Table 5S-10 Cross-sectional Asthma Prevalence and Asthma Severity Studies.

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Cross-Sectional Asthma Prevalence Studies					
Akinbami et al. (2010) Metropolitan areas, United States 2001−2004	National Health Interview Survey, children (3−17 yr) N = 34,073.	SO_2, NO_2, O_3, $PM_{2.5}$ and PM_{10}. SO_2 12 mo average by county Median 3.0 ppb, IQR 1.7−4.8 ppb Exposure estimated with a single pollutant logistic regression	SO_2−N_2: 0.25 SO_2−O_3: −0.38 SO_2−$PM_{2.5}$: 0.12 SO_2−PM_{10}: −0.15	The adjusted current asthma was strongest for ozone	SO_2 per 5-ppb increase positive for both current asthma and asthma attack but CI spanned well below 1. Current asthma adjusted 4th quartile OR 1.15 (0.26−5.01). Covariate adjustment: age, sex, race/ethnicity, and adult smoker in household, single parent, highest level of parental education, poverty status, and region of residence
Altuğ et al. (2013) Prevalence of asthma symptoms and lung function Eskisehir, Turkey Jan 2008−Mar 2009	ISAAC questionnaire School children (9−13 yr) N = 1,880	Summer (May 27−Jun 13, 2008) and winter (Feb 27−Mar 13, 2009) seasons SO_2, NO_2, O_3 by passive sampling SO_2 sampled regions-mean (SD) Summer Suburban 9(7);Urban 11(4) Winter Suburban 21 (6); Urban 29 (7) ppb Exposure estimated from measurements taken in the child's primary school garden	SO_2−O_3: −0.395 (winter) SO_2−NO_2: 0.486 (winter)	Association between ozone and impaired lung function only for girls in the summer season Potentially confounding variables included: responder, sex, age, parental smoking habits, coal or wood stove use, maximal parental education of family, domestic pets, and mold in the home	No associations found for SO_2, some positive some negative

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Amster et al. (2014) Prevalence of asthma, COPD, and related symptoms Hadera, Israel area 2003 to 2004	Adults in the European Community Respiratory Health Survey (ECRHS) cohort; cross-sectional prevalence design N = 2,244	SO_2 exposures at the residence were determined for an 8 yr avg from 20 monitoring sites based on kriging in relation to emissions from the power plant. Annual SO_2 mean (SD) for total, power plant source, and power plant event in ppb were respectively: 2.52 (0.32); 6.22(2.03); and 16.55 (12.10)	"Source approach" correlated with the "event approach" for SO_2 (Pearson correlation coefficient $r = 0.66$) but not for NO_X ($r = -0.07$) Strong association between NO_X and SO_2 exposure estimates for both the "source approach" (Pearson correlation coefficient $r = 0.62$) and the "event approach" (Pearson correlation coefficient $r = 0.97$)	Prevalence of asthma and history of shortness of breath were statistically associated with total (power plant and nonpower plant) exposures to SO_2. Both source and event approaches of estimating the power plant-specific exposure to SO_2 were not statistically associated with the outcomes of interest. The "source approach" yielded much wider 95% CI than the "event approach"	For the adjusted model for asthma prevalence for a 5-ppb increase for total exposure: 24.11 (1.61, 362.59); for power plant event 1.05 (0.95, 1.16); and for power plant source 1.47 (0.95, 2.19), adjusted for age, sex, smoking history, housing density, proximity to major highways, and level of education Two pollutant models with SO_2 and NO_X did not change the results
Arnedo-Pena et al. (2009) Prevalence of recent symptoms of asthma Seven centers (Asturias, Barcelona, Bilbao, Cartagena, LA Coruna, Madrid, and Valencia), Spain 2002−2003	ISAAC questionnaire School children (6−7 yr) N = 20,455	SO_2, CO, NO_2, TSP-SO_2 monitors annual concentration mean (SD) 5(2) ppb	SO_2−CO: 0.6203 SO_2−NO_2: −0.5505 SO_2−TSP: −0.1615	Other pollutants not as strongly or inverse associations Cross-sectional, covariate adjusted multivariate logistic regression	Recent severe asthma-adjusted OR (95% CI) 1.34 (1.01−1.78) between Level 1 and 3 (IQR). Covariate adjustment: sex, use of paracetamol, maternal smoking, elder siblings cooking with electricity or gas, temperature and humidity

