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Supplemental Material

Exposure to Air Pollution in Relation to Risk of Dementia and Related Outcomes: An Updated Systematic Review of the Epidemiological Literature

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Table 1: Summary of study characteristics for eligible studies on air pollution and late-life cognitive health identified through December 31, 2020

(Citation) / Cohort	N / Location	Exposures Considered								Outcomes Considered							New to the Review
		PM_{10}	$PM_{2.5-10}$	$PM_{2.5}$	Traffic-related air pollution [a]	Wood burning PM	NO_2 or NO_x	Ozone	API	Cognitive Test Scores	Prevalent Cognitive Impairment	Change in Cognitive Test Scores	Dementia (Medical Records or Claims)	Dementia (Study Assessment)	Other Incident Cognitive Impairment	Neuroimaging	
Cognitive Level																	
(Ailshire and Crimmins 2014) / HRS	13,996 / US			X						X							
(Ailshire and Clarke 2015) / ACL Survey	780 / US			X						X							
(Chen et al. 2020) / TIGER	360 / Taipei and Keelung, Taiwan	X	X	X			X			X	X						X
(Chen and Schwartz 2009) / NHANES III	1,764 / US	X						X		X							
(Gatto et al. 2014) / WISH, BVAIT, and ELITE	1,496 / Los Angeles Basin, US			X			X	X		X							
(Kim et al. 2019) / Volunteer community-based sample in South Korea	1,484 / 4 regions of South Korea	X	X				X			X	X						X
(Lo et al. 2019) / TLSA	6,546 / Taiwan	X						X			X						X
(Power et al. 2011) / NAS	680 / Greater Boston, US				X					X	X						
(Ranft et al. 2009) / SALIA	399 / Ruhr and adjacent area, Germany	X			X					X							
(Rocha et al. 2020) / ELSA-Brasil	3,050 / Sao Paolo, Brazil				X					X							X
(Salinas-Rodriguez et al. 2018) / ENSANUT-2012	7,986 / Mexico			X						X							X
(Schikowski et al. 2015) / SALIA	789 / Ruhr and adjacent area, Germany	X		X	X		X			X							
(Shin et al. 2019) / KFACS	2,896 / South Korea	X		X			X	X		X	X						X
(Tallon et al. 2017) / NSHAP	3,377 / US			X			X			X							X
(Tzivian et al. 2016) / Heinz Nixdorf RECALL	4,050 / Ruhr area, Germany	X	X	X	X		X			X							X
(Wellenius et al. 2012a) / MOBILIZE Boston	765 / Boston, US				X					X	X						
(Wurth et al. 2018) / BPRHS	1497 / Boston, US			X	X					X							X

(Citation) / Cohort	N / Location	Exposures Considered								Outcomes Considered							New to the Review
		PM_{10}	$PM_{2.5-10}$	$PM_{2.5}$	Traffic-related air pollution [a]	Wood burning PM	NO_2 or NO_x	Ozone	API	Cognitive Test Scores	Prevalent Cognitive Impairment	Change in Cognitive Test Scores	Dementia (Medical Records or Claims)	Dementia (Study Assessment)	Other Incident Cognitive Impairment	Neuroimaging	
(Yao et al. 2021) / CLHLS	11,187 / China				X					X	X						X
(Younan et al. 2020a) / WHIMS-MRI and WHISCA	998 / US			X						X		X				X	X
(Zeng et al. 2010) / CLHLS	15,973 / China								X		X						
Neuroimaging Level and Cognitive Level																	
(Crous-Bou et al. 2020) / ALFA	958 (cognitive level); 228 (neuroimaging) / Barcelona, Spain	X	X	X	X		X			X						X	X
(Nußbaum et al. 2020) / 1000BRAINS	615 / Ruhr area, Germany	X		X	X		X			X						X	X
Neuroimaging Level																	
(Casanova et al. 2016) / WHIMS-MRI	1,365 / US			X												X	X
(Chen et al. 2015) / WHIMS-MRI	1,403 / US			X												X	
(Erickson et al. 2020) / UK Biobank	18,292 / UK	X	X	X			X									X	X
(Gale et al. 2020) / UK Biobank	18,288 / UK	X	X	X			X									X	X
(Hedges et al. 2019) / UK Biobank	18,278 / UK	X	X	X			X									X	X
(Hedges et al. 2020) / UK Biobank	18,278 / United Kingdom	X	X	X			X									X	X
(Iaccarino et al. 2021) / IDEAS	18,178 / US			X				X								X	X
(Kulick et al. 2017) / NOMAS	1,075 / New York, US			X	X		X	X								X	X
(Power et al. 2018a) / ARIC	1,753 / 4 regions of the US	X		X												X	X
(Wilker et al. 2015) / FOS	929 [b] / New England, US			X	X											X	
(Wilker et al. 2016a) / MADRC	236 / New England and New York, US			X	X											X	X
(Younan et al. 2020b) / WHIMS-MRI	1,365 (cross-sectional); 712 (longitudinal) / US			X												X	X

(Citation) / Cohort	N / Location	Exposures Considered								Outcomes Considered							New to the Review
		PM_{10}	$PM_{2.5-10}$	$PM_{2.5}$	Traffic-related air pollution [a]	Wood burning PM	NO_2 or NO_x	Ozone	API	Cognitive Test Scores	Prevalent Cognitive Impairment	Change in Cognitive Test Scores	Dementia (Medical Records or Claims)	Dementia (Study Assessment)	Other Incident Cognitive Impairment	Neuroimaging	
Cognitive Level and Cognitive Change																	
(Cullen et al. 2018) / UK Biobank	86,759 (cross-sectional analysis); 2,913 (follow-up sample) / United Kingdom	X	X	X			X			X		X					X
(Kulick et al. 2020) / WHICAP and NOMAS	5,330 (WHICAP); 1,093 (NOMAS) / northern Manhattan, New York, US	X		X	X		X			X		X					X
(Tonne et al. 2014) / Whitehall II	2,867 / Greater London, United Kingdom	X		X	X					X		X					
Cognitive Change																	
(Cleary et al. 2018) / National AD Centers Database	5,116 / US			X				X				X					X
(Colicino et al. 2014) / NAS	387 / Greater Boston, US				X							X					X
(Oudin et al. 2017) / Betula	1,469 / Umeå, Sweden						X					X					X
(Petkus et al. 2020) / WHISCA	2,202 / US			X								X					X
(Petkus et al. 2021) / WHIMS-ECHO	1,583 / US			X			X					X					X
(Weuve et al. 2012) / NHS	19,409 / US	X	X	X								X					
Prevalent Dementia																	
(Dimakakou et al. 2020) / UK Biobank	502,504 / United Kingdom			X									X				X
Incident Dementia or Other Incident Cognitive Impairment																	
(Ailshire and Walsemann 2021) / HRS	9,970 (year 2004); 9,185 (year 2014) / US			X											X		X

(Citation) / Cohort	N / Location	Exposures Considered								Outcomes Considered							New to the Review
		PM_{10}	$PM_{2.5-10}$	$PM_{2.5}$	Traffic-related air pollution [a]	Wood burning PM	NO_2 or NO_x	Ozone	API	Cognitive Test Scores	Prevalent Cognitive Impairment	Change in Cognitive Test Scores	Dementia (Medical Records or Claims)	Dementia (Study Assessment)	Other Incident Cognitive Impairment	Neuroimaging	
(Carey et al. 2018) / CPRD	130,978 / Greater London, UK			X	X		X	X					X				X
(Cerza et al. 2019)/ Rome Longitudinal Cohort	350,844 / Rome, Italy	X	X	X	X		X	X					X				X
(Chang et al. 2014) / NHIRD Taiwan	29,547 / Taiwan						X						X				
(H Chen et al. 2017a) / Ontario Population Health and Environment Cohort	2,066,639 / Ontario, Canada			X			X	X					X				X
(H Chen et al. 2017b) / Ontario Population Health and Environment Cohort	2,165,268 / Ontario, Canada				X								X				X
(Grande et al. 2020) / SNAC-K	2,927 / Kungsholmen district, Stockholm, Sweden			X			X						X	X			X
(He et al. 2020) / ZJMPHS	7,311 / Zhejiang province, China	X		X			X	X	X						X		X
(Ilango et al. 2020) / NPHS and CCHS participants	34,391 / Ontario, Canada			X			X						X				X
(Jung et al. 2015) / NHIRD Taiwan	95,690 / Taiwan			X				X					X				
(Li et al. 2019) / NHIRD Taiwan	4,155 / Taiwan	X					X	X					X				X
(Loop et al. 2013) / REGARDS	20,150 / US			X											X		
(Oudin et al. 2016) / Betula	1,806 / Umeå, Sweden						X						X	X			
(Oudin et al. 2018) / Betula	1,806 / Umeå, Sweden				X	X							X	X			X
(Paul et al. 2020) / SALSA	1,564 / Sacramento Valley, California, US				X									X	X		X
(Ran et al. 2021) / Chinese EHS	59,349 / Hong Kong, China			X									X				X
(Shi et al. 2020) / Medicare fee-for-service beneficiaries	63,038,019 / US			X									X				X

(Citation) / Cohort	N / Location	Exposures Considered								Outcomes Considered							New to the Review
		PM_{10}	$PM_{2.5-10}$	$PM_{2.5}$	Traffic-related air pollution [a]	Wood burning PM	NO_2 or NO_x	Ozone	API	Cognitive Test Scores	Prevalent Cognitive Impairment	Change in Cognitive Test Scores	Dementia (Medical Records or Claims)	Dementia (Study Assessment)	Other Incident Cognitive Impairment	Neuroimaging	
(Smargiassi et al. 2020) / QICDSS	1,807,133 (Quebec); 457,768 (Montreal) / Quebec/Montreal, Canada			X	X		X						X				X
(Wang et al. 2020) / CLHLS	13,324 / China			X											X		X
(Wu et al. 2015) / Case-control	871 / northern Taiwan	X						X						X			X
(Yuchi et al. 2020) / MSP registry	633,949 (NAD analysis); 13,498 (AD analysis) / Metro Vancouver, Canada			X	X		X						X				X
Incident Dementia or Other Incident Cognitive Impairment and Neuroimaging Level																	
(JC Chen et al. 2017) / WHIMS	1,403 (neuroimaging); 7,447 (incident dementia or cognitive impairment) / US			x	x									X	X	X	X

a) Includes measures of distance to road, traffic intensity, black carbon, traffic-sourced particulate matter, and TRAP-NO_x. Though NO_2 and NO_x are often considered as traffic-related air pollution, we consider them separately.
b) Sample size varies by analysis. N=929 represents the largest reported sample size for primary analyses.
Abbreviations: ACL, Americans' Changing Lives; ALFA, Alzheimer's and Family; AD, Alzheimer's disease; ARIC, Atherosclerosis Risk in Communities; BPRHS, Boston Puerto Rican Health Study; BVAIT, B-Vitamin Atherosclerosis Intervention Trial; CCHS, Canadian Community Health Survey; CLHLS, Chinese Longitudinal Healthy Longevity Survey; CPRD, Clinical Practice Research Datalink; EHS, Elderly Health Service; ELITE, Early Versus Late Intervention Trial; ELSA-Brasil, Brazilian Longitudinal Study on Adult Health; ENSANUT-2012, Spanish acronym for National Survey of Health and Nutrition in Mexico in 2012; FOS, Framingham Offspring Study; Heinz Nixdorf RECALL, Risk factors, Evaluation of Coronary Calcium and Lifestyle study; HRS, Health and Retirement Study; ICD-9, International Classification of Diseases, Ninth Revision; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; IDEAS, Imaging Dementia – Evidence for Amyloid Scanning; KFACS, Korean Frailty and Aging Cohort Study; MADRC, Massachusetts Alzheimer's Disease Research Center Longitudinal Cohort; MOBILIZE, Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly; MSP, Medical Service Plan; NAS, Normative Aging Study; NAD, non-Alzheimer's dementia; NHANES III, Third National Health and Nutrition Examination Survey; NHIRD, National Health Insurance Research Database; NHS, Nurses' Health Study; NO2, nitrogen dioxides; NOx, nitrogen oxides; NOMAS, Northern Manhattan Study; NPHS, National Population Health Survey; NSHAP, National Social Health and Aging Study; PM, particulate matter; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; PM10, particulate matter with an aerodynamic diameter < 10 micrometers; PM2.5-10, particulate matter with an aerodynamic diameter between 2.5 and 10 micrometers; QICDSS, Quebec Integrated Chronic Disease Surveillance System; REGARDS, Reasons for Geographic and Racial Differences in Stroke; SALIA, Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; SALSA, Sacramento Area Latino Study on Aging; SNAC-K, Swedish National Study of Aging and Care in Kungsholmen; TIGER, Taiwan Institute for Geriatric Epidemiological Research; TLSA, Taiwanese Longitudinal Study on Aging; UK, United Kingdom; US, United States; WHICAP, Washington Heights-Inwood Community Aging Project; WHIMS-ECHO, Women's Health Initiative Memory Study of the Epidemiology of Cognitive Health Outcomes; WHIMS-MRI, Women's Health Initiative Memory Study

Magnetic Resonance Imaging Study; WHISCA, Women’s Health Initiative Study of Cognitive Aging; WISH, Women's Isoflavone Soy Health; ZJMPHS, Zhejiang Major Public Health Surveillance.

Table 2. Summary of quality assessment for eligible studies on air pollution and late-life cognitive health identified through December 31, 2020

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/ Inappropriate Adjustment	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
Cognitive Level							
(Ailshire and Crimmins 2014) / HRS		✓	✓	✓	✓		No individual-level exposure assessment, restricted to regions near regulatory monitors.
(Ailshire and Clarke 2015) / ACL Survey				✓	✓		No individual-level exposure assessment, restricted to regions near regulatory monitors; insensitive test of cognition will likely only pick up highly impaired; crude age and education adjustment.
(Chen et al. 2020) / TIGER					✓	X	Limited exposure variability; reporting on outcome definition is unclear; inappropriate adjustment for a potential intermediate; no information on correlates of attrition.
(Chen and Schwartz 2009) / NHANES III		✓		✓	✓		No individual-level exposure assessment, restricted to regions near regulatory monitors; adjusted for age in 10-year bands, different adjustment for socioeconomic status across exposures, specifically some models of PM_{10} not adjusted for both race/ethnicity and socioeconomic status.
(Gatto et al. 2014) / WISH, BVAIT, and ELITE		✓	✓				Only modest capture of local exposure gradients; cohort was extremely healthy for age due to inclusion/exclusion criteria of original randomized controlled trials.
(Kim et al. 2019) / Voluntary community-based sample	✓				✓	X	Outcome was below threshold on dementia screening test after excluding persons with dementia or mild cognitive impairment; crude age adjustment, inappropriate adjustment for intermediates, reported only stratified analysis without justification.
(Lo et al. 2019) / TLSA					✓	X	No individual-level exposure assessment or information on exposure distribution; insensitive test of cognition will likely only pick up highly impaired; inappropriate adjustment for IADLs; lack of information on loss to follow-up despite use of repeated measures for cross-sectional analysis.
(Power et al. 2011) / NAS	✓	✓		✓	✓		Inappropriate adjustment for intermediates.
(Ranft et al. 2009) / SALIA		✓		✓	✓		Relatively little exposure variability in recent exposure for rural participants, modest capture of local exposure gradients; crude adjustment for age and socioeconomic status, inappropriate adjustment for co-morbidities.
(Rocha et al. 2020) / ELSA-Brasil	✓	✓	✓		✓	X	Excluded substantial proportion of sample for missing exposure data.
(Salinas-Rodriguez et al. 2018) / ENSANUT-2012		✓	✓	✓	✓	X	No individual-level exposure assessment, limited capture of local air pollution exposure gradients.
(Schikowski et al. 2015) / SALIA		✓	✓	✓	✓		Relatively little variation in PM across study participants.

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/ Inappropriate Adjustment	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
(Shin et al. 2019) / KFACS		✓		✓	✓	X	Limited exposure variation, exposure estimation poorly documented, no individual-level exposure assessment; inappropriate adjustment for co-morbidities.
(Tallon et al. 2017) / NSHAP		✓	✓	✓	✓	X	Excluded 1/3 of participants from analyses with NO_2 exposure, spatial resolution is limited, especially for NO_2.
(Tzivian et al. 2016) / Heinz Nixdorf RECALL		✓	✓	✓	✓	X	Limited exposure variability.
(Wellenius et al. 2012a) / MOBILIZE Boston	✓	✓	✓		✓		Lack of information on loss to follow-up despite use of repeated measures for cross-sectional analysis.
(Wurth et al. 2018) / BPRHS		✓			✓	X	Limited exposure variation, no individual-level exposure assessment; no adjustment for calendar time (necessary because a single monitor was used to assess exposure based on individual's cognitive test date); lack of information on loss to follow-up despite use of repeated measures for cross-sectional analysis.
(Yao et al. 2021) / CLHLS		✓	✓		✓	X	Use self-report for assessment of distance to road; excluded 23% due to missing MMSE data.
(Younan et al. 2020a) / WHIMS-MRI and WHISCA	✓	✓		✓		X	Inappropriate adjustment for intermediates; MRI sample appears extremely healthy based on sample characteristics.
(Zeng et al. 2010) / CLHLS		✓	✓	✓	✓		API is a crude measure combining multiple air pollutants with variable correlation, measured at the community level.
Neuroimaging Level and Cognitive Level							
(Crous-Bou et al. 2020) / ALFA		✓	✓	✓		X	Did not report exposure contrast associated with reported effect estimate; enriched in participants who are APOE E4 positive, have a family history of dementia.
(Nußbaum et al. 2020) / 1000BRAINS		✓	✓	✓	✓	X	Limited exposure variability.
Neuroimaging Level							
(Casanova et al. 2016) / WHIMS-MRI	✓	✓				X	Adjustment for intermediates in presented models; no comparison of MRI sub-cohort to full cohort; MRI sample appears extremely healthy based on sample characteristics.
(Chen et al. 2015) / WHIMS-MRI		✓	✓				~11% of the cohort were missing >40% of $PM_{2.5}$ data for the exposure assessment period and point estimates are attenuated, but remain statistically significant when excluding this group; no comparison of MRI sub-cohort to full cohort; MRI sample appears extremely healthy based on sample characteristics.
(Erickson et al. 2020) / UK Biobank	✓	✓				X	Inappropriate adjustment for intermediates or consequences of exposure or outcome; no comparison of MRI sub-cohort to full cohort; sample is much healthier than general UK population.

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
(Gale et al. 2020) / UK Biobank	✓					X	Unclear if volumes standardized by intracranial volume, no information on MRI processing pipeline, left/right separated without confirmation of effect modification; inappropriate adjustment for intermediates or consequences of exposure or outcome, a proxy of exposure; no comparison of MRI sub-cohort to full cohort; sample is much healthier than general UK population.
(Hedges et al. 2019) / UK Biobank	✓					X	Unclear if volumes standardized by intracranial volume, no information on MRI processing pipeline, left/right separated without confirmation of effect modification; inappropriate adjustment for intermediates or consequences of exposure or outcome, a proxy of exposure; no comparison of MRI sub-cohort to full cohort; sample is much healthier than general UK population.
(Hedges et al. 2020) / UK Biobank	✓					X	Unclear if volumes standardized by intracranial volume, no information on MRI processing pipeline, left/right separated without confirmation of effect modification; inappropriate adjustment for intermediates or consequences of exposure or outcome, a proxy of exposure; no comparison of MRI sub-cohort to full cohort; sample is much healthier than general UK population.
(Iaccarino et al. 2021) / IDEAS		✓				X	No individual-level exposure assessment; inappropriate adjustment for intermediates; selection based on cognitive status could cause collider bias; highly selected clinical sample of people with uncertain cognitive impairment etiology who access tertiary care.
(Kulick et al. 2017) / NOMAS	✓	✓	✓		✓	X	No comparison of MRI sub-cohort to full cohort.
(Power et al. 2018a) / ARIC		✓	✓		✓	X	Limited exposure variation for site-specific analyses, selection based on cognitive status could cause collider bias.
(Wilker et al. 2015) / FOS	✓	✓	✓		✓		No comparison of MRI sub-cohort to full cohort.
(Wilker et al. 2016a) / MADRC	✓	✓	✓			X	Highly selected clinical sample.
(Younan et al. 2020b) / WHIMS-MRI	✓	✓	✓	✓		X	MRI sample appears extremely healthy based on sample characteristics.
Cognitive Level and Cognitive Change							
(Cullen et al. 2018) / UK Biobank	✓		✓			X	Time period elapsed and limited number of assessments may limit ability to detect change given age of sample; not representative of sampling frame and low participation rate; sample is much healthier than general UK population.
(Kulick et al. 2020) / WHICAP and NOMAS		✓	✓		✓	X	Low exposure variability within NOMAS participants; no comparison of MRI sub-cohort to full cohort.

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
(Tonne et al. 2014) / Whitehall II		✓		✓	✓		Relatively little variation in total PM_{10} and total $PM_{2.5}$ across study participants, no individual-level exposure assessment; did not report whether they adjusted for time-by-covariate interactions in analyses of cognitive change.
Cognitive Change							
(Cleary et al. 2018) / National AD Centers Database		✓				X	No individual-level exposure, low spatial resolution of model, use of tertiles for exposure; did not specify if including cross-product terms to adjust for confounding of decline; highly selected clinical sample and required development of cognitive impairment during follow-up; enriched in participants who are APOE E4 positive, have a family history of dementia, or have rare dementias.
(Colicino et al. 2014) / NAS	✓	✓			✓	X	Inappropriate adjustment for potential intermediates; no discussion of extent or correlates of attrition during follow-up.
(Oudin et al. 2017) / Betula		✓	✓	✓	✓	X	Exposures were predicted for 2009-2010, but outcome follow-up spanned 1993-2010.
(Petkus et al. 2020) / WHISCA	✓	✓			✓	X	Inappropriate adjustment for intermediates; no discussion of extent or correlates of attrition during follow-up.
(Petkus et al. 2021) / WHIMS-ECHO	✓	✓			✓	X	Inappropriate adjustment for intermediates; recruitment required survival to age 80, no discussion of extent or correlates of attrition during follow-up.
(Weuve et al. 2012) / NHS	✓	✓	✓		✓		No discussion of correlates of attrition during follow-up.
Prevalent Dementia							
(Dimakakou et al. 2020) / UK Biobank						X	No information on exposure distribution, no information on how exposure was linked to participants; reliance on medical records; inappropriate adjustment for potential consequences of disease, no adjustment for individual-level SES; sample is much healthier than general UK population, inclusion of young participants not at risk of dementia; not representative of sampling frame and low participation rate.
Incident Dementia or Other Incident Cognitive Impairment							
(Ailshire and Walsemann 2021) / HRS		✓	✓		✓	X	No individual-level exposure assessment; no information on proportion of persons lost to follow-up or correlates of attrition
(Carey et al. 2018) / CPRD					✓	X	Limited exposure variation, no individual-level exposure assessment; reliance on medical records/claims data; no adjustment for individual-level education; no discussion of extent or correlates of attrition during follow-up.
(Cerza et al. 2019) / Rome Longitudinal Cohort			✓	✓	✓	X	Exposures were predicted for 2009-2010, but outcome follow-up started in 2001; reliance on hospital admissions for identifying dementia.

