How many can you infect?

Hadi Susanto

Thanks to members of SimcovID
http://simcovid.github.io

09 May 2020

Prediksi Ilmuwan Singapura: Corona di Indonesia Berakhir Mulai Juni

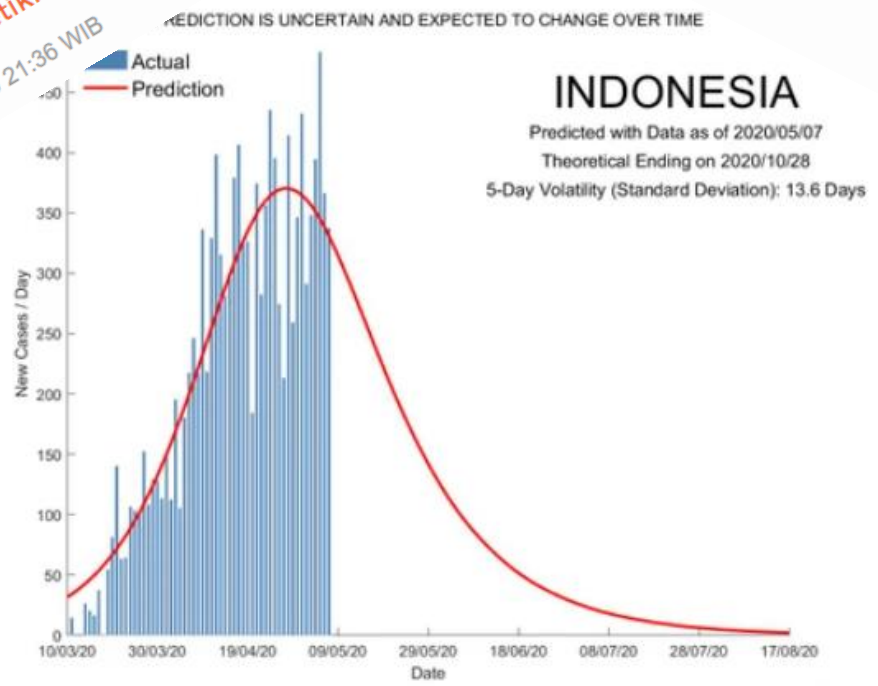
Danu Damarjati - detikNews

Minggu, 26 Apr 2020 21:36 WIB

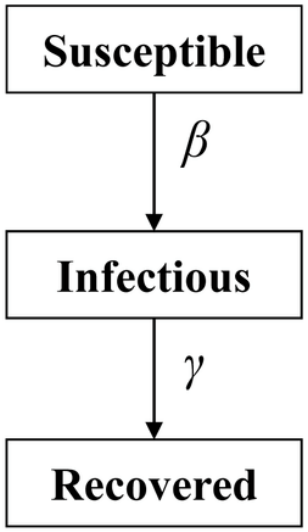
Selasa, 05 Mei 2020 13:24 WIB

Prediksi Akhir Wabah Corona Mundur, Indonesia Jadi 23 September

Nafilah Sri Sagita K - detikHealth



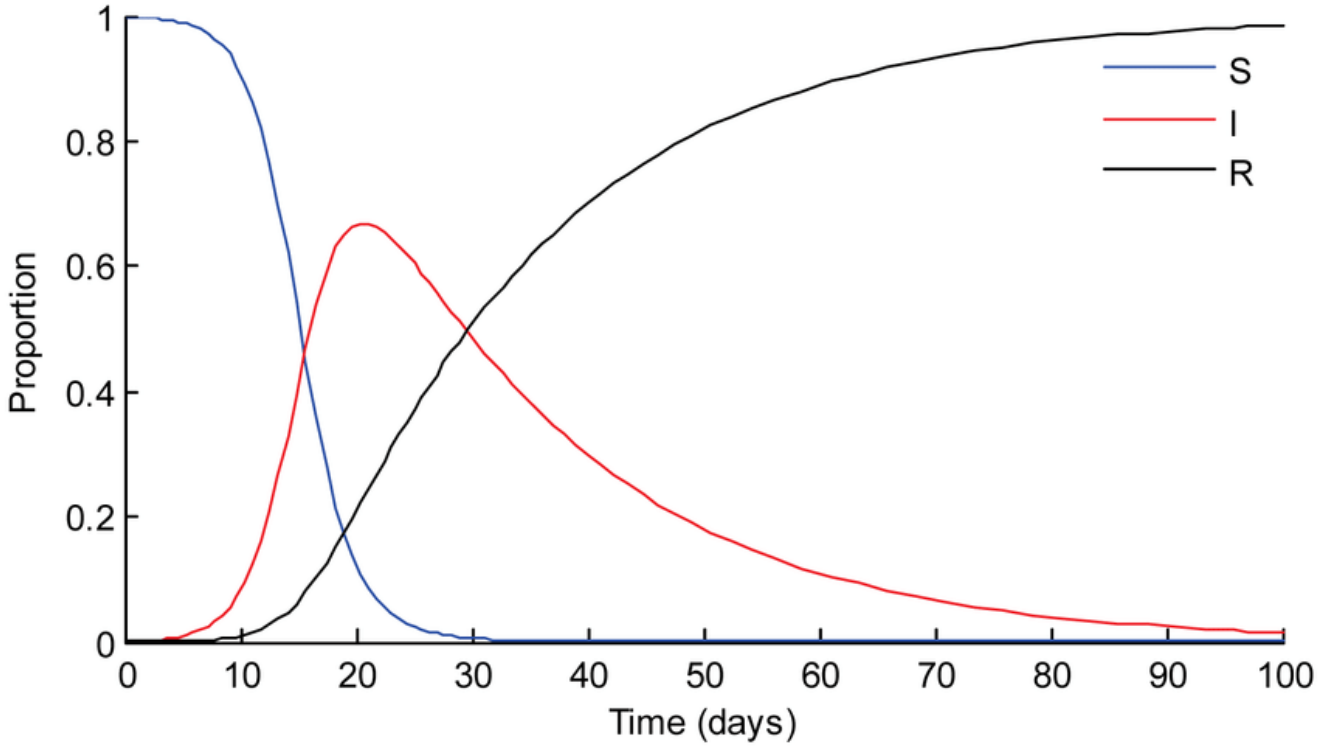
Be careful with ‘data-driven analysis’!



