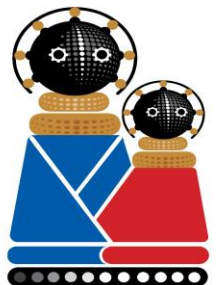


The health impacts of dirty air on people in South Africa

Date: 04 September 2025

Joyce Shirinde



**School of
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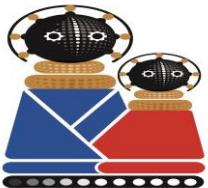
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Introduction

- Air pollution: major public health challenge in SA
- Sources: coal-fired power stations, industries, traffic, household fuels etc.
- The WHO ranks South Africa among top African countries for pollution-related deaths



A visible band of pollution across the city of Joburg. Picture: Karen Sandison/African News Agency(ANA)
South Africa - Johannesburg - 27 August 2019 - A band of pollution across the city of Joburg, early morning. While South Africa is going through a national lockdown due to the Coronavirus, parts of the world have seen a drop in the air pollution. It's estimated around 4 million people die each year due to air pollution. Emissions have fallen but the warning levels could rise sharply after the pandemic. Picture: Karen Sandison/African News Agency(ANA)



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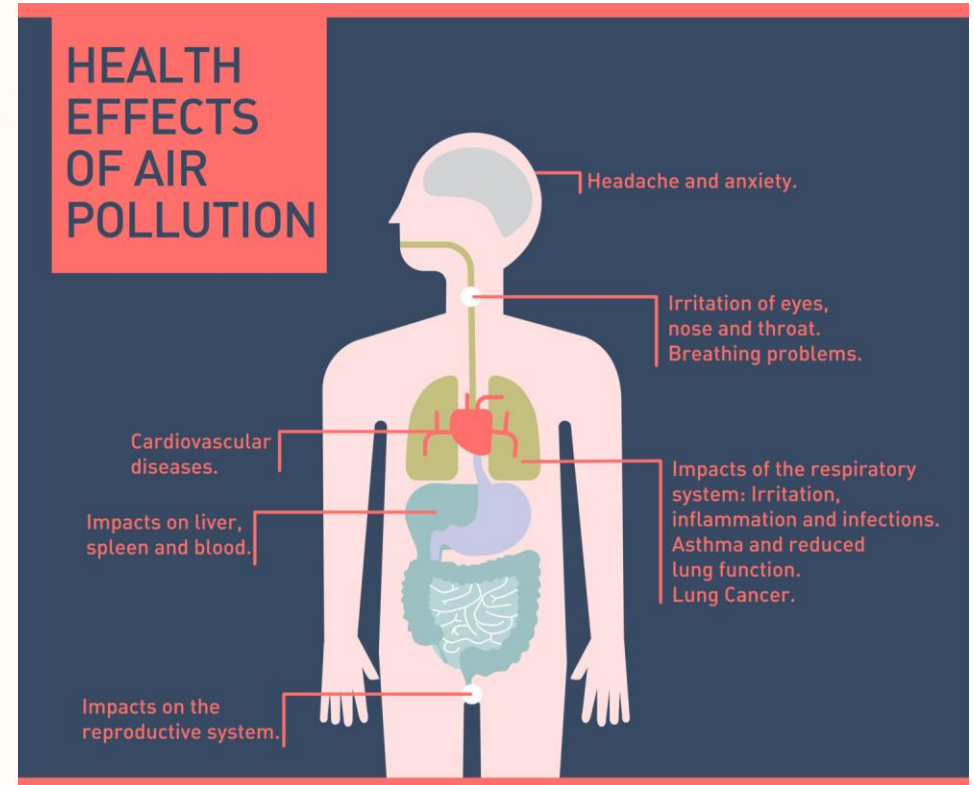
Health effects of air pollution

Short-Term Effects

-  Eye, nose, throat, and skin irritation
-  Wheezing, coughing, chest tightness
-  Breathing difficulties
-  Headaches, nausea, dizziness
-  Asthma attacks
-  Pneumonia and bronchitis
Temporary lung and heart problems

Long-Term Effects

-  Damage to the neurological system
-  Damage to the reproductive system
-  Damage to the respiratory system
-  Chronic respiratory diseases (e.g., asthma, bronchitis, COPD)
-  Cardiovascular diseases (heart disease, stroke)
-  Various cancers (lung, other organ systems)