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
(Chang et al. 2014) / NHIRD Taiwan							No individual-level exposure estimates, exposure averaging period depended on date of censoring; use of ICD-9-CM codes for identification of dementia, youngest participants not at risk of dementia given <65 years of age for duration of follow-up; no adjustment for education, inappropriate adjustment for multiple potential mediating health conditions in all presented models; no information on attrition or its correlates; inclusion criteria required respiratory tract infection, which may have resulted in selection of sicker or more susceptible persons.
(H Chen et al. 2017a) / Ontario Population Health and Environment Cohort					✓	X	No individual-level exposure assessment, poor resolution for ozone; reliance on medical records/claims data; crude adjustment for SES; no discussion of extent or correlates of attrition during follow-up.
(H Chen et al. 2017b) / Ontario Population Health and Environment Cohort					✓	X	Proximity to major roadways based on postcode centroid; reliance on medical records/claims data; crude adjustment for SES, adjustment for mediators in primary analyses; no discussion of extent or correlates of attrition during follow-up.
(Grande et al. 2020) / SNAC-K				✓	✓	X	Limited exposure variability; partial reliance on medical records for identification of dementia without information on frequency of identification through this method; inappropriate adjustment for intermediates.
(He et al. 2020) / ZJMPHS		✓	✓	✓	✓	X	No individual-level exposure assessment, spatial resolution is limited.
(Ilango et al. 2020) / NPHS and CCHS participants			✓		✓	X	Lacking information on how air pollution linked to participant location; reliance on medical records/claims data; no discussion of extent or correlates of attrition during follow-up.
(Jung et al. 2015) / NHIRD Taiwan					✓		No individual-level exposure estimates; use of ICD-9-CM codes for identification of dementia; no adjustment for education or socioeconomic status; no information on attrition or its correlates.
(Li et al. 2019) / NHIRD Taiwan					✓	X	No individual-level exposure assessment; use of ICD-9-CM codes for identification of dementia; crude adjustment for SES; case-control design assumes no informative attrition.
(Loop et al. 2013) / REGARDS		✓	✓		✓		No individual level exposure estimates; no information on correlates of attrition and requirement of completion of 2 cognitive assessments for inclusion in analysis.
(Oudin et al. 2016) / Betula			✓	✓	✓		Exposures were predicted for 2009-2010, but outcome follow-up spanned 1993-2010, results using back-extrapolated exposure predictions were reported to be similar, but data not shown; partial reliance on medical records for identification of dementia.

Citation / Cohort	Study Strengths [a]					New to the Review	Noted Study Limitations [b]
	Exposure Assessment and Variability	Outcome Assessment	No Substantial Issues with Confounding/	No Substantial Issues with Cohort Formation/Loss to Follow-Up	Generalizability		
(Oudin et al. 2018) / Betula	✓		✓		✓	X	Partial reliance on medical records for identification of dementia; did not address loss to follow-up as a potential source of bias.
(Paul et al. 2020) / SALSA	✓	✓	✓	✓	✓	X	Nothing of note.
(Ran et al. 2021) / Chinese EHS			✓			X	Limited exposure variability; reliance on medical records; no information on correlates of attrition; fee charged for participant enrollment.
(Shi et al. 2020) / Medicare fee-for-service beneficiaries				✓	✓	X	No individual-level exposure assessment; reliance on claims data; crude adjustment for SES
(Smargiassi et al. 2020) / QICDSS					✓	X	No individual-level exposure assessment, distance to road based on postcode centroid; reliance on medical records/claims data; no adjustment for individual-level SES; no information on correlates of attrition.
(Wang et al. 2020) / CLHLS	✓				✓	X	No information on timing of follow-up assessment; inappropriate adjustment for intermediates; no discussion of selective survival to enrollment or correlates of attrition despite large loss to follow-up.
(Wu et al. 2015) / Case-control		✓			✓	X	Inadequate documentation of exposure model validation, used tertiles of exposure; large differences in age across cases and controls may result in positivity violations; unclear whether case-control selection related to exposure.
(Yuchi et al. 2020) / MSP registry					✓	X	No individual-level exposure assessment; reliance on medical records/claims data; crude adjustment for SES, inappropriate adjustment for potential mediators; no information on attrition or its correlates.
Incident Dementia or Other Incident Cognitive Impairment and Neuroimaging Level							
(JC Chen et al. 2017) / WHIMS		✓	✓			X	No individual-level exposure assessment for diesel; no comparison of MRI subcohort to full cohort, no discussion of extent of or correlates of attrition; MRI appears extremely healthy based on sample characteristics.

[a] Studies that received a checkmark for the study strength category were not found to have any substantial limitations in those categories. Substantial limitations in categories without a checkmark are explained in the rightmost column.
[b] Study bias assessment pertains only to exposure-outcome associations that were unique to the sample population.

Abbreviations: ACL, Americans' Changing Lives; ALFA, Alzheimer's and Family; AD, Alzheimer's disease; ARIC, Atherosclerosis Risk in Communities; BPRHS, Boston Puerto Rican Health Study; BVAIT, B-Vitamin Atherosclerosis Intervention Trial; CCHS, Canadian Community Health Survey; CLHLS, Chinese Longitudinal Healthy Longevity Survey; CPRD, Clinical Practice Research Datalink; EHS, Elderly Health Service; ELITE, Early Versus Late Intervention Trial; ELSA-Brasil, Brazilian Longitudinal Study on Adult Health; ENSANUT-2012, Spanish acronym for National Survey of Health and Nutrition in Mexico in 2012; FOS, Framingham Offspring Study; Heinz Nixdorf RECALL, Risk factors, Evaluation of Coronary Calcium and Lifestyle study; HRS, Health and Retirement Study; IADL, instrumental activities of daily living; ICD-9, International Classification of Diseases, Ninth Revision; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; IDEAS, Imaging Dementia – Evidence for Amyloid Scanning; KFACS, Korean Frailty and Aging Cohort Study; MADRC, Massachusetts Alzheimer's Disease Research Center Longitudinal Cohort; MOBILIZE, Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly; MSP, Medical Service Plan; NAS, Normative Aging Study; NAD, non-Alzheimer's dementia; NHANES III, Third National Health and Nutrition Examination Survey; NHIRD, National Health Insurance Research Database; NHS, Nurses' Health Study; NO2, nitrogen dioxides; NOx, nitrogen oxides;

NOMAS, Northern Manhattan Study; NPHS, National Population Health Survey; NSHAP, National Social Health and Aging Study; PM, particulate matter; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; PM10, particulate matter with an aerodynamic diameter < 10 micrometers; PM2.5-10, particulate matter with an aerodynamic diameter between 2.5 and 10 micrometers; QICDSS, Quebec Integrated Chronic Disease Surveillance System; REGARDS, Reasons for Geographic and Racial Differences in Stroke; SALIA, Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; SALSA, Sacramento Area Latino Study on Aging; SES, socioeconomic status; SNAC-K, Swedish National Study of Aging and Care in Kungsholmen; TIGER, Taiwan Institute for Geriatric Epidemiological Research; TLSA, Taiwanese Longitudinal Study on Aging; WHICAP, Washington Heights-Inwood Community Aging Project; WHIMS-ECHO, Women's Health Initiative Memory Study of the Epidemiology of Cognitive Health Outcomes; WHIMS-MRI, Women's Health Initiative Memory Study Magnetic Resonance Imaging Study; WHISCA, Women's Health Initiative Study of Cognitive Aging; WISH, Women's Isoflavone Soy Health; ZJMPHS, Zhejiang Major Public Health Surveillance

Appendix A. Original PubMed and EMBASE Search Criteria with Updated Search Dates

	PUBMED	EMBASE
Search Strategy	**#1 AND #2 AND #3 AND #4 AND #5 NOT #6**	**#1 AND #2 AND #3 AND #4 AND #5 NOT #6**
#1 Disease	"dementia"[mesh:noexp] OR "alzheimer Disease"[mesh] OR ("dementia"[tw] OR "alzheimer"[tw] OR "alzheimers"[tw] OR "alzheimer's"[tw]) OR "Mild Cognitive Impairment"[Mesh] OR "cognitive decline" OR "neuropsycholog*" OR cognit* OR "cognitive change" OR "cognitive aging" OR "cognitive impairment" OR "neurobehavioral"	('dementia'/de OR 'alzheimer disease'/de OR 'frontotemporal dementia'/de OR 'multiinfarct dementia'/de OR 'presenile dementia'/de OR 'senile dementia'/de OR dementia OR alzheimer* OR 'mild cognitive impairment'/ exp OR 'mci':ab,ti OR 'cognitive decline':ab,ti OR neuropsycholog*:ab,ti OR cognit*:ab,ti OR 'cognitive change':ab,ti OR 'cognitive aging':ab,ti OR 'cognitive impairment':ab,ti OR 'neurobehavioral':ab,ti)
#2 Outcome	"risk"[mesh] OR "incidence"[mesh] OR ("risk"[tw] OR "incident"[tw] OR "incidence"[tw] OR "onset"[tw] OR "prevent"[tw] OR "prevents"[tw] OR "prevented"[tw] OR "cause"[tw] OR "causes"[tw] OR "caused"[tw] OR "effect"[TW] OR "associated"[TW] OR "association"[TW] OR "protect"[TW] OR "protects"[TW] OR "protected"[TW] OR "protective"[TW] OR "harm"[TW] OR "harms"[TW] OR "harmful"[TW] OR "develop"[TW] OR "develops"[TW] OR "developed"[TW])	('risk' OR 'risk factor' OR 'population risk' OR 'attributable risk')/de OR (risk OR inciden* OR onset OR prevent* OR associat*):ti,ab
#3 Study Design	"intervention studies"[mesh:noexp] OR "clinical trials as topic"[mesh] OR "cohort studies"[mesh:noexp] OR "longitudinal studies"[mesh] OR "case-control studies"[mesh:noexp] OR "Health	clinical trial'/exp OR ('intervention study' OR 'cohort analysis' OR 'longitudinal study' OR 'prospective study' OR 'evaluation and follow up' OR 'follow up' OR 'case control study' OR 'population based case control study' OR

	Surveys”[Mesh:noexp] OR (“longitudinal”[tw] OR “longitudinally”[tw] OR “prospective”[tw] OR “prospectively”[tw] OR “follow”[tw] OR “followed”[tw] OR “follow-up”[tw] OR “follow up”[tw] OR “cohort”[tw] OR “later”[tw] OR “case control”[tw] OR “case-control”[tw] OR “clinical trial”[tw] OR “controlled trial”[tw] OR “intervention study”[tw] or “intervention studies”[tw] or “cross-sectional”[tw] OR “regression”[tw] OR “association”[tw])	‘controlled study' OR ‘major clinical study')/de OR (longitudinal* OR prospective* OR follow* OR associate* OR follow-up OR ‘follow up' OR cohort OR later OR ‘case control' OR ‘case-control' OR ‘clinical trial' OR ‘controlled trial' OR ‘intervention study' OR ‘intervention studies' OR ‘cross-sectional’ OR ‘regression’):ti,ab
#4 Exposure	“Air Pollution”[Mesh] OR “Particulate Matter”[Mesh] OR “Nitrogen Dioxide”[Mesh] OR “Ozone”[Mesh] OR “Volatile Organic Compounds”[Mesh] OR “Sulfur Dioxide”[Mesh] OR “Carbon Monoxide”[Mesh] OR “Vehicle Emissions”[Mesh] OR “distance to road”[tw] OR “PM10” [tw] OR “PM2.5” [tw] OR “traffic-related air pollution” [tw] OR “air pollution” [tw] OR “particulate matter” [tw] OR “ozone”[tw] OR “nitrogen dioxide”[tw] OR “particulates” [tw] OR “black carbon” [tw] OR “traffic pollution” [tw] OR “residential distance to nearest major”[tw] OR “traffic-related PM”[tw]	air pollution'/de OR ‘air pollutant’/de OR ‘particulate matter'/exp OR ‘nitrogen dioxide'/exp OR ‘ozone'/exp OR ‘volatile organic compound'/exp OR ‘sulfur dioxide'/exp OR ‘exhaust gas'/exp OR ‘distance to road':ab,ti OR ‘pm100:ab, ti OR ‘pm2.50:ab,ti OR ‘traffic-related air pollution':ab,ti OR ‘air pollution':ab,ti OR ‘particulate matter':ab,ti OR ‘ozone': ab,ti OR ‘nitrogen dioxide':ab,ti OR ‘particulates':ab,ti OR ‘black carbon':ab,ti OR ‘traffic pollution':ab,ti OR ‘residential distance to nearest major':ab,ti OR trafficrelated pm':ab,ti
#5 Date	Search 1: Entrez date - 2015/08/11 to 2019/06/19 Search 2: Entrez date – 2019/06/20 to 2020/07/31 Search 3: Entrez date – 2020/08/01 to 2020/12/31	Search 1: 2015/08/11 to 2019/06/19 Search 2: 2019/06/20 to 2020/07/31 Search 3: 2020/08/01 to 2020/12/31

#6 Exclude/Irrelevant (NOT)	“mice”[ti] OR “mouse”[ti] OR “rat”[ti] OR “rats”[ti] OR “cells”[ti] OR “plasticity”[ti] OR “synaptic”[ti] OR “signaling”[ti] OR “children”[ti] OR “children's”[ti] OR “infant”[ti] OR “infants”[ti] OR “pediatric”[ti] OR “adolescent”[ti] OR “in vivo”[ti] OR “in vitro”[ti] OR “smoking”[ti] OR “smoker”[ti] OR “second hand smoke”[ti] OR “second-hand smoke”[ti] OR “smokers”[ti] OR “environmental tobacco”[ti] OR “cigarette”[ti] OR “tobacco”[ti] OR “secondhand”[ti] OR “childhood”[ti] OR “adolescents”[ti] OR “adolescence”[ti] OR “child”[ti] OR “preschool”[ti] OR “prenatal”	(‘mice’ OR ‘mouse’ OR ‘rat’ OR ‘rats’ OR ‘cells’ OR ‘plasticity’ OR ‘synaptic’ OR ‘signaling’ OR ‘children’ OR ‘infant’ OR ‘infants’ OR ‘pediatric’ OR ‘adolescent’ OR ‘in vivo’ OR ‘in vitro’ OR ‘smoking’ OR ‘smoker’ OR ‘second hand smoke’ OR ‘second-hand smoke’ OR ‘smokers’ OR ‘environmental tobacco’ OR ‘cigarette’ OR ‘tobacco’ OR ‘secondhand’ OR ‘childhood’ OR ‘adolescents’ OR ‘adolescence’ OR ‘child’ OR ‘preschool’ OR ‘prenatal’):ti

Note that changes to indexing can alter search results.

Our PubMed searches were conducted on June 20, 2019 when using Entrez date of 2015/08/11 to 2019/06/19; on August 13, 2020 when using Entrez date of 2019/06/20 to 2020/07/31; and on May 27, 2021 when using Entrez date of 2020/08/01 to 2020/12/31.

Our EMBASE searches were conducted on June 27, 2019 for #5 Date criterion of 2015/08/11 to 2019/06/19; on August 13, 2020 when using #5 Date criterion of 2019/06/20 to 2020/07/31; and on May 27, 2021 when using #5 Date criterion of 2020/08/01 to 2020/12/31.

Appendix B. New PubMed and EMBASE Search Criteria to Improve Identification of Articles Reporting on Neuroimaging Outcomes

	PUBMED	EMBASE
Search Strategy	**(#1 AND #2) AND #3 AND #4 AND #5 AND #6 NOT #7**	**(#1 AND #2) AND #3 AND #4 AND #5 AND #6 NOT #7**
#1 MRI Terms	"magnetic resonance imaging"[MeSH Terms] OR ("magnetic"[All Fields] AND "resonance"[All Fields] AND "imaging"[All Fields]) OR "magnetic resonance imaging"[tw] OR ("MRI"[All Fields]) OR ("MRI"[tw]) OR (white matter hyperintensities[All Fields] OR white matter hyperintensity[All Fields]) OR (brain volume[All Fields] OR brain volumes[All Fields]) OR (infarcts[Title/Abstract] AND brain[Title/Abstract]) OR (sulci[All Fields] AND width[All Fields]) OR ("cerebral cortex"[MeSH Terms] OR ("cerebral"[All Fields] AND "cortex"[All Fields]) OR "cerebral cortex"[All Fields] OR "cortical"[All Fields] AND thickness[All Fields])) OR (cortical volume[All Fields] OR cortical volumes[All Fields])) OR (microbleed[All Fields] OR microbleeds[All Fields]	('magnetic resonance imaging'/de OR ('magnetic':ab,ti AND 'resonance':ab,ti AND 'imaging':ab,ti) OR 'magnetic resonance imaging':ab,ti OR 'mri':ab,ti OR 'mri'/de OR 'white matter hyperintensities':ab,ti OR 'white matter hyperintensity':ab,ti OR 'brain volumes':ab,ti OR 'brain volume':ab,ti OR 'infarct';ab,ti OR 'sulci':ab,ti OR 'cerebral cortex':ab,ti OR 'cortical':ab,ti OR 'microbleed':ab,ti)
#2 Disease	"dementia"[mesh:noexp] OR "alzheimer Disease"[mesh] OR ("dementia"[tw] OR "alzheimer"[tw] OR alzheimers"[tw] OR "alzheimer's"[tw]) OR "Mild Cognitive Impairment"[Mesh] OR "cognitive decline" OR "neuropsycholog*" OR cognit* OR "cognitive change" OR "cognitive aging" OR "cognitive impairment" OR "neurobehavioral"	('dementia'/de OR 'alzheimer disease'/de OR 'frontotemporal dementia'/de OR 'multiinfarct dementia'/de OR 'presenile dementia'/de OR 'senile dementia'/de OR dementia OR alzheimer* OR 'mild cognitive impairment'/ exp OR 'mci':ab,ti OR 'cognitive decline':ab,ti OR neuropsycholog*:ab,ti OR cognit*:ab,ti OR 'cognitive change':ab,ti OR 'cognitive

		aging':ab,ti OR ‘cognitive impairment':ab,ti OR ‘neurobehavioral':ab,ti)
#3 Outcome	“risk”[mesh] OR “incidence”[mesh] OR (“risk”[tw] OR “incident”[tw] OR “incidence”[tw] OR “onset”[tw] OR “prevent”[tw] OR “prevents”[tw] OR “prevented”[tw] OR “cause”[tw] OR “causes”[tw] OR “caused”[tw] OR “effect”[TW] OR “associated”[TW] OR “association”[TW] OR “protect”[TW] OR “protects”[TW] OR “protected”[TW] OR “protective”[TW] OR “harm”[TW] OR “harms”[TW] OR “harmful”[TW] OR “develop”[TW] OR “develops”[TW] OR “developed”[TW])	('risk' OR ‘risk factor' OR ‘population risk' OR ‘attributable risk')/de OR (risk OR inciden* OR onset OR prevent* OR associat*):ti,ab
#4 Study Design	“intervention studies”[mesh:noexp] OR “clinical trials as topic”[mesh] OR “cohort studies”[mesh:noexp] OR “longitudinal studies”[mesh] OR “case-control studies”[mesh:noexp] OR “Health Surveys”[Mesh:noexp] OR (“longitudinal”[tw] OR “longitudinally”[tw] OR “prospective”[tw] OR “prospectively”[tw] OR “follow”[tw] OR “followed”[tw] OR “follow-up”[tw] OR “follow up”[tw] OR “cohort”[tw] OR “later”[tw] OR “case control”[tw] OR “case-control”[tw] OR “clinical trial”[tw] OR “controlled trial”[tw] OR “intervention study”[tw] or “intervention studies”[tw] or “cross-sectional”[tw] OR “regression”[tw] OR “association”[tw])	clinical trial'/exp OR ('intervention study' OR ‘cohort analysis' OR ‘longitudinal study' OR ‘prospective study' OR ‘evaluation and follow up' OR ‘follow up' OR ‘case control study' OR ‘population based case control study' OR ‘controlled study' OR ‘major clinical study')/de OR (longitudinal* OR prospective* OR follow* OR associate* OR follow-up OR ‘follow up' OR cohort OR later OR ‘case control' OR ‘case-control' OR ‘clinical trial' OR ‘controlled trial' OR ‘intervention study' OR ‘intervention studies' OR ‘cross-sectional’ OR ‘regression’):ti,ab

#5 Exposure	“Air Pollution”[Mesh] OR “Particulate Matter”[Mesh] OR “Nitrogen Dioxide”[Mesh] OR “Ozone”[Mesh] OR Volatile Organic Compounds”[Mesh] OR “Sulfur Dioxide”[Mesh] OR “Carbon Monoxide”[Mesh] OR “Vehicle Emissions”[Mesh] OR “distance to road”[tw] OR “PM10” [tw] OR “PM2.5” [tw] OR “traffic-related air pollution” [tw] OR “air pollution” [tw] OR “particulate matter” [tw] OR “ozone”[tw] OR “nitrogen dioxide”[tw] OR “particulates” [tw] OR “black carbon” [tw] OR “traffic pollution” [tw] OR “residential distance to nearest major”[tw] OR “traffic-related PM”[tw]	air pollution'/de OR ‘air pollutant’/de OR ‘particulate matter'/exp OR ‘nitrogen dioxide'/exp OR ‘ozone'/exp OR ‘volatile organic compound'/exp OR ‘sulfur dioxide'/exp OR ‘exhaust gas'/exp OR ‘distance to road':ab,ti OR ‘pm100:ab, ti OR ‘pm2.50:ab,ti OR ‘traffic-related air pollution':ab,ti OR ‘air pollution':ab,ti OR ‘particulate matter':ab,ti OR ‘ozone': ab,ti OR ‘nitrogen dioxide':ab,ti OR ‘particulates':ab,ti OR ‘black carbon':ab,ti OR ‘traffic pollution':ab,ti OR ‘residential distance to nearest major':ab,ti OR trafficrelated pm':ab,ti
#6 Date	Search 1: Entrez date - Ever to 2019/06/19 Search 2: Entrez date – 2019/06/20 to 2020/07/31 Search 3: Entrez date – 2020/08/01 to 2020/12/31	Search 1: Ever to 2019/06/19 Search 2: 2019/06/20 to 2020/07/31 Search 3: 2020/08/01 to 2020/12/31
#7 Exclude/Irrelevant (NOT)	“mice”[ti] OR “mouse”[ti] OR “rat”[ti] OR “rats”[ti] OR “cells”[ti] OR “plasticity”[ti] OR “synaptic”[ti] OR “signaling”[ti] OR “children”[ti] OR “children's”[ti] OR “infant”[ti] OR “infants”[ti] OR “pediatric”[ti] OR “adolescent”[ti] OR “in vivo”[ti] OR “in vitro”[ti] OR “smoking”[ti] OR “smoker”[ti] OR “second hand smoke”[ti] OR “second-hand smoke”[ti] OR “smokers”[ti] OR “environmental tobacco”[ti] OR “cigarette”[ti] OR “tobacco”[ti] OR “secondhand”[ti] OR “childhood”[ti] OR “adolescents”[ti] OR	(‘mice’ OR ‘mouse’ OR ‘rat’ OR ‘rats’ OR ‘cells’ OR ‘plasticity’ OR ‘synaptic’ OR ‘signaling’ OR ‘children’ OR ‘infant’ OR ‘infants’ OR ‘pediatric’ OR ‘adolescent’ OR ‘in vivo’ OR ‘in vitro’ OR ‘smoking’ OR ‘smoker’ OR ‘second hand smoke’ OR ‘second-hand smoke’ OR ‘smokers’ OR ‘environmental tobacco’ OR ‘cigarette’ OR ‘tobacco’ OR ‘secondhand’ OR ‘childhood’ OR ‘adolescents’ OR ‘adolescence’ OR ‘child’ OR ‘preschool’ OR ‘prenatal’):ti

"adolescence"[ti] OR "child"[ti] OR
"preschool"[ti] OR "prenatal"

Note that changes to indexing can alter search results.

