Covid 19 Analysis

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Introduction

This is the analysis of the covid-19 public data set. This involves summarization of the covid cases and visualization of the current situation of the pandemic worldwide. This explains the number or infections, deaths and recoveries throughout the countries of the world.

This data analysis plots the visualizations of the trends and patterns derived form the data set. This helps an individual understand the growth rate of the infeciton throughout the world. Thus, helping them to understand the global scenario as of today.

Install Library

```
library(covid19.analytics)
```

Access Data

```
ag <- covid19.data(case = 'aggregated')
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_daily_reports/07-09-2021.csv
```

```
tsc <- covid19.data(case = 'ts-confirmed')
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_confirmed_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:17 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 279
```

```
## --------------------------------------------------------------------------------
```

```
tsa <- covid19.data(case = 'ts-ALL')
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_confirmed_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:19 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 279
```

```
## --------------------------------------------------------------------------------
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_deaths_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:21 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 279
```

```
## --------------------------------------------------------------------------------
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_recovered_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:23 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 264
```

```
## --------------------------------------------------------------------------------
```

#3 Summary with graphics

```
report.summary(Nentries = 10,
               graphical.output = T)
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_confirmed_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:26 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 279
```

```
## ------------------------------------------------------------------------------
```

```
##  >>> checking data integrity...
```

```
## checking for ... Country Province Lat Long
```

```
## No critical issues have been found.
```

```
##  >>> checking data consistency...
```

```
## Warning in consistency.check(data, n0, nf, datasetName, details = details, :
## Inconsistency of type.II in ts-confirmed data detected -- 74 records (out of
## 279) show inconsistencies in the data...
```

```
## ################################################################################
##   ##### TS-CONFIRMED Cases  -- Data dated:  2021-07-09  ::  2021-07-10 12:30:29
## ################################################################################
##   Number of Countries/Regions reported:  195
##   Number of Cities/Provinces reported:  88
##   Unique number of distinct geographical locations combined: 279
## --------------------------------------------------------------------------------
##   Worldwide ts-confirmed  Totals: 186015939
## --------------------------------------------------------------------------------
##    Country.Region Province.State   Totals GlobalPerc LastDayChange   t-2   t-3   t-7  t-14
t-30
## 1              US                33837389      18.19         46884 20061 22931  4739  7303
14545
## 2           India                30752950      16.53             0 43393 45892 43071 50040
92291
## 3          Brazil                19020499      10.23         57737 53725 54022 54556 64134
88092
## 4          France                 5733214       3.08          4377  4442  3802  3006  2128
4276
## 5          Russia                 5664200       3.05         25299 24361 23510 24003 21312
11560
## 6          Turkey                 5465094       2.94             0  5171  5160  4537  5266
6408
## 7  United Kingdom                 5058093       2.72         35200 31977 32048 24447 17943
7232
## 8       Argentina                 4627537       2.49         14518 19256 19423 14034 18555
27628
## 9        Colombia                 4471622       2.40         21536 23275 24229 26928 33594
31656
## 10          Italy                 4268491       2.29          1386  1391  1010   929   838
2078
## --------------------------------------------------------------------------------
##   Global Perc. Average:  0.36 (sd: 1.65)
##   Global Perc. Average in top  10 :  6.39 (sd: 6.26)
## --------------------------------------------------------------------------------
## ================================================================================
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_deaths_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:31 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 279
```

```
## --------------------------------------------------------------------------------
```

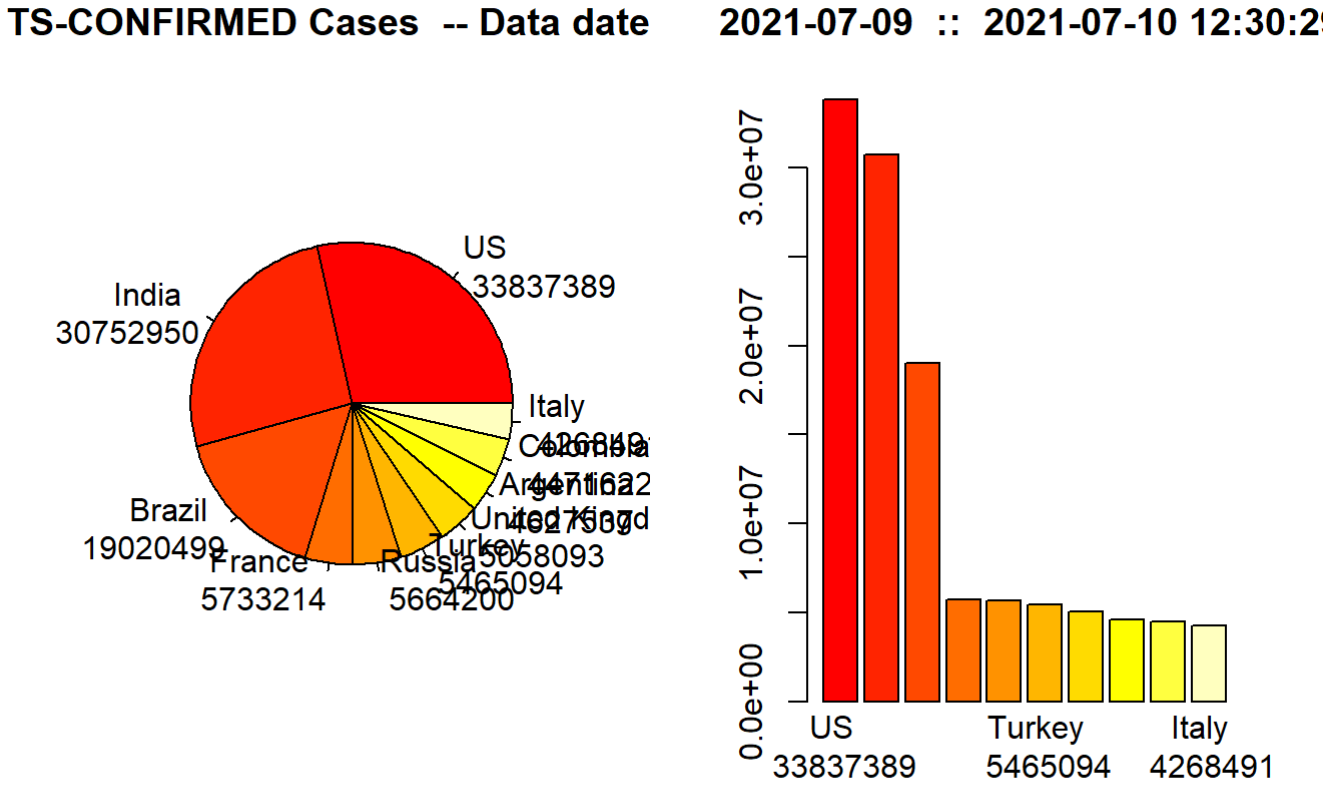
```
##  >>> checking data integrity...
```

```
## checking for ... Country Province Lat Long
```

```
## No critical issues have been found.
```

```
##  >>> checking data consistency...
```

```
## Warning in consistency.check(data, n0, nf, datasetName, details = details, :
## Inconsistency of type.II in ts-deaths data detected -- 62 records (out of 279)
## show inconsistencies in the data...
```



```
## ################################################################################
##   ##### TS-DEATHS Cases  -- Data dated:  2021-07-09  ::  2021-07-10 12:30:34
## ################################################################################
##   Number of Countries/Regions reported:  195
##   Number of Cities/Provinces reported:  88
##   Unique number of distinct geographical locations combined: 279
## --------------------------------------------------------------------------------
##   Worldwide ts-deaths  Totals: 4017782
## --------------------------------------------------------------------------------
##    Country.Region Province.State Totals Perc LastDayChange  t-2  t-3  t-7 t-14 t-30
## 1              US                606988 1.79           513  257  312   80  147  429
## 2          Brazil                531688 2.80          1509 1639 1648 1635 1593 2504
## 3           India                405939 1.32             0  911  817  955 1258 7374
## 4          Mexico                234675 9.11           217  266  234  152  175  227
## 5            Peru                193909 9.35             0  166  155    0    0  690
## 6          Russia                139156 2.46           715  723  713  685  610  376
## 7  United Kingdom                128365 2.54            29   35   33   18   23    7
## 8           Italy                127756 2.99            25   13   14   22   40   88
## 9        Colombia                111731 2.50           576  577  559  591  693  652
## 10         France                110360 1.92            16   25   22   17   12   67
## --------------------------------------------------------------------------------
## --------------------------------------------------------------------------------
## ================================================================================
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_time_series/time_series_covid19_recovered_global.csv
```

```
## Data retrieved on 2021-07-10 12:30:37 || Range of dates on data: 2020-01-22--2021-07-09 |
Nbr of records: 264
```

```
## --------------------------------------------------------------------------------
```

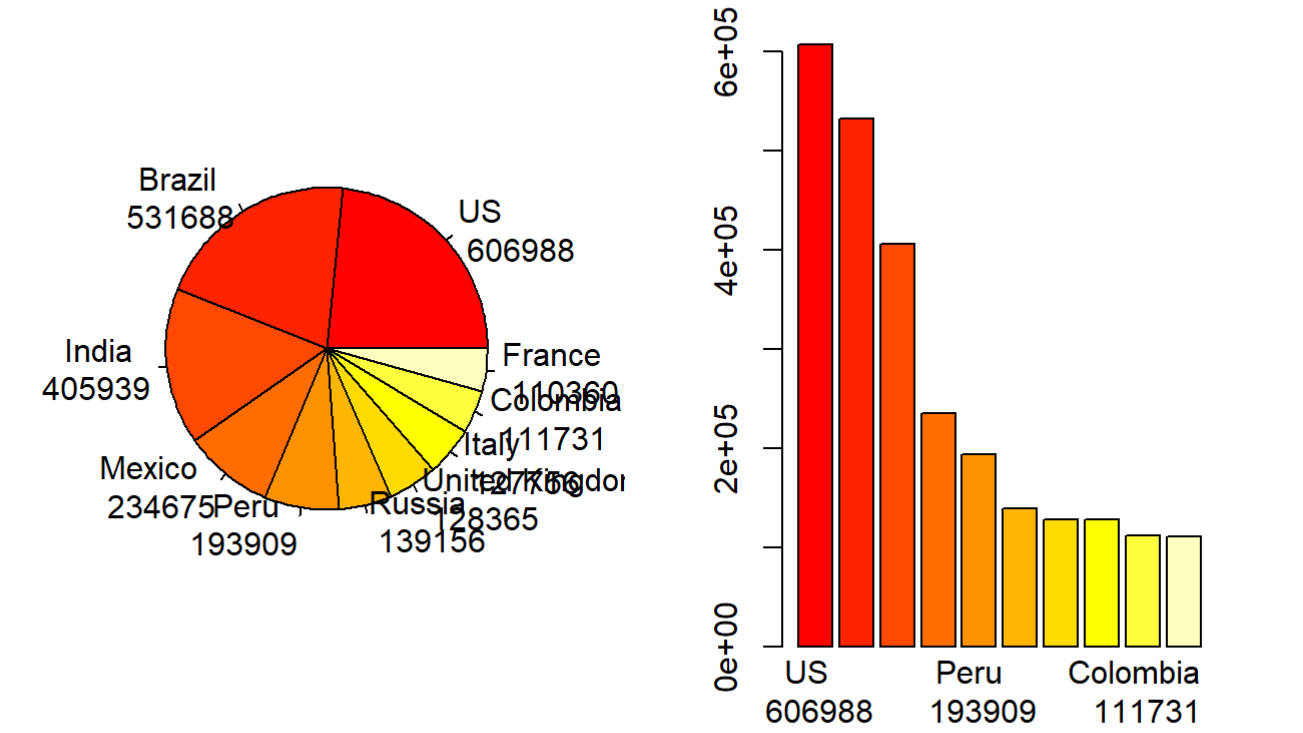
```
##  >>> checking data integrity...
```

```
## checking for ... Country Province Lat Long
```

```
## No critical issues have been found.
```

```
##  >>> checking data consistency...
```

```
## Warning in consistency.check(data, n0, nf, datasetName, details = details, :
## Inconsistency of type.II in ts-recovered data detected -- 102 records (out of
## 264) show inconsistencies in the data...
```




```
## ################################################################################
##   ##### TS-RECOVERED Cases  -- Data dated:  2021-07-09  ::  2021-07-10 12:30:40
## ################################################################################
##   Number of Countries/Regions reported:  195
##   Number of Cities/Provinces reported:  72
##   Unique number of distinct geographical locations combined: 264
## --------------------------------------------------------------------------------
##   Worldwide ts-recovered  Totals: 122412570
## --------------------------------------------------------------------------------
##    Country.Region Province.State   Totals LastDayChange   t-2   t-3   t-7  t-14   t-30
## 1           India                29888284             0 44459 44291 52299 57944 134580
## 2          Brazil                16823301         27140 32639 23386 14279 48897  57075
## 3          Turkey                 5333759             0  5012  4636  4913  7402   6895
## 4          Russia                 5104709         21458 20926 19809 17642 14139   9962
## 5       Argentina                 4246200         19506 20216 13932 22728 20057  30507
## 6        Colombia                 4199227         27209 29634 28467 27603 29099  23490
## 7           Italy                 4099339          1434  1749  1735  3110  3301   7616
## 8         Germany                 3632230           920   970  1430   870  1040   5320
## 9            Iran                 2995195         14176 13198 14235 12690 13109  21409
## 10         Poland                 2652409            37    79    28    68   151    448
## --------------------------------------------------------------------------------
## --------------------------------------------------------------------------------
## ================================================================================
```

```
## Data being read from JHU/CCSE repository
```

```
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
## Reading data from https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_co
vid_19_data/csse_covid_19_daily_reports/07-09-2021.csv
```

```
##  >>> checking data integrity...
```

```
## checking for ... Country Province Lat Long
```

```
## No critical issues have been found.
```

```
## Possible <<Aggregated data-type>> detected...
```

```
## checking for ... Active Deaths Recovered Confirmed
```

```
## No critical issues have been found.
```