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Deger et al. (2012) Prevalence of asthma Montreal, Quebec, Canada 2006	ISAAC questionnaire Children (6 mo−12 yr N = 821	Yearly ambient SO_2 levels from refinery stack emissions at the locations of the centroid coordinates of the six-digit postal code using dispersion modeling to determine residential exposure Yearly SO_2 level ppb mean (SD) active asthma 2(1); poor asthma control group 2(1)	NR	No other pollutants considered Residences median 3.6 km to stacks, schools 4.2 km. Not moved the year before the questionnaire. IQR = 4.7 ug/m3; = 2 ppb.	PR adjusted—active asthma per 5 ppb 1.39 (0.84 to 2.48) 1; poor asthma control 2.28 (1.00 to 5.25) Covariate adjustment: child's age, sex, parental history of atopy and tobacco smoke exposure at home Cross-sectional covariate-adjusted log-binomial regression model.
Deng et al. (2015a) Asthma prevalence in Changsha, China, between September 2011 and January 2012	2490 children aged 3-6 years, ISAAC questionnaire cross-sectional design	Ambeint SO2, NO2, and PM10 estimated from 7 municipal monitoring stations during the period 2005 – 2010 which encompasses from the year when the oldest child was gestated to one year after the youngest child was born. Using IDW at the 4 closest monitoring stations to the kindergartens using the method discussed by Marshall et al., 2008. The first-year mean was 26 ± 9 ppb SO2, Logistic regression model.	SO2 – NO2 0.42	Multi-pollutant model per 5 ppb SO2; SO2 : PM10 + SO2 1.15(1.01, 1.30) ; SO2 + NO2 1.01 (0.85, 1.21); and PM10 + SO2 + NO2; 1.03 (0.86, 1.22). The asthmatic risk of adjusting SO2 for PM10 was only slightly changed. However, adjusting SO2 for NO2 substantially changed the SO2 result. 3897 completed questionnaires were received representing a response rate of 78%. Analysis of children's migration indicated its influence was very limited.	Doctor-diagnosed asthma and SO2 exposure (per 5 ppb SO2) for the first year of life; OR 1.13 (1.003 – 1.29) were the associations are higher for males and children 3-4 vs 5-6 years of age. Adjusted for sex, age, breast-feeding, parental atopy, and living area.

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Deng et al. (2015b) Asthma prevalence in Changsha, China, between September 2011 and January 2012. Indoor and ambient SO2 exposure estimates.	2490 children aged 3-6 years, ISAAC questionnaire cross-sectional design of asthma prevalence.	Ambeint SO2, NO2, and PM10 measured as described above in (Deng et al., 2015a) The first-year mean was 26 ± 9 ppb SO2, Indoor exposures were estimated from questions related to new furniture and decoration in home both during pregnancy and the first year of age.	SO2 – NO2 0.42.	The effects of outdoor SO2 and indoor exposures on asthma prevalence were considered to be independent to each other in this study. Indoor renovation was considered to have a stronger contribution during pregnancy than the first year of exposure after birth. Logistic regression model.	Asthma prevalence for outdoor exposure for 5 ppb increment OR 95% CI: 1.13 (1.05, 1.20).
Dong et al. (2013a) Asthma symptoms and obesity 25 districts of seven cites in Northeast China 2006−2008	Children (2−14 yr) Three body weight categories; normal weight, overweight, and obese defined by BMI N = 30,056	Ambient SO_2, PM_{10}, NO_2, O_3 measured at municipal air pollution monitoring stations Annual SO_2 mean (range) 19 (8 to 31) ppb Three-yr mean SO_2 concentrations used as surrogate of long term exposure Cross-sectional mixed logistic regression model	NR	The association between each pollutants concentrations and the studies respiratory symptoms and asthma was consistently stronger among children with a status of BMI ≥85% than those with normal weight	Doctor-diagnosed asthma in combined overweight and obese population SO_2 IQR 5ppb-OR (95% CI) 1.24 (1.13−1.35) Interaction between overweight and obese with SO_2 *p*-value = 0.011 Covariate adjustment: age, sex, breast feeding habits family history of atopy, passive smoking exposure, study district and parental education level

