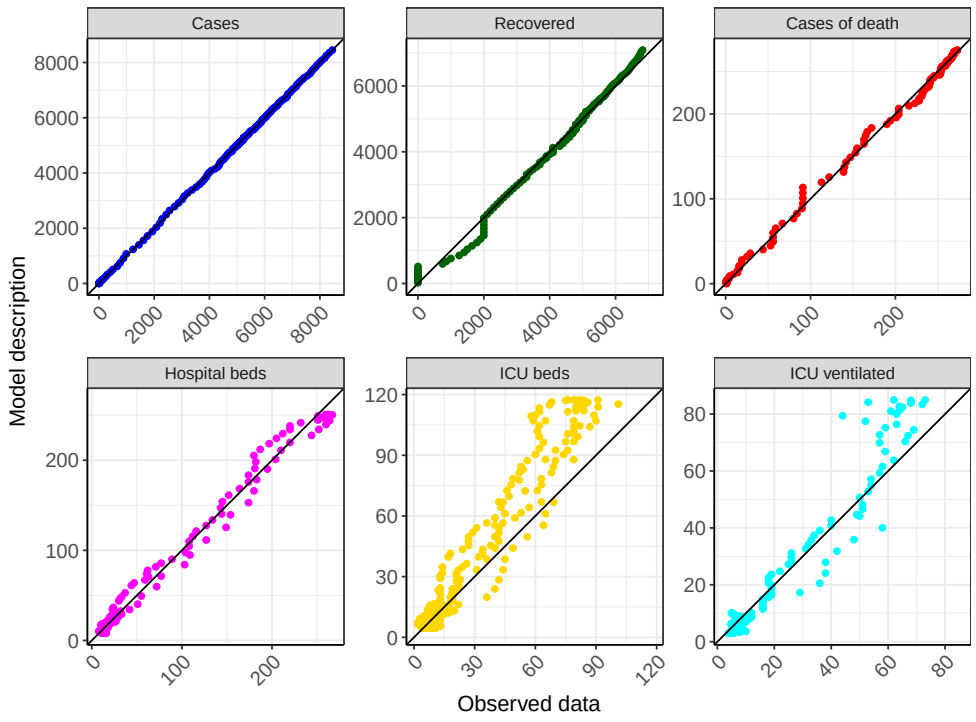


Figure 67: Goodness-of-fit plots for Hamburg. Lines: lines of identity.

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

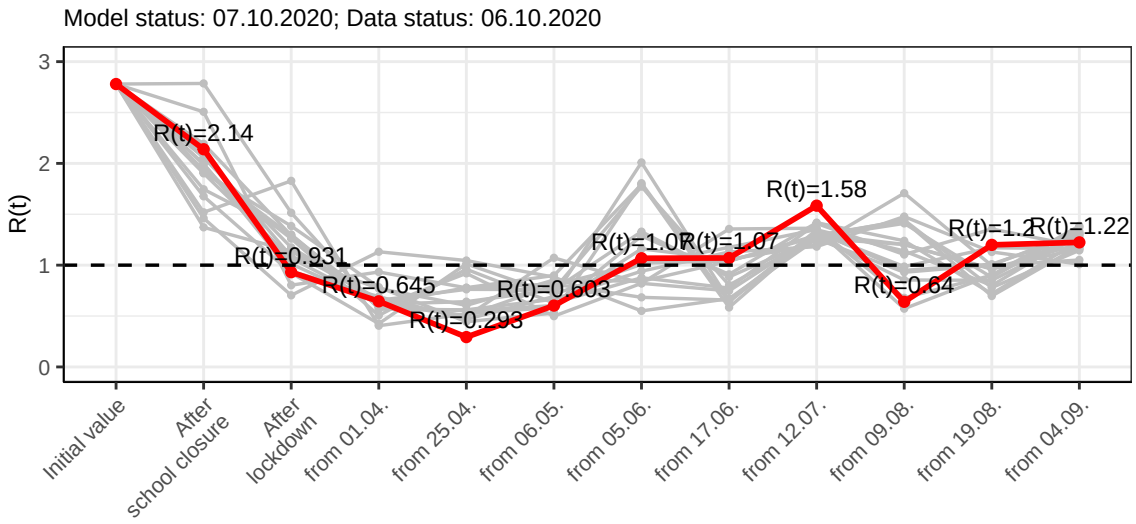


Figure 68: R(t) values before and after the NPIs for Hamburg

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

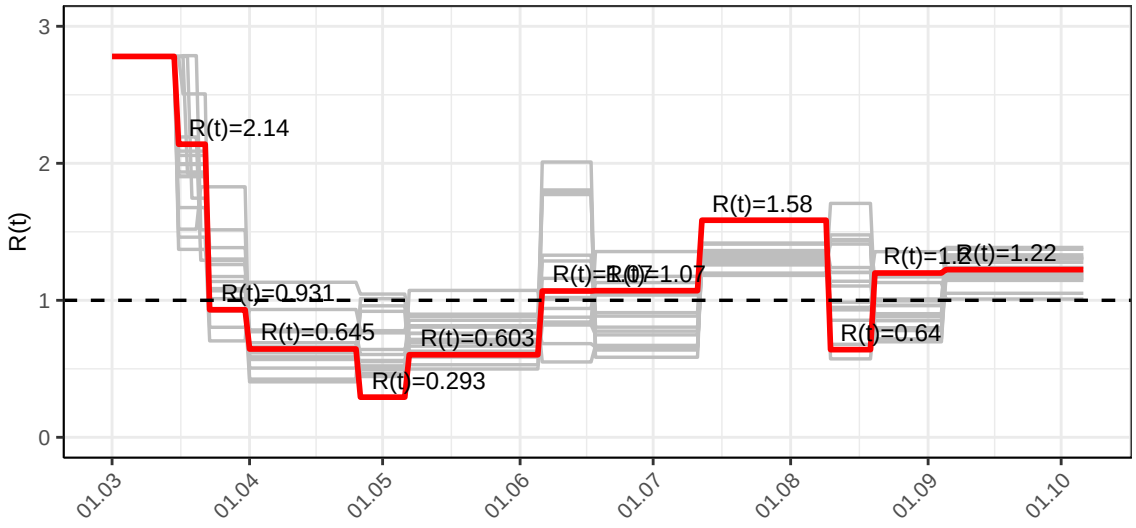


Figure 69: R(t) values over time for Hamburg

7.2 Model predictions

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

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.

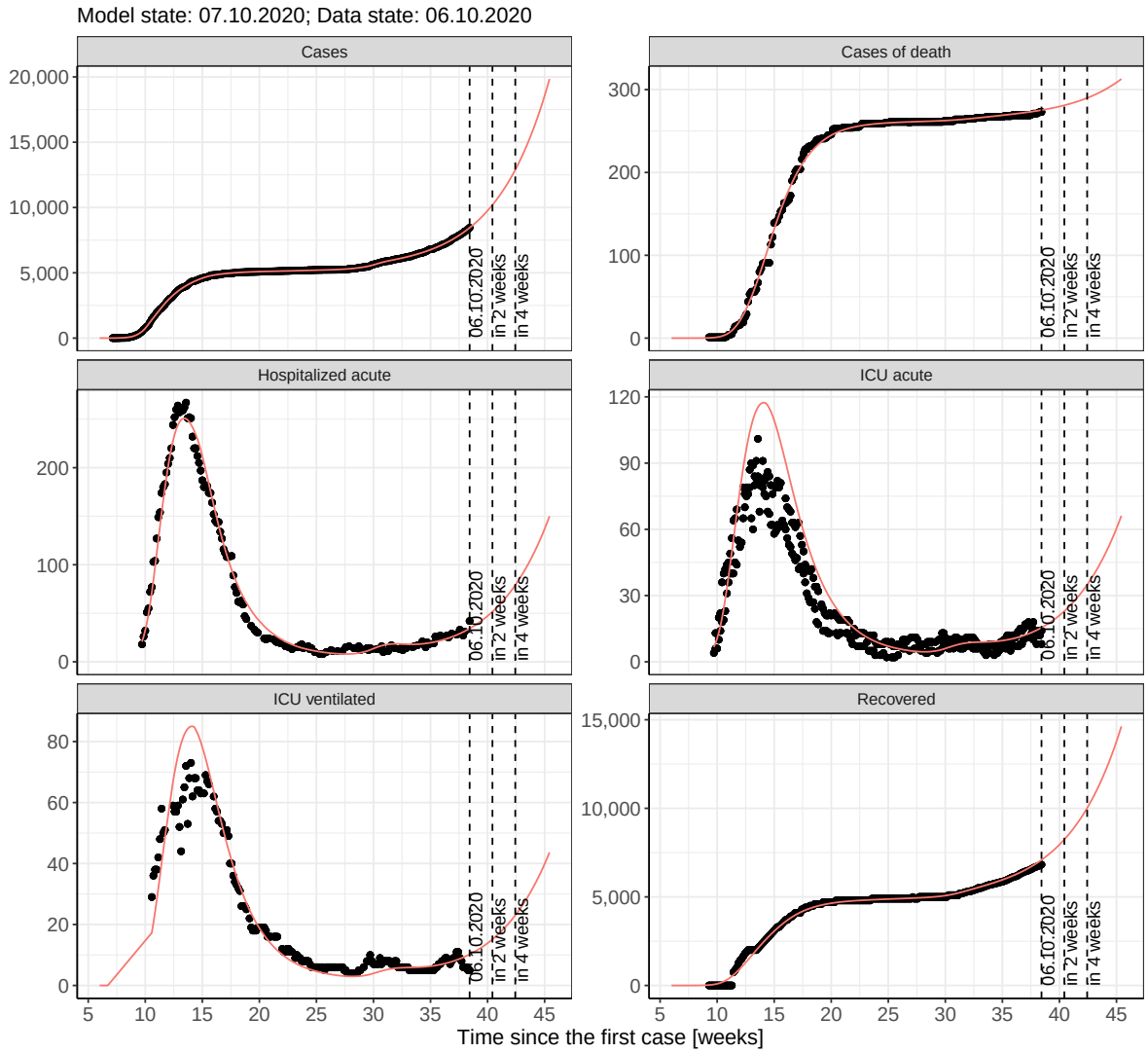


Figure 70: Representation of the model predictions for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

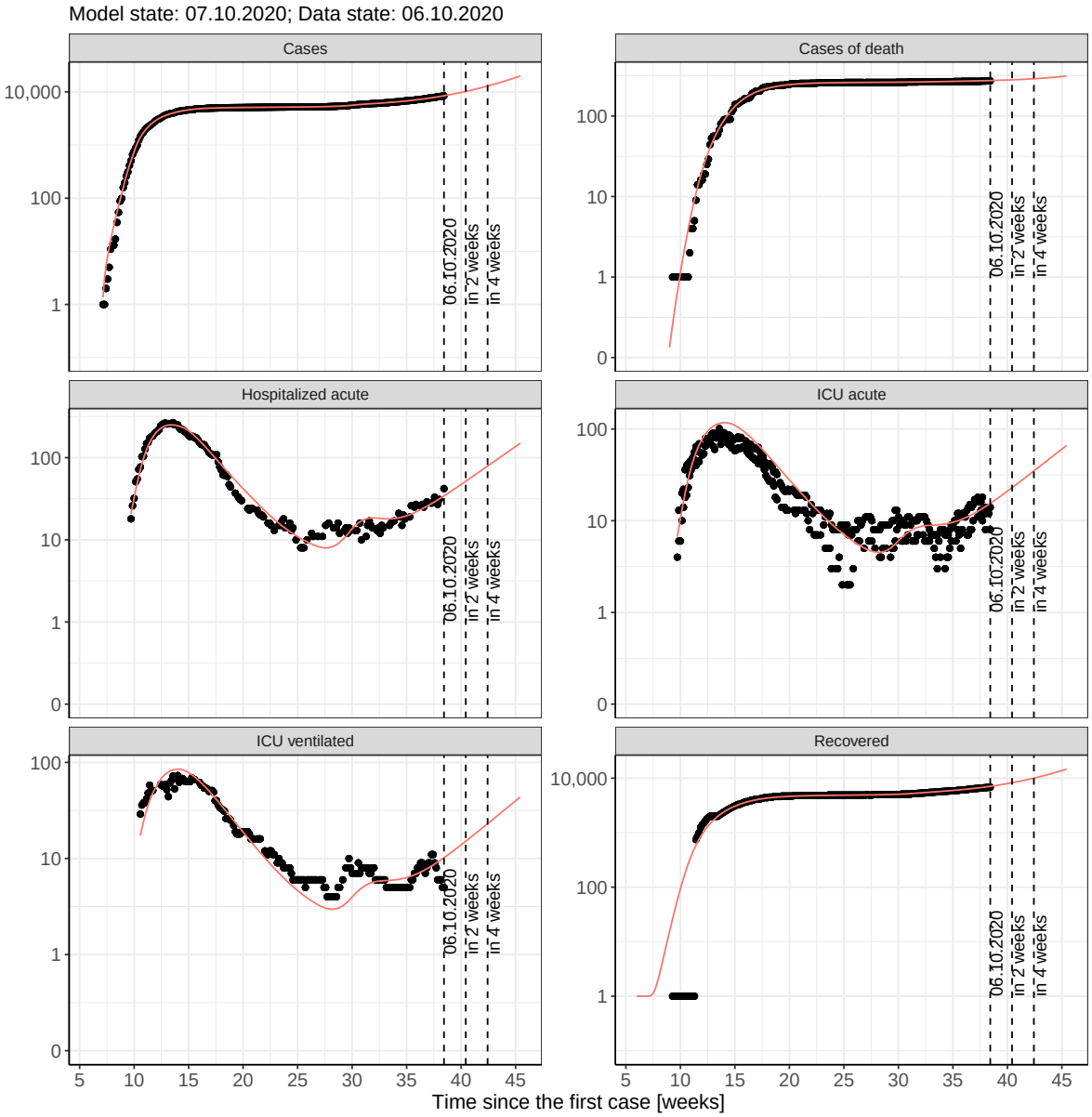


Figure 71: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

7.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

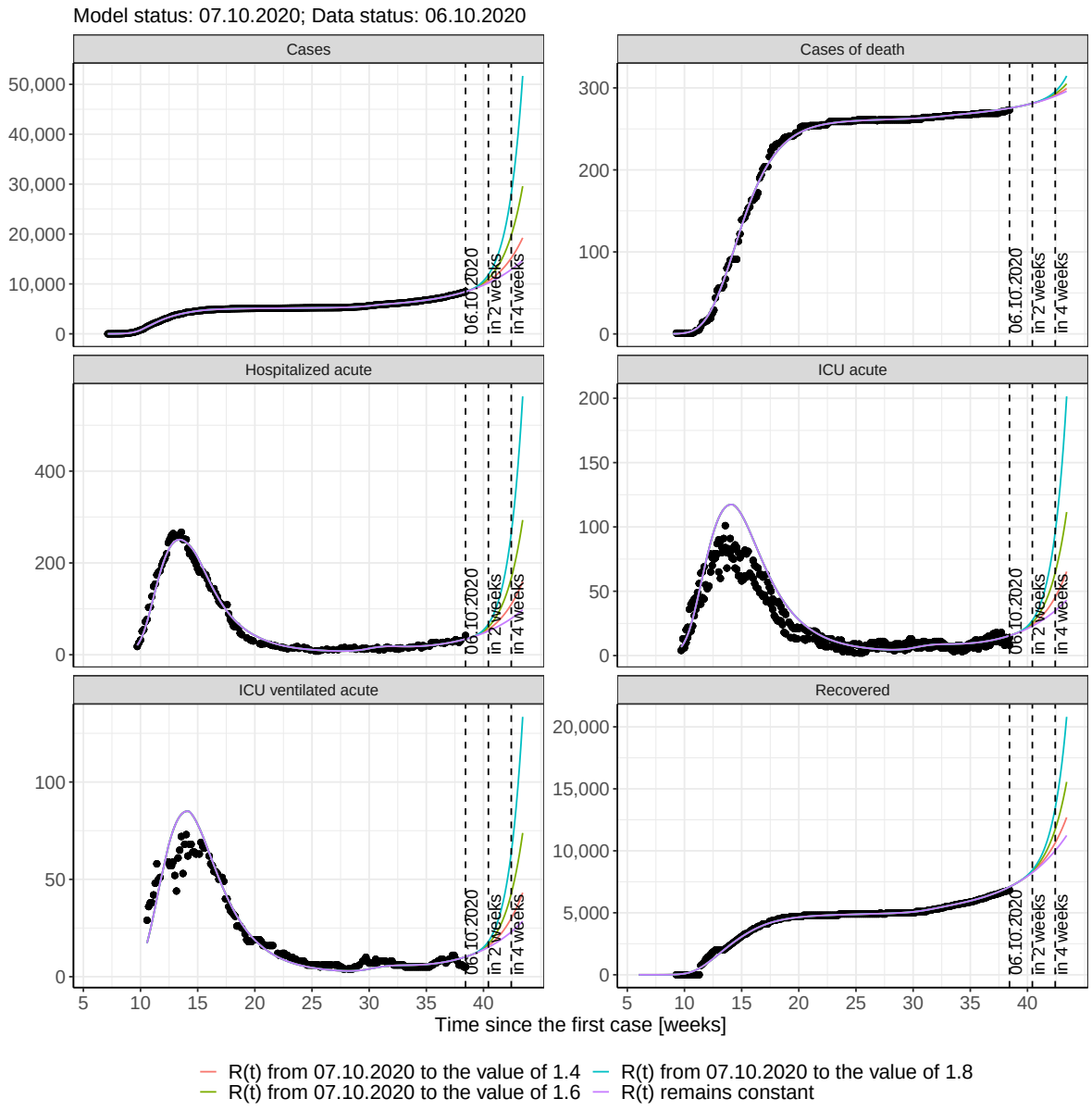


Figure 72: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

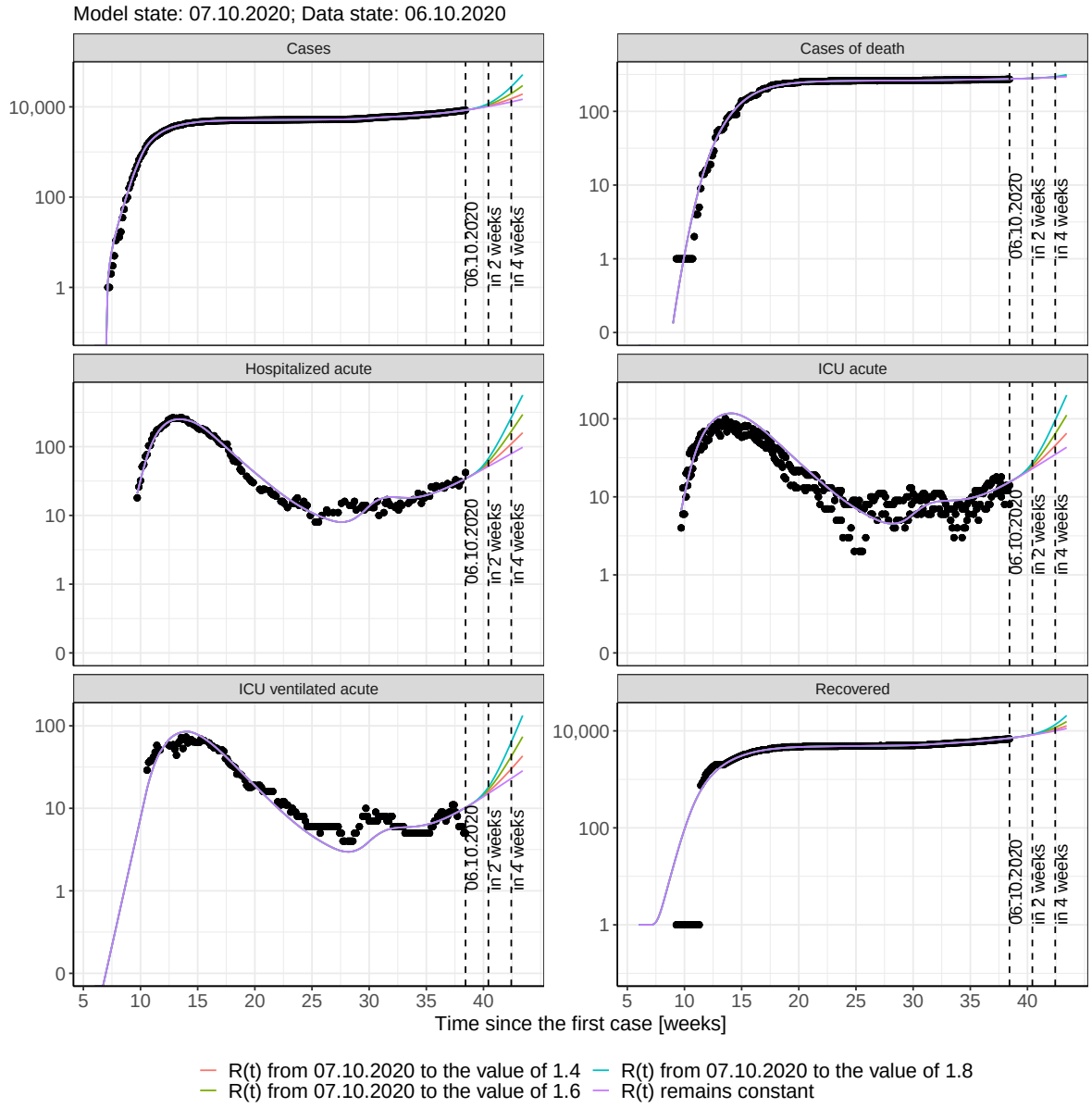


Figure 73: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

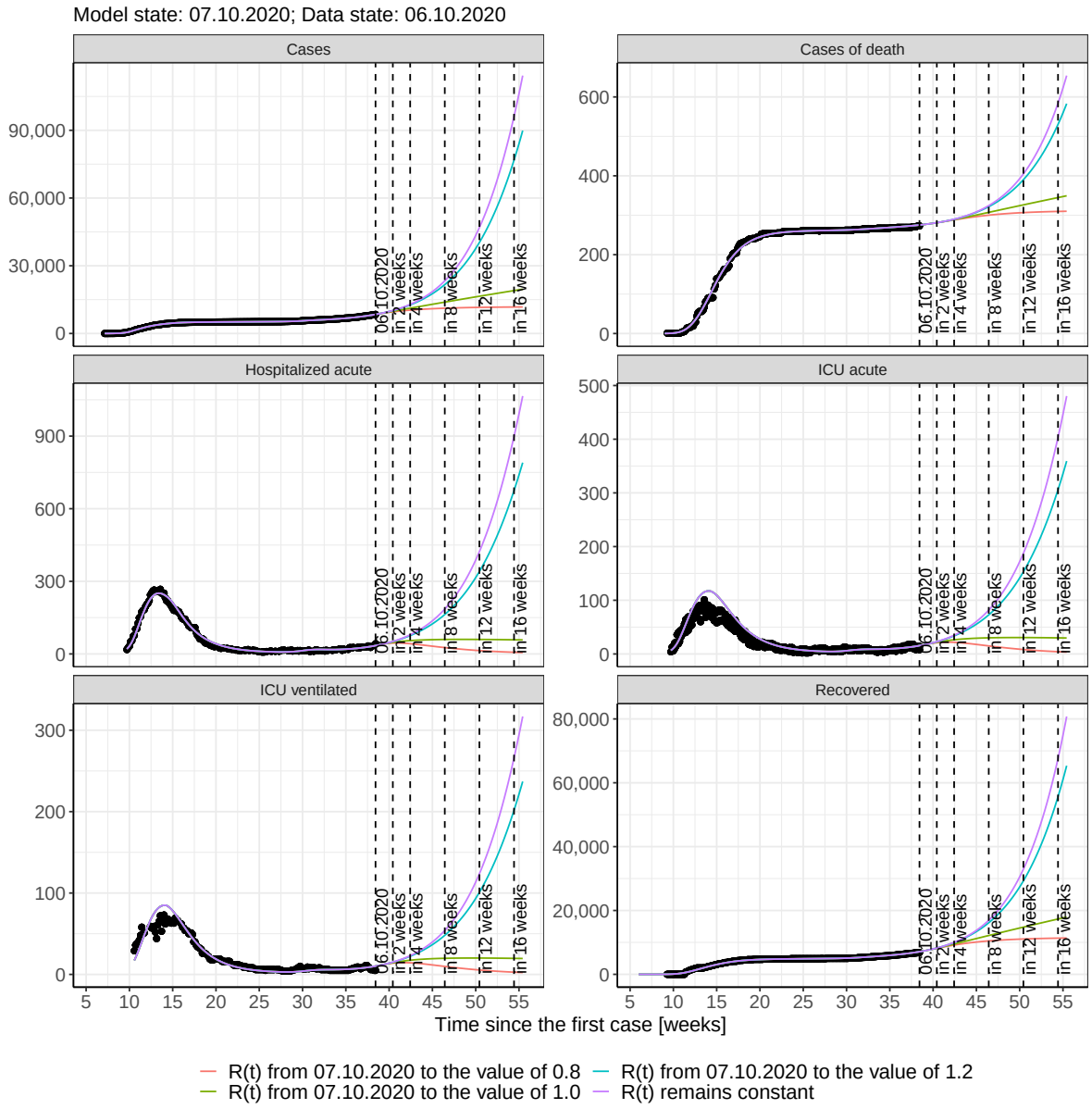


Figure 74: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

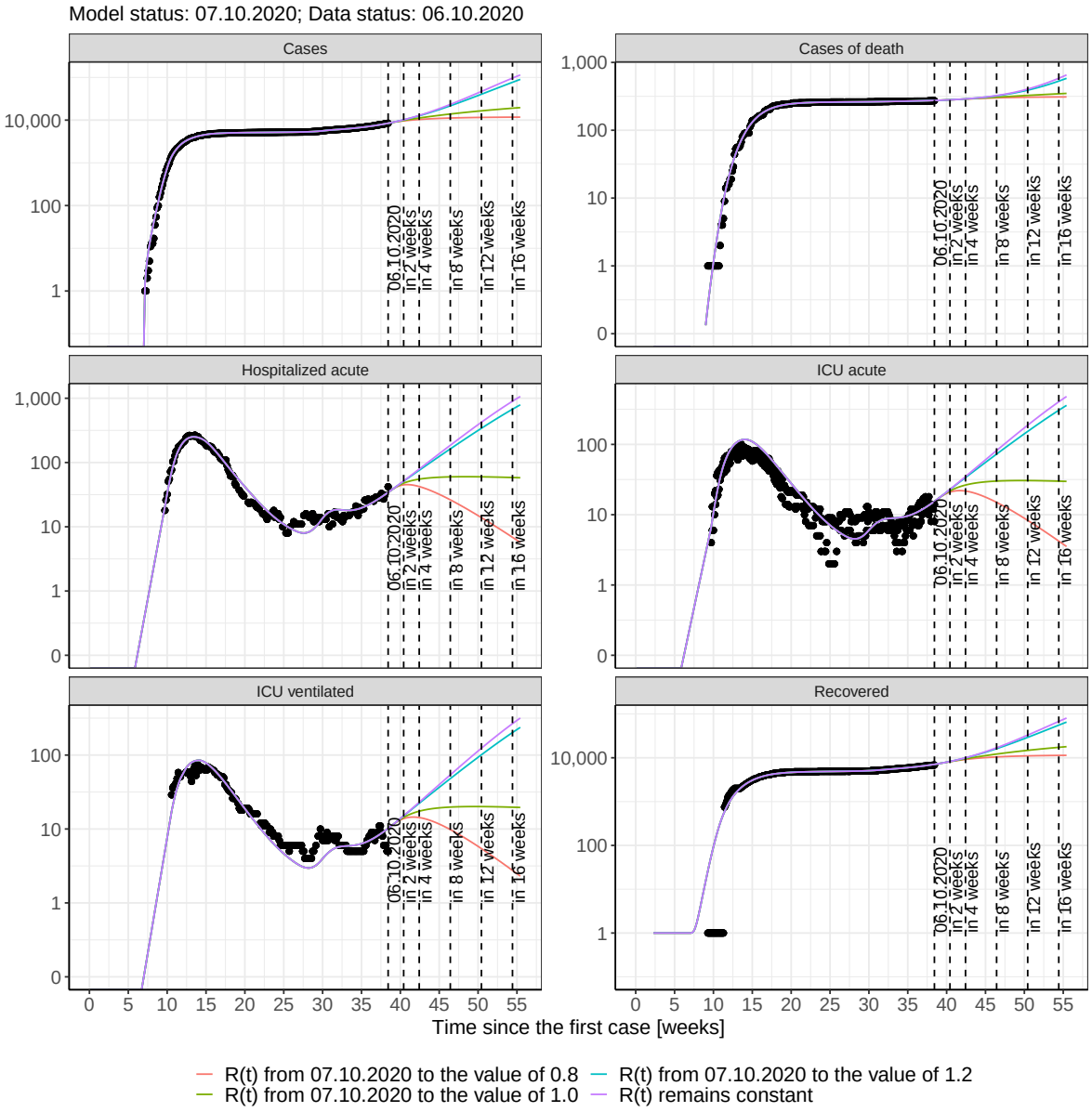


Figure 75: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hamburg assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 22); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 23); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 24); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 25) Model status from 07.10.2020; Data status: 06.10.2020.

Table 22: Hamburg - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	8550	276	7156	35	16	10
08.10.2020	8655	276	7225	36	16	11
09.10.2020	8762	276	7296	37	17	11
10.10.2020	8873	277	7369	38	17	11
11.10.2020	8988	277	7445	40	18	12
12.10.2020	9106	277	7522	41	18	12
13.10.2020	9228	278	7603	42	19	12
14.10.2020	9353	278	7686	43	19	13
15.10.2020	9483	279	7771	44	20	13
16.10.2020	9617	279	7859	46	20	13
17.10.2020	9755	280	7950	47	21	14
18.10.2020	9897	280	8044	49	22	14
19.10.2020	10044	281	8141	50	22	15
20.10.2020	10195	281	8240	52	23	15
21.10.2020	10351	282	8344	53	24	16
22.10.2020	10512	282	8450	55	24	16
23.10.2020	10679	283	8559	57	25	17
24.10.2020	10850	283	8672	58	26	17
25.10.2020	11027	284	8789	60	27	18
26.10.2020	11209	284	8909	62	27	18
27.10.2020	11397	285	9033	64	28	19
28.10.2020	11590	286	9161	66	29	19
29.10.2020	11790	286	9293	68	30	20
30.10.2020	11996	287	9429	70	31	20
31.10.2020	12209	288	9569	72	32	21
01.11.2020	12428	288	9714	74	33	22
02.11.2020	12654	289	9863	77	34	22
03.11.2020	12887	290	10017	79	35	23

Table 23: Hamburg - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	8547	276	7156	35	16	10
08.10.2020	8642	276	7225	36	16	11
09.10.2020	8735	276	7296	37	17	11
10.10.2020	8825	277	7368	38	17	11
11.10.2020	8912	277	7442	39	18	12
12.10.2020	8997	277	7518	40	18	12
13.10.2020	9079	278	7595	41	19	12
14.10.2020	9159	278	7672	42	19	12
15.10.2020	9237	279	7751	43	19	13
16.10.2020	9312	279	7830	43	20	13
17.10.2020	9386	280	7910	44	20	13
18.10.2020	9457	280	7990	44	20	13
19.10.2020	9526	281	8069	45	21	14
20.10.2020	9593	281	8148	45	21	14
21.10.2020	9658	281	8227	45	21	14
22.10.2020	9722	282	8306	45	21	14
23.10.2020	9783	282	8384	45	22	14
24.10.2020	9843	283	8460	45	22	14
25.10.2020	9901	283	8537	45	22	14
26.10.2020	9957	284	8612	45	22	14
27.10.2020	10012	284	8686	45	22	14
28.10.2020	10065	285	8759	45	22	14
29.10.2020	10117	286	8830	44	22	14
30.10.2020	10167	286	8901	44	22	14
31.10.2020	10215	287	8970	44	22	14
01.11.2020	10263	287	9038	43	22	14
02.11.2020	10309	288	9104	43	22	14
03.11.2020	10353	288	9169	42	22	14

Table 24: Hamburg - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	8549	276	7156	35	16	10
08.10.2020	8648	276	7225	36	16	11
09.10.2020	8747	276	7296	37	17	11
10.10.2020	8847	277	7369	38	17	11
11.10.2020	8946	277	7443	39	18	12
12.10.2020	9045	277	7520	40	18	12
13.10.2020	9144	278	7598	41	19	12
14.10.2020	9243	278	7678	42	19	13
15.10.2020	9342	279	7760	43	20	13
16.10.2020	9441	279	7843	44	20	13
17.10.2020	9540	280	7927	45	20	14
18.10.2020	9638	280	8013	46	21	14
19.10.2020	9737	281	8100	47	21	14
20.10.2020	9835	281	8187	48	22	14
21.10.2020	9934	282	8276	48	22	15
22.10.2020	10032	282	8366	49	23	15
23.10.2020	10130	283	8456	50	23	15
24.10.2020	10228	283	8547	50	23	15
25.10.2020	10327	284	8639	51	24	16
26.10.2020	10425	284	8731	52	24	16
27.10.2020	10522	285	8824	52	24	16
28.10.2020	10620	285	8917	53	25	16
29.10.2020	10718	286	9011	53	25	17
30.10.2020	10816	286	9105	54	25	17
31.10.2020	10913	287	9199	54	26	17
01.11.2020	11011	288	9294	54	26	17
02.11.2020	11108	288	9388	55	26	17
03.11.2020	11206	289	9484	55	26	17

Table 25: Hamburg - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	8550	276	7156	35	16	10
08.10.2020	8654	276	7225	36	16	11
09.10.2020	8760	276	7296	37	17	11
10.10.2020	8870	277	7369	38	17	11
11.10.2020	8983	277	7444	40	18	12
12.10.2020	9099	277	7522	41	18	12
13.10.2020	9218	278	7602	42	19	12
14.10.2020	9341	278	7685	43	19	13
15.10.2020	9466	279	7770	44	20	13
16.10.2020	9596	279	7857	46	20	13
17.10.2020	9729	280	7948	47	21	14
18.10.2020	9866	280	8040	48	22	14
19.10.2020	10007	281	8136	50	22	15
20.10.2020	10151	281	8234	51	23	15
21.10.2020	10300	282	8336	53	23	15
22.10.2020	10453	282	8440	54	24	16
23.10.2020	10610	283	8547	56	25	16
24.10.2020	10771	283	8657	57	26	17
25.10.2020	10937	284	8770	59	26	17
26.10.2020	11107	284	8887	61	27	18
27.10.2020	11283	285	9007	62	28	18
28.10.2020	11463	286	9130	64	29	19
29.10.2020	11648	286	9257	66	29	19
30.10.2020	11838	287	9388	68	30	20
31.10.2020	12034	288	9522	70	31	20
01.11.2020	12234	288	9660	72	32	21
02.11.2020	12441	289	9802	74	33	22
03.11.2020	12653	290	9947	76	34	22

7.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

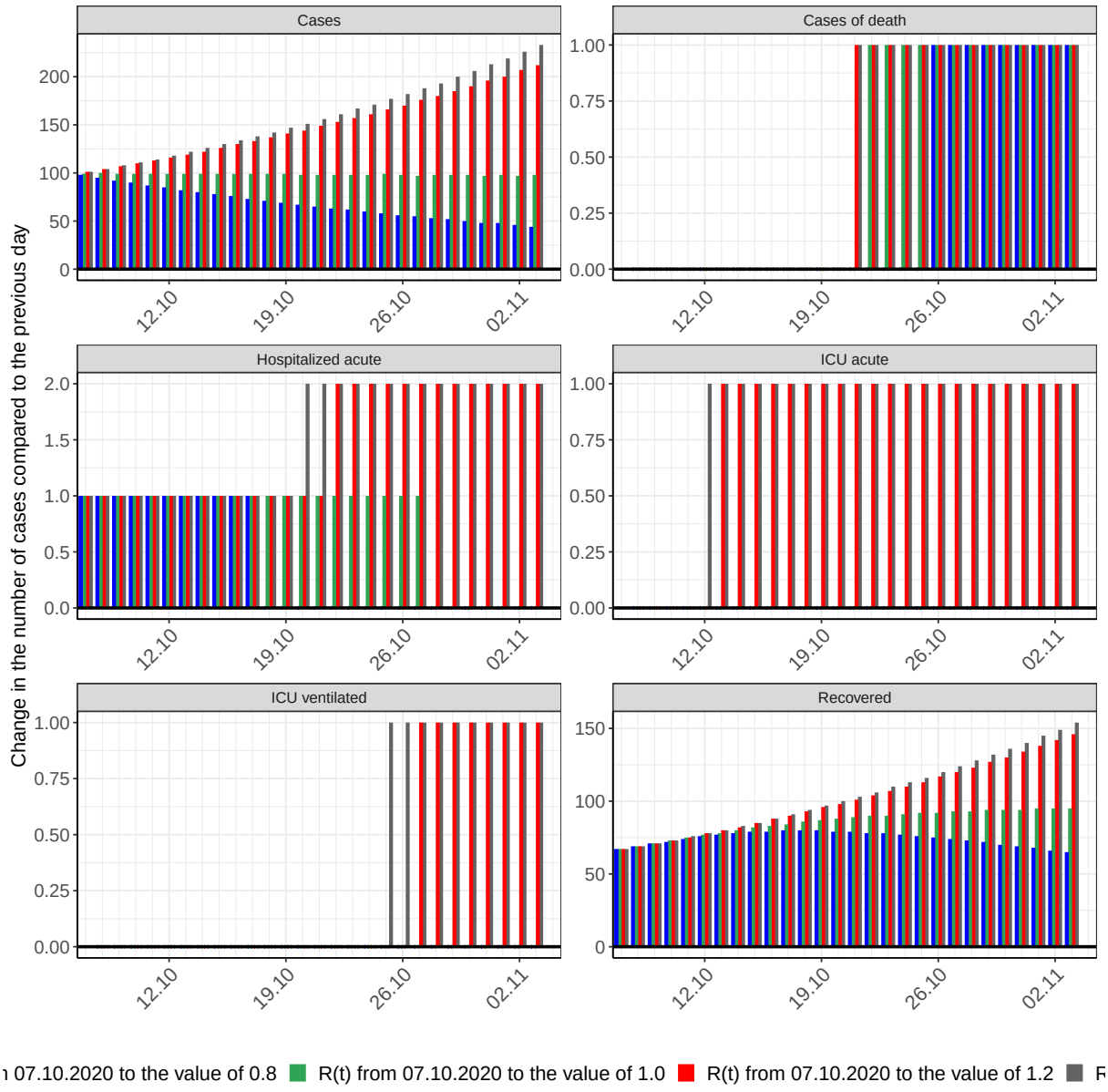


Figure 76: Simulation of daily new cases for the next 4 weeks - Hamburg

8 Hesse

8.1 Model description

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

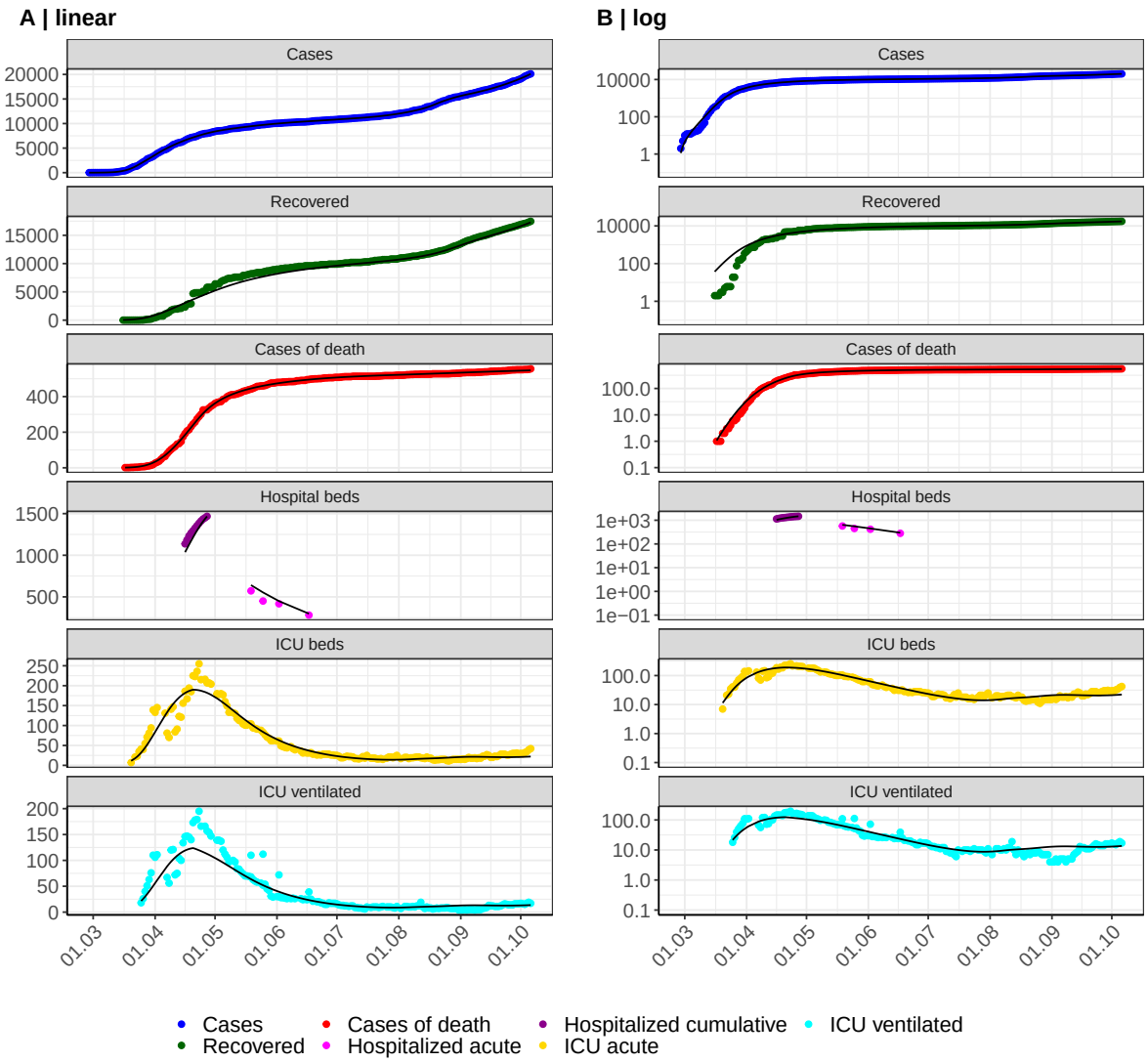


Figure 77: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Hesse. Points: reported data; lines: model description.

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

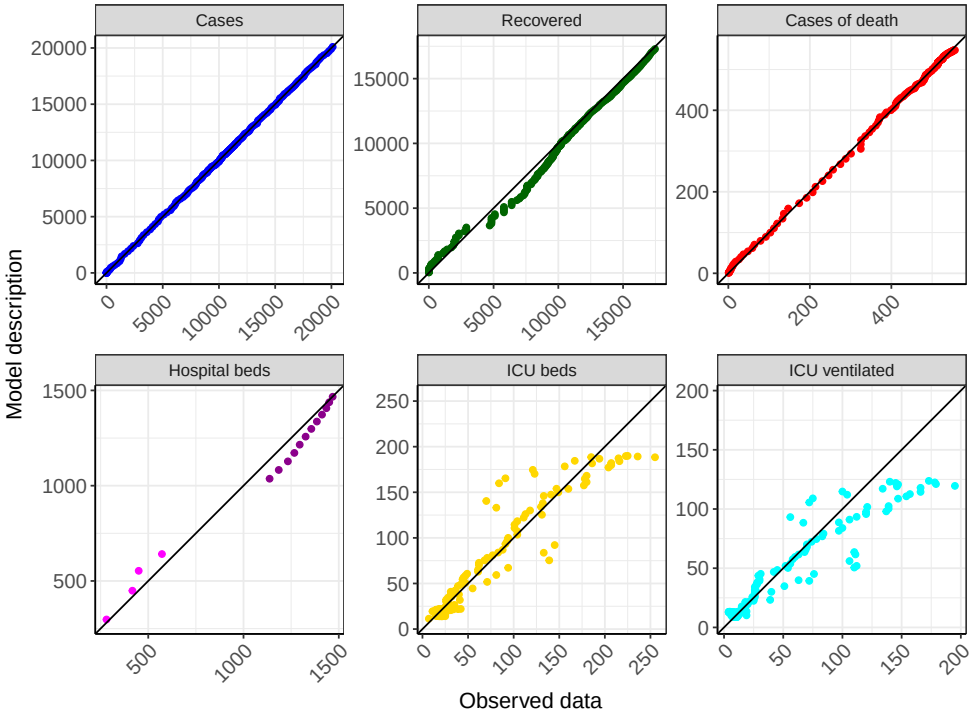


Figure 78: Goodness-of-fit plots for Hesse. Lines: lines of identity.

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

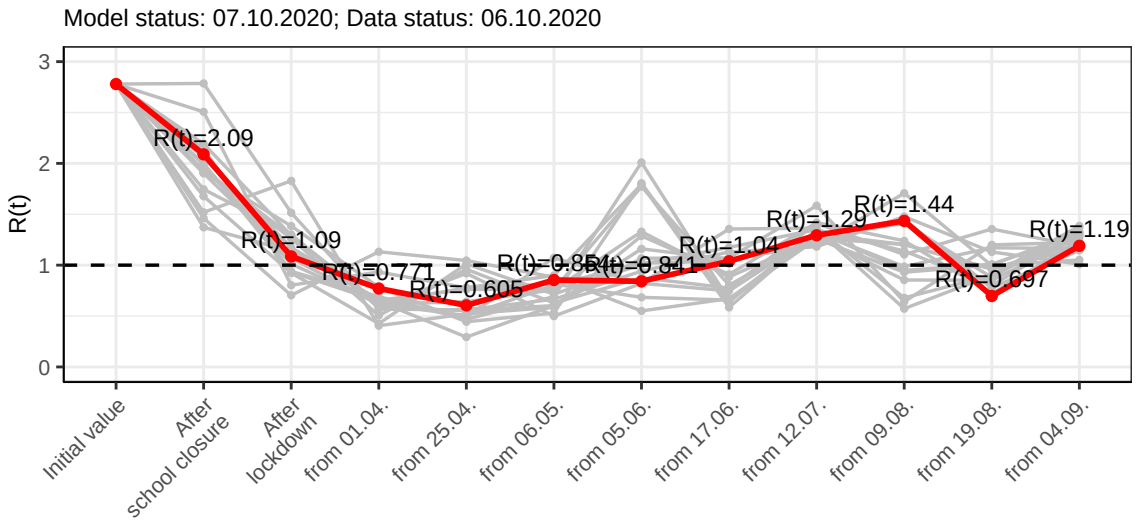


Figure 79: R(t) values before and after the NPIs for Hesse

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

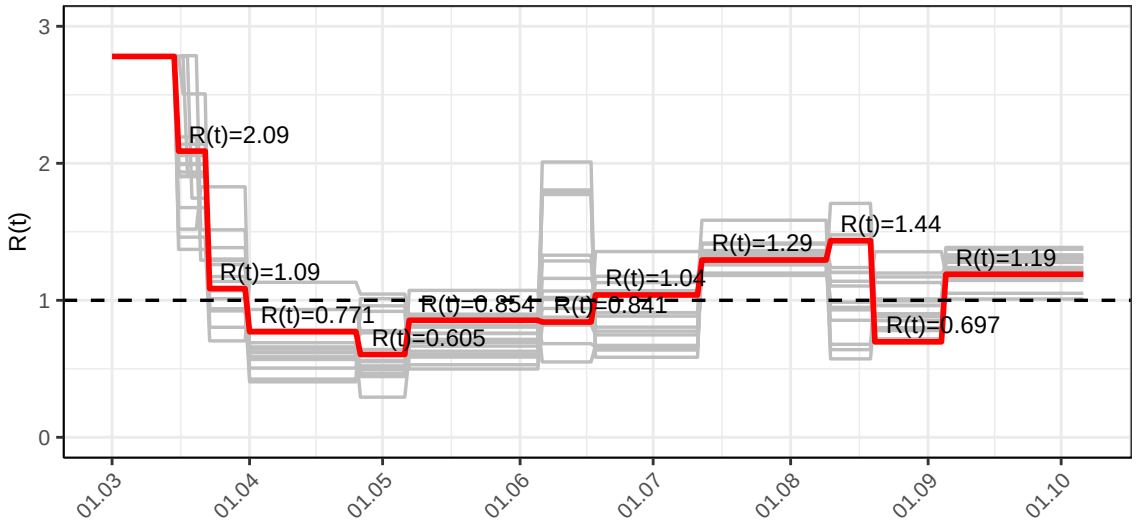


Figure 80: R(t) values over time for Hesse

8.2 Model predictions

8.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.19)

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.

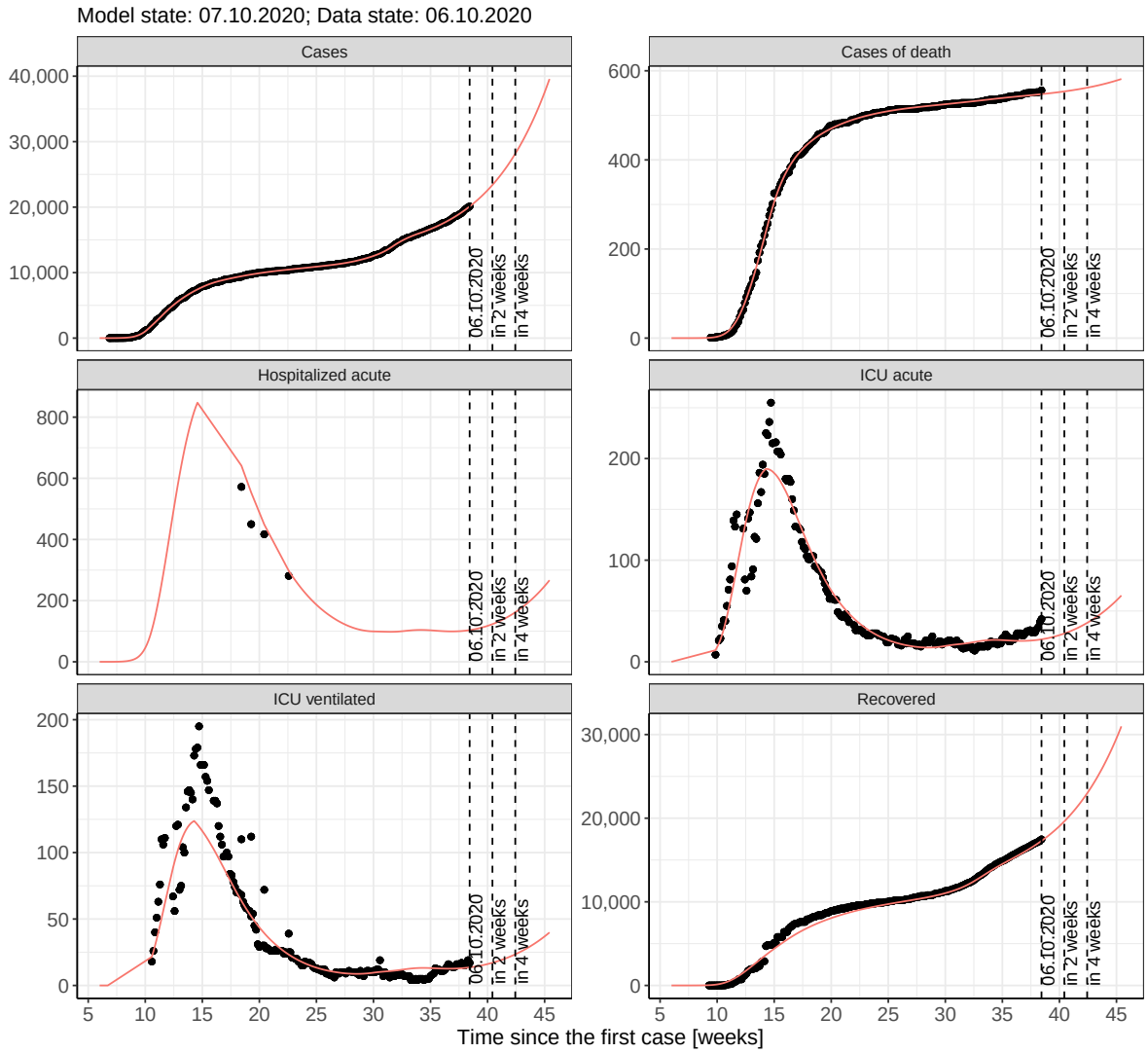


Figure 81: Representation of the model predictions for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

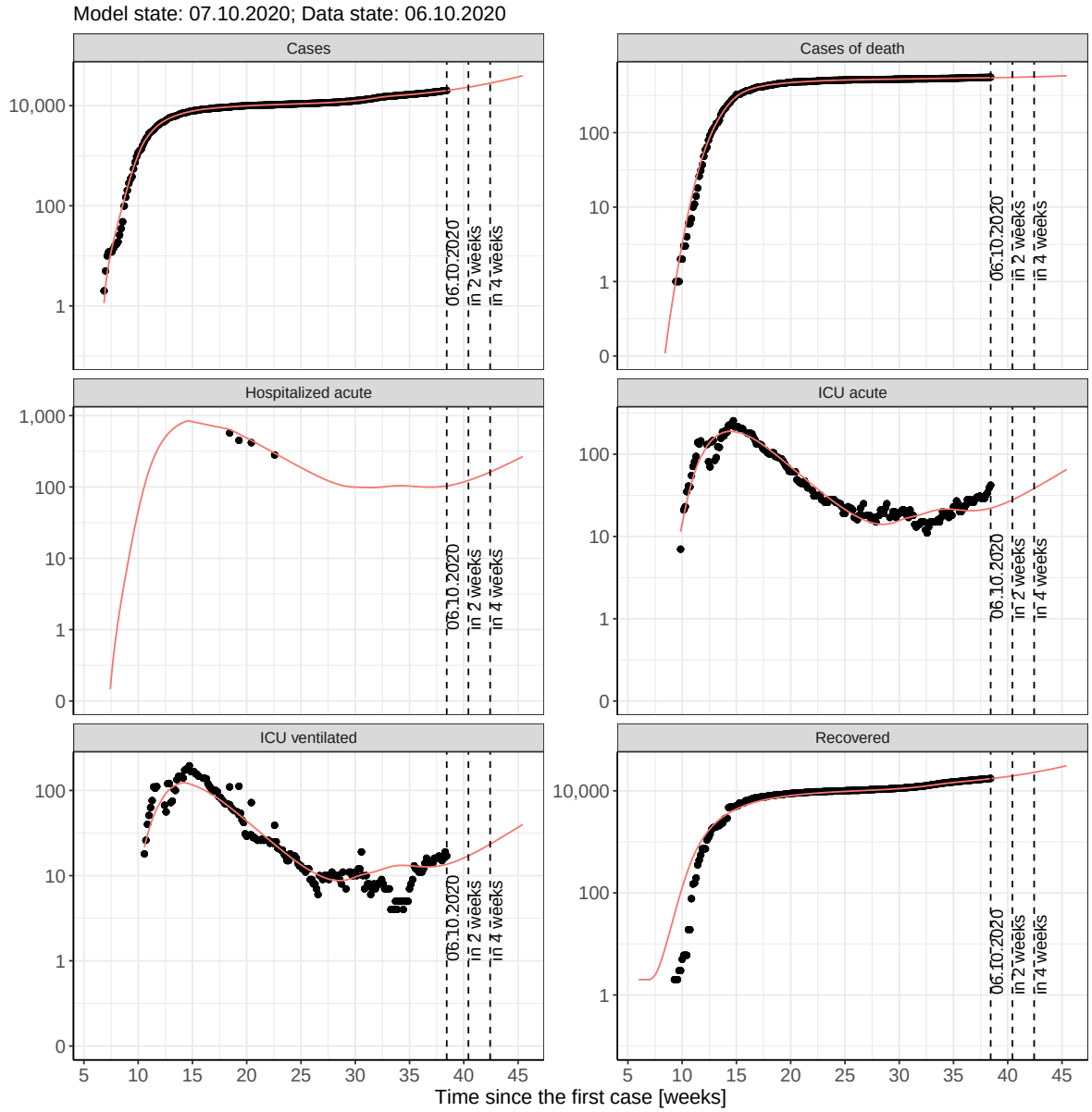


Figure 82: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

8.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

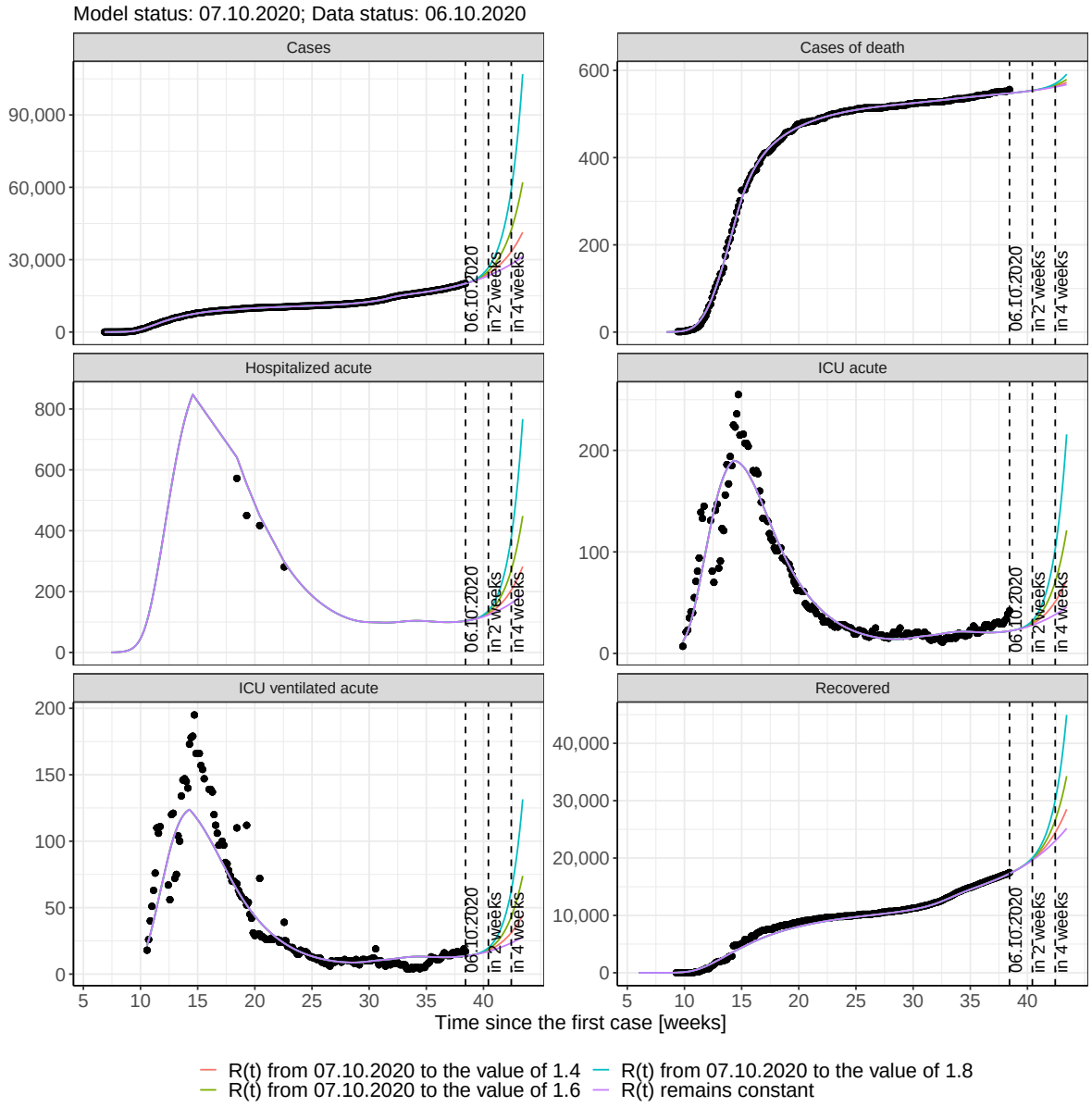


Figure 83: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

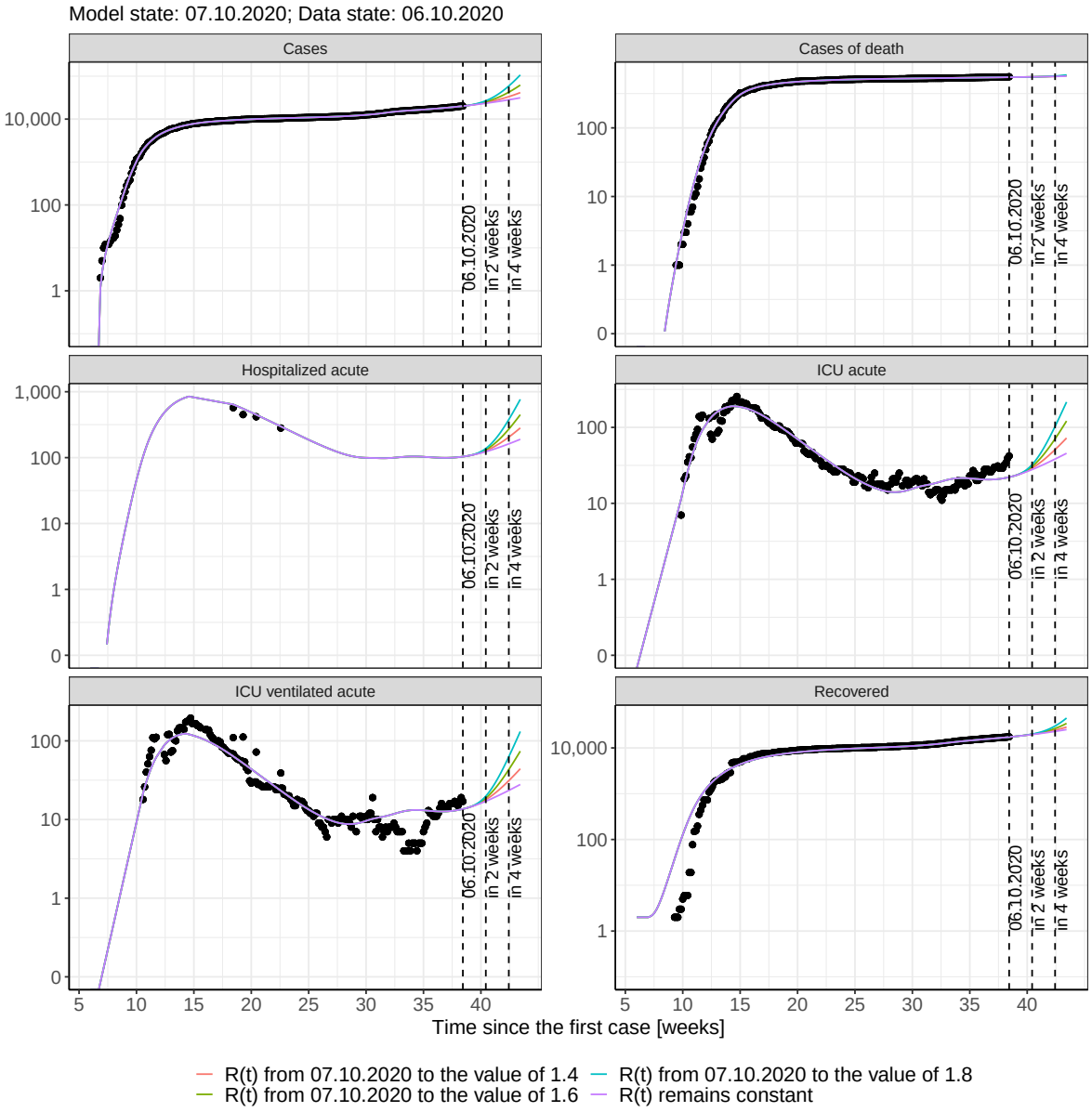


Figure 84: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

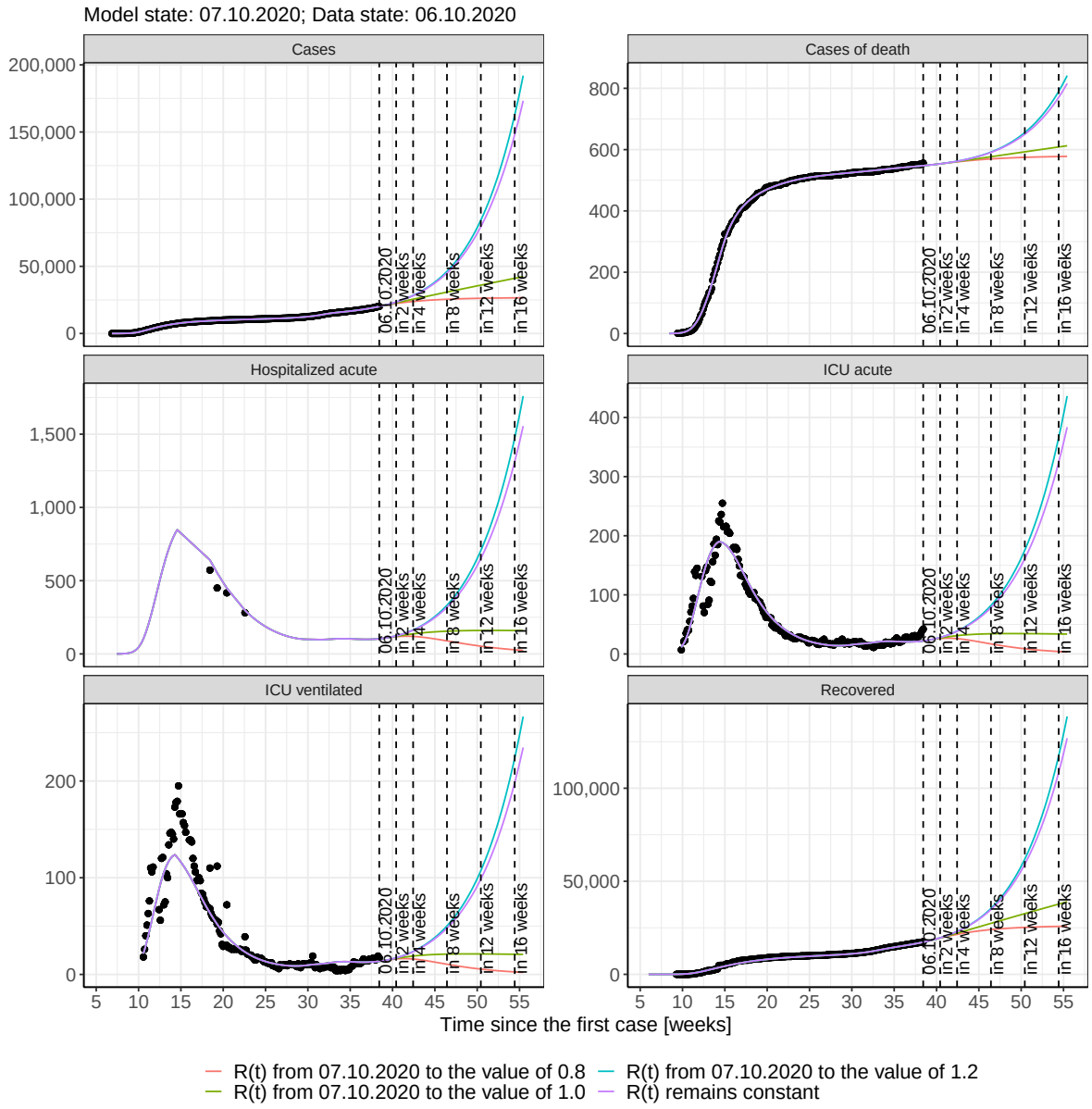


Figure 85: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

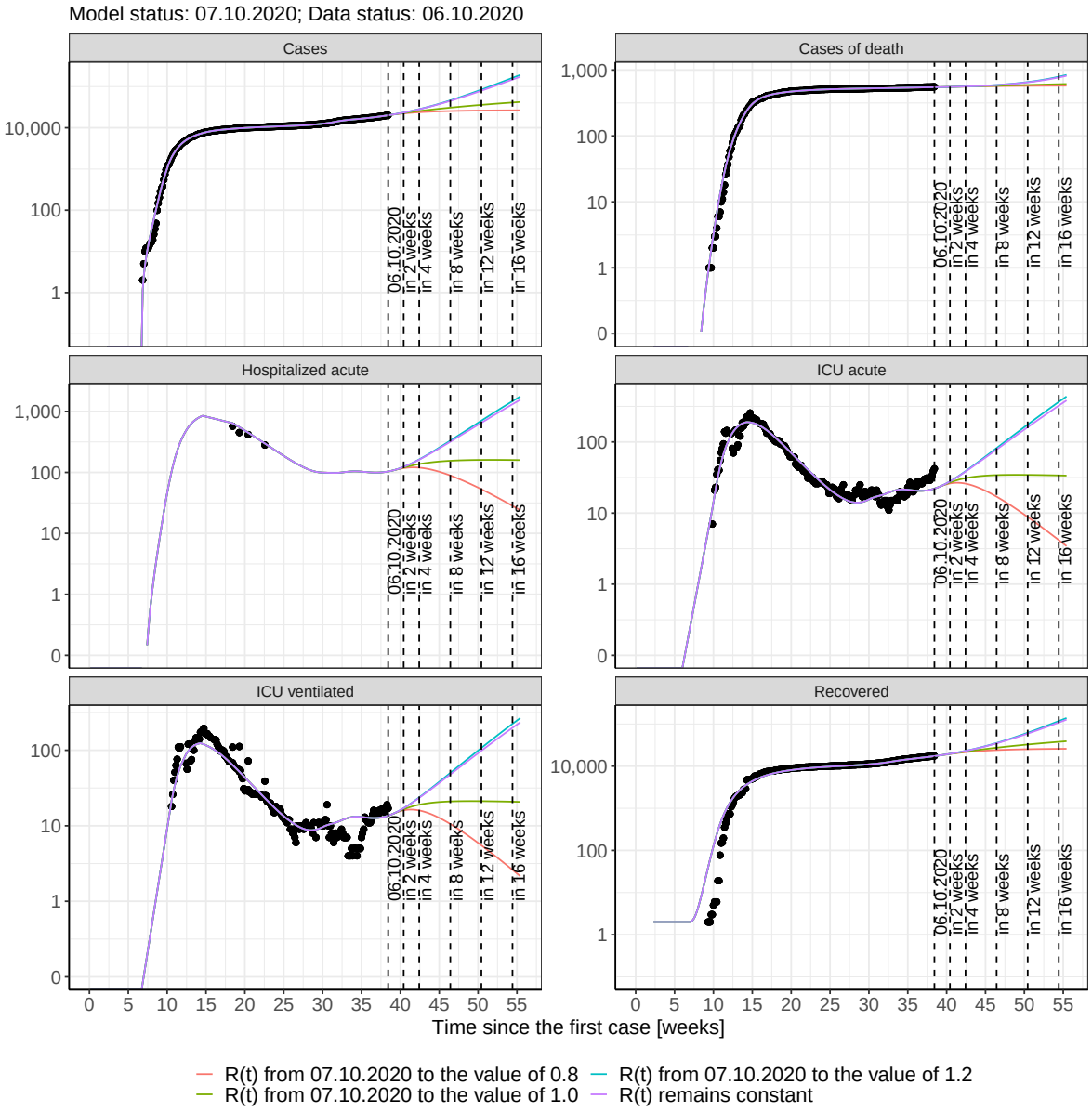


Figure 86: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Hesse assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 26); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 27); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 28); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 29) Model status from 07.10.2020; Data status: 06.10.2020.

