COVID19_30_04_estados

April 30, 2020

1 Dados COVID19 em .ipynb 30/04/2020

Estou tentando importar e utilizar os dados do Ministério da Saúde em https://covid.saude.org.br para avaliar a situação divulgada oficialmente pelo MS; A url muda diariamente, há uma série de caracteres em primeira vista aleatórios que é atualizada também todo dia... como puxar o arquivo csv automaticamente?

O site não disponibiliza dados de SRAG, apenas uma tabela repetida e desatualizada do COVID19.

Nova tabela com dados do Brasil (população)

Dados de SRAG da fiocruz estão no padrão brasileiro (109,0009) como transformar o arquivo em padrão americano/internacional (109.0009) automaticamente pela URL?

1.1 Gráficos dos Dados

Mostrar infectados e mortes confirmados diariamente
Mostrar infectados e mortes confirmados acumulados
Mostrar dados separados por região e por estado

Mostrar dados de SRAG e comparar com o aumento dos números confirmados de COVID
Dados em semana epidemiológica

1.2 Estimativas (Regressão)

Estimar próximos números (até 7 dias?) utilizando 3 dias anteriores e regressão não linear

Estimar curvas com ajuda dos dados de SRAG inconclusivos (qual a porcentagem de testes incompletos espera-se que serão confirmados)

1.3 Modelo de Contágio

Utilizar dados adquiridos para rodar um modelo epidemiológico que

utiliza valores de reprodução base e evolução da COVID-19, causada pelo vírus SARS-COV-2

1.4 Creating the base of the code

[1]:
```
import pandas as pd
import numpy as np
from datetime import datetime,timedelta
from sklearn.metrics import mean_squared_error
from scipy.stats import norm
from scipy.optimize import curve_fit
from scipy.optimize import fsolve
import matplotlib.pyplot as plt
%matplotlib inline

# Databases

url_B = "https://raw.githubusercontent.com/Yannngn/COVID19-04-20/master/brasil.
 ↪csv"
url_C = "https://mobileapps.saude.gov.br/esus-vepi/files/
 ↪unAFkcaNDeXajurGB7LChj8SgQYS2ptm/
 ↪1d2b944e065c7304b2754cc386635e38_Download_COVID19_20200430.csv"
```

[2]:
```
brasil = pd.read_csv(url_B, sep = ';')
df = pd.read_csv(url_C, sep = ";")
```

[3]:
```
FMT = '%Y-%m-%d'

date = df['data']
regi = df['regiao']

df['data'] = date.map(lambda x : (datetime.strptime(x, FMT) - datetime.
 ↪strptime("2020-01-30", FMT)).days)
```

[4]:
```
df_BR = brasil.loc[range(27), ['UF', 'Unidade da Federação', 'Regiao',␣
 ↪'População']]
df_BR = df_BR.sort_values('UF')

df = df.sort_values('estado')

df1 = df.loc[:, ['data', 'casosAcumulados', 'casosNovos', 'obitosAcumulados',␣
 ↪'obitosNovos']]
dfs = df.loc[:, ['regiao', 'data', 'casosAcumulados', 'casosNovos',␣
 ↪'obitosAcumulados', 'obitosNovos', 'estado']]
df_UF = df.loc[:, ['estado', 'data', 'casosAcumulados', 'casosNovos',␣
 ↪'obitosAcumulados', 'obitosNovos']]
```

[5]:
```
df1 = df1.groupby("data").sum()

# total of days since 2020-01-30 - x
days = list(df1.index)
x = days
```

1.5 Exponential Model

[6]:
```
# exponential model for the evolution of the covid 19 in Brazil

def exponential_model (x, a, b, c) :
    return a * np.exp (b * (x - c))

def exp_param (R, X) :
    a = np.exp(X[2] * (((np.log(R[2]))/X[2]) - ((np.log(R[1]) - np.log(R[0]))/
 ↪(X[1] - X[0]))))
    b = (np.log(R[2])/X[2]) - (1/X[2])*(((np.log(R[0])/X[0]) - (np.log(R[1])/
 ↪X[1]))/((X[0])**(-1) - (X[1])**(-1)))
    return [a, b]

def exp_est (R, X) :
    np.random.seed(max(x))
    a = np.exp(X[2] * (((np.log(R[2]))/X[2]) - ((np.log(R[1]) - np.log(R[0]))/
 ↪(X[1] - X[0]))))
    b = (np.log(R[2])/X[2]) - (1/X[2])*(((np.log(R[0])/X[0]) - (np.log(R[1])/
 ↪X[1]))/((X[0])**(-1) - (X[1])**(-1)))
    return a * np.exp(b * (max(x) + 1)) + norm.rvs(size = 1,scale = 0.05 *␣
 ↪(max(x) + 1))
```

1.6 Logistic Model

[7]:
```
# logistic model for the evolution of the covid 19 in Brazil

def logistic_model (x, a, b, c) :
    return c / (1 + np.exp ( - (x - b) / a))

a0 = 2.7

lb = [df1.index.size + 31, df1.index.size + 86, df1.index.size + 45, df1.index.
 ↪size + 45]

pBrasil = brasil.at[brasil['UF'].eq('BR').idxmax(),'População']
lc = [0.2 * pBrasil, 0.001 * pBrasil, 0.008 * pBrasil, 0.00016 * pBrasil]
```

1.7 Data for every Brazilian State

1.7.1 Population

Source: IBGE

1.7.2 Last Confimed Numbers

Source: covid.saude.gov.br

1.7.3 Incidence of Cases and Deaths

Number of cases or deaths for million citizens

1.7.4 Speed of the Contamination

How many days does the COVID takes to double in every state

[8]:
```
casosInc = []
casosDia = []
casosCres = []
obitosInc = []
obitosDia = []
obitosCres = []
dfs = dfs.sort_values('estado')
estados = dfs["estado"].unique()
x = days

for e in estados :
    pop = brasil.at[brasil['UF'].eq(e).idxmax(),'População']
    uf = brasil.at[brasil['UF'].eq(e).idxmax(), "Unidade da Federação"]

    # Values for daily cases
    df_e = df_UF.loc[df_UF.iloc[:,0] == e, :].iloc[:, [1, 2]].
 ↪sort_values("data")
    y = list(df_e.iloc[:, 1])
    casosDia.append(round(y[max(days)], 2))
    casosInc.append(round((10 ** 6) * y[max(days)] / pop, 2))

    exp_p = exp_param([y[-5], y[-3], y[-1]], [x[-5], x[-3], x[-1]])
    exponential_fit = curve_fit(exponential_model, x, y, p0 = [exp_p[0] * np.
 ↪exp(-1), exp_p[1], 1])
    casosCres.append(round(np.log(2) / exponential_fit[0][1], 1))

    # Values for daily deaths
    df_e = df_UF.loc[df_UF.iloc[:,0] == e, :].iloc[:, [1, 4]].
 ↪sort_values("data")
    y = list(df_e.iloc[:, 1])
    obitosInc.append(round((10 ** 6) * y[max(days)] / pop, 2))
```

```
    obitosDia.append(round(y[max(days)], 2))

    exp_p = exp_param([y[-5], y[-3], y[-1]], [x[-5], x[-3], x[-1]])
    exponential_fit = curve_fit(exponential_model, x, y, p0 = [exp_p[0] * np.
↪exp(-1), exp_p[1], 1])
    obitosCres.append(round(np.log(2) / exponential_fit[0][1], 1))

df_BR['Casos'] = casosDia
df_BR['Incidência de Casos'] = casosInc
df_BR['Dias para dobrar (casos)'] = casosCres
df_BR['Mortes'] = obitosDia
df_BR['Incidência de Mortes'] = obitosInc
df_BR['Dias para dobrar (obitos)'] = obitosCres
df_BR = df_BR.sort_values('Incidência de Casos', ascending = False)
df_BR.reset_index(drop = True, inplace = True)

df_BR
```

```
C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```

[8]:

	UF	Unidade da Federação	Regiao	População	Casos	\
0	AP	Amapá	Norte	842914	1080	
1	AM	Amazonas	Norte	4240210	5254	
2	RR	Roraima	Norte	546891	519	
3	CE	Ceará	Nordeste	9178363	7606	
4	PE	Pernambuco	Nordeste	9650604	6876	
5	SP	São Paulo	Sudeste	46064928	28698	
6	ES	Espírito Santo	Sudeste	4138657	2465	
7	RJ	Rio de Janeiro	Sudeste	16946541	9453	
8	AC	Acre	Norte	866811	404	
9	MA	Maranhão	Nordeste	7121156	3190	
10	DF	Distrito Federal	Centro-Oeste	3223048	1356	
11	PA	Pará	Norte	8628901	2876	
12	RN	Rio Grande do Norte	Nordeste	3598288	1177	
13	AL	Alagoas	Nordeste	3419689	1044	
14	SC	Santa Catarina	Sul	7266193	2085	
15	RO	Rondônia	Norte	1857992	502	
16	PB	Paraíba	Nordeste	4097859	814	
17	SE	Sergipe	Nordeste	2352207	447	
18	BA	Bahia	Nordeste	15522855	2851	
19	PI	Piauí	Nordeste	3233891	513	
20	RS	Rio Grande do Sul	Sul	11416895	1466	
21	PR	Paraná	Sul	11538518	1407	
22	GO	Goiás	Centro-Oeste	7017496	781	
23	MS	Mato Grosso do Sul	Centro-Oeste	2800704	255	

24	MT	Mato Grosso	Centro-Oeste	3455092	297	
25	TO	Tocantins	Norte	1599316	137	
26	MG	Minas Gerais	Sudeste	21451356	1827	

	Incidência de Casos	Dias para dobrar (casos)	Mortes	\
0	1281.27	7.0	34	
1	1239.09	7.7	425	
2	949.00	7.2	7	
3	828.69	7.9	482	
4	712.49	6.5	565	
5	622.99	9.6	2375	
6	595.60	7.4	83	
7	557.81	9.3	854	
8	466.08	8.2	19	
9	447.96	6.5	184	
10	420.72	12.9	30	
11	333.30	5.5	208	
12	327.10	9.2	56	
13	305.29	4.1	47	
14	286.95	10.4	46	
15	270.18	5.6	16	
16	198.64	5.9	62	
17	190.03	4.5	12	
18	183.66	8.4	104	
19	158.63	5.7	24	
20	128.41	12.2	51	
21	121.94	12.1	83	
22	111.29	9.4	29	
23	91.05	11.4	9	
24	85.96	10.5	11	
25	85.66	6.9	3	
26	85.17	11.5	82	

	Incidência de Mortes	Dias para dobrar (obitos)
0	40.34	6.1
1	100.23	6.9
2	12.80	9.4
3	52.51	6.9
4	58.55	6.7
5	51.56	8.3
6	20.05	6.5
7	50.39	7.8
8	21.92	6.2
9	25.84	5.6
10	9.31	11.4
11	24.11	4.2
12	15.56	8.2

13	13.74	5.5
14	6.33	10.6
15	8.61	5.2
16	15.13	7.6
17	5.10	9.2
18	6.70	7.4
19	7.42	9.0
20	4.47	8.9
21	7.19	9.2
22	4.13	9.8
23	3.21	9.1
24	3.18	8.0
25	1.88	5.8
26	3.82	8.2

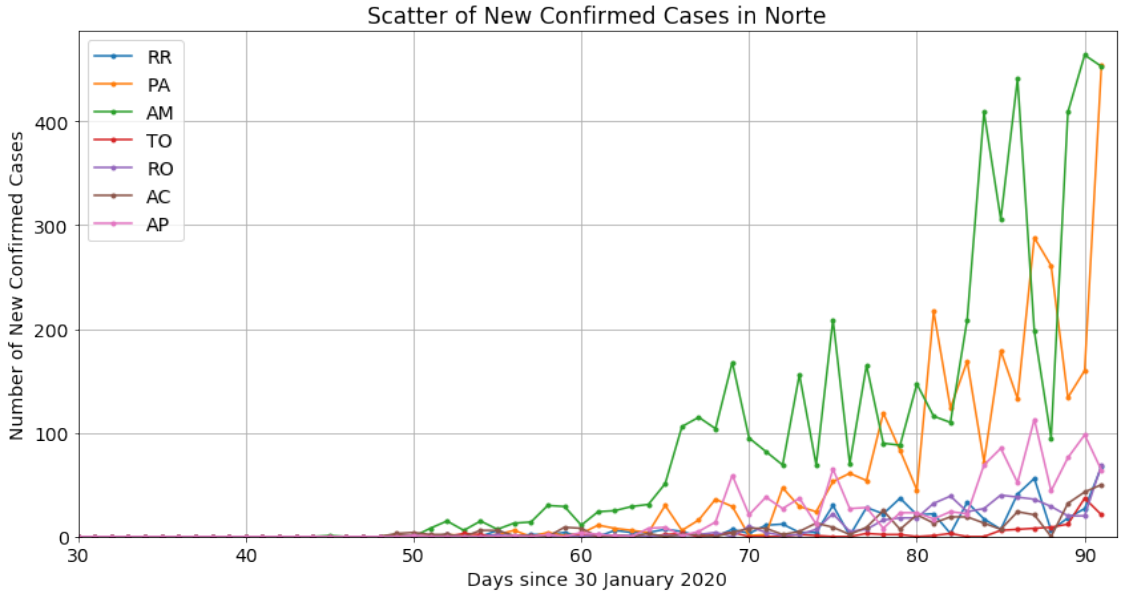
1.8 Plots

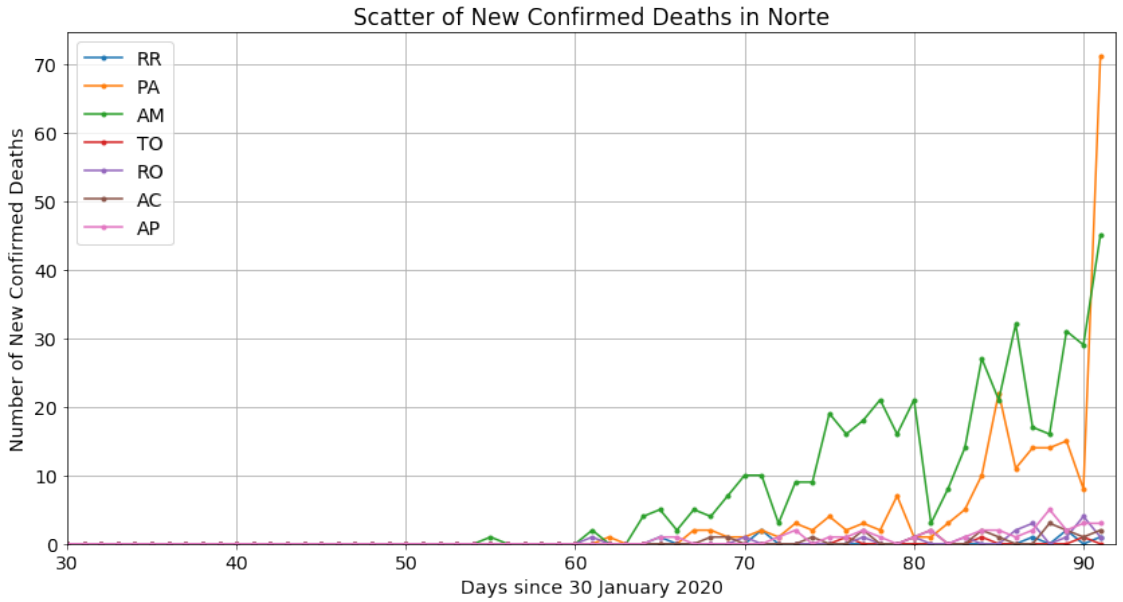
1.8.1 Daily Confirmed Number by Brazilian regions

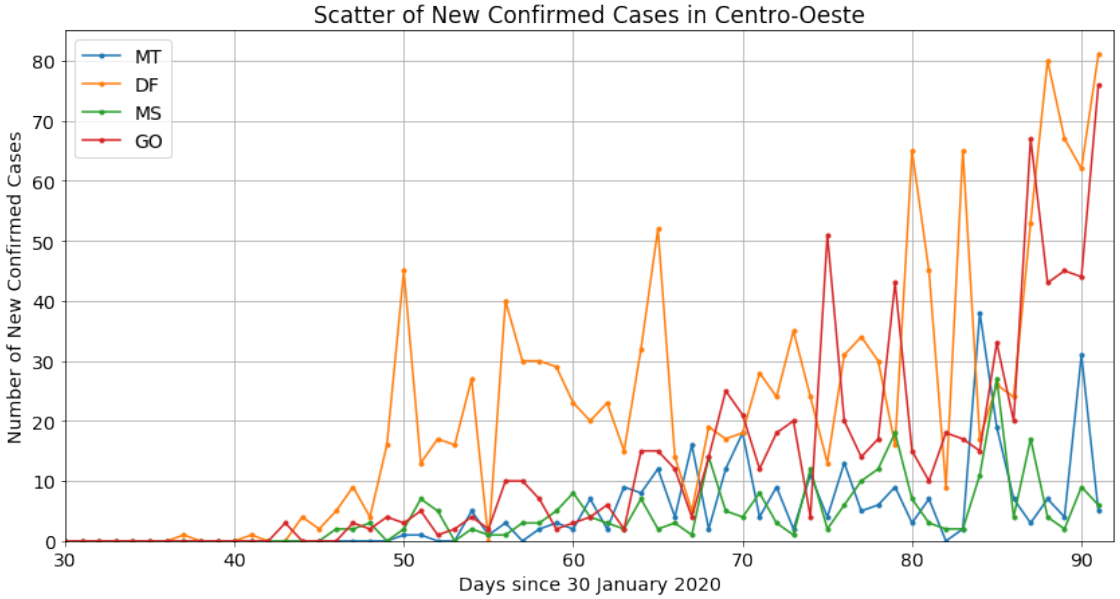
```
Norte
Centro-Oeste
Nordeste
Sudeste
Sul

New Confirmed Cases
New Confimed Deaths
```

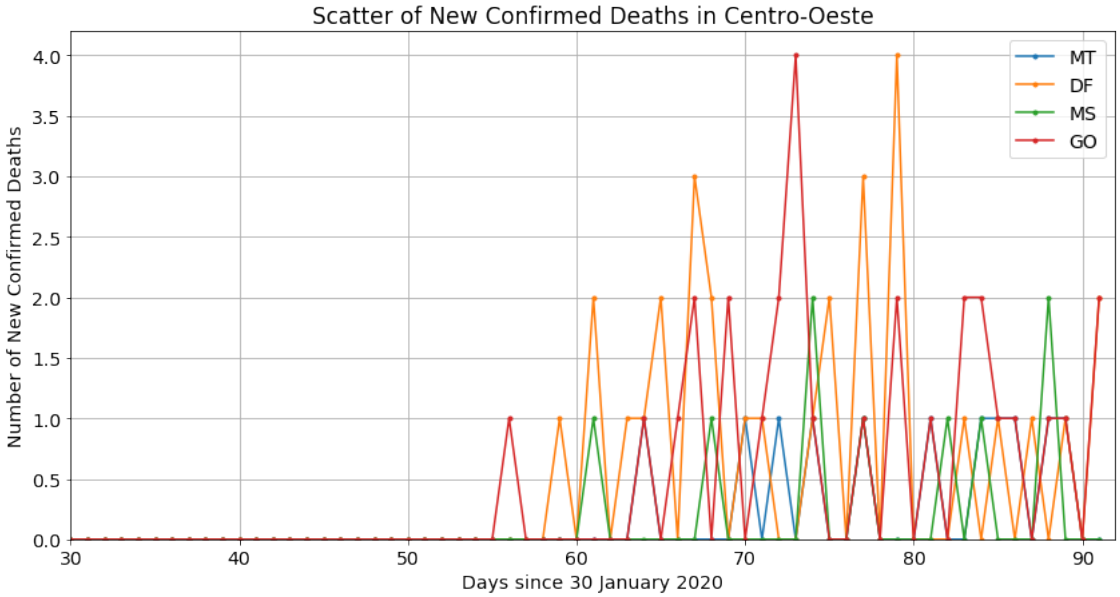
[9]:
```
plt.rc('font', size=14)
plt.rcParams['figure.figsize'] = [14, 7]

ttl = ["New Confirmed Cases", "New Confirmed Deaths"]
dfs = dfs.sort_values("data")
regioes = dfs["regiao"].unique()
estados = list(dfs["estado"].unique())

