Modeling Covid_19 Mortality in Kenya

LANGAT ERICK

2023-07-23

Project:Machine Learning, Modeling Covid_19 Mortality Cases In Kenya

```
#IMPORT LIBRARIES
# install.packages("webshot2")
suppressPackageStartupMessages(require(webshot2))
suppressPackageStartupMessages(require(dplyr))
suppressPackageStartupMessages(require(officer))
suppressPackageStartupMessages(require(modeltime))
suppressPackageStartupMessages(require(tidymodels))
suppressPackageStartupMessages(require(xgboost))
suppressPackageStartupMessages(require(tidyverse))
suppressPackageStartupMessages(require(timetk))
suppressPackageStartupMessages(require(tibble))
suppressPackageStartupMessages(require(report))
suppressPackageStartupMessages(require(tinytex))
suppressPackageStartupMessages(require(rmarkdown))
```

```
#IMPORT DATA SETS
kenya_d <- read.csv("C:/Users/langa/OneDrive/Desktop/Dataset/owid-covid-data.csv")
head(kenya_d)
```

```
##   iso_code continent    location       date total_cases new_cases
## 1      AFG      Asia Afghanistan 2020-01-03          NA         0
## 2      AFG      Asia Afghanistan 2020-01-04          NA         0
## 3      AFG      Asia Afghanistan 2020-01-05          NA         0
## 4      AFG      Asia Afghanistan 2020-01-06          NA         0
## 5      AFG      Asia Afghanistan 2020-01-07          NA         0
## 6      AFG      Asia Afghanistan 2020-01-08          NA         0
##   new_cases_smoothed total_deaths new_deaths new_deaths_smoothed
## 1                 NA           NA          0                  NA
## 2                 NA           NA          0                  NA
## 3                 NA           NA          0                  NA
## 4                 NA           NA          0                  NA
## 5                 NA           NA          0                  NA
## 6                  0           NA          0                   0
##   total_cases_per_million new_cases_per_million new_cases_smoothed_per_million
## 1                      NA                     0                              NA
## 2                      NA                     0                              NA
## 3                      NA                     0                              NA
## 4                      NA                     0                              NA
```

```
## 5                      NA                    0                              NA
## 6                      NA                    0                               0
##   total_deaths_per_million new_deaths_per_million
## 1                       NA                     0
## 2                       NA                     0
## 3                       NA                     0
## 4                       NA                     0
## 5                       NA                     0
## 6                       NA                     0
##   new_deaths_smoothed_per_million reproduction_rate icu_patients
## 1                              NA                NA           NA
## 2                              NA                NA           NA
## 3                              NA                NA           NA
## 4                              NA                NA           NA
## 5                              NA                NA           NA
## 6                               0                NA           NA
##   icu_patients_per_million hosp_patients hosp_patients_per_million
## 1                       NA           NA                        NA
## 2                       NA           NA                        NA
## 3                       NA           NA                        NA
## 4                       NA           NA                        NA
## 5                       NA           NA                        NA
## 6                       NA           NA                        NA
##   weekly_icu_admissions weekly_icu_admissions_per_million
## 1                    NA                               NA
## 2                    NA                               NA
## 3                    NA                               NA
## 4                    NA                               NA
## 5                    NA                               NA
## 6                    NA                               NA
##   weekly_hosp_admissions weekly_hosp_admissions_per_million total_tests
## 1                     NA                                NA          NA
## 2                     NA                                NA          NA
## 3                     NA                                NA          NA
## 4                     NA                                NA          NA
## 5                     NA                                NA          NA
## 6                     NA                                NA          NA
##   new_tests total_tests_per_thousand new_tests_per_thousand new_tests_smoothed
## 1        NA                       NA                      NA                 NA
## 2        NA                       NA                      NA                 NA
## 3        NA                       NA                      NA                 NA
## 4        NA                       NA                      NA                 NA
## 5        NA                       NA                      NA                 NA
## 6        NA                       NA                      NA                 NA
##   new_tests_smoothed_per_thousand positive_rate tests_per_case tests_units
## 1                              NA            NA             NA
## 2                              NA            NA             NA
## 3                              NA            NA             NA
## 4                              NA            NA             NA
## 5                              NA            NA             NA
## 6                              NA            NA             NA
##   total_vaccinations people_vaccinated people_fully_vaccinated total_boosters
## 1                 NA                NA                       NA             NA
## 2                 NA                NA                       NA             NA
```

```
## 3                 NA                NA                      NA             NA
## 4                 NA                NA                      NA             NA
## 5                 NA                NA                      NA             NA
## 6                 NA                NA                      NA             NA
##   new_vaccinations new_vaccinations_smoothed total_vaccinations_per_hundred
## 1               NA                       NA                              NA
## 2               NA                       NA                              NA
## 3               NA                       NA                              NA
## 4               NA                       NA                              NA
## 5               NA                       NA                              NA
## 6               NA                       NA                              NA
##   people_vaccinated_per_hundred people_fully_vaccinated_per_hundred
## 1                            NA                                   NA
## 2                            NA                                   NA
## 3                            NA                                   NA
## 4                            NA                                   NA
## 5                            NA                                   NA
## 6                            NA                                   NA
##   total_boosters_per_hundred new_vaccinations_smoothed_per_million
## 1                         NA                                   NA
## 2                         NA                                   NA
## 3                         NA                                   NA
## 4                         NA                                   NA
## 5                         NA                                   NA
## 6                         NA                                   NA
##   new_people_vaccinated_smoothed new_people_vaccinated_smoothed_per_hundred
## 1                             NA                                         NA
## 2                             NA                                         NA
## 3                             NA                                         NA
## 4                             NA                                         NA
## 5                             NA                                         NA
## 6                             NA                                         NA
##   stringency_index population_density median_age aged_65_older aged_70_older
## 1                0              54.422       18.6         2.581         1.337
## 2                0              54.422       18.6         2.581         1.337
## 3                0              54.422       18.6         2.581         1.337
## 4                0              54.422       18.6         2.581         1.337
## 5                0              54.422       18.6         2.581         1.337
## 6                0              54.422       18.6         2.581         1.337
##   gdp_per_capita extreme_poverty cardiovasc_death_rate diabetes_prevalence
## 1       1803.987              NA                597.029                9.59
## 2       1803.987              NA                597.029                9.59
## 3       1803.987              NA                597.029                9.59
## 4       1803.987              NA                597.029                9.59
## 5       1803.987              NA                597.029                9.59
## 6       1803.987              NA                597.029                9.59
##   female_smokers male_smokers handwashing_facilities hospital_beds_per_thousand
## 1             NA           NA                 37.746                        0.5
## 2             NA           NA                 37.746                        0.5
## 3             NA           NA                 37.746                        0.5
## 4             NA           NA                 37.746                        0.5
## 5             NA           NA                 37.746                        0.5
## 6             NA           NA                 37.746                        0.5
##   life_expectancy human_development_index population
```