Table 26: Hesse - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	20294	548	17427	104	22	14
08.10.2020	20497	548	17572	105	23	14
09.10.2020	20704	549	17720	106	23	14
10.10.2020	20917	549	17872	107	23	14
11.10.2020	21136	550	18028	109	24	15
12.10.2020	21361	550	18188	110	24	15
13.10.2020	21592	550	18351	111	24	15
14.10.2020	21829	551	18519	113	25	15
15.10.2020	22073	551	18692	114	25	16
16.10.2020	22323	552	18868	116	26	16
17.10.2020	22579	552	19049	117	26	16
18.10.2020	22843	553	19235	119	27	16
19.10.2020	23114	553	19426	121	27	17
20.10.2020	23392	554	19622	123	28	17
21.10.2020	23677	554	19823	125	28	17
22.10.2020	23970	555	20029	127	29	18
23.10.2020	24271	555	20241	130	30	18
24.10.2020	24580	556	20458	132	30	19
25.10.2020	24897	556	20681	135	31	19
26.10.2020	25223	557	20910	137	32	19
27.10.2020	25557	558	21144	140	32	20
28.10.2020	25900	558	21386	143	33	20
29.10.2020	26253	559	21633	146	34	21
30.10.2020	26615	559	21887	149	35	21
31.10.2020	26987	560	22148	152	36	22
01.11.2020	27368	561	22416	155	36	22
02.11.2020	27760	561	22691	158	37	23
03.11.2020	28162	562	22973	162	38	23

Table 27: Hesse - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	20289	548	17427	104	22	14
08.10.2020	20475	548	17572	105	23	14
09.10.2020	20656	549	17720	106	23	14
10.10.2020	20831	549	17870	107	23	14
11.10.2020	21002	550	18024	108	24	15
12.10.2020	21167	550	18179	110	24	15
13.10.2020	21328	550	18337	111	24	15
14.10.2020	21484	551	18495	112	25	15
15.10.2020	21636	551	18655	113	25	15
16.10.2020	21784	552	18816	114	25	15
17.10.2020	21927	552	18976	115	25	16
18.10.2020	22066	553	19137	116	26	16
19.10.2020	22201	553	19296	117	26	16
20.10.2020	22333	554	19455	118	26	16
21.10.2020	22460	554	19613	118	26	16
22.10.2020	22584	555	19770	119	26	16
23.10.2020	22705	555	19925	119	27	16
24.10.2020	22822	555	20078	120	27	16
25.10.2020	22935	556	20229	120	27	16
26.10.2020	23046	556	20377	121	27	16
27.10.2020	23153	557	20524	121	27	16
28.10.2020	23257	557	20668	121	27	16
29.10.2020	23358	558	20809	121	27	16
30.10.2020	23457	558	20948	121	27	16
31.10.2020	23552	559	21085	121	26	16
01.11.2020	23645	559	21218	120	26	16
02.11.2020	23735	560	21349	120	26	16
03.11.2020	23822	560	21477	120	26	16

Table 28: Hesse - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	20292	548	17427	104	22	14
08.10.2020	20486	548	17572	105	23	14
09.10.2020	20680	549	17720	106	23	14
10.10.2020	20874	549	17871	107	23	14
11.10.2020	21068	550	18026	108	24	15
12.10.2020	21261	550	18183	110	24	15
13.10.2020	21455	550	18344	111	24	15
14.10.2020	21648	551	18507	112	25	15
15.10.2020	21842	551	18673	113	25	15
16.10.2020	22035	552	18841	115	25	16
17.10.2020	22228	552	19011	116	26	16
18.10.2020	22421	553	19183	117	26	16
19.10.2020	22614	553	19358	119	27	16
20.10.2020	22807	554	19533	120	27	17
21.10.2020	23000	554	19711	122	27	17
22.10.2020	23193	555	19889	123	28	17
23.10.2020	23385	555	20069	124	28	17
24.10.2020	23578	556	20251	125	28	17
25.10.2020	23770	556	20433	127	29	18
26.10.2020	23962	557	20616	128	29	18
27.10.2020	24154	557	20800	129	29	18
28.10.2020	24346	558	20984	130	29	18
29.10.2020	24538	558	21169	132	30	18
30.10.2020	24730	559	21355	133	30	18
31.10.2020	24922	559	21541	134	30	19
01.11.2020	25113	560	21728	135	31	19
02.11.2020	25305	560	21915	136	31	19
03.11.2020	25496	561	22103	137	31	19

Table 29: Hesse - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	20295	548	17427	104	22	14
08.10.2020	20497	548	17572	105	23	14
09.10.2020	20706	549	17720	106	23	14
10.10.2020	20920	549	17872	107	23	14
11.10.2020	21140	550	18028	109	24	15
12.10.2020	21367	550	18188	110	24	15
13.10.2020	21600	550	18352	111	24	15
14.10.2020	21839	551	18520	113	25	15
15.10.2020	22086	551	18693	114	25	16
16.10.2020	22339	552	18870	116	26	16
17.10.2020	22600	552	19052	118	26	16
18.10.2020	22868	553	19238	119	27	16
19.10.2020	23143	553	19430	121	27	17
20.10.2020	23427	554	19627	123	28	17
21.10.2020	23718	554	19829	126	28	17
22.10.2020	24017	555	20037	128	29	18
23.10.2020	24326	555	20251	130	30	18
24.10.2020	24642	556	20470	133	30	19
25.10.2020	24968	556	20695	135	31	19
26.10.2020	25303	557	20927	138	32	20
27.10.2020	25647	558	21165	141	33	20
28.10.2020	26001	558	21410	143	33	20
29.10.2020	26365	559	21662	147	34	21
30.10.2020	26739	559	21920	150	35	21
31.10.2020	27124	560	22186	153	36	22
01.11.2020	27520	561	22459	156	37	23
02.11.2020	27926	561	22740	160	38	23
03.11.2020	28345	562	23029	164	39	24

8.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

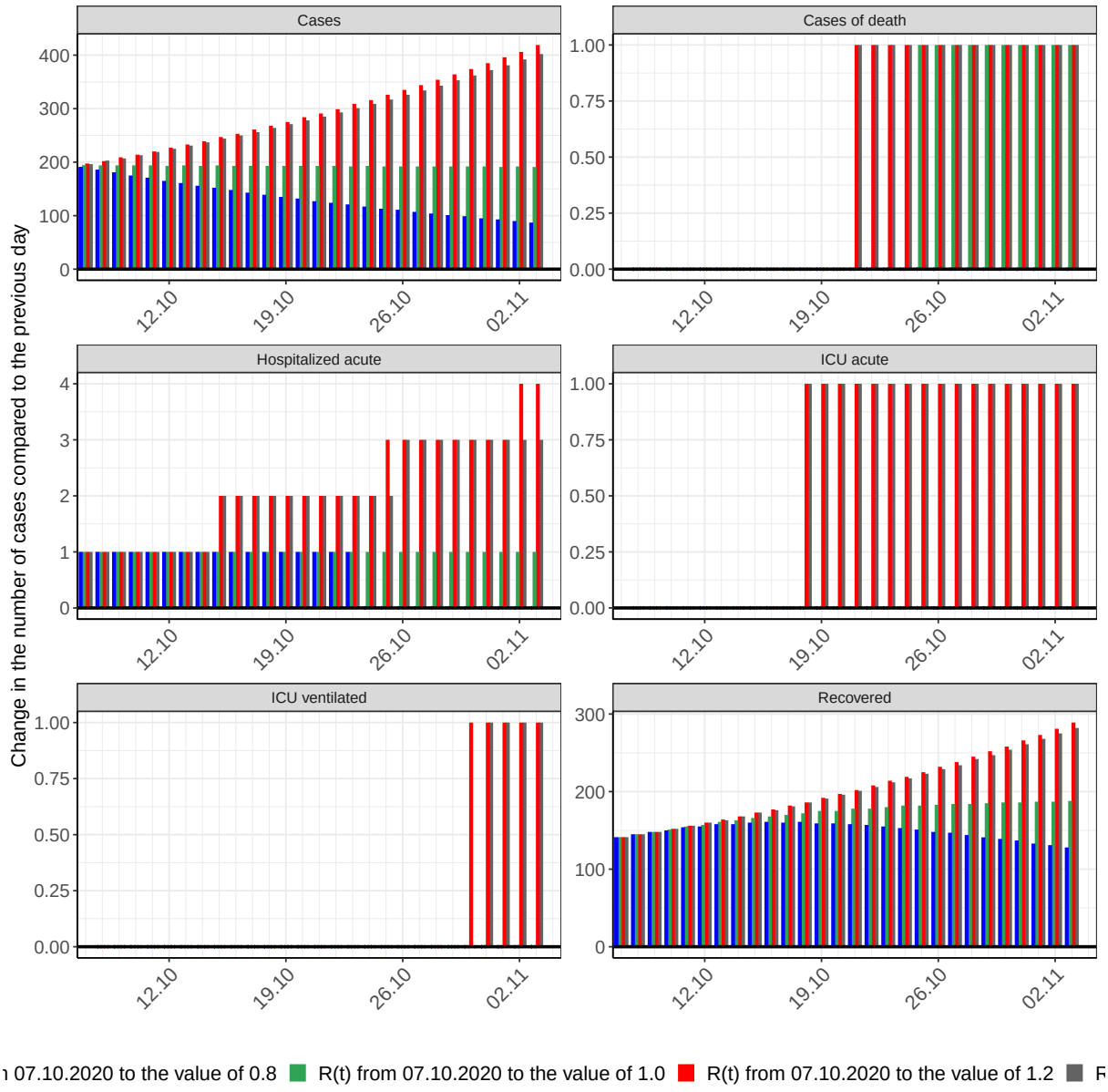


Figure 87: Simulation of daily new cases for the next 4 weeks - Hesse

9 Mecklenburg-Vorpommern

9.1 Model description

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

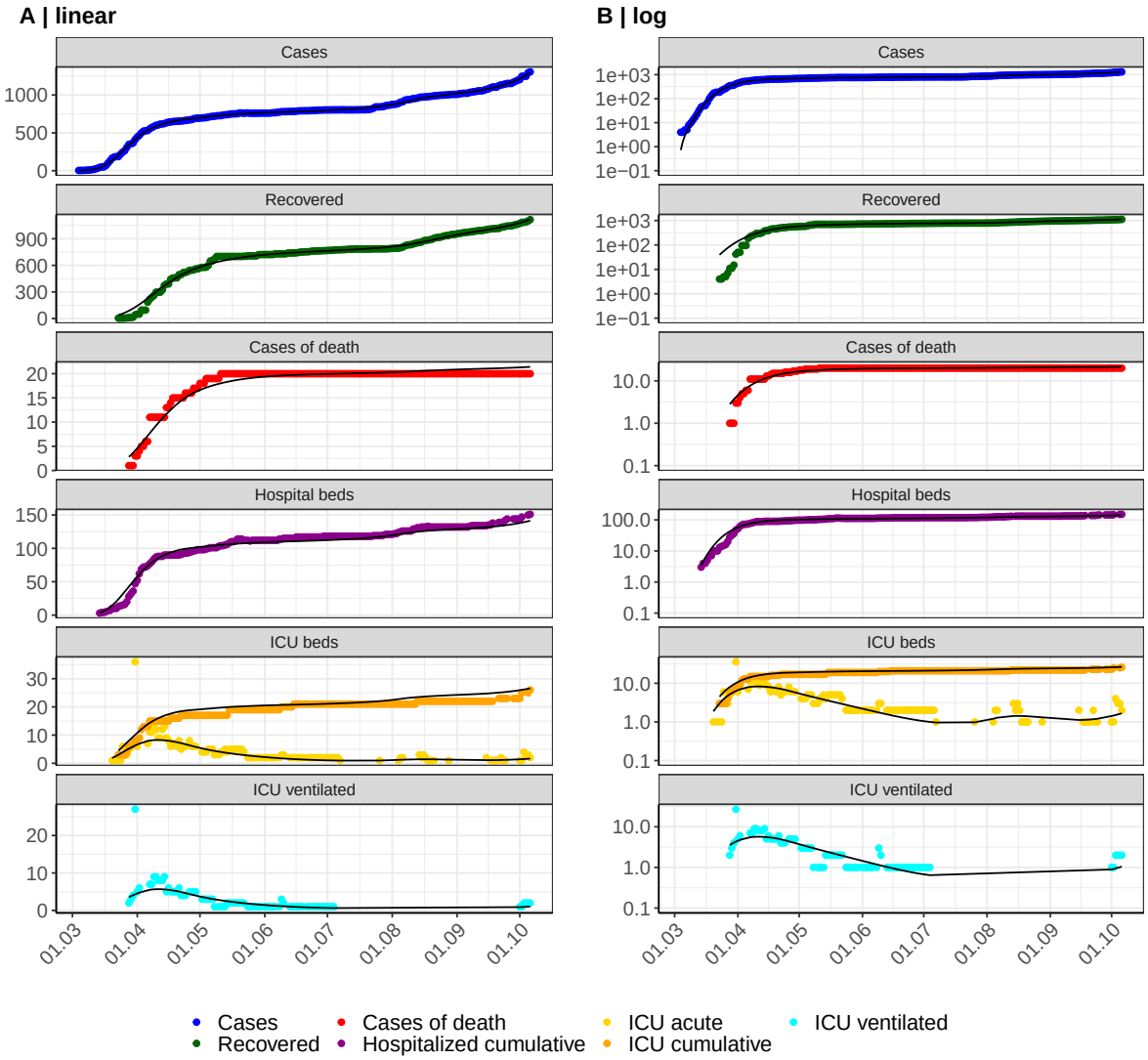


Figure 88: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Mecklenburg-Vorpommern. Points: reported data; lines: model description.

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

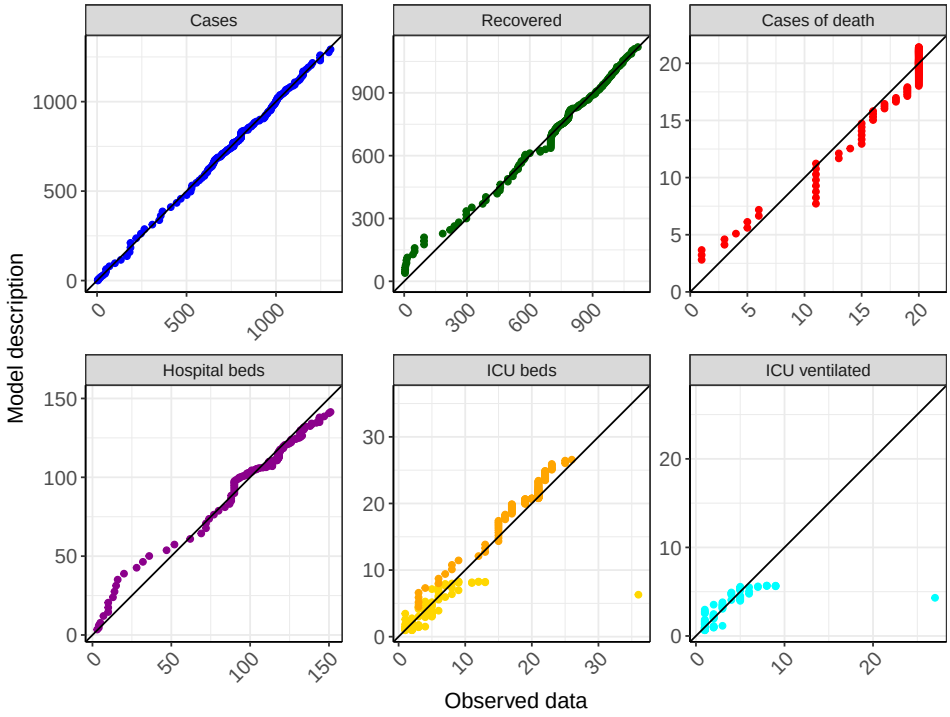


Figure 89: Goodness-of-fit plots for Mecklenburg-Vorpommern. Lines: lines of identity.

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

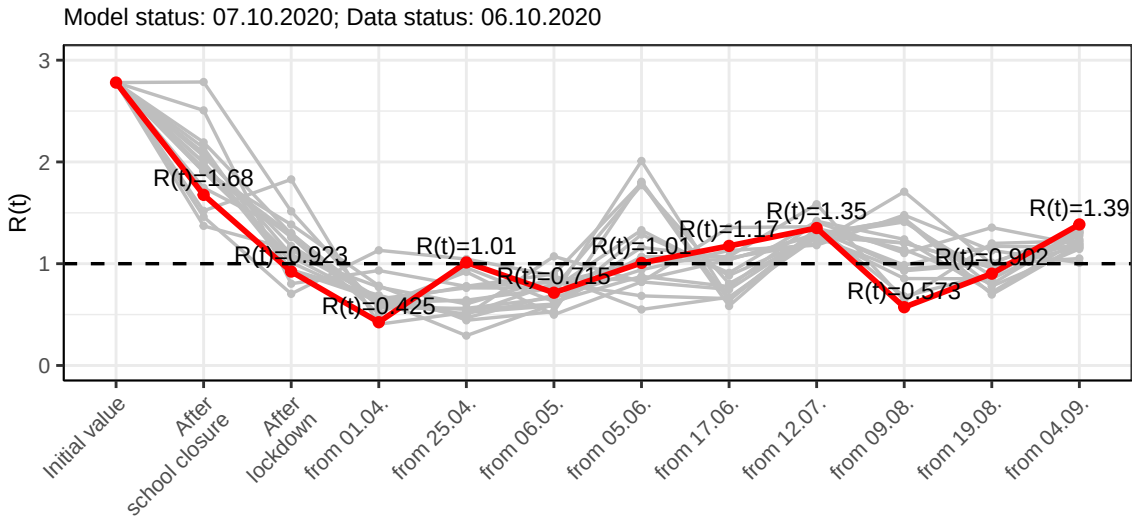


Figure 90: R(t) values before and after the NPIs for Mecklenburg-Vorpommern

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

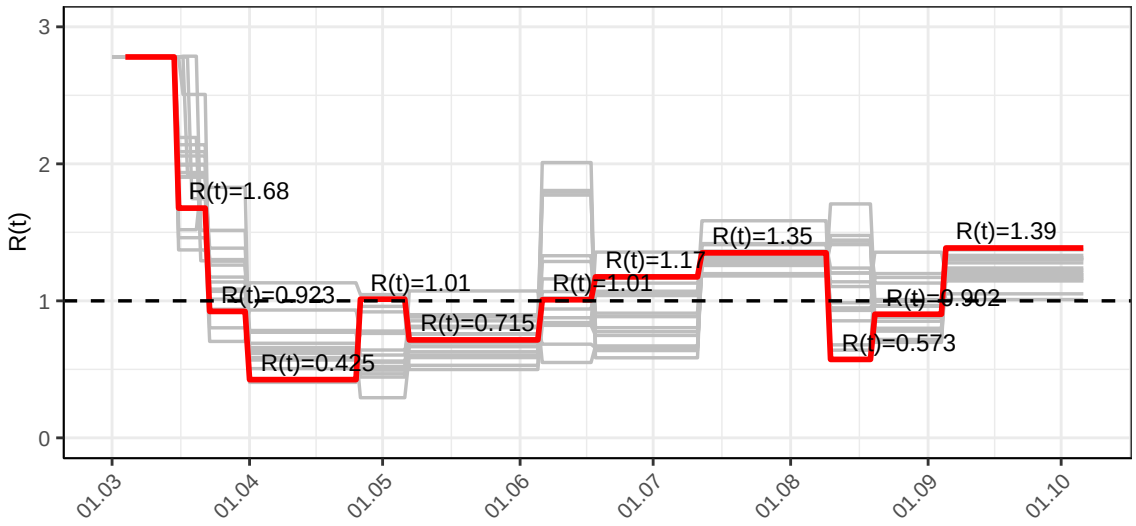


Figure 91: R(t) values over time for Mecklenburg-Vorpommern

9.2 Model predictions

9.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.39)

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.

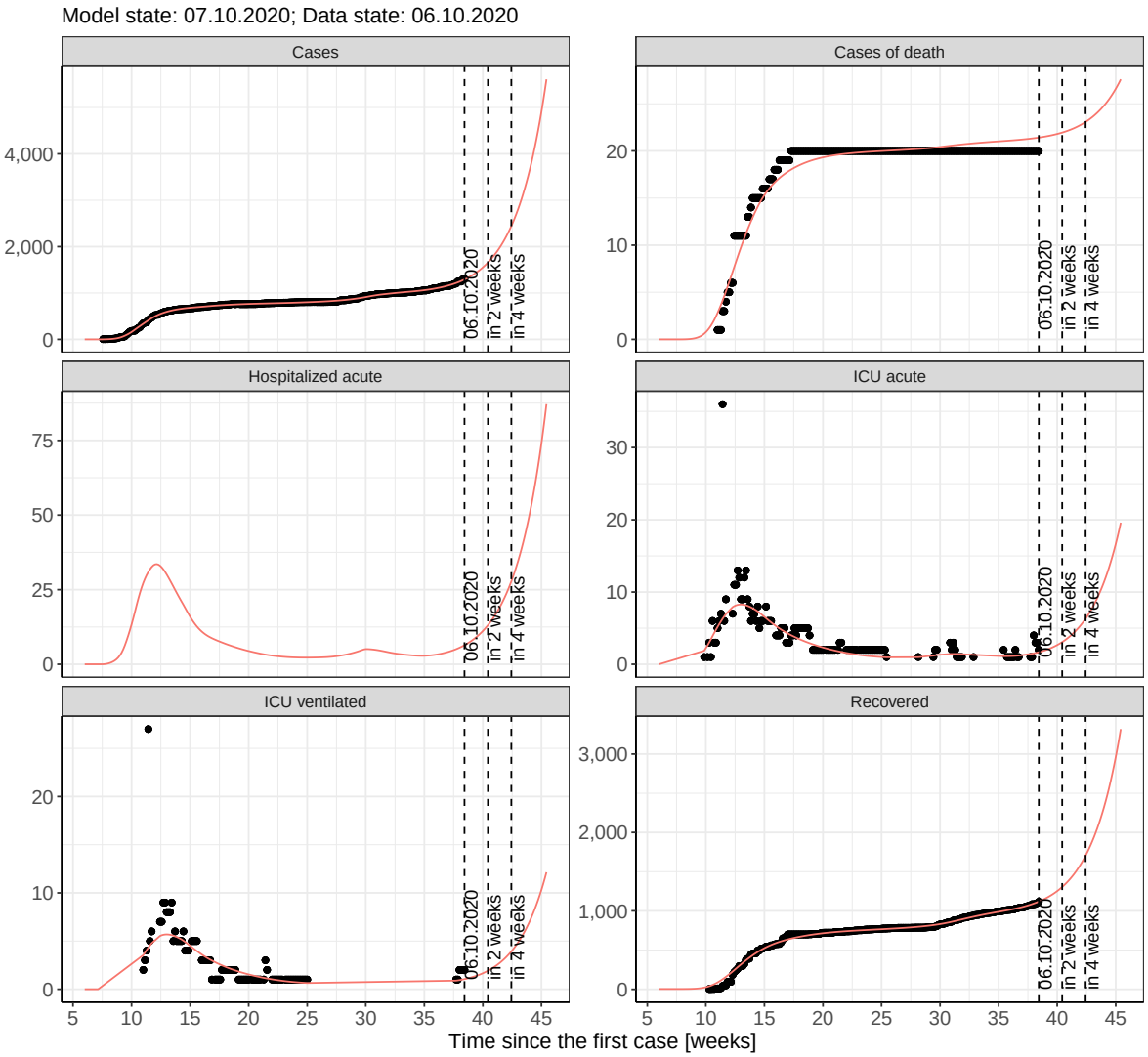


Figure 92: Representation of the model predictions for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

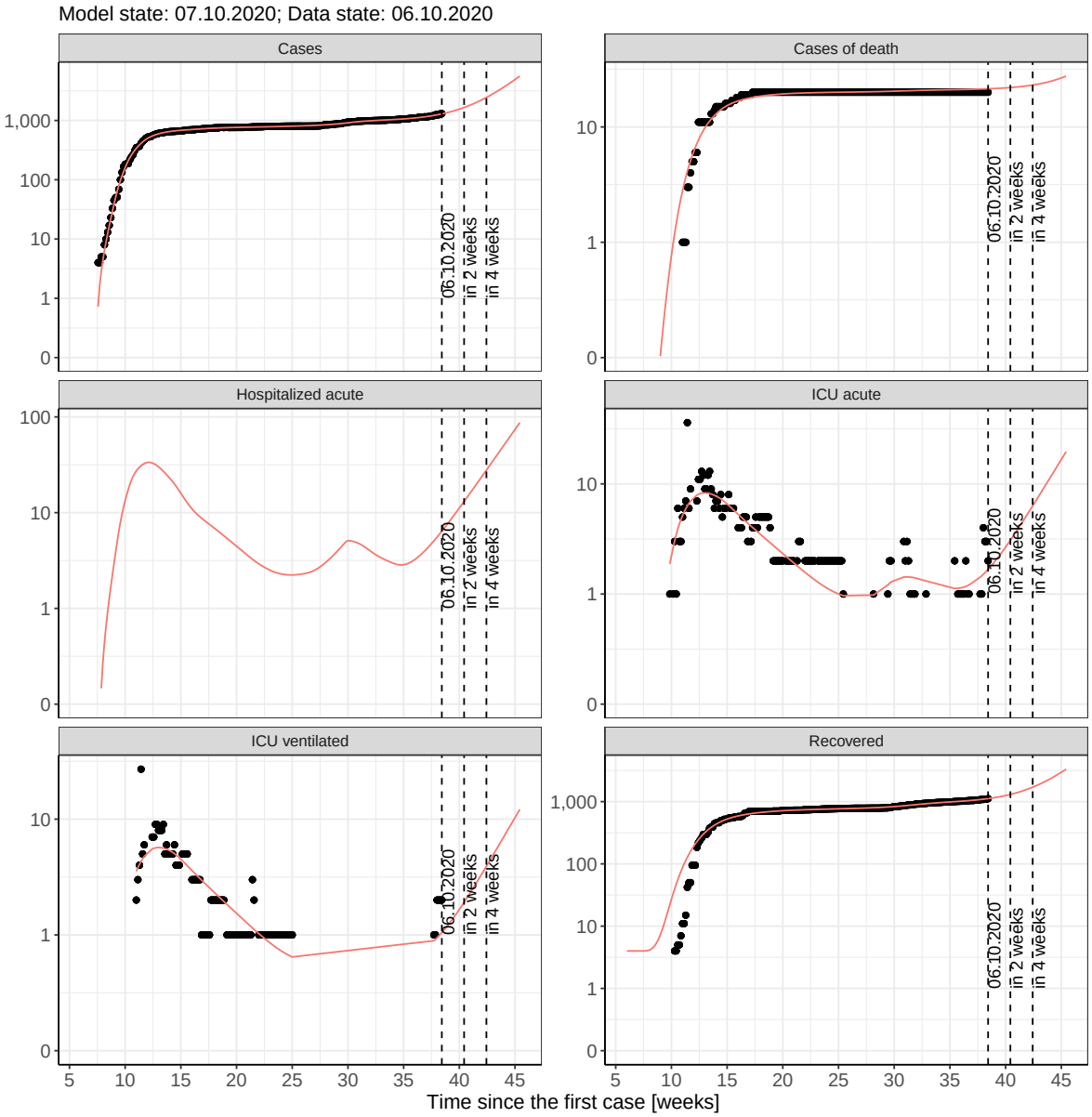


Figure 93: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

9.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

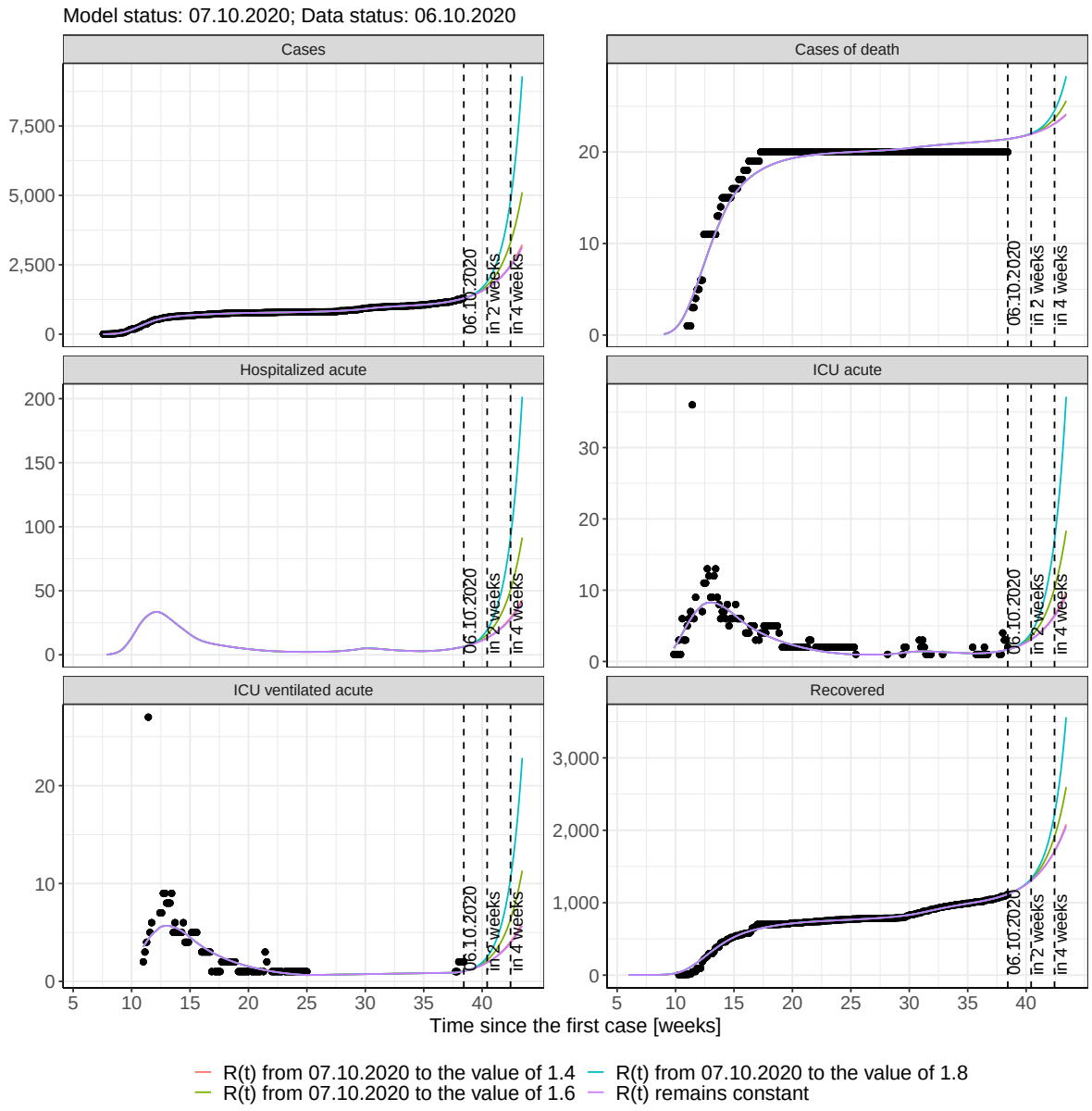


Figure 94: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

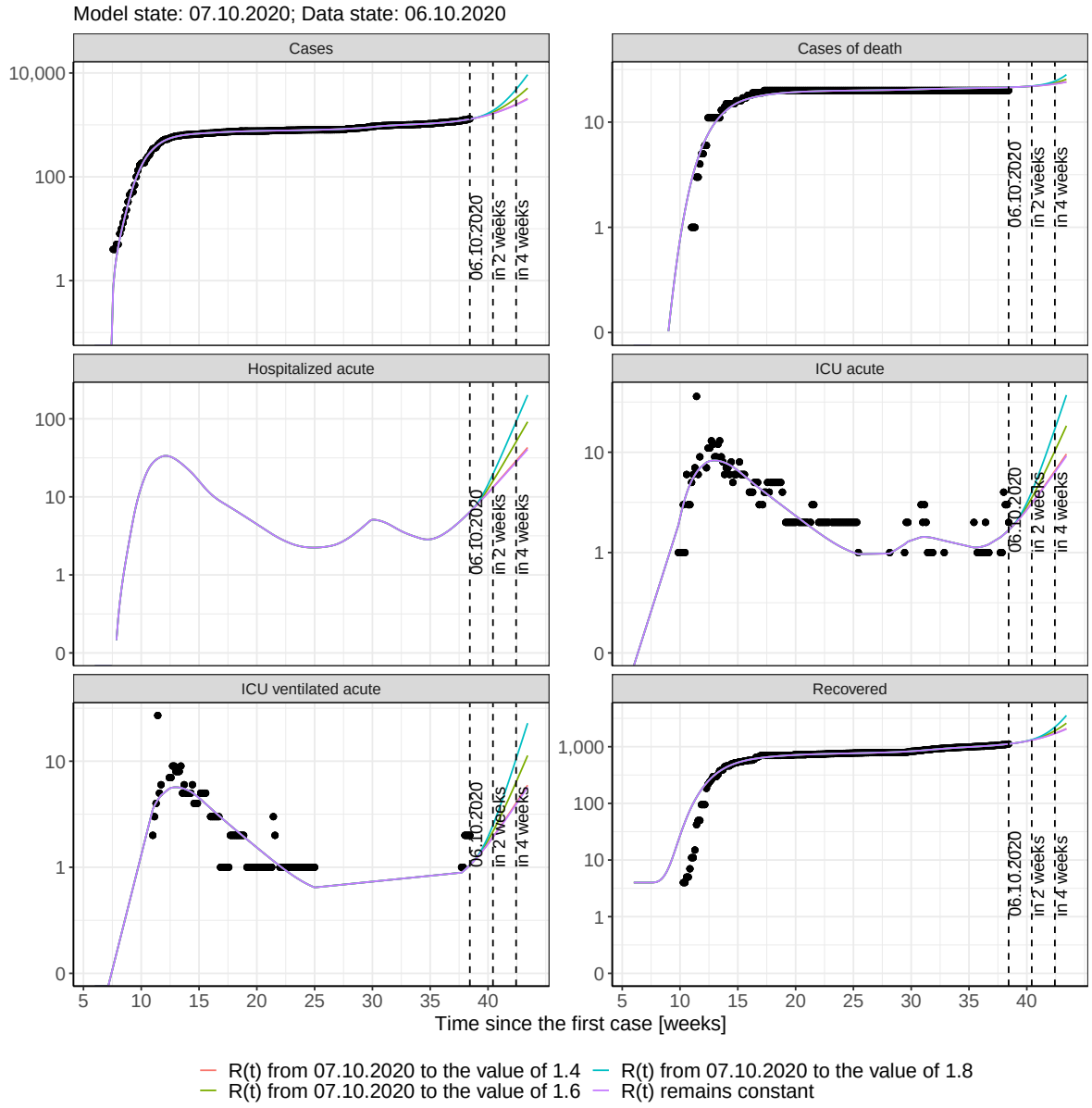


Figure 95: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

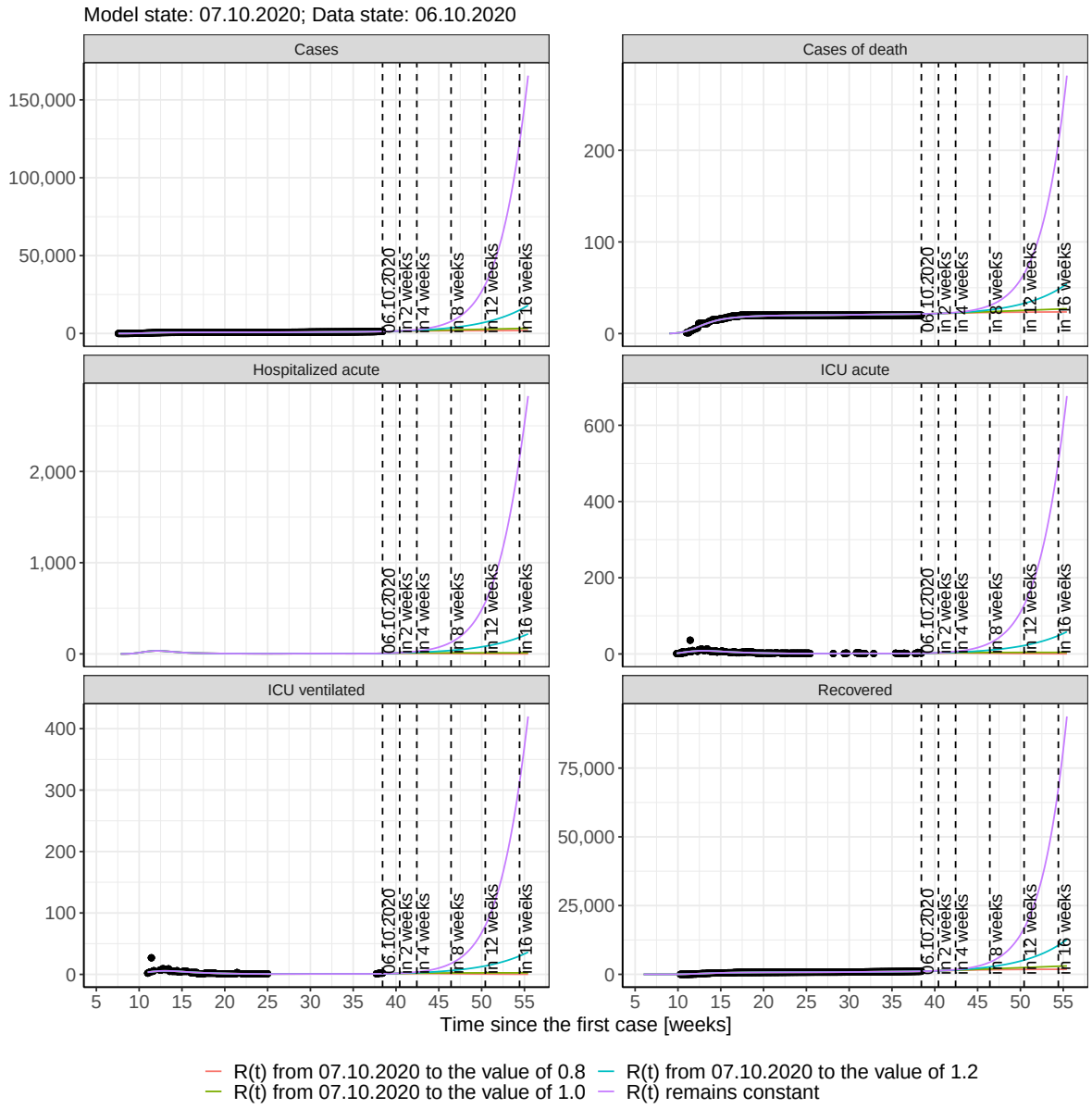


Figure 96: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

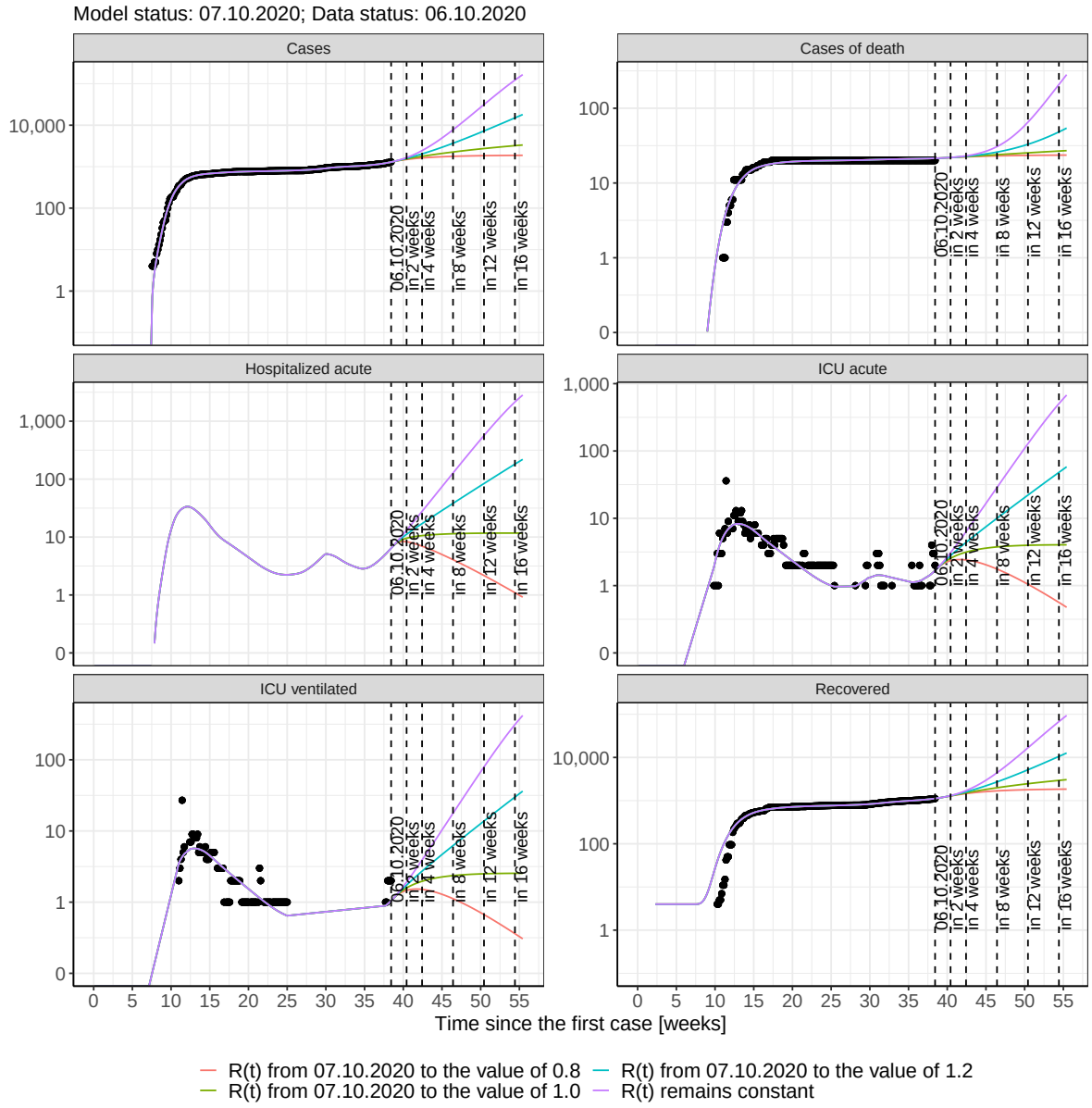


Figure 97: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Mecklenburg-Vorpommern assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 30); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 31); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 32); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 33) Model status from 07.10.2020; Data status: 06.10.2020.

Table 30: Mecklenburg-Vorpommern - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	1310	21	1128	7	2	1
08.10.2020	1329	21	1137	7	2	1
09.10.2020	1349	22	1148	7	2	1
10.10.2020	1370	22	1158	8	2	1
11.10.2020	1392	22	1170	8	2	1
12.10.2020	1415	22	1182	9	2	1
13.10.2020	1440	22	1194	9	2	1
14.10.2020	1466	22	1208	10	2	1
15.10.2020	1494	22	1222	10	2	2
16.10.2020	1523	22	1237	11	3	2
17.10.2020	1554	22	1252	11	3	2
18.10.2020	1586	22	1269	12	3	2
19.10.2020	1621	22	1286	12	3	2
20.10.2020	1657	22	1305	13	3	2
21.10.2020	1695	22	1325	14	3	2
22.10.2020	1736	22	1345	15	3	2
23.10.2020	1779	22	1367	15	4	2
24.10.2020	1824	22	1390	16	4	2
25.10.2020	1872	22	1414	17	4	2
26.10.2020	1922	22	1440	18	4	3
27.10.2020	1976	22	1467	19	4	3
28.10.2020	2032	22	1496	20	5	3
29.10.2020	2092	23	1526	21	5	3
30.10.2020	2154	23	1558	22	5	3
31.10.2020	2221	23	1592	24	5	3
01.11.2020	2291	23	1628	25	6	4
02.11.2020	2365	23	1665	26	6	4
03.11.2020	2443	23	1705	28	6	4

Table 31: Mecklenburg-Vorpommern - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	1309	21	1128	7	2	1
08.10.2020	1326	21	1137	7	2	1
09.10.2020	1342	22	1148	7	2	1
10.10.2020	1358	22	1158	8	2	1
11.10.2020	1373	22	1169	8	2	1
12.10.2020	1388	22	1181	8	2	1
13.10.2020	1402	22	1192	8	2	1
14.10.2020	1416	22	1204	8	2	1
15.10.2020	1430	22	1217	8	2	1
16.10.2020	1443	22	1229	8	2	1
17.10.2020	1456	22	1242	8	2	1
18.10.2020	1468	22	1255	8	2	1
19.10.2020	1480	22	1268	8	2	1
20.10.2020	1492	22	1281	8	2	1
21.10.2020	1503	22	1294	8	2	1
22.10.2020	1514	22	1307	8	2	1
23.10.2020	1525	22	1320	8	2	2
24.10.2020	1536	22	1333	8	2	2
25.10.2020	1546	22	1346	8	2	2
26.10.2020	1556	22	1358	8	2	2
27.10.2020	1565	22	1371	8	2	2
28.10.2020	1575	22	1383	8	2	2
29.10.2020	1584	22	1396	8	2	2
30.10.2020	1592	22	1408	7	2	2
31.10.2020	1601	22	1420	7	2	2
01.11.2020	1609	22	1431	7	2	2
02.11.2020	1617	22	1443	7	2	2
03.11.2020	1625	22	1454	7	2	2

Table 32: Mecklenburg-Vorpommern - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	1310	21	1128	7	2	1
08.10.2020	1327	21	1137	7	2	1
09.10.2020	1344	22	1148	7	2	1
10.10.2020	1361	22	1158	8	2	1
11.10.2020	1379	22	1169	8	2	1
12.10.2020	1396	22	1181	8	2	1
13.10.2020	1413	22	1193	8	2	1
14.10.2020	1431	22	1205	9	2	1
15.10.2020	1448	22	1218	9	2	1
16.10.2020	1465	22	1232	9	2	1
17.10.2020	1482	22	1245	9	2	1
18.10.2020	1500	22	1259	9	2	2
19.10.2020	1517	22	1273	9	2	2
20.10.2020	1534	22	1288	10	3	2
21.10.2020	1552	22	1302	10	3	2
22.10.2020	1569	22	1318	10	3	2
23.10.2020	1586	22	1333	10	3	2
24.10.2020	1603	22	1348	10	3	2
25.10.2020	1621	22	1364	10	3	2
26.10.2020	1638	22	1379	10	3	2
27.10.2020	1655	22	1395	10	3	2
28.10.2020	1672	22	1411	10	3	2
29.10.2020	1690	22	1427	10	3	2
30.10.2020	1707	22	1444	10	3	2
31.10.2020	1724	22	1460	10	3	2
01.11.2020	1741	22	1476	10	3	2
02.11.2020	1759	22	1493	11	3	2
03.11.2020	1776	23	1509	11	3	2

Table 33: Mecklenburg-Vorpommern - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	1310	21	1128	7	2	1
08.10.2020	1328	21	1137	7	2	1
09.10.2020	1346	22	1148	7	2	1
10.10.2020	1366	22	1158	8	2	1
11.10.2020	1385	22	1170	8	2	1
12.10.2020	1405	22	1181	8	2	1
13.10.2020	1426	22	1194	9	2	1
14.10.2020	1448	22	1207	9	2	1
15.10.2020	1470	22	1220	9	2	1
16.10.2020	1492	22	1234	10	2	2
17.10.2020	1516	22	1249	10	3	2
18.10.2020	1540	22	1264	10	3	2
19.10.2020	1564	22	1280	11	3	2
20.10.2020	1590	22	1296	11	3	2
21.10.2020	1616	22	1313	12	3	2
22.10.2020	1643	22	1330	12	3	2
23.10.2020	1670	22	1348	12	3	2
24.10.2020	1699	22	1367	13	3	2
25.10.2020	1728	22	1387	13	3	2
26.10.2020	1758	22	1407	13	3	2
27.10.2020	1789	22	1427	14	4	2
28.10.2020	1821	22	1449	14	4	2
29.10.2020	1854	22	1471	15	4	2
30.10.2020	1888	22	1493	15	4	2
31.10.2020	1922	23	1517	16	4	2
01.11.2020	1958	23	1541	16	4	3
02.11.2020	1995	23	1566	17	4	3
03.11.2020	2033	23	1591	17	4	3

9.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

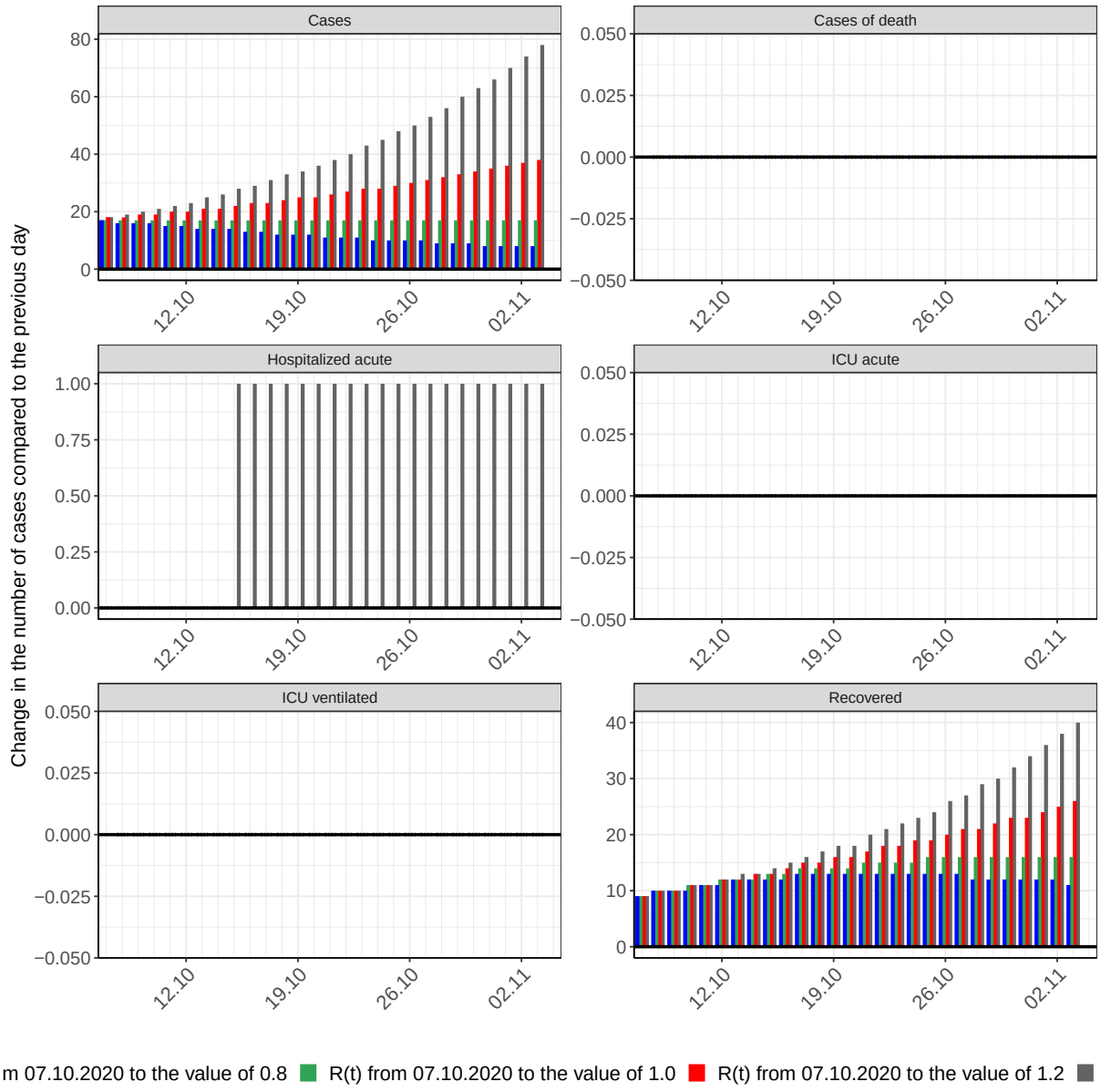


Figure 98: Simulation of daily new cases for the next 4 weeks - Mecklenburg-Vorpommern

10 Lower Saxony

10.1 Model description

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

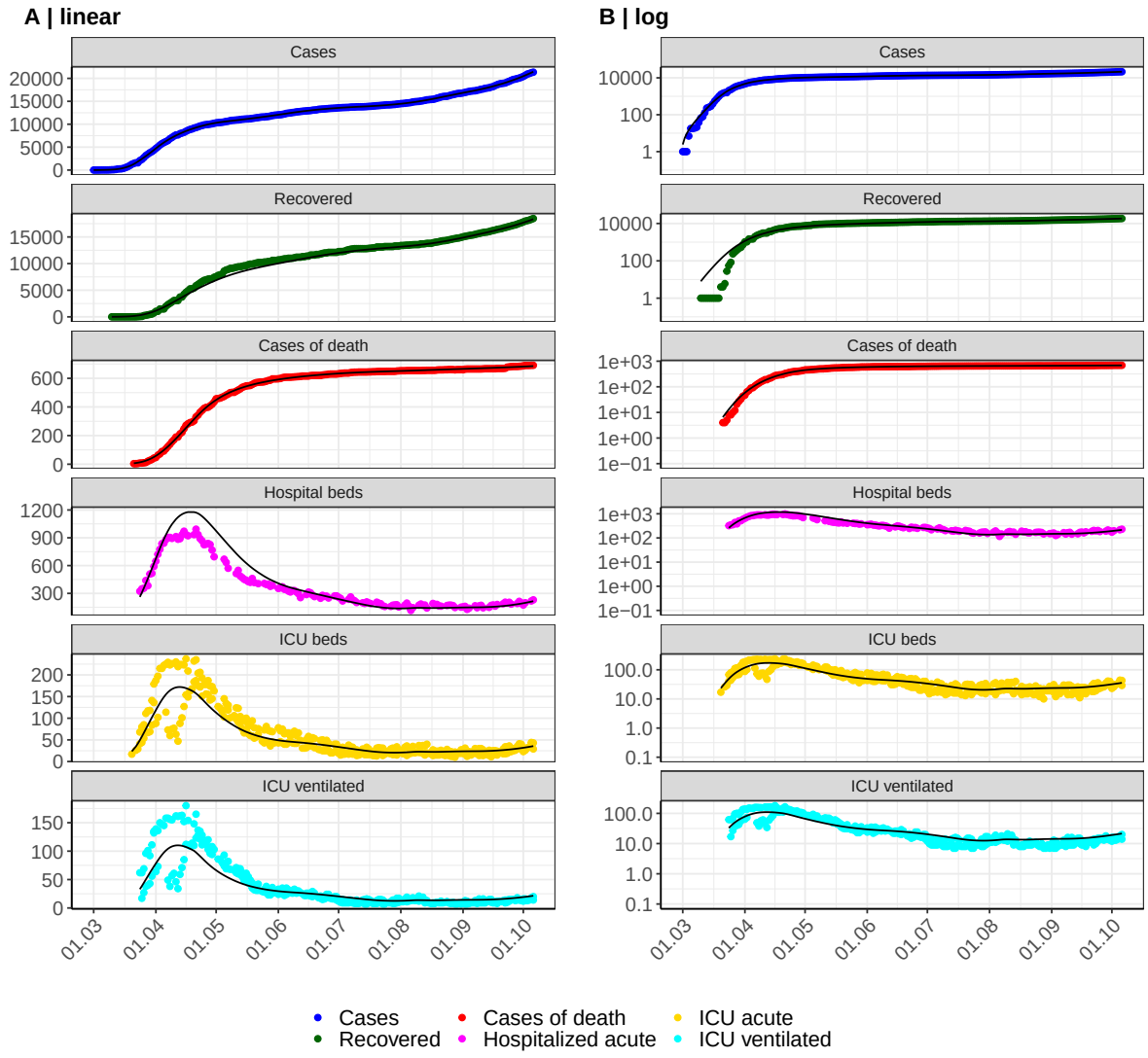


Figure 99: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Lower Saxony. Points: reported data; lines: model description.

