**Appendix**

**Prenatal exposure to ambient air pollution and subsequent risk of lower respiratory tract infections in childhood and adolescence: A systematic review**

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# Search strategy

## Ovid MEDLINE(R) ALL

|  |  |
| --- | --- |
| **#** | **Query** |
| 1 | environmental pollutants/ or exp air pollutant/ |
| 2 | environmental pollution/ or air pollution/ or traffic-related pollution/ |
| 3 | exp Particulate Matter/ |
| 4 | Vehicle Emissions/ |
| 5 | environmental exposure/ or environmental monitoring/ or inhalation exposure/ |
| 6 | carbon dioxide/ or carbon monoxide/ or nitrogen oxides/ or nitrogen dioxide/ or sulfur oxides/ or sulfur dioxide/ |
| 7 | Ozone/ |
| 8 | exp Polycyclic Aromatic Hydrocarbons/ |
| 9 | Lead/ |
| 10 | Benzene/ |
| 11 | Nickel/ |
| 12 | Cadmium/ |
| 13 | Arsenic/ |
| 14 | ((air or atmosphere or ambient or outdoor or urban) and pollut\*).ti,ab,kf. |
| 15 | ((environment\* or traffic\* or vehic\*) and (pollut\* or emission\*)).ti,ab,kf. |
| 16 | air quality.ti,ab,kf. |
| 17 | carbon monoxide.ti,ab,kf. |
| 18 | sulphur dioxide.ti,ab,kf. |
| 19 | sulfur dioxide.ti,ab,kf. |
| 20 | "SO2".ti,ab,kf. |
| 21 | nitrogen oxide\*.ti,ab,kf. |
| 22 | nitrogen dioxide.ti,ab,kf. |
| 23 | NOx.ti,ab,kf. |
| 24 | "NO2".ti,ab,kf. |
| 25 | ozone.ti,ab,kf. |
| 26 | "O3".ti,ab,kf. |
| 27 | particulate\*.ti,ab,kf. |
| 28 | black carbon.ti,ab,kf. |
| 29 | elemental carbon.ti,ab,kf. |
| 30 | organic carbon.ti,ab,kf. |
| 31 | "PM10".ti,ab,kf. |
| 32 | "PM2.5".ti,ab,kf. |
| 33 | (PAH not (pulmonary arterial hypertension or pulmonary artery hypertension or phenylalanine hydroxylase)).ti,ab,kf. |
| 34 | polycyclic aromatic hydrocarbon\*.ti,ab,kf. |
| 35 | (ultrafine and (fibre\* or particle\* or particulate\*)).ti,ab,kf. |
| 36 | UFPM.ti,ab,kf. |
| 37 | diesel.ti,ab,kf. |
| 38 | soot.ti,ab,kf. |
| 39 | smoke.ti,ab,kf. |
| 40 | smog.ti,ab,kf. |
| 41 | dust.ti,ab,kf. |
| 42 | (benzene or C6H6).ti,ab,kf. |
| 43 | (nickel or ni).ti,ab,kf. |
| 44 | pb.ti,ab,kf. |
| 45 | (cadmium or cd).ti,ab,kf. |
| 46 | arsenic.ti,ab,kf. |
| 47 | Maternal Exposure/ |
| 48 | pregnancy/ or maternal-fetal exchange/ or Prenatal Exposure Delayed Effects/ |
| 49 | Pregnant Women/ |
| 50 | Fetus/ |
| 51 | pregnancy trimesters/ or pregnancy trimester, first/ or pregnancy trimester, second/ or pregnancy trimester, third/  |
| 52 | Peripartum Period/ |
| 53 | Prenatal Care/ or Perinatal Care/ |
| 54 | pregnan\*.ti,ab,kf. |
| 55 | maternal-fetal.ti,ab,kf. |
| 56 | fetal-maternal.ti,ab,kf. |
| 57 | materno-fetal.ti,ab,kf. |
| 58 | materno-foetal.ti,ab,kf. |
| 59 | maternal-foetal.ti,ab,kf. |
| 60 | foetal-maternal.ti,ab,kf. |
| 61 | fetomaternal.ti,ab,kf. |
| 62 | perinatal.ti,ab,kf. |
| 63 | prenatal.ti,ab,kf. |
| 64 | antenatal.ti,ab,kf. |
| 65 | early life\*.ti,ab,kf. |
| 66 | gestation\*.ti,ab,kf. |
| 67 | foetus.ti,ab,kf. |
| 68 | fetus.ti,ab,kf. |
| 69 | fetal.ti,ab,kf. |
| 70 | foetal.ti,ab,kf. |
| 71 | intrauterine\*.ti,ab,kf. |
| 72 | intra-uterine\*.ti,ab,kf. |
| 73 | uterin\*.ti,ab,kf. |
| 74 | in utero.ti,ab,kf. |
| 75 | trimester\*.ti,ab,kf. |
| 76 | peripartum.ti,ab,kf. |
| 77 | (matern\* adj3 expos\*).ti,ab,kf. |
| 78 | (pre-birth or prebirth).ti,ab,kf. |
| 79 | "first 1000 days".ti,ab,kf. |
| 80 | "first 1,000 days".ti,ab,kf. |
| 81 | offspring.ti,ab,kf. |
| 82 | mother-child.ti,ab,kf. |
| 83 | mother-baby.ti,ab,kf. |
| 84 | (prepartum or pre-partum).ti,ab,kf. |
| 85 | antepartum.ti,ab,kf. |
| 86 | or/1-46 |
| 87 | or/47-85 |
| 88 | exp Respiratory Tract Infections/ |
| 89 | [exp Bronchitis/] |
| 90 | [exp Pneumonia/] |
| 91 | [Influenza, Human/] |
| 92 | [Lung Abscess/] |
| 93 | exp Pneumovirus Infections/ |
| 94 | exp Respirovirus Infections/ |
| 95 | Respiratory Syncytial Virus, Human/  |
| 96 | ((respiratory or respiration) adj3 infect\*).ti,ab,kf. |
| 97 | influenza.ti,ab,kf. |
| 98 | flu.ti,ab,kf. |
| 99 | acute respiratory.ti,ab,kf. |
| 100 | pneumon\*.ti,ab,kf. |
| 101 | bronchopneumon\*.ti,ab,kf. |
| 102 | pleuropneumon\*.ti,ab,kf. |
| 103 | LRTI.ti,ab,kf. |
| 104 | LRTIs.ti,ab,kf. |
| 105 | lower RTI.ti,ab,kf. |
| 106 | lower RTIs.ti,ab,kf. |
| 107 | (lung adj3 infect\*).ti,ab,kf. |
| 108 | (chest adj3 infect\*).ti,ab,kf. |
| 109 | (pulmonary adj3 infect\*).ti,ab,kf.  |
| 110 | (broncho\* adj3 infect\*).ti,ab,kf.  |
| 111 | (pleural adj3 infect\*).ti,ab,kf. |
| 112 | bronchio\*.ti,ab,kf. |
| 113 | bronchit\*.ti,ab,kf. |
| 114 | tracheobronchit\*.ti,ab,kf. |
| 115 | lower respiratory.ti,ab,kf. |
| 116 | (lung adj3 abscess\*).ti,ab,kf. |
| 117 | (pulmonary adj3 abscess\*).ti,ab,kf. |
| 118 | or/88-117 |
| 119 | 86 and 87 and 118  |

## Web of Science Core Collection

|  |  |
| --- | --- |
| **#** | **Query** |
| 1 | TS=(Pb) |
| 2 | TS=(arsenic)  |
| 3 | (TS=(Cadmium)) OR TS=(Cd)  |
| 4 | (TS=(nickel)) OR TS=(Ni)  |
| 5 | (TS=(benzene)) OR TS=(C6H6)  |
| 6 | TS=(diesel) Results: 88512  |
| 7 | TS=(UFPM) Results: 32  |
| 8 | TS=((air or atmosphere or ambient or outdoor or urban) and pollut\*)  |
| 9 | TS=((environment\* or traffic\* or vehic\*) and (pollut\* or emission\*))  |
| 10 | TS=("air quality")  |
| 11 | TS=("carbon monoxide")  |
| 12 | TS=("sulphur dioxide")  |
| 13 | TS=("sulfur dioxide")  |
| 14 | TS=("SO2")  |
| 15 | TS=("nitrogen oxide\*")  |
| 16 | TS=(nitrogen dioxide)  |
| 17 | TS=("NOx")  |
| 18 | TS=("NO2")  |
| 19 | TS=(ozone)  |
| 20 | TS=("O3")  |
| 21 | TS=(particulate\*)  |
| 22 | TS=("black carbon")  |
| 23 | TS=("elemental carbon")  |
| 24 | TS=("organic carbon")  |
| 25 | TS=("PM10")  |
| 26 | TS=("PM2.5")  |
| 27 | TS=(PAH not ("pulmonary arterial hypertension" or "pulmonary artery hypertension" or "phenylalanine hydroxylase")) |
| 28 | TS=("polycyclic aromatic hydrocarbon\*")  |
| 29 | TS=(ultrafine and (fibre\* or particle\* or particulate\*))  |
| 30 | TS=(soot)  |
| 31 | TS=(smoke)  |
| 32 | TS=(smog)  |
| 33 | TS=(dust)  |
| 34 | #33 OR #32 OR #31 OR #30 OR #29 OR #28 OR #27 OR #26 OR #25 OR #24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1 |
| 35 | TS=((respiratory or respiration) near/3 infect\*) Results: 71242  |
| 36 | TS=(tracheobronchit\*)  |
| 37 | TS=(pleural\* near/3 infect\*)  |
| 38 | TS=(broncho\* near/3 infect\*)  |
| 39 | TS=("lower RTI")  |
| 40 | TS=("lower RTIs")  |
| 41 | TS=(flu)  |
| 42 | TS=(influenza)  |
| 43 | TS=("acute respiratory")  |
| 44 | TS=(pneumon\*)  |
| 45 | TS=(bronchopneumon\*)  |
| 46 | TS=(pleuropneumon\*)  |
| 47 | TS=("LRTIs")  |
| 48 | TS=("LRTI")  |
| 49 | TS=(lung near/3 infect\*)  |
| 50 | TS=(chest near/3 infect\*)  |
| 51 | TS=(pulmonary near/3 infect\*)  |
| 52 | TS=(bronchio\*)  |
| 53 | TS=(bronchit\*)  |
| 54 | TS=("lower respiratory")  |
| 55 | TS=(lung near/3 abscess\*)  |
| 56 | TS=(pulmonary near/3 abscess\*)  |
| 57 | #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 |
| 58 | TS=(antenatal)  |
| 59 | TS=(pre-partum)  |
| 60 | TS=(prepartum)  |
| 61 | TS=(antepartum)  |
| 62 | TS=("first 1,000 days")  |
| 63 | TS=("first 1000 days")  |
| 64 | TS=(pre-birth or prebirth)  |
| 65 | TS=(matern\* near/3 expos\*)  |
| 66 | TS=(peripartum)  |
| 67 | TS=(trimester\*)  |
| 68 | TS=("in utero")  |
| 69 | TS=(uterin\*)  |
| 70 | TS=(intra-uterine\*)  |
| 71 | TS=(intrauterine\*)  |
| 72 | TS=(foetal)  |
| 73 | TS=(fetal)  |
| 74 | TS=(fetus)  |
| 75 | TS=(foetus)  |
| 76 | TS=(gestation\*)  |
| 77 | TS=(prenatal)  |
| 78 | TS=("early life\*")  |
| 79 | TS=(materno-foetal)  |
| 80 | TS=(perinatal)  |
| 81 | TS=(foetal-maternal)  |
| 82 | TS=(maternal-foetal)  |
| 83 | TS=(fetal-maternal)  |
| 84 | TS=(materno-fetal)  |
| 85 | TS=(maternal-fetal)  |
| 86 | TS=(pregnan\*)  |
| 87 | TS=(offspring)  |
| 88 | TS=(mother-child)  |
| 89 | TS=(mother-baby)  |
| 90 | TS=(fetomaternal)  |
| 91 | #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74 OR #75 OR #76 OR #77 OR #78 OR #79 OR #80 OR #81 OR #82 OR #83 OR #84 OR #85 OR #86 OR #87 OR #88 OR #89 OR #90 |
| 92 | #91 AND #57 AND #34  |