```
## 1           64.83                    0.511   41128772
## 2           64.83                    0.511   41128772
## 3           64.83                    0.511   41128772
## 4           64.83                    0.511   41128772
## 5           64.83                    0.511   41128772
## 6           64.83                    0.511   41128772
##   excess_mortality_cumulative_absolute excess_mortality_cumulative
## 1                                   NA                           NA
## 2                                   NA                           NA
## 3                                   NA                           NA
## 4                                   NA                           NA
## 5                                   NA                           NA
## 6                                   NA                           NA
##   excess_mortality excess_mortality_cumulative_per_million
## 1               NA                                      NA
## 2               NA                                      NA
## 3               NA                                      NA
## 4               NA                                      NA
## 5               NA                                      NA
## 6               NA                                      NA
```

```
#DATA CLEANING
kenya_d <-kenya_d %>% select(location, date, new_deaths) %>%
           filter(location=='Kenya', date>="2020-03-14")
kenya_d <- kenya_d %>% select(date, new_deaths)
kenya_d$date <- as.Date(kenya_d$date)#character to date
kenya_d
```

```
##           date new_deaths
## 1   2020-03-14          0
## 2   2020-03-15          0
## 3   2020-03-16          0
## 4   2020-03-17          0
## 5   2020-03-18          0
## 6   2020-03-19          0
## 7   2020-03-20          0
## 8   2020-03-21          0
## 9   2020-03-22          0
## 10  2020-03-23          0
## 11  2020-03-24          0
## 12  2020-03-25          0
## 13  2020-03-26          0
## 14  2020-03-27          4
## 15  2020-03-28          0
## 16  2020-03-29          0
## 17  2020-03-30          0
## 18  2020-03-31          0
## 19  2020-04-01          0
## 20  2020-04-02          2
## 21  2020-04-03          0
## 22  2020-04-04          1
## 23  2020-04-05          0
## 24  2020-04-06          0
## 25  2020-04-07          0
```

```
## 26   2020-04-08          0
## 27   2020-04-09          0
## 28   2020-04-10          0
## 29   2020-04-11          0
## 30   2020-04-12          0
## 31   2020-04-13          1
## 32   2020-04-14          1
## 33   2020-04-15          0
## 34   2020-04-16          0
## 35   2020-04-17          1
## 36   2020-04-18          0
## 37   2020-04-19          1
## 38   2020-04-20          2
## 39   2020-04-21          0
## 40   2020-04-22          0
## 41   2020-04-23          0
## 42   2020-04-24          0
## 43   2020-04-25          0
## 44   2020-04-26          0
## 45   2020-04-27          0
## 46   2020-04-28          0
## 47   2020-04-29          0
## 48   2020-04-30          1
## 49   2020-05-01          2
## 50   2020-05-02          4
## 51   2020-05-03          1
## 52   2020-05-04          2
## 53   2020-05-05          0
## 54   2020-05-06          0
## 55   2020-05-07          3
## 56   2020-05-08          3
## 57   2020-05-09          0
## 58   2020-05-10          1
## 59   2020-05-11          2
## 60   2020-05-12          1
## 61   2020-05-13          3
## 62   2020-05-14          4
## 63   2020-05-15          2
## 64   2020-05-16          3
## 65   2020-05-17          5
## 66   2020-05-18          0
## 67   2020-05-19          0
## 68   2020-05-20          0
## 69   2020-05-21          0
## 70   2020-05-22          0
## 71   2020-05-23          0
## 72   2020-05-24          0
## 73   2020-05-25          1
## 74   2020-05-26          1
## 75   2020-05-27          0
## 76   2020-05-28          3
## 77   2020-05-29          3
## 78   2020-05-30          4
## 79   2020-05-31          1
```

```
## 80   2020-06-01          1
## 81   2020-06-02          5
## 82   2020-06-03          2
## 83   2020-06-04          3
## 84   2020-06-05          4
## 85   2020-06-06          1
## 86   2020-06-07          4
## 87   2020-06-08          1
## 88   2020-06-09          1
## 89   2020-06-10          3
## 90   2020-06-11          1
## 91   2020-06-12          3
## 92   2020-06-13          4
## 93   2020-06-14          4
## 94   2020-06-15          3
## 95   2020-06-16          1
## 96   2020-06-17          1
## 97   2020-06-18          2
## 98   2020-06-19         10
## 99   2020-06-20          2
## 100  2020-06-21          2
## 101  2020-06-22          2
## 102  2020-06-23          2
## 103  2020-06-24          3
## 104  2020-06-25          2
## 105  2020-06-26          2
## 106  2020-06-27          5
## 107  2020-06-28          4
## 108  2020-06-29          2
## 109  2020-06-30          1
## 110  2020-07-01          4
## 111  2020-07-02          1
## 112  2020-07-03          3
## 113  2020-07-04          2
## 114  2020-07-05          5
## 115  2020-07-06          1
## 116  2020-07-07          4
## 117  2020-07-08          3
## 118  2020-07-09          2
## 119  2020-07-10          4
## 120  2020-07-11          8
## 121  2020-07-12          3
## 122  2020-07-13          1
## 123  2020-07-14         12
## 124  2020-07-15          5
## 125  2020-07-16          7
## 126  2020-07-17          8
## 127  2020-07-18          5
## 128  2020-07-19          3
## 129  2020-07-20          9
## 130  2020-07-21          4
## 131  2020-07-22         12
## 132  2020-07-23         10
## 133  2020-07-24          3
```

```
## 134  2020-07-25         11
## 135  2020-07-26          4
## 136  2020-07-27          2
## 137  2020-07-28          5
## 138  2020-07-29         14
## 139  2020-07-30         12
## 140  2020-07-31         14
## 141  2020-08-01         16
## 142  2020-08-02         23
## 143  2020-08-03          5
## 144  2020-08-04         13
## 145  2020-08-05          6
## 146  2020-08-06          3
## 147  2020-08-07          8
## 148  2020-08-08         14
## 149  2020-08-09          5
## 150  2020-08-10          2
## 151  2020-08-11          3
## 152  2020-08-12         15
## 153  2020-08-13         18
## 154  2020-08-14          4
## 155  2020-08-15          5
## 156  2020-08-16          7
## 157  2020-08-17          2
## 158  2020-08-18          8
## 159  2020-08-19          5
## 160  2020-08-20         19
## 161  2020-08-21         10
## 162  2020-08-22         16
## 163  2020-08-23         10
## 164  2020-08-24          6
## 165  2020-08-25          6
## 166  2020-08-26          6
## 167  2020-08-27          4
## 168  2020-08-28          3
## 169  2020-08-29          0
## 170  2020-08-30          5
## 171  2020-08-31          2
## 172  2020-09-01          3
## 173  2020-09-02          0
## 174  2020-09-03          4
## 175  2020-09-04          4
## 176  2020-09-05          4
## 177  2020-09-06          5
## 178  2020-09-07          3
## 179  2020-09-08          2
## 180  2020-09-09          0
## 181  2020-09-10          8
## 182  2020-09-11          5
## 183  2020-09-12          4
## 184  2020-09-13          3
## 185  2020-09-14          3
## 186  2020-09-15          2
## 187  2020-09-16         10
```

```
## 188  2020-09-17          3
## 189  2020-09-18          5
## 190  2020-09-19          4
## 191  2020-09-20          0
## 192  2020-09-21          2
## 193  2020-09-22          2
## 194  2020-09-23          9
## 195  2020-09-24          5
## 196  2020-09-25          5
## 197  2020-09-26         13
## 198  2020-09-27          7
## 199  2020-09-28          2
## 200  2020-09-29          9
## 201  2020-09-30          7
## 202  2020-10-01          4
## 203  2020-10-02          7
## 204  2020-10-03          7
## 205  2020-10-04          3
## 206  2020-10-05          3
## 207  2020-10-06          4
## 208  2020-10-07          8
## 209  2020-10-08          5
## 210  2020-10-09          3
## 211  2020-10-10          4
## 212  2020-10-11          5
## 213  2020-10-12          6
## 214  2020-10-13         11
## 215  2020-10-14         10
## 216  2020-10-15         10
## 217  2020-10-16          8
## 218  2020-10-17          8
## 219  2020-10-18         12
## 220  2020-10-19          7
## 221  2020-10-20          7
## 222  2020-10-21          3
## 223  2020-10-22         16
## 224  2020-10-23         12
## 225  2020-10-24         14
## 226  2020-10-25         12
## 227  2020-10-26          6
## 228  2020-10-27         18
## 229  2020-10-28         14
## 230  2020-10-29         16
## 231  2020-10-30         14
## 232  2020-10-31         17
## 233  2020-11-01         15
## 234  2020-11-02         17
## 235  2020-11-03         14
## 236  2020-11-04         12
## 237  2020-11-05         12
## 238  2020-11-06         21
## 239  2020-11-07         21
## 240  2020-11-08         10
## 241  2020-11-09          8
```

