# Air Quality before and after Corona

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## Introduction

The corona pandemic has had a lot of consequences for all of us, but these were not all negative. There were for instance positive effects for our environment, because of the reduction in greenhouse gasses emitted by motorized traffic. This research will investigate the difference of the concentration of the chemical NO in the air before and after the start of the corona pandemic, focusing on the situation in the Netherlands. This will be done according to the main research question: Was the air quality in the Netherlands better during the Corona pandemic than before?

## Methods

This research question was solved by looking at the data from a Rotterdam measuring station from 2014 to 2021. To begin, we separated our data into two periods: before Corona and after Corona. We can simply compare these data sets by putting them as a heatmap and a violin plot. In addition, we developed a hypothesis based on our research topic and evaluated it by calculating the P-value and Confidence Interval. These methods were chosen because it is easy to compare data and to see the effect of Corona on NO concentration when the data is compared side-by-side. Furthermore, you can than verify your findings by determining whether your hypothesis is correct.

## Results

Presented here are the visualizations of the results. On the right we see the **Heatmap**. It indicates the number of hours (shown by the colors) that NO emission is detected for each rating. Each rating has a predetermined concentration of NO gas in one $m^3$ air (rating one has the lowest concentration and twelve has the highest). We may deduce from this heatmap that there are lower values after Corona than before Corona.

**The violin plot**, which depicts NO concentrations in $\mu g/m^3$ for each year from 2014 through 2021, is next. The years before Corona are represented by the dark blue violin plots, while the years after Corona are represented by the light blue violin plots. This allows you to see the periods before and after Corona in a clear side-by-side comparison. From this visual can also be seen that the values after Corona are lower than before.

Finally, we investigated our **Hypothesis**. This Hypothesis includes a zero Hypothesis: no change in NO concentration. And an alternative Hypothesis: The concentration NO before Corona is bigger than after Corona. To investigate if the zero Hypothesis can be rejected and the alternative one is true we calculated the P-value and the Confidence Interval. Our P-value is 2.787e-10, meaning that the zero Hypothesis can be rejected (because the P-value is below 0.05, indicating that there is less than 5% chance that this data would occur when drawn from a normal distribution). The Confidence Interval has the values [4.181, 7.877] which also means the zero Hypothesis can be rejected (If the confidence interval contains 0 (no difference in means) we cannot reject the null hypothesis. Otherwise, we reject the null hypothesis.



*@Heatmap, Own Creation*



*@Violin Plot, Own Creation*
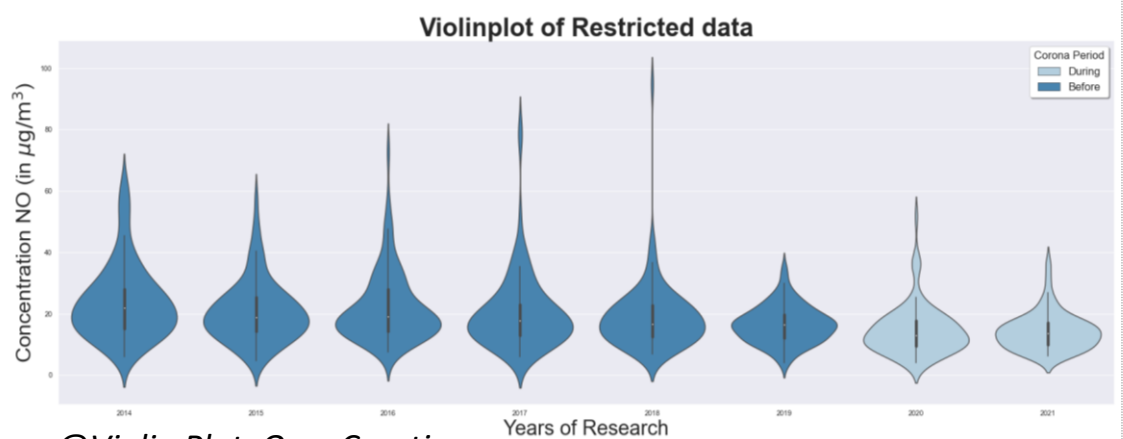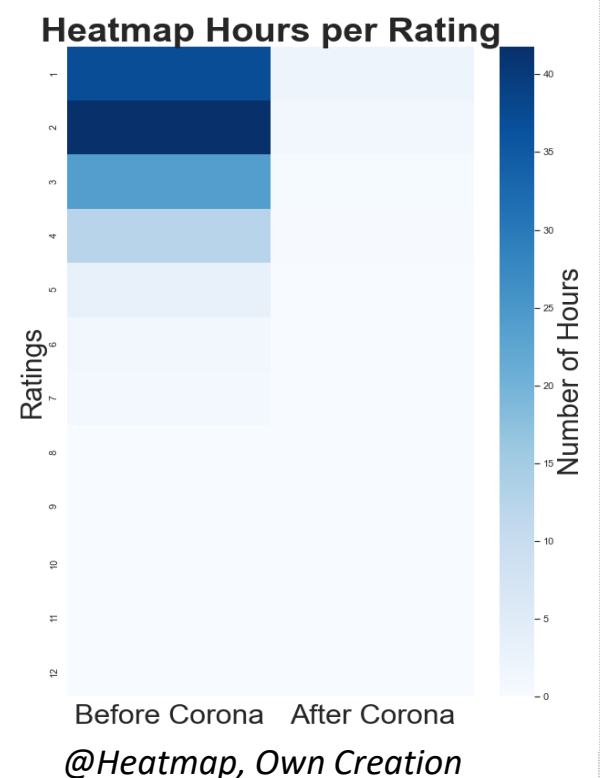
## Discussion

The research question was well answered by the analysis. You have a clear side-by-side comparison that demonstrates the difference in NO concentration after Corona. However, the information we gathered was not complete. Around four months of data were missing in 2021. Because this was most of the data in 2021, it has a lot of implications for our findings. As an improvement, we could make a prediction to forecast missing data, or we could take look at data from nearby measurement stations.

## Conclusion

From this analysis we can give a clear answer on the question if the air quality in the Netherlands was better during the Corona pandemic than before. From the results can be clearly observed that the value of the NO concentration is lower after the Corona period than before the Corona period. Concluding we can state that (in terms of NO concentration): The air quality in the Netherlands was better during the Corona pandemic than before.