## Embase Classic+Embase

|  |  |
| --- | --- |
| **#** | **Query** |
| 1 | pollutant/ or exp air pollutant/ |
| 2 | pollution/ or exp air pollution/ or traffic pollution/ |
| 3 | exp particulate matter/ |
| 4 | exp particulate matter exposure/ |
| 5 | environmental exposure/ or environmental monitoring/ or air monitoring/ or exposure/ |
| 6 | carbon dioxide/ or carbon monoxide/ or nitrogen oxide/ or nitrogen dioxide/ or sulfur oxide/ or sulfur dioxide/ |
| 7 | Ozone/ |
| 8 | exp Polycyclic Aromatic Hydrocarbons/ |
| 9 | Lead/ |
| 10 | dust/ |
| 11 | Benzene/ |
| 12 | Nickel/ |
| 13 | Cadmium/ |
| 14 | Arsenic/ |
| 15 | ((air or atmosphere or ambient or outdoor or urban) and pollut\*).ti,ab,kf. |
| 16 | ((environment\* or traffic\* or vehic\*) and (pollut\* or emission\*)).ti,ab,kf. |
| 17 | air quality.ti,ab,kf. |
| 18 | carbon monoxide.ti,ab,kf. |
| 19 | sulphur dioxide.ti,ab,kf. |
| 20 | sulfur dioxide.ti,ab,kf. |
| 21 | "SO2".ti,ab,kf. |
| 22 | nitrogen oxide\*.ti,ab,kf. |
| 23 | nitrogen dioxide.ti,ab,kf. |
| 24 | NOx.ti,ab,kf. |
| 25 | "NO2".ti,ab,kf. |
| 26 | ozone.ti,ab,kf. |
| 27 | "O3".ti,ab,kf. |
| 28 | particulate\*.ti,ab,kf. |
| 29 | black carbon.ti,ab,kf. |
| 30 | elemental carbon.ti,ab,kf. |
| 31 | organic carbon.ti,ab,kf. |
| 32 | "PM10".ti,ab,kf. |
| 33 | "PM2.5".ti,ab,kf. |
| 34 | (PAH not (pulmonary arterial hypertension or pulmonary artery hypertension or phenylalanine hydroxylase)).ti,ab,kf. |
| 35 | polycyclic aromatic hydrocarbon\*.ti,ab,kf. |
| 36 | (ultrafine and (fibre\* or particle\* or particulate\*)).ti,ab,kf. |
| 37 | UFPM.ti,ab,kf. |
| 38 | diesel.ti,ab,kf. |
| 39 | soot.ti,ab,kf. |
| 40 | smoke.ti,ab,kf. |
| 41 | smog.ti,ab,kf. |
| 42 | dust.ti,ab,kf. |
| 43 | (benzene or C6H6).ti,ab,kf. |
| 44 | (nickel or ni).ti,ab,kf. |
| 45 | (cadmium or cd).ti,ab,kf. |
| 46 | arsenic.ti,ab,kf. |
| 47 | pb.ti,ab,kf. |
| 48 | Maternal Exposure/ |
| 49 | pregnancy/ or fetomaternal transfusion/ |
| 50 | Pregnant Woman/ |
| 51 | Fetus/ |
| 52 | first trimester pregnancy/ or second trimester pregnancy/ or third trimester pregnancy/ |
| 53 | perinatal period/ or prenatal period/ |
| 54 | prenatal care/ or perinatal care/ |
| 55 | perinatal exposure/ or prenatal exposure/ |
| 56 | pregnan\*.ti,ab,kf. |
| 57 | maternal-fetal.ti,ab,kf. |
| 58 | fetal-maternal.ti,ab,kf. |
| 59 | materno-fetal.ti,ab,kf. |
| 60 | materno-foetal.ti,ab,kf. |
| 61 | maternal-foetal.ti,ab,kf. |
| 62 | foetal-maternal.ti,ab,kf. |
| 63 | fetomaternal.ti,ab,kf. |
| 64 | perinatal.ti,ab,kf. |
| 65 | prenatal.ti,ab,kf. |
| 66 | antenatal.ti,ab,kf. |
| 67 | early life\*.ti,ab,kf. |
| 68 | gestation\*.ti,ab,kf. |
| 69 | foetus.ti,ab,kf. |
| 70 | fetus.ti,ab,kf. |
| 71 | fetal.ti,ab,kf.  |
| 72 | foetal.ti,ab,kf.  |
| 73 | intrauterine\*.ti,ab,kf.  |
| 74 | intra-uterine\*.ti,ab,kf.  |
| 75 | uterin\*.ti,ab,kf.  |
| 76 | in utero.ti,ab,kf.  |
| 77 | trimester\*.ti,ab,kf.  |
| 78 | peripartum.ti,ab,kf.  |
| 79 | (matern\* adj3 expos\*).ti,ab,kf.  |
| 80 | (pre-birth or prebirth).ti,ab,kf.  |
| 81 | "first 1000 days".ti,ab,kf.  |
| 82 | "first 1,000 days".ti,ab,kf.  |
| 83 | offspring.ti,ab,kf.  |
| 84 | mother-child.ti,ab,kf.  |
| 85 | mother-baby.ti,ab,kf.  |
| 86 | (prepartum or pre-partum).ti,ab,kf.  |
| 87 | antepartum.ti,ab,kf.  |
| 88 | or/1-47  |
| 89 | or/48-87  |
| 90 | exp respiratory tract infection/  |
| 91 | exp bronchitis/  |
| 92 | exp pneumonia/  |
| 93 | [Influenza, Human/]  |
| 94 | [Lung Abscess/]  |
| 95 | exp Pneumovirus infection/  |
| 96 | exp Respirovirus infection/  |
| 97 | exp Human respiratory syncytial virus/  |
| 98 | ((respiratory or respiration) adj3 infect\*).ti,ab,kf.  |
| 99 | influenza.ti,ab,kf.  |
| 100 | flu.ti,ab,kf.  |
| 101 | acute respiratory.ti,ab,kf.  |
| 102 | pneumon\*.ti,ab,kf.  |
| 103 | bronchopneumon\*.ti,ab,kf.  |
| 104 | pleuropneumon\*.ti,ab,kf.  |
| 105 | LRTI.ti,ab,kf.  |
| 106 | LRTIs.ti,ab,kf.  |
| 107 | lower RTI.ti,ab,kf.  |
| 108 | lower RTIs.ti,ab,kf.  |
| 109 | (lung adj3 infect\*).ti,ab,kf.  |
| 110 | (chest adj3 infect\*).ti,ab,kf.  |
| 111 | (pulmonary adj3 infect\*).ti,ab,kf.  |
| 112 | (broncho\* adj3 infect\*).ti,ab,kf.  |
| 113 | (pleural adj3 infect\*).ti,ab,kf.  |
| 114 | bronchio\*.ti,ab,kf.  |
| 115 | bronchit\*.ti,ab,kf.  |
| 116 | tracheobronchit\*.ti,ab,kf.  |
| 117 | lower respiratory.ti,ab,kf.  |
| 118 | (lung adj3 abscess\*).ti,ab,kf.  |
| 119 | (pulmonary adj3 abscess\*).ti,ab,kf.  |
| 120 | or/90-119  |
| 121 | 88 and 89 and 120  |