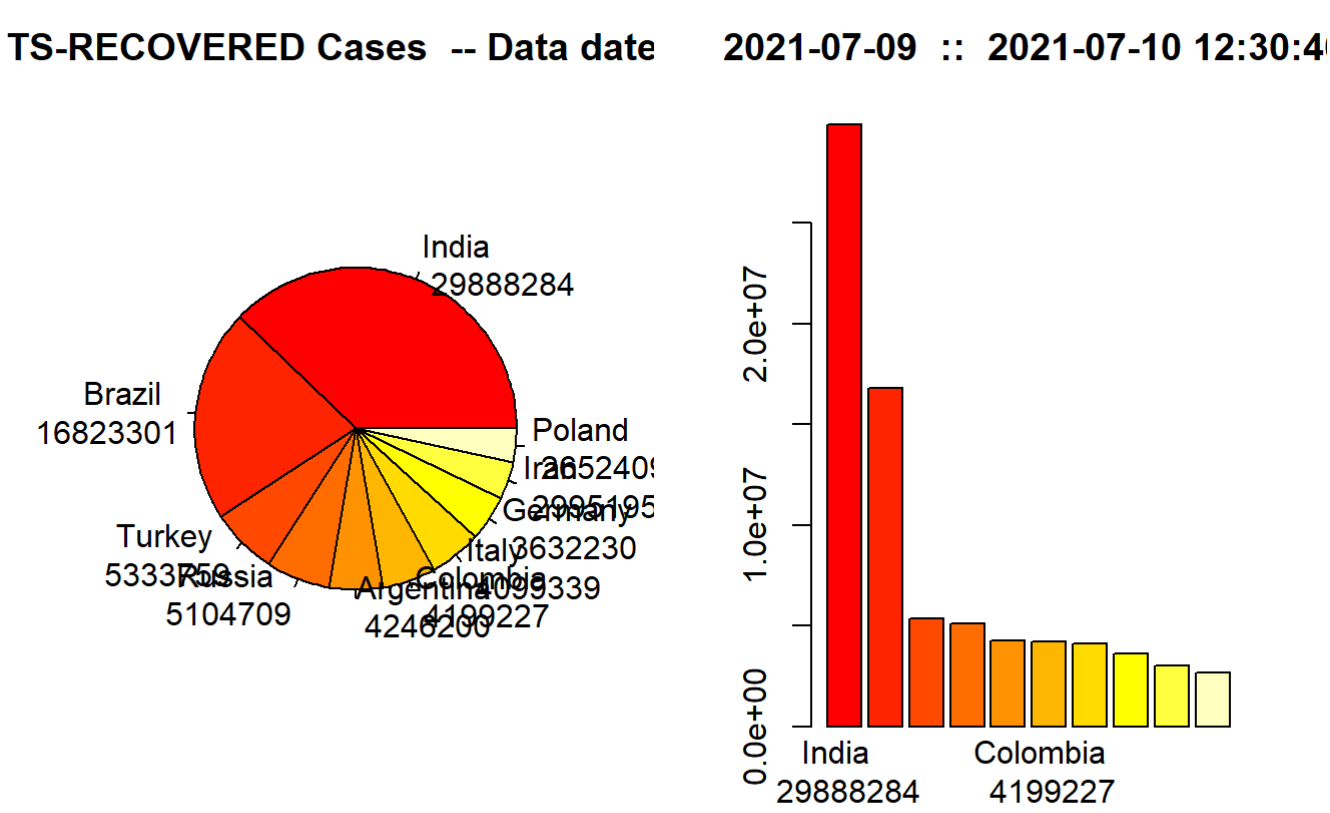
```
## Warning in chck.cols.qty(agg.critical.cols, data, disclose = disclose): Column Active has
10 entries reporting negative values!
##   on entries: 33 142 176 322 331 336 339 348 419 493
```

```
## Warning in chck.cols.qty(agg.critical.cols, data, disclose = disclose): number of 'active+
recovered+deaths' cases does NOT match the number of 'confirmed' cases!
##  on 1 entries -- 40
##   ||  FIPS  Admin2  Province_State  Country_Region  Last_Update  Lat  Long_  Confirmed  De
aths  Recovered  Active  Combined_Key  Incident_Rate  Case_Fatality_Ratio
##   40 || NA      Bosnia and Herzegovina  2021-07-10 04:21:25  43.9159  17.6791  205047  966
7  183663  10490  Bosnia and Herzegovina  6252.86704675515  4.71452886411408
```

```
## *** 11 entries were removed due to data inconsistences
```

```
##  >>> checking data consistency...
```

```
## This function applies to TimeSeries data only
```


TS-RECOVERED Cases -- Data date 2021-07-09 :: 2021-07-10 12:30:4
India
29888284
Brazil
16823301
Poland
Germany
Italy
3632230
Turkey
Russia
5104709
Colombia
4199227
4246200
2.0e+07
1.0e+07
0.0e+00
India
29888284
Colombia
4199227

```
## ################################################################################################
################################################
##   ##### AGGREGATED Data  -- ORDERED BY  CONFIRMED Cases  -- Data dated:  2021-07-10  ::  2
021-07-10 12:30:42
## ################################################################################################
################################################
##   Number of Countries/Regions reported: 194
##   Number of Cities/Provinces reported: 573
##   Unique number of distinct geographical locations combined: 3976
## ------------------------------------------------------------------------------------------
-----------------------------------------------
##                  Location Confirmed Perc.Confirmed Deaths Perc.Deaths Recovered Perc.Reco
vered  Active Perc.Active
## 1       Maharashtra, India   6131976           3.30 124296        2.03   5889982
96.05  117698        1.92
## 2                   France   5733214           3.09 110360        1.92    341046
5.95 5281808       92.13
## 3                   Turkey   5465094           2.94  50096        0.92   5333759
97.60   81239        1.49
## 4                Argentina   4627537           2.49  98148        2.12   4246200
91.76  283189        6.12
## 5  England, United Kingdom   4393205           2.37 112880        2.57         0
0.00 4280325       97.43
## 6        Sao Paulo, Brazil   3853276           2.07 131960        3.42   3442275
89.33  279041        7.24
## 7                      Iran   3344122           1.80  85543        2.56   2995195
89.57  263384        7.88
## 8            Kerala, India   3025466           1.63  14250        0.47   2900600
95.87  110616        3.66
## 9                   Poland   2880670           1.55  75152        2.61   2652409
92.08  153109        5.32
## 10        Karnataka, India   2864868           1.54  35663        1.24   2790453
97.40   38752        1.35
## ================================================================================================
================================================
```

```
## ##############################################################################################################
##################################################
##   ##### AGGREGATED Data  -- ORDERED BY  DEATHS Cases  -- Data dated:  2021-07-10  ::  2021
-07-10 12:30:42
## ##############################################################################################################
##################################################
##   Number of Countries/Regions reported: 194
##   Number of Cities/Provinces reported: 573
##   Unique number of distinct geographical locations combined: 3976
## ------------------------------------------------------------------------------------------
------------------------------------------------
##                  Location Confirmed Perc.Confirmed Deaths Perc.Deaths Recovered Perc.Reco
vered  Active Perc.Active
## 1        Sao Paulo, Brazil   3853276           2.07 131960        3.42   3442275
89.33  279041        7.24
## 2       Maharashtra, India   6131976           3.30 124296        2.03   5889982
96.05  117698        1.92
## 3  England, United Kingdom   4393205           2.37 112880        2.57         0
0.00 4280325       97.43
## 4                   France   5733214           3.09 110360        1.92    341046
5.95 5281808       92.13
## 5                Argentina   4627537           2.49  98148        2.12   4246200
91.76  283189        6.12
## 6                Lima, Peru    911402           0.49  86605        9.50         0
0.00  824797       90.50
## 7                     Iran   3344122           1.80  85543        2.56   2995195
89.57  263384        7.88
## 8                   Poland   2880670           1.55  75152        2.61   2652409
92.08  153109        5.32
## 9                Indonesia   2455912           1.32  64631        2.63   2023548
82.39  367733       14.97
## 10            South Africa   2157687           1.16  63873        2.96   1884170
87.32  209644        9.72
## ==========================================================================================
================================================
```

```
## ##############################################################################################################
##################################################
##   ##### AGGREGATED Data  -- ORDERED BY  RECOVERED Cases  -- Data dated:  2021-07-10  ::  2
021-07-10 12:30:42
## ##############################################################################################################
##################################################
##   Number of Countries/Regions reported: 194
##   Number of Cities/Provinces reported: 573
##   Unique number of distinct geographical locations combined: 3976
## ------------------------------------------------------------------------------------------
-----------------------------------------------
##              Location Confirmed Perc.Confirmed Deaths Perc.Deaths Recovered Perc.Recovered
Active Perc.Active
## 1  Maharashtra, India   6131976           3.30 124296        2.03   5889982          96.05
117698        1.92
## 2              Turkey   5465094           2.94  50096        0.92   5333759          97.60
81239        1.49
## 3           Argentina   4627537           2.49  98148        2.12   4246200          91.76
283189        6.12
## 4   Sao Paulo, Brazil   3853276           2.07 131960        3.42   3442275          89.33
279041        7.24
## 5                Iran   3344122           1.80  85543        2.56   2995195          89.57
263384        7.88
## 6       Kerala, India   3025466           1.63  14250        0.47   2900600          95.87
110616        3.66
## 7    Karnataka, India   2864868           1.54  35663        1.24   2790453          97.40
38752        1.35
## 8              Poland   2880670           1.55  75152        2.61   2652409          92.08
153109        5.32
## 9   Tamil Nadu, India   2510059           1.35  33253        1.32   2443141          97.33
33665        1.34
## 10          Indonesia   2455912           1.32  64631        2.63   2023548          82.39
367733       14.97
## ==============================================================================================
================================================
```

```
## ##############################################################################################################
##################################################
##   ##### AGGREGATED Data  -- ORDERED BY  ACTIVE Cases  -- Data dated:  2021-07-10  ::  2021
-07-10 12:30:42
## ##############################################################################################################
##################################################
##   Number of Countries/Regions reported: 194
##   Number of Cities/Provinces reported: 573
##   Unique number of distinct geographical locations combined: 3976
## ------------------------------------------------------------------------------------------
------------------------------------------------
##                     Location Confirmed Perc.Confirmed Deaths Perc.Deaths Recovered Perc.Re
covered  Active Perc.Active
## 1                      France   5733214           3.09 110360        1.92    341046
5.95 5281808       92.13
## 2    England, United Kingdom   4393205           2.37 112880        2.57         0
0.00 4280325       97.43
## 3                  Lima, Peru    911402           0.49  86605        9.50         0
0.00  824797       90.50
## 4                      Serbia    717403           0.39   7067        0.99         0
0.00  710336       99.01
## 5               Madrid, Spain    743109           0.40  15479        2.08     40736
5.48  686894       92.44
## 6   Ciudad de Mexico, Mexico    704488           0.38  34886        4.95         0
0.00  669602       95.05
## 7           Catalonia, Spain    696621           0.38  14756        2.12     26203
3.76  655662       94.12
## 8           Andalusia, Spain    635969           0.34  10095        1.59     10671
1.68  615203       96.73
## 9  Zuid-Holland, Netherlands    407952           0.22   4288        1.05         0
0.00  403664       98.95
## 10      C. Valenciana, Spain    413446           0.22   7421        1.79      9970
2.41  396055       95.79
## ==========================================================================================
==================================================
```

```
##       Confirmed  Deaths  Recovered   Active
##   Totals
##       185754674  3981784 NA  NA
##   Average
##       46718.98   1001.45 NA  NA
##   Standard Deviation
##       261651.01  5770.96 NA  NA
##
##
##  * Statistical estimators computed considering 3976 independent reported entries
```

```
##  >>> checking data integrity...
```

```
## checking for ... Country Province Lat Long
```

```
## No critical issues have been found.
```

