



Letter to The Editor / Editöre Mektup

# Graphic Estimation of SARS-CoV-2 (Covid 19) outbreak in timeline from 11<sup>th</sup> of March to 2<sup>nd</sup> of May 2020

## Sars-CoV-2 (Covid 19) salgınının 11 Mart-8 Mayıs zaman çizelgesinde grafik olarak değerlendirilmesi

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### Abstract

The outbreak of Sars-Cov-2 pandemic has reached the peak infection rate in several countries. Since the start of outbreak Turkey in 10th of March 2020 ministry of health announced the figures about the number of performed tests, number of confirmed cases, number deaths related to outbreak, number of patients in intensive care units and intubated, and number of healed patients. We used regression analysis curve estimation method to predict the probable end point of outbreak. Cubic regression estimation was calculated as the most appropriate method of estimation (R2: 0.978). Finally future prediction of the SARS-CoV-2 infection course is determined as minimum of 90 days according to the observed data up to date. The decrease in the number of individuals in intensive care unit or intubated may be ten to twenty days later after the decrease or disappearance of confirmed cases.

**Key words:** Sars-Cov-2, outbreak, estimation, Turkey

### Özet

Sars-Cov-2 pandemisi çoğu ülkede zirve enfeksiyon seviyesine erişti. Türkiye’de salgının başladığı 10 Mart 2020 tarihinden beri sağlık bakanlığı yapılan test sayısı, test ile doğrulanan vaka sayısı, salgınla ilişkili ölüm sayısı, yoğunbakımda olan ve entübe olan hastaların sayısı ve iyileşen hasta sayılarını yayınlamaktadır. Regresyon analizini eğri tahmini yöntemini salgının muhtemel sonlanım noktasını bulmak için kullandık. Kübük regresyon tahmini en uygun tahmin yöntemi olarak bellirlendi (R2: 0.978). Sonuç olarak SARS-CoV-2 enfeksiyonunun geleceği ile ilgili değerlendirme bugüne kadar gözlenen verilere göre en az 90 gün olarak belirlenmiştir. Yoğun bakımda bulunan ya da entübe olan hastaların sayısının azalması on ila yirmi gün sonrasında olabilir, daha sonra doğrulanan vaka sayılarında azalma ya da ortadan kalma görülebilir.

