**APPENDIX A. Strategy and terms used searching bibliographic databases**

We searched EmBase, MedLine, "EBM Reviews/Cochrane, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) bibliographic databases using a combination of keywords targeting the following four concepts: 1) Industries; 2) Air pollution; 3) Respiratory outcomes; 4) Children. The complete list of keywords is presented below. These keywords were used to search title and abstract of articles. The search was also limited to studies in humans and published in English language. As well, conference abstracts or papers were excluded.

**Concept 1. Industries:**

industr\* OR industrial complex\* OR coal min\* OR smelter\* OR refiner\* OR power plant\* OR wood industr\* OR cement\* OR paper mill\* OR petrochemical OR chemical factor\* OR coke work\*

AND

**Concept 2. Air Pollution :**

air OR pollution OR pollutant\* OR sulfur oxide OR sulfur dioxide OR nitrogen oxide OR nitrogen dioxide OR particle\* OR particulate\* OR emission

AND

**Concept 3. Respiratory Outcomes:**

respiratory OR infection\* OR symptom\* OR pulmonary OR bronchi\* OR pneumoni\* OR asthma OR lung function\* OR allerg\* OR consultation\* OR wheez\*

AND

**Concept 4. Children**

children OR infant OR preschooler OR adolescent

**APPENDIX B. Additional results**

**Table B1. Description of the main characteristics of the selected studies, ordered by geographic region and country.**

| **Reference** | **Location and period** | **Design** | **Children’s age and sample size (or no. of events)**  | **Type of outcome assessment** | **Asthma-related outcome** | **Type of effect a** | **Type of industry** | **Exposure metrics** | **Covariates** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **North America** |
| Smargiassi et al., 2009 | Montreal (Canada), 1996-2004  | Case-crossover | 2-4 yrs,n = 263 hospitalization; 1,579 emergency room visits | Administrative health data | * Hospitalization for asthma
* Emergency department visits for asthma
 | Short-term | Refineries  | 1. SO2 emissions from dispersion modeling
2. Ambient SO2 from fixed site monitors
 | Background air pollutant levels (daily mean concentrations of regional SO2, O3, NO2, and PM2.5), temperature, relative humidity |
| Deger et al., 2012 | Montreal (Canada), 2006 | Cross- sectional | 0.5 - 12 yrs, n = 842 | Questionnaire (ISAAC, ECHRS) | * Asthma ever
* Wheezing in the past 12 months
* Asthma attack in the past 12 months
* Medication use against asthma in the past 12 months
* Current wheeze at least 3 times per week.
 | Long-term | Refineries  | SO2 annual concentrations at the residence and school, estimated from dispersion modeling | Age, sex, family history of atopy, tobacco smoke exposure at home |
| Lewin et al., 2013 | Shawinigan (Canada), 1999-2008  | Case-crossover | 0-4 yrs,n = 396 hospitalizations | Administrative health data | * Hospitalization for asthma
 | Short-term | Aluminum smelter | i) The percentage of hours per day that the hospitalized child’s residence was at downwind of the smelter.ii) SO2 and PM2.5 concentrations measured at a single fixed-site monitoring station | Average daily wind speed  |
| Labelle et, al. 2015 | Saguenay (Canada),2001-2010  | Case-crossover | 0-4 yrs,n = 1 006 hospitalizations | Administrative health data | * Hospitalization for asthma and bronchiolitis
 | Short-term | Industrial complex including a cast house, an alumina production plant, an iron smelter and a paper mill. | i) Daily mean and maximum concentrations of SO2 and PM2.5 at fixed monitoring stations.ii) Daily percentage of hours that a child’s residence was downwind of the industry | Daily mean temperature, relative humidity, and average daily wind speed. |
| Buteau et al., 2018  | Province of Québec (Canada), 2002-2011 | Cohort | 0-9 yrs, n = 722,667 (including 66,591 new cases of asthma) | Administrative health data | * Asthma onset
 | Long-term | all industries reporting to the NPRI | i) Yearly number of tons of pollutant (PM2.5, SO2) emitted by industries within 2.5km of the residence;ii) Distance (in meters) between the residence and the closest industries emitting 100 tons of PM2.5 or SO2;iii) Yearly number of tons of pollutant (PM2.5, SO2) emitted by the closest major industries (100 tons/year), weighted by the inverse of the distance and percentage of time downwind. | Sex, material and social deprivation, calendar year, and unmeasured secondhand smoke (indirect adjustment).  |
| Brand et al., 2016 | Province of Quebec and of British Columbia (Canada), 2002-2010 | Case-crossover | 2-4 yrs,n = 2868 hospital admissions for wheezing diseases | Administrative health data | * Hospitalization for asthma and bronchiolitis
 | Short-term | Pulp mills, metal smelters and oil refineries (from the NPRI) | 1. air pollutant (PM2.5, SO2, and NO2) emissions by industries within 7.5km, weighted by the percentage of time downwind

ii) Daily ambient PM2.5, SO2, NO2 at central fixed-site monitoring stations | Daily average temperature, relative humidity, and wind speed. |
| Clark et al., 2010  | Southwestern British Columbia (Canada), 1999-2003 | Nested case- control | 3-4 yrs, n = 37,401 (including 3,482 new cases of asthma) | Administrative health data | * Asthma onset
 | Long-term | All types  | Inverse distance- weighted summation of emissions from point sources within 10 km  | Native status, breast-feeding, maternal smoking, income quintile, education quartile, maternal age, birth weight, gestational length and sex (strata) |
| Karr et al., 2009 | Georgia Air Basin, British Columbia (Canada),1999-2003 | Nested case- control | 2-12 months,n = 11,676 cases and 57,127 controls | Administrative health data | * Outpatient visit or hospitalization for bronchiolitis
 | Long-term | All types | Proximity-weighted summation of emissions from point sources within 10 km of the residence | Sex, gestational age, first nation status, parity, maternal age, maternal smoking during pregnancy, maternal initiation of breastfeeding at birth, income, maternal education, and date of birth (matched). |
| Liu et al., 2012 | New-York State (excluding New York city) (USA), 1993-2008 | Cohort | <10 yrs, n =21,524,390 person-yrs | Administrative health data | * Hospitalization for asthma
 | Long-term  | Fuel-fired power plant, electric generators, and hazardous waste site. | Residential proximity (binary; children residing in a ZIP code with at least one fuel-fired power plant were exposed). | Sex, race/ethnicity, age, median household income, urban/rural. |
| Maantay et al., 2007 | Bronx, New York City(USA), 1995-1999 | Ecological | 0-15 yrs,n = 20,764 asthma hospitalizations | Administrative health data | * Hospitalization for asthma
 | Long-term  | Facilities reporting to TRI and other major point sources | Residential proximity (binary; one-quarter mile cut-off) | Poverty, minority status |
| Patel et al., 2011 | Northern Manhattan and the South Bronx (USA), 1998-2010  | Longitudinal | 0-5 yrs, n = 593 | Questionnaire | * Asthma in past 12 months.
* Wheezing in past 12 months.
 | Long-term | Not specified | Percentage of residential buffer area within 0.80 km of an industrial facility were considered as exposed. | Age, sex, ethnicity, presence of smokers in the home, annual house hold income, residential concentrations of cockroach and mouse allergen, four way intersection density and percentage of building area designated for commercial use. |
| Mirabelli and Wing, 2006 | North Carolina (USA), 1999-2000 | Cross-sectional | 12-14 yrs, n = 64,432 | Questionnaire (ISAAC) | * Wheezing in past 12 months
 | Long-term  | Pulp and paper mill | 1. School proximity (3 categories: 0-≤10 miles; >10-≤30 miles; >30 miles)
2. Odor reported (binary)
3. Distance and odor (binary: 0-≤10 and odor; >30 miles and no odor)
 | Sex, age, race, socioeconomic status, cigarette smoking, household cigarette smoke exposure, use of a gas kitchen stove at home |
| **Latin America and the Caribbean** |
| Loyo-Berrios et al., 2007 | Catano (Puerto Rico), 1997-2001 | Nested case-control | <17 yrsn = 6282 (including 1382 cases) | Administrative health data | * Asthma-related medical visits