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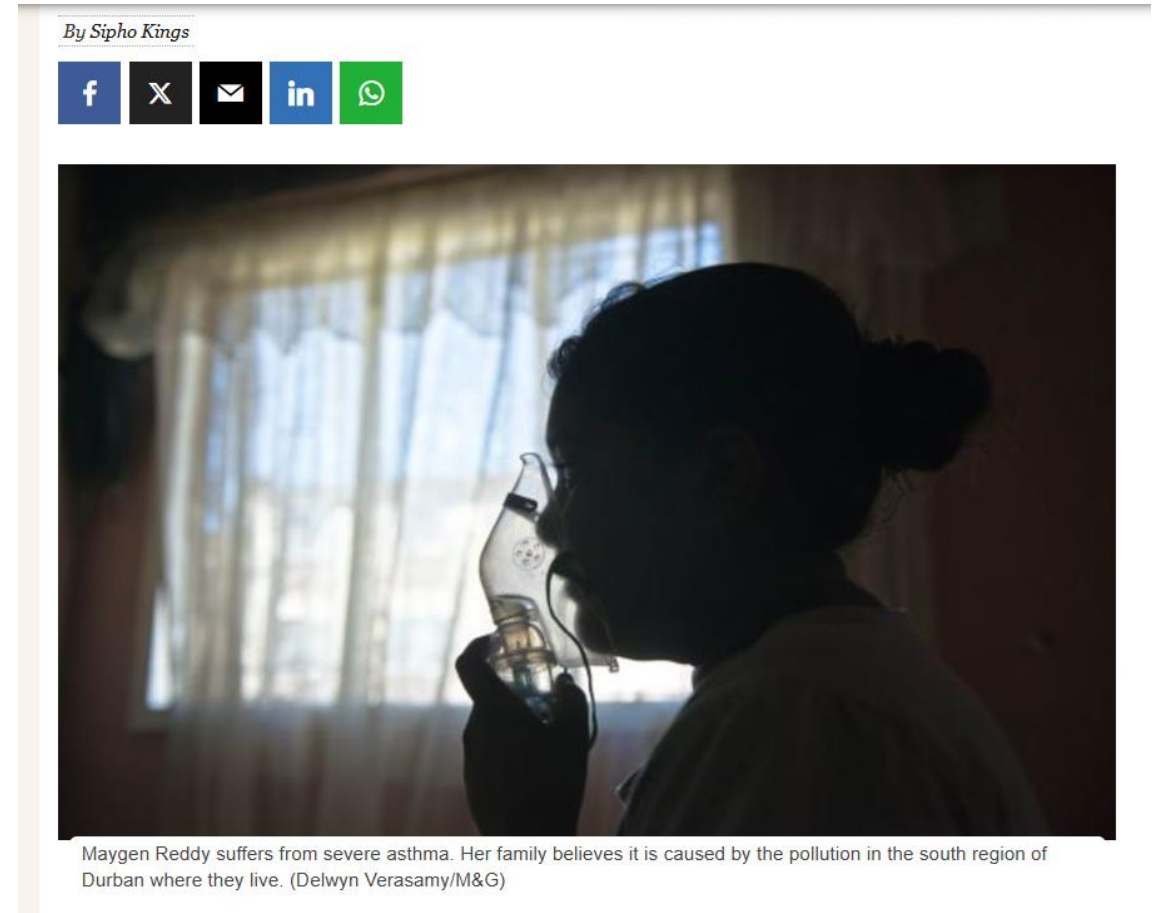
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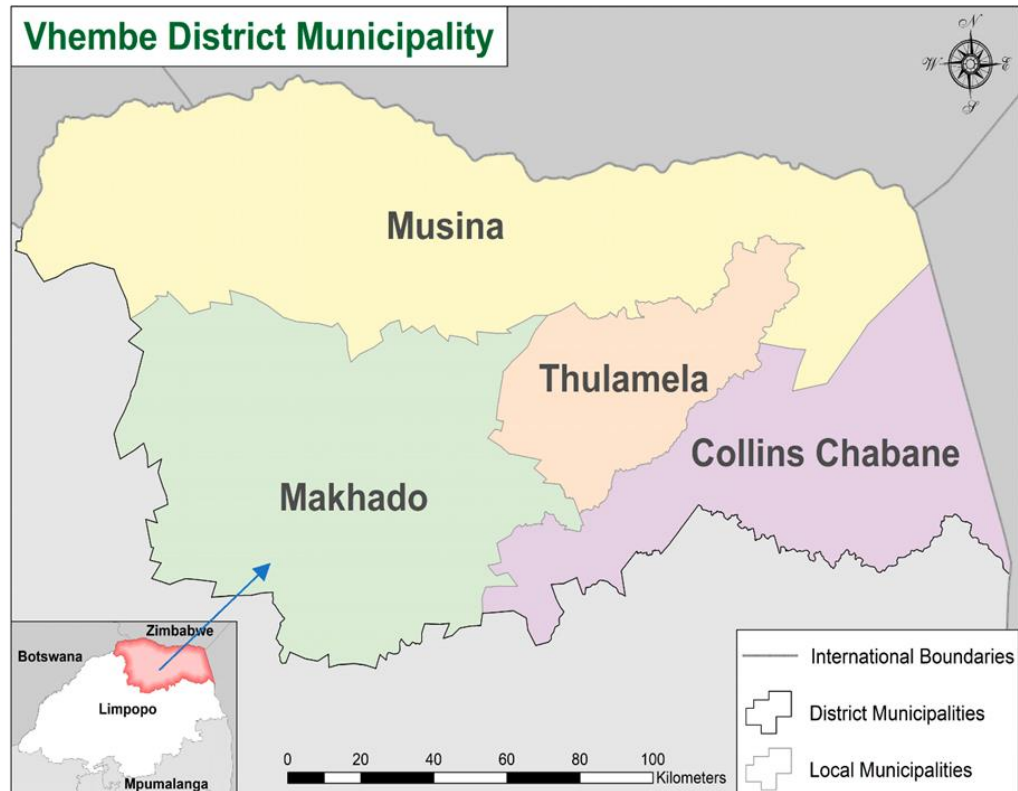
Health effects of air pollution on children