**Anahtar kelimeler:** Sars-Cov-2, salgın, tahmin, Türkiye

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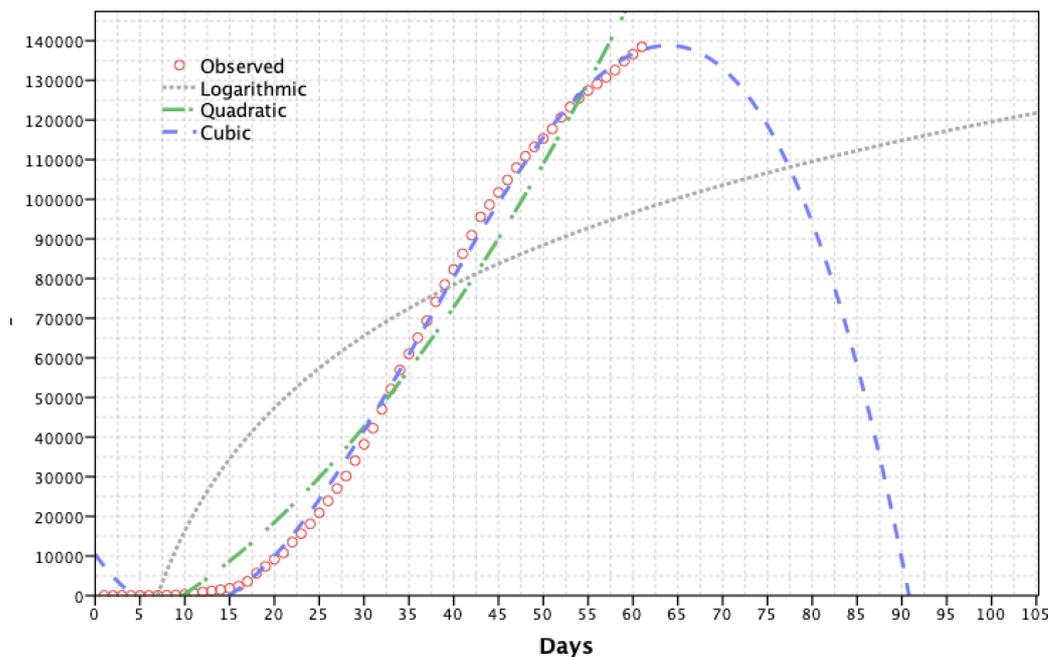
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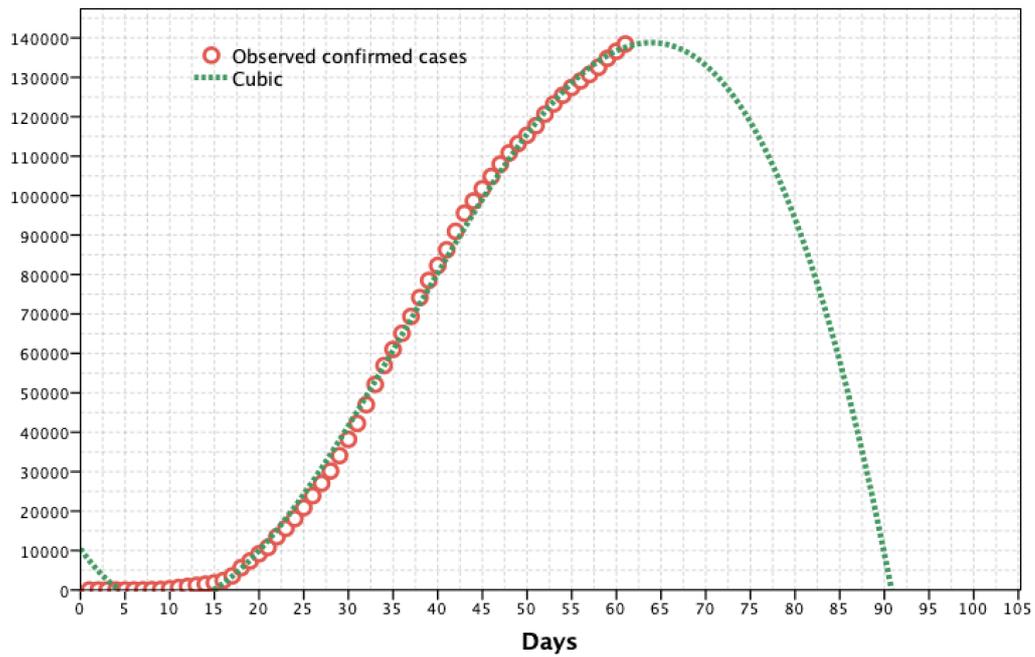
Dear Editor,

Early in April 2020, the leading countries having the highest number of confirmed SARS-CoV-2 cases were in Far East Asia, primarily in China and Korea (Coronavirus disease 2019-Covid-19) (1). Consequent frequency of confirmed cases in European countries were 40 000 to more than 100 000. Initial consideration about SARS-CoV-2 infection was its description as an endemic. Later the unexpectedly fast spread of the infection raised tremendous anxiety about SARS- CoV-2 and the World Health Organization (WHO) described the situation as pandemics. The frequency of SARS-CoV-2 in the middle of Chinese outbreak is calculated as 130.5 and 41.5, respectively in healthcare workers and public per million population(2). Lack of a known therapy and vaccine for the infection was contributing to the increased anxiety. The course of pandemic reached its peak in Europe and United States in late April. Then comprehensive and wide spread definition of the disease, isolation of the virus and published studies about several drugs those have several mechanisms of action were proposed but could not provide a reliable final solution up to date. The last consideration in this course became a reliable prediction of minimization date of confirmed cases and disappearance of individuals in intensive care units. National authorities may then design improvement in social life and economic reconstruction.