# Real data
# Brazilian areas separated
for r in regioes :
    for f in range(2) :
        for e in estados :
            plt.grid(True)

            uf = brasil.at[brasil['UF'].eq(e).idxmax(), "Regiao"]
            yx = max(dfs[dfs['regiao'] == r].iloc[:, 3 + (2 * f)])

            if uf == r :
                xs = days
```

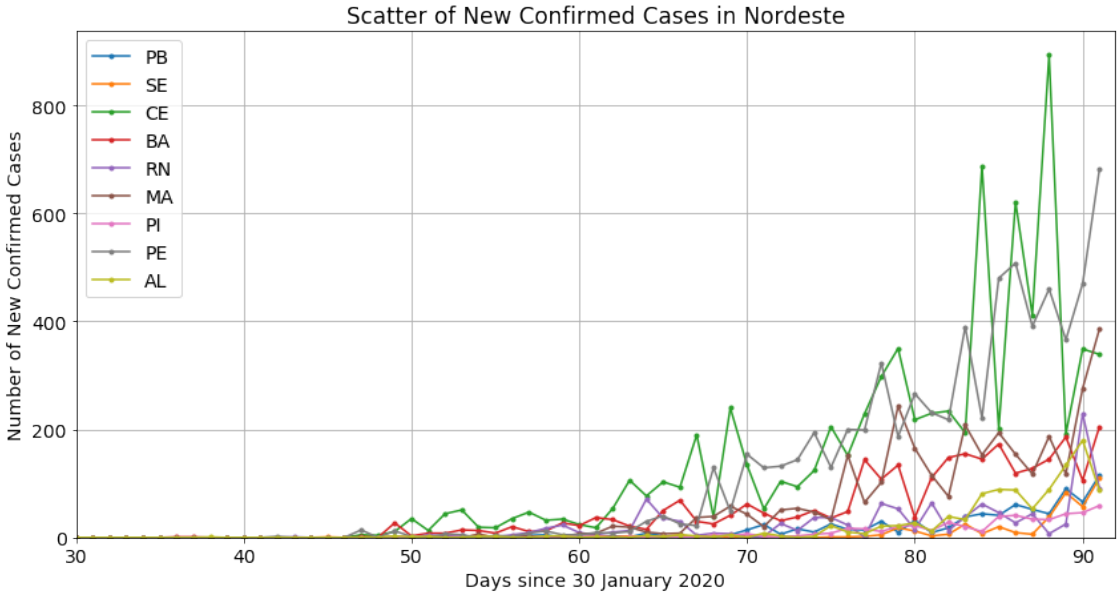
```
            ys = list(dfs[dfs['estado'] == e].iloc[:, 3 + (2 * f)])
            plt.plot(xs, ys, marker = '.', label = e)
    plt.title("Scatter of " + ttl[f] + " in " + r)
    plt.legend()
    plt.xlabel("Days since 30 January 2020")
    plt.ylabel("Number of " + ttl[f])
    plt.xlim(30, max(xs) * 1.01)
    plt.ylim(0, yx * 1.05)
    plt.show()
```

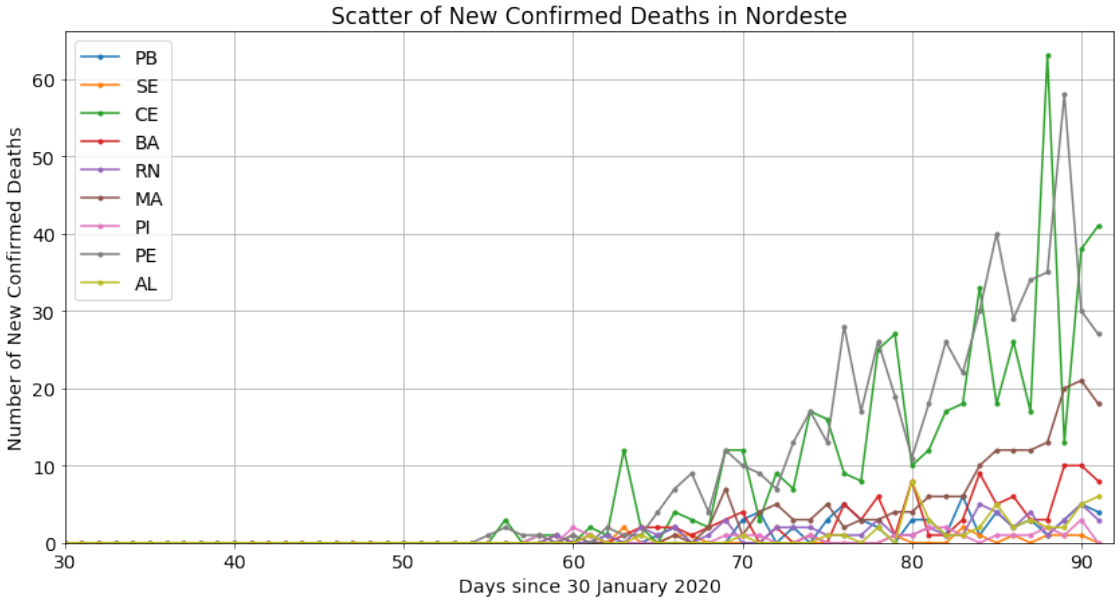


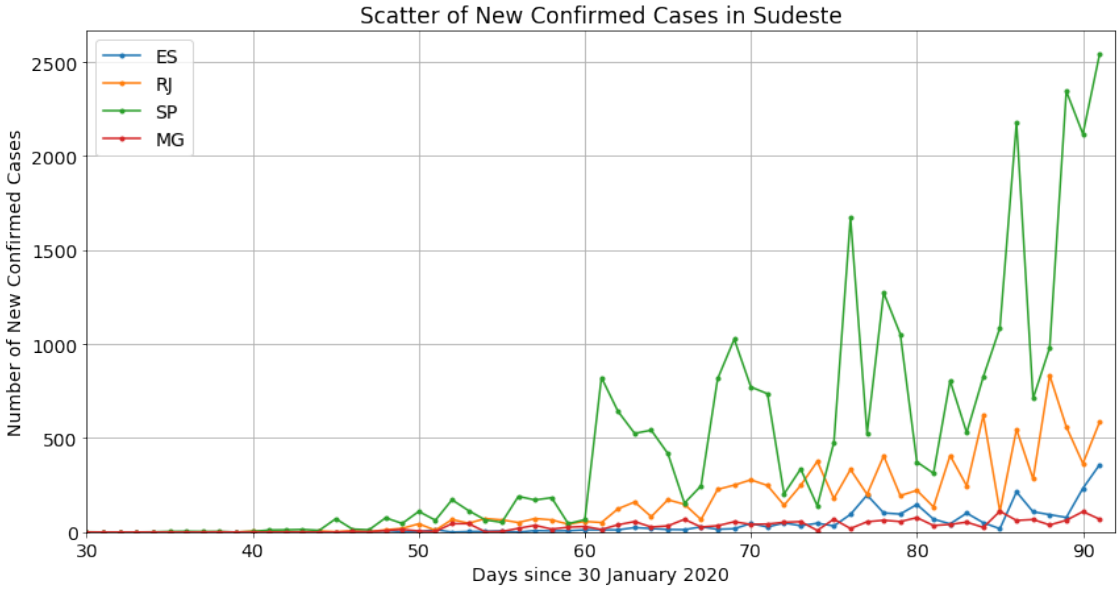


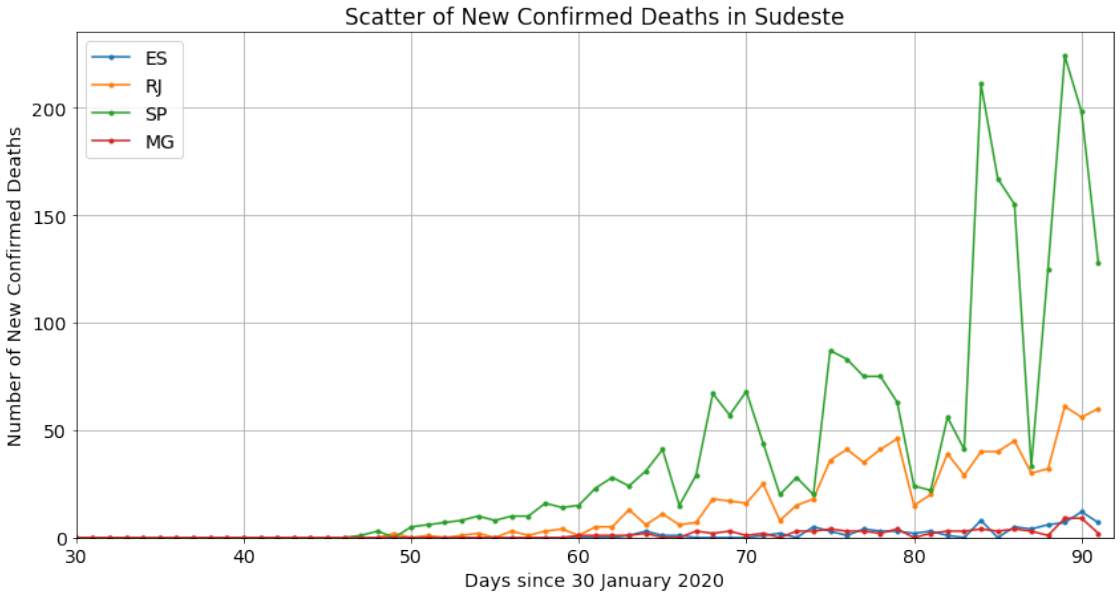

Scatter of New Confirmed Cases in Centro-Oeste
MT
DF
MS
GO
Number of New Confirmed Cases
Days since 30 January 2020

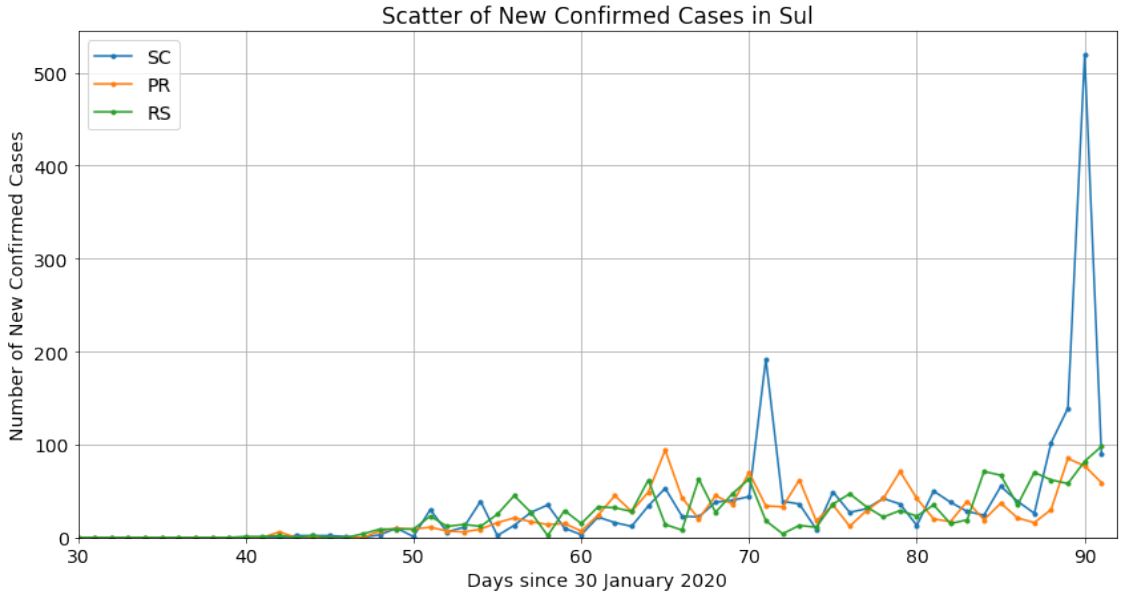

Scatter of New Confirmed Deaths in Centro-Oeste
MT
DF
MS
GO
Number of New Confirmed Deaths
Days since 30 January 2020

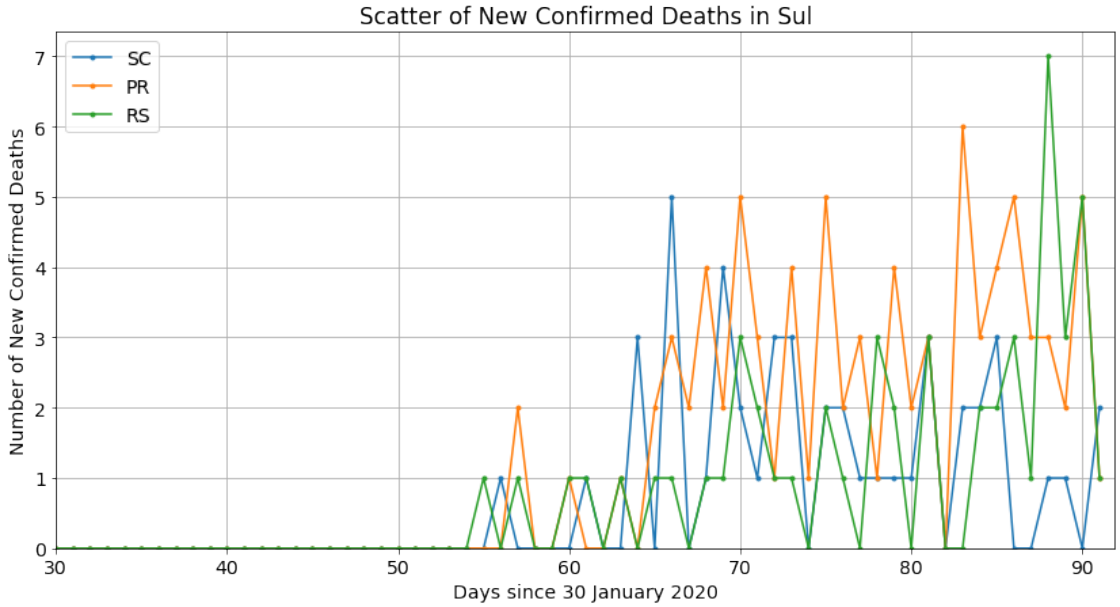

Scatter of New Confirmed Cases in Nordeste
PB
SE
CE
BA
RN
MA
PI
PE
AL
Number of New Confirmed Cases
0
200
400
600
800
30
40
50
60
70
80
90
Days since 30 January 2020


Scatter of New Confirmed Deaths in Nordeste
PB
SE
CE
BA
RN
MA
PI
PE
AL
Number of New Confirmed Deaths
0
10
20
30
40
50
60
30
40
50
60
70
80
90
Days since 30 January 2020


Scatter of New Confirmed Cases in Sudeste
ES
RJ
SP
MG
Number of New Confirmed Cases
Days since 30 January 2020
0
500
1000
1500
2000
2500
30
40
50
60
70
80
90


Scatter of New Confirmed Deaths in Sudeste
ES
RJ
SP
MG
Number of New Confirmed Deaths
Days since 30 January 2020
0
50
100
150
200
30
40
50
60
70
80
90





1.9 Casos Totais por estado

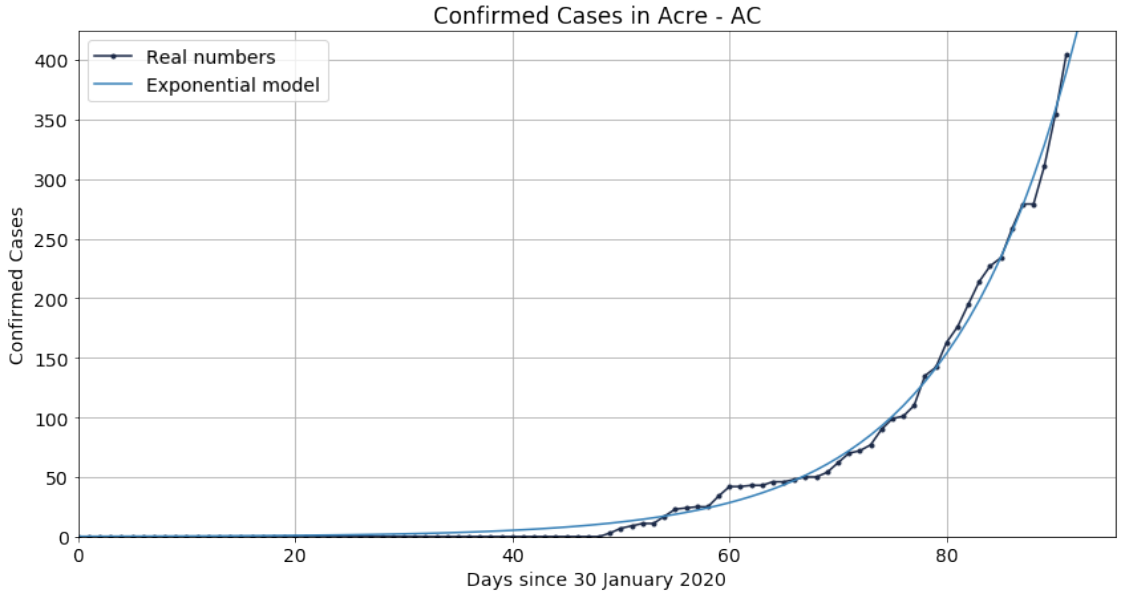
Casos confirmados x tempo

Dados reais, estimativa exponencial e em estados com mais de 1000 casos estimativa logistica

Os dados são subnotificados e possuem baixa confiabilidade

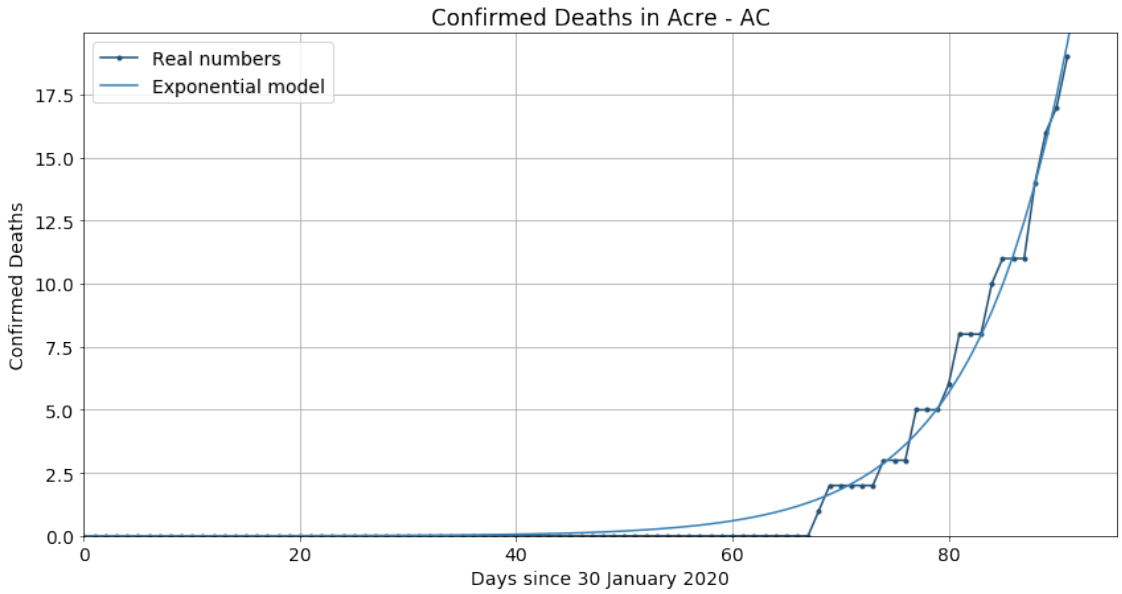
[10]:
```
plt.rc('font', size = 14)
plt.rcParams['figure.figsize'] = [14, 7]

ttl = ["Confirmed Cases", "Confirmed Deaths"]
dfs = dfs.sort_values('estado')
estados = dfs["estado"].unique()
cor = ["#1d2b49", "#235174"]

for e in estados :
    df_e = df_UF.loc[df_UF.iloc[:, 0] == e, :].iloc[:, [2, 4, 1]].
 ↪sort_values("data")
    pop = brasil.at[brasil['UF'].eq(e).idxmax(),'População']
    est = brasil.at[brasil['UF'].eq(e).idxmax(),'Unidade da Federação']

    for f in range(2) :
        plt.grid(True)
        x = days

        # Real Numbers
        y = list(df_e.iloc[:, f])
        plt.plot(x, y, marker = '.', label = "Real numbers", color = cor[f])