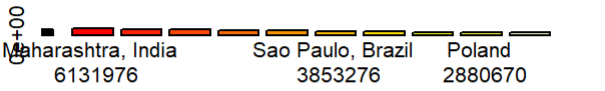
```
## Possible <<Aggregated data-type>> detected...
```

```
## checking for ... Active Deaths Recovered Confirmed
```

```
## No critical issues have been found.
```

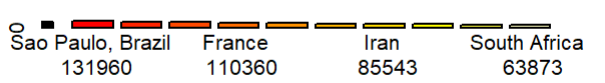
AGGREGATED Data -- ORDERED BY CONFIRMED Case

-- Data dated: 2021-07-10 :: 2021-07-10 12:30:42



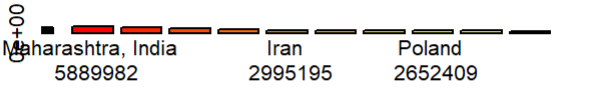
AGGREGATED Data -- ORDERED BY DEATHS Cases

Data dated: 2021-07-10 :: 2021-07-10 12:30:42



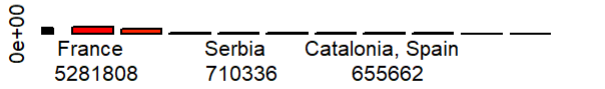
AGGREGATED Data -- ORDERED BY RECOVERED Case

-- Data dated: 2021-07-10 :: 2021-07-10 12:30:42



AGGREGATED Data -- ORDERED BY ACTIVE Cases

Data dated: 2021-07-10 :: 2021-07-10 12:30:42



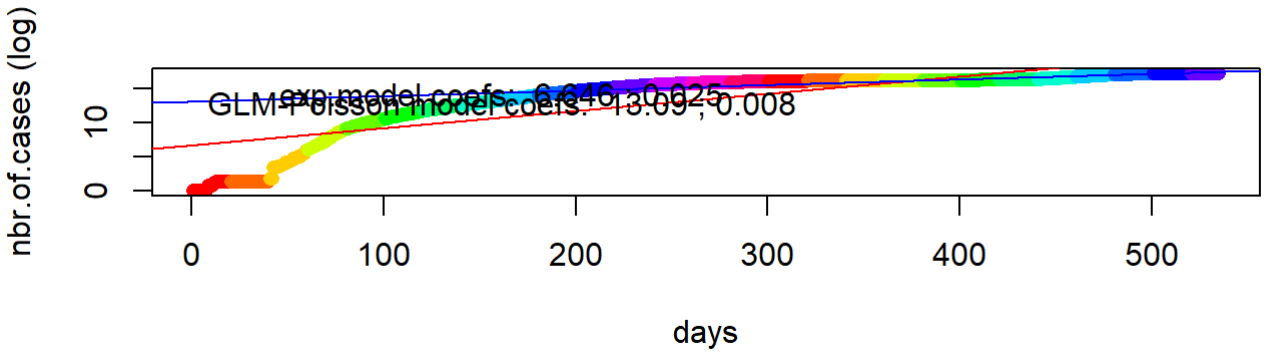
```
##
##
## ********************************************************************************
## ******************************  OVERALL SUMMARY*******************************
## ********************************************************************************
##   ****  Time Series Worldwide TOTS ****
##       ts-confirmed   ts-deaths   ts-recovered
##       186015939  4017782 122412570
##              2.16%       65.81%
##   ****  Time Series Worldwide AVGS ****
##       ts-confirmed   ts-deaths   ts-recovered
##       666723.8   14400.65    463683.98
##              2.16%       69.55%
##   ****  Time Series Worldwide SDS ****
##       ts-confirmed   ts-deaths   ts-recovered
##       3066924.56 59687.6 2222718.72
##              1.95%       72.47%
##
##
##  * Statistical estimators computed considering 279/279/264 independent reported entries pe
r case-type
## ********************************************************************************
```

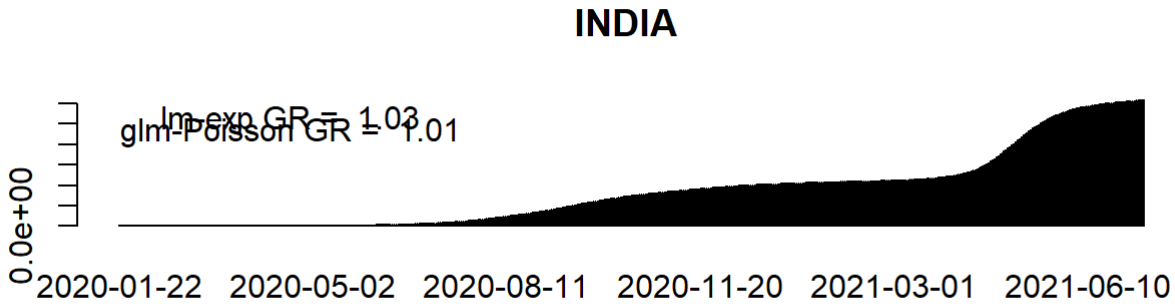
Totals as per India

```
tots.per.location(tsc, geo.loc = 'India')
```

```
## INDIA  --  30752950
## ==============================   running models...==============================
##   Linear Regression (lm):
##
## Call:
## lm(formula = y.var ~ x.var)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4926038 -2488974 -1188193  2150879  8600990
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5765250     321034  -17.96   <2e-16 ***
## x.var          52518       1038   50.60   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3708000 on 533 degrees of freedom
## Multiple R-squared:  0.8277, Adjusted R-squared:  0.8274
## F-statistic:  2560 on 1 and 533 DF,  p-value: < 2.2e-16
##
## ------------------------------------------------------------------------------
##   Linear Regression (lm):
##
## Call:
## lm(formula = y.var ~ x.var)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.8478 -1.6353  0.6184  2.3253  2.8911
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 6.6456436  0.2252654    29.5   <2e-16 ***
## x.var       0.0252686  0.0007283    34.7   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.602 on 533 degrees of freedom
## Multiple R-squared:  0.6931, Adjusted R-squared:  0.6925
## F-statistic:  1204 on 1 and 533 DF,  p-value: < 2.2e-16
##
## ------------------------------------------------------------------------------
##   GLM using Family [1] "poisson" :
##
## Call:
## glm(formula = y.var ~ x.var, family = family)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1364.0  -1081.7   -381.4    545.3   1422.9
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) 1.309e+01  6.059e-05  216031   <2e-16 ***
## x.var       8.064e-03  1.402e-07   57521   <2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 5246753527  on 534  degrees of freedom
## Residual deviance:  499623610  on 533  degrees of freedom
## AIC: 499631752
##
## Number of Fisher Scoring iterations: 5
##
## ----------------------------------------------------------------------------
```





