# Prediction of daily contagions of CoViD-19 - SARS-CoV-2 from August 24 to October 20, 2020 in Italy by using a New Epidemiologic Fractal Model.

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**Abstract** : We study a new  fractal model for prediction of contagions of CoViD-19 (SarbecoBetavirus SARS-CoV-2) from August 24, 2020 to October 20, 2020  in Italy. We obtain that the time of the peak is estimated to be at December 7, 2020 and the number of contagions will be about 20580 cases.

## Introduction

The aim of the present work is to effect a prediction of the contagions of SARS-CoV-2  in Italy in the period from August 24, 2020 to October 20, 2020.In the work we use the methods of the fractal analysis, fitting a new fractal model following the performance that was used previously from Ziff and Ziff [1] during the contagions in China. The current prediction, effected by such new model introduced by us, is that the size of the epidemic will be about 20580 cases of contagions in Italy and the time of peak will be about December 7, 2020  on the general plane, depending instead the actual size of the process from the respect or an increase o decrease of the prevention measures  that are fixed from the governing bodies.

## Materials and Methods

The power-law (fractal) behavior has been postulated and applied in epidemic studies of Corona Virus disease in China. It is related to the properties of the networks that carry out the propagation of the disease. Vazquez [2] developed a network model, Anna L. Ziff and Robert M. Ziff [1] applied a fractal behavior model in contagions in China. The daily number of new contagions cases, n(t), in an epidemic followed a power-law with an exponential cutoff

$n(t)=kt^{\gamma}exp(-t/t_0)$

This model was used in our previous estimations [3,4,5]. We have modified such model introducing an additive linear term C(n). Therefore, the model that we adopt is the following

$n(t)=kt^{\gamma}exp(-t/t_0)+C(n)$

where $C(n)$ is a linear parameter that is established by the fitting operation.

**Results**

We applied the previous model for the contagions of SARS-CoV-2 in Italy. The parameter values that we estimate are the follows

$k$ =0.0158

$\gamma$ =3.8431

$t_0$=27.2511

$C(n)$= 950.00

They confirm that we are in presence of a fractal regime given by the non-integer value of $\gamma$ .The value $\gamma t_0$ represents the Time of the Peak. The results are in Figure 1. The time explored is from August 24, 2020 to October 20, 2020. It is seen that the time peak is about the December 7, 2020 22-23th with a total of contagions of about 20580 cases.
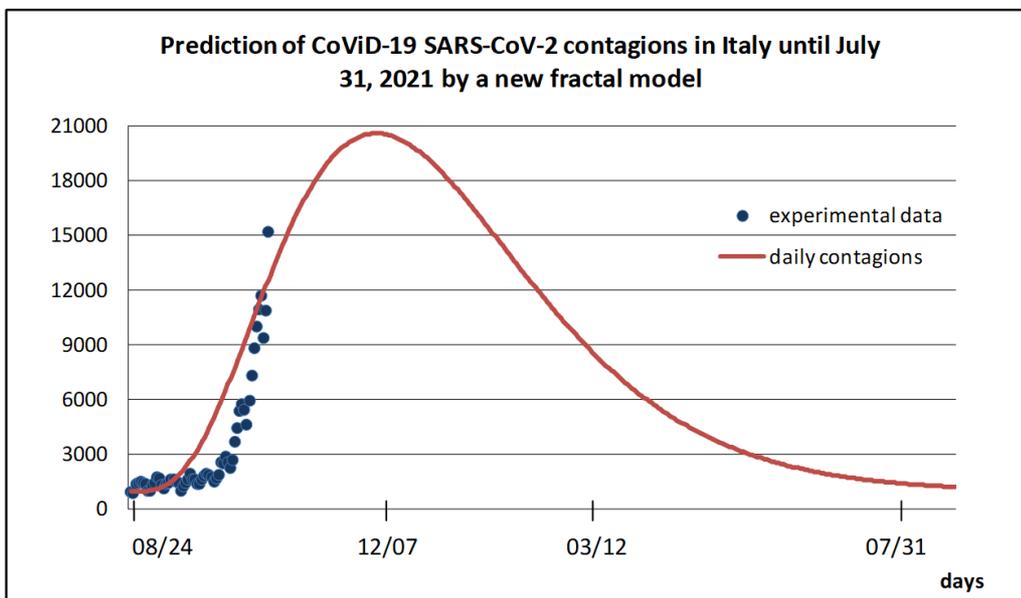


Figure 1

We calculated also the correlation existing daily between the number of contagions and the swabs made. The results that follow, indicate that such correlation exist at an high statistics level since the P-value is of 0.0004 and the P value summary has three stars.

| | |
|---|---|
| Number of XY Pairs | 17 |
| Pearson r | 0,761 |
| 95% confidence interval | 0.4420 to 0.9092 |
| P value (two-tailed) | 0,0004 |
| P value summary | *** |
| Is the correlation significant? (alpha=0.05) | Yes |
| R squared | 0,5792 |

**References**

[1] Anna L. Ziff and Robert M. Ziff, Fractal kinetics of COVID-19 pandemic (with update 3/1/20),medRxiv preprint doi: https://doi.org/10.1101/2020.02.16.20023820.

[2] Alexei Vazquez. Polynomial growth in age-dependent branching processes with diverging reproductive number. Physical Review Letters, 96(3):038702, January 2006. ISSN 0031-9007, 1079-7114.doi: 10.1103/ Phys. Rev. Lett.96.038702. URL http://arxiv.org/abs/cond-mat/0505116. arXiv: cond-mat/0505116.

[3] Calogero Rinzivillo, Sergio Conte, Ferda Kaleagasioglu, Fang Wang, Alberto Foletti, Elio Conte, The Basic Indications and the Clinical Implications of Being the SARS Covid-19 a multifractal. vixra [v1] 2020-04-07

[4] Calogero Rinzivillo, Sergio Conte, Ferda Kaleagasioglu, Fang Wang, Alberto Foletti, Elio Conte, Prediction of Daily Contagions of Covid-19 from March 01 to May 19 in Italy. vixra[v1] 2020-03-17

[5] Calogero Rinzivillo, Sergio Conte, Ferda Kaleagasioglu, Fang Wang, Alberto Foletti, Cengiz Mordeniz, Elio Conte, New Prediction of Sars-Covid-19 in Italy. vixra [v1] 2020-04-24