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Dong et al. (2013b) Asthma symptoms and breastfeeding 25 districts of seven cites in Northeast China 2008−2009	Children (2−14 yr) Two breast feeding groups; mainly breastfed for greater than 3 mo and not mainly breast-fed for greater than 3 mo N = 31,049	Ambient SO_2, PM_{10}, NO_2, O_3 measured at municipal air pollution monitoring stations taken 2006−2008 Annual SO_2 mean (range) 19 (8 to 31) ppb Three-yr mean SO_2 concentrations used as surrogate of long-term exposure Cross-sectional mixed logistic regression model	NR	Association of air pollution with respiratory conditions was modified by breastfeeding Breastfeeding is associated with smaller associations between air pollution and respiratory conditions in children but not for doctor-diagnosed asthma	Doctor-diagnosed asthma in breastfed population SO_2 IQR 5 ppb OR 95% CI 1.11 (1.04−1.19) Breastfeeding status test for interaction p= 0.70 Covariate adjustment: age, sex, parental education, obesity, family history of atopy, low birth weight, home coal use, home pets, district, passive smoking exposure, and area of residence per person
Gorai et al. (2014) Asthma emergency department visit rate and asthma discharge rate New York State, United States 2005−2007	Department of Health Asthma Surveillance summary report Asthma hospital discharges visits for 2005, 2006, and 2007 respectively: 39,927, 40,205, and 37,950 Asthma ED visits for 2005, 2006, and 2007 respectively: 59,572, 164,116, and 161,200	Estimated $PM_{2.5}$, SO_2, and O_3 concentrations at centroids of counties using GIS kriging SO_2 mean (SD) ppb for 2005, 2006, and 2007 respectively: 8.46 (2.88), 6.92 (2.31), and 7.18 (2.38) Pearson two-tailed correlation analysis	SO_2−O_3: −0.759 (2005) SO_2−O_3: −0.716 (2006) SO_2−O_3: −0.741 (2007) SO_2−$PM_{2.5}$: 0.868 (2005) SO_2−$PM_{2.5}$: 0.922 (2006) SO_2−$PM_{2.5}$: 0.794 (2007)	A negative association between asthma rate and O_3 observed	Asthma prevalence among the New York residents was associated with exposure to $PM_{2.5}$ followed by SO_2 Correlation coefficients asthma hospital discharges and SO_2 for 2005, 2006, and 2007 respectively: 0.52, 0.38, and 0.41 Correlation coefficients asthma ED visits and SO_2 for 2005, 2006, and 2007 respectively: 0.46, 0.31, and 0.13

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Kara et al. (2013) Asthma cases Niğde, Turkey 2006−2010	Asthma hospital admissions determined from the hospital automated diagnosis system (captures >80% of city patients)	Ambient SO_2 and PM_{10} were obtained from the continuous emissions monitoring system. Vehicular SO_2 emissions were estimated using motor vehicle data 9.3% of the daily average SO_2 concentrations were above 23 ppb	SO_2-PM_{10}: 0.045 SO_2-O_3: −0.36 SO_2-NO_2: 0.42 SO_2-CO: 0.24	PM_{10} and SO_2 reported to effect asthma cases in Niğde Parametric statistical analysis and Mann-Kendall nonparametric evaluation.	Total cases of asthma were dependent on ambient SO_2 concentration Pearson correlation coefficient between ambient SO_2 and total monthly asthma cases = 0.4869.
Liu et al. (2014) Prevalence of respiratory symptoms and diagnosed asthma China 2006–2008	23,326 children aged 6 to 13 yr were evaluated using the ATS respiratory questionnaire in a cross-sectional study using a two-stage hierarchical model with logistic and ecologic model analyses	Three-year (2006−2008) average SO_2 concentration, mean (SD): 19 (6) ppb Ranges: PM_{10} (79−171 μg/m^3), SO_2 (8 to 31 ppb), and O_3 (34−89 μg/m^3 calculated from monitoring stations in each of the 25 districts located near schools and near the students' homes	NO_2 with O_3 (0.66) and SO_2 (0.52) tended to be relatively low across the 25 districts, with a higher correlation between PM_{10} and SO_2 (0.78), and between PM_{10} and O_3 (0.74)	Two-pollutant models were not possible due to the high correlation between pollutants; unable to control for weather factors (e.g., temperature or humidity).	Adjusted OR for diagnosed asthma was 1.14 (95% CI, 1.09−1.19) per 5-ppb increase in SO_2 Adjusted for age, sex, house type, smoking, parental atopic disease, breastfeeding, proximity to main roads and factories