  | Long-term | Industrial park, including rum distillery, electric power plants, petroleum refineries, sewage incinerator and treatment plants, cement plants. | 1. Distance (continuous) to minor (<100 tons/year) and major>100 tons/year) industries
2. Distance (continuous) ) to minor (<100 tons/year) and major>100 tons/year) industries, adjusted for same-day wind direction
 | cases and controls were matched on sex, age, insurance company, and event date  |
| Wichmann et al., 2009 | La Plata (Argentina), 2005-2006 | Cross-sectional | 6-12 yrs, n = 1212 | Questionnaire (ISAAC) | * Asthma ever (doctor-diagnosed)
* Asthma exacerbations in previous 12 months
 | Long-term  | Petrochemical complex | Residential proximity (binary; children living in neighborhoods next to the petrochemical complex were considered as exposed). | Age, sex, secondhand smoke, living close to busy roads or other non-petrochemical industries, time of residence in the study area, home environment, length of exclusive breast-feeding and family socioeconomic and demographic data |
| Lopes de Moraes et al., 2010 | Guamaré (Brazil), 2006 | Cross- sectional | 0-14 yrs, n = 209 | Questionnaire (ISAAC) | * Wheezing ever ;
* Wheezing in past 12 months ;
* No. of wheezing attacks in past 12 months;
* Sleep disturbance by wheezing in past 12 months
* Speech limiting wheezing in past 12 months
* Asthma ever
 | Long-term  | Petrochemical complex | Children living for at least 1 year in communities located within 5 km and downwind of petrochemical complex were considered as exposed. | Age, sex, race, family income, parental education, number of persons living in the house per room, water supply and disposition of household waste, presence or absence of farming activities, environmental tobacco smoke |
| Herrera et al., 2016 | Northen Chile (Chile), 2009 | Cross- Sectional | 6-15 yrs, n = 288 | Questionnaire (ISAAC) | * Asthma ever (doctor diagnosed or taking asthma medications in past 12 months)
 | Long-term  | Opencast mining sites (gold and copper). | Residential proximity to each mine separately and the average distance (binary; 1st quartile as the cut-off)  | Parental history of atopic diseases, child’s mother working, living with both parents |
| Prieto-Parra et al., 2017 | Santiago (Chile), winter (May– September) of 2010-2011 | Panel (12 weeks follow-up) | 6-14 yrs, n = 174 (90 asthmatics and 84 non-asthmatics) | Questionnaire and daily diary | * Wheezing
* Medication for asthma crisis
 | Short-term | Copper smelter | 1. Air pollutant concentration (PM2.5, PM10, PM2.5-10, CO, NO2, SO2, O3) measured one fixed site monitor
2. PM2.5 composition measured fixed site monitors
3. PM2.5 sources contribution estimated from positive matric factorization
 | Viruses (Influenza B, parainfluenza, respiratory syncytial virus, adenovirus), time variables (weekday, year), and meteorology (minimum temperature, relative humidity) |
| **Europe** |
| Pless-Mulloli et al., 2000; Pless-Mulloli et al., 2001; Howel et al. 2001. | Northern England (United Kingdom), 1996-1997  | Cross- sectional | 1-11 yrs,n = 3216 | Questionnaire (ISAAC) | Lifetime prevalence:* Wheeze
* Asthma

Period prevalence (past 12 months):* >12 Wheezing in past 12 months
* Woken child at night in past 12 months
* Limited speech in past 12 months
* Occurred on exercise in past 12 months
 | Long-term | Opencast coal mining sites | Distance (binary; 5 communities near industries *vs* 5 referent communities further away) | Age, sex, community pairs, number of people in household, environmental tobacco smoke, presence of moulting pets, use of polluting fuel to heat or cook, quality of insulation, indicator of damp, housing tenure, unemployment, access to transport, family history of asthma, eczema/hay fever, propensity of parent to worry, population stability |
| Pless-Mulloli et al., 2000; Pless-Mulloli et al., 2001; Howel et al. 2001. b | Northern England (United Kingdom), 1996-1997  | Panel | 1-11 yrs,n = 244 | Daily diary | Daily prevalence and incidence of respiratory symptoms: * Wheeze
* Asthma reliever use
 | Short-term | Opencast coal mining sites | Daily PM10 concentration from fixed site monitors | Age, sex, community pairs, number of people in household, environmental tobacco smoke, presence of moulting pets, use of polluting fuel to heat or cook, quality of insulation, indicator of damp, housing tenure, unemployment, access to transport, family history of asthma, eczema/hay fever, propensity of parent to worry, population stability |
| Aylin et al., 2001 | England and Wales (United Kingdom), 1992-1995 | Time series | 0-4 yrs,n = approx. 43,932 | Administrative health data | * Emergency hospital admission for asthma

  | Long-term | Coke works | Distance (continuous) | Age, sex, deprivation quintile, medical service provider |
| Ripabelli et al., 2013 | Termoli (Italy), 2008-2009 | Cross-sectional | 6 mo. - 14 yrs,n = 95 | Questionnaire (ISAAC) | * Asthma
 | Long-term | Not specified | Residential proximity (binary; living in Termoli (yes/no)) | Age, gender |
| Rosa et al., 2016 | Brescia (Italy), period not specified | Cross-sectional | 11-14 yrs, n = 280 | Questionnaire (ISAAC, ECRHS) | * Asthma
* Asthma medication use in past 12 months
* Wheezing in the past 12 months
 | Long-term | Ferroalloy plants | PM10 and metals (Mn, Ni, Cr, Fe, Zn) concentrations measured for 24 hours using personal monitoring | Maternal asthma, child’s sex, child’s age and SES status |
| Rusconi et al., 2011  | Sarroch and Brucei (Italy), 2006 | Cross- sectional  | 6-14 yrs, n = 489 | Questionnaire (ISAAC) | * Wheezing symptoms in past 12 months
 | Long-term | Petrochemical high-complexity refinery and liquid fuel gasification plants.  | Residential proximity (binary; Children living in Sarroch and Burcei were classified as exposed and unexposed, respectively)  | Age, sex, active smoking, environmental tobacco smoke, parental education, distance to major road, respiratory infections in the last week, history of steroid prescriptions in the last 12 months, damp or mold in child’s bedroom |
| De Marco et al., 2010; Rava et al., 2011; Rava et al., 2012 | Viadana District (Italy), 2006 | Cross- sectional | 3-14 yrs, n = 3854 | Questionnaire (ISAAC) | * doctor-diagnosed asthma
* current asthma-like symptoms (in last 12 months) Asthma-like symptoms score (sums of symptoms by subjects)
* asthma severity index

  | Long-term | Chipboard industries | Residential and school proximity, 3-level categorical:Unexposed : no wood factories < 2 km from home and school;Low exposure : at least 1 low emission factory (but no chipboard industries) <2 km from home or school; High exposure: at least 1 chipboard industry <2 km from home or school.  | Age, sex, nationality, residential area, frequency of heavy traffic, parental education, questionnaire complier (mother, father or others), compiler’s environmental concern, environmental tobacco smoke, parents’ smoking |
| Rovira et al., 2014 | Tarragona (Spain), 2010 | Cross-sectional | 6-7 yrs (n = 2672) and 13-14 yrs (n = 2524) | Questionnaire (ISAAC) | * Wheezing ever
* Wheezing in past 12 months
* Wheezing with exercise in past 12 months
* Severe wheezing
* Asthma ever
 | Long-term | Oil refinery, chemical industries, petro-chemical plants, a municipal solid waste incinerator, a hazardous waste incinerator, and two power plants. | Residential proximity to petrochemical sites: Subjects residing in municipalities near two large petrochemical sites and those living in a city with medium vehicular traffic were cross-sectionally compared with children from an area with low vehicular traffic and without industry.  | Gender, length of residence in the town, parents’ nationality, parental history of asthma, family affluence and passive and active smoking |
| Hruba et al., 2001 | Banska Bystrica (Slovakia), 1996 | Cross-Sectional | 7-11 yrs,n = 667 | Questionnaire (ISAAC) | * Asthma (doctor-diagnosed)
* Hospital admission ever for asthma or bronchitis or pneumonia.
* Wheeze ever

