COVID-19 Daily Cases and Deaths during September 1st 2021 - January 13th 2022: An Analysis for Greece and Cyprus

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Herein is a brief analysis of COVID-19 data (daily cases and deaths) in Greece and Cyprus, conducted using the least-squares convex-concave data smoothing method of Demetriou (2004), which generates piecewise-linear convex-concave splines to approximate the data. The data have been downloaded from John Hopkins University, and the results are presented in two sections, one for each country. For an extended method and its application to Covid-19 data from Greece, USA and UK the reader may consult Davos and Demetriou (2021).

1   Greece

The studied period for the data of Greece ranges from September 1st 2021 to January 13th 2022.

1.1   New Cases

Figure 1 depicts the progress of daily COVID-19 cases in Greece throughout the studied period. This period can be split into two distinct subperiods.

1) The first, starting on September 1st 2021, extends up to the end of December 2021 and finds Greece going through a standard COVID-19 cases surge. It starts with a slow ascent in cases numbers, accelerating and inflecting in cases numbers around October 30th and November 1st 2021. This inflection is followed by a leveling-off in cases, peaking at about 6791 cases, as suggested by the approximation spline and slowly descending from then on.

2) The second subperiod, which starts from the days of Christmas around December 25th 2021, is characterized by the advent of the Omicron variant of COVID-19 in Greece; said variant is significantly more contagious compared to previous variants. Its highly

contagious nature, coupled with its advent during the Christmas holidays, had a tremendous impact on the cases measures; as seen in Figure 1, the number of cases skyrockets in a sudden fashion - with the approximation splines nearly forming an almost right angle -, reaching as high as 50182 new cases on January 5th alone (compared to all days before December's end in the studied period staying in the range of 3000 to 6000 on average). The effect of this contagion is such that the data prior to Christmas of 2021 are treated as practically linear by the approximation algorithm (seen in the approximation splines that reach December 31st 2021 and January 13th 2022, respectively).

1.2   New Deaths

Figure 2 depicts all daily COVID-19 related deaths in Greece in the studied period. The same split into subperiods as in the previous section applies.

The first subperiod, reaching up to the end of December 2021, has the data exhibit a sigmoid trend, as expected given the associated cases surge, which is also sigmoid in nature. The inflection in the data, most accurately detected by the approximation spline of September 1st to December 15th, is located in the area of November 9th and 10th (a little more than a week after the October 30th inflection in cases, to account for cases becoming mortalities). The peak of deaths is somewhere in the period November 24th and December 15th (with the data themselves reaching 130 deaths on December 14th 2021), though the structure in the four splines depicted does not serve to provide a more accurate approximation to the location of the peak; that said, interspersing these with more approximation splines would likely yield more concrete results.

There is a clear change in convexity/concavity in the data once the second subperiod comes into effect, with the advent of the Omicron variant. As can also be seen in Figure 2, the data proceed to become convex after the area of November 24th and December 15th; this is also highlighted by the intersection in the approximation splines the reach December 31st 2021 and January 13th 2022, as there are indications that the intersection of the final linear segments of successive approximation splines approximates the location of a concave/convex inflection point (Davos, 2021).

