Table S1 The search strategy of air pollution and cognitive impairment in PubMed

Step	Search term (the number of articles)
#1	air pollution (74146)
#2	particulate matter (68978)
#3	carbon monoxide (35041)
#4	nitrogen dioxide (16102)
#5	nitrogen oxide (119241)
#6	sulfur dioxide (8985)
#7	ozone (23094)
#8	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 (285015)
#9	cognitive impairment (97224)
#10	dementia (201291)
#11	#9 OR #10 (266902)
#12	#8 AND #11(1085)

Table S2 Detailed list of the number of exclude full-text reviewed articles

Step	The number of articles before exclusion	Excluding reasons	The number of articles after exclusion	References number of excluded articles
1	41	Exposure of interest was not air pollution	37	1-4
2	37	Outcome of interest was not cognitive impairment	34	5-7
3	34	Can not be converted into *RR* with per increment	17	8-24
4	17	Duplicate from the same population	13	25-28
5	13	Not cohort studies	10	29-31

References

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4. Malmqvist, E., et al., *Estimated health benefits of exhaust free transport in the city of Malmo, Southern Sweden.* Environ Int, 2018. **118**: p. 78-85.

5. Li, R.L., et al., *Influence of PM2.5 Exposure Level on the Association between Alzheimer's Disease and Allergic Rhinitis: A National Population-Based Cohort Study.* Int J Environ Res Public Health, 2019. **16**(18).

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15.   Power, M.C., et al., *Traffic-related air pollution and cognitive function in a cohort of older men.* Environ Health Perspect, 2011. **119**(5): p. 682-7.

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18.   Saenz, J.L., R. Wong, and J.A. Ailshire, *Indoor air pollution and cognitive function among older Mexican adults.* Journal of Epidemiology and Community Health, 2018. **72**(1): p. 21-26.

19.   Salinas-Rodriguez, A., et al., *Exposure to ambient PM2.5 concentrations and cognitive function among older Mexican adults.* Environment International, 2018. **117**: p. 1-9.

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23.   Wu, Y.C., et al., *Association between air pollutants and dementia risk in the elderly.* Alzheimers Dement (Amst), 2015. **1**(2): p. 220-8.

24.   Wurth, R., et al., *Fine Particle Sources and Cognitive Function in An Older Puerto Rican Cohort in Greater Boston.* Environ Epidemiol, 2018. **2**(3).

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28.   Oudin, A., et al., *Traffic-Related Air Pollution as a Risk Factor for Dementia: No Clear Modifying Effects of APOEvarepsilon4 in the Betula Cohort.* Radiol Med, 2019.

29.   Culqui, D.R., et al., *Association between environmental factors and emergency hospital admissions due to Alzheimer's disease in Madrid.* Sci Total Environ, 2017. **592**: p. 451-457.

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31.   Tzivian, L., et al., *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.* Environmental Health Perspectives, 2016. **124**(9): p. 1361-1368.

Table S3 Quality assessment of included cohort studies

First author, (year)	Representativeness of the exposed cohort	Selection of the unexposed cohort	Ascertainment of exposure	Outcome of interest not present at start of study	Control for important factor or additional factor[2]	Outcome assessment	Follow-up long enough for outcomes to occur[3]	Adequacy of follow-up of cohorts[4]	Overall quality score
Carey,IM. (2018)	*		*	*	**	*	*	*	8
Oudin,A. (2016)	*		*	*	**	*	*	*	8
Oudin,A. (2018)	*		*	*	**	*	*	*	8
Chen,H. (2017)	*		*	*	**	*	*	*	8
Cerza,F (2019)	*		*	*	**	*	*	*	8
Kioumourtzoglou,MA. (2016)	*		*		**	*	*	*	7
Ilango,SD (2019)	*		*	*	* *	*	*	*	8
Yu,YJ. (2016)	*		*	*	* *	*	*	*	8
Jung, CR. (2015)	*		*	*	**	*	*	*	8
Loop,MS.	*		*	*	**	*	*	*	8

[1] A study could be awarded a maximum of one star for each item except for the item Control for important factor or additional factor. A maximum of 2 stars could be awarded for this item. Studies that

controlled for age or gender received one star, whereas studies that controlled for other important confounders such as chronic health conditions received an additional star.

[2] A cohort study with a follow-up time >3 year was assigned one star.

[3] A cohort study with a follow-up rate >70% was assigned one star.