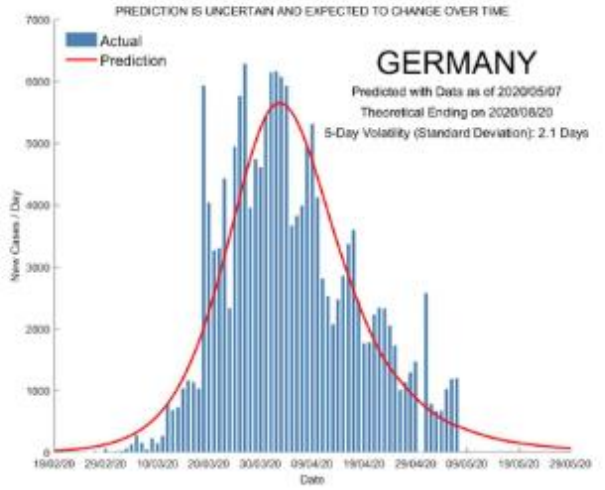
$$\frac{dS}{dt} = -\beta SI$$

$$\frac{dI}{dt} = \beta SI - \gamma I$$

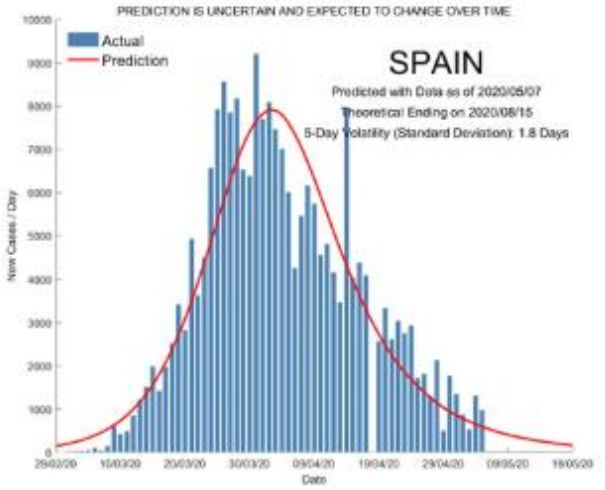
$$\frac{dR}{dt} = \gamma I$$



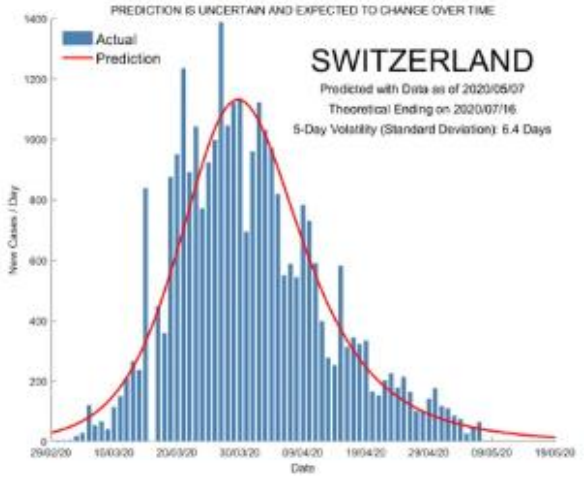
This only works for herds, not people



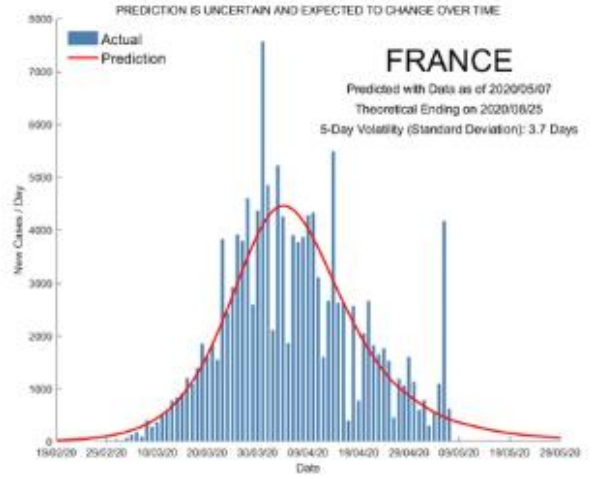
Germany



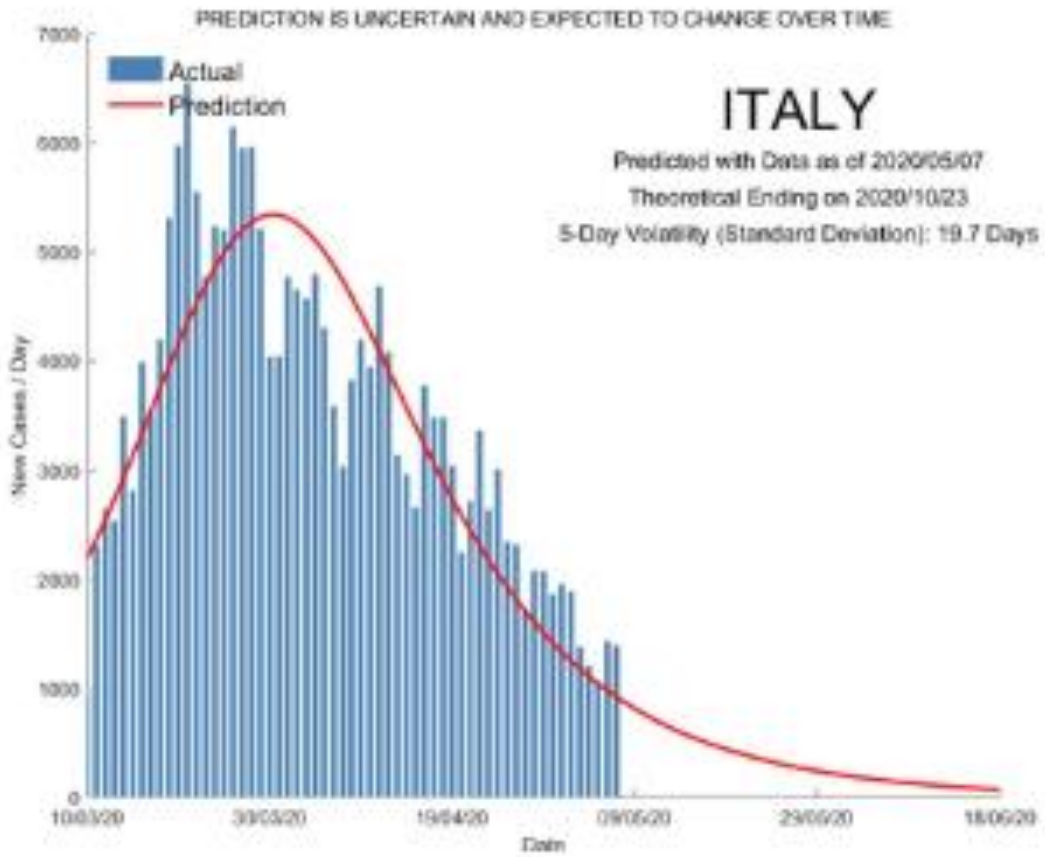
Spain



Switzerland



France


PREDICTION IS UNCERTAIN AND EXPECTED TO CHANGE OVER TIME
Actual
Prediction
ITALY
Predicted with Data as of 2020/05/07
Theoretical Ending on 2020/10/23
5-Day Volatility (Standard Deviation): 19.7 Days
New Cases / Day
7000
6000
5000
4000
3000
2000
1000
0
10/03/20
Date

Italy


JANGAN
TANYA
IPK
Saya !!