Growth rate in India

```
growth.rate(tsc, geo.loc = 'India')
```

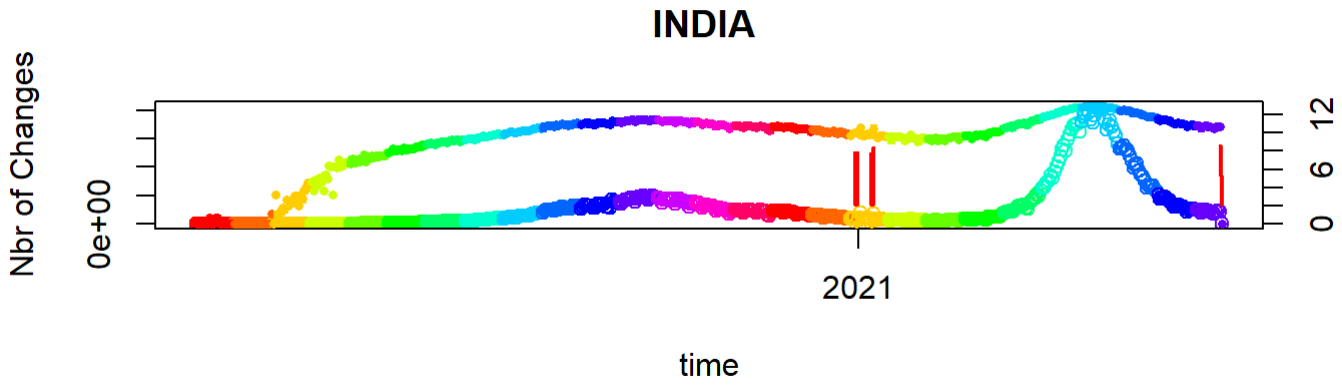
```
## Processing...  INDIA
```

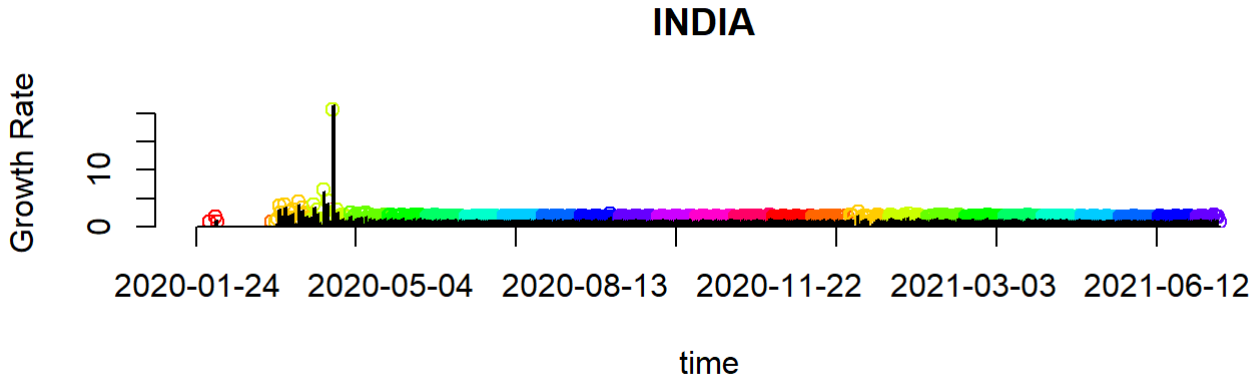
```
## Loading required package: pheatmap
```

```
## Loading required package: gplots
```

```
##
## Attaching package: 'gplots'
```

```
## The following object is masked from 'package:stats':
##
##     lowess
```





```
## $Changes
##   geo.loc 2020-01-23 2020-01-24 2020-01-25 2020-01-26 2020-01-27 2020-01-28
## 1   INDIA          0          0          0          0          0          0
##   2020-01-29 2020-01-30 2020-01-31 2020-02-01 2020-02-02 2020-02-03 2020-02-04
## 1          0          1          0          0          1          1          0
##   2020-02-05 2020-02-06 2020-02-07 2020-02-08 2020-02-09 2020-02-10 2020-02-11
## 1          0          0          0          0          0          0          0
##   2020-02-12 2020-02-13 2020-02-14 2020-02-15 2020-02-16 2020-02-17 2020-02-18
## 1          0          0          0          0          0          0          0
##   2020-02-19 2020-02-20 2020-02-21 2020-02-22 2020-02-23 2020-02-24 2020-02-25
## 1          0          0          0          0          0          0          0
##   2020-02-26 2020-02-27 2020-02-28 2020-02-29 2020-03-01 2020-03-02 2020-03-03
## 1          0          0          0          0          0          2          0
##   2020-03-04 2020-03-05 2020-03-06 2020-03-07 2020-03-08 2020-03-09 2020-03-10
## 1         23          2          1          3          5          4         13
##   2020-03-11 2020-03-12 2020-03-13 2020-03-14 2020-03-15 2020-03-16 2020-03-17
## 1          6         11          9         20         11          6         23
##   2020-03-18 2020-03-19 2020-03-20 2020-03-21 2020-03-22 2020-03-23 2020-03-24
## 1         14         38         50         86         66        103         37
##   2020-03-25 2020-03-26 2020-03-27 2020-03-28 2020-03-29 2020-03-30 2020-03-31
## 1        121         70        160        100         37        227        146
##   2020-04-01 2020-04-02 2020-04-03 2020-04-04 2020-04-05 2020-04-06 2020-04-07
## 1        601        545         24        515        506       1190        533
##   2020-04-08 2020-04-09 2020-04-10 2020-04-11 2020-04-12 2020-04-13 2020-04-14
## 1        605        809        873        848        759       1248       1034
##   2020-04-15 2020-04-16 2020-04-17 2020-04-18 2020-04-19 2020-04-20 2020-04-21
## 1        835       1108        922       1370       1893        924       1541
##   2020-04-22 2020-04-23 2020-04-24 2020-04-25 2020-04-26 2020-04-27 2020-04-28
## 1       1290       1707       1453       1753       1607       1561       1873
##   2020-04-29 2020-04-30 2020-05-01 2020-05-02 2020-05-03 2020-05-04 2020-05-05
## 1       1738       1801       2394       2442       2806       3932       2963
##   2020-05-06 2020-05-07 2020-05-08 2020-05-09 2020-05-10 2020-05-11 2020-05-12
## 1       3587       3364       3344       3113       4353       3607       3524
##   2020-05-13 2020-05-14 2020-05-15 2020-05-16 2020-05-17 2020-05-18 2020-05-19
## 1       3763       3942       3787       4864       5050       4630       6147
##   2020-05-20 2020-05-21 2020-05-22 2020-05-23 2020-05-24 2020-05-25 2020-05-26
## 1       5553       6198       6568       6629       7113       6414       5843
##   2020-05-27 2020-05-28 2020-05-29 2020-05-30 2020-05-31 2020-06-01 2020-06-02
## 1       7293       7300       8105       8336       8782       7761       8821
##   2020-06-03 2020-06-04 2020-06-05 2020-06-06 2020-06-07 2020-06-08 2020-06-09
## 1       9633       9889       9471      10438      10864       8442      10218
##   2020-06-10 2020-06-11 2020-06-12 2020-06-13 2020-06-14 2020-06-15 2020-06-16
## 1      10459      10930      11458      11929      11502      10667      10974
##   2020-06-17 2020-06-18 2020-06-19 2020-06-20 2020-06-21 2020-06-22 2020-06-23
## 1      12881      13586      14516      15403      14831      14933      15968
##   2020-06-24 2020-06-25 2020-06-26 2020-06-27 2020-06-28 2020-06-29 2020-06-30
## 1      16922      17296      18552      19906      19459      18522      18641
##   2020-07-01 2020-07-02 2020-07-03 2020-07-04 2020-07-05 2020-07-06 2020-07-07
## 1      19160      20903      22771      24850      24248      22251      22753
##   2020-07-08 2020-07-09 2020-07-10 2020-07-11 2020-07-12 2020-07-13 2020-07-14
## 1      24879      26506      27114      28606      28732      28498      29429
##   2020-07-15 2020-07-16 2020-07-17 2020-07-18 2020-07-19 2020-07-20 2020-07-21
## 1      32676      34975      35252      38697      40425      37132      37740
##   2020-07-22 2020-07-23 2020-07-24 2020-07-25 2020-07-26 2020-07-27 2020-07-28
## 1      45720      49310      48916      48611      49981      44457      51596
##   2020-07-29 2020-07-30 2020-07-31 2020-08-01 2020-08-02 2020-08-03 2020-08-04
## 1      50294      52783      61242      54735      52972      52050      52509
```

```
##   2020-08-05 2020-08-06 2020-08-07 2020-08-08 2020-08-09 2020-08-10 2020-08-11
## 1      56282      62538      61537      64399      62064      53601      60963
##   2020-08-12 2020-08-13 2020-08-14 2020-08-15 2020-08-16 2020-08-17 2020-08-18
## 1      66999      64553      64732      64030      57711      55018      64572
##   2020-08-19 2020-08-20 2020-08-21 2020-08-22 2020-08-23 2020-08-24 2020-08-25
## 1      69672      68900      69876      69239      61408      60975      57224
##   2020-08-26 2020-08-27 2020-08-28 2020-08-29 2020-08-30 2020-08-31 2020-09-01
## 1      85687      77266      76472      78761      78512      69921      78357
##   2020-09-02 2020-09-03 2020-09-04 2020-09-05 2020-09-06 2020-09-07 2020-09-08
## 1      83883      83341      86432      90632      90802      75809      89706
##   2020-09-09 2020-09-10 2020-09-11 2020-09-12 2020-09-13 2020-09-14 2020-09-15
## 1      95735      96551      97570      94372      92071      83809      90123
##   2020-09-16 2020-09-17 2020-09-18 2020-09-19 2020-09-20 2020-09-21 2020-09-22
## 1      97894      96424      93337      92605      86961      75083      83347
##   2020-09-23 2020-09-24 2020-09-25 2020-09-26 2020-09-27 2020-09-28 2020-09-29
## 1      86508      86052      85362      88600      82170      70589      80472
##   2020-09-30 2020-10-01 2020-10-02 2020-10-03 2020-10-04 2020-10-05 2020-10-06
## 1      86821      81484      79476      75829      74442      61267      72049
##   2020-10-07 2020-10-08 2020-10-09 2020-10-10 2020-10-11 2020-10-12 2020-10-13
## 1      78524      70496      73272      74383      66732      55342      63509
##   2020-10-14 2020-10-15 2020-10-16 2020-10-17 2020-10-18 2020-10-19 2020-10-20
## 1      67708      63371      62212      61871      55722      46790      54044
##   2020-10-21 2020-10-22 2020-10-23 2020-10-24 2020-10-25 2020-10-26 2020-10-27
## 1      55839      54366      53370      50129      45148      36470      43893
##   2020-10-28 2020-10-29 2020-10-30 2020-10-31 2020-11-01 2020-11-02 2020-11-03
## 1      49881      48648      48268      46963      45231      38310      46253
##   2020-11-04 2020-11-05 2020-11-06 2020-11-07 2020-11-08 2020-11-09 2020-11-10
## 1      50210      47638      50356      45674      45903      38073      44281
##   2020-11-11 2020-11-12 2020-11-13 2020-11-14 2020-11-15 2020-11-16 2020-11-17
## 1      47905      44879      44684      41100      30548      29163      38617
##   2020-11-18 2020-11-19 2020-11-20 2020-11-21 2020-11-22 2020-11-23 2020-11-24
## 1      45576      45882      46232      45209      44059      37975      44376
##   2020-11-25 2020-11-26 2020-11-27 2020-11-28 2020-11-29 2020-11-30 2020-12-01
## 1      44489      43082      41322      41810      38772      31118      36604
##   2020-12-02 2020-12-03 2020-12-04 2020-12-05 2020-12-06 2020-12-07 2020-12-08
## 1      35551      36595      36652      36011      32981      26567      32080
##   2020-12-09 2020-12-10 2020-12-11 2020-12-12 2020-12-13 2020-12-14 2020-12-15
## 1      31521      29373      30031      30254      27071      22065      26382
##   2020-12-16 2020-12-17 2020-12-18 2020-12-19 2020-12-20 2020-12-21 2020-12-22
## 1      24010      22890      25152      26624      24337      19556      23950
##   2020-12-23 2020-12-24 2020-12-25 2020-12-26 2020-12-27 2020-12-28 2020-12-29
## 1      24712      23067      22273      18732      20021      16432      20549
##   2020-12-30 2020-12-31 2021-01-01 2021-01-02 2021-01-03 2021-01-04 2021-01-05
## 1      21822          0      20035      37256      16504      16375      18088
##   2021-01-06 2021-01-07 2021-01-08 2021-01-09 2021-01-10 2021-01-11 2021-01-12
## 1      20346      18139          0      36867      16311      12584      15968
##   2021-01-13 2021-01-14 2021-01-15 2021-01-16 2021-01-17 2021-01-18 2021-01-19
## 1      16946      15590      15158      15144      13788      10050      13816
##   2021-01-20 2021-01-21 2021-01-22 2021-01-23 2021-01-24 2021-01-25 2021-01-26
## 1      15244      14545      14256      14849      13203       9102      12689
##   2021-01-27 2021-01-28 2021-01-29 2021-01-30 2021-01-31 2021-02-01 2021-02-02
## 1      11666      18855      13082      13044      11436       8635      11039
##   2021-02-03 2021-02-04 2021-02-05 2021-02-06 2021-02-07 2021-02-08 2021-02-09
## 1      12899      12408      11713      12059      11831       9110      11067
##   2021-02-10 2021-02-11 2021-02-12 2021-02-13 2021-02-14 2021-02-15 2021-02-16
## 1      12923       9309      12143      12194      11649       9121      11610
##   2021-02-17 2021-02-18 2021-02-19 2021-02-20 2021-02-21 2021-02-22 2021-02-23
## 1      12881      13193      13993      14264      14199      10584      13742
```