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## 242  2020-11-10         19
## 243  2020-11-11         24
## 244  2020-11-12         26
## 245  2020-11-13         23
## 246  2020-11-14         25
## 247  2020-11-15         21
## 248  2020-11-16         20
## 249  2020-11-17         18
## 250  2020-11-18         15
## 251  2020-11-19         11
## 252  2020-11-20         17
## 253  2020-11-21         19
## 254  2020-11-22         17
## 255  2020-11-23         14
## 256  2020-11-24         12
## 257  2020-11-25         17
## 258  2020-11-26          8
## 259  2020-11-27         10
## 260  2020-11-28         14
## 261  2020-11-29          4
## 262  2020-11-30          7
## 263  2020-12-01         17
## 264  2020-12-02          5
## 265  2020-12-03         10
## 266  2020-12-04         16
## 267  2020-12-05          6
## 268  2020-12-06         12
## 269  2020-12-07          8
## 270  2020-12-08          5
## 271  2020-12-09         14
## 272  2020-12-10          7
## 273  2020-12-11         16
## 274  2020-12-12         14
## 275  2020-12-13          4
## 276  2020-12-14          1
## 277  2020-12-15          6
## 278  2020-12-16         11
## 279  2020-12-17         10
## 280  2020-12-18          4
## 281  2020-12-19         11
## 282  2020-12-20          4
## 283  2020-12-21          6
## 284  2020-12-22          5
## 285  2020-12-23          3
## 286  2020-12-24          1
## 287  2020-12-25          4
## 288  2020-12-26          1
## 289  2020-12-27          2
## 290  2020-12-28          3
## 291  2020-12-29          6
## 292  2020-12-30          1
## 293  2020-12-31          2
## 294  2021-01-01          3
## 295  2021-01-02         11
```