Our PubMed searches were conducted on June 20, 2019 when using Entrez date of Ever to 2019/06/19; on August 13, 2020 when using Entrez date of 2019/06/20 to 2020/07/31; and on May 27, 2021 when using Entrez date of 2020/08/01 to 2020/12/31.

Our EMBASE searches were conducted on June 27, 2019 for #5 Date criterion of Ever to 2019/06/19; on August 13, 2020 when using #5 Date criterion of 2019/06/20 to 2020/07/31; and on May 27, 2021 when using #5 Date criterion of 2020/08/01 to 2020/12/31.

Appendix C. Information Abstracted on Each Eligible Article

First Author, Year
Cohort Name
Geographic area
Sample size
Follow-up time
Exclusions
Total # excluded
% excluded
Age at outcome assessment/baseline outcome
Race/ethnicity
Exposures considered
Exposure considered, detailed
Exposure assessment method, brief
Exposure assessment method, detailed
Timing/average periods considered
Exposure parameterization
Reported exposure characteristics
Calculated exposure characteristics
Univariate association of exposure with confounders
Outcome
Outcome assessment, brief
Outcome assessment, detailed
Summary statistics for cognitive outcome
Exposure period
Cognitive outcome period
Regression model
Estimate, 95% interval, p-value
Adjustment covariates
Sensitivity analyses
Effect modification
Study design
Author conclusions
Equivalency reported
Summary of study findings

Appendix D: Citations for Articles for Full-Text Review

Full Citation	Included/excluded	Reason for exclusion, if applicable
Ailshire J, Karraker A, Clarke P. 2017. Neighborhood social stressors, fine particulate matter air pollution, and cognitive function among older U.S. adults. Soc Sci Med 172:56-63.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Ailshire J, Walsemann KM. 2021. Education differences in the adverse impact of PM2.5 on incident cognitive impairment among U.S. older adults. J Alzheimers Dis 79:615-625.	Included	N/A
Ailshire JA, Clarke P. 2015. Fine particulate matter air pollution and cognitive function among U.S. older adults. J Gerontol B Psychol Sci Soc Sci 70:322-328.	Included in prior review	N/A
Andersson J, Oudin A, Sundstrom A, Forsberg B, Adolfsson R, Nordin M. 2018. Road traffic noise, air pollution, and risk of dementia - results from the Betula project. Environ Res 166:334-339.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Bernardini F, Attademo L, Trezzi R, Gobbicchi C, Balducci P, Del Bello V, et al. 2020. T125. An association between ozone, but not other air pollutants, and daily number of visits to psychiatric emergency services. Schizophr Bull 46:S277-S278.	Excluded	Ineligible outcome
Best EA, Juarez-Colunga E, James K, LeBlanc WG, Serdar B. 2016. Biomarkers of exposure to polycyclic aromatic hydrocarbons and cognitive function among elderly in the United States (National Health and Nutrition Examination Survey: 2001-2002). Plos One 11:e0147632.	Excluded	Ineligible exposure
Bowler RM, Kornblith ES, Gocheva VV, Colledge MA, Bollweg G, Kim Y, et al. 2015. Environmental exposure to manganese in air: associations with cognitive functions. Neurotoxicology 49:139-148.	Excluded	Ineligible exposure
Byrne C, Bennett K, Hickey A, Kavanagh P, Broderick B, O'Mahony M, et al. 2019. 207 Acute incidence of disease at elevated levels of fine particulate matter (PM2.5) in Dublin, Ireland. Age Ageing 48.	Excluded	Conference abstract
Cacciottolo M, Wang X, Driscoll I, Woodward N, Saffari A, Reyes J, et al. 2017. Particulate air pollutants, apoe alleles and their contributions to cognitive impairment in older women and to amyloidogenesis in experimental models. Transl Psychiatry 7:e1022.	Excluded	Study with updated effect estimates using larger sample size within same study population became newly available and was included in review
Calderon-Garciduenas L, Mukherjee PS, Kulesza RJ, Torres-Jardón R, Hernández-Luna J, Ávila-Cervantes R, et al. 2019. Mild cognitive impairment and dementia involving multiple cognitive domains in Mexican urbanites. J Alzheimers Dis 68:1113-1123.	Excluded	Sample included participants under 18 years old
Carey IM, Anderson HR, Atkinson RW, Beevers SD, Cook DG, Strachan DP, et al. 2018. Are noise and air pollution related to the incidence of dementia? A cohort study in London, England. BMJ Open 8:e022404.	Included	N/A
Casanova R, Wang X, Reyes J, Akita Y, Serre M, Vizuete W, et al. 2015. Exposures to fine particulate air pollutants are associated with smaller brain volumes in older women: A voxel-based analysis. Alzheimers Dement 11:P148-P149.	Excluded	Podium presentation
Casanova R, Wang X, Reyes J, Akita Y, Serre ML, Vizuete W, et al. 2016. A voxel-based morphometry study reveals local brain	Included	N/A

structural alterations associated with ambient fine particles in older women. Front Hum Neurosci 10:495.		
Cerza F, Renzi M, Gariazzo C, Davoli M, Michelozzi P, Forastiere F, et al. 2019. Long-term exposure to air pollution and hospitalization for dementia in the Rome longitudinal study. Environ Health 18:72.	Included	N/A
Cerza F, Renzi M, Michelozzi P, Forastiere F, Cesaroni G. 2018. Long-term exposure to air pollution and first hospitalisation for dementia. Occup Environ Med 75:A1-A2.	Excluded	Podium presentation
Chen C, Xun P, Kaufman J, Hayden KM, Espeland MA, Whitsel EA, et al. 2019. Adherence to MIND diet modifies the association between air pollution and brain aging: Findings from the women's health initiative memory study MRI. Alzheimers Dement 15:P833.	Excluded	Conference abstract
Chen C, Xun P, Kaufman JD, Hayden KM, Espeland MA, Whitsel EA, et al. 2020. Erythrocyte omega-3 index, ambient fine particle exposure and brain aging. Neurology 95:e995-e1007.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Chen H, Kwong JC, Copes R, Hystad P, van Donkelaar A, Tu K, et al. 2017. Exposure to ambient air pollution and the incidence of dementia: A population-based cohort study. Environ Int 108:271-277.	Included	N/A
Chen H, Kwong JC, Copes R, Tu K, Villeneuve PJ, van Donkelaar A, et al. 2017. Living near major roads and the incidence of dementia, Parkinson's disease, and multiple sclerosis: A population-based cohort study. Lancet 389:718-726.	Included	N/A
Chen JC, Wang X, Espeland MA, Chui H. 2014. Particulate air pollutants and white matter brain aging. Alzheimers Dement 10:P266.	Excluded	Conference abstract
Chen JC, Wang X, Serre M, Cen S, Franklin M, Espeland M. 2017. Particulate air pollutants, brain structure, and neurocognitive disorders in older women. Research report (Health Effects Institute):1-65.	Included	N/A
Chen JC, Wang X, Wellenius GA, Serre ML, Driscoll I, Casanova R, et al. 2015. Ambient air pollution and neurotoxicity on brain structure: Evidence from women's health initiative memory study. Ann Neurol 78:466-476.	Included in prior review	N/A
Chen JH, Kuo TY, Yu HL, Wu C, Yeh SL, Chiou JM, et al. 2020. Long-term exposure to air pollutants and cognitive function in Taiwanese community-dwelling older adults: A four-year cohort study. J Alzheimers Dis 78:1585-1600.	Included	N/A
Cho J, Sohn J, Noh J, Cho SK, Choi JE, Kim H, et al. 2018. Ambient air pollution associated with brain cortical thinning: A cross-sectional study in a community-based cohort. Alzheimers Dement 14:P966.	Excluded	Conference abstract
Cho J, Sohn J, Noh J, Cho SK, Choi JE, Kim H, et al. 2019. Long-term exposure to nitrogen dioxide and brain cortical thinning. Alzheimers Dement 15:P829.	Excluded	Conference abstract
Cleary EG, Cifuentes M, Grinstein G, Brugge D, Shea TB. 2018. Association of low-level ozone with cognitive decline in older adults. J Alzheimers Dis 61:67-78.	Included	N/A
Colicino E, Giuliano G, Power MC, Lepeule J, Wilker EH, Vokonas P, et al. 2016. Long-term exposure to black carbon, cognition and single nucleotide polymorphisms in microRNA processing genes in older men. Environ Int 88:86-93.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the

		main effect was also available and included in review
Colicino E, Power MC, Cox DG, Weisskopf MG, Hou L, Alexeeff SE, et al. 2014. Mitochondrial haplogroups modify the effect of black carbon on age-related cognitive impairment. Environ Health 13:1-8.	Included	N/A
Colicino E, Wilson A, Frisardi MC, Prada D, Power MC, Hoxha M, et al. 2017. Telomere length, long-term black carbon exposure, and cognitive function in a cohort of older men: The VA normative aging study. Environ Health Perspect 125:76-81.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Crous-Bou M, Falcon C, Gascón M, Cirach M, Molinuevo JL, Nieuwenhuijsen M, et al. 2019. Brain correlates of air pollution in cognitively healthy individuals at risk of Alzheimer's disease. Alzheimers Dement 15:P1272-P1273.	Excluded	Podium presentation
Crous-Bou M, Gascon M, Gispert JD, Cirach M, Sánchez-Benavides G, Falcon C, et al. 2020. Impact of urban environmental exposures on cognitive performance and brain structure of healthy individuals at risk for Alzheimer's dementia. Environ Int 138:105546.	Included	N/A
Cullen B, Newby D, Lee D, Lyall DM, Nevado-Holgado AJ, Evans JJ, et al. 2018. Cross-sectional and longitudinal analyses of outdoor air pollution exposure and cognitive function in UK Biobank. Sci Rep-Uk 8:12089.	Included	N/A
Culqui DR, Linares C, Ortiz C, Carmona R, Díaz J. 2017. Association between environmental factors and emergency hospital admissions due to Alzheimer's disease in Madrid. Sci Total Environ 592:451-457.	Excluded	Ineligible exposure
Dimakakou E, Johnston HJ, Streftaris G, Cherrie JW. 2020. Is environmental and occupational particulate air pollution exposure related to type-2 diabetes and dementia? A cross-sectional analysis of the UK Biobank. Int J Environ Res Public Health 17:9581.	Included	N/A
Erickson LD, Gale SD, Anderson JE, Brown BL, Hedges DW. 2020. Association between exposure to air pollution and total gray matter and total white matter volumes in adults: A cross-sectional study. Brain Sci 10:164.	Included	N/A
Fajersztajn L, Justo LT, Cremasco Takano AP, Veras M, Villa dos Santos N, Allen IE, et al. 2019. Long-term exposure to air pollution and dementia: A large clinicopathological study. Alzheimers Dement 15:P555-P556.	Excluded	Podium presentation
Fehsel K, Schikowski T, Jänner M, Hüls A, Voussoughi M, Schulte T, et al. 2016. Estrogen receptor beta polymorphisms and cognitive performance in women: Associations and modifications by genetic and environmental influences. J Neural Transm 123:1369-1379.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Gale SD, Erickson LD, Anderson JE, Brown BL, Hedges DW. 2020. Association between exposure to air pollution and prefrontal cortical volume in adults: A cross-sectional study from the UK Biobank. Environ Res 185:109365.	Included	N/A
Grande G, Bellander T, Rizzuto D. 2019. Long-term exposure to air pollution and the risk of dementia: The role of cardiovascular diseases. Eur J Neurol 26:330.	Excluded	Conference abstract
Grande G, Ljungman PLS, Eneroth K, Bellander T, Rizzuto D. 2020. Association between cardiovascular disease and long-term exposure to air pollution with the risk of dementia. JAMA Neurol 77:801-809.	Included	N/A

He F, Tang JJ, Zhang T, Lin J, Li F, Gu X, et al. 2020. Impact of air pollution on cognitive impairment in older people: A cohort study in rural and suburban China. J Alzheimers Dis 77:1671-1679.	Included	N/A
Hedges DW, Erickson LD, Gale SD, Anderson JE, Brown BL. 2020. Association between exposure to air pollution and thalamus volume in adults: A cross-sectional study. Plos One 15:e0230829.	Included	N/A
Hedges DW, Erickson LD, Kunzelman J, Brown BL, Gale SD. 2019. Association between exposure to air pollution and hippocampal volume in adults in the UK Biobank. Neurotoxicology 74:108-120.	Included	N/A
Ho HC, Fong KN, Chan T-C, Shi Y. 2020. The associations between social, built and geophysical environment and age-specific dementia mortality among older adults in a high-density Asian city. Int J Health Geogr 19:1-13.	Excluded	Ineligible outcome
Huls A, Vierkotter A, Sugiri D, Abramson MJ, Ranft U, Kramer U, et al. 2018. The role of air pollution and lung function in cognitive impairment. Eur Respir J 51.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Iaccarino L, La Joie R, Lesman-Segev OH, Lee E, Hanna L, Allen IE, et al. 2021. Association between ambient air pollution and amyloid positron emission tomography positivity in older adults with cognitive impairment. JAMA Neurol 78:197-207.	Included	N/A
Ilango SD, Chen H, Hystad P, van Donkelaar A, Kwong JC, Tu K, et al. 2020. The role of cardiovascular disease in the relationship between air pollution and incident dementia: A population-based cohort study. Int J of Epidemiol 49:36-44.	Included	N/A
Kim H, Noh J, Noh Y, Oh SS, Koh SB, Kim C. 2019. Gender difference in the effects of outdoor air pollution on cognitive function among elderly in Korea. Front Public Health 7:375.	Included	N/A
Kioumourtzoglou MA, Schwartz JD, Weisskopf MG, Melly SJ, Wang Y, Dominici F, et al. 2016. Long-term PM2.5 exposure and neurological hospital admissions in the northeastern United States. Environ Health Perspect 124:23-29.	Excluded	Study with updated effect estimates using larger sample size within same study population became newly available and was included in review
Klompmaker JO, Hoek G, Bloemsma LD, Marra M, Wijga AH, van den Brink C, et al. 2020. Surrounding green, air pollution, traffic noise exposure and non-accidental and cause-specific mortality. Environ Int 134:105341.	Excluded	Ineligible outcome
Kulick E, Wellenius G, Boehme A, Schupf N, Mayeux R, Sacco R, et al. 2019. Long-term exposure to ambient air pollution and trajectories of cognitive decline among older adults in northern manhattan. Neurology 92.	Excluded	Conference abstract
Kulick ER, Elkind MSV, Boehme AK, Joyce NR, Schupf N, Kaufman JD, et al. 2020. Long-term exposure to ambient air pollution, apoe-ε4 status, and cognitive decline in a cohort of older adults in northern Manhattan. Environ Int 136:105440.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Kulick ER, Wellenius GA, Boehme AK, Joyce NR, Schupf N, Kaufman JD, et al. 2020. Long-term exposure to air pollution and trajectories of cognitive decline among older adults. Neurology 94:e1782-e1792.	Included	N/A
Kulick ER, Wellenius GA, Kaufman JD, DeRosa JT, Kinney PL, Cheung YK, et al. 2017. Long-term exposure to ambient air pollution and subclinical cerebrovascular disease in NOMAS (the northern Manhattan study). Stroke 48:1966-1968.	Included	N/A

Lee J, Dey A. 2020. Introduction to LASI-DAD: The longitudinal aging study in India-diagnostic assessment of dementia. J Am Geriatr Soc 68:S3-S4.	Excluded	Editorial
Lee JH, Byun MS, Yi D, Ko K, Jeon SY, Kim WJ, et al. 2018. Association of long-term exposure to air particulate matter with cerebral amyloid deposition and gray matter changes in cognitively normal older adults. Alzheimers Dement 14:P1420.	Excluded	Conference abstract
Lee M, Schwartz J, Wang Y, Dominici F, Zanobetti A. 2019. Long-term effect of fine particulate matter on hospitalization with dementia. Environ Pollut 254:112926.	Excluded	Study with updated effect estimates using larger sample size within same study population became newly available and was included in review
Li CY, Li CH, Martini S, Hou WH. 2019. Association between air pollution and risk of vascular dementia: A multipollutant analysis in Taiwan. Environ Int 133:105233.	Included	N/A
Li RL, Ho YC, Luo CW, Lee SS, Kuan YH. 2019. Influence of PM(2.5) exposure level on the association between Alzheimer's disease and allergic rhinitis: A national population-based cohort study. Int J Environ Res Public Health 16:3357.	Excluded	Ineligible exposure
Lin H, Guo Y, Zheng Y, Zhao X, Cao Z, Rigdon SE, et al. 2017. Exposure to ambient PM2.5 associated with overall and domain-specific disability among adults in six low- and middle-income countries. Environ Int 104:69-75.	Excluded	Ineligible outcome
Linares C, Culqui D, Carmona R, Ortiz C, Diaz J. 2017. Short-term association between environmental factors and hospital admissions due to dementia in Madrid. Environ Res 152:214-220.	Excluded	Ineligible exposure
Lo YC, Lu YC, Chang YH, Kao S, Huang HB. 2019. Air pollution exposure and cognitive function in Taiwanese older adults: A repeated measurement study. Int J Environ Res Public Health 16:2976.	Included	N/A
Loop MS, Kent ST, Al-Hamdan MZ, Crosson WL, Estes SM, Estes Jr MG, et al. 2013. Fine particulate matter and incident cognitive impairment in the reasons for geographic and racial differences in stroke (REGARDS) cohort. Plos One 8:e75001.	Included in prior review	N/A
Lucchini RG, Guazzetti S, Zoni S, Benedetti C, Fedrighi C, Peli M, et al. 2014. Neurofunctional dopaminergic impairment in elderly after lifetime exposure to manganese. Neurotoxicology 45:309-317.	Excluded	Ineligible exposure
Malmqvist E, Jensen EL, Westerberg K, Stroh E, Rittner R, Gustafsson S, et al. 2018. Estimated health benefits of exhaust free transport in the city of Malmö, southern Sweden. Environ Int 118:78-85.	Excluded	No original effect estimates
Marabotti C, Piaggi P, Scarsi P, Venturini E, Cecchi R, Pingitore A. 2017. Mortality for chronic-degenerative diseases in Tuscany: Ecological study comparing neighboring areas with substantial differences in environmental pollution. Int J Occup Environ Med 30:641-653.	Excluded	Ineligible outcome
Mueller N, Rojas-Rueda D, Basagaña X, Cirach M, Cole-Hunter T, Dadvand P, et al. 2017. Health impacts related to urban and transport planning: A burden of disease assessment. Environ Int 107:243-257.	Excluded	Ineligible outcome
Nicolle-Mir L. 2016. Exposure to PM2.5 and hospitalizations for neurodegenerative diseases in the Medicare cohort. Environnement, Risques et Sante 15:280-281.	Excluded	Article review

Nicolle-Mir L. 2016. Traffic-related pollution and incidence of dementia: Longitudinal study at Umeå. Environnement, Risques et Sante 15:281-283.	Excluded	Article review
Nußbaum R, Lucht S, Jockwitz C, Moebus S, Engel M, Jöckel KH, et al. 2020. Associations of air pollution and noise with local brain structure in a cohort of older adults. Environ Health Perspect 128:67012.	Included	N/A
Oudin A, Andersson J, Sundström A, Nordin Adolfsson A, Oudin Åström D, Adolfsson R, et al. 2019. Traffic-related air pollution as a risk factor for dementia: No clear modifying effects of apoeε4 in the Betula cohort. J Alzheimers Dis 71:733-740.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Oudin A, Forsberg B, Adolfsson AN, Lind N, Modig L, Nordin M, et al. 2016. Traffic-related air pollution and dementia incidence in northern Sweden: A longitudinal study. Environ Health Perspect 124:306-312.	Included in prior review	N/A
Oudin A, Forsberg B, Lind N, Nordin S, Astrom DO, Sundstrom A, et al. 2017. Is long-term exposure to air pollution associated with episodic memory? A longitudinal study from northern Sweden. Sci Rep-Uk 7:1-7.	Included	N/A
Oudin A, Segersson D, Adolfsson R, Forsberg B. 2018. Association between air pollution from residential wood burning and dementia incidence in a longitudinal study in northern Sweden. Plos One 13:e0198283.	Included	N/A
Paul KC, Haan M, Yu Y, Inoue K, Mayeda ER, Dang K, et al. 2020. Traffic-related air pollution and incident dementia: Direct and indirect pathways through metabolic dysfunction. J Alzheimers Dis 76:1477-1491.	Included	N/A
Petkus AJ, Younan D, Wang X, Beavers DP, Espeland MA, Gatz M, et al. 2021. Air pollution and the dynamic association between depressive symptoms and memory in oldest-old women. J Am Geriatr Soc 69:474-484.	Included	N/A
Petkus AJ, Younan D, Widaman K, Gatz M, Manson JE, Wang X, et al. 2020. Exposure to fine particulate matter and temporal dynamics of episodic memory and depressive symptoms in older women. Environ Int 135:105196.	Included	N/A
Petkus AJ, Younan D, Widaman KF, Wang X, Casanova R, Espeland MA, et al. 2019. The association between particulate matter and episodic memory decline is partially mediated by early neuroanatomic biomarkers of alzheimer's disease. Alzheimers Dement 15:P1271-P1272.	Excluded	Podium presentation
Power MC, Lamichhane AP, Liao D, Xu X, Jack CR, Gottesman RF, et al. 2018. The association of long-term exposure to particulate matter air pollution with brain MRI findings: The ARIC study. Environ Health Perspect 126:027009.	Included	N/A
Qiu H, Zhu X, Wang L, Pan J, Pu X, Zeng X, et al. 2019. Attributable risk of hospital admissions for overall and specific mental disorders due to particulate matter pollution: A time-series study in Chengdu, China. Environ Res 170:230-237.	Excluded	Ineligible exposure
Ran J, Schooling CM, Han L, Sun S, Zhao S, Zhang X, et al. 2021. Long-term exposure to fine particulate matter and dementia incidence: A cohort study in Hong Kong. Environ Pollut 271:116303.	Included	N/A
Rocha D, Suemoto CK, Souza Santos I, Lotufo PA, Benseñor I, Gouveia N. 2020. Vehicular traffic density and cognitive performance in the ELSA-Brasil study. Environ Res 191:110208.	Included	N/A