  | Long-term | Wood processing facility, cement plant, pharmaceutical company. | TSP Annual average concentrations at the residence from industrial emissions, estimated from dispersion modeling, and treated as quartile in the analysis. | Age, sex, mother's education, number of smokers in house, moisture stain or molds in house, parental history of asthma or atopy |
| Cara et al., 2007  | Calarasi and Roseti (Romania), 1994-2002  | Cohort | <2 yrs n= 851  | Administrative health data | * Wheezing (doctor-diagnosed)
 | Long-term | Iron, steel and coke factory | Residential proximity (binary, community-based) to the industry and cohorts before vs after factory closure:  | Environmental tobacco smoke, family history of allergy, at least 1 year of breastfeeding, presence of mould on the walls |
| Cara et al., 2010 | Calarasi and Roseti (Romania), 1994-2002 | Cross- sectional | 7-10 yrs,n = 519  | Questionnaire (ISAAC) | * Asthma ever (doctor-diagnosed)
* Wheezing ever
* Wheezing in past 12 months
* No. of wheezing attacks in past 12 months
* Sleep disturbance by wheezing in past 12 months
* Speech limiting wheezing in past 12 months
* Exercise related wheezing in past 12 months
 | Long-term | Iron, steel, and coke factory | Residential proximity (binary, community-based) to the industry and cohorts before vs after factory closure. | Gender, birth cohort, environmental tobacco smoke, family history of allergy, at least six months of breastfeeding, the presence of mould in the house |
| **Middle East** |
| Alwahaibi et al., 2016 | Province of Sohar and of Liwa (Oman), 2006-2010 | Time series  | ≤ 1 yr (n = 7998),1-14 yrs (n = 12,148) | Administrative health data | * Medical clinics visits for asthma
 | Long-term | Petrochemical industrial complex, iron smelter | Residential proximity, 3-level categorical variable: - low/unexposed: ≥ 20 km from the refinery - moderate exposure: 5-10 km from the refinery- high exposure: ≤ 5 km from the refinery. | Age, gender, time trend, and SES. |
| Kobrossi et al., 2002 | Districts of Koura, Batroun and Jbeil (Lebanon), 1999-2000 | Cross- sectional | 5-15 yrs, n = 486 | Questionnaire (ATS) | * Wheezing
* Wheezing after physical exercise
 | Long-term | Four cement factories, one lime and plaster factory, one asbestos-cement factory, and two fertilizer factories | Residential proximity (binary; residents of Koura and Batroun are exposed; residents of Jbeil are unexposed)  | Age, gender, parental education, income, type of residence, crowding index, dust level indoors, humidity index, frequency of heavy traffic, presence of carpets in bedrooms, use of polluting fuel to heat, school sector, number of classmates, frequency of exercise, number of persons sharing the child’s bed, child allergies and eczema |
| Nirel et al., 2015 | Neot Hovav (Israel), 2004-2009  | Case-control | 0-14 yrs,n = 6666 (3608 cases and 3058 controls)  | Administrative health data | * Hospitalization for asthma
 | Long-term | Hazardous waste treatment site | 1. Residential proximity, (3-level categorical variable: low/unexposed : >20 km ; moderate exposure : 11–20 km ; high exposure : ≤10 km)
2. relative direction of the residence to the site (4-level categorical)
 | gender, area-level SES (low: ≤40th percentile for the study population, high: >40th percentile), urbanity and stratified by age group (0–1, 2–5, 6–14 yrs old)  |
| Karakis et al, 2009 | Negev (Isreal), 2002  | Cross-sectional | 0-14 yrs,n = 550 | Administrative health data | * Asthma life prevalence (medical clinics visits for asthma)
 | Long-term | Industrial park including chemical, pharmacochemical and heavy industries, industrial hazardous waste disposal site and an incinerator. | 1. Residential proximity (binary; using a 20 km cut-off)
2. Dominant wind direction was also considered as a binary indicator of exposure for those living within the 20 km buffer
 | Gender, parental origin, parental education, mother’s marital status, child’s birth history, pregnancy type, pregnancy complications, multiple gestation, mother’s medication during pregnancy, mother’s infectious diseases during pregnancy, delivery complications, environmental tobacco smoke, parents’ hazardous occupational exposure, home pesticides use, pets, family history of asthma, number of people in household |
| **East, South and Southeast Asia** |
| Deng et al., 2015 | Changsha (China), 2011-2012  | Cross- sectional | 3-6 yrs,n = 2490 | Questionnaire (ISAAC) | * Doctor-diagnosed asthma
 | Long-term  | All types  | SO2 (continuous and quartiles) average concentration at kindergartens during 1st year of life, estimated from IDW of measurements at 7 monitoring stations.  | Sex, age, birth weight, breast feeding, gestational age, and living area and covariates for parents were parental smoking during pregnancy, maternal age (the mother’s age at the time of child’s birth), parental atopy, and socio economic status. |
| Awasthi et al., 2013 | Lucknow (India), 2007-2009 | Case- control | ≤15 yrs, n = 348 (211 cases, 137 controls) | Questionnaire | * Asthma symptoms from clinic record
 | Long-term | Smoke emitting industries | Residential proximity (binary; living within 1.5 km of industrial area with emission of smoke) | Family type, birth order, motor vehicle air pollution, smoking status |
| Chiang et al., 2016 c | Taiwan, 1999-2010 | Longitudinal | 11-14 yrs,n = 587 | Administrative health data | * Outpatient visit or hospitalization for asthma
 | Long-term | Petrochemical complex | Residential proximity (binary; 10-km cut-off) | Age, sex, living near roads, passive smoking exposure, incense burning |
| **Southern Africa** |
| Naidoo et al., 2013 | South Durban (South Africa), period not specified | Cross- sectional | 9-12 yrs,n= 423 | Questionnaire | * Doctor-diagnosed asthma
* Wheezing
* Wheezing with shortness of breath
* Persistent asthma
 | Long-term | Not specified | Children living in four communities in south Durban in close proximity to industrial area were considered as exposed and living in three communities in north Durban were considered as unexposed. | Age, gender, race/ethnicity, previous history of respiratory disease, education level of primary caregiver, smoker in the household, atopy status, annual household income. |
| White et al., 2009 d | Cape Town (South Africa), 2002 | Cross- sectional | 11-14 yrs,n = 2361 | Questionnaire (ISAAC) | Prevalence of recent, frequent, and ever: * Wheeze at rest
* Waking with wheezing at night
* Wheezing after exercise
* Distressing wheeze at rest
* Need to bring inhaler to school
 | Long-term | Petrochemical refinery | 1. Distance (continuous)
2. Distance (continuous), weighted for wind speed, wind direction and proportion of the year blown
 | Family history of atopic disease, passive smoking, distance from a major road, sex. |

Abbreviations: ATS, American Thoracic Society; CI, confidence interval; HR, hazard ratio; IDW, inverse-distance weighting; ISAAC, The International Study of Asthma and Allergies in Childhood; max., maximum; N/A, not applicable (as the metric of exposure is categorical); NPRI, National Pollutant release inventory (<https://www.canada.ca/en/services/environment/pollution-waste-management/national-pollutant-release-inventory.html>); NO2, nitrogen dioxide; OR, odds ratio; PM2.5, particulate matter of median diameter of less than 2.5 µm, PM10, particulate matter of median diameter of less than 10 µm; RR, risk ratio; SES, socio-economic status; SO2, sulfur dioxide; TRI, Toxics related inventory program (<https://www.epa.gov/toxics-release-inventory-tri-program>); TSP, total suspended particles; yr, year.

a The type of effect distinguishes short-term from long-term exposure associations.

b In the study by Howel et al. (2001) and Pless-Mulloli et al. (2000), a symptom was defined as incident if it had not been present on the previous day.

c In the study by Chiang et al. (2016), the methods section states that the study population was children aged 11 to 14 yrs; however some estimates of association are reported for children with mean age of 6.65 yrs (standard deviation: 0.69 yrs).

d In the study by White et al. (2009), recent was defied as in the last 12 months, whereas frequent was defined as at least monthly in the last 12 months.

**Table B2. Description studies making use of administrative health data in the investigation of the association between air pollution from industrial point source and asthma-related outcomes in childhood, ordered by metric of exposure and outcome.**

