



# EFFETTI E IMPATTO DELL'INQUINAMENTO ATMOSFERICO NEI PRIMI 1000 GIORNI DI VITA SULLA SALUTE RESPIRATORIA. UNA REVISIONE DELLA LETTERATURA

A cura del gruppo di lavoro **“I primi 1000 giorni”**

Questo documento nasce nell'ambito del progetto Coorti di nuovi nati, esposizioni ambientali e promozione della salute nei primi 1000 giorni di vita: integrazione dei dati di esposizione con dati molecolari ed epigenetici (CUP: C92F17003030001)

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## Effetti e impatto dell'inquinamento atmosferico nei primi 1000 giorni di vita sulla salute respiratoria

**Table 1. Association between exposure to traffic related air pollutants in pregnancy and wheezing and asthma development**

Reference	Country	Participants included in the analysis	Pollutants	Outcome and assessment	Main results
Lavigne E et al, Am J Respir Crit Care Med, 2019.	Canada	160,641	Ultrafine particles UFPs (diameter <0.1 mm); PM 2.5; NO2	Asthma: primary care visits/ hospitalizations. From birth up to <6 years	UFPs, PM2.5 and NO2 concentrations during the second trimester were positively associated with childhood asthma incidence; HR:1.09; 95% CI 1.06–1.12 (for a 10,770 count/cm <sup>3</sup> [IQR] increase), HR:1.08; 95% CI 1.05–1.11 (for a 3.8 mg/m <sup>3</sup> [IQR] increase) and HR:1.12; 95% CI 1.09–1.15 (for a 9.7 ppb [IQR] increase) respectively
Jung CR et al, J Allergy Clin Immunol, 2019	Taiwan	184,604	PM <sub>2.5</sub>	Asthma: primary care visits/ hospitalizations. From birth up to 3-10 years	PM <sub>2.5</sub> (10 µg/m <sup>3</sup> increase): HR 1.26 (1.17-1.35). Stronger association during gestational weeks 6 to 22. No association after adjustment for exposure in the first year of life.



Pennington AF et al, Epidemiology 2018	USA	23,100	NO <sub>x</sub> , PM <sub>2.5</sub> , CO	Asthma: asthma diagnosis and dispensing medication. From 2 up to 6 years	PM <sub>2.5</sub> , NO <sub>x</sub> , CO (risk difference per 2.7-fold natural log increase): RD 3.5% (0.6-6.5), RD 3.1% (0.3-5.9), RD 3.1% (0.0-6.1) respectively.
Lavigne E et al, Eur Respir J 2018	Canada	222,864	PM 2.5, NO <sub>2</sub>	Asthma: primary care visits/ hospitalizations. From birth up to < 6 years	PM <sub>2.5</sub> , NO <sub>2</sub> (IQR increase in the second trimester): HR 1.07 (1.06-1.09), HR 1.06 (1.03-1.08).
Soh S et al, Int J Environ Res Public Health 2018	Singapore	953	PM <sub>2.5</sub> : average measured from eight stations with representation from urban stations	Wheezing: parental reporting. From birth up to 2 years	PM <sub>2.5</sub> (for Q2, Q3 and Q4): IRR 1.50 (1.11-2.03), IRR 1.56 (1.17-2.08), IRR 1.38 (0.96-1.99). No consistent associations per trimesters of pregnancy.
Lee A et al, J Allergy Clin Immunol 2017	USA	736	PM <sub>2.5</sub>	Asthma; maternal reporting. From birth up to 6 years	PM <sub>2.5</sub> (IQR increase): OR 1.17 (1.04-1.30). Sensitive windows at 19-23 weeks in exposed to prenatal maternal stress, OR 1.15 (1.03-1.26)
Madsen C et al, BMJ Open 2017	Norway	17,533	NO <sub>2</sub>	Wheezing: maternal reporting. From 6 to 18 months	No association.
Bose S et al., Am J Respir Crit Care Med 2017	USA	752	NO <sub>3</sub> -	Asthma: maternal reporting. From birth up to 6 years	No association overall. Ln NO <sub>3</sub> - (IQR increase): OR 1.95 (1.11-3.46) only in boys exposed to prenatal maternal stress.