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
(Liu et al., 2016) Asthma and Allergic rhinitis prevalence in Shanghai, China between 2006 and 2008.	3358 four to six year old children who had not changed residence since gestation from forty-four kindergartens using a modified ISAAC questionnaire in a retrospective cohort cross-sectional design.	Ambient SO2, NO2, and PM10 from January 1 , 2006 to April 30, 2012 for each of the 18 districts in Shanghai from daily levels from the Shanghai Environmental Monitoring Center for several time periods. First year of life mean ±SD SO2 17±3 ppb; IQR 5 ppb Multiple logistic regression was used.	Pearson's correlation coefficients; SO2 – NO2 0.693; SO2 – PM10 0.712 for the first year of life period.	Time periods longer than one year did not provide consistent results. When adjusted for the other air pollutants, the result was attenuated.	For an IQR increase of 12 ug/m3 which is 5 ppb for SO2, during the period of the first year of life, the OR and 95% CI for asthma prevalence was 1.22 (1.01, 1.49); and allergic rhinitis 1.31 (1.10, 1.56) adjusted for age, sex, family history of atopy, ownership of residence, breastfeeding, home dampness, distance from traffic road, heating in winter, residential renovations, new furniture, and household ETS.
Pan et al. (2010) Asthma prevalence 18 districts of six cities in Liaoning Province, northern China 1997−2000	Children (3−12 yr) N = 11,860	SO_2, TSP, NO_2. SO_2 monitored within 1 km of elementary school in each district, annual mean SO_2 (SD) 24 (16) ppb Cross-sectional two-stage regression	SO_2−TSP: 0.889 SO_2−NO_2: 0.577	Larger effects between cities than within reflecting wider between-city air gradient. Three pollutant analysis OR's for SO_2 decreased	For IQR of 5 ppb for SO_2 OR (95% CI) current asthma—1.09 (1.05,1.15)

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Penard-Morand et al. (2010) Prevalence of asthma and allergies French Cities (Bordeaux, Clermont-Ferrand, Creteil, Marseille, Reims, and Strasbourg) Mar 1999−Oct 2000	ISAAC questionnaire Children (9−11 yr) N = 6,683 Cross-sectional generalized estimating equation adjusted for potential confounders	SO_2, benzene, PM_{10}, NO_2, CO. Mean SO_2 range across the six cites—mean (minimum–maximum) ppb 2 (1 to 3) to 5 (4 to 6). Exposure estimated using SO_2 concentrations at the school calculated with a validated dispersion model that integrates background air pollution, traffic emissions, topography and meteorology	SO_2−benzene: 0.70 SO_2−VOC: 0.54 SO_2−CO: 0.60 SO_2−NO_2: 0.58 SO_2−NO_X: 0.51 SO_2−PM_{10}: 0.70	The most robust associations were found for PM_{10} and benzene	SO_2 OR (95% CI) adjusted for lifetime asthma for IQR (5 ppb) 1.83 (1.31−2.51) Covariate adjustment: age, sex, older siblings, family history of allergy, parental education, mother's ethnic origin, and potential sources of indoor pollution at home (smoking; mould or dampness; natural gas used for heating, cooking, or water-heater; and pets)
Portnov et al. (2012) Asthma prevalence Northern Israel 2006−2008	Clalit Health Services Database School children (6−14 yr) [mean age 10.2 yr (SD 2.6 yr)] N = 3,922 Binary logistic regression performed separately for the seven individual townships covered. Bayesian Model Averaging (BMA) implemented	SO_2, PM_{10}. SO_2 measured at 14 monitoring stations. The average values of SO_2 were interpolated by kriging providing continuous surfaces and IDW. GIS mapping used home addresses SO_2 mean (SD) 5.4 (1.3) ppb	SO_2−PM_{10}: 0.322	PM_{10} effects observed	SO_2 asthma prevalence IDW OR (95% CI)—0.99 (0.89−1.10) BMA approach estimates the posterior probability for an SO_2 effect to be only 2.8% strengthening the standard logistic regression analysis that SO_2 should not be added to the model when PM_{10} is included Covariate adjustment: sex, age, proximity to main roads, town or residence, and families SES

