REACH
RESEARCH EDUCATION ON AIR & CARDIOVASCULAR HEALTH
UNIVERSITY OF MONTANA, MISSOULA

BIG SKY
EAGLES

Student Traffic Effect on Air Quality

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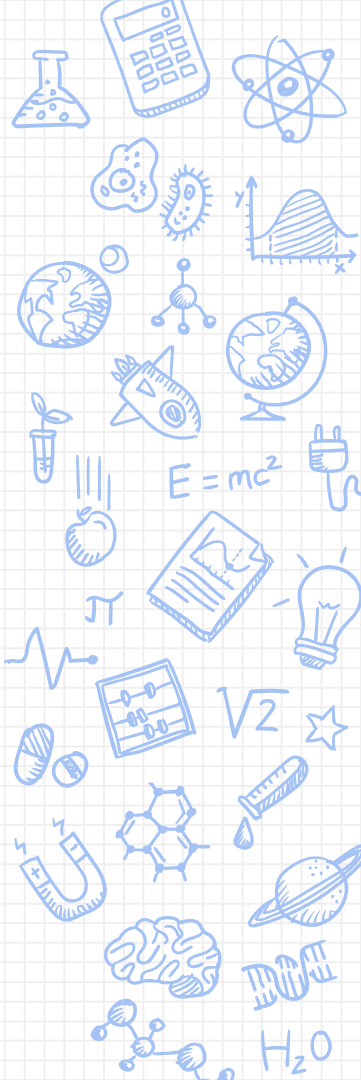
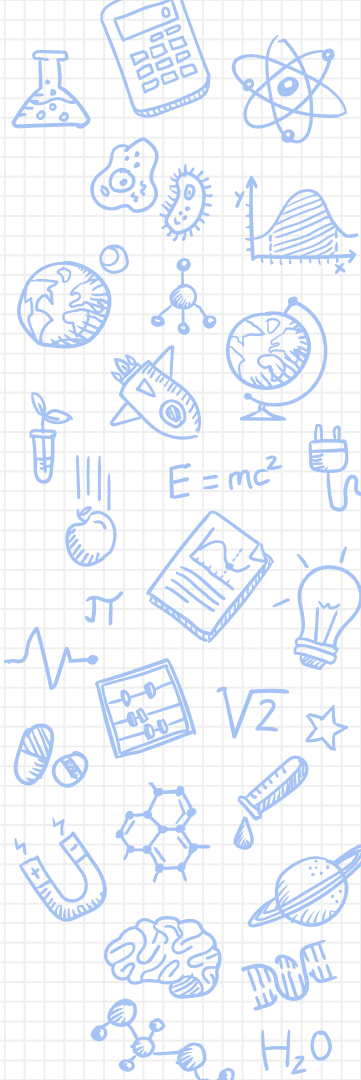
Our question

How does the rate of people flowing through a hallway affect the PM 2.5 levels in that hallway?



Hypothesis

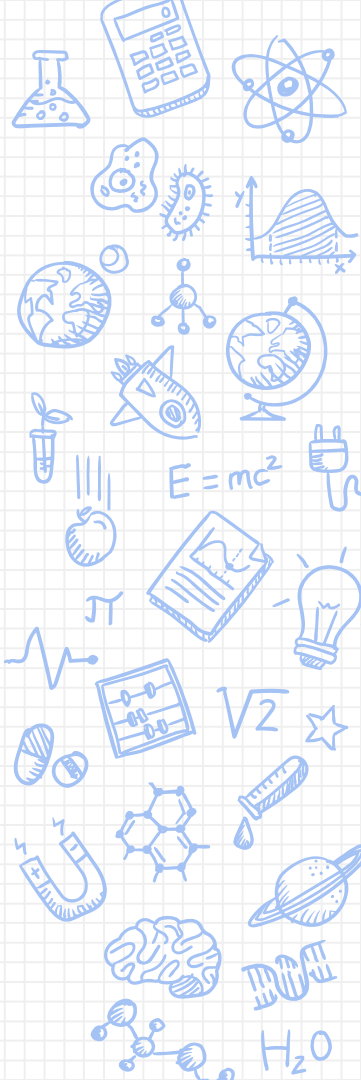
We believe that as more people flow through a hallway, the PM 2.5 measurement will increase because the movement of people will cause dust and small particles to be moved around and will cause an increase in PM 2.5 levels.