```
## 296  2021-01-03          4
## 297  2021-01-04          0
## 298  2021-01-05          1
## 299  2021-01-06          4
## 300  2021-01-07          4
## 301  2021-01-08          8
## 302  2021-01-09          1
## 303  2021-01-10          1
## 304  2021-01-11          6
## 305  2021-01-12          3
## 306  2021-01-13          3
## 307  2021-01-14          4
## 308  2021-01-15          3
## 309  2021-01-16          3
## 310  2021-01-17          2
## 311  2021-01-18          3
## 312  2021-01-19          3
## 313  2021-01-20          0
## 314  2021-01-21          2
## 315  2021-01-22          3
## 316  2021-01-23          1
## 317  2021-01-24          0
## 318  2021-01-25          4
## 319  2021-01-26          0
## 320  2021-01-27          6
## 321  2021-01-28          1
## 322  2021-01-29          2
## 323  2021-01-30          0
## 324  2021-01-31          2
## 325  2021-02-01          8
## 326  2021-02-02          3
## 327  2021-02-03          0
## 328  2021-02-04          3
## 329  2021-02-05          4
## 330  2021-02-06          3
## 331  2021-02-07          0
## 332  2021-02-08          3
## 333  2021-02-09          7
## 334  2021-02-10          3
## 335  2021-02-11          2
## 336  2021-02-12          3
## 337  2021-02-13          0
## 338  2021-02-14          1
## 339  2021-02-15          0
## 340  2021-02-16          0
## 341  2021-02-17          2
## 342  2021-02-18          4
## 343  2021-02-19          6
## 344  2021-02-20          6
## 345  2021-02-21          4
## 346  2021-02-22          6
## 347  2021-02-23          4
## 348  2021-02-24         10
## 349  2021-02-25          2
```

```
## 350  2021-02-26          8
## 351  2021-02-27          6
## 352  2021-02-28          1
## 353  2021-03-01          2
## 354  2021-03-02          3
## 355  2021-03-03          4
## 356  2021-03-04          3
## 357  2021-03-05          4
## 358  2021-03-06          3
## 359  2021-03-07          1
## 360  2021-03-08          2
## 361  2021-03-09          3
## 362  2021-03-10          7
## 363  2021-03-11         12
## 364  2021-03-12          1
## 365  2021-03-13          2
## 366  2021-03-14          7
## 367  2021-03-15          5
## 368  2021-03-16          5
## 369  2021-03-17          7
## 370  2021-03-18         12
## 371  2021-03-19         17
## 372  2021-03-20         28
## 373  2021-03-21         12
## 374  2021-03-22         17
## 375  2021-03-23         12
## 376  2021-03-24         25
## 377  2021-03-25         18
## 378  2021-03-26         26
## 379  2021-03-27          6
## 380  2021-03-28          6
## 381  2021-03-29         13
## 382  2021-03-30         18
## 383  2021-03-31         12
## 384  2021-04-01          6
## 385  2021-04-02         14
## 386  2021-04-03         19
## 387  2021-04-04         20
## 388  2021-04-05         18
## 389  2021-04-06         20
## 390  2021-04-07         14
## 391  2021-04-08         18
## 392  2021-04-09         16
## 393  2021-04-10         17
## 394  2021-04-11         21
## 395  2021-04-12         18
## 396  2021-04-13         20
## 397  2021-04-14         26
## 398  2021-04-15         26
## 399  2021-04-16          4
## 400  2021-04-17         19
## 401  2021-04-18         20
## 402  2021-04-19         18
## 403  2021-04-20         20
```