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

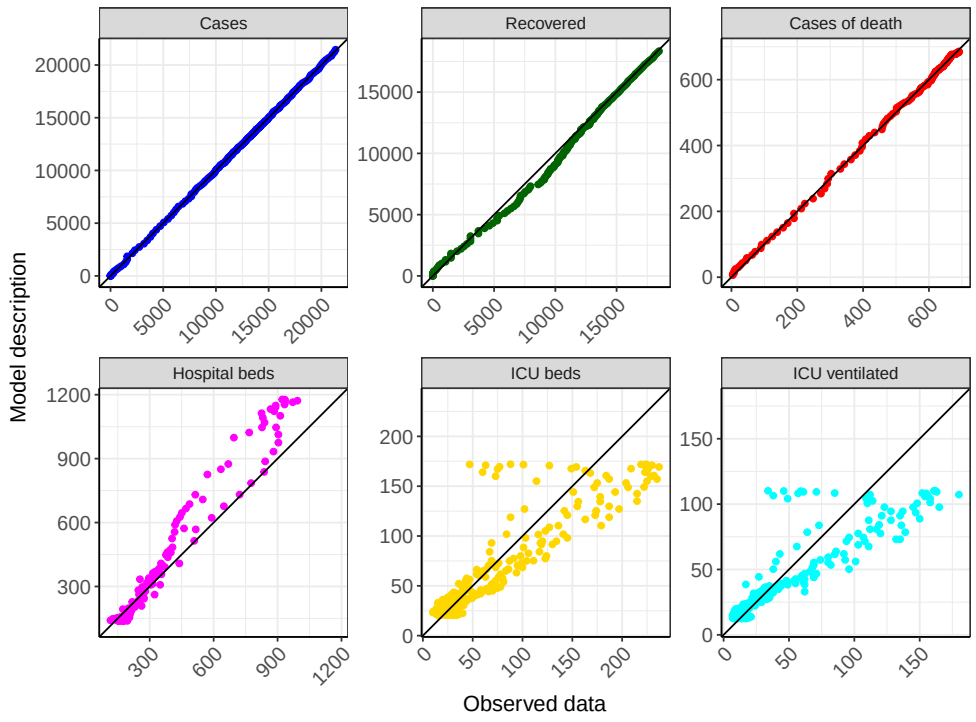


Figure 100: Goodness-of-fit plots for Lower Saxony. Lines: lines of identity.

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

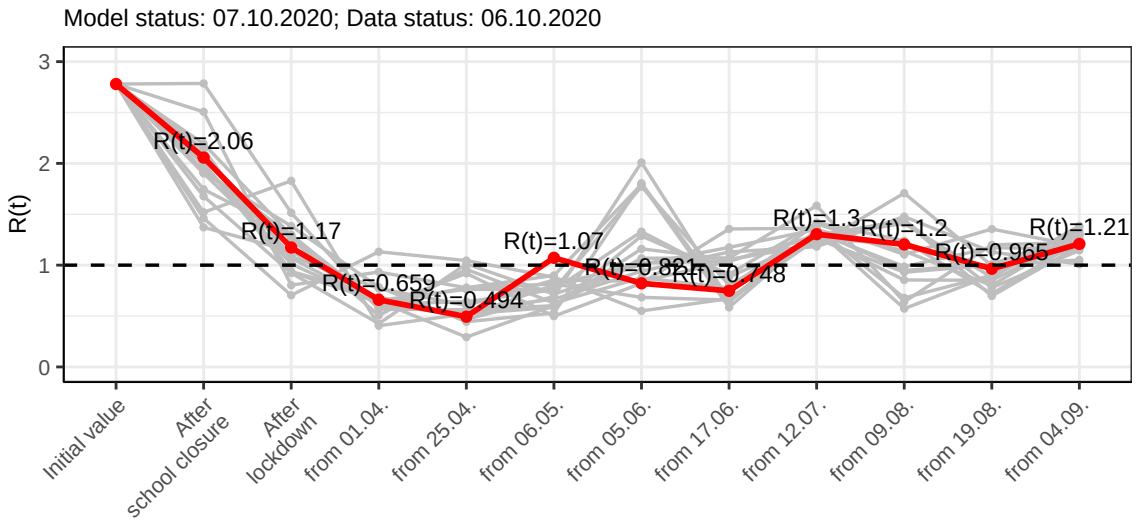


Figure 101: R(t) values before and after the NPIs for Lower Saxony

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

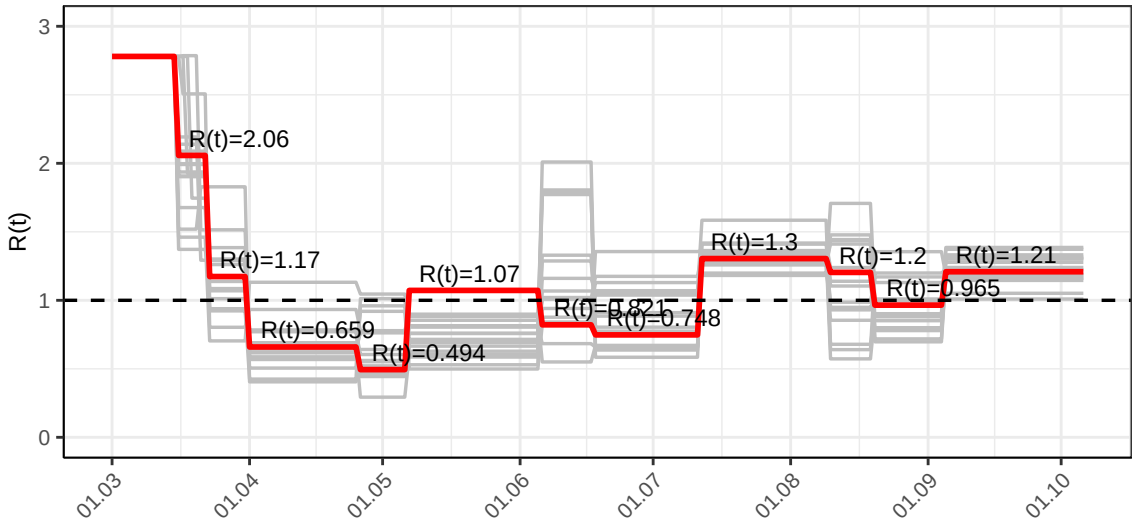


Figure 102: R(t) values over time for Lower Saxony

10.2 Model predictions

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

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

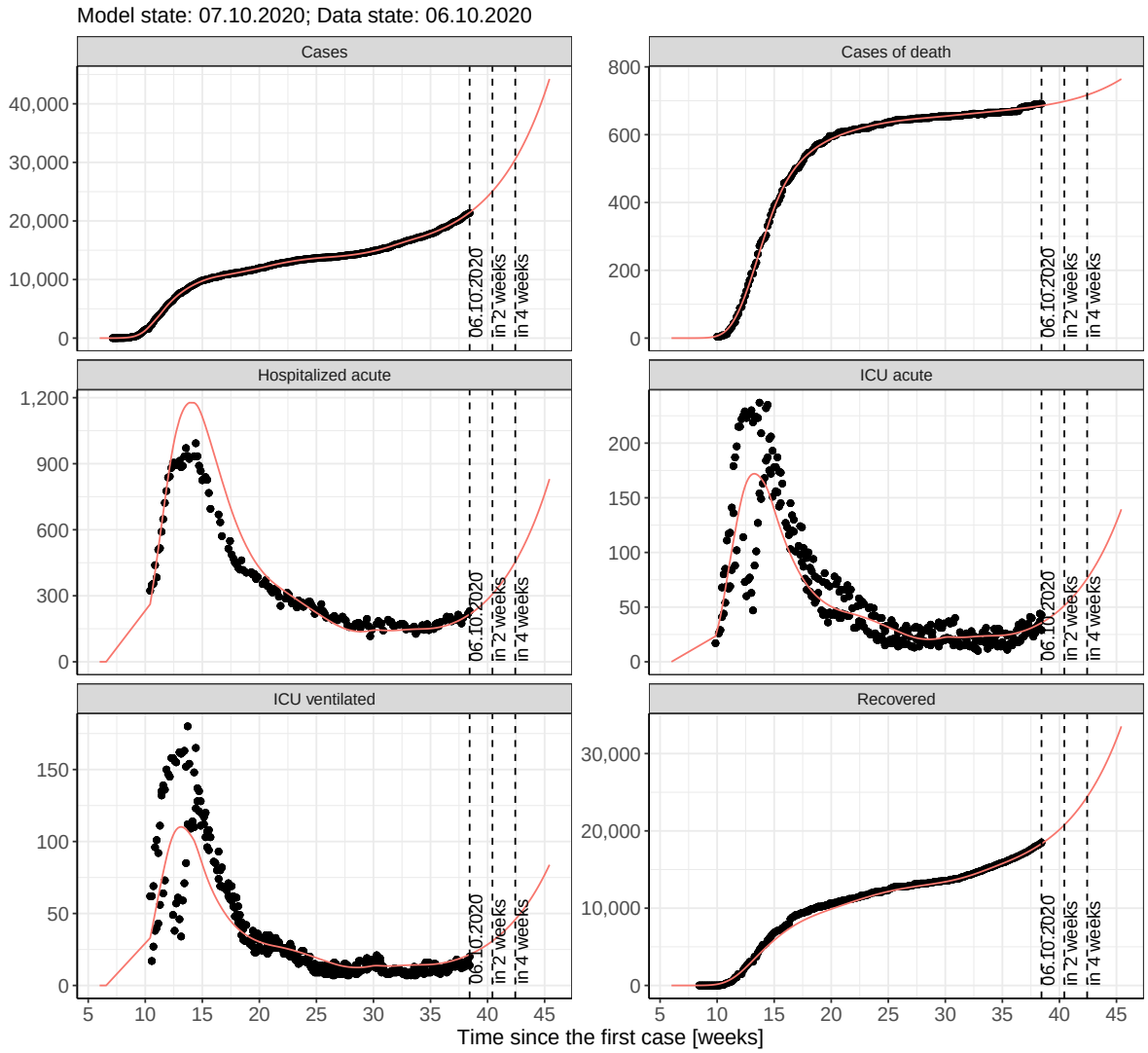


Figure 103: Representation of the model predictions for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

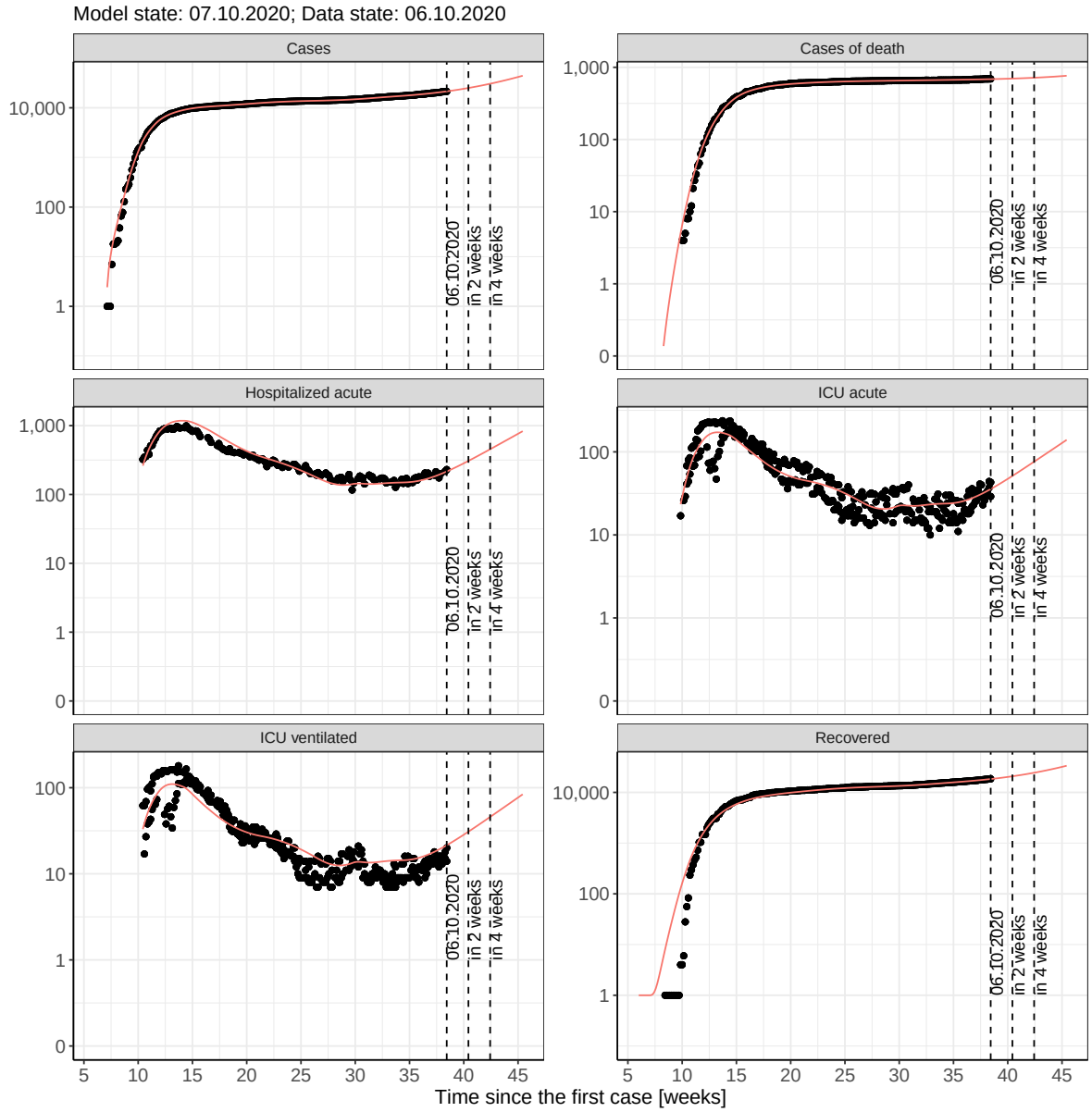


Figure 104: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

10.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

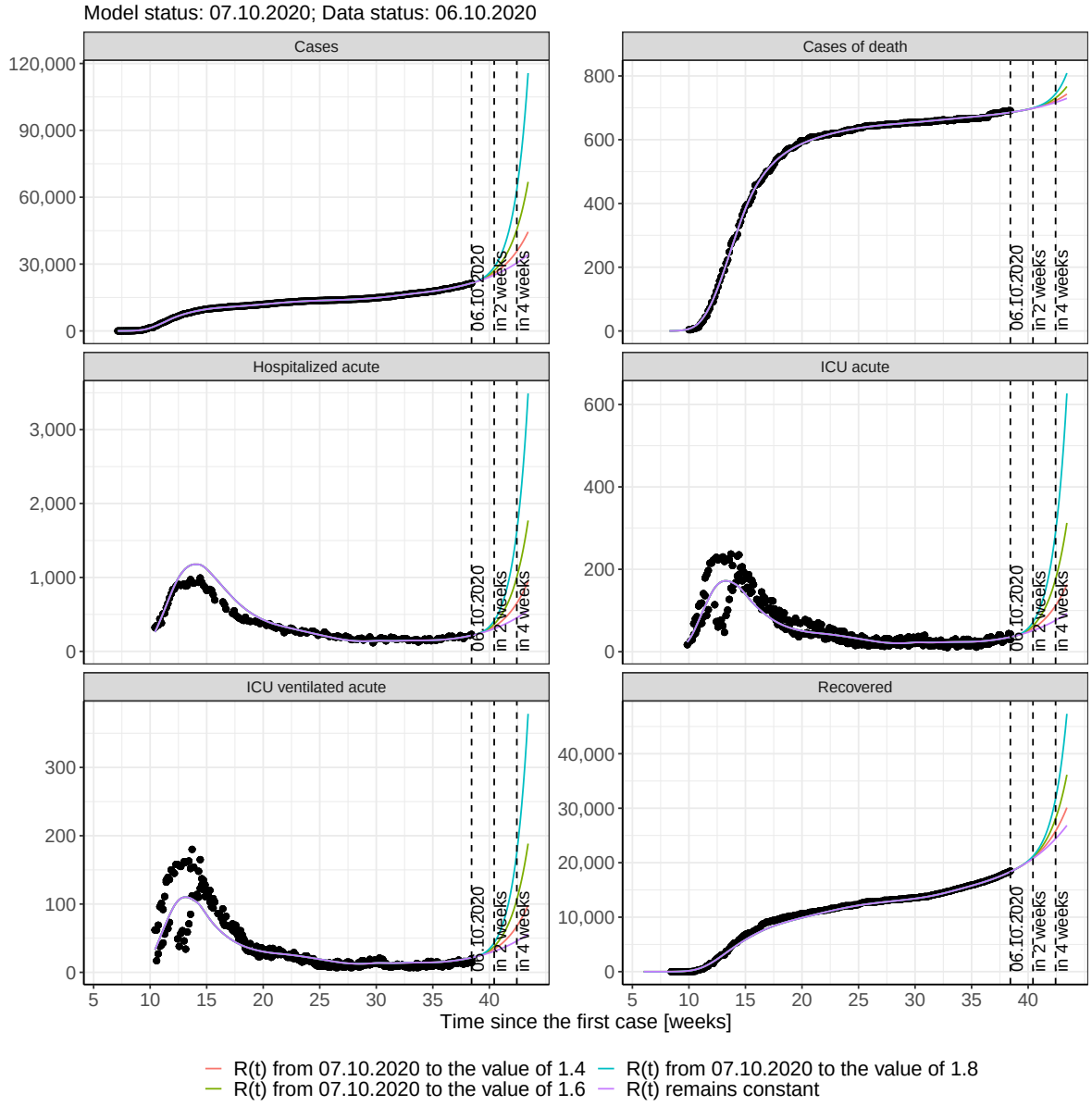


Figure 105: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

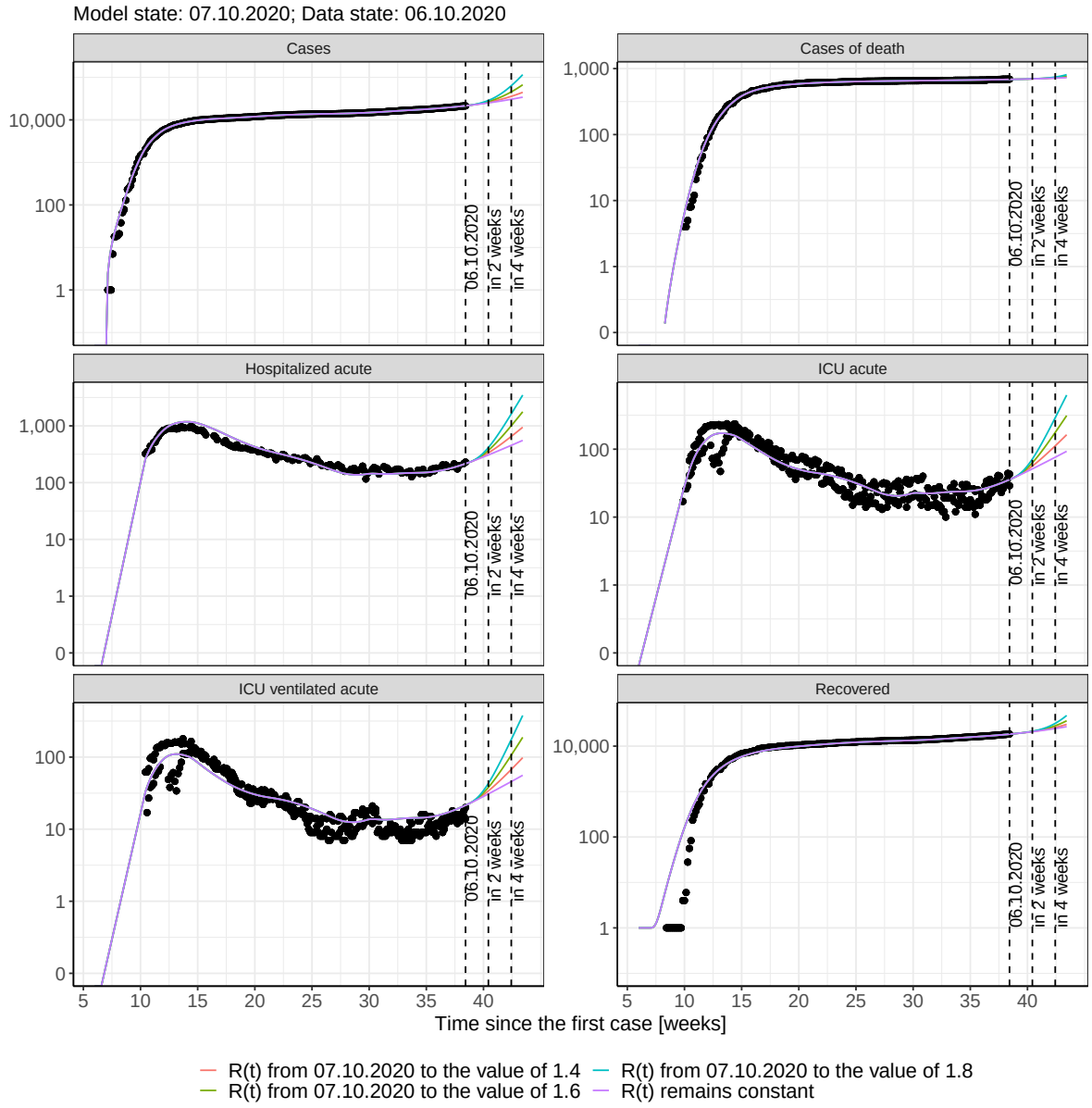


Figure 106: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

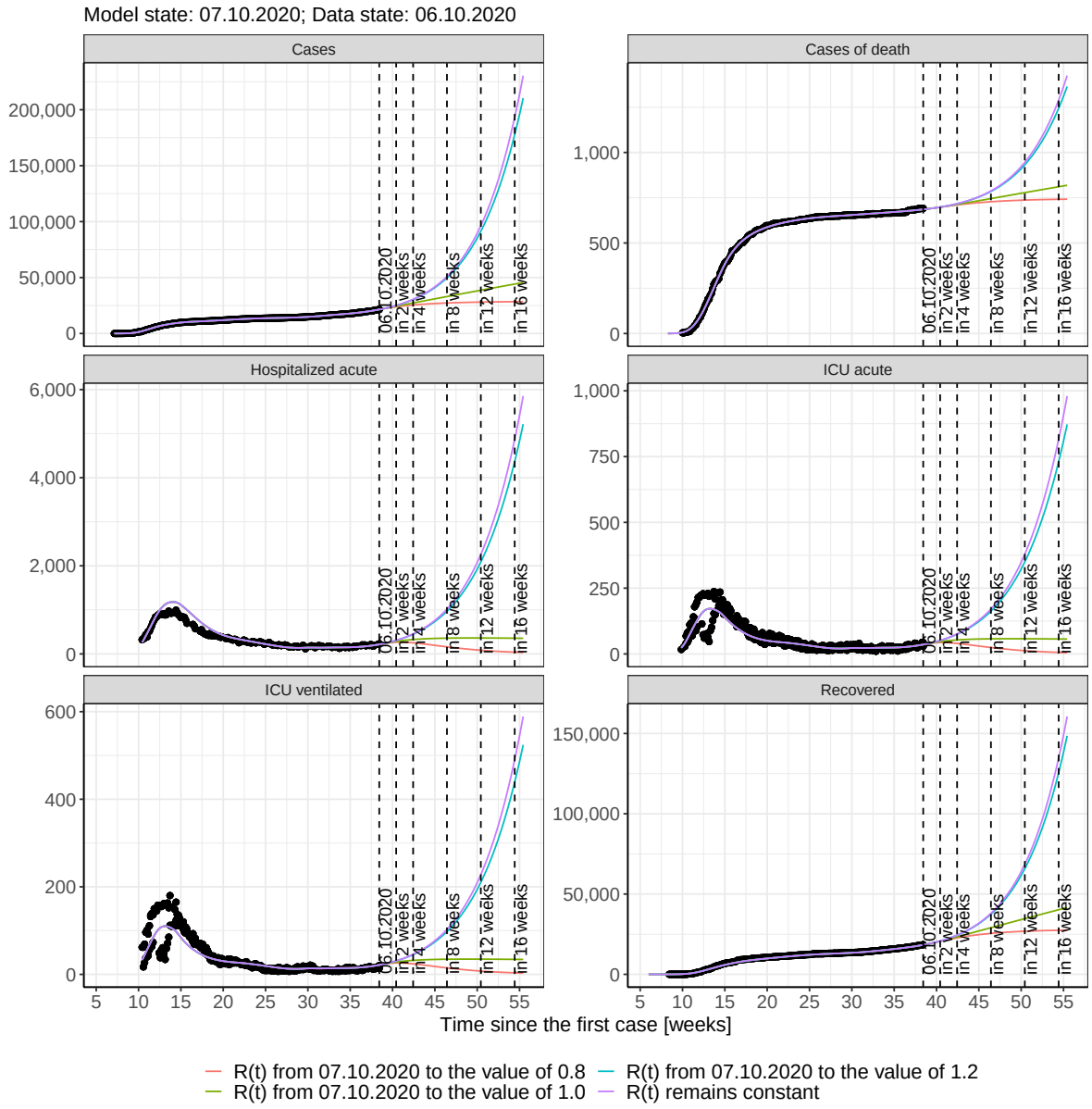


Figure 107: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

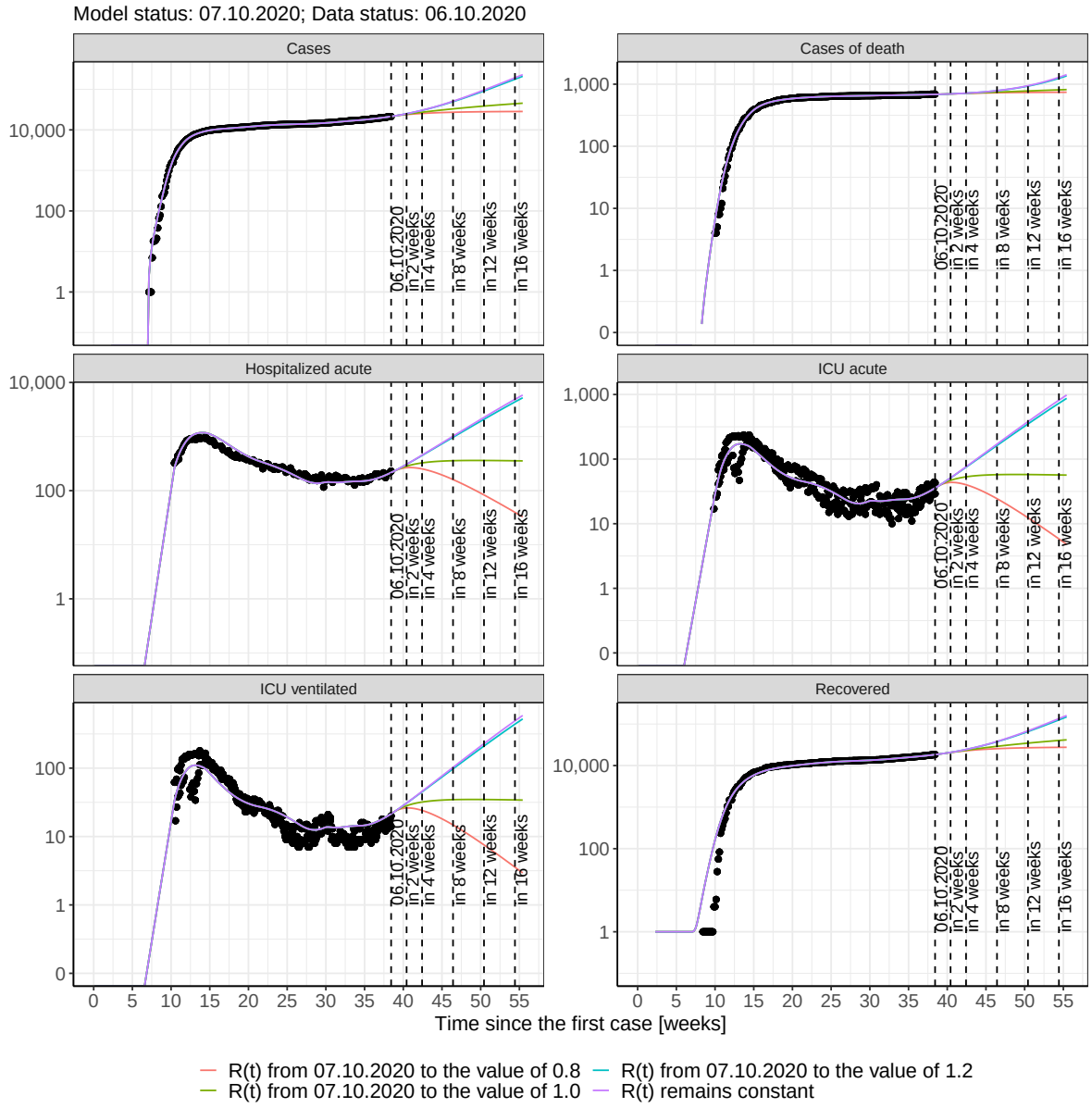


Figure 108: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Lower Saxony assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 34); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 35); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 36); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 37) Model status from 07.10.2020; Data status: 06.10.2020.

Table 34: Lower Saxony - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	21663	686	18484	221	37	22
08.10.2020	21882	687	18631	226	37	23
09.10.2020	22107	688	18782	232	38	23
10.10.2020	22339	689	18938	237	39	24
11.10.2020	22578	689	19098	243	40	24
12.10.2020	22824	690	19263	249	41	25
13.10.2020	23077	691	19433	256	43	26
14.10.2020	23338	692	19607	262	44	26
15.10.2020	23606	693	19787	269	45	27
16.10.2020	23883	694	19972	276	46	28
17.10.2020	24168	695	20162	284	47	28
18.10.2020	24461	696	20357	291	49	29
19.10.2020	24763	697	20559	299	50	30
20.10.2020	25073	698	20766	307	51	31
21.10.2020	25393	699	20979	316	53	32
22.10.2020	25723	700	21199	325	54	33
23.10.2020	26062	702	21425	334	56	34
24.10.2020	26411	703	21657	343	57	34
25.10.2020	26771	704	21897	352	59	35
26.10.2020	27141	705	22143	362	61	36
27.10.2020	27522	707	22397	373	62	38
28.10.2020	27915	708	22658	383	64	39
29.10.2020	28319	709	22927	394	66	40
30.10.2020	28735	711	23204	405	68	41
31.10.2020	29163	712	23489	417	70	42
01.11.2020	29604	714	23783	429	72	43
02.11.2020	30058	715	24085	441	74	44
03.11.2020	30526	717	24396	454	76	46

Table 35: Lower Saxony - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	21657	686	18484	221	37	22
08.10.2020	21857	687	18631	226	37	23
09.10.2020	22052	688	18782	231	38	23
10.10.2020	22241	689	18936	236	39	24
11.10.2020	22425	689	19094	241	40	24
12.10.2020	22604	690	19254	245	41	24
13.10.2020	22777	691	19417	249	41	25
14.10.2020	22946	692	19581	253	42	25
15.10.2020	23109	693	19747	256	42	25
16.10.2020	23268	694	19914	259	43	26
17.10.2020	23423	695	20081	261	43	26
18.10.2020	23573	696	20249	263	43	26
19.10.2020	23719	697	20416	265	43	26
20.10.2020	23860	698	20583	266	44	26
21.10.2020	23998	699	20748	267	44	26
22.10.2020	24131	700	20913	267	44	26
23.10.2020	24261	700	21076	267	43	26
24.10.2020	24387	701	21237	267	43	26
25.10.2020	24510	702	21397	267	43	26
26.10.2020	24629	703	21554	266	43	26
27.10.2020	24745	704	21710	265	43	26
28.10.2020	24857	705	21862	264	42	25
29.10.2020	24966	706	22013	262	42	25
30.10.2020	25072	707	22160	261	42	25
31.10.2020	25175	708	22306	259	41	25
01.11.2020	25275	709	22448	257	41	25
02.11.2020	25373	709	22588	255	41	24
03.11.2020	25467	710	22725	252	40	24

Table 36: Lower Saxony - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	21660	686	18484	221	37	22
08.10.2020	21869	687	18631	226	37	23
09.10.2020	22078	688	18782	231	38	23
10.10.2020	22287	689	18937	237	39	24
11.10.2020	22496	689	19096	242	40	24
12.10.2020	22705	690	19258	247	41	25
13.10.2020	22914	691	19424	252	42	25
14.10.2020	23122	692	19593	257	43	26
15.10.2020	23331	693	19765	262	43	26
16.10.2020	23539	694	19940	267	44	27
17.10.2020	23748	695	20118	271	45	27
18.10.2020	23956	696	20298	276	46	27
19.10.2020	24164	697	20480	280	46	28
20.10.2020	24372	698	20664	284	47	28
21.10.2020	24580	699	20850	288	47	29
22.10.2020	24788	700	21038	291	48	29
23.10.2020	24996	701	21227	295	49	29
24.10.2020	25203	702	21418	298	49	30
25.10.2020	25411	703	21610	302	50	30
26.10.2020	25618	704	21803	305	50	30
27.10.2020	25826	705	21997	308	51	30
28.10.2020	26033	706	22192	311	51	31
29.10.2020	26240	707	22388	314	51	31
30.10.2020	26447	708	22585	316	52	31
31.10.2020	26654	710	22782	319	52	31
01.11.2020	26861	711	22980	321	53	32
02.11.2020	27068	712	23179	324	53	32
03.11.2020	27274	713	23378	326	53	32

Table 37: Lower Saxony - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	21663	686	18484	221	37	22
08.10.2020	21881	687	18631	226	37	23
09.10.2020	22106	688	18782	232	38	23
10.10.2020	22337	689	18938	237	39	24
11.10.2020	22574	689	19098	243	40	24
12.10.2020	22819	690	19263	249	41	25
13.10.2020	23070	691	19432	256	42	26
14.10.2020	23328	692	19607	262	44	26
15.10.2020	23594	693	19786	269	45	27
16.10.2020	23867	694	19970	276	46	28
17.10.2020	24148	695	20160	283	47	28
18.10.2020	24437	696	20355	291	48	29
19.10.2020	24735	697	20555	298	50	30
20.10.2020	25040	698	20761	306	51	31
21.10.2020	25355	699	20973	314	53	32
22.10.2020	25678	700	21191	323	54	32
23.10.2020	26010	702	21416	332	55	33
24.10.2020	26352	703	21646	341	57	34
25.10.2020	26704	704	21883	350	59	35
26.10.2020	27065	705	22127	360	60	36
27.10.2020	27437	707	22378	369	62	37
28.10.2020	27819	708	22636	380	64	38
29.10.2020	28212	709	22901	390	65	39
30.10.2020	28617	711	23174	401	67	40
31.10.2020	29032	712	23455	412	69	41
01.11.2020	29460	714	23743	423	71	43
02.11.2020	29899	715	24040	435	73	44
03.11.2020	30351	717	24345	447	75	45

10.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

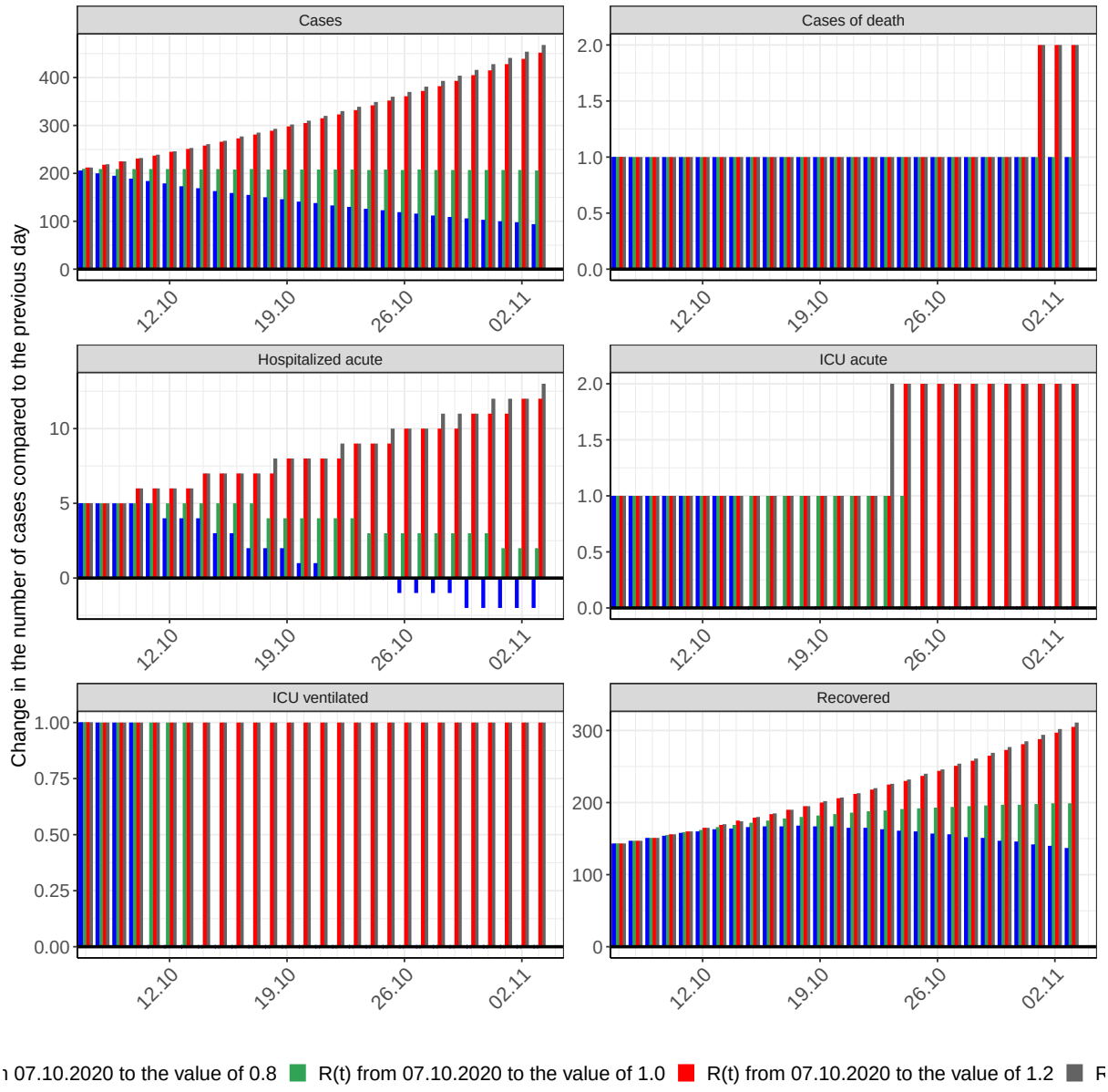


Figure 109: Simulation of daily new cases for the next 4 weeks - Lower Saxony

11 North Rhine-Westphalia

11.1 Model description

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

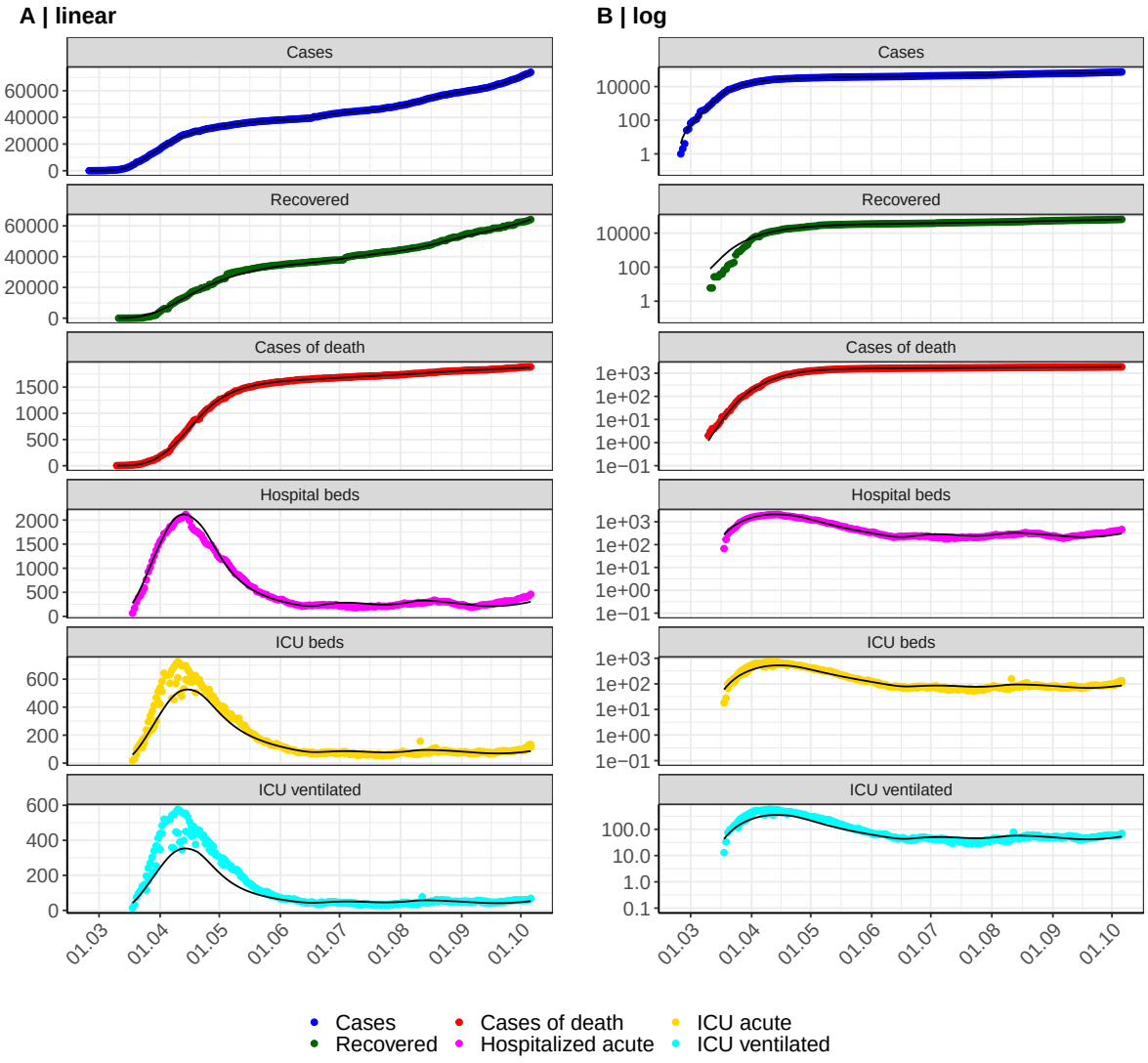


Figure 110: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in North Rhine-Westphalia. Points: reported data; lines: model description.

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

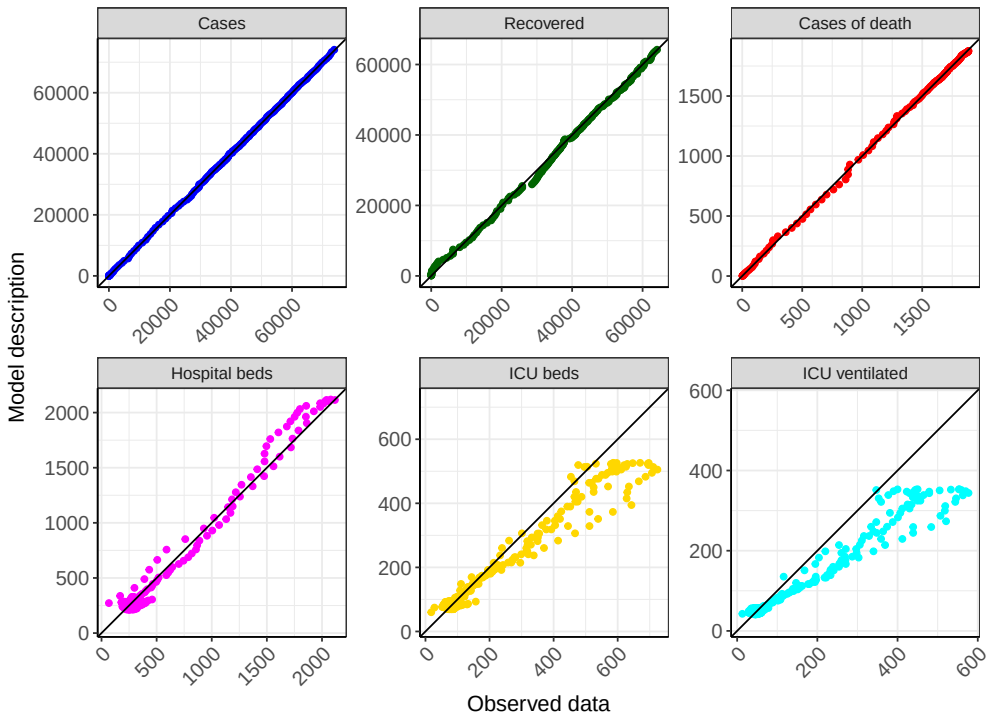


Figure 111: Goodness-of-fit plots for North Rhine-Westphalia. Lines: lines of identity.

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

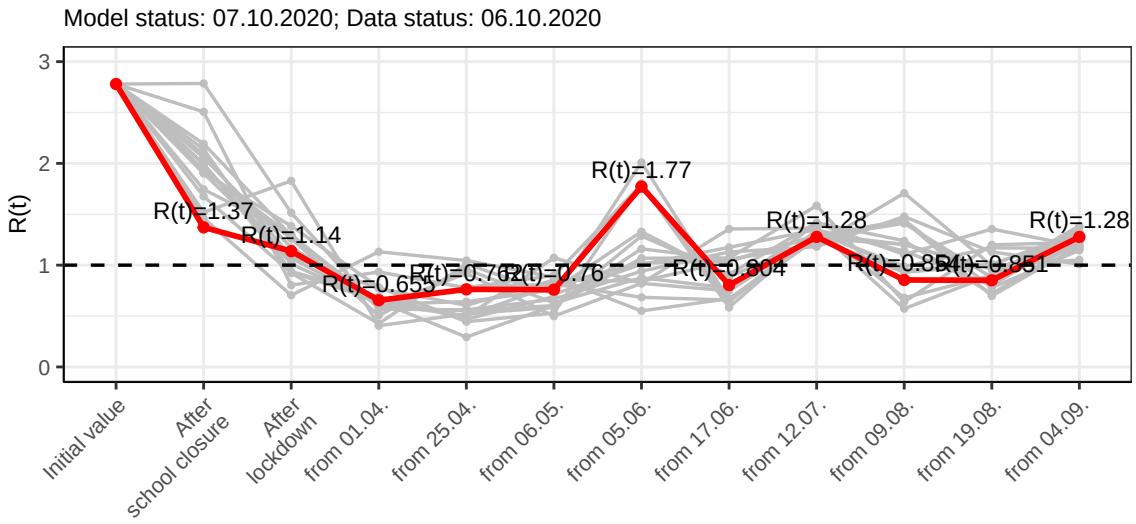


Figure 112: R(t) values before and after the NPIs for North Rhine-Westphalia

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

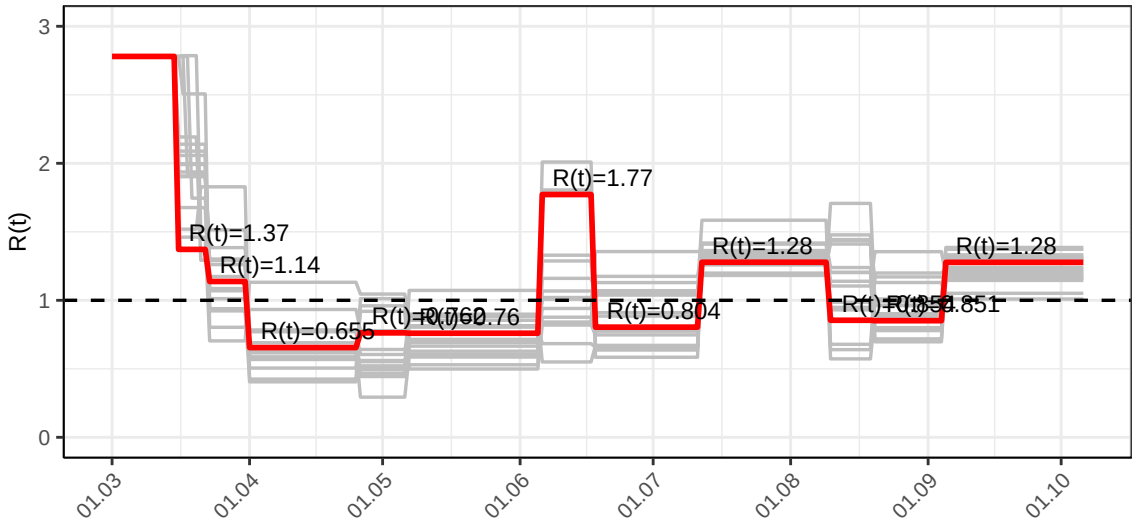


Figure 113: R(t) values over time for North Rhine-Westphalia

11.2 Model predictions

11.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.28)

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.

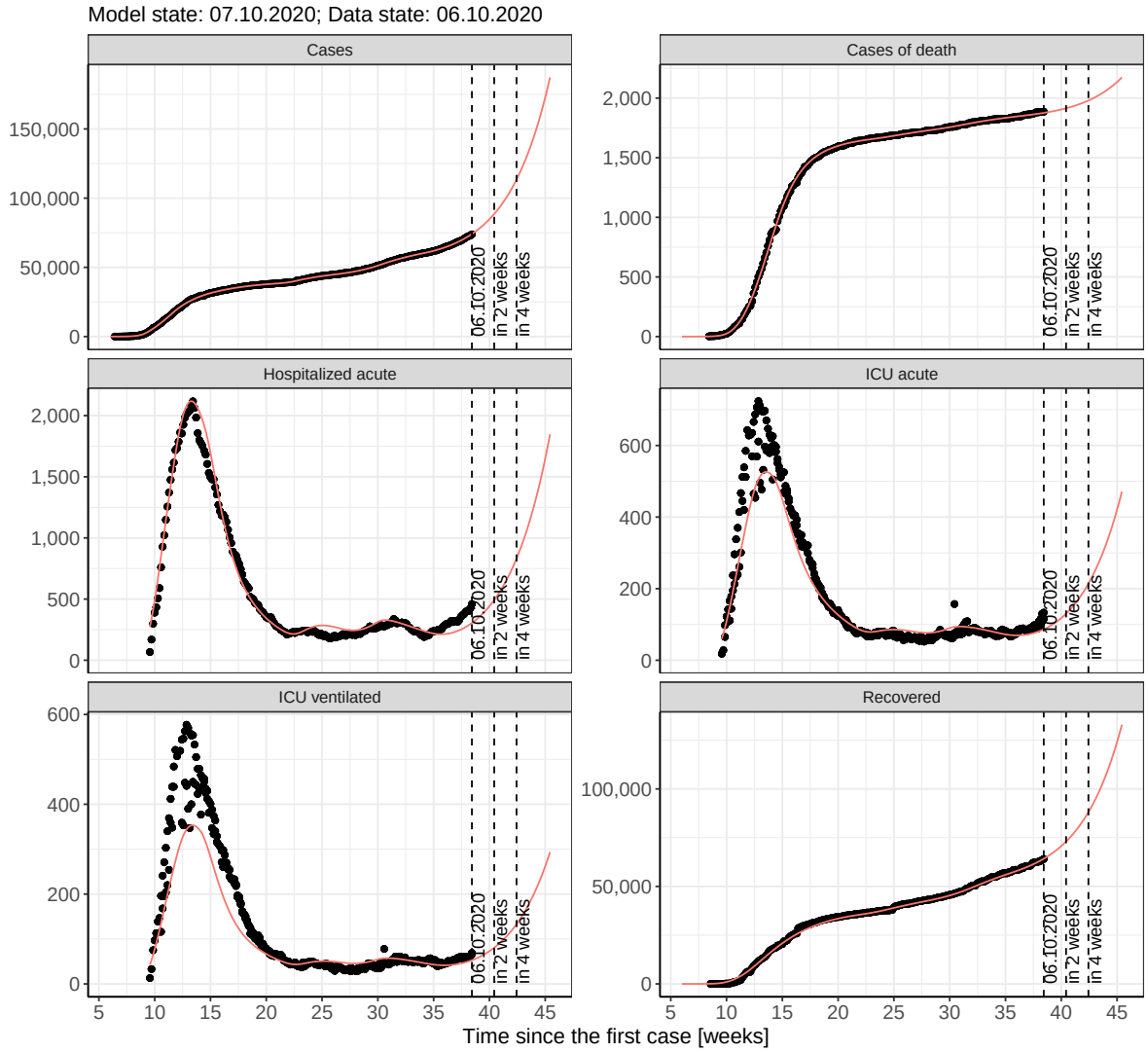


Figure 114: Representation of the model predictions for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model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

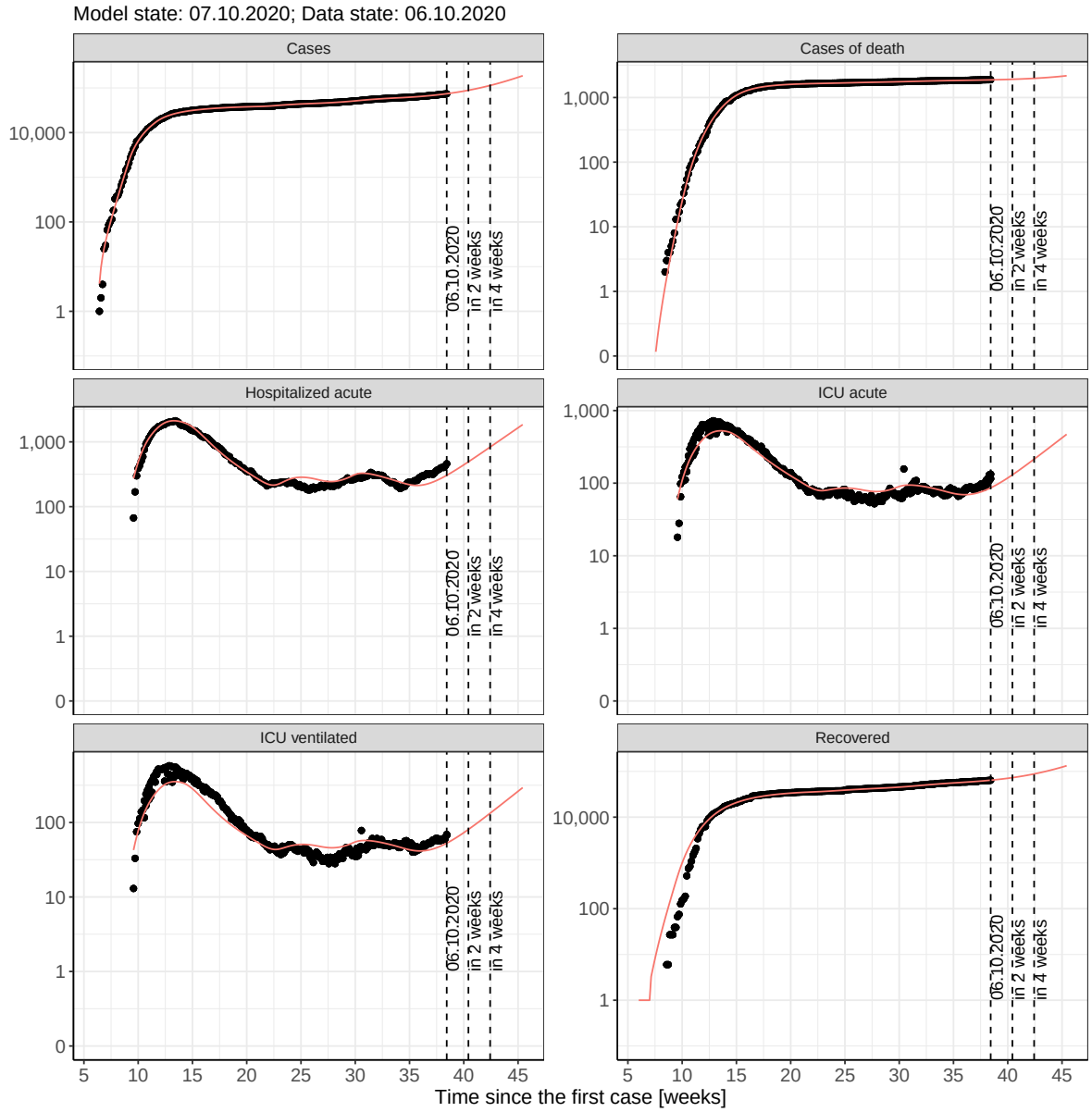


Figure 115: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model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

11.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

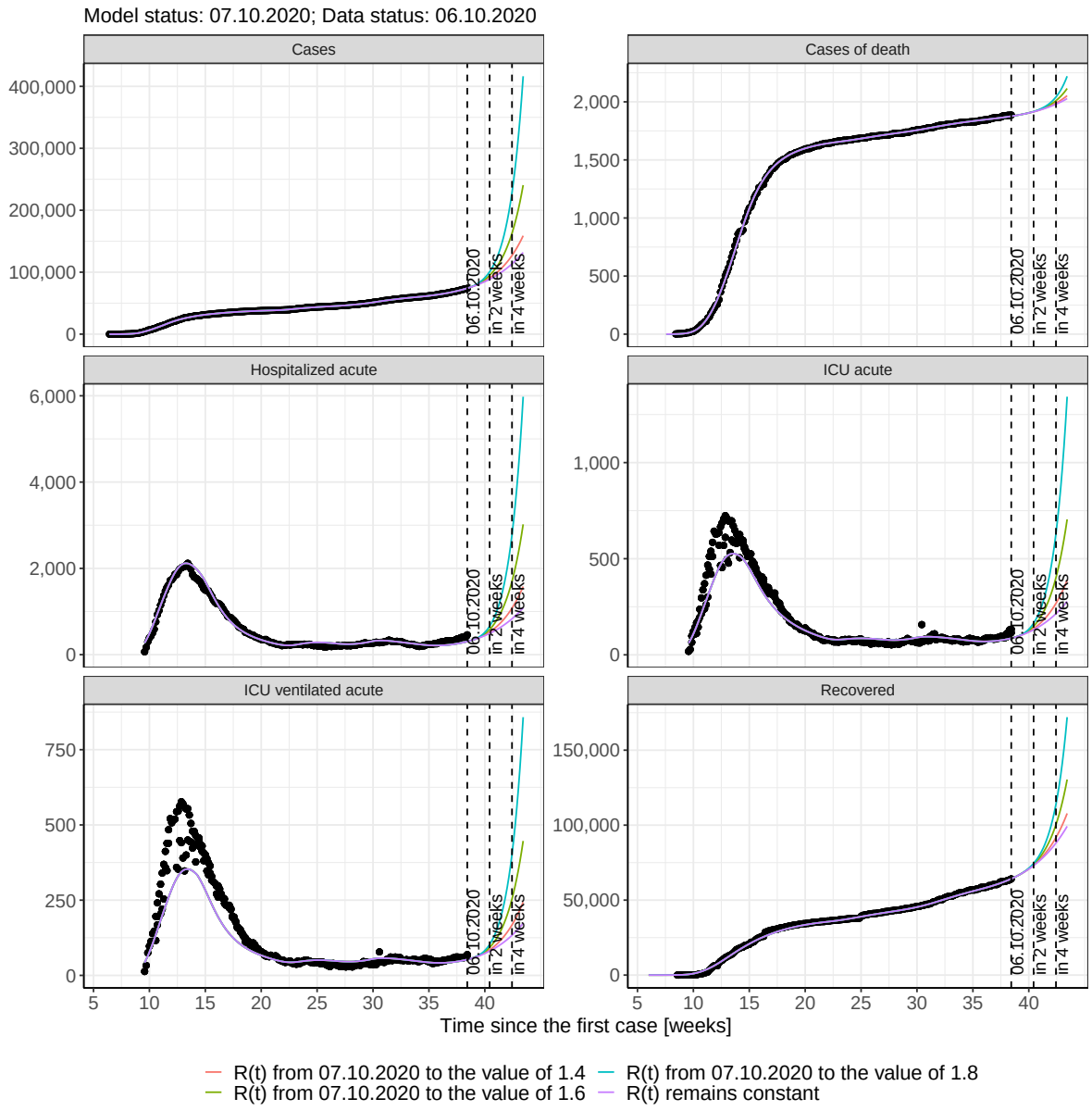


Figure 116: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

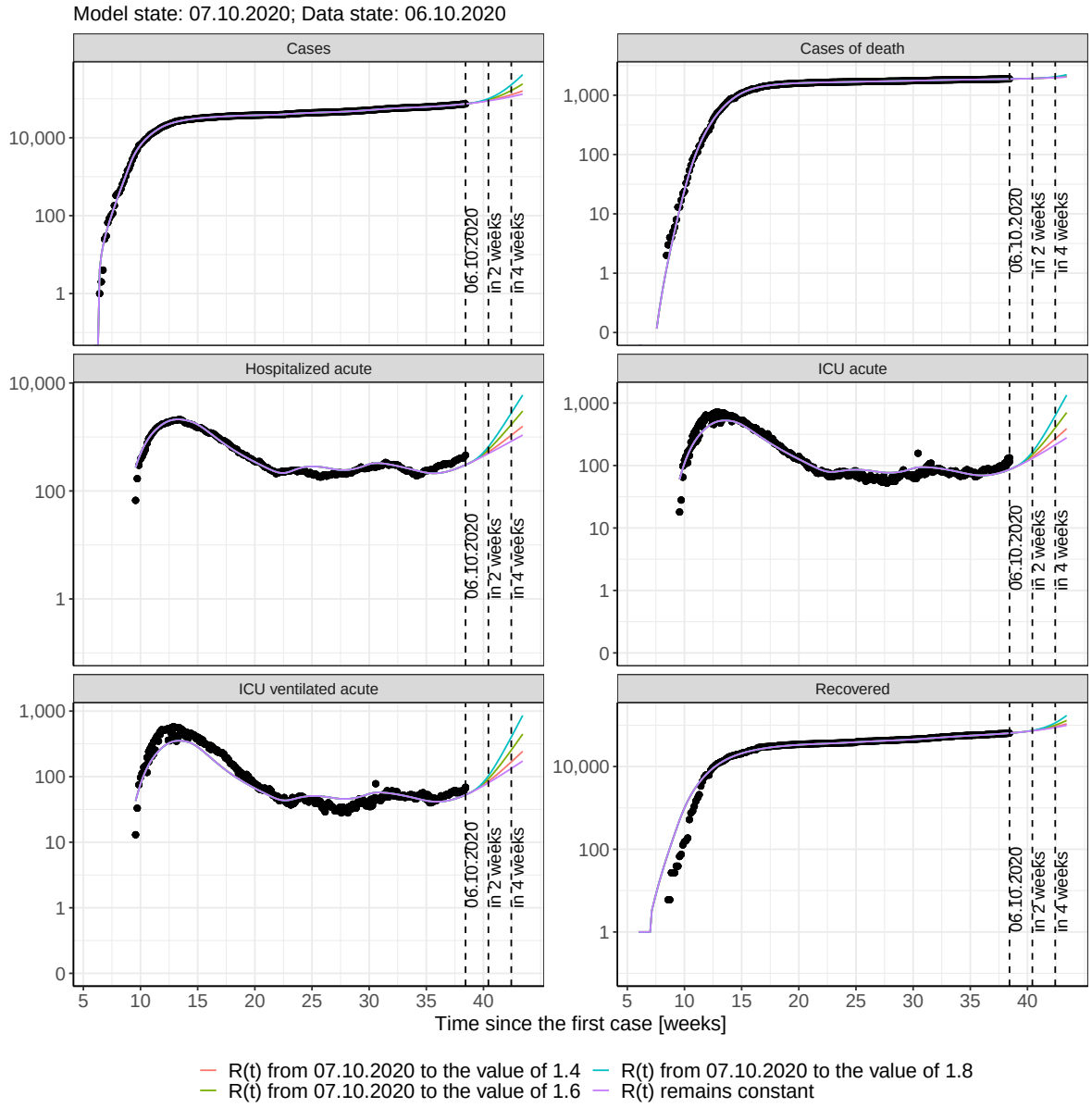


Figure 117: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

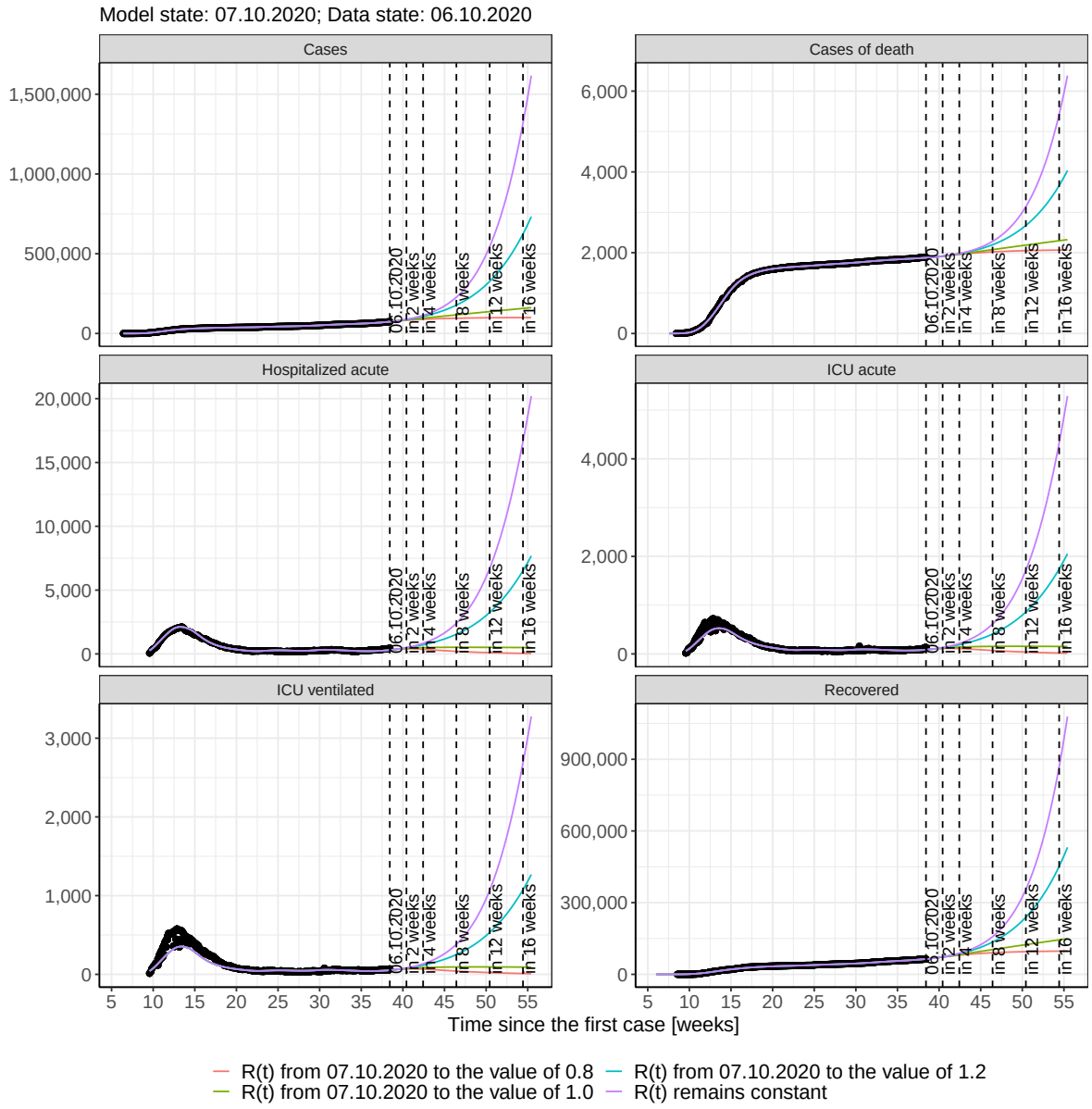


Figure 118: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

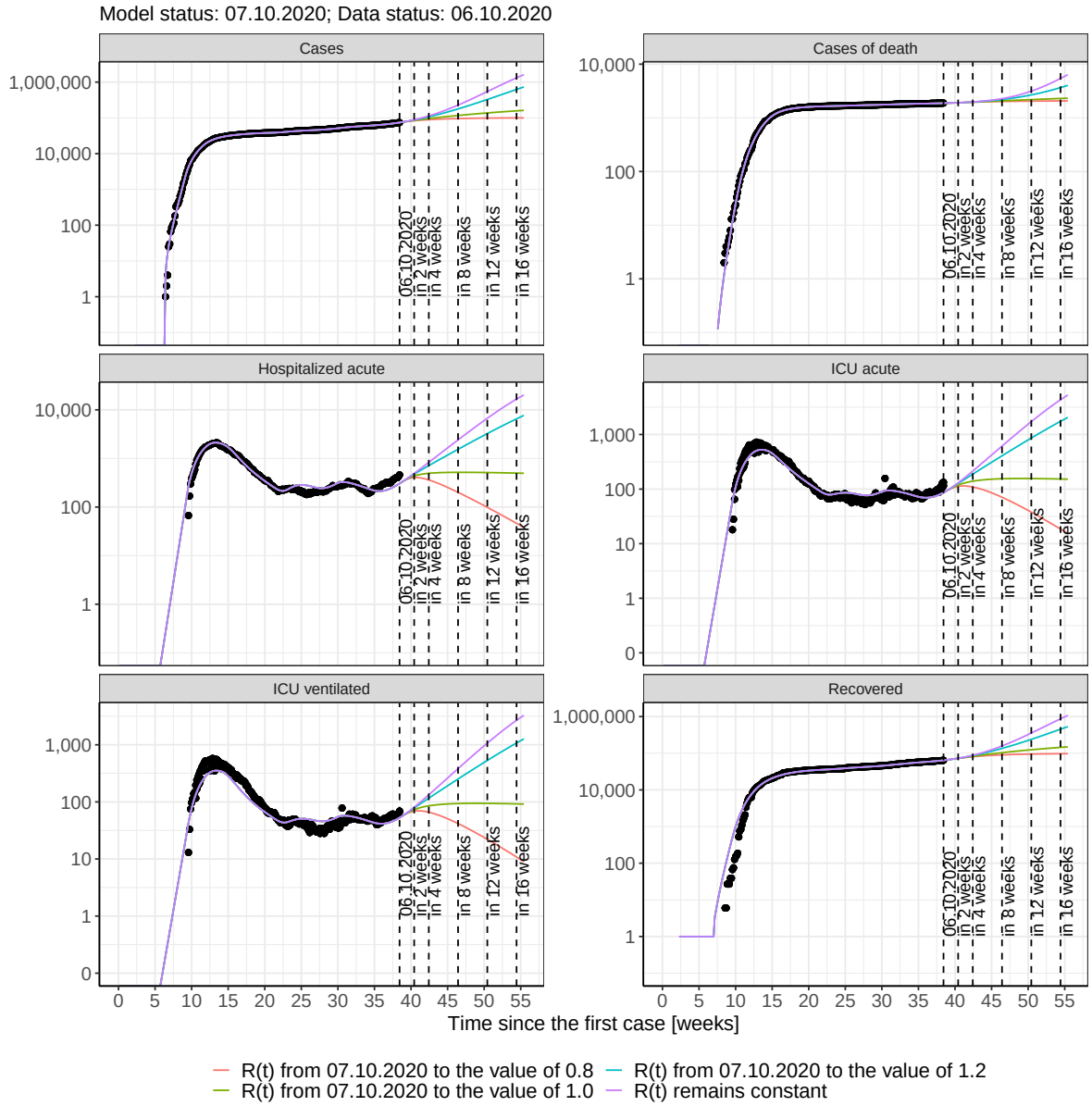


Figure 119: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for North Rhine-Westphalia assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 38); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 39); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 40); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 41) Model status from 07.10.2020; Data status: 06.10.2020.

