



Universidade Federal do Ceará

Modelagem epidemiológica do COVID19 para o Estado do Ceará empregando o modelo SEIIR

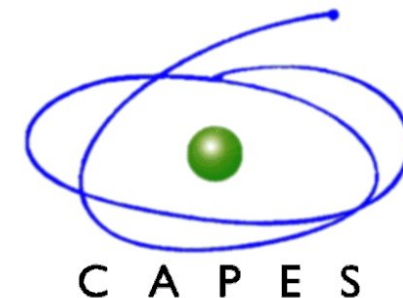
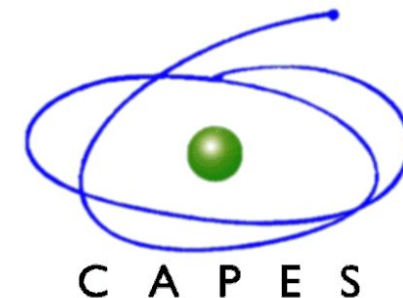
Equipe Cientista-Chefe de Dados (UFC & CAPP-IPECE):

José Soares de Andrade (UFC-Física)

Humberto Carmona (UFC-Física)

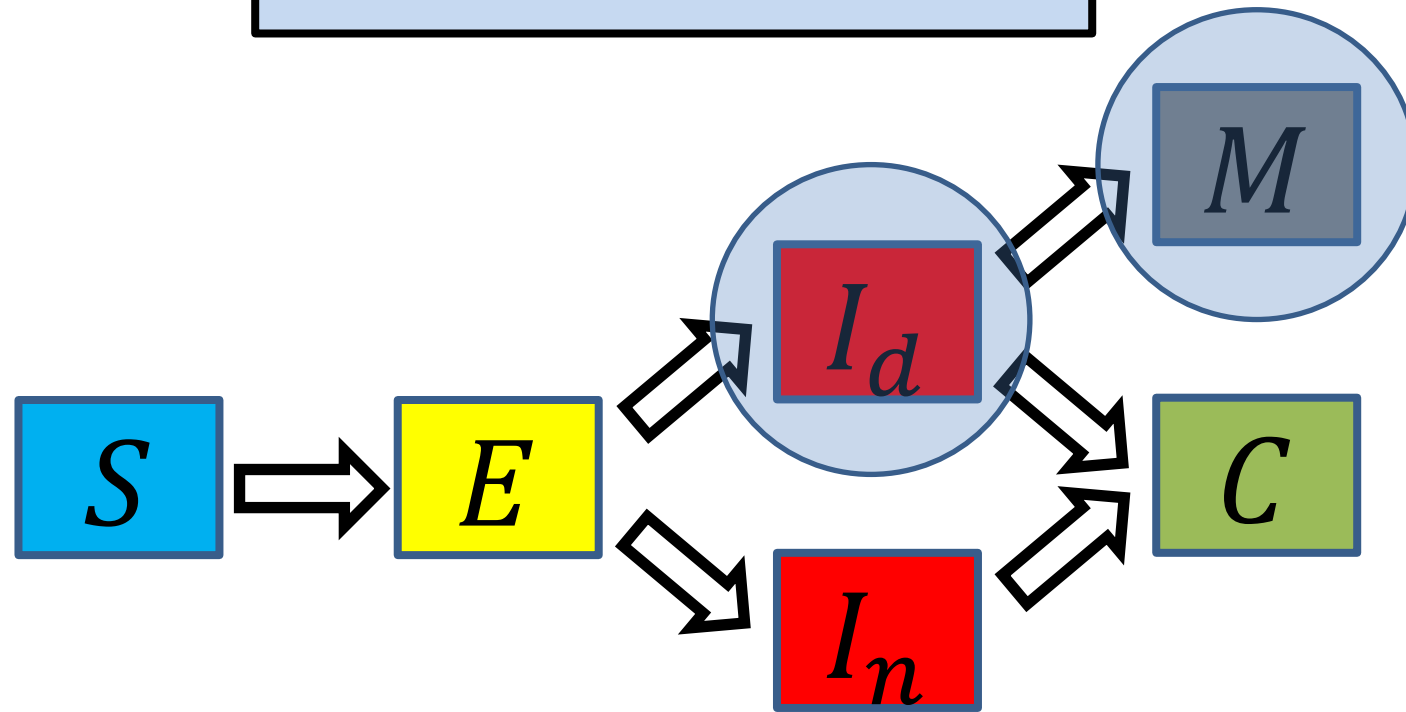
Rilder Pires (CAPP-IPECE-SEPLAG)

Saulo Reis (UFC-Física)



C A P E S

Modelo SEIIR



Categorias de Populações

S - suscetíveis

E - expostos

I_d - infectado documentados

I_n - infectado não-documentados

C - curados

M - óbitos

Equações Diferenciais Representativas

$$\frac{dS}{dt} = -\beta \frac{I_d}{N} S - \mu\beta \frac{I_n}{N} S$$

$$\frac{dE}{dt} = \beta \frac{I_d}{N} S + \mu\beta \frac{I_n}{N} S - \frac{E}{Z}$$

$$\frac{dI_d}{dt} = \alpha \frac{E}{Z} - \frac{I_d}{D} - \gamma I_d$$

$$\frac{dI_n}{dt} = (1 - \alpha) \frac{E}{Z} - \frac{I_n}{D}$$

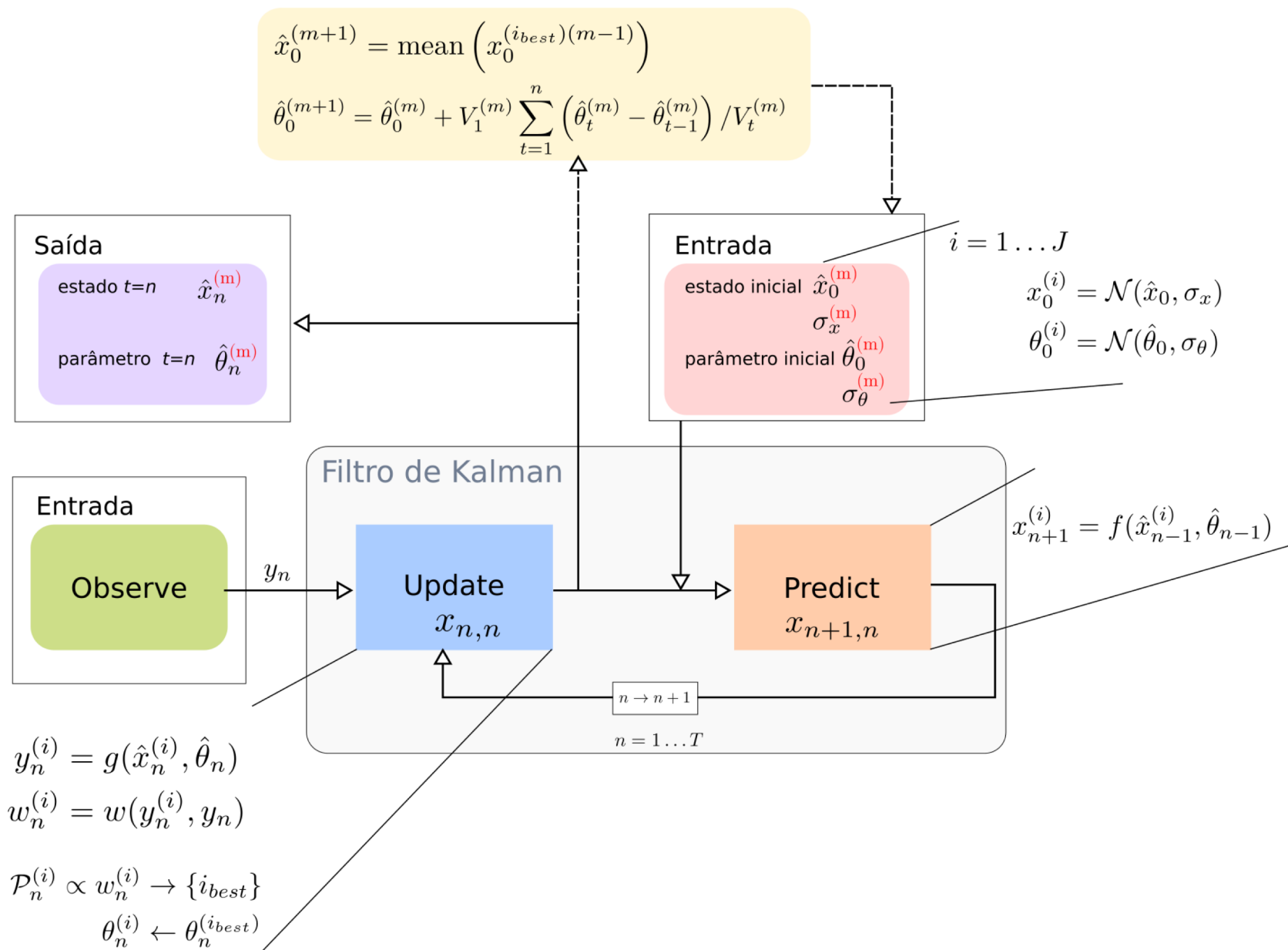
$$\frac{dC}{dt} = \frac{I_d}{D} + \frac{I_n}{D}$$

