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Special Report 23

Systematic Review and Meta-analysis of Selected Health Effects of Long-Term Exposure to Traffic-Related Air Pollution

HEI Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution

Chapter 5: General Methods

These Appendices were reviewed solely for spelling, grammar, and cross-references to the main text. They have not been formatted or fully edited by HEI. This document was part of the HEI Panel's review process.

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Appendices Chapter 5: General Methods

Appendix 5A. Main Rationales for Exclusion of Health Outcomes Initially Considered in the Traffic Review

Health outcome category	Subcategory	Main rationale for final exclusion
Pregnancy outcomes	• Gestational diabetes • Blood pressure and gestational hypertension • Preeclampsia / Eclampsia / Hemolysis Elevated Liver Enzyme Low Platelet Count (HELLP) syndrome	These pregnancy complications were included in a comprehensive systematic review evaluating TRAP from NTP in 2019. These pregnancy complications may explain the mechanisms of the effect of TRAP on the birth outcomes included in the traffic review.
Respiratory outcomes	• Lung function	Lung function tests (indices of volumes and flows) indicate how the lung works and they are used in the diagnosis of several pulmonary diseases like asthma and COPD. They are physio-pathological markers but not clinical outcomes themselves. The study of lung function is useful in the evaluation of the mechanism of the pulmonary diseases. Lung function is typically not used in risk and health impact assessments. There was additional discussion whether to limit this outcome only to studies of lung function growth in children, but this was considered artificial.
Cardiometabolic outcomes	• Blood pressure and hypertension	High blood pressure and hypertension are major risk factors for the included outcomes ischemic heart disease, coronary events and stroke, and on the causal pathway; therefore those outcomes are included indirectly. Usually blood pressure and hypertension are not used in risk and health impact assessments, because of its intermediary role in disease causation. There was additional discussion because of the high prevalence of increased blood pressure in populations, and high systolic blood pressure was the

		leading global risk factor for mortality and lost years of healthy life (DALY) in 2019 (GBD 2019).
	• Type 1 diabetes	Most studies do not differentiate between Type 1 and 2 diabetes; however prevalence and incidence of diabetes mellitus in adulthood are dominated by Type 2 diabetes. Studies specifically focusing on Type 1 diabetes are rare and evidence for an association of air pollution with Type 1 diabetes so far is very limited.
	• Atherosclerosis	It is not a clinical outcome but the underlying pathology/disease process for some major clinical outcomes that were included in the traffic review such as ischemic heart disease, coronary events, and stroke.
	• Heart failure	Heart failure is not a disease per se but a syndrome, a cluster of signs and symptoms caused by the impairment of the heart's function. It is secondary to several circulatory conditions, including ischemic heart disease, high blood pressure, and atrial fibrillation.
Mortality	• Diabetes mortality	Diabetes morbidity was included in the traffic review. Diabetes mortality is prone to substantial outcome misclassification because diabetes is infrequently indicated as a primary cause of death on death certificates, but rather the co-morbidities ischemic heart disease or stroke.
Cancers	• Lung cancer incidence	Lung cancer mortality was included in the traffic review and lung cancer five-year survival rate remains relatively low. Therefore, mortality is a good proxy for incidence. Also lung cancer was included in a systematic review of TRAP from Hamra et al. 2015

	• Childhood leukemia	This outcome was included in a comprehensive systematic review evaluating TRAP from the CDC in 2014 (Boothe et al. 2014).

