Methods applied for the modeling of COVID-19 cases in voivodships by multiple linear regression

Distribution of correlation coefficients (R, square root of R^2) for statistically significant models were presented as box plots for each voivodeship. The values vary from around 0.5 to 1, the highest median value is observed in Podkarpackie and the lowest in Lubuskie. Presented distribution of correlation coefficients for each voivodeship is related to their temporal variability. To expose days when model agreement is the highest, the 95th percentile of R has been chosen for each voivodeships as a minimum threshold and these days are indicated as red crosses.

The days with exceptionally high correlation values were identified. On most days, the model was statistically significant. It may be seen that there were days which group together in longer periods, especially in September and October. These periods indicate specific attribution of weather conditions to the dynamics of COVID-19 cases. This result shows plain difference between the northeast and eastern parts of Poland and the south, central, and northwest parts. In the former, the attribution of weather to COVID-19 cases is weakened, and in the latter, it is enhanced.

Figure S1. Cross-correlations between the number of new hospitalizations due to COVID-19 (hospital patients) and meteorologic parameters: daily maximum temperature (A), daily minimum temperature (B), variability of daily temperature (C), sunshine duration (D), relative humidity (E), and wind speed (F). The 95% confidence intervals are indicated by a blue dashed line.
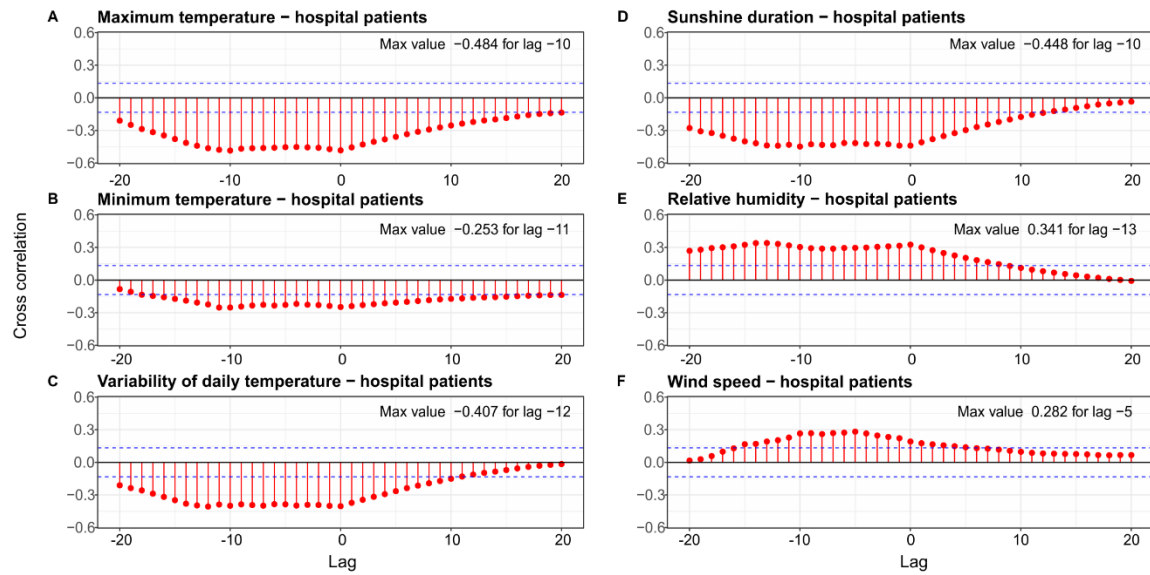
Figure S2. Modeling of COVID-19 cases in voivodeships by meteorologic parameters.

Distribution of correlation coefficients for significant model fits is presented as box plots for