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Sbihi H et al, Am J Respir Crit Care Med 2017	Canada	65,254	NO <sub>2</sub> , PM <sub>2.5</sub>	Asthma trajectories (late-onset chronic, early-onset chronic, transient): primary care visits/ hospitalizations. From birth up to 7-10 years	NO <sub>2</sub> (IQR increase) and early and late-onset chronic asthma: RRR: 1.51 (1.21-1.88), RRR 1.20 (1.03-1.41). PM <sub>2.5</sub> (IQR increase) and transient and late onset asthma: RRR 1.24 (1.08-1.42), RRR 1.24 (1.07-1.45).
Rosa MJ et al, Allergy Asthma Immunol 2017	Mexico	552	PM <sub>2.5</sub>	Wheezing: maternal reporting. From birth up to 4 years	No association.
Sbihi H et al, Eur Respir J 2016	Canada	Preschoolers: 6,948 cases 34, 621 controls; school age: 1,711 cases 8,577 controls	NO <sub>2</sub> , NO, BC, PM <sub>2.5</sub> , PM <sub>10</sub> , CO	Asthma: primary care visits/ hospitalizations. From birth up to 5 years (pre-schoolers) and from 6 up to 10 years (school age)	Pre-schoolers: PM <sub>10</sub> (IQR increase): OR 1.12 (95% CI 1.05;1.19) No association for BC, CO, NO, NO <sub>2</sub> and PM <sub>2.5</sub> . School age children: Negative association for CO: OR 0.90 (0.83-0.98) No association for other pollutants
Hsu H-H L et al, Am J Respr Crit Care Med 2015	USA	736	PM <sub>2.5</sub>	Asthma: maternal reporting. From birth up to 6 years	PM <sub>2.5</sub> (10 µg/m <sup>3</sup> increase at 16-25 weeks): association (distributed lag models).



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Aguilera I et al, Environ Health Perspect 2013	Spain	2,199	NO2	Wheezing: parental reporting. From birth up to 12-18 months	No association.
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BC=black carbon; CI=confidence interval; CO=carbon monoxide; HR=hazard ratio; IQR=interquartile range; IRR= incidence rate ratio; PM2.5=particulate matter <2.5 µm in diameter; PM10= particulate matter <10 µm in diameter; NOx= nitrogen oxides; NO=nitric oxide; NO2=nitrogen dioxide; NO3-=nitrate; OR=odds ratio; Q=quartile; RD=risk difference; UFPs=ultra-fine particles ≤ 0.1 µm in diameter

**Table 2. Association between exposure to traffic related air pollutants in early life and wheezing and asthma development**

Reference	Country	Participants included in the analysis	Pollutants	Outcome and assessment	Main results
To T et al, Eur Respir J, 2020	Canada	1,286	NO <sub>2</sub> , PM <sub>2.5</sub>	Asthma: hospital admission or asthma insurance claims From birth up to 15-20 years	NO <sub>2</sub> (for IQR increase): HR 1.17 (1.05-1.31). No association for PM <sub>2.5</sub> .
Jung CR et al, J Allergy Clin Immunol 2019.	Taiwan	184,604	PM <sub>2.5</sub>	Asthma: primary care visits/hospitalizations. From birth up to 3-10 years	PM <sub>2.5</sub> (for increase of 10 µg/m <sup>3</sup> in the first year of life): HR 1.61 (1.48-1.76).
Lavigne E et al, Eur Respir J 2018	Canada	222,864	PM <sub>2.5</sub> , NO <sub>2</sub>	Asthma: primary care visits/hospitalizations. From birth up to < 6 years	NO <sub>2</sub> (for IQR increase): HR 1.08 (1.06-1.09). No association for PM <sub>2.5</sub> .



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Pennington AF et al, Epidemiol, 2018	USA	23,100	NO <sub>x</sub> , PM2.5, CO	Asthma: asthma diagnosis and dispensing medication. From 2 up to 6 years	PM2.5, NO <sub>x</sub> , CO (natural log increase): RD 3.5% (0.5-6.4), RD 3.1% (0.3-5.9), RD 3.1% (0.1-6.2).
Ranci�re F et al, Environ Health Perspect 2017	France	2,015	NO <sub>x</sub>	Wheezing phenotypes (early-transient, late-onset, persistent) and asthma: parental questionnaire. Form birth up to 4 years	NO <sub>x</sub> (for IQR increase of 26 µg/m <sup>3</sup> NO <sub>2</sub> equivalent) and persistent wheezing or asthma: OR 1.27 (95% CI 1.09-1.47), OR 1.15 (1.01-1.31) respectively.  No association with early-transient and late-onset wheezing.
T�treault L-F et al, Environ Health Perspect 2016	Canada	1,183,865	NO <sub>2</sub> , PM2.5	Asthma: physician visits/hospitalizations. Form birth up to 1-12 years	NO <sub>2</sub> , (IQR increase at the birth address): HR 1.04 (1.02-1.05), PM2.5 (IQR increase at the birth address) HR 1.31 (1.28-1.33).