… puncak, tapi tanyalah efektivitas

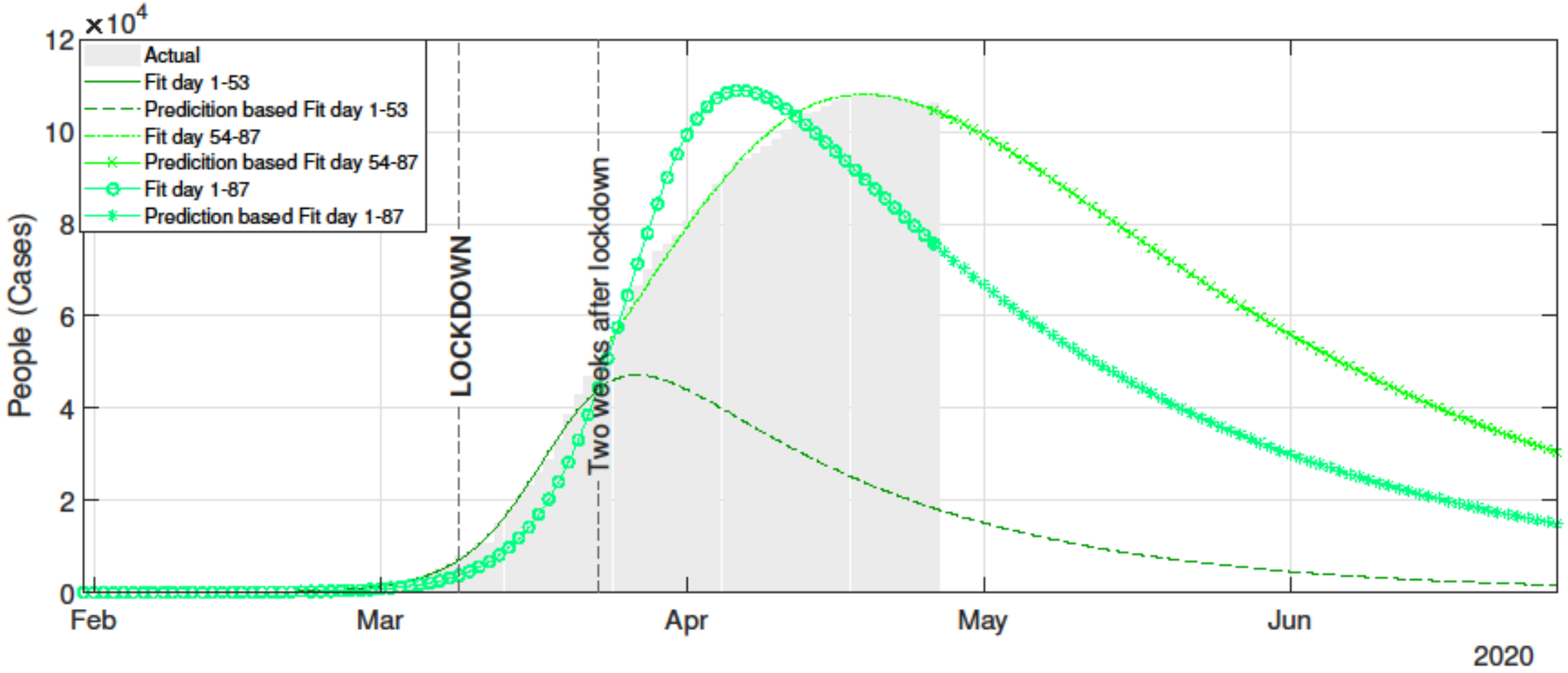
Reproduction number/Reproductive factor

$$\frac{dS}{dt} = -\beta \frac{SI}{N},$$
$$\frac{dI}{dt} = \beta \frac{SI}{N} - \gamma I = \gamma \left(R_t - 1\right) I,$$
$$\frac{dR}{dt} = \gamma I.$$

$$R_t = \frac{S}{N} R_0, \quad R_0 = \beta/\gamma.$$

Is this the actual reproduction number?