[4] One star represents a score of 1, and a study can be awarded a maximum score of 9 (9 stars) in total.
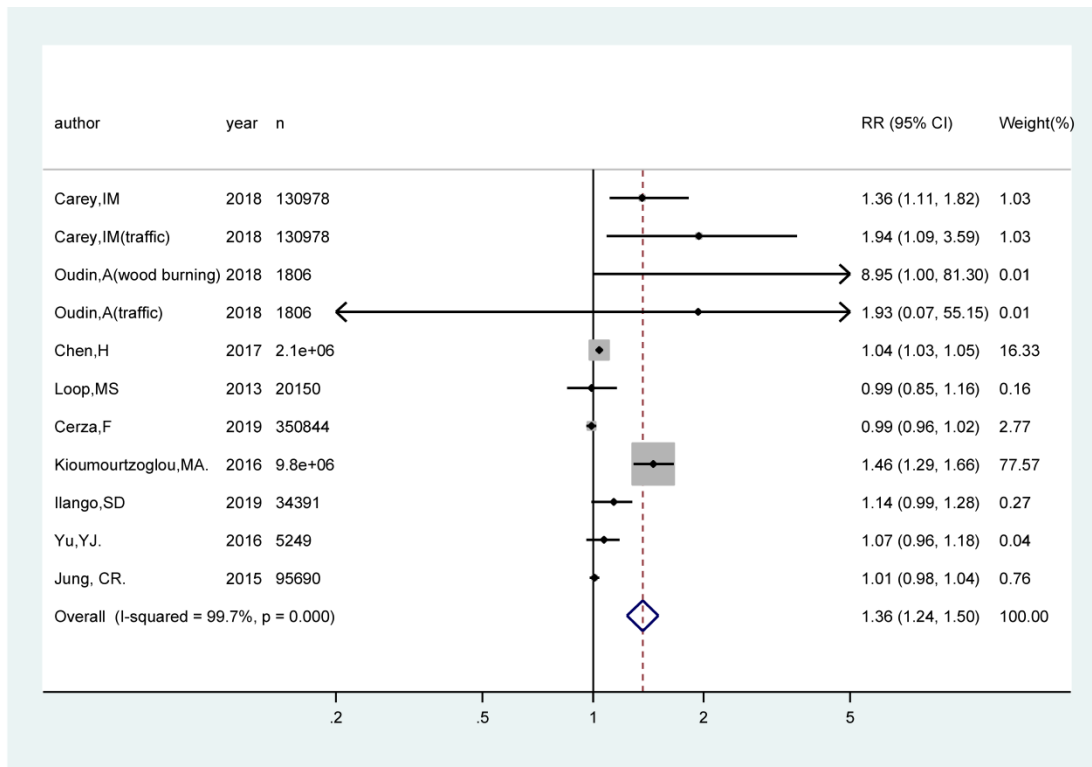
author	year	n	RR (95% CI)	Weight(%)
Carey,IM	2018	130978	1.36 (1.11, 1.82)	1.03
Carey,IM(traffic)	2018	130978	1.94 (1.09, 3.59)	1.03
Oudin,A(wood burning)	2018	1806	8.95 (1.00, 81.30)	0.01
Oudin,A(traffic)	2018	1806	1.93 (0.07, 55.15)	0.01
Chen,H	2017	2.1e+06	1.04 (1.03, 1.05)	16.33
Loop,MS	2013	20150	0.99 (0.85, 1.16)	0.16
Cerza,F	2019	350844	0.99 (0.96, 1.02)	2.77
Kioumourtzoglou,MA.	2016	9.8e+06	1.46 (1.29, 1.66)	77.57
Ilango,SD	2019	34391	1.14 (0.99, 1.28)	0.27
Yu,YJ.	2016	5249	1.07 (0.96, 1.18)	0.04
Jung, CR.	2015	95690	1.01 (0.98, 1.04)	0.76
Overall (I-squared = 99.7%, p = 0.000)			1.36 (1.24, 1.50)	100.00

