

CORRESPONDENCE

Updated fractal assessment of Italian Covid-19 disease

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To the Editor,

Fractal assessment of the Italian outbreak of the Covid-19 disease has been previously submitted to your journal (1). That article (1) suggested how many tests Italy would be able to perform in case of new full lock-down and same biocomplexity of the SARS-Cov2 diffusion.

In the current days, Italian people are facing a new phase of Covid-19 diffusion. The present letter, written the 8 of September, aims to integrate the fractal investigations previously reported (1). The worsening of new cases of Covid-19 in Italy, since 30 July to 6 September, were assessed by using same fractal statistic as the one already reported (1). The 7 of August, Italian Ministry of Health enacted provisions to contain the diffusion of SARS-Cov2 (working from the 9 of August) and, since 13 of August, testing for SARS-Cov2 people coming from some foreign countries was also established. Infected people and their contacts were isolated and put in quarantine as during the full lock-down period. Therefore, we were able to assess the trend of new cases out off new tests daily from the 29 July to 15 August (retaining the incubation period of 6 days (2,3)) and after the 18 of August to 6 of September (when analyses had been performed). Data were collected at <https://github.com/pcm-dpc/COVID-19/tree/master/schede-riepilogative/regioni>, day by day.

The self-similarity parameter (alpha) of the trend before the 15 of August was -0.270168 (level of noise: pink; Zipf' test positive) chaos was 13.3%. The self-similarity parameter of the fractal trend after the 18 of August was -0.110559 (level of noise: pink; Zipf' test positive, chaos 47.1%). Table 1 reports p values of

Table 1.

	Pre lock-down phase	16 days after full lock-down
Before 15 of August	p=0.0013	p<0.0001
After 18 of August	p=0.0002	p=0.0023

comparisons among fractal shapes obtained in the pre-lock down period and 16 days after the full lock down: fractal shapes of trends were significantly different.

Since the pre-lock down phase of Covid-19 outbreak, the ability of Italy of performing more tests has been improved. Currently, mean number of tests has been 64624 (± 23035) daily, with lower ratio among new cases and new tests than before. Nevertheless, trend of new cases of Covid-19 seems worsening in unpredictable way because of chaos observed. Comparisons of segments of fractal shapes demonstrates that chaotic ratios happened between 2 August and 4 August, between 4 of August and 6 of August, between 19 August and 25 August, between 30 August and 3 September. The establishment to test voyagers coming back from foreign countries has changed the fractal trends of outbreak, demonstrating that many new cases were imported. We are unable to explain why chaotic behavior and changes of trends have been occurred. However, poor tracing ability of people might explain chaotic behavior of ratios. Fractal statistic has been able to detect when those changes occurred, thereby helping Italian Health Supervisors to best assess the phenomenon.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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