Children are most vulnerable:

- Their lungs and immune systems are still developing
- They breathe faster than adults: spend more time outdoors, making them more exposed to polluted air.
- Respiratory illnesses: asthma, wheezing, dry cough
- Missed school days, impaired lung growth



Study on air pollution and children's health Thulamela and Musina, Vhembe District



International Journal of
Environmental Research
and Public Health



Article

The Prevalence of Childhood Asthma, Respiratory Symptoms and Associated Air Pollution Sources Among Adolescent Learners in Selected Schools in Vhembe District, South Africa

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Abstract: This study investigated the prevalence of childhood asthma and respiratory symptoms with their associated air pollution sources among adolescents aged 13–14 years residing in a Malaria-endemic region. **Methods:** A cross-sectional survey was conducted with 2855 adolescents from fourteen (14) selected schools in communities exposed to high levels of air pollution from indoor residual spraying (IRS) that is used for malaria vector control in the Vhembe region. Data were collected using a self-administered standardized International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. Statistical software STATA version 17 was used to analyze the data. Binary logistic regression was used to determine the relationship between air pollution sources and childhood asthma/symptoms. **Results:** The prevalences of asthma, ‘wheeze ever’ and ‘wheeze in the past’ were 18.91%, 37.69% and 24.69%, respectively. The results from the adjusted binary logistic



Citation: Rathogwa-Takalani, F.; Mudau, T.R.; Patrick, S.; Shirinde, J.; Voyi, K.

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Melusi informal settlement, Pretoria



Fig. 1 Map illustrating the City of Tshwane metropolitan municipality



RESEARCH

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Respiratory conditions and health symptoms associated with air pollution amongst children aged six years and below in Melusi Informal Settlement, Tshwane Metropolitan Municipality, South Africa: a cross-sectional study

Moipoti Ruth Makgalemane^{1*}, Sean Patrick¹ and Joyce Shirinde¹

Abstract

Background Respiratory conditions and health symptoms associated with air pollution in children are a major public health concern, as their immune systems and lungs are not yet fully developed. This study aimed to assess self-reported respiratory conditions and health symptoms associated with air pollution sources amongst children aged six years and below in Melusi informal settlement, Tshwane Metropolitan Municipality, South Africa.

Methods With a quantitative cross-sectional study design, parents/caregivers of children aged six years and below ($n = 300$) from eight Early Childhood Development Centres were invited to participate in the study. This study employed complete sampling, and data was collected using the modified International Study of Asthma and Allergies in Children. The chi-square and multiple logistic regression models were used to analyze data, with $p < 0.05$ in the adjusted odds ratios considered as being statistically significant.