$$\frac{dM}{dt} = \gamma I_d$$

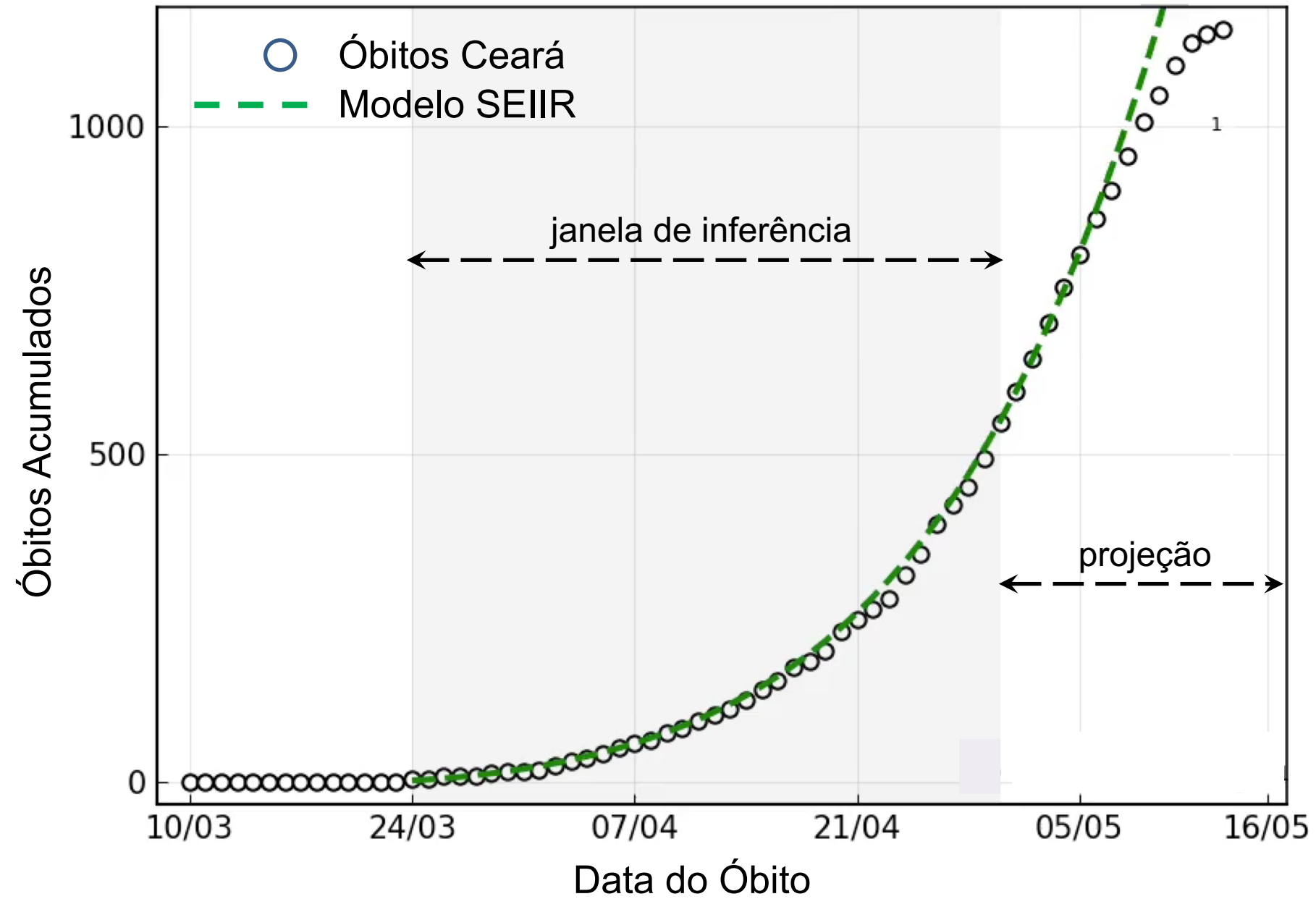
Inferência Bayesiana

Estimativa de Máxima Verossimilhança com Filtro de Kalman

Ionides *et al.*, PNAS 103, 18438 (2006)