Russ T, Murianni L, Icaza G, Slachevsky A, Starr J. 2016. Geographical variation in dementia mortality in Italy, New Zealand, and Chile: The impact of latitude, vitamin D, and air pollution. Dement Geriatr Cogn Dis 42:31-41.	Excluded	No measure of exposure
Russ TC, Cherrie MP, Dibben C, Tomlinson SJ, Reis S, Dragosits U, et al. 2018. Life course air pollution exposure and cognitive decline in Scotland: Modelled historical air pollution data and the Lothian birth cohort 1936. Alzheimers Dement 14:P1381.	Excluded	Conference abstract
Salinas-Rodriguez A, Fernandez-Nino JA, Manrique-Espinoza B, Moreno-Banda GL, Sosa-Ortiz AL, Qian ZM, et al. 2018. Exposure to ambient PM2.5 concentrations and cognitive function among older Mexican adults. Environ Int 117:1-9.	Included	N/A
Salm AK, Benson MJ. 2019. Increased dementia mortality in West Virginia counties with mountaintop removal mining? Int J Environ Res Public Health 16:4278.	Excluded	Ineligible exposure
Sánchez-Benavides G, Gascón M, Gramunt N, Gotsens X, Fauria K, Gispert JD, et al. 2017. Exposure to air pollution and cognitive performance of healthy individuals at risk for Alzheimer's disease. Alzheimers Dement 13:P564-P565.	Excluded	Podium presentation
Shi L, Wu X, Danesh Yazdi M, Braun D, Abu Awad Y, Wei Y, et al. 2020. Long-term effects of PM(2·5) on neurological disorders in the American Medicare population: A longitudinal cohort study. Lancet Planet Health 4:e557-e565.	Included	N/A
Shin J, Han SH, Choi J. 2019. Exposure to ambient air pollution and cognitive impairment in community-dwelling older adults: The Korean frailty and aging cohort study. Int J Environ Res Public Health 16:3767.	Included	N/A
Smargiassi A, Sidi EAL, Robert LE, Plante C, Haddad M, Gamache P, et al. 2020. Exposure to ambient air pollutants and the onset of dementia in Québec, Canada. Environ Res 190:109870.	Included	N/A
Tallon LA, Manjourides J, Pun VC, Salhi C, Suh H. 2017. Cognitive impacts of ambient air pollution in the national social health and aging project (NSHAP) cohort. Environ Int 104:102-109.	Included	N/A
Tzivian L, Dlugaj M, Winkler A, Hennig F, Fuks K, Sugiri D, et al. 2016. Long-term air pollution and traffic noise exposures and cognitive function: A cross-sectional analysis of the Heinz Nixdorf recall study. J Toxicol Environ Health A 79:1057-1069.	Included	N/A
Tzivian L, Dlugaj M, Winkler A, Weinmayr G, Hennig F, Fuks KB, et al. 2016. Long-term air pollution and traffic noise exposures and mild cognitive impairment in older adults: A cross-sectional analysis of the Heinz Nixdorf recall study. Environ Health Perspect 124:1361-1368.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Tzivian L, Jokisch M, Winkler A, Weimar C, Hennig F, Sugiri D, et al. 2017. Associations of long-term exposure to air pollution and road traffic noise with cognitive function-an analysis of effect measure modification. Environ Int 103:30-38.	Excluded	Paper focused on effect modification or additional covariate adjustment, paper reporting on the main effect was also available and included in review
Vossoughi M, Vierkotter A, Sugiri D, Probst-Hensch N, Stolz S, Luckhaus C, et al. 2015. The roles of lung function and air pollution on cognitive decline: Predictor and mediator? Am J Respir Crit Care Med 191.	Excluded	Conference abstract
Wang J, Li T, Lv Y, Kraus VB, Zhang Y, Mao C, et al. 2020. Fine particulate matter and poor cognitive function among Chinese older adults: Evidence from a community-based, 12-year prospective cohort study. Environ Health Perspect 128:67013.	Included	N/A

Wang JN, Wang Q, Li TT, Shi XM. 2017. [Association between air pollution and cognitive function in the elderly]. Zhonghua yu fang yi xue za zhi [Chinese journal of preventive medicine] 51:364-368.	Excluded	Review article
Wilker EH, Martinez-Ramirez S, Kloog I, Schwartz J, Mostofsky E, Koutrakis P, et al. 2016. Fine particulate matter, residential proximity to major roads, and markers of small vessel disease in a memory study population. J Alzheimers Dis 53:1315-1323.	Included	N/A
Wilker EH, Mittleman MA, Kloog I, Schwartz J, Koutrakis P, Blacker D. 2016. Exposure to ambient air pollution and repeated measures of executive function. Alzheimers Dement 12:P600.	Excluded	Conference abstract
Wilker EH, Preis SR, Beiser AS, Wolf PA, Au R, Kloog I, et al. 2015. Long-term exposure to fine particulate matter, residential proximity to major roads and measures of brain structure. Stroke 46:1161-1166.	Included in prior review	N/A
Wu SM, Chen ZF, Young L, Shiao SPK. 2017. Meta-prediction of the effect of methylenetetrahydrofolate reductase polymorphisms and air pollution on Alzheimer's disease risk. Int J Environ Res Public Health 14:63.	Excluded	Meta-analysis
Wu YC, Lin YC, Yu HL, Chen JH, Chen TF, Sun Y, et al. 2015. Association between air pollutants and dementia risk in the elderly. Alzheimer Dement: Diagnosis, Assessment & Disease Monitoring 1:220-228.	Included	N/A
Wurth R, Kioumourtzoglou MA, Tucker KL, Griffith J, Manjourides J, Suh H. 2018. Fine particle sources and cognitive function in an older Puerto Rican cohort in greater Boston. Environ Epidemiol 2:e022.	Included	N/A
Yang SM, Lin YC, Yu HL, Chen JH, Chen TF, Sun Y, et al. 2017. Association between PM10 exposure, coffee or tea consumption, and dementia risk in the elderly. Alzheimers Dement 13:P1196-P1197.	Excluded	Conference abstract
Yao Y, Jin X, Cao K, Zhao M, Zhu T, Zhang J, et al. 2021. Residential proximity to major roadways and cognitive function among Chinese adults 65 years and older. Sci Total Environ 766:142607.	Included	N/A
Younan D, Petkus AJ, Wang X, Resnick SM, Serre M, Vizuete W, et al. 2019. Heterogeneity in the increased risk for Alzheimer's disease and related dementias associated with fine particle exposure: Exploring the role of cognitive reserve. Alzheimers Dement 15:P833-P834.	Excluded	Conference abstract
Younan D, Petkus AJ, Widaman KF, Wang X, Casanova R, Espeland MA, et al. 2020. Particulate matter and episodic memory decline mediated by early neuroanatomic biomarkers of Alzheimer's disease. Brain 143:289-302.	Included	N/A
Younan D, Wang X, Casanova R, Barnard R, Gaussoin SA, Saldana S, et al. 2020. PM2.5 associated with gray matter atrophy reflecting increased Alzheimers risk in older women. Neurology 96:e1190-e1201.	Included	N/A
Younan D, Wang X, Lurmann F, Serre M, Vizuete W, He K, et al. 2018. Racial-ethnic disparities in Alzheimer's risk: Role of exposure to ambient fine particles. Alzheimers Dement 14:P1613.	Excluded	Conference abstract
Younan D, Wang X, Petkus AJ, Casanova R, Barnard R, Gaussoin SA, et al. 2018. Environmental determinants of neuroanatomic risk for Alzheimer's disease in older women: Role of fine particulate matter. Alzheimer Dement 14:P278.	Excluded	Conference abstract

Yuchi W, Sbihi H, Davies H, Tamburic L, Brauer M. 2020. Road proximity, air pollution, noise, green space and neurologic disease incidence: A population-based cohort study. Environ Health 19:8.	Included	N/A
Zhang HW, Kok VC, Chuang SC, Tseng CH, Lin CT, Li TC, et al. 2019. Long-term exposure to ambient hydrocarbons increases dementia risk in people aged 50 years and above in Taiwan. Curr Alzheimer Res 16:1276-1289.	Excluded	Ineligible exposure
Zhang X, Chen X, Zhang X. 2018. The impact of exposure to air pollution on cognitive performance. Proc Natl Acad Sci USA 115:9193-9197.	Excluded	Sample included participants under 18 years old, and no estimated effects of air pollution reported specifically for subgroup of persons 18 years or older

Table S1: Associations between air pollution exposure and cognitive level in qualifying studies [a, b]

Paper	N	Exposure	Cognitive domain	Test(s)	Difference in SD units per common exposure contrast [c]	Other difference			
					Difference (95% CI)	Outcome	Measure of association	Exposure contrast	Estimate (95% CI)
Crous-Bou 2020 (ALFA)	958	NO_2	Global	Modified-PACC composite	2.60 (-14.31, 19.52)				
			Memory	Memory binding test	21.93 (4.56, 39.30)				
			Executive function	WAIS-IV subtests	-9.68 (-24.62, 5.25)				
Kulick 2020 (NOMAS)	1,093	NO_2	Global	Global cognitive score	0.05 (-0.03, 0.14)				
			Memory	Modified California Verbal Learning Test	0.08 (-0.07, 0.22)				
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	0.02 (-0.13, 0.16)				
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	0.18 (0.03, 0.31)				
Kulick 2020 (WHICAP)	5,330	NO_2	Global	Global cognitive score	-0.09 (-0.13, -0.06)				
			Memory	Selective reminding test	-0.08 (-0.12, -0.04)				
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	-0.10 (-0.14, -0.07)				
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	-0.10 (-0.14, -0.06)				

Nußbaum 2020 (1000BRAINS)	615	NO_2	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed		Test score rank Difference	Per 10 μg/m³	0.02 (-0.06, 0.09)
			Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards		Test score rank Difference	Per 10 μg/m³	0.04 (-0.02, 0.09)
			Executive function	Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test		Test score rank Difference	Per 10 μg/m³	0.04 (-0.04, 0.09)
			Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test		Test score rank Difference	Per 10 μg/m³	0 (-0.08, 0.06)
			Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)		Test score rank Difference	Per 10 μg/m³	0.02 (-0.08, 0.09)
Schikowski 2015 (SALIA)	789	NO_2	Global	MMSE	0 (-0.14, 0.14)			
			Global	CERaD total score	-0.12 (-0.26, 0.02)			
			Memory	Word list learning	-0.01 (-0.15, 0.13)			
			Memory	Word list recall	0.03 (-0.11, 0.17)			
			Memory	Figure recall	-0.04 (-0.17, 0.11)			
			Memory	Boston naming test	-0.13 (-0.27, 0.01)			
			Executive function	Semantic fluency	0.00 (-0.14, 0.14)			
			Executive function	Phonemic fluency	-0.08 (-0.21, 0.06)			
			Executive function	Trail making A	-0.06 (-0.20, 0.06)			
			Executive function	Trail making B	-0.07 (-0.21, 0.06)			
			Executive function	Trail making B/A	-0.01 (-0.15, 0.13)			
			Other	Figure copying	-0.21 (-0.36, -0.08)			
Shin 2019 (KFACS)	2,896	NO_2	Global	MMSE-KC		Log(test score) Difference	Per 10 μg/m³	0.01 (0.00, 0.02)

			Memory	Digit forward span		Log(test score)	Difference	Per 10 μg/m³	-0.02 (-0.03, 0.00)
			Memory	Digit backward span		Log(test score)	Difference	Per 10 μg/m³	0.01 (-0.01, 0.03)
			Memory	Word list memory		Log(test score)	Difference	Per 10 μg/m³	0.02 (0.00, 0.04)
			Memory	Word list recall		Log(test score)	Difference	Per 10 μg/m³	-0.01 (-0.02, 0.00)
			Memory	Recall storage		Log(test score)	Difference	Per 10 μg/m³	0.00 (-0.03, 0.01)
			Memory	Word list recognition		Log(test score)	Difference	Per 10 μg/m³	0.00 (-0.01, 0.01)
			Executive function	FAB score		Log(test score)	Difference	Per 10 μg/m³	-0.01 (-0.02, 0.00)
Tallon 2017 (NSHAP)	2,106	NO_2	Global	Modified MoCA	-0.06 (-0.10, -0.02)				
Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	NO_2	Global	Global cognitive score	-0.06 (-0.09, -0.01)				
			Memory	8 word immediate recall	-0.07 (-0.13, 0.02)				
			Memory	8 word delayed recall	-0.07 (-0.11, 0.02)				
			Executive function	Semantic fluency	-0.10 (-0.16, -0.03)				
			Executive function	Labyrinth test	-0.05 (-0.11, 0.02)				
			Other	Clock drawing		Poor performance (score≥3)	OR	Per 10 μg/m³	1.02 (0.87, 1.20)
Crous-Bou 2020 (ALFA)	958	NO_x	Global	Modified-PACC composite	7.67 (-35.29, 50.63)				
			Memory	Memory binding test	49.20 (4.88, 93.53)				
			Executive function	WAIS-IV subtests	-20.63 (-58.90, 17.63)				
Nußbaum 2020 (1000BRAINS)	615	NO_x	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed		Test score rank	Difference	Per 10 μg/m³	0.01 (-0.01, 0.04)
			Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards		Test score rank	Difference	Per 10 μg/m³	0.01 (-0.01, 0.04)

			Executive function	Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test		Test score rank Difference	Per 10 μg/m³	0.01 (-0.02, 0.04)
			Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test		Test score rank Difference	Per 10 μg/m³	-0.01 (-0.04, 0.02)
			Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)		Test score rank Difference	Per 10 μg/m³	-0.01 (-0.05, 0.02)
Schikowski 2015 (SALIA)	789	NO_x	Global	MMSE	-0.01 (-0.07, 0.04)			
			Global	CERaD total score	-0.06 (-0.11, 0.00)			
			Memory	Word list learning	-0.01 (-0.07, 0.04)			
			Memory	Word list recall	0.00 (-0.06, 0.05)			
			Memory	Figure recall	-0.02 (-0.08, 0.04)			
			Memory	Boston naming test	-0.06 (-0.11, 0.00)			
			Executive function	Semantic fluency	0.00 (-0.05, 0.06)			
			Executive function	Phonemic fluency	-0.03 (-0.09, 0.02)			
			Executive function	Trail making A	-0.03 (-0.08, 0.03)			
			Executive function	Trail making B	-0.04 (-0.09, 0.02)			
			Executive function	Trail making B/A	-0.01 (-0.06, 0.04)			
			Other	Figure copying	-0.08 (-0.14, -0.03)			
Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	NO_x	Global	Global cognitive score	-0.03 (-0.05, -0.01)			
			Memory	8 word immediate recall	-0.03 (-0.05, -0.01)			
			Memory	8 word delayed recall	-0.03 (-0.05, -0.01)			
			Executive function	Semantic fluency	-0.05 (-0.08, -0.02)			

			Executive function	Labyrinth test	-0.04 (-0.06, -0.01)				
			Other	Clock drawing		Poor performance (score≥3)	OR	Per 10 μg/m^3	1 (0.94, 1.07)
Chen 2009 (NHANES III)	1,677	Ozone	Memory	Serial-digit learning test-trials to criterion	-0.10 (-0.18, -0.02)				
	1,677		Memory	Serial-Digit Learning Test total score	-0.10 (-0.18, -0.03)				
	1,756		Other	Simple reaction time test	0.00 (-0.09, 0.09)				
	1,724		Executive function	Symbol digit substitution test	-0.12 (-0.19, -0.04)				
Shin 2019 (KFACS)	2,896	Ozone	Global	MMSE-KC		Log(test score)	Difference	Per 10 ppb	0.10 (0.06, 0.14)
			Memory	Digit forward span		Log(test score)	Difference	Per 10 ppb	0.14 (0.07, 0.22)
			Memory	Digit backward span		Log(test score)	Difference	Per 10 ppb	-0.07 (-0.15, 0.01)
			Memory	Word list memory		Log(test score)	Difference	Per 10 ppb	0.02 (-0.07, 0.11)
			Memory	Word list recall		Log(test score)	Difference	Per 10 ppb	0.08 (0.04, 0.11)
			Memory	Recall storage		Log(test score)	Difference	Per 10 ppb	0.03 (0.00, 0.06)
			Memory	Word list recognition		Log(test score)	Difference	Per 10 ppb	0.02 (0.00, 0.05)
			Executive function	FAB score		Log(test score)	Difference	Per 10 ppb	0.03 (0.00, 0.04)
Chen 2009 (NHANES III)	1,677	PM_{10}	Memory	Serial-digit learning test-trials to criterion	0.01 (-0.03, 0.04)				
	1,677		Memory	Serial-digit learning test total score	-0.02 (-0.06, 0.01)				
	1,756		Other	Simple reaction time test	0.01 (-0.03, 0.05)				
	1,724		Executive function	Symbol digit substitution test	0 (-0.04, 0.03)				
Crous-Bou 2020 (ALFA)	958	PM_{10}	Global	Modified-PACC composite	2.05 (-3.58, 7.69)				
			Memory	Memory binding test	5.45 (-0.34, 11.25)				
			Executive function	WAIS-IV subtests	-0.79 (-5.77, 4.18)				

Kulick 2020 (NOMAS)	1,093	PM_{10}	Global	Global cognitive score	0.00 (-0.10, 0.11)			
			Memory	Modified California Verbal Learning Test	0.05 (-0.13, 0.22)			
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	-0.02 (-0.20, 0.15)			
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	0.12 (-0.05, 0.29)			
Kulick 2020 (WHICAP)	5,330	PM_{10}	Global	Global cognitive score	-0.06 (-0.11, 0.00)			
			Memory	Selective reminding test	-0.09 (-0.15, -0.03)			
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	-0.04 (-0.09, 0.02)			
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	-0.11 (-0.17, -0.06)			
Nußbaum 2020 (1000BRAINS)	615	PM_{10}	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed		Test score rank Difference	Per 10 μg/m³	0 (-0.20, 0.20)
			Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards		Test score rank Difference	Per 10 μg/m³	0 (-0.15, 0.20)
			Executive function	Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test		Test score rank Difference	Per 10 μg/m³	0.05 (-0.15, 0.25)
			Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test		Test score rank Difference	Per 10 μg/m³	0 (-0.20, 0.20)
			Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)		Test score rank Difference	Per 10 μg/m3	-0.05 (-0.25, 0.20)

Ranft 2009 (SALIA)	396	PM_{10}	Global	CERAD-plus test	-0.60 (-1.40, 0.20)				
	308		Executive function	Stroop test		Log(test score)	Difference	Per 10 μg/m³	0 (-4.00, 4.00)
	377		Other	Sniffing test	0 (-0.38, 0.38)				
Schikowski 2015 (SALIA)	789	PM_{10}	Global	MMSE	0.26 (-0.22, 0.75)				
			Global	CERaD total score	0.15 (-0.32, 0.63)				
			Memory	Word list learning	0.44 (-0.04, 0.92)				
			Memory	Word list recall	0.25 (-0.20, 0.74)				
			Memory	Figure recall	0.08 (-0.42, 0.55)				
			Memory	Boston naming test	-0.20 (-0.68, 0.28)				
			Executive function	Semantic fluency	0.10 (-0.35, 0.61)				
			Executive function	Phonemic fluency	0.04 (-0.41, 0.54)				
			Executive function	Trail making A	0 (-0.47, 0.47)				
			Executive function	Trail making B	0.05 (-0.41, 0.51)				
			Executive function	Trail making B/A	0.05 (-0.41, 0.51)				
			Other	Figure copying	-0.52 (-1.00, -0.03)				
Shin 2019 (KFACS)	2,896	PM_{10}	Global	MMSE-KC		Log(test score)	Difference	Per 10 μg/m³	-0.08 (-0.11, -0.04)
			Memory	Digit forward span		Log(test score)	Difference	Per 10 μg/m³	-0.06 (-0.12, 0.00)
			Memory	Digit backward span		Log(test score)	Difference	Per 10 μg/m³	0.05 (-0.02, 0.12)
			Memory	Word list memory		Log(test score)	Difference	Per 10 μg/m³	0.11 (0.03, 0.18)
			Memory	Word list recall		Log(test score)	Difference	Per 10 μg/m³	-0.02 (-0.07, 0.02)
			Memory	Recall storage		Log(test score)	Difference	Per 10 μg/m³	-0.03 (-0.07, 0.01)
			Memory	Word list recognition		Log(test score)	Difference	Per 10 μg/m³	0.00 (-0.03, 0.03)
			Executive function	FAB score		Log(test score)	Difference	Per 10 μg/m³	0.00 (-0.05, 0.04)

Tonne 2014 (Whitehall II)	2,762	PM_{10}	Memory	20 word free recall list	-0.22 (-0.50, 0.05)				
	2,761		Executive function	Semantic fluency	0.06 (-0.19, 0.30)				
	2,749		Executive function	Phonemic fluency	0.10 (-0.19, 0.39)				
	2,767		Executive function	Alice Heim 4-I test	-0.22 (-0.43, -0.01)				
Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	PM_{10}	Global	Global cognitive score	-0.14 (-0.25, -0.04)				
			Memory	8 word immediate recall	-0.10 (-0.24, 0.05)				
			Memory	8 word delayed recall	-0.14 (-0.29, 0.05)				
			Executive function	Semantic fluency	-0.14 (-0.33, 0.05)				
			Executive function	Labyrinth test	-0.24 (-0.43, -0.10)				
			Other	Clock drawing		Poor performance (score≥3)	OR	Per 10 μg/m³	0.95 (0.60, 1.45)
Ailshire 2014 (HRS)[d]	13,996	$PM_{2.5}$	Global	TICS (out of 35 points)		Test score	Difference	Quartile 1 (4.5 - 9.942 μg/m³)	0 (reference)
								Quartile 2 (9.943 - 12.184 μg/m³)	-0.02 (-0.07, 0.02)
								Quartile 3 (12.185 - 13.796 μg/m³)	-0.09 (-0.14, -0.05)
								Quartile 4 (13.797 - 20.661 μg/m³)	-0.06 (-0.10, -0.01)
			Memory	Episodic memory - sum of immediate and delayed recall scores from TICS		Test score	Difference	Quartile 1 (4.5 - 9.942 μg/m³)	0 (reference)
								Quartile 2 (9.943 - 12.184 μg/m³)	-0.03 (-0.08, 0.01)