## Global Health

|  |  |
| --- | --- |
| **#** | **Query** |
| 1 | pollutants/ or emissions/ or exp air pollutants/ |
| 2 | pollution/ or exp air pollution/ or air quality/ or exhaust gases/ |
| 3 | [exp Particulate Matter/] |
| 4 | vehicle emissions/ |
| 5 | exposure/ |
| 6 | carbon dioxide/ or carbon monoxide/ or nitrogen dioxide/ or nitrogen oxides/ or sulfur dioxide/ |
| 7 | Ozone/ |
| 8 | exp polycyclic aromatic hydrocarbons/ |
| 9 | lead/ |
| 10 | smoke/ or dust/ |
| 11 | benzene/ |
| 12 | nickel/ |
| 13 | Cadmium/ |
| 14 | Arsenic/ |
| 15 | ((air or atmosphere or ambient or outdoor or urban) and pollut\*).ti,ab. |
| 16 | ((environment\* or traffic\* or vehic\*) and (pollut\* or emission\*)).ti,ab. |
| 17 | air quality.ti,ab. |
| 18 | carbon monoxide.ti,ab. |
| 19 | sulphur dioxide.ti,ab. |
| 20 | sulfur dioxide.ti,ab. |
| 21 | "SO2".ti,ab. |
| 22 | nitrogen oxide\*.ti,ab. |
| 23 | nitrogen dioxide.ti,ab. |
| 24 | NOx.ti,ab. |
| 25 | "NO2".ti,ab. |
| 26 | ozone.ti,ab. |
| 27 | "O3".ti,ab. |
| 28 | particulate\*.ti,ab. |
| 29 | black carbon.ti,ab. |
| 30 | elemental carbon.ti,ab. |
| 31 | organic carbon.ti,ab. |
| 32 | "PM10".ti,ab. |
| 33 | "PM2.5".ti,ab. |
| 34 | (PAH not (pulmonary arterial hypertension or pulmonary artery hypertension or phenylalanine hydroxylase)).ti,ab. |
| 35 | polycyclic aromatic hydrocarbon\*.ti,ab. |
| 36 | (ultrafine and (fibre\* or particle\* or particulate\*)).ti,ab. |
| 37 | UFPM.ti,ab. |
| 38 | diesel.ti,ab. |
| 39 | soot.ti,ab. |
| 40 | smoke.ti,ab. |
| 41 | smog.ti,ab. |
| 42 | dust.ti,ab. |
| 43 | (benzene or C6H6).ti,ab. |
| 44 | (nickel or ni).ti,ab. |
| 45 | (cadmium or cd).ti,ab. |
| 46 | arsenic.ti,ab. |
| 47 | pb.ti,ab. |
| 48 | [Maternal Exposure/] |
| 49 | pregnancy/ or maternal-fetal exchange/ |
| 50 | Pregnant Women/ |
| 51 | Fetus/ |
| 52 | [pregnancy trimesters/ or pregnancy trimester, first/ or pregnancy trimester, second/ or pregnancy trimester, third/] |
| 53 | prenatal period/ or prepartum period/ |
| 54 | prenatal care/ |
| 55 | [prenatal development/] |
| 56 | pregnan\*.ti,ab. |
| 57 | maternal-fetal.ti,ab. |
| 58 | fetal-maternal.ti,ab. |
| 59 | materno-fetal.ti,ab. |
| 60 | materno-foetal.ti,ab. |
| 61 | maternal-foetal.ti,ab. |
| 62 | foetal-maternal.ti,ab. |
| 63 | fetomaternal.ti,ab. |
| 64 | perinatal.ti,ab. |
| 65 | prenatal.ti,ab. |
| 66 | antenatal.ti,ab. |
| 67 | early life\*.ti,ab. |
| 68 | gestation\*.ti,ab. |
| 69 | foetus.ti,ab. |
| 70 | fetus.ti,ab. |
| 71 | fetal.ti,ab. |
| 72 | foetal.ti,ab. |
| 73 | intrauterine\*.ti,ab. |
| 74 | intra-uterine\*.ti,ab. |
| 75 | uterin\*.ti,ab. |
| 76 | in utero.ti,ab. |
| 77 | trimester\*.ti,ab. |
| 78 | peripartum.ti,ab. |
| 79 | (matern\* adj3 expos\*).ti,ab. |
| 80 | (pre-birth or prebirth).ti,ab. |
| 81 | "first 1000 days".ti,ab. |
| 82 | "first 1,000 days".ti,ab. |
| 83 | offspring.ti,ab. |
| 84 | mother-child.ti,ab. |
| 85 | mother-baby.ti,ab. |
| 86 | (prepartum or pre-partum).ti,ab. |
| 87 | antepartum.ti,ab. |
| 88 | or/1-47 |
| 89 | or/48-87 |
| 90 | exp lower respiratory tract infections/ |
| 91 | bronchiolitis/ or bronchitis/ |
| 92 | exp Pneumonia/ |
| 93 | exp influenza/ |
| 94 | [Lung Abscess/] |
| 95 | pneumovirus/ |
| 96 | exp respirovirus/ |
| 97 | human respiratory syncytial virus/ |
| 98 | ((respiratory or respiration) adj3 infect\*).ti,ab. |
| 99 | influenza.ti,ab. |
| 100 | flu.ti,ab. |
| 101 | acute respiratory.ti,ab. |
| 102 | pneumon\*.ti,ab. |
| 103 | bronchopneumon\*.ti,ab. |
| 104 | pleuropneumon\*.ti,ab. |
| 105 | LRTI.ti,ab. |
| 106 | LRTIs.ti,ab. |
| 107 | lower RTI.ti,ab. |
| 108 | lower RTIs.ti,ab. |
| 109 | (lung adj3 infect\*).ti,ab. |
| 110 | (chest adj3 infect\*).ti,ab. |
| 111 | (pulmonary adj3 infect\*).ti,ab. |
| 112 | (broncho\* adj3 infect\*).ti,ab. |
| 113 | (pleural adj3 infect\*).ti,ab. |
| 114 | bronchio\*.ti,ab. |
| 115 | bronchit\*.ti,ab. |
| 116 | tracheobronchit\*.ti,ab. |
| 117 | lower respiratory.ti,ab. |
| 118 | (lung adj3 abscess\*).ti,ab. |
| 119 | (pulmonary adj3 abscess\*).ti,ab. |
| 120 | or/90-119 |
| 121 | 88 and 89 and 120 |

## CINAHL Complete

|  |  |
| --- | --- |
| S1 | (MH "Environmental Pollutants") OR (MH "Air Pollutants+") |
| S2 | (MH "Environmental Pollution")  |
| S3 | (MH "Air Pollution") OR (MH "Motor Vehicle Emissions") OR (MH "Particulate Matter+") |
| S4 | (MH "Environmental Exposure") OR (MH "Environmental Monitoring") OR (MH "Inhalation Exposure") |
| S5 | (MH "Traffic Pollution")  |
| S6 | (MH "Carbon Dioxide") OR (MH "Carbon Monoxide") OR (MH "Nitrogen Oxides") |
| S7 | (MH "Ozone")  |
| S8 | (MH "Polycyclic Hydrocarbons, Aromatic")  |
| S9 | (MH "Lead")  |
| S10 | (MH "Smog") OR (MH "Smoke")  |
| S11 | (air or atmosphere or ambient or outdoor or urban) and pollut\* |
| S12 | (environment\* or traffic\* or vehic\*) and (pollut\* or emission\*) |
| S13 | "air quality"  |
| S14 | "carbon monoxide"  |
| S15 | "sulphur dioxide"  |
| S16 | "sulfur dioxide"  |
| S17 | "SO2"  |
| S18 | "nitrogen oxide\*"  |
| S19 | "nitrogen dioxide\*"  |
| S20 | "NOx"  |
| S21 | "NO2"  |
| S22 | ozone  |
| S23 | "O3"  |
| S24 | particulate\*  |
| S25 | "black carbon"  |
| S26 | "elemental carbon"  |
| S27 | "organic carbon"  |
| S28 | "PM10"  |
| S29 | "PM2.5"  |
| S30 | PAH not ("pulmonary arterial hypertension" or "pulmonary artery hypertension" or "phenylalanine hydroxylase") |
| S31 | "polycyclic aromatic hydrocarbon\*"  |
| S32 | ultrafine and (fibre\* or particle\* or particulate\*)  |
| S33 | UFPM  |
| S34 | diesel  |
| S35 | soot  |
| S36 | smoke  |
| S37 | smog  |
| S38 | dust  |
| S39 | (MH "Nickel")  |
| S40 | (MH "Cadmium")  |
| S41 | (MH "Arsenic")  |
| S42 | benzene or C6H6  |
| S43 | nickel or Ni  |
| S44 | cadmium or Cd  |
| S45 | arsenic  |
| S46 | Pb  |
| S47 | S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46  |
| S48 | (MH "Maternal Exposure")  |
| S49 | (MH "Pregnancy")  |
| S50 | (MH "Maternal-Fetal Exchange")  |
| S51 | (MH "Maternal-Fetal Exchange") or (MH "Prenatal Exposure Delayed Effects") |
| S52 | (MH "Expectant Mothers")  |
| S53 | (MH "Fetus")  |
| S54 | (MH "Pregnancy Trimesters") OR (MH "Pregnancy Trimester, First") OR (MH "Pregnancy Trimester, Second") OR (MH "Pregnancy Trimester, Third") |
| S55 | (MH "Perinatal Period")  |
| S56 | (MH "Prenatal Care") OR (MH "Perinatal Care")  |
| S57 | pregnan\*  |
| S58 | maternal-fetal  |
| S59 | fetal-maternal  |
| S60 | materno-fetal  |
| S61 | materno-foetal  |
| S62 | maternal-foetal  |
| S63 | foetal-maternal  |
| S64 | perinatal  |
| S65 | prenatal  |
| S66 | antenatal  |
| S67 | "early life\*"  |
| S68 | gestation\*"  |
| S69 | foetus  |
| S70 | fetus  |
| S71 | fetal  |
| S72 | foetal  |
| S73 | intrauterine\*  |
| S74 | intra-uterine\*  |
| S75 | uterin\*  |
| S76 | "in utero"  |
| S77 | trimester\*  |
| S78 | peripartum  |
| S79 | matern\* N3 expos\*  |
| S80 | "pre birth"  |
| S81 | pre-birth  |
| S82 | "first 1000 days"  |
| S83 | "first 1,000 days"  |
| S84 | offspring  |
| S85 | mother-child  |
| S86 | mother-baby  |
| S87 | prepartum  |
| S88 | pre-partum  |
| S89 | antepartum  |
| S90 | fetomaternal  |
| S91 | S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56 OR S57 OR S58 OR S59 OR S60 OR S61 OR S62 OR S63 OR S64 OR S65 OR S66 OR S67 OR S68 OR S69 OR S70 OR S71 OR S72 OR S73 OR S74 OR S75 OR S76 OR S77 OR S78 OR S79 OR S80 OR S81 OR S82 OR S83 OR S84 OR S85 OR S86 OR S87 OR S88 OR S89 OR S90  |
| S92 | (MH "Respiratory Tract Infections+")  |
| S93 | (MH "Respiratory Syncytial Virus Infections") |
| S94 | (respiratory OR respiration) N3 infect\*  |
| S95 | influenza  |
| S96 | "acute respiratory"  |
| S97 | pneumon\*  |
| S98 | bronchopneumon\*  |
| S99 | pleuropneumon\*  |
| S100 | LRTI  |
| S101 | LRTIs  |
| S102 | lung N3 infect\*  |
| S103 | chest N3 infect\*  |
| S104 | pulmonary N3 infect\*  |
| S105 | bronchit\*  |
| S106 | bronchio\*  |
| S107 | "lower respiratory"  |
| S108 | lung N3 abscess  |
| S109 | pulmonary N3 abscess  |
| S110 | flu  |
| S111 | "lower RTI"  |
| S112 | "lower RTIs"  |
| S113 | broncho\* N3 infect\*  |
| S114 | pleural N3 infect\*  |
| S115 | tracheobronchit\*  |
| S116 | S92 OR S93 OR S94 OR S95 OR S96 OR S97 OR S98 OR S99 OR S100 OR S101 OR S102 OR S103 OR S104 OR S105 OR S106 OR S107 OR S108 OR S109 OR S110 OR S111 OR S112 OR S113 OR S114 OR S115  |
| S117 | S47 AND S91 AND S116  |