Appendix 5B. Search Strategy

PECOS		PubMed search terms
Population		adult[tiab] OR adults[tiab] OR child[tiab] OR children[tiab] OR pupils[tiab] OR preschooler[tiab] OR preschoolers[tiab] OR student[tiab] OR students[tiab] OR adolescent[tiab] OR adolescents[tiab] OR infant[tiab] OR infants[tiab] OR toddler[tiab] OR toddlers[tiab] OR newborn[tiab] OR baby[tiab] OR babies[tiab] OR person[tiab] OR persons[tiab] OR human[tiab] OR humans[tiab] OR people[tiab] OR man[tiab] OR men[tiab] OR woman[tiab] OR women[tiab] OR elderly[tiab] OR boy[tiab] OR boys[tiab] OR girl[tiab] OR girls[tiab] OR patients[tiab] OR population[tiab] OR populations[tiab] OR survivor[tiab] OR survivors[tiab] OR spouse[tiab] OR spouses[tiab] OR wife[tiab] OR husband[tiab] OR smoker[tiab] OR smokers[tiab] OR resident[tiab] OR residents[tiab] OR veteran[tiab] OR mother[tiab] OR mothers[tiab] OR father[tiab] OR fathers[tiab] OR “population based”[tiab] OR “cohort”[tiab] OR (("persons"[Mesh] OR "humans"[Mesh]) NOT (animals[Mesh] NOT humans[Mesh]))
Exposure	General terms to be combined with pollutants Different pollutants to be combined with OR	("Environmental Exposure"[Mesh] OR "Environmental Pollution"[Mesh] OR "Air Pollutants"[Mesh] OR "Air Pollution"[Mesh] OR "air pollution"[tiab] OR "air pollutants"[tiab] OR "polluted atmosphere"[tiab] OR "atmospheric pollution"[tiab] OR "polluted air"[tiab] OR "ambient air"[tiab] OR "Inhalation Exposure/adverse effects"[Mesh] OR "Motor Vehicles"[Mesh] OR "Vehicle Emissions"[Mesh] OR "traffic–related"[tiab]) OR ((traffic OR transport) AND air)
	NO_x	((("Nitrogen Oxides"[Mesh] OR "Nitrogen dioxide"[tiab] OR "NO2"[tiab] OR "NO(2)"[tiab] OR "NOx"[tiab] OR "NO(x)"[tiab] OR "Nitrogen oxide"[tiab] OR "nitrogen oxides"[tiab])) OR "oxides of nitrogen"[tiab]
	CO	"Carbon Monoxide"[Mesh] OR "carbon monoxide"[tiab]
	Traffic PM	"Particulate Matter"[Mesh:NoExp] OR "Smog"[Mesh] OR “smog”[tiab] OR "Particle Size"[Mesh] OR "PM10"[tiab] OR PM2.5[tiab] OR PM10–2.5[tiab] OR PM2.5–10[tiab] OR PM1[tiab] OR “fine particulate”[tiab] OR "PM10"[tiab] OR "PM2.5"[tiab] OR "PM10–2.5"[tiab] OR "PM2.5–10"[tiab] OR "PM1"[tiab] OR "PM(10)"[tiab] OR "PM(2.5)"[tiab] OR "PM(10–

		2.5)"[tiab] OR "PM(2.5–10)"[tiab] OR "PM(1)"[tiab] OR "particulate matter"[tiab] OR "PMcoarse"[tiab] OR "PMcoarse"[tiab]
	Non–tailpipe emissions and metals	resuspended dust[tiab] OR re–suspended dust[tiab] OR road dust[tiab] OR brake dust[tiab] OR tire dust[tiab] OR tyre dust[Text Word] OR brake wear[tiab] OR tire wear[tiab] OR tyre wear[tiab] OR road wear[tiab] OR debris dust[tiab] OR fugitive dust[tiab] OR diffuse dust[tiab] OR wear dust[tiab] OR non–exhaust[tiab] OR source apportionment[tiab] OR windblown dust[tiab] OR non–tailpipe[tiab] OR mineral dust[tiab] (nickel[tiab] OR Ni[tiab] OR Copper[tiab] OR Cu[tiab] OR aluminium[tiab] OR aluminum[tiab] OR Al[tiab] OR zinc[tiab] OR Zn[tiab] OR barium[tiab] OR Ba[tiab] OR iron[tiab] OR Fe[tiab] OR copper[tiab] OR Cu[tiab] OR Antimon[tiab] OR Sb[tiab] OR Tinn[tiab] OR Sn[tiab] OR Zirconium[tiab] OR Zr[tiab] OR "trace metals"[tiab] AND ("Particulate Matter"[Mesh:NoExp] OR "Smog"[Mesh] OR “smog”[tiab] OR "Particle Size"[Mesh] OR "PM10"[tiab] OR PM2.5[tiab] OR PM10–2.5[tiab] OR PM2.5–10[tiab] OR PM1[tiab] OR “fine particulate”[tiab] OR "PM10"[tiab] OR "PM2.5"[tiab] OR "PM10–2.5"[tiab] OR "PM2.5–10"[tiab] OR "PM1"[tiab] OR "PM(10)"[tiab] OR "PM(2.5)"[tiab] OR "PM(10–2.5)"[tiab] OR "PM(2.5–10)"[tiab] OR "PM(1)"[tiab] OR "particulate matter"[tiab] OR "PMcoarse"[tiab] OR "PMcoarse"[tiab]))
	UFPs	“submicron“[tiab] OR “surface area“[tiab] OR “ultrafine“[tiab] OR “ultrafine particles“[tiab] OR “ultrafine particle“[tiab] OR “nano particle“[tiab] OR “nano particles“[tiab] OR “nanoparticles“[tiab] OR “nanoparticle“[tiab] OR PM0.1[tiab] OR “PM0.1“[tiab] OR “PM(0.1)“[tiab] OR PM0.25[tiab] OR “PM(0.25)“[tiab] OR “PM0.25“[tiab] OR “quasi–ultrafine“[tiab] OR “quasi ultrafine“[tiab] OR “PNC“[tiab] OR “accumulation mode“[tiab] OR “particle number“[tiab] OR "number of particles"[tiab] OR “aitken mode“[tiab]
	Soot/BC	"Soot"[Mesh] OR soot[tiab] OR "PM2.5 absorbance"[tiab] OR "PM2.5absorbance"[tiab] OR “PM2.5abs”[tiab] OR "black