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Gehring U et al, Epidemiology 2015	the Netherlands	3,702	PM2.5 abs, PM2.5, PM10, PM coarse, NO2 and concentrations of copper, iron, potassium, nickel, sulfur, silicon, vanadium, and zinc in PM2.5 and PM10	Asthma: parental reporting of doctor diagnosis. From birth up to 11 years	Associations (IQR increase) with incident asthma and exposures at birth address: NO2 - OR 1.13 (1.01-1.25); K PM2.5 - OR 1.13 (1.03-1.25); K PM10 - OR 1.13 (1.05-1.21); S PM2.5- OR 1.21 (1.01-1.44); Zn PM10 - OR 1.13 (1.02-1.25). No association for other pollutants considered.
Gehring U et al, Lancet Respir Med 2015	Four cohorts in Germany, Sweden and the Netherlands	14,126	NO2, PM2.5, PM10, PM coarse, PM2.5 abs	Asthma: parental reporting of doctor diagnosed asthma ever; wheezing last 12 months; asthma medication last 12 months. From birth up to 14-16 years	NO2 (10 µg/m3 increase): OR 1.13 (1.02-1.25). PM2.5 abs (1unit increase): 1.29 (1.00 -1.66) No association for PM2.5, PM10, and PM coarse.
Ranzi A et al, Occup Environ Med 2014	Italy	672	NO2	Asthma: parental reporting of doctor diagnosis. From birth up to 7 years	No association





Gruzieva O et al, Epidemiology 2013	Sweden	3,633	NO <sub>x</sub> , PM10	Asthma: parental reporting. From birth up to 12 years	PM10 (5th to 95th difference during the first year of life): OR 2.39 (1.18-4.86); NO <sub>x</sub> (5th to 95th difference during the first year of life): OR 1.87 (1.01-3.44).
Fuertes E et al, Peer J 2013	Germany	6,604	NO <sub>2</sub> , PM2.5, mass, PM2.5 abs	Asthma: parental reporting of doctor diagnosis. From birth up to 10 years	No association
Aguilera I et al, Environ Health Perspect 2013	Spain	2,199	NO <sub>2</sub>	Wheezing: parental reporting. From birth up to 12-18 months	No association
Lindgren A et al, Environ Health 2013	Sweden	7,898	NO <sub>x</sub>	Asthma: asthma medication; doctor diagnosed asthma. From birth up to 1-6 years	Negative association with incident asthma: NO <sub>x</sub> 15-25 µg/m <sup>3</sup> OR 0.8 (0.7-0.9); NO <sub>x</sub> >25 µg/m <sup>3</sup> OR 0.7 (0.5-0.9). Similar associations also for use of asthma medications.
Clark NA et al, Environ Health Perspect 2010	Canada	3,482 cases, 17,410 controls	NO <sub>2</sub> , NO, BC, PM2.5, PM10, CO, SO <sub>2</sub>	Asthma: primary care visits/hospitalizations. From birth up to 36-59 months	NO <sub>2</sub> (10 µg/m <sup>3</sup> increase) OR 1.13 (1.04-1.23); BC (10-5/m increase in filter absorbance) OR 1.14 (1.01-1.29). CO (100 µg/m <sup>3</sup> increase) OR 1.10 (1.06-1.13); PM10 (1 µg/m <sup>3</sup> increase): OR 1.07 (1.03-1.12). No association for other pollutants.



