The differences of air quality between the outdoor and indoor interchange

Group 1
Our groupmates

<table>
<thead>
<tr>
<th>LFC</th>
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<tbody>
<tr>
<td>Alfie Wong</td>
<td>Nicole Ng</td>
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<tr>
<td>Jason Wong</td>
<td>Bridget Yip</td>
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<tr>
<td>Samantha Yuen</td>
<td>Philia Yu</td>
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<td>Jasmine Cheung</td>
<td>Cassie Cheng</td>
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<tr>
<td>Joey Lee</td>
<td>Isaac Ho</td>
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</tbody>
</table>
Content

- Background information
- Our hypothesis
- Details of our sampling
- Data analysis
- Our discussion
- Problems
- Suggestion
- Conclusion
Background

- The official document: in 64 public transport change → the air pollutants in air of HK > 50% → affect public’s health

- Hypothesis: ? air pollutants in outdoor bus stop > semi-closed bus stop

- Aim: to alleviate the air pollution and raise the awareness of public about his environmental problem
Hypothesis

To explain the air quality in a outdoor is better than that in semi-covered bus stop

- make use of portable outdoor air quality monitors
- take the pollutants concentration, e.g. carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), PM₂.5 and PM₁₀

→ to confirm more air pollutants in semi-covered bus stop than outdoor
Sampling details

Venue: Metro City indoor bus stop V.S Outdoor
Indoor (the middle of semi-covered bus stop)
Outdoor (near the Cinema)
Date: 8/10, 22/10, 26/11, 10/12 (lunch period 12:45)
5mins per data (CO, NO₂, SO₂, O₃, PM₂.₅, PM₁₀)
Our sampling location
Semi-covered bus stop
Outdoor
Portable Outdoor Air Quality Monitors
Substances

Nitrogen dioxide (NO$_2$)
- a group of highly reactive gases
- irritate airways in the human respiratory system
- form acid rain

Ozone (O3)
- both a natural and a man-made product
- reducing human exposure to harmful UV radiation
- reacts chemically with many biological molecules in the respiratory tract

Sulfur dioxide (SO$_2$)
- invisible and has a nasty, sharp smell
- from human sources
- irritates
Substances

Carbon monoxide
- odorless, colorless gas
- in fumes produced
- ‘flu-like’ symptoms

PM2.5 & PM10
- atmospheric particulate matter
- leads to health problem
# Data Record (1st)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Venue</th>
<th>NO₂</th>
<th>O₃</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₂.₅</th>
<th>PM₁₀</th>
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<tbody>
<tr>
<td>08/10/2019</td>
<td>1307-1312</td>
<td>Outdoor bus stop</td>
<td>0.237</td>
<td>0.069</td>
<td>0</td>
<td>0</td>
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<th>O₃</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₂.₅</th>
<th>PM₁₀</th>
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</thead>
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<td>Outdoor bus stop</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>10/12/2019</td>
<td>1303-1308</td>
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<td>0</td>
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The comparison of the air pollutants between 4 sampling days
Average result

The average result between Indoor and Outdoor air quality

- NO2
- O3
- SO2
- CO
- PM2.5
- PM10

Indoor

Comparison of Indoor and Outdoor air quality for different pollutants.
Data analysis

- $\text{NO}_2$ : outside $>$ semi-covered bus stop
- $\text{O}_3$ : outside $<$ semi-covered bus stop
- $\text{SO}_2$ : outside $<$ semi-covered bus stop
- CO : remain 0
- $\text{PM}_{2.5}$ : outside $<$ semi-covered bus stop
- $\text{PM}_{10}$ : outside $>$ semi-covered bus stop

- Overall : outside $>$ semi-covered bus stop
- Our hypothesis $\times$
Our Discussion

Q1. Why the results turn out like this

How come some substances are absent?

- Vehicles pass through Yan King Road rapidly
- Increase air pollutants (e.g. SO2) outside
Q2. Does petrol affect our results?

- Yes
- It affected CO (if it burn completely, it will not affected CO), NO$_2$, and PM$_{2.5}$
- Especially SO$_2$, are emitted by the burning of fossil fuels — coal, oil, and diesel — or other materials that contain sulfur
- It is produced in the incomplete combustion of carbon-containing fuels.
Our discussion

Q3. How to reduce the error next time?

- take more sampling data > more accurate average data > avoid extreme data

- pay attention on surrounding > look for causes of extreme value (take photo to observe the surrounding environment)
Problems

1. The indoor air quality is much worse than outdoor

1. Extreme data (10/12 value of PM\textsubscript{10} is 0)
Suggestions

Based on different perspectives

1. Government
2. District counciler
3. Citizens
Suggestion (1)

- Encourage the car owners to convert diesel vehicles into electric vehicles
- Reduce pollutants
- Increase support or fundings
- Install solar panel on the roof of our building to generate electricity (reduce the need from electric company)
Suggestions ( 2 )

- Plants more plants in the different district (reduce the carbon emission)
- especially near the road
- Promote the wider use of renewable energy
Suggestions (3)

- Choose to use public transport
- Cycling or walking is also better than driving your own vehicles
- Stop buying vehicles
Conclusion

- The air quality inside the transport interchange > the air quality outside the transport interchange.

- The amount of $O_3$ and $SO_2$ are the most obvious proof

- The hypothesis is disagreed.
References

3. https://www.epa.gov/no2-pollution/basic-information-about-no2l
7. https://blissair.com/what-is-pm-2-5.htm