# Supplementary Figures

## Figure A.1: PRISMA Flow Diagram for Search 1 and Search 2 separately



## Figure A.2: Distribution of risk of bias of the included publications (n = 16) by criteria using the Office of Health Assessment and Translation (OHAT) risk of bias tool



# Supplementary Tables

## Table A.1: Criteria for the risk of bias assessment of each study (based on the tool developed by the Office of Health Assessment and Translation)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Bias** | **Question (and key considerations)** | **Ratings** |
| Key criteria | Confounding Bias | Did the study design or analysis account for important confounding and modifying variables?*Key confounders: proxies of socioeconomic status, environmental tobacco smoking, indoor home environment, and postnatal air pollution exposures* | ++: Study accounted for all important confounders which were measured consistently+: Study accounted for most of confounders AND is not expected to introduce bias-: Study accounted for some but not all of confounders (minimum two key confounders)--: Study did not account for potential confounders OR were inappropriately measured   |
| Detection bias, exposure assessment | Can we be confident in the exposure characterization?*Major considerations: 1) accuracy of information on pregnancy location (++: exposure estimates account for residential mobility during pregnancy, +: exposure estimated for actual pregnancy address) 2) frequency of exposure measurement (++: minimum daily) 3) spatial resolution (-: ecological exposures such as regional/ national averages)* | ++: There is direct evidence that exposure was consistently assessed  using valid, reliable, and sensitive methods (studies meet ++ criteria for consideration 1 and 2)+: There is indirect evidence that exposure was consistently assessed using valid, reliable, and sensitive methods (studies do not meet ++ criteria for consideration 1 and 2, but meet + criteria)-: There was insufficient information to permit a judgment of high risk of bias, but there is indirect evidence that suggests high risk of bias (studies do not meet ++/+ criteria for consideration 1 and 2 OR meet - criteria for consideration 3)--: There was direct evidence of high risk of misclassification bias (e.g., self-reports) |
| Detection bias, outcome assessment | Can we be confident in the outcome assessment?*To be considered low or probably low risk, outcome needed to be measured consistently (e.g., same length of follow-up across study groups).*  | ++: Outcome extracted from medical records using ICD codes+: Outcome directly assed by a clinician-: Outcome ascertained by a clinician but diagnosis self-reported (e.g. by caregivers)--: Outcome assessed by self-reports (e.g. caregivers reporting symptoms) |
| Other criteria | Selection bias | Did selection of study participants result in appropriate comparison groups and is the sample representative of the target population?*Co: Subjects in the comparison groups similar and subjects sampled representative of the target population.**CaCo: Cases and controls similar, recruitment methods and timeframe similar, and controls described as having no history of the outcome.* | ++: The descriptions of the studied population were sufficiently detailed to support the assertion that risk of selection effects was minimal+: There was insufficient information about population selection to permit a judgment of low risk of bias, but there was indirect evidence that suggests low risk of bias-: There was insufficient information about population selection to permit a judgment of high risk of bias, but there was indirect evidence that suggests high risk of bias--: There were indications from descriptions of the studied population of high risk of bias |
| Attrition/Exclusion Bias | Were outcome data complete without attrition or exclusion from analysis? | ++: Complete outcome data (without attrition or exclusion) or reasons formissing (or exclusion of) subjects unlikely to be related to outcome (or exposure) +: Some missing outcome data but sufficient information provided about subjects lost/removed AND unlikely to introduce bias-: Indirect evidence that loss of subjects was unacceptably high or inadequately addressed (e.g., response rates not reported)--: Direct evidence that loss of subjects was not adequately addressed (e.g., exclusions linked to true outcome) |
| Selective Reporting Bias | Were all measured outcomes reported? | ++: All of the studies pre-specified outcomes and findings were reported +: Indirect evidence that suggests study was free of selective reporting (e.g., post-hoc modifications clearly labelled and unlikely to introduce bias)-: Indirect evidence that study was not free of selective reporting (including some of the outcomes/analyses reported but not specified in abstract, intro, or methods)--: Direct evidence of some of the specified outcomes/findings not reported. |
| Other Sources of Bias | Were there no other potential threats to internal validity (e.g., statistical methods were appropriate and researchers adhered to the study protocol)?*Some potential sources of bias: no description of how confounders were selected, no sensitivity analyses (despite being warranted), no statement on how findings were interpreted when multiple models were presented.* | ++: No other sources of bias+: There was insufficient information to judge for low risk, but indirect evidence suggests study was free of other problems-: There insufficient information to judge for high risk, but indirect evidence suggests study was not free of other problems--: There was at least one important risk of bias |
| Definitely low risk of bias (++), Probably low risk of bias (+), Probably high risk of bias (-; NR: not reported), Definitely high risk of bias (--) |

**Criteria was adapted from:**

Ziou, M., Tham, R., Wheeler, A. J., Zosky, G. R., Stephens, N., & Johnston, F. H. (2022). Outdoor particulate matter exposure and upper respiratory tract infections in children and adolescents: A systematic review and meta-analysis. Environmental Research, 210, 112969. https://doi.org/10.1016/J.ENVRES.2022.112969

## Table A.2: Records ineligible for synthesis (with reasons for exclusion)

|  |  |
| --- | --- |
| **Reference** | **Reason for exclusion** |
| (Bai et al., 2024) | Wrong outcome |
| (Beamer et al., 2010) | Wrong publication type (conference abstract) |
| (Boland et al., 2018) | Wrong population (adults) |
| (Chaudhary et al., 2023) | Wrong outcome (acute respiratory infections, not just LRTIs) |
| (Chen et al., 2023) | Wrong exposure |
| (Crow et al., 2024) | Wrong exposure (indoor air pollution) |
| (Dorj et al., 2016) | Wrong publication type (conference abstract) |
| (Fuertes et al., 2014) | Wrong exposure window (after birth) |
| (Guillien et al., 2024) | Wrong outcome |
| (Jedrychowski et al., 2005) | Wrong outcome (respiratory symptoms, not just LRTIs) |
| (Jedrychowski et al., 2008) | Wrong outcome (respiratory symptoms, not just LRTIs) |
| (Lanari et al., 2015) | Wrong exposure window (after pregnancy) |
| (Lanari et al., 2016) | Wrong exposure window (after pregnancy) |
| (Lavaine and Neidell, 2017) | Wrong exposure window (after pregnancy) |
| (Leem et al., 2011) | Wrong publication type (conference abstract) |
| (Lu et al., 2022) | Wrong exposure (home environmental factors) |
| (Lu et al., 2023) | Wrong exposure (meteorological) |
| (Moncrieff, 1961) | Wrong publication type (review) |
| (Nicolle-Mir, 2016) | Wrong exposure (water contamination) |
| (Nicolle-Mir, 2018) | Wrong publication type |
| (Polańska et al., 2016) | Wrong outcome |
| (Rice et al., 2015) | Wrong outcome |
| (Smith, 1975) | Wrong publication type (review) |
| (Soesanti et al., 2024) | Wrong exposure period (perinatal) |
| (Spengler et al., 2004) | Wrong exposure window (after pregnancy) |
| (Spivey, 2011) | Wrong exposure |
| (Sram et al., 2013) | Wrong publication type |
| (Stelmach et al., 2018) | Wrong publication type (conference abstract) |
| (Takashima et al., 2024) | Wrong outcome (nasal acquisition of pathogens) |
| (Tischer et al., 2018) | Wrong exposure window (after pregnancy) |
| (Toure et al., 2019) | Wrong exposure window (after pregnancy) |
| (von Hinke and Sørensen, 2023) | Wrong population (adults) |
| (Yang et al., 2020) | Wrong outcome (upper and lower respiratory tract infections) |
| (Ziou et al., 2023a) | Wrong outcome (respiratory-related infections, not just LRTIs) |
| (Ziou et al., 2023b) | Wrong outcome (GP presentations and prescription dispensing) |

## References Table A.2

Bai, S., Zhang, J., Cui, L., Du, S., Lin, S., Liang, Y., Liu, Y., Wang, Z., 2024. The joint effect of cumulative doses for outdoor air pollutants exposure in early life on asthma and wheezing among young children. Ecotoxicol Environ Saf 273, 116097. https://doi.org/10.1016/J.ECOENV.2024.116097

Beamer, P.I., Ascher, R.I., Stern, D.A., Sherrill, D.L., Wright, A.L., Martinez, F.D., 2010. Spatial Relation Of Diesel-Related Pollutants And Early Childhood Respiratory Illnesses And Wheezing In Tucson, Arizona. American Thoracic Society International Conference Meetings Abstracts American Thoracic Society International Conference Meetings Abstracts A1897–A1897. https://doi.org/10.1164/AJRCCM-CONFERENCE.2010.181.1\_MEETINGABSTRACTS.A1897

Boland, M.R., Parhi, P., Li, L., Miotto, R., Carro, R., Iqba, U., Nguyen, P.A., Schuemie, M., You, S.C., Smith, D., Mooney, S., Ryan, P., Li, Y.C., Park, R.W., Denny, J., Dudley, J.T., Hripcsak, G., Gentine, P., Tatonetti, N.P., 2018. Uncovering exposures responsible for birth season – disease effects: a global study. Journal of the American Medical Informatics Association 25, 275–288. https://doi.org/10.1093/JAMIA/OCX105