Gehring U. et al, Am J Respir Crit Care Med 2010	the Netherlands	3,863	PM2.5; Soot; NO2	Wheezing phenotypes (early transient, late-onset, persistent) and asthma: parental reporting. From 1 up to 8 years	PM2.5 (IQR increase) and early transient or late onset wheezing: OR 1.29 (1.04-1.62), OR 1.18 (1.01-1.37). NO2 (IQR increase) and asthma: OR 1.19 (1.05 -1.34); PM2.5 (IQR increase) and asthma: OR 1.28 (1.10-1.49); Soot (IQR increase) and asthma: OR 1.21 (1.06 -1.38). No association for the other exposures and outcomes studied.
Nordling E et al, Epidemiology 2008	Sweden	3,515	PM10; NOx	Wheezing overall and phenotypes (transient, persistent, late-onset): parental reporting. From birth up to 4 years	NOx (difference between the 5th and 95th percentile range) and persistent wheezing: OR 1.60 (1.09-2.36). No association for the other exposures and outcomes studied.
Morgenstern V et al, Occup Environ Med 2007	Germany	3,577	PM2.5 mass; PM2.5 abs; NO2	Wheezing: parental reporting. From birth up to 2 years	No association



Brauer M et al, Am J Respir Crit Care Med 2002	the Netherlands	3,730	PM2.5, Soot, NO2	Wheezing: parental reporting. From birth up to 2 years	No association
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Abs=absorbance; BC=black carbon; CI=confidence interval; CO=carbon monoxide; HR=hazard ratio; IQR=interquartile range; PM2.5=particulate matter <2.5 µm in diameter; PM10= particulate matter <10 µm in diameter; NOx= nitrogen oxides; NO=nitric oxide; NO2=nitrogen dioxide; NO3-=nitrate; OR=odds ratio; Q=quartile; RD=risk difference; UFPs=ultra-fine particles ≤ 0.1 µm in diameter

**Table 3. Exposure in pregnancy to outdoor air pollutants and respiratory infections in childhood in prospective longitudinal birth cohort and case-control studies**

Author, year	country	Participants included in the analysis	Pollutants	Outcome and assessment	Main results
Soh S et al, 2018	Singapore	953	PSI (PM <sub>10</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO, O <sub>3</sub> ), PM <sub>2.5</sub>	Bronchiolitis/bronchitis, pneumonia and otitis media; interviewer-administered questionnaires	Association between PM <sub>2.5</sub> and bronchitis/bronchiolitis by two years of life: IRR 2.43 (1.27;4.63) for the third quartile (19,88 µg/m <sup>3</sup> ) in the second trimester; IRR 2.36 (1.22;4.56) for the fourth quartile in the third trimester. PSI and bronchitis/bronchiolitis: IRR 1.67 (1.07;2.60) for the third quartile (36,92 µg/m <sup>3</sup> ) in the first trimester; IRR 2.18 (1.05;4.56) and IRR 2.32 (1.06;5.08) for the third (37,73 µg/m <sup>3</sup> ) and the fourth quartiles in the second trimester. PM <sub>2.5</sub> and ear infections in the first and in the second years: OR 7.64 (95% IC: 1.18; 49.37) and OR 3.28 (1.00; 10.73) for the second quartile and OR 11.37 (1.47; 87.97) and 4.15 (1.05;16.36) for the third quartile (19,19 µg/m <sup>3</sup> ) in the first trimester. No associations for pneumonia.
Madsen C et al, 2017	Norway	14,386	NO <sub>2</sub>	LRTI: bronchiolitis, bronchitis and pneumonia; parental questionnaires	No significant associations for NO <sub>2</sub> exposure in pregnancy and LRTI by 6 and 18 months



Jedrychowski WA et al, 2013	Poland	214	PM <sub>2.5</sub>	Acute bronchitis and pneumonia; parental questionnaires	Association between PM <sub>2.5</sub> and recurrent bronchopulmonary infections (five or more episodes): OR 2.05 (95% CI: 1.05; 3.99)
Aguilera I et al, 2013	Spain	2,199	NO <sub>2</sub> , benzene	Doctor- diagnosed LRTI (bronchitis, bronchiolitis, pneumonia, or pneumonitis), ear infections; parental interviews	Association between 10-µg/m <sup>3</sup> increase of NO <sub>2</sub> and 1-µg/m <sup>3</sup> increase of benzene in the second trimester and LRTI: RR 1.08 (95% IC: 1.02;1.15) and 1.10 (1.01-1.20) respectively Association between 1-µg/m <sup>3</sup> increase of benzene in the first trimester and ear infections: 1.08 (1.02;1.15).
Espugues A et al, 2011	Spain	352	NO <sub>2</sub>	LRTI: bronchiolitis, bronchitis or pneumonia; parental questionnaires and diary for doctor consultation	No association between exposure to NO <sub>2</sub> at any time during pregnancy and LRTI
Jedrikowsky W, 2005	Poland	333	PAHs	Ear infections; parental questionnaires	Association between exposure to PAHs and number and duration of ear infection episodes. For a logarithmic unit of PAHs concentration in ng/m <sup>3</sup> RR 1.82 (95%CI: 1.03;3.23) and 1.64 (1.34;2.00) respectively