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Sahsuvaroglu et al. (2009); Asthma prevalence Hamilton, Canada 1994−1995	The ISAAC Phase I questionnaire Children [6−7 yr and 13−14 yr (pre and post-pubescent)] N~1,467	SO_2, Ozone, PM NO_2. SO_2 Thiessen polygons, bicubic spline, and IDW interpolation techniques used to estimate exposure: SO_2 3 yr average 5.82 ppb Adjusted logistic regressions	SO_2-NO_X: −0.165 (Thiessen) SO_2−NO_2: 0.442 (SO_2 Thiessen; NO_2 Kriged) SO_2−NO_2: 0.237 (SO_2 Thiessen; NO_2 LURshort)	The most robust effects were observed in NO_2 LUR models in girls for asthma without hay fever	Per 5-ppb increase in SO_2 (Thiessen) controlling for confounding, strongest effect, regression coefficient between nonallergic (without hay fever) asthma and SO_2 in the older children Exp (B) = 1.25) (1.02−1.53). All other SO_2 effects were positive but CI spanned below 1.00 such as all children 1.09 (0.99−1.20). Covariate adjustment: neighborhood proxies for income, dwelling value, female smoking
Asthma Severity					
Deger et al. (2012), Prevalence of asthma in Montreal, Quebec, Canada 2006	ISAAC questionnaire Children (6 mo−12 yr)	Yearly ambient SO_2 levels from refinery stack emissions were estimated at the locations of the centroid coordinates of the six-digit postal code using dispersion modeling to determine residential exposure estimates. Yearly SO_2 level ppb mean (SD) active asthma 2(1); poor asthma control group 2(1)	NR	No other pollutants considered	Prevalence Ratio (PR) adjusted—active asthma per 5ppb 1.39 (95% CI 0.86 to 2.28); poor asthma control 2.28 (1.00 to 5.25) Covariate adjustment: child's age, sex, parental history of atopy and tobacco smoke exposure at home Cross-sectional covariate-adjusted log-binomial regression model