Background

A recent study of urban areas in the US found that as population density increases, PM 2.5 concentrations are higher. Our research is looking for a similar relationship, but on a much smaller scale, with significantly fewer variables. (1)

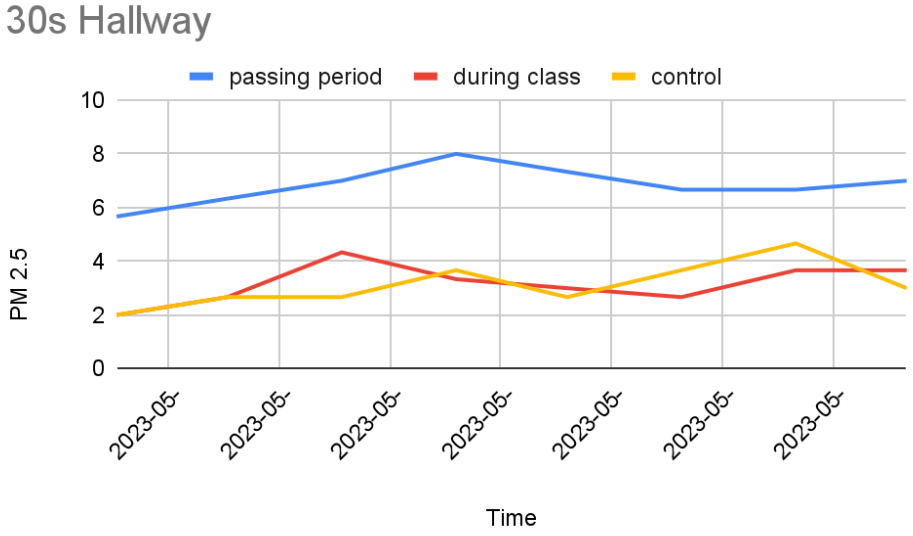
Inversely, there have been other studies that have seen lower density urban sprawls have a higher air pollution compared to higher density areas. (2)