        # Lines

        if max(y) > 1000 :
            logistic_fit = curve_fit(logistic_model, x, y, p0 = [a0, lb[f * 2],␣
 ↪0.1 * pop])
            logistic_sol = int(fsolve(lambda x : logistic_model(x,␣
 ↪logistic_fit[0][0], logistic_fit[0][1],
                                                                ␣
 ↪logistic_fit[0][2]) - int(logistic_fit[0][2]),
                                      logistic_fit[0][1]))

            pred_x = list(range(max(x), logistic_sol))

            # Predicted logistic curve
            plt.plot(x + pred_x, [logistic_model(i, logistic_fit[0][0],␣
 ↪logistic_fit[0][1], logistic_fit[0][2])
                                  for i in x + pred_x], label = "Logistic␣
 ↪model", color = "#c2cdd8")

            plt.xlim(0, max(pred_x) * 1.05)
            plt.ylim(0, logistic_fit[0][2] * 1.05)
        else :

            pred_x = list(range(max(x), max(x) + 15))
```

```
            plt.xlim(0, max(x) * 1.05)
            plt.ylim(0, max(y) * 1.05)

        exp_p = exp_param([y[-5], y[-3], y[-1]], [x[-5], x[-3], x[-1]])
        exponential_fit = curve_fit(exponential_model, x, y, p0 = [exp_p[0] *␣
↪np.exp(-1), exp_p[1], 1])

        plt.plot(x + pred_x, [exponential_model(i, exponential_fit[0][0],␣
↪exponential_fit[0][1], exponential_fit[0][2])
                              for i in x + pred_x], label = "Exponential␣
↪model", color = "#3881b8")

        plt.title(ttl[f] + " in " + est + " - " + e)
        plt.legend()
        plt.xlabel("Days since 30 January 2020")
        plt.ylabel(ttl[f])
        plt.show()
        print("Next estimated number of confirmed cases in " + est + " is: " +
              str(round(exponential_model(max(x) + 1, exponential_fit[0][0],␣
↪exponential_fit[0][1], exponential_fit[0][2]), 3))
              + " or + " +
              str(round(exponential_model(max(x) + 1, exponential_fit[0][0],␣
↪exponential_fit[0][1], exponential_fit[0][2]) - max(y), 3))  )
```

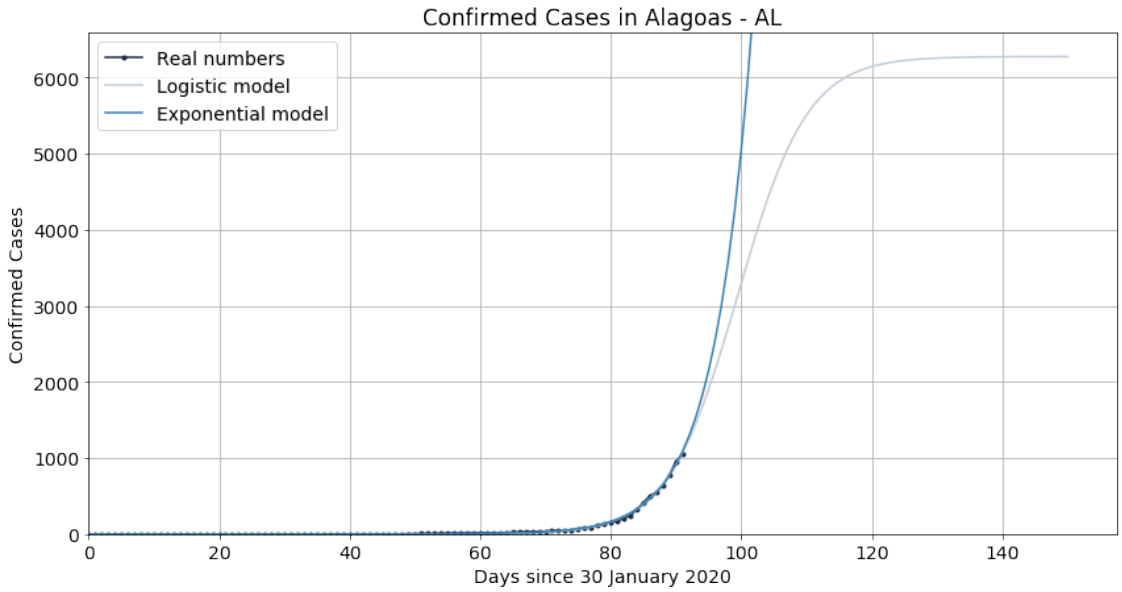



```
Next estimated number of confirmed cases in Acre is: 423.412 or + 19.412

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
```

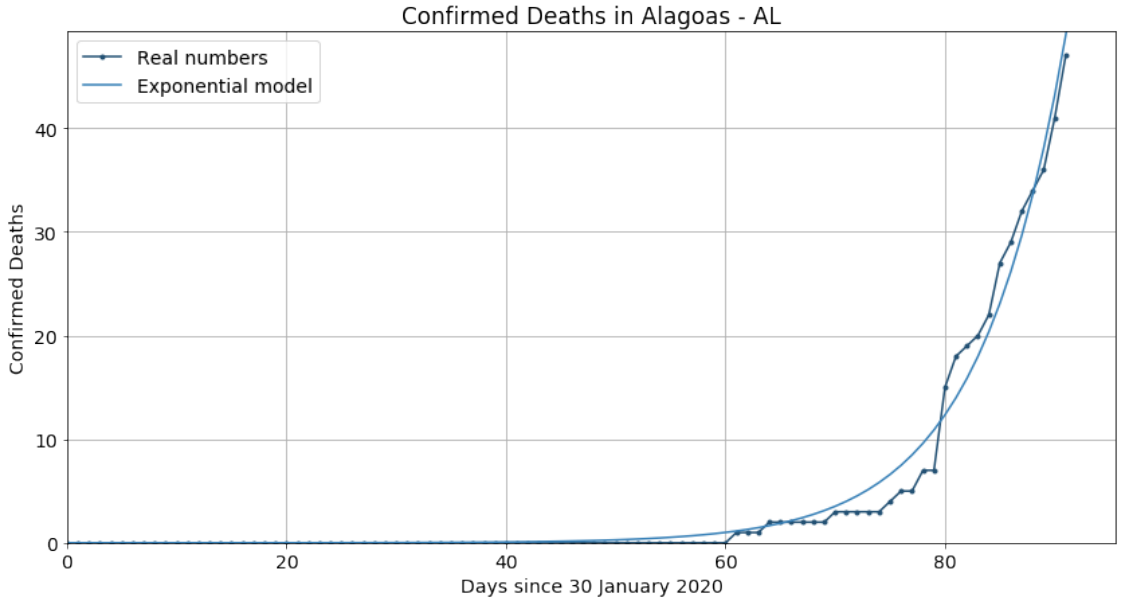
```
after removing the cwd from sys.path.
```



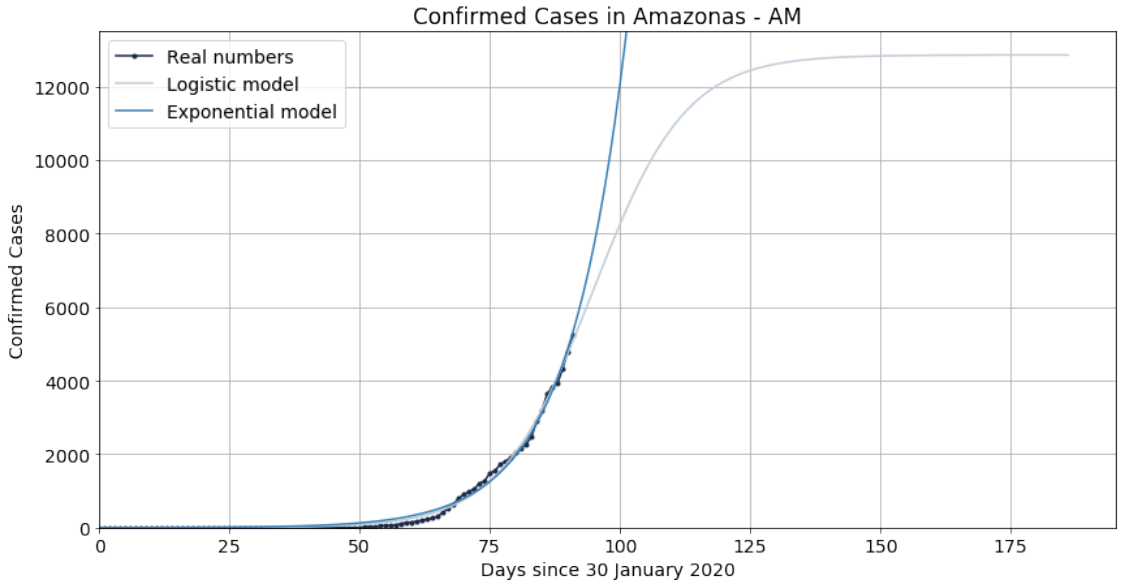

```
Next estimated number of confirmed cases in Acre is: 21.868 or + 2.868
```




```
Next estimated number of confirmed cases in Alagoas is: 1287.105 or + 243.105
```

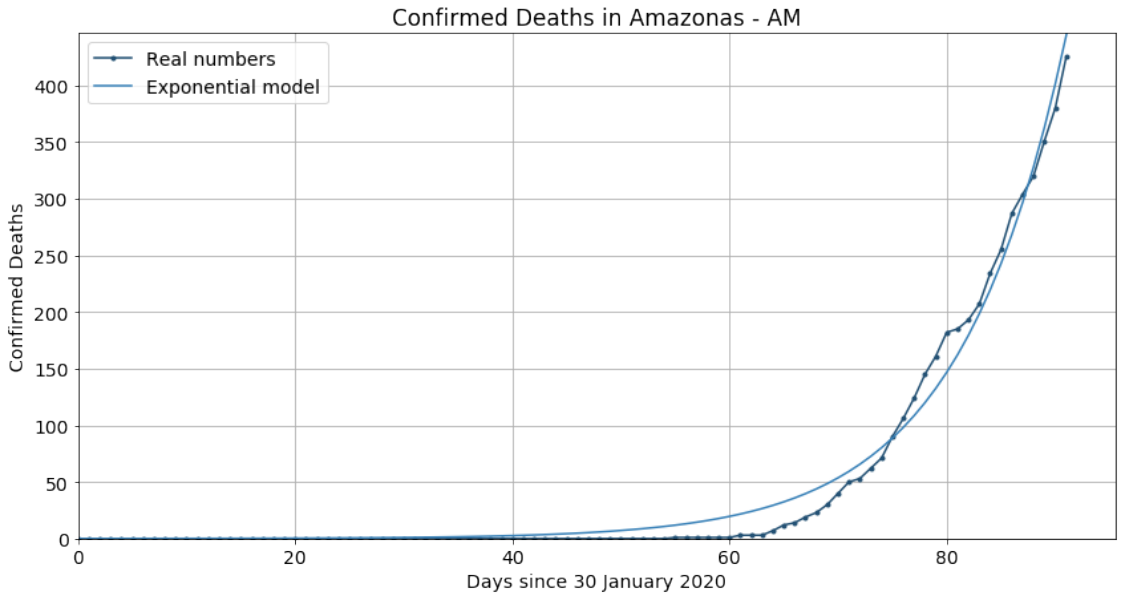



```
Next estimated number of confirmed cases in Alagoas is: 55.467 or + 8.467

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```

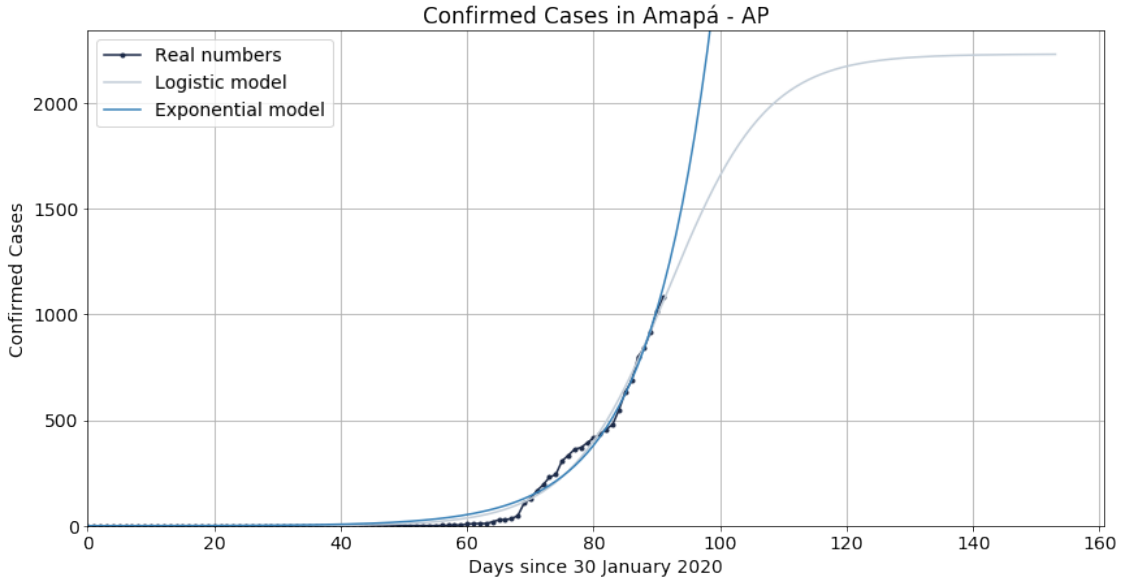



```
Next estimated number of confirmed cases in Amazonas is: 5855.522 or + 601.522

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
```

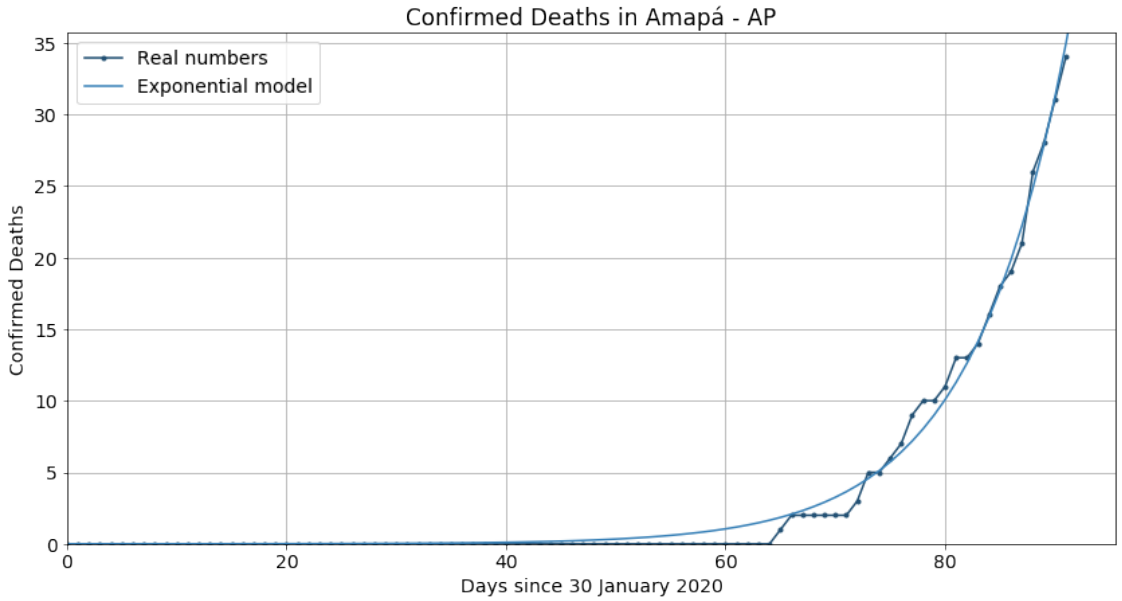
```
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



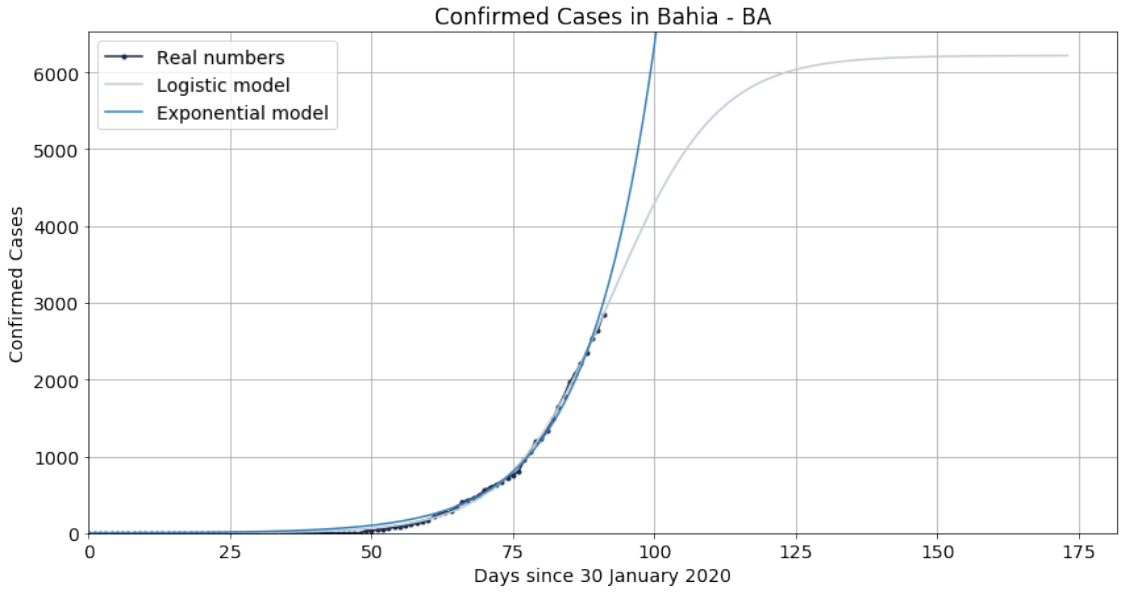

```
Next estimated number of confirmed cases in Amazonas is: 490.704 or + 65.704
```



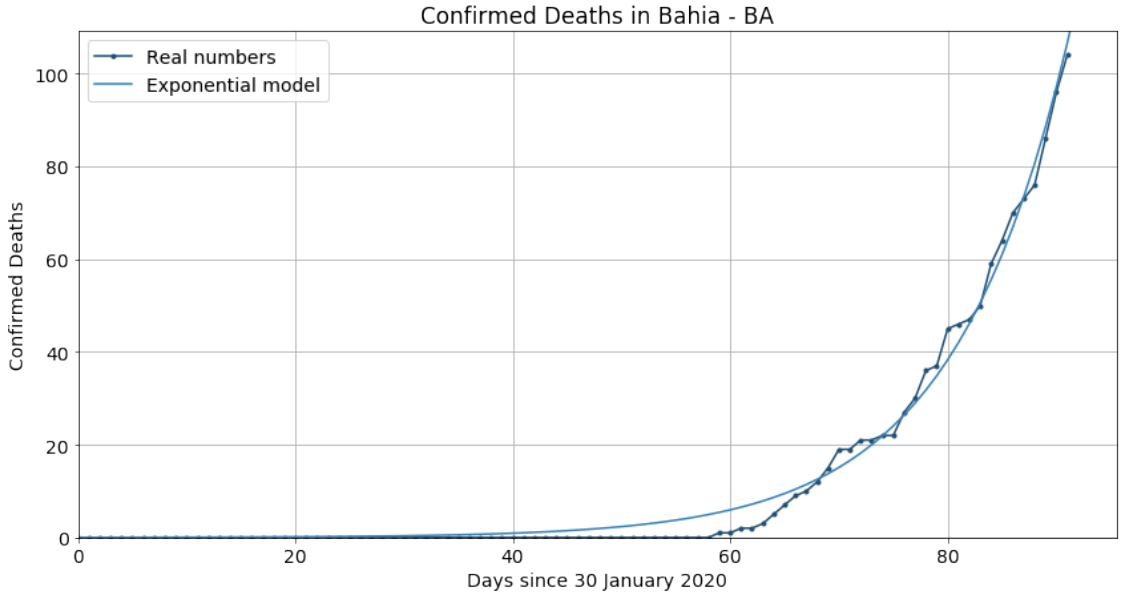