One important aspect of the data to consider is brought to light by comparing Figures 1 and 2; while the advent of Omicron brought about an abrupt and intense spike in the measures of the daily COVID-19 cases, it did not in the deaths data. Certainly, there was an increase in deaths, as would be expected by such a sudden entry to a new COVID-19 cases surge; however, there was no spike corresponding to that in the cases data, instead behaving as if entering a cases surge that was in line to that of the first subperiod, in terms of magnitude. There are many factors that may contribute to this, such as vaccination efforts, experience in treatment gathered over the period of the entire pandemic, as well as - and, perhaps, characteristically so - the comparatively benign nature of Omicron, where the symptoms made manifest are generally milder, compared to those seen in previous variants.
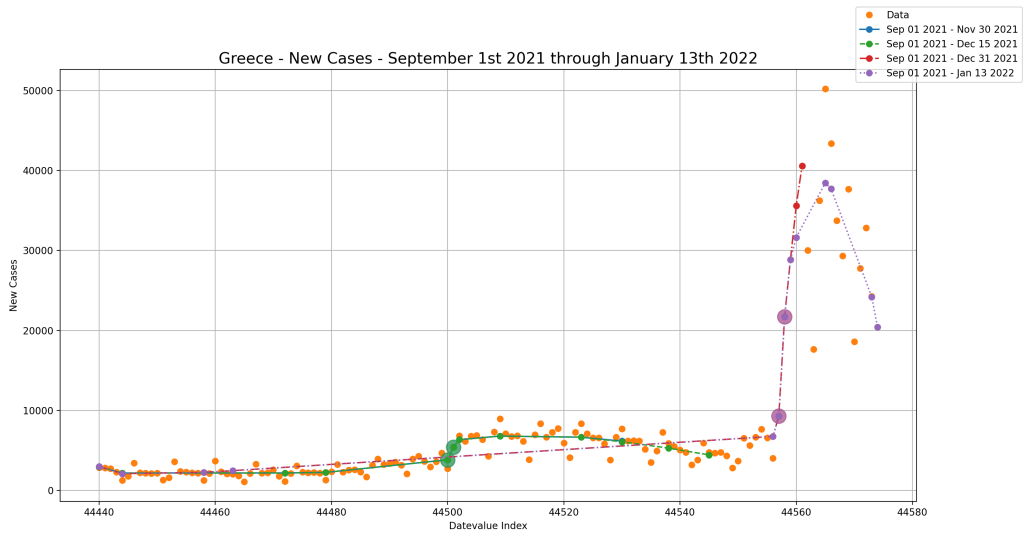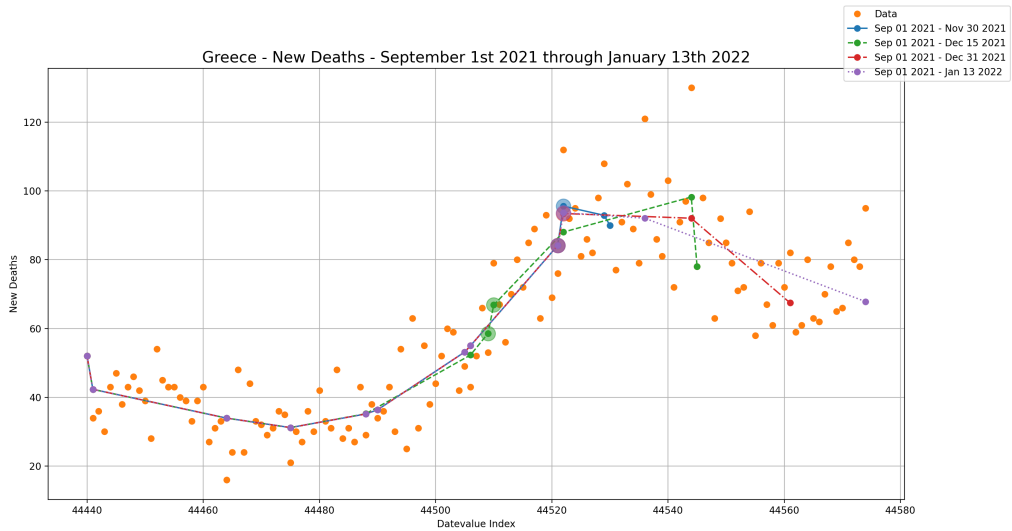
Figure 1: New Cases in Greece

Figure 2: New Deaths in Greece

2   Cyprus

The studied period for the data of Cyprus ranges from October 1st 2021 to January 13th 2022.

2.1 New Cases

Figure 3 depicts the new cases data and associated approximation splines for Cyprus in the studied period. The studied period sees Cyprus entering a slow and regular COVID-19 cases surge, with a slow ascent that lasts well until Christmas; after this point, the **advent of Omicron** in Cyprus makes its appearance, with cases expectedly skyrocketing. It is interesting to note that, despite the difference in scale between the data of Greece and Cyprus, with the latter routinely remaining under 1000 daily cases prior to the Omicron surge, the **spike** brought about due to the advent of Omicron more-or-less increased the cases measures fivefold (cases in Cyprus peaked at **5457** on January 4th, 2022, which also where the splines assert the peak to be, once that date is reached). In addition, the behaviour of the approximation splines is markedly **similar** between the two countries, with the post-Omicron splines considering all prior data to be almost linear in comparison.