								Quartile 3 (12.185 - 13.796 μg/m3)	-0.10 (-0.15, -0.06)
								Quartile 4 (13.797 - 20.661 μg/m3)	-0.05 (-0.10, 0.00)
			Other	Mental status - sum of the rest of the scores from the TICS		Test score	Difference	Quartile 1 (4.5 - 9.942 μg/m3)	0 (reference)
								Quartile 2 (9.943 - 12.184 μg/m3)	0.01 (-0.04, 0.05)
								Quartile 3 (12.185 - 13.796 μg/m3)	-0.05 (-0.09, 0.01)
								Quartile 4 (13.797 - 20.661 μg/m3)	-0.05 (-0.10, 0.00)
Crous-Bou 2020 (ALFA)	958	$PM_{2.5}$	Global	Modified-PACC composite	1.23 (-31.52, 33.99)				
			Memory	Memory binding test	3.18 (-0.16, 6.52)				
			Executive function	WAIS-IV subtests	-0.63 (-3.43, 2.17)				
Kulick 2020 (NOMAS)	1,093	$PM_{2.5}$	Global	Global cognitive score	0.34 (-0.19, 0.87)				
			Memory	Modified California Verbal Learning Test	0.32 (-0.55, 1.20)				
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	0.18 (-0.69, 1.05)				
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	0.84 (-0.01, 1.70)				
Kulick 2020 (WHICAP)	5,330	$PM_{2.5}$	Global	Global cognitive score	-0.23 (-0.41, -0.04)				
			Memory	Selective reminding test	-0.21 (-0.42, 0.00)				

			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	-0.21 (-0.38, -0.03)			
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	-0.22 (-0.41, -0.03)			
Nußbaum 2020 (1000BRAINS)	615	$PM_{2.5}$	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed		Test score rank Difference	Per 10 μg/m³	-0.07 (-0.43, 0.29)
			Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards		Test score rank Difference	Per 10 μg/m³	0.07 (-0.21, 0.36)
			Executive function	Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test		Test score rank Difference	Per 10 μg/m³	0.07 (-0.21, 0.36)
			Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test		Test score rank Difference	Per 10 μg/m³	-0.14 (-0.50, 0.21)
			Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)		Test score rank Difference	Per 10 μg/m³	-0.14 (-0.57, 0.21)
Salinas-Rodriguez 2018 (ENSANUT-2012)	7,986	$PM_{2.5}$	Memory	3 word memory test		Recalled none of the words OR	Per 10 μg/m³	1.30 (1.03, 1.65)
			Executive function	Semantic fluency	-0.11 (-0.22, -0.06)			
Schikowski 2015 (SALIA)	789	$PM_{2.5}$	Global	MMSE	0.30 (-0.43, 1.08)			
			Global	CERaD total score	0.17 (-0.60, 0.94)			
			Memory	Word list learning	0.51 (-0.28, 1.25)			
			Memory	Word list recall	0.47 (-0.33, 1.23)			
			Memory	Figure recall	0.29 (-0.49, 1.07)			

			Memory	Boston naming test	-0.42 (-1.21, 0.33)			
			Executive function	Semantic fluency	0.41 (-0.35, 1.17)			
			Executive function	Phonemic fluency	0.29 (-0.48, 1.05)			
			Executive function	Trail making A	-0.27 (-1.03, 0.49)			
			Executive function	Trail making B	-0.11 (-0.85, 0.64)			
			Executive function	Trail making B/A	0.16 (-0.58, 0.90)			
			Other	Figure copying	-0.76 (-1.52, 0.04)			
Shin 2019 (KFACS)	2,896	$PM_{2.5}$	Global	MMSE-KC		Log(test score)	Difference	Per 10 μg/m³	-0.07 (-0.13, -0.01)
			Memory	Digit forward span		Log(test score)	Difference	Per 10 μg/m³	-0.15 (-0.27, -0.03)
			Memory	Digit backward span		Log(test score)	Difference	Per 10 μg/m³	-0.26 (-0.38, -0.13)
			Memory	Word list memory		Log(test score)	Difference	Per 10 μg/m³	-0.16 (-0.24, -0.07)
			Memory	Word list recall		Log(test score)	Difference	Per 10 μg/m³	-0.24 (-0.36, -0.12)
			Memory	Recall storage		Log(test score)	Difference	Per 10 μg/m³	-0.16 (-0.25, -0.07)
			Memory	Word list recognition		Log(test score)	Difference	Per 10 μg/m³	-0.11 (-0.19, -0.02)
			Executive function	FAB score		Log(test score)	Difference	Per 10 μg/m³	-0.25 (-0.32, -0.17)
Tallon 2017 (NSHAP)	3,374	$PM_{2.5}$	Global	Modified MoCA	-0.14 (-0.25, -0.03)				
Tonne 2014 (Whitehall II)	2,762	$PM_{2.5}$	Memory	20 word free recall list	0.10 (-0.31, 0.52)				
	2,761		Executive function	Semantic fluency	-0.38 (-0.88, 0.12)				
	2,749		Executive function	Phonemic fluency	0.16 (-0.34, 0.67)				
	2,767		Executive function	Alice Heim 4-I test	-0.41 (-0.78, -0.04)				

Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	$PM_{2.5}$	Global	Global cognitive score	-0.39 (-0.58, -0.21)				
			Memory	8 word immediate recall	-0.35 (-0.63, -0.07)				
			Memory	8 word delayed recall	-0.42 (-0.69, -0.07)				
			Executive function	Semantic fluency	-0.49 (-0.76, -0.21)				
			Executive function	Labyrinth test	-0.63 (-0.90, -0.28)				
			Other	Clock drawing		Poor performance (score≥3)	OR	Per 10 μg/m³	0.70 (0.35, 1.50)
Younan 2020-BRAIN (WHIMS-MRI)	531	$PM_{2.5}$	Memory	CVLT: Immediate recall of List A trials 1-3	0.01 (-0.19, 0.20)				
			Memory	CVLT: Immediate recall of List B	0.15 (-0.01, 0.30)				
			Memory	CVLT: Short-delay recall of List A	-0.06 (-0.25, 0.14)				
			Memory	CVLT: Long-delay recall of List A	-0.09 (-0.28, 0.10)				
			Memory	CVLT: Composite score of episodic memory, based on the 3 List A (not List B) scores	-0.06 (-0.25, 0.13)				
Crous-Bou 2020 (ALFA)	958	$PM_{2.5-10}$	Global	Modified-PACC composite	0.68 (-2.54, 3.91)				
			Memory	Memory binding test	0.80 (-2.55, 4.14)				
			Executive function	WAIS-IV subtests	0.16 (-2.64, 2.96)				
Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	$PM_{2.5-10}$	Global	Global cognitive score	-0.23 (-0.36, -0.11)				
			Memory	8 word immediate recall	-0.22 (-0.43, -0.05)				
			Memory	8 word delayed recall	-0.22 (-0.43, -0.05)				
			Executive function	Semantic fluency	-0.38 (-0.60, -0.16)				
			Executive function	Labyrinth test	-0.27 (-0.49, -0.05)				
			Other	Clock drawing		Poor performance (score≥3)	OR	Per 10 μg/m³	0.85 (0.50, 1.44)

Abbreviations: 1000BRAINS: Cohort study of the 1000Brains population; ALFA: ALzheimer's and FAmilies; BTT: Block-Tapping Test; CERaD: Consortium to Establish a Registry for Alzheimer's Disease; CI: Confidence Interval; CVLT: California Verbal Learning Test; ENSANUT: National Survey on Health and Nutrition; FAB Score: Frontal Assessment Battery Score; HRS: Health and Retirement Study; KFACS: Korean Frailty and Aging Cohort Study; MMSE :Mini-Mental State Examination; MMSE-KC: Mini-Mental State Examination Korean Consortium; MoCA: Montreal Cognitive Assessment; mPACC: Modified Preclinical Alzheimer Cognitive Composite; MRI :Magnetic Resonance Imaging; N: Sample Size; NHANES III: Third National Health and Nutrition Examination Survey; NO: Nitrogen Oxide; NO_2: Nitrogen dioxide; NOMAS: Northern Manhattan Study; NO_x: Oxides of Nitrogen; NSHAP :The National Social Life, Health, and Aging Project; OR: Odds Ratio; PACC: Preclinical Alzheimer Cognitive Composite; PM_{10}: Inhalable particles with diameters that are 10 µm in diameter or smaller; $PM_{2.5}$: fine particulate matter less than 2.5 µm in diameter; $PM_{2.5\text{-}10}$: Particulate matter with diameter between 2.5 and 10 microns; ppb: Parts per billion; SALIA: Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; SD: Standard Deviation; TICS: Telephone Interview of Cognitive Status; VGT: Verbaler Gedächtnistest; WAIS-IV: Wechsler Adult Intelligence Scale-Fourth Edition; WHICAP: The Washington Heights-Inwood Community Aging Project; WHIMS-MRI: Women's Health Initiative Magnetic Resonance Imaging; ZNS: Zahlennachsprechen.

a) Only effect estimates reporting an association between air pollutants and cognitive level from studies that had 3 or more strengths according to our bias assessment are included in this table. If a study reported the standard deviation of the test used or used a test z-score, we transformed associations to represent SD-unit differences in test scores per common exposure contrast (10 $\mu g/m^3$ for $PM_{2.5}$, PM_{10}, $PM_{2.5\text{-}10}$, NO_2, and NO_x; and 10 ppb for ozone). If transformation to SD units of test scores was not possible, associations were still scaled to common exposure contrasts where possible. If neither was possible, we reported the associations as presented in their studies. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.
b) Excluded from this table was the study by Zeng et al. (2010). Although otherwise eligible, the exposure contrast for the reported effect estimates was not reported, and we were unable to obtain this information from the authors by the time of submission.
c) We transformed effect estimates to represent SD-unit differences in test scores per 10 $\mu g/m^3$ for $PM_{2.5}$, PM_{10}, $PM_{2.5\text{-}10}$, NO_2, and NO_x; and 10 ppb for ozone.
d) We standardized effect estimates reported by Ailshire et al. (2014) to reflect SD-unit change in cognitive test score per quartile of $PM_{2.5}$ exposure.

Table S2: Associations between air pollution exposure and cognitive change in qualifying studies [a]

Paper	N	Exposure	Cognitive domain	Test(s)	Difference in biannual rate of change, per 10 μg/m³ Difference (95% CI)
Kulick 2020 (NOMAS)	1,093	NO_2	Global	Global cognitive score	0.00 (-0.03, 0.02)
			Memory	Modified California Verbal Learning Test	-0.02 (-0.06, 0.02)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	0.01 (-0.03, 0.05)
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	-0.02 (-0.06, 0.02)
Kulick 2020 (WHICAP)	5,330	NO_2	Global	Global cognitive score	-0.03 (-0.04, -0.02)
			Memory	Selective reminding test	-0.01 (-0.02, 0.00)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	0.00 (-0.01, 0.01)
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	-0.01 (-0.02, 0.00)
Petkus 2021 (WHIMS-ECHO)	1,583	NO_2	Memory	East Boston Memory Test (EBMT)21 and word-list items of the Telephone Interview for Cognitive Status-modified (TICSm)	-0.02 (-0.05, 0.01)
Oudin 2017 (Betula)	1,469	NO_x	Memory	Episodic memory measure: immediate free recall and delayed cued recall	0.00 (-0.01, 0.01)
Kulick 2020 (NOMAS)	1,093	PM_{10}	Global	Global cognitive score	-0.01 (-0.04, 0.02)
			Memory	Modified California Verbal Learning Test	-0.03 (-0.08, 0.02)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	0.00 (-0.05, 0.05)
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	-0.04 (-0.09, 0.01)
Kulick 2020 (WHICAP)	5,330	PM_{10}	Global	Global cognitive score	-0.03 (-0.05, -0.01)
			Memory	Selective reminding test	-0.01 (-0.03, 0.01)

			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	0.01 (-0.01, 0.03)
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	0.00 (-0.02, 0.02)
Tonne 2014 (Whitehall II)	2,867	PM_{10}	Memory	20 word free recall list	-0.06 (-0.14, 0.02)
			Executive function	Semantic fluency	-0.02 (-0.08, 0.04)
			Executive function	Phonemic fluency	-0.02 (-0.08, 0.04)
			Executive function	Alice Heim 4-I test	-0.02 (-0.06, 0.01)
Weuve 2012 (NHS)	16,887	PM_{10}	Global	Global cognitive score	-0.02 (-0.01, -0.01)
	19,409		Global	TICS	-0.02 (-0.03, 0.00)
	16,906		Memory	Composite of immediate/delayed recall from EBMT and TICS 10-word list	-0.02 (-0.03, -0.01)
	18,652		Executive function	Semantic fluency	-0.01 (-0.03, 0.00)
	16,916		Executive function	Digit span backward	-0.02 (-0.04, -0.01)
Kulick 2020 (NOMAS)	1,093	$PM_{2.5}$	Global	Global cognitive score	-0.04 (-0.19, 0.10)
			Memory	Modified California Verbal Learning Test	-0.13 (-0.37, 0.11)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	0.01 (-0.22, 0.25)
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	-0.12 (-0.36, 0.12)
Kulick 2020 (WHICAP)	5,330	$PM_{2.5}$	Global	Global cognitive score	-0.14 (-0.18, -0.10)
			Memory	Selective reminding test	-0.08 (-0.28, -0.06)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	-0.03 (-0.07, -0.01)
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	-0.08 (-0.12, -0.04)
Petkus 2020 (WHISCA)	2,202	$PM_{2.5}$	Memory	California Verbal Learning Test trials 1-3	-0.73 (-1.04, -0.42)
			Memory	Short delay free recall	-0.71 (-1.05, -0.36)
			Memory	Long delay free recall	-0.55 (-0.89, -0.21)

Petkus 2021 (WHIMS-ECHO)	1,583	$PM_{2.5}$	Memory	East Boston Memory Test (EBMT)21 and word-list items of the Telephone Interview for Cognitive Status-modified (TICSm)	-0.05 (-0.16, 0.05)
Tonne 2014 (Whitehall II)	2,867	$PM_{2.5}$	Memory	20 word free recall list	-0.11 (-0.23, 0.01)
			Executive function	Semantic fluency	-0.04 (-0.13, 0.04)
			Executive function	Phonemic fluency	-0.03 (-0.12, 0.05)
			Executive function	Alice Heim 4-I test	-0.04 (-0.09, 0.01)
Weuve 2012 (NHS)	16,887	$PM_{2.5}$	Global	Global cognitive score	-0.02 (-0.04, 0.00)
	19,409		Global	TICS	-0.05 (-0.09, -0.01)
	16,906		Memory	Composite of immediate/delayed recall from EBMT and TICS 10-word list	-0.01 (-0.04, 0.01)
	18,652		Executive function	Semantic fluency	0.00 (-0.03, 0.02)
	16,916		Executive function	Digit span backward	-0.03 (-0.06, -0.01)
Weuve 2012 (NHS)	16,887	$PM_{2.5-10}$	Global	Global cognitive score	-0.02 (-0.03, -0.01)
	19,409		Global	TICS	-0.02 (-0.04, 0.00)
	16,906		Memory	Composite of immediate/delayed recall from EBMT and TICS 10-word list	-0.03 (-0.04, -0.01)
	18,652		Executive function	Semantic fluency	-0.04 (-0.08, 0.00)
	16,916		Executive function	Digit span backward	-0.02 (-0.04, -0.01)

Abbreviations: CI: Confidence Interval; EBMT: East Boston Memory Test; N: Sample Size; NHS: Nurses' Health Study; NO: Nitrogen Oxide; NO_2: Nitrogen dioxide; NOMAS: Northern Manhattan Study; NO_x: Oxides of Nitrogen; PM_{10}: Inhalable particles with diameters that are 10 μm in diameter or smaller; $PM_{2.5}$: fine particulate matter less than 2.5 μm in diameter; $PM_{2.5-10}$: Particulate matter with diameter between 2.5 and 10 microns; ppb: Parts per billion; ref: Reference; TICS: Telephone Interview of Cognitive Status; WHICAP: The Washington Heights-Inwood Community Aging Project; WHIMS: Women's Health Initiative Memory Study; WHIMS-ECHO: Women's Health Initiative Memory Study - Epidemiology of Cognitive Health Outcomes; WHISCA: Women's Health Initiative Study of Cognitive Aging;

a) Only effect estimates reporting an association between air pollutants and cognitive change from studies that had 3 or more strengths according to our bias assessment are included in this table. We transformed each measure of association using the reported cognitive test standard deviation, length of time between follow-up assessments, and exposure contrast. Each effect estimate and associated 95% CI was transformed to reflect the 2-year change in standard deviation units of the cognitive test outcome per 10 $\mu g/m^3$ of the pollutant. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S3. Associations between air pollution exposure and incident dementia/cognitive impairment in qualifying studies [a]

Paper	N	Cases	Exposure	Dementia outcome	Measured using medical records?	Measure of association	Exposure contrast	Estimate (95% CI)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	NO_2	Hospitalization for all-cause dementia	Y	HR	Per 10 μg/m³	0.97 (0.96, 0.99)
		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	0.91 (0.89, 0.94)
He 2020 (ZIMPHS)	7,311	1,652	NO_2	Incident cognitive impairment	N	OR	Per 10 μg/m³	1 (0.66, 1.63)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	NO_x	Hospitalization for all-cause dementia	Y	HR	Per 10 μg/m³	1.00 (1.00, 1.01)
		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	0.98 (0.97, 0.99)
Oudin 2016 (Betula)	1,806	275	NO_x	All-cause dementia	Y	HR	Per 10 μg/m³	1.05 (0.98, 1.12)
		173		Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	1.05 (0.97, 1.15)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	Ozone	Hospitalization for all-cause dementia	Y	HR	Per 10 ppb	1.12 (1.06, 1.17)
		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 ppb	0.96 (0.90, 1.04)
He 2020 (ZIMPHS)	7,311	1,652	Ozone	Incident cognitive impairment	N	OR	Per 10 ppb	0.54 (0.23, 1.49)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	PM_{10}	Hospitalization for all-cause dementia	Y	HR	Per 10 μg/m³	1 (0.98, 1.03)
		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	0.95 (0.91, 0.99)
He 2020 (ZIMPHS)	7,311	1,652	PM_{10}	Incident cognitive impairment	N	OR	Per 10 μg/m³	1.34 (0.98, 1.79)
Ailshire 2021 (HRS - 2004)	9,970	1,386	$PM_{2.5}$	Incident cognitive impairment	N	OR	Per 10 μg/m³	1.19 (0.92, 1.52)
Ailshire 2021 (HRS - 2014)	9,185	964	$PM_{2.5}$	Incident cognitive impairment	N	OR	Per 10 μg/m³	1.34 (0.74, 2.41)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	$PM_{2.5}$	Hospitalization for all-cause dementia	Y	HR	Per 10 μg/m³	0.98 (0.92, 1.04)

		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	0.83 (0.72, 0.94)
He 2020 (ZIMPHS)	7,311	1,652	$PM_{2.5}$	Incident cognitive impairment	N	OR	Per 10 μg/m³	1.48 (1.01, 2.16)
Loop 2013 (REGARDS)	20,150	1,633	$PM_{2.5}$	Mild cognitive impairment	N	OR	Per 10 μg/m³	0.97 (0.72, 1.31)
Oudin 2018 (Betula)	1,806	302	Wood-burning-sourced $PM_{2.5}$	All-cause dementia	Y	HR	Per 1 μg/m³	1.55 (1.00, 2.41)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	$PM_{2.5-10}$	Hospitalization for all-cause dementia	Y	HR	Per 10 μg/m³	0.96 (0.92, 1.00)
		7,671		Hospitalization for Alzheimer's disease dementia	Y	HR	Per 10 μg/m³	0.83 (0.76, 0.88)

Abbreviations: CI: Confidence Interval; HR: Hazard Ratio; HRS: Health and Retirement Study; N: Sample Size; NO: Nitrogen Oxide; NO_2: Nitrogen dioxide; NO_x: Oxides of Nitrogen; O_3: Ozone; OR: Odds Ratio; PM_{10}: Inhalable particles with diameters that are 10 μm in diameter or smaller; $PM_{2.5}$: fine particulate matter less than 2.5 μm in diameter; $PM_{2.5-10}$: Particulate matter with diameter between 2.5 and 10 microns; ppb: Parts per billion; REGARDS: Reasons for Geographic and Racial Differences in Stroke; ZJMPHS: Zheijang Major Public Health Surveillance Program;

a) Only effect estimates reporting an association between air pollutants and incident dementia or cognitive impairment from studies that had 3 or more strengths according to our bias assessment are included in this table. We transformed associations to reflect common exposure contrasts (10 μg/m³ for $PM_{2.5}$, PM_{10}, $PM_{2.5-10}$, NO_2, and NO_x; 10 ppb for ozone; and 1 μg/m³ for wood-burning-sourced $PM_{2.5}$). If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S4: Associations between air pollution exposure and neuroimaging outcomes in qualifying studies [a]

		Volumetric outcomes					Cerebrovascular outcomes				
Paper	**Exposure**	**N**	**Outcome measure**	**Measure of association**	**Exposure contrast**	**Estimate (95% CI)**	**N**	**Outcome measure**	**Measure of association**	**Exposure contrast**	**Estimate (95% CI)**
Crous-Bou 2020 (ALFA)	NO_2	228	Hippocampal volume	Difference (in mm^3)	Per 1 $\mu g/m^3$	-56.80 (-210.27, 96.67)					
			Ventricles volume	Difference (in mm^3)	Per 1 $\mu g/m^3$	34.30 (-38.42, 107.02)					
			AD signature cortical thickness	Difference	Per 1 $\mu g/m^3$	-16.40 (-32.84, 0.04)					
Kulick 2017 (NOMAS)	NO_2	1,075	Total cerebral brain volume / total cranial volume	Difference	Per IQR = 3.63 ppb	0.00 (-0.18, 0.18)	1,075	Presence of subclinical brain infarct	OR	Per IQR = 3.63 ppb	0.99 (0.85, 1.16)
								Log-white matter hyperintensity volume / total cranial volume	Difference	Per IQR = 3.63 ppb	-0.02 (-0.06, 0.03)
Nußbaum 2020 (1000BRAINS)	NO_2	590	Left hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=5.3 $\mu g/m^3$	-0.01 (-0.02, 0.00)					
			Left hemisphere inferior parietal lobule IGI	Difference	Per IQR=5.3 $\mu g/m^3$	0.00 (-0.02, 0.01)					
			Left hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=5.3 $\mu g/m^3$	-0.01 (-0.03, 0.00)					
			Right hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=5.3 $\mu g/m^3$	-0.01 (-0.02, 0.01)					