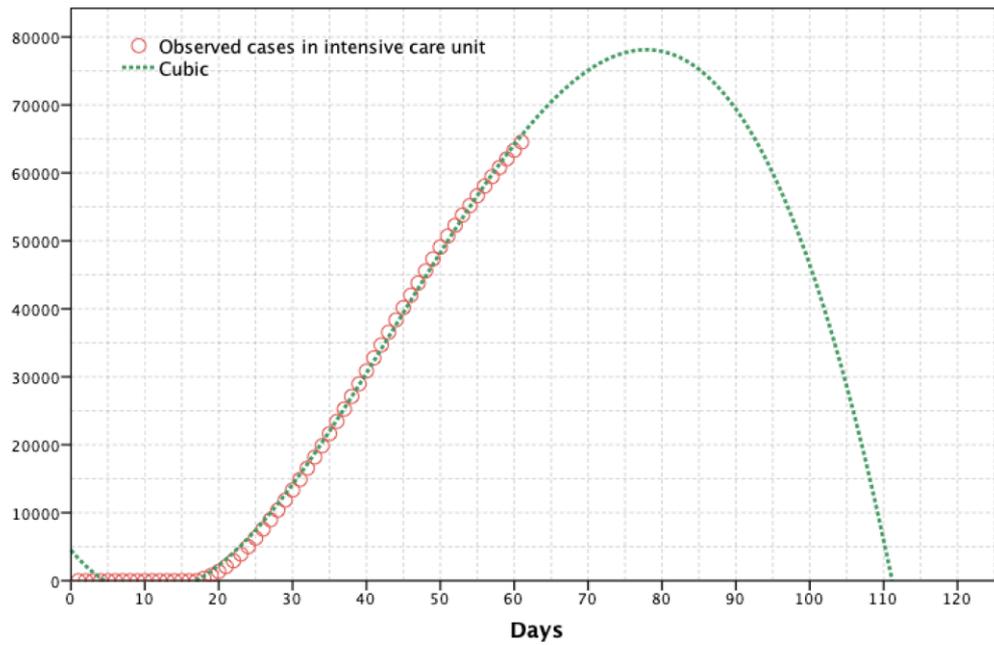
A simple and a reliable non-parametric visual method can be stated as constructing prediction analysis by regression analysis. This method provides a line graphic to estimate the possible end time predicting from the course that researchers or health authority may use in future planning together with the other types of information. In this model, several prediction equations are used to predict the future course of pandemic according to the distribution of previous daily alteration of observed cases. The cumulative data (number of individuals) across the days passed are used as template in all figures other than Figure 3 where days passed were crossed with natural logarithm (Ln) to see all parameters in the same figure. A couple of prediction equations is shown in Figure 1 to shown how an equation was chosen as the best predictor of future course. This visual presentation is off course having the highest regression coefficient ( $R^2$ 's for Cubic, Quadratic, and Logarithmic estimations respectively 0.997, 0.975, and 0.638). In Figure 2, the daily SARS-CoV-2 related; 2a. confirmed patients, 2b. patients in intensive care unit, 2c. patients intubated, 2d. patients healed, 2 e. patients died, and 2f. active cases. In this report, we used the data provided by Turkish Ministry of Health and published daily from the web site of Ministry of Health (3). In Figure 3, the natural logarithmic conversion of variable to be seen in a unique graph to observe the change of all variables together.



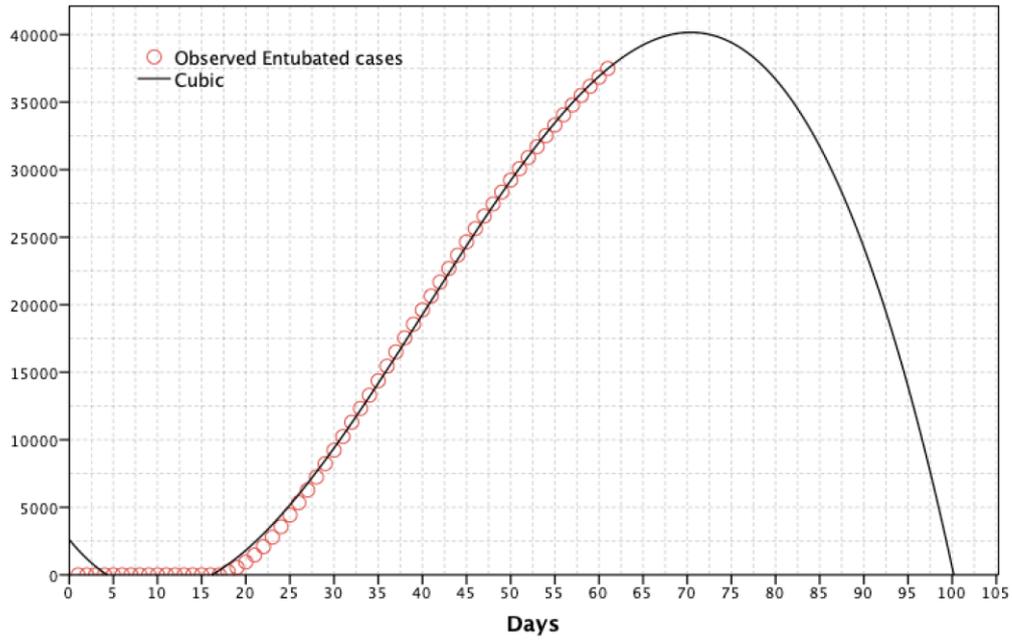
**Figure 1. Three predictive equations used to chose the most possible curve estimation**  
 $R^2$ 's for Cubic, Quadratic, and Logarithmic estimations respectively 0.997, 0.975, and 0.638