```
## 404  2021-04-21         18
## 405  2021-04-22         21
## 406  2021-04-23         20
## 407  2021-04-24         23
## 408  2021-04-25         20
## 409  2021-04-26         19
## 410  2021-04-27         21
## 411  2021-04-28         22
## 412  2021-04-29         23
## 413  2021-04-30         19
## 414  2021-05-01         17
## 415  2021-05-02         20
## 416  2021-05-03         19
## 417  2021-05-04         18
## 418  2021-05-05         24
## 419  2021-05-06         20
## 420  2021-05-07         25
## 421  2021-05-08         15
## 422  2021-05-09         18
## 423  2021-05-10         12
## 424  2021-05-11         12
## 425  2021-05-12         21
## 426  2021-05-13         22
## 427  2021-05-14         18
## 428  2021-05-15          8
## 429  2021-05-16         25
## 430  2021-05-17          2
## 431  2021-05-18         10
## 432  2021-05-19          8
## 433  2021-05-20         14
## 434  2021-05-21          5
## 435  2021-05-22          3
## 436  2021-05-23          6
## 437  2021-05-24         10
## 438  2021-05-25         14
## 439  2021-05-26         14
## 440  2021-05-27         10
## 441  2021-05-28         11
## 442  2021-05-29         16
## 443  2021-05-30         17
## 444  2021-05-31         16
## 445  2021-06-01         15
## 446  2021-06-02         16
## 447  2021-06-03         18
## 448  2021-06-04         17
## 449  2021-06-05         17
## 450  2021-06-06         24
## 451  2021-06-07         23
## 452  2021-06-08         21
## 453  2021-06-09         18
## 454  2021-06-10         19
## 455  2021-06-11         17
## 456  2021-06-12         16
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```

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## 1052 2023-01-29          0
## 1053 2023-01-30          0
## 1054 2023-01-31          0
## 1055 2023-02-01          0
## 1056 2023-02-02          0
## 1057 2023-02-03          0
## 1058 2023-02-04          0
## 1059 2023-02-05          0
## 1060 2023-02-06          0
## 1061 2023-02-07          0
## 1062 2023-02-08          0
## 1063 2023-02-09          0
## 1064 2023-02-10          0
## 1065 2023-02-11          0
## 1066 2023-02-12          0
## 1067 2023-02-13          0
## 1068 2023-02-14          0
## 1069 2023-02-15          0
## 1070 2023-02-16          0
## 1071 2023-02-17          0
## 1072 2023-02-18          0
## 1073 2023-02-19          0
## 1074 2023-02-20          0
## 1075 2023-02-21          0
## 1076 2023-02-22          0
## 1077 2023-02-23          0
## 1078 2023-02-24          0
## 1079 2023-02-25          0
## 1080 2023-02-26          0
## 1081 2023-02-27          0
## 1082 2023-02-28          0
## 1083 2023-03-01          0
## 1084 2023-03-02          0
## 1085 2023-03-03          0
## 1086 2023-03-04          0
## 1087 2023-03-05          0
## 1088 2023-03-06          0
## 1089 2023-03-07          0
## 1090 2023-03-08          0
## 1091 2023-03-09          0
## 1092 2023-03-10          0
## 1093 2023-03-11          0
## 1094 2023-03-12          0
## 1095 2023-03-13          0
## 1096 2023-03-14          0
## 1097 2023-03-15          0
## 1098 2023-03-16          0
## 1099 2023-03-17          0
## 1100 2023-03-18          0
## 1101 2023-03-19          0
## 1102 2023-03-20          0
## 1103 2023-03-21          0
## 1104 2023-03-22          0
## 1105 2023-03-23          0
```

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## 1106 2023-03-24          0
## 1107 2023-03-25          0
## 1108 2023-03-26          0
## 1109 2023-03-27          0
## 1110 2023-03-28          0
## 1111 2023-03-29          0
## 1112 2023-03-30          0
## 1113 2023-03-31          0
## 1114 2023-04-01          0
## 1115 2023-04-02          0
## 1116 2023-04-03          0
## 1117 2023-04-04          0
## 1118 2023-04-05          0
## 1119 2023-04-06          0
## 1120 2023-04-07          0
## 1121 2023-04-08          0
## 1122 2023-04-09          0
## 1123 2023-04-10          0
## 1124 2023-04-11          0
## 1125 2023-04-12          0
## 1126 2023-04-13          0
## 1127 2023-04-14          0
## 1128 2023-04-15          0
## 1129 2023-04-16          0
## 1130 2023-04-17          0
## 1131 2023-04-18          0
## 1132 2023-04-19          0
## 1133 2023-04-20          0
## 1134 2023-04-21          0
## 1135 2023-04-22          0
## 1136 2023-04-23          0
## 1137 2023-04-24          0
## 1138 2023-04-25          0
## 1139 2023-04-26          0
## 1140 2023-04-27          0
## 1141 2023-04-28          0
## 1142 2023-04-29          0
## 1143 2023-04-30          0
## 1144 2023-05-01          0
## 1145 2023-05-02          0
## 1146 2023-05-03          0
## 1147 2023-05-04          0
## 1148 2023-05-05          0
## 1149 2023-05-06          0
## 1150 2023-05-07          0
## 1151 2023-05-08          0
## 1152 2023-05-09          0
## 1153 2023-05-10          0
## 1154 2023-05-11          0
## 1155 2023-05-12          0
## 1156 2023-05-13          0
## 1157 2023-05-14          0
## 1158 2023-05-15          0
## 1159 2023-05-16          0
```