```
Next estimated number of confirmed cases in Amapá is: 1245.971 or + 165.971
```



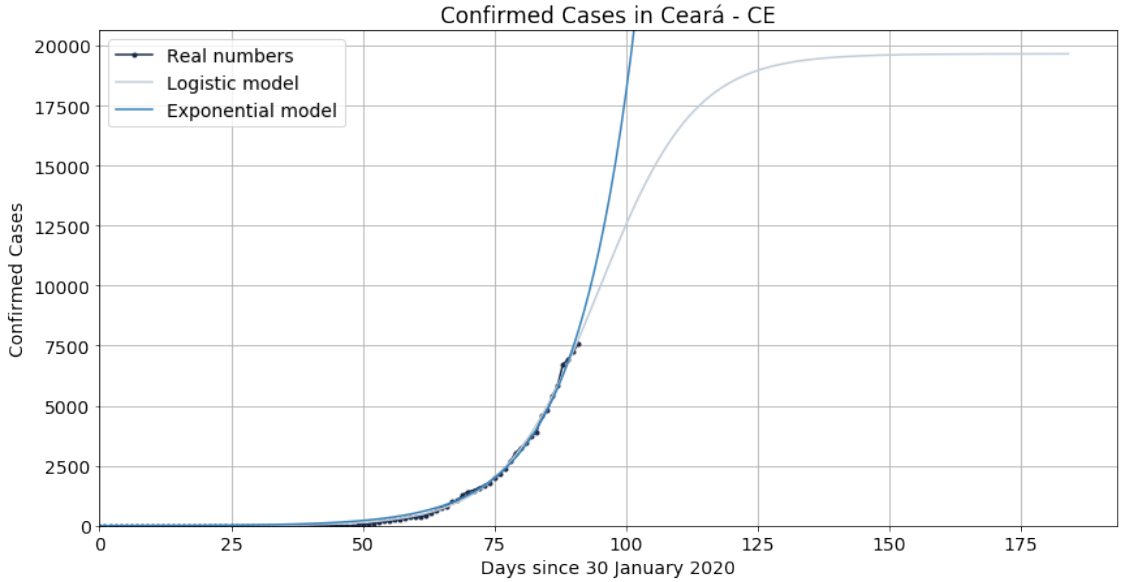
Next estimated number of confirmed cases in Amapá is: 39.076 or + 5.076



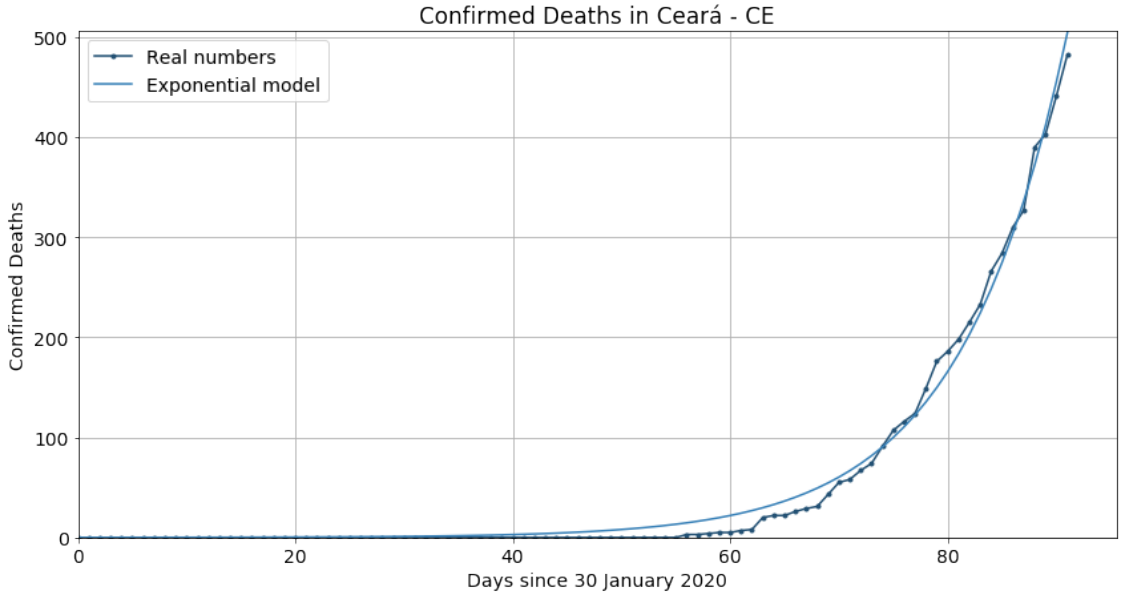
Next estimated number of confirmed cases in Bahia is: 3274.571 or + 423.571



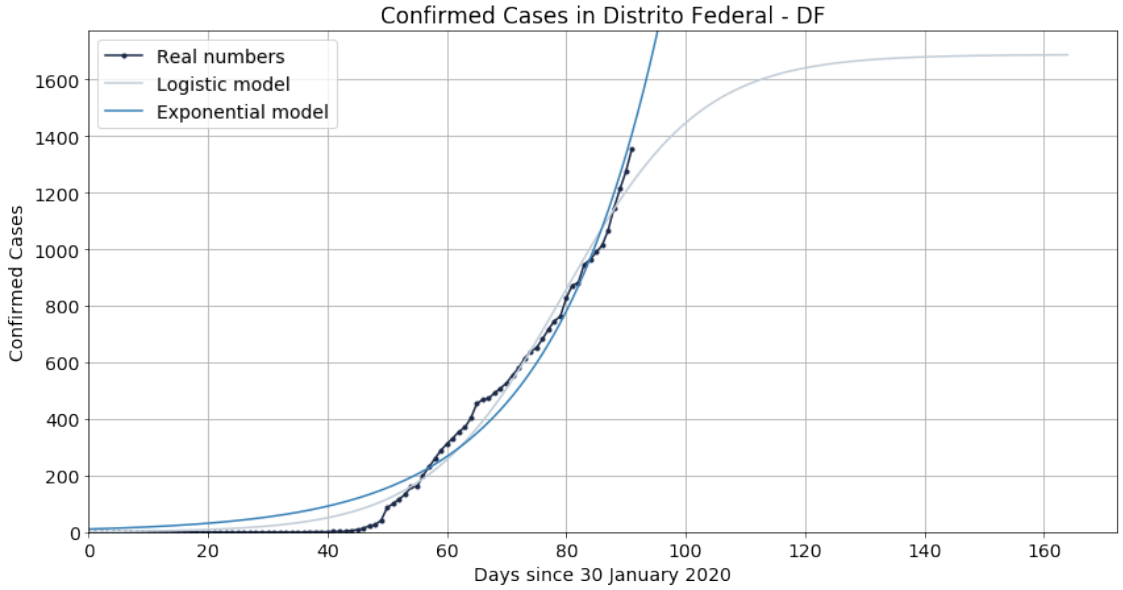

```
Next estimated number of confirmed cases in Bahia is: 116.981 or + 12.981
```



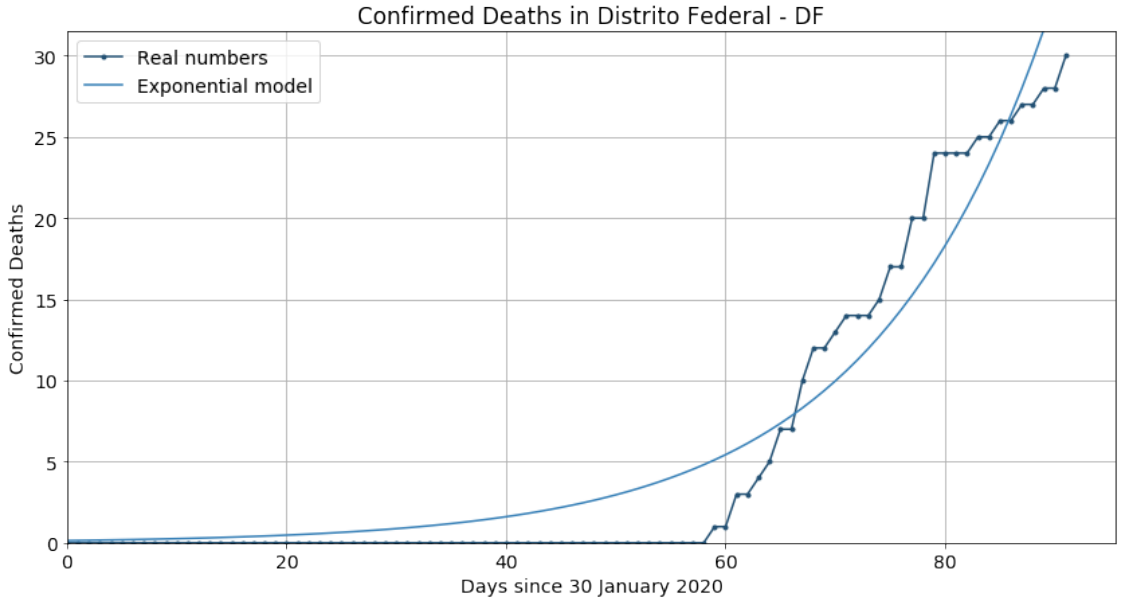

```
Next estimated number of confirmed cases in Ceará is: 8913.326 or + 1307.326
```



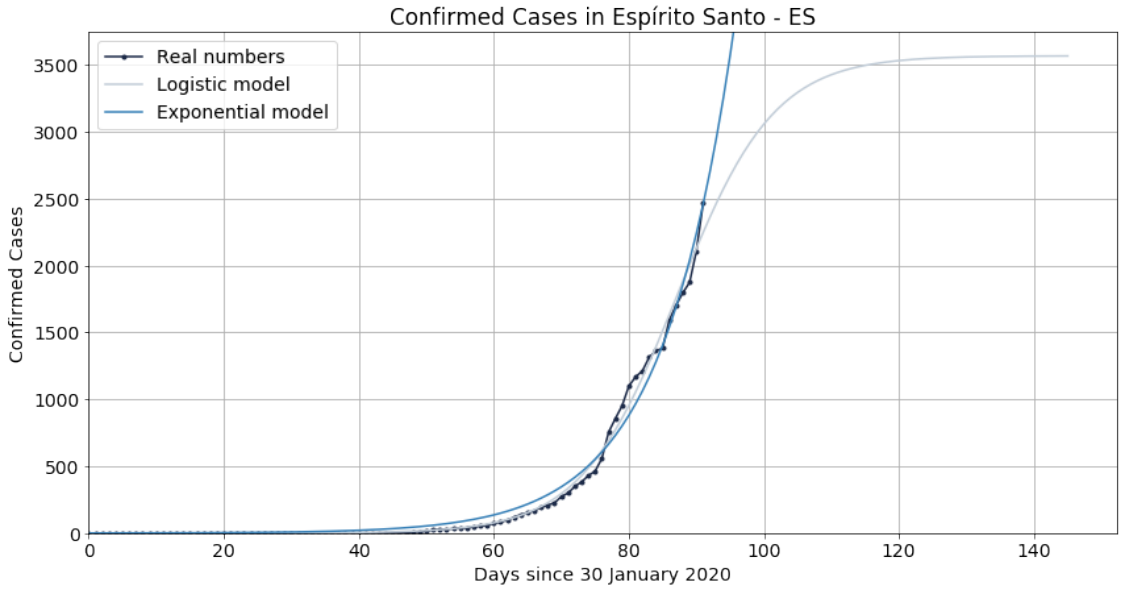

```
Next estimated number of confirmed cases in Ceará is: 557.208 or + 75.208
```



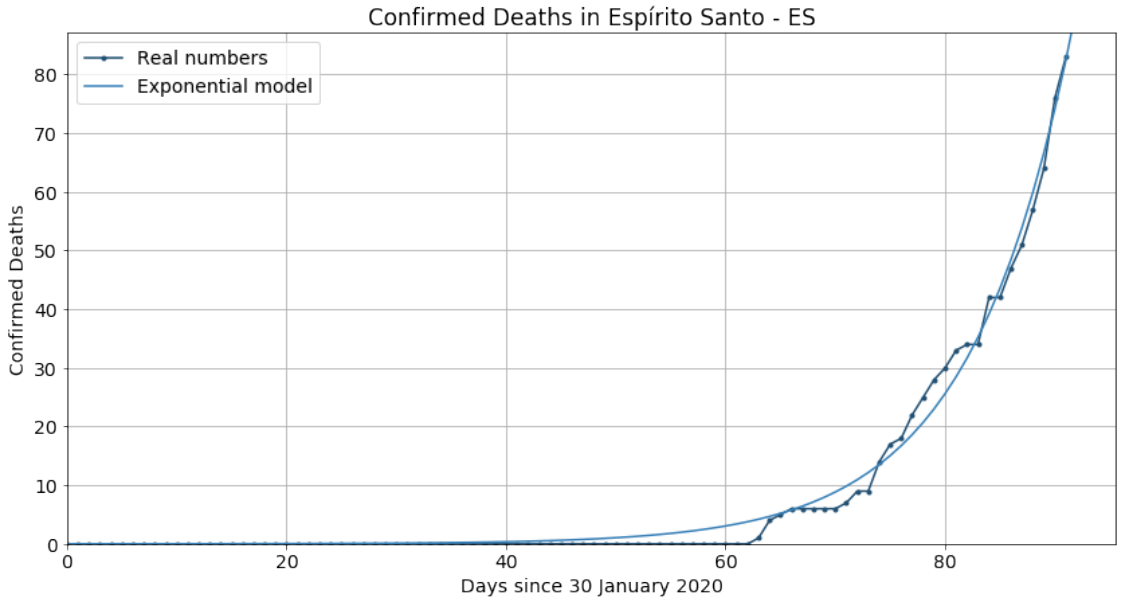

```
Next estimated number of confirmed cases in Distrito Federal is: 1484.329 or +
128.329
```



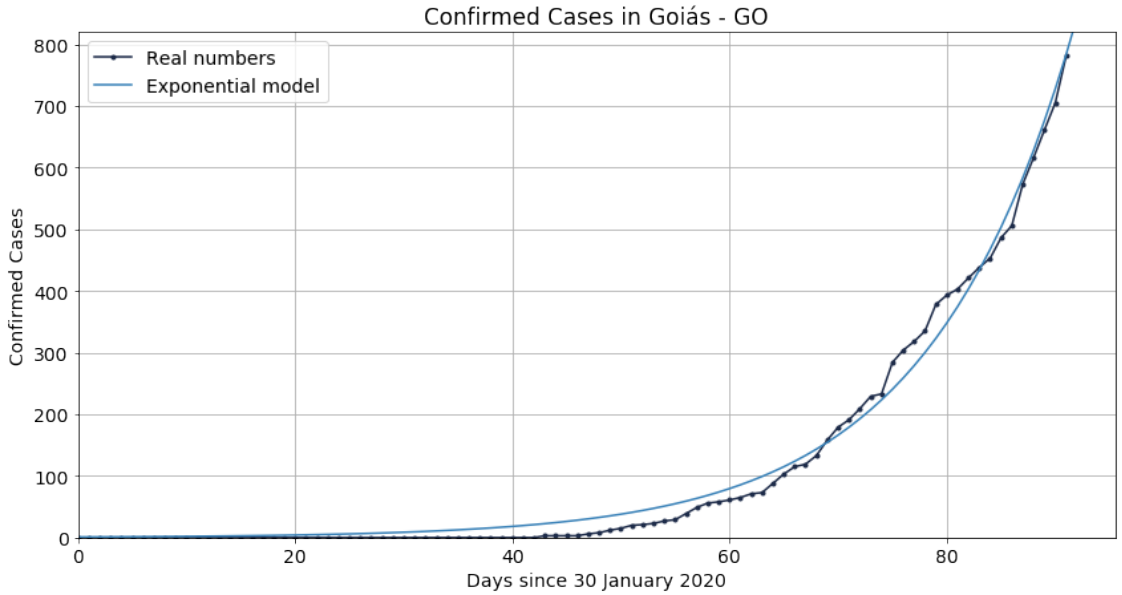
Next estimated number of confirmed cases in Distrito Federal is: 37.952 or + 7.952



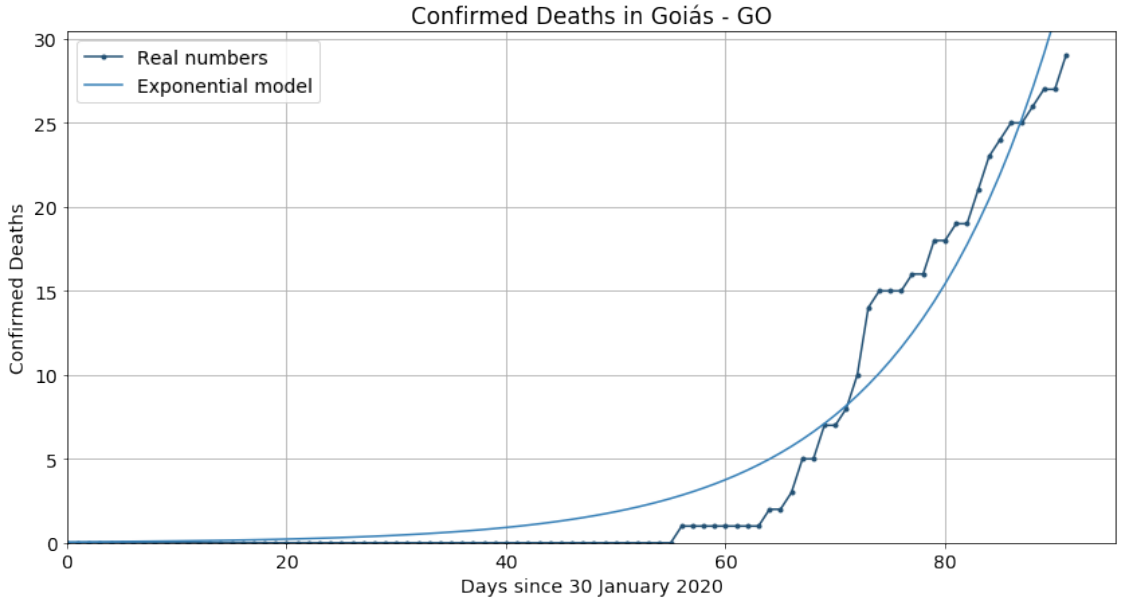
Next estimated number of confirmed cases in Espírito Santo is: 2698.314 or + 233.314



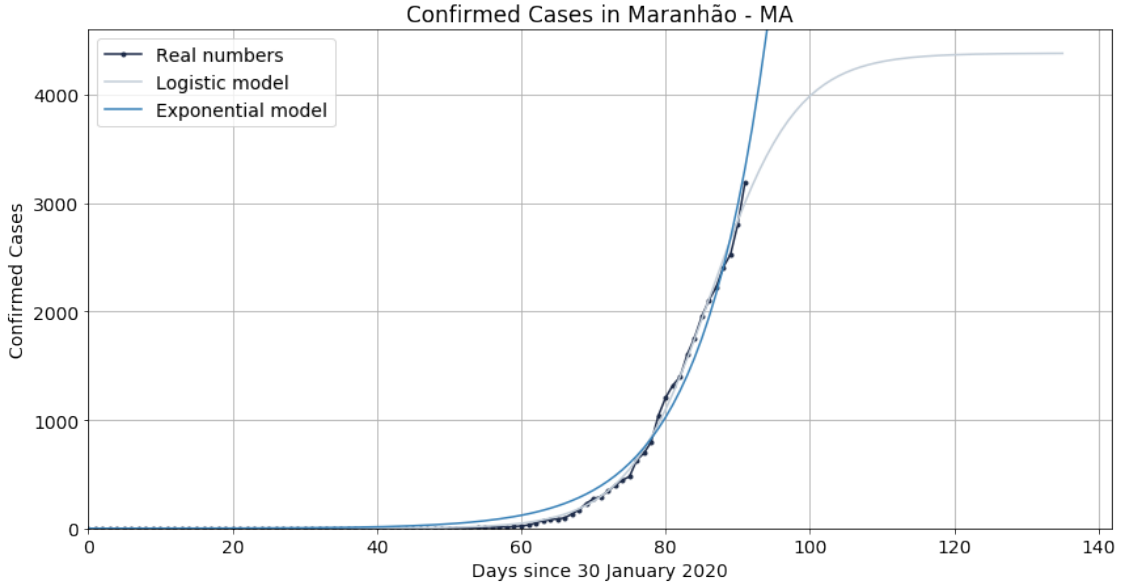
Next estimated number of confirmed cases in Espírito Santo is: 91.707 or + 8.707



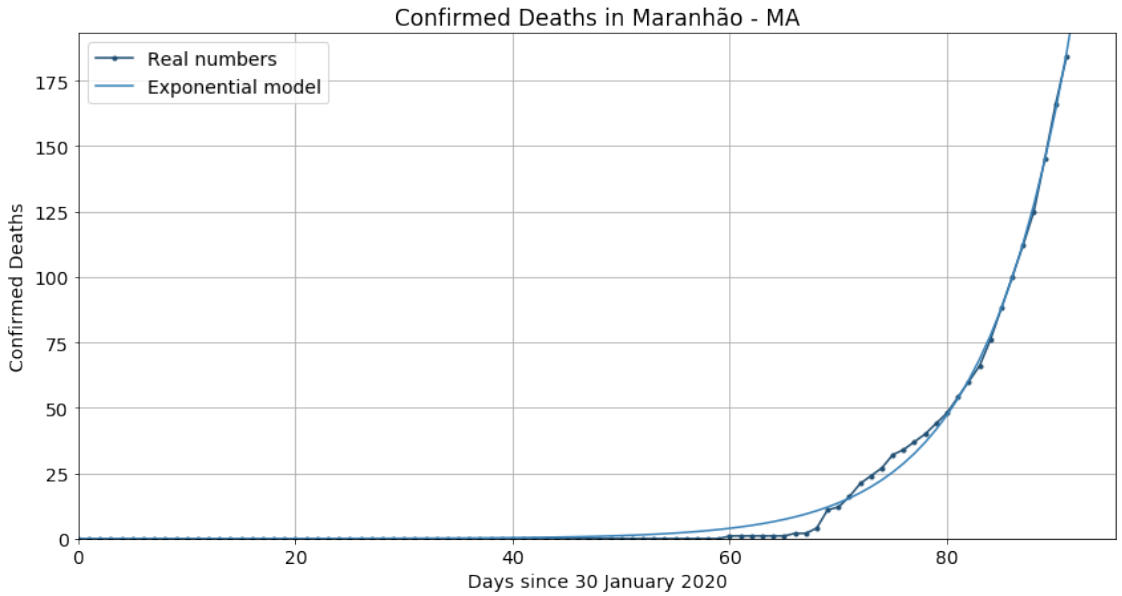
Next estimated number of confirmed cases in Goiás is: 843.598 or + 62.598



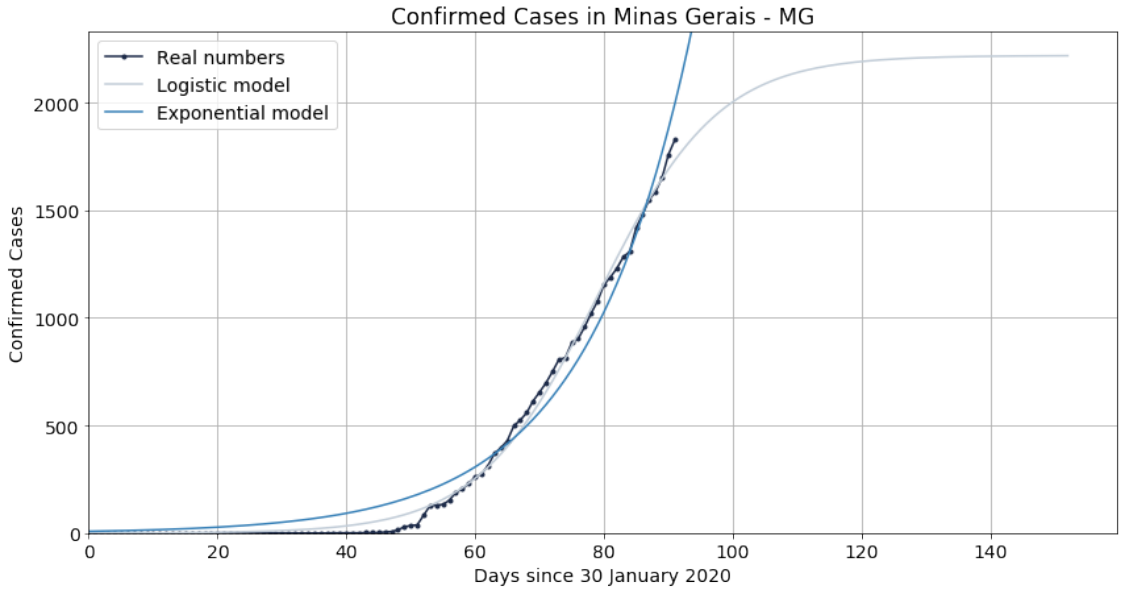