		carbon"[tiab] OR "carbon black"[tiab] OR “organic carbon”[tiab] OR “elemental carbon”[tiab] OR “black smoke”[tiab]
	PAHs	"Polycyclic Aromatic Hydrocarbons"[Mesh:NoExp] OR “polycyclic aromatic hydrocarbons”[tiab] OR PAH[tiab] OR "PAH's"[tiab] OR PAHs[tiab] OR "benzo(a)pyrene"[tiab] OR benzopyrene[tiab]
	Benzene	"benzene"[Mesh] OR benzene[tiab] OR BTEX[tiab]
	Proxy measures for traffic	((((traffic[tiab]) NOT ("Accidents, Traffic"[Mesh] OR safety[tiab] OR accident[tiab] OR accidents[tiab] OR injur*[tiab] OR collision*[tiab] OR crash*[tiab])) OR "traffic intensity"[tiab] OR "traffic density"[tiab] OR "traffic load"[tiab] OR "traffic count"[tiab] OR "road length"[tiab] OR ((proximity[tiab] OR near[tiab] OR distance[tiab] OR nearest[tiab] OR next[tiab] OR close[tiab] OR closest[tiab]) AND (road*[tiab] OR highway*[tiab] OR freeway*[tiab] OR motorway*[tiab] OR interstate[tiab] OR expressway[tiab])))) OR ((vehicle[tiab] OR vehicles[tiab] OR vehicular[tiab] OR auto[tiab] OR automobile[tiab] OR bus[tiab] OR buses[tiab] OR car[tiab] OR truck[tiab] OR trucker[tiab] OR trucks[tiab] OR engine[tiab] OR transport[tiab] OR traffic[tiab]) AND (emissions[tiab] OR exhaust[tiab] OR fume*[tiab]))
Comparator	Measures of effect	“risk”[Mesh] OR “risk”[tiab] OR “risks”[tiab] OR “incidence”[Mesh] OR “incidence”[tiab] OR “incident”[tiab] OR "Prevalence"[Mesh] OR “prevalence”[tiab] OR “prevalent”[tiab] OR "Risk Factors"[Mesh] OR "risk factor"[tiab] OR "Odds Ratio"[Mesh] OR "odds"[tiab] OR “onset”[tiab] OR “associated”[tiab] OR “association”[tiab] OR “cause”[tiab] OR “causes”[tiab] OR “caused”[tiab] OR “develop”[tiab] OR “developed”[tiab] OR “prevent”[tiab] OR “prevents”[tiab] OR “prevented”[tiab] OR “increase”[tiab] OR “increased”[tiab] OR “increases”[tiab] OR “effect”[tiab] OR “effects”[tiab] OR “affect”[tiab] OR “affects”[tiab] OR “affected”[tiab] OR “protective”[tiab] OR “protect”[tiab] OR “protected”[tiab] OR “harm”[tiab] OR “harms”[tiab] OR “harmed”[tiab] OR “harmful”[tiab] OR “hazard”[tiab] OR “hazardous”[tiab] OR "Proportional Hazards Models"[Mesh] OR "proportional hazard"[tiab]
Outcome	Mortality	("Mortality"[Mesh] OR "mortality"[MeSH Subheading] OR "Cardiovascular Diseases/mortality"[Mesh] OR "Myocardial Ischemia/mortality"[Mesh] OR "Respiratory Tract Diseases/mortality"[Mesh] OR "Respiratory Tract