Table 38: North Rhine-Westphalia - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	74894	1878	64690	314	88	54
08.10.2020	75719	1880	65196	325	91	56
09.10.2020	76577	1883	65721	335	93	57
10.10.2020	77469	1885	66266	347	96	59
11.10.2020	78397	1888	66832	358	98	60
12.10.2020	79361	1890	67419	371	101	62
13.10.2020	80363	1893	68029	384	104	64
14.10.2020	81404	1896	68662	397	107	66
15.10.2020	82487	1899	69320	412	111	68
16.10.2020	83613	1902	70003	427	114	71
17.10.2020	84782	1905	70713	442	118	73
18.10.2020	85998	1908	71450	458	122	75
19.10.2020	87262	1911	72216	475	126	78
20.10.2020	88576	1915	73012	493	130	81
21.10.2020	89941	1918	73839	511	135	83
22.10.2020	91360	1922	74699	530	139	86
23.10.2020	92835	1926	75592	550	144	89
24.10.2020	94368	1930	76520	571	149	93
25.10.2020	95961	1934	77484	593	155	96
26.10.2020	97617	1938	78487	615	160	99
27.10.2020	99337	1943	79528	639	166	103
28.10.2020	101130	1948	80611	663	172	107
29.10.2020	102980	1952	81736	688	178	111
30.10.2020	104910	1957	82905	715	185	115
31.10.2020	106920	1963	84120	742	192	119
01.11.2020	109010	1968	85383	771	199	124
02.11.2020	111170	1974	86696	800	206	128
03.11.2020	113420	1980	88060	831	214	133

Table 39: North Rhine-Westphalia - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	74867	1878	64689	314	88	54
08.10.2020	75612	1880	65195	324	91	56
09.10.2020	76336	1883	65718	335	93	57
10.10.2020	77039	1885	66257	345	95	59
11.10.2020	77722	1888	66810	355	98	60
12.10.2020	78386	1890	67377	364	100	61
13.10.2020	79030	1893	67956	372	102	63
14.10.2020	79656	1896	68544	380	104	64
15.10.2020	80264	1898	69140	387	106	65
16.10.2020	80855	1901	69742	392	107	66
17.10.2020	81428	1904	70348	397	109	67
18.10.2020	81985	1907	70957	400	110	68
19.10.2020	82527	1910	71566	403	111	68
20.10.2020	83052	1913	72175	405	112	69
21.10.2020	83563	1916	72782	405	113	69
22.10.2020	84059	1920	73386	405	113	70
23.10.2020	84540	1923	73986	404	114	70
24.10.2020	85008	1926	74580	403	114	70
25.10.2020	85462	1929	75168	401	114	70
26.10.2020	85904	1932	75749	398	114	70
27.10.2020	86332	1935	76322	395	114	69
28.10.2020	86749	1939	76887	391	113	69
29.10.2020	87153	1942	77444	387	113	69
30.10.2020	87546	1945	77991	382	112	68
31.10.2020	87927	1948	78528	377	112	68
01.11.2020	88298	1951	79056	372	111	67
02.11.2020	88658	1954	79573	367	110	67
03.11.2020	89007	1957	80080	361	109	66

Table 40: North Rhine-Westphalia - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	74878	1878	64689	314	88	54
08.10.2020	75656	1880	65195	324	91	56
09.10.2020	76433	1883	65719	335	93	57
10.10.2020	77210	1885	66260	346	95	59
11.10.2020	77986	1888	66819	356	98	60
12.10.2020	78762	1890	67394	367	100	62
13.10.2020	79537	1893	67984	377	103	63
14.10.2020	80312	1896	68590	387	105	65
15.10.2020	81086	1898	69209	396	108	66
16.10.2020	81860	1901	69842	405	110	68
17.10.2020	82633	1904	70486	414	112	69
18.10.2020	83406	1907	71141	422	114	71
19.10.2020	84178	1911	71807	429	117	72
20.10.2020	84949	1914	72482	436	119	73
21.10.2020	85720	1917	73166	443	121	74
22.10.2020	86490	1920	73857	449	122	75
23.10.2020	87260	1924	74556	455	124	76
24.10.2020	88030	1927	75261	460	126	78
25.10.2020	88798	1931	75972	465	128	78
26.10.2020	89566	1934	76688	469	129	79
27.10.2020	90334	1938	77409	473	131	80
28.10.2020	91101	1942	78134	477	132	81
29.10.2020	91867	1945	78862	480	133	82
30.10.2020	92633	1949	79595	484	135	83
31.10.2020	93398	1953	80330	487	136	83
01.11.2020	94163	1957	81068	489	137	84
02.11.2020	94927	1960	81808	492	138	85
03.11.2020	95690	1964	82551	494	139	85

Table 41: North Rhine-Westphalia - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	74889	1878	64689	314	88	54
08.10.2020	75701	1880	65195	325	91	56
09.10.2020	76536	1883	65720	335	93	57
10.10.2020	77394	1885	66264	346	96	59
11.10.2020	78277	1888	66828	358	98	60
12.10.2020	79184	1890	67412	370	101	62
13.10.2020	80117	1893	68016	382	104	64
14.10.2020	81076	1896	68641	394	107	66
15.10.2020	82062	1898	69287	407	110	68
16.10.2020	83076	1902	69955	420	113	70
17.10.2020	84118	1905	70645	434	116	72
18.10.2020	85190	1908	71357	447	120	74
19.10.2020	86292	1911	72092	461	123	76
20.10.2020	87424	1914	72850	475	127	78
21.10.2020	88589	1918	73632	490	130	81
22.10.2020	89786	1922	74438	505	134	83
23.10.2020	91017	1925	75269	520	138	85
24.10.2020	92282	1929	76125	535	142	88
25.10.2020	93582	1933	77007	551	146	90
26.10.2020	94919	1937	77914	567	150	93
27.10.2020	96293	1941	78849	584	154	96
28.10.2020	97706	1946	79811	601	159	98
29.10.2020	99158	1950	80801	618	163	101
30.10.2020	100650	1955	81820	636	168	104
31.10.2020	102190	1960	82869	655	173	107
01.11.2020	103760	1964	83948	673	178	110
02.11.2020	105380	1969	85057	693	183	113
03.11.2020	107050	1975	86199	712	188	116

11.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

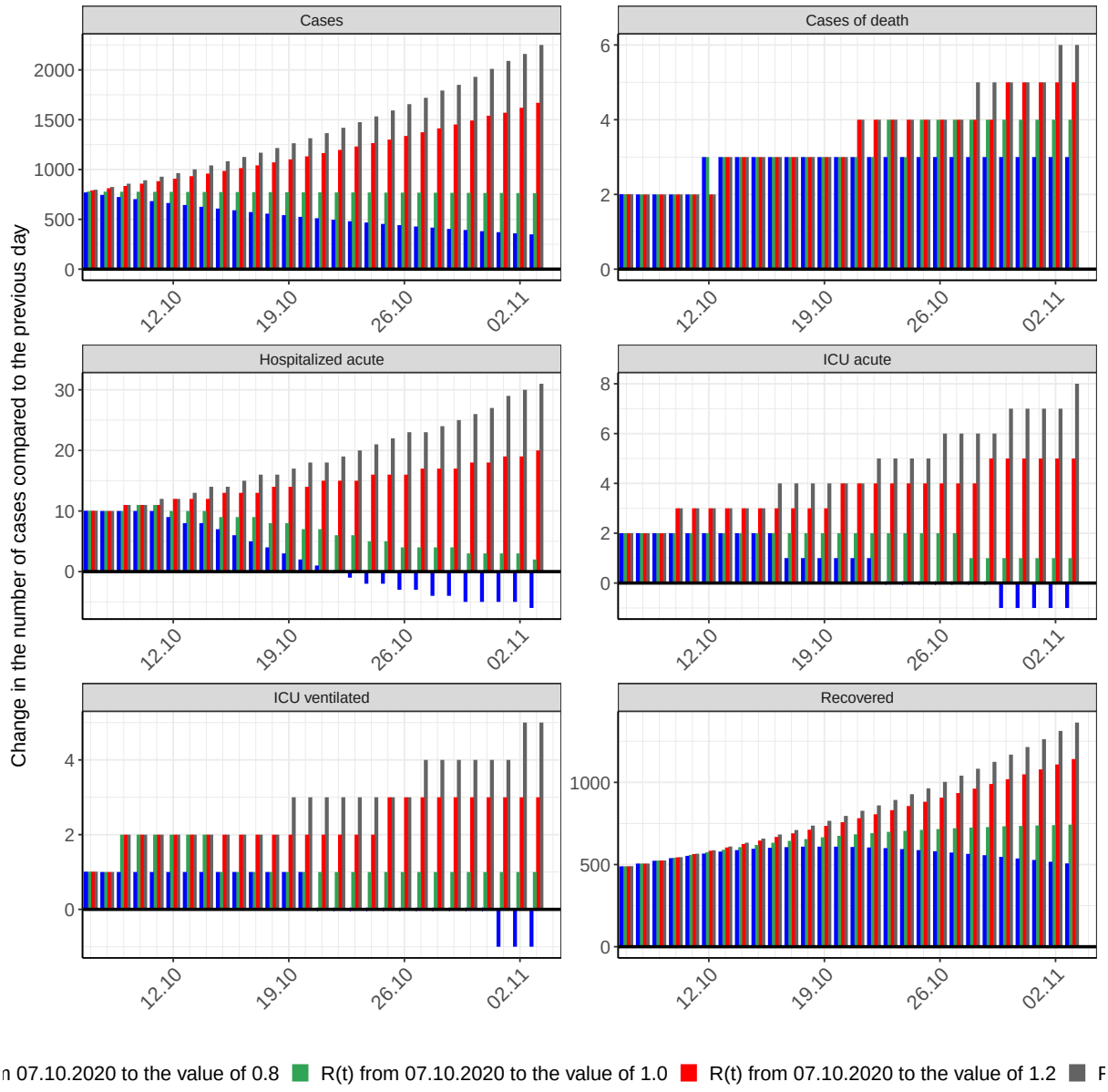


Figure 120: Simulation of daily new cases for the next 4 weeks - North Rhine-Westphalia

12 Rhineland-Palatinate

12.1 Model description

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

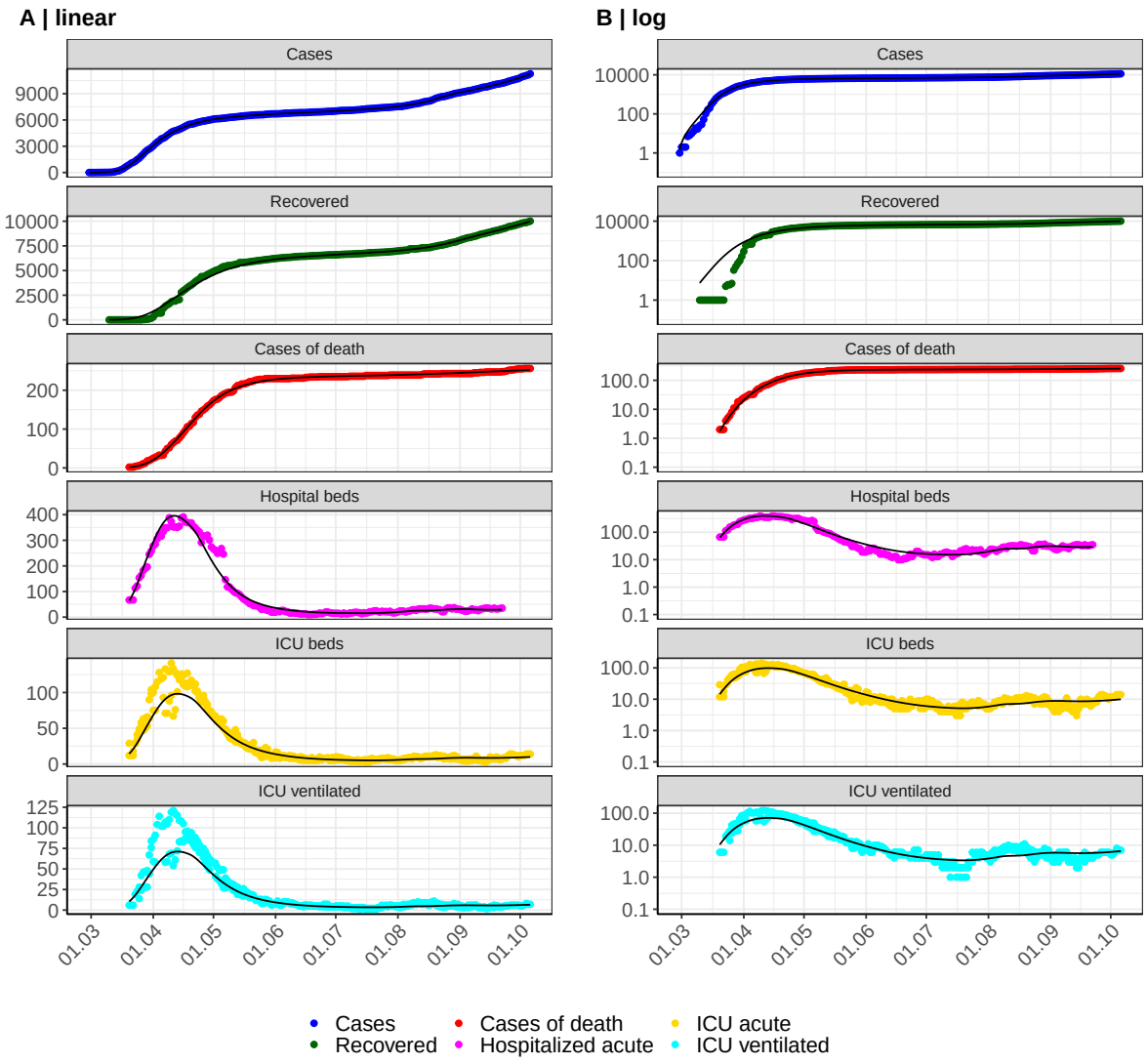


Figure 121: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Rhineland-Palatinate. Points: reported data; lines: model description.

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

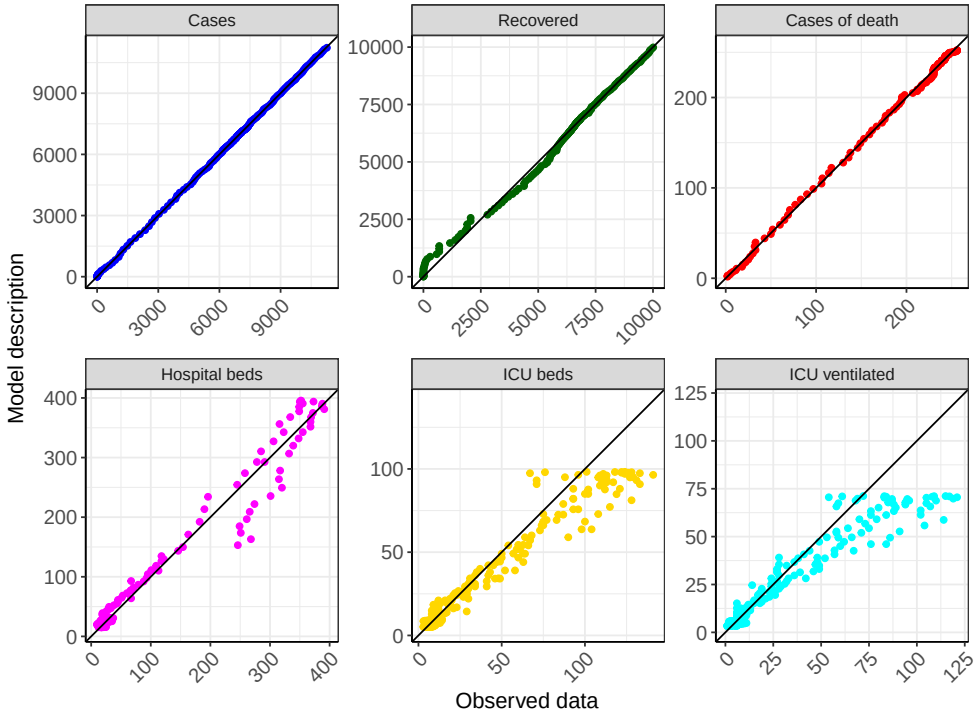


Figure 122: Goodness-of-fit plots for Rhineland-Palatinate. Lines: lines of identity.

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

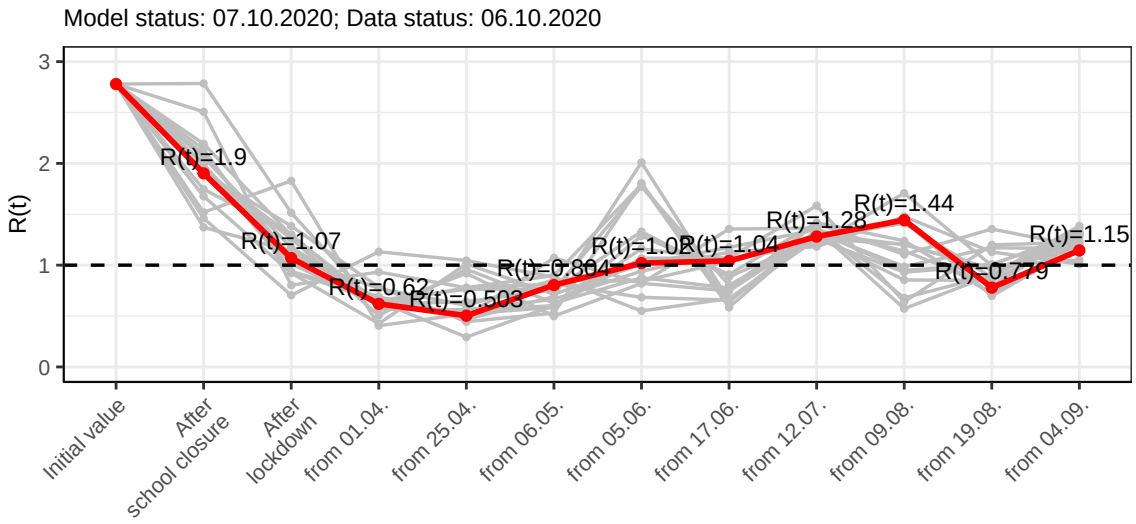


Figure 123: R(t) values before and after the NPIs for Rhineland-Palatinate

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

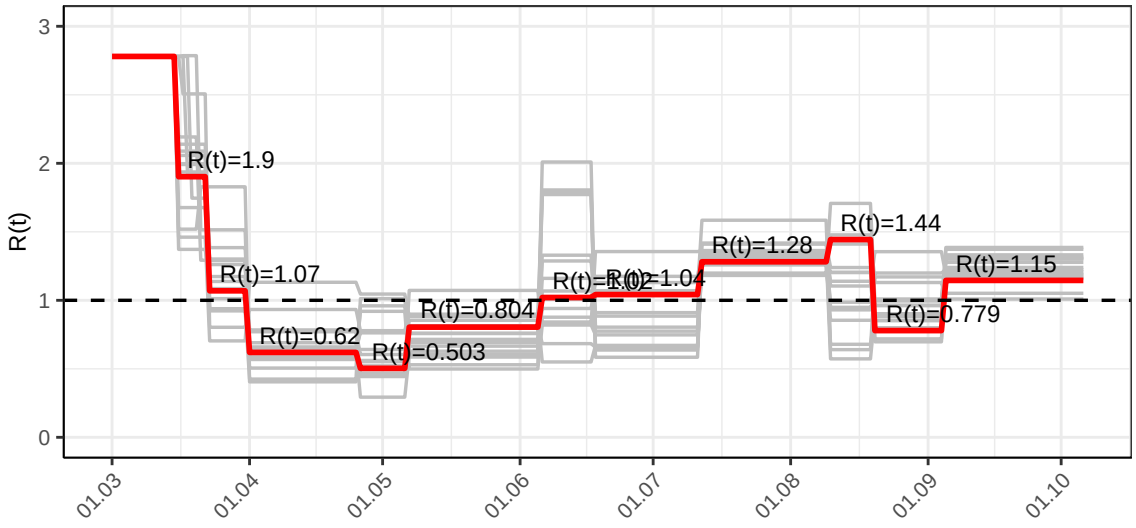


Figure 124: R(t) values over time for Rhineland-Palatinate

12.2 Model predictions

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

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.

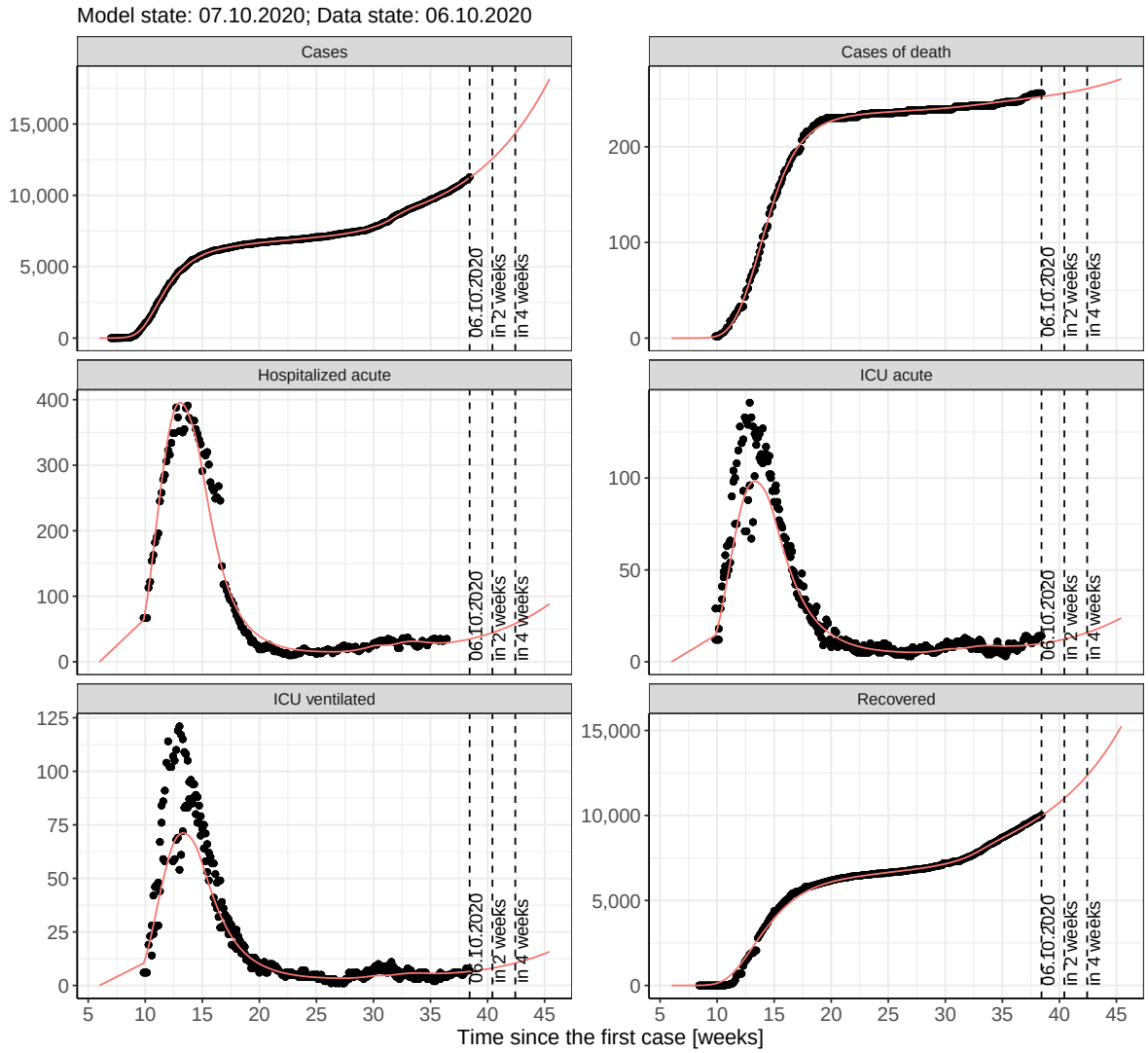


Figure 125: Representation of the model predictions for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

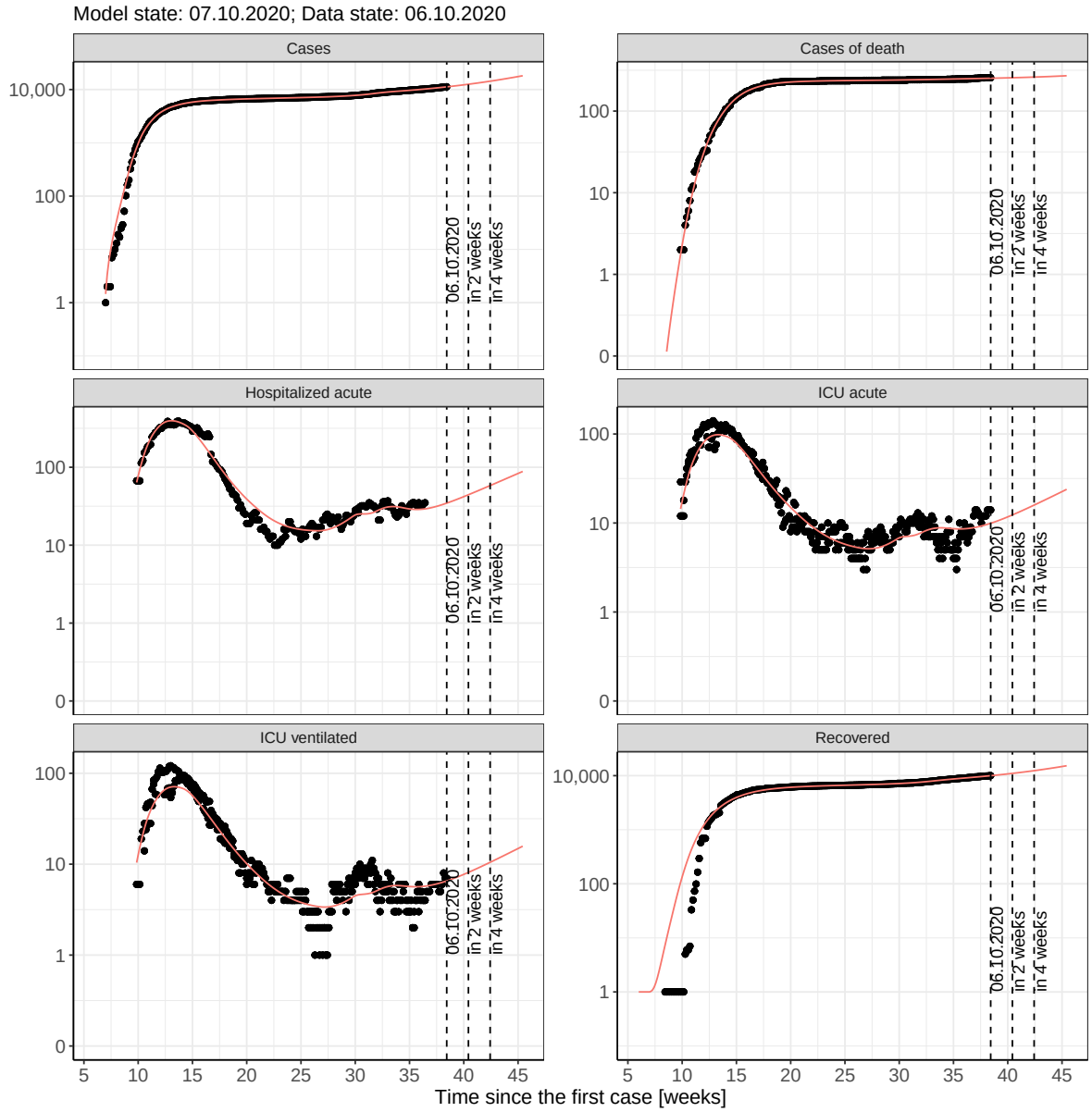


Figure 126: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

12.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

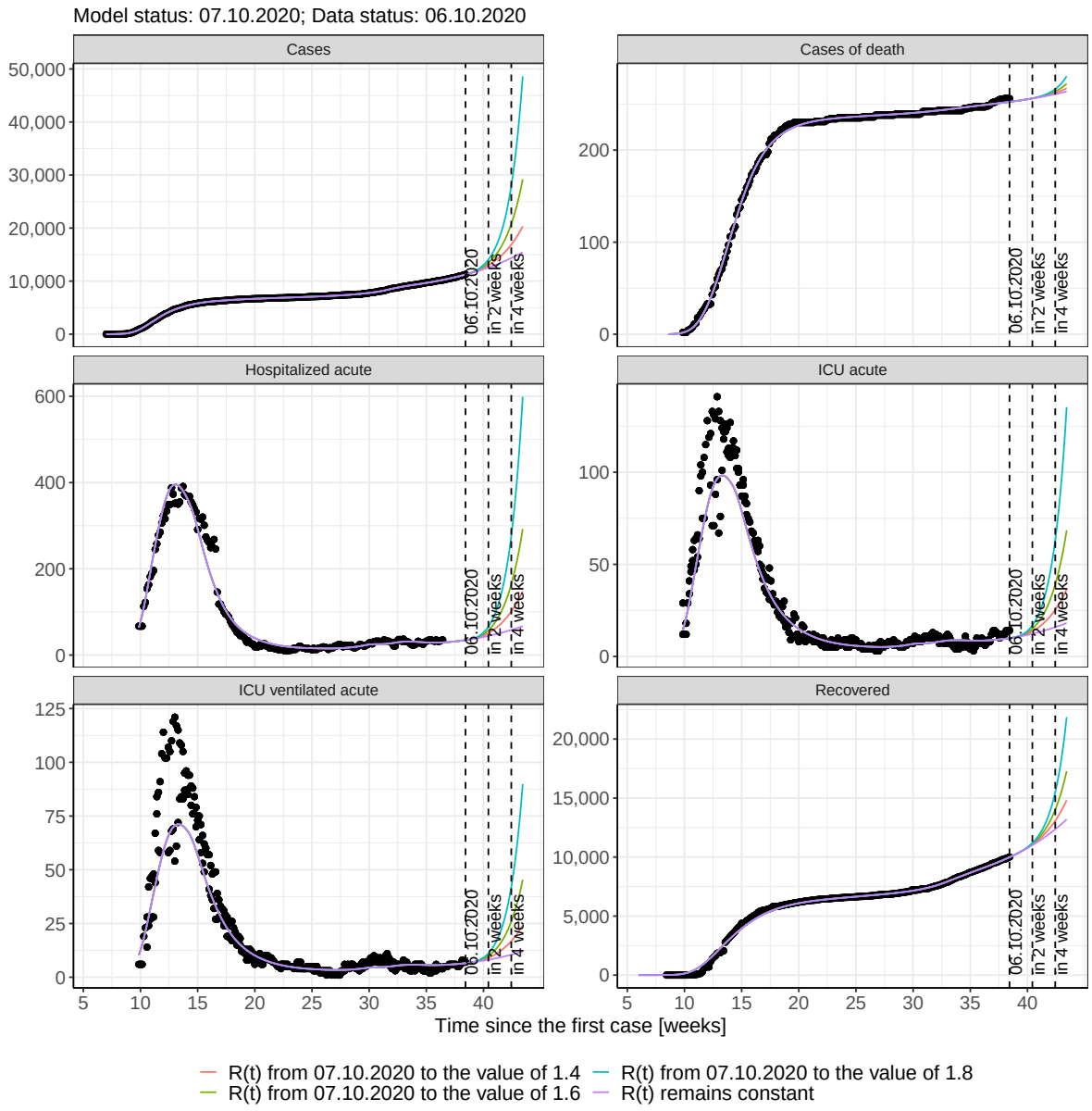


Figure 127: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

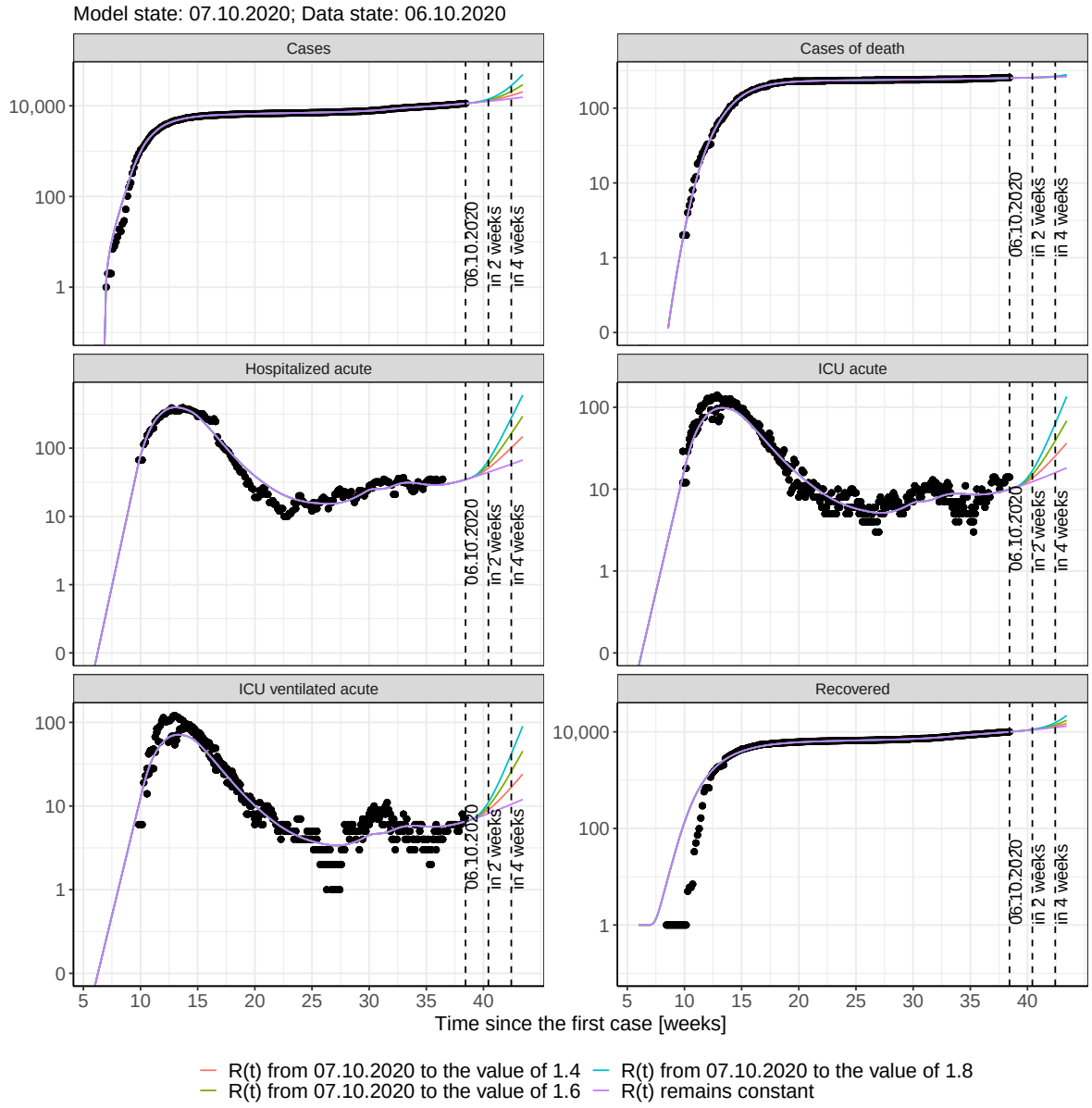


Figure 128: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

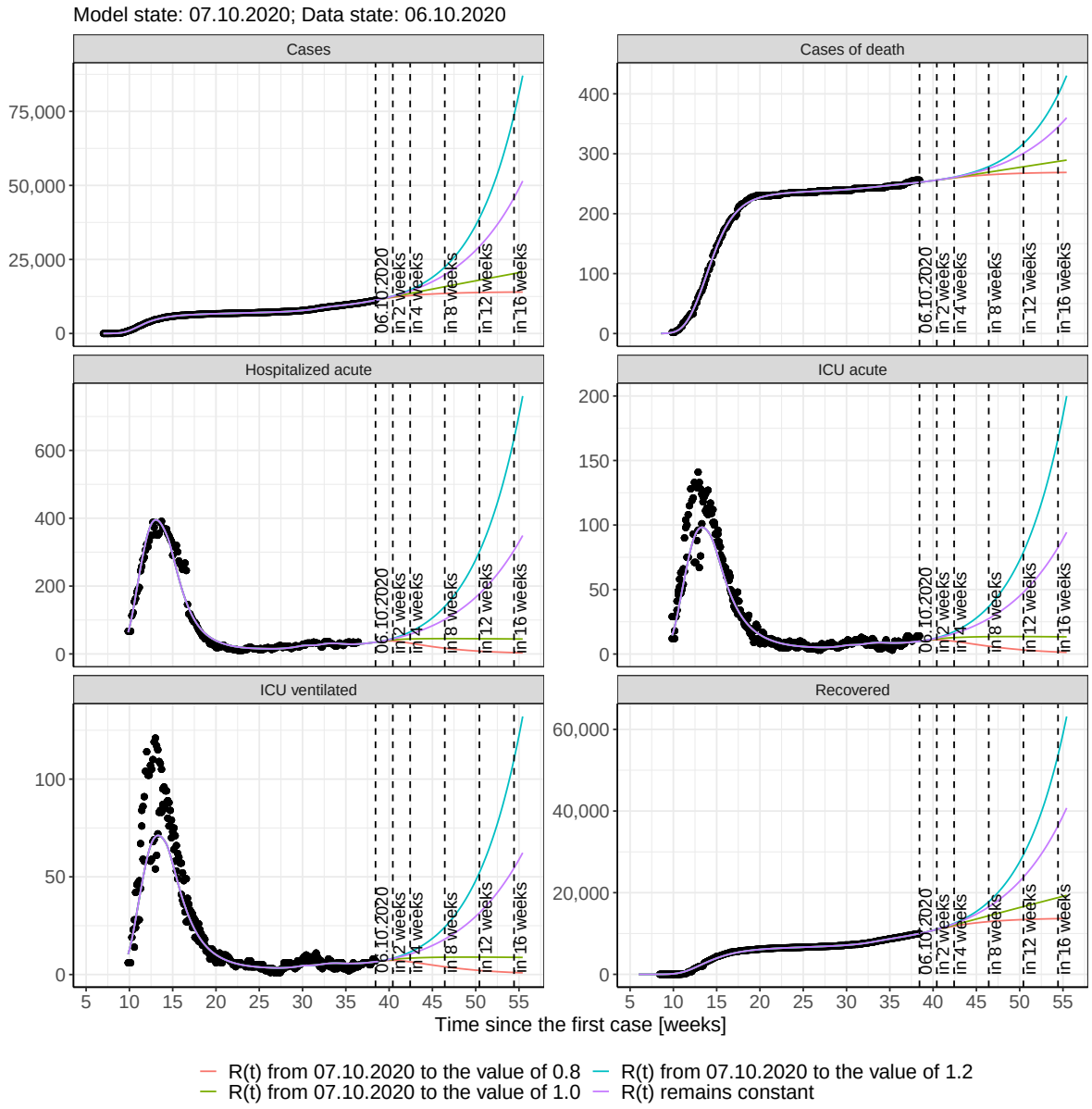


Figure 129: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

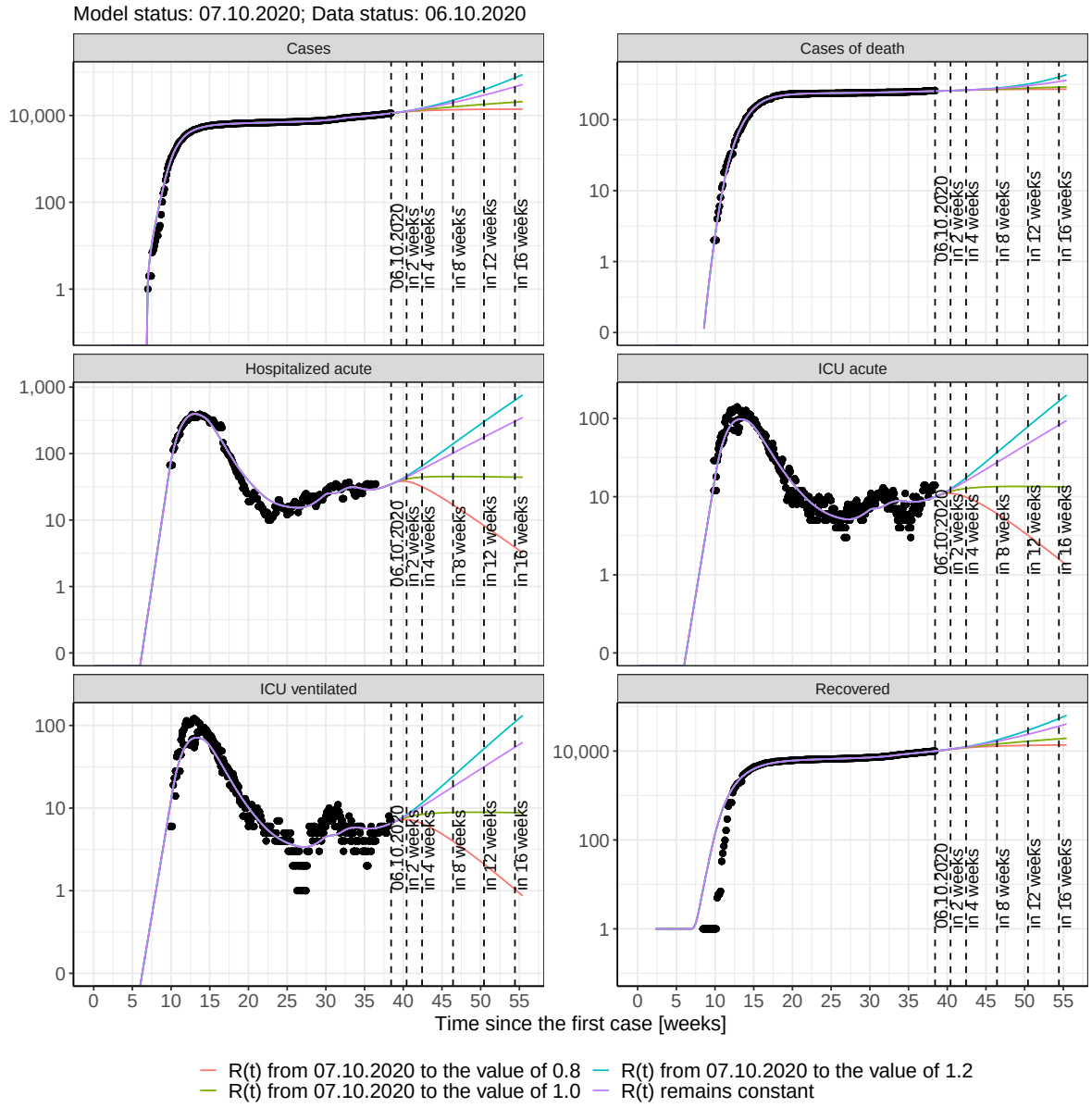


Figure 130: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Rhineland-Palatinate assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 42); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 43); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 44); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 45) Model status from 07.10.2020; Data status: 06.10.2020.

Table 42: Rhineland-Palatinate - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	11315	253	10051	35	10	7
08.10.2020	11400	253	10117	36	10	7
09.10.2020	11487	253	10183	36	10	7
10.10.2020	11576	253	10251	37	11	7
11.10.2020	11666	254	10321	38	11	7
12.10.2020	11759	254	10391	38	11	7
13.10.2020	11853	254	10463	39	11	7
14.10.2020	11949	254	10537	40	11	7
15.10.2020	12047	255	10612	40	11	7
16.10.2020	12148	255	10688	41	12	8
17.10.2020	12250	255	10766	42	12	8
18.10.2020	12354	255	10845	43	12	8
19.10.2020	12461	256	10926	44	12	8
20.10.2020	12570	256	11009	44	12	8
21.10.2020	12681	256	11093	45	13	8
22.10.2020	12794	257	11179	46	13	8
23.10.2020	12909	257	11267	47	13	9
24.10.2020	13027	257	11356	48	13	9
25.10.2020	13147	258	11447	49	13	9
26.10.2020	13270	258	11540	50	14	9
27.10.2020	13395	258	11635	51	14	9
28.10.2020	13523	259	11732	52	14	9
29.10.2020	13653	259	11831	53	14	10
30.10.2020	13787	259	11932	54	15	10
31.10.2020	13922	260	12035	55	15	10
01.11.2020	14061	260	12140	56	15	10
02.11.2020	14202	260	12247	57	16	10
03.11.2020	14346	261	12357	58	16	10

Table 43: Rhineland-Palatinate - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	11313	253	10051	35	10	7
08.10.2020	11392	253	10117	36	10	7
09.10.2020	11469	253	10183	36	10	7
10.10.2020	11543	253	10251	37	10	7
11.10.2020	11616	254	10319	37	11	7
12.10.2020	11686	254	10388	38	11	7
13.10.2020	11755	254	10458	38	11	7
14.10.2020	11821	254	10528	38	11	7
15.10.2020	11886	255	10598	38	11	7
16.10.2020	11949	255	10668	38	11	7
17.10.2020	12010	255	10739	38	11	7
18.10.2020	12069	255	10809	38	11	7
19.10.2020	12127	256	10878	38	11	7
20.10.2020	12183	256	10947	38	11	7
21.10.2020	12237	256	11016	38	11	7
22.10.2020	12290	257	11084	38	11	7
23.10.2020	12341	257	11151	37	11	7
24.10.2020	12391	257	11217	37	11	7
25.10.2020	12439	257	11282	36	11	7
26.10.2020	12486	258	11347	36	11	7
27.10.2020	12532	258	11410	36	11	7
28.10.2020	12576	258	11472	35	11	7
29.10.2020	12619	258	11533	35	10	7
30.10.2020	12661	259	11593	34	10	7
31.10.2020	12702	259	11651	33	10	7
01.11.2020	12742	259	11709	33	10	7
02.11.2020	12780	259	11765	32	10	7
03.11.2020	12817	260	11820	32	10	6

Table 44: Rhineland-Palatinate - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	11314	253	10051	35	10	7
08.10.2020	11396	253	10117	36	10	7
09.10.2020	11479	253	10183	36	10	7
10.10.2020	11561	253	10251	37	10	7
11.10.2020	11644	254	10320	38	11	7
12.10.2020	11726	254	10390	38	11	7
13.10.2020	11809	254	10461	39	11	7
14.10.2020	11891	254	10533	39	11	7
15.10.2020	11974	255	10606	40	11	7
16.10.2020	12056	255	10679	40	11	7
17.10.2020	12138	255	10753	40	11	8
18.10.2020	12220	255	10829	41	12	8
19.10.2020	12303	256	10904	41	12	8
20.10.2020	12385	256	10980	41	12	8
21.10.2020	12467	256	11057	42	12	8
22.10.2020	12549	257	11135	42	12	8
23.10.2020	12631	257	11212	42	12	8
24.10.2020	12713	257	11290	43	12	8
25.10.2020	12795	257	11369	43	12	8
26.10.2020	12877	258	11448	43	12	8
27.10.2020	12959	258	11527	43	12	8
28.10.2020	13041	258	11606	43	12	8
29.10.2020	13123	259	11686	44	12	8
30.10.2020	13204	259	11766	44	13	8
31.10.2020	13286	259	11846	44	13	8
01.11.2020	13368	260	11926	44	13	8
02.11.2020	13450	260	12006	44	13	8
03.11.2020	13531	260	12086	44	13	8

Table 45: Rhineland-Palatinate - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	11315	253	10051	35	10	7
08.10.2020	11401	253	10117	36	10	7
09.10.2020	11490	253	10183	36	10	7
10.10.2020	11581	253	10251	37	11	7
11.10.2020	11675	254	10321	38	11	7
12.10.2020	11771	254	10392	38	11	7
13.10.2020	11871	254	10464	39	11	7
14.10.2020	11973	254	10538	40	11	7
15.10.2020	12078	255	10614	41	11	8
16.10.2020	12185	255	10691	42	12	8
17.10.2020	12296	255	10771	43	12	8
18.10.2020	12411	256	10852	44	12	8
19.10.2020	12528	256	10935	45	12	8
20.10.2020	12649	256	11020	46	13	8
21.10.2020	12773	256	11108	47	13	8
22.10.2020	12901	257	11197	48	13	9
23.10.2020	13032	257	11289	49	13	9
24.10.2020	13167	257	11384	50	14	9
25.10.2020	13306	258	11480	52	14	9
26.10.2020	13449	258	11580	53	14	9
27.10.2020	13596	258	11682	54	15	10
28.10.2020	13747	259	11787	56	15	10
29.10.2020	13902	259	11895	57	15	10
30.10.2020	14062	259	12006	59	16	10
31.10.2020	14226	260	12119	60	16	11
01.11.2020	14395	260	12236	62	17	11
02.11.2020	14568	261	12357	63	17	11
03.11.2020	14747	261	12480	65	17	12

12.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

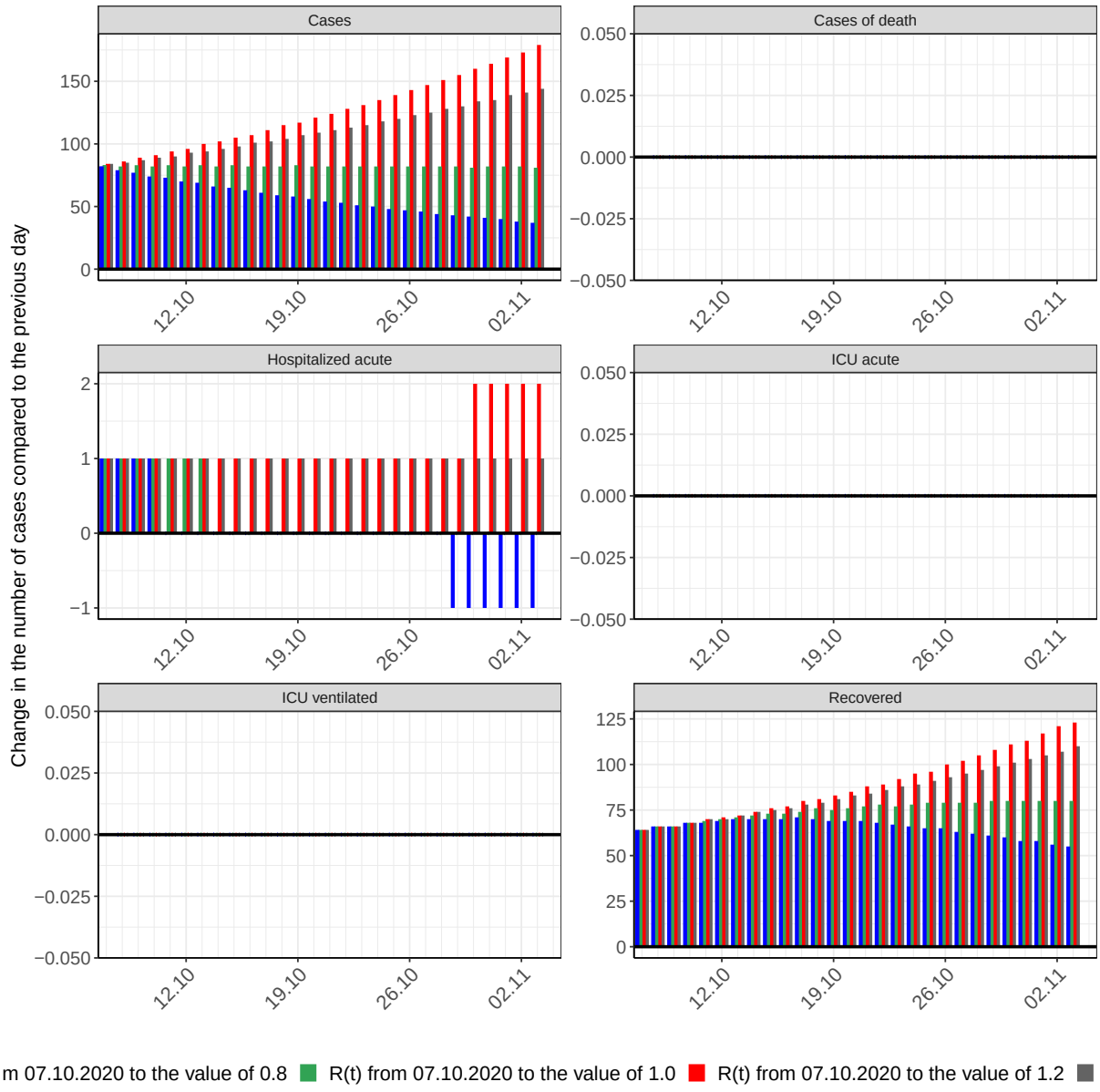


Figure 131: Simulation of daily new cases for the next 4 weeks - Rhineland-Palatinate

13 Saarland

13.1 Model description

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

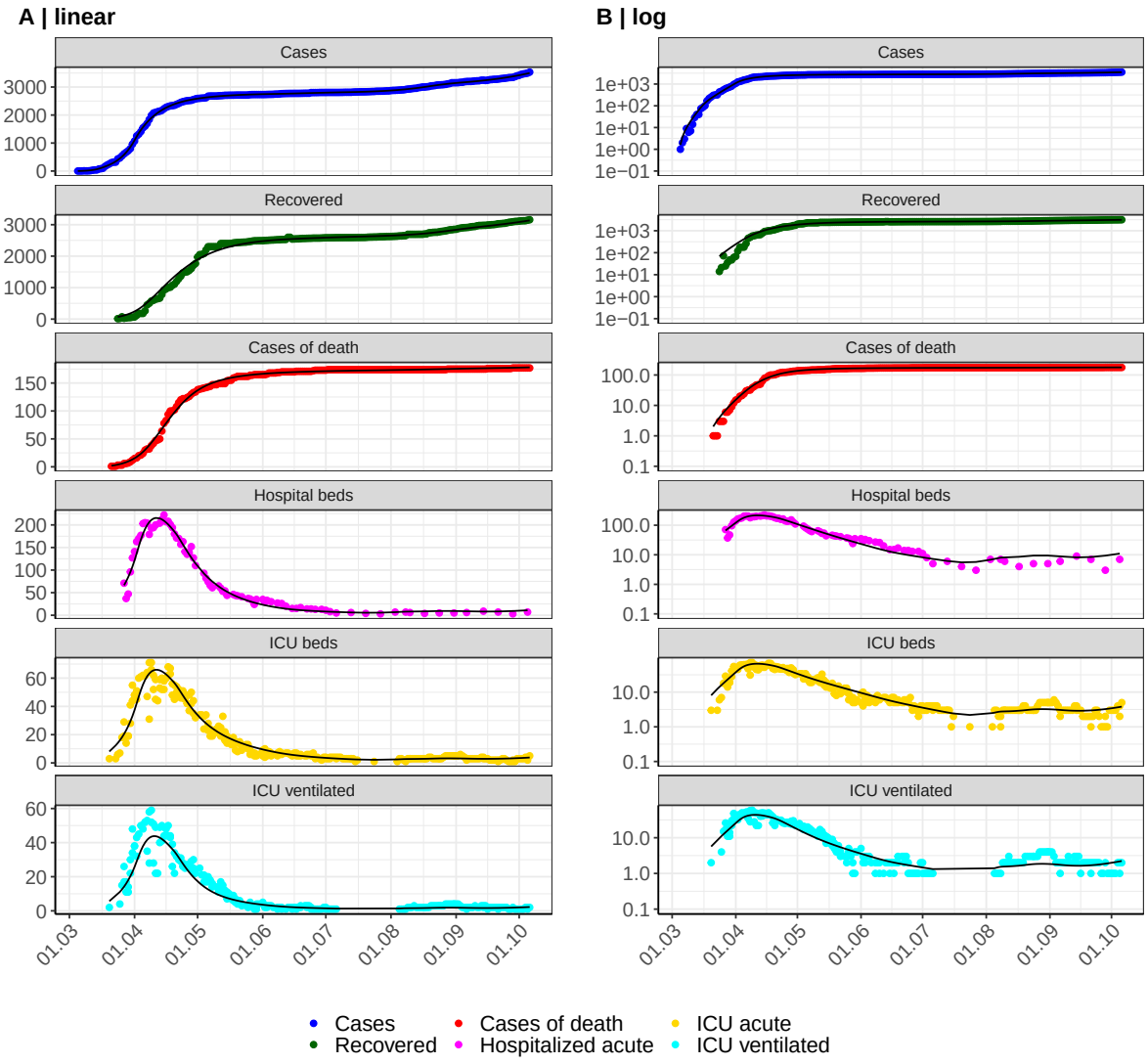


Figure 132: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saarland. Points: reported data; lines: model description.