Results Three models were run to examine the predictors of wheezing in the past 12 months, dry cough, and itchy-watery eyes. The model for asthma was excluded, as only seven participants reported having asthma. Wheeze in the past 12 months was associated with participants living in the area for more than three years (OR 2.96 95%CI: 1.011–8.674). Furthermore, having a dog in the house in the past 12 months was associated with wheeze in the past 12 months (OR 5.98 95%CI: 2.107–16.967). There was an association between duration of stay in a residence and dry cough prevalence (OR 5.63 95%CI: 2.175–14.584). Trucks always or frequently passing near homes was associated with itchy-watery eyes (OR 3.27 95%CI: 1.358–7.889). 59% (59%) of participants perceived the indoor air quality in their homes to be good, while 6% perceived it as poor. In contrast, 36% of participants perceived the outdoor air quality to

Gert Sibande District Municipality Mpumalanga

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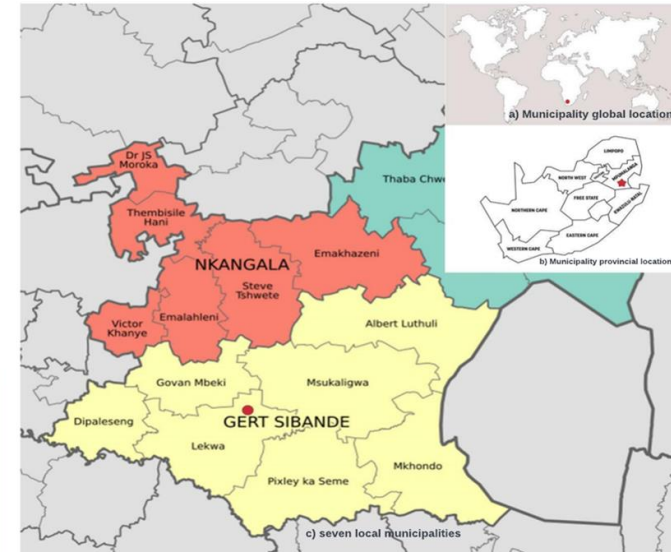
SHORT COMMUNICATION

Public Health CHALLENGES

WILEY

Indoor and outdoor NO₂ and SO₂ levels in 13 randomly selected preschools from 7 districts in Mpumalanga Province, South Africa

Mudau Rodney¹ | Vuyi Kuku² | Shirinde Joyce²



and a public health

Article

Prevalence of Wheezing and Its Association with Environmental Tobacco Smoke Exposure among Rural and Urban Preschool Children in Mpumalanga Province, South Africa

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Abstract: Background: This study aimed to investigate the prevalence of wheezing and its association with environmental tobacco smoke exposure among rural and urban preschool children in Mpumalanga province, South Africa, an area associated with poor air quality. Methods: In this study, parents/caregivers of preschool children ($n = 3145$) completed a modified International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. Data were analysed using multiple logistic regression models. Results: The overall prevalence of Wheeze Ever was 15.14%, with a higher prevalence in urban preschoolers than rural preschoolers (20.71% vs. 13.30%, $p < 0.000$). Moreover, the total prevalence of Asthma Ever was 2.34%. The prevalence was greater in urban preschoolers than in rural preschoolers (3.92% vs. 1.81%, $p < 0.001$). In the final adjusted model, both urban- and rural-area children who lived with one or more people who smoked in the same household (WE: OR 1.44, 95% CI 1.11–1.86) (CW: OR 2.09, 95% CI 1.38–3.16) and (AE: OR 2.49, 95% CI 1.12–5.54) were found to have an increased likelihood of having Wheeze Ever, Current Wheeze, and Asthma Ever as compared to those who lived with non-smokers. Conclusions: The implementation of smoking limits and prohibition is crucial in areas that are frequented or utilized by children. Hence, it is imperative for healthcare providers to actively champion the rights of those who do not smoke within the society, while also endorsing legislative measures aimed at curtailing the extent of tobacco smoke exposure.