2.2 New Deaths

Figure 4 depicts the new deaths of Cyprus as well as their associated approximation splines, for the studied period. As is readily observed, the nature of the data is unfavourable towards the approximation method employed; since deaths in Cyprus tend to range in the low single digits[1], their resulting distribution over time fails to provide something of a non-discrete behaviour (compare, say, to the data of Greece, depicted in Figures 1 and 2, where clear sigmoid trends can be detected). That said, the is one aspect that applies here, as did in the deaths data for Greece; **the cases surge brought about by the advent of Omicron in Cyprus was not met with a similarly abrupt increase in deaths**. Deaths did increase in general, as seen by the rightward transposition of the inflection point in more recent splines, however that increase was not on the scale of the increase in cases.

References

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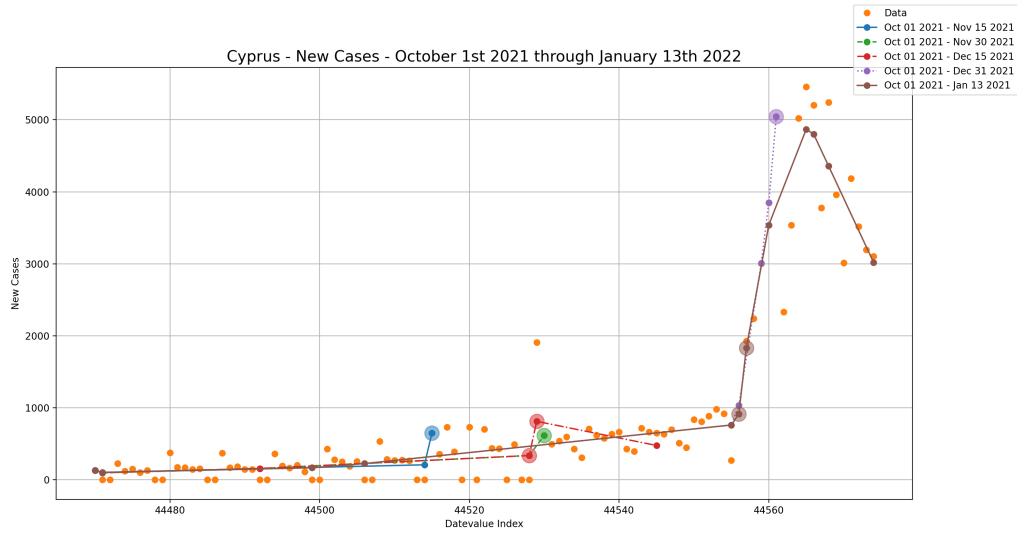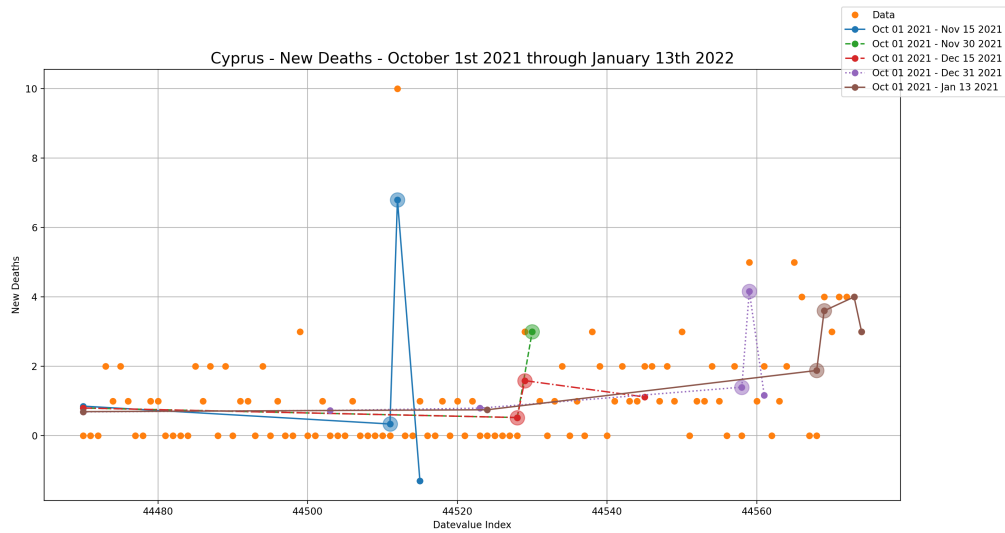[1]The 10 deaths on November 12th 2021 are a distinct outlier in this.

Figure 3: New Cases in Cyprus

Figure 4: New Deaths in Cyprus