| **Reference** | **Design** | **Outcomes** | **Age group (in years)** | **Type of industry** | **Exposure metric** | **Results** |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Increment** | **Effect** | **Mean**  | **95% CI** |
| **Effects of short-term exposure: PM25 concentration** |
| Labelle et al. 2015 | Case-crossover | Hospitalisation for asthma or bronchiolitis | <5 | Aluminum smelter | PM2.5 (fixed site) - daily mean  | 4.3 µg/m3 | OR | 0.94 | 0.84-1.06 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | ≤1 | Aluminum smelter | PM2.5 (fixed site) - daily mean  | 14.3 µg/m3 | OR | 0.96 | 0.86-1.07 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Aluminum smelter  | PM2.5 (fixed site) - daily mean  | 15.7 µg/m3 | OR | 1.22 | 1.03-1.44 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | PM2.5 (fixed site) - daily mean  | 5.8 µg/m3 | OR | 1.06 | 0.89-1.26 |
|   |   |   |   |   |   |  |  |  |  |
| Labelle et al., 2015 | Case-crossover | Hospitalisation for asthma or bronchiolitis | < 5 | Aluminum smelter | PM2.5 (fixed site) - daily hourly max. | 10.0 µg/m3 | OR | 0.97 | 0.86-1.09 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | ≤1 | Aluminum smelter | PM2.5 (fixed site) - daily hourly max. | 57.0 µg/m3 | OR | 0.97 | 0.89-1.07 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Aluminum smelter | PM2.5 (fixed site) - daily hourly max. | 57.5 µg/m3 | OR | 1.16 | 0.99-1.36 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | PM2.5 (fixed site) - daily hourly max. | 14.7 µg/m3 | OR | 1.09 | 0.88-1.34 |
| **Effects of short-term exposure: SO2 concentration** |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 0-1  | Aluminum smelter | SO2 (fixed site) - daily mean | 9.7 ppb | OR | 0.98 | 0.89-1.08 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Aluminum smelter | SO2 (fixed site) - daily mean | 8.4 ppb | OR | 1.11 | 0.97-1.25 |
| Labelle et al., 2015 | Case-crossover | Hospitalisation for asthma or bronchiolitis | < 5  | Aluminum smelter | SO2 (fixed site) - daily mean | 9.2 ppb | OR | 1.03 | 0.98-1.08 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | SO2 (fixed site) - daily mean | 2.3 ppb | OR | 0.96 | 0.91-1.02 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily mean, lag 0 | 6.3 ppb | OR | 0.91 | 0.67-1.23 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily mean, lag 0 | 4.3 ppb | OR | 1.14 | 1.00-1.30 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily mean, lag 1 | 6.3 ppb | OR | 0.84 | 0.63-1.21 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily mean, lag 1 | 4.3 ppb | OR | 1.03 | 0.91-1.16 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - 5-day mean (lag 0 to lag 4) | 4.4 ppb | OR | 0.71 | 0.46-1.09 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - 5-day mean (lag 0 to lag 4) | 3.6 ppb | OR | 1.07 | 0.87-1.31 |
|  |  |  |  |  |  |  |  |  |  |
| Labelle et al., 2015 | Case-crossover | Hospitalisation for asthma or bronchiolitis | < 5  | Aluminum smelter | SO2 (fixed site) - daily hourly max. | 47.0 ppb | OR | 1.06 | 0.98-1.15 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 0-1 | Aluminum smelter | SO2 (fixed site) - daily hourly max. | 48.0 ppb | OR | 1.02 | 0.90-1.15 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Aluminum smelter | SO2 (fixed site) - daily hourly max. | 45.8 ppb | OR | 1.11 | 0.89-1.38 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | SO2 (fixed site) - daily hourly max. | 7.2 ppb | OR | 0.96 | 0.92-1.01 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily hourly max., lag 0 | 31.2 ppb | OR | 1.42 | 1.10-1.82 |
| Smargiassi et al., 2009 | Case-crossover | Hospitalisation for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily hourly max., lag 1 | 31.2 ppb | OR | 1.01 | 0.79-1.29 |
|   |  |   |   |   |   |  |  |  |  |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily mean, lag 0 | 6.3 ppb | OR | 1.04 | 0.94-1.16 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily mean, lag 0 | 4.3 ppb | OR | 1.04 | 0.98-1.10 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily mean, lag 1 | 6.3 ppb | OR | 1.06 | 0.96-1.17 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily mean, lag 1 | 4.3 ppb | OR | 1.05 | 1.00-1.12 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - 5-day mean (i.e., lag 0 - lag 4) | 4.4 ppb | OR | 1.17 | 0.99-1.39 |
|  |  |  |  |  |  |  |  |  |  |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily hourly max., lag 0 | 11.9 ppb | OR | 1.03 | 0.94-1.14 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily hourly max., lag 0 | 31.2 ppb | OR | 1.10 | 1.00-1.22 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - daily hourly max., lag 1 | 11.9 ppb | OR | 0.95 | 0.86-1.06 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - daily hourly max., lag 1 | 31.2 ppb | OR | 1.05 | 0.95-1.16 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (fixed site) - 5-day mean (i.e., lag 0 - lag 4) | 3.7 ppb | OR | 0.969 | 0.73-1.29 |
| Smargiassi et al., 2009 | Case-crossover | Emergency department visits for asthma | 2-4 | Petrochemical refineries | SO2 (dispersion model) - 5-day mean (i.e., lag 0 - lag 4) | 3.6 ppb | OR | 1.04 | 0.94-1.14 |
| **Effects of short-term exposure: NO2 concentration** |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | NO2 (fixed site) - daily mean | 7.4 ppb | OR | 1.09 | 0.65-1.82 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | NO2 (fixed site) - daily hourly max. | 14.6 ppb | OR | 1.15 | 0.64-2.06 |
| **Effects of long-term exposure: Distance (categorical)** |
| Alwahaibi et al., 2016 | Cross-sectional | visits to health clinics for asthma | ≤ 1 | Petrochemical | Distance (≤10 km vs ≥20km) | N/A | RR | 3.6 | 2.2-6.1 |
| Alwahaibi et al., 2016 | Cross-sectional | visits to health clinics for asthma | 1-14 | Petrochemical | Distance (≤10 km vs ≥20km) | N/A | RR | 4.6 | 3.8-5.7 |
| Alwahaibi et al., 2016 | Cross-sectional | visits to health clinics for asthma follow-ups | ≤ 1  | Petrochemical | Distance (≤10 km vs ≥20km) | N/A | RR | 4.4 | 1.9-10.1 |
| Alwahaibi et al., 2016 | Cross-sectional | visits to health clinics for asthma follow-ups | 1-14 | Petrochemical | Distance (≤10 km vs ≥20km) | N/A | RR | 3.5 | 2.8-4.4 |
| Liu et al., 2012 | Cohort | Hospitalisation for asthma | < 10  | Fuel-fired power plant | Distance (binary, living in a ZIP code that contained a fuel-fired power plant) | N/A | RR | 1.01 | 0.91-1.12 |
| Liu et al., 2012 | Cohort | Hospitalisation for asthma | < 10 | Hazardous waste site | Distance (binary, living in a ZIP code that contained a hazardous waste site) | N/A | RR | 1.11 | 1.03-1.19 |
| Liu et al., 2012 | Cohort | Hospitalisation for asthma | < 10 | Fuel-fired power plant and hazardous waste site | Distance (binary, living in a ZIP code that contained a fuel-fired power plant and a hazardous waste site) | N/A | RR | 1.19 | 1.11-1.28 |
| Maantay et al., 2007 | Ecological  | Hospitalisation for asthma | 0-15 | All industries reporting to the TRI | Distance (binary; cut-off: one-quarter mile radius ) | N/A | OR | 1.22 | 1.14-1.30 |
| Maantay et al., 2007 | Ecological  | Hospitalisation for asthma | 0-15  | other major stationary point sources | Distance (binary; cut-off: one-quarter mile radius ) | N/A | OR | 1.23 | 1.16-1.30 |
| Chiang et al., 2016 | Longitudinal  | Emergency department visits for asthma | Mean (SD) : 6.65 (0.69) | Petrochemical | Distance (binary; cut-off: 10km ) | N/A | HR | 1.60 | 1.03-2.48 |
| Chiang et al., 2016 | Longitudinal  | Emergency department visits for asthma | Mean (SD) : 10.65 (0.69) | Petrochemical | Distance (binary; cut-off: 10km) | N/A | HR | 1.28 | 0.89-1.83 |
| Chiang et al., 2016 | Longitudinal  | Emergency department visits for asthma | Mean (SD) : 13.65 (0.69) | Petrochemical | Distance (binary; cut-off: 10km) | N/A | HR | 1.29 | 0.91-1.83 |
| Nirel et al., 20152 | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 0-1  | Industrial complex | Distance (≤10 km vs >20km) | N/A | OR | 2.31 | 1.39-3.81 |
| Nirel et al., 2015b | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 2-5 | Industrial complex | Distance (≤10 km vs >20 km) | N/A | OR | 1.05 | 0.74-1.49 |
| Nirel et al., 2015b | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 6-14 | Industrial complex | Distance (≤10 km vs >20 km) | N/A | OR | 0.83 | 0.50-1.38 |
| Nirel et al., 2015b | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 0-1  | Industrial complex | Distance (11-20 km vs >20 km) | N/A | OR | 1.24 | 0.89-1.72 |
| Nirel et al., 2015b | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 2-5 | Industrial complex | Distance (11-20 km vs >20km) | N/A | OR | 0.97 | 0.75-1.26 |
| Nirel et al., 2015b | Case-control  | Hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis | 6-14 | Industrial complex | Distance (11-20km vs >20km) | N/A | OR | 1.04 | 0.73-1.48 |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All major (≥100 tons) SO2 emitters from NPRI | Distance (binary; cut-off: 7.5km) | N/A | HR | 1.09 | 1.07-1.11 |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All major (≥100 tons) PM2.5 emitters from NPRI | Distance (binary; cut-off: 7.5km) | N/A | HR | 1.03 | 1.00-1.05 |
| **Effects of long-term exposure: Distance (continuous)** |
| Aylin et al., 2001 | Ecological | Hospitalisation for asthma | 0-4 | Coke works | Distance (continuous, up to 7.5km) | 1-km decrease | RR | 1.07 | 0.98-1.18 |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | <17  | Major (≥100 tons) industrial point source | Distance (continuous) | 1-km decrease | OR | 1.69 | 1.50-1.91 |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | <17 | Minor (<100 tons) industrial point source | Distance (continuous) | 1-km decrease | OR | 1.95 | 1.51-2.53 |
| Buteau et al., 2018 | cohort | Asthma onset | 0-9 | Major (≥100 tons) SO2 emitters from NPRI | Distance (continuous, up to 7.5km) | 1-km decrease | HR | 1.02 | 1.01-1.03 |
| Buteau et al., 2018 | cohort | Asthma onset | 0-9 | Major (≥100 tons) PM2.5 emitters from NPRI | Distance (continuous, up to 7.5km) | 1-km decrease | HR | 1.00 | 0.99-1.01 |
| **Effects of long-term exposure: Wind direction (categorical)** |
| Karakis et al., 2009 | Cross-sectional  | Asthma prevalence from clinic records | 0-14 | Chemical factory | Wind direction (binary) | N/A | OR | 1.95 | 1.01-3.76 |
| **Effects of short-term exposure: Wind direction (continuous)**  |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 0-1 | Aluminum smelter | Percentage of hours downwind | 29% | OR | 1.00 | 0.84-1.20 |
| Lewin et al., 2013a | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Aluminum smelter | Percentage of hours downwind | 21% | OR | 1.27 | 1.03-1.56 |
| Labelle et al., 2015 | Case-crossover | Hospitalisation for asthma or bronchiolitis | < 5  | Aluminum smelter | Percentage of hours downwind | 27% | OR | 1.11 | 1.01-1.22 |
| **Effects of long-term exposure: Emissions** |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All PM2.5 emitters from NPRI | Tons of PM2.5 from all emitters within 2.5 km of the residence | 13 tons | HR | 1.002 | 1.001-1.003 |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All SO2 emitters from NPRI | Tons of SO2 from all emitters within 2.5 km of the residence | 327 tons | HR | 1.003 | 1.003-1.005 |
| **Effects of short-term exposure: Emissions, adjusted for wind direction** |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | Tons of PM2.5 emitted, weighted for percentage of time downwind | 0.15 tons/day | OR | 1.03 | 0.99-1.06 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | Tons of SO2 emitted, weighted for percentage of time downwind | 1.50 tons/day | OR | 1.02 | 1.00-1.04 |
| Brand et al., 2016 | Case-crossover | Hospitalisation for asthma or bronchiolitis | 2-4 | Pulp mills, metal smelters, oil refineries | Tons of NO2 emitted, weighted for percentage of time downwind | 0.40 tons/day | OR | 0.99 | 0.88-1.11 |
| **Effects of long-term exposure: Distance, adjusted for wind direction** |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | < 17 | Power plants | Distance, corrected for wind direction | 1-km decrease | OR | 1.12 | 1.03-1.22 |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | < 17 | Grain mills | Distance, corrected for wind direction | 1-km decrease | OR | 1.38 | 1.28-1.49 |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | < 17 | Petroleum refineries | Distance, corrected for wind direction | 1-km decrease | OR | 1.33 | 1.24-1.42 |
| Loyo-Berrios et al., 2007 | Nested case-control  | Asthma-related medical visits | < 17 | Asphalt plants | Distance, corrected for wind direction | 1-km decrease | OR | 1.39 | 1.29-1.50 |
| **Effects of long-term exposure: Emissions, corrected for distance** |
| Clark et al., 2010c | Nested case-control  | Asthma onset | 0-4 | Industrial complex | Industrial point source score (from emissions and distance to point sources within 10 km, during 1st year of life) | 30 points | OR | 1.10 | 1.04-1.17 |
| Karr et al., 2009c | Nested case-control  | Hospitalisation and ER for bronchiolitis | 2 mo -1yr | not specified | Industrial point source score (from total emissions and distance to point sources within 10 km, during 1st year of life) | 28 points | OR | 1.10 | 1.06-1.13 |
| **Effects of long-term exposure: Emissions, corrected for distance and wind direction** |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All major (≥100 tons) PM2.5 emitters from NPRI | Wind and inverse-distance weighted emissions of closest major emitter | 255 tons-km-1 | HR | Positive non-linear response function |
| Buteau et al., 2018 | Cohort | Asthma onset | 0-9 | All major (≥100 tons) SO2 emitters from NPRI | Wind and inverse-distance weighted emissions of closest major emitter | 98 tons-km-1 | HR | 1.004 | 1.003-1.006 |
| **Effects of long-term exposure: Before vs after closure of the industry** |
| Cara et al., 2007  | Cohort | Wheezing, during first year of life | < 2 | Iron, steel and coke factory | Cohort born after closure vs cohort ≥2 years old at time of the closure | N/A | OR | 0.38 | 0.19-0.76 |
| Cara et al., 2007  | Cohort | Wheezing, during first 2 years of life | < 2  | Iron, steel and coke factory | Cohort born after closure vs cohort ≥2 years old at time of the closure | N/A | OR | 0.44 | 0.23-0.82 |