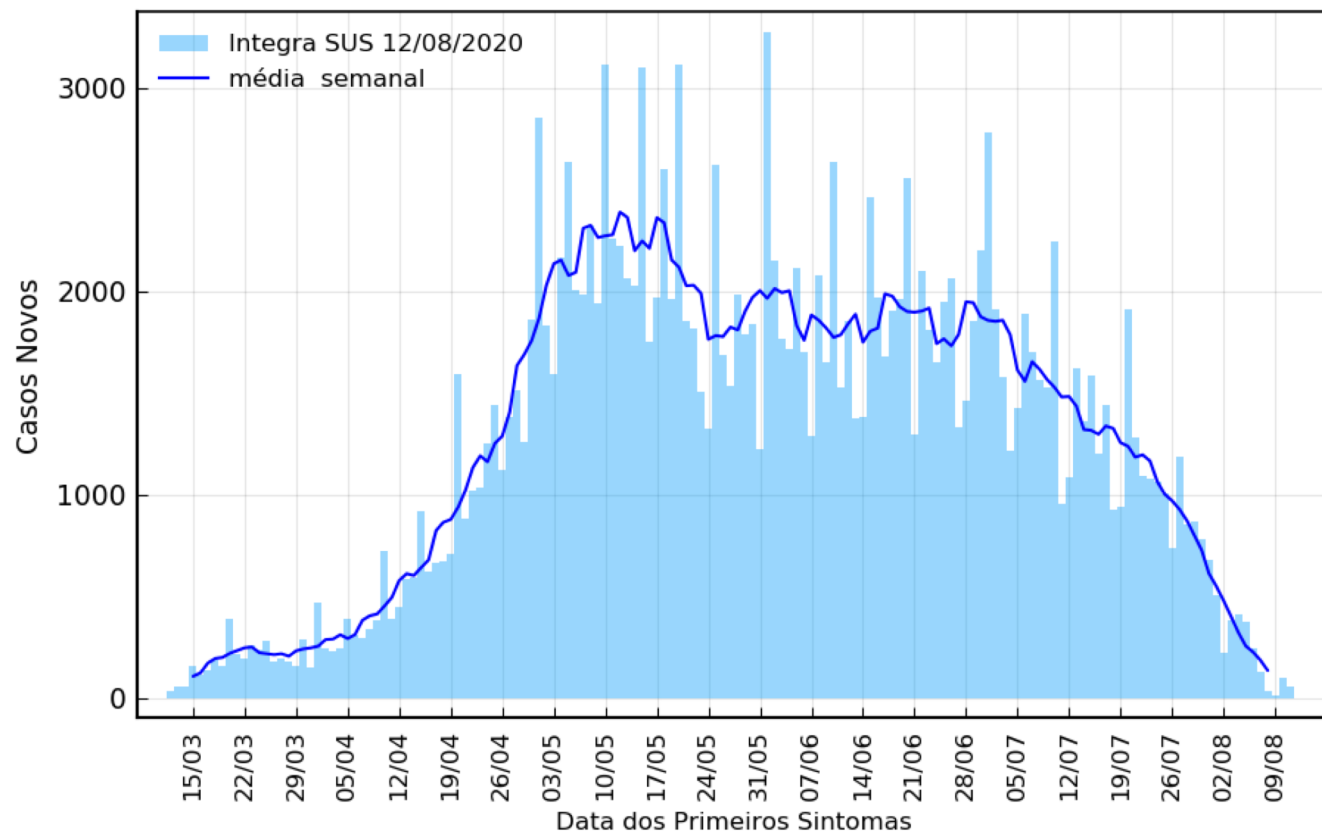
Ceará – Inferência Pré-lockdown



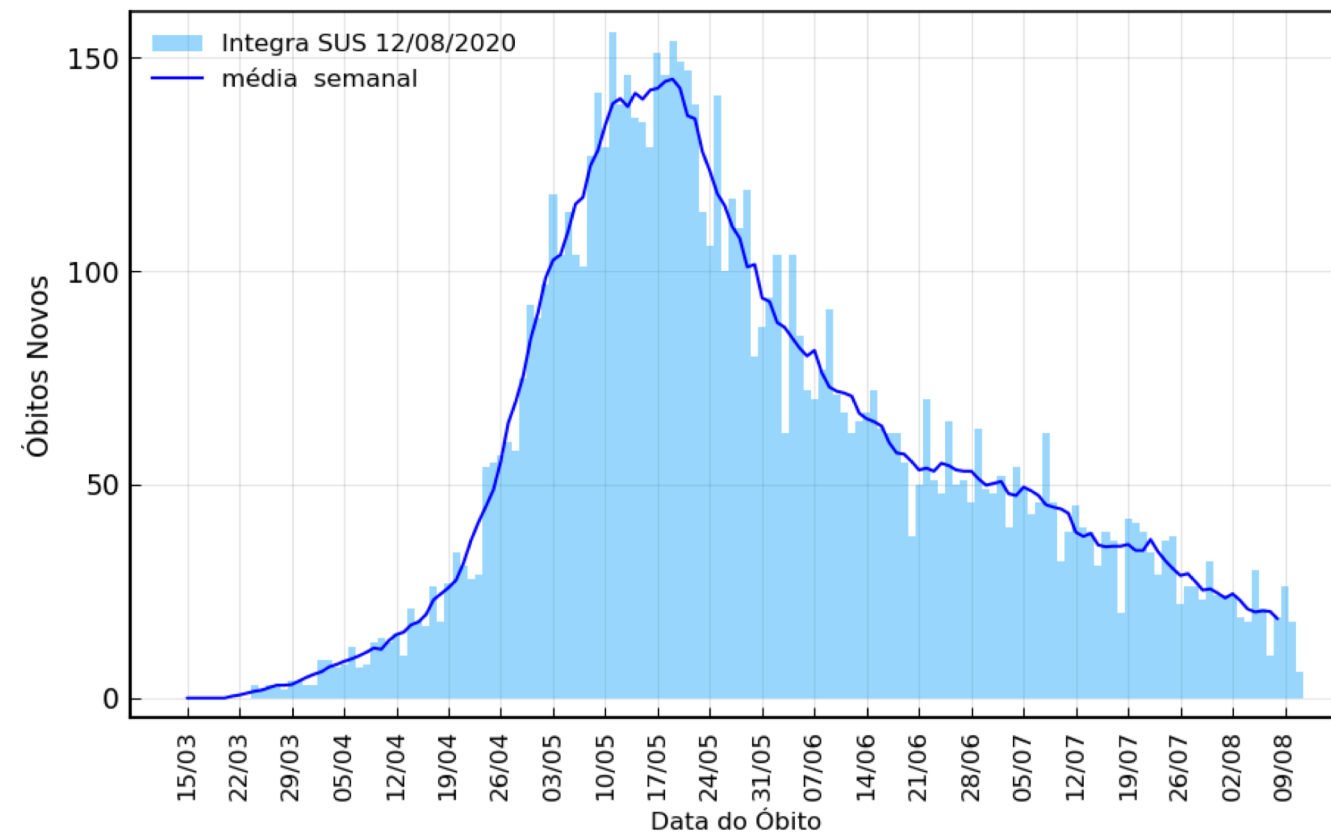
Ceará

Dados atualizados em 12/08/2020

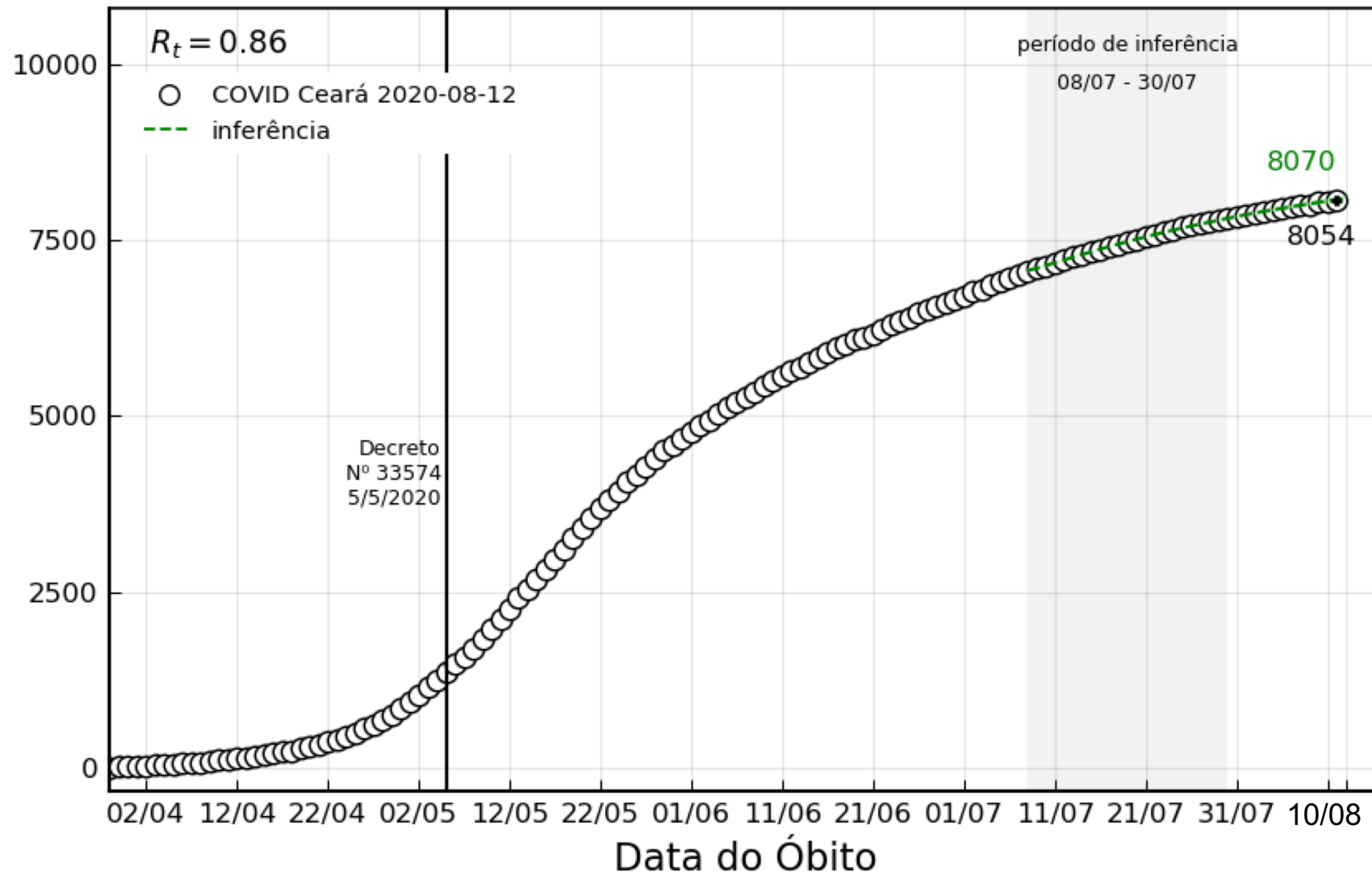
Ceará



Ceará



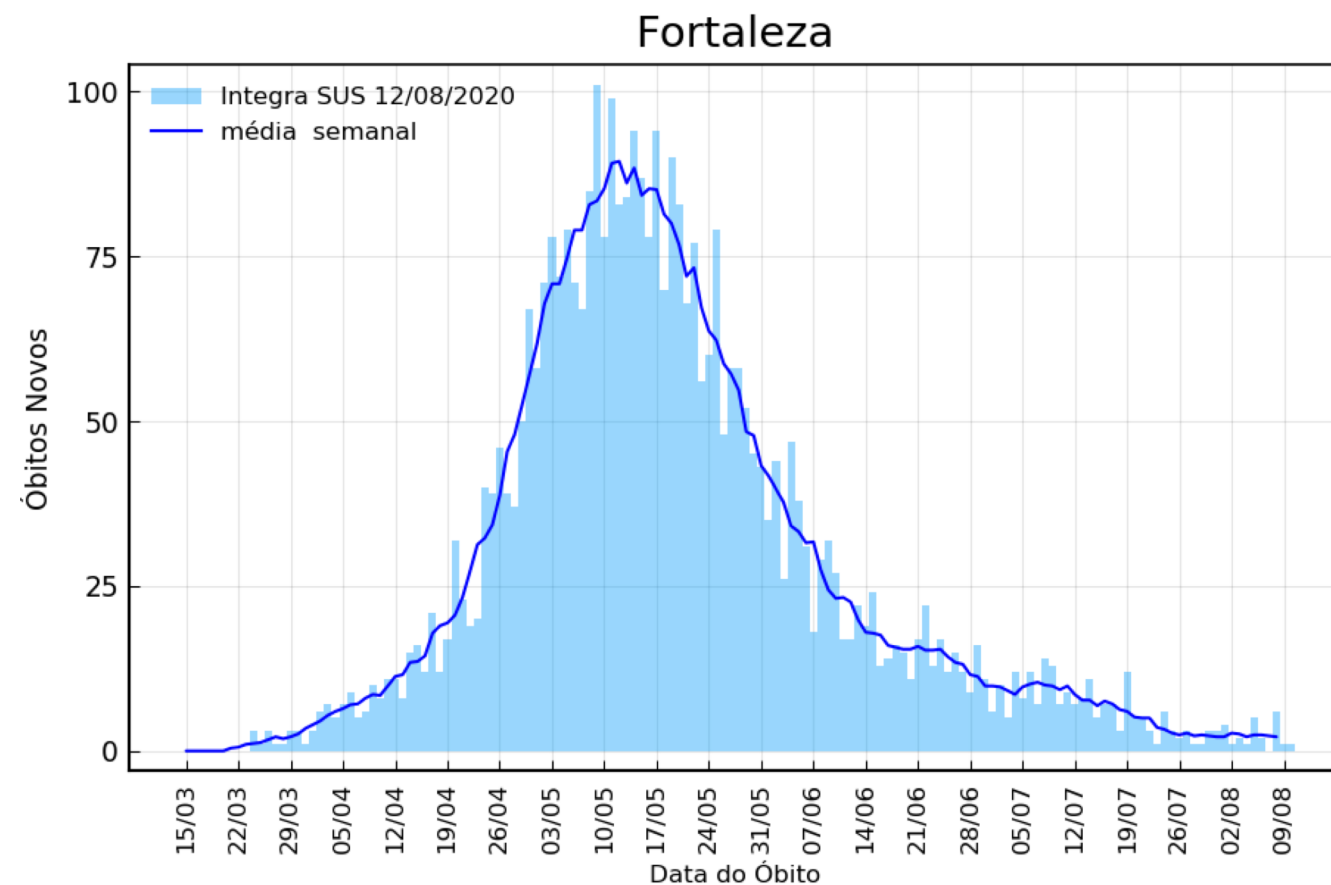
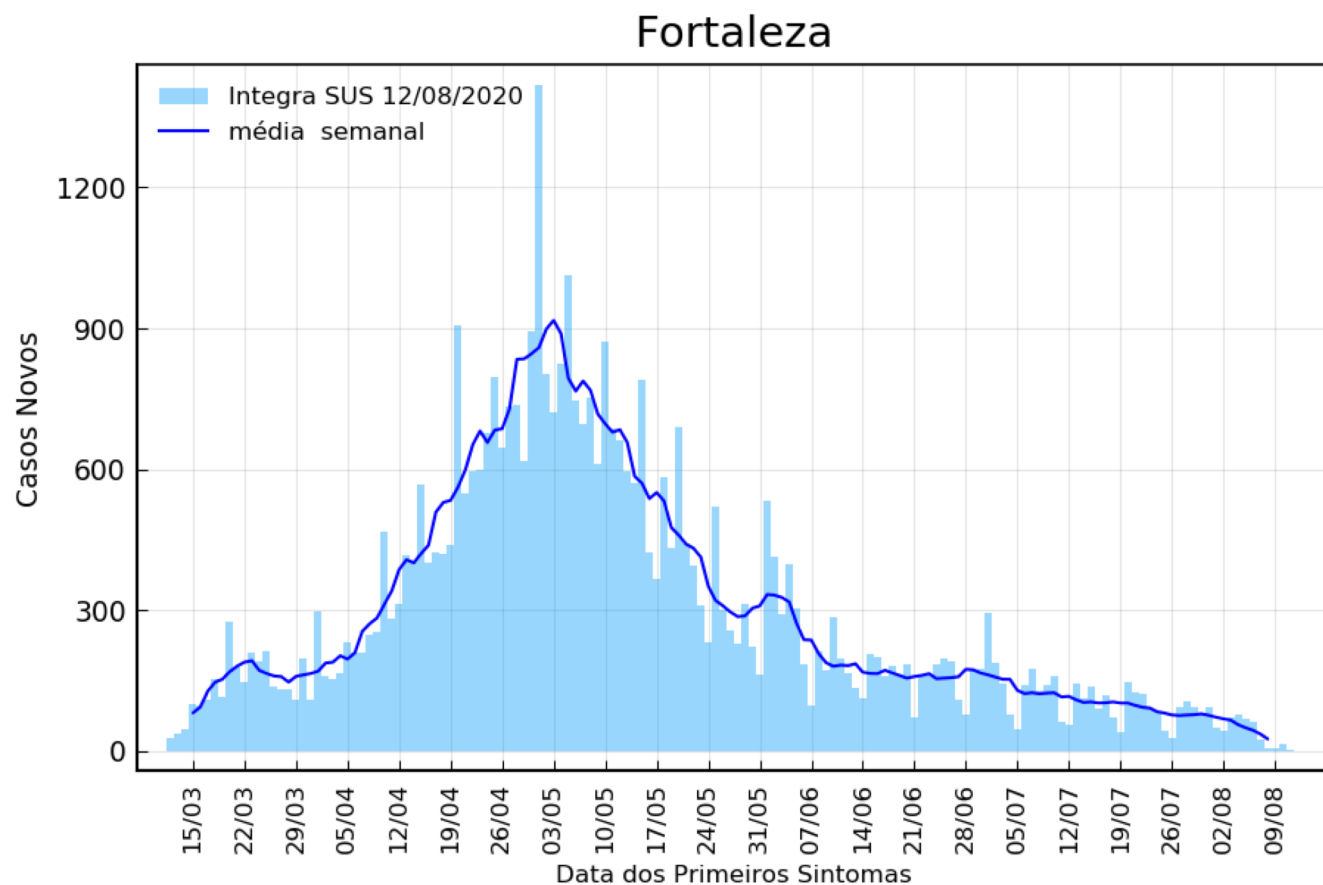
Ceará