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

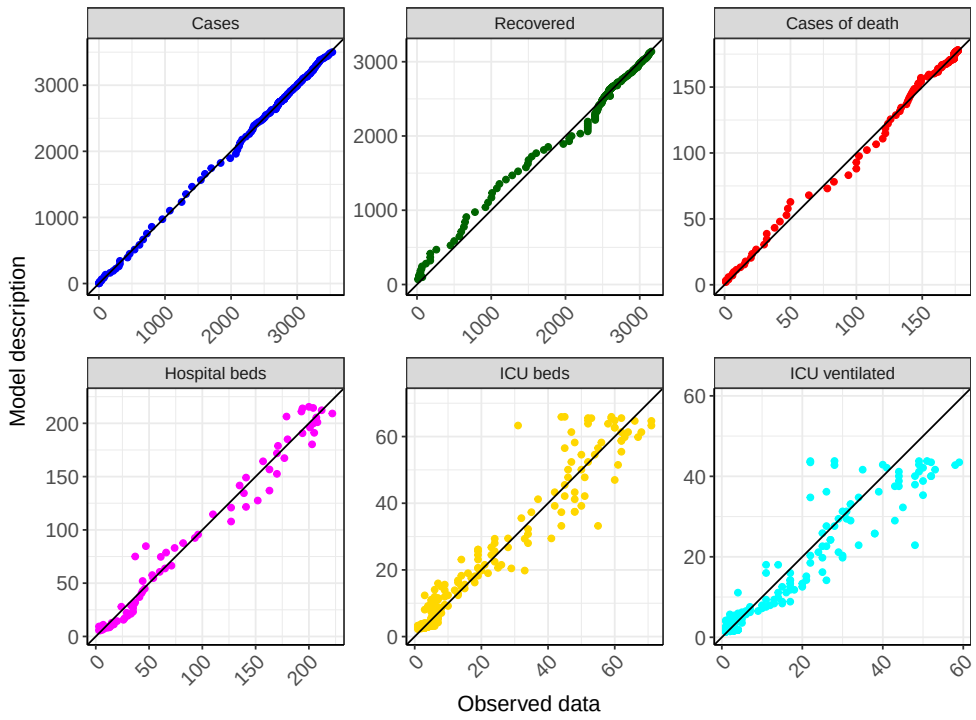


Figure 133: Goodness-of-fit plots for Saarland. Lines: lines of identity.

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

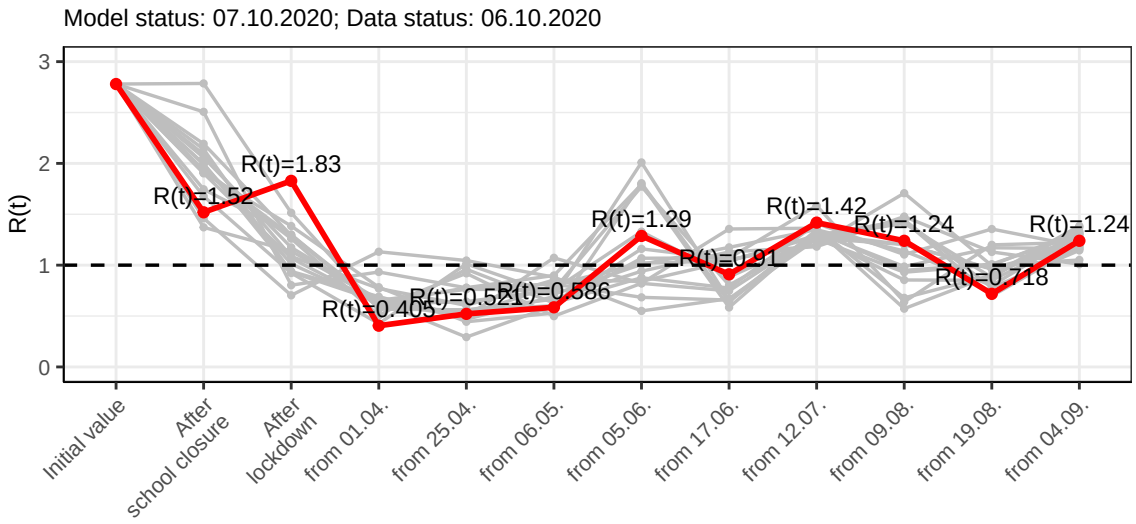


Figure 134: R(t) values before and after the NPIs for Saarland

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

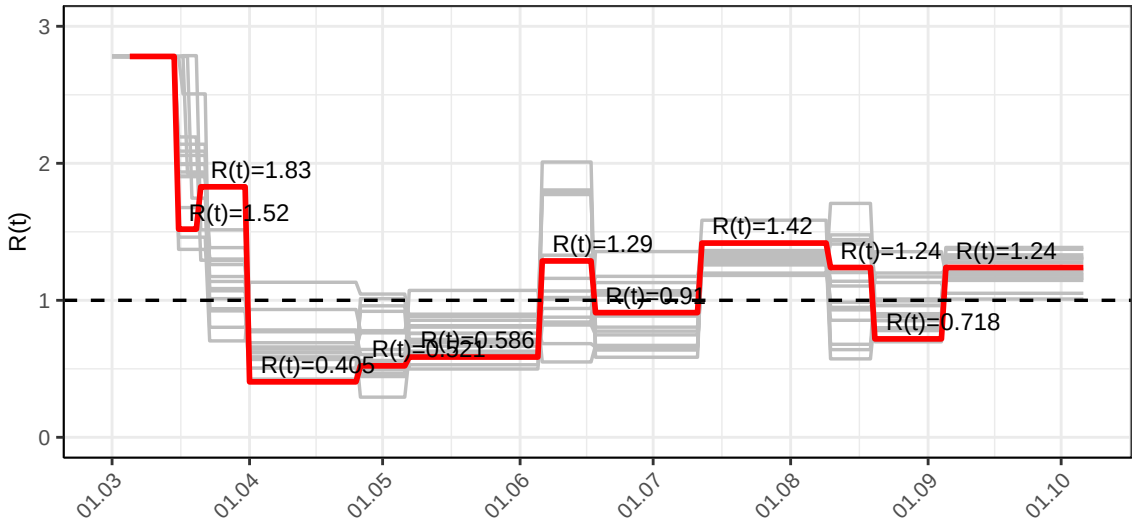


Figure 135: R(t) values over time for Saarland

13.2 Model predictions

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

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.

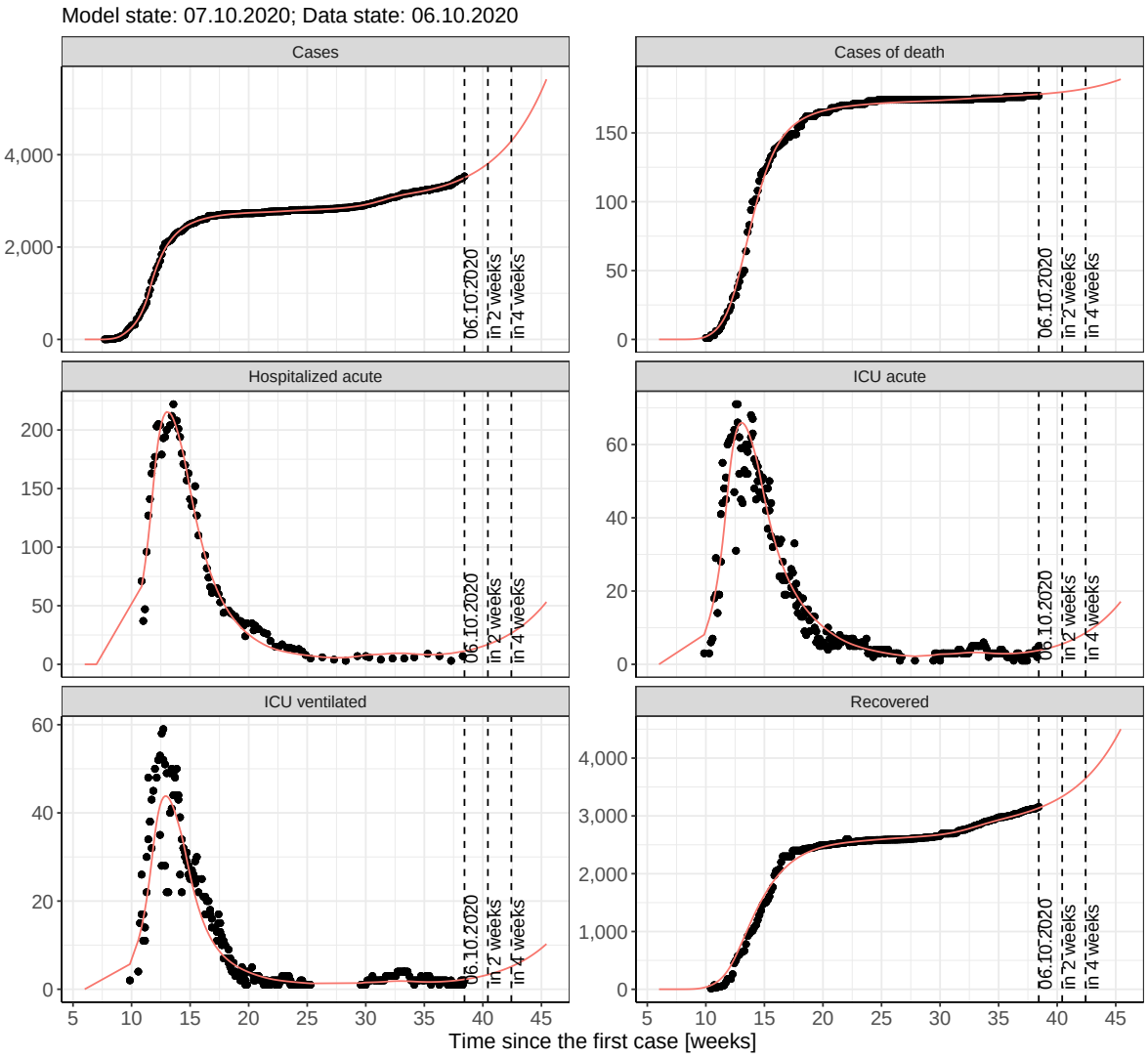


Figure 136: Representation of the model predictions for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

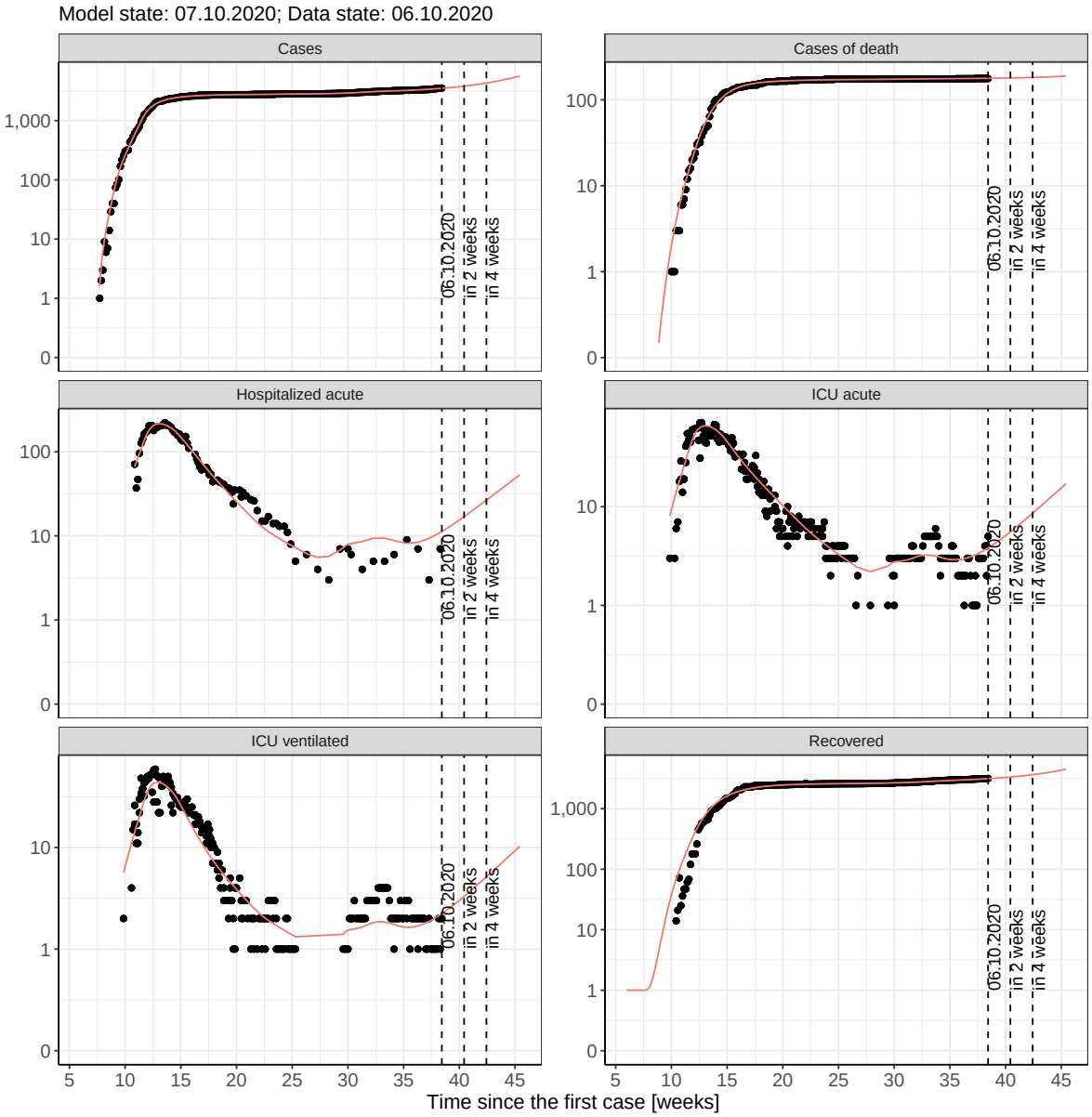


Figure 137: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

13.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

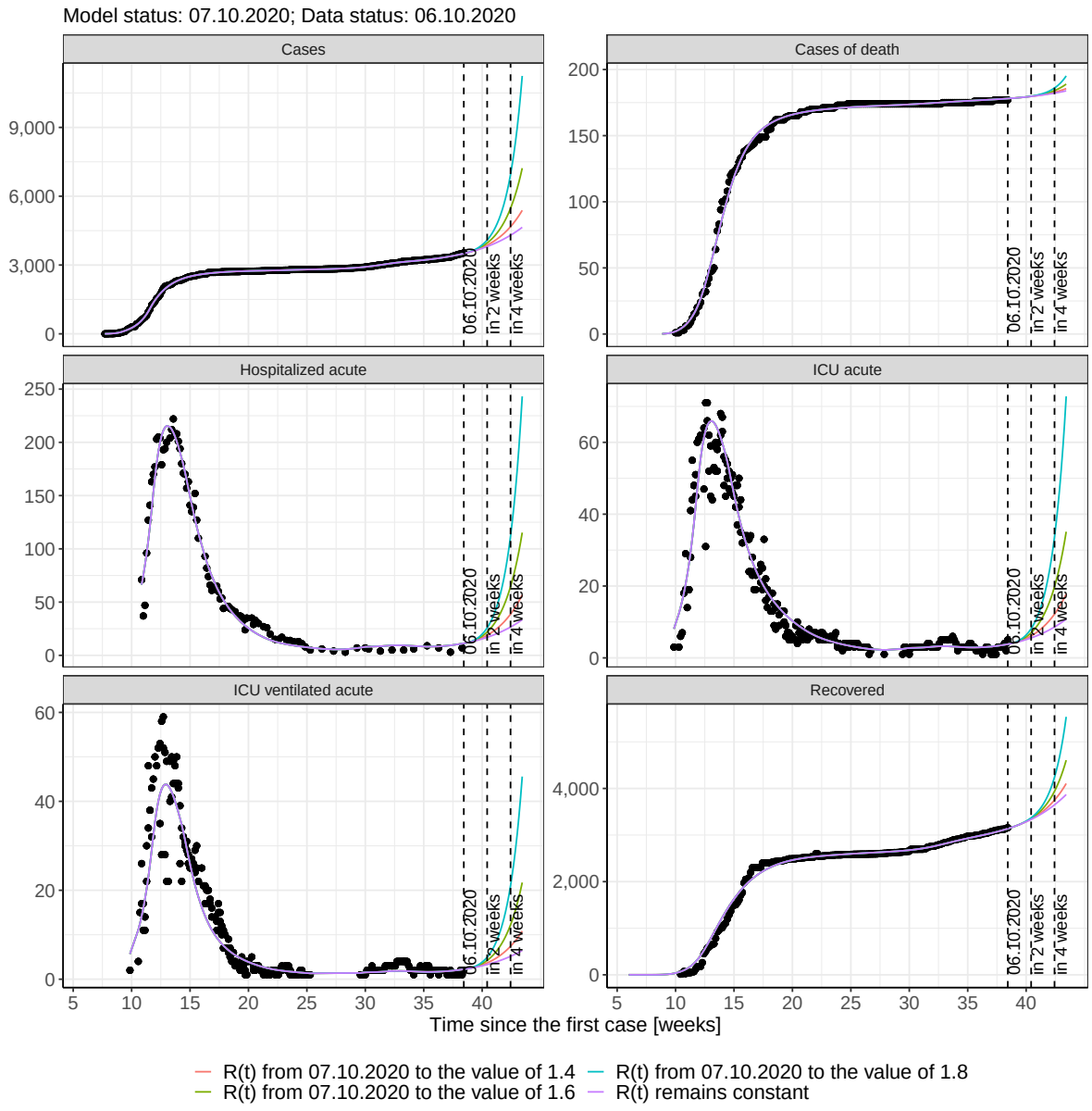


Figure 138: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

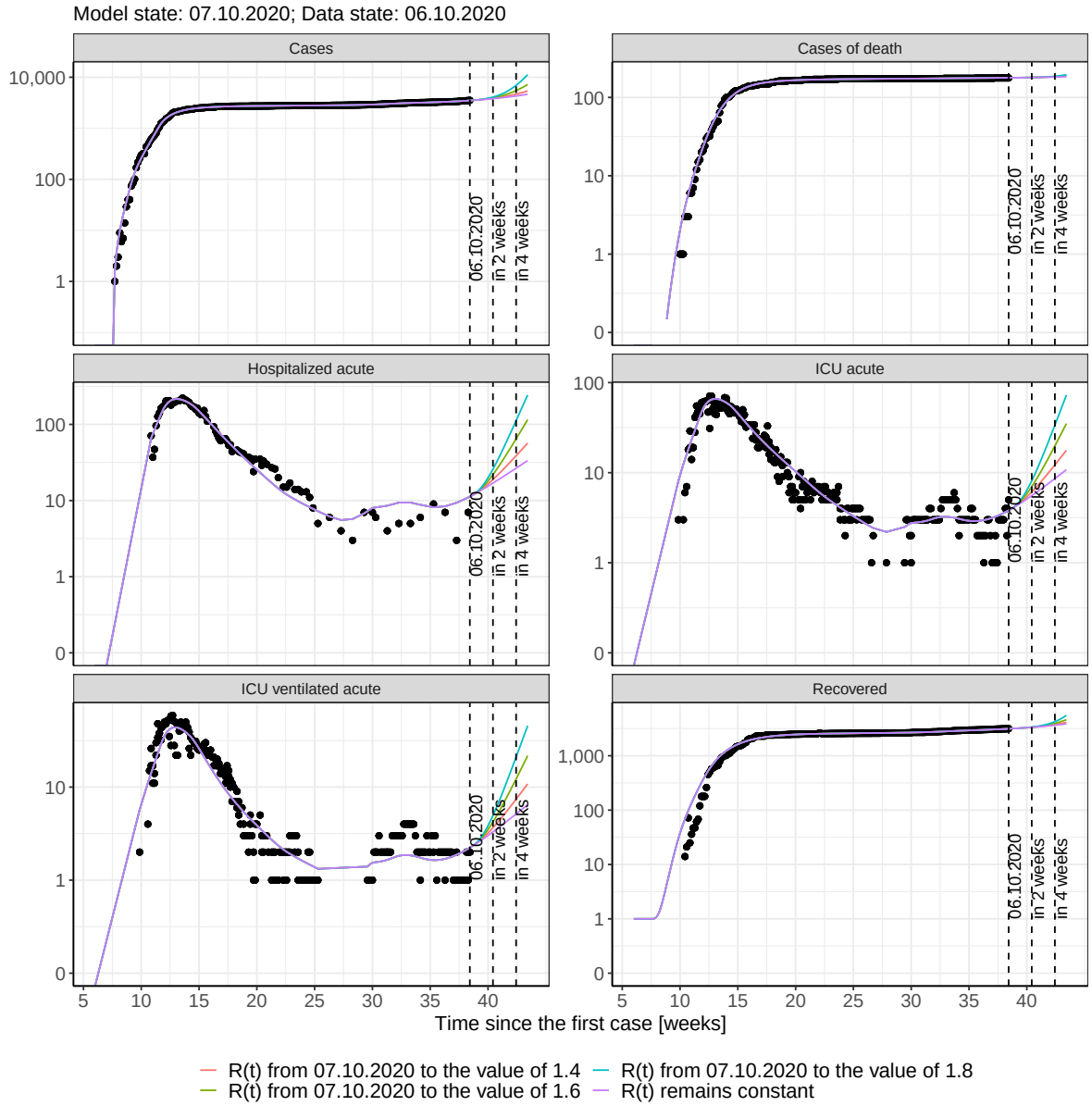


Figure 139: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

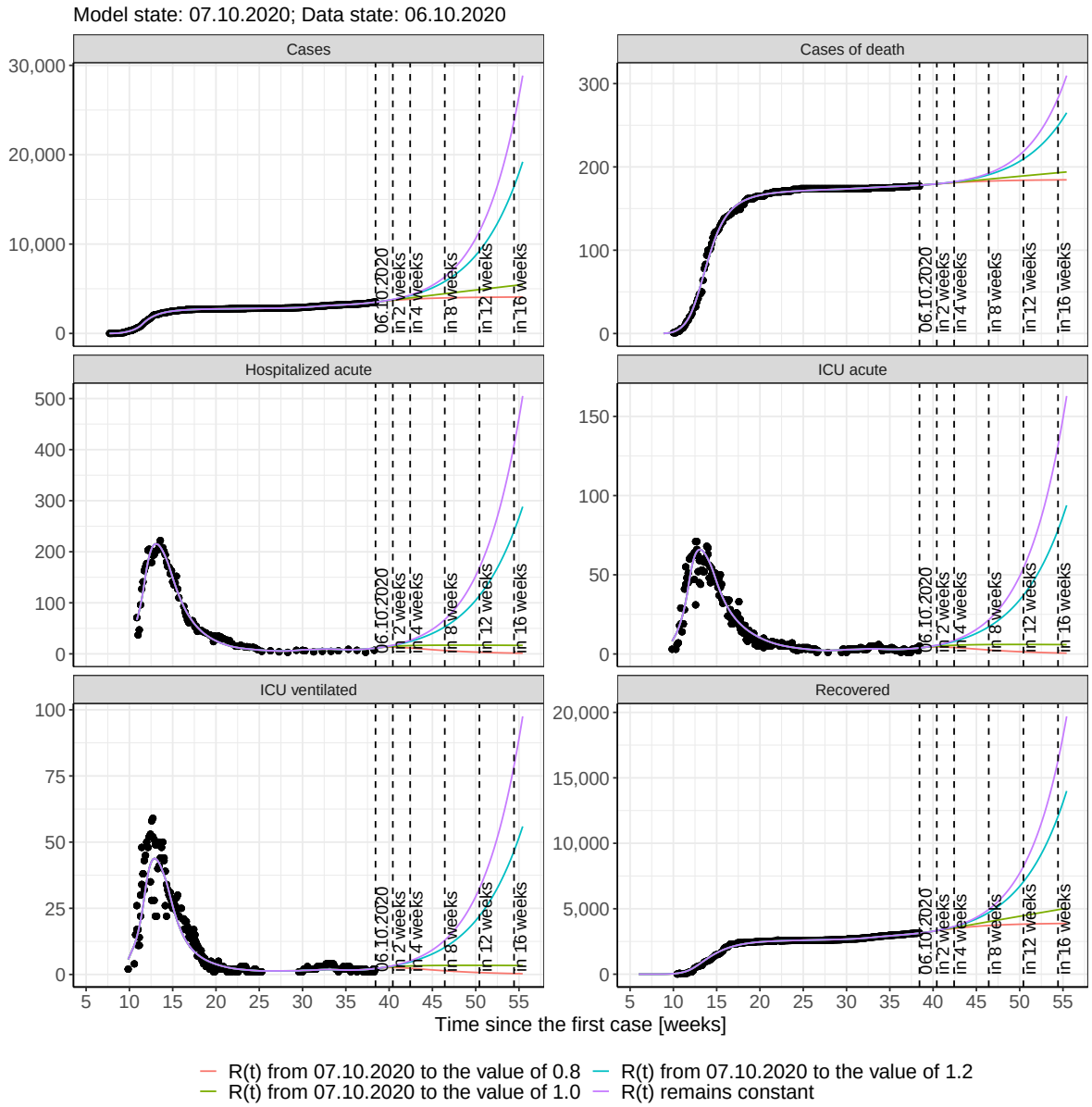


Figure 140: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

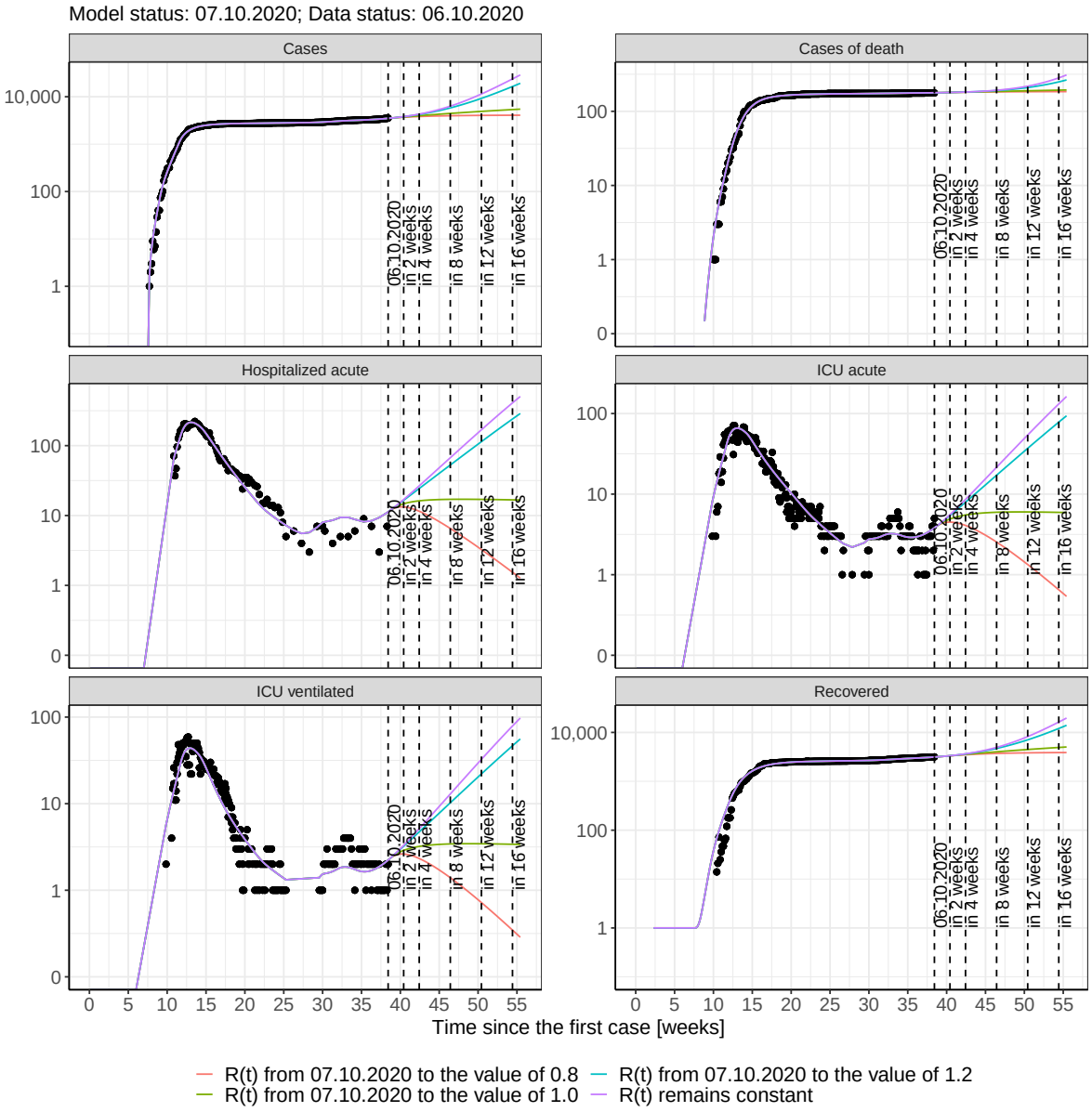


Figure 141: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saarland assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 46); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 47); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 48); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 49) Model status from 07.10.2020; Data status: 06.10.2020.

Table 46: Saarland - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	3518	178	3148	12	4	2
08.10.2020	3536	178	3160	12	4	2
09.10.2020	3555	178	3172	12	4	2
10.10.2020	3574	178	3185	13	4	2
11.10.2020	3594	179	3198	13	4	3
12.10.2020	3615	179	3211	13	4	3
13.10.2020	3636	179	3225	14	5	3
14.10.2020	3658	179	3239	14	5	3
15.10.2020	3681	179	3254	15	5	3
16.10.2020	3705	179	3269	15	5	3
17.10.2020	3729	179	3285	15	5	3
18.10.2020	3755	179	3301	16	5	3
19.10.2020	3781	180	3318	16	5	3
20.10.2020	3808	180	3335	17	6	3
21.10.2020	3836	180	3353	17	6	3
22.10.2020	3865	180	3371	18	6	4
23.10.2020	3894	180	3390	19	6	4
24.10.2020	3925	180	3410	19	6	4
25.10.2020	3957	180	3431	20	6	4
26.10.2020	3990	181	3452	21	7	4
27.10.2020	4025	181	3474	21	7	4
28.10.2020	4060	181	3496	22	7	4
29.10.2020	4096	181	3520	23	7	4
30.10.2020	4134	181	3544	23	8	5
31.10.2020	4173	182	3568	24	8	5
01.11.2020	4214	182	3594	25	8	5
02.11.2020	4255	182	3621	26	8	5
03.11.2020	4299	182	3648	27	9	5

Table 47: Saarland - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	3518	178	3148	12	4	2
08.10.2020	3534	178	3160	12	4	2
09.10.2020	3550	178	3172	12	4	2
10.10.2020	3566	178	3185	12	4	2
11.10.2020	3581	179	3197	13	4	2
12.10.2020	3596	179	3210	13	4	3
13.10.2020	3610	179	3224	13	4	3
14.10.2020	3624	179	3237	13	4	3
15.10.2020	3637	179	3250	13	4	3
16.10.2020	3650	179	3264	13	4	3
17.10.2020	3663	179	3277	13	4	3
18.10.2020	3675	179	3291	13	4	3
19.10.2020	3687	179	3305	13	4	3
20.10.2020	3698	180	3318	13	4	3
21.10.2020	3710	180	3332	13	4	3
22.10.2020	3721	180	3345	13	4	3
23.10.2020	3731	180	3359	13	4	3
24.10.2020	3742	180	3372	13	4	3
25.10.2020	3752	180	3385	13	4	3
26.10.2020	3761	180	3398	13	4	3
27.10.2020	3771	180	3411	13	4	3
28.10.2020	3780	180	3423	12	4	2
29.10.2020	3789	181	3435	12	4	2
30.10.2020	3798	181	3448	12	4	2
31.10.2020	3806	181	3460	12	4	2
01.11.2020	3814	181	3471	12	4	2
02.11.2020	3822	181	3483	12	4	2
03.11.2020	3830	181	3494	12	4	2

Table 48: Saarland - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	3518	178	3148	12	4	2
08.10.2020	3535	178	3160	12	4	2
09.10.2020	3552	178	3172	12	4	2
10.10.2020	3570	178	3185	12	4	2
11.10.2020	3587	179	3198	13	4	3
12.10.2020	3604	179	3211	13	4	3
13.10.2020	3621	179	3224	13	4	3
14.10.2020	3638	179	3238	14	5	3
15.10.2020	3655	179	3252	14	5	3
16.10.2020	3672	179	3266	14	5	3
17.10.2020	3689	179	3280	14	5	3
18.10.2020	3706	179	3295	14	5	3
19.10.2020	3723	179	3310	15	5	3
20.10.2020	3740	180	3325	15	5	3
21.10.2020	3757	180	3340	15	5	3
22.10.2020	3774	180	3356	15	5	3
23.10.2020	3791	180	3371	15	5	3
24.10.2020	3808	180	3387	15	5	3
25.10.2020	3825	180	3403	15	5	3
26.10.2020	3842	180	3418	16	5	3
27.10.2020	3859	180	3434	16	5	3
28.10.2020	3876	181	3450	16	5	3
29.10.2020	3893	181	3467	16	5	3
30.10.2020	3910	181	3483	16	5	3
31.10.2020	3927	181	3499	16	5	3
01.11.2020	3944	181	3515	16	5	3
02.11.2020	3961	181	3532	16	5	3
03.11.2020	3978	181	3548	16	6	3

Table 49: Saarland - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	3518	178	3148	12	4	2
08.10.2020	3536	178	3160	12	4	2
09.10.2020	3555	178	3172	12	4	2
10.10.2020	3574	178	3185	13	4	2
11.10.2020	3593	179	3198	13	4	3
12.10.2020	3613	179	3211	13	4	3
13.10.2020	3634	179	3225	14	5	3
14.10.2020	3655	179	3239	14	5	3
15.10.2020	3677	179	3254	14	5	3
16.10.2020	3699	179	3268	15	5	3
17.10.2020	3722	179	3284	15	5	3
18.10.2020	3746	179	3300	16	5	3
19.10.2020	3770	180	3316	16	5	3
20.10.2020	3795	180	3333	17	5	3
21.10.2020	3821	180	3351	17	6	3
22.10.2020	3847	180	3368	17	6	3
23.10.2020	3874	180	3387	18	6	3
24.10.2020	3902	180	3406	18	6	4
25.10.2020	3931	180	3425	19	6	4
26.10.2020	3961	181	3445	20	6	4
27.10.2020	3991	181	3466	20	7	4
28.10.2020	4023	181	3487	21	7	4
29.10.2020	4055	181	3509	21	7	4
30.10.2020	4088	181	3532	22	7	4
31.10.2020	4122	181	3555	22	7	4
01.11.2020	4157	182	3579	23	8	4
02.11.2020	4193	182	3603	24	8	5
03.11.2020	4230	182	3628	24	8	5

13.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

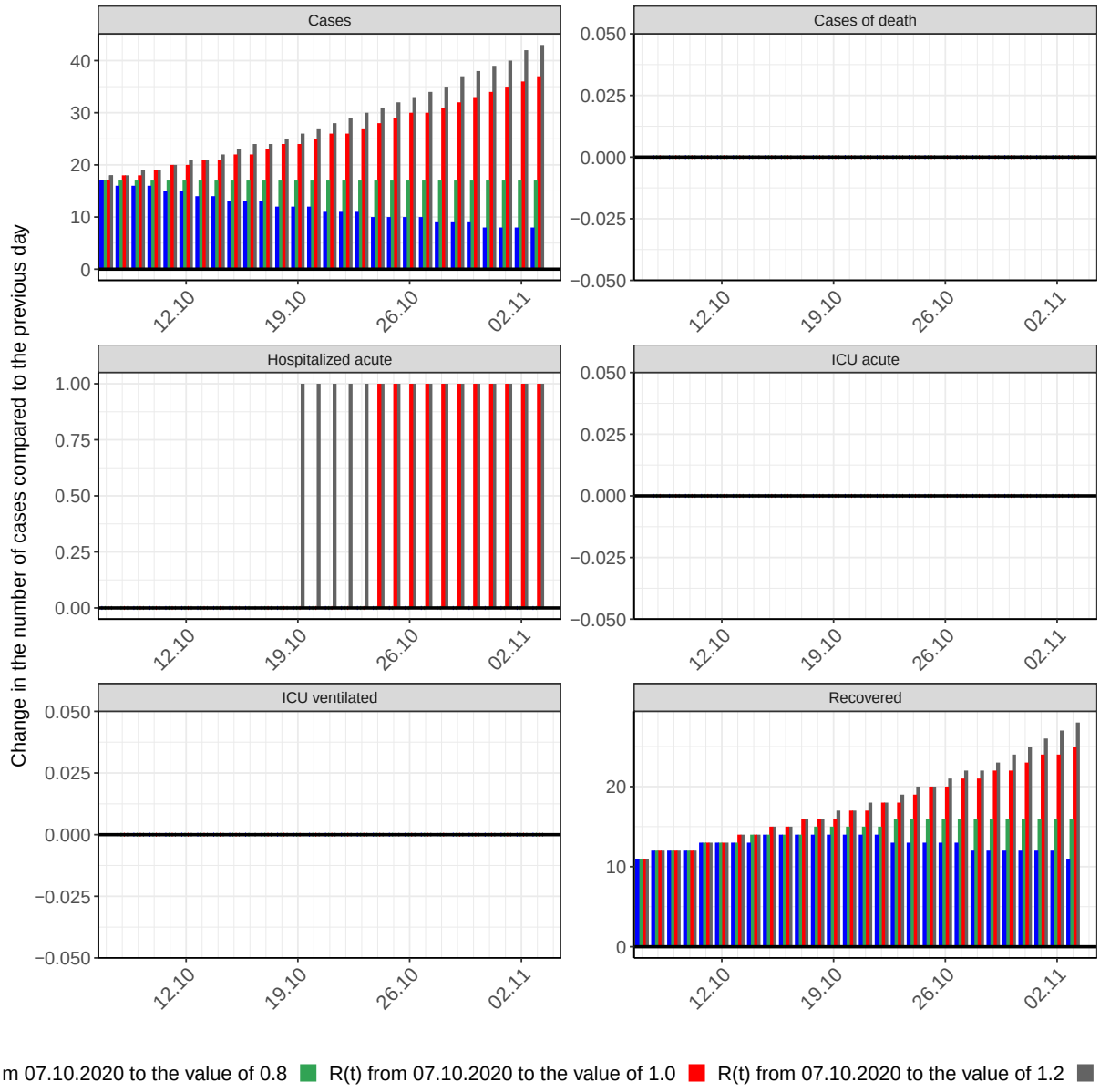


Figure 142: Simulation of daily new cases for the next 4 weeks - Saarland

14 Saxony

14.1 Model description

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

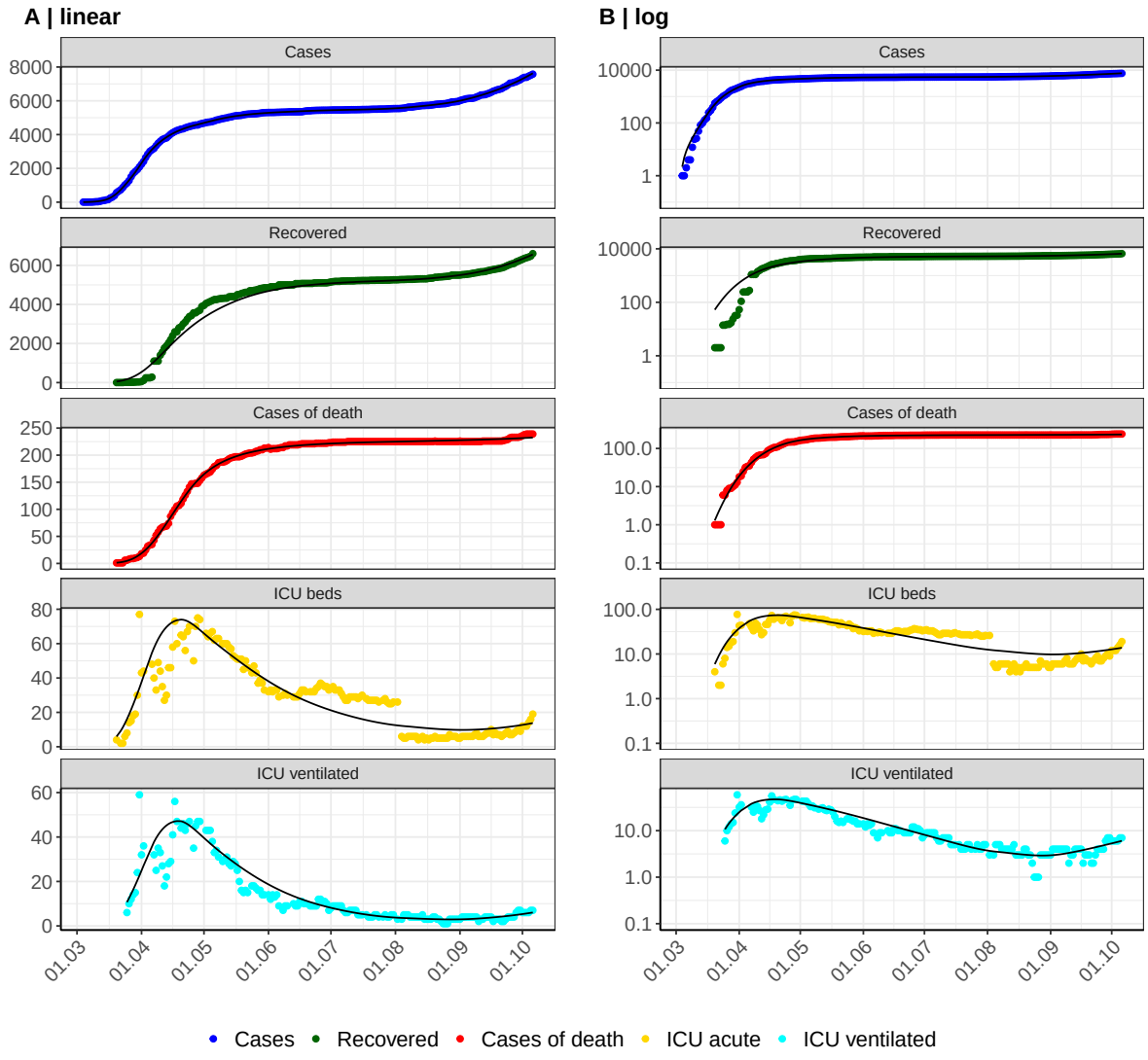


Figure 143: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony. Points: reported data; lines: model description.

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

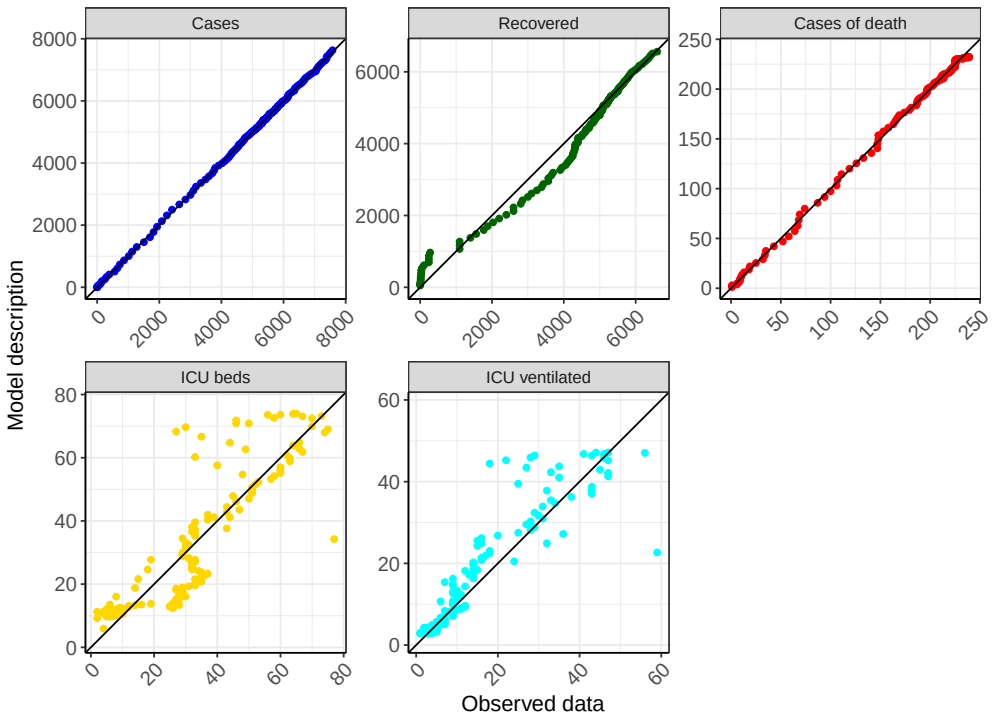


Figure 144: Goodness-of-fit plots for Saxony. Lines: lines of identity.

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

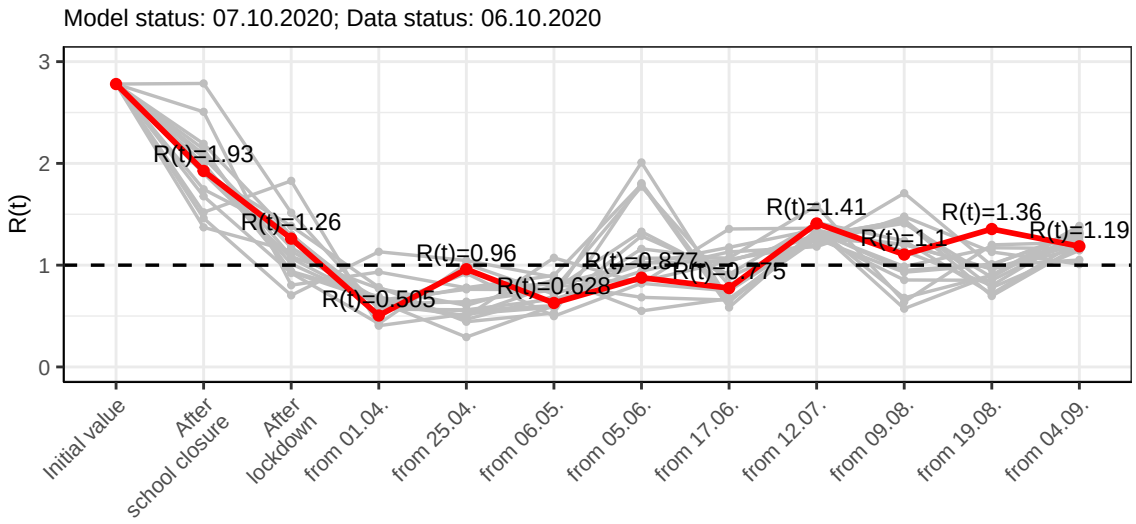


Figure 145: R(t) values before and after the NPIs for Saxony

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

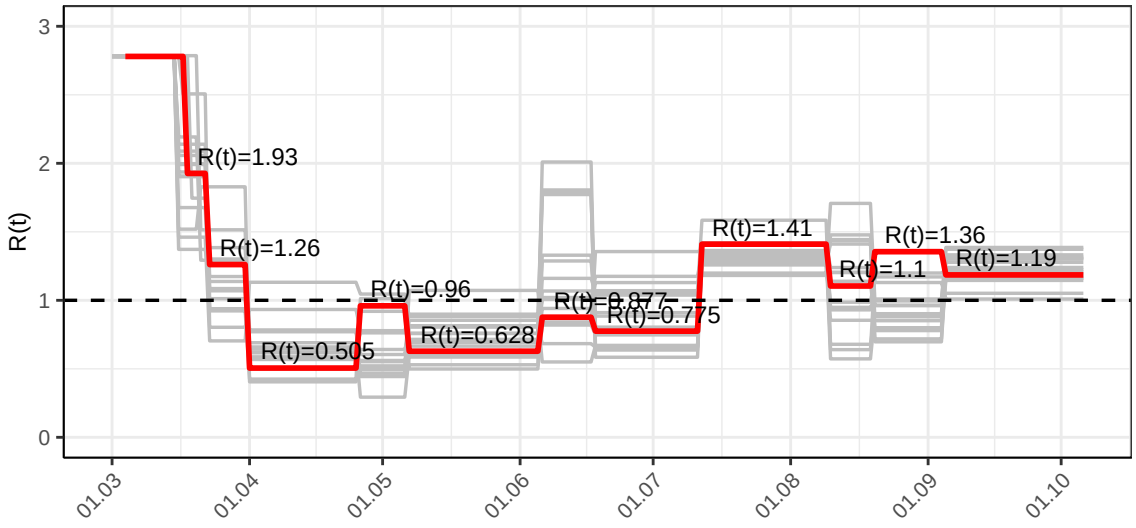


Figure 146: R(t) values over time for Saxony

14.2 Model predictions

14.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.19)

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.

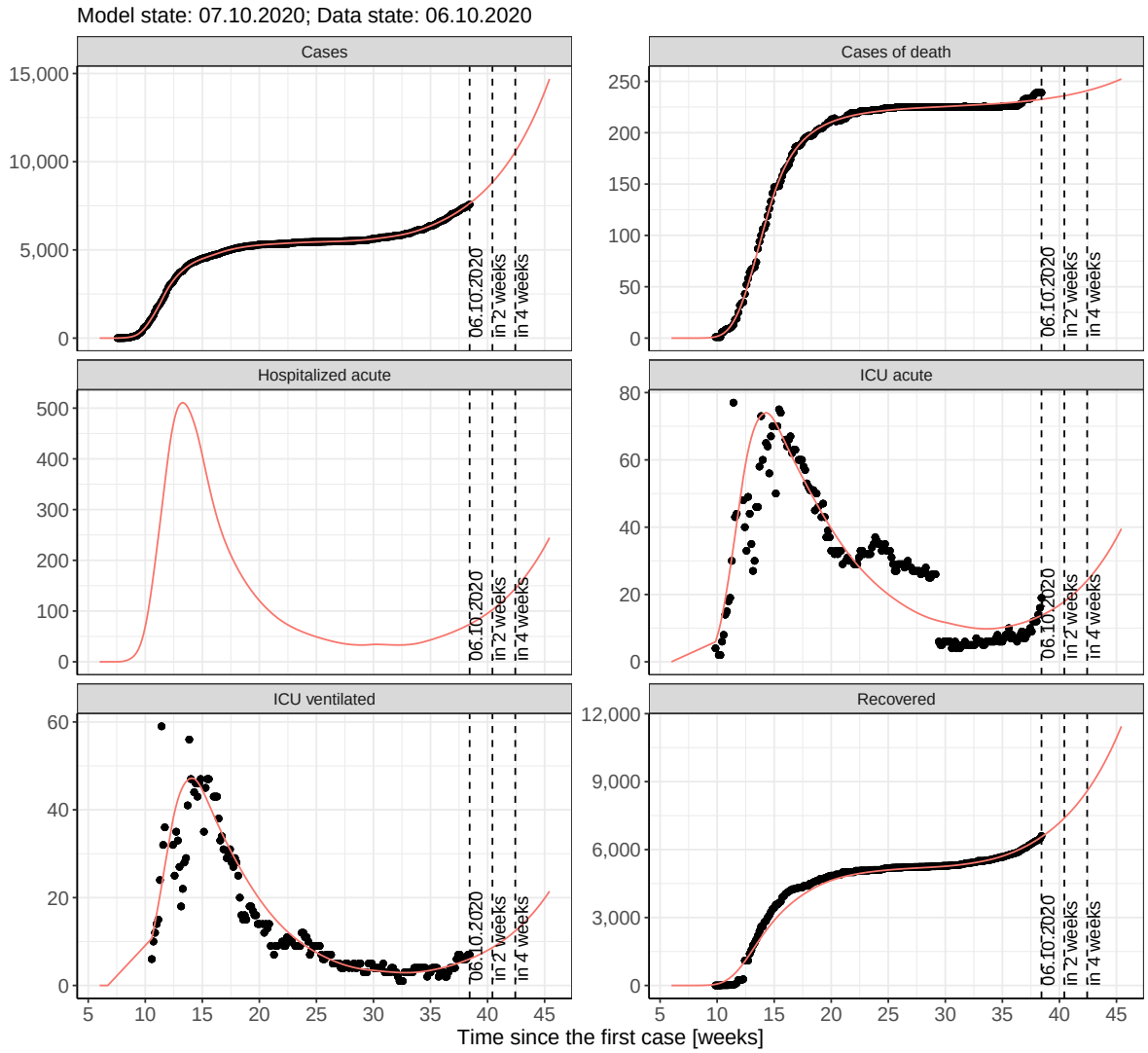


Figure 147: Representation of the model predictions for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

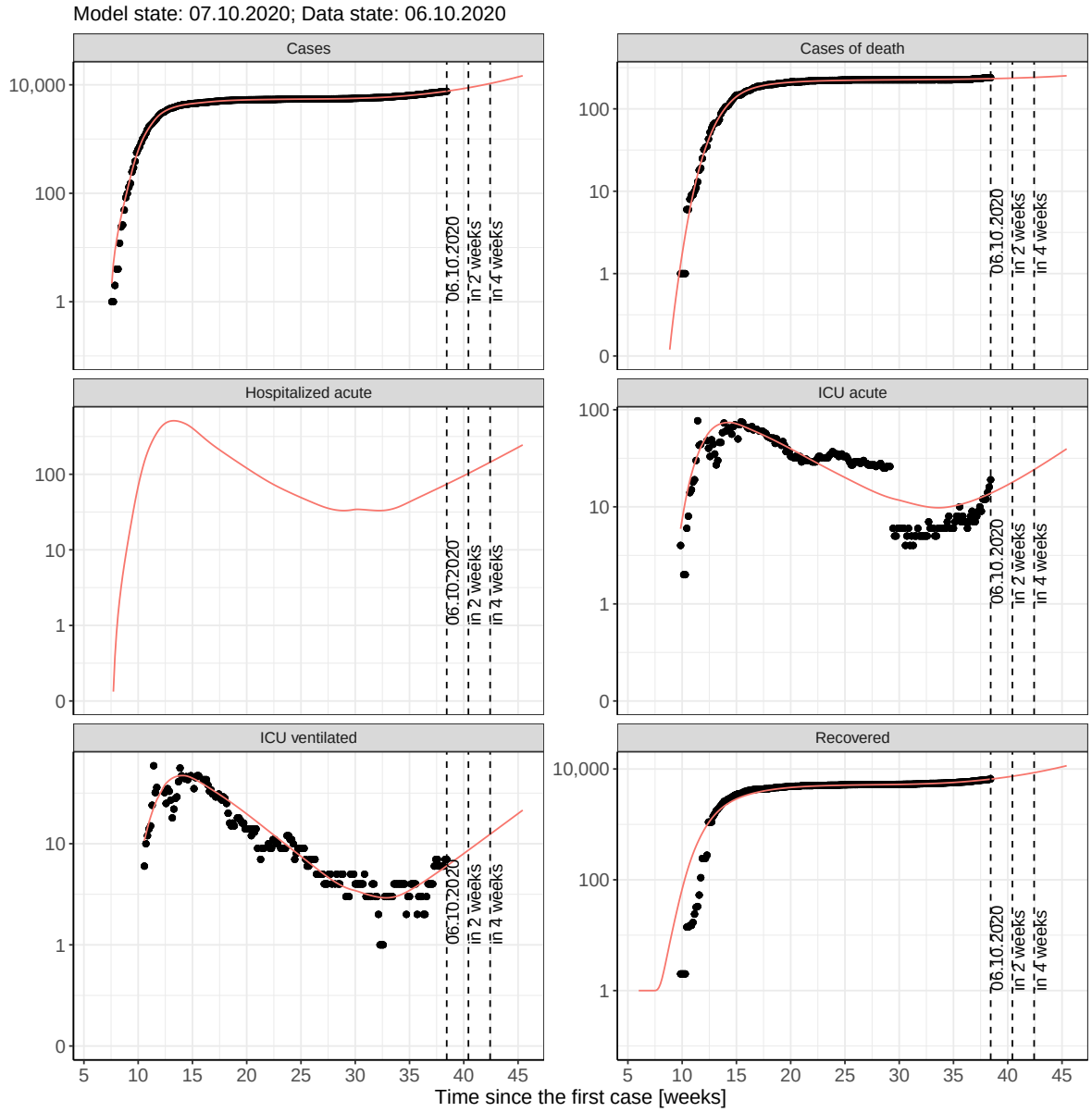


Figure 148: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

14.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

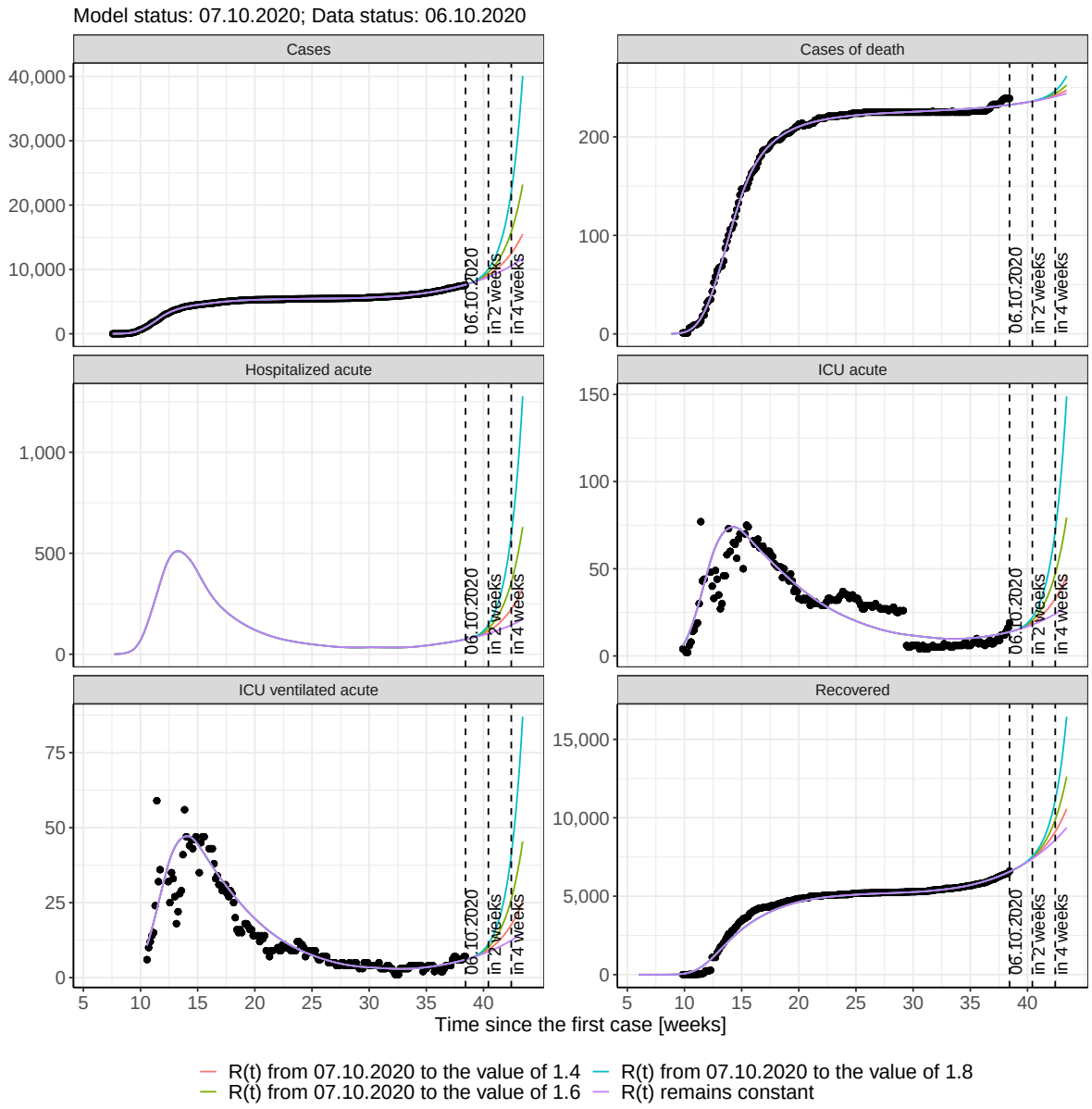


Figure 149: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

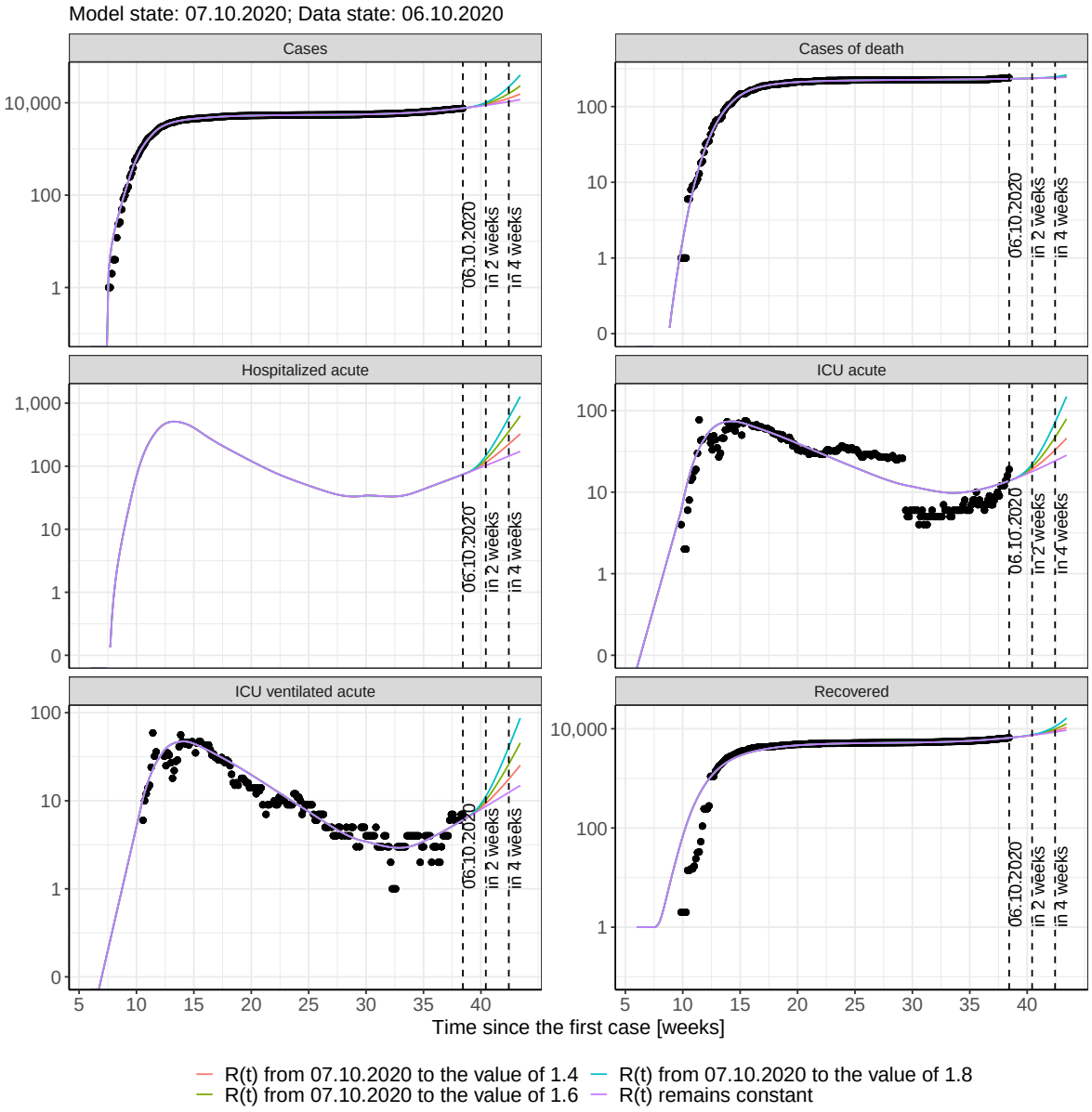


Figure 150: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

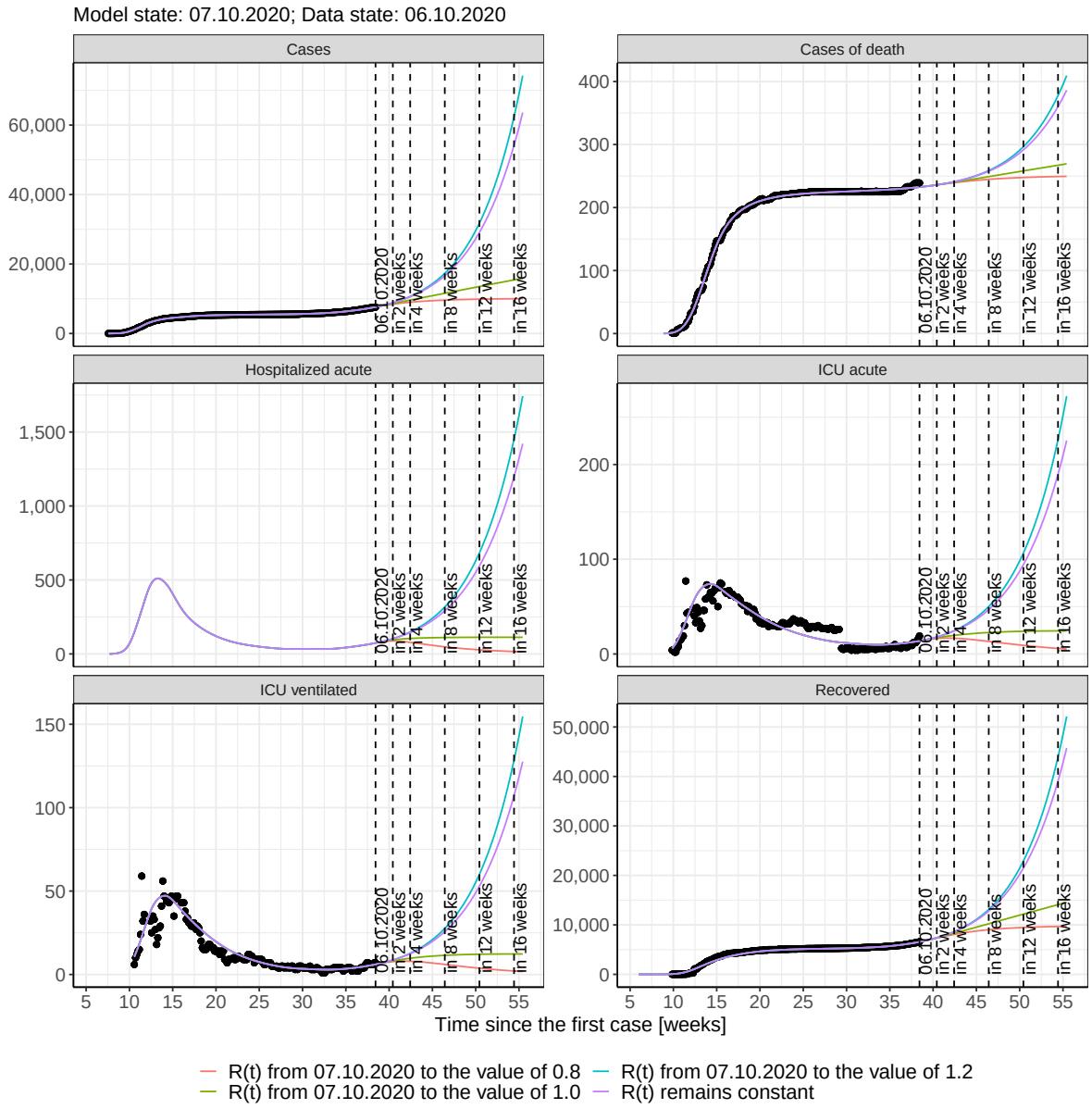


Figure 151: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

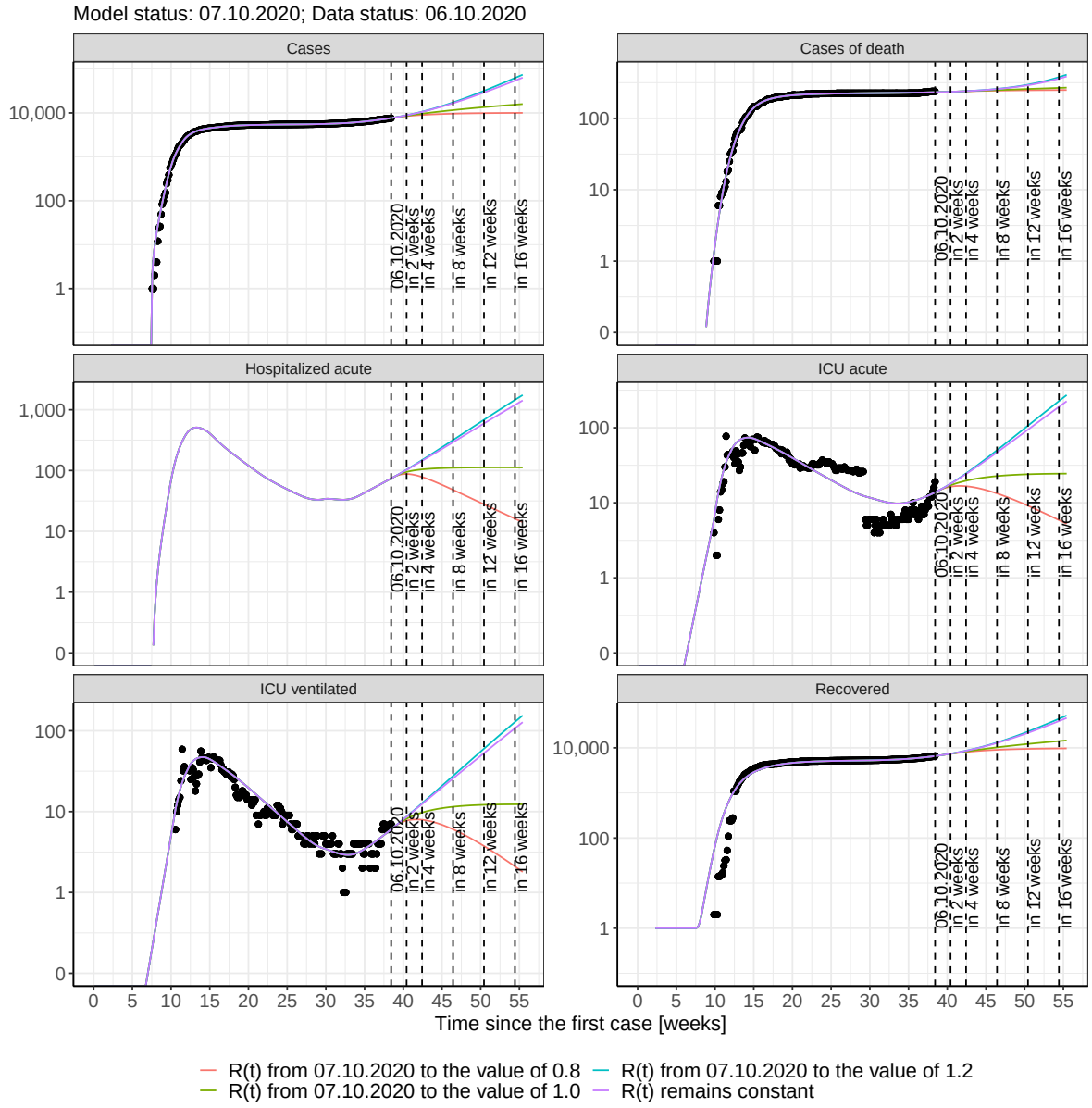


Figure 152: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 50); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 51); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 52); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 53) Model status from 07.10.2020; Data status: 06.10.2020.