```
##   2021-02-24 2021-02-25 2021-02-26 2021-02-27 2021-02-28 2021-03-01 2021-03-02
## 1      16738      16577      16488      16752      15510      12286      14989
##   2021-03-03 2021-03-04 2021-03-05 2021-03-06 2021-03-07 2021-03-08 2021-03-09
## 1      17407      16838      18284      18754      18599      15388      17921
##   2021-03-10 2021-03-11 2021-03-12 2021-03-13 2021-03-14 2021-03-15 2021-03-16
## 1      22854      23285      24882      25320      26291      24492      28903
##   2021-03-17 2021-03-18 2021-03-19 2021-03-20 2021-03-21 2021-03-22 2021-03-23
## 1      35871      39726      40953      43846      46951      40715      47262
##   2021-03-24 2021-03-25 2021-03-26 2021-03-27 2021-03-28 2021-03-29 2021-03-30
## 1      53476      59118      62258      62714      68020      56211      53480
##   2021-03-31 2021-04-01 2021-04-02 2021-04-03 2021-04-04 2021-04-05 2021-04-06
## 1      72330      81466      89129      93249     103558      96982     115736
##   2021-04-07 2021-04-08 2021-04-09 2021-04-10 2021-04-11 2021-04-12 2021-04-13
## 1     126789     131968     145384     152879     168912     161736     184372
##   2021-04-14 2021-04-15 2021-04-16 2021-04-17 2021-04-18 2021-04-19 2021-04-20
## 1     200739     217353     234692     261394     273802     259167     295158
##   2021-04-21 2021-04-22 2021-04-23 2021-04-24 2021-04-25 2021-04-26 2021-04-27
## 1     314644     332921     346786     349691     352991     323023     360927
##   2021-04-28 2021-04-29 2021-04-30 2021-05-01 2021-05-02 2021-05-03 2021-05-04
## 1     379308     386555     401993     392488     368060     357316     382146
##   2021-05-05 2021-05-06 2021-05-07 2021-05-08 2021-05-09 2021-05-10 2021-05-11
## 1     412431     414188     401078     403405     366494     329942     348421
##   2021-05-12 2021-05-13 2021-05-14 2021-05-15 2021-05-16 2021-05-17 2021-05-18
## 1     362727     343144     326098     311170     281386     263533     267334
##   2021-05-19 2021-05-20 2021-05-21 2021-05-22 2021-05-23 2021-05-24 2021-05-25
## 1     276110     259551     257299     240842     222315     196427     208921
##   2021-05-26 2021-05-27 2021-05-28 2021-05-29 2021-05-30 2021-05-31 2021-06-01
## 1     211298     186364     173790     165553     152734     127510     132788
##   2021-06-02 2021-06-03 2021-06-04 2021-06-05 2021-06-06 2021-06-07 2021-06-08
## 1     134154     132364     120529     114460     100636      86498      92596
##   2021-06-09 2021-06-10 2021-06-11 2021-06-12 2021-06-13 2021-06-14 2021-06-15
## 1      93463      92291      84332      80834      70421      60471      62224
##   2021-06-16 2021-06-17 2021-06-18 2021-06-19 2021-06-20 2021-06-21 2021-06-22
## 1      67208      62480      60753      58226      53449      42640      50848
##   2021-06-23 2021-06-24 2021-06-25 2021-06-26 2021-06-27 2021-06-28 2021-06-29
## 1      54069      51667      48698      50040      46148      37566      45951
##   2021-06-30 2021-07-01 2021-07-02 2021-07-03 2021-07-04 2021-07-05 2021-07-06
## 1      48786      46617      44111      43071      39796      34703      43733
##   2021-07-07 2021-07-08 2021-07-09
## 1      45892      43393          0
##
## $Growth.Rate
##   geo.loc 2020-01-24 2020-01-25 2020-01-26 2020-01-27 2020-01-28 2020-01-29
## 1   INDIA        NaN        NaN        NaN        NaN        NaN        NaN
##   2020-01-30 2020-01-31 2020-02-01 2020-02-02 2020-02-03 2020-02-04 2020-02-05
## 1         NA          0        NaN         NA          1          0        NaN
##   2020-02-06 2020-02-07 2020-02-08 2020-02-09 2020-02-10 2020-02-11 2020-02-12
## 1        NaN        NaN        NaN        NaN        NaN        NaN        NaN
##   2020-02-13 2020-02-14 2020-02-15 2020-02-16 2020-02-17 2020-02-18 2020-02-19
## 1        NaN        NaN        NaN        NaN        NaN        NaN        NaN
##   2020-02-20 2020-02-21 2020-02-22 2020-02-23 2020-02-24 2020-02-25 2020-02-26
## 1        NaN        NaN        NaN        NaN        NaN        NaN        NaN
##   2020-02-27 2020-02-28 2020-02-29 2020-03-01 2020-03-02 2020-03-03 2020-03-04
## 1        NaN        NaN        NaN        NaN         NA          0         NA
##   2020-03-05 2020-03-06 2020-03-07 2020-03-08 2020-03-09 2020-03-10 2020-03-11
## 1 0.08695652        0.5          3   1.666667        0.8       3.25  0.4615385
##   2020-03-12 2020-03-13 2020-03-14 2020-03-15 2020-03-16 2020-03-17 2020-03-18
## 1   1.833333  0.8181818   2.222222       0.55  0.5454545   3.833333  0.6086957
```

```
##   2020-03-19 2020-03-20 2020-03-21 2020-03-22 2020-03-23 2020-03-24 2020-03-25
## 1   2.714286   1.315789       1.72  0.7674419   1.560606  0.3592233    3.27027
##   2020-03-26 2020-03-27 2020-03-28 2020-03-29 2020-03-30 2020-03-31 2020-04-01
## 1  0.5785124   2.285714      0.625       0.37   6.135135  0.6431718   4.116438
##   2020-04-02 2020-04-03 2020-04-04 2020-04-05 2020-04-06 2020-04-07 2020-04-08
## 1   0.906822  0.0440367   21.45833  0.9825243   2.351779  0.4478992   1.135084
##   2020-04-09 2020-04-10 2020-04-11 2020-04-12 2020-04-13 2020-04-14 2020-04-15
## 1    1.33719    1.07911  0.9713631  0.8950472   1.644269  0.8285256  0.8075435
##   2020-04-16 2020-04-17 2020-04-18 2020-04-19 2020-04-20 2020-04-21 2020-04-22
## 1   1.326946    0.83213     1.4859   1.381752  0.4881141   1.667749  0.8371188
##   2020-04-23 2020-04-24 2020-04-25 2020-04-26 2020-04-27 2020-04-28 2020-04-29
## 1   1.323256  0.8512009   1.206469  0.9167142  0.9713752   1.199872  0.9279231
##   2020-04-30 2020-05-01 2020-05-02 2020-05-03 2020-05-04 2020-05-05 2020-05-06
## 1   1.036249   1.329262    1.02005   1.149058   1.401283  0.7535605   1.210597
##   2020-05-07 2020-05-08 2020-05-09 2020-05-10 2020-05-11 2020-05-12 2020-05-13
## 1  0.9378311  0.9940547  0.9309211    1.39833  0.8286239  0.9769892   1.067821
##   2020-05-14 2020-05-15 2020-05-16 2020-05-17 2020-05-18 2020-05-19 2020-05-20
## 1   1.047568  0.9606799   1.284394    1.03824  0.9168317   1.327646  0.9033675
##   2020-05-21 2020-05-22 2020-05-23 2020-05-24 2020-05-25 2020-05-26 2020-05-27
## 1   1.116153   1.059697   1.009287   1.073013  0.9017292   0.910976    1.24816
##   2020-05-28 2020-05-29 2020-05-30 2020-05-31 2020-06-01 2020-06-02 2020-06-03
## 1    1.00096   1.110274   1.028501   1.053503  0.8837395    1.13658   1.092053
##   2020-06-04 2020-06-05 2020-06-06 2020-06-07 2020-06-08 2020-06-09 2020-06-10
## 1   1.026575  0.9577308   1.102101   1.040812  0.7770619   1.210377   1.023586
##   2020-06-11 2020-06-12 2020-06-13 2020-06-14 2020-06-15 2020-06-16 2020-06-17
## 1   1.045033   1.048307   1.041107  0.9642049  0.9274039    1.02878   1.173774
##   2020-06-18 2020-06-19 2020-06-20 2020-06-21 2020-06-22 2020-06-23 2020-06-24
## 1   1.054732   1.068453   1.061105  0.9628644   1.006877    1.06931   1.059744
##   2020-06-25 2020-06-26 2020-06-27 2020-06-28 2020-06-29 2020-06-30 2020-07-01
## 1   1.022101   1.072618   1.072984  0.9775445  0.9518475   1.006425   1.027842
##   2020-07-02 2020-07-03 2020-07-04 2020-07-05 2020-07-06 2020-07-07 2020-07-08
## 1   1.090971   1.089365     1.0913  0.9757746  0.9176427   1.022561   1.093438
##   2020-07-09 2020-07-10 2020-07-11 2020-07-12 2020-07-13 2020-07-14 2020-07-15
## 1   1.065397   