Chaudhary, E., George, F., Saji, A., Dey, S., Ghosh, S., Thomas, T., Kurpad, A. V., Sharma, S., Singh, N., Agarwal, S., Mehta, U., 2023. Cumulative effect of PM2.5 components is larger than the effect of PM2.5 mass on child health in India. Nat Commun 14, 1234567890. https://doi.org/10.1038/S41467-023-42709-1

Chen, P.S., Tsai, Y.F., Yu, H.R., Hung, C.H., Chen, W.Y., Lin, C.W., Lee, J., Chen, C.A., Tsai, H.J., Wang, J.Y., 2023. Association between prenatal and neonatal risk factors and development of bronchiolitis in early life. Asia Pac Allergy 13, 10. https://doi.org/10.5415/APALLERGY.0000000000000002

Crow, R., Satav, A., Potdar, V., Satav, S., Dani, V., Simões, E.A.F., 2024. Risk factors for the development of severe or very severe respiratory syncytial virus-related lower respiratory tract infection in Indian infants: A cohort study in Melghat, India. Tropical Medicine & International Health. https://doi.org/10.1111/TMI.14003

Dorj, G., Dorj, G., Gendenragchaa, B., Sanjjav, T., 2016. Influence of Air Pollution on Some Pregnancy Outcomes and Burden of Pneumonia on Children Under Five Years Old in Mongolia. Value in Health 19, A379–A380. https://doi.org/10.1016/j.jval.2016.09.191

Fuertes, E., MacIntyre, E., Agius, R., Beelen, R., Brunekreef, B., Bucci, S., Cesaroni, G., Cirach, M., Cyrys, J., Forastiere, F., Gehring, U., Gruzieva, O., Hoffmann, B., Jedynska, A., Keuken, M., Klümper, C., Kooter, I., Korek, M., Krämer, U., Mölter, A., Nieuwenhuijsen, M., Pershagen, G., Porta, D., Postma, D.S., Simpson, A., Smit, H.A., Sugiri, D., Sunyer, J., Wang, M., Heinrich, J., 2014. Associations between particulate matter elements and early-life pneumonia in seven birth cohorts: Results from the ESCAPE and TRANSPHORM projects. Int J Hyg Environ Health 217, 819–829. https://doi.org/10.1016/J.IJHEH.2014.05.004

Guillien, A., Slama, R., Andrusaityte, S., Casas, M., Chatzi, L., de Castro, M., de Lauzon-Guillain, B., Granum, B., Grazuleviciene, R., Julvez, J., Krog, N.H., Lepeule, J., Maitre, L., McEachan, R., Nieuwenhuijsen, M., Oftedal, B., Urquiza, J., Vafeiadi, M., Wright, J., Vrijheid, M., Basagaña, X., Siroux, V., 2024. Associations between combined urban and lifestyle factors and respiratory health in European children. Environ Res 242, 117774. https://doi.org/10.1016/J.ENVRES.2023.117774

Jedrychowski, W., Flak, E., Mroz, E., Pac, A., Jacek, R., Sochacka-Tatara, E., Spengler, J., Rauh, V., Perera, F., 2008. Modulating effects of maternal fish consumption on the occurrence of respiratory symptoms in early infancy attributed to prenatal exposure to fine particles. Ann Nutr Metab 52, 8–16. https://doi.org/10.1159/000114289

Jedrychowski, W., Galas, A., Pac, A., Flak, E., Camman, D., Rauh, V., Perera, F., 2005. Prenatal Ambient Air Exposure to Polycyclic Aromatic Hydrocarbons and the Occurrence of Respiratory Symptoms over the First Year of Life. Eur J Epidemiol 20, 775–782. https://doi.org/10.1007/s10654-005-1048-l

Lanari, M., Prinelli, F., Adorni, F., Di Santo, S., Vandini, S., Silvestri, M., Musicco, M., Faldella, G., Spinelli, M., Corsello, G., Gabriele, B., La Forgia, N., Loprieno, S., Boldrini, A., Vuerich, M., Del Vecchio, A., Bertino, E., Fabris, C., Coscia, A., Fanos, V., Puddu, M., Gargano, G., Braibanti, S., Corso, G., Orfeo, L., De Luca, M.G., Paolillo, P., Fabiano, A., Barberi, I., Arco, A., Barboni, G., Molinari, L., Bonomi, A., Ladetto, L., Carlucci, A., Zorzi, G., Dall’agnola, A., Girardi, E., Di Fabio, S., Faccia, P., Bottau, P., Macagno, F., Ellero, S., Magaldi, R., Rinaldi, M., Memo, L., Nicolini, G., Ngalikpima, C.J., Nosari, N., Sarnelli, P., Parmigiani, S., Agosti, M., Negri, C., Corona, M.F., Piano, F., Scarcella, A., Umbaldo, A., De Curtis, M., Natale, F., Aurilia, C., Romagnoli, C., 2015. Risk factors for bronchiolitis hospitalization during the first year of life in a multicenter Italian birth cohort. Ital J Pediatr 41, 1–10. https://doi.org/10.1186/S13052-015-0149-Z/TABLES/5

Lanari, M., Vandini, S., Prinelli, F., Adorni, F., DI Santo, S., Silvestri, M., Musicco, M., 2016. Exposure to vehicular traffic is associated to a higher risk of hospitalization for bronchiolitis during the first year of life. Minerva Pediatr 68, 391–7.

Lavaine, E., Neidell, M., 2017. Energy Production and Health Externalities: Evidence from Oil Refinery Strikes in France. https://doi.org/10.1086/691554 4, 447–477. https://doi.org/10.1086/691554

Leem, J.H., Woo Lee, J.Y., Kim, H.C., Kim, J.H., Lim, D.H., Son, B.K., 2011. Effect of Perinatal Exposure to Air Pollution on Development of Asthma and Allergic Diseases in Incheon, Korea; A Life-course Approach. Epidemiology 22, S104. https://doi.org/10.1097/01.EDE.0000391987.25743.6F

Lu, C., Yang, W., Lan, M., Li, B., Wang, F., 2023. Effects of intrauterine and postnatal exposure to meteorological factors on childhood pneumonia. Build Environ 244, 110800. https://doi.org/10.1016/J.BUILDENV.2023.110800

Lu, C., Yang, W., Liu, Z., Liao, H., Li, Q., Liu, Q., 2022. Effect of preconceptional, prenatal and postnatal exposure to home environmental factors on childhood pneumonia: A key role in early life exposure. Environ Res 214, 114098. https://doi.org/10.1016/J.ENVRES.2022.114098

Moncrieff, A., 1961. Environmental factors in acute chest disorders in early life. West Afr Med J 10, 234–237.

Nicolle-Mir, L., 2018. Exposition maternelle à la pollution de l’air et infections respiratoires basses du nourrisson dans la cohorte MoBa. Environnement, Risques & Santé 17, 218–219. https://doi.org/10.1136/BMJOPEN-2016-015796

Nicolle-Mir, L., 2016. Exposition in utero à l’arsenic et infections au cours de la première année de vie. Environnement, Risques & Santé 15, 389–390. https://doi.org/10.1684/ERS.2016.0907

Polańska, K., Kowalska, M., Hanke, W., 2016. Impact Of Air Pollution On Pregnancy Duration, Birth Outcomes And Children’s Health: Polish Mother And Child Cohort. WIT Transactions on Ecology and the Environment 207, 203–213. https://doi.org/10.2495/AIR160191

Rice, M.B., Rifas-Shiman, S.L., Oken, E., Gillman, M.W., Ljungman, P.L., Litonjua, A.A., Schwartz, J., Coull, B.A., Zanobetti, A., Koutrakis, P., Melly, S.J., Mittleman, M.A., Gold, D.R., 2015. Exposure to traffic and early life respiratory infection: A cohort study. Pediatr Pulmonol 50, 252–259. https://doi.org/10.1002/PPUL.23029

Smith, J.W., 1975. Significant determinants in the acquisition of and response to pulmonary infections. J Ky Med Assoc 73, 543–547.

Soesanti, F., Hoek, G., Brunekreef, B., Meliefste, K., Chen, J., Idris, N.S., Putri, N.D., Uiterwaal, C.S.P.M., Grobbee, D.E., Klipstein-Grobusch, K., 2024. Perinatal exposure to traffic related air pollutants and the risk of infection in the first six months of life: a cohort study from a low-middle income country. Int Arch Occup Environ Health 97, 575–586. https://doi.org/10.1007/S00420-024-02064-0/TABLES/5

Spengler, J.D., Jaakkola, J.J.K., Parise, H., Katsnelson, B.A., Privalova, L.I., Kosheleva, A.A., 2004. Housing Characteristics and Children’s Respiratory Health in the Russian Federation. Am J Public Health 94.

Spivey, A., 2011. Arsenic and Infectious Disease: A Potential Factor in Morbidity among Bangladeshi Children. Environ Health Perspect 119, A218.