Table 50: Saxony - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	7703	233	6610	76	14	6
08.10.2020	7777	233	6660	77	14	6
09.10.2020	7853	233	6713	79	15	7
10.10.2020	7931	233	6766	81	15	7
11.10.2020	8011	234	6822	83	15	7
12.10.2020	8093	234	6878	85	15	7
13.10.2020	8177	234	6936	87	16	7
14.10.2020	8264	234	6996	89	16	7
15.10.2020	8353	235	7057	91	16	8
16.10.2020	8444	235	7120	93	17	8
17.10.2020	8538	235	7185	96	17	8
18.10.2020	8634	235	7251	98	17	8
19.10.2020	8732	236	7319	100	18	8
20.10.2020	8834	236	7389	103	18	9
21.10.2020	8937	236	7461	105	18	9
22.10.2020	9044	237	7535	108	19	9
23.10.2020	9154	237	7610	110	19	9
24.10.2020	9266	237	7688	113	19	10
25.10.2020	9381	238	7768	116	20	10
26.10.2020	9500	238	7850	119	20	10
27.10.2020	9621	238	7933	122	21	10
28.10.2020	9746	239	8020	125	21	11
29.10.2020	9874	239	8108	128	22	11
30.10.2020	10005	239	8199	131	22	11
31.10.2020	10140	240	8292	134	23	11
01.11.2020	10278	240	8388	137	23	12
02.11.2020	10420	240	8486	141	24	12
03.11.2020	10566	241	8587	144	24	12

Table 51: Saxony - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	7701	233	6610	76	14	6
08.10.2020	7769	233	6660	77	14	6
09.10.2020	7835	233	6712	79	14	7
10.10.2020	7900	233	6766	81	15	7
11.10.2020	7962	234	6820	82	15	7
12.10.2020	8023	234	6875	83	15	7
13.10.2020	8082	234	6931	85	15	7
14.10.2020	8139	234	6988	86	16	7
15.10.2020	8195	235	7045	86	16	7
16.10.2020	8249	235	7102	87	16	7
17.10.2020	8302	235	7160	87	16	8
18.10.2020	8352	235	7217	88	16	8
19.10.2020	8402	236	7274	88	16	8
20.10.2020	8450	236	7332	88	16	8
21.10.2020	8497	236	7389	88	16	8
22.10.2020	8543	236	7445	87	17	8
23.10.2020	8587	237	7501	87	17	8
24.10.2020	8630	237	7556	87	17	8
25.10.2020	8672	237	7611	86	17	8
26.10.2020	8712	237	7665	85	17	8
27.10.2020	8752	238	7718	85	17	8
28.10.2020	8790	238	7771	84	17	8
29.10.2020	8827	238	7822	83	17	8
30.10.2020	8863	238	7873	82	17	8
31.10.2020	8898	239	7923	81	17	8
01.11.2020	8932	239	7972	80	17	8
02.11.2020	8965	239	8020	79	17	8
03.11.2020	8998	239	8067	78	17	8

Table 52: Saxony - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	7702	233	6610	76	14	6
08.10.2020	7773	233	6660	77	14	6
09.10.2020	7844	233	6713	79	15	7
10.10.2020	7915	233	6766	81	15	7
11.10.2020	7986	234	6821	83	15	7
12.10.2020	8057	234	6877	84	15	7
13.10.2020	8128	234	6934	86	15	7
14.10.2020	8199	234	6992	87	16	7
15.10.2020	8270	235	7051	89	16	7
16.10.2020	8341	235	7111	90	16	8
17.10.2020	8412	235	7172	91	16	8
18.10.2020	8483	235	7234	92	17	8
19.10.2020	8554	236	7296	94	17	8
20.10.2020	8625	236	7359	95	17	8
21.10.2020	8695	236	7423	96	17	8
22.10.2020	8766	237	7487	97	18	8
23.10.2020	8837	237	7552	98	18	9
24.10.2020	8908	237	7617	98	18	9
25.10.2020	8978	237	7683	99	18	9
26.10.2020	9049	238	7749	100	18	9
27.10.2020	9120	238	7815	101	18	9
28.10.2020	9190	238	7882	101	19	9
29.10.2020	9261	239	7949	102	19	9
30.10.2020	9332	239	8017	102	19	9
31.10.2020	9402	239	8084	103	19	9
01.11.2020	9473	239	8152	104	19	10
02.11.2020	9543	240	8220	104	19	10
03.11.2020	9614	240	8288	104	20	10

Table 53: Saxony - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	7703	233	6610	76	14	6
08.10.2020	7777	233	6660	77	14	6
09.10.2020	7854	233	6713	79	15	7
10.10.2020	7932	233	6766	81	15	7
11.10.2020	8013	234	6822	83	15	7
12.10.2020	8096	234	6878	85	15	7
13.10.2020	8182	234	6937	87	16	7
14.10.2020	8270	234	6996	89	16	7
15.10.2020	8360	235	7058	91	16	8
16.10.2020	8453	235	7121	94	17	8
17.10.2020	8549	235	7186	96	17	8
18.10.2020	8647	235	7253	98	17	8
19.10.2020	8748	236	7321	101	18	8
20.10.2020	8852	236	7392	103	18	9
21.10.2020	8959	236	7464	106	18	9
22.10.2020	9070	237	7539	109	19	9
23.10.2020	9183	237	7616	112	19	9
24.10.2020	9299	237	7694	114	20	10
25.10.2020	9419	238	7775	117	20	10
26.10.2020	9542	238	7859	120	20	10
27.10.2020	9669	238	7944	124	21	10
28.10.2020	9800	239	8032	127	21	11
29.10.2020	9934	239	8123	130	22	11
30.10.2020	10072	239	8216	134	22	11
31.10.2020	10214	240	8312	137	23	12
01.11.2020	10360	240	8410	141	23	12
02.11.2020	10510	241	8512	145	24	12
03.11.2020	10664	241	8616	148	25	13

14.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

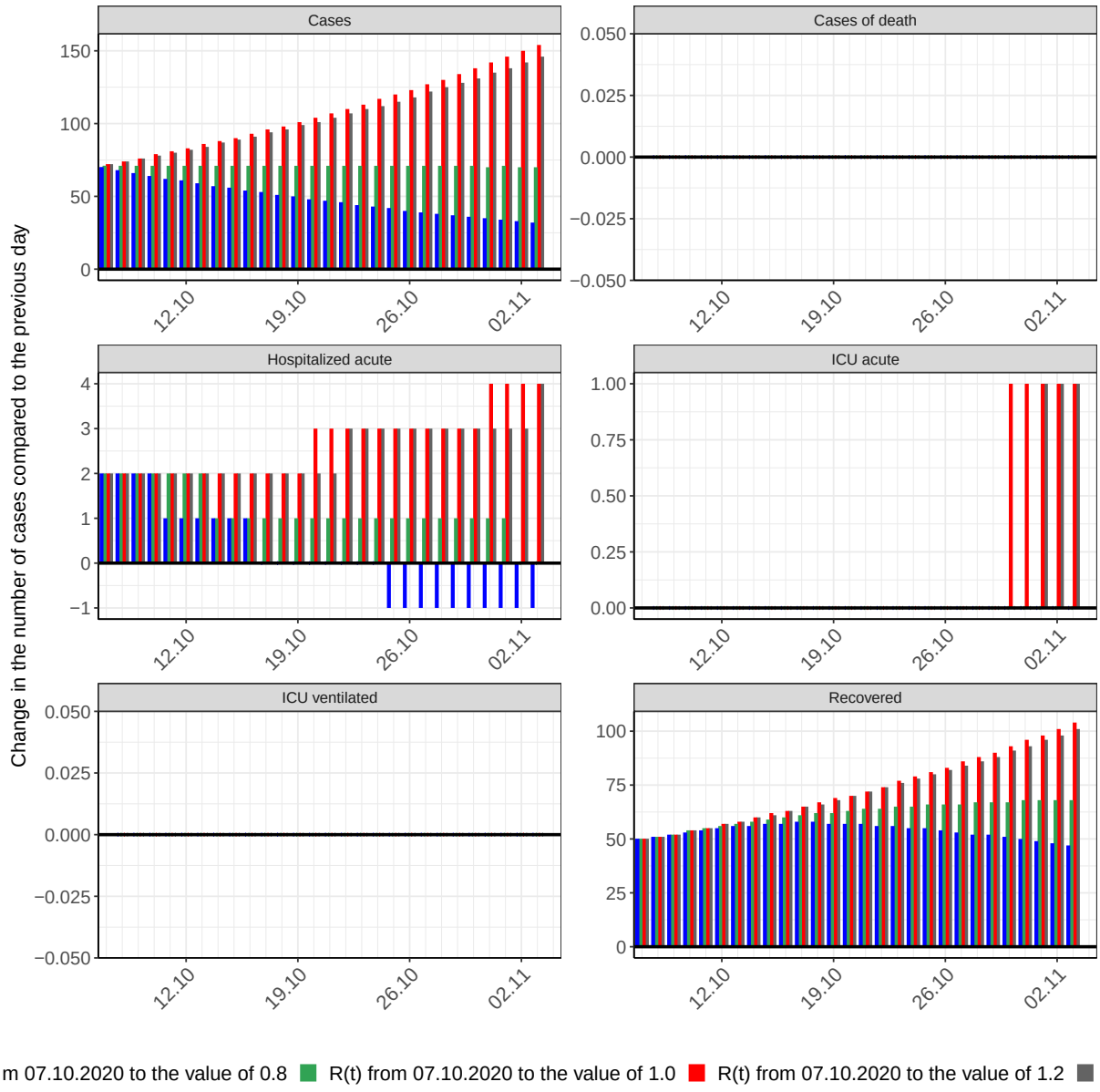


Figure 153: Simulation of daily new cases for the next 4 weeks - Saxony

15 Saxony-Anhalt

15.1 Model description

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

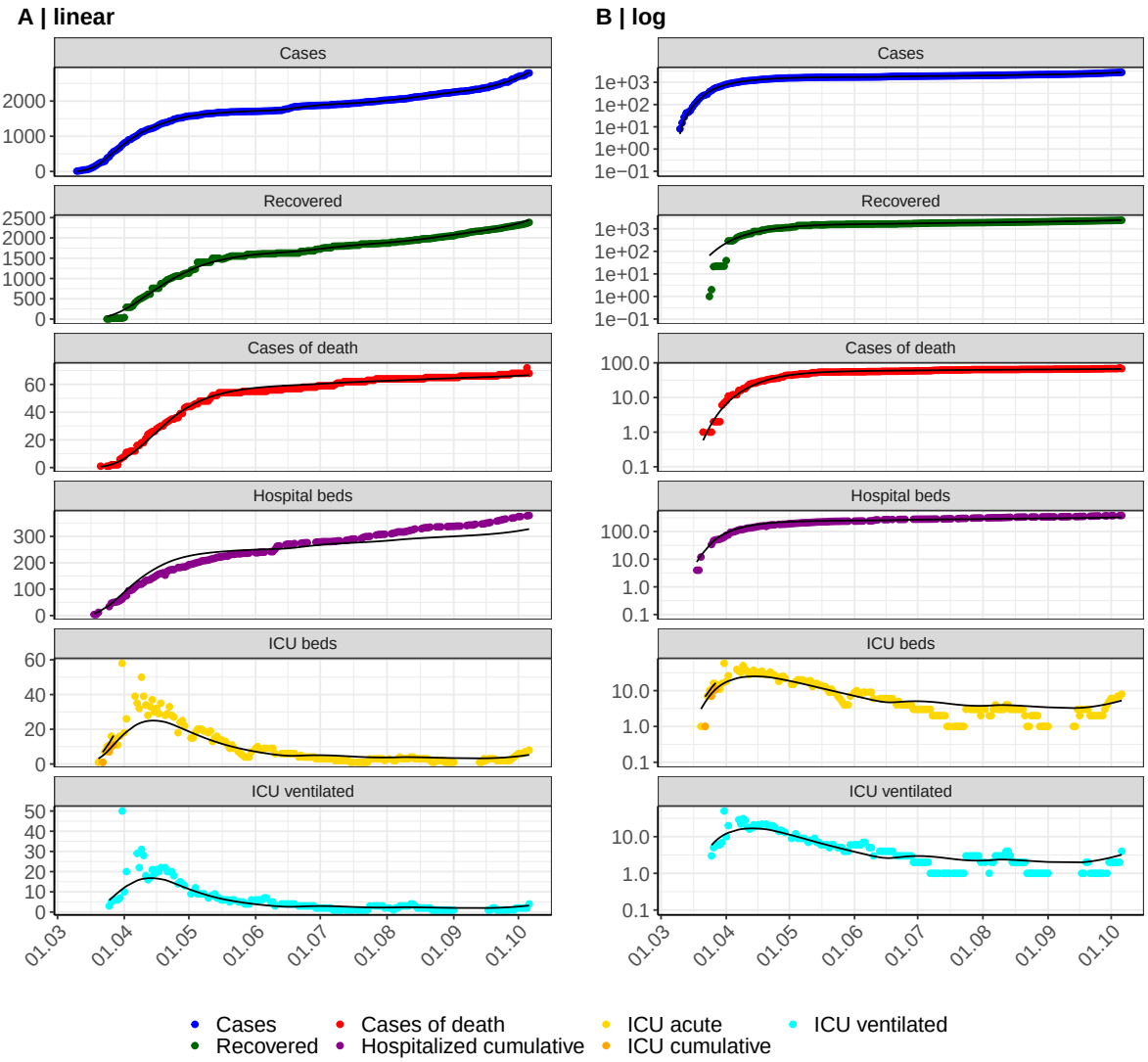


Figure 154: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Saxony-Anhalt. Points: reported data; lines: model description.

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

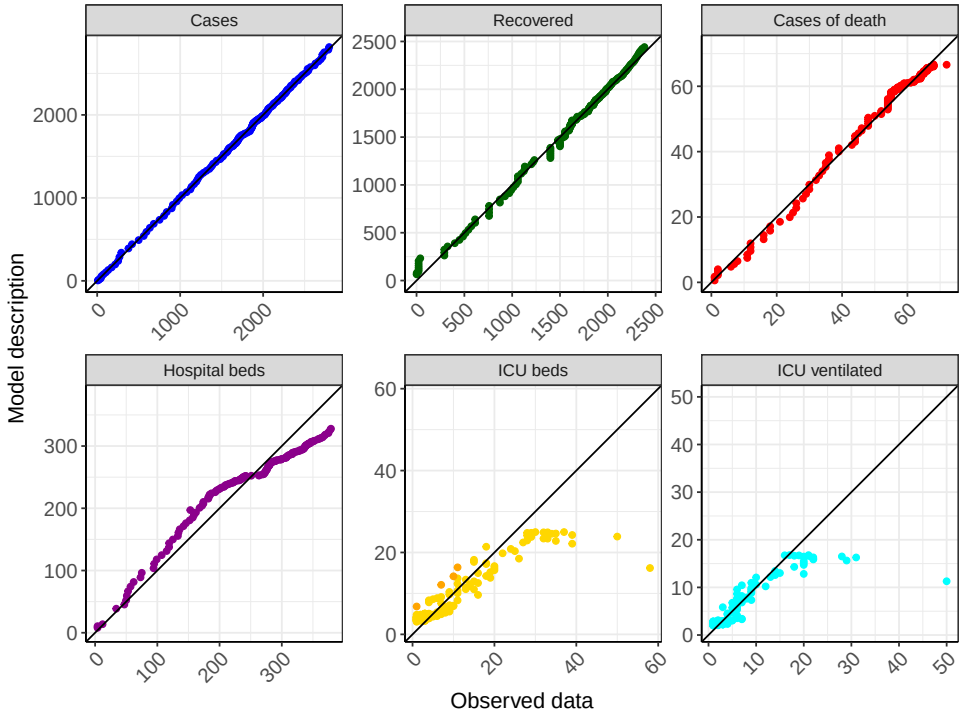


Figure 155: Goodness-of-fit plots for Saxony-Anhalt. Lines: lines of identity.

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

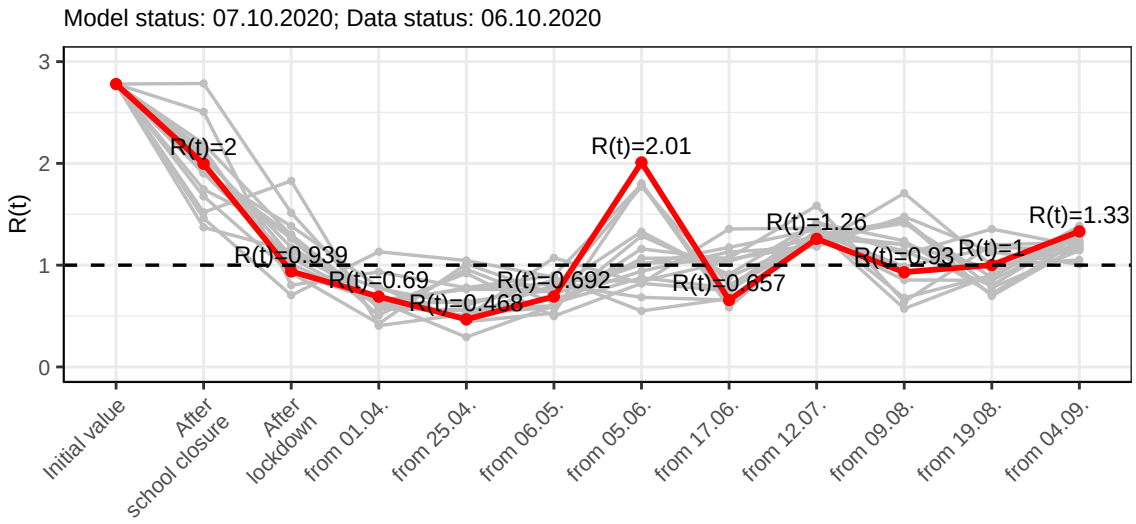


Figure 156: R(t) values before and after the NPIs for Saxony-Anhalt

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

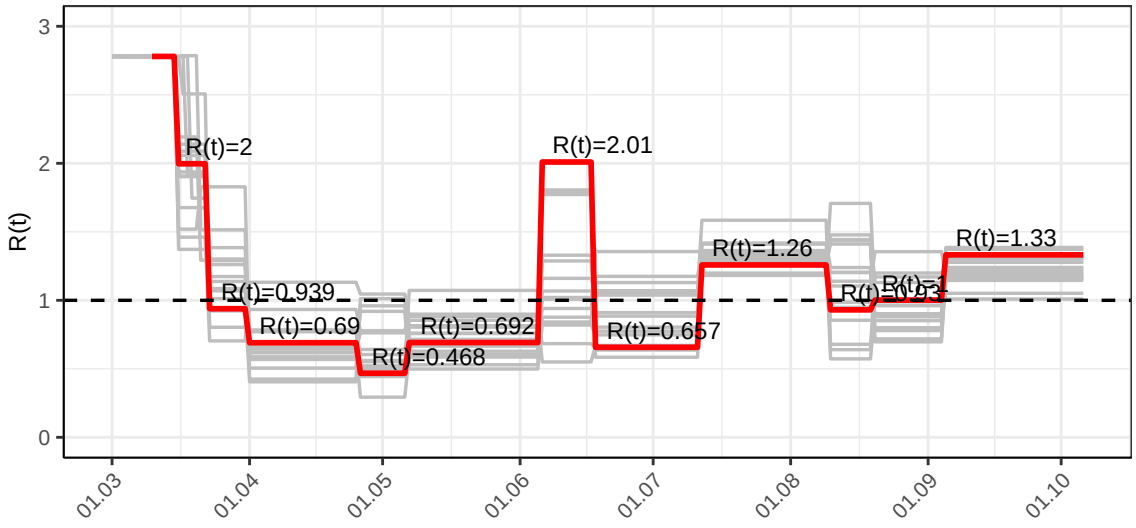


Figure 157: R(t) values over time for Saxony-Anhalt

15.2 Model predictions

15.2.1 Prediction for the next 4 weeks assuming that R(t) estimate will not change (R(t) = 1.33)

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.

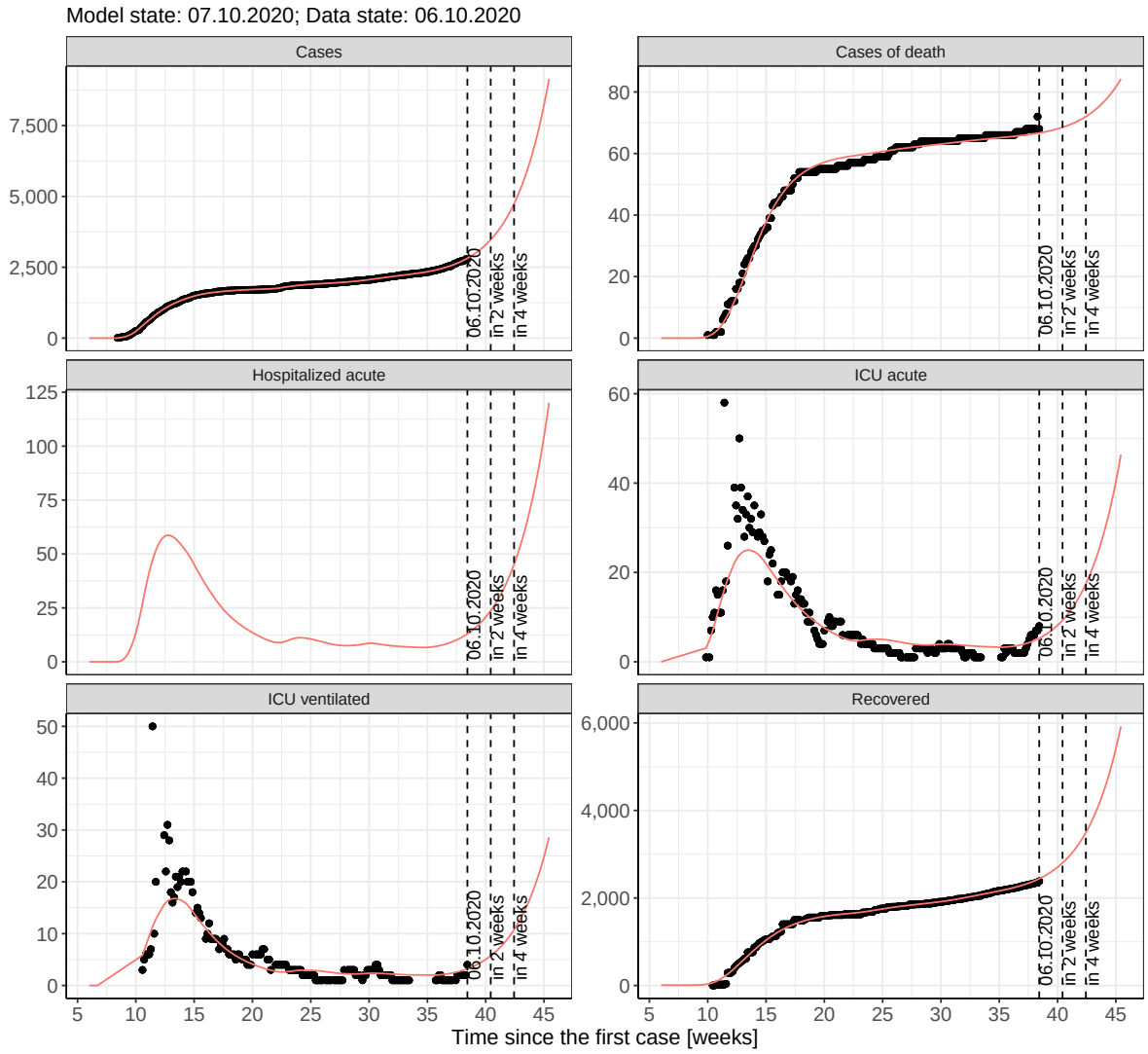


Figure 158: Representation of the model predictions for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

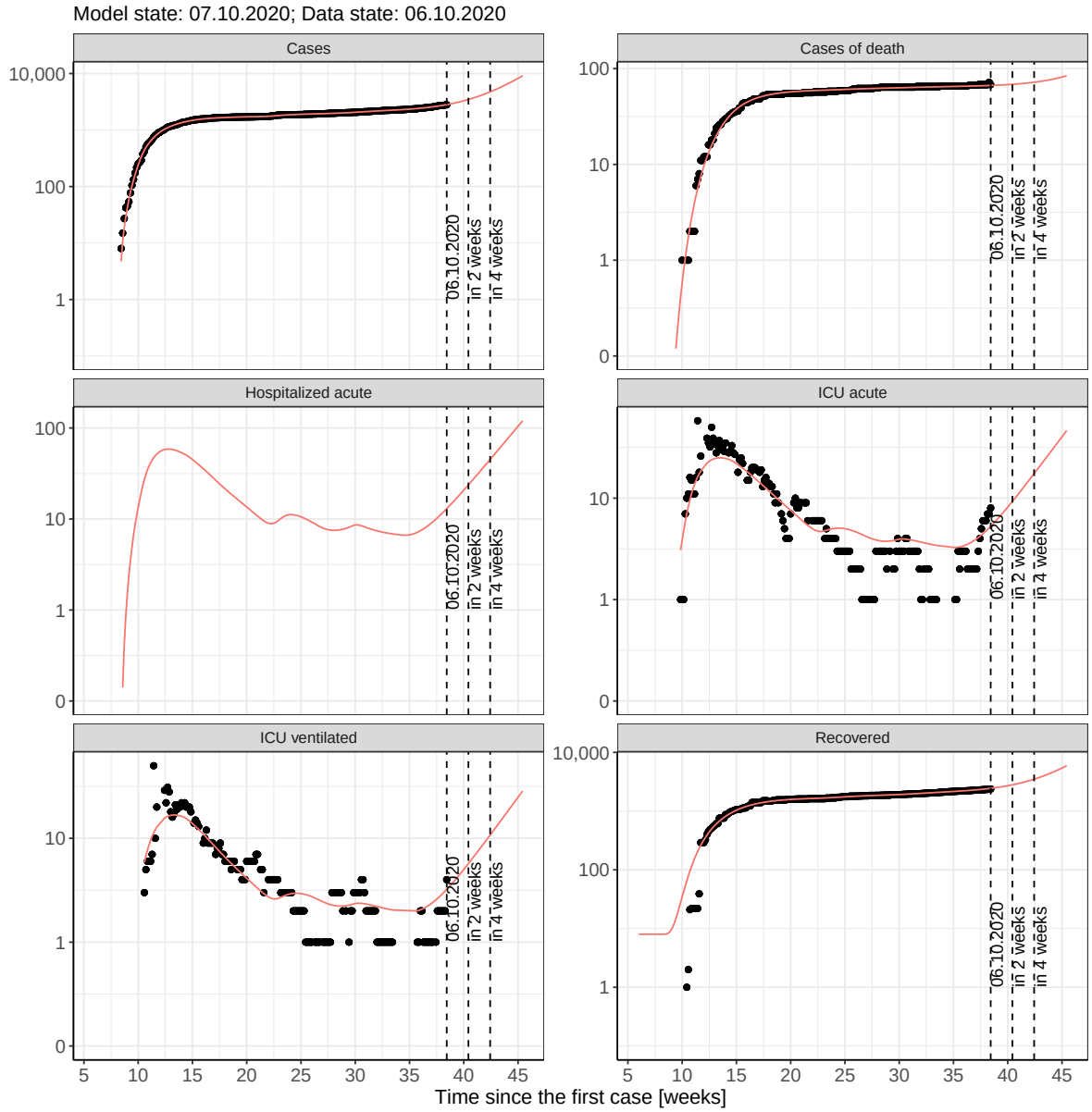


Figure 159: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

15.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

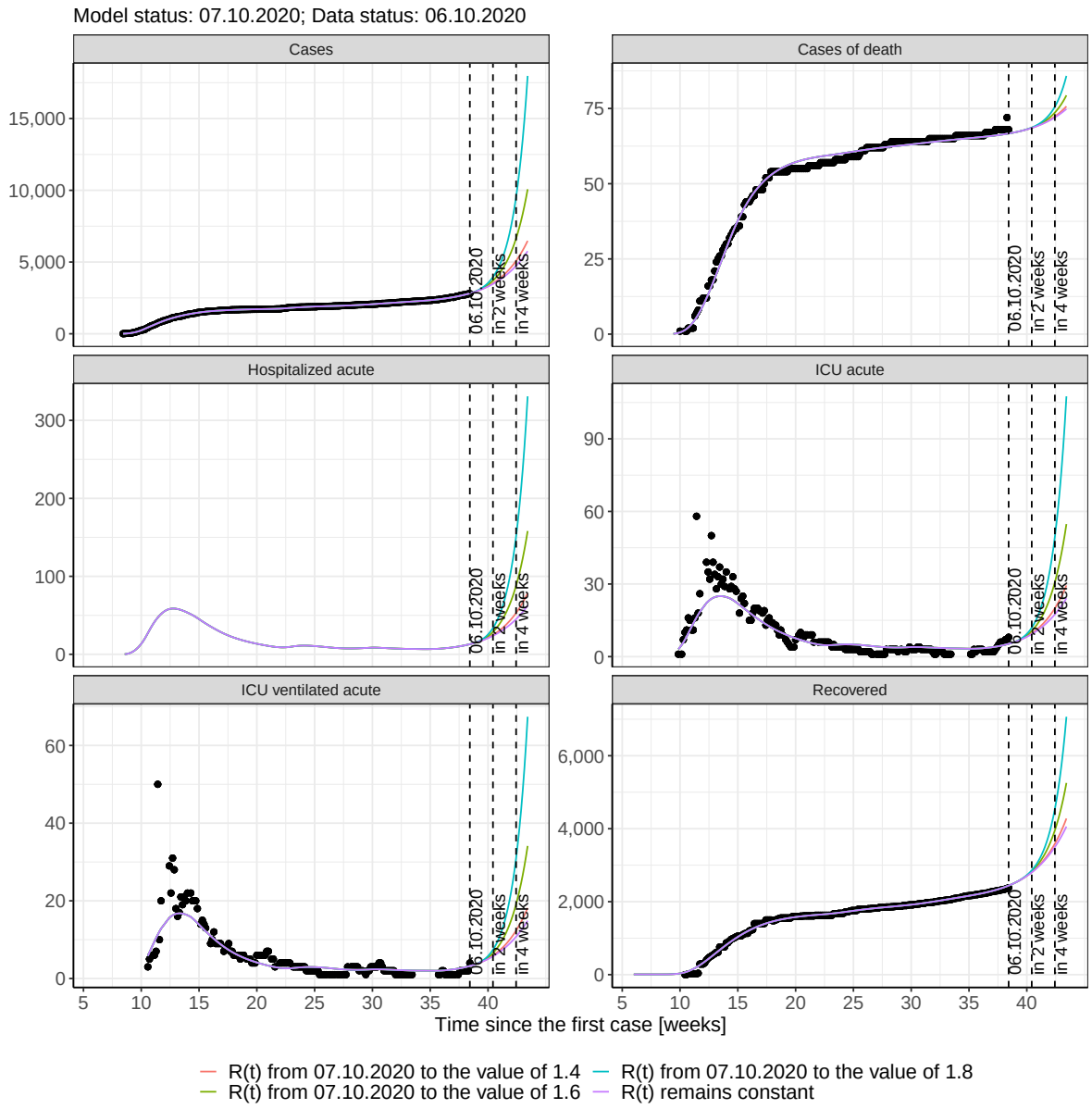


Figure 160: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

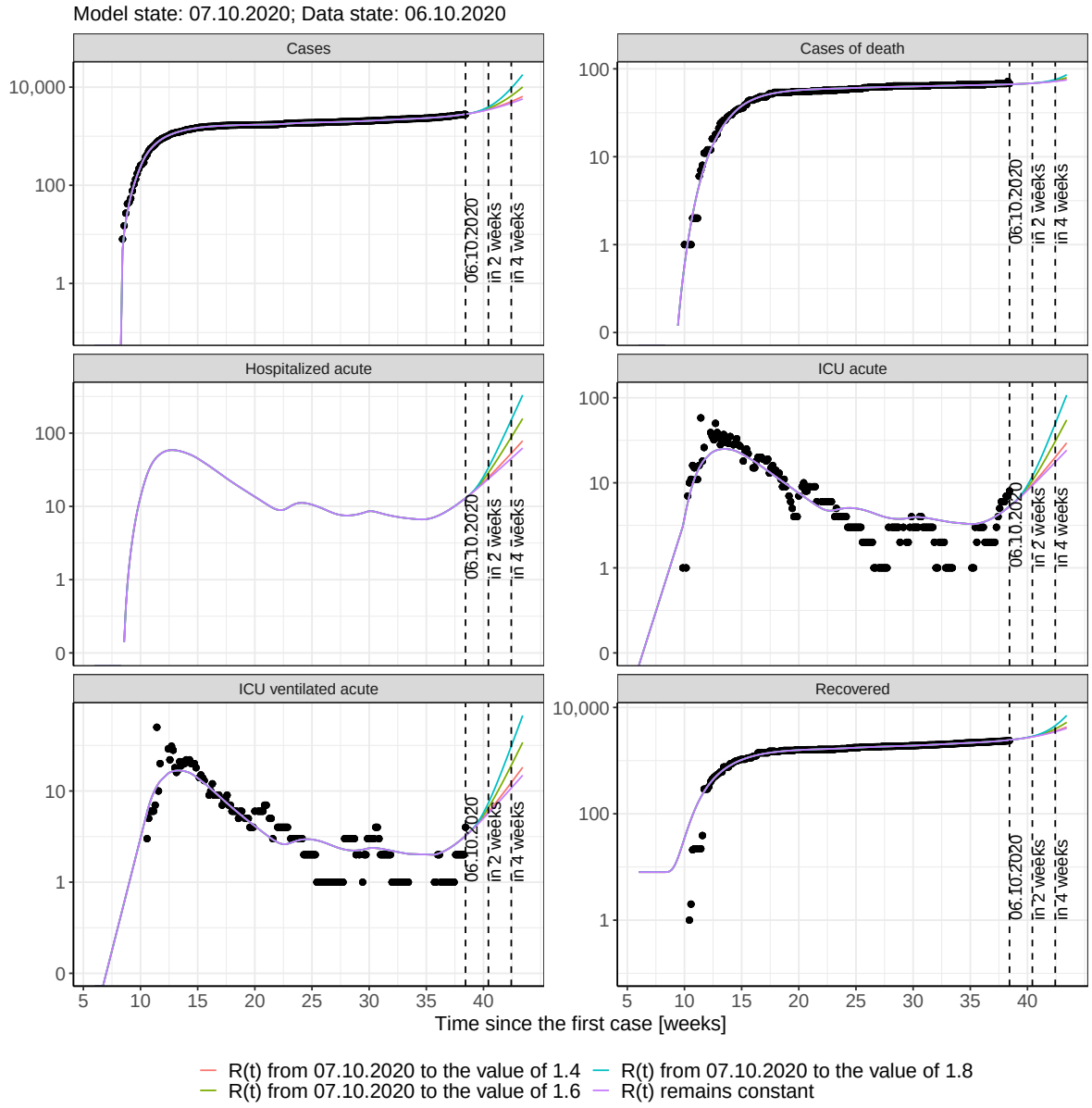


Figure 161: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

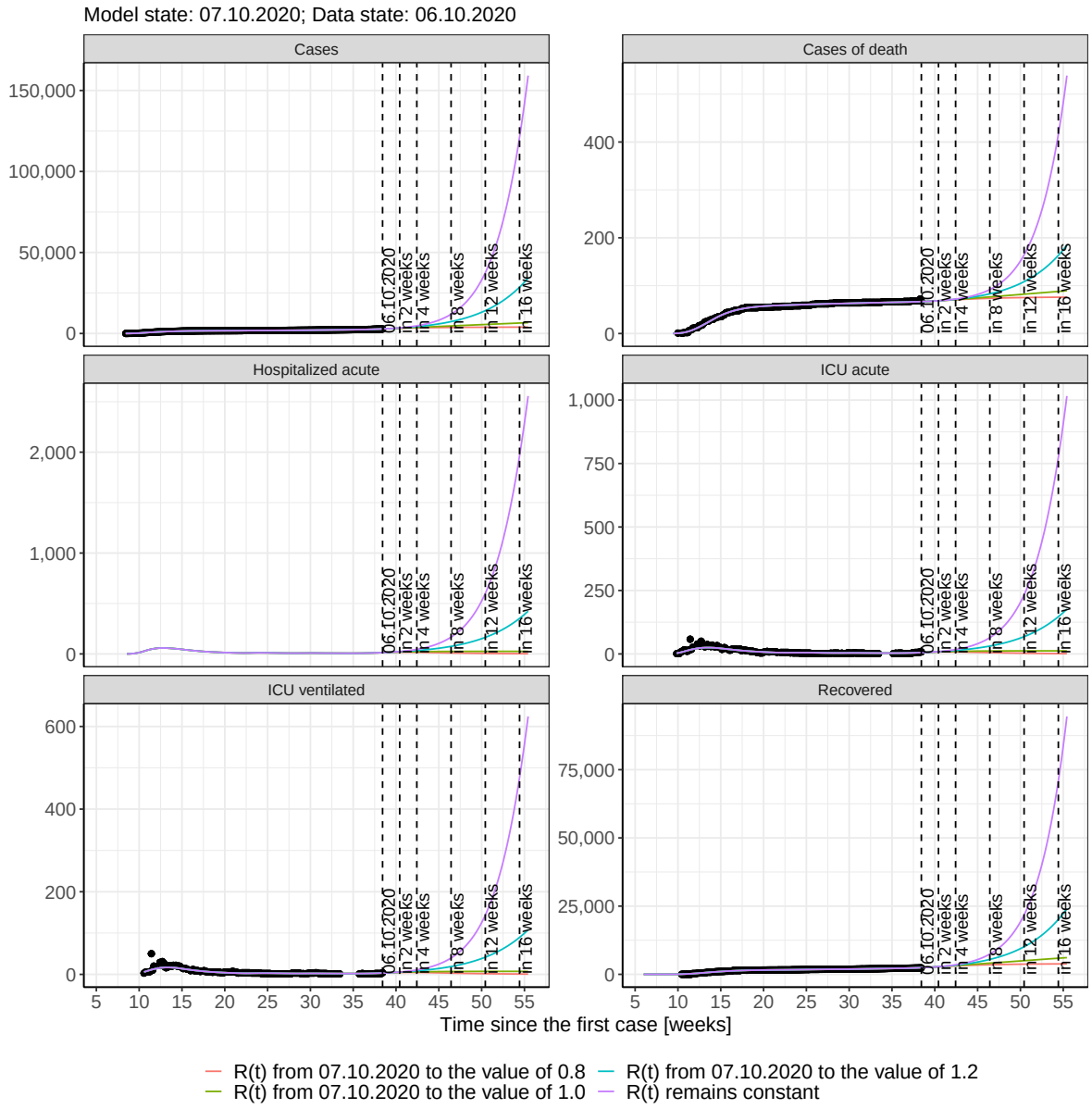


Figure 162: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

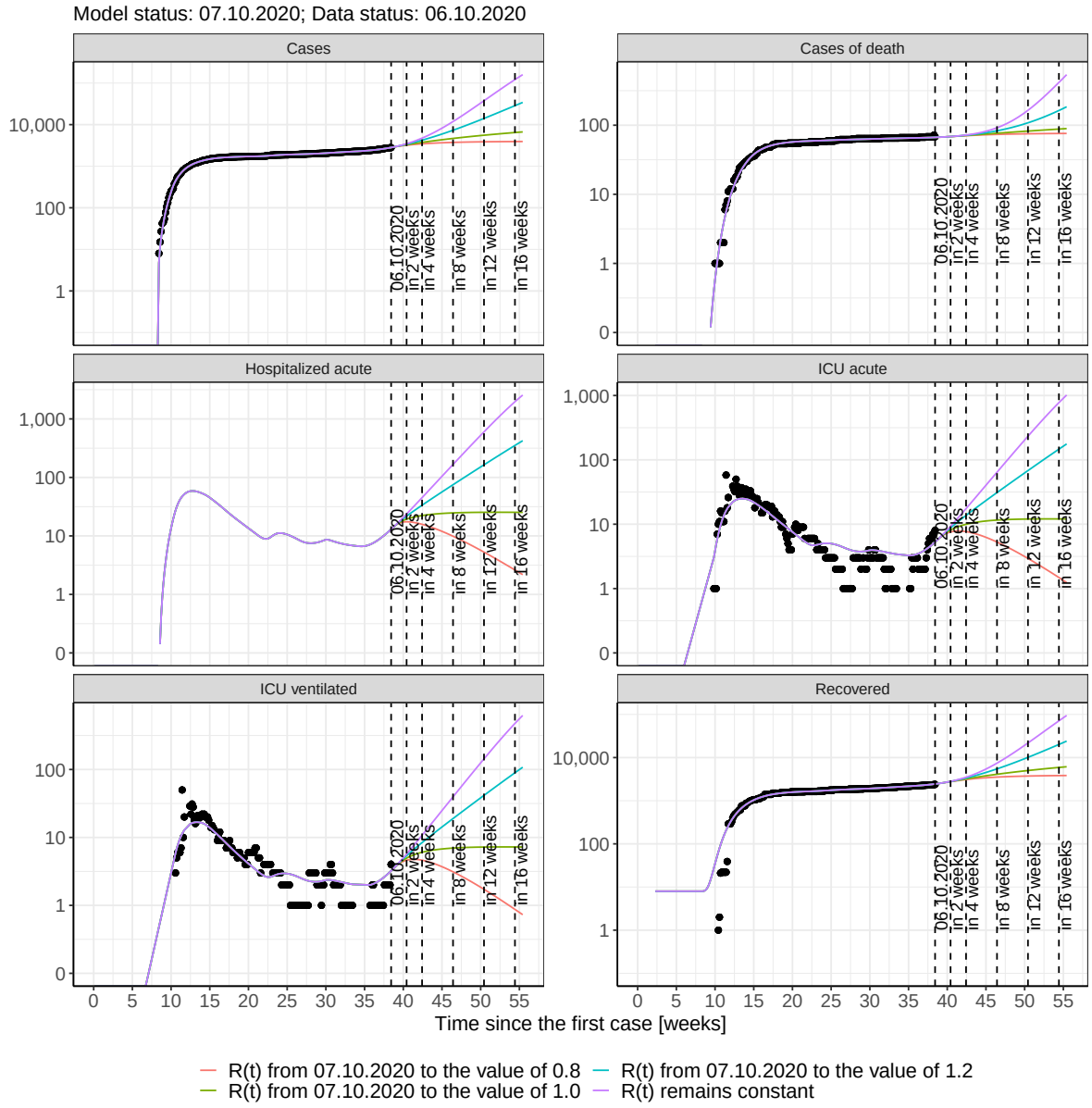


Figure 163: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Saxony-Anhalt assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 54); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 55); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 56); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 57) Model status from 07.10.2020; Data status: 06.10.2020.

Table 54: Saxony-Anhalt - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2851	67	2460	14	5	3
08.10.2020	2886	67	2480	14	6	3
09.10.2020	2924	67	2500	15	6	4
10.10.2020	2963	67	2522	15	6	4
11.10.2020	3004	67	2544	16	6	4
12.10.2020	3046	67	2568	17	7	4
13.10.2020	3091	67	2592	17	7	4
14.10.2020	3138	68	2618	18	7	4
15.10.2020	3187	68	2646	19	8	5
16.10.2020	3239	68	2674	20	8	5
17.10.2020	3293	68	2704	21	8	5
18.10.2020	3350	68	2735	22	9	5
19.10.2020	3410	68	2768	23	9	5
20.10.2020	3472	69	2802	24	9	6
21.10.2020	3537	69	2838	25	10	6
22.10.2020	3606	69	2876	26	10	6
23.10.2020	3678	69	2915	27	11	7
24.10.2020	3753	69	2956	28	11	7
25.10.2020	3832	70	3000	30	12	7
26.10.2020	3915	70	3045	31	12	7
27.10.2020	4001	70	3093	33	13	8
28.10.2020	4092	70	3143	34	13	8
29.10.2020	4188	71	3195	36	14	9
30.10.2020	4287	71	3250	37	15	9
31.10.2020	4392	71	3308	39	15	9
01.11.2020	4502	71	3368	41	16	10
02.11.2020	4617	72	3431	43	17	10
03.11.2020	4737	72	3497	45	17	11

Table 55: Saxony-Anhalt - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2850	67	2460	14	5	3
08.10.2020	2881	67	2480	14	6	3
09.10.2020	2912	67	2500	15	6	4
10.10.2020	2942	67	2521	15	6	4
11.10.2020	2971	67	2543	16	6	4
12.10.2020	2999	67	2566	16	6	4
13.10.2020	3027	67	2589	16	7	4
14.10.2020	3053	68	2613	17	7	4
15.10.2020	3079	68	2637	17	7	4
16.10.2020	3104	68	2662	17	7	4
17.10.2020	3129	68	2686	17	7	4
18.10.2020	3152	68	2711	17	7	5
19.10.2020	3175	68	2736	17	7	5
20.10.2020	3198	68	2762	17	8	5
21.10.2020	3220	69	2787	17	8	5
22.10.2020	3241	69	2812	17	8	5
23.10.2020	3261	69	2837	17	8	5
24.10.2020	3281	69	2862	17	8	5
25.10.2020	3301	69	2886	17	8	5
26.10.2020	3319	69	2911	17	8	5
27.10.2020	3338	69	2935	17	8	5
28.10.2020	3356	70	2959	17	8	5
29.10.2020	3373	70	2982	17	8	5
30.10.2020	3390	70	3005	16	8	5
31.10.2020	3406	70	3028	16	8	5
01.11.2020	3422	70	3050	16	8	5
02.11.2020	3437	70	3072	16	8	5
03.11.2020	3452	70	3093	16	8	5

Table 56: Saxony-Anhalt - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2850	67	2460	14	5	3
08.10.2020	2883	67	2480	14	6	3
09.10.2020	2916	67	2500	15	6	4
10.10.2020	2949	67	2521	15	6	4
11.10.2020	2982	67	2544	16	6	4
12.10.2020	3015	67	2566	16	7	4
13.10.2020	3048	67	2590	17	7	4
14.10.2020	3081	68	2615	17	7	4
15.10.2020	3114	68	2640	18	7	4
16.10.2020	3147	68	2666	18	7	5
17.10.2020	3180	68	2692	18	8	5
18.10.2020	3213	68	2719	19	8	5
19.10.2020	3246	68	2747	19	8	5
20.10.2020	3279	68	2775	19	8	5
21.10.2020	3312	69	2803	20	8	5
22.10.2020	3345	69	2832	20	8	5
23.10.2020	3377	69	2861	20	9	5
24.10.2020	3410	69	2890	20	9	5
25.10.2020	3443	69	2920	21	9	5
26.10.2020	3476	69	2950	21	9	6
27.10.2020	3509	70	2981	21	9	6
28.10.2020	3542	70	3011	21	9	6
29.10.2020	3575	70	3042	21	9	6
30.10.2020	3608	70	3073	22	10	6
31.10.2020	3640	70	3104	22	10	6
01.11.2020	3673	71	3135	22	10	6
02.11.2020	3706	71	3167	22	10	6
03.11.2020	3739	71	3198	22	10	6

Table 57: Saxony-Anhalt - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	2851	67	2460	14	5	3
08.10.2020	2885	67	2480	14	6	3
09.10.2020	2921	67	2500	15	6	4
10.10.2020	2957	67	2522	15	6	4
11.10.2020	2995	67	2544	16	6	4
12.10.2020	3033	67	2567	16	7	4
13.10.2020	3073	67	2592	17	7	4
14.10.2020	3114	68	2617	18	7	4
15.10.2020	3156	68	2643	18	7	5
16.10.2020	3199	68	2670	19	8	5
17.10.2020	3243	68	2699	20	8	5
18.10.2020	3289	68	2728	20	8	5
19.10.2020	3336	68	2759	21	8	5
20.10.2020	3384	68	2790	22	9	5
21.10.2020	3434	69	2823	23	9	6
22.10.2020	3486	69	2856	23	9	6
23.10.2020	3538	69	2891	24	10	6
24.10.2020	3592	69	2927	25	10	6
25.10.2020	3648	69	2964	26	10	6
26.10.2020	3706	70	3002	26	11	7
27.10.2020	3764	70	3042	27	11	7
28.10.2020	3825	70	3082	28	11	7
29.10.2020	3888	70	3124	29	12	7
30.10.2020	3952	70	3167	30	12	7
31.10.2020	4018	71	3212	31	13	8
01.11.2020	4086	71	3258	32	13	8
02.11.2020	4156	71	3305	33	13	8
03.11.2020	4227	71	3353	33	14	8

15.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

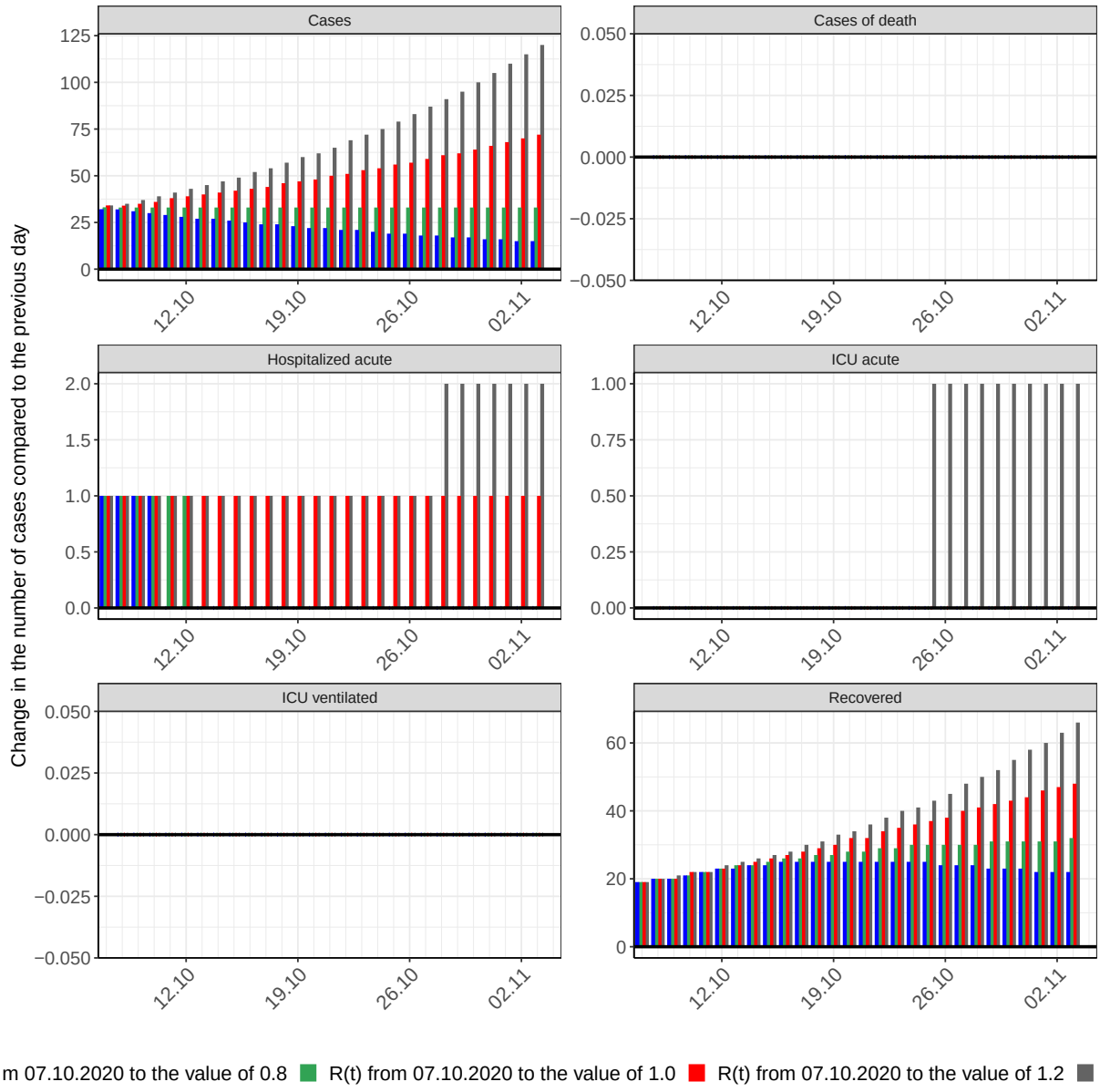


Figure 164: Simulation of daily new cases for the next 4 weeks - Saxony-Anhalt

16 Schleswig-Holstein

16.1 Model description

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

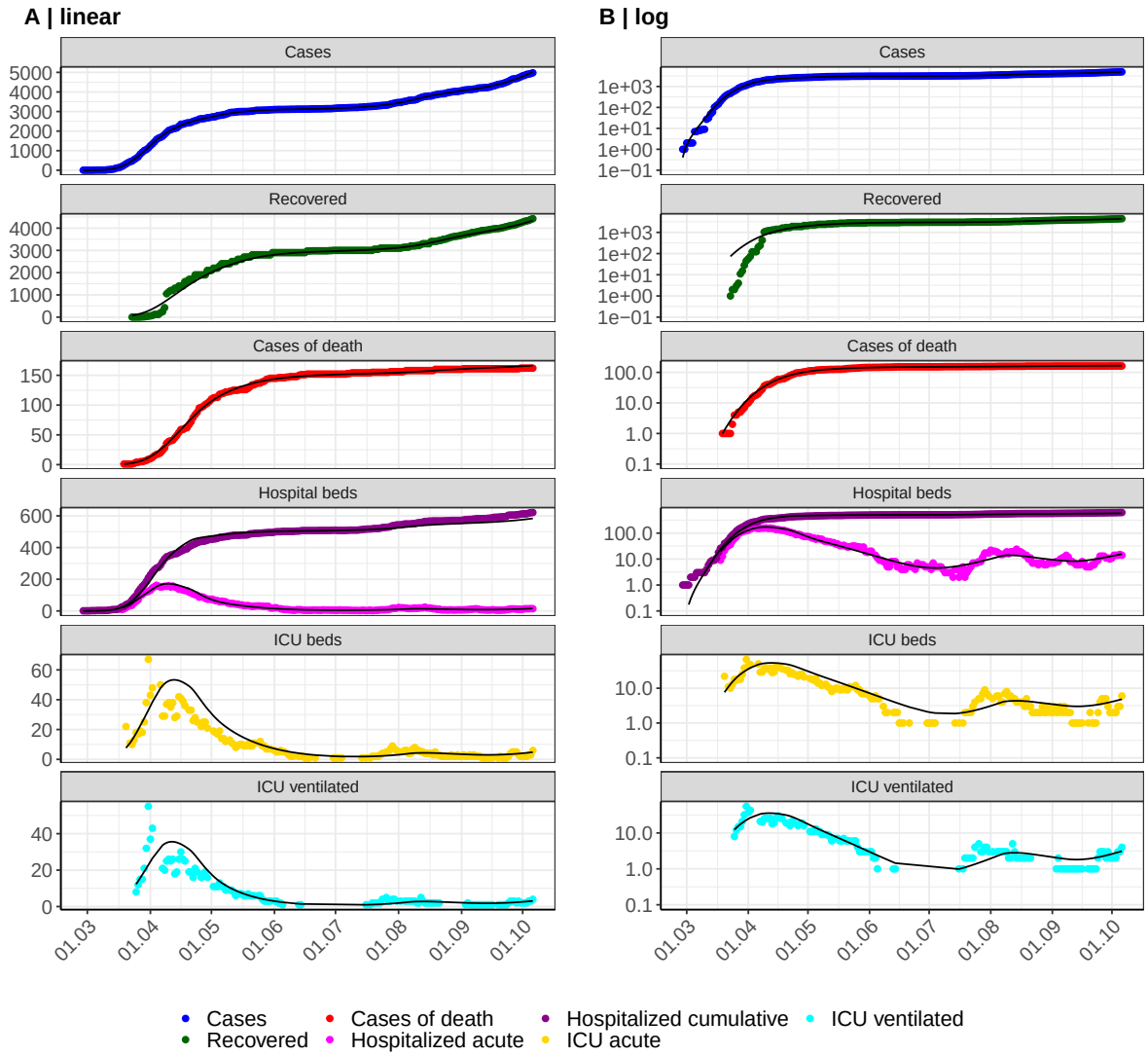


Figure 165: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Schleswig-Holstein. Points: reported data; lines: model description.