			Right hemisphere inferior parietal lobule IGI	Difference	Per IQR=5.3 μg/m³	-0.01 (-0.03, 0.00)					
			Right hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=5.3 μg/m³	-0.02 (-0.04, 0.00)					
Crous-Bou 2020 (ALFA)	NO_x	228	Hippocampal volume	Difference (in mm³)	Per 1 μg/m³	-76.10 (-161.75, 9.55)					
			Ventricles volume	Difference (in mm³)	Per 1 μg/m³	50.90 (-21.62, 123.42)					
			AD signature cortical thickness	Difference	Per 1 μg/m³	-36.80 (-77.37, 3.77)					
Kulick 2017 (NOMAS)	NO_x	1,075	Total cerebral brain volume / total cranial volume	Difference	Per IQR = 13.94 ppb	-0.01 (-0.21, 0.19)	1,075	Presence of subclinical brain infarct	OR	Per IQR = 13.94 ppb	0.99 (0.84, 1.18)
								Log-white matter hyperintensity volume / total cranial volume	Difference	Per IQR = 13.94 ppb	-0.02 (-0.07, 0.04)
Nußbaum 2020 (1000BRAINS)	NO_x	590	Left hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=14.0 μg/m³	-0.01 (-0.02, 0.01)					
			Left hemisphere inferior parietal lobule IGI	Difference	Per IQR=14.0 μg/m³	0.00 (-0.02, 0.01)					
			Left hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=14.0 μg/m³	-0.02 (-0.04, 0.00)					
			Right hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=14.0 μg/m³	-0.01 (-0.02, 0.01)					

			Right hemisphere inferior parietal lobule IGI	Difference	Per IQR=14.0 μg/m³	-0.02 (-0.03, 0.00)					
			Right hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=14.0 μg/m³	-0.02 (-0.04, -0.01)					
Kulick 2017 (NOMAS)	Ozone	1,075	Total cerebral brain volume / total cranial volume	Difference	Per IQR = 1.2 ppb	0.21 (-0.06, 0.48)	1,075	Presence of subclinical brain infarct	OR	Per IQR = 1.2 ppb	0.91 (0.72, 1.14)
								Log-white matter hyperintensity volume / total cranial volume	Difference	Per IQR = 1.2 ppb	0.01 (-0.06, 0.08)
Crous-Bou 2020 (ALFA)	PM_{10}	228	Hippocampal volume	Difference (in mm^3)	Per 1 μg/m³	-55.1 (-173.29, 63.09)					
			Ventricles volume	Difference (in mm^3)	Per 1 μg/m³	77.00 (-13.55, 167.55)					
			AD signature cortical thickness	Difference	Per 1 μg/m³	-5.34 (-10.93, 0.25)					
Nußbaum 2020 (1000BRAINS)	PM_{10}	590	Left hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=2.0 μg/m³	0.00 (-0.02, 0.01)					
			Left hemisphere inferior parietal lobule IGI	Difference	Per IQR=2.0 μg/m³	0.00 (-0.02, 0.01)					
			Left hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=2.0 μg/m³	-0.01 (-0.03, 0.01)					
			Right hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=2.0 μg/m³	-0.01 (-0.02, 0.01)					

			Right hemisphere inferior parietal lobule IGI	Difference	Per IQR=2.0 μg/m³	-0.02 (-0.03, 0.00)					
			Right hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=2.0 μg/m³	-0.02 (-0.04, 0.00)					
Power 2018 (ARIC)	PM_{10}	1,749	Total brain volume	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.02, 0.01)	1,747	Presence of infarct	OR	Per 1 μg/m³	1.00 (0.94, 1.07)
		1,745	AD signature	Difference (in SD units)	Per 1 μg/m³	0.01 (-0.02, 0.04)	1,746	Severe white matter hyperintensity	OR	Per 1 μg/m³	0.96 (0.90, 1.02)
		1,745	Deep gray matter volume	Difference (in SD units)	Per 1 μg/m³	-0.02 (-0.04, 0.00)	1,747	Presence of lacunes	OR	Per 1 μg/m³	1.00 (0.93, 1.07)
		1,745	Frontal lobe volume	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.02, 0.02)	1,736	Presence of microbleeds	OR	Per 1 μg/m³	1.05 (0.97, 1.13)
		1,738	Hippocampal volume	Difference (in SD units)	Per 1 μg/m³	-0.01 (-0.03, 0.02)	1,723	Presence of lobar microbleeds	OR	Per 1 μg/m³	1.05 (0.96, 1.16)
		1,745	Occipital lobe volume	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.03, 0.04)	1,723	Presence of subcortical microbleeds	OR	Per 1 μg/m³	1.05 (0.97, 1.13)
		1,745	Parietal lobe volume	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.01, 0.02)					
		1,745	Temporal lobe volume	Difference (in SD units)	Per 1 μg/m³	0.01 (-0.02, 0.05)					
Crous-Bou 2020 (ALFA)	$PM_{2.5}$	228	Hippocampal volume	Difference (in mm^3)	Per 1 μg/m³	-44.90 (-108.21, 18.41)					
			Ventricles volume	Difference (in mm^3)	Per 1 μg/m³	-4.00 (-52.80, 44.80)					
			AD signature cortical thickness	Difference	Per 1 μg/m³	-2.46 (-5.44, 0.52)					
Kulick 2017 (NOMAS)	$PM_{2.5}$	1,075	Total cerebral brain volume / total cranial volume	Difference	Per IQR = 1.48 μg/m³	-0.12 (-0.38, 0.14)	1,075	Presence of subclinical brain infarct	OR	Per IQR = 1.48 μg/m³	1.13 (0.91, 1.40)

								Log-white matter hyperintensity volume / total cranial volume	Difference	Per IQR = 1.48 μg/m³	-0.06 (-0.13, 0.00)
Nußbaum 2020 (1000BRAINS)	$PM_{2.5}$	590	Left hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=1.4 μg/m³	-0.01 (-0.02, 0.01)					
			Left hemisphere inferior parietal lobule IGI	Difference	Per IQR=1.4 μg/m³	0.00 (-0.02, 0.01)					
			Left hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=1.4 μg/m³	-0.01 (-0.03, 0.01)					
			Right hemisphere dorsolateral prefrontal cortex IGI	Difference	Per IQR=1.4 μg/m³	-0.01 (-0.03, 0.01)					
			Right hemisphere inferior parietal lobule IGI	Difference	Per IQR=1.4 μg/m³	-0.02 (-0.04, 0.00)					
			Right hemisphere posterior cingulate cortex and precuneus IGI	Difference	Per IQR=1.4 μg/m³	-0.02 (-0.04, 0.00)					
Power 2018 (ARIC)	$PM_{2.5}$	1,749	Total brain volume	Difference (in SD units)	Per 1 μg/m³	-0.02 (-0.09, 0.04)	1,747	Presence of infarct	OR	Per 1 μg/m³	0.98 (0.85, 1.13)
		1,745	AD signature	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.06, 0.05)	1,746	Severe white matter hyperintensity	OR	Per 1 μg/m³	1.01 (0.89, 1.15)
		1,745	Deep gray matter volume	Difference (in SD units)	Per 1 μg/m³	-0.03 (-0.07, 0.00)	1,747	Presence of lacunes	OR	Per 1 μg/m³	1.06 (0.91, 1.24)
		1,745	Frontal lobe volume	Difference (in SD units)	Per 1 μg/m³	-0.02 (-0.05, 0.01)	1,736	Presence of microbleeds	OR	Per 1 μg/m³	1.03 (0.89, 1.20)
		1,738	Hippocampal volume	Difference (in SD units)	Per 1 μg/m³	-0.01 (-0.05, 0.04)	1,723	Presence of lobar microbleeds	OR	Per 1 μg/m³	0.98 (0.71, 1.37)
		1,745	Occipital lobe volume	Difference (in SD units)	Per 1 μg/m³	-0.01 (-0.10, 0.08)	1,723	Presence of subcortical microbleeds	OR	Per 1 μg/m³	1.07 (0.92, 1.26)

		1,745	Parietal lobe volume	Difference (in SD units)	Per 1 μg/m³	-0.02 (-0.07, 0.03)					
		1,745	Temporal lobe volume	Difference (in SD units)	Per 1 μg/m³	0.00 (-0.07, 0.07)					
Wilker 2015 (FOS)	$PM_{2.5}$	929	Total cerebral volume / total cranial volume	Difference	Per 2 μg/m³	-0.32 (-0.59, -0.05)	926	Covert brain infarcts	OR	Per 2 μg/m³	1.46 (1.10, 1.94)
		921	Total hippocampal volume / total cranial volume	Difference	Per 2 μg/m³	0.00 (-0.01, 0.01)	929	Excessive white matter hyperintensity volume for age	OR	Per 2 μg/m³	1 (0.76, 1.32)
							929	Log (white matter hyperintensities)	Difference	Per 2 μg/m³	-0.06 (-0.16, 0.03)
Wilker 2016 (MADRC)	$PM_{2.5}$	202	Brain parenchymal fraction	% Difference	Per 2 μg/m³	0.02 (-0.52, 0.56)	236	Log white matter hyperintensities	Difference (in cc)	Per 2 μg/m³	-0.19 (-0.37, -0.01)
							236	Microbleed presence	OR	Per 2 μg/m³	0.79 (0.50, 1.26)
Younan 2020 (WHIMS-MRI)	$PM_{2.5}$	1,361	AD pattern similarity score	Difference	Per 3.24 μg/m³	0.00 (-0.02, 0.01)					
		709	5-year change in AD pattern similarity score	Difference	Per 3.24 μg/m³	0.03 (0.01, 0.05)					
Crous-Bou 2020 (ALFA)	$PM_{2.5-10}$	228	Hippocampal volume	Difference (in mm³)	Per 1 μg/m³	-28.70 (-99.65, 42.25)					
			Ventricles volume	Difference (in mm³)	Per 1 μg/m³	52.7 (2.52, 102.88)					
			AD signature cortical thickness	Difference	Per 1 μg/m³	-3.00 (-6.08, 0.08)					

Abbreviations: 1000BRAINS: Cohort study of the 1000Brains population; AD: Alzheimer's Disease; ALFA: Alzheimer's and Families; ARIC: Atherosclerosis Risk in Communities Study;; CI: Confidence Interval; FOS: Framingham Offspring Study; ; IGI: Local Gyrification Index ;IQR: Interquartile Range; MADRC: Massachusetts's Alzheimer's Disease Research Center; mm^3: cubic millimeter; N: Sample Size; NO: Nitrogen Oxide; NO_2: Nitrogen dioxide; NOMAS: Northern Manhattan Study; NO_x: Oxides of Nitrogen;; OR: Odds Ratio; PM_{10}: Inhalable particles with diameters that are 10 μm in diameter or smaller; $PM_{2.5}$: fine particulate matter

less than 2.5 µm in diameter; $PM_{2.5-10}$: Particulate matter with diameter between 2.5 and 10 microns; ppb: Parts per billion; SD: Standard Deviation; WHIMS-MRI: Women's Health Initiative Magnetic Resonance Imaging;

a) Only effect estimates reporting an association between air pollutants and neuroimaging outcomes from studies that had 3 or more strengths according to our bias assessment are included in this table. We did not transform effect estimates for associations with neuroimaging outcomes. Instead, we report the original exposure contrast for each measure of association. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S5: Associations between traffic-related air pollution exposure and cognitive level in qualifying studies [a]

Paper	N	Exposure	Exposure Contrast	Cognitive domain	Test(s)	Outcome	Measure of association	Estimate (95% CI)
Crous-Bou 2020 (ALFA)	958	$PM_{2.5}$ absorbance	Per 1 μg/m³	Global	Modified-PACC composite	Test score	Difference	0.02 (-0.04, 0.08)
				Memory	Memory binding test	Test score	Difference	0.08 (0.00, 0.16)
				Executive function	WAIS-IV subtests	Test score	Difference	-0.02 (-0.08, 0.04)
Kulick 2020 (NOMAS)	1,093	Distance to road	Per IQR = 278.1 meters	Global	Global cognitive score	Test score	Difference	-0.06 (-0.12, 0.00)
				Memory	Modified California Verbal Learning Test	Test score	Difference	-0.13 (-0.23, -0.04)
				Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	Test score	Difference	-0.08 (-0.17, 0.02)
				Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	Test score	Difference	-0.02 (-0.11, 0.08)
Kulick 2020 (WHICAP)	5,330	Distance to road	Per IQR = 277.6 meters	Global	Global cognitive score	Test score	Difference	-0.01 (-0.03, 0.02)
				Memory	Selective Reminding test	Test score	Difference	-0.01 (-0.04, 0.02)
				Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	Test score	Difference	0.02 (-0.01, 0.05)

				Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	Test score	Difference	0.01 (-0.01, 0.04)
Nusbaum 2020 (1000BRAINS)	615	$PM_{2.5}$ absorbance	Per 0.3 10^{-5}/m	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed	Test score rank	Difference	-0.02 (-0.06, 0.02)
				Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards	Test score rank	Difference	0.00 (-0.03, 0.03)
				Executive function	Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test	Test score rank	Difference	0.01 (-0.03, 0.04)
				Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test	Test score rank	Difference	-0.01 (-0.05, 0.03)
				Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)	Test score rank	Difference	0.01 (-0.03, 0.06)
		Distance to major road	100-200 meters vs. ≥ 200 meters	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed	Test score rank	Difference	-0.07 (-0.23, 0.08)
				Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards	Test score rank	Difference	-0.07 (-0.19, 0.05)

	Executive function	Subtest 3 of “Leistungsprüfungssystem 50+”, problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test	Test score rank	Difference	0.07 (-0.07, 0.20)
	Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test	Test score rank	Difference	-0.05 (-0.20, 0.09)
	Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)	Test score rank	Difference	0.12 (-0.04, 0.29)
<100 meters vs. ≥ 200 meters	Memory	Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed	Test score rank	Difference	0.02 (-0.15, 0.19)
	Memory	Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards	Test score rank	Difference	0.12 (-0.02, 0.25)
	Executive function	Subtest 3 of “Leistungsprüfungssystem 50+”, problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test	Test score rank	Difference	0.06 (-0.09, 0.20)
	Executive function	Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test	Test score rank	Difference	0.03 (-0.13, 0.19)
	Executive function	Alters-Konzentrations selective attention test; Trail Making test (part A)	Test score rank	Difference	0.12 (-0.06, 0.30)

Power 2011 (NAS)	680	Black carbon	Doubling of BC concentration	Global	Digit span backward, verbal fluency, constructional praxis, immediate recall of 10 item list, delayed recall of 10 item list, pattern comparison	Composite of z-scores	Difference	-0.05 (-0.10, 0.00)
			Doubling of BC concentration	Global	MMSE	Poor performance (score<26)	OR	1.30 (1.10, 1.60)
Ranft 2009 (SALIA)	396	Distance to road	≤ 50 meters to busy road vs. >50 meters	Global	CERAD-plus test	Test score	Difference	-3.8 (-7.80, 0.10)
	308			Executive function	Stroop test	Log(test score)	Difference	-5.1 (-8.20, -2.00)
	377			Other	Sniffing test	Test score	Difference	-1.3 (-2.40, -0.20)
Rocha 2021 (ELSA-Brasil)	3,050	Combined distance-weighted traffic density of residence and workplace	Tertile 2 (15.3-256.9 vehicles/hour) vs. Tertile 1 (0-15.3 vehicles/hour)	Global	Composite global cognitive score (averaged and standardized z-scores of all tests)	Test score	Difference	-0.03 (-0.13, 0.06)
				Memory	Consortium to Establish a Registry for Alzheimer's Disease Word List Memory Test (CERAD-WLMT)	Test score	Difference	-0.04 (-0.15, 0.08)
				Executive function	Semantic Verbal Fluency Test (SVFT), Phonemic Verbal Fluency Test (PVFT)	Test score	Difference	0.01 (-0.11, 0.12)
				Executive function	Trail Making Test, version B (TMT)	Test score	Difference	-0.06 (-0.15, 0.04)
			Tertile 3 (256.9-12912.0 vehicles/hour) vs. Tertile 1 (0-15.3 vehicles/hour)	Global	Composite global cognitive score (averaged and standardized z-scores of all tests)	Test score	Difference	0.03 (-0.07 ,0.13)
				Memory	Consortium to Establish a Registry for Alzheimer's Disease Word List Memory Test (CERAD-WLMT)	Test score	Difference	0.03 (-0.08, 0.15)

				Executive function	Semantic Verbal Fluency Test (SVFT), Phonemic Verbal Fluency Test (PVFT)	Test score	Difference	0.03 (-0.09, 0.14)
				Executive function	Trail Making Test, version B (TMT)	Test score	Difference	-0.01 (-0.09, 0.11)
		Distance-weighted traffic density of residence	Tertile 2 (51.1-557.2 vehicles/hour) vs. Tertile 1 (0.2-51.1 vehicles/hour)	Global	Composite global cognitive score (averaged and standardized z-scores of all tests)	Test score	Difference	0.04 (-0.03, 0.10)
				Memory	Consortium to Establish a Registry for Alzheimer's Disease Word List Memory Test (CERAD-WLMT)	Test score	Difference	0.01 (-0.07, 0.08)
				Executive function	Semantic Verbal Fluency Test (SVFT), Phonemic Verbal Fluency Test (PVFT)	Test score	Difference	0.07 (-0.01, 0.15)
				Executive function	Trail Making Test, version B (TMT)	Test score	Difference	0.02 (-0.05, 0.08)
			Tertile 3 (557.6-19351.2 vehicles/hour) vs. Tertile 1 (0.2-51.1 vehicles/hour)	Global	Composite global cognitive score (averaged and standardized z-scores of all tests)	Test score	Difference	0.10 (0.04, 0.17)
				Memory	Consortium to Establish a Registry for Alzheimer's Disease Word List Memory Test (CERAD-WLMT)	Test score	Difference	0.08 (0.00, 0.16)
				Executive function	Semantic Verbal Fluency Test (SVFT), Phonemic Verbal Fluency Test (PVFT)	Test score	Difference	0.09 (0.01, 0.17)
				Executive function	Trail Making Test, version B (TMT)	Test score	Difference	0.07 (0.00, 0.13)
Schikowski 2015 (SALIA)	789	Traffic load	Per 26.7 thousand cars / km driven per day	Global	MMSE	Test score	Difference	0.04 (-0.18, 0.26)
				Global	CERaD total score	Test score	Difference	-0.40 (-2.16, 1.36)
				Memory	Word list learning	Test score	Difference	-0.02 (-0.22, 0.19)
				Memory	Word list recall	Test score	Difference	-0.02 (-0.22, 0.17)
				Memory	Figure recall	Test score	Difference	0.03 (-0.23, 0.17)

				Memory	Boston naming test	Test score	Difference	-0.03 (-0.24, 0.17)
				Executive function	Semantic fluency	Test score	Difference	0.09 (-0.08, 0.25)
				Executive function	Phonemic fluency	Test score	Difference	-0.07 (-0.27, 0.13)
				Executive function	Trail making A	Test score	Difference	0.08 (-0.10, 0.26)
				Executive function	Trail making B	Test score	Difference	0.13 (-0.05, 0.31)
				Executive function	Trail making B/A	Test score	Difference	0.07 (-0.11, 0.25)
				Other	Figure copying	Test score	Difference	-0.10 (-0.35, 0.14)
Tonne 2014 (Whitehall II)	2,762	PM_{10} exhaust	Per 0.3 μg/m^3	Memory	20 word free recall list	Test score	Difference	0.01 (-0.02, 0.03)
	2,761			Executive function	Semantic fluency	Test score	Difference	-0.03 (-0.06, 0.01)
	2,749			Executive function	Phonemic fluency	Test score	Difference	-0.03 (-0.06, 0.00)
	2,767			Executive function	Alice Heim 4-I test	Test score	Difference	0.01 (-0.03, 0.05)
	2,762	$PM_{2.5}$ exhaust	Per 0.27 μg/m^3	Memory	20 word free recall list	Test score	Difference	0.01 (-0.04, 0.06)
	2,761			Executive function	Semantic fluency	Test score	Difference	-0.04 (-0.10, 0.01)
	2,749			Executive function	Phonemic fluency	Test score	Difference	0.02 (-0.04, 0.08)
	2,767			Executive function	Alice Heim 4-I test	Test score	Difference	-0.05 (-0.09, 0.00)
Tzivian 2016 (Heinz Nixdorf RECALL)	4,050	Traffic load	Per vehicle-meter/day	Global	Global cognitive score	Test score	Difference	0.02 (-0.04, 0.07)
				Memory	8 word immediate recall	Test score	Difference	-0.01 (-0.03, 0.03)
				Memory	8 word delayed recall	Test score	Difference	-0.01 (-0.03, 0.03)
				Executive function	Semantic fluency	Test score	Difference	0.01 (-0.02, 0.03)
				Executive function	Labyrinth test	Test score	Difference	0.01 (-0.02, 0.04)
				Other	Clock drawing	Test score	OR	1.03 (0.98, 1.09)

Wellenius 2012 (MOBILIZE Boston)	765	Black carbon	Per IQR = 0.11 $\mu g/m^3$	Global	MMSE	Poor performance (score<26)	OR	1.15 (0.99, 1.34)
				Memory	Immediate recall from Hopkins Verbal Learning Test	Test score	Difference	-0.36 (-0.71, -0.01)
				Memory	Delayed recall from Hopkins Verbal Learning Test	Test score	Difference	-0.14 (-0.37, 0.09)
				Memory	Recognition from Hopkins Verbal Learning Test	Test score	Difference	0.03 (-0.12, 0.17)
				Executive function	Phonemic fluency	Test score	Difference	-0.26 (-1.04, 0.53)
				Executive function	Semantic fluency	Test score	Difference	0.05 (-0.26, 0.35)
				Executive function	Trail making A	Test score	Difference	-0.59 (-3.35, 2.17)
				Executive function	Trail making B	Test score	Difference	-2.51 (-7.94, 2.91)
				Executive function	Delta of TMT	Test score	Difference	-2.23 (-6.57, 2.11)
				Other	Clock in the Box	Test score	Difference	-0.04 (-0.13, 0.05)
		Distance to road	Per 851.2 meters	Global	MMSE	Test score< 26	Odds ratio	1.07 (0.84, 1.36)
				Memory	Immediate recall from Hopkins Verbal Learning Test	Test score	Difference	-0.60 (-1.10, -0.10)
				Memory	Delayed recall from Hopkins Verbal Learning Test	Test score	Difference	-0.40 (-0.70, -0.10)
				Memory	Recognition from Hopkins Verbal Learning Test	Test score	Difference	0.07 (-0.12, 0.25)
				Executive function	Letter fluency	Test score	Difference	-1.40 (-2.70, -0.20)
				Executive function	Category fluency	Test score	Difference	-0.70 (-1.10, -0.30)
				Executive function	Trail making Test Part A	Test score	Difference	2.10 (-0.70, 4.90)
				Executive function	Trail making test Part B	Test score	Difference	10.5 (4.00, 17.10)

