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Urbanization and Air Pollution: Its Effects on Children's Health

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Background

- Ambient air pollution is derived mainly from fossil fuel combustion, industrial processes, waste incineration, agricultural practices and natural processes such as wildfires, dust storms and volcanic eruptions.
- In 2016, this type of pollution was responsible for **4.2 million premature deaths** in 2016; of these, almost **300,000 were children under the age of 5 years**.
- As of 2018, approximately 2 billion children around the world are exposed to **severe** urban outdoor air pollution. This does not include the amount of children under the "severe" category of exposure.
- Research shows that from 1990 to 2015, the estimated outdoor air pollution related deaths has increased from 2.2 to 4.2 million. At this rate, 70% of the world's population is forecasted to be urbanized by the year of 2050.
- Exhaled nitric oxide (FeNO) is an air pollution-responsive biomarker, signifying the presence of airway inflammation and is associated with asthma.



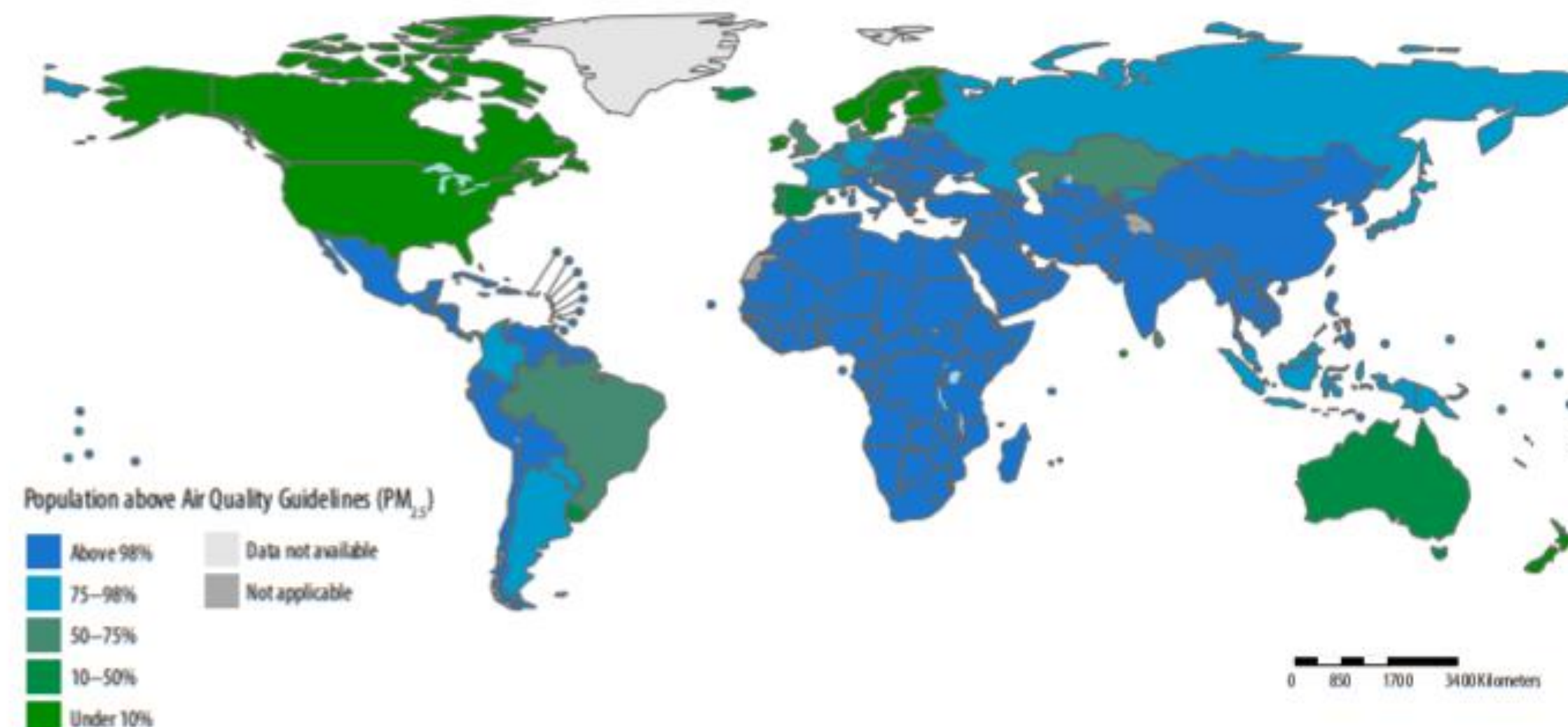
Study Objectives

Exposure to pollutants in the air threatens the health of people of all ages, in every part of the world, in both urban and rural areas, but it affects the most vulnerable among us – children – in unique ways. The purpose of this study is to present an integration of data and analyses of the impact pollution has on children short- and long-term. This study is intended to provide an overall analysis of such research and the potential methods of prevention and protection from the hinderance of the health of community members.