```
Next estimated number of confirmed cases in Goiás is: 35.953 or + 6.953

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



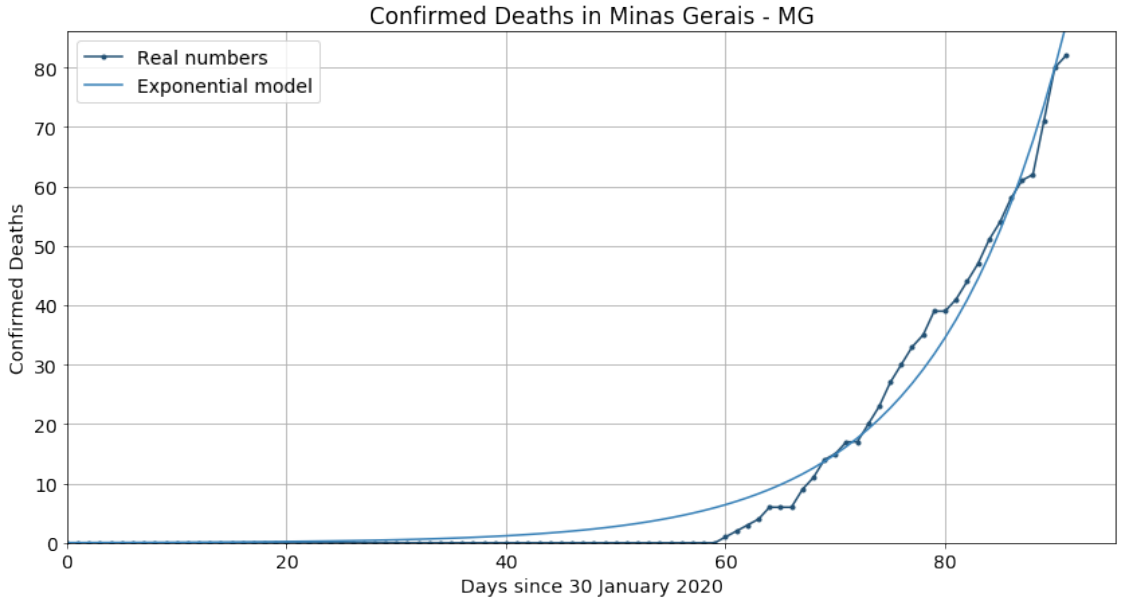

```
Next estimated number of confirmed cases in Maranhão is: 3693.448 or + 503.448
```



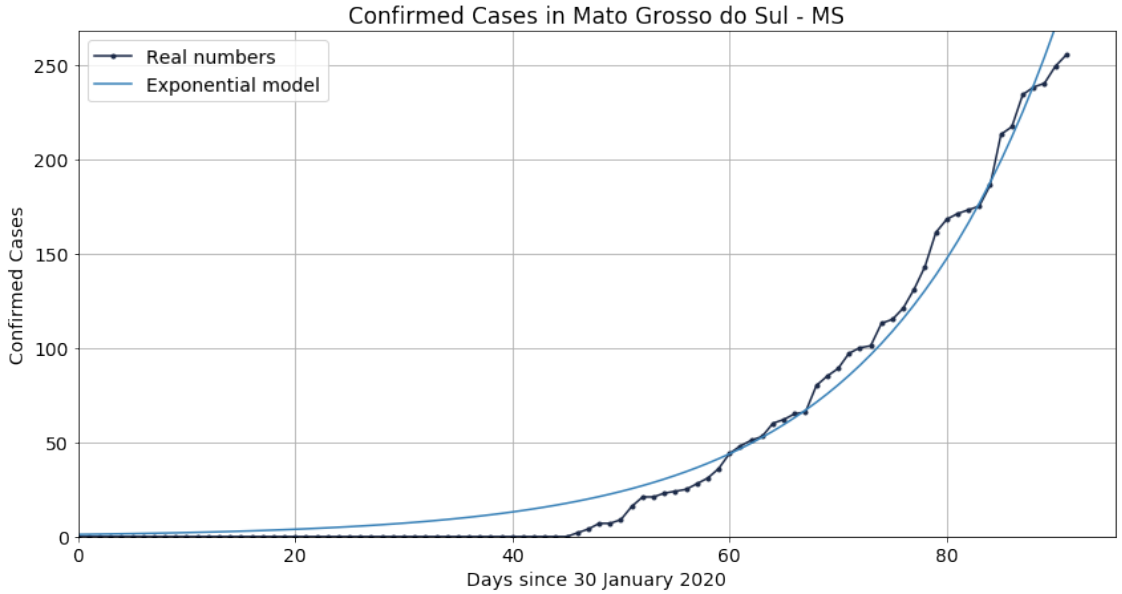

```
Next estimated number of confirmed cases in Maranhão is: 209.941 or + 25.941
```



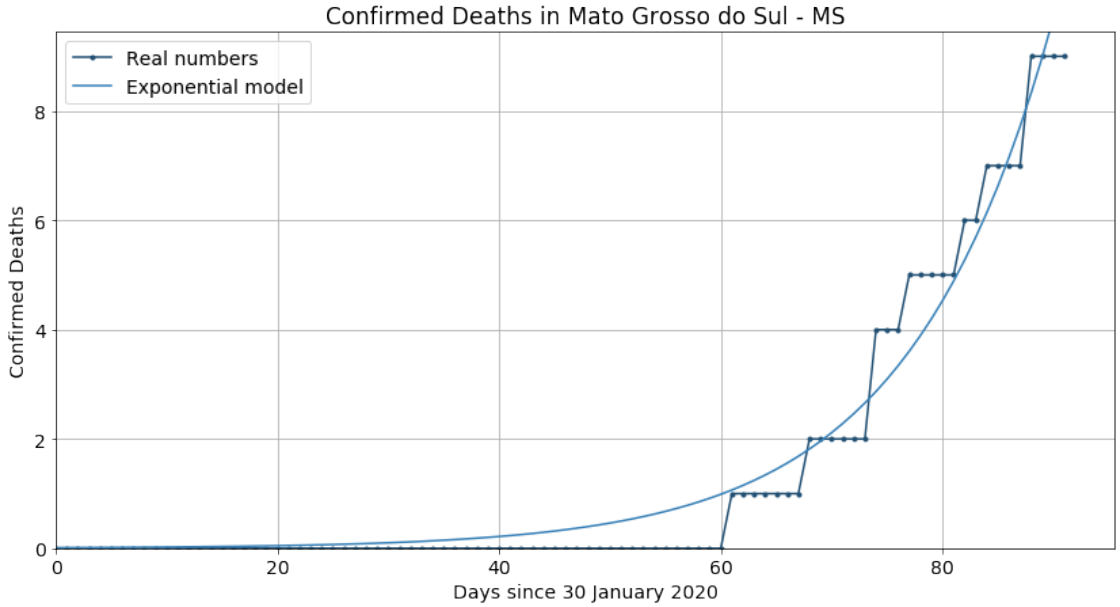

```
Next estimated number of confirmed cases in Minas Gerais is: 2118.478 or +
291.478
```



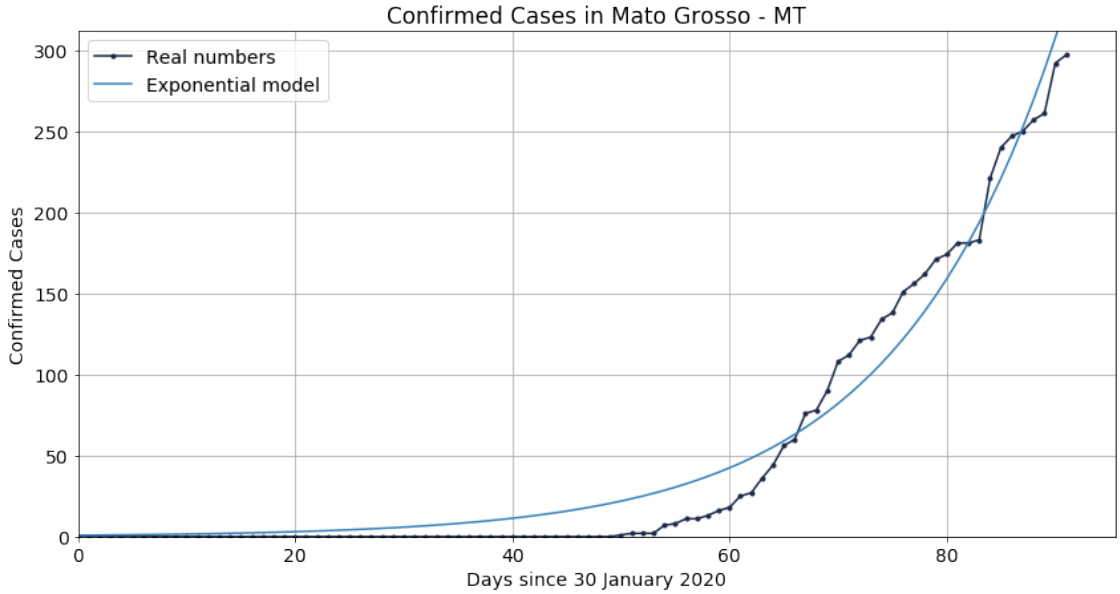
Next estimated number of confirmed cases in Minas Gerais is: 94.714 or + 12.714



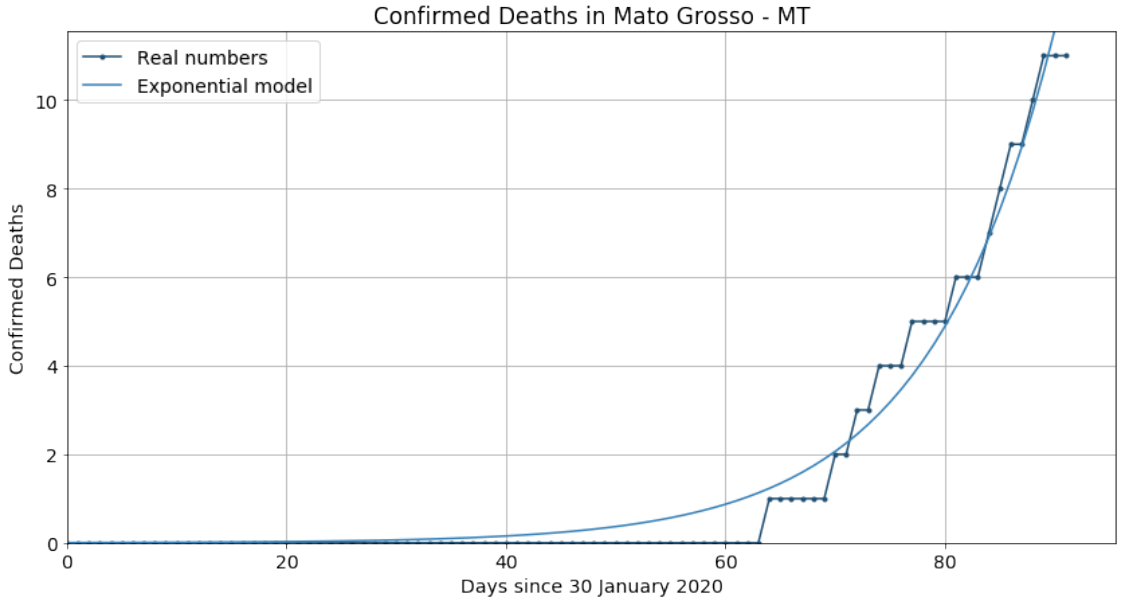
Next estimated number of confirmed cases in Mato Grosso do Sul is: 304.439 or + 49.439



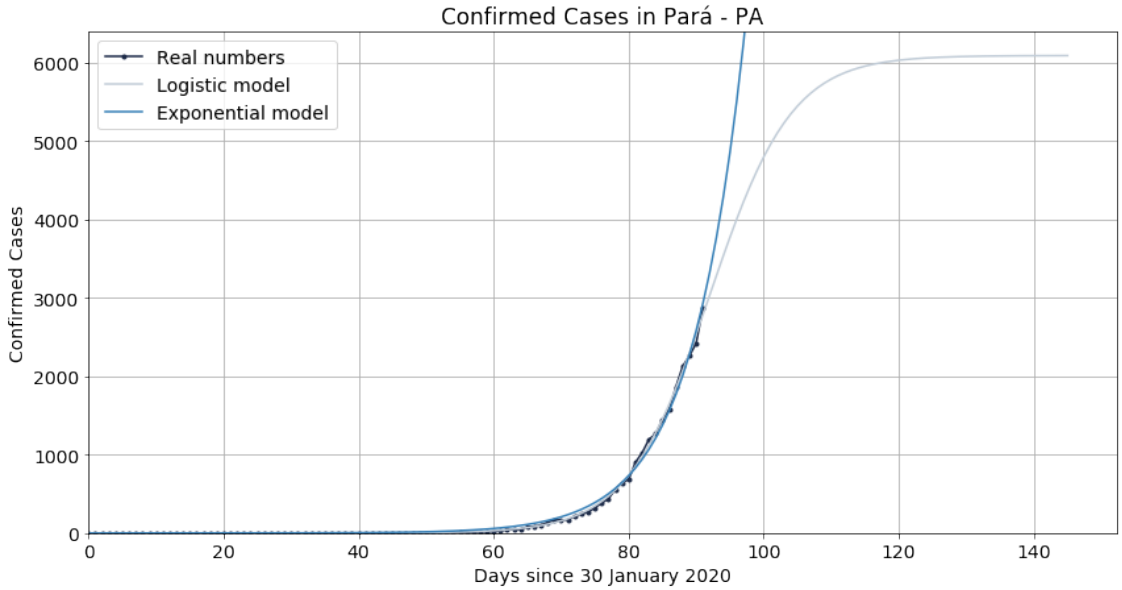
Next estimated number of confirmed cases in Mato Grosso do Sul is: 11.294 or + 2.294