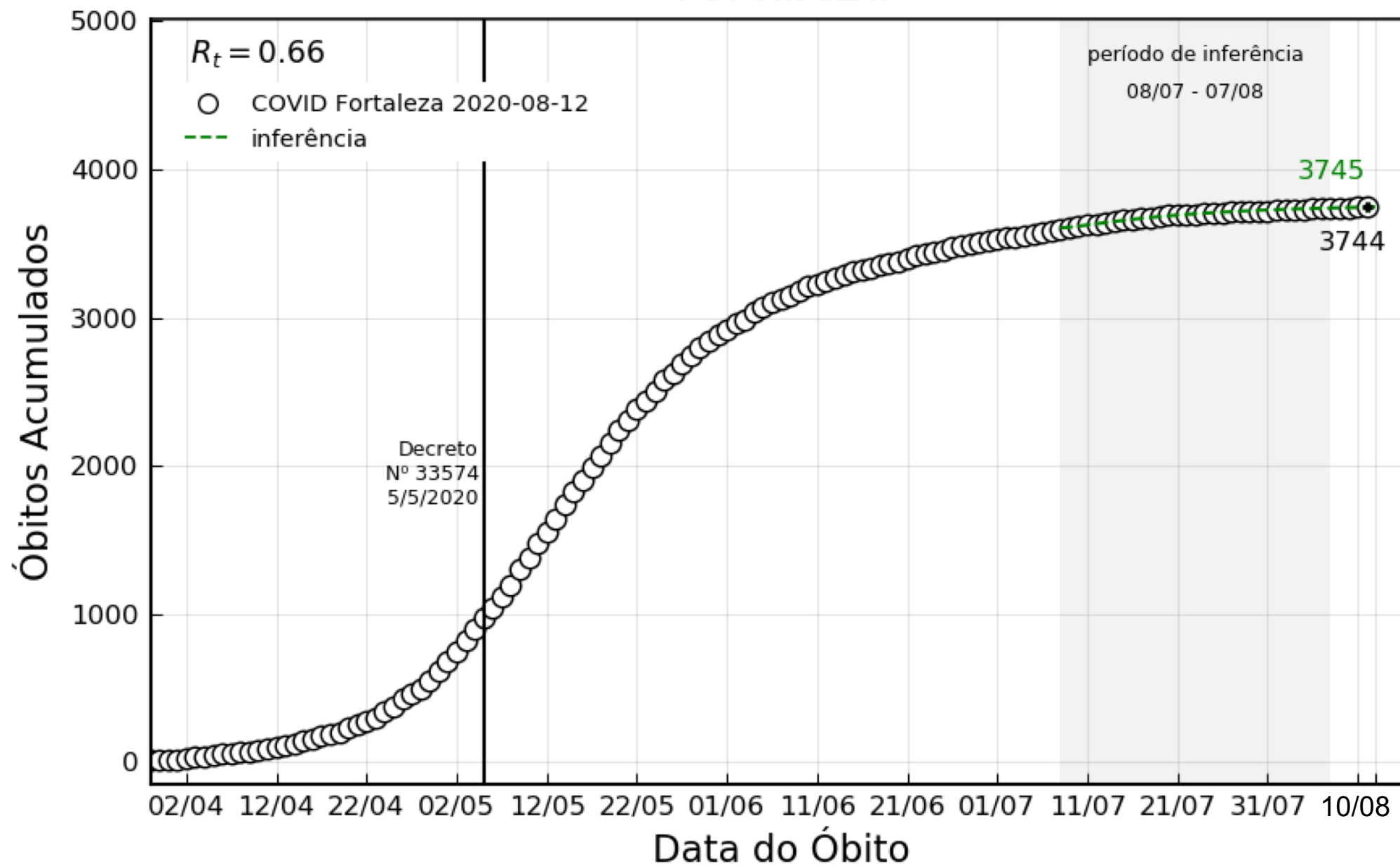
Janela de Inferência	R_t
05/05 – 31/05	0.89
12/05 – 12/06	0.80
22/05 – 17/06	0.81
01/06 – 27/06	0.85
01/06 – 06/07	0.88
15/06 – 13/07	0.89
22/06 - 20/07	0.89
29/06 – 27/07	0.87
08/07 – 30/07	0.86