CO: carbon monoxide; NO: nitric oxide; NO<sub>2</sub>:nitrogen dioxide; NO<sub>x</sub>= nitrogen oxides; O<sub>3</sub>= ozono; PHAs: polycyclic aromatic hydrocarbons; PM<sub>10</sub>: particulate matter with an aerodynamic diameter of <10 µm; PM<sub>2.5</sub>: particulate matter with an aerodynamic diameter less than 2.5 mm; LTRI: Low tract respiratory infections; IRR: incidence rate ratio; HR:hazard ratio; OR: odds ratio; RR: relative risk; IQR: interquartile ranges.

**Table 4. Exposure to outdoor air pollutants in infancy and respiratory infections in childhood in prospective longitudinal cohort studies and case-control studies**

Author, year	country	Participants included in the analysis	Pollutants	Outcome and assessment	Main results
Kennedy CM et al, 2018	USA	22,441	PM <sub>2.5</sub> , NO <sub>x</sub> , CO	Incident outcome: pneumonia based on ICD-9 codes 480–486, otitis media based ICD-9 codes 382.XX, acute bronchitis and bronchiolitis ICD-9 codes 466.XX; Kaiser Permanente Georgia (KPGA) Health Maintenance Organization's register	Association between a log increase in exposure of PM <sub>2.5</sub> , NO <sub>x</sub> , CO during the first year of life and bronchiolitis HR 1.23 (95% CI:1.15; 1.32), HR 1.19 (95% CI:1.12; 1.27) HR 1.16 (95% CI:1.08; 1.25) and otitis media HR 1.17 (95% CI:1.11; 1.22), HR 1.17 (95% CI:1.12; 1.22), HR 1.15 (95% CI:1.10; 1.21). No associations for pneumonia
Fuertes E et al, 2014	Sweden, Italy, Germany, Spain, England, the Netherlands	15,980	8 elements (Cu, Fe, K, Ni, S, Si, V, Zn) derived from PM <sub>10</sub> e PM <sub>2.5</sub>	Doctor diagnosis of pneumonia; parental questionnaires	No association with pneumonia in the first 2 years of life with the exception of zinc derived from PM <sub>10</sub> (mean 17.1 - 41.6 µg/m <sup>3</sup> ): OR 1.47 (95% CI: 0.99; 2.18) per 20 µg/m <sup>3</sup> increase



MacIntyre EA et al, 2014	Sweden, Italy, Germany, Spain, England, the Netherlands	16,059	NO <sub>2</sub> , NO <sub>x</sub> , PM <sub>2.5</sub> , PM <sub>2.5</sub> abs, PM <sub>10</sub> , PM coarse, traffic density	Pneumonia, otitis, croup; parental questionnaires	Associations between 10 µg/m <sup>3</sup> increment of NO <sub>2</sub> , 20 µg/m <sup>3</sup> increment of NO <sub>x</sub> , 5 µg/m <sup>3</sup> increment of PM <sub>2.5</sub> , 1 unit of PM <sub>2.5</sub> abs, 10 µg/m <sup>3</sup> increment of PM <sub>10</sub> , 5 µg/m <sup>3</sup> increment of PM coarse and pneumonia during the first year of life: NO <sub>2</sub> : OR 1.47 (95%IC: 1.15; 1.89), NO <sub>x</sub> : 1.45 (1.21;1.75), PM <sub>2.5</sub> : 4.06 (1.93;8.57), PM <sub>2.5</sub> abs : 2.71 (1.68;4.37), PM <sub>10</sub> : 1.77 (1.18, 2.67); PM coarse: 1.46 (1.11;1.92). For otitis media, NO <sub>2</sub> :OR 1.19 (95 % CI: 1.07;1.33). No association for the other pollutants. Association with pneumonia in the second year of life only for NO <sub>2</sub> : OR 1.40 (95 % CI: 1.04;1.88), NO <sub>x</sub> : 1.29 (1.07; 1.55). No association with otitis in the second year of life
Ranzi A et al, 2014	Italy	672	NO <sub>2</sub>	Otitis and LRTI (bronchitis, bronchiolitis or pneumonia); parental questionnaires	No significant association between exposure at birth and otitis and LRTI in the overall follow-up period
Lindgren A et al, 2013	Sweden	7,898	NO <sub>x</sub> (NO <sub>2</sub> +NO)	Bronchiolitis; ICD10 hospital and primary health care diagnosis	Inverse association between exposure at birth address to 15-25 µg/m <sup>3</sup> NO <sub>x</sub> and bronchiolitis HR 0.6 (95% CI: 0.5;0.8) and to >25 µg/m <sup>3</sup> 0.5 (0.4;0.8), compared to a ≤15 µg/m <sup>3</sup> exposure.
Aguilera I et al, 2013	Spain	2,199	NO <sub>2</sub> , benzene	Doctor-diagnosed LRTI (bronchitis, bronchiolitis, pneumonia, or pneumonitis), ear infections; interviewer-led questionnaires	Association between a 10 µg/m <sup>3</sup> increase in average NO <sub>2</sub> during the first year of life and ear infections RR 1.15 (95% CI:1.01; 1.31). No associations for LRTI



