

School Aged Children and Exposure to Diesel Exhaust

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INTRODUCTION / RATIONAL

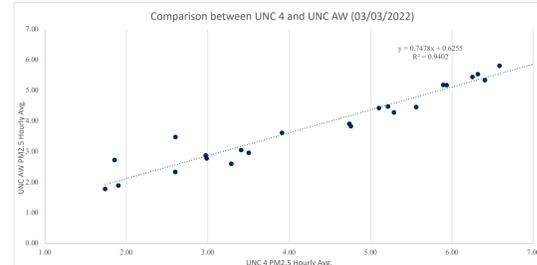
- Diesel exhaust contains carbon particles and other trace compounds and is a major contributor to air pollution.¹
- Lack of air quality regulation for busses used by children.²
- Inhalation of the minute particles in diesel exhaust harms children.³
- Children are exposed to diesel exhaust in the school building from buses idling outside as well as when playing outside or waiting for the buses.
- Bus drivers often let buses idle to be able to cool or heat the bus to maintain comfort.
- As children are still growing, their immune and respiratory systems are not fully developed, making them more prone to health issues like asthma attacks.

METHODS

1. Conduct a literature review on the children's health outcomes due to exposure to school bus exhaust.
 - Use of databases such as PubMed, and NCBI
 - Key words: Diesel effects in children, school air pollution, asthma children

2. Place a Purple air monitor (low-cost) inside a school.
 - Evaluation of current monitors

Comparing two monitors to establish precision and accuracy of the monitors.



3. Indoor monitor collects data, and this will be analyzed
 - When children are in school (buses idling vs not idling)

4. Conduct a literature review on remedies for air quality issues in and around schools.
 - Use of databases such as Google Scholar, PubMed, and NCBI
 - Key words: COVID-19 mitigation strategies, HEPA air filters for diesel

RESEARCH QUESTION

How does school bus idling impact indoor and ambient (outdoor) air quality at schools and community centers in Robeson County? What is known about the affect of school bus exhaust on children's health? What are some efficient measures that can be taken to minimize these affects?



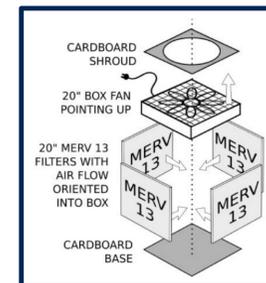
RESULTS

HEALTH OUTCOMES

- Even though school buses only represent "10% of a child's day", on average they contributed one-third of exposure to particulate matter.⁴
- A school in Cincinnati, Ohio found that particulate matter count exceeded 5 times than the control group in heavy bus traffic.⁵
 - Although, particulate matter indoors were not measured, it was predicted that a similar effect would occur inside as well.
- School bus exhaust causes increased asthma attacks and pneumonia in at risk populations.
- Air pollution and high traffic levels have also caused neurodevelopmental problems at increased rates.
- Long-term exposure of diesel exhaust on mice can lead to an increase in inflammation and lung fibrosis.⁶

MITIGATIONS

- Minimum size of a classroom for 15 students should be 784 sq feet.⁷
- Blue Pure 121 Particle + Carbon Filter uses HEPA Filters and costs only ~\$80, however frequent changing of filters may make it expensive.⁸
- COVID-19 has also brought many DIY solutions in the market.
 - These are cost-efficient and can involve the school community in making them.



Products of both designs were shipped to India and China and resulted in significant reduction in particulate matter.^{9,10}

CHALLENGES

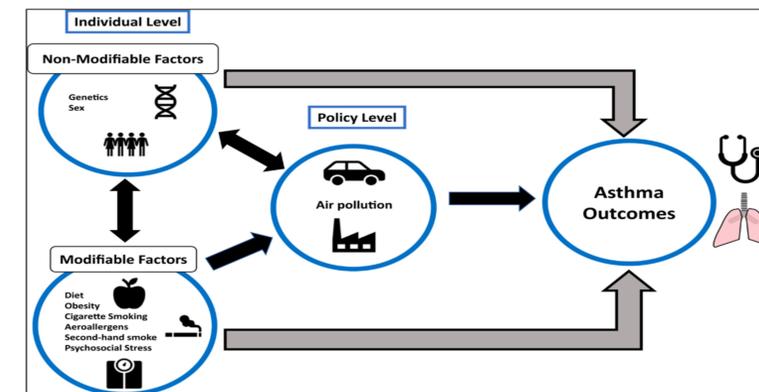
1. Delays in setting-up air monitor outside the school.
2. The monitor inside (UNC 4) was not able to connect to Wi-Fi, hence data needs to be collected manually from the SD cards embedded.
3. The long distance to visit Robeson County to collect data is an impediment.

REFERENCES



DISCUSSIONS/CONCLUSIONS

- Children's health should be evaluated differently as diesel exhaust affects their brain and cognitive health.



Literature reviews pointed towards a need for further regulations to protect children's health.¹¹

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NEXT STEPS

1. Set-up monitor outside to collect data
2. Gather data from both monitors
3. Compare the data from the indoor monitor with the outdoor monitor at bus idling times
4. Community Collaboration
 - Coordinate with students and faculty at the community centers and schools on mitigation strategies
 - Implement mitigations identified