Sram, R.J., Binkova, B., Dostal, M., Merkerova-Dostalova, M., Libalova, H., Milcova, A., Rossner, P., Rossnerova, A., Schmuczerova, J., Svecova, V., Topinka, J., Votavova, H., 2013. Health impact of air pollution to children. Int J Hyg Environ Health 216, 533–540. https://doi.org/10.1016/J.IJHEH.2012.12.001

Stelmach, I., Podlecka, D., Polanska, K., 2018. Prenatal and postnatal exposure to environmental factors in relation to asthma-like and allergy symptoms in city children. Allergy: European Journal of Allergy and Clinical Immunology 73, 336. https://doi.org/10.1111/all.13537

Takashima, M.D., Grimwood, K., Vilcins, D., Knibbs, L.D., Sly, P.D., Lambert, S.B., Ware, R.S., 2024. Association of antenatal and early childhood air pollution and greenspace exposures with respiratory pathogen upper airway acquisitions and respiratory health outcomes. Int J Environ Health Res. https://doi.org/10.1080/09603123.2023.2299225

Tischer, C., Dadvand, P., Basagana, X., Fuertes, E., Bergström, A., Gruzieva, O., Melen, E., Berdel, D., Heinrich, J., Koletzko, S., Markevych, I., Standl, M., Sugiri, D., Cirugeda, L., Estarlich, M., Fernández-Somoano, A., Ferrero, A., Ibarlueza, J., Lertxundi, A., Tardón, A., Sunyer, J., Anto, J.M., 2018. Urban upbringing and childhood respiratory and allergic conditions: A multi-country holistic study. Environ Res 161, 276–283. https://doi.org/10.1016/J.ENVRES.2017.11.013

Toure, N.O., Gueye, N.R.D., Mbow-Diokhane, A., Jenkins, G.S., Li, M., Drame, M.S., Coker, K.A.R., Thiam, K., 2019. Observed and Modeled Seasonal Air Quality and Respiratory Health in Senegal During 2015 and 2016. Geohealth 3, 423–442. https://doi.org/10.1029/2019GH000214

von Hinke, S., Sørensen, E.N., 2023. The long-term effects of early-life pollution exposure: Evidence from the London smog. J Health Econ 92, 102827. https://doi.org/10.1016/J.JHEALECO.2023.102827

Yang, S.I., Kim, H. Bin, Kim, H.C., Lee, S.Y., Kang, M.J., Cho, H.J., Yoon, J., Jung, S., Lee, E., Yang, H.J., Ahn, K., Kim, K.W., Shin, Y.H., Suh, D.I., Hong, S.J., 2020. Particulate matter at third trimester and respiratory infection in infants, modified by GSTM1. Pediatr Pulmonol 55, 245–253. https://doi.org/10.1002/PPUL.24575

Ziou, M., Gao, C.X., Wheeler, A.J., Zosky, G.R., Stephens, N., Knibbs, L.D., Melody, S.M., Venn, A.J., Dalton, M.F., Dharmage, S.C., Johnston, F.H., 2023a. Contrasting Health Outcomes following a Severe Smoke Episode and Ambient Air Pollution in Early Life: Findings from an Australian Data Linkage Cohort Study of Hospital Utilization. Environ Health Perspect 131. https://doi.org/10.1289/EHP12238/SUPPL\_FILE/EHP12238.S001.ACCO.PDF

Ziou, M., Gao, C.X., Wheeler, A.J., Zosky, G.R., Stephens, N., Knibbs, L.D., Williamson, G.J., Melody, S.M., Venn, A.J., Dalton, M.F., Dharmage, S.C., Johnston, F.H., 2023b. Primary and pharmaceutical care usage concurrent associations with a severe smoke episode and low ambient air pollution in early life. Science of The Total Environment 883, 163580. https://doi.org/10.1016/J.SCITOTENV.2023.163580

#

## Table A.3: Overview of included publications – study description, and exposure and outcome definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Study №** | **Reference** | Study Description | Exposure | Outcome |
| **Study name1** | **Study design and population** | **Study setting**  | **Sample size**  | **Dates of data collection** | **Pollutant** | **Measurement of pollutants** | **Exposure window2** | **Outcome definition2** | **Ascertainment method** | **Age at ascer- tainment** |
| #1 | Aguilera 2013 | INMA (4 regions) | Population-based birth cohort | Spain; 4 regions | 2199 | Recruitment from 2003 to 2008 | NO2, C6H6 | Estimated for pregnancy home address: land use regression models, based on data from measurement campaign | Each trimester, entire pregnancy | Physician-diagnosed LRTI (98% classified as bronchitis or bronchiolitis) | Parent report | Up to 18 months |
|  | Esplugues 2011 | INMA Valencia | Population-based birth cohort | Spain; Valencia | 352 | Eligible babies were born between 2005 and 2006 | NO2 | Estimated for pregnancy home address: land use regression models, based on data from measurement campaign | Each trimester, entire pregnancy | Physician-diagnosed LRTI (bronchitis, bronchiolitis, pneumonia) | Parent report | Up to 12 months |
|  | Gutiérrez Oyarce 2018 | INMA Valencia | Birth cohort | Spain; Valencia | 624 | Recruitment between 2003 and 2005 | NO2 | Estimated for pregnancy home address: land use regression models, based on data from measurement campaign | Each trimester, entire pregnancy | Physician-diagnosed LRTI (bronchitis, bronchiolitis, pneumonia) | Parent report | Up to 2 years |
| #2 | Belachew 2024 | ECS | Population-based cohort; children living in Espoo in 1991 | Finland; Espoo | 2568 | Children were born between 1984 and 1990 | PM2.5, PM10, SO2, NO2, CO, O3 | Estimated for pregnancy home address: modelled atmospheric concentrations, based on data from the Finnish Meteorological Institute | Entire pregnancy | LRTI hospitalization (clinician-diagnosed pneumonia and acute bronchitis) | National Hospital Discharge Register | Up to 2 years |
| #3 | Goshen 2020 | *Not reported* | Population-based retrospective cohort; women insured by Clalit Health Services | Israel; 1 hospital | 57,331 | Infants were born between 2004 and 2012 | PM2.5 | Estimated for delivery home address: hybrid land use regression model approach, incorporating data from satellite-based predictions and monitoring stations. | Each trimester | First LRTI hospitalization (bronchiolitis or pneumonia) | Medical charts | Up to 1 year |
| #4 | Jedrychowski 2013 | *Not reported* | Birth cohort | Poland; Krakow | 214 | Recruitment started in 2000 | PM2.5 | Personal environmental monitoring sampler used over 48h period | Single point measure: 2nd trimester | Recurrent broncho-pulmonary infections (physician-diagnosed acute bronchitis and pneumonia; ≥5 episodes) | Parent report | Up to 7 years |
| #5 | Jiang 2018 | CCCH Changsha | Retrospective cohort; preschool children | China; Changsha | 2598 | 2011 to 2012 | SO2, NO2, PM10 | Estimated for kindergarten address: inverse distance weight method, based on data from local monitoring stations | Entire pregnancy | Physician-diagnosed pneumonia | Parent report | 3 to 6 years |
| #6 | Liu 2020 | CCCH Shanghai | Retrospective cohort; preschool children | China; Shanghai | 3177 | 2011 to 2012 | SO2, NO2, PM10 | Estimated at district-level: average concentration, based on data from local monitoring stations | Each trimester, entire pregnancy | Physician-diagnosed pneumonia | Parent report | 4 to 6 years |
|  | Liu 2016 | CCCH Shanghai | Retrospective cohort; preschool children | China; Shanghai | 3358 | 2011 to 2012 | SO2, NO2, PM10 | Estimated at district-level: average concentration, based on data from local monitoring stations | Entire pregnancy | Physician-diagnosed pneumonia | Parent report | 4 to 6 years |
| #7 | Liu 2022 | CCCH Shenzhen | Retrospective cohort; preschool children | China; Shenzhen | 3226 | 2015 to 2016 | SO2, NO2, PM10 | Estimated for kindergarten address: inverse distance weight method, based on data from local monitoring stations | Entire pregnancy | Physician-diagnosed pneumonia | Parent report | 3 to 6 years |
| #8 | Lu 2023 | CCCH Changsha, 2nd round | Retrospective cohort (with cross-sectional survey) | China; Changsha | 8689 | 2019 to 2020 | PM2.5, PM2.5-10, PM10, SO2, NO2, CO | Estimated for child’s home address: inverse distance weight method, based on data from local monitoring stations | Each trimester, entire pregnancy | Physician-diagnosed pneumonia | Parent report | Up to 6 years |
| #9 | Madsen 2017 | MoBa | Population-based pregnancy cohort | Norway; 4 regions | 17,533 | Recruitment between 1999 and 2008 | NO2 | Estimated for delivery home address: land use regression models, based on data from measurement campaign | Entire pregnancy  | LRTI hospitalization (respiratory syncytial virus, bronchiolitis, bronchitis, pneumonia) | Maternal report | Up to 18 months |
| #10 | Soh 2018 | GUSTO | Birth cohort | Singapore; 2 hospitals | 953 | 2009 to 2011 | PM2.5, PSI | Estimated at national level: average concentration, based on data from monitoring stations | Each trimester, entire pregnancy | Physician-diagnosed bronchiolitis/bronchitis and pneumonia | Parent report | Up to 2 years |
| #11 | Yang 2023 | *Not reported* | Case-control; children visiting paediatric ward | China; Changsha, 1 hospital | 1510 (699 cases, 811 controls) | 2017 to 2019 | SO2, NO2, PM10 | Estimated for child's home address: inverse distance weight method, based on data from local monitoring stations | Each trimester, entire pregnancy | Physician-diagnosed pneumonia | Hospital records | 0 to 14 years |
|  | Lu 2021 | *Not reported* | Case-control; children visiting paediatric ward | China; Changsha, 1 hospital | 1510 (699 cases, 811 controls) | 2017 to 2019 | SO2, NO2, PM10 | Estimated for child's home address: inverse distance weight method, based on data from local monitoring stations | Each trimester, entire pregnancy | Physician-diagnosed pneumonia | Hospital records | 0 to 14 years |
| #12 | Zhou 2013 | EDEN | Mother-child-cohort | France; Nancy and Poitiers | 1765 | 2003 to 2006 | Traffic-related air pollution | Questionnaire (Q1: Does your house located near a bus stop or a passageway of trucks?, Q2: Does the cars often or continuously pass by your house?) | Single point measure (assessed around birth) | Bronchiolitis symptoms | Parent report | Up to 12 months |
| 1 Full study names: INMA – INfancia y Medio Ambiente, ECS – Espoo Cohort Study, CCCH – China-Children-Homes-Health, MoBa – Norwegian Mother and Child Cohort Study, GUSTO – Growing Up in Singapore towards healthy Outcomes, EDEN mother-child cohort study2 Only exposure windows and outcome definitions relevant to our research question are listed (i.e. exposures during pregnancy, outcomes which are LRTIs). Some studies also investigated additional exposure periods (i.e. before conception or post birth) and other outcomes which are not listed here.Abbreviations: lower-respiratory tract infection (LRTI), nitrogen dioxide (NO2), benzene (C6H6), sulphur dioxide (SO2), particulate matter with a diameter of less than 10μm (PM10), particulate matter with a diameter of less than 10μm but greater than 2.5μm (PM2.5-10), particulate matter with a diameter of less than 2.5μm (PM2.5), ozone (O3), carbon monoxide (CO), Pollution Standard Index (PSI) |