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
(Greenberg et al., 2016) Asthma prevalence and severity in Israel from 1999 to 2008.	17 year-old male candidates for military service underwent medical examinations to include questionnaires on health status and demographic variables yielding 137,040 adults.	From Israeli national network of 58 AQMS SO2 levels were averaged to estimate annual concentrations at the place of residence. Mean levels of SO2 were classified as low (1 to 3 ppb), intermediate (3 to 5 ppb) and high (5 to 226 ppb)	NR	Prevalence of both mild asthma and moderate-severe asthma were determined using the Global Initiative for Asthma	Both asthma prevalence and asthma severity were related to the level of SO2 measured as high, intermediate, and low. Logistic regression models were used.
(Ierodiakonou et al., 2015), Longitudinal AHR multicity study conducted from late December 1993 to early September 1995 The original study, a randomized clinical trial with a longitudinal prospective cohort design with repeated measures but without a pollution component, was designed to examine the long-term safety and effectiveness of daily inhaled anti-inflammatory medication in children with mild to moderate asthma diagnosed and was sponsored by the NHLB.	1003 children from the CAMP cohort {CAMP, 1999, 1005467, Cherniak, 1999, 3245621}. Mean age was 9.2 (SD, 2.1 years). All subjects were treated and followed for 4 years, with visits at 2 and 4 months after randomization and at 4-month intervals thereafter	SO2, O3, CO, and NO2 levels from AIRS for the US cities and from AQRU for Toronto linked to ZIP/Postal codes centroid coordinates of the subjects address from the nearest monitor within 50 km from December 1993 to June 1999 ; 4-month SO2 levels were calculated. 24-hour IQR across the cities was from 1 ppb to 16 ppb with most between 4 to 6 ppb. The number of SO2 monitors in each city as reported by (Schildcrout et al., 2006); Albuquerque – 0; Baltimore – 3; Boston – 5; Denver – 2; San Diego – 3; Seattle – 4; St Louis – 9; and Toronto – 4.	Spearman's correlations of 24-hour pollution concentrations for SO2 and CO, NO2, and O3 where respectfully 0.2, 0.4, and –0.2.	Multiple comparisons across pollutant durations, lung function parameters, and medications used suggest caution as the results have unclear inference. In the original health study (CAMP, 2000) noted that the analysis of long-term effects of treatments in children with asthma had not been adjusted for multiple comparisons. This first epidemiological study raises the possibility of longer term effects on AHR and as such this is considered with the multiple cautions noted.	Long-term exposures to sulfur dioxide were associated with reduced methacholine responsiveness (PC20) (percent change per interquartile range 2ppb 4-month moving average), -6% [95% CI, -11% to -1.5%].Standardized to a 5 ppb increment: -15% (-27.5 to -3.75%). A linear mixed model was used. Gender, ethnicity, *in utero* smoking exposure, annual family income, IgE levels, height and history of parental asthma were controlled. For PC20 one and two pollutant models were compared for O3, NO2, and CO, but not for SO2.

Study, Location, and Years	Population	Exposure Assessment	Pollutant Correlations	Comment	Results
Rage et al. (2009), Asthma severity in French cities (Paris, Lyon, Marseille, Montpellier, and Grenoble) 1991−1995	EGEA cohort [mean age 37.3 yr (SD 13.3 yr)] N = 328 Four-class asthma severity score integrated clinical events and type of treatment. Five-level asthma score based only on symptoms.	SO_2, O_3, NO_2. SO_2 annual mean concentrations all based on background monitors. : (1) from the closest monitor assigned to each residence- mean (SD) 8 (3) ppb, (2) geo-statistical model on a 4 km × 4 km grid residential addresses 4 (2) ppb. Model validated taking into account spatial structure.	SO_2−NO_2: 0.48	Exposure estimate for model 1 for years 1991 -1995; model 2 1998. Model 2 produced a 2.5-fold increase for contrast for SO2. Strongest effects related to O3 exposure.	SO_2 correlated with severity but reached OR with CI above 1 only for model-based assignment of exposure-SO_2 adjusted model IQR-5 ppb. Four-class asthma severity score OR(SD) 4.41 (1.56 to 9.75) Covariate adjustment: age, sex, smoking habits, educational level and occupational level did not alter results.

ATS = American Thoracic Society; BMA = Bayesian Model Averaging; BMI = body mass index; CI = confidence interval; CO = carbon monoxide; COPD = chronic obstructive pulmonary disease; DFA = Detrended Fluctuation Analysis; ECRHS = European Community Respiratory Health Survey; ED = emergency department; Exp(B) = odds ratio of bivariate associations; GALA II = Genes-environments and Admixture in Latino Americans; GIS = geographic information systems; IDW = inverse distance weighting; IQR = interquartile range; ISAAC = International Study of Asthma and Alerrgies in Children; LUR = land use regression; N = population number; N_2 = nitrogen; NO_2 = nitrogen dioxide; NR = not reported; O_3 = ozone; OR = odds ratio; PM = particulate matter; ppb = parts per billion; PR = prevalence ratio; *r* = correlation coefficient; SD = standard deviation; SES = socioeconomic status; SO_2 = sulfur dioxide; TSP = total suspended solids; VOC = volatile organic compound.