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## 1160 2023-05-17          0
## 1161 2023-05-18          0
## 1162 2023-05-19          0
## 1163 2023-05-20          0
## 1164 2023-05-21          0
## 1165 2023-05-22          0
## 1166 2023-05-23          0
## 1167 2023-05-24          0
## 1168 2023-05-25          0
## 1169 2023-05-26          0
## 1170 2023-05-27          0
## 1171 2023-05-28          0
## 1172 2023-05-29          0
## 1173 2023-05-30          0
## 1174 2023-05-31          0
## 1175 2023-06-01          0
## 1176 2023-06-02          0
## 1177 2023-06-03          0
## 1178 2023-06-04          0
## 1179 2023-06-05          0
## 1180 2023-06-06          0
## 1181 2023-06-07          0
## 1182 2023-06-08          0
## 1183 2023-06-09          0
## 1184 2023-06-10          0
## 1185 2023-06-11          0
## 1186 2023-06-12          0
## 1187 2023-06-13          0
## 1188 2023-06-14          0
## 1189 2023-06-15          0
## 1190 2023-06-16          1
## 1191 2023-06-17          0
## 1192 2023-06-18          0
## 1193 2023-06-19          0
## 1194 2023-06-20          0
## 1195 2023-06-21          0
## 1196 2023-06-22          0
## 1197 2023-06-23          0
## 1198 2023-06-24          0
## 1199 2023-06-25          0
## 1200 2023-06-26          0
## 1201 2023-06-27          0
## 1202 2023-06-28          0
## 1203 2023-06-29          0
## 1204 2023-06-30          0
## 1205 2023-07-01          0
## 1206 2023-07-02          0
## 1207 2023-07-03          0
## 1208 2023-07-04          0
## 1209 2023-07-05          0
## 1210 2023-07-06          0
## 1211 2023-07-07          0
## 1212 2023-07-08          0
## 1213 2023-07-09          0
```
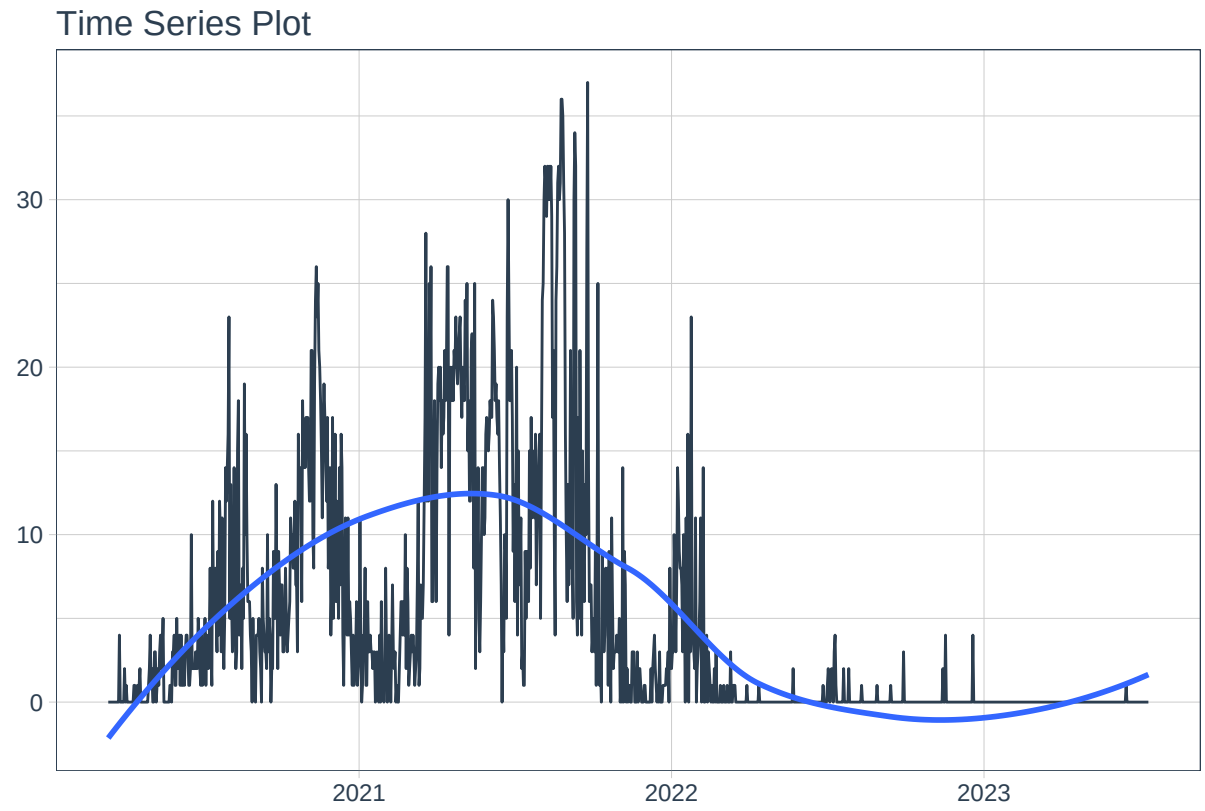