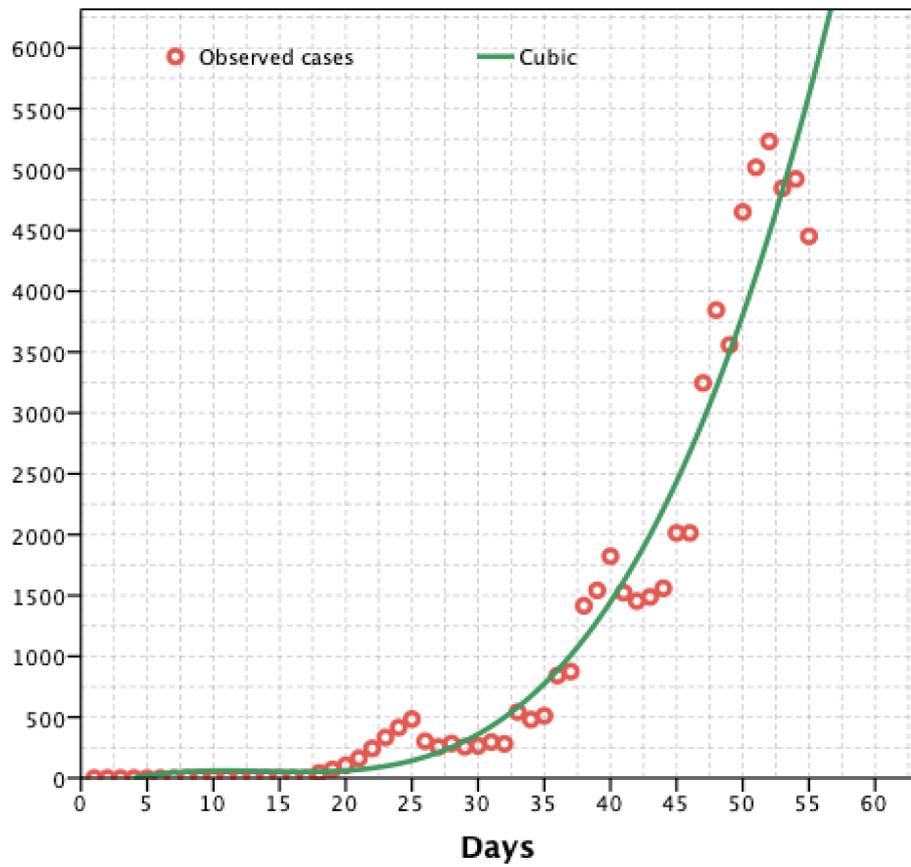
**Figure 2a. Confirmed patients**  
 $R^2: 0.997$