Abbreviations: CI, confidence interval; HR, hazard ratio; max., maximum; mo, month; N/A, not applicable (as the metric of exposure is categorical); NPRI, National Pollutant release inventory (Canada, <https://www.canada.ca/en/services/environment/pollution-waste-management/national-pollutant-release-inventory.html>); NO2, nitrogen dioxide; OR, odds ratio; PM2.5, particulate matter of median diameter of less than 2.5 µm, PM10, particulate matter of median diameter of less than 10 µm; RR, risk ratio, SO2, sulfur dioxide; TRI, Toxics related inventory program (USA, <https://www.epa.gov/toxics-release-inventory-tri-program>); yr, year.

a Results reported for Lewin et al. (2013) are those for children living within 7.5 km of the industries. For air pollutants, similar findings were reported when restricting to children living within 2.5 km of the point source. For wind direction, stronger mean effect estimates were obtained for children living within 2.5 km of the point source, however confidence intervals were wider due to reduced power (≤1 year, OR = 1.08 (95% CI: 0.76-1.53); 2-4 years, OR=1.45 (95% CI: 1.00-2.12)).

b Results reported by Nirel et al. (2015) are for hospitalisation for acute bronchitis, pneumonia, asthma, bronchitis; although not reported in the paper the authors mentioned in the text that similar results were obtained were restricting the analysis to asthma only.

c In the study by Karr et al., (2009) and Clark et al. (2010), the metric of exposure was an index value calculated as follow: each point source was assigned an index value base on its pollutant contribution (PM2.5, NOx, SOx, VOC) relative to other point sources in the region. Exposure at the children’s postal code was determined using the inverse-distance weighted summations of emissions from point sources within 10 km.

d In the study by Smargiassi et al., (2009) two distinct monitoring stations were used to assess SO2 of two communities and associations were reported separately for these two communities. One of the communities is less affected by emissions (based on wind direction) and the monitoring station is located further away (median distance 5.6 km). Therefore, we decided to report findings for the community that is mostly exposed to emissions and for which the monitoring station likely provide a better estimate of people’s exposure (median distance 1.6 km).

**Table B3. Description studies making use of questionnaire or diary in the investigation of the association between air pollution from industrial point source and asthma-related outcomes in childhood, ordered by metric of exposure and outcome.**