		Infections/mortality"[Mesh] OR "Respiration Disorders/mortality"[Mesh] OR "Lung Neoplasms/mortality"[Mesh] OR "Pulmonary Disease, Chronic Obstructive/mortality"[Mesh]) OR (("cause–specific"[tiab] OR "all–cause"[tiab] OR "non–accidental"[tiab] OR "natural"[tiab] OR "natural–cause"[tiab] OR "cardiovascular"[tiab] OR "respiratory"[tiab] OR "cardiorespiratory"[tiab] OR "cardio respiratory"[tiab] OR "lung cancer"[tiab] OR "COPD"[tiab]) AND (mortality[tiab] OR death[tiab] OR "deadly"[tiab] OR died[tiab] OR fatal*[tiab] OR surviv*[tiab])) OR ("mortality"[tiab] OR "death"[tiab])
Outcome	Respiratory outcomes	"Pulmonary Ventilation"[Mesh] OR "Respiratory Function Tests"[Mesh] OR “spirometry”[tiab] OR "plethysmography"[tiab] OR “forced expiratory”[tiab] OR “FEV”[tiab] OR “FVC”[tiab] OR “FEF25–75”[tiab] OR “MEF”[tiab] OR “expiratory flow”[tiab] OR “expiration flow”[tiab] OR “small airway”[tiab] OR “impulse oscillometry”[tiab] OR “FOT”[tiab] OR “peripheral airway”[tiab] OR (("pulmonary"[tiab] OR "respiratory"[tiab] OR "lung"[tiab]) AND ("volume"[tiab] OR "function"[tiab] OR "ventilation"[tiab] OR "capacity"[tiab])) OR "Asthma"[Mesh] OR asthma[tiab] OR asthmatic[tiab] OR wheezing[tiab] OR wheeze[tiab] OR whistle[tiab] OR whistling[tiab] OR "bronchial hyperreactivity"[tiab] OR "Bronchial Hyperreactivity"[Mesh] OR "bronchial hyperresponsiveness"[tiab] OR "airway hyperresponsiveness"[tiab] OR ISAAC[tiab] OR "Respiratory Hypersensitivity/chemically induced"[Mesh] OR bronchiodilat*[tiab] OR "bronchial dilation"[tiab] OR "bronchial dilatation"[tiab] OR bronchioconstrict*[tiab] OR salbutamol*[tiab] OR "methacholine"[tiab] OR "mannitol"[tiab] OR "Breath Tests"[Mesh] OR “exhaled nitric oxide”[tiab] OR “FeNO”[tiab] OR “fractional exhaled NO”[tiab] OR "Acute lower respiratory infection"[tiab] OR "Acute lower respiratory tract infection"[tiab] OR "ALRI"[tiab] OR ("respiration tract"[tiab] AND "infection"[tiab]) OR "Pneumonia"[Mesh] OR "pneumonia"[tiab] OR "Bronchiolitis"[tiab] OR "Bronchitis"[Mesh] OR "Bronchitis"[tiab] OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR COPD[tiab] OR ((“chronic obstructive”[tiab]) AND (bronchitis[tiab] OR