each voivodeship. Red crosses indicate the *R* values exceeding the 95th percentile.
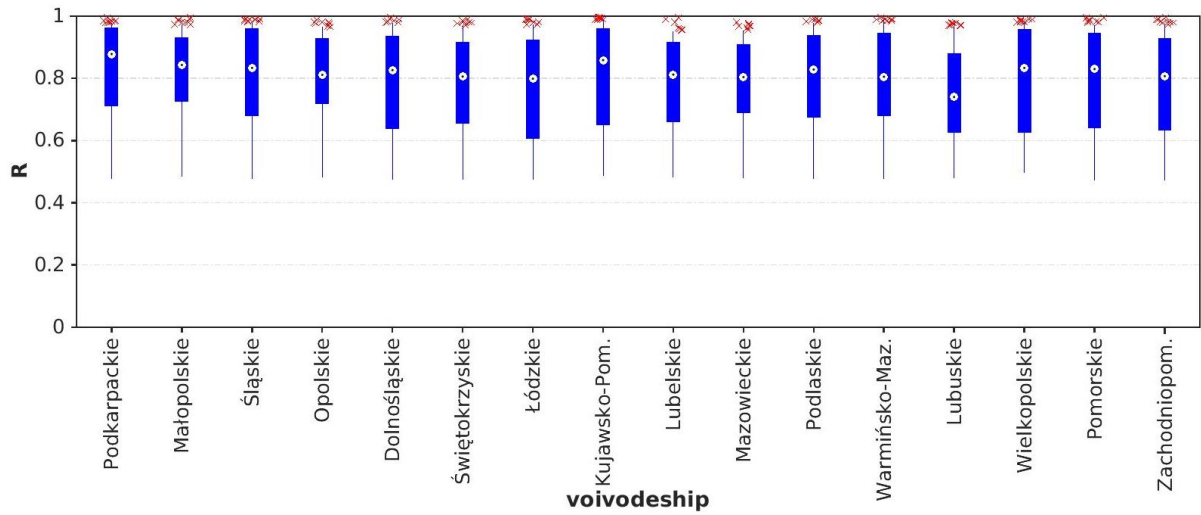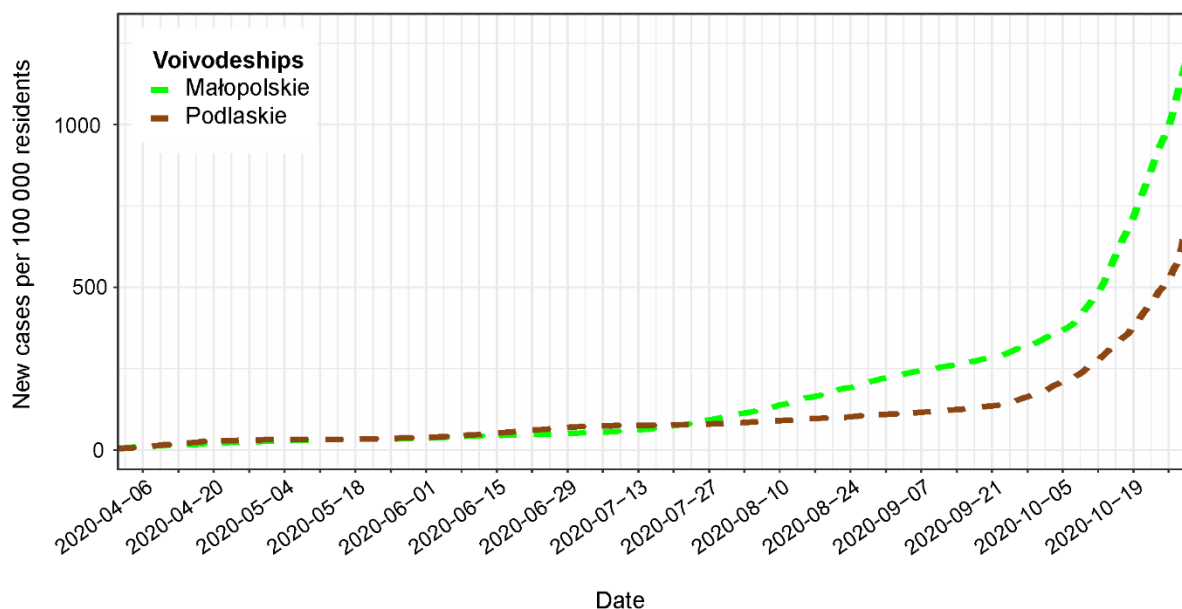
Figure S3. Daily new laboratory-confirmed COVID-19 cases per 100,000 residents for the ~~16 voivodeships in Poland (a) and~~ Małopolskie and Podlaskie Voivodeships ~~(b)~~.

Regional differences in weather conditions in September and October 2020

The precipitation was abundant in the second half of September and October 2020, differing significantly from its climatological characteristics for that period. This abundant precipitation, especially over southern Poland, was related to a sequence of frontal passages linked with active low-pressure systems, the so-called Genova lows, typical for spring and summer but rare at that time of the year. The precipitation events were prolonged and spatially extensive, with intensity varying in time. In terms of the climate, in that part of Poland, the extreme daily amounts of precipitation are observed between April and September, and since 1950s, they were not observed in October.

In October 2020, local maximum daily precipitation amounts exceeded 45 mm, forming 10-day series. They locally exceeded the absolute maximum for October (recorded systematically since 1951), with, for example, 47.8 mm in Częstochowa. The daily amounts locally exceeded the mean monthly precipitation sums for October, which slightly exceed 40

mm over the Małopolska Highlands. The number of days with precipitation exceeded 15 in a large area of southern Poland, also exceeding the climate norm of 12 days. Monthly precipitation amounts in October 2020 locally exceeded 110 mm, being the largest in record since 1974 and one of the largest since the beginning of systematically recorded data. Using the quantile-based precipitation classification from the period 1951-2010, the month was classified as extremely wet. Additionally, it was preceded by abundant precipitation of the last decade of September, also classified as a wet and locally extremely wet month (Figure S4).

Figure S4. Weather conditions in September and October 2020 at Białystok (a) and Krakow-Balice (b) synoptic stations.