



Breastfeeding decreases the respiratory health effects of air pollution in children: The Seven Northeastern Cities (SNEC) Study

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Introduction

- Breastfeeding and exposure to ambient air pollution are both important factors for respiratory symptoms and illness in children.
- Evidence suggests that breastfeeding may reduce the effect of environmental risk factors on children's respiratory systems.

Objective

- To evaluate whether breastfeeding modifies the effects of air pollution on children's respiratory symptoms and asthma

Methods

- 31,049 Chinese children, ages 2 to 14 years old, were selected from 25 elementary schools and 50 kindergartens within the SNEC in China.
- Parents of selected children completed questionnaires that characterized the children's histories of respiratory illness, associated risk factors, and means of feeding.
- Three-year average concentrations of particles with an aerodynamic diameter $\leq 10 \mu\text{m}$ (PM_{10}) of sulfur dioxide (SO_2), nitrogen dioxides (NO_2), and Ozone (O_3) were calculated from monitoring stations in each of the 25 study districts among the SNEC.
- The 25 districts were selected to maximize the range of exposures and to obtain a variety of profiles exposed to a mix of criteria air pollutants measured in Northeast China¹ (see Figure 1).
- The association of air pollution with reported symptoms and illness was examined in participating children who were breastfed and children who were not breastfed.

Methods (cont.)

- To investigate the relationship between the respiratory symptoms and ambient air pollution, we considered a two-level logistic regression model in which children were the first-level units and the districts were the second-level units.

Results

- Breastfeeding modified the effect of exposure to air pollution in children: statistically significant effects were observed for the interactions between air pollution and breastfeeding on child respiratory symptoms and illness.
- All non-breastfed children exhibited positive associations between all pollutants and the risks of all surveyed respiratory illness and symptoms.
- Compared to children who had been breastfed for at least 3 months, children who were not breastfed exhibited consistently stronger effects of air pollution on respiratory symptoms and asthma. Odds ratios (ORs) ranged from 1.17 per $21 \mu\text{g}/\text{m}^3$ increase in NO_2 for current wheeze [95% confidence interval (CI), 1.00-1.37] to 1.42 per $10 \mu\text{g}/\text{m}^3$ increase in NO_2 for phlegm (95% CI, 1.18-1.72).
- Stronger interactions were observed among kindergarteners than among elementary school children.

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Results (cont.)

Respiratory symptoms and yearly variability in air pollution by children breastfed or non-breastfed from kindergarteners (N=7855)

	Breastfed OR (95%CI) [†] (n=6130)	Non-breastfed OR (95%CI) [†] (n=1725)	Interaction p-value [‡]
Cough			
PM_{10}	1.34(1.10-1.62)	1.82(1.38-2.39)	0.023
SO_2	1.40(1.16-1.68)	1.66(1.31-2.11)	0.129
NO_2	1.31(1.06-1.63)	1.62(1.23-2.14)	0.092
O_3	1.40(1.12-1.75)	1.76(1.33-2.35)	0.093
Phlegm			
PM_{10}	1.26(0.99-1.60)	1.94(1.37-2.76)	0.012
SO_2	1.29(1.02-1.63)	1.70(1.26-2.30)	0.049
NO_2	1.17(0.89-1.52)	1.82(1.29-2.57)	0.005
O_3	1.25(0.94-1.65)	1.96(1.38-2.80)	0.009
Current wheeze			
PM_{10}	1.04(0.91-1.20)	1.11(0.88-1.41)	0.581
SO_2	1.05(0.92-1.19)	1.18(0.96-1.45)	0.262
NO_2	0.99(0.86-1.14)	1.16(0.92-1.45)	0.182
O_3	1.09(0.93-1.26)	1.32(1.03-1.70)	0.153
Doctor-diagnosed asthma			
PM_{10}	1.16(0.99-1.36)	1.29(0.99-1.68)	0.471
SO_2	1.11(0.95-1.29)	1.26(1.00-1.59)	0.278
NO_2	1.03(0.87-1.21)	1.23(0.96-1.58)	0.181
O_3	1.15(0.97-1.37)	1.39(1.05-1.83)	0.215

Discussion

- Few published studies exist regarding the interaction between air pollution and breastfeeding on respiratory symptoms and illness among children.
- The effect of breastfeeding may be due to the anti-infectious and anti-inflammatory factors found within breast milk^{2,3}. Human milk contains a number of components that support the infant's host defense immune system, both passively and actively.
- Further research should address the timing, frequency, and duration of breastfeeding during the first six months of a child's life and clarify the etiologic relationships and public health implications of these present findings.



Figure 1. Locations of the SNEC, China