		“bronchopulmonary disease”[tiab] OR “lung disorder”[tiab] OR “pulmonary disease”[tiab] OR “pulmonary disorder”[tiab] OR “respiratory disease”[tiab] OR disease[tiab])) OR "emphysema"[tiab] OR "chronic airway obstruction"[tiab] OR "chronic airflow obstruction"[tiab]
Outcome	Cardiovascular outcomes	(“cardiovascular”[Title/Abstract] OR “cardiorespiratory”[Title/Abstract] OR “cardio–respiratory”[Title/Abstract]) OR ("Myocardial Ischemia"[Mesh] OR ((myocardial[tiab] OR myocard[tiab] OR heart[tiab] OR cardiac[tiab] OR cardial[tiab] OR myocardium[tiab]) AND (infarct[tiab] OR infarction[tiab] OR attack[tiab] OR failure[tiab] OR disease[tiab])) OR "Heart Failure"[Mesh] OR “fatal MI”[tiab] OR “coronary event”[tiab] OR “coronary syndrome”[tiab] OR “coronary syndrom”[tiab] OR “cardiac death”[tiab] OR “revascularization”[tiab] OR “revascularisation”[tiab]) OR ("Stroke"[Mesh] OR "Stroke"[tiab] OR "acute cerebrovascular lesion"[tiab] OR "cerebral vasculopathy"[tiab] OR "brain attack"[tiab] OR "cerebral apoplexy"[tiab] OR "brain ischemic attack"[tiab] OR (("cerebrovascular"[tiab] OR "cerebro vascular"[tiab] OR cerebral[tiab]) AND (insufficiency[tiab] OR "accident"[tiab] OR arrest[tiab] OR "failure"[tiab] OR "injury"[tiab] OR "attack"[tiab]))) OR ("Arteriosclerosis"[Mesh] OR “atherosclerosis”[tiab] OR “arteriosclerosis”[tiab] OR “vascular sclerosis”[tiab] OR "Carotid Intima–Media Thickness"[Mesh] OR “CIMT”[tiab] OR "aorta wall thickness"[tiab] OR "aortic thickness"[tiab] OR "aortic wall thickness"[tiab] OR "arterial thickness"[tiab] OR "artery thickness"[tiab] OR "artery wall thickness"[tiab] OR "carotid intima media thickness"[tiab] OR "carotid intima–media thickness"[tiab] OR "carotid intimamedia thickness"[tiab] OR "intima–media thickness"[tiab] OR "intimal medial thickness"[tiab] OR "intimamedia thickness"[tiab]) OR "Ankle Brachial Index"[Mesh] OR “ankle–brachial index”[tiab] OR "ankle brachial pressure index"[tiab] OR "ankle brachial ratio"[tiab] OR "Pulse Wave Analysis"[Mesh] OR "pulse wave velocity"[tiab] OR "pulse wave analysis"[tiab] OR "augmentation pressure"[tiab] OR "augmentation index"[tiab] OR "vascular reactivity"[tiab] OR "vascular function"[tiab] OR "Vascular Stiffness"[Mesh] OR ((aorta[tiab] OR arterial[tiab] OR aortic[tiab] OR artery[tiab] OR vascular[tiab]) AND (stiffness[tiab] OR stiffening[tiab])) OR "Calcinosis"[Mesh] OR