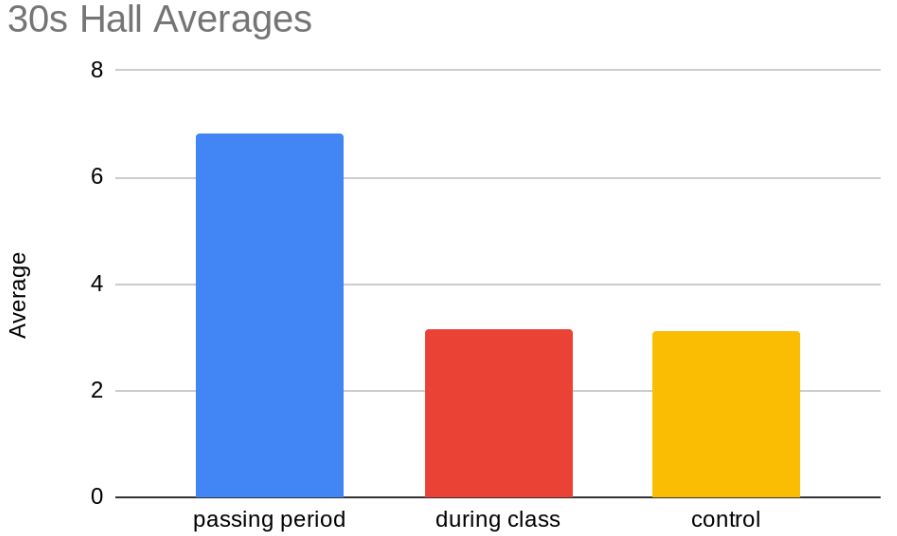


Method

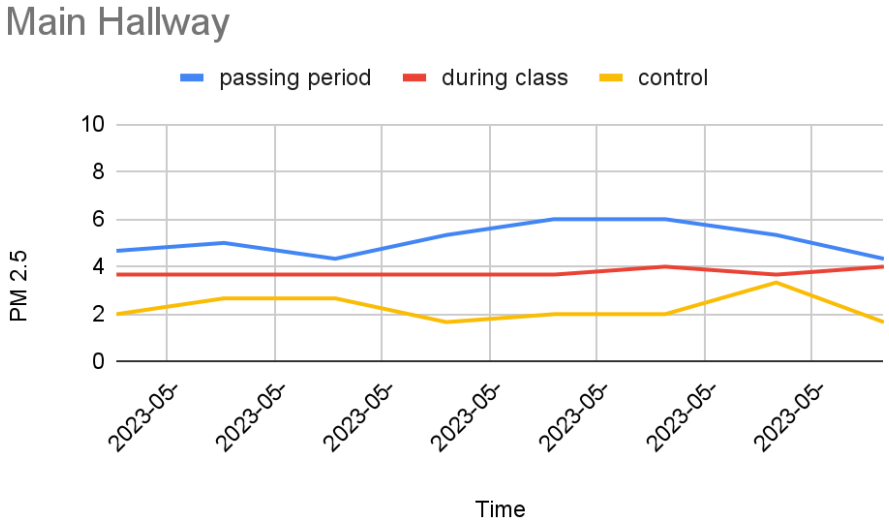
1. Composed question and hypothesis
2. Collect Materials:
    a. WYND tracker instrument
        i. Charger cord for longevity of device
    b. iPhone or other device for data tracking
    c. Platform for consistent height
    d. Signs for signaling persons within hallways
3. Connect WYND tracker to device for data collection
4. Set up WYND device in hallway of choosing during a class period.
    a. Place on a platform 42 centimeters high
5. Mark 10 feet radius around device
6. Ensure that WYND device is undisturbed with sign or verbal communication
7. Step out of testing zone
8. Track for 5 minute increments' while counting people passing inside of area. A person is counted once they pass entirely out of the area and if a person leaves and enters again then they count as another individual towards total amount.
9. Record exact people, start time, and end time.
10. Do three rounds of testing for each area designated area (Main Hall, 30s Hall, 60s hall)
11. Repeat steps for passing period, class period, and control (before school)