Next estimated number of confirmed cases in Mato Grosso is: 351.039 or + 54.039

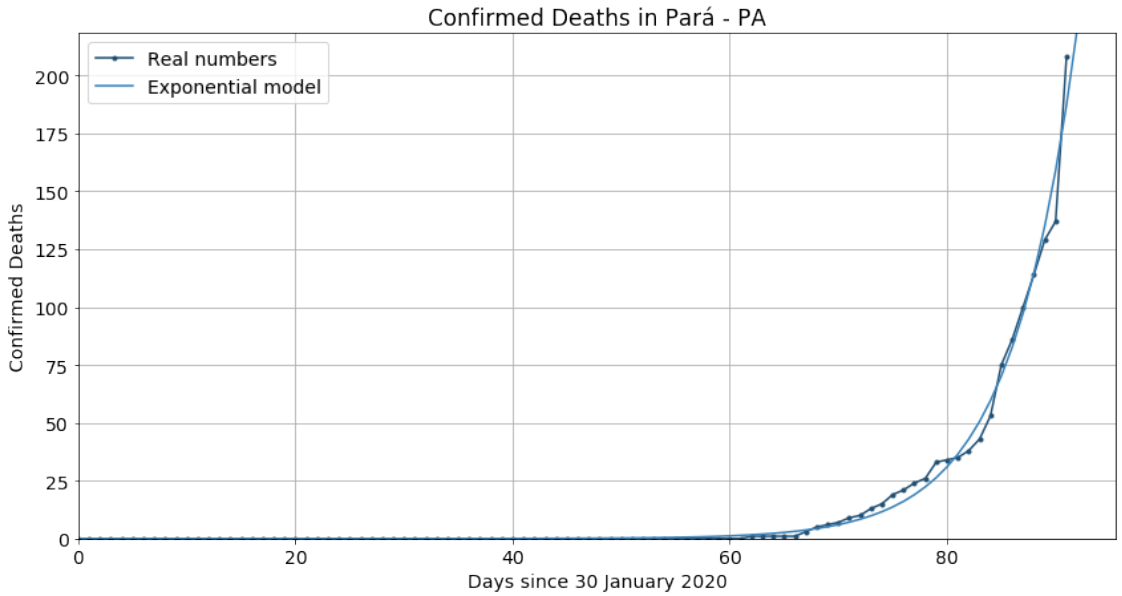



```
Next estimated number of confirmed cases in Mato Grosso is: 13.759 or + 2.759

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```

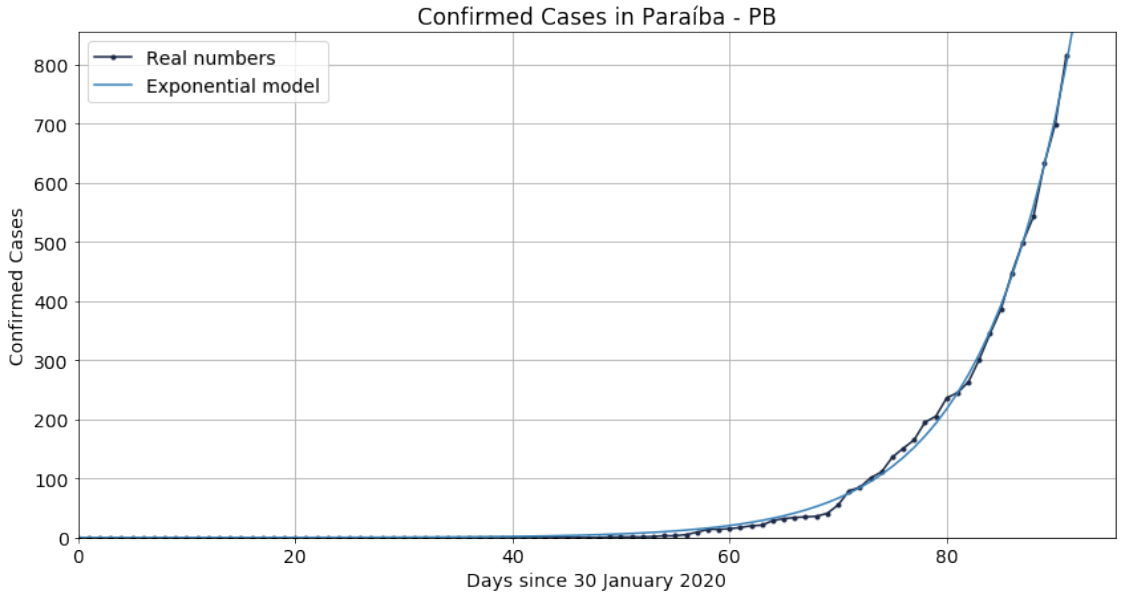



```
Next estimated number of confirmed cases in Pará is: 3326.416 or + 450.416

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
```

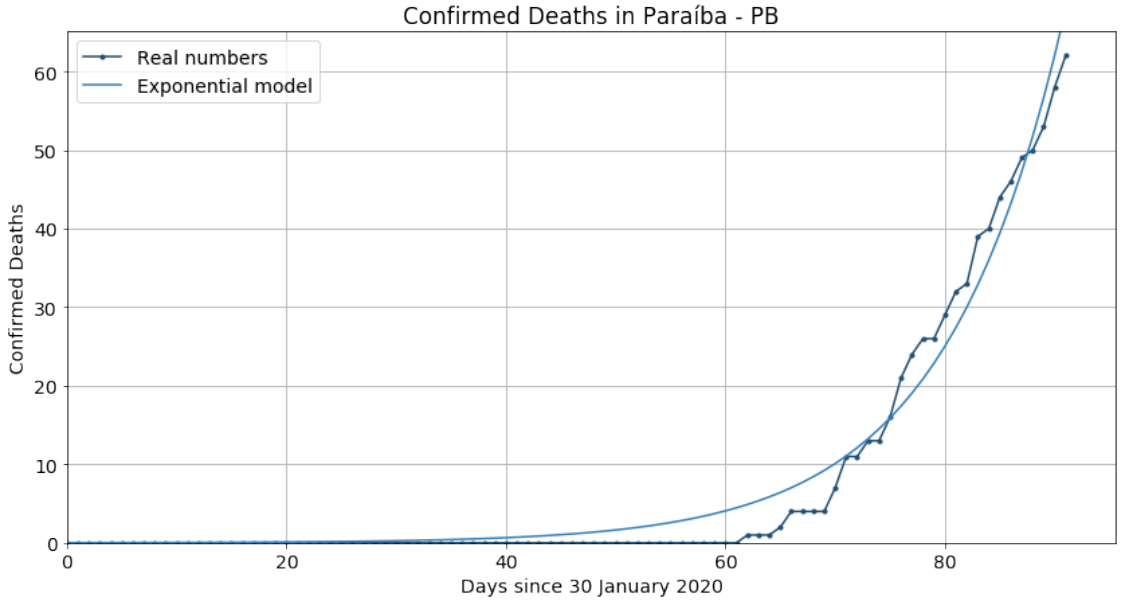
```
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



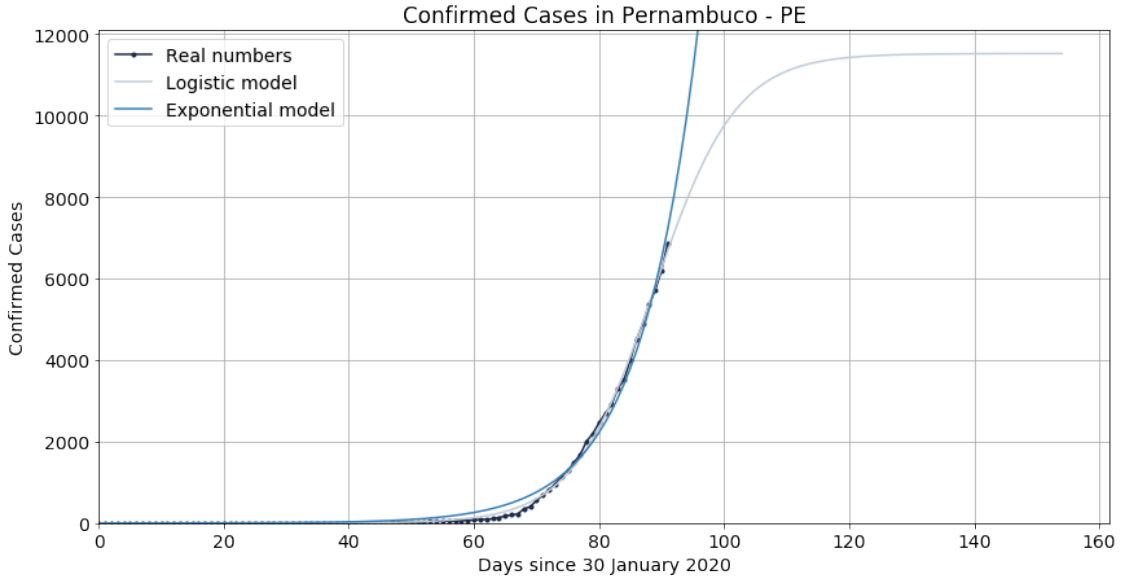

```
Next estimated number of confirmed cases in Pará is: 220.56 or + 12.56
```



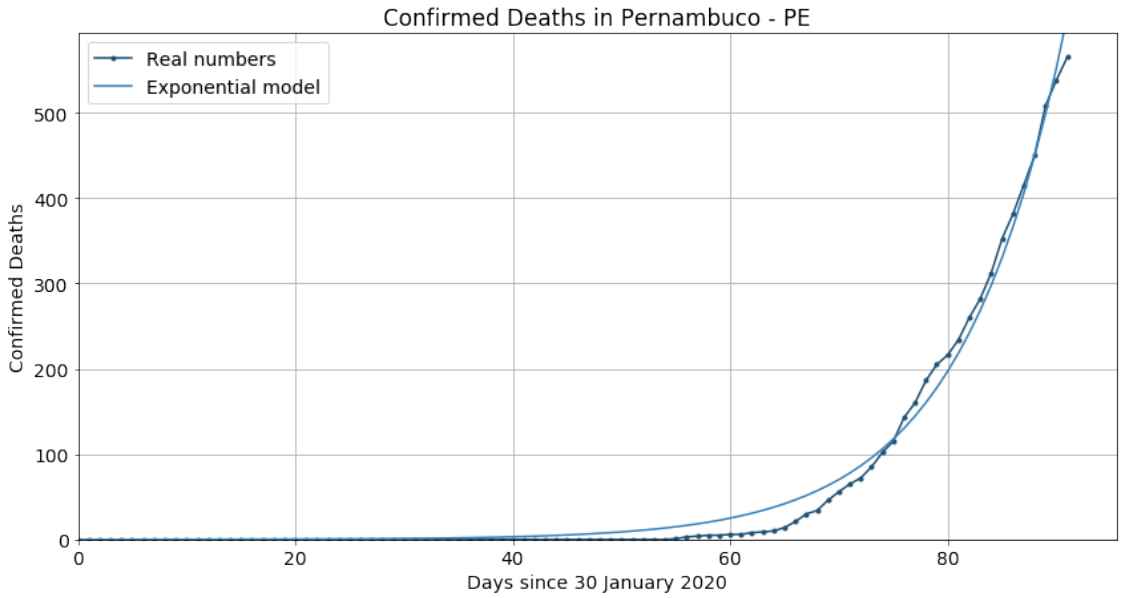

```
Next estimated number of confirmed cases in Paraíba is: 899.782 or + 85.782
```



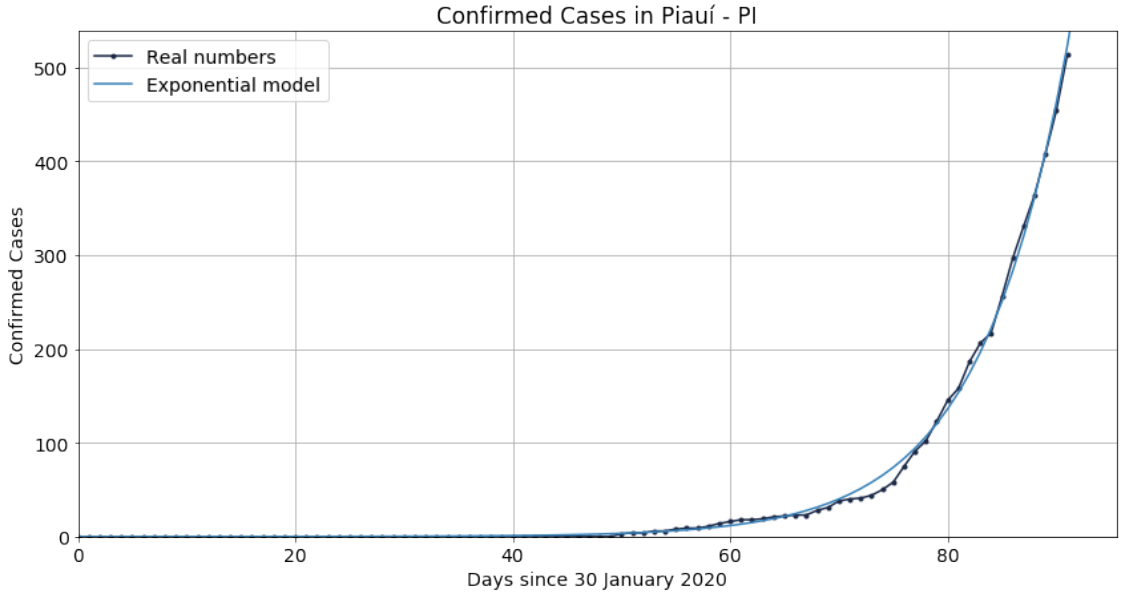
Next estimated number of confirmed cases in Paraíba is: 74.425 or + 12.425



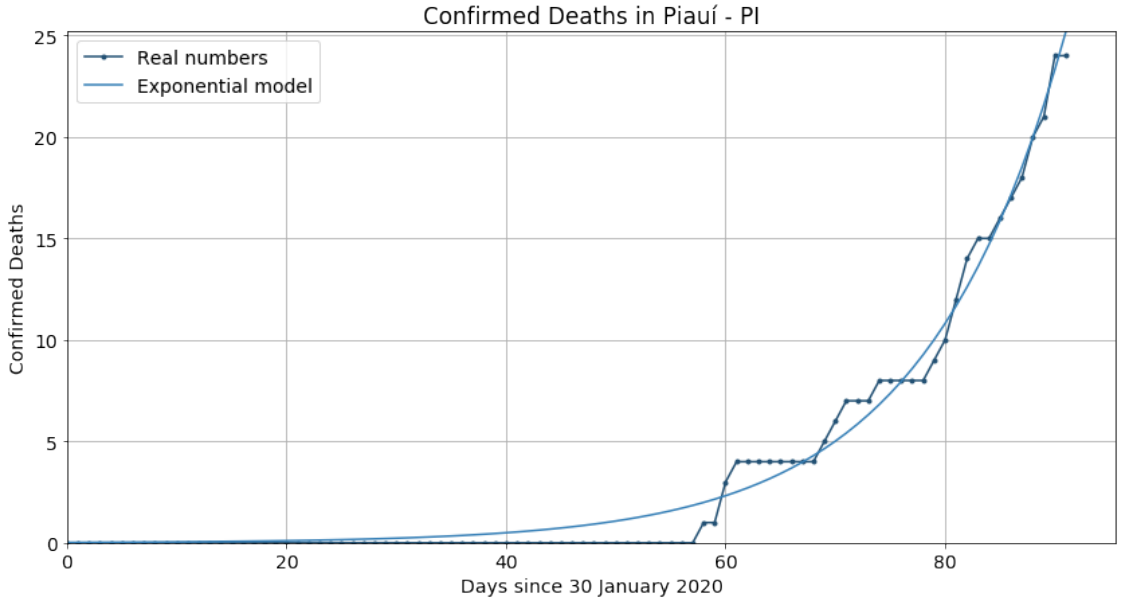
Next estimated number of confirmed cases in Pernambuco is: 8039.848 or + 1163.848



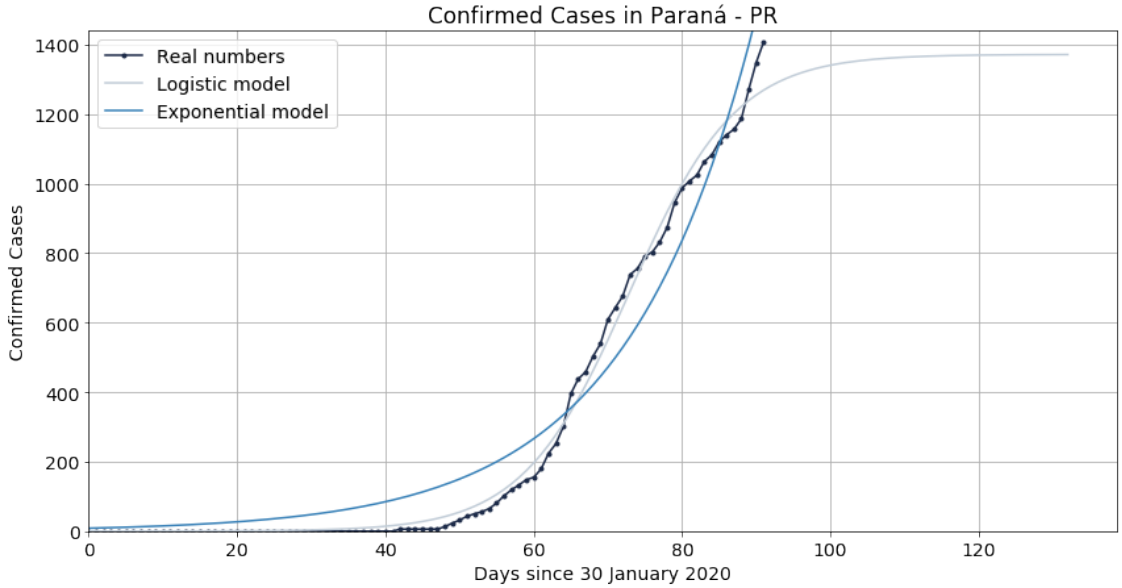

```
Next estimated number of confirmed cases in Pernambuco is: 678.992 or + 113.992

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



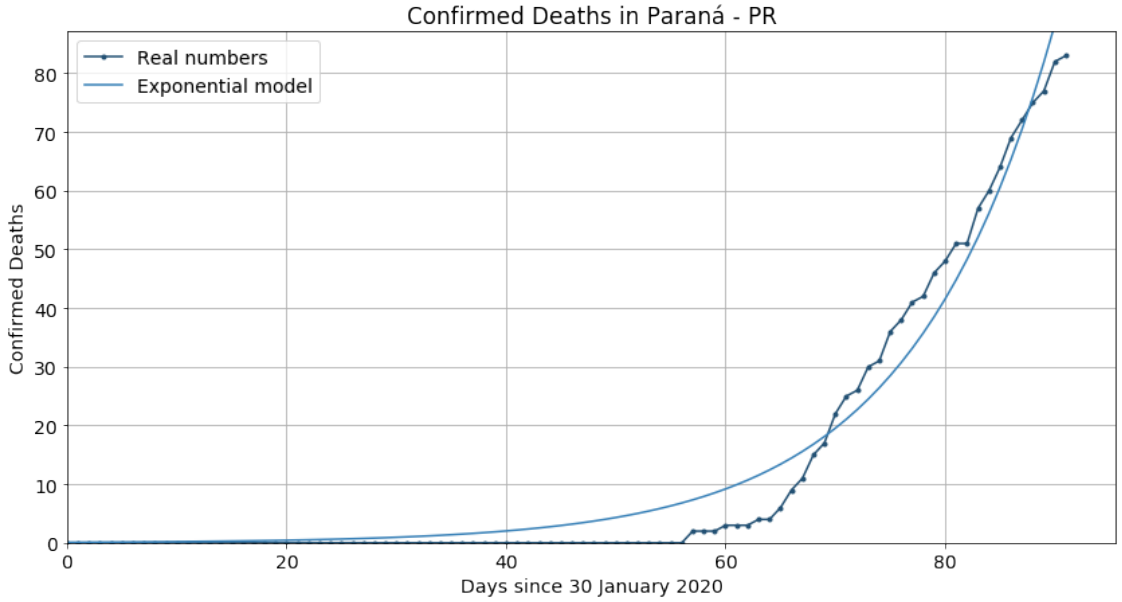