Keywords: environmental tobacco smoke exposure; the risk of wheezing; poor air quality; preschool children



Citation: Mudau, R.; Vuyi, K.; Shirinde, J. Prevalence of Wheezing and Its Association with Environmental Tobacco Smoke Exposure among Rural and Urban Preschool Children in Mpumalanga Province, South Africa. *Int. J. Environ. Res. Public Health* 2024, 21, 469.

nd: Air pollution is a serious worldwide issue, where both outdoor and quality have a substantial impact on the health of children. Children are erable to the effects of air pollution due to their developing respiratory nd higher respiration rates than adults. These children dedicate a sub-ount of time to the preschool setting. The study sought to evaluate the ion of NO₂ and SO₂ in both outdoor and indoor environments of preschool

Concurrently, the levels of NO₂ and SO₂ were measured indoors and out-3 randomly selected preschools in 7 districts in Mpumalanga Province, ica. Radiello passive air samplers were employed to collect gaseous



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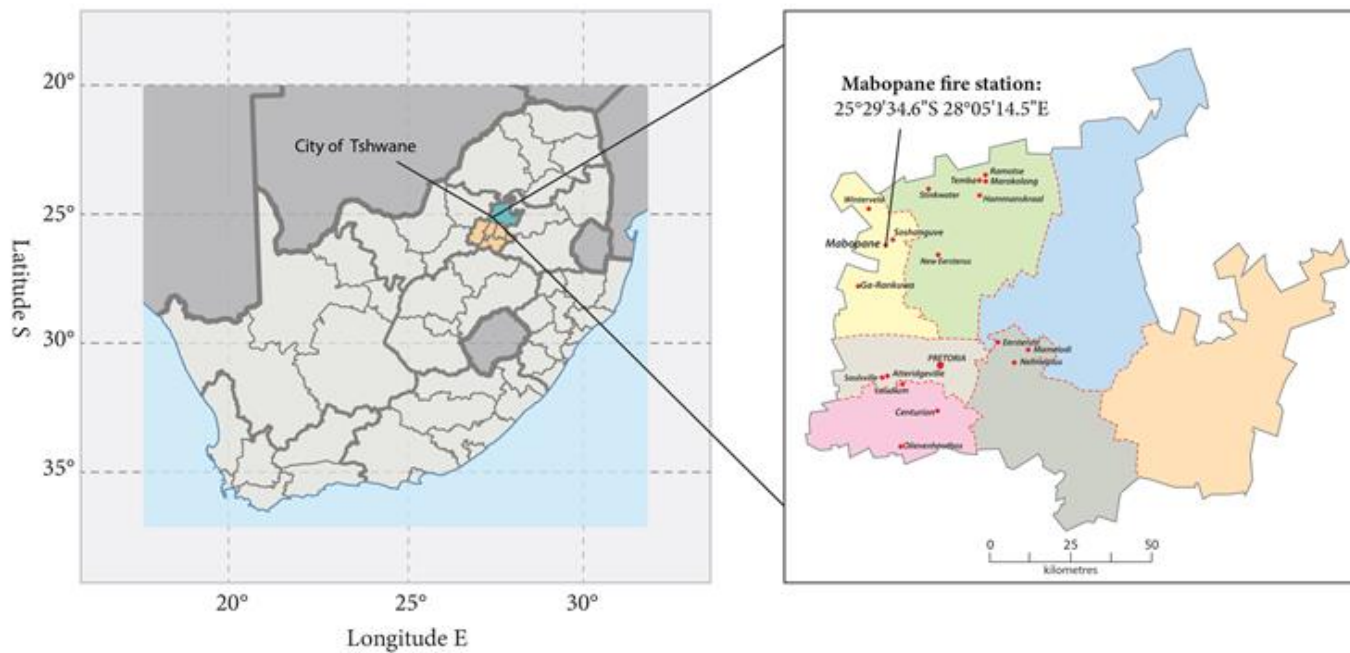
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Indoor and outdoor air pollution health risks in Mabopane and Soshanguve townships in the City of Tshwane, South Africa.



Indoor and outdoor air pollution health risks in Mabopane and Soshanguve townships, City of Tshwane, South Africa



International Journal of
Environmental Research
and Public Health



Article

Association between Outdoor and Indoor Air Pollution Sources and Atopic Eczema among Preschool Children in South Africa