				Executive function	Delta of TMT	Test score	Difference	7.50 (2.20, 12.80)
				Other	Clock in the Box	Test score	Difference	-0.04 (-0.15, 0.07)
Yao 2021 (CLHLS)	11,187	Distance to major road	201-300 meters vs. > 300 meters (ref)	Global	Chinese MMSE	Test score	Difference	-0.04 (-0.26, 0.19)
			101-200 meters vs. > 300 meters (ref)	Global	Chinese MMSE	Test score	Difference	-0.07 (-0.29, 0.15)
			50-100 meters vs. > 300 meters (ref)	Global	Chinese MMSE	Test score	Difference	-0.2 (-0.38, -0.01)
			< 50 meters vs. > 300 meters (ref)	Global	Chinese MMSE	Test score	Difference	-0.18 (-0.34, -0.02)

Abbreviations: 1000BRAINS: Cohort study of the 1000Brains population;; ALFA: ALzheimer's and FAmilies; BC: Black Carbon;: Block-Tapping Test; CERaD: Consortium to Establish a Registry for Alzheimer's Disease; CERAD-WLMT: Consortium to Establish a Registry for Alzheimer's Disease-Word List Memory Test; CI: Confidence Interval; CLHLS: The Chinese Longitudinal Healthy Longevity Survey; ELSA-Brasil: The Brazilian Longitudinal Study of Adult Health; IQR: Interquartile RangeMMSE :Mini-Mental State Examination; MOBILIZE Boston: Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly; N: Sample Size; NAS: Veterans Affairs Normative Aging Study; NOMAS: Northern Manhattan Study; OR: Odds Ratio; PACC: Preclinical Alzheimer Cognitive Composite; PM_{10}: Inhalable particles with diameters that are 10 µm in diameter or smaller; $PM_{2.5}$: fine particulate matter less than 2.5 µm in diameter; $PM_{2.5\text{-}10}$: Particulate matter with diameter between 2.5 and 10 microns;; PVFT: Phonemic Verbal Fluency Test; SALIA: Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; SVFT: Semantic Verbal Fluency Test; TMT: Trail Making Test; VGT: Verbaler Gedächtnistest; WAIS-IV: Wechsler Adult Intelligence Scale-Fourth Edition; WHICAP: The Washington Heights-Inwood Community Aging Project; ZNS: Zahlennachsprechen.

a) Only effect estimates reporting an association between traffic and cognitive level outcomes from studies that had 3 or more strengths according to our bias assessment are included in this table. We did not transform effect estimates for associations between traffic-related air pollution and cognitive level. Instead, we report the original exposure contrast for each measure of association. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S6: Associations between traffic-related air pollution exposure and cognitive change in qualifying studies [a]

Paper	N	Exposure	Cognitive domain	Test(s)	Exposure Contrast	Difference in biannual rate of change: Difference (95% CI)
Colicino 2014 (NAS)	387	Black carbon	Global	MMSE	Effect of doubling BC concentration	0.07 (-0.06, 0.19)
Kulick 2020 (NOMAS)	1,093	Distance to road	Global	Global cognitive score	Per IQR = 278.1 meters	0.00 (-0.04, 0.04)
			Memory	Modified California Verbal Learning Test	Per IQR = 278.1 meters	0.04 (-0.03, 0.11)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering	Per IQR = 278.1 meters	0.01 (-0.06, 0.07)
			Executive function	Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities	Per IQR = 278.1 meters	-0.04 (-0.10, 0.03)
Kulick 2020 (WHICAP)	5,330	Distance to road	Global	Global cognitive score	Per IQR = 277.6 meters	0.02 (0.00, 0.03)
			Memory	Selective reminding test	Per IQR = 277.6 meters	0.01 (0.00, 0.03)
			Executive function	(Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale	Per IQR = 277.6 meters	-0.01 (-0.02, 0.01)
			Executive function	Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1	Per IQR = 277.6 meters	0.01 (0.00, 0.02)
Tonne 2014 (Whitehall II)	2,762	$PM_{2.5}$ exhaust	Memory	20 word free recall list	Per 0.27 $\mu g/m^3$	0.00 (-0.02, 0.01)
			Executive function	Semantic fluency	Per 0.27 $\mu g/m^3$	0.00 (-0.01, 0.01)
			Executive function	Phonemic fluency	Per 0.27 $\mu g/m^3$	0.00 (-0.01, 0.01)
			Executive function	Alice Heim 4-I test	Per 0.27 $\mu g/m^3$	0.00 (-0.01, 0.00)
		PM_{10} exhaust	Memory	20 word free recall list	Per 0.3 $\mu g/m^3$	0.00 (-0.02, 0.01)

	Executive function	Semantic fluency	Per 0.3 μg/m^3	0.00 (-0.01, 0.01)
	Executive function	Phonemic fluency	Per 0.3 μg/m^3	0.00 (-0.01, 0.01)
	Executive function	Alice Heim 4-I test	Per 0.3 μg/m^3	0.00 (-0.01, 0.00)

Abbreviations: BC: Black Carbon; CI: Confidence Interval; IQR: Interquartile Range; MMSE :Mini-Mental State Examination; N: Sample Size; NAS: Veterans Affairs Normative Aging Study; NOMAS: Northern Manhattan Study; PM_{10}: Inhalable particles with diameters that are 10 μm in diameter or smaller; $PM_{2.5}$: fine particulate matter less than 2.5 μm in diameter; WHICAP: The Washington Heights-Inwood Community Aging Project;

a) Only effect estimates reporting an association between traffic-related air pollution exposure and cognitive change outcomes from studies that had 3 or more strengths according to our bias assessment are included in this table. We transformed effect estimates to represent biannual cognitive change, but performed no further manipulations to align effect estimates to common exposure contrasts or outcome units. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S7: Associations between traffic-related air pollution exposure and incident dementia/cognitive impairment in qualifying studies [a]

Paper	N	Cases	Dementia outcome	Measured using medical records?	Measure of association	Exposure	Exposure contrast	Estimate (95%CI)
Cerza 2019 (Rome Longitudinal Cohort)	350,844	21,548	Hospitalization for all-cause dementia	Y	HR	$PM_{2.5}$ absorbance	1 10^{-5}/m	1.00 (0.98, 1.03)
		7,671	Hospitalization for Alzheimer's disease dementia	Y	HR	$PM_{2.5}$ absorbance	1 10^{-5}/m	0.91 (0.86, 0.96)
		21,548	Hospitalization for all-cause dementia	Y	HR	Distance to high traffic road	<50 meters	1.01 (0.97, 1.06)
							50-100 meters	0.98 (0.93, 1.02)
							101-200 meters	0.99 (0.95, 1.03)
							201-300 meters	1.00 (0.95, 1.04)
							>300 meters	1 (ref)
		7,671	Hospitalization for Alzheimer's disease dementia	Y	HR	Distance to high traffic road	<50 meters	0.97 (0.90, 1.04)
							50-100 meters	0.96 (0.89, 1.04)
							101-200 meters	0.99 (0.92, 1.05)
							201-300 meters	1.00 (0.93, 1.08)
							>300 meters	1 (ref)
Oudin 2018 (Betula)	1,806	302	All-cause dementia	Partially	HR	$PM_{2.5}$ (traffic exhaust)	1 $\mu g/m^3$	1.14 (0.59, 2.23)
Paul 2020 (SALSA)	1,564	100	All-cause dementia	N	HR	TRAP-NO_x	2.31 ppb	1.20 (0.98, 1.47)
		67	Cognitive impairment-not dementia	N	HR	TRAP-NO_x	2.31 ppb	1.21 (1.00, 1.46)

Abbreviations: CI: Confidence Interval; HR: Hazard Ratio; N: Sample Size; NO_x: Oxides of Nitrogen; $PM_{2.5}$: fine particulate matter less than 2.5 μm in diameter;; ppb: Parts per billion; ref: Reference; SALSA: The Sacramento Are Latino Study on Aging; TRAP: Traffic-Related Air Pollution;

a) Only effect estimates reporting an association between traffic-related air pollution and incident dementia/cognitive impairment from studies that had 3 or more strengths according to our bias assessment are included in this table. We did not transform effect estimates for associations between traffic-related air pollution and incident

dementia/cognitive impairment. Instead, we report the original exposure contrast for each measure of association. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Table S8: Associations between traffic-related air pollution exposure and neuroimaging outcomes in qualifying studies[a]

Paper	N	Outcome measure	Outcome Type	Measure of association	Exposure	Exposure contrast	Estimate (95% CI)
Crous-Bou 2020 (ALFA)	228	Hippocampal volume	Volumetric	Difference (in mm^3)	$PM_{2.5}$ absorbance	Per 1 $\mu g/m^3$	-61.9 (-241.24, 117.44)
		Ventricles volume		Difference (in mm^3)	$PM_{2.5}$ absorbance	Per 1 $\mu g/m^3$	1.83 (-11.99, 15.65)
		AD signature cortical thickness		Difference	$PM_{2.5}$ absorbance	Per 1 $\mu g/m^3$	-0.65 (-1.49, 0.19)
Kulick 2017 (NOMAS)	1,075	Total cerebral volume / total intracranial volume	Volumetric	Difference	Log-distance to road	256.97 meters	-0.10 (-0.30, 0.10)
Nußbaum 2020 (1000BRAINS)	590	Left hemisphere dorsolateral prefrontal cortex IGI	Volumetric	Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	0.00 (-0.02, 0.01)
		Left hemisphere inferior parietal lobule IGI		Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	0.00 (-0.01, 0.02)
		Left hemisphere posterior cingulate cortex and precuneus IGI		Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	-0.01 (-0.03, 0.01)
		Right hemisphere dorsolateral prefrontal cortex IGI		Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	0.00 (-0.02, 0.01)
		Right hemisphere inferior parietal lobule IGI		Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	-0.01 (-0.02, 0.01)
		Right hemisphere posterior cingulate cortex and precuneus IGI		Difference	$PM_{2.5}$ absorbance	0.3 $\mu g/m^3$	-0.01 (-0.03, 0.01)
		Left hemisphere dorsolateral prefrontal cortex IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	-0.01 (-0.06, 0.04)
		Left hemisphere inferior parietal lobule IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	-0.04 (-0.09, 0.01)
		Left hemisphere posterior cingulate cortex and precuneus IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	0.00 (-0.07, 0.07)
		Right hemisphere dorsolateral prefrontal cortex IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	-0.06 (-0.12, -0.01)
		Right hemisphere inferior parietal lobule IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	-0.02 (-0.08, 0.04)
		Right hemisphere posterior cingulate cortex and precuneus IGI		Difference	Distance to major road	100-200 vs. $\geq$ 200 meters	-0.07 (-0.13, 0.00)

		Left hemisphere dorsolateral prefrontal cortex IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	-0.03 (-0.09, 0.02)
		Left hemisphere inferior parietal lobule IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	0.00 (-0.06, 0.06)
		Left hemisphere posterior cingulate cortex and precuneus IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	-0.03 (-0.10, 0.05)
		Right hemisphere dorsolateral prefrontal cortex IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	-0.02 (-0.08, 0.04)
		Right hemisphere inferior parietal lobule IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	0.00 (-0.07, 0.06)
		Right hemisphere posterior cingulate cortex and precuneus IGI		Difference	Distance to major road	<100 vs. ≥ 200 meters	-0.01 (-0.09, 0.06)
Wilker 2015 (FOS)	865	Hippocampal volume	Volumetric	Difference	Log(distance) to road	367 meters	-0.00 (-0.01, 0.00)
	873	Total cerebral brain volume		Difference	Log(distance) to road	367 meters	-0.15 (-0.41, 0.11)
Wilker 2016 (MADRC)	202	Brain parenchymal fraction	Volumetric	Difference	Log-distance to road	<50 vs. >400 meters from major road	0.04 (-0.46, 0.54)
Kulick 2017 (NOMAS)	1,075	Presence of subclinical brain infarct	Cerebrovascular	OR	Log-distance to road	256.97 meters	1.06 (0.89, 1.26)
		Log-white matter hyperintensity volume / total intracranial volume		Difference	Log-distance to road	256.97 meters	0.11 (-0.38, 0.06)
Wilker 2015 (FOS)	870	Covert brain infarcts	Cerebrovascular	OR	Log(distance) to road	367 meters	1.05 (0.79, 1.40)
	873	Excessive white matter hyperintensity volume for age		OR	Log(distance) to road	367 meters	1.11 (0.84, 1.48)
	873	Log (white matter hyperintensities)		Difference	Log(distance) to road	367 meters	0.10 (0.01, 0.19)
Wilker 2016 (MADRC)	236	Log white matter hyperintensities	Cerebrovascular	Difference	Log-distance to road	<50 vs. >400 meters from major road	-0.13 (-0.31, 0.04)
	236	Microbleed presence		OR	Log-distance to road	<50 vs. >400 meters from major road	0.89 (0.58, 1.39)

Abbreviations: 1000BRAINS: Cohort study of the 1000Brains population; AD: Alzheimer's Disease;; ALFA: ALzheimer's and FAmilies; CI: Confidence Interval; FOS: Framingham Offspring Study; lGI: Local Gyrification Index; mm^3: cubic millimeters; MADRC: Massachusetts's Alzheimer's Disease Research Center; OR: Odds Ratio; $PM_{2.5}$: fine particulate matter less than 2.5 µm in diameter;

a) Only effect estimates reporting an association between traffic-related air pollution and neuroimaging outcomes from studies that had 3 or more strengths according to our bias assessment are included in this table. We did not transform effect estimates for associations with neuroimaging outcomes. Instead, we report the original exposure contrast for each measure of association. If multiple associations between the same exposure and outcome were published, we reported those associations that used a continuous exposure contrast and did not adjust for potential intermediates.

Figure S1. Flowchart for identification of eligible articles for inclusion in this systematic review

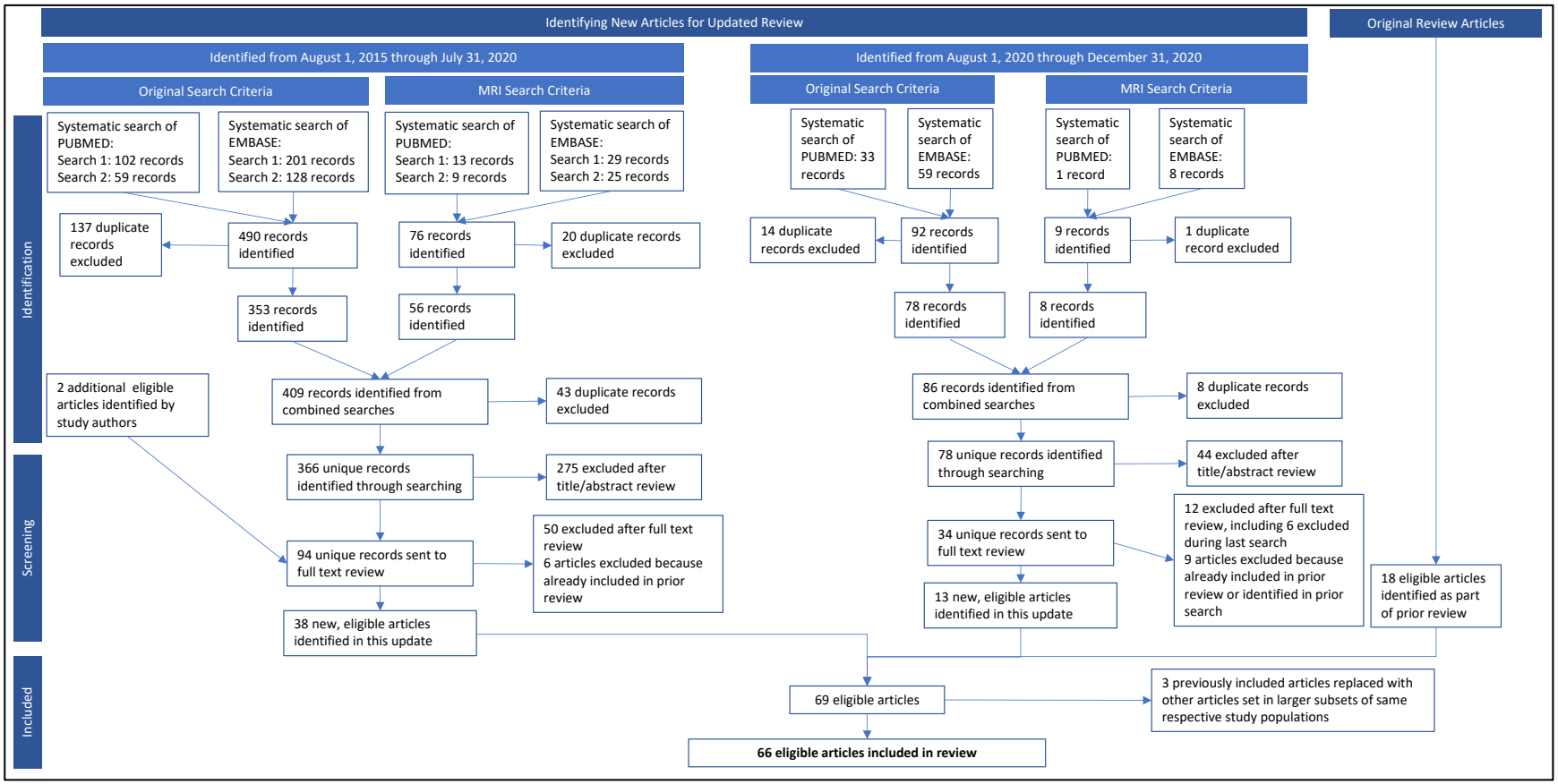
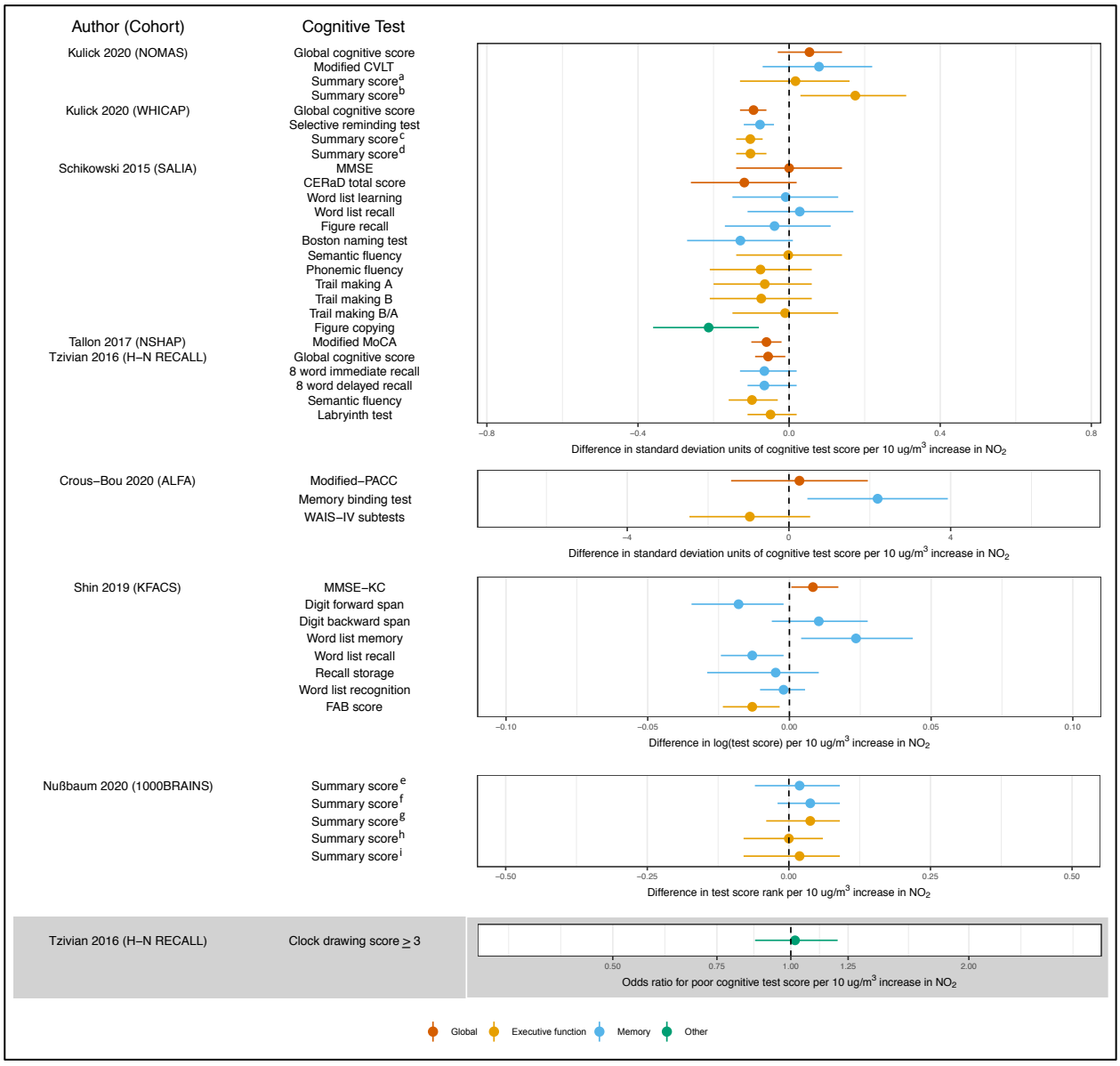


Figure S2: Associations between NO_2 exposure and cognitive level in qualifying studies



Abbreviations: CERaD, Consortium to Establish a Registry for Alzheimer's Disease; CVLT, California Verbal Learning Test; FAB, frontal assessment battery; H-N RECALL, Heinz Nixdorf Risk factors, Evaluation of Coronary Calcium and Lifestyle study; KFACS, Korean Frailty and Aging Cohort Study; MMSE, Mini-Mental State Exam; MMSE-KC, Mini-Mental State Exam – Korean version; MoCA, Montreal Cognitive Assessment; NO2, nitrogen dioxides; NOMAS, Northern Manhattan Study; NSHAP, National Social Health and Aging Study; SALIA, Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; WHICAP, Washington Heights-Inwood Community Aging Project.