```
## 1214 2023-07-10          0
## 1215 2023-07-11          0
## 1216 2023-07-12          0
```

```
# VISUALIZE OUR DATA TO CHECK ON THE TREND
kenya_d %>% plot_time_series(date,new_deaths, .interactive = F)
```




```
#Data Spliting/ training /test set
set.seed(0)
split1 <- initial_time_split(kenya_d, prop = .75)
train <- training(split1)
test <- testing(split1)
```

```
#DEFINE THE MODEL
#arima model
arima_m <- arima_reg(mode="regression") %>% set_engine(engine = "auto_arima") %>%
  fit(new_deaths~date, data=train)
```

```
## frequency = 7 observations per 1 week
```

```
arima_m
```

```
## parsnip model object
##
```

```
## Series: outcome
## ARIMA(1,1,2)(0,0,2)[7]
##
## Coefficients:
##          ar1      ma1     ma2     sma1    sma2
##       0.6554  -1.2342  0.3177  -0.0893  0.1093
## s.e.  0.1422   0.1561  0.1163   0.0355  0.0331
##
## sigma^2 = 17.91:  log likelihood = -2604.78
## AIC=5221.56   AICc=5221.65   BIC=5250.45
```

```
#ARIMA BOOST
arima_boost <- arima_boost(min_n = 2, learn_rate = .5, mode = "regression") %>%
      set_engine(engine = "auto_arima_xgboost") %>%
    fit(new_deaths~date+as.numeric(date)+factor(month(date, label=TRUE),
                                                ordered=FALSE),
                                            data=train)
```

```
## frequency = 7 observations per 1 week
```

```
arima_boost
```

```
## parsnip model object
##
## ARIMA(1,1,2)(2,0,1)[7] w/ XGBoost Errors
## ---
## Model 1: Auto ARIMA
## Series: outcome
## ARIMA(1,1,2)(2,0,1)[7]
##
## Coefficients:
##          ar1      ma1     ma2    sar1   sar2     sma1
##       0.7034  -1.2877  0.3607  0.5419  0.157  -0.6316
## s.e.  0.1418   0.1556  0.1148  0.1496  0.034   0.1531
##
## sigma^2 = 17.82:  log likelihood = -2602.2
## AIC=5218.4   AICc=5218.53   BIC=5252.11
##
## ---
## Model 2: XGBoost Errors
##
## xgboost::xgb.train(params = list(eta = 0.5, max_depth = 6, gamma = 0,
##     colsample_bytree = 1, colsample_bynode = 1, min_child_weight = 2,
##     subsample = 1), data = x$data, nrounds = 15, watchlist = x$watchlist,
##     verbose = 0, objective = "reg:squarederror", nthread = 1)
```

```
#EXPONENTIAL SMOOTHING(MODELTIME):ETS
ets_model <- exp_smoothing(mode = 'regression') %>% set_engine(engine = "ets") %>%
      fit(new_deaths~date, data=train)
```

```
## frequency = 7 observations per 1 week
```

```
ets_model
```

```
## parsnip model object
##
## ETS(A,N,A)
##
## Call:
##  forecast::ets(y = outcome, model = model_ets, damped = damping_ets,
##
##  Call:
##      alpha = alpha, beta = beta, gamma = gamma)
##
##   Smoothing parameters:
##     alpha = 0.3943
##     gamma = 1e-04
##
##   Initial states:
##     l = 0.2412
##     s = 0.4383 0.5971 -0.0583 -0.6582 -0.8681 -0.1041
##           0.6533
##
##   sigma:  4.3012
##
##      AIC     AICc      BIC
## 8887.837 8888.081 8935.994
```

ADDFITTED MODEL TO MODELTIME TABLE

```
table_model <- modeltime_table(
  arima_m,
  arima_boost,
  ets_model
)
table_model
```