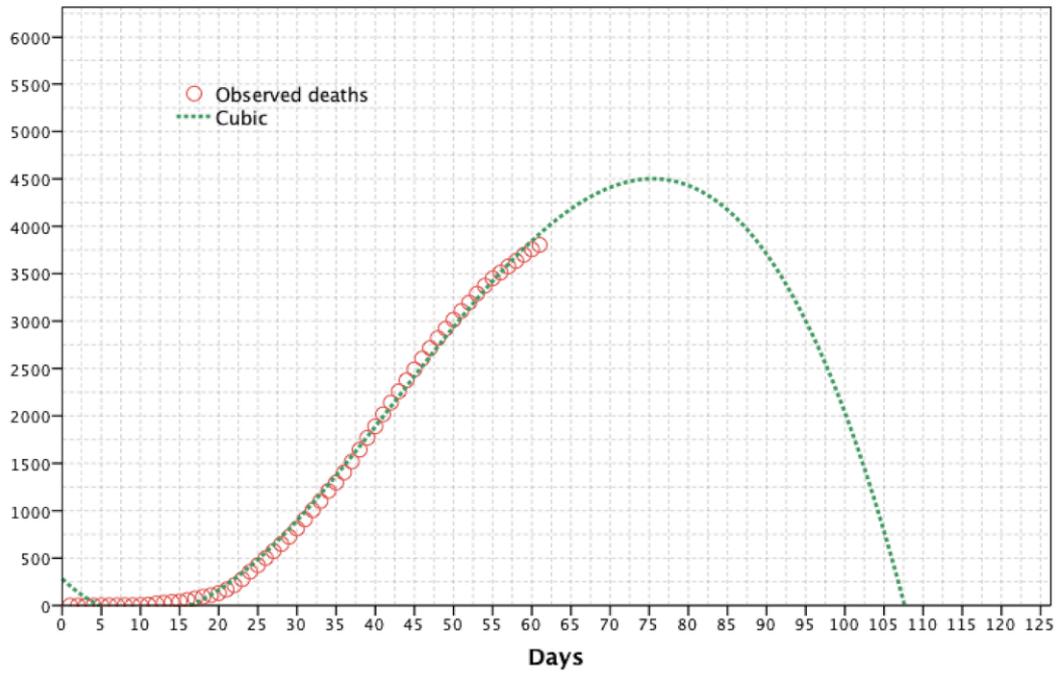
**Figure 2b. Patients in intensive care unit**  
 $R^2: 0.998$



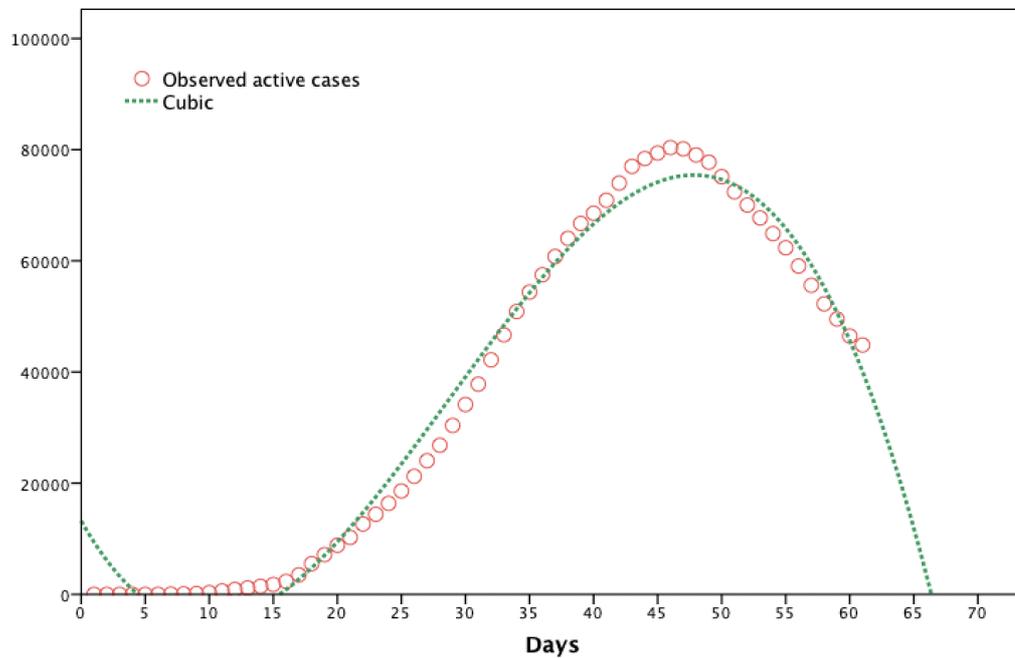
**Figure 2c. Patients intubated**  
 $R^2: 0.998$