References

Akinbami, LJ; Lynch, CD; Parker, JD; Woodruff, TJ. (2010). The association between childhood asthma prevalence and monitored air pollutants in metropolitan areas, United States, 2001-2004. Environ Res 110: 294-301. http://dx.doi.org/10.1016/j.envres.2010.01.001

Altuğ, H; Gaga, EO; Döğeroğlu, T; Ozden, O; Ornektekin, S; Brunekreef, B; Meliefste, K; Hoek, G; Van Doorn, W. (2013). Effects of air pollution on lung function and symptoms of asthma, rhinitis and eczema in primary school children. Environ Sci Pollut Res Int 20: 6455-6467. http://dx.doi.org/10.1007/s11356-013-1674-1

Amster, ED; Haim, M; Dubnov, J; Broday, DM. (2014). Contribution of nitrogen oxide and sulfur dioxide exposure from power plant emissions on respiratory symptom and disease prevalence. Environ Pollut 186: 20-28. http://dx.doi.org/10.1016/j.envpol.2013.10.032

Arnedo-Pena, A; García-Marcos, L; Carvajal Urueña, I; Busquets Monge, R; Morales Suárez-Varela, M; Miner Canflanca, I; Batlles Garrido, J; Blanco Quirós, A; López-Silvarrey Varela, A; García Hernández, G; Aguinaga Ontoso, I; González Díaz, C. (2009). Air pollution and recent symptoms of asthma, allergic rhinitis, and atopic eczema in schoolchildren aged between 6 and 7 years. Arch Bronconeumol 45: 224-229. http://dx.doi.org/10.1016/S1579-2129(09)72152-4

CAMP (Childhood Asthma Management Program). (2000). Long-term effects of budesonide or nedocromil in children with asthma. N Engl J Med 343: 1054-1063. http://dx.doi.org/10.1056/NEJM200010123431501

Deger, L; Plante, C; Jacques, L; Goudreau, S; Perron, S; Hicks, J; Kosatsky, T; Smargiassi, A. (2012). Active and uncontrolled asthma among children exposed to air stack emissions of sulphur dioxide from petroleum refineries in Montreal, Quebec: A cross-sectional study. Can Respir J 19: 97-102.

Deng, Q; Lu, C; Norbäck, D; Bornehag, CG; Zhang, Y; Liu, W; Yuan, H; Sundell, J. (2015a). Early life exposure to ambient air pollution and childhood asthma in China. Environ Res 143: 83-92. http://dx.doi.org/10.1016/j.envres.2015.09.032

Deng, Q; Lu, C; Ou, C; Liu, W. (2015b). Effects of early life exposure to outdoor air pollution and indoor renovation on childhood asthma in China. Build Environ 93: 84-91. http://dx.doi.org/10.1016/j.buildenv.2015.01.019

Dong, GH; Qian, Z; Liu, MM; Wang, D; Ren, WH; Fu, Q; Wang, J; Simckes, M; Ferguson, TF; Trevathan, E. (2013a). Obesity enhanced respiratory health effects of ambient air pollution in Chinese children: the Seven Northeastern Cities study. Int J Obes (Lond) 37: 94-100. http://dx.doi.org/10.1038/ijo.2012.125

Dong, GH; Qian, ZM; Liu, MM; Wang, D; Ren, WH; Bawa, S; Fu, J; Wang, J; Lewis, R; Zelicoff, A; Simckes, M; Trevathan, E. (2013b). Breastfeeding as a modifier of the respiratory effects of air pollution in children. Epidemiology 24: 387-394. http://dx.doi.org/10.1097/EDE.0b013e3182877eb8

Gorai, AK; Tuluri, F; Tchounwou, PB. (2014). A GIS based approach for assessing the association between air pollution and asthma in New York State, USA. Int J Environ Res Public Health 11: 4845-4869. http://dx.doi.org/10.3390/ijerph110504845