```
## # Modeltime Table
## # A tibble: 3 x 3
##   .model_id .model   .model_desc
##       <int> <list>   <chr>
## 1         1 <fit[+]> ARIMA(1,1,2)(0,0,2)[7]
## 2         2 <fit[+]> ARIMA(1,1,2)(2,0,1)[7] W/ XGBOOST ERRORS
## 3         3 <fit[+]> ETS(A,N,A)
```

CALIBRATE MODEL TO THE TEST DATA

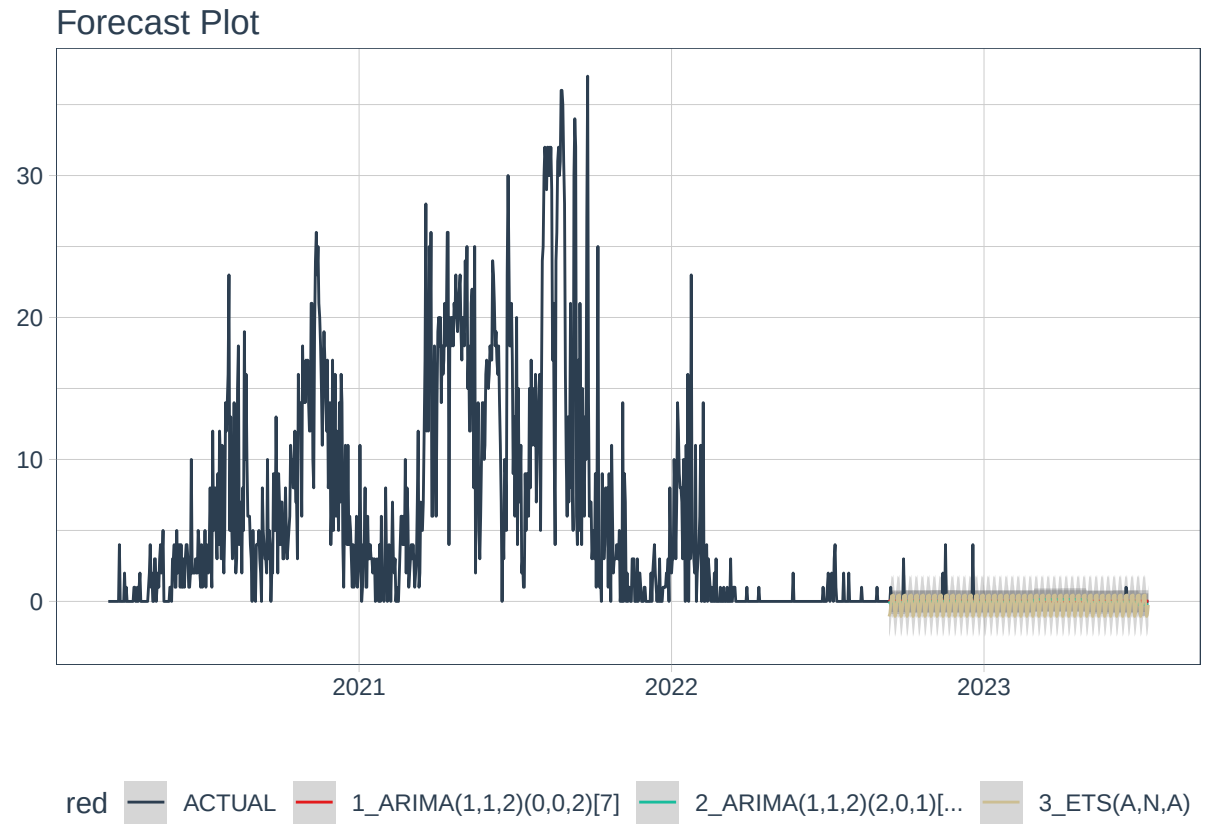
```
calib_table <- table_model %>% modeltime_calibrate(new_data = test)
calib_table
```

```
## # Modeltime Table
## # A tibble: 3 x 5
##   .model_id .model   .model_desc                          .type .calibration_data
```

```
##       <int> <list>   <chr>                                  <chr> <list>
## 1         1 <fit[+]> ARIMA(1,1,2)(0,0,2)[7]                 Test  <tibble>
## 2         2 <fit[+]> ARIMA(1,1,2)(2,0,1)[7] W/ XGBOOST ~ Test  <tibble>
## 3         3 <fit[+]> ETS(A,N,A)                             Test  <tibble>
```

```
#TESTING SET FORECAST & ACCURACY EVALUATION
calib_table %>% modeltime_forecast(new_data = test,
                                   actual_data = kenya_d) %>%
    plot_modeltime_forecast(
      .color_lab = "red",
      .legend_max_width = 25,#fro mobile screens
      .interactive = F
    )
```

```
## Warning in max(ids, na.rm = TRUE): no non-missing arguments to max; returning
## -Inf
```




```
#ACCURACY METRICS
calib_table %>% modeltime_accuracy() %>% table_modeltime_accuracy(
  .interactive = T
)
```

```
## i We have detected a possible intermittent series, you can change the default metric set to the exte
```

Search

.model_id	.model_desc	.type	mae	mape	mase
1	ARIMA(1,1,2)(0,0,2)[7]	Test	0.07	Infinity	0.72
2	ARIMA(1,1,2)(2,0,1)[7] W/ XGBOOST ERRORS	Test	0.11	Infinity	1.12
3	ETS(A,N,A)	Test	0.55	Infinity	5.6

```
#REFIT THE MODEL TO FULL DATASET& FORECAST FORWARD
refit_table <- calib_table %>% modeltime_refit(data = kenya_d)
```

```
## frequency = 7 observations per 1 week
## frequency = 7 observations per 1 week
## frequency = 7 observations per 1 week
```

```
refit_table %>% modeltime_forecast(h="90 days", actual_data = kenya_d) %>% plot_modeltime_forecast(
  .interactive = F
)
```

```
## Warning in max(ids, na.rm = TRUE): no non-missing arguments to max; returning
## -Inf
```