| **Study reference**  | **Study design** | **Asthma-related outcome** | **Age group (years)** | **Type of industries** | **Metric of exposure** | **Results** |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Exposure increment** | **Effect** | **Mean** | **95% CI** |
| **Effects of short-term exposure: PM2.5 concentration (continuous)** |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 1-day average | 18.0 µg/m3 | OR | 1.01 | 0.85-1.23 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 3-day average | 18.0 µg/m3 | OR | 1.05 | 0.85-1.30 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 5-day average | 18.0 µg/m3 | OR | 1.25 | 1.04-1.70 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 7-day average | 18.0 µg/m3 | OR | 1.60 | 1.15-2.26 |
|   |   |   |   |   |   |  |  |  |  |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 1-day average | 18.0 µg/m3 | OR | 0.93 | 0.83-1.06 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 3-day average | 18.0 µg/m3 | OR | 0.92 | 0.80-1.07 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 5-day average | 18.0 µg/m3 | OR | 0.93 | 0.79-1.08 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 7-day average | 18.0 µg/m3 | OR | 0.95 | 0.79-1.13 |
| **Effects of short-term exposure: ambient PM2.5 concentration from industrial emissions** |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 1-day average | N/S | OR | 0.85 | 0.71-0.99 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 3-day average | N/S | OR | 0.86 | 0.69-1.03 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 5-day average | N/S | OR | 0.89 | 0.70-1.11 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM2.5 (fixed site), 7-day average | N/S | OR | 0.85 | 0.51-1.07 |
|   |   |   |   |   |   |  |  |  |  |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 1-day average | N/S | OR | 0.97 | 0.89-1.08 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 3-day average | N/S | OR | 0.91 | 0.84-1.07 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 5-day average | N/S | OR | 0.88 | 0.80-1.07 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM2.5 (fixed site), 7-day average | N/S | OR | 0.94 | 0.80-1.11 |
| **Effect of short term exposure: PM10 concentration** |
| Howel et al., 2001 C | Panel  | Wheezing (daily incidence) b | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 0 | 10.0 µg/m3 | OR | 1.16 | 1.05-1.28 |
| Howel et al., 2001 C | Panel | Wheezing (daily incidence) b | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 1 | 10.0 µg/m3 | OR | 1.02 | 0.87-1.19 |
| Howel et al., 2001 C | Panel  | Wheezing (daily prevalence) b | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 0 | 10.0 µg/m3 | OR | 1.05 | 0.96-1.15 |
| Howel et al., 2001 C | Panel | Wheezing (daily prevalence) b | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 1 | 10.0 µg/m3 | OR | 1.03 | 0.93-1.13 |
|  |  |  |  |  |  |  |  |  |  |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM10 (fixed site), daily mean | 40.6 µg/m3 | OR | 0.95 | 0.80-1.12 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM10 (fixed site), 3-day average | 40.6 µg/m3 | OR | 0.99 | 0.79-1.22 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM10 (fixed site), 5-day average | 40.6 µg/m3 | OR | 1.12 | 0.89-1.46 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | PM10 (fixed site), 7-day average | 40.6 µg/m3 | OR | 1.40 | 1.01-2.00 |
|  |  |  |  |  |  |  |  |  |  |
| Howel et al., 2001 C | Panel | Reliever use (daily prevalence) b  | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 0 | 10.0 µg/m3 | OR | 1.00 | 0.94-1.06 |
| Howel et al., 2001 C | Panel | Reliever use (daily prevalence) b | 1-11  | Opencast mining  | PM10 (fixed site), 24-h mean lag 1 | 10.0 µg/m3 | OR | 1.01 | 0.94-1.07 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM10 (fixed site), 1-day average | 40.6 µg/m3 | OR | 0.92 | 0.85-1.05 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM10 (fixed site), 3-day average | 40.6 µg/m3 | OR | 0.91 | 0.80-1.05 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM10 (fixed site), 5-day average | 40.6 µg/m3 | OR | 0.85 | 0.80-1.09 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | PM10 (fixed site), 7-day average | 40.6 µg/m3 | OR | 0.96 | 0.81-1.17 |
| **Effect of long term exposure: PM10 concentration** |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | PM10 (personal monitoring), 24-h mean | 38 µg/m3 | OR | 1.12 | 1.00-1.21 |
| Naidoo et al., 2013 a | Cross-sectional | Persistent asthma | 9-12  | N/S | PM10 (fixed site at school), 8-mo. average | 12.6 µg/m3 | OR | 1.09 | 0.56-2.12 |
|  |  |  |  |  |  |  |  |  |  |
| Naidoo et al., 2013 a | Cross-sectional | Wheezing | 9-12  | N/S | PM10 (fixed site at school), 8-mo. average | 12.6 µg/m3 | OR | 1.27 | 0.75-2.15 |
| Naidoo et al., 2013 a | Cross-sectional | Wheezing with SOB | 9-12  | N/S | PM10 (fixed site at school), 8-mo. average | 12.6 µg/m3 | OR | 0.98 | 0.88-1.10 |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | PM10 (personal monitoring), 24-h mean | 38 µg/m3 | OR | 0.58 | 0.28-1.21 |
|  |  |  |  |  |  |  |  |  |  |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use, past 12 mo. | 11-14 | Ferroalloy activity | PM10 (personal monitoring), 24-h mean | 38 µg/m3 | OR | 1.21 | 1.09-1.35 |
| **Effects of long term exposure: TSP concentration** |
| Hruba et al., 2001 | Cross-sectional | Asthma | 7-10  | Wood industries | TSP (dispersion modeling), annual average  | 15.0 µg/m3 | OR | 1.62 | 0.62-4.19 |
| Hruba et al., 2001 | Cross-sectional | Wheezing | 7-10  | Wood industries | TSP (dispersion modeling), annual average  | 15.0 µg/m3 | OR | 1.24 | 0.68-2.28 |
| Hruba et al., 2001 | Cross-sectional | Hospital admission for asthma, bronchitis, or pneumonia | 7-10 | Wood industries | TSP (dispersion modeling), annual average  | 15.0 µg/m3 | OR | 2.16 | 1.01-4.60 |
| **Effects of long-term exposure: Metals concentration** |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | Mn from PM10 24-h personal monitoring | 38 ng/m3 | OR | 1.09 | 1.00-1.18 |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | Ni from PM10 24-h personal monitoring | 42 ng/m3 | OR | 1.11 | 1.02-1.20 |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | Fe from PM10 24-h personal monitoring | 4 ng/m3 | OR | 1.00 | 1.00-1.00 |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | Cr from PM10 24-h personal monitoring | 498 ng/m3 | OR | 1.08 | 1.06-1.11 |
| Rosa et al., 2016 | Cross-sectional | Asthma | 11-14 | Ferroalloy activity | Zn from PM10 24-h personal monitoring | 72 ng/m3 | OR | 1.00 | 0.81-1.33 |
|   |   |   |   |   |   |  |  |  |  |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | Mn from PM10 24-h personal monitoring | 38 ng/m3 | OR | 1.09 | 0.92-1.29 |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | Ni from PM10 24-h personal monitoring | 42 ng/m3 | OR | 1.00 | 0.83-1.21 |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | Fe from PM10 24-h personal monitoring | 4 ng/m3 | OR | 1.00 | 0.99-1.00 |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | Cr from PM10 24-h personal monitoring | 498 ng/m3 | OR | 1.06 | 0.96-1.17 |
| Rosa et al., 2016 | Cross-sectional | Wheezing in past 12 mo. | 11-14 | Ferroalloy activity | Zn from PM10 24-h personal monitoring | 72 ng/m3 | OR | 0.75 | 0.36-1.65 |
|   |   |   |   |   |   |  |  |  |  |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use past 12 mo. | 11-14 | Ferroalloy activity | Mn from PM10 24-h personal monitoring | 38 ng/m3 | OR | 1.13 | 1.00-1.23 |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use past 12 mo. | 11-14 | Ferroalloy activity | Ni from PM10 24-h personal monitoring | 42 ng/m3 | OR | 1.11 | 1.00-1.24 |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use past 12 mo. | 11-14 | Ferroalloy activity | Fe from PM10 24-h personal monitoring | 4 ng/m3 | OR | 1.00 | 1.00-1.00 |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use past 12 mo. | 11-14 | Ferroalloy activity | Cr from PM10 24-h personal monitoring | 498 ng/m3 | OR | 1.06 | 0.97-1.15 |
| Rosa et al., 2016 | Cross-sectional | Asthma medication use past 12 mo. | 11-14 | Ferroalloy activity | Zn from PM10 24-h personal monitoring | 72 ng/m3 | OR | 1.15 | 0.93-1.54 |
| **Effects of short-term exposure: SO2 concentration** |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | SO2 (fixed site), 1-day average | 1 ppb | OR | 0.92 | 0.80-1.09 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | SO2 (fixed site), 3-day average | 1 ppb | OR | 0.94 | 0.79-1.17 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | SO2 (fixed site), 5-day average | 1 ppb | OR | 1.00 | 0.80-1.31 |
| Prieto-Parra et al., 2017 | Panel | Wheezing | 6-14 | Copper smelter | SO2 (fixed site), 7-day average | 1 ppb | OR | 1.05 | 0.81-1.48 |
|  |  |  |  |  |  |  |  |  |  |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | SO2 (fixed site), 1-day average | 1 ppb | OR | 0.96 | 0.90-1.05 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | SO2 (fixed site), 3-day average | 1 ppb | OR | 0.95 | 0.82-1.10 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | SO2 (fixed site), 5-day average | 1 ppb | OR | 0.97 | 0.82-1.13 |
| Prieto-Parra et al., 2017 | Panel | Reliever use | 6-14 | Copper smelter | SO2 (fixed site), 7-day average | 1 ppb | OR | 1.05 | 0.90-1.25 |
| **Effects of long-term exposure: SO2 concentration** |
| Deng et al., 2015 | Cross-sectional | Asthma | 3-6  | N/S | SO2 (IDW from fixed site monitors), average during 1st yr of life at kindergarten | 50.0 ppb | OR | 1.62 | 1.01-2.60 |
| Naidoo et al., 2013 a | Cross-sectional | Persistent asthma | 9-12  | N/S | SO2 (fixed site at school), 8-mo. average | 6.7 ppb | OR | 1.37 | 0.80-2.35 |
|   |   |   |   |   |   |  |  |  |  |
| Naidoo et al., 2013 a | Cross-sectional | Wheezing | 9-12  | N/S | SO2 (fixed site at school), 8-mo. average | 6.7 ppb | OR | 1.13 | 0.73-1.74 |
| Naidoo et al., 2013 a | Cross-sectional | Wheezing with SOB | 9-12  | N/S | SO2 (fixed site at school), 8-mo. average | 6.7 ppb | OR | 0.86 | 0.49-1.53 |
| **Effects of long-term exposure: Distance (categorical)** |
| Awasthi et al., 2013 | Case-control  | Asthma | <=15 | N/S | Distance (binary, cut-off: 1.5km) | N/A | OR | 2.90 | 1.30-6.90 |
| Herrera et al., 2016 | Cross-sectional | Asthma | 6-12  | Opencast mining | Distance (binary, cut-off 1st quartile of distance) | N/A | OR | 1.62 | 0.82-3.18 |
| Ripabelli et al., 2012 | Cross-sectional | Asthma | 0.5-14 | N/S | Distance (binary, community-based) | N/A | OR | 8.98 | 1.17-68.91 |
| Cara et al., 2010 | Cross-sectional | Asthma | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 9.00 | 1.20-18.70 |
| Pless-Mulloli et al., 2000; 2001 C | Cross-sectional | Asthma | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.0 | 0.8-1.3 |
| Wichmann et al., 2009 | Cross-sectional  | Asthma | 6-12  | Petrochemical | Distance (binary, community-based) | N/A | OR | 2.76 | 1.96-3.89 |
| Rovira et al., 2014 | Cross-sectional | Asthma | 6-7 | Petrochemical | Distance (binary, community-based) | N/A | PR | 1.01 | 0.67-2.75 |
| Rovira et al., 2014 | Cross-sectional | Asthma | 13-14 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.90 | 0.70-1.95 |
| Naidoo et al., 2013 | Cross-sectional | Asthma | 9-12  | N/S | Distance (binary, community-based) | N/A | OR | 1.14 | 0.75-1.74 |