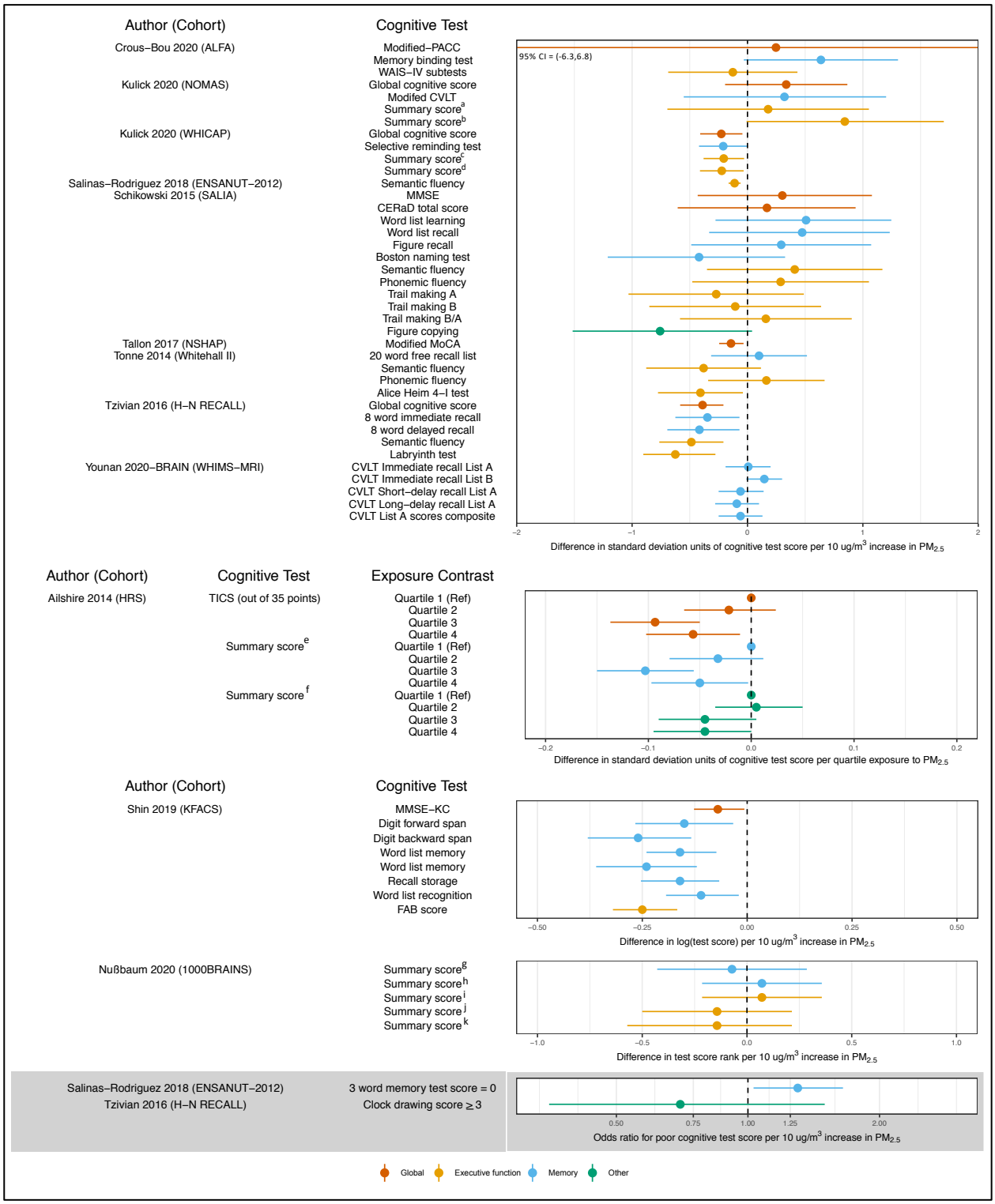
Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure. Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful effects. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful effects. Wherever possible, reported associations were transformed to be on a common scale (e.g. SD units per 10 $\mu g/m^3$ increase). In order to aid assessment of domain-specific effects, we classified each test as examining global cognition, executive function, memory, indicated by the color-coding of the point estimate and 95% confidence interval.

Tests included in summary scores include:

a) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering

b) Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities
c) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale
d) Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1
e) Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed
f) Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards
g) Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test
h) Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test
i) Alters-Konzentrations selective attention test; Trail Making test (part A)

Figure S3: Associations between $PM_{2.5}$ exposure and cognitive level in qualifying studies



Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure. Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful associations. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful associations. Wherever

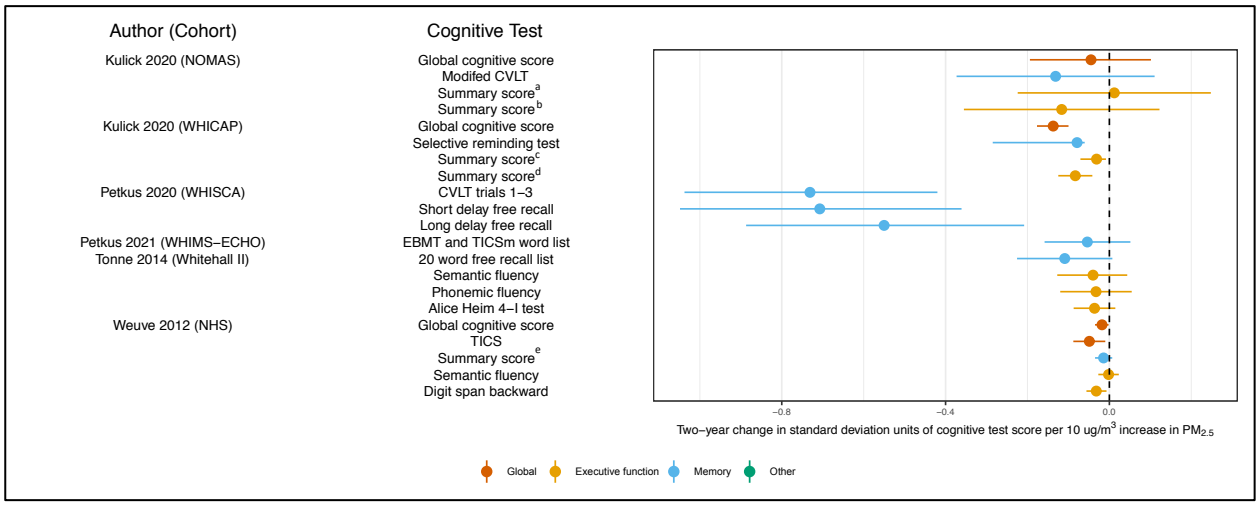
possible, reported associations were transformed to be on a common scale (e.g. SD units per 10 $\mu g/m^3$ increase of $PM_{2.5}$). In order to aid assessment of domain-specific effects, we classified each test as examining global cognition, executive function, memory, indicated by the color-coding of the point estimate and 95% confidence interval.

Abbreviations: ALFA, Alzheimer's and Family; CERaD, Consortium to Establish a Registry for Alzheimer's Disease; CVLT, California Verbal Learning Test; ENSANUT-2012, Spanish acronym for National Survey of Health and Nutrition in Mexico in 2012; FAB, frontal assessment battery; H-N RECALL, Heinz Nixdorf Risk factors, Evaluation of Coronary Calcium and Lifestyle study; HRS, Health and Retirement Study; KFACS, Korean Frailty and Aging Cohort Study; MMSE, Mini-Mental State Exam; MMSE-KC, Mini-Mental State Exam – Korean version; MoCA, Montreal Cognitive Assessment; NOMAS, Northern Manhattan Study; NSHAP, National Social Health and Aging Study; PACC, Preclinical Alzheimer Cognitive Composite; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; Ref, reference; SALIA, Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; TICS, Telephone Interview for Cognitive Status; WAIS-IV, Wechsler Adult Intelligence Scale 4th edition; WHICAP, Washington Heights-Inwood Community Aging Project; WHIMS-MRI, Women's Health Initiative Memory Study - MRI.

Tests included in summary scores include:

a) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering
b) Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities
c) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale
d) Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1
e) Sum of immediate and delayed recall scores from TICS
f) Sum of all scores from the TICS excluding immediate and delayed recall
g) Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed
h) Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards
i) Subtest 3 of "Leistungsprüfungssystem 50+", problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test
j) Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test
k) Alters-Konzentrations selective attention test; Trail Making test (part A)

Figure S4: Associations between $PM_{2.5}$ exposure and cognitive change in qualifying studies



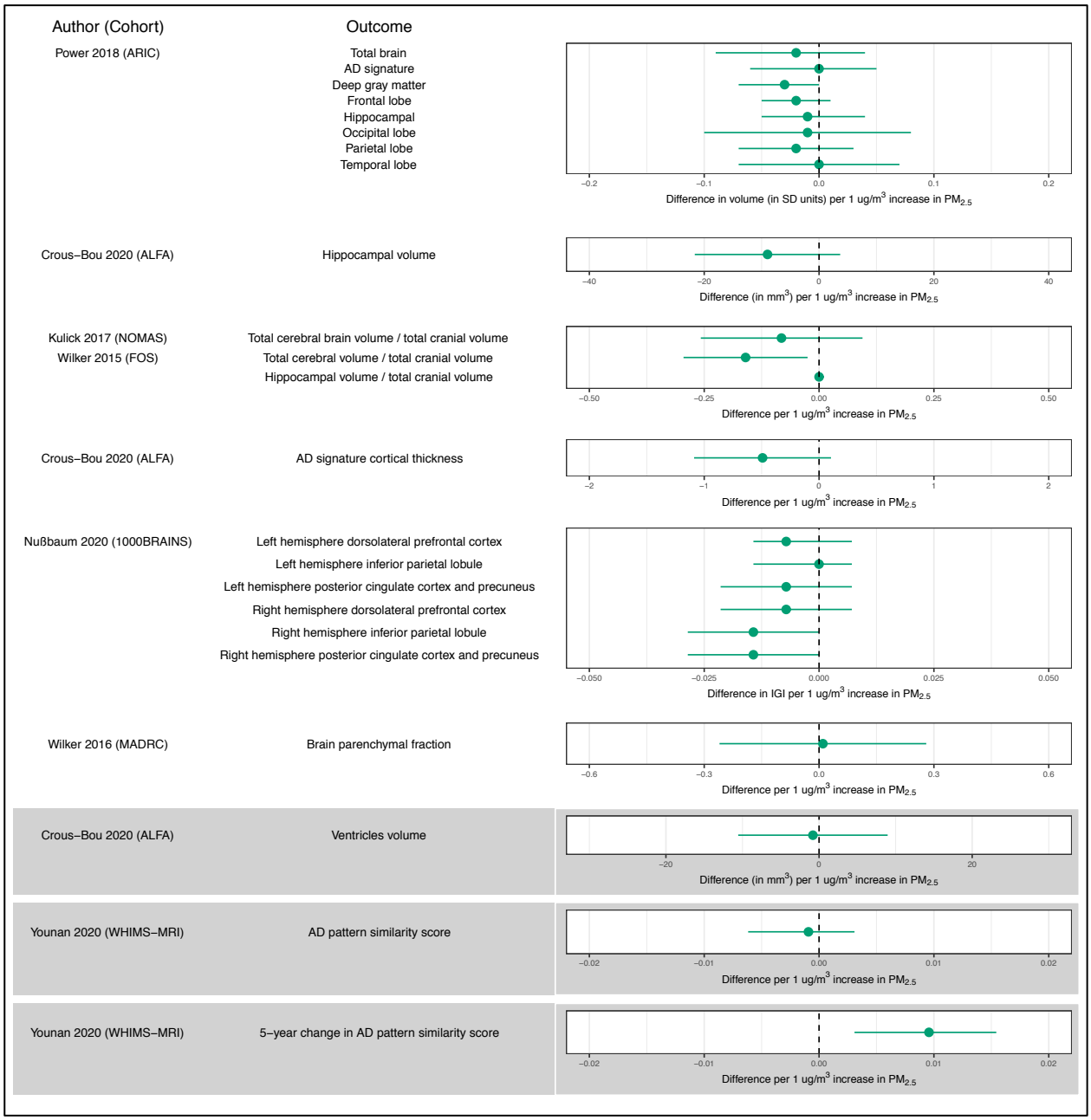
Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure. Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful effects. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful effects. Wherever possible, reported associations were transformed to be on a common scale (e.g. excess change in SD units per 10 $\mu g/m^3$ increase). In order to aid assessment of domain-specific effects, we classified each test as examining global cognition, executive function, memory, indicated by the color-coding of the point estimate and 95% confidence interval.

Abbreviations: CVLT, California Verbal Learning Test; EBMT, East Boston Memory Test; NHS, Nurses' Health Study; NOMAS, Northern Manhattan Study; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; TICS, Telephone Interview for Cognitive Status; TICSm, modified Telephone Interview for Cognitive Status; WHICAP, Washington Heights-Inwood Community Aging Project; WHISCA, Women's Health Initiative Study of Cognitive Aging; WHIMS-ECHO, Women's Health Initiative Memory Study of the Epidemiology of Cognitive Health Outcomes.

Tests included in summary scores include:

a) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering
b) Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities
c) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale
d) Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1
e) Composite of immediate/delayed recall from East Boston Memory Test and TICS 10-word list

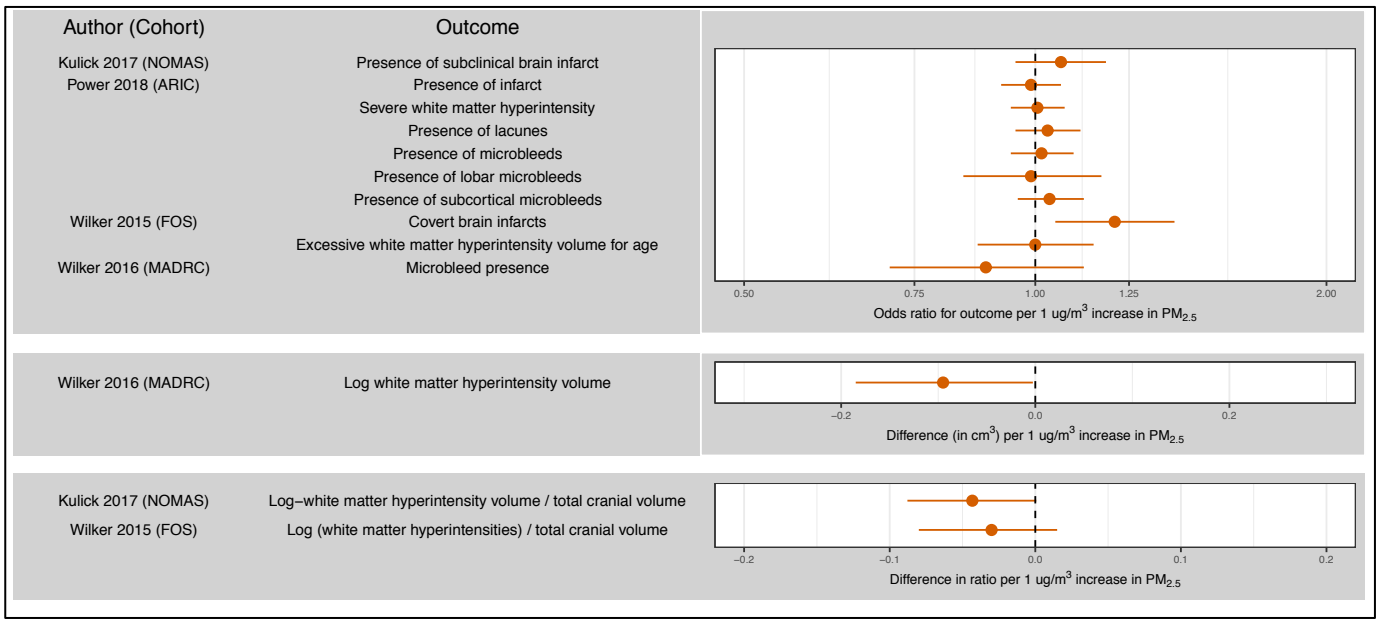
Figure S5: Associations between $PM_{2.5}$ exposure and MRI volumetric outcomes in qualifying studies



Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure. Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful effects. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful effects.

Abbreviations: AD, Alzheimer's disease; ALFA, Alzheimer's and Family; ARIC, Atherosclerosis Risk in Communities; FOS, Framingham Offspring Study; IGI, local gyrification index; MADRC, Massachusetts Alzheimer's Disease Research Center Longitudinal Cohort; NOMAS, Northern Manhattan Study; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; SD, standard deviation; WHIMS-MRI, Women's Health Initiative Memory Study.

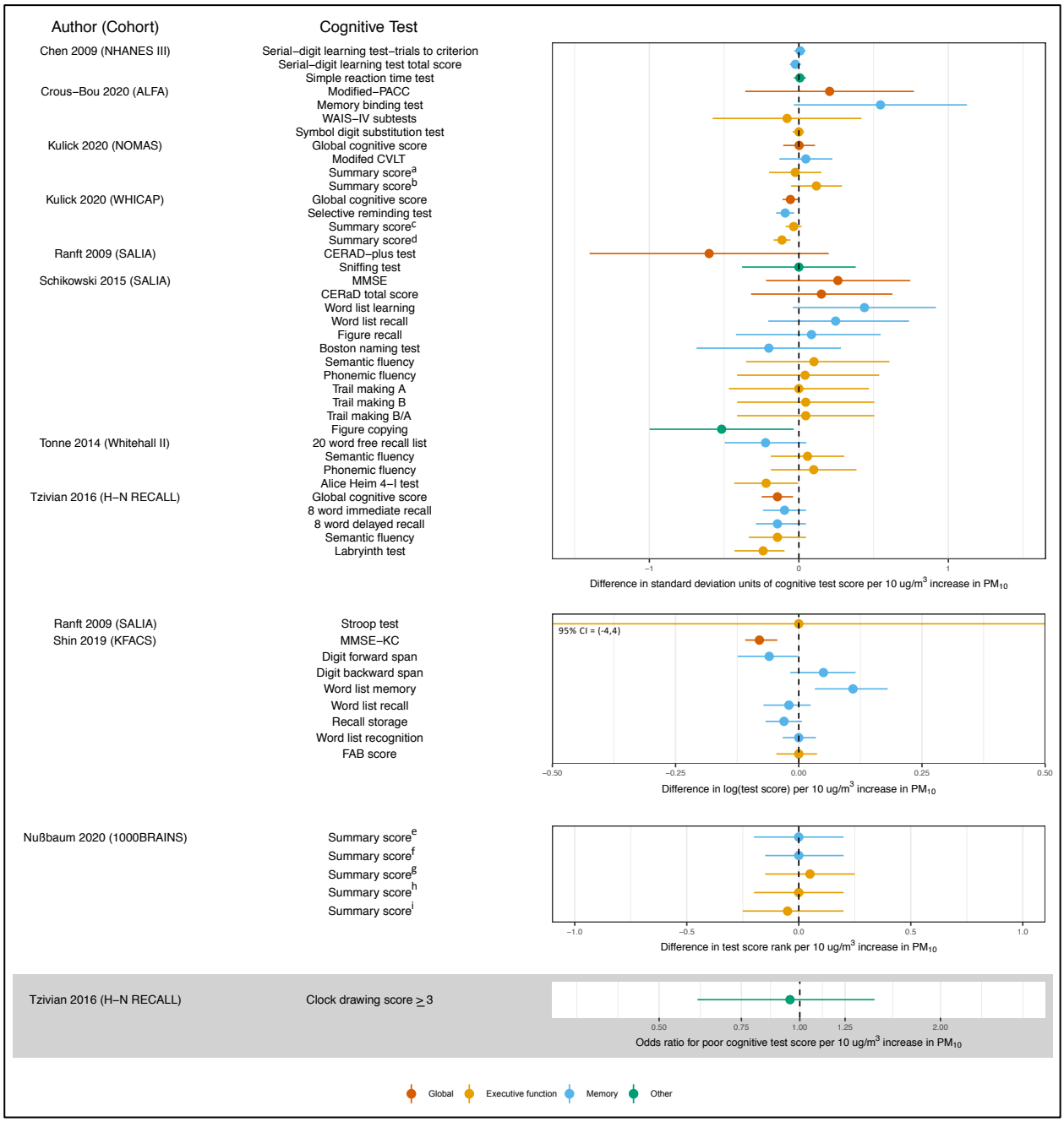
Figure S6: Associations between $PM_{2.5}$ exposure and MRI cerebrovascular outcomes in qualifying studies



Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful effects. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful effects.

Abbreviations: AD, Alzheimer's disease; ALFA, Alzheimer's and Family; ARIC, Atherosclerosis Risk in Communities; FOS, Framingham Offspring Study; IGI, local gyrification index; MADRC, Massachusetts Alzheimer's Disease Research Center Longitudinal Cohort; NOMAS, Northern Manhattan Study; PM2.5, particulate matter with an aerodynamic diameter < 2.5 micrometers; SD, standard deviation; WHIMS, Women's Health Initiative Memory Study

Figure S7: Associations between PM_{10} exposure and cognitive level in qualifying studies



Only effect estimates from studies that had 3 or more strengths according to our bias assessment are included in this figure. Dots represent effect estimates, and bars represent 95% confidence intervals. For subplots with white backgrounds, effect estimates to the left of the null line represent harmful associations. For subplots with grey backgrounds, effect estimates to the right of the null line represent harmful associations. Wherever possible, reported associations were transformed to be on a common scale (e.g. SD units per 10 $\mu g/m^3$ increase). In order to aid assessment of domain-specific effects, we classified each test as examining global cognition, executive function, memory, indicated by the color-coding of the point estimate and 95% confidence interval.

Abbreviations: ALFA, Alzheimer's and Family; CERaD, Consortium to Establish a Registry for Alzheimer's Disease; CI, confidence interval; CVLT, California Verbal Learning Test; FAB, frontal assessment battery; H-N RECALL, Heinz Nixdorf Risk factors, Evaluation of Coronary Calcium and Lifestyle study; KFACS, Korean Frailty and Aging Cohort Study; MMSE, Mini-Mental State Exam; MMSE-KC, Mini-Mental State Exam – Korean version; NHANES III, Third National Health and Nutrition Examination Survey; NOMAS, Northern Manhattan Study; PACC,

Preclinical Alzheimer Cognitive Composite; PM10, particulate matter with an aerodynamic diameter < 10 micrometers**;** SALIA, Study on the Influence of Air Pollution on Lung Function, Inflammation, and Aging; WAIS-IV, Wechsler Adult Intelligence Scale 4th edition; WHICAP, Washington Heights-Inwood Community Aging Project.

Tests included in summary scores include:

a) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Odd Man Out, Digit Reordering
b) Boston Naming Test (15-item), Animal Naming, Color Trails 2, Color Trails 1, Grooved Pegboard, Letter-Number Sequencing, Symbol Digit Modalities
c) (Color Trails 2-Color Trails 1), Controlled Oral Word Association Test, Identities and Oddities; similarities subset from the Wechsler Adult Intelligence Scale
d) Boston Naming Test (15-item), Animal Naming, Comprehension subtest from the Boston Diagnostic Aphasia Exam, Color Trails 2, Color Trails 1
e) Benton figural memory test; Verbaler Gedächtnistest (VGT) verbal learning test; VGT delayed
f) Visual-Pattern-test; Block-tapping test (BTT) forwards; BTT backwards; Zahlennachsprechen (ZNS) verbal memory test forwards; ZNS backwards
g) Subtest 3 of “Leistungsprüfungssystem 50+”, problem solving test; Fünf-Punkte figural fluency test; Trail making test B-A; Color-Word Interference Test
h) Regensburger Wortflüssigkeitstest phonemic fluency and semantic fluency tests; Wortschatztest vocabulary test
i) Alters-Konzentrations selective attention test; Trail Making test (part A)