		"artery calcification"[tiab] OR "aortic calcification"[tiab] OR ("Blood Pressure"[Mesh] OR “blood pressure”[tiab] OR “systolic pressure”[tiab] OR “diastolic pressure”[tiab] OR "Hypertension"[Mesh] OR “hypertension”[tiab] OR “intravascular pressure”[tiab] OR “vascular pressure”[tiab] OR “blood tension”[tiab] OR “normotension”[tiab] OR “hypertensive”[tiab]) OR ("Plaque, Atherosclerotic"[Mesh] OR "plaque area"[tiab] OR “atherosclerotic plaque”[tiab] OR “arteriosclerotic plaque”[tiab] OR "atheromatous plaque”[tiab] OR "intima plaque”[tiab]) "Diabetes Mellitus, Type 2"[Mesh] OR "diabetes"[tiab] OR "diabetic"[tiab] OR T2DM[tiab] OR "type 2 DM"[tiab] OR "fasting blood glucose"[tiab] OR "fasting glucose"[tiab] OR "glucose metabolism"[tiab] OR "glucose homeostasis"[tiab] OR Hba1c[tiab] OR IDDM[tiab] OR NIDDM[tiab] OR HOMA–IR[tiab] OR hyperglycemia[tiab]
Outcome	Childhood leukemia	(("Leukemia"[Mesh] OR "Leukemia"[tiab] OR "Leukaemia"[tiab] OR leucemia[tiab] OR leucaemia[tiab] OR "childhood cancer"[tiab] OR hemoblastoma[tiab]) AND ("Child"[Mesh] OR "Adolescent"[Mesh] OR "Young Adult"[Mesh] OR "Infant"[Mesh] OR "children"[tiab] OR "childhood"[tiab] OR child[tiab] OR preschooler[tiab] OR preschoolers[tiab] OR pupil[tiab] OR pupils[tiab] OR student[tiab] OR students[tiab] OR adolescent[tiab] OR adolescents[tiab] OR infant[tiab] OR infants[tiab] OR toddler[tiab] OR toddlers[tiab] OR newborn[tiab] OR newborns[tiab] OR baby[tiab] OR babies[tiab] OR boy[tiab] OR boys[tiab] OR girl[tiab] OR girls[tiab]))
Outcome	Birth outcomes	"Fetal Growth Retardation"[Mesh] OR "Birth Weight"[Mesh] OR "Infant, Low Birth Weight"[Mesh] OR "Premature Birth"[Mesh] OR “intrauterine growth restriction”[tiab] OR "Fetal Development"[Mesh] OR “fetal development”[tiab] OR “foetal development”[tiab] OR “intrauterine growth retardation”[tiab] OR "birth weight"[tiab] OR “small for gestational age”[tiab] OR “preterm birth”[tiab] OR “premature birth”[tiab] OR "birth outcome"[tiab] OR "pregnancy outcome"[tiab] OR “neonatal weight”[tiab] OR “newborn weight”[tiab] OR “fetal growth”[tiab] OR “foetal growth”[tiab] OR “foetus growth”[tiab] OR “fetus growth”[tiab] OR “foetal growth restriction”[tiab] OR “foetal growth retardation”[tiab] OR “in utero growth retardation”[tiab] OR “in utero growth restriction”[tiab] OR “congenital hypotrophy”[tiab] OR “prenatal growth retardation”[tiab] OR “prenatal growth restriction”[tiab] OR

		“retarded intrauterine growth”[tiab] OR “premature childbirth”[tiab] OR “premature birth”[tiab] OR “small for date”[tiab] OR “low birth weight”[tiab] OR (LBW[tiab] AND (infant[tiab] OR baby[tiab] OR newborn[tiab] OR child[tiab])) OR (premature[tiab] AND (infant[tiab] OR baby[tiab] OR newborn[tiab] OR child[tiab])) OR (“preterm”[tiab] AND (infant[tiab] OR baby[tiab] OR newborn[tiab] OR child[tiab]))
Outcome	Pregnancy outcomes	"Diabetes, Gestational"[Mesh] OR "Hypertension, Pregnancy–Induced"[Mesh] OR "Gestational Hypertension"[tiab] OR "pregnancy–induced hypertension"[tiab] OR (pregnan*[tiab] AND hypertens*[tiab]) OR pre–eclampsia[tiab] OR preeclampsia[tiab] OR (pregnan*[tiab] AND toxemia*[tiab])
Outcome	Neurodevelopment outcomes (children) and neurocognitive outcomes (adults)	"Cognition Disorders"[Mesh] OR cognition[tiab] OR cognitive[tiab] OR neurobehavio*[tiab] OR neuropsych*[tiab] OR "Mental Processes"[Mesh] OR memory[tiab] OR "mental recall"[tiab] OR (verbal[tiab] OR language[tiab] OR reading[tiab] AND (comprehension[tiab])) OR “language”[tiab] OR learning[tiab] OR perception[tiab] OR perceptual[tiab] OR neurodevelop*[tiab] OR intelligen*[tiab] OR intellect*[tiab] OR “IQ”[tiab] OR behavior[Mesh:NoExp] OR Child behavior[Mesh] OR Adolescent behavior[Mesh] OR Behavioral symptoms[Mesh] OR Spatial behavior[Mesh] OR executive function[tiab] OR “academic achievement”[tiab] OR “academic performance”[tiab] OR "Neurodevelopmental Disorders"[Mesh] OR attention[tiab] OR inattenti*[tiab] OR hyperactiv*[tiab] OR "impulsive behavior"[Mesh] OR impulsive[tiab] OR impulse–control[tiab] OR impulsivity[tiab] OR “response inhibition”[tiab] OR “inhibitory control”[tiab] OR “vigilance”[tiab] OR “social–behavior”[tiab] OR “social–behaviour”[tiab] OR “social skills”[tiab] OR aggression[tiab] OR aggressive[tiab] OR “ADDH”[tiab] OR “ADHS”[tiab] OR “ADHD”[tiab] OR “ADH”[tiab] OR "Autism Spectrum Disorder"[Mesh] OR autistic[tiab] OR autism[tiab] OR “Tic–disorder”[tiab] OR Asperger*[tiab] OR “communication–disorder*”[tiab] OR language[tiab] OR agraphia[tiab] OR dyslexi*[tiab] OR dyscalculia[tiab] OR speech[tiab] OR aphasia[tiab] OR echolalia[tiab] OR “stereotyp*”[tiab] OR “Pervasive Developmental Disorder”[tiab] OR “social cognition”[tiab] OR “social communication”[tiab] OR “social reciprocity”[tiab] OR “repetitive behavior*”[tiab] OR “repetitive behaviour”[tiab] OR “restricted interests”[tiab] OR