Method of Research

The purpose of this study is to present an integration of quantitative data and analyses of the impact pollution has on children's health. Secondary research methods were utilized to gain insight on the impact of air pollution in the health of children. This study is intended to provide an overall analysis of such research and the potential methods of prevention and protection from the hinderance of the health of community members.

Results



Proportions of children exposed to levels of fine particulate matter (PM_{2.5}) higher than the WHO (World Health Organization) air quality guidelines are as follows:

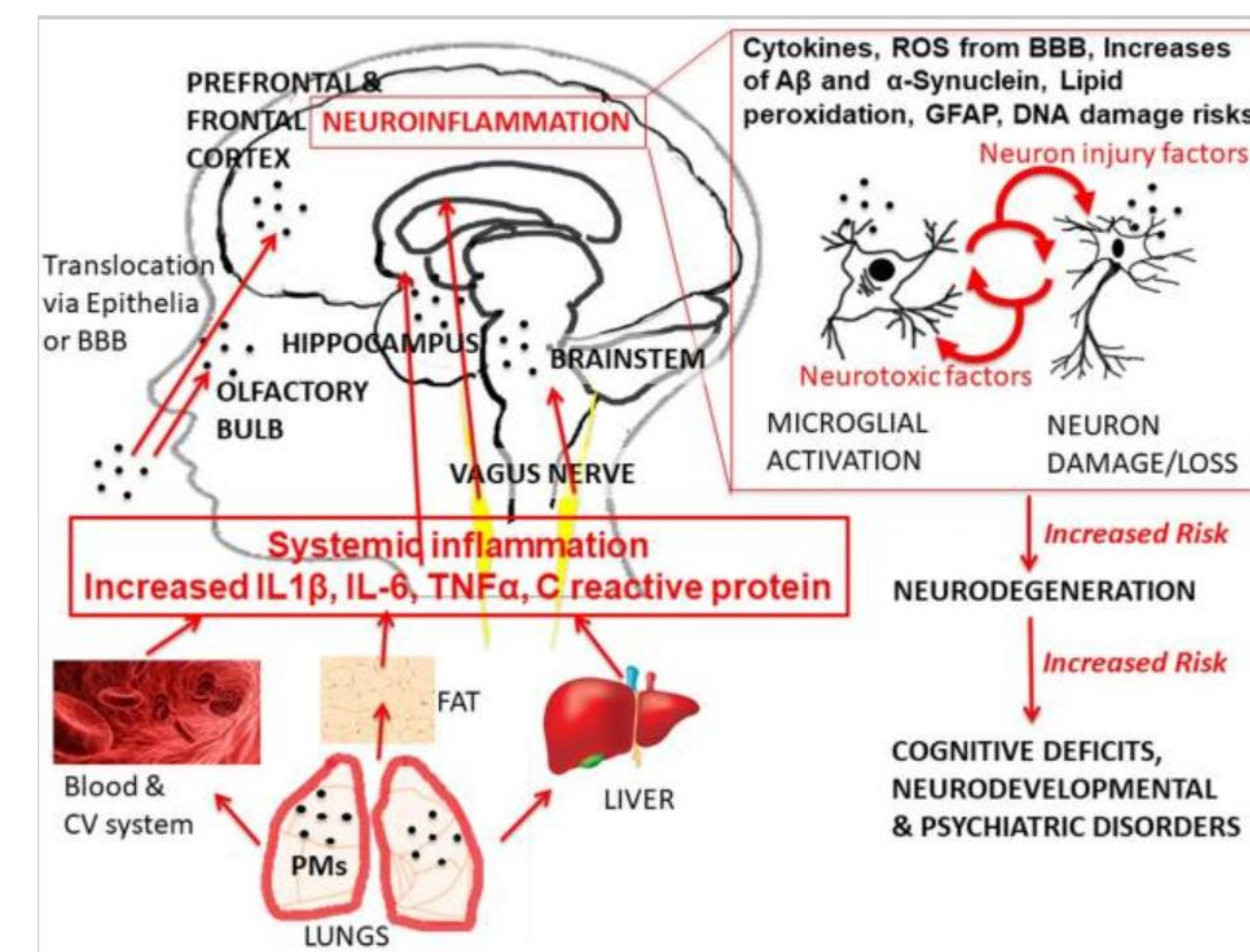
- 93% of all children, and about 630 million children under 5 years, in the world
- in **lower middle-income countries** (LMICs), 98% of all children under 5 yrs.
- in **high-income countries** (HICs), 52% of children under 5 yrs.
- in the WHO African and Eastern Mediterranean regions, 100% of children under 5 yrs.
- in LMICs in the South-East Asia Region, 99% of all children under 5 yrs.
- in LMICs in the Western Pacific Region, 98% of all children under 5 yrs.
- in LMICs in the Region of the Americas, 87% of all children under 5 yrs.
- in LMICs in the South-East Asia Region, 99% of all children under 5 yrs.
- in LMICs in the Western Pacific Region, 98% of all children under 5 yrs.
- in LMICs in the Region of the Americas, 87% of all children under 5 yrs.
- There is a large body of evidence indicating **nitric oxide (FeNO)** is influenced by air pollution and reflects pollution-responsive domains of airway inflammation.
 - Their bodies, and especially their lungs, are rapidly developing and therefore more vulnerable to inflammation and other damage caused by pollutants.