1.022938   1.055027   1.004405  0.9918558   1.032669   1.110333
##   2020-07-16 2020-07-17 2020-07-18 2020-07-19 2020-07-20 2020-07-21 2020-07-22
## 1   1.070357    1.00792   1.097725   1.044655  0.9185405   1.016374   1.211447
##   2020-07-23 2020-07-24 2020-07-25 2020-07-26 2020-07-27 2020-07-28 2020-07-29
## 1   1.078521  0.9920097  0.9937648   1.028183   0.889478   1.160582  0.9747655
##   2020-07-30 2020-07-31 2020-08-01 2020-08-02 2020-08-03 2020-08-04 2020-08-05
## 1   1.049489    1.16026  0.8937494  0.9677903  0.9825946   1.008818   1.071854
##   2020-08-06 2020-08-07 2020-08-08 2020-08-09 2020-08-10 2020-08-11 2020-08-12
## 1   1.111155  0.9839937   1.046509  0.9637417  0.8636408   1.137348   1.099011
##   2020-08-13 2020-08-14 2020-08-15 2020-08-16 2020-08-17 2020-08-18 2020-08-19
## 1   0.963492   1.002773  0.9891553  0.9013119  0.9533365   1.173652   1.078982
##   2020-08-20 2020-08-21 2020-08-22 2020-08-23 2020-08-24 2020-08-25 2020-08-26
## 1  0.9889195   1.014165  0.9908839   0.886899  0.9929488   0.938483   1.497396
##   2020-08-27 2020-08-28 2020-08-29 2020-08-30 2020-08-31 2020-09-01 2020-09-02
## 1  0.9017237  0.9897238   1.029933  0.9968385  0.8905772    1.12065   1.070523
##   2020-09-03 2020-09-04 2020-09-05 2020-09-06 2020-09-07 2020-09-08 2020-09-09
## 1  0.9935386   1.037089   1.048593   1.001876  0.8348825   1.183316   1.067208
##   2020-09-10 2020-09-11 2020-09-12 2020-09-13 2020-09-14 2020-09-15 2020-09-16
## 1   1.008524   1.010554  0.9672235  0.9756178  0.9102649   1.075338   1.086227
##   2020-09-17 2020-09-18 2020-09-19 2020-09-20 2020-09-21 2020-09-22 2020-09-23
## 1  0.9849838  0.9679851  0.9921575   0.939053    0.86341   1.110065   1.037926
##   2020-09-24 2020-09-25 2020-09-26 2020-09-27 2020-09-28 2020-09-29 2020-09-30
## 1  0.9947288  0.9919816   1.037933  0.9274266  0.8590605   1.140008   1.078897
##   2020-10-01 2020-10-02 2020-10-03 2020-10-04 2020-10-05 2020-10-06 2020-10-07
## 1  0.9385287  0.9753571  0.9541119  0.9817088  0.8230166   1.175984   1.089869
```

```
##   2020-10-08 2020-10-09 2020-10-10 2020-10-11 2020-10-12 2020-10-13 2020-10-14
## 1  0.8977637   1.039378   1.015163  0.8971405  0.8293173   1.147573   1.066117
##   2020-10-15 2020-10-16 2020-10-17 2020-10-18 2020-10-19 2020-10-20 2020-10-21
## 1  0.9359455  0.9817109  0.9945187  0.9006158  0.8397042   1.155033   1.033214
##   2020-10-22 2020-10-23 2020-10-24 2020-10-25 2020-10-26 2020-10-27 2020-10-28
## 1  0.9736206  0.9816797   0.939273  0.9006364  0.8077877   1.203537   1.136423
##   2020-10-29 2020-10-30 2020-10-31 2020-11-01 2020-11-02 2020-11-03 2020-11-04
## 1  0.9752812  0.9921888  0.9729635  0.9631199  0.8469855   1.207335   1.085551
##   2020-11-05 2020-11-06 2020-11-07 2020-11-08 2020-11-09 2020-11-10 2020-11-11
## 1  0.9487751   1.057055   0.907022   1.005014  0.8294229   1.163055   1.081841
##   2020-11-12 2020-11-13 2020-11-14 2020-11-15 2020-11-16 2020-11-17 2020-11-18
## 1  0.9368333   0.995655  0.9197923  0.7432603  0.9546615   1.324178   1.180206
##   2020-11-19 2020-11-20 2020-11-21 2020-11-22 2020-11-23 2020-11-24 2020-11-25
## 1   1.006714   1.007628  0.9778725  0.9745626  0.8619124   1.168558   1.002546
##   2020-11-26 2020-11-27 2020-11-28 2020-11-29 2020-11-30 2020-12-01 2020-12-02
## 1  0.9683742  0.9591477    1.01181   0.927338  0.8025895   1.176297  0.9712327
##   2020-12-03 2020-12-04 2020-12-05 2020-12-06 2020-12-07 2020-12-08 2020-12-09
## 1   1.029366   1.001558  0.9825112   0.915859  0.8055244   1.207513  0.9825748
##   2020-12-10 2020-12-11 2020-12-12 2020-12-13 2020-12-14 2020-12-15 2020-12-16
## 1   0.931855   1.022402   1.007426  0.8947908  0.8150789   1.195649  0.9100902
##   2020-12-17 2020-12-18 2020-12-19 2020-12-20 2020-12-21 2020-12-22 2020-12-23
## 1  0.9533528    1.09882   1.058524  0.9141001  0.8035501   1.224688   1.031816
##   2020-12-24 2020-12-25 2020-12-26 2020-12-27 2020-12-28 2020-12-29 2020-12-30
## 1  0.9334331  0.9655785  0.8410183   1.068813  0.8207382   1.250548   1.061949
##   2020-12-31 2021-01-01 2021-01-02 2021-01-03 2021-01-04 2021-01-05 2021-01-06
## 1          0         NA   1.859546   0.442989  0.9921837   1.104611   1.124834
##   2021-01-07 2021-01-08 2021-01-09 2021-01-10 2021-01-11 2021-01-12 2021-01-13
## 1  0.8915266          0         NA  0.4424282  0.7715039   1.268913   1.061247
##   2021-01-14 2021-01-15 2021-01-16 2021-01-17 2021-01-18 2021-01-19 2021-01-20
## 1  0.9199811  0.9722899  0.9990764  0.9104596  0.7288947   1.374726   1.103358
##   2021-01-21 2021-01-22 2021-01-23 2021-01-24 2021-01-25 2021-01-26 2021-01-27
## 1  0.9541459  0.9801306   1.041597  0.8891508  0.6893888   1.394089   0.919379
##   2021-01-28 2021-01-29 2021-01-30 2021-01-31 2021-02-01 2021-02-02 2021-02-03
## 1   1.616235  0.6938213  0.9970952  0.8767249  0.7550717   1.278402   1.168494
##   2021-02-04 2021-02-05 2021-02-06 2021-02-07 2021-02-08 2021-02-09 2021-02-10
## 1   0.961935  0.9439877    1.02954   0.981093   0.770011   1.214819   1.167706
##   2021-02-11 2021-02-12 2021-02-13 2021-02-14 2021-02-15 2021-02-16 2021-02-17
## 1  0.7203436   1.304437     1.0042  0.9553059  0.7829857   1.272887   1.109475
##   2021-02-18 2021-02-19 2021-02-20 2021-02-21 2021-02-22 2021-02-23 2021-02-24
## 1   1.024222   1.060638   1.019367  0.9954431  0.7454046   1.298375   1.218018
##   2021-02-25 2021-02-26 2021-02-27 2021-02-28 2021-03-01 2021-03-02 2021-03-03
## 1  0.9903812  0.9946311   1.016012  0.9258596  0.7921341   1.220007   1.161318
##   2021-03-04 2021-03-05 2021-03-06 2021-03-07 2021-03-08 2021-03-09 2021-03-10
## 1   0.967312   1.085877   1.025706  0.9917351  0.8273563   1.164609   1.275264
##   2021-03-11 2021-03-12 2021-03-13 2021-03-14 2021-03-15 2021-03-16 2021-03-17
## 1   1.018859   1.068585   1.017603   1.038349  0.9315735     1.1801   1.241082
##   2021-03-18 2021-03-19 2021-03-20 2021-03-21 2021-03-22 2021-03-23 2021-03-24
## 1   1.107468   1.030887   1.070642   1.070816  0.8671807   1.160801    1.13148
##   2021-03-25 2021-03-26 2021-03-27 2021-03-28 2021-03-29 2021-03-30 2021-03-31
## 1   1.105505   1.053114   1.007324   1.084606  0.8263893  0.9514152   1.352468
##   2021-04-01 2021-04-02 2021-04-03 2021-04-04 2021-04-05 2021-04-06 2021-04-07
## 1    1.12631   1.094064   1.046225   1.110553  0.9364994   1.193376   1.095502
##   2021-04-08 2021-04-09 2021-04-10 2021-04-11 2021-04-12 2021-04-13 2021-04-14
## 1   1.040847   1.101661   1.051553   1.104874  0.9575163   1.139956   1.088772
##   2021-04-15 2021-04-16 2021-04-17 2021-04-18 2021-04-19 2021-04-20 2021-04-21
## 1   1.082764   1.079773   1.113775   1.047469   0.946549   1.138872   1.066019
##   2021-04-22 2021-04-23 2021-04-24 2021-04-25 2021-04-26 2021-04-27 2021-04-28
## 1   1.058088   1.041647   1.008377   1.009437  0.9151027   1.117341   1.050927
```

```
##   2021-04-29 2021-04-30 2021-05-01 2021-05-02 2021-05-03 2021-05-04 2021-05-05
## 1   1.019106   1.039937  0.9763553  0.9377612  0.9708091    1.06949    1.07925
##   2021-05-06 2021-05-07 2021-05-08 2021-05-09 2021-05-10 2021-05-11 2021-05-12
## 1    1.00426  0.9683477   1.005802  0.9085014  0.9002658   1.056007    1.04106
##   2021-05-13 2021-05-14 2021-05-15 2021-05-16 2021-05-17 2021-05-18 2021-05-19
## 1  0.9460117  0.9503241  0.9542224  0.9042838  0.9365533   1.014423   1.032828
##   2021-05-20 2021-05-21 2021-05-22 2021-05-23 2021-05-24 2021-05-25 2021-05-26
## 1  0.9400275  0.9913235  0.9360394   0.923074  0.8835526   1.063606   1.011378
##   2021-05-27 2021-05-28 2021-05-29 2021-05-30 2021-05-31 2021-06-01 2021-06-02
## 1   0.881996  0.9325299  0.9526037  0.9225686  0.8348501   1.041393   1.010287
##   2021-06-03 2021-06-04 2021-06-05 2021-06-06 2021-06-07 2021-06-08 2021-06-09
## 1  0.9866571  0.9105875   0.949647  0.8792242  0.8595135   1.070499   1.009363
##   2021-06-10 2021-06-11 2021-06-12 2021-06-13 2021-06-14 2021-06-15 2021-06-16
## 1  0.9874603  0.9137619  0.9585211  0.8711804  0.8587069   1.028989   1.080098
##   2021-06-17 2021-06-18 2021-06-19 2021-06-20 2021-06-21 2021-06-22 2021-06-23
## 1  0.9296512  0.9723592  0.9584053  0.9179576  0.7977698   1.192495   1.063346
##   2021-06-24 2021-06-25 2021-06-26 2021-06-27 2021-06-28 2021-06-29 2021-06-30
## 1  0.9555753  0.9425359   1.027558  0.9222222  0.8140331   1.223207   1.061696
##   2021-07-01 2021-07-02 2021-07-03 2021-07-04 2021-07-05 2021-07-06 2021-07-07
## 1  0.9555405  0.9462428  0.9764231  0.9239628  0.8720223   1.260208   1.049368
##   2021-07-08 2021-07-09 NA
## 1  0.9455461          0 NA
```