Figure.S1 Forest plot for the pooled *RR* and 95 %*CI* of studies on PM$_{2.5}$ exposure (per 5 μg/m^3 increment) with cognitive impairment. The size of the grey box is positively proportional to the weight assigned to each study, and horizontal lines represent the 95%*CI*
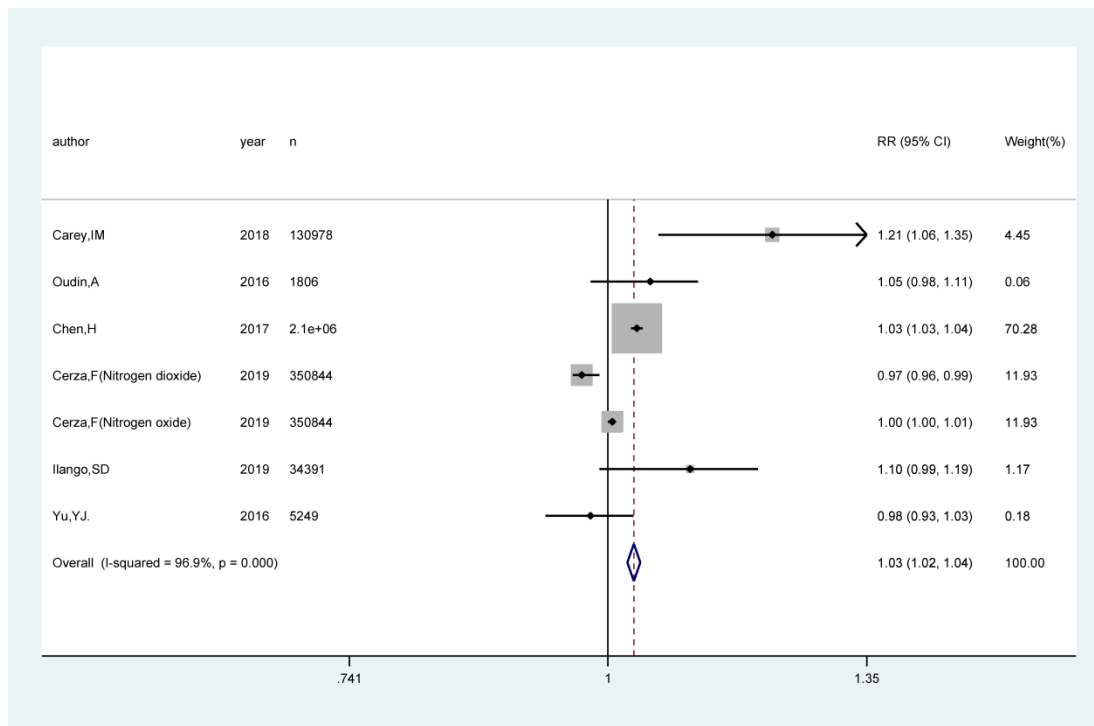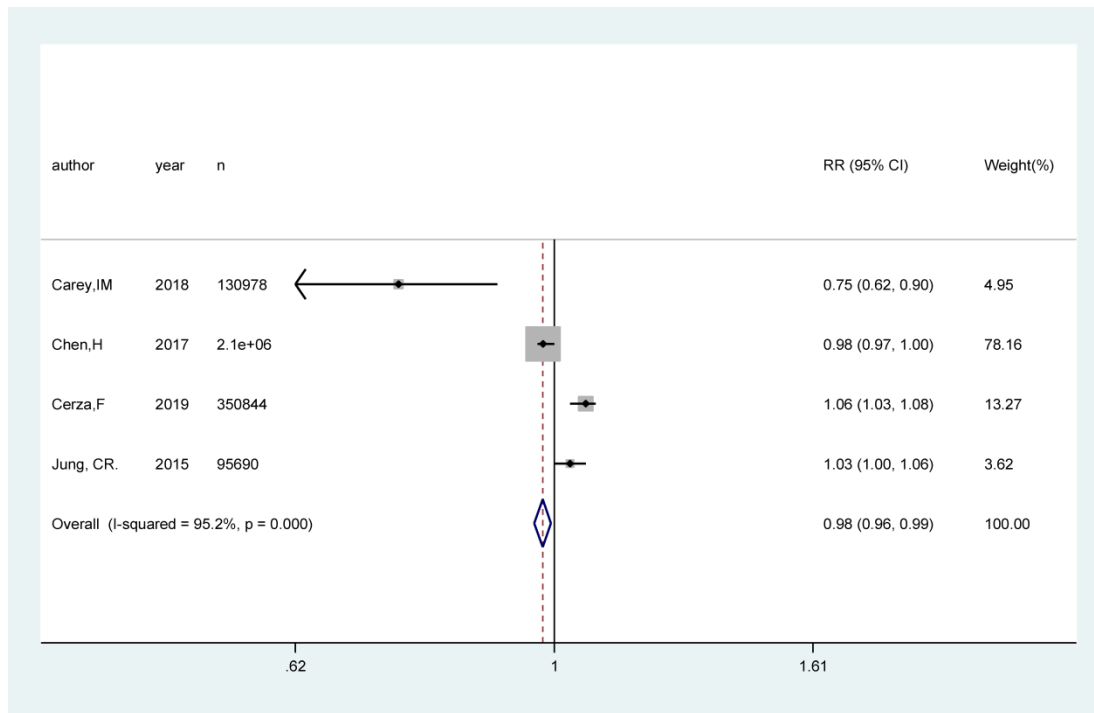
Figure.S2 Forest plot for the pooled *RR* and 95 %*CI* of studies on NO_2/NO_x exposure