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

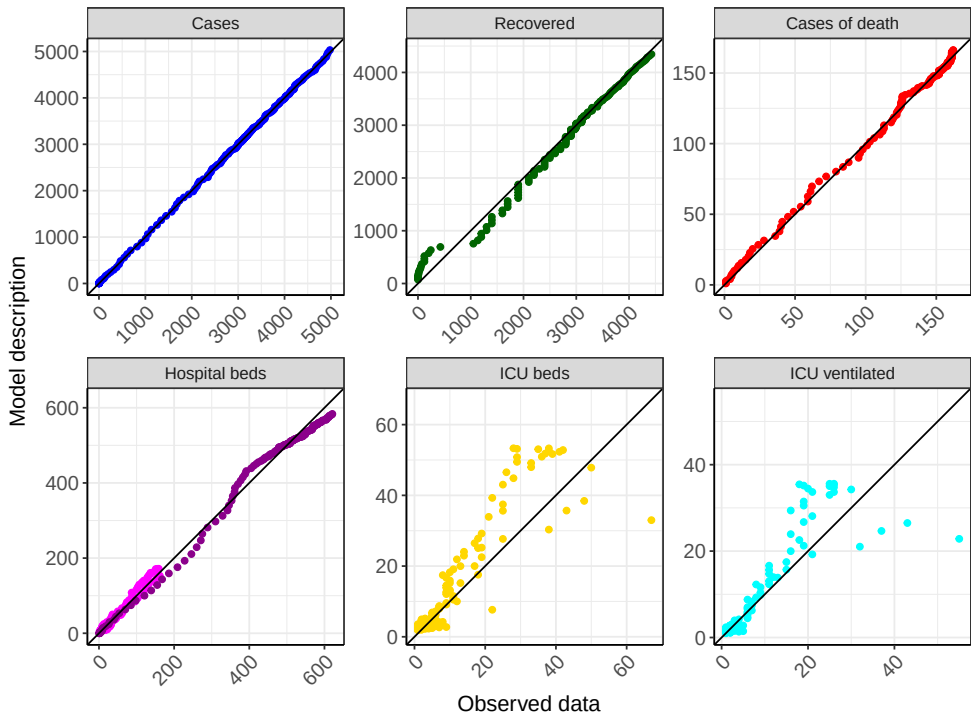


Figure 166: Goodness-of-fit plots for Schleswig-Holstein. Lines: lines of identity.

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

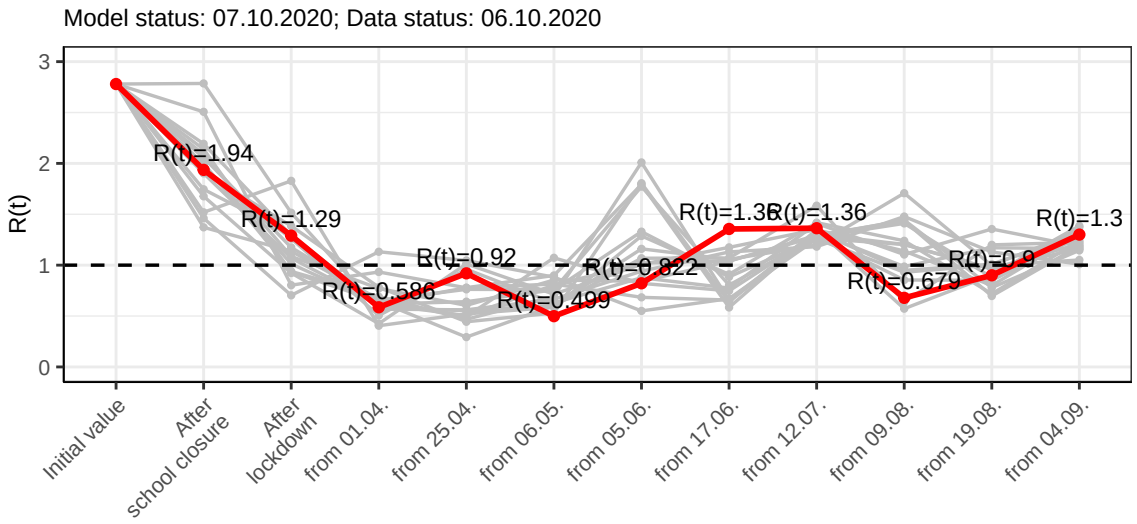


Figure 167: R(t) values before and after the NPIs for Schleswig-Holstein

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

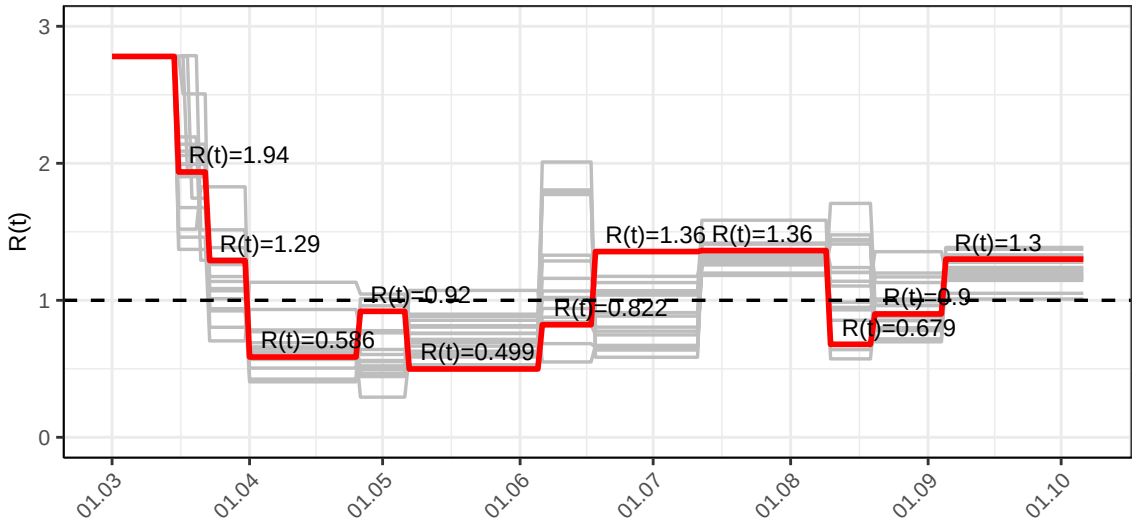


Figure 168: R(t) values over time for Schleswig-Holstein

16.2 Model predictions

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

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.

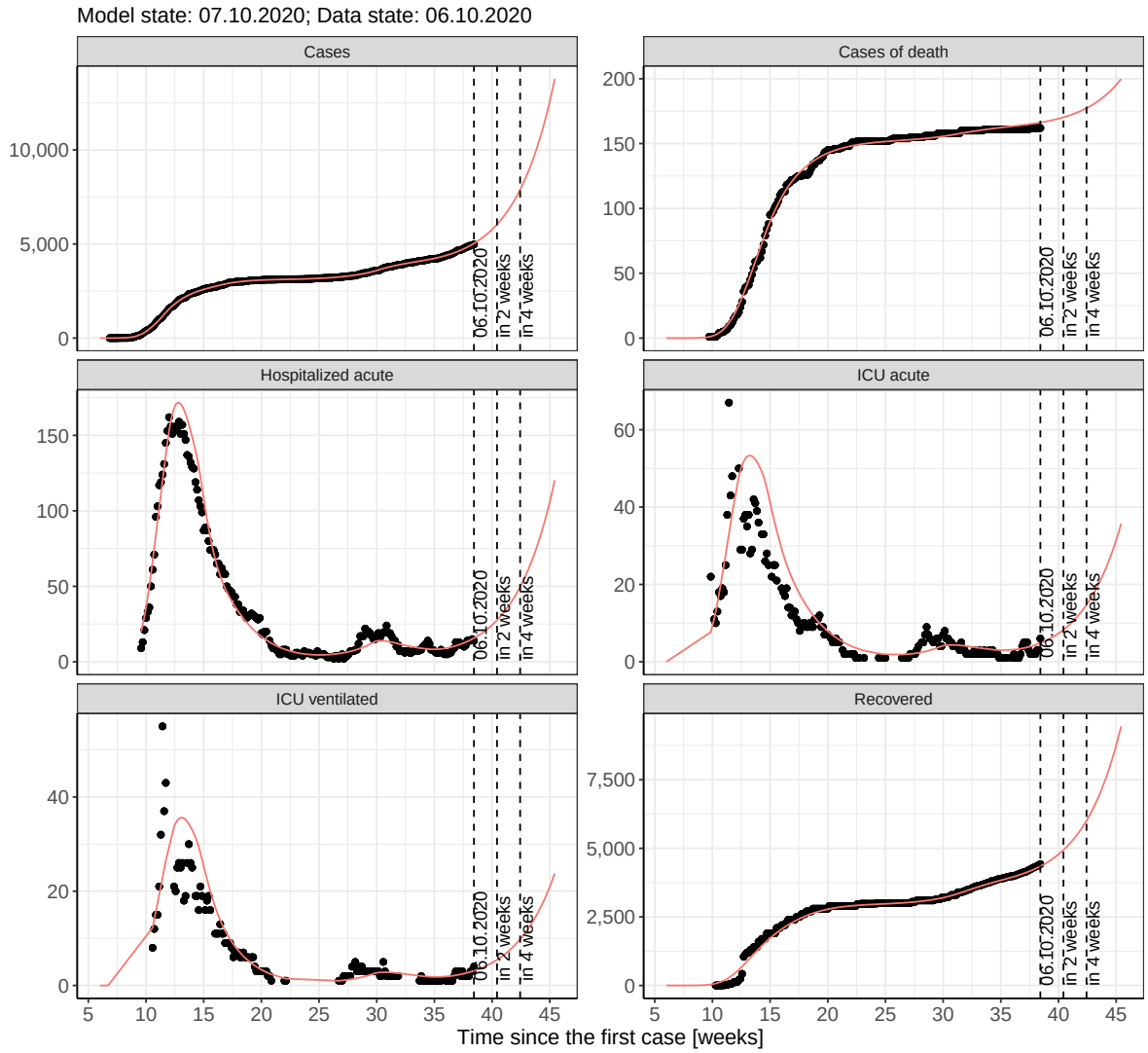


Figure 169: Representation of the model predictions for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

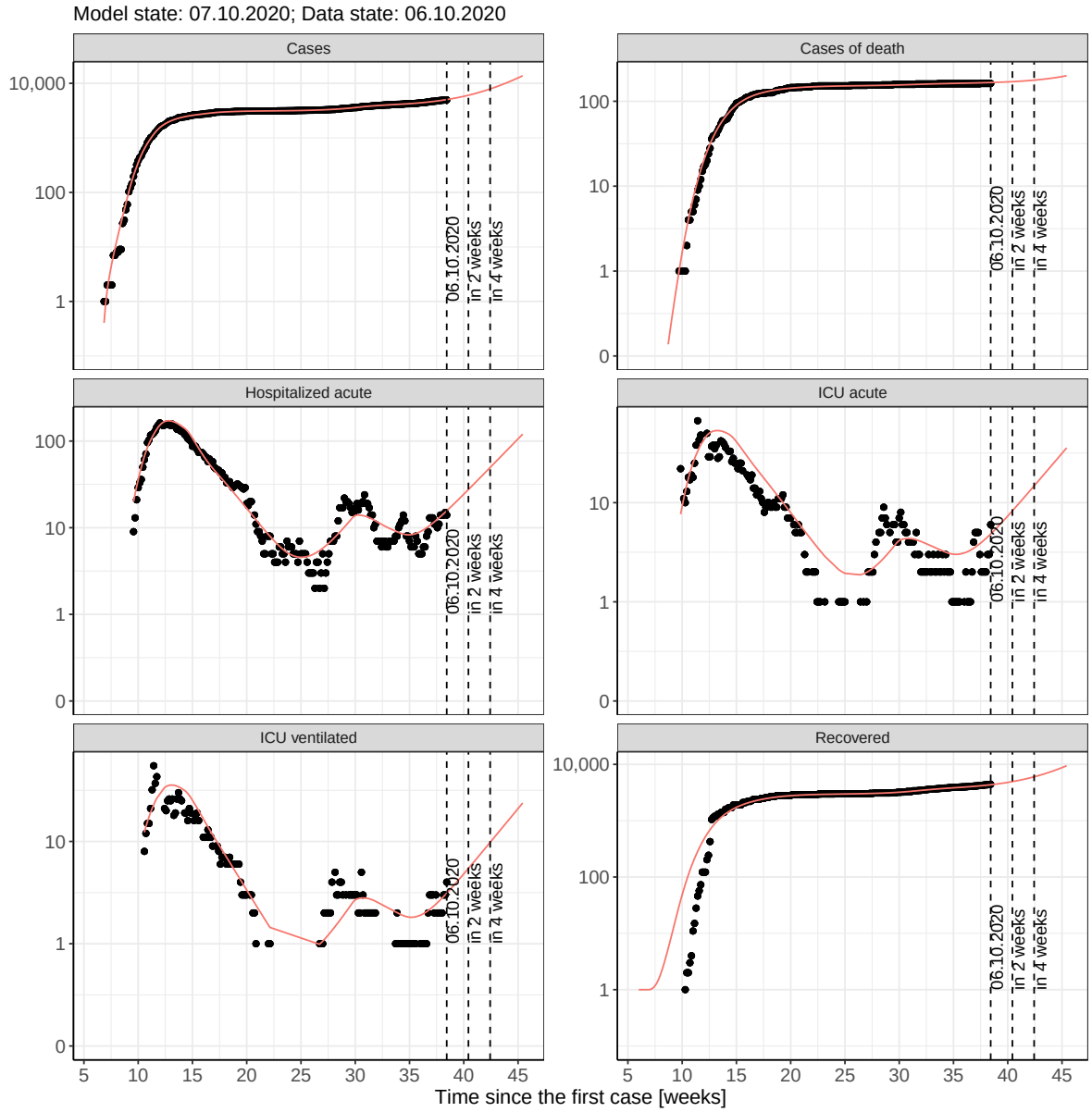


Figure 170: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

16.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

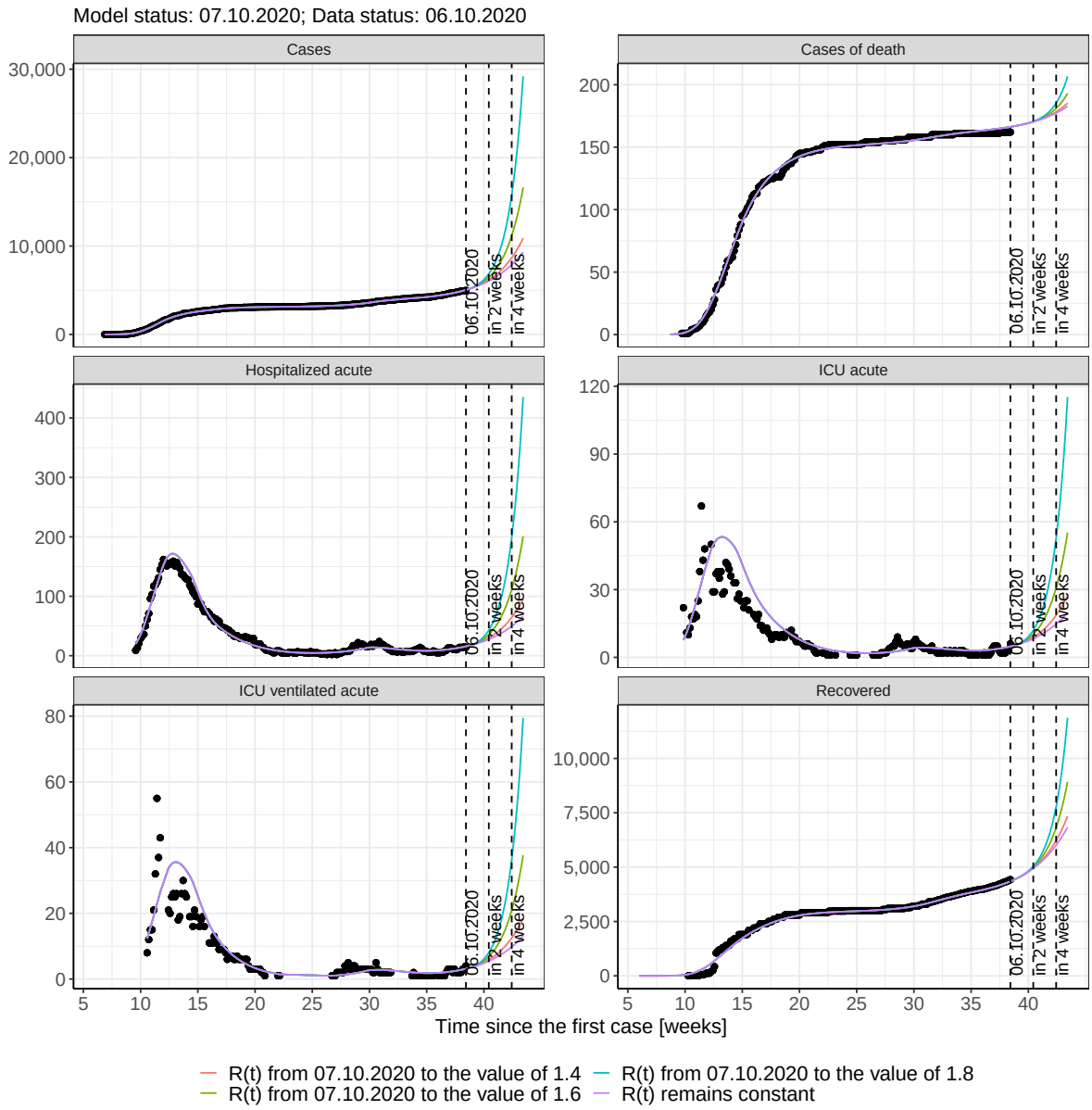


Figure 171: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

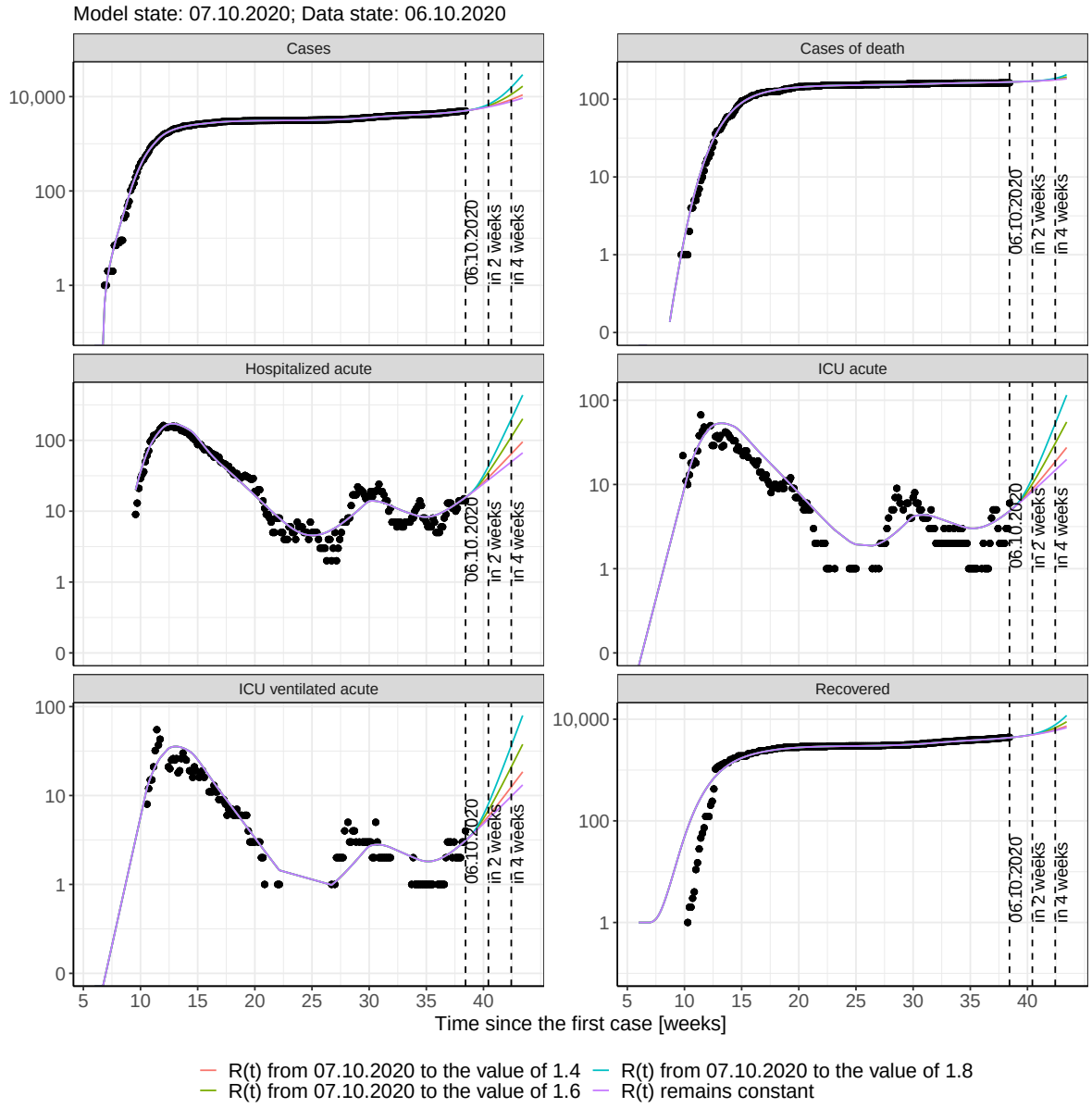


Figure 172: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

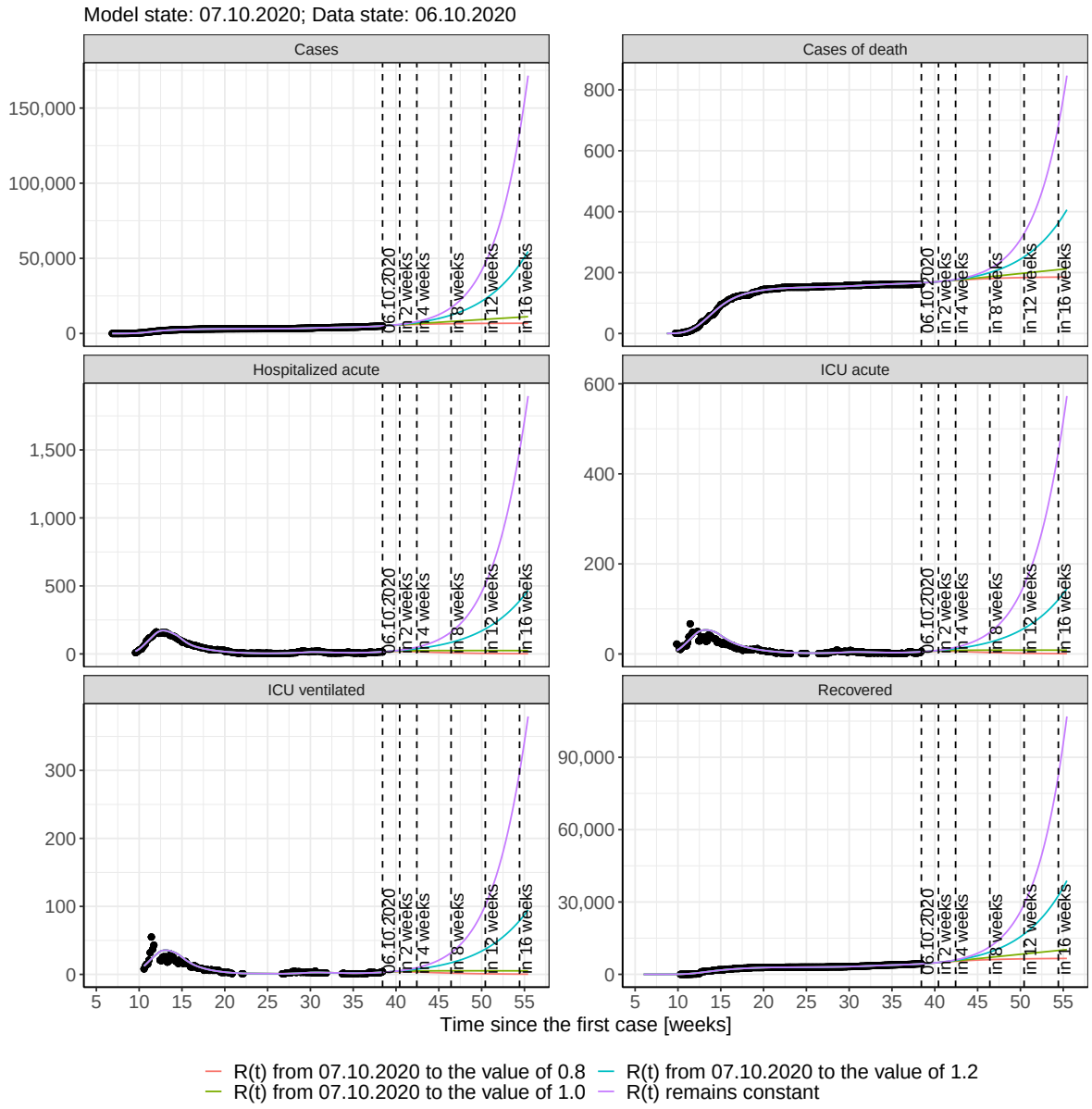


Figure 173: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

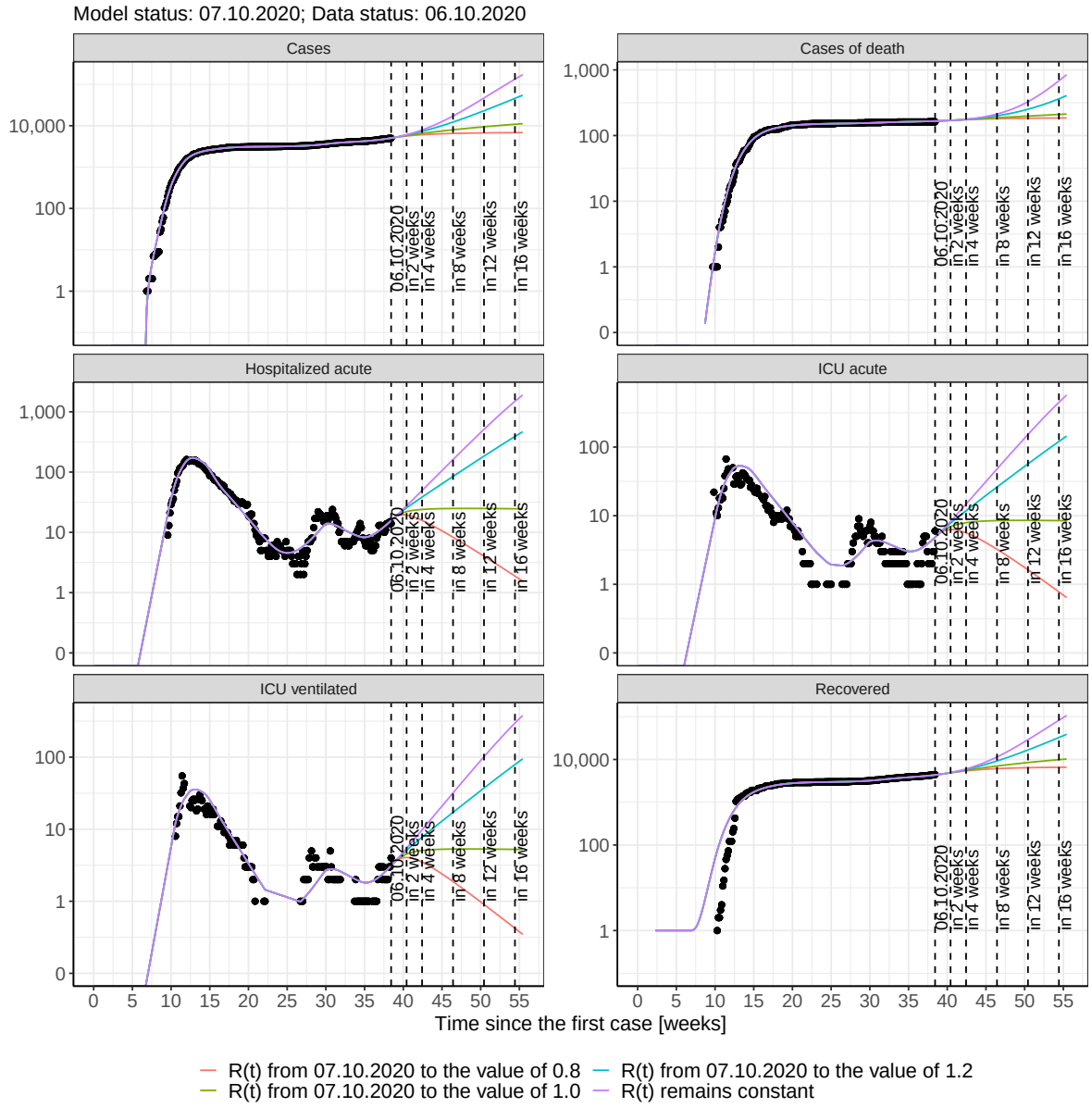


Figure 174: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Schleswig-Holstein assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 58); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 59); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 60); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 61) Model status from 07.10.2020; Data status: 06.10.2020.

Table 58: Schleswig-Holstein - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	5084	166	4377	16	5	3
08.10.2020	5141	167	4411	17	5	3
09.10.2020	5200	167	4445	18	5	3
10.10.2020	5262	167	4481	18	6	4
11.10.2020	5326	167	4519	19	6	4
12.10.2020	5393	168	4558	20	6	4
13.10.2020	5462	168	4599	21	6	4
14.10.2020	5535	168	4642	22	7	4
15.10.2020	5612	169	4686	22	7	4
16.10.2020	5691	169	4732	23	7	5
17.10.2020	5774	169	4781	24	7	5
18.10.2020	5860	170	4831	25	8	5
19.10.2020	5950	170	4884	26	8	5
20.10.2020	6044	170	4939	28	8	5
21.10.2020	6143	171	4996	29	9	6
22.10.2020	6245	171	5056	30	9	6
23.10.2020	6352	171	5118	31	9	6
24.10.2020	6464	172	5183	33	10	6
25.10.2020	6580	172	5251	34	10	7
26.10.2020	6702	173	5322	35	11	7
27.10.2020	6828	173	5395	37	11	7
28.10.2020	6960	174	5472	39	11	8
29.10.2020	7098	174	5553	40	12	8
30.10.2020	7242	175	5637	42	12	8
31.10.2020	7392	175	5724	44	13	9
01.11.2020	7549	176	5816	46	14	9
02.11.2020	7712	177	5911	48	14	9
03.11.2020	7883	177	6010	50	15	10

Table 59: Schleswig-Holstein - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	5083	166	4377	16	5	3
08.10.2020	5133	167	4411	17	5	3
09.10.2020	5183	167	4445	17	5	3
10.10.2020	5230	167	4481	18	6	4
11.10.2020	5277	167	4517	18	6	4
12.10.2020	5322	168	4555	19	6	4
13.10.2020	5366	168	4594	19	6	4
14.10.2020	5409	168	4633	19	6	4
15.10.2020	5450	169	4673	19	6	4
16.10.2020	5491	169	4713	20	6	4
17.10.2020	5530	169	4754	20	6	4
18.10.2020	5568	169	4795	20	6	4
19.10.2020	5605	170	4836	19	6	4
20.10.2020	5641	170	4878	19	6	4
21.10.2020	5676	170	4919	19	6	4
22.10.2020	5710	171	4959	19	6	4
23.10.2020	5742	171	5000	19	6	4
24.10.2020	5774	171	5040	19	6	4
25.10.2020	5806	172	5080	18	6	4
26.10.2020	5836	172	5120	18	6	4
27.10.2020	5865	172	5159	18	6	4
28.10.2020	5894	173	5197	18	6	4
29.10.2020	5921	173	5235	17	6	4
30.10.2020	5948	173	5272	17	6	4
31.10.2020	5974	173	5308	17	6	4
01.11.2020	6000	174	5344	16	6	4
02.11.2020	6024	174	5380	16	6	4
03.11.2020	6048	174	5414	16	6	3

Table 60: Schleswig-Holstein - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	5083	166	4377	16	5	3
08.10.2020	5136	167	4411	17	5	3
09.10.2020	5189	167	4445	18	5	3
10.10.2020	5242	167	4481	18	6	4
11.10.2020	5295	167	4518	19	6	4
12.10.2020	5348	168	4556	19	6	4
13.10.2020	5401	168	4596	20	6	4
14.10.2020	5454	168	4636	20	6	4
15.10.2020	5506	169	4678	21	6	4
16.10.2020	5559	169	4720	21	6	4
17.10.2020	5612	169	4764	21	7	4
18.10.2020	5665	169	4808	22	7	4
19.10.2020	5718	170	4853	22	7	4
20.10.2020	5770	170	4899	22	7	5
21.10.2020	5823	170	4945	22	7	5
22.10.2020	5876	171	4992	23	7	5
23.10.2020	5929	171	5039	23	7	5
24.10.2020	5981	171	5087	23	7	5
25.10.2020	6034	172	5136	23	7	5
26.10.2020	6087	172	5184	23	7	5
27.10.2020	6139	173	5234	23	8	5
28.10.2020	6192	173	5283	23	8	5
29.10.2020	6245	173	5333	24	8	5
30.10.2020	6297	174	5383	24	8	5
31.10.2020	6350	174	5433	24	8	5
01.11.2020	6402	174	5484	24	8	5
02.11.2020	6455	175	5534	24	8	5
03.11.2020	6508	175	5585	24	8	5

Table 61: Schleswig-Holstein - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	5084	166	4377	16	5	3
08.10.2020	5139	167	4411	17	5	3
09.10.2020	5196	167	4445	18	5	3
10.10.2020	5255	167	4481	18	6	4
11.10.2020	5315	167	4519	19	6	4
12.10.2020	5377	168	4557	20	6	4
13.10.2020	5440	168	4598	20	6	4
14.10.2020	5506	168	4640	21	6	4
15.10.2020	5573	169	4683	22	7	4
16.10.2020	5643	169	4728	22	7	4
17.10.2020	5714	169	4775	23	7	5
18.10.2020	5787	170	4823	24	7	5
19.10.2020	5862	170	4873	25	8	5
20.10.2020	5940	170	4924	25	8	5
21.10.2020	6020	171	4977	26	8	5
22.10.2020	6102	171	5032	27	8	5
23.10.2020	6186	171	5089	28	9	6
24.10.2020	6273	172	5147	29	9	6
25.10.2020	6362	172	5207	30	9	6
26.10.2020	6454	173	5269	31	9	6
27.10.2020	6549	173	5333	31	10	6
28.10.2020	6646	173	5399	32	10	7
29.10.2020	6746	174	5467	33	10	7
30.10.2020	6849	174	5537	34	11	7
31.10.2020	6954	175	5609	35	11	7
01.11.2020	7063	175	5683	36	11	7
02.11.2020	7175	176	5759	37	11	8
03.11.2020	7290	176	5838	38	12	8

16.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

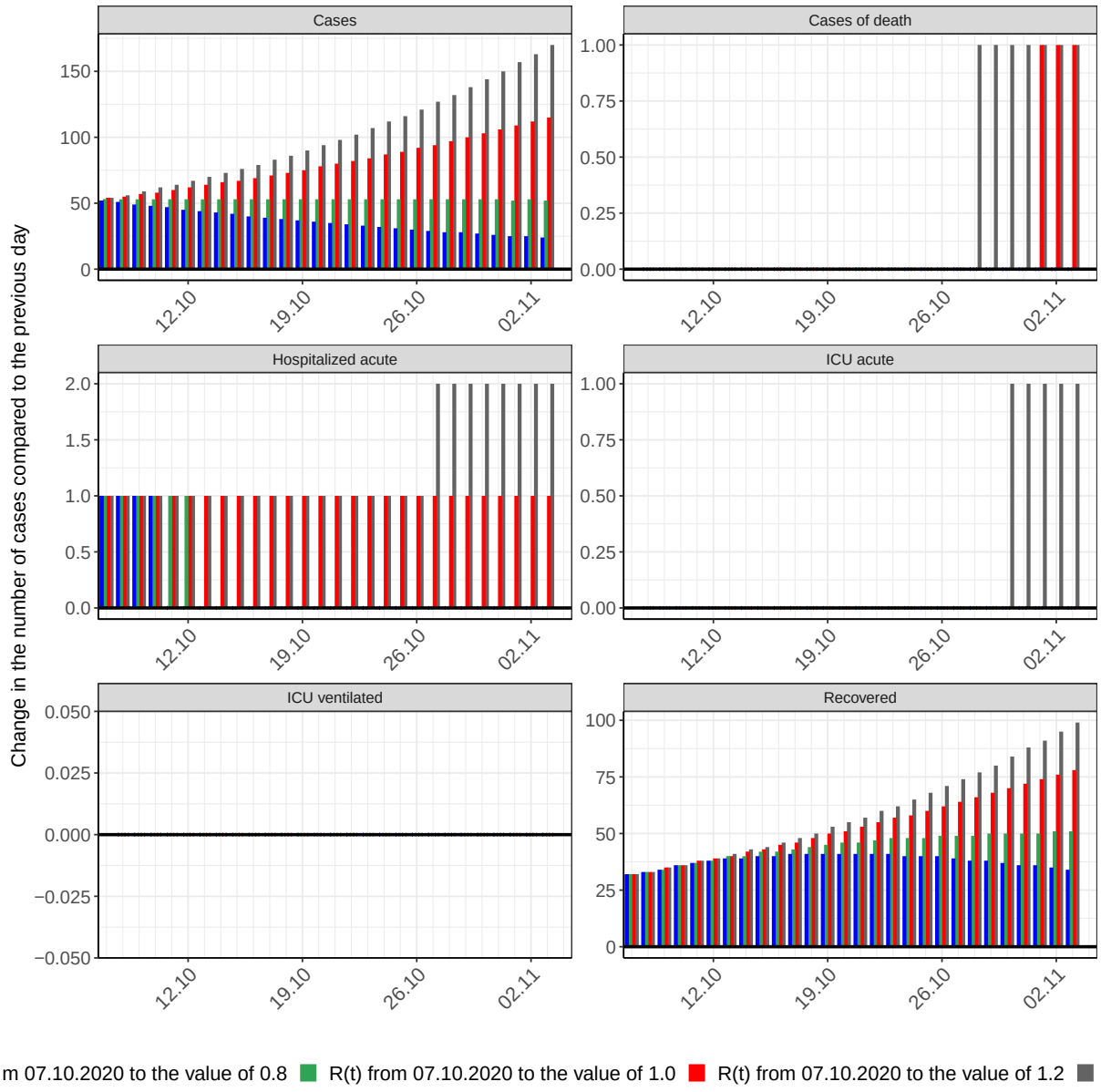


Figure 175: Simulation of daily new cases for the next 4 weeks - Schleswig-Holstein

17 Thuringia

17.1 Model description

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

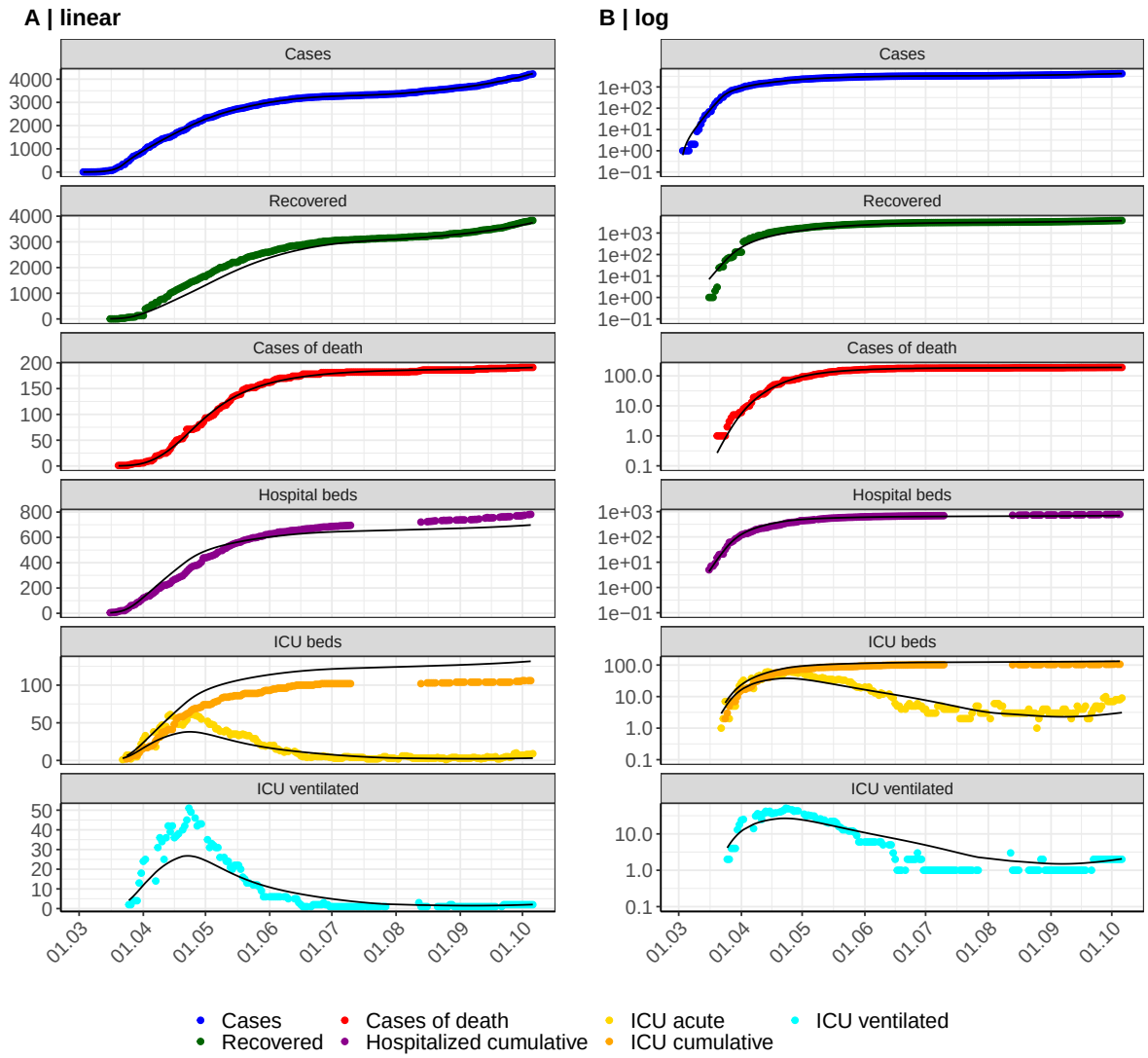


Figure 176: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Thuringia. Points: reported data; lines: model description.

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

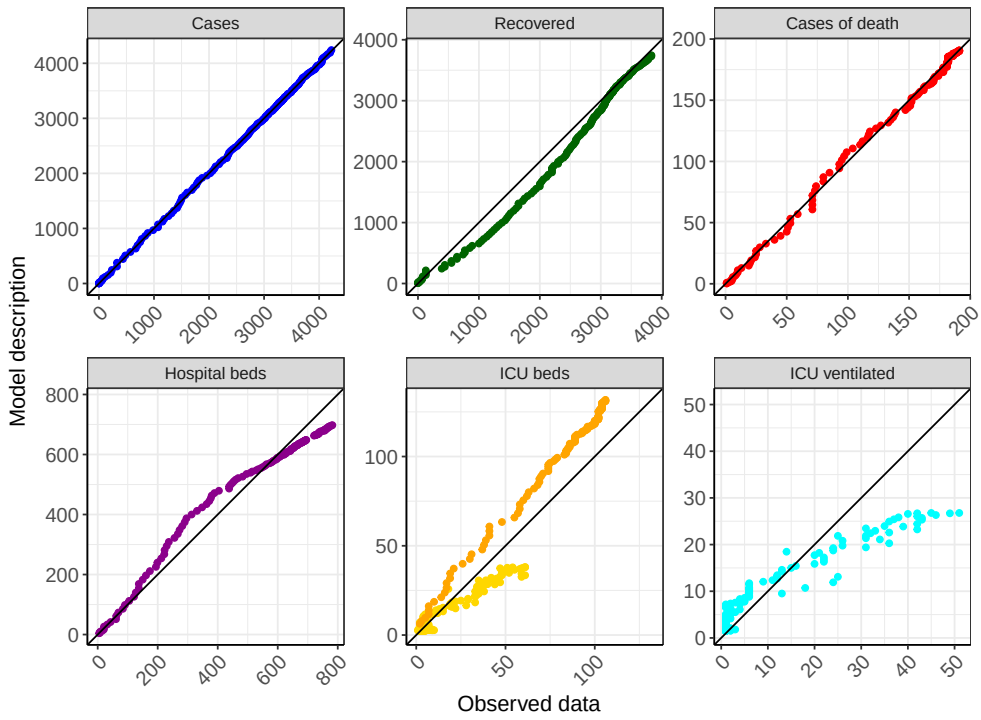


Figure 177: Goodness-of-fit plots for Thuringia. Lines: lines of identity.

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

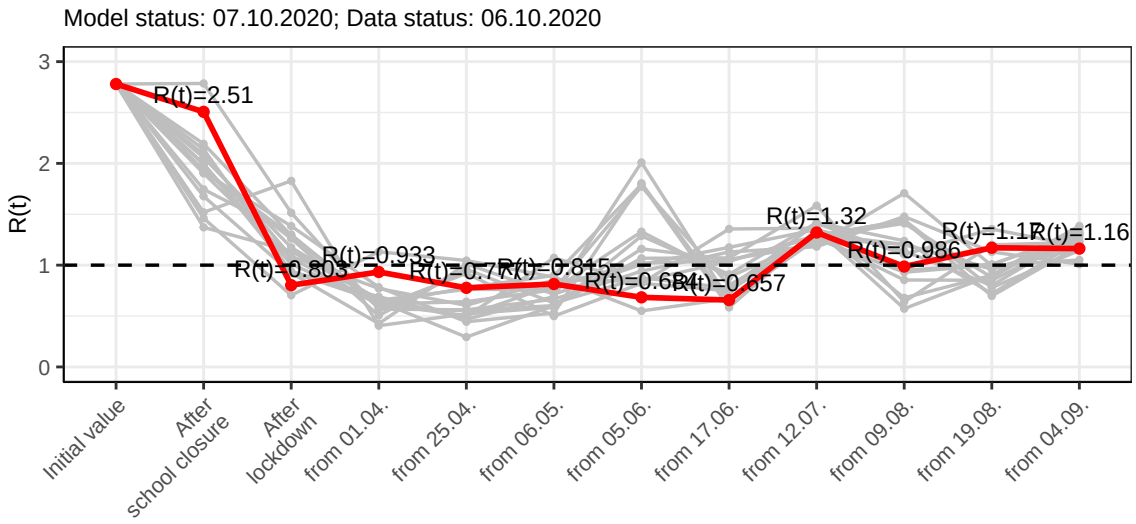


Figure 178: R(t) values before and after the NPIs for Thuringia

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

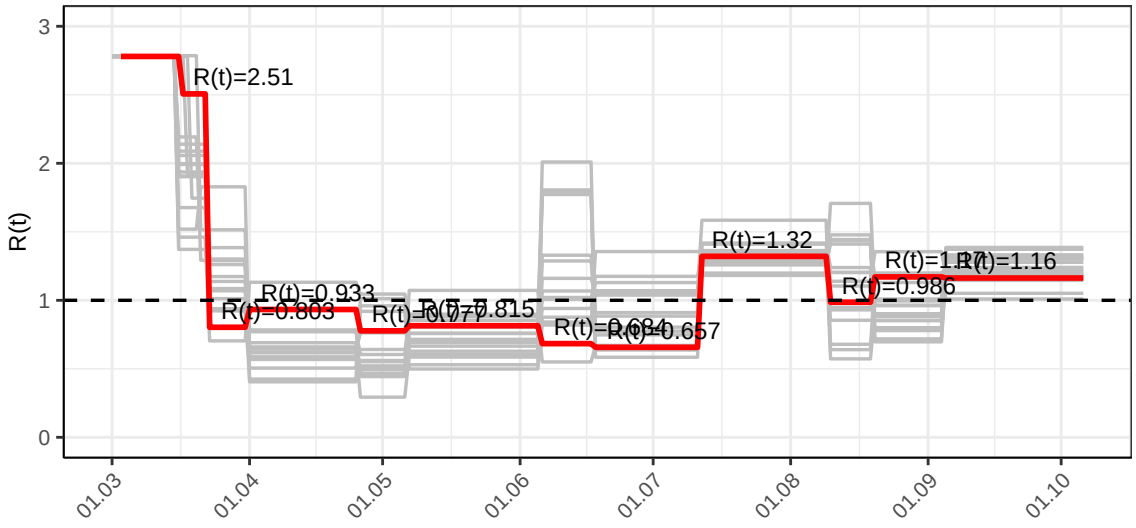


Figure 179: R(t) values over time for Thuringia

17.2 Model predictions

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

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.

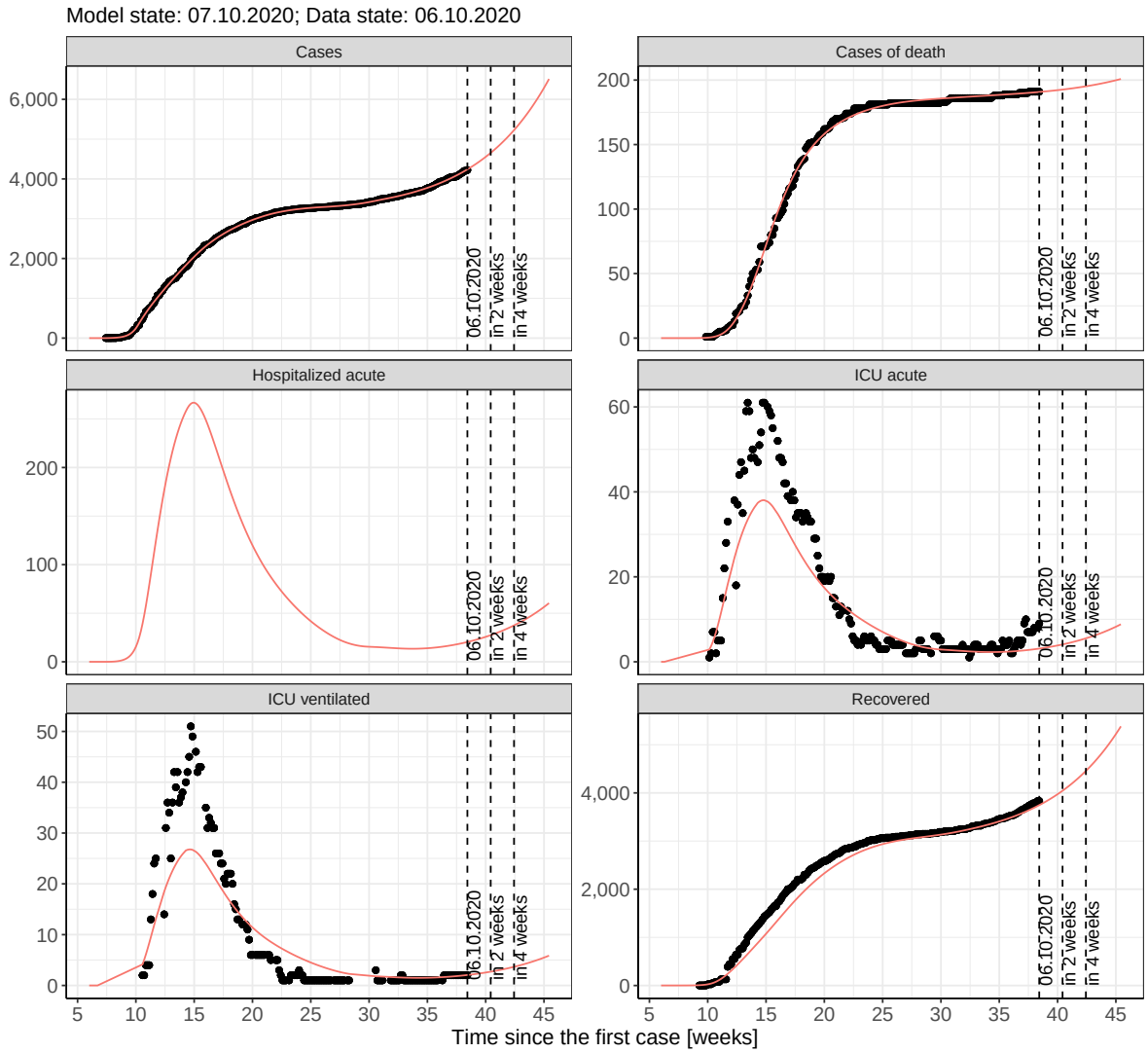


Figure 180: Representation of the model predictions for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

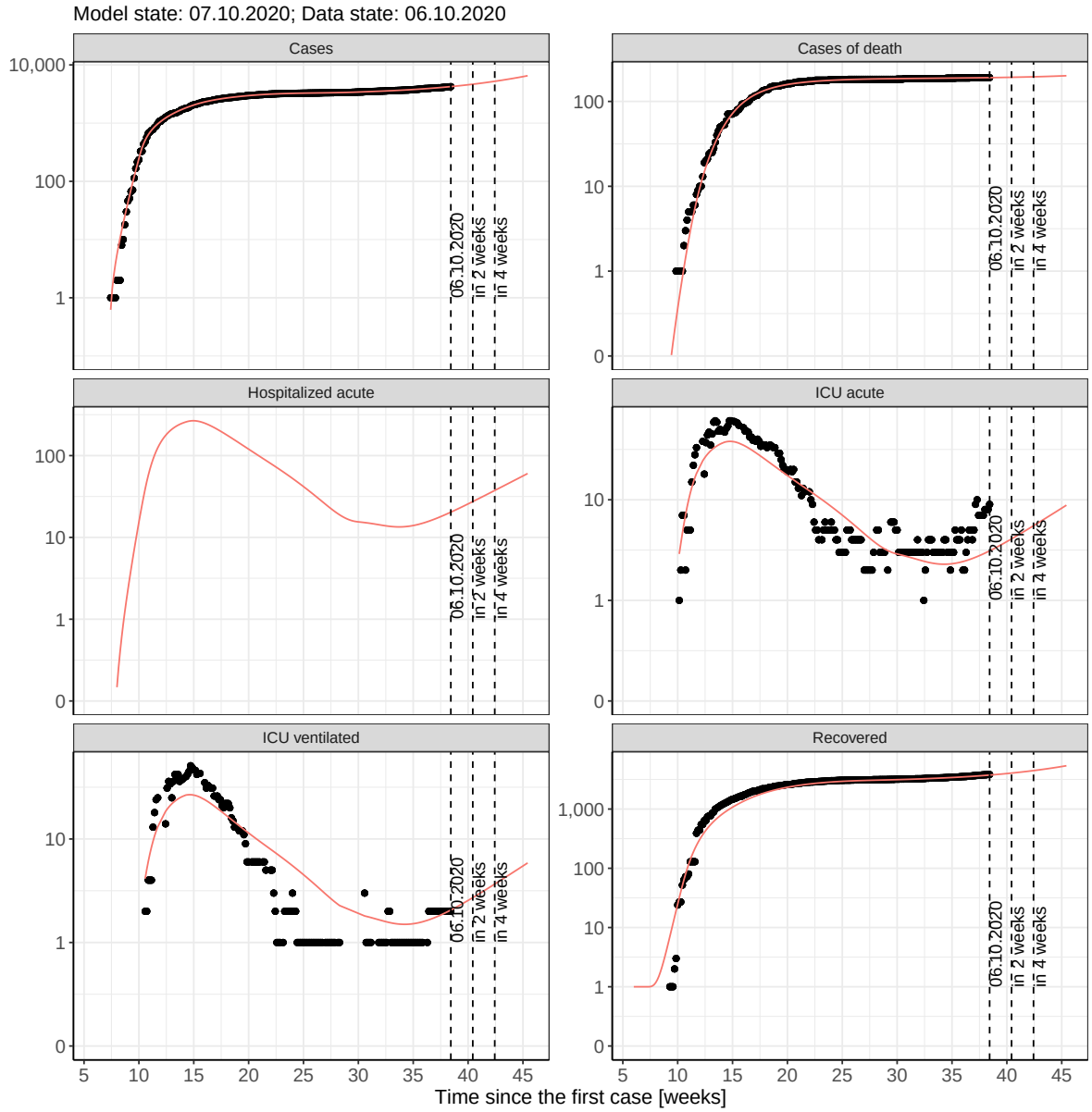


Figure 181: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

17.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

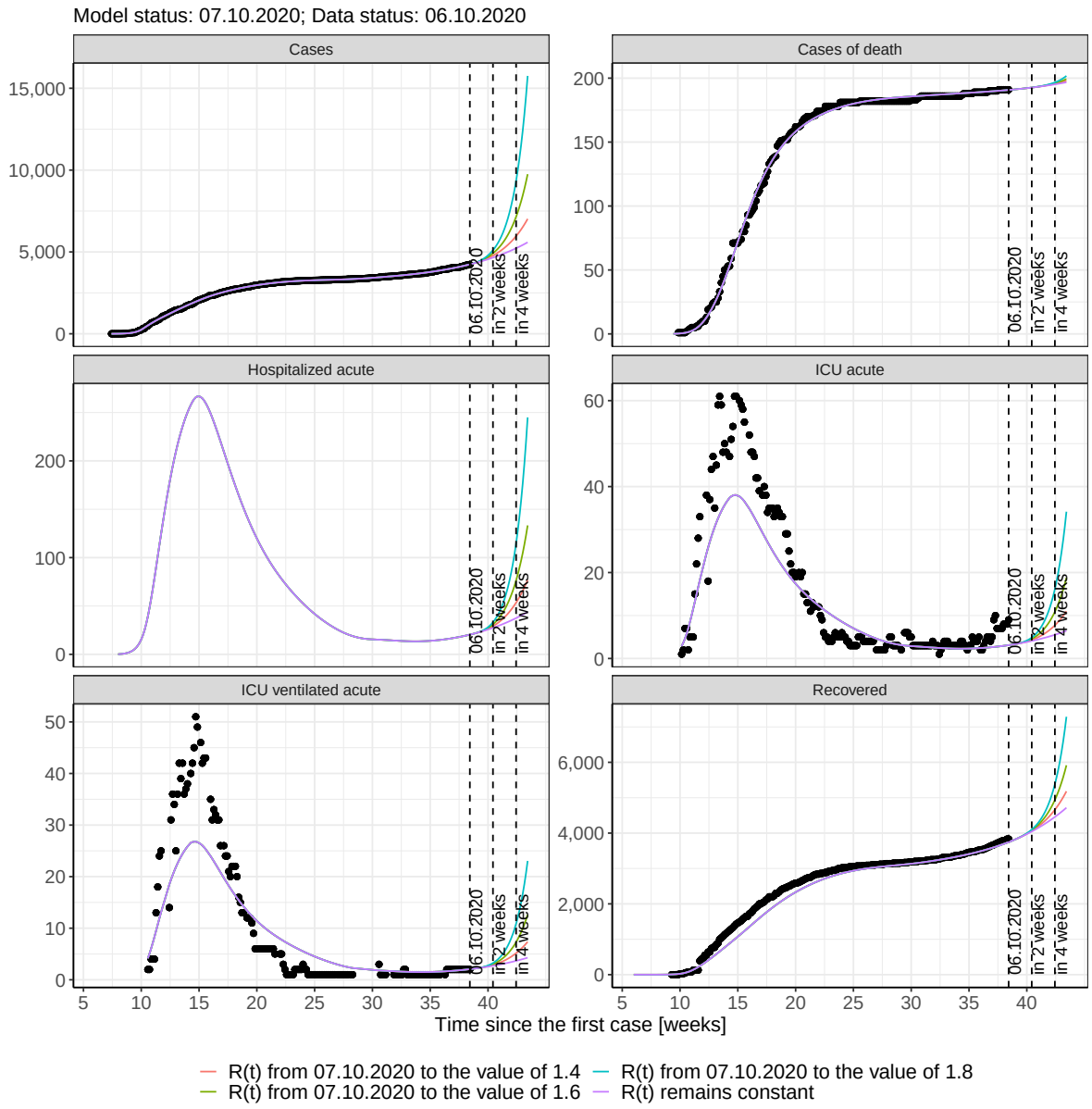


Figure 182: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

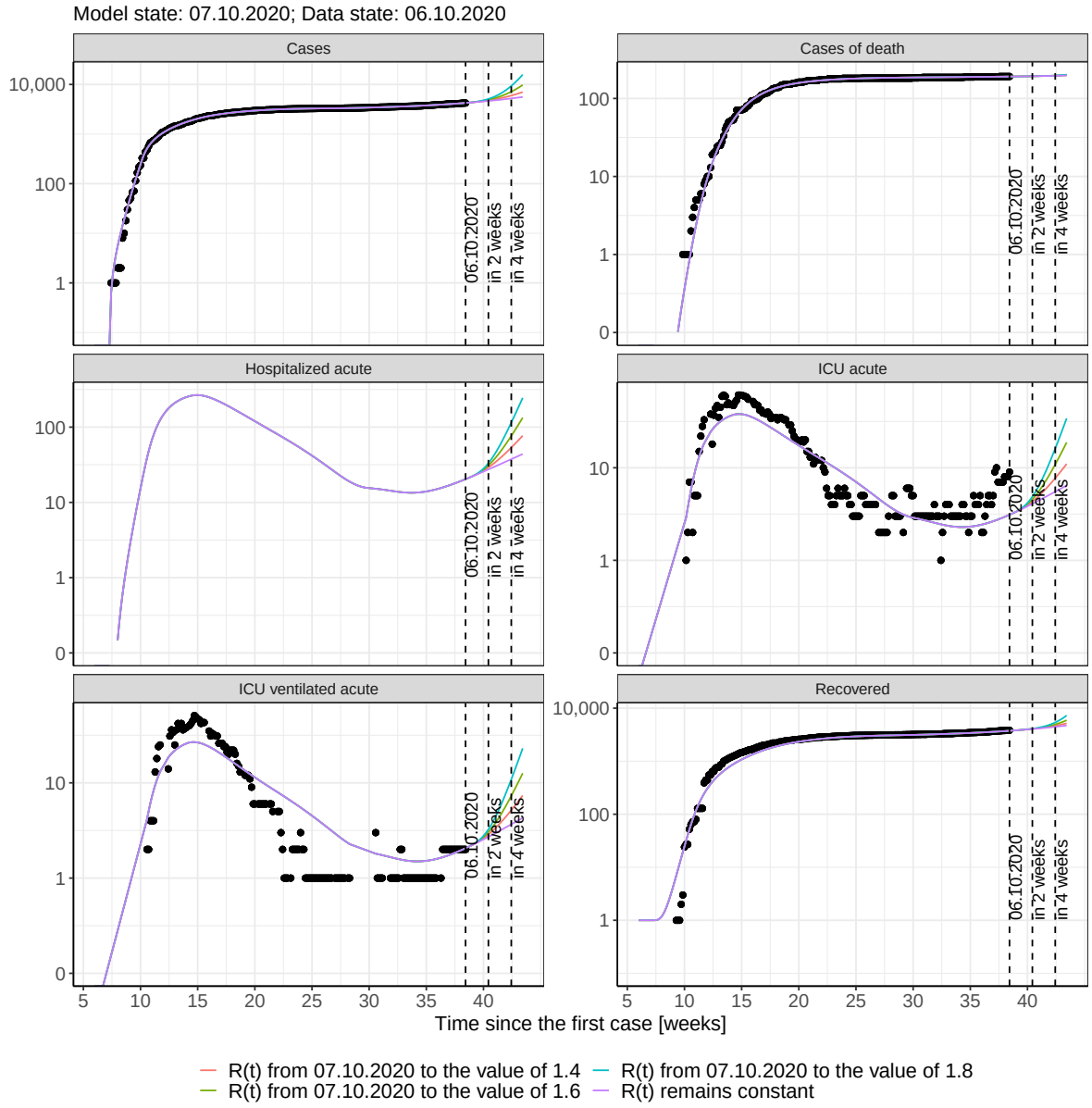


Figure 183: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

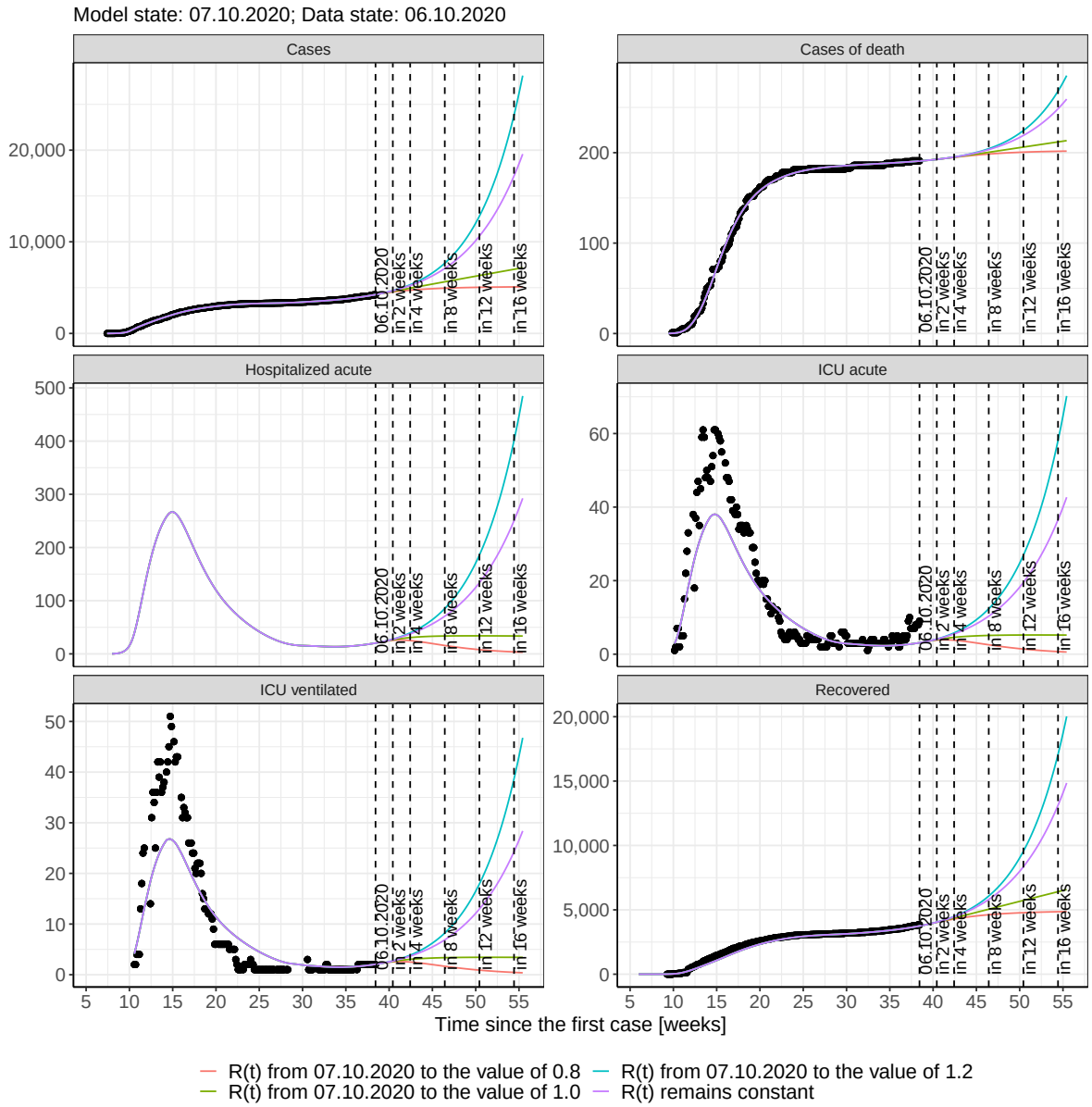


Figure 184: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

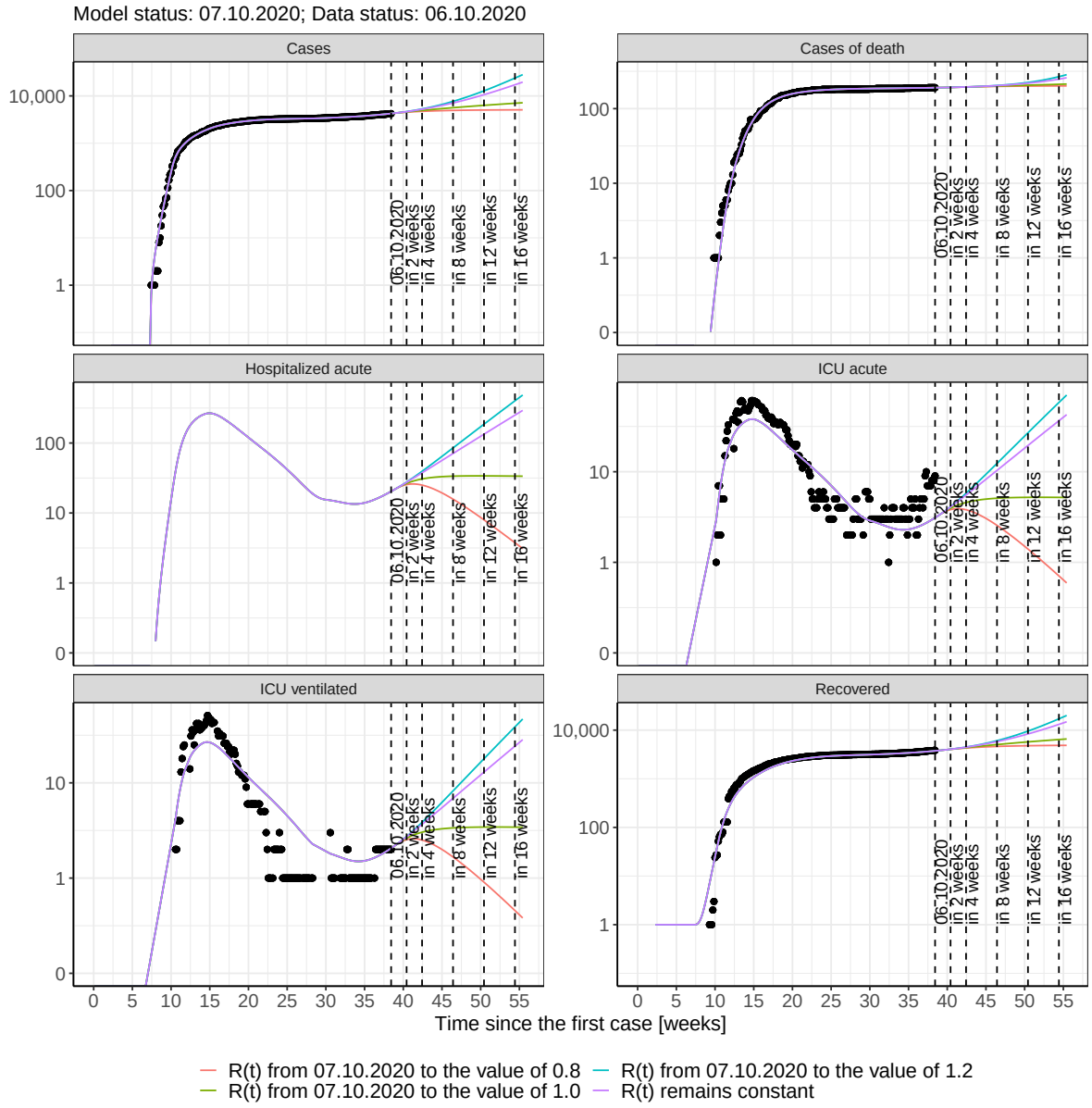


Figure 185: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Thuringia assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 62); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 63); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 64); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 65) Model status from 07.10.2020; Data status: 06.10.2020.

