

Statistical analysis Covid-19 data : from 20/02/2020 to 15/06/2020 by A. Pagano (inf n ct) ; Emanuele V. pagano (LNS-CT) – Entropic model – The Number (y) of infected humans is solution of the differential equation: $Y' = by - cy^2$. The parameters K, a and b are determined by fitting the curve of infected from 20-02-2020 to 19-03-2020. **No Fit adjustments has been made after March 19-2020.** Solution of the equation is given in the inserts of the figures Fig.1 (infected)-Fig.2 (rate by day of infected) –Fig.3 (relative rate : daily number of infected human over the number of cumulative infected human). Accuracy of the predictions are strongly dependent on the data taking method (coronavirus swab methods). However, under reasonable physical assumptions, the expectation entropy-method (curves red-green-black) represents significantly the statistical dynamical evolution of the infection process.

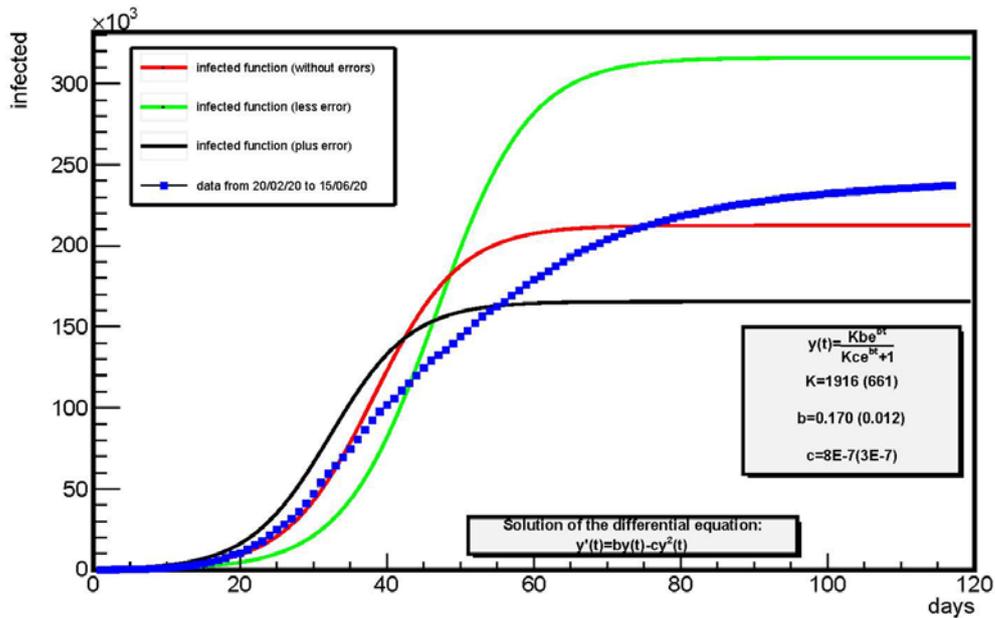


Fig.1 Integrated Infected humans as detected by coronavirus swab methods as a function of the time. Different curves indicate statistical significance: most probable (red), adding the variance in the parameters (black), subtracting the variance in the parameters (green). The Fit (read-black-green) curves indicates saturations (asymptotic) behaviours. The number of experimental determined infected (blue) is significantly lower than the most probable predictions (read) in the range: [34 -60] days evaluation, indicating a steady displacement of the number of infected with the time . As a consequence, starting from 34-day evaluation, a nearly linear dependence of the number of infected as a function of the time has been observed. After about 80 –day evaluation a saturation effect is clear observed. This behaviour could be interpreted as a superposition of different logistic functions steady moving towards to the right day-scale with the time, indicating a displacement of the infection towards larger regional extension from the northern regions to the southern ones. The displacement velocity ranges between 25 to 50 Km/day during 35-70 days evaluations. However, the agreement between the logistic-entropy function predictions and experimental data is good within statistical errors (variances). The picture clearly indicates that the saturation level (around 230.000 Infected) has been determined just at the beginning of the infection, demonstrating the good quality of the entropic model.