Fortaleza

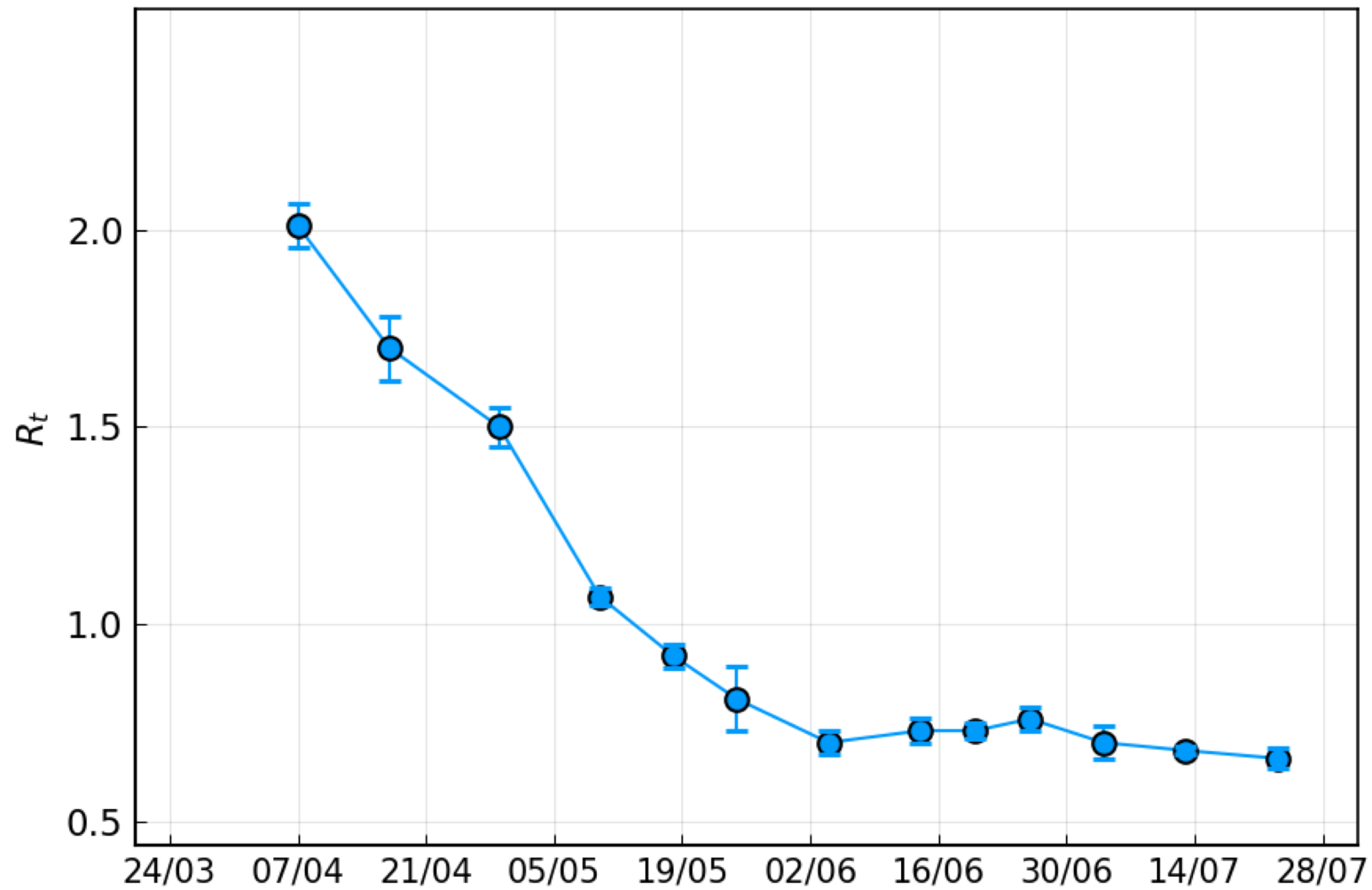
Dados atualizados em 12/08/2020



Fortaleza



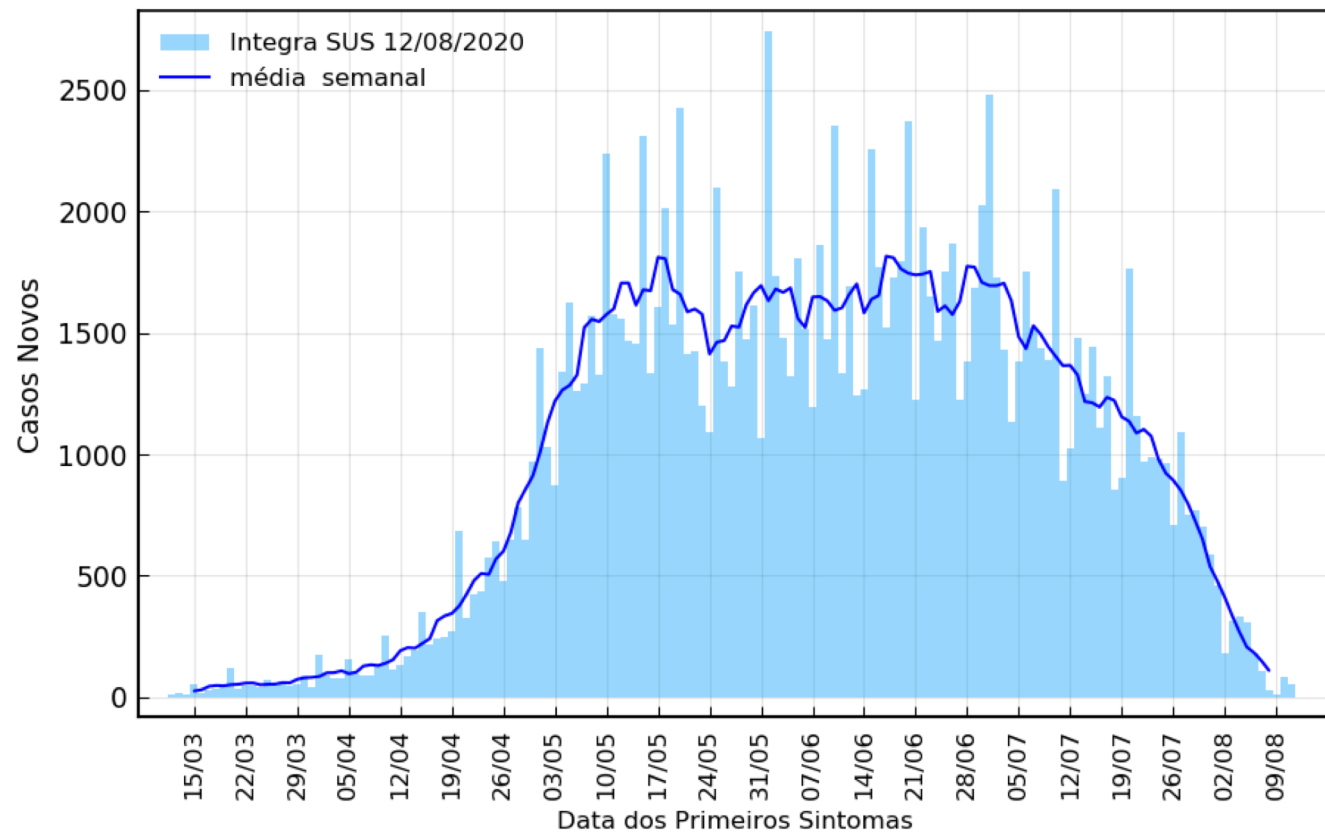
Fortaleza



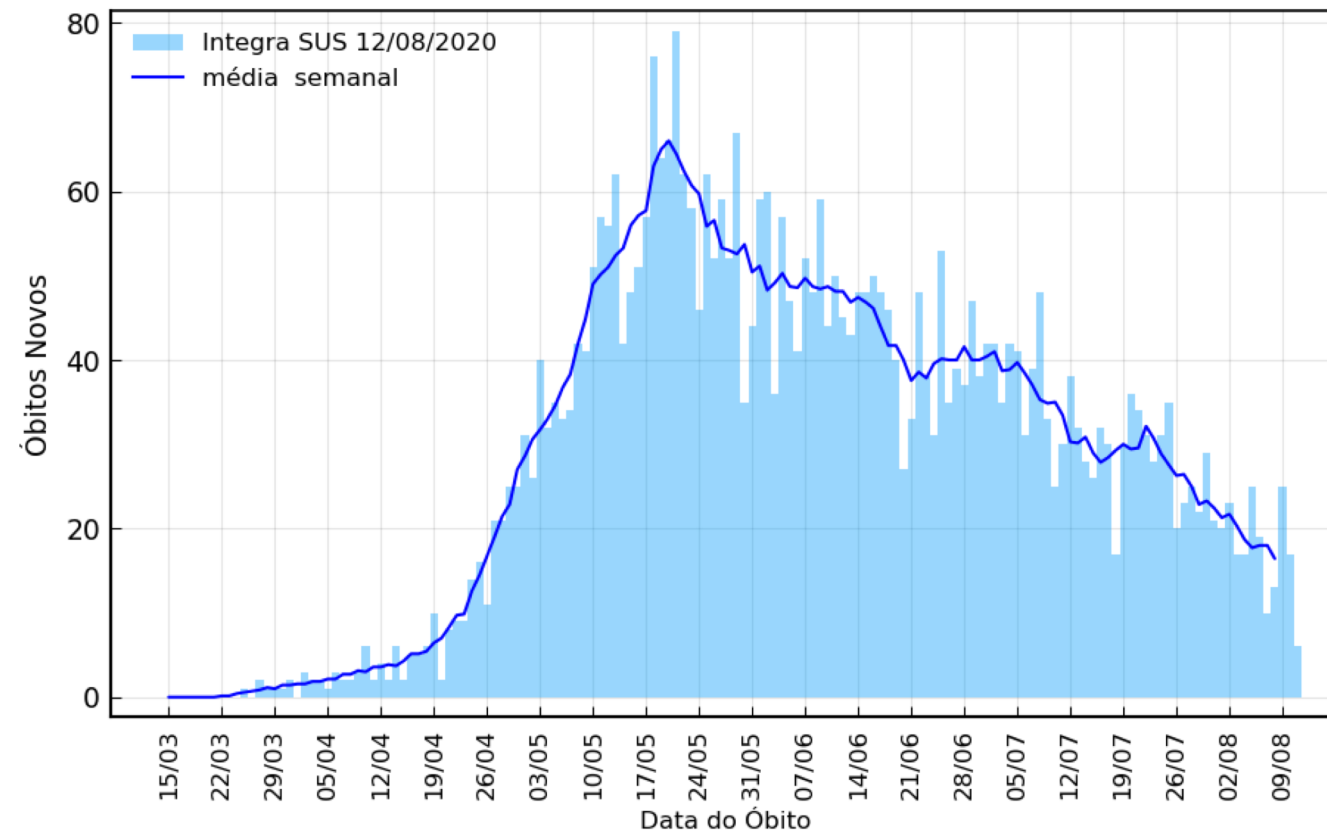
Interior

Dados atualizados em 12/08/2020

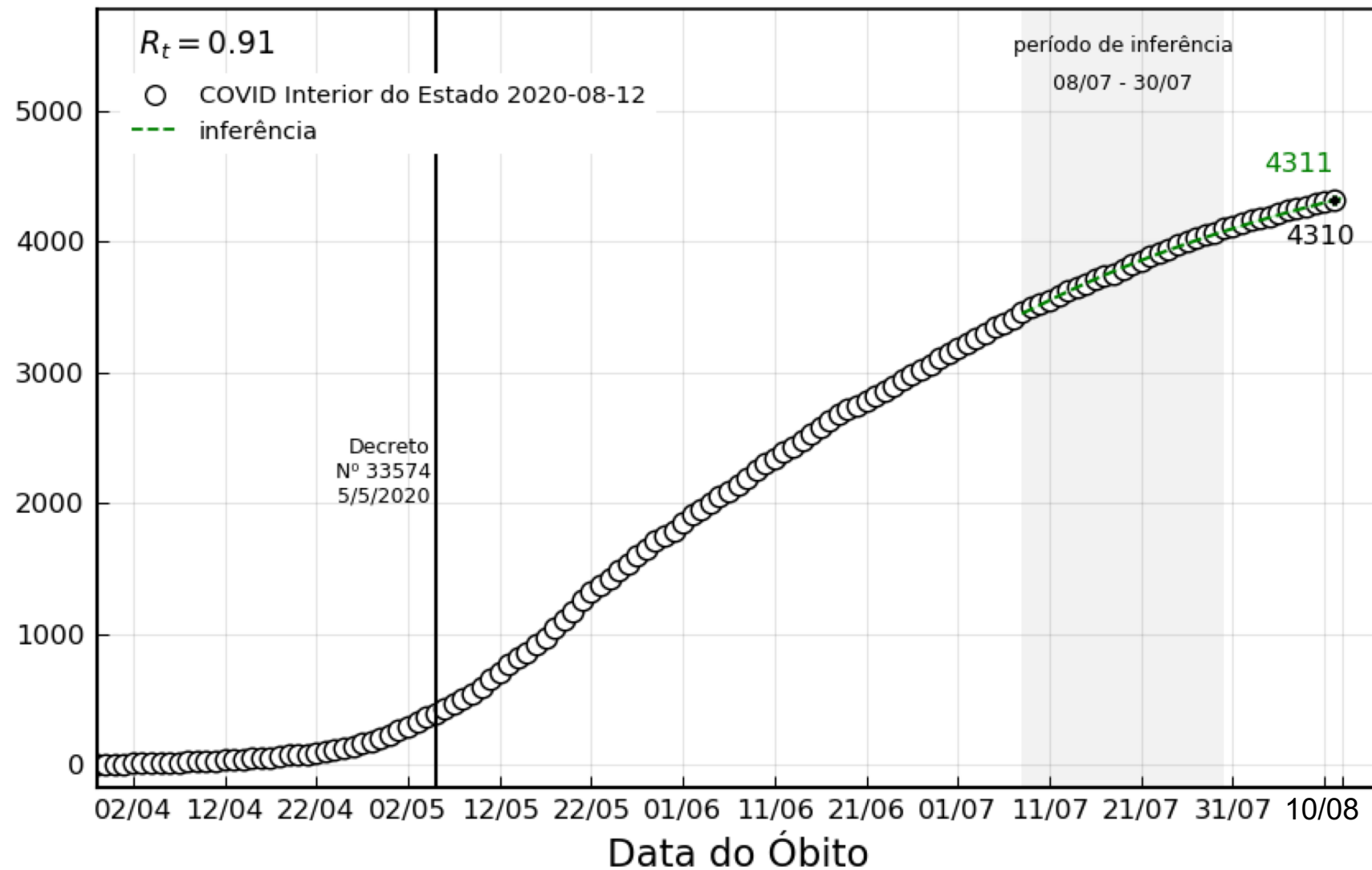
Interior do Estado