Table 62: Thuringia - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4266	191	3764	21	3	2
08.10.2020	4292	191	3783	21	3	2
09.10.2020	4318	191	3802	22	3	2
10.10.2020	4345	191	3822	22	3	2
11.10.2020	4373	191	3842	23	3	2
12.10.2020	4402	191	3862	23	3	2
13.10.2020	4431	192	3883	24	4	2
14.10.2020	4461	192	3905	24	4	2
15.10.2020	4491	192	3927	25	4	2
16.10.2020	4522	192	3950	25	4	2
17.10.2020	4554	192	3973	26	4	3
18.10.2020	4587	192	3996	26	4	3
19.10.2020	4621	192	4020	27	4	3
20.10.2020	4655	193	4045	27	4	3
21.10.2020	4690	193	4070	28	4	3
22.10.2020	4726	193	4096	29	4	3
23.10.2020	4762	193	4122	29	4	3
24.10.2020	4800	193	4150	30	4	3
25.10.2020	4838	193	4177	31	5	3
26.10.2020	4878	194	4206	31	5	3
27.10.2020	4918	194	4234	32	5	3
28.10.2020	4959	194	4264	33	5	3
29.10.2020	5001	194	4294	33	5	3
30.10.2020	5044	194	4325	34	5	3
31.10.2020	5088	195	4357	35	5	3
01.11.2020	5133	195	4390	36	5	4
02.11.2020	5179	195	4423	37	5	4
03.11.2020	5226	195	4457	37	6	4

Table 63: Thuringia - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4265	191	3764	21	3	2
08.10.2020	4289	191	3783	21	3	2
09.10.2020	4312	191	3802	22	3	2
10.10.2020	4335	191	3822	22	3	2
11.10.2020	4357	191	3841	23	3	2
12.10.2020	4378	191	3861	23	3	2
13.10.2020	4399	192	3882	23	4	2
14.10.2020	4420	192	3902	24	4	2
15.10.2020	4439	192	3923	24	4	2
16.10.2020	4458	192	3943	24	4	2
17.10.2020	4477	192	3964	25	4	2
18.10.2020	4495	192	3985	25	4	2
19.10.2020	4512	192	4005	25	4	3
20.10.2020	4530	193	4026	25	4	3
21.10.2020	4546	193	4046	26	4	3
22.10.2020	4562	193	4066	26	4	3
23.10.2020	4578	193	4086	26	4	3
24.10.2020	4593	193	4106	26	4	3
25.10.2020	4608	193	4125	26	4	3
26.10.2020	4622	194	4144	26	4	3
27.10.2020	4636	194	4163	26	4	3
28.10.2020	4650	194	4182	26	4	3
29.10.2020	4663	194	4200	26	4	3
30.10.2020	4675	194	4218	26	4	3
31.10.2020	4688	194	4235	26	4	3
01.11.2020	4700	194	4252	25	4	3
02.11.2020	4712	195	4269	25	4	3
03.11.2020	4723	195	4286	25	4	3

Table 64: Thuringia - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4265	191	3764	21	3	2
08.10.2020	4290	191	3783	21	3	2
09.10.2020	4315	191	3802	22	3	2
10.10.2020	4340	191	3822	22	3	2
11.10.2020	4366	191	3842	23	3	2
12.10.2020	4391	191	3862	23	3	2
13.10.2020	4416	192	3883	23	4	2
14.10.2020	4441	192	3904	24	4	2
15.10.2020	4466	192	3925	24	4	2
16.10.2020	4491	192	3947	25	4	2
17.10.2020	4516	192	3968	25	4	3
18.10.2020	4541	192	3991	26	4	3
19.10.2020	4566	192	4013	26	4	3
20.10.2020	4591	193	4036	26	4	3
21.10.2020	4616	193	4058	27	4	3
22.10.2020	4641	193	4081	27	4	3
23.10.2020	4666	193	4104	28	4	3
24.10.2020	4691	193	4128	28	4	3
25.10.2020	4716	193	4151	28	4	3
26.10.2020	4741	194	4174	29	4	3
27.10.2020	4766	194	4198	29	4	3
28.10.2020	4791	194	4222	29	4	3
29.10.2020	4816	194	4245	29	4	3
30.10.2020	4841	194	4269	30	4	3
31.10.2020	4866	194	4293	30	4	3
01.11.2020	4891	195	4317	30	5	3
02.11.2020	4916	195	4341	30	5	3
03.11.2020	4941	195	4365	31	5	3

Table 65: Thuringia - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	4266	191	3764	21	3	2
08.10.2020	4292	191	3783	21	3	2
09.10.2020	4319	191	3802	22	3	2
10.10.2020	4346	191	3822	22	3	2
11.10.2020	4375	191	3842	23	3	2
12.10.2020	4404	191	3862	23	3	2
13.10.2020	4435	192	3884	24	4	2
14.10.2020	4466	192	3905	24	4	2
15.10.2020	4498	192	3928	25	4	2
16.10.2020	4530	192	3950	25	4	3
17.10.2020	4564	192	3974	26	4	3
18.10.2020	4599	192	3998	26	4	3
19.10.2020	4635	192	4022	27	4	3
20.10.2020	4672	193	4047	28	4	3
21.10.2020	4710	193	4073	28	4	3
22.10.2020	4748	193	4100	29	4	3
23.10.2020	4788	193	4127	30	4	3
24.10.2020	4830	193	4155	30	5	3
25.10.2020	4872	193	4184	31	5	3
26.10.2020	4916	194	4214	32	5	3
27.10.2020	4960	194	4244	33	5	3
28.10.2020	5006	194	4275	34	5	3
29.10.2020	5054	194	4308	35	5	3
30.10.2020	5103	194	4340	36	5	3
31.10.2020	5153	195	4374	36	5	4
01.11.2020	5204	195	4409	37	5	4
02.11.2020	5257	195	4445	38	6	4
03.11.2020	5312	195	4482	39	6	4

17.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

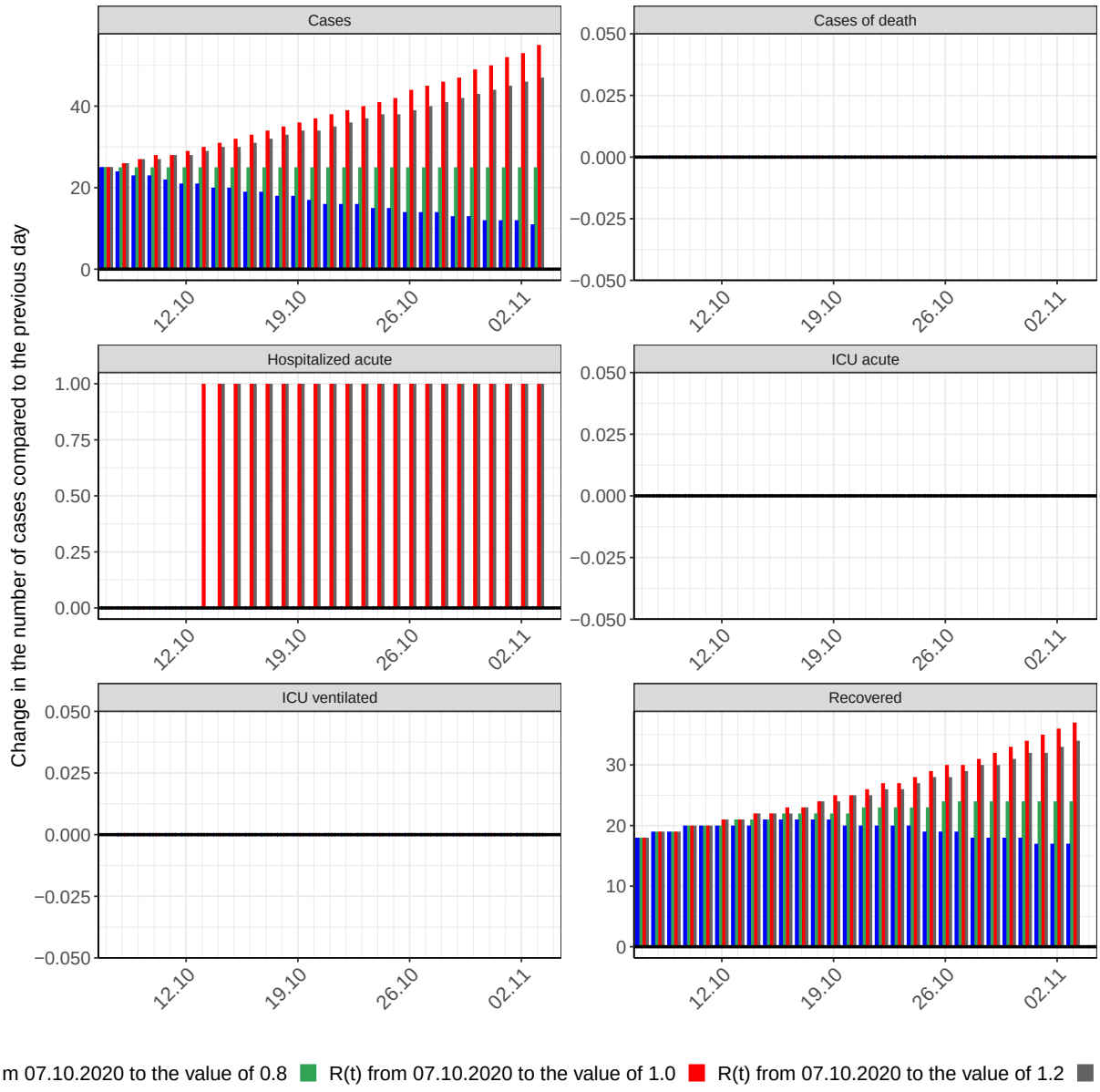


Figure 186: Simulation of daily new cases for the next 4 weeks - Thuringia

18 Germany

18.1 Model description

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

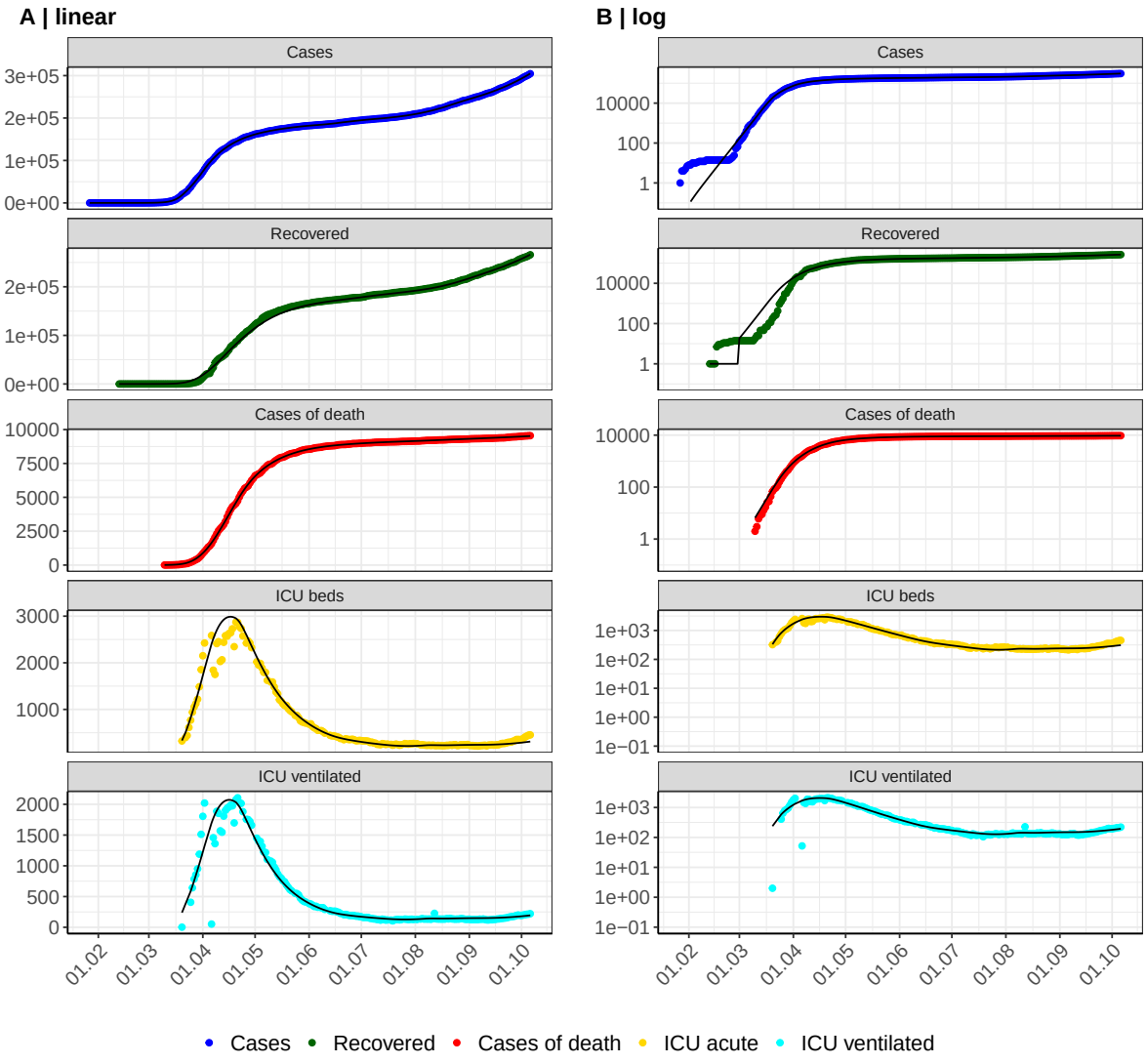


Figure 187: Model description of the reported case numbers, occupancy of hospital beds, recovery and deaths in Germany. Points: reported data; lines: model description.

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

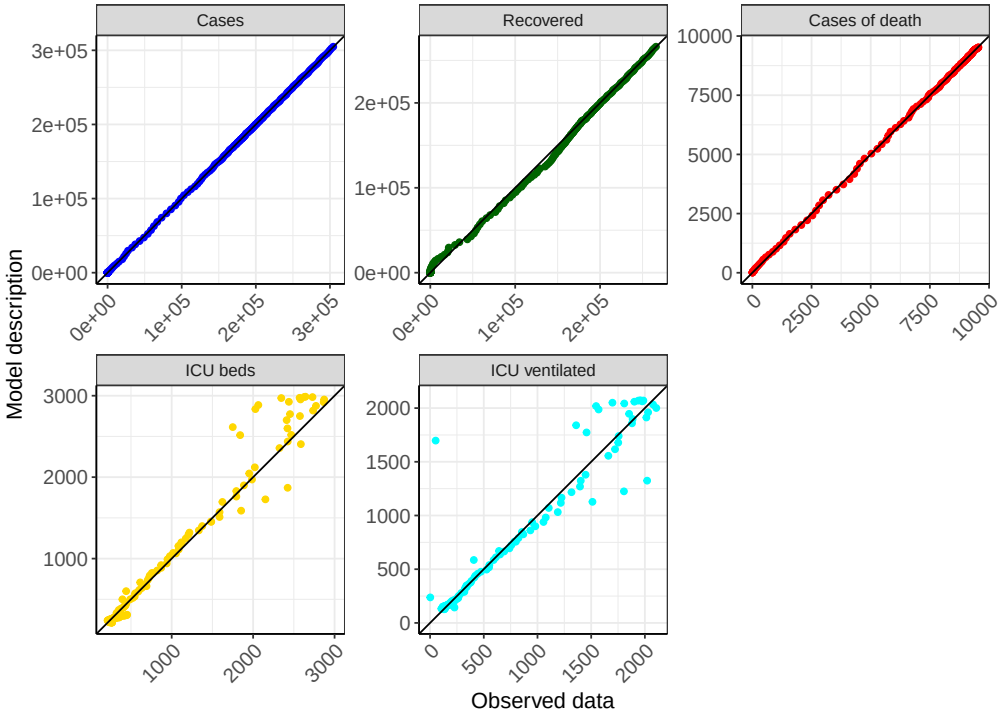


Figure 188: Goodness-of-fit plots for Germany. Lines: lines of identity.

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

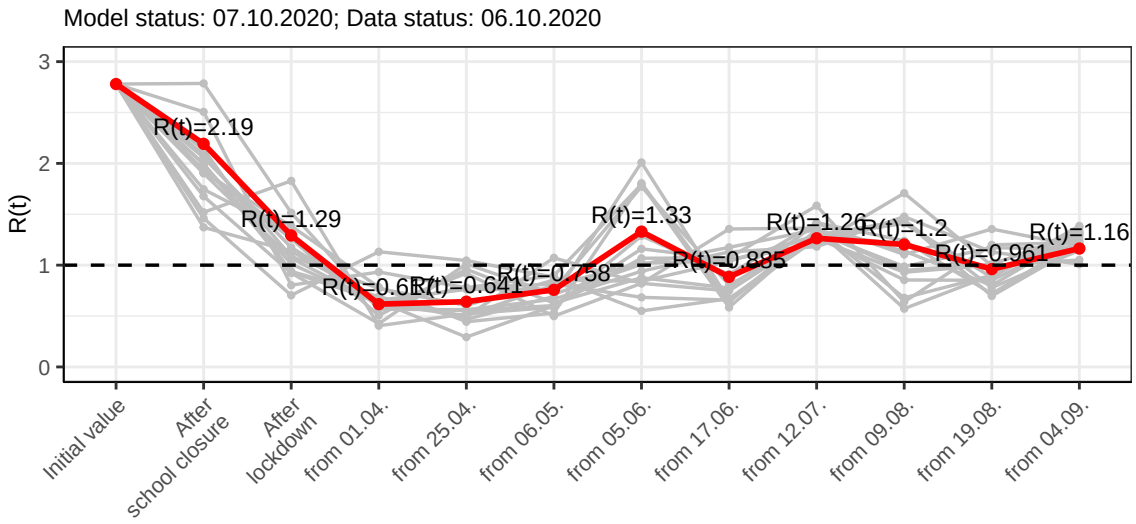


Figure 189: R(t) values before and after the NPIs for Germany

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

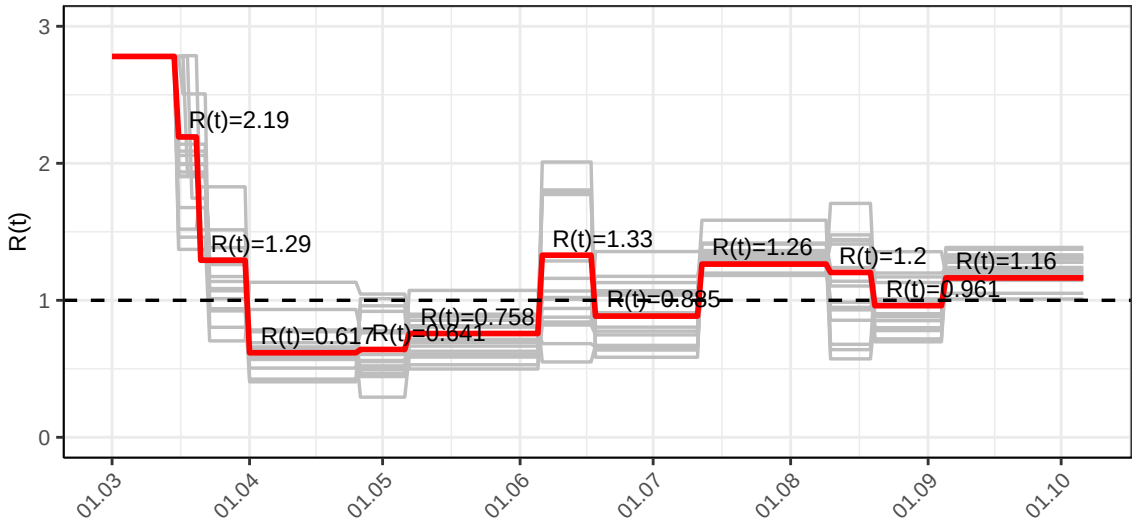


Figure 190: R(t) values over time for Germany

18.2 Model predictions

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

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.

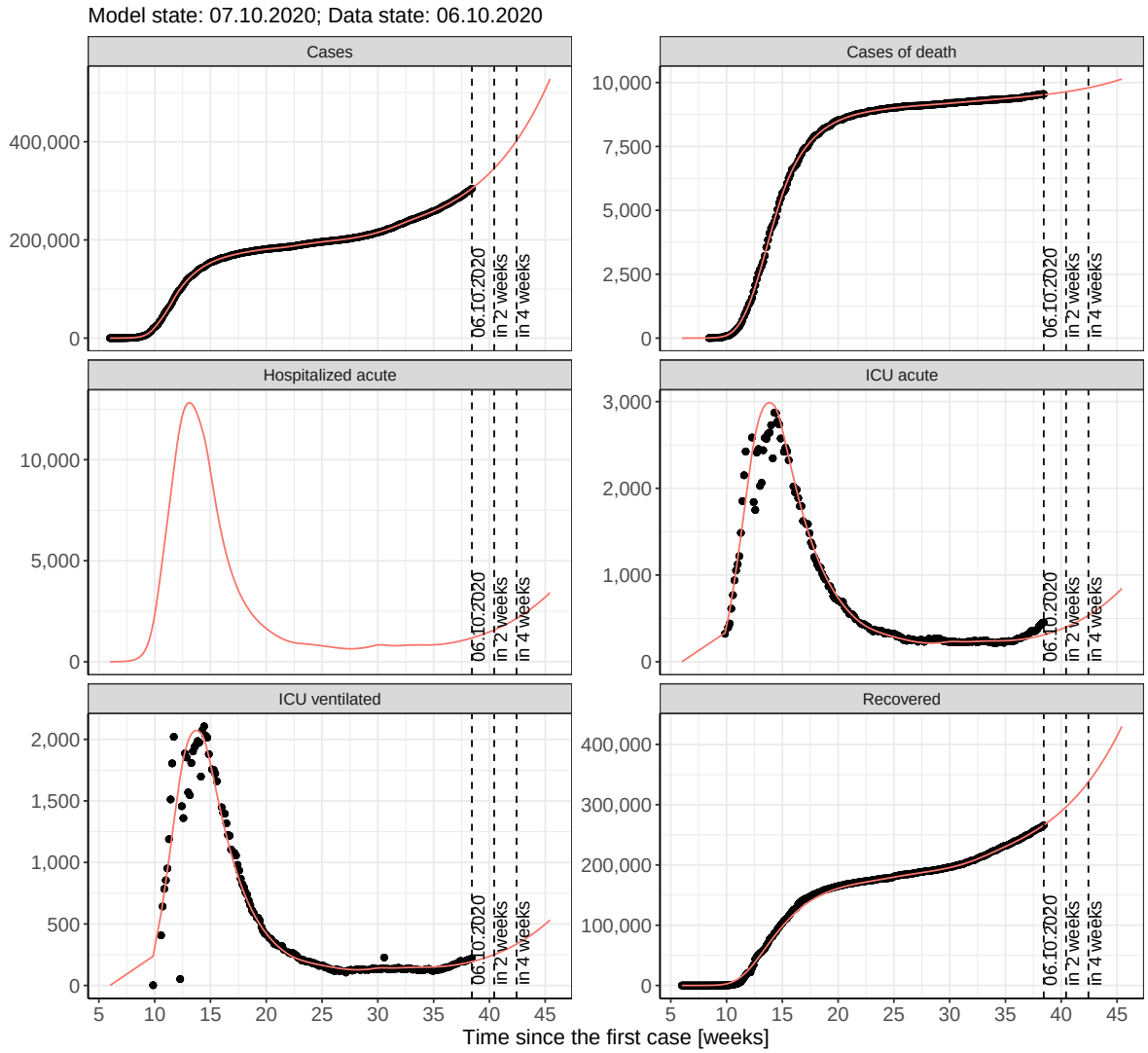


Figure 191: Representation of the model predictions for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same on linear scale (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths). Points: Reported case numbers; Red lines: Model predictions.

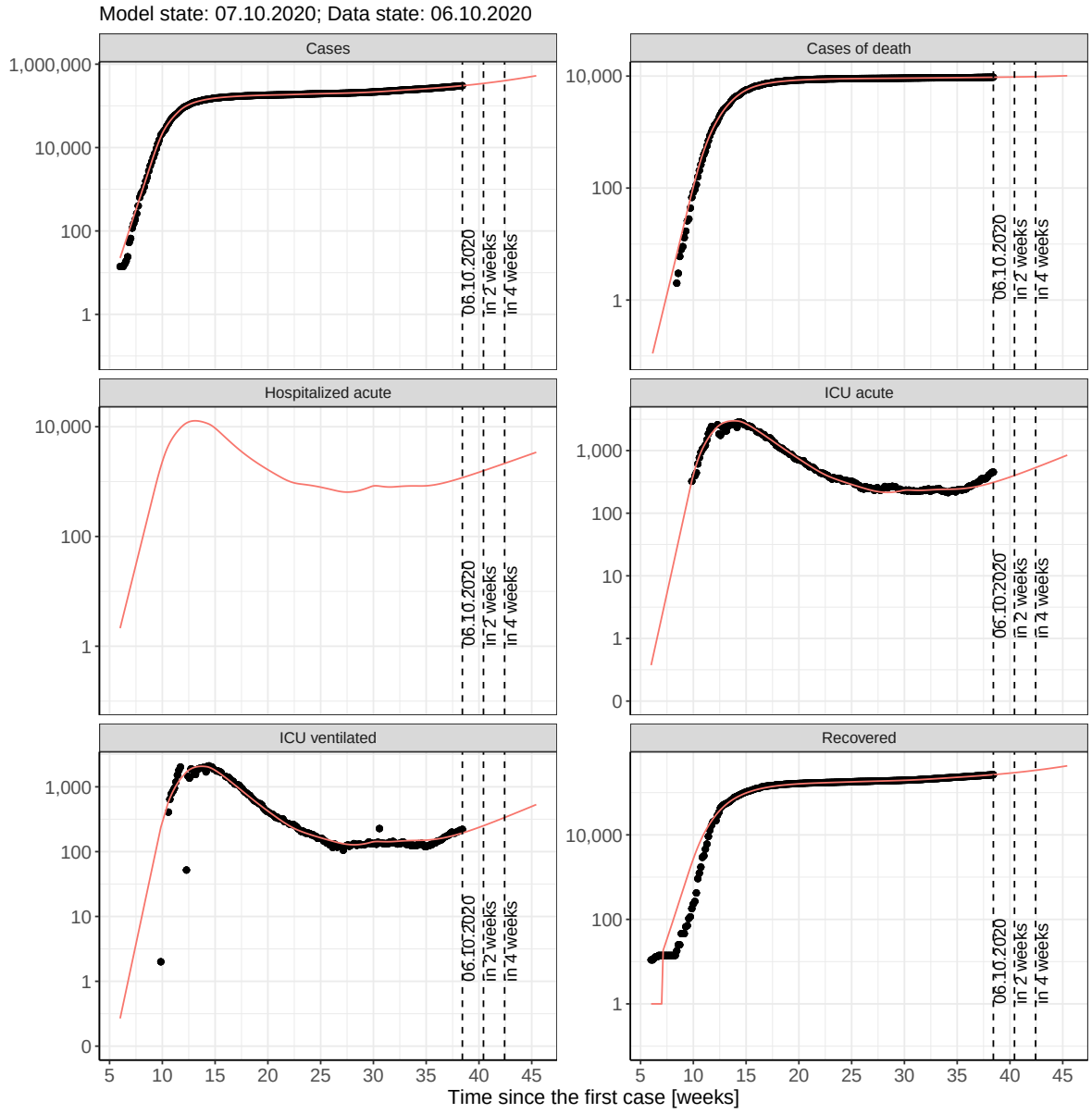


Figure 192: Semi-logarithmic representation of the model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany for the next 4 weeks under the assumption that the R(t) estimate remains the same. Points: Reported case numbers; Red lines: Model predictions.

18.2.2 Predictions for the next 4 weeks assuming different scenarios (with the R(t) value above 1.2) from 07.10.2020

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 07.10.2020 were tested.

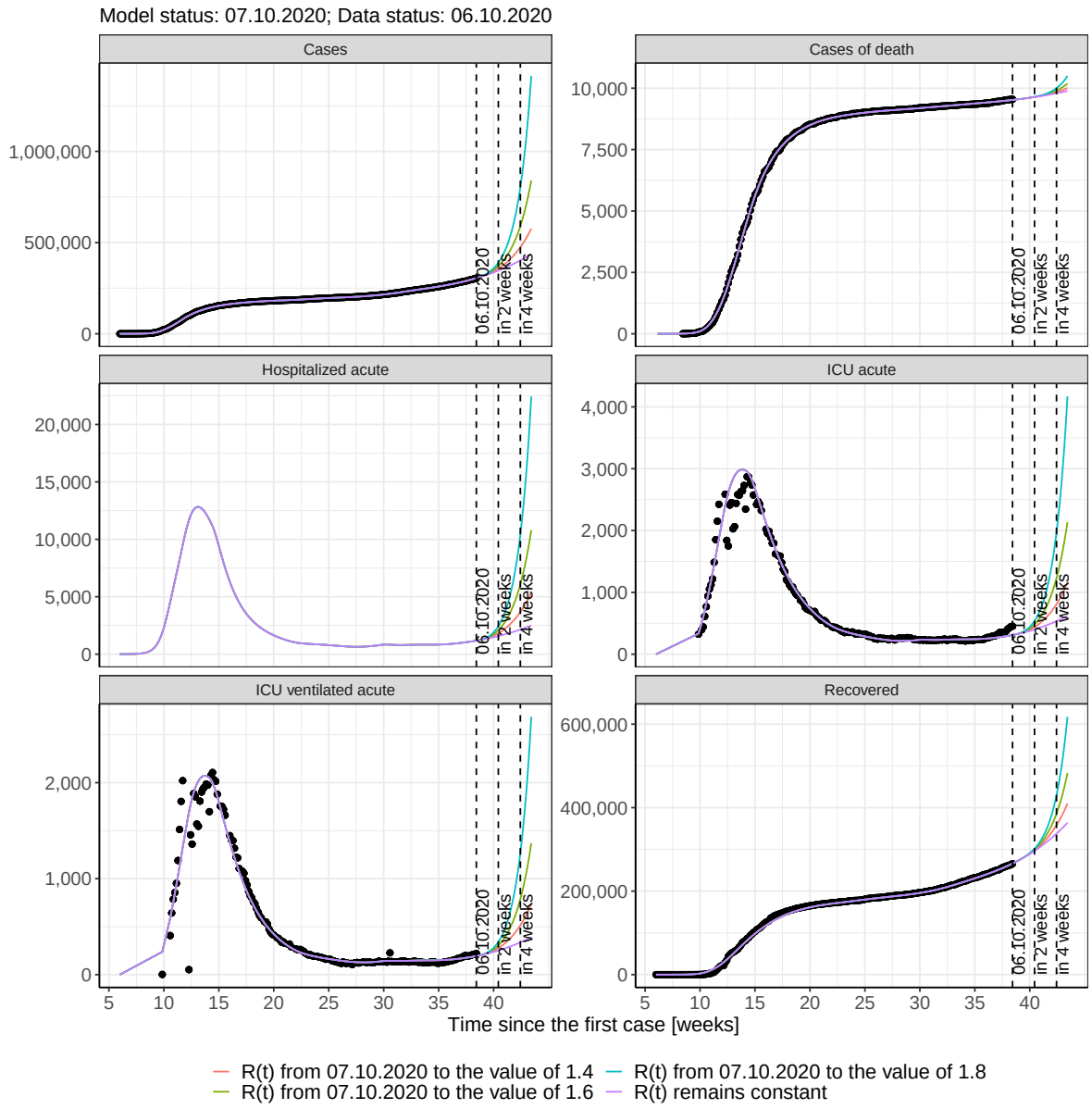


Figure 193: Linear representation of model prediction (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

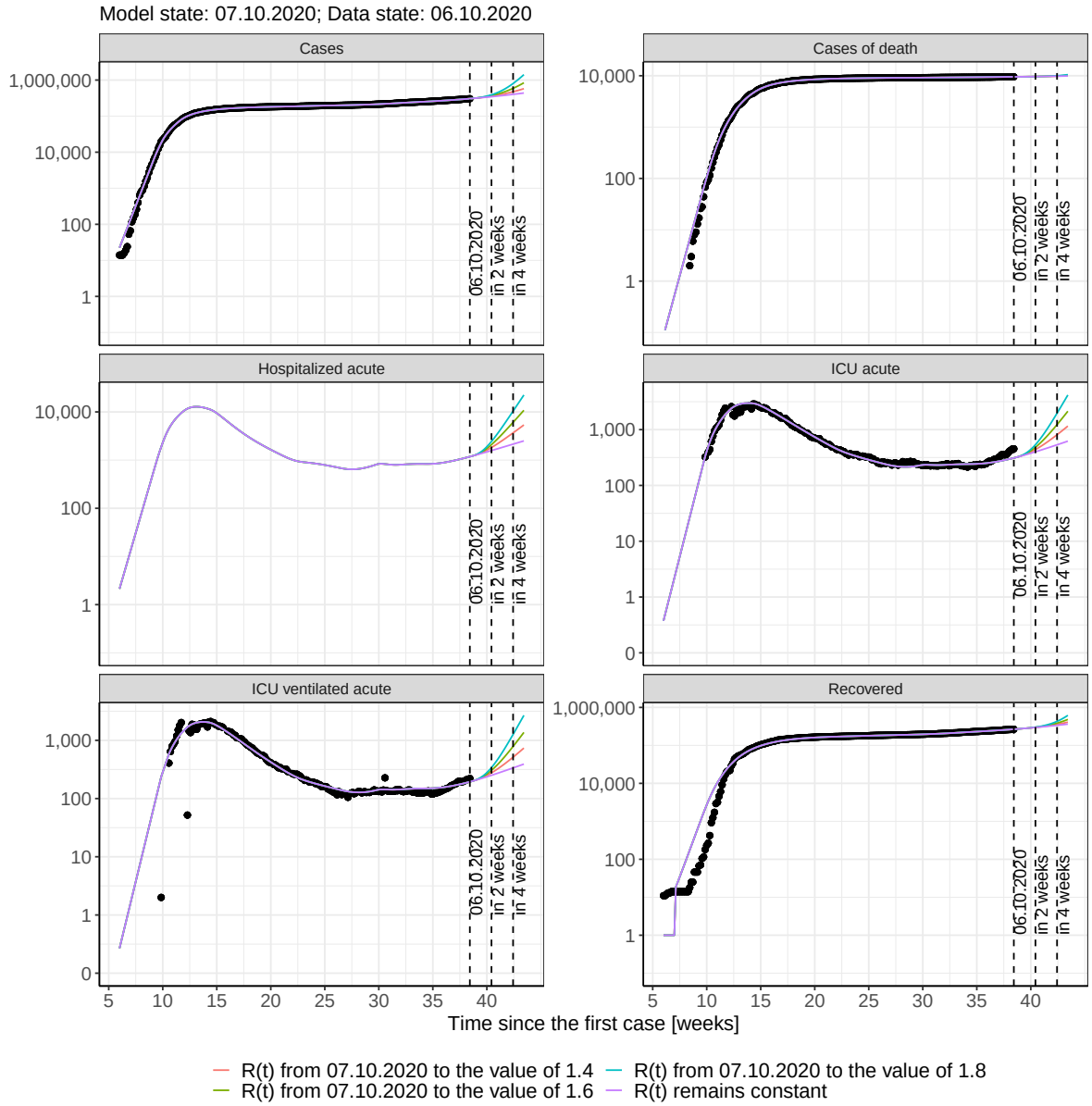


Figure 194: Semi-logarithmic representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 07.10.2020. Points: Reported case numbers; Lines: Model predictions.

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 07.10.2020 were tested.

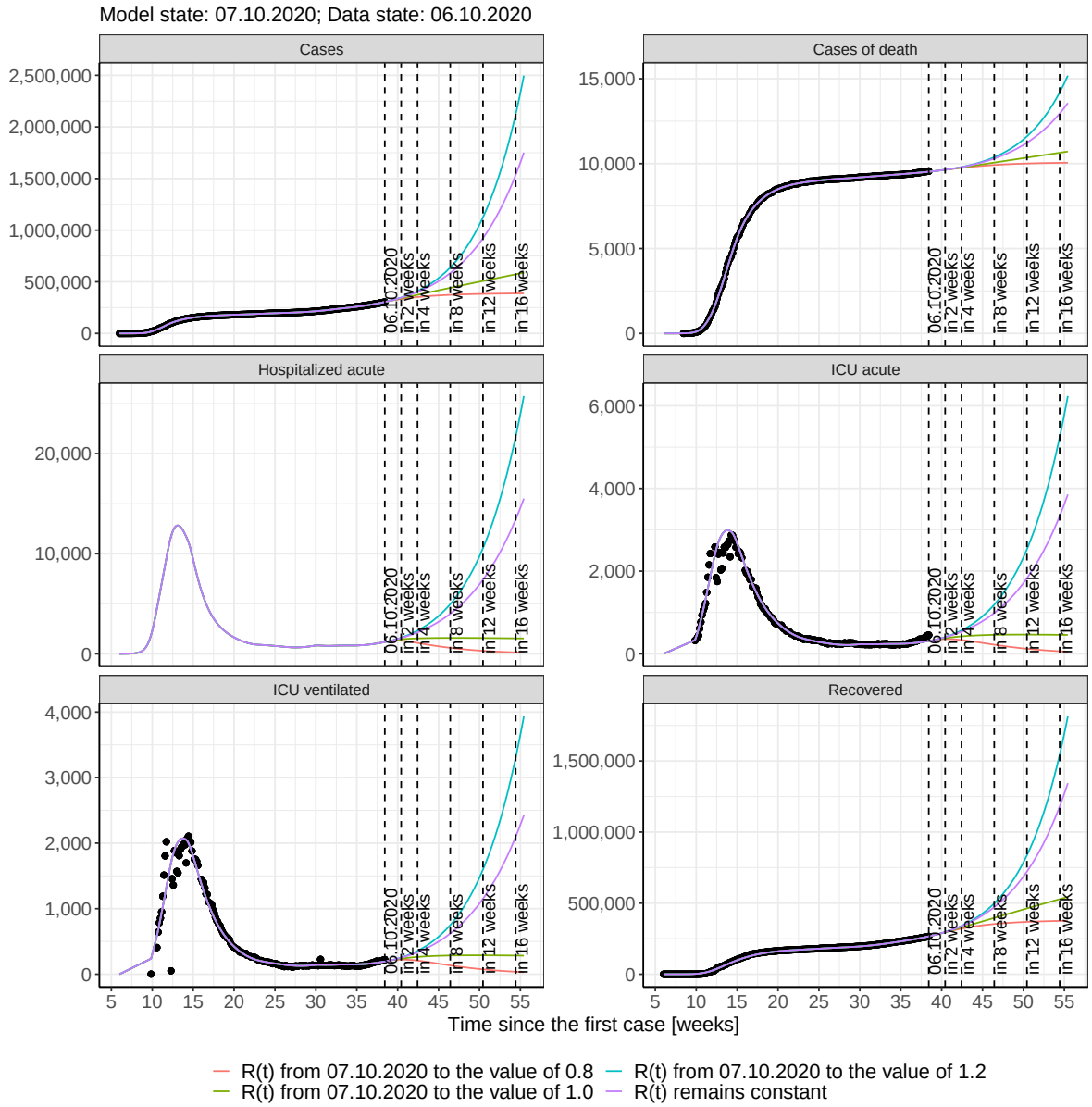


Figure 195: Linear representation of model predictions (case numbers, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios from the 07.10.2020. Points: reported case numbers; lines: model prediction.

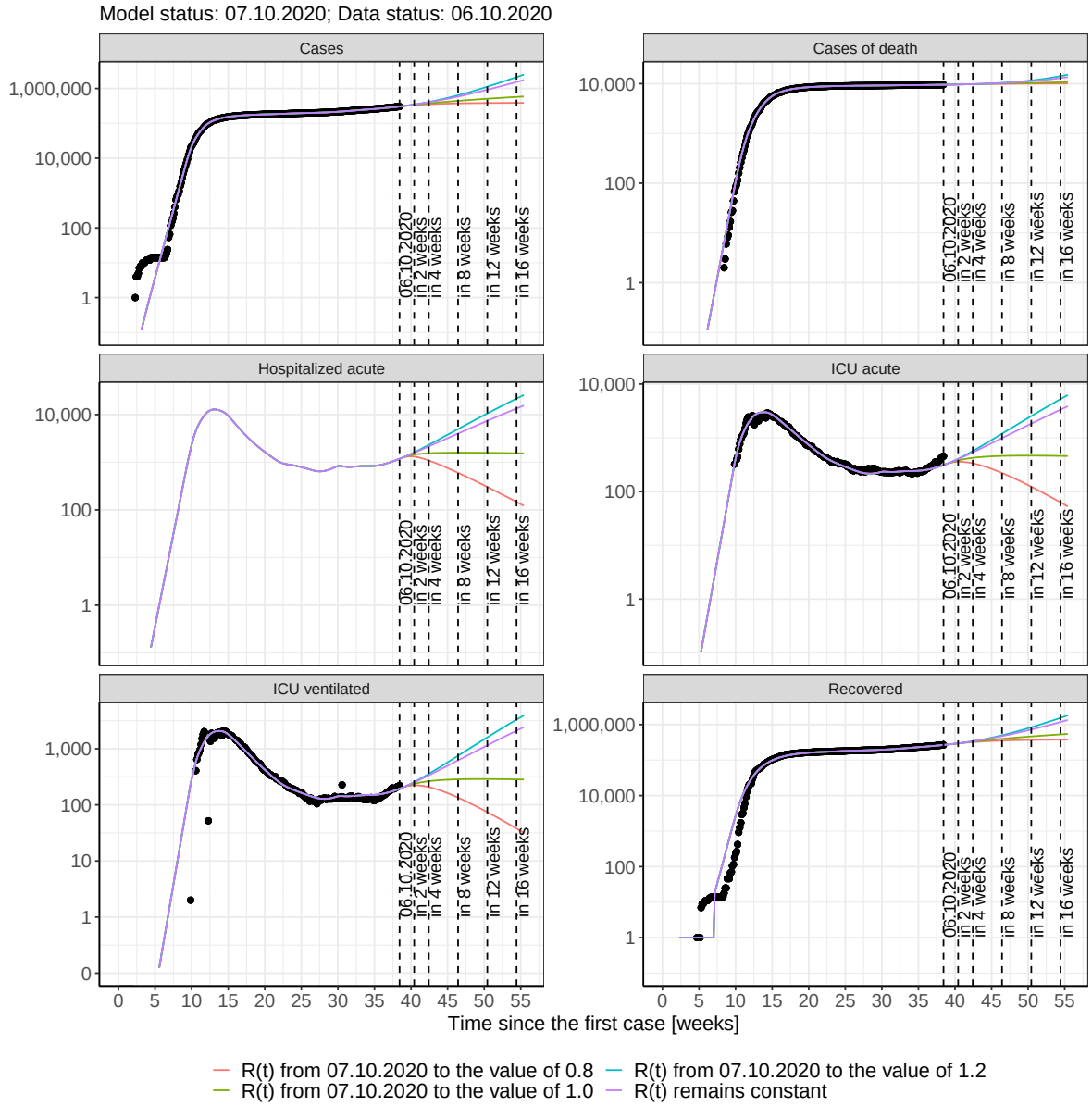


Figure 196: Semi-logarithmic depiction of the model prediction (cases, recovered, ICU ventilated, ICU beds, hospital beds, deaths) for Germany assuming various scenarios after 07.10.2020. Points: reported case numbers; lines: model predictions.

The tables show the modeling results for four conceivable scenarios: Scenario 1: The R(t) estimated value after 07.10.2020 remains the same as today's value (Tab. 66); Scenario 2: The R(t) estimated value after 07.10.2020 takes the value of 0.8 (Tab. 67); Scenario 3: The R(t) estimated value takes the value of 1 after the 07.10.2020 (Tab. 68); Scenario 4: The R(t) estimated value takes the value of 1.2 after the 07.10.2020 (Tab. 69) Model status from 07.10.2020; Data status: 06.10.2020.

Table 66: Germany - R(t) remains unchanged after the 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	307400	9530	268040	1203	316	197
08.10.2020	309970	9537	269940	1228	321	201
09.10.2020	312610	9545	271880	1253	326	204
10.10.2020	315300	9553	273870	1278	332	208
11.10.2020	318050	9560	275900	1305	338	212
12.10.2020	320870	9568	277970	1332	344	215
13.10.2020	323750	9576	280090	1360	350	219
14.10.2020	326700	9585	282260	1389	357	224
15.10.2020	329720	9593	284480	1419	363	228
16.10.2020	332810	9602	286750	1449	370	232
17.10.2020	335960	9611	289070	1480	378	237
18.10.2020	339190	9620	291440	1512	385	241
19.10.2020	342500	9629	293860	1545	392	246
20.10.2020	345870	9638	296340	1578	400	251
21.10.2020	349330	9648	298880	1613	408	256
22.10.2020	352870	9658	301480	1648	416	261
23.10.2020	356480	9668	304130	1684	425	267
24.10.2020	360180	9678	306850	1721	434	272
25.10.2020	363960	9688	309620	1759	443	278
26.10.2020	367830	9699	312460	1798	452	284
27.10.2020	371790	9710	315370	1838	461	290
28.10.2020	375840	9721	318340	1879	471	296
29.10.2020	379980	9733	321380	1920	481	302
30.10.2020	384220	9744	324490	1963	491	309
31.10.2020	388550	9756	327670	2007	501	315
01.11.2020	392980	9768	330920	2052	512	322
02.11.2020	397510	9781	334250	2098	523	329
03.11.2020	402150	9794	337650	2144	534	336

Table 67: Germany - R(t) takes on the value of 0.8 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	307340	9530	268040	1203	316	197
08.10.2020	309720	9537	269940	1227	321	201
09.10.2020	312030	9545	271870	1249	326	204
10.10.2020	314270	9552	273840	1270	331	207
11.10.2020	316460	9560	275840	1288	335	210
12.10.2020	318580	9568	277870	1302	339	212
13.10.2020	320630	9576	279920	1314	343	215
14.10.2020	322630	9584	281980	1322	347	217
15.10.2020	324580	9593	284050	1327	349	219
16.10.2020	326460	9601	286130	1329	352	220
17.10.2020	328300	9609	288210	1329	354	221
18.10.2020	330080	9618	290280	1326	355	222
19.10.2020	331810	9626	292350	1320	356	223
20.10.2020	333490	9635	294410	1313	357	223
21.10.2020	335120	9643	296440	1303	357	223
22.10.2020	336710	9652	298460	1292	357	223
23.10.2020	338240	9660	300460	1280	357	223
24.10.2020	339740	9669	302440	1266	356	222
25.10.2020	341190	9677	304380	1251	355	221
26.10.2020	342600	9686	306300	1235	354	220
27.10.2020	343980	9694	308190	1219	352	219
28.10.2020	345310	9702	310050	1202	351	218
29.10.2020	346600	9710	311870	1184	349	217
30.10.2020	347860	9718	313660	1165	346	215
31.10.2020	349080	9726	315420	1147	344	213
01.11.2020	350260	9734	317140	1128	341	212
02.11.2020	351410	9742	318830	1108	338	210
03.11.2020	352530	9750	320470	1089	335	208

Table 68: Germany - R(t) takes on the value of 1.0 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	307370	9530	268040	1203	316	197
08.10.2020	309850	9537	269940	1227	321	201
09.10.2020	312340	9545	271880	1251	326	204
10.10.2020	314820	9552	273850	1274	331	207
11.10.2020	317300	9560	275870	1297	337	211
12.10.2020	319780	9568	277920	1318	342	214
13.10.2020	322260	9576	280010	1338	347	217
14.10.2020	324730	9585	282130	1357	352	220
15.10.2020	327210	9593	284270	1375	357	223
16.10.2020	329680	9601	286450	1391	361	226
17.10.2020	332150	9610	288650	1406	366	229
18.10.2020	334620	9619	290880	1420	370	232
19.10.2020	337090	9628	293120	1433	375	235
20.10.2020	339550	9637	295390	1445	379	237
21.10.2020	342020	9646	297680	1456	383	240
22.10.2020	344480	9655	299980	1466	386	242
23.10.2020	346950	9664	302290	1476	390	244
24.10.2020	349410	9673	304620	1484	394	246
25.10.2020	351870	9683	306960	1492	397	248
26.10.2020	354320	9692	309320	1500	400	250
27.10.2020	356780	9702	311680	1507	403	252
28.10.2020	359240	9712	314050	1513	407	254
29.10.2020	361690	9721	316430	1519	409	256
30.10.2020	364140	9731	318820	1525	412	258
31.10.2020	366590	9741	321210	1530	415	259
01.11.2020	369040	9750	323600	1534	418	261
02.11.2020	371480	9760	326010	1539	420	262
03.11.2020	373930	9770	328410	1543	422	264

Table 69: Germany - R(t) takes on the value of 1.2 after 07.10.2020

Datum	Cases	Cases of death	Recovered	Hospitalized acute	ICU acute	ICU ventilated
07.10.2020	307410	9530	268040	1203	316	197
08.10.2020	310000	9537	269940	1228	321	201
09.10.2020	312670	9545	271880	1253	326	204
10.10.2020	315410	9553	273870	1279	332	208
11.10.2020	318230	9560	275900	1307	338	212
12.10.2020	321130	9568	277980	1336	344	216
13.10.2020	324110	9576	280110	1366	351	220
14.10.2020	327170	9585	282290	1397	358	224
15.10.2020	330330	9593	284520	1429	365	229
16.10.2020	333570	9602	286810	1463	373	234
17.10.2020	336900	9611	289160	1498	380	239
18.10.2020	340330	9620	291570	1535	388	244
19.10.2020	343850	9629	294040	1572	397	249
20.10.2020	347470	9639	296570	1612	406	255
21.10.2020	351200	9648	299170	1652	415	260
22.10.2020	355030	9658	301840	1694	424	266
23.10.2020	358970	9669	304580	1738	434	273
24.10.2020	363020	9679	307400	1783	444	279
25.10.2020	367180	9690	310290	1829	454	286
26.10.2020	371460	9701	313260	1877	465	293
27.10.2020	375860	9712	316300	1927	476	300
28.10.2020	380380	9724	319440	1978	488	307
29.10.2020	385040	9736	322660	2031	500	315
30.10.2020	389820	9748	325970	2085	512	323
31.10.2020	394730	9760	329360	2141	525	331
01.11.2020	399790	9773	332860	2198	539	339
02.11.2020	404990	9786	336450	2258	552	348
03.11.2020	410330	9800	340140	2319	566	357

18.2.3 Prediction for the next 4 weeks under the assumption of different scenarios from 07.10.2020

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

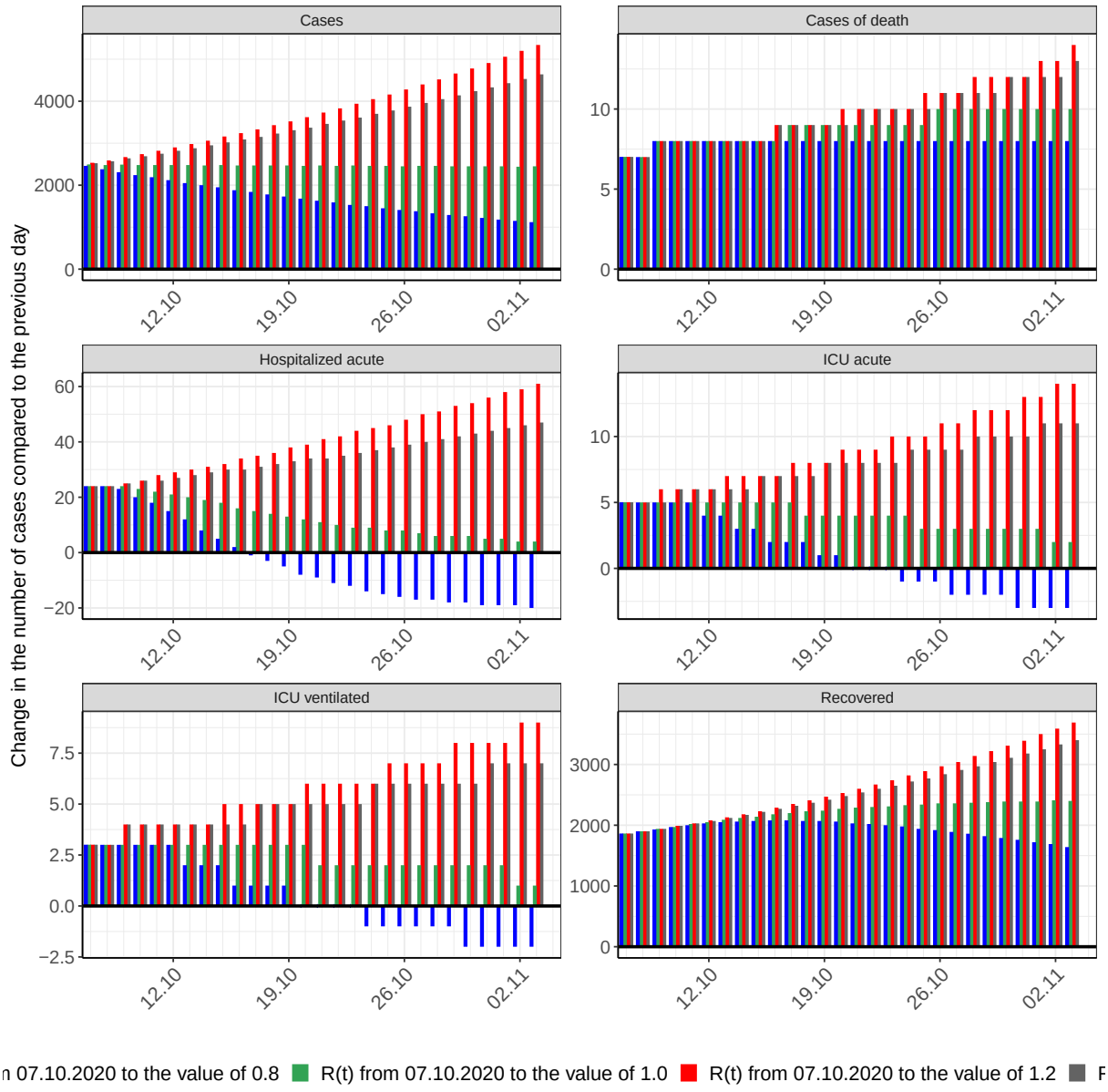


Figure 197: Simulation of daily new cases for the next 4 weeks - Germany