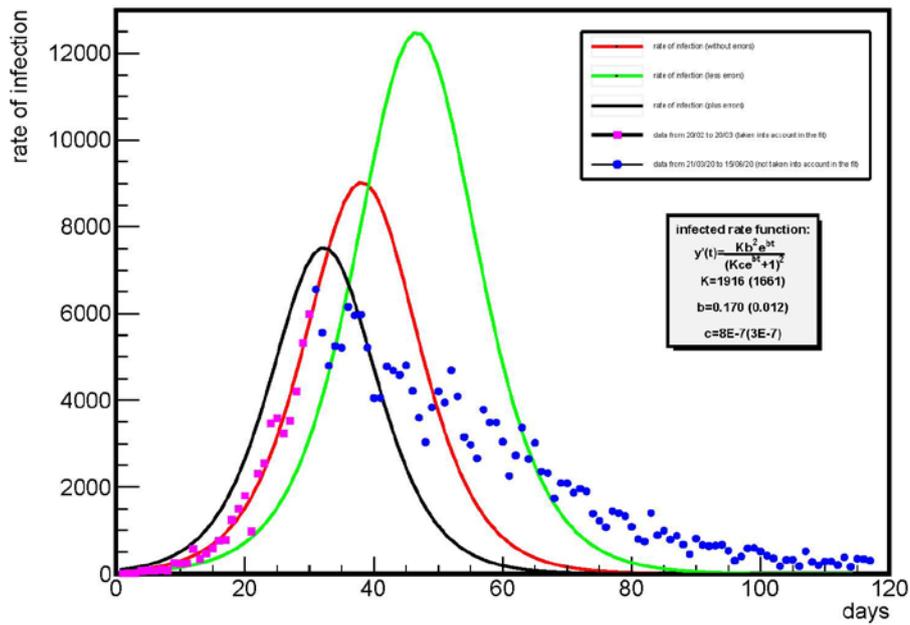


Fig. 2 Rate of infection as a function of the time (derivative of function in Fig.1). The parameters: K, b and c, of the Fit –functions have been obtained by Experimental data taken from 20-02-2020 to 19-03-2020. No further adjustments have been done on the functions reported in Fig.1, Fig 2 and Fig.3. after 19-03-2020.

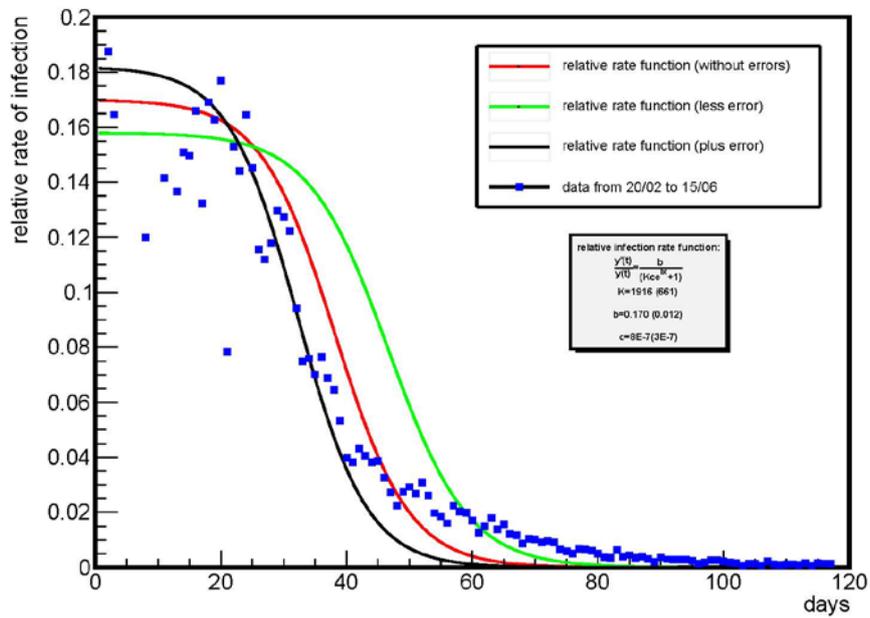


Fig.3 relative rate of the infection as a function the time. The function (red one) reproduce the history of the infection in very good agreement within the experimental errors (black and green functions).