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Abstract: The objective of the study was to investigate the association between outdoor and indoor air pollution sources and atopic eczema among preschool children in South Africa. A cross-sectional design, following the International Study of Asthma and Allergies in Childhood (ISAAC) Phase III protocol, was applied. The study was conducted in Mabopane and Soshanguve Townships in the City of Tshwane Metropolitan Municipality in Gauteng, South Africa. A total population of 1844 preschool children aged 7 years and below participated in the study; 1840 were included in the final data analysis. Data were analyzed using multilevel logistic regression analysis. The prevalence of eczema ever (EE) and current eczema symptoms (ESs) was 11.9% and 13.3%, respectively. The use of open fires (paraffin, wood, or coal) for cooking and heating increased the likelihood of EE (OR = 1.63; 95% CI: 0.76–3.52) and current ESs (OR = 1.94; 95% CI: 1.08–2.55) and current ESs (OR = 1.61; 95% CI: 1.07–2.43). Mothers or female guardians smoking cigarettes increased the likelihood of EE (OR = 1.50; 95% CI: 0.86–2.62) and current ESs (OR = 1.23; 95% CI: 0.71–2.13). The use of combined building materials in homes increased the likelihood of EE, and corrugated iron significantly increased the likelihood of current ESs. The frequency of trucks passing near the preschool children's residences on weekdays was found to be associated with EE and current ESs, with a significant association observed when trucks passed the children's residences almost all day



BMJ
Public
Health

Household fuel use and severe asthma symptoms among preschool children in Gauteng province, South Africa: a cross-sectional study

Mandla Bhuda ^{1,2}, Janine Wichmann ², Joyce Shirinde ²

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► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/bmjph-2024-000938>).

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ABSTRACT

Background Household air pollution continues to be a major public health hazard due to the continued use of household fuel sources. Globally, approximately 4 million people die prematurely each year due to exposure to household air pollution sources. Children are more susceptible to health effects associated with air pollution because their immune systems and lungs are not fully developed.

Objective The objective of the study was to investigate the association between household fuel use and current severe asthma symptoms among preschool children in Gauteng province, South Africa.

Methods This was a cross-sectional study conducted in the City of Tshwane Metropolitan Municipality in Gauteng province, South Africa. A total of 1844 parents and guardians of preschool children completed the modified International Study of Asthma and Allergies in Childhood questionnaire. However, a total of four questionnaires were discarded due to incorrect completion. Therefore, a total of 1840 questionnaires were included in the data analysis. Data were analysed using multilevel logistic regression

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Asthma symptoms are more prevalent in high and upper middle-income countries than in lower middle-income countries; however, the proportion of severe symptoms is similar across all income categories and age groups.

WHAT THIS STUDY ADDS

⇒ Few studies have investigated the association between household fuel use and current severe asthma symptoms among preschool-age children in low- and middle-income country townships.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings will encourage the development and implementation of indoor air regulation in low- and middle-income countries like South Africa to reduce respiratory illnesses, such as asthma symptoms, especially among the vulnerable population.



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Study on air pollution and children's health : Ekurhuleni Metropolitan Municipality

RESEARCH

Open Access

Association between wheeze and selected air pollution sources in an air pollution priority area in South Africa: a cross-sectional study

Joyce Shirinde^{1,2†}, Janine Wichmann^{2†} and Kuku Voyi^{2†}

Abstract

Background: An association between wheeze (a symptom of asthma) and environmental tobacco smoke (ETS), types of fuel used for residential heating or cooking and the frequency of trucks passing near homes, has been reported mainly in developed countries. Little is known about the strength of such associations in developing countries. This study was conducted in residential areas situated in Ekurhuleni Metropolitan Municipality, namely Tembisa and Kempton Park, which form part of the Highveld region, a priority area in terms of air pollution in South Africa.

Methods: From 3764 eligible school children, aged between 13 and 14 years, from 16 selected high schools in the study area, 3468 completed a modified questionnaire based on the International Study of Asthma and Allergies in Childhood (ISAAC). Data were analysed using multiple logistic regression models.

Results: The results are based on data from 3424 children. In the adjusted models, exposure to ETS at school was associated with wheeze ever (OR 1.22 95% CI: 1.03 – 1.45) and current wheeze (OR 1.33 95% CI: 1.08 – 1.64). When gas was most frequently used for residential heating the likelihood of wheeze ever increased by 47% (OR 1.47 95% CI: 1.15 – 1.88). Trucks passing near homes for almost the whole day during weekdays, increased the likelihood of wheeze ever (OR 1.32 95% CI: 1.01 – 1.73), current wheeze (OR 1.61 95% CI: 1.15 – 2.24) and current severe wheeze (OR 2.22 95% CI: 1.28 – 3.77). When data were stratified according to residential area, for children living in Tembisa, ETS exposure at home was associated with current wheeze (OR 1.36 95% CI: 1.06 – 1.77); gas most frequently used for residential heating was associated with wheeze ever (OR 1.68 95% CI: 1.23 – 2.28) and current wheeze (OR 1.61 95% CI: 1.08 – 2.39); paraffin most frequently used for residential heating was associated with current severe wheeze (OR 1.85 95% CI: 1.04 – 3.28).