## Table A.4: Overview of included publications – crude and adjusted measures of association

|  |  |  |  |
| --- | --- | --- | --- |
| **Study** | **Crude measures of association (95% confidence intervals)** | **Adjusted measures of association (95% confidence intervals)1** | **Covariates (in adjusted model)** |
| Aguilera 2013 | Crude RR of LRTI associated with NO2 (per 10 μg/m3 increase):Entire pregnancy: 1.04 (0.97-1.11)First trimester: 1.05 (0.99-1.11)**Second trimester: 1.07 (1.01-1.13)**Third trimester: 1.00 (0.94-1.05)Crude RR of LRTI associated with benzene (per 1 μg/m3 increase):Entire pregnancy: 1.06 (0.97-1.15)First trimester: 1.06 (1.00-1.13)Second trimester: 1.09 (1.00-1.19)Third trimester: 1.01 (0.89-1.15)*Crude estimates are adjusted for child's sex and age* | Adjusted RR of LRTI associated with NO2 (per 10 μg/m3):Entire pregnancy: 1.05 (0.98-1.12)First trimester: 1.06 (1.00-1.12)**Second trimester: 1.08 (1.02-1.15)**Third trimester: 1.00 (0.93-1.07)Adjusted RR of LRTI associated with C6H6 (per 1 μg/m3 increase):Entire pregnancy: 1.05 (0.96-1.14)First trimester: 1.06 (0.99-1.13)**Second trimester: 1.10 (1.01-1.20)**Third trimester: 0.99 (0.87-1.12) | Child's sex and age, childcare attendance, siblings at birth, maternal asthma, parental allergy, maternal age at delivery, pre-pregnancy body mass index, and cotinine levels in urine at 32 weeks of gestation |
| Esplugues 2011 | Crude RR of LRTI associated with NO2 (per 10 μg/m3 increase):Entire pregnancy: 1.15 (0.94-1.42)**First trimester: 1.19 (1.01-1.41)**Second trimester: 1.08 (0.90-1.29)Third trimester: 1.06 (0.88-1.28)Crude RR of bronchiolitis associated with NO2 (per 10 μg/m3 increase):Entire pregnancy: 1.22 (0.96-1.54)**First trimester: 1.24 (1.03-1.50)**Second trimester: 1.14 (0.93-1.38)Third trimester: 1.08 (0.88-1.32)Crude RR of bronchitis associated with NO2 (per 10 μg/m3 increase):Entire pregnancy: 1.15 (0.85-1.56)First trimester: 1.11 (0.87-1.40)Second trimester: 1.11 (0.86-1.43)Third trimester: 1.10 (0.85-1.43) | Adjusted RR of LRTI associated with NO2 (per 10 μg/m3):Entire pregnancy: 1.18 (0.92-1.53)First trimester: 1.18 (0.94-1.48)Second trimester: 1.13 (0.89-1.43)Third trimester: 1.14 (0.90-1.46)Adjusted RR of bronchiolitis associated with NO2 (per 10 μg/m3):Entire pregnancy: 1.23 (0.93-1.62)First trimester: 1.25 (0.98-1.60)Second trimester: 1.19 (0.92-1.54)Third trimester: 1.13 (0.87-1.47)Adjusted RR of bronchitis associated with NO2 (per 10 μg/m3):Entire pregnancy: 1.39 (0.94-2.05)First trimester: 1.25 (0.89-1.74)Second trimester: 1.28 (0.90-1.82)Third trimester: 1.40 (0.97-2.04) | Sex, smoking at week 12 of pregnancy, going to a day-care centre, zone of residence, season of birth. Model for bronchiolitis was not adjusted for going to day-care but included number of persons who live together. |
| Gutiérrez Oyarce 2018 | *Not reported* | Adjusted RR of LRTI associated with NO2 (per 10 μg/m3):Entire pregnancy: 0.96 (0.82-1.12)First trimester: 0.93 (0.83-1.05)Second trimester: 0.93 (0.83-1.05)Third trimester: 1.06 (0.94-1.19) | Child’s sex |
| Belachew 2024 | *Not reported* | Adjusted IRR of LRTI hospitalization associated with PM2.5 (compared to first quartile):Q2: 1.67 (0.85-3.28)Q3: 0.91 (0.37-2.20)Q4: 0.62 (0.20-1.90)Adjusted IRR of LRTI hospitalization associated with NO2 (compared to first quartile):Q2: 1.33 (0.66-2.67)Q3: 0.43 (0.15-1.23)Q4: 0.42 (0.11-1.56)Adjusted IRR of LRTI hospitalization associated with CO (compared to first quartile):Q2: 1.05 (0.51-2.16)Q3: 0.81 (0.29-2.26)Q4: 0.77 (0.21-2.81)Adjusted IRR of LRTI hospitalization associated with PM10 (compared to first quartile):Q2: 1.63 (0.81-3.28)Q3: 1.15 (0.45-2.89)Q4: 0.83 (0.23-2.94)Adjusted IRR of LRTI hospitalization associated with SO2 (compared to first quartile):Q2: 3.19 (1.41-7.22)Q3: 1.85 (0.57-6.07)Q4: 1.62 (0.33-7.85)Adjusted IRR of LRTI hospitalization associated with O3 (compared to first quartile):Q2: 0.70 (0.39-1.27)Q3: 0.45 (0.23-0.90)Q4: 0.69 (0.36-1.33)Non-significant associations were also observed when testing for presence of a linear trend or when exposure to multiple pollutants was combined in a pollutant mixture index. | Prenatal exposure of the respective pollutant, sex, breastfeeding duration, maternal smoking duringpregnancy, family socioeconomic status, child atopy, and parental atopy. Also adjusted for the effect of two other pollutants in the same exposure period2 |
| Goshen 2020 | *Not reported* | Adjusted RR of LRTI hospitalization associated with PM2.5 (for the highest quartile) in Arab Bedouin population:**First trimester: 1.31 (1.08-1.60)****Second trimester: 1.34 (1.09-1.66)**No statistically meaningful association found for third trimester exposure and in the Jewish population. | Gender of a newborn, parity, preterm delivery, low birth weight, Apgar score at 5 min, temperature, NO2 level, ozone level, and cold season during first months of life |
| Jedrychowski 2013 | Crude OR of recurrent broncho-pulmonary infections associated with PM2.5 (ln transformed concentrations):**2.00 (1.09-3.70, p=0.026)** | Adjusted OR of recurrent broncho-pulmonary infections associated with PM2.5 (ln transformed concentrations):**2.05 (1.05-3.99, p=0.035)** | Prenatal and postnatal ETS, child's atopy and asthma status, residence city area |
| Jiang 2018 | Crude OR of childhood pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 1.04 (0.95-1.14)Crude OR of childhood pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 0.95 (0.85-1.06)Crude OR of childhood pneumonia associated with NO2 (per increment of IQR):**Entire pregnancy: 0.87 (0.77-0.98, p≤0.05)** | Adjusted OR of childhood pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 0.92 (0.76-1.11)Adjusted OR of childhood pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 0.77 (0.58-1.02)Adjusted OR of childhood pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 0.77 (0.50-1.19) | Sex, age, birth season, breast-feeding, day-care attendance, parental atopy, parental socioeconomic status, ETS, visible mould/damp stains at home, and window condensation in winter. Also adjusted for the effect of the pollutant postnatally. |
| Liu 2020 | *Not reported* | Adjusted OR of pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 1.04 (0.84-1.32, p=0.675)First trimester: 0.87 (0.70-1.05, p=0.166)Second trimester: 0.96 (0.78-1.18, p=0.663)Third trimester: 1.10 (0.88-1.38, p=0.391)Adjusted OR of pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 1.04 (0.80-1.34, p=0.771)First trimester: 1.08 (0.87-1.33, p=0.517)Second trimester: 0.92 (0.75-1.15, p=0.493)Third trimester: 1.05 (0.86-1.29, p=0.652)Adjusted OR of pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 1.24 (0.90-1.68, p=0.199)**First trimester: 1.38 (1.04-1.81, p=0.020)****Second trimester: 1.43 (1.09-1.90, p=0.010)****Third trimester: 1.29 (1.04-1.55, p=0.015)** | Child’s age and sex, family history of atopy, ownership of residence, breastfeeding, home dampness, distance of residence from the nearest main traffic road, usage of heating during winter, renovating the residence during early lifetime, household ETS, birth month, and ambient air temperature, as well as the other two pollutants in the same exposure periods. |
| Liu 2016 | Crude OR of pneumonia associated with PM10 (per increment of IQR):**Entire pregnancy: 1.19 (1.05-1.34, p<0.05)**Crude OR of pneumonia associated with SO2 (per increment of IQR):**Entire pregnancy: 1.23 (1.08-1.41, p<0.05)**Crude OR of pneumonia associated with NO2 (per increment of IQR):**Entire pregnancy: 1.40 (1.17-1.68, p<0.05)** | Adjusted OR of pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 0.97 (0.81-1.15)Adjusted OR of pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 1.09 (0.86-1.38)Adjusted OR of pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 1.25 (0.95-1.64) | Child’s age and sex, family history of atopy, ownership of residence, breastfeeding, home dampness, distance of residence from the nearest main traffic road, usage of heating during winter, renovating the residence or buying new large furniture during early lifetime, household ETS, as well as the other two pollutants in the same exposure period. |
| Liu 2022 | Crude OR of pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 0.95 (0.85-1.07)Crude OR of pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 0.96 (0.86-1.08)Crude OR of pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 1.02 (0.94-1.11) | Adjusted OR of pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 0.94 (0.74-1.18)Adjusted OR of pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 0.78 (0.60-1.00)Adjusted OR of pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 0.95 (0.82-1.10) | Child's sex, age, birth season, gestational age, duration of breastfeeding, parental atopy, starting age of entering kindergarten, ETS, painting in child's room, room dampness/mould, window condensation, pets, maternal education, maternal occupation, as well as outdoor air temperature and exposure to the pollutant in the first year of life. |