Interior do Estado



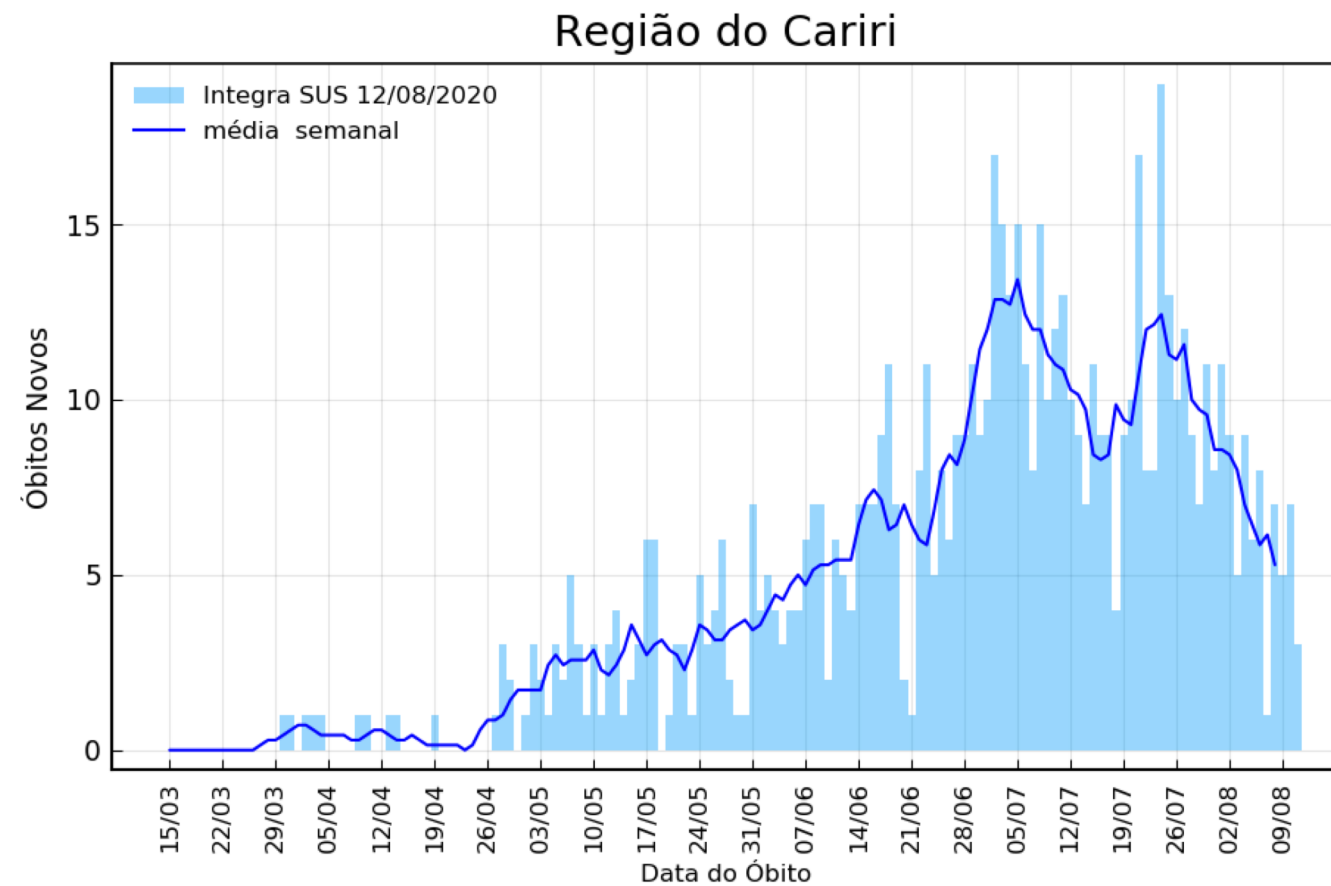
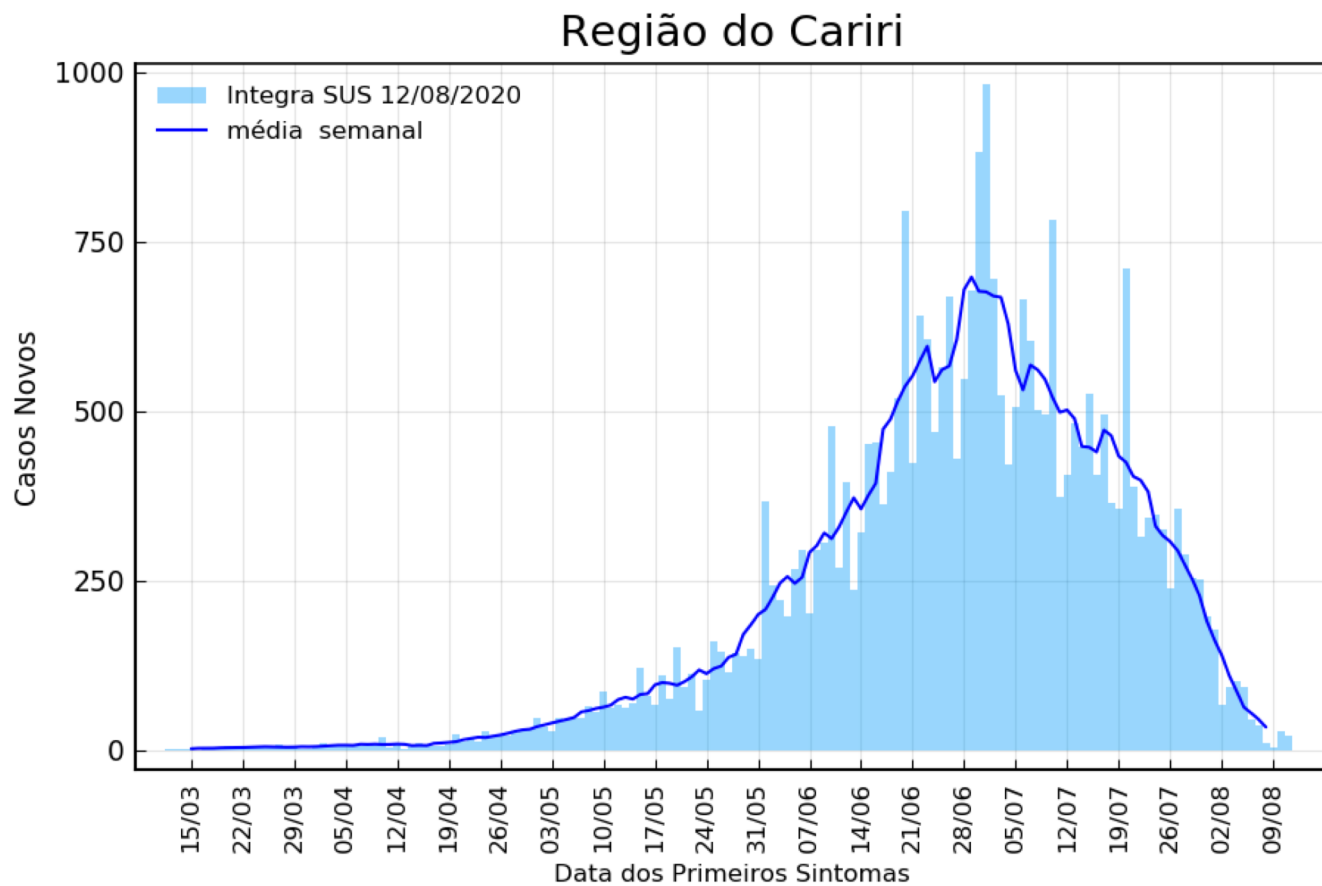
Interior do Estado



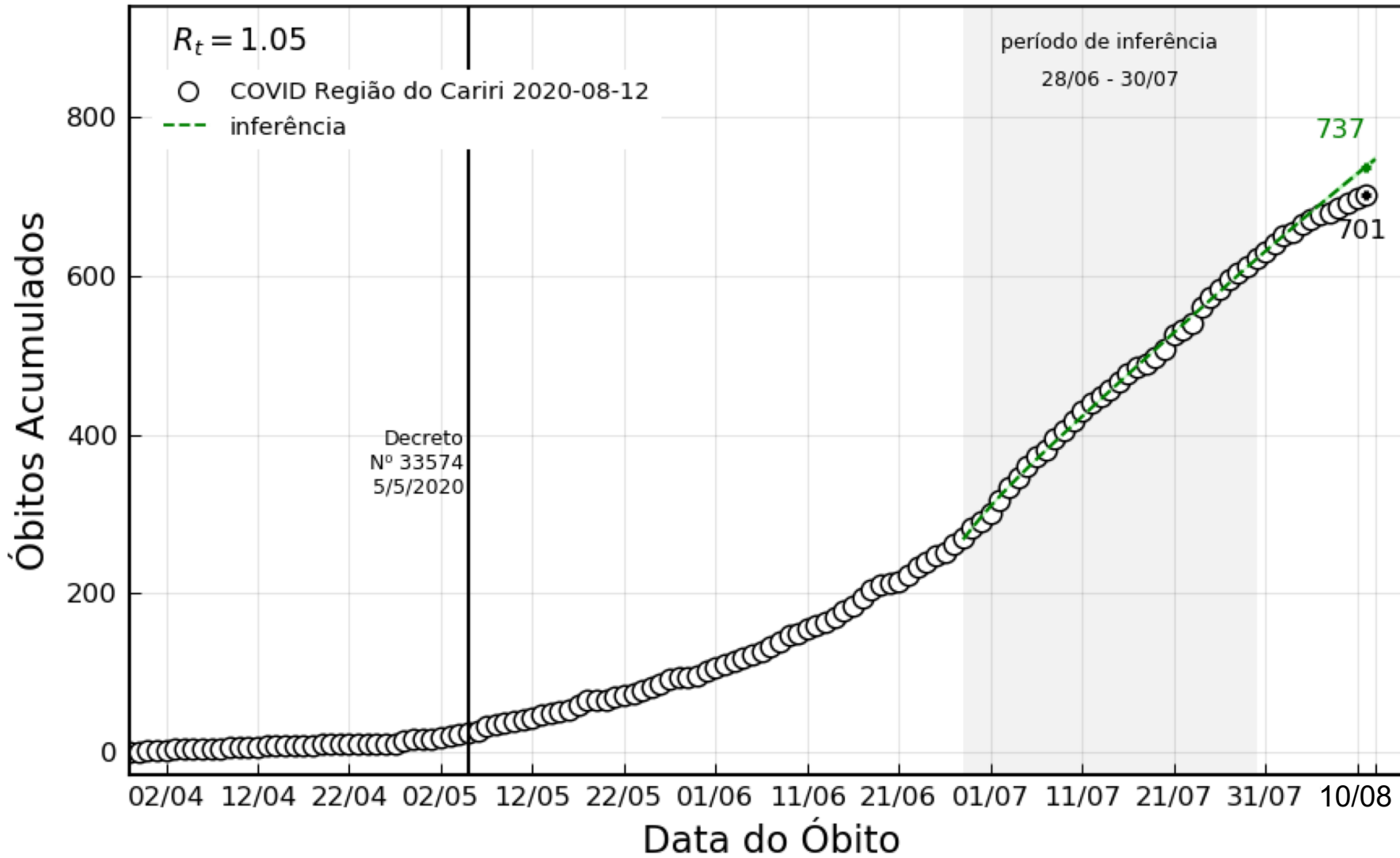
Janela de Inferência	R_t
01/06 – 27/06	0.90
08/06 – 06/07	0.93
15/05 – 13/07	0.98
22/06 – 20/07	0.84
29/06 – 27/07	0.90
08/07 – 30/07	0.91