```
Next estimated number of confirmed cases in Piauí is: 590.351 or + 77.351
```



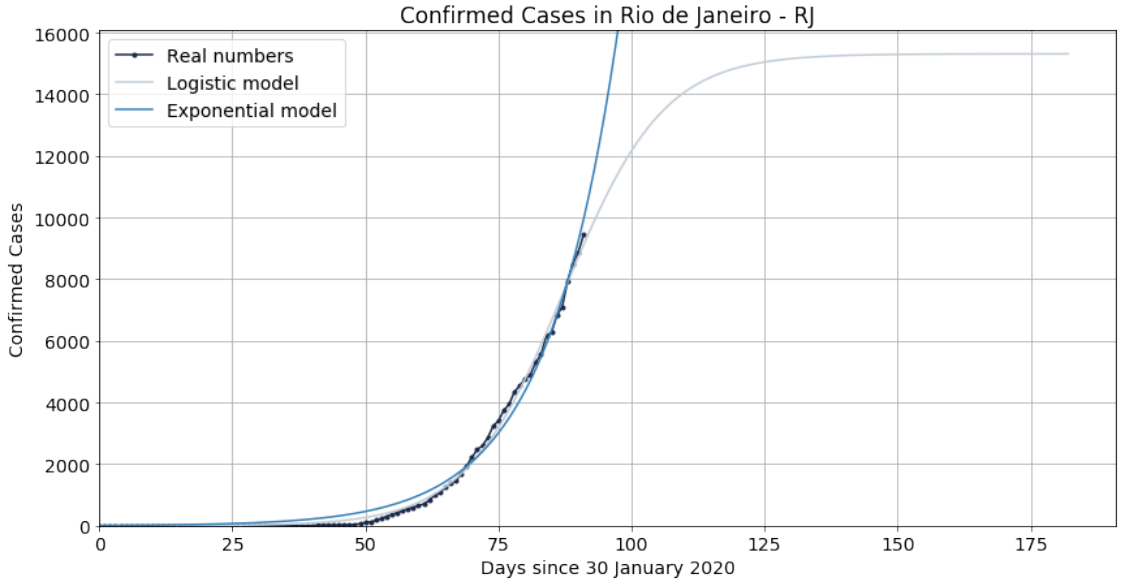

```
Next estimated number of confirmed cases in Piauí is: 27.192 or + 3.192
```



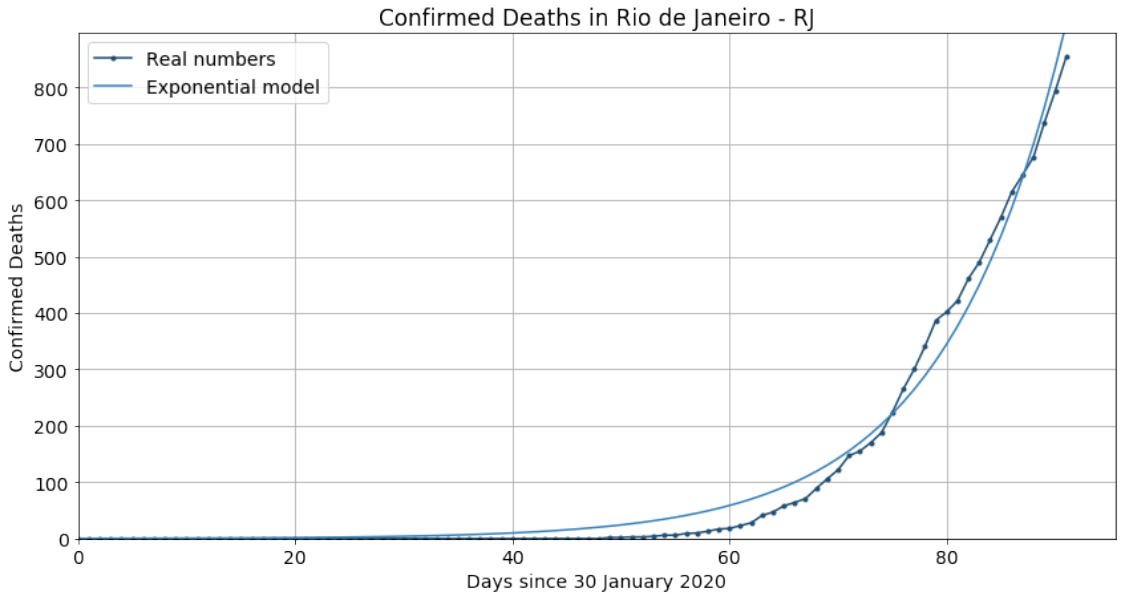

```
Next estimated number of confirmed cases in Paraná is: 1660.857 or + 253.857
```



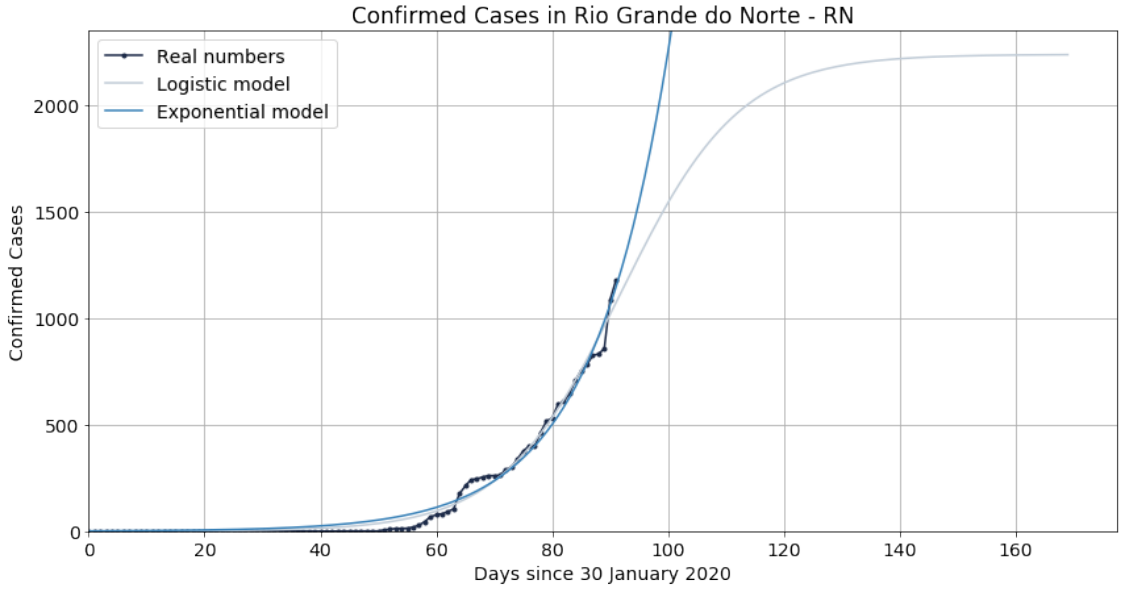

```
Next estimated number of confirmed cases in Paraná is: 102.717 or + 19.717
```



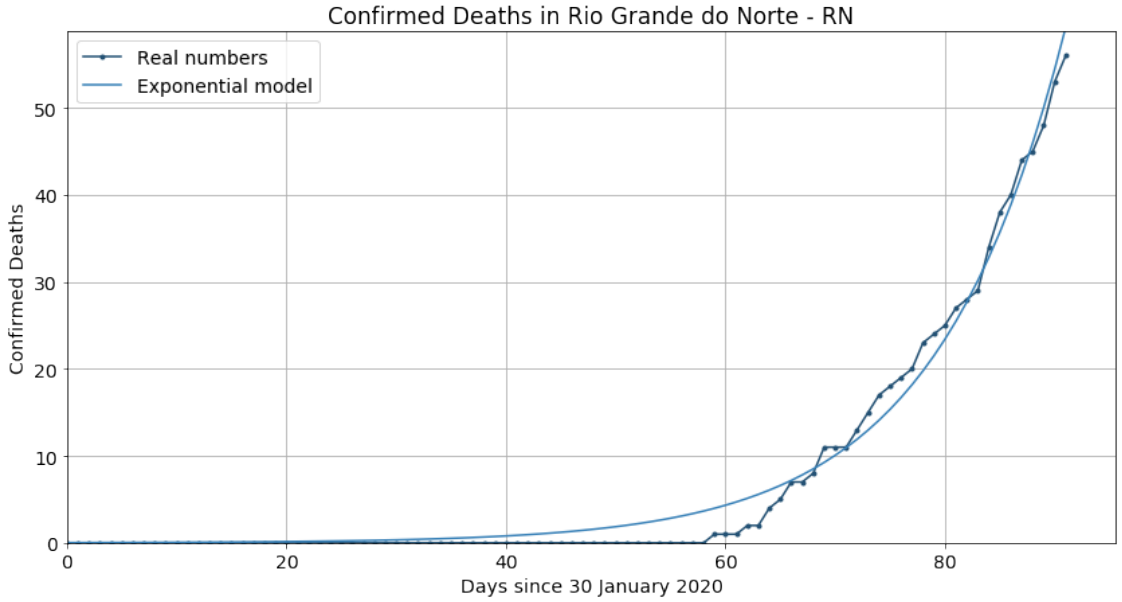

```
Next estimated number of confirmed cases in Rio de Janeiro is: 10714.042 or +
1261.042

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



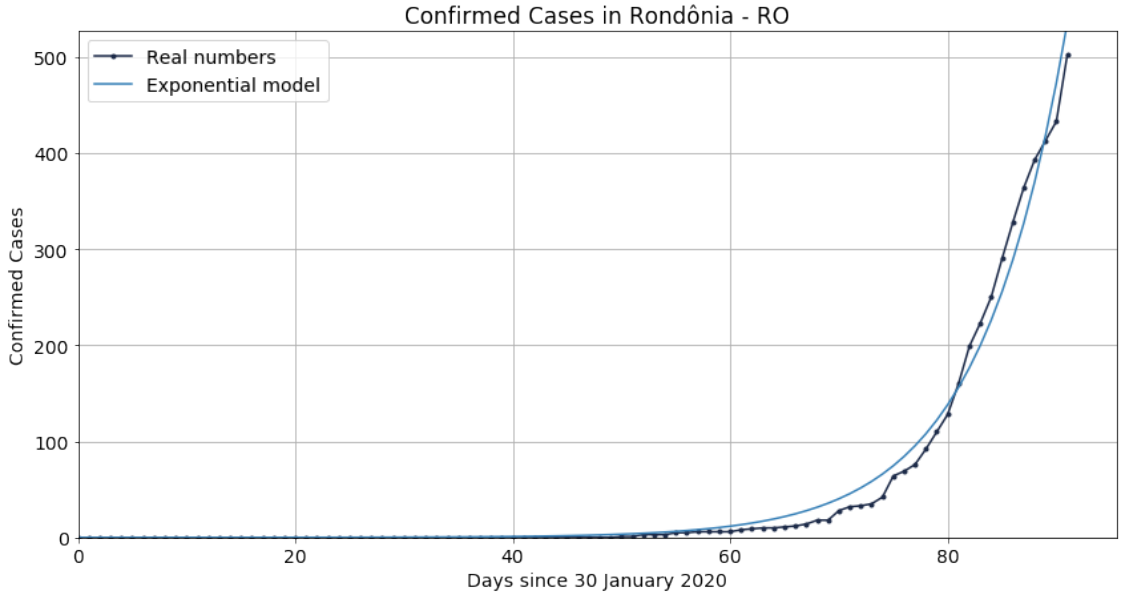
Next estimated number of confirmed cases in Rio de Janeiro is: 997.514 or + 143.514



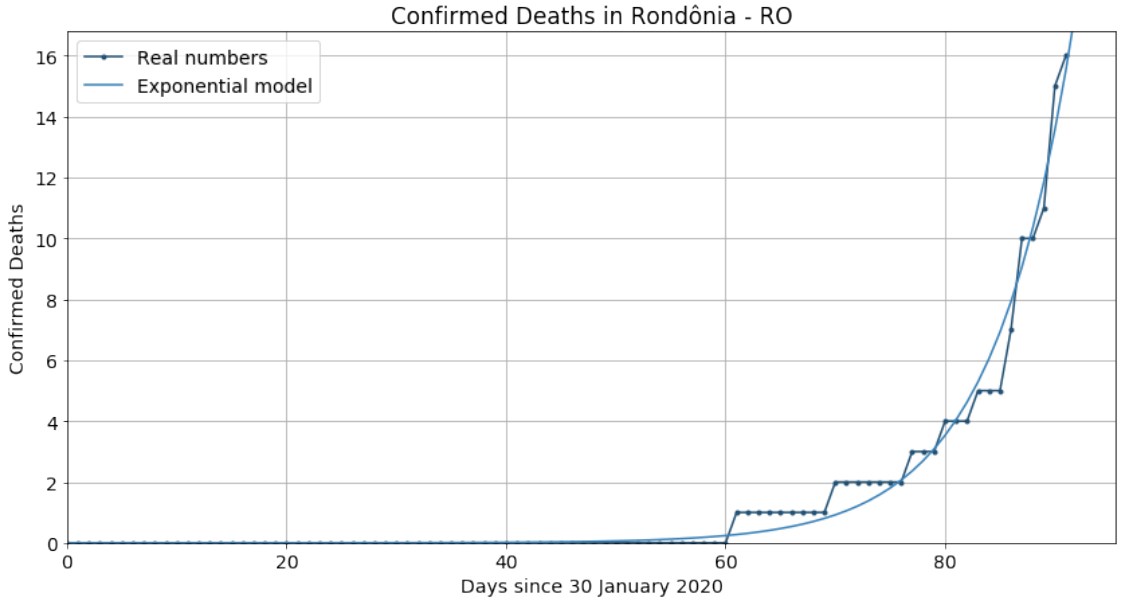
Next estimated number of confirmed cases in Rio Grande do Norte is: 1234.132 or + 57.132



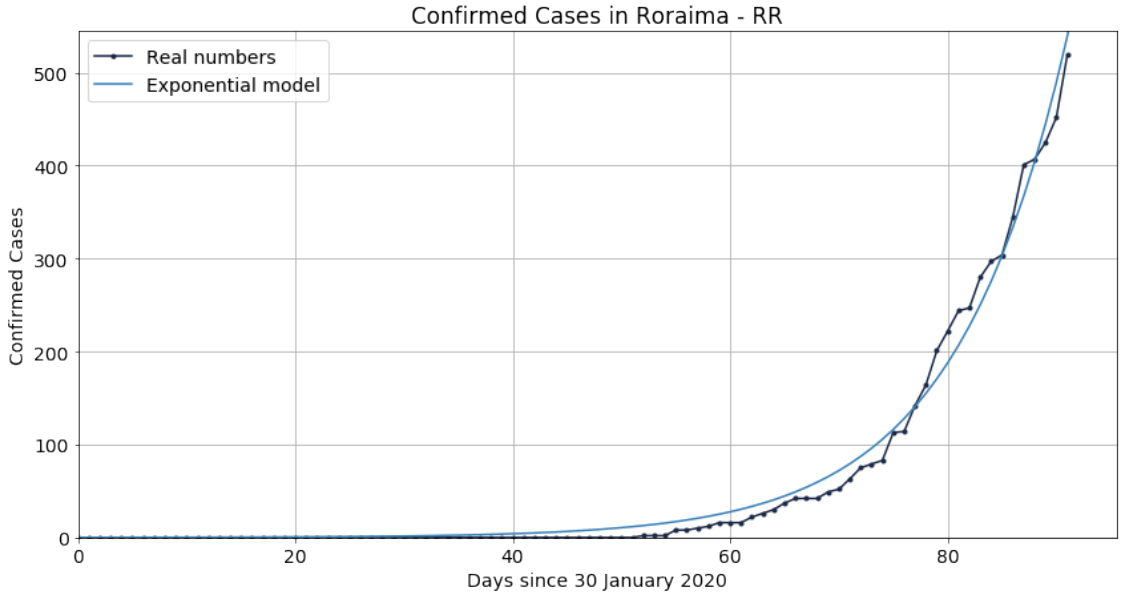

```
Next estimated number of confirmed cases in Rio Grande do Norte is: 64.477 or +
8.477

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



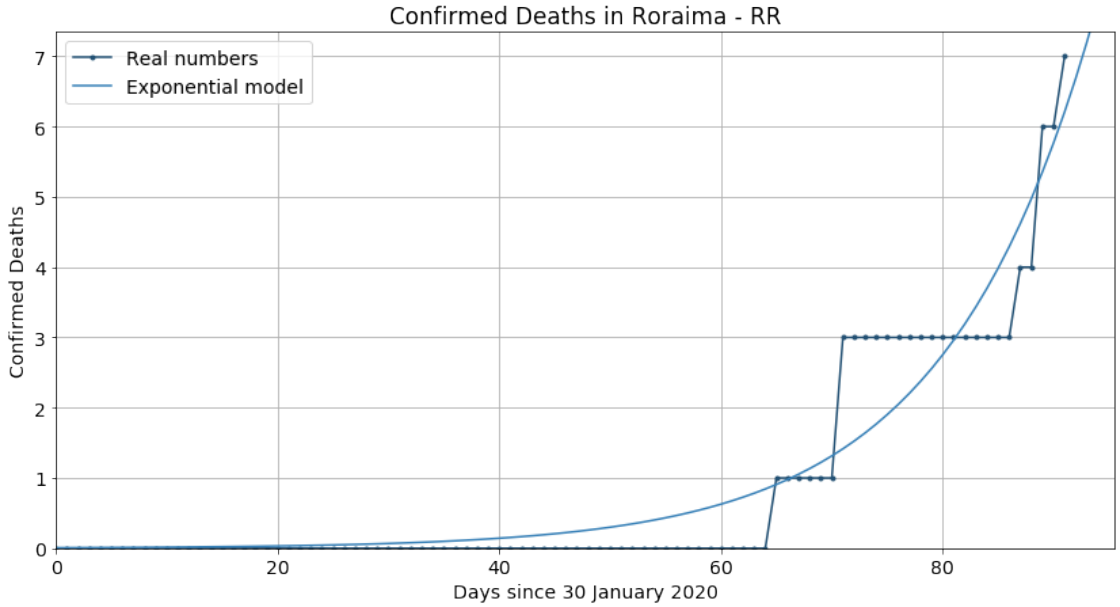

```
Next estimated number of confirmed cases in Rondônia is: 605.252 or + 103.252
```



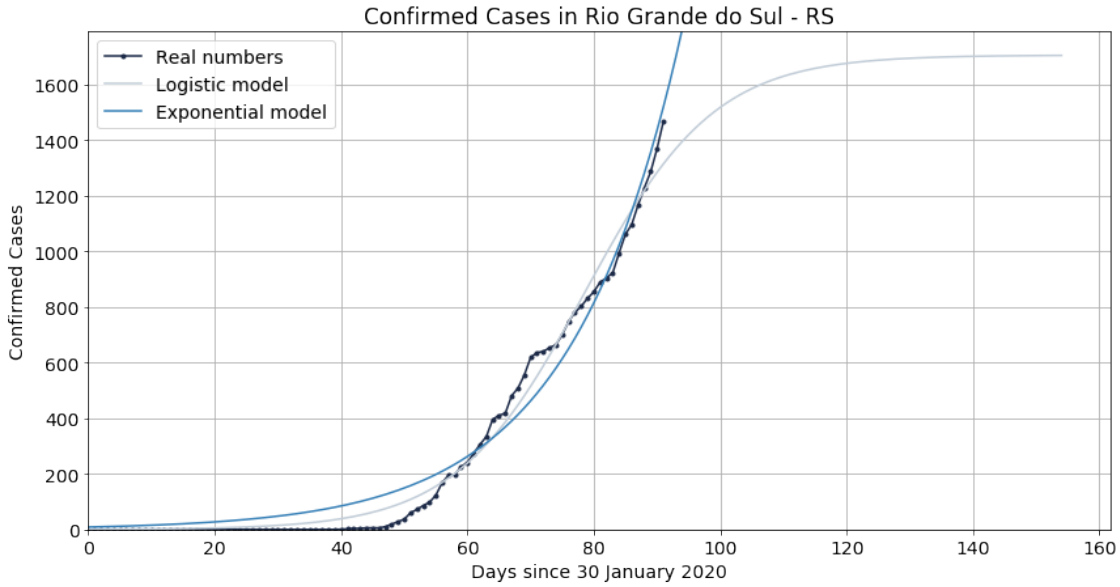