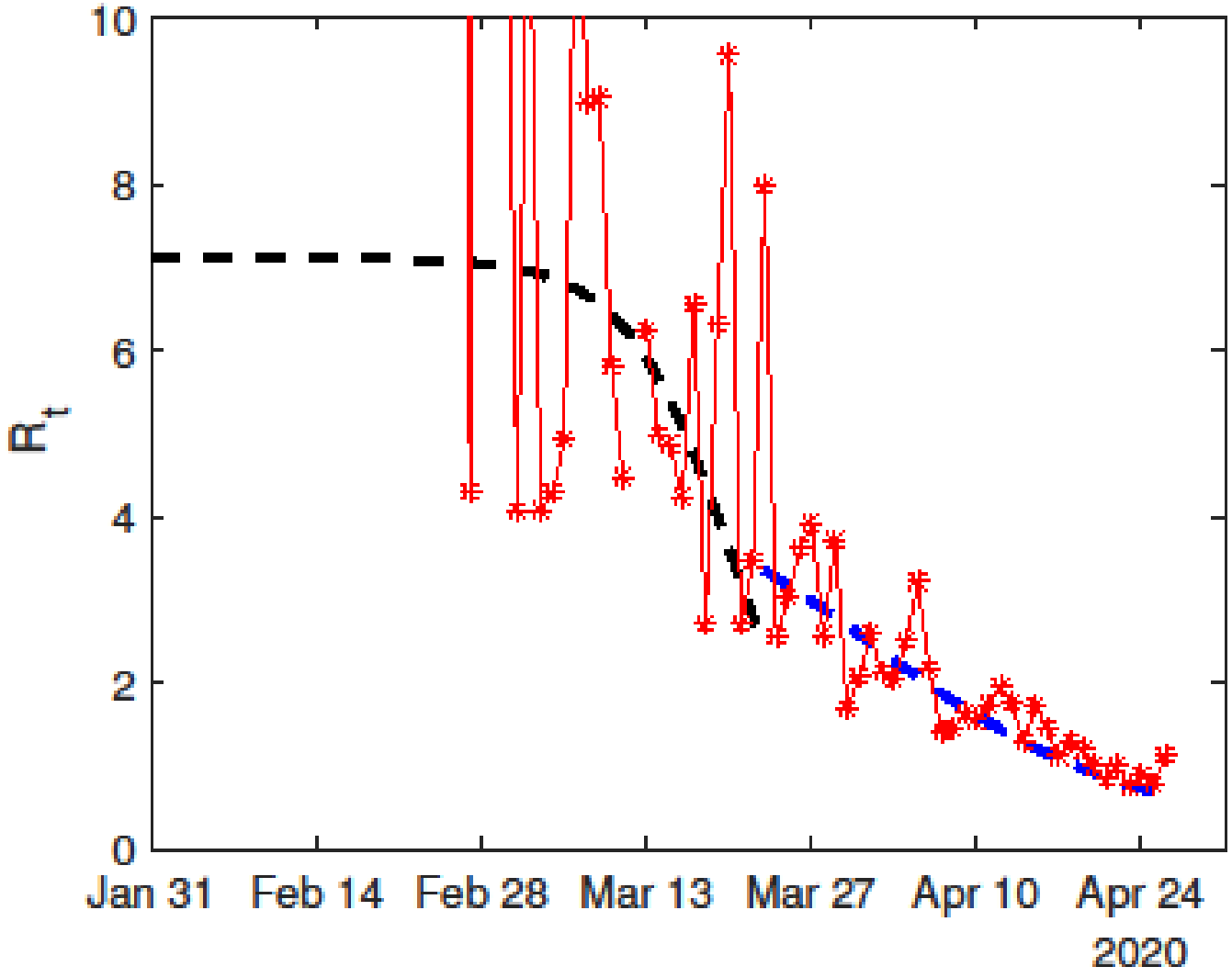
Metode 1: Parameter fit



Metode 2: Data Infected dan Removed

$$\beta_n = \frac{\Delta(I_n + R_n)}{\tau S_n I_n} N, \quad \gamma_n = \frac{\Delta R_n}{\tau I_n}.$$