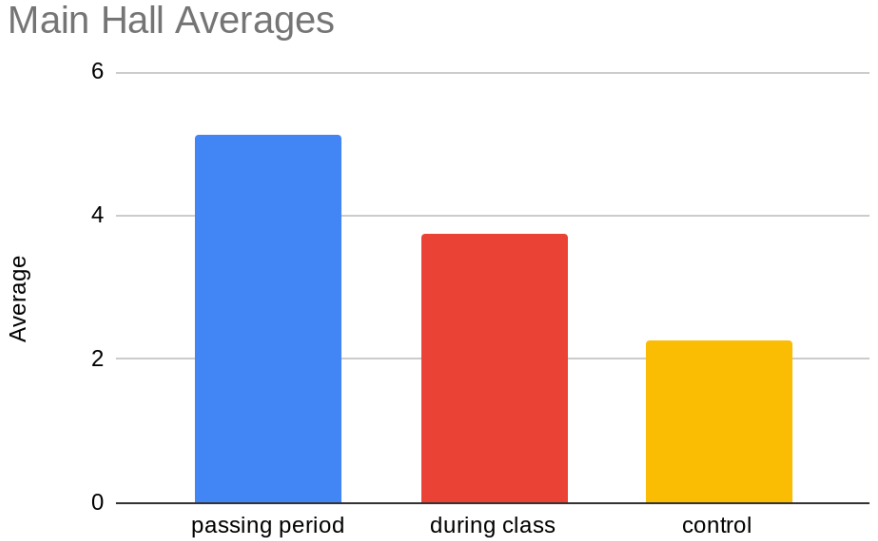
Results – 30s Hallway



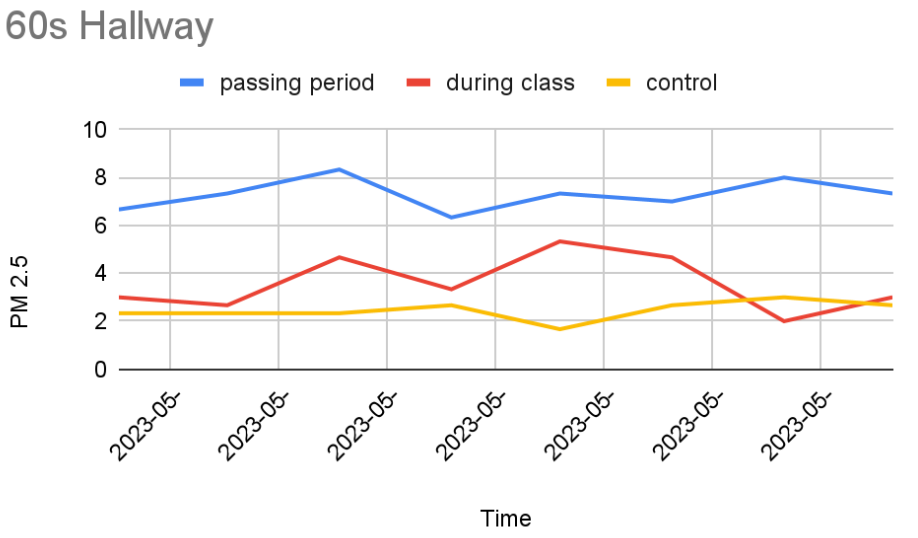


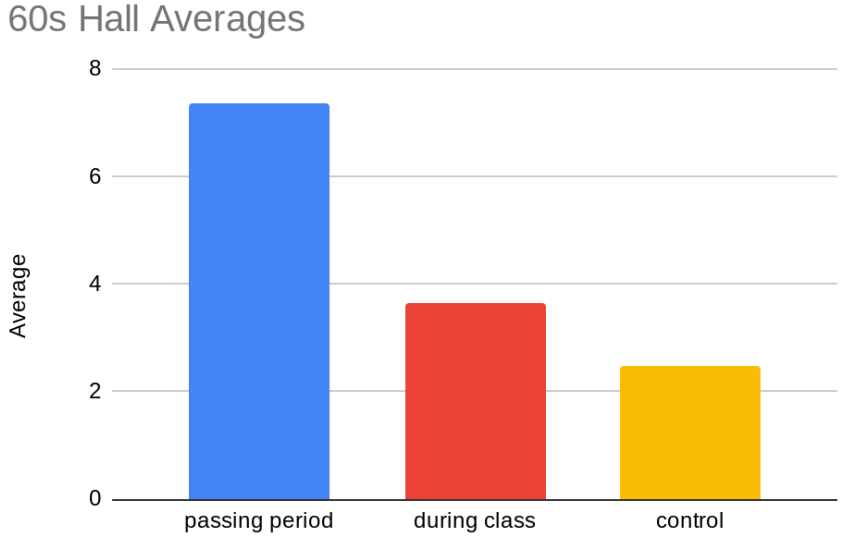
Results – Main Hall





Results – 60s Hallway





Flow Rate of People

30s Hallway:

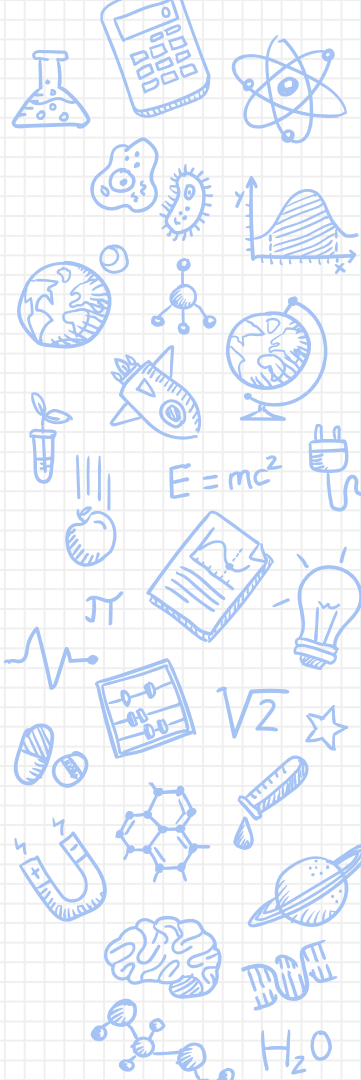
- Passing period:
  118 people/ 5 min
- During Class:
  2 people/5 min
- Control:
  0 people/ 5 min

Main Hall

- Passing period:
  176 people/ 5 min
- During Class:
  4 people/5 min
- Control:
  0 people/5 min

60s Hallway

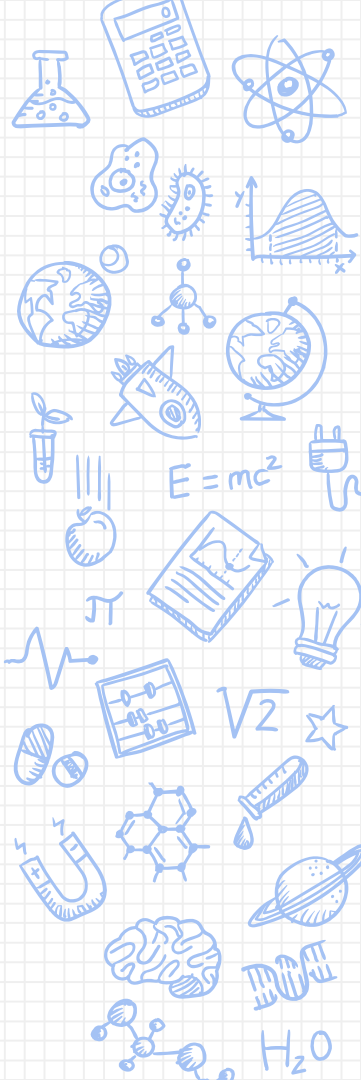
- Passing period:
  220 people/ 5 min
- During Class:
  2 people/ 5 min
- Control:
  0 people/ 5 min



Conclusion

Our hypothesis was supported by the evidence. In all testing areas the time period with the highest flow rate had the highest PM 2.5. However the difference is minimal and the data for control and during class is similar which shows that for smaller changes to flow rate there is minimal affect.

Because of this and the fact that no PM 2.5 levels ever reach a hazardous level, we can say that there wasn't as noticeable of a difference as we predicted and the amount of people passing through school hallways doesn't have a negative health effect on people.



References

(1)Clark LP, Millet DB, Marshall JD. Air quality and urban form in U.S. urban areas: evidence from regulatory monitors. Environ Sci Technol. 2011 Aug 15;45(16):7028-35. doi: 10.1021/es2006786. Epub 2011 Jul 18. PMID: 21766846.)

(2)Bradley Bereitschaft & Keith Debbage (2013) Urban Form, Air Pollution, and CO2 Emissions in Large U.S. Metropolitan Areas, The Professional Geographer, 65:4, 612-635, DOI: 10.1080/00330124.2013.799991