**Figure 2d. Patients healed**  
 $R^2: 0.997$

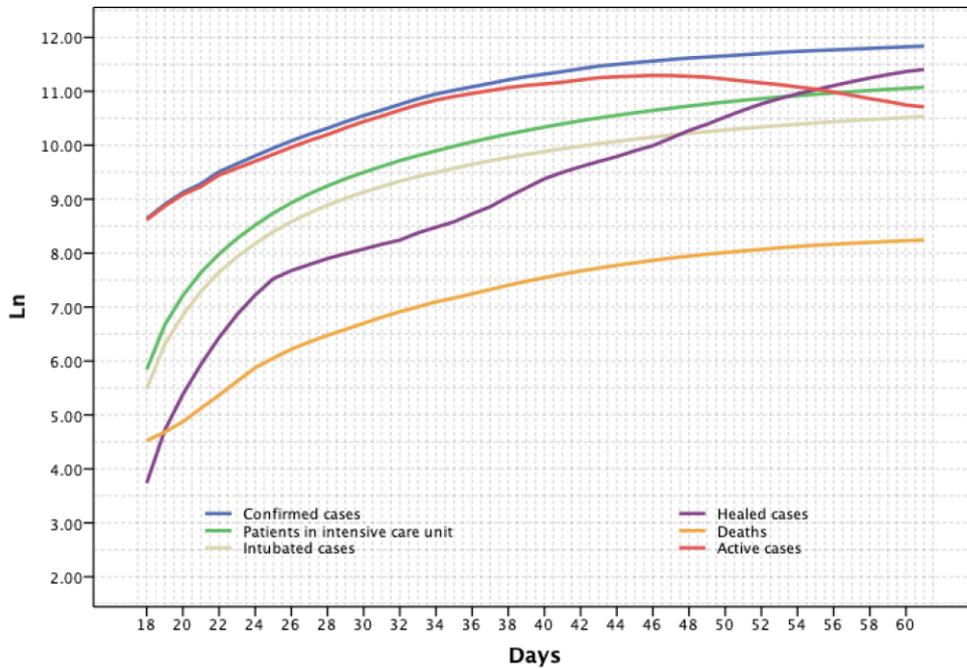


**Figure 2e. Patients died**  
 $R^2: 0.997$



**Figure 2f. Active cases with Covid-19 infection**  
 $R^2: 0.984$

**Figure 2.** The Cubic estimation for a. confirmed patients, b. patients in intensive care unit, c. patients intubated, d. patients healed, e. patients died, and f. active cases with Covid-19 infection (The cumulative number of cases versus days passed).



**Figure 3. The course of confirmed patients, patients in intensive care unit, patients intubated, patients healed, patients died, and active cases with Covid-19 infection converted in natural logarithm to see all in a unique graph(The cumulative number of cases versus Ln).**

Curve estimations show that probable date of minimization since the start of SARS- Cov-2 (10<sup>th</sup> March of 2020) would be between 90<sup>th</sup>-110<sup>th</sup> days for confirmed cases and deaths. The last figures used in these predictions belong to 8<sup>th</sup> of May that this text was sent for review. However curve estimation for end point in case of patients in intensive care unit, intubated patients and active case were all between 65<sup>th</sup>-75<sup>th</sup> days. These figures can be used as a template in future attacks of SARS- Cov-2 also.

In conclusion, future prediction of the SARS-CoV-2 infection course has a minimum of 65 days according to the observed data up to date. The decrease in the number of individuals in intensive care unit or intubated may be ten to twenty days later than the decrease or disappearance of confirmed cases. These considerations are all based on the assumption that another attack of the SARS-CoV-2 infection does not appear during this course. The most significant support to beware of this unexpected assumption arises from the

scientific board constructed by Ministry of Health and political assistance to this board by Ministry of Health and the Turkish government. Even in case of falling this unexpected position (new viral attack,) the prediction by regression analysis would also be useful to redesign the new organizational scheme. Emerging new drugs and developing vaccine if available would suppress and clear the magnitude of regressive prediction equation.

## REFERENCES

1. World Health Organization report. COVID-19) Situation Report – 76 pp: 3
2. Pan A, Liu, Li, Wang C, Guo H, Hao X, Wang Qi, Huang J, He N, Yu H, Lin X, Wei S, Wu T. Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak inWuhan, China. [Epub ahead of print] JAMA 2020: E1-E9
3. <https://covid19.saglik.gov.tr>. Reached: 03.05.2020.