Totals plot for India

```
totals.plt(tsa, c('India'))
```

```
## Warning in par(new = TRUE): calling par(new=TRUE) with no plot
```

```
## Loading required package: plotly
```

```
## Loading required package: ggplot2
```

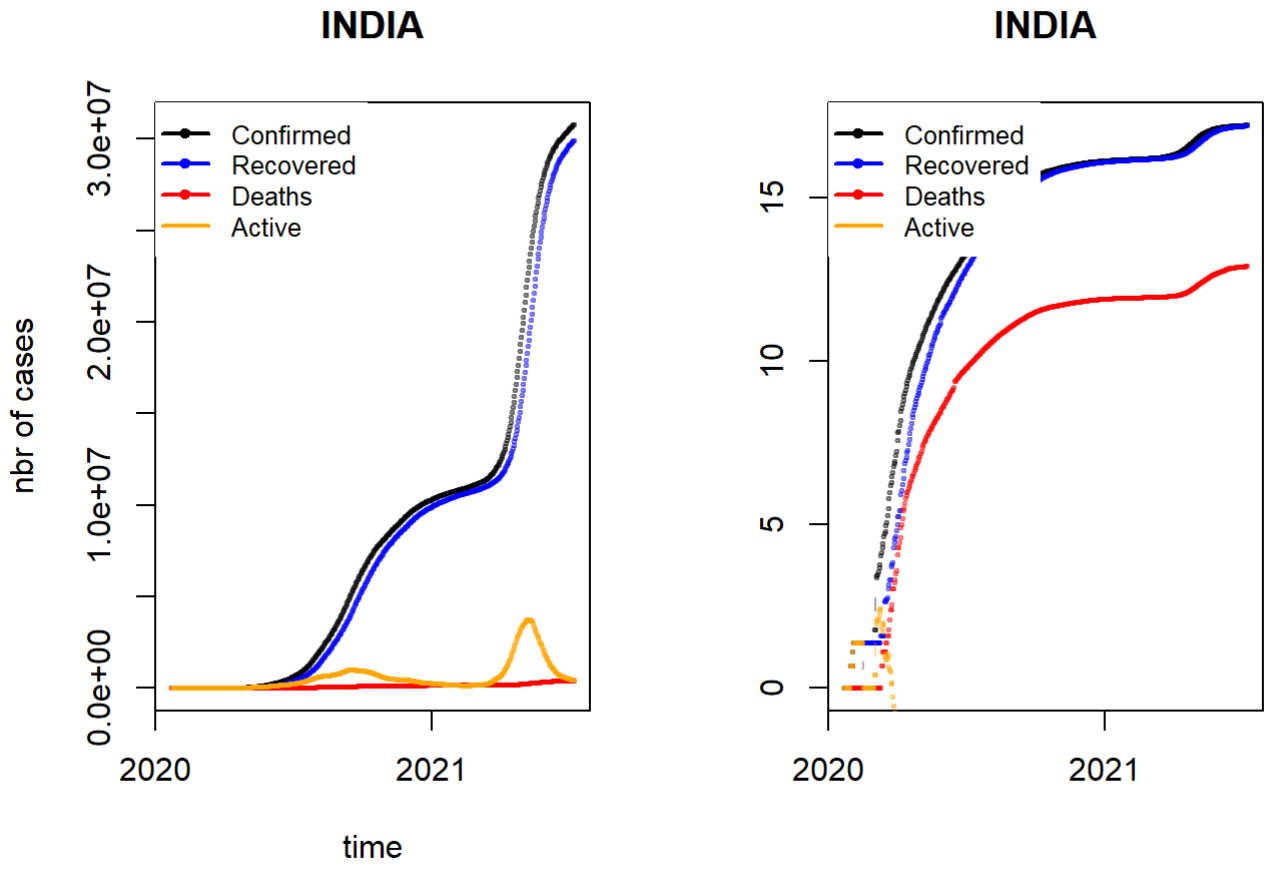
```
##
## Attaching package: 'plotly'
```

```
## The following object is masked from 'package:ggplot2':
##
##     last_plot
```

```
## The following object is masked from 'package:stats':
##
##     filter
```

```
## The following object is masked from 'package:graphics':
##
##     layout
```

```
## A line object has been specified, but lines is not in the mode
## Adding lines to the mode...
```



Interactive world map with covid cases for each country.

```
live.map(tsc)
```

```
## Warning: Ignoring 2 observations
```

```
## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.

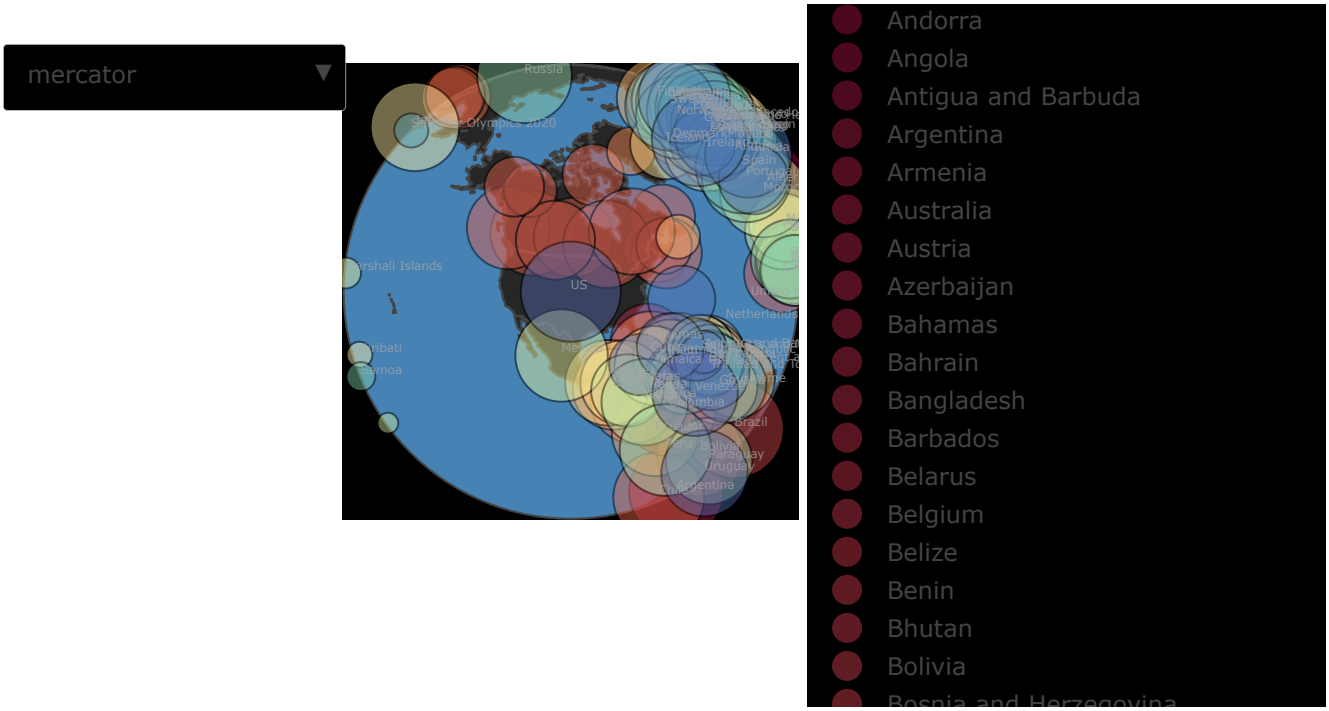
## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.

## Warning: `line.width` does not currently support multiple values.
```



SIR Model (Susceptible Infected Recovered Model) with respect to total population of India

```
generate.SIR.model(tsc, 'India', tot.population = 1360000000)
```

```
## ################################################################################
```

```
## This is an experimental feature, being currently under active development!
```

```
## Please check the development version of the package for the latest updates on it
```

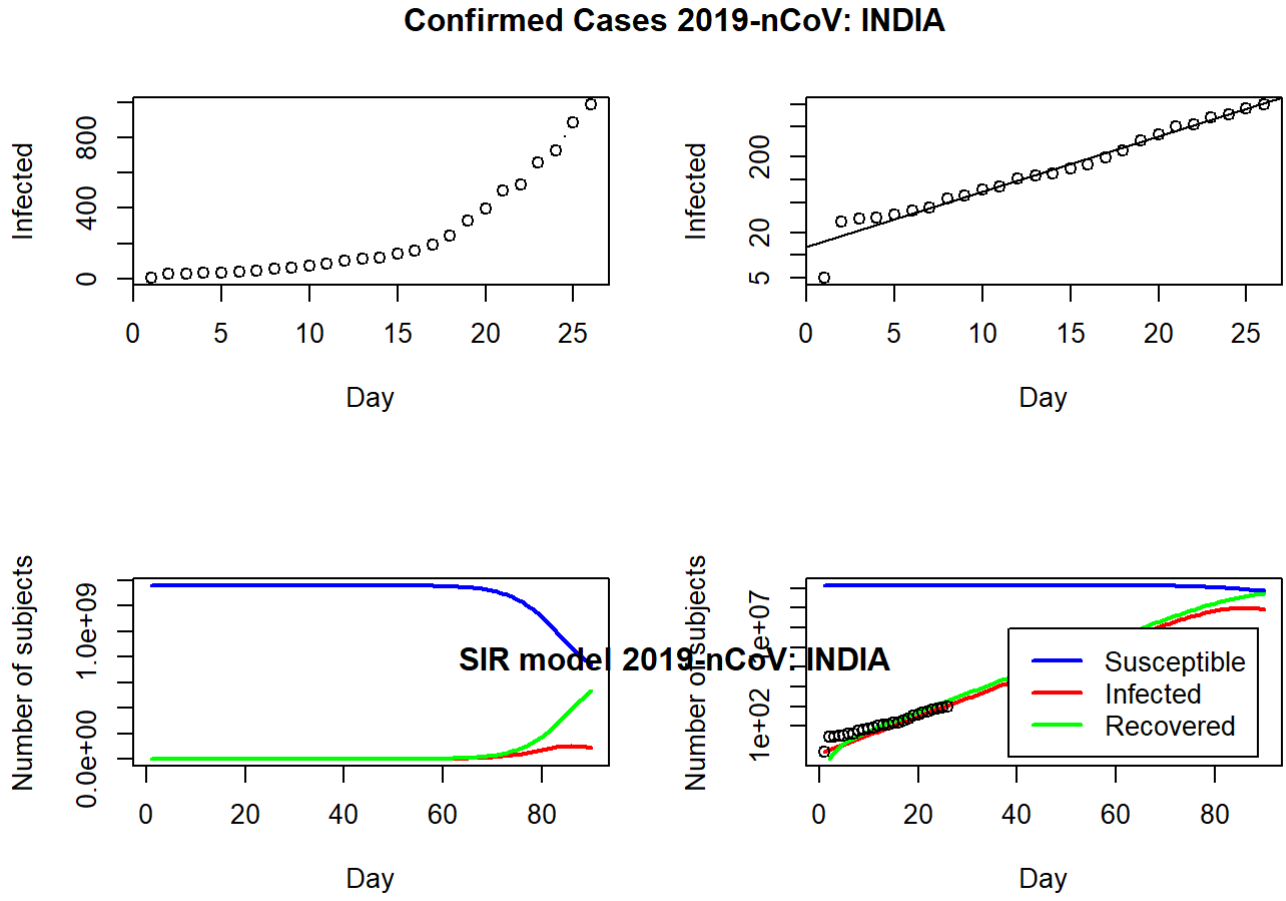
```
## ################################################################################
## Processing...  INDIA
##   [1]        0        0        0        0        0        0        0        0
##   [9]        1        1        1        2        3        3        3        3
##  [17]        3        3        3        3        3        3        3        3
##  [25]        3        3        3        3        3        3        3        3
##  [33]        3        3        3        3        3        3        3        3
##  [41]        5        5       28       30       31       34       39       43
##  [49]       56       62       73       82      102      113      119      142
##  [57]      156      194      244      330      396      499      536      657
##  [65]      727      887      987     1024     1251     1397     1998     2543
##  [73]     2567     3082     3588     4778     5311     5916     6725     7598
##  [81]     8446     9205    10453    11487    12322    13430    14352    15722
##  [89]    17615    18539    20080    21370    23077    24530    26283    27890
##  [97]    29451    31324    33062    34863    37257    39699    42505    46437
## [105]    49400    52987    56351    59695    62808    67161    70768    74292
## [113]    78055    81997    85784    90648    95698   100328   106475   112028
## [121]   118226   124794   131423   138536   144950   150793   158086   165386
## [129]   173491   181827   190609   198370   207191   216824   226713   236184
## [137]   246622   257486   265928   276146   286605   297535   308993   320922
## [145]   332424   343091   354065   366946   380532   395048   410451   425282
## [153]   440215   456183   473105   490401   508953   528859   548318   566840
## [161]   585481   604641   625544   648315   673165   697413   719664   742417
## [169]   767296   793802   820916   849522   878254   906752   936181   968857
## [177]  1003832  1039084  1077781  1118206  1155338  1193078  1238798  1288108
## [185]  1337024  1385635  1435616  1480073  1531669  1581963  1634746  1695988
## [193]  1750723  1803695  1855745  1908254  1964536  2027074  2088611  2153010
## [201]  2215074  2268675  2329638  2396637  2461190  2525922  2589952  2647663
## [209]  2702681  2767253  2836925  2905825  2975701  3044940  3106348  3167323
## [217]  3224547  3310234  3387500  3463972  3542733  3621245  3691166  3769523
## [225]  3853406  3936747  4023179  4113811  4204613  4280422  4370128  4465863
## [233]  4562414  4659984  4754356  4846427  4930236  5020359  5118253  5214677
## [241]  5308014  5400619  5487580  5562663  5646010  5732518  5818570  5903932
## [249]  5992532  6074702  6145291  6225763  6312584  6394068  6473544  6549373
## [257]  6623815  6685082  6757131  6835655  6906151  6979423  7053806  7120538
## [265]  7175880  7239389  7307097  7370468  7432680  7494551  7550273  7597063
## [273]  7651107  7706946  7761312  7814682  7864811  7909959  7946429  7990322
## [281]  8040203  8088851  8137119  8184082  8229313  8267623  8313876  8364086
## [289]  8411724  8462080  8507754  8553657  8591730  8636011  8683916  8728795
## [297]  8773479  8814579  8845127  8874290  8912907  8958483  9004365  9050597
## [305]  9095806  9139865  9177840  9222216  9266705  9309787  9351109  9392919
## [313]  9431691  9462809  9499413  9534964  9571559  9608211  9644222  9677203
## [321]  9703770  9735850  9767371  9796744  9826775  9857029  9884100  9906165
## [329]  9932547  9956557  9979447 10004599 10031223 10055560 10075116 10099066
## [337] 10123778 10146845 10169118 10187850 10207871 10224303 10244852 10266674
## [345] 10266674 10286709 10323965 10340469 10356844 10374932 10395278 10413417
## [353] 10413417 10450284 10466595 10479179 10495147 10512093 10527683 10542841
## [361] 10557985 10571773 10581823 10595639 10610883 10625428 10639684 10654533
## [369] 10667736 10676838 10689527 10701193 10720048 10733130 10746174 10757610
## [377] 10766245 10777284 10790183 10802591 10814304 10826363 10838194 10847304
## [385] 10858371 10871294 10880603 10892746 10904940 10916589 10925710 10937320
## [393] 10950201 10963394 10977387 10991651 11005850 11016434 11030176 11046914
## [401] 11063491 11079979 11096731 11112241 11124527 11139516 11156923 11173761
## [409] 11192045 11210799 11229398 11244786 11262707 11285561 11308846 11333728
## [417] 11359048 11385339 11409831 11438734 11474605 11514331 11555284 11599130
## [425] 11646081 11686796 11734058 11787534 11846652 11908910 11971624 12039644
## [433] 12095855 12149335 12221665 12303131 12392260 12485509 12589067 12686049
```

```
## [441] 12801785 12928574 13060542 13205926 13358805 13527717 13689453 13873825
## [449] 14074564 14291917 14526609 14788003 15061805 15320972 15616130 15930774
## [457] 16263695 16610481 16960172 17313163 17636186 17997113 18376421 18762976
## [465] 19164969 19557457 19925517 20282833 20664979 21077410 21491598 21892676
## [473] 22296081 22662575 22992517 23340938 23703665 24046809 24372907 24684077
## [481] 24965463 25228996 25496330 25772440 26031991 26289290 26530132 26752447
## [489] 26948874 27157795 27369093 27555457 27729247 27894800 28047534 28175044
## [497] 28307832 28441986 28574350 28694879 28809339 28909975 28996473 29089069
## [505] 29182532 29274823 29359155 29439989 29510410 29570881 29633105 29700313
## [513] 29762793 29823546 29881772 29935221 29977861 30028709 30082778 30134445
## [521] 30183143 30233183 30279331 30316897 30362848 30411634 30458251 30502362
## [529] 30545433 30585229 30619932 30663665 30709557 30752950 30752950
## [1] 42
##  [1]   5  28  30  31  34  39  43  56  62  73  82 102 113 119 142 156 194 244 330
## [20] 396 499 536 657 727 887 987
## ------------------------  Parameters used to create model -----------------------
##      Region: INDIA
##      Time interval to consider: t0=42 - t1= ; tfinal=90
##          t0: 2020-03-04 -- t1:
##      Number of days considered for initial guess: 26
##      Fatality rate: 0.02
##      Population of the region: 1.36e+09
## --------------------------------------------------------------------------------
```

```
## Loading required package: deSolve
```

```
## [1] "CONVERGENCE: REL_REDUCTION_OF_F <= FACTR*EPSMCH"
##      beta     gamma
## 0.6081878 0.3918122
##   R0 = 1.55224332311041
##   Max nbr of infected: 98602967.63  ( 7.25 %)
##   Max nbr of casualties, assuming  2% fatality rate: 1972059.35
##   Max reached at day : 86 ==>  2020-05-29
## ================================================================================
```

```
## Warning in xy.coords(x, y, xlabel, ylabel, log = log, recycle = TRUE): 1 y value
## <= 0 omitted from logarithmic plot
```