| Pless-Mulloli et al., 2000; 2001 C | Cross-sectional  | Asthma in past 2 mo. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.7 | 0.9-3.5 |
|   |   |   |   |   |   |  |  |  |  |
| De Marco et al., 2010 | Cross-sectional  | Asthma-like symptoms | 3-14  | Wood industries | Distance (binary, cut-off: 2km ) | N/A | OR | 1.33 | 1.11-1.60 |
| Pless-Mulloli et al., 2000; 2001 C | Cross-sectional  | Asthma or wheezing in past 12 mo. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.00 | 0.70-1.30 |
| Wichmann et al., 2009 | Cross-sectional  | Asthma exacerbation in past 12 mo. | 6-12  | Petrochemical | Distance (binary, community-based) | N/A | OR | 1.88 | 1.25-1.93 |
| Naidoo et al., 2013 | Cross-sectional | Wheezing with SOB | 9-12  | N/S | Distance (binary, community-based) | N/A | OR | 1.12 | 1.01-1.24 |
|   |   |   |   |   |   |  |  |  |  |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing | 5-15  | Industrial complex  | Distance (binary, ≤ 3km vs. 4-7km) | N/A | OR | 2.23 | 1.21-4.12 |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing | 5-15  | Industrial complex  | Distance (binary, ≤ 3km vs. in a community unexposed) | N/A | OR | 1.54 | 0.94-2.54 |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing  | 5-15  | Industrial complex  | Distance (binary, 4-7km vs. in a community unexposed) | N/A | OR | 0.78 | 0.43-1.43 |
| Cara et al., 2010 | Cross-sectional | Wheezing | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 7.20 | 3.20-16.70 |
| Pless-Mulloli et al., 2000; 2001 C | Cross-sectional  | Wheezing | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.00 | 0.80-1.30 |
| Naidoo et al., 2013 | Cross-sectional | Wheezing | 9-12  | N/S | Distance (binary, community-based) | N/A | OR | 1.00 | 0.63-1.57 |
| Rovira et al., 2014 | Cross-sectional | Wheezing | 6-7 | Petrochemical | Distance (binary, community-based) | N/A | PR | 1.10 | 0.88-1.75 |
| Rovira et al., 2014 | Cross-sectional | Wheezing | 13-14 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.95 | 0.80-1.49 |
|  |  |  |  |  |  |  |  |  |  |
| Pless-Mulloli et al., 2000 C | Cross-sectional | Wheezing in past 6 wk. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 0.82 | 0.36-1.89 |
| Wichmann et al., 2009 | Cross-sectional  | Wheezing in past 12 mo. | 6-12  | Petrochemical | Distance (binary, community-based) | N/A | OR | 1.93 | 1.39-2.67 |
| Cara et al., 2010 | Cross-sectional | Wheezing in past 12 mo. | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 13.60 | 3.10-83.00 |
| Rovira et al., 2014 | Cross-sectional | Wheezing in past 12 mo. | 6-7 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.95 | 0.76-2.01 |
| Rovira et al., 2014 | Cross-sectional | Wheezing in past 12 mo. | 13-14 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.90 | 0.71-1.45 |
| Pless-Mulloli et al., 2001 C | Cross-sectional | Wheezing or asthma attack in past 12 mo. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.0 | 0.7-1.3 |
|   |   |   |   |   |   |  |  |  |  |
| Rovira et al., 2014 | Cross-sectional | Severe wheezing  | 13-14 | Petrochemical | Distance (binary, community-based) | N/A | PR | 2.51 | 0.73-5.00 |
| Rovira et al., 2014 | Cross-sectional | Severe wheezing  | 6-7 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.92 | 0.63-2.10 |
|   |   |   |   |   |   |  |  |  |  |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing after physical exercise | 5-15  | Industrial complex  | Distance (binary, ≤3km vs. 4-7km) | N/A | OR | 0.76 | 0.28-2.08 |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing after physical exercise | 5-15  | Industrial complex  | Distance (binary, ≤ 3km vs. in a community unexposed) | N/A | OR | 1.81 | 0.69-4.78 |
| Kobrossi et al., 2002 | Cross-sectional | Wheezing after physical exercise | 5-15  | Industrial complex  | Distance (binary, 4-7km vs. in a community unexposed) | N/A | OR | 2.30 | 0.78-6.75 |
| Cara et al., 2010 | Cross-sectional | Wheezing after physical exercise in past 12 mo. | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 6.60 | 1.40-42.20 |
| Rovira et al., 2014 | Cross-sectional | Wheezing after physical exercise in past 12 mo. | 13-14 | Petrochemical | Distance (binary, community-based) | N/A | PR | 1.98 | 0.81-3.92 |
| Rovira et al., 2014 | Cross-sectional | Wheezing after physical exercise in past 12 mo. | 6-7 | Petrochemical | Distance (binary, community-based) | N/A | PR | 0.98 | 0.82-1.75 |
|   |   |   |   |   |   |  |  |  |  |
| Cara et al., 2010 | Cross-sectional | 1-3 Wheezing attacks in past 12 mo. | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 21.60 | 3.10-432.00 |
| Pless-Mulloli et al., 2000; 2001 C | Cross-sectional | > 12 Wheezing attacks in past 12 mo. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 0.5 | 0.2-0.9 |
| Cara et al., 2010 | Cross-sectional | Wheezing: Sleep disturbance, in past 12 mo. | 7-10  | Heavy industries | Distance (binary, community-based) | N/A | OR | 8.40 | 1.90-52.60 |
| Pless-Mulloli et al., 2000 C | Cross-sectional | Asthma attack: Woken child at night, in past 12 mo. | 1-11 | Opencast mining  | Distance (binary, community-based) | N/A | OR | 0.8 | 0.6-1.2 |
| Pless-Mulloli et al., 2000 C | Cross-sectional | Asthma attack: Limited speech, in past 12 mo. | 1-11  | Opencast mining | Distance (binary, community-based) | N/A | OR | 0.9 | 0.5-1.4 |
| Pless-Mulloli et al., 2000 C | Cross-sectional | Asthma attack: Occurred on exercise, in past 12 mo. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.01 | 0.7-1.5 |
|   |   |   |   |   |   |  |  |  |  |
| Pless-Mulloli et al., 2000 C | Cross-sectional | Asthma reliever use in past 6 wk. | 1-11  | Opencast mining  | Distance (binary, community-based) | N/A | OR | 1.00 | 0.3-2.9 |
| **Effects of long-term exposure: Distance (continuous)** |
| Rava et al., 2011 | Cross-sectional | Asthma | 3-14 | Wood industries | Weighted average of minimum distances of each child's home and school from the chipboard industries  | 2 km | RR | 0.99 | 0.95-1.04 |
| Rava et al., 2011 | Cross-sectional | Asthma like symptoms, in past 12 mo. | 3-14 | Wood industries | Weighted average of minimum distances of each child's home and school from the chipboard industries  | 2 km | RR | 0.98 | 0.97-0.99 |
| Rava et al., 2011 | Cross-sectional | Asthma severity index (based on symptoms), in past 12 mo. | 3-14 | Wood industries | Weighted average of minimum distances of each child's home and school from the chipboard industries  | 2 km | RR | 0.97 | 0.95-0.99 |
|   |   |   |   |   |   |  |  |  |  |
| White et al., 2009 | Cross-sectional  | Need to bring inhaler to school | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.89 | 0.72 - 1.11 |
| White et al., 2009 | Cross-sectional  | Ever wheeze at rest | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 1.10 | 0.95 - 1.27 |
| White et al., 2009 | Cross-sectional  | Wheezing at rest in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.89 | 0.70 - 1.14 |
| White et al., 2009 | Cross-sectional  | Wheezing at rest at least monthly in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.93 | 0.71 - 1.21 |
| White et al., 2009 | Cross-sectional  | Ever wake with wheezing at night | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 1.11 | 0.97 - 1.28 |
| White et al., 2009 | Cross-sectional  | Waking with wheezing at night in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.95 | 0.74 - 1.24 |
| White et al., 2009 | Cross-sectional  | Waking with wheezingat night, at least monthly in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 1.08 | 0.86 - 1.37 |
| White et al., 2009 | Cross-sectional  | Ever wheeze after exercise | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.98 | 0.84 - 1.14 |
| White et al., 2009 | Cross-sectional  | Wheezing after exercise in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.83 | 0.64 - 1.08 |
| White et al., 2009 | Cross-sectional  | Wheezing after exercise, at least monthly in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.86 | 0.63 - 1.16 |
| White et al., 2009 | Cross-sectional  | Ever distressing wheeze at rest | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 1.02 | 0.86 - 1.20 |
| White et al., 2009 | Cross-sectional  | Distressing wheeze atrest, in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.97 | 0.72 - 1.30 |
| White et al., 2009 | Cross-sectional  | Distressing wheeze atrest, at least monthly in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 1.6 km | OR | 0.95 | 0.67 - 1.35 |
| **Effects of long-term exposure: Distance (% of residential buffer area within 0.8km of an industrial facility)** |
| Patel et al., 2011 | Longitudinal | Asthma in past 12 mo. | 0-5  | N/S | % area <0.8km (continuous) | 68.9% | OR | 1.30 | 0.98-1.52 |
| Patel et al., 2011 | Longitudinal | Wheezing in past 12 mo. | 0-5  | N/S | % area <0.8km (continuous) | 68.9% | OR | 0.90 | 0.70-1.15 |
| **Effects of long-term exposure: Wind direction (categorical)** |
| Lopes de Moraes et al., 2010 | Cross-sectional  | Wheezing, in past 12 mo. | 0-14  | Petrochemical | Wind direction (binary) | N/A | OR | 2.01 | 1.01-4.01 |
| **Effects of long-term exposure: Distance, weighted for wind direction and wind speed** |
| White et al., 2009 | Cross-sectional  | Need to bring inhaler to school | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.22 | 1.06 - 1.40 |
| White et al., 2009 | Cross-sectional  | Ever wheeze at rest | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.15 | 1.04 - 1.28 |
| White et al., 2009 | Cross-sectional  | Wheezing at rest in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.12 | 0.94 - 1.34 |
| White et al., 2009 | Cross-sectional  | Wheezing at rest at least monthly in the last 12 mo.. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.27 | 1.05 - 1.54 |
| White et al., 2009 | Cross-sectional  | Ever wake with wheezing at night | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.03 | 0.93 - 1.14 |
| White et al., 2009 | Cross-sectional  | Waking with wheezing at night in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.33 | 1.06 - 1.66 |
| White et al., 2009 | Cross-sectional  | Waking with wheezingat night, at least monthly in the last 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.10 | 0.94 - 1.29 |
| White et al., 2009 | Cross-sectional  | Ever wheeze after exercise | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.08 | 0.97 - 1.21 |
| White et al., 2009 | Cross-sectional  | Wheezing after exercise in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.17 | 0.96 - 1.42 |
| White et al., 2009 | Cross-sectional  | Wheezing after exercise, at least monthly in the last 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.14 | 0.93 - 1.41 |
| White et al., 2009 | Cross-sectional  | Ever distressing wheeze at rest | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.08 | 0.96 - 1.21 |
| White et al., 2009 | Cross-sectional  | Distressing wheeze atrest, in past 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.16 | 0.93 - 1.43 |
| White et al., 2009 | Cross-sectional  | Distressing wheeze atrest, at least monthly in the last 12 mo. | 11-14 | Petrochemical refinery | Distance, weighted for wind direction and wind speed | 0.29 h/km2 | OR | 1.26 | 0.98 - 1.62 |