| Lu 2023 | *Not reported* | Adjusted OR of pneumonia associated with PM2.5 (per increment of IQR):Entire pregnancy: 1.07 (0.95-1.21)First trimester: 1.12 (0.98-1.27)**Second trimester: 1.18 (1.04, 1.34)**Third trimester: 1.05 (0.92-1.20)Adjusted OR of pneumonia associated with PM2.5-10 (per increment of IQR):Entire pregnancy: 0.99 (0.89-1.10)First trimester: 1.03 (0.95, 1.11)Second trimester: 0.99 (0.92-1.06)Third trimester: 1.08 (0.99-1.17)Adjusted OR of pneumonia associated with PM10 (per increment of IQR):Entire pregnancy: 1.05 (0.96-1.15)First trimester: 1.04 (0.93-1.16)Second trimester: 1.07 (0.97-1.20)Third trimester: 1.02 (0.92-1.12)Adjusted OR of pneumonia associated with SO2 (per increment of IQR):Entire pregnancy: 0.98 (0.87-1.12)First trimester: 1.02 (0.90-1.15)Second trimester: 1.04 (0.92-1.17)Third trimester: 0.95 (0.85-1.06)Adjusted OR of pneumonia associated with NO2 (per increment of IQR):Entire pregnancy: 1.05 (0.92-1.20)First trimester: 1.01 (0.85-1.21)Second trimester: 1.07 (0.91-1.27)Third trimester: 0.95 (0.82-1.11)Adjusted OR of pneumonia associated with CO (per increment of IQR):Entire pregnancy: 0.93 (0.84-1.02)First trimester: 0.97 (0.86-1.09)Second trimester: 1.01 (0.87-1.17)Third trimester: 0.97 (0.84-1.11) | Child’s sex, age, birth season, duration of breastfeeding, age when attending kindergarten, number of children in family, parental annual income, parental smoking, new furniture, house redecoration, home mould/dampness, damp clothing and bedding, household pets or plants. Also adjusted for temperature during each time window, other pollutants during the same time window, and exposure to the same pollutant during other exposure periods (including postnatal exposure). |
| Madsen 2017 | Crude RR of LRTI hospitalisation (at 6 months) associated with NO2 (per 10 μg/m3):**Entire pregnancy: 0.84 (0.76-0.95)**Crude RR of LRTI hospitalisation (at 18 months) associated with NO2 (per 10 μg/m3):Entire pregnancy: 0.94 (0.94-1.01) | Adjusted RR of LRTI hospitalisation (at 6 months) associated with NO2 (per 10 μg/m3):Entire pregnancy: 0.99 (0.84-1.17)Adjusted RR of LRTI hospitalisation (at 18 months) associated with NO2 (per 10 μg/m3):Entire pregnancy: 1.05 (0.94-1.16) | Maternal age at delivery, years of birth, maternal marital status, maternal education, sex of child, maternal pre-pregnancy BMI, smoking during pregnancy, parity, maternal atopy and study area. |
| Soh 2018 | *Not reported* | Adjusted IRR of bronchiolitis/bronchitis at 2 years associated with PM2.5 (compared to first quartile):Q2, entire pregnancy: 1.14 (0.67-1.94)Q3, entire pregnancy: 1.44 (0.88-2.37)Q4, entire pregnancy: 1.30 (0.70-2.39)Q2, first trimester: 1.36 (0.85-2.15)Q3, first trimester: 1.02 (0.59-1.76)Q4, first trimester: 0.75 (0.41-1.37)**Q2, second trimester: 1.90 (1.08-3.35)****Q3, second trimester: 2.43 (1.27-4.63)**Q4, second trimester: 1.74 (0.93-3.25)Q2, third trimester: 0.91 (0.60-1.39)**Q3, third trimester: 0.47 (0.23-0.94)****Q4, third trimester: 2.36 (1.22-4.56)**Adjusted IRR of bronchiolitis/bronchitis at 2 years associated with PSI (compared to first quartile):**Q2, entire pregnancy: 0.46 (0.28-0.78)**Q3, entire pregnancy: 0.95 (0.63-1.44)Q4, entire pregnancy: 1.29 (0.91-1.84)Q2, first trimester: 0.92 (0.58-1.47)**Q3, first trimester: 1.67 (1.07-2.60)****Q4, first trimester: 1.80 (1.05-3.10)**Q2, second trimester: 1.54 (0.96–2.48)**Q3, second trimester: 2.18 (1.05-4.56)****Q4, second trimester: 2.32 (1.06-5.08)**Q2, third trimester: 1.56 (0.96-2.56)Q3, third trimester: 0.92 (0.48-1.78)Q4, third trimester: 1.51 (0.75-3.02)Adjusted OR of pneumonia at 2 years associated with PM2.5 (compared to first quartile):Q2, entire pregnancy: 1.68 (0.20-14.06)Q3, entire pregnancy: 3.71 (0.53-26.00)Q4, entire pregnancy: 3.93 (0.45-34.41)Q2, first trimester: 0.87 (0.09-7.95)Q3, first trimester: 1.26 (0.14-11.13)Q4, first trimester: 3.67 (0.37-36.28)Q2, second trimester: 1.26 (0.17-9.36)Q3, second trimester: 1.57 (0.11-21.02)Q4, second trimester: 5.30 (0.53-52.98)Q2, third trimester: 1.08 (0.15-7.65)Q3, third trimester: 7.51 (0.69-81.35)Q4, third trimester: 6.00 (0.41-87.60)Adjusted OR of pneumonia at 2 years associated with PSI (compared to first quartile):Q2, entire pregnancy: 0.48 (0.04-4.78)Q3, entire pregnancy: 2.68 (0.58-12.45)Q4, entire pregnancy: 2.25 (0.51-9.84)Q2, first trimester: 0.88 (0.13-5.79)Q3, first trimester: 1.39 (0.21-9.19)Q4, first trimester: 0.44 (0.05-3.85)Q2, second trimester: 1.25 (0.28-5.55)Q3, second trimester: 0.35 (0.03-3.90)Q4, second trimester: 0.12 (0.007-2.38)Q2, third trimester: 1.14 (0.14-9.22)Q3, third trimester: 0.94 (0.11-7.91)Q4, third trimester: 1.76 (0.19-16.36) | Maternal age at delivery, ethnicity, education level, parity, maternal atopy, maternal smoking during pregnancy and ETS, child’s gender, gestation age, and birthweight, as well as exposure to the air pollutant during other trimesters and postnatal ETS and air pollution. |
| Yang 2023 | Crude OR of pneumonia associated with PM10 (per 10 μg/m3 increase):**Entire pregnancy: 1.20 (1.11-1.29, p≤0.001)****First trimester: 1.07 (1.02-1.13, p≤0.01)****Second trimester: 1.10 (1.05-1.16, p≤0.001)****Third trimester: 1.10 (1.05-1.16, p≤0.001)**Crude OR of pneumonia associated with SO2 (per 10 μg/m3 increase):**Entire pregnancy: 2.39 (2.14-2.68, p≤0.001)****First trimester: 1.90 (1.73-2.08, p≤0.001)****Second trimester: 2.05 (1.85-2.27, p≤0.001)****Third trimester: 2.09 (1.88-2.33, p≤0.001)**Crude OR of pneumonia associated with NO2 (per 10 μg/m3 increase):Entire pregnancy: 1.11 (0.93-1.33)First trimester: 1.07 (0.97-1.18)Second trimester: 1.02 (0.92-1.13)Third trimester: 1.01 (0.92-1.11) | Adjusted OR of pneumonia associated with PM10 (per 10 μg/m3):Entire pregnancy: 1.07 (0.86-1.34)First trimester: 0.98 (0.84-1.14)Second trimester: 1.18 (0.98-1.42)Third trimester: 0.99 (0.85-1.15)Adjusted OR of pneumonia associated with SO2 (per 10 μg/m3):**Entire pregnancy: 4.95 (3.15-7.78, p≤0.001)****First trimester: 1.57 (1.20-2.06, p≤0.001)****Second trimester: 2.07 (1.44-2.96, p≤0.001)****Third trimester: 2.20 (1.61-3.02, p≤0.001)**Adjusted OR of pneumonia associated with NO2 (per 10 μg/m3):**Entire pregnancy: 0.13 (0.08-0.24, p≤0.001)****First trimester: 0.45 (0.32-0.63, p≤0.001)****Second trimester: 0.36 (0.24-0.53, p≤0.001)****Third trimester: 0.40 (0.28-0.57, p≤0.001)** | Gender, age, birth season, parity, gestational age, birth weight, mode of delivery, parental atopy, outdoor temperature, as well as exposure to the other two pollutants during the same time period, and exposure to the pollutant pre-conception and during the other trimesters. |
| Lu 2021 | *Not reported* | Adjusted OR of pneumonia associated with PM10 (per 10 μg/m3):First trimester: 0.98 (0.84-1.14)Second trimester: 1.18 (0.98-1.42)Third trimester: 0.99 (0.85-1.15)Adjusted OR of pneumonia associated with SO2 (per 10 μg/m3):**First trimester: 1.57 (1.20-2.06, p≤0.001)****Second trimester: 2.07 (1.44-2.96, p≤0.001)****Third trimester: 3.92 (3.07-5.00, p≤0.001)**Adjusted OR of pneumonia associated with NO2 (per 10 μg/m3):**First trimester: 0.45 (0.32-0.62, p≤0.001)****Second trimester: 0.36 (0.24-0.53, p≤0.001)****Third trimester: 0.40 (0.28-0.57, p≤0.001)** | Sex, age, birth season, parity, gestational age, birth weight, mode of delivery, parental atopy, as well as outdoor air temperature, the other pollutants during the same exposure period, and exposure to the same pollutant during the other trimesters. |
| Zhou 2013 | *Not reported* | Adjusted OR of bronchiolitis associated with *in utero* exposure to traffic-related air pollution:**1.51 (1.18-1.92)** | *Covariates included the adjusted analysis were not reported. However, the covariates were selected from a list of potential confounders which included study centre, maternal occupation, maternal age at recruitment, maternal pre-pregnancy body mass index, child's birth weight, caesarean delivery, preterm birth, breastfeeding, siblings, gender, and family history of asthma, eczema, allergic rhinitis, and food allergy.* |
| 1 Some papers presented results from multiple adjusted models. We report the results from the model which includes most covariates.2 Covariates as specified in the caption of Table S6.Abbreviations: lower-respiratory tract infection (LRTI), nitrogen dioxide (NO2), benzene (C6H6), sulphur dioxide (SO2), particulate matter with a diameter of less than 10μm (PM10), particulate matter with a diameter of less than 10μm but greater than 2.5μm (PM2.5-10) particulate matter with a diameter of less than 2.5μm (PM2.5), ozone (O3), carbon monoxide (CO), Pollution Standard Index (PSI), risk ratio (RR), incidence rate ratio (IRR), interquartile range (IQR), second quartile (Q2), third quartile (Q3), fourth quartile (Q4), environmental tobacco smoke (ETS) |