Cariri

Dados atualizados em 12/08/2020



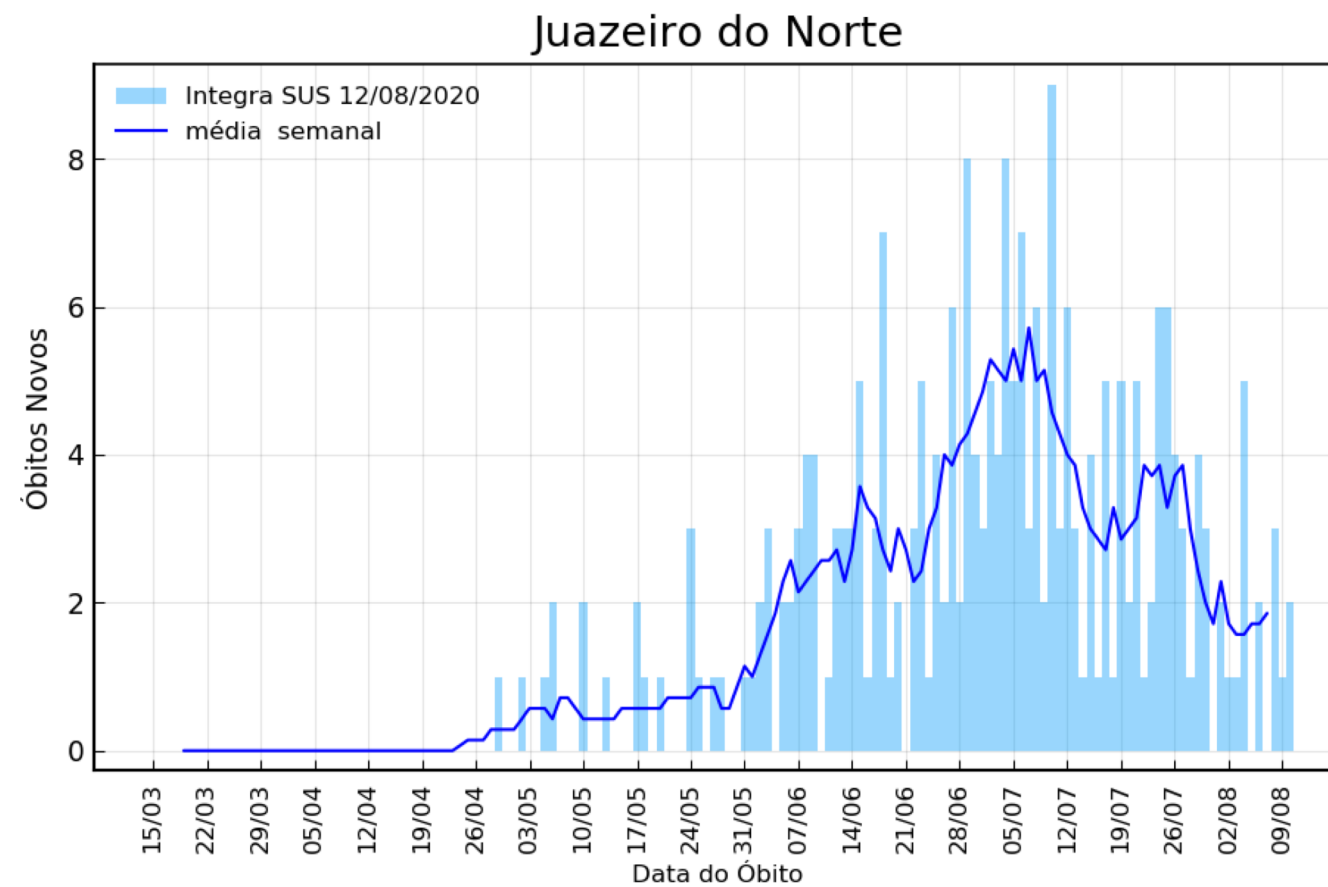
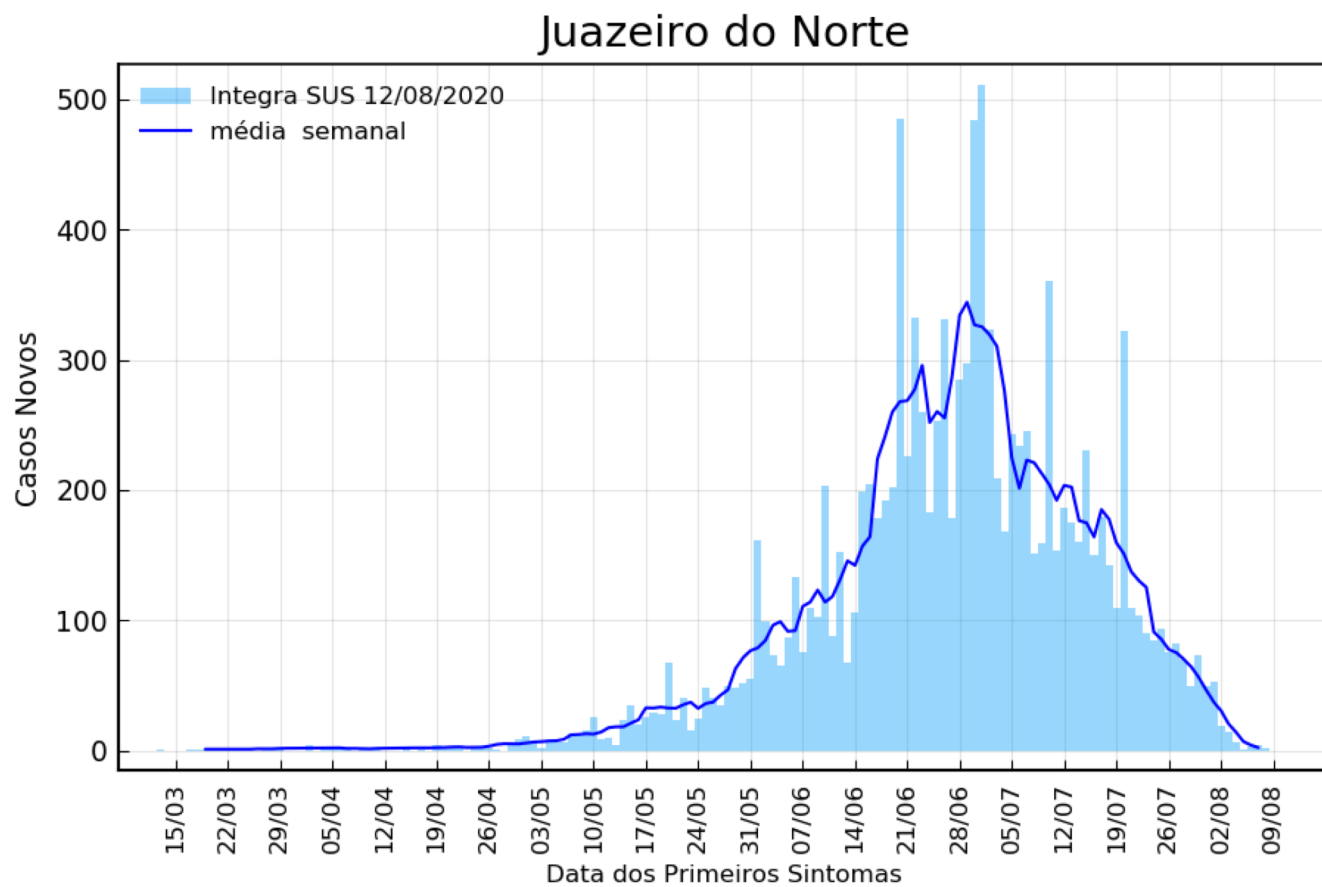
Região do Cariri



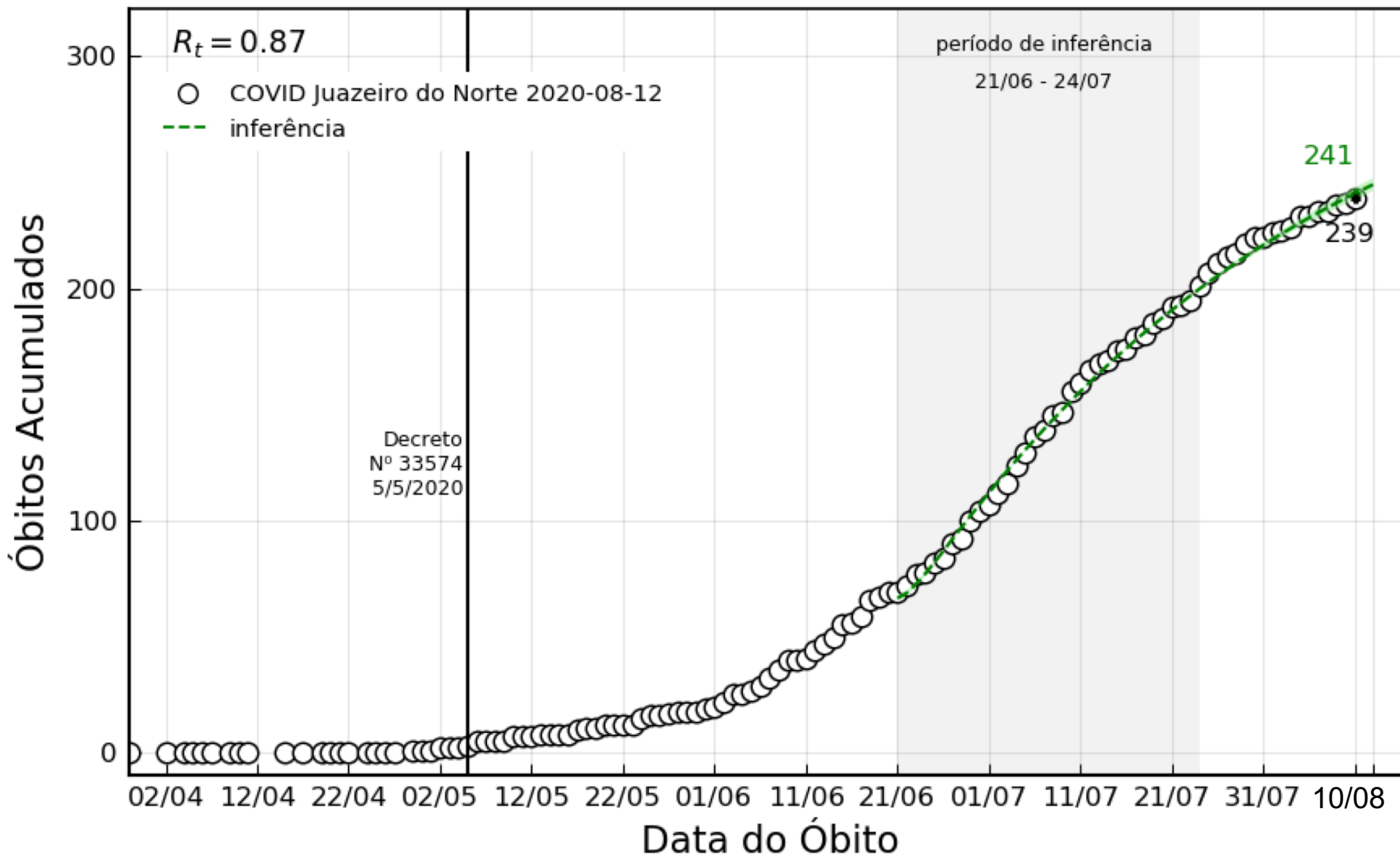
Janela de Inferência	R_t
01/05 – 10/06 (casos)	1.35
01/06 – 05/07 (óbitos)	1.25
07/06 – 11/07 (óbitos)	1.23
14/06 – 18/07 (óbitos)	1.12
21/06 – 25/07 (óbitos)	1.02
28/06 – 30/07 (óbitos)	1.05