The World Health Organization monitors the levels of air-pollutants at ground-level in 3,000 cities worldwide

- Between 2008 and 2015, 98% of cities in low/middle income countries did not meet the cut-off pollutant level requirement.
- In high-income countries, 56% of cities were over the limit.
 - 80% of these cities are **OVEREXPOSED**

Children present unique risks of exposures and vulnerabilities, as they are continually developing and growing. Exposure to such pollutants hinder their development. This demographic is further at risk as they are closer to ground-level where the pollutant concentration is higher.

- Traffic-related OA-pollution has been shown to activate proteins responsible for inflammation in the brain.
- It has also been linked to break down the blood-brain barrier (BBB), which is responsible for keeping harmful particles and chemicals out of the brain.



Conclusion

Exposure to air pollution contributes to more than half of all deaths from acute lower respiratory infections (ALRIs) in children under 5 years in LMICs, making it one of the leading killers of children worldwide. Reducing air pollution results in a decreased infancy mortality, low birthweight, and premature birth. The impact of air pollution on children's health is of great interest because prenatal and early life environments affect the health of the child throughout their entire life.

Among these negative health effects are the impairment or reduction in lung development and function, cardiovascular disease, asthma, leukemia, etc. Specifically, the exposure to traffic-related air pollution is associated with asthma, allergic rhinitis (AR). As can be seen, there is surely a hindrance on the health of children, prenatally and in their early years of life, when being exposed to nitric oxide for long periods of time. This effects of this constant exposure is carried into their adolescence and adult life. Scientific knowledge suggests that urban air pollution is a serious threat to healthy brain development. To reduce children's exposure to outdoor air pollutants, strategic precautionary actions are necessary to minimize the negative neurological, respiratory and developmental effects in children.

Future Implications

Exposure to ambient air pollutants over long periods of time correlates with the impairment of children's respiratory health, hindrance of the child's neurodevelopment, and others that may lead to premature disability and mortality.

CHILDHOOD CANCERS

- Several studies have found associations between prenatal exposure to ambient air pollution and higher risks for retinoblastomas and leukemia in children.

LUNG FUNCTION

- Prenatal exposure to air pollution is associated with impairment of lung development and lung function in childhood. Conversely, there is evidence that children experience better lung function growth in areas in which ambient air quality has improved.

CHILD OBESITY

- Correlation between exposure to air pollution in utero and postnatal weight gain or attained body-mass index for age, and an association has been reported between traffic-related air pollution and insulin resistance in children.

NEURODEVELOPMENT

- Both post- and prenatal exposure negatively influences the child's cognitive, neurodevelopmental and behavioral growth

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