Brauer M et al, 2007	the Netherlands	3,538	PM <sub>2.5</sub> , soot, NO <sub>2</sub>	Doctor-diagnosed bronchitis ever and in the last 12 months and ear/nose/throat infections in the last 12 months; parental questionnaires	Association between soot and NO <sub>2</sub> evaluated at 2-3 years at birth address and ear/nose/throat infections at 4 years of age, OR 1.15 (95% CI: 1.01 - 1.31) and 1.17 (1.03 - 1.32). No association between PM <sub>2.5</sub> and ear/nose/throat infections at 4 years. No association between the exposure to the three pollutants and doctor diagnosis of bronchitis at 4 years of age or ever. OR are calculated for an IQR increase in annual average concentration of pollutants: PM <sub>2.5</sub> (14.8 - 18.1 µg/m <sup>3</sup> ); soot (1.33 - 1.91 10 <sup>-5</sup> /m); NO <sub>2</sub> (18.2 - 28.8 µg/m <sup>3</sup> )
Morgenstern V et al, 2007	Germany	3,577	PM <sub>2.5</sub> , PM <sub>2.5</sub> abs, NO <sub>2</sub>	Doctor diagnosed respiratory infections; parental questionnaires	No significant associations between different pollutants during the first 2 years of life and respiratory infections in the first 2 years of life
Brauer M et al, 2006	the Netherlands, Germany	3,700 (PIAMA) 650 (LISA)	PM <sub>2.5</sub> , light-absorbing carbon, NO <sub>2</sub>	Doctor diagnosis of otitis media; parental questionnaires	Association between an exposure of 3 µg/m <sup>3</sup> for PM <sub>2.5</sub> , 0.5 × 10 <sup>-5</sup> /m for particle light absorbance and 10 µg/m <sup>3</sup> for NO <sub>2</sub> and otitis in the first 2 year of life only in PIAMA: OR 1.14 (95%CI 1.03;1.27)





Brauer M, 2002	the Netherlands	3,730	PM <sub>2.5</sub> , soot, NO <sub>2</sub>	Ear/nose/throat infections, doctor diagnosed bronchitis; parental questionnaires	Association between an IQR increase in PM <sub>2.5</sub> (3.2 g/m <sup>3</sup> ), Soot (0.54 x 10 <sup>-5</sup> /m) and NO <sub>2</sub> (10.3 g/m <sup>3</sup> ) and ear/nose/throat infections in the second years of life: OR 1.20 (95% CI 1,01; 1,42), 1.15 (1.00; 1.33) and 1.16 (1.00; 1.34) respectively. No associations with bronchitis
Gehring U, 2002	Germany	1,756	NO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>2.5</sub> abs	Doctor diagnosis of respiratory infections; parental questionnaires	No associations between exposure to NO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>2.5</sub> absorbance in the first 2 years of life and respiratory infections up to 2 years

CO: carbon monoxide; NO: nitric oxide; NO<sub>2</sub>:nitrogen dioxide; NO<sub>x</sub>= nitrogen oxides; PM<sub>10</sub>: particulate matter with an aerodynamic diameter of <10 μm; PM<sub>2.5</sub>: particulate matter with an aerodynamic diameter less than 2.5 mm; S: sulphur; Si: silicon; V: vanadium; Zn: zinc; LUR: land use regression; LTRI: Lower respiratory tract infections; HR:hazard ratio; IQR: interquartile range.