Juazeiro do Norte

Dados atualizados em 12/08/2020



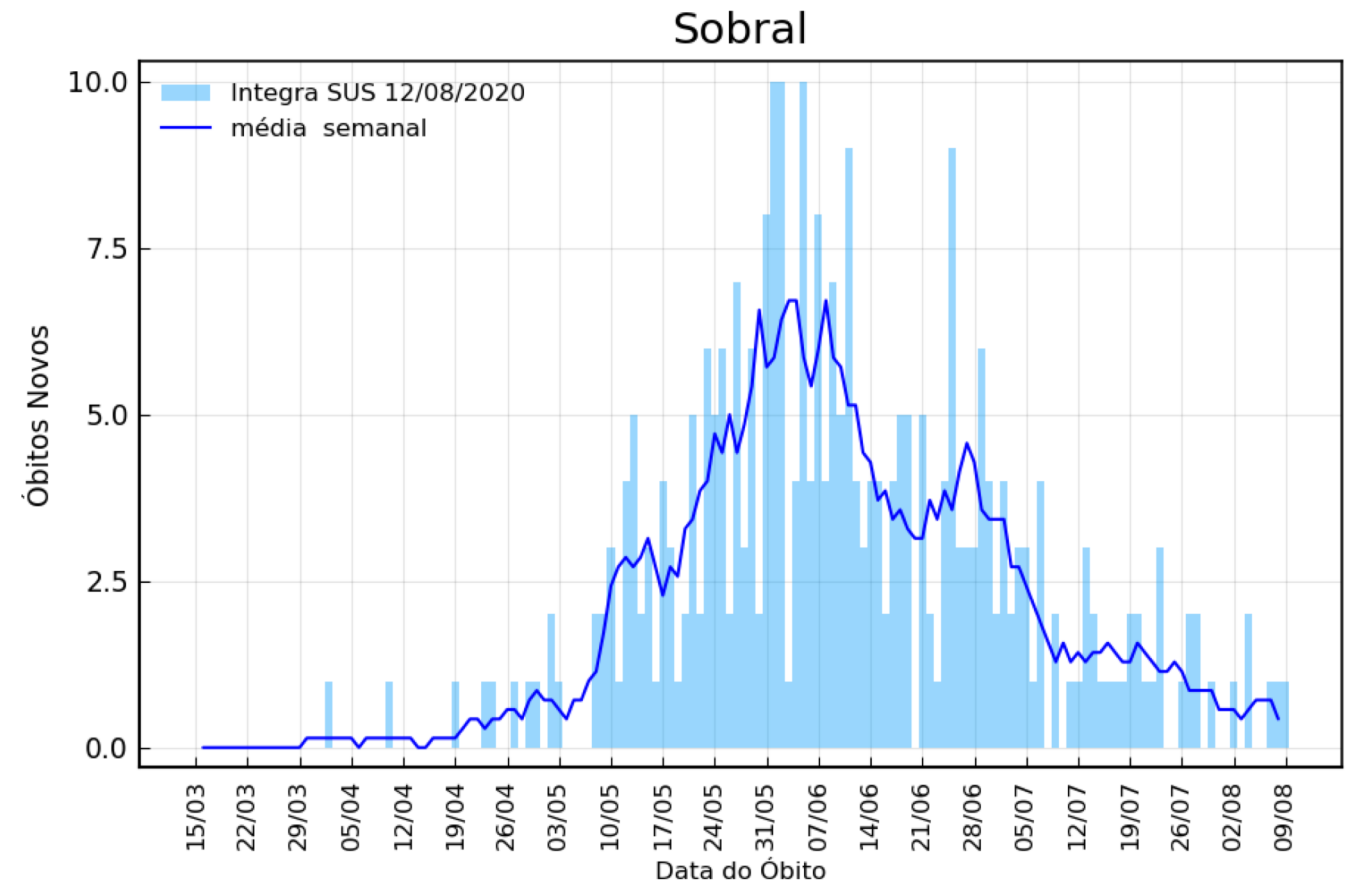
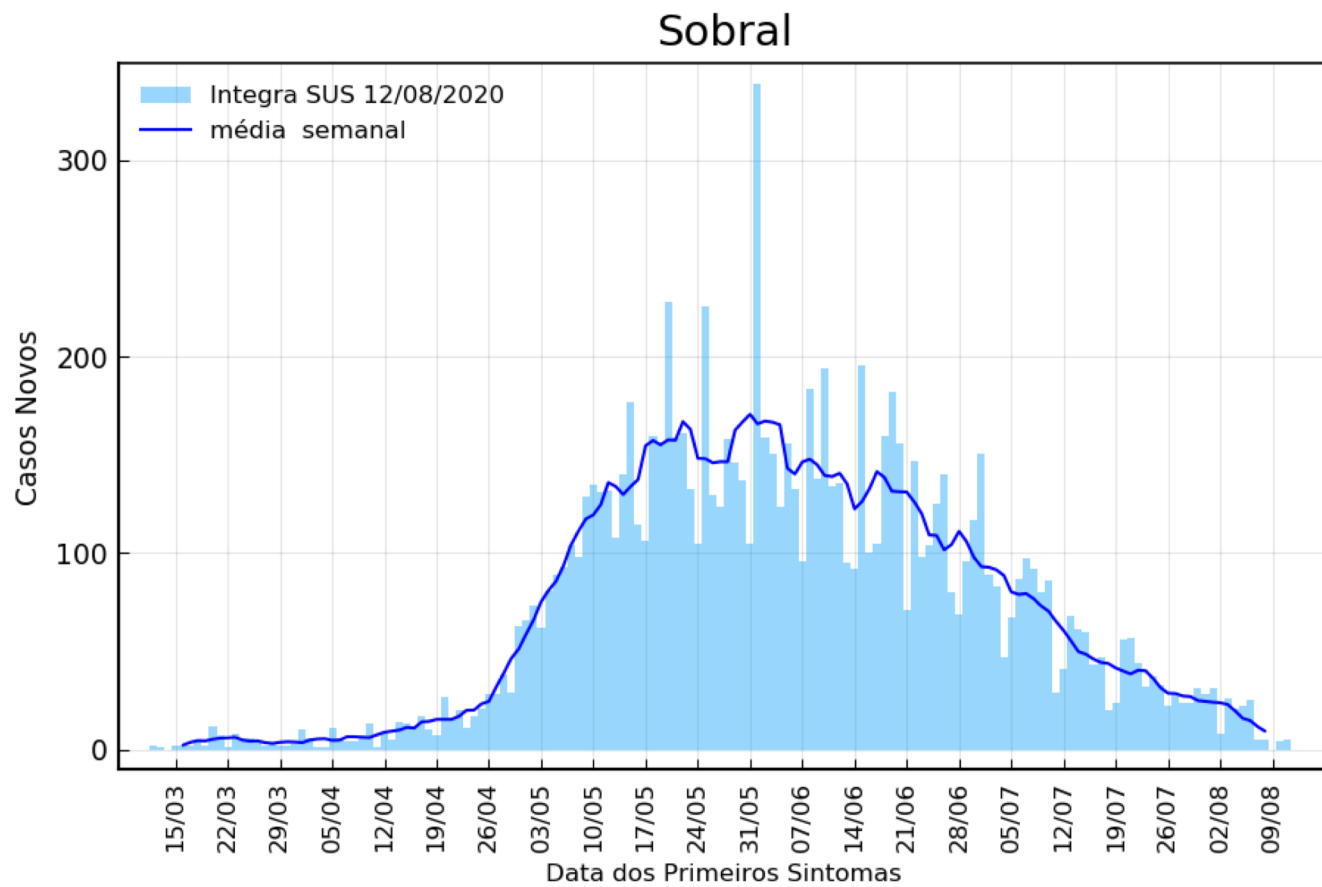
Juazeiro do Norte



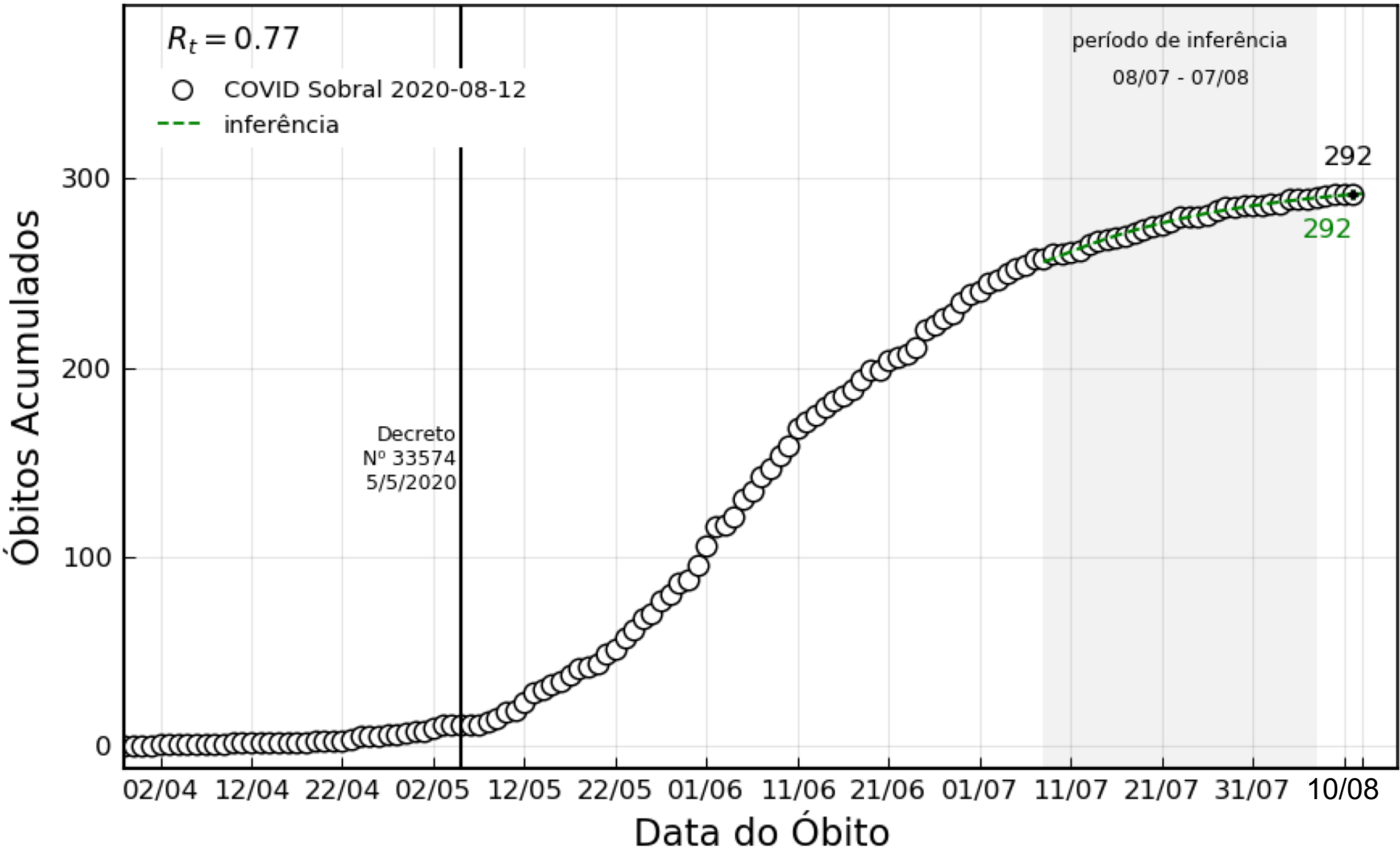
Janela de Inferência	R_t
20/05 – 19/06	1.45
01/06 – 30/06	1.27
07/06 – 10/07	1.19
14/06 – 17/07	1.04
21/06 – 24/07	0.87

Sobral

Dados atualizados em 12/08/2020



Sobral



Janela de Inferência	R_t
27/05 – 26/06	0.94
08/06 – 06/07	0.96
15/06 – 13/07	0.91
22/06 – 20/07	0.75
01/07 – 31/07	0.75
08/07 – 07/08	0.77