		“maladaptive behavior”[tiab] OR “maladaptive behaviour”[tiab] OR “adaptive behavior”[tiab] OR “behavioral regulation”[tiab] OR "Aging"[Mesh] OR "Cognitive Dysfunction"[Mesh] OR “dementia”[Mesh] OR dementia[tiab] OR alzheime*[tiab] OR neurotox*[tiab] OR “Neurodegenerative Diseases”[Mesh] OR neurodegenerat*[tiab] OR neurodisease*[tiab] OR Parkinson*[tiab] OR neuropsycholog*[tiab]
Study	Filters	NOT ((((((("shortterm"[ti] OR "short–term"[ti] OR “time series”[ti] OR time–series[ti]) AND (("shortterm"[ti] OR "short–term"[ti] OR “time series”[ti] OR time–series[ti]) NOT ("longterm"[tiab] OR "long term"[tiab] OR "medium term"[tiab] OR "intermediate term"[tiab] OR “chronic”[tiab])))))) OR ("Clinical Trial"[Publication Type] OR "Treatment Outcome"[MeSH] OR "Cross–Over Studies"[Mesh] OR "case cross over"[tiab])) OR ("Air Pollutants, Occupational"[Mesh] OR "Accidents, Traffic"[Mesh] OR "Protective Devices"[Mesh])) OR (mouse[Title/Abstract] OR mice[Title/Abstract] OR rat[Title/Abstract] OR rats[Title/Abstract]) AND English[Language] AND ("1980/01/01"[Date – Publication] : "3000"[Date – Publication])

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Appendix 5C. Scaling and Conversion Factors for Use in Meta-analysis

Pollutant	Conversion	Factor	Source	Increment	Unit	Source
NO_2	ppb>µg/m^3	1.88	Defra 2005	10	µg/m^3	Beelen 2014
NO	ppb>µg/m^3	1.23	Calculated from NO_2 using molar mass of 30 vs. 46 for NO_2	10	µg/m^3	
NO_X	ppb>µg/m^3	1.55	There is no universal correct transformation. The Panel assumed 50% of NO_x is NO_2 and used the average of the NO_2 and NO factor.	20	µg/m^3	Beelen 2014
CO	ppm>mg/m^3	1.15	Defra 2005	1	mg/m^3	
EC	NA	NA		1	µg/m^3	Beelen 2014
BC	µg/ m^3>µg/m^3 EC	1.25	Cyrys 2003; Janssen 2011	NA	NA	
BS	µg/ m^3>µg/m^3 EC	0.11	Cyrys 2003; Janssen 2011	NA	NA	
PM absorbance ('soot')	10^{-5}/m >µg/m^3 EC	1.1	Cyrys 2003; Janssen 2011	NA	NA	
PM_{10}	NA	NA		10	µg/m^3	Beelen 2014
$PM_{2.5}$	NA	NA		5	µg/ m^3	Beelen 2014
$PM_{2.5}$ Cu	NA	NA		5	ng/ m^3	Beelen 2015
$PM_{2.5}$ Fe	NA	NA		500	ng/ m^3	Beelen 2015

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