$$R_t = \frac{S_n}{N} R_0 = 1 + \frac{\Delta I_n}{\Delta R_n}.$$


10
8
6
4
2
0
R_t
Jan 31
Feb 14
Feb 28
Mar 13
Mar 27
Apr 10
Apr 24
2020

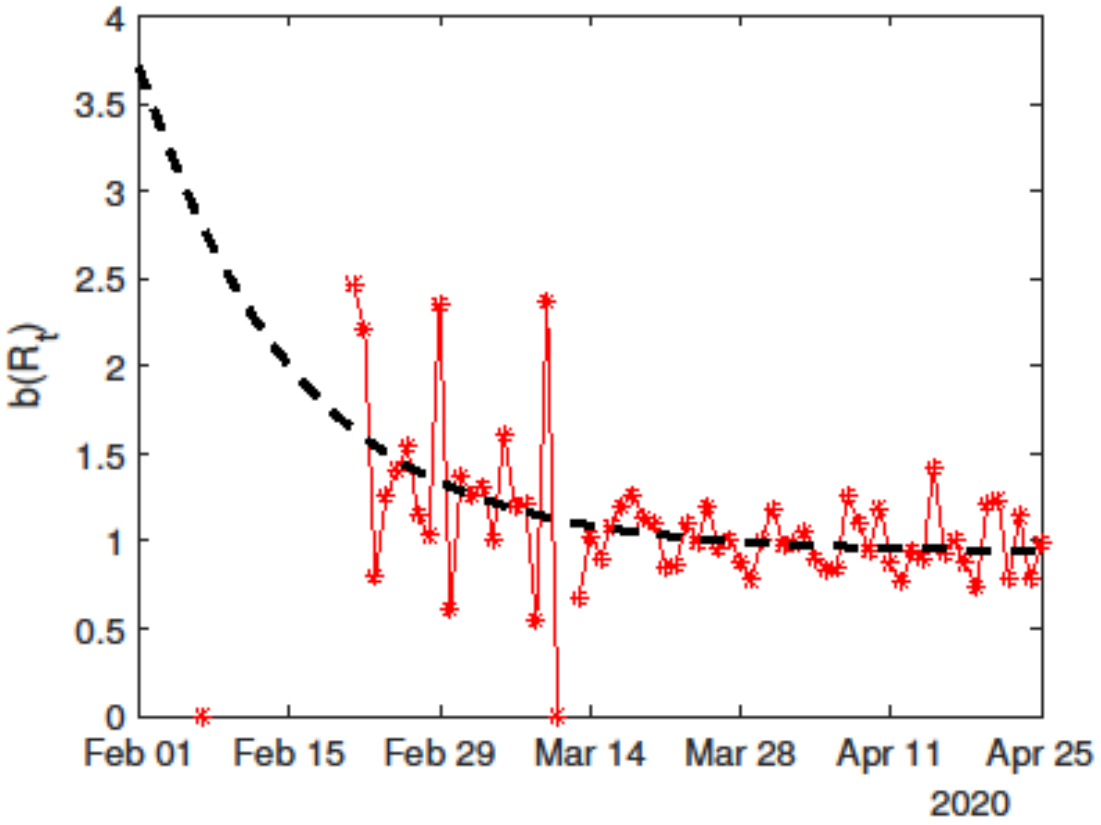
Metode 3: Data Kasus Baru

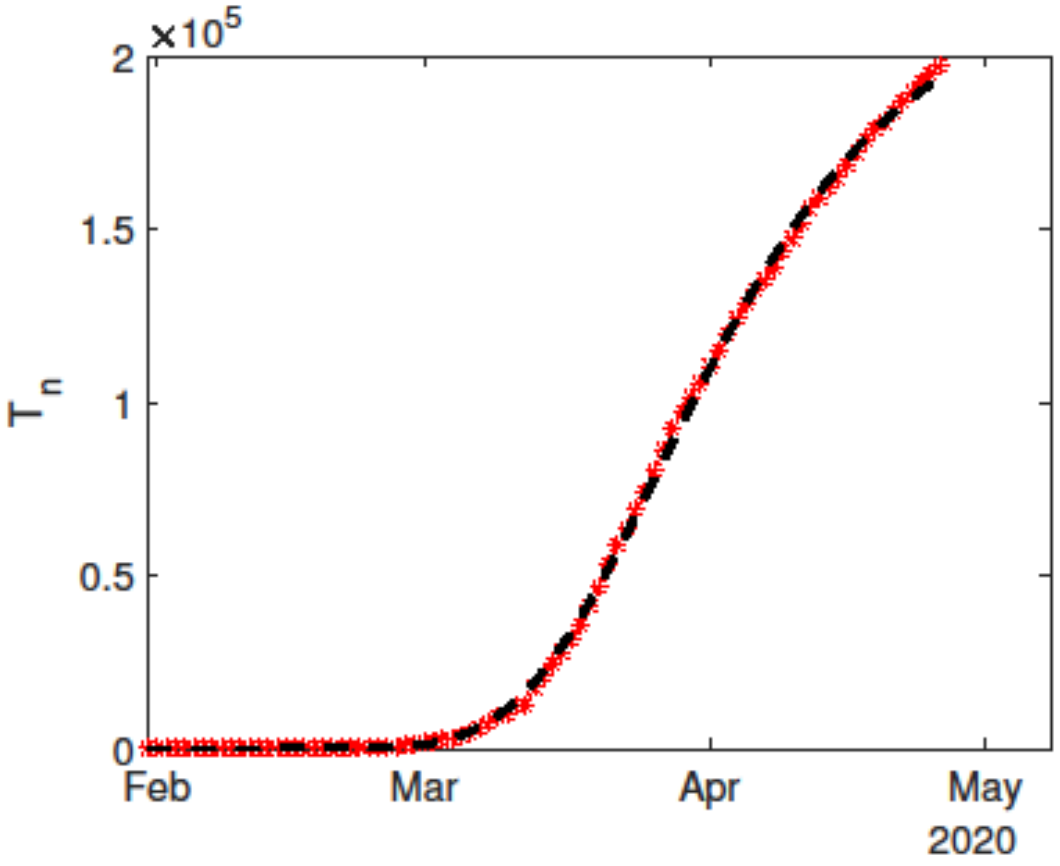
$$\frac{dI}{dt} = \beta \frac{SI}{N} - \gamma I = \gamma \left(R_t - 1 \right) I, \quad \text{Integrasikan untuk mendapatkan}$$

$$I_{n+1} = I_n e^{\gamma \int_t^{t+\tau} (R_t - 1) dt} \simeq I_n b(R_t), \quad b(R_t) = e^{\gamma \tau (R_t - 1)}.$$

$$\frac{dT}{dt} = \beta \frac{SI}{N}. \quad \Delta T_n = \tau \beta S_{n+1} I_{n+1} / N = \tau \beta S_{n+1} I_n b(R_t) / N \simeq \tau \beta S_n I_n b(R_t) / N.$$

$$= \Delta T_{n-1} \, b(R_t)$$


b(R_t)
4
3.5
3
2.5
2
1.5
1
0.5
0
Feb 01
Feb 15
Feb 29
Mar 14
Mar 28
Apr 11
Apr 25
2020


x10^5
2
1.5
1
0.5
0
T_n
Feb
Mar
Apr
May
2020

Kesimpulan

Mengikutkan randomness?!


σας ευχαριστώ
谢谢
ԱՒԱՒԱՐ
merci
teşekkür ederim
thank you
شكرا
danke
salamat
TERIMAKASIH
cảm ơn bạn
ขอขอบคุณคุณ
falemnderit
muchas gracias
obrigado
MATURNUWUN
nirringrazzjak
dank u
gratias
спасибо
감사합니다
grazie
ありがとう
go raibh maith agat
շնորհակալություն
dankie