```
Next estimated number of confirmed cases in Rondônia is: 17.752 or + 1.752
```



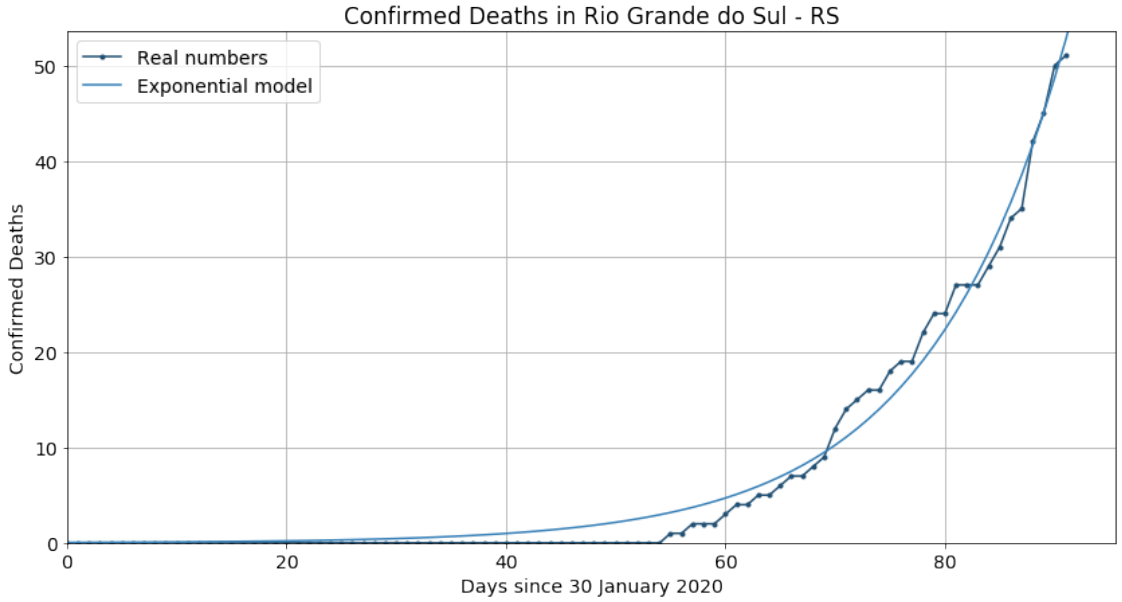

```
Next estimated number of confirmed cases in Roraima is: 593.288 or + 74.288
```



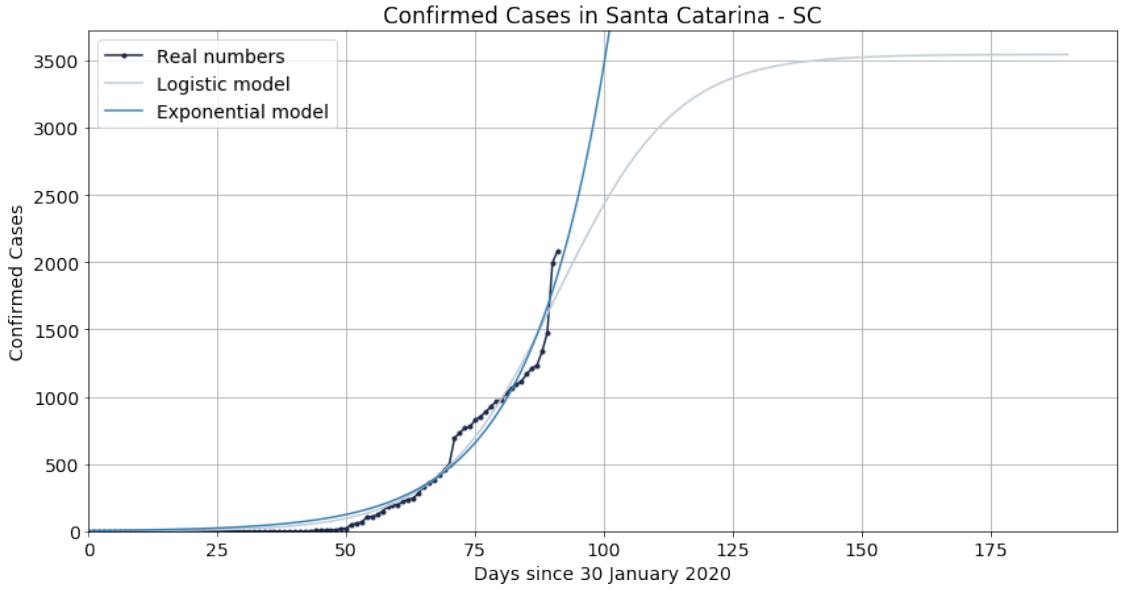

```
Next estimated number of confirmed cases in Roraima is: 6.685 or + -0.315
```



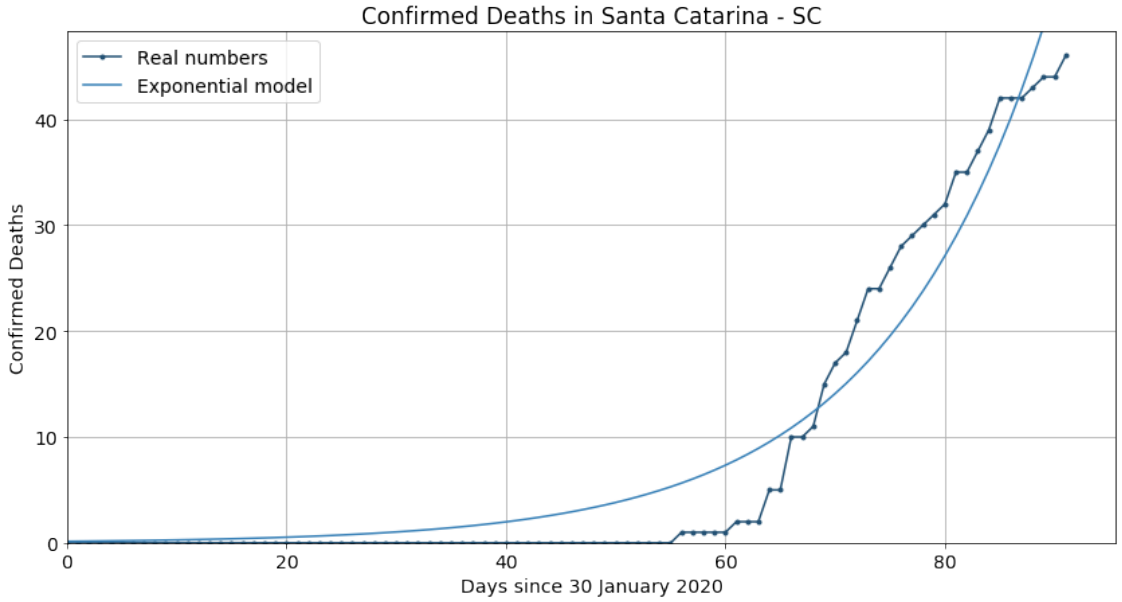

```
Next estimated number of confirmed cases in Rio Grande do Sul is: 1606.484 or +
140.484

C:\Users\calad\anaconda3\lib\site-packages\ipykernel_launcher.py:4:
RuntimeWarning: overflow encountered in exp
  after removing the cwd from sys.path.
```



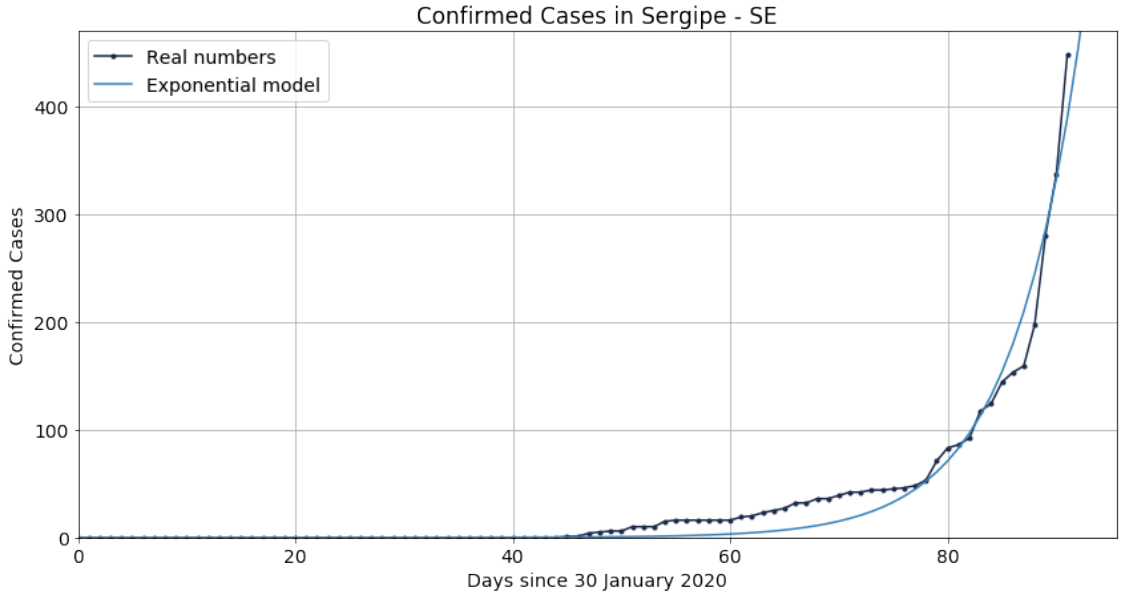
Next estimated number of confirmed cases in Rio Grande do Sul is: 56.911 or + 5.911



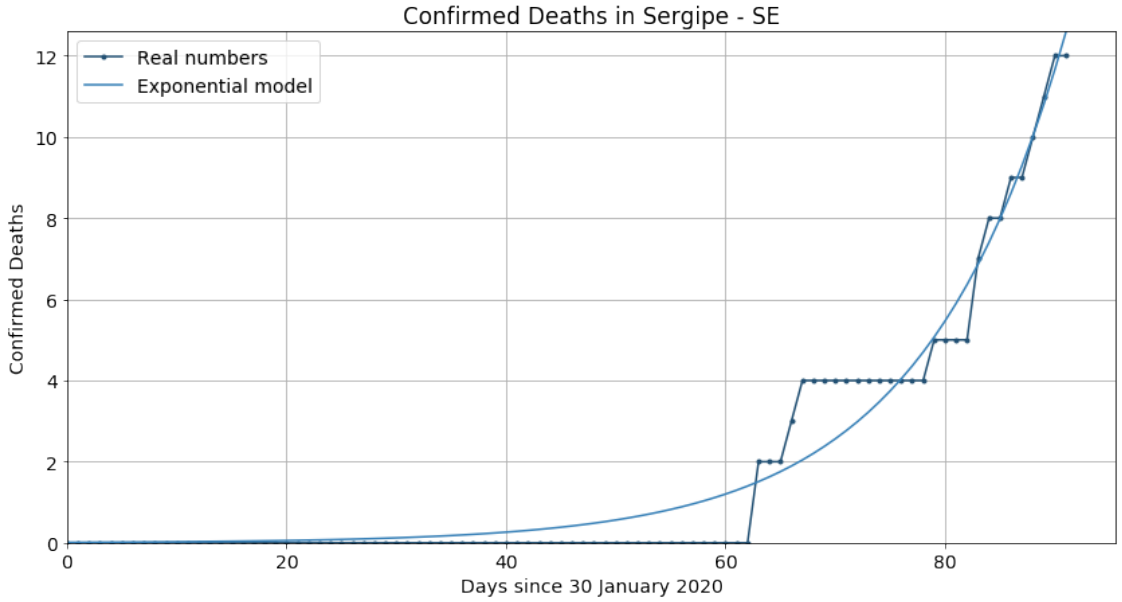
Next estimated number of confirmed cases in Santa Catarina is: 2038.004 or + -46.996



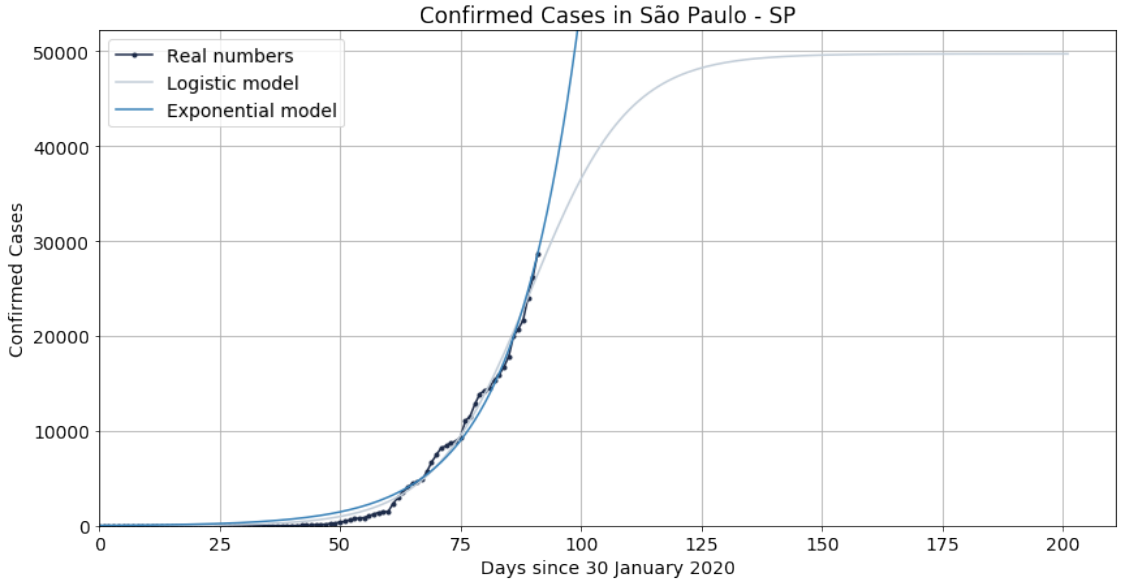

```
Next estimated number of confirmed cases in Santa Catarina is: 59.403 or +
13.403
```



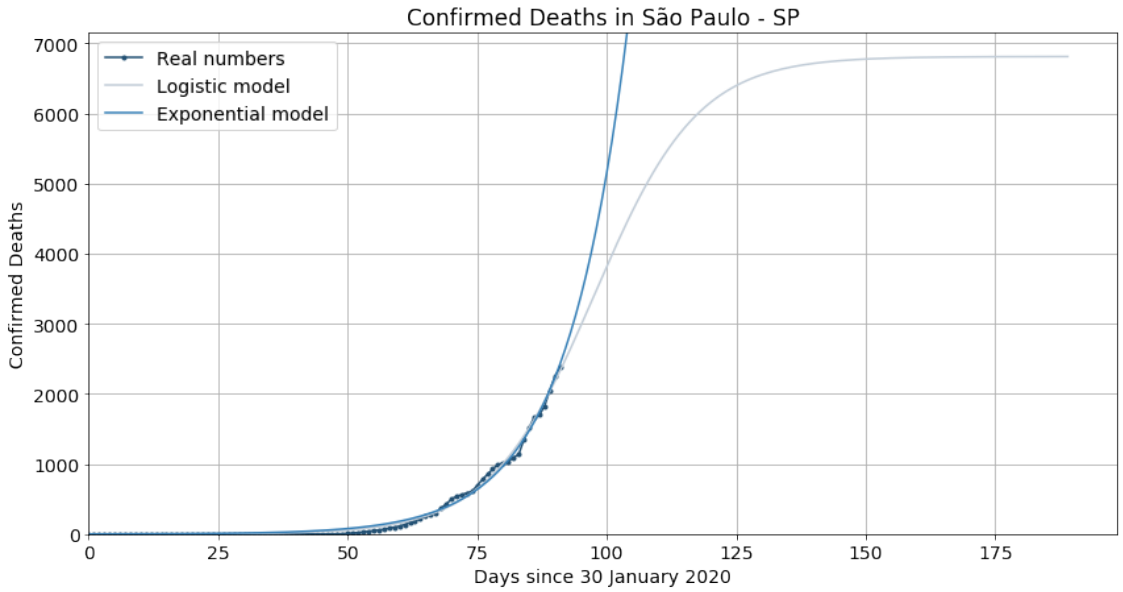

```
Next estimated number of confirmed cases in Sergipe is: 453.196 or + 6.196
```



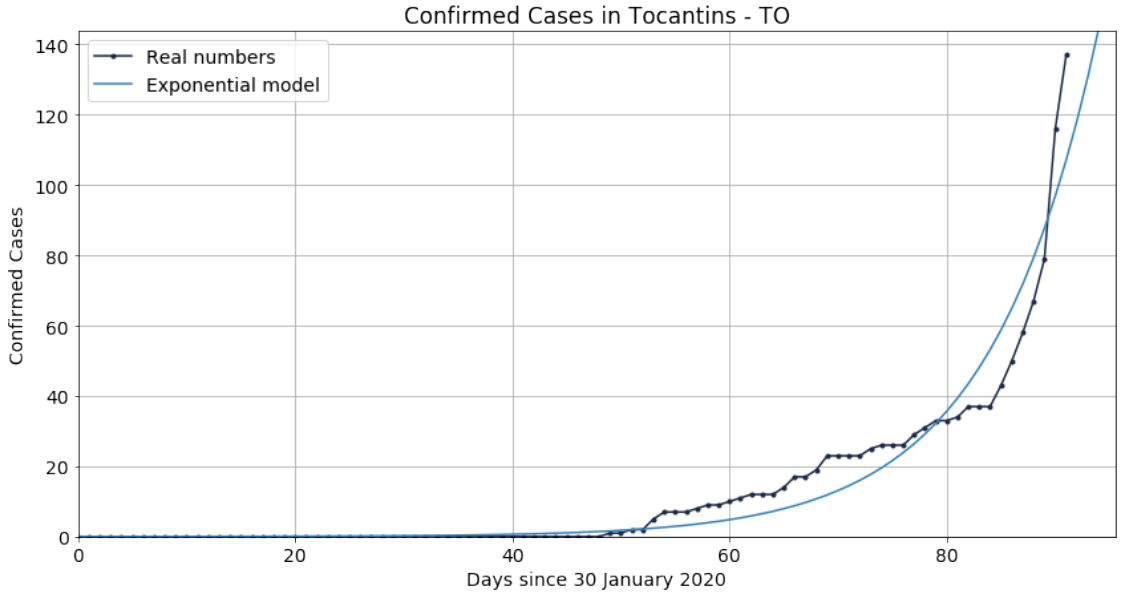

```
Next estimated number of confirmed cases in Sergipe is: 13.565 or + 1.565
```



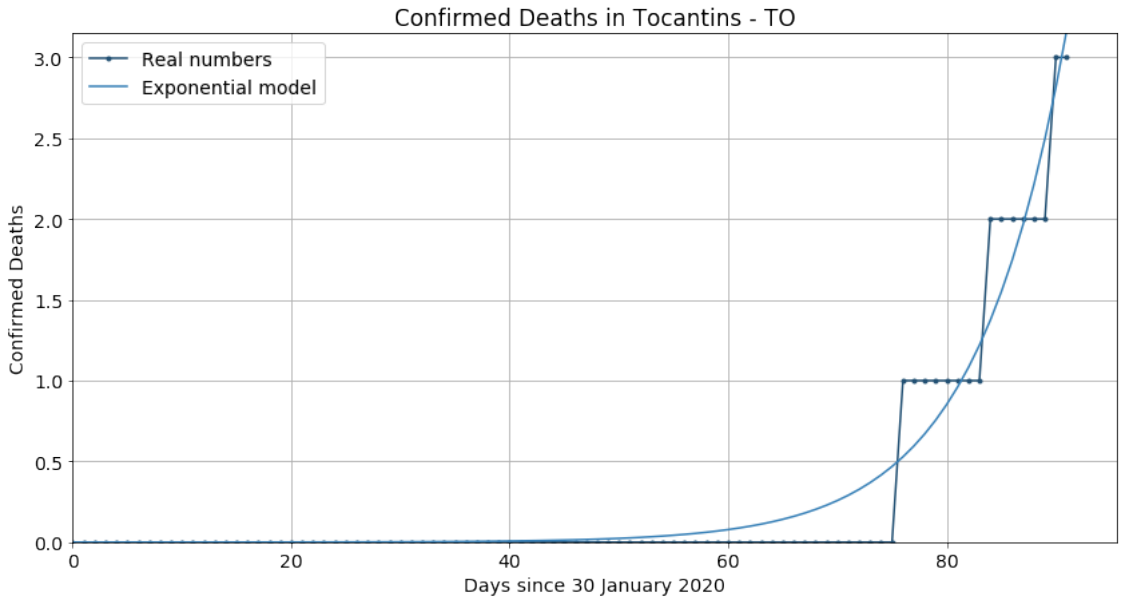

```
Next estimated number of confirmed cases in São Paulo is: 30813.583 or +
2115.583
```




```
Next estimated number of confirmed cases in São Paulo is: 2639.596 or + 264.596
```




```
Next estimated number of confirmed cases in Tocantins is: 118.367 or + -18.633
```




```
Next estimated number of confirmed cases in Tocantins is: 3.574 or + 0.574
```

```
[ ]:
```