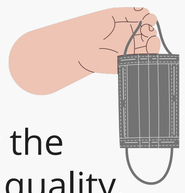
Analysis of Nitrogen Dioxide Levels during the COVID-19 Lockdown (Cairo x Lisbon)

جامعة مصر للمعلوماتية
EGYPT UNIVERSITY OF INFORMATICS

EGYPT UNIVERSITY OF INFORMATICS
FACULTY OF COMPUTING & INFORMATION SCIENCES

Introduction

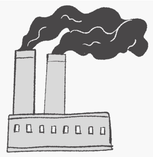


This report aims to answer whether the Covid-19 pandemic led to better air quality. Despite the pandemic being harmful, it is believed that the lockdown may have improved air quality by reducing Nitrogen Dioxide levels, which can damage the respiratory system. The report will focus on Cairo, Egypt, and Lisbon, Portugal.

Done by:
- Ahmed Yasser Hassanein
- Omar Mohamed Elabasery
- Roba Mahmoud Zinhom
- Abdulrahman Khaled Salah

Supervised by:
- Dr. Mohamed Taher Alrefaei
- Eng. Nadine Elsaeed
- Eng. Mira Raheem

Dataset

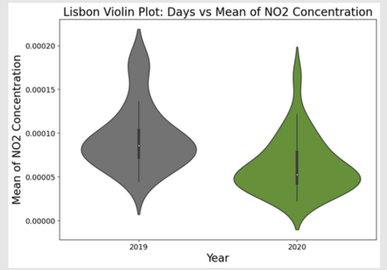


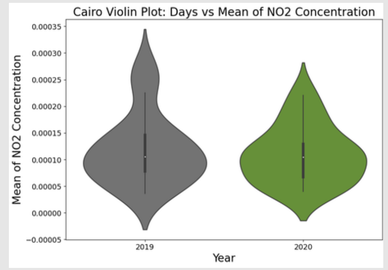
The datasets on NO2 levels in Lisbon, Portugal and Cairo,Egypt measure the concentration of nitrogen dioxide (NO2) in the air. The datasets provide information on the levels of NO2 in different areas of Lisbon and Cairo over time, which can be used to track changes in air quality and inform policy decisions aimed at improving public health.

Hypothesis

- Null hypothesis (H0):
  - μ1 = μ2 (the two population means are equal)
  - There is no difference between the maximum NO2 concentration, before and after the Covid-19 Pandemic, in Lisbon, Portugal. The Covid-19 Pandemic has no effect on the maximum NO2 concentration in Lisbon, Portugal.
- Alternative hypothesis (Ha):
  - μ1 ≠ μ2 (the two population means are not equal)
  - There is a right-tailed difference, μ1 > μ2, between the maximum NO2 concentration, before and after the Covid-19 Pandemic, in Lisbon, Portugal. The maximum NO2 concentration is higher in April 2019 than in 2020 due to the Covid-19 pandemic which led to lockdowns/quarantines all over Portugal.

Findings





The Violin Plots show the mean of Nitrogen Dioxide for every day in the month of April in Cairo and Lisbon for the years 2019 and 2020. While 2019 has higher means, further analysis is needed to determine if they are outliers or not. The plots suggest that the "Mean" may not be the best variable to use for formulating a hypothesis.

Line Plot showing the maximum computed value of Nitrogen Dioxide for each day in the month of April in both Cairo & Lisbon in 2019 and 2020. The Line Plot shows that the maximum NO2 concentration in 2019 is much higher than the value in 2020 which is a motive to construct a hypothesis and conduct hypothesis testing on the two following categories, maximum NO2 concentration values in 2019 and maximum NO2 concentration values in 2020.

Conclusion

At a 5% significance level, we have enough evidence to prove that there is a difference in the maximum NO2 concentration in Lisbon, Portugal, before and after the Covid-19 pandemic, with a higher concentration in April 2019 than in April 2020. The p-value (0.010) is less than 0.05, so we can reject the Null Hypothesis (H0). This means that the Covid-19 lockdown had a positive effect on the NO2 levels in Lisbon, Portugal.