Abbreviations: CI, confidence interval; h, h; HR, hazard ratio; IDW, inverse-distance weighting; IQR: interquartile range; km, kilometer; max., maximum; mo. month.; N/A, not applicable; NO2, nitrogen dioxide; N/S, not specified; OR, odds ratio; PM2.5, particulate matter of median diameter of less than 2.5 µm, PM10, particulate matter of median diameter of less than 10 µm; PR, prevalence ratio; RR, risk ratio, SO2, sulfur dioxide; SOB, shortness of breath; TSP, total suspended particulate; week, wk.; yr, year.

a In the paper by Naidoo et al. (2013), the exposure increment for PM10 and SO2 estimate associations are not reported. The exposure increment are interquartile range, corresponding to 12.6 µg/m3 for PM10 and 6.7 ppb for SO2. (Naidoo, Personal Communication, 2019-04-16). Wheezing was defined as ‘chest sounding wheezy or whistling on most days and nights’.

b In the study by Howel et al. (2001), a symptom was defined as incident if it had not been present on the previous day.

c In the study by Pless-Mulloli et al. (2000, 2001) and by Howel et al. (2001), some results were reported separately by communities; in such instances we pooled results and we reported the pooled effect estimates for all communities.

(A)



(B)



**Figure B1.** **Forest plots of case-crossover studies of the association between hospitalization for asthma or bronchiolitis and same-day daily mean concentration of SO2, including results from Smargiassi et al. (2009) from fixed-site monitors.** In the study by Smargiassi et al., (2009) two distinct monitoring stations were used to assess SO2 of two communities and associations were reported separately for these two communities. In (A) we included the effect when combining the two communities, whereas in (B) we included the results from the community that is mostly exposed to emissions and for which the monitoring station likely provide a better estimate of people’s exposure (median distance 1.6 km). Effect size and 95% confidence intervals (CI) are expressed relative to a 10 ppb increase. Pooled estimates of effect size are indicated by black squares and 95% CI are represented by horizontal lines; size of black square around point estimate is proportional to weight in calculating pooled estimate.

(A)

 

(B)



**Figure B2. Forest plots of case-crossover studies of the association between hospitalization for asthma or bronchiolitis and same-day hourly maximum concentration of SO2, including results from Smargiassi et al. (2009) from fixed-site monitors.** In the study by Smargiassi et al. (2009) two distinct monitoring stations were used to assess SO2 of two communities and associations were reported separately for these two communities. In (A) we included the effect when combining the two communities, whereas in (B) we included the results from the community that is mostly exposed to emissions and for which the monitoring station likely provide a better estimate of people’s exposure (median distance 1.6 km). Effect size and 95% confidence intervals (CI) are expressed relative to a 10 ppb increase. Pooled estimates of effect size are indicated by black squares and 95% CI are represented by horizontal lines; size of black square around point estimate is proportional to weight in calculating pooled estimate.



**Figure B3. Forest plot of the association between residential proximity to industries and the prevalence of asthma, from cross-sectional studies using questionnaire.** Pooled random-effect estimate of ORs is indicated by vertical points of diamonds and 95% CI are represented by horizontal points. Black squares represent individual effect size of primary studies and the bars the 95% CI; size of black squares is proportional to weight in calculating random-effect summary estimate. The arrows indicate that the confidence interval extends beyond the range of the value display.



**Figure B4. Forest plot of the association between residential proximity to industries and the prevalence of wheezing, from cross-sectional studies using questionnaire.** Pooled random-effect estimate of ORs is indicated by vertical points of diamonds and 95% CI are represented by horizontal points. Black squares represent individual effect size of primary studies and the bars the 95% CI; size of black squares is proportional to weight in calculating random-effect summary estimate. The arrows indicate that the confidence interval extends beyond the range of the value display.

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