Confirmed Cases 2019-nCoV: INDIA
Infected
Day
Infected
Day
Number of subjects
Day
SIR model 2019-nCoV: INDIA
Number of subjects
Day
Susceptible
Infected
Recovered

```
## $Infected
##  [1]   5  28  30  31  34  39  43  56  62  73  82 102 113 119 142 156 194 244 330
## [20] 396 499 536 657 727 887 987
##
## $model
##    time          S            I            R
## 1     1 1359999995 5.000000e+00 0.000000e+00
## 2     2 1359999992 6.207843e+00 2.187158e+00
## 3     3 1359999987 7.707465e+00 4.902667e+00
## 4     4 1359999982 9.569347e+00 8.274155e+00
## 5     5 1359999976 1.188100e+01 1.246009e+01
## 6     6 1359999968 1.475108e+01 1.765722e+01
## 7     7 1359999958 1.831449e+01 2.410983e+01
## 8     8 1359999945 2.273869e+01 3.212116e+01
## 9     9 1359999930 2.823165e+01 4.206778e+01
## 10   10 1359999911 3.505154e+01 5.441721e+01
## 11   11 1359999887 4.351890e+01 6.974987e+01
## 12   12 1359999857 5.403171e+01 8.878643e+01
## 13   13 1359999820 6.708408e+01 1.124216e+02
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## 15   15 1359999718 1.034096e+02 1.781998e+02
## 16   16 1359999648 1.283902e+02 2.234345e+02
## 17   17 1359999561 1.594052e+02 2.795965e+02
## 18   18 1359999453 1.979125e+02 3.493254e+02
## 19   19 1359999318 2.457219e+02 4.358986e+02
## 20   20 1359999152 3.050806e+02 5.433852e+02
## 21   21 1359998944 3.787784e+02 6.768372e+02
## 22   22 1359998687 4.702792e+02 8.425269e+02
## 23   23 1359998368 5.838837e+02 1.048242e+03
## 24   24 1359997971 7.249312e+02 1.303651e+03
## 25   25 1359997479 9.000511e+02 1.620759e+03
## 26   26 1359996868 1.117474e+03 2.014470e+03
## 27   27 1359996109 1.387419e+03 2.503289e+03
## 28   28 1359995167 1.722573e+03 3.110189e+03
## 29   29 1359993998 2.138687e+03 3.863697e+03
## 30   30 1359992545 2.655320e+03 4.799225e+03
## 31   31 1359990743 3.296750e+03 5.960745e+03
## 32   32 1359988504 4.093123e+03 7.402845e+03
## 33   33 1359985725 5.081865e+03 9.193303e+03
## 34   34 1359982274 6.309441e+03 1.141627e+04
## 35   35 1359977990 7.833536e+03 1.417620e+04
## 36   36 1359972671 9.725768e+03 1.760282e+04
## 37   37 1359966068 1.207505e+04 2.185716e+04
## 38   38 1359957869 1.499175e+04 2.713912e+04
## 39   39 1359947690 1.861289e+04 3.369692e+04
## 40   40 1359935053 2.310859e+04 4.183869e+04
## 41   41 1359919363 2.868997e+04 5.194696e+04
## 42   42 1359899884 3.561914e+04 6.449662e+04
## 43   43 1359875701 4.422141e+04 8.007718e+04
## 44   44 1359845679 5.490051e+04 9.942043e+04
## 45   45 1359808408 6.815752e+04 1.234347e+05
## 46   46 1359762138 8.461416e+04 1.532476e+05
## 47   47 1359704700 1.050418e+05 1.902583e+05
## 48   48 1359633399 1.303974e+05 2.362036e+05
## 49   49 1359544894 1.618678e+05 2.932384e+05
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## 51   51 1359298694 2.493910e+05 4.519148e+05
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## 52   52 1359129485 3.095278e+05 5.609873e+05
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## 55   55 1358335794 5.914232e+05 1.072783e+06
## 56   56 1357934934 7.336829e+05 1.331383e+06
## 57   57 1357437867 9.099794e+05 1.652154e+06
## 58   58 1356821688 1.128358e+06 2.049954e+06
## 59   59 1356058143 1.398714e+06 2.543142e+06
## 60   60 1355112429 1.733188e+06 3.154383e+06
## 61   61 1353941758 2.146632e+06 3.911610e+06
## 62   62 1352493654 2.657150e+06 4.849197e+06
## 63   63 1350703947 3.286709e+06 6.009345e+06
## 64   64 1348494464 4.061809e+06 7.443727e+06
## 65   65 1345770412 5.014184e+06 9.215404e+06
## 66   66 1342417506 6.181488e+06 1.140101e+07
## 67   67 1338298963 7.607863e+06 1.409317e+07
## 68   68 1333252561 9.344265e+06 1.740317e+07
## 69   69 1327088106 1.144833e+07 2.146356e+07
## 70   70 1319585840 1.398351e+07 2.643065e+07
## 71   71 1310496543 1.701700e+07 3.248646e+07
## 72   72 1299544319 2.061619e+07 3.983949e+07
## 73   73 1286433302 2.484288e+07 4.872382e+07
## 74   74 1270859625 2.974507e+07 5.939531e+07
## 75   75 1252529804 3.534600e+07 7.212420e+07
## 76   76 1231186154 4.163099e+07 8.718286e+07
## 77   77 1206638624 4.853322e+07 1.048282e+08
## 78   78 1178800596 5.592099e+07 1.252784e+08
## 79   79 1147723977 6.358978e+07 1.486862e+08
## 80   80 1113626885 7.126330e+07 1.751098e+08
## 81   81 1076906340 7.860671e+07 2.044869e+08
## 82   82 1038129701 8.525337e+07 2.366169e+08
## 83   83  998002308 9.084248e+07 2.711552e+08
## 84   84  957314325 9.506171e+07 3.076240e+08
## 85   85  916875234 9.768578e+07 3.454390e+08
## 86   86  877447640 9.860297e+07 3.839494e+08
## 87   87  839691773 9.782366e+07 4.224846e+08
## 88   88  804128624 9.547085e+07 4.604005e+08
## 89   89  771124220 9.175600e+07 4.971198e+08
## 90   90  740893058 8.694709e+07 5.321599e+08
##
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## $params$beta
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## 0.6081878
##
## $params$gamma
##     gamma
## 0.3918122
##
## $params$R0
##       R0
## 1.552243
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