Conclusion: It was concluded that children living in one of the air pollution priority areas of South Africa, have an increased risk of wheezing due to exposure to both indoor and outdoor air pollution sources.

Keywords: Wheeze, Asthma, Environmental tobacco smoke, Heating fuel, Cooking fuel, Traffic, Air pollution, South Africa, Industrial

RESEARCH

Open Access



Allergic rhinitis, rhinoconjunctivitis and hayfever symptoms among children are associated with frequency of truck traffic near residences: a cross sectional study

Joyce Shirinde^{1†}, Janine Wichmann^{2†} and Kuku Voyi^{2†}

Abstract

Background: Allergic rhinitis (AR) is an increasing and common condition affecting many people globally, especially children. The aim of the study was to investigate the association between the frequency of truck traffic and allergic rhinitis symptoms, rhinoconjunctivitis and hayfever among 13 to 14 year old school children in Ekurhuleni Metropolitan Municipality, Gauteng Province, South Africa.

Methods: In a cross-sectional study design, 3764 children from 16 randomly selected high schools were eligible to participate, 3468 completed the International Study of Asthma and Allergies in Childhood (ISAAC) Phase I questionnaire of which 3424 were suitable for analysis; the overall response rate was 92 %. Data were analysed using multilevel logistic regression analysis.

Results: The prevalence of self-reported rhinitis ever, current rhinitis rhinoconjunctivitis and hayfever was 52, 40, 21 and 37 % respectively. Rhinitis ever, current rhinitis and current rhinoconjunctivitis were significantly associated with the frequency of trucks passing near residences almost all day on weekdays, (OR 1.46 95 % CI: 1.16 – 1.84), (OR 1.60 95 % CI: 1.24–2.02) and (OR 1.42 95 % CI: 1.09–1.84) respectively. No association was observed between truck traffic and hay fever in the multiple analyses.

Conclusion: The study shows a high prevalence of allergic rhinitis symptoms amongst children. The results support the hypothesis that traffic related pollution plays a role in the prevalence of allergic rhinitis symptoms in children residing in the area.

Keywords: Allergic rhinitis, Rhinoconjunctivitis, Hayfever, Traffic, Air pollution, South Africa

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Health education and awareness about air pollution

Studies - Knowledge, attitudes, and practices of Early Childhood Development Centres teachers in Khayelitsha Township, Cape Town and in Tshwane,

Factors contributing to air pollution

- Burning of waste
- Lack of education/ awareness
- Lack of resources e.g refuse bins, water and sanitation facilities

Measures to reduce air pollution

- Government/ community Prevention
- Individual prevention
- Community participation



Community level impact, economic and social burden

- **Social and systemic impacts:**

- ~30 million lost workdays per year
- Children missing school; education disrupted
- Strain on the healthcare system
- Financial burden for the patients e.g. asthma pumps – no medical aid.

- **Equity and justice:**

- Marginalized communities: mostly affected by the combined effects of indoor and outdoor pollution e.g informal settlements, townships etc.
- These communities bear the brunt of exposure



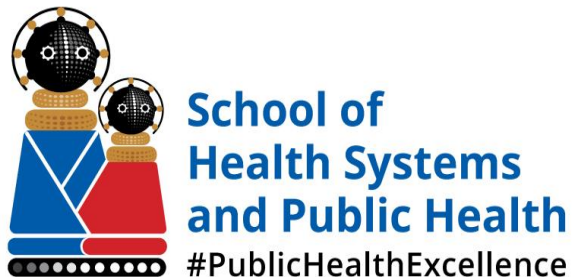
Call to action

- ❑ Cleaner air saves lives, protects children, reduces healthcare costs, and boosts economic productivity
- ❑ Contributes to climate goals

Call to action:

- ❑ Align South Africa's air quality standards with WHO guidelines
- ❑ Enforce emissions regulations strictly
- ❑ Shift from coal to renewable energy
- ❑ Promote community education, awareness and advocacy

THANK YOU



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