Greenberg, N; Carel, RS; Derazne, E; Bibi, H; Shpriz, M; Tzur, D; Portnov, BA. (2016). Different effects of long-term exposures to SO2 and NO2 air pollutants on asthma severity in young adults. J Toxicol Environ Health A 79: 1-10. http://dx.doi.org/10.1080/15287394.2016.1153548

Ierodiakonou, D; Zanobetti, A; Coull, BA; Melly, S; Postma, DS; Boezen, HM; Vonk, JM; Williams, PV; Shapiro, GG; Mckone, EF; Hallstrand, TS; Koenig, JQ; Schildcrout, JS; Lumley, T; Fuhlbrigge, AN; Koutrakis, P; Schwartz, J; Weiss, ST; Gold, DR; Group, CAMPR. (2015). Ambient air pollution, lung function, and airway responsiveness in asthmatic children. J Allergy Clin Immunol 137: 390-399. http://dx.doi.org/10.1016/j.jaci.2015.05.028

Kara, E; Özdilek, HG; Kara, EE. (2013). Ambient air quality and asthma cases in Niğde, Turkey. Environ Sci Pollut Res Int 20: 4225-4234. http://dx.doi.org/10.1007/s11356-012-1376-0

Liu, F; Zhao, Y; Liu, YQ; Liu, Y; Sun, J; Huang, MM; Liu, Y; Dong, GH. (2014). Asthma and asthma related symptoms in 23,326 Chinese children in relation to indoor and outdoor environmental factors: The Seven Northeastern Cities (SNEC) Study. Sci Total Environ 497-498: 10-17. http://dx.doi.org/10.1016/j.scitotenv.2014.07.096

Liu, W; Huang, C; Hu, Y; Fu, Q; Zou, Z; Sun, C; Shen, L; Wang, X; Cai, J; Pan, J; Huang, Y; Chang, J; Sun, Y; Sundell, J. (2016). Associations of gestational and early life exposures to ambient air pollution with childhood respiratory diseases in Shanghai, China: A retrospective cohort study. Environ Int 92-93: 284-293. http://dx.doi.org/10.1016/j.envint.2016.04.019

Pan, G; Zhang, S; Feng, Y; Takahashi, K; Kagawa, J; Yu, L; Wang, P; Liu, M; Liu, Q; Hou, S; Pan, B; Li, J. (2010). Air pollution and children's respiratory symptoms in six cities of Northern China. Respir Med 104: 1903-1911. http://dx.doi.org/10.1016/j.rmed.2010.07.018

Penard-Morand, C; Raherison, C; Charpin, D; Kopferschmitt, C; Lavaud, F; Caillaud, D; Annesi-Maesano, I. (2010). Long-term exposure to proximity air pollution and asthma and allergies in urban children. Eur Respir J 36: 33-40. http://dx.doi.org/10.1183/09031936.00116109

Portnov, BA; Reiser, B; Karkabi, K; Cohen-Kastel, O; Dubnov, J. (2012). High prevalence of childhood asthma in Northern Israel is linked to air pollution by particulate matter: evidence from GIS analysis and Bayesian Model Averaging. Int J Environ Health Res 22: 249-269. http://dx.doi.org/10.1080/09603123.2011.634387

Rage, E; Siroux, V; Künzli, N; Pin, I; Kauffmann, F. (2009). Air pollution and asthma severity in adults. Occup Environ Med 66: 182-188. http://dx.doi.org/10.1136/oem.2007.038349

Sahsuvaroglu, T; Jerrett, M; Sears, MR; McConnell, R; Finkelstein, N; Arain, A; Newbold, B; Burnett, R. (2009). Spatial analysis of air pollution and childhood asthma in Hamilton, Canada: comparing exposure methods in sensitive subgroups. Environ Health 8: Z. http://dx.doi.org/10.1186/1476-069X-8-14

Schildcrout, JS; Sheppard, L; Lumley, T; Slaughter, JC; Koenig, JQ; Shapiro, GG. (2006). Ambient air pollution and asthma exacerbations in children: An eight-city analysis. Am J Epidemiol 164: 505-517. http://dx.doi.org/10.1093/aje/kwj225