(per 5 ppb increment) with cognitive impairment. The size of the grey box

is positively proportional to the weight assigned to each study, and

horizontal lines represent the 95%*CI*

Figure.S3 Forest plot for the pooled *RR* and 95 %*CI* of studies on O_3 exposure (per 5 ppb increment) with cognitive impairment. The size of the grey box is positively proportional to the weight assigned to each study, and horizontal lines represent the 95%*CI*
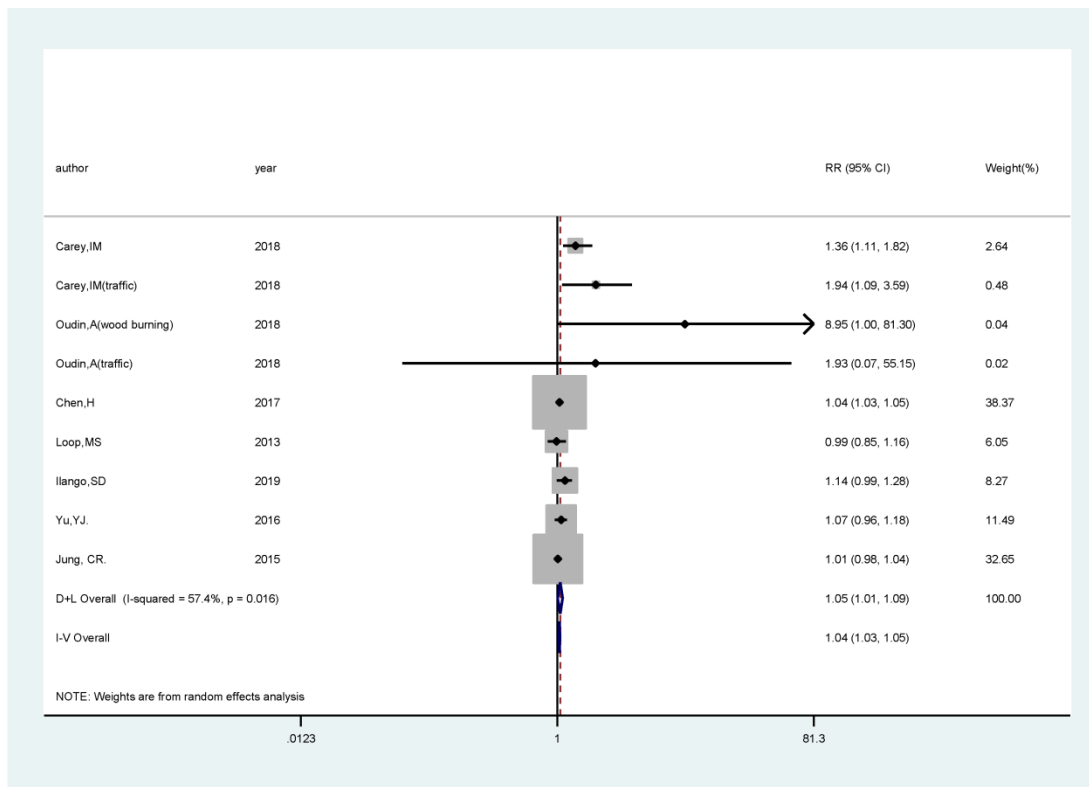
author	year		RR (95% CI)	Weight(%)
Carey,IM	2018		1.36 (1.11, 1.82)	2.64
Carey,IM(traffic)	2018		1.94 (1.09, 3.59)	0.48
Oudin,A(wood burning)	2018		8.95 (1.00, 81.30)	0.04
Oudin,A(traffic)	2018		1.93 (0.07, 55.15)	0.02
Chen,H	2017		1.04 (1.03, 1.05)	38.37
Loop,MS	2013		0.99 (0.85, 1.16)	6.05
Ilango,SD	2019		1.14 (0.99, 1.28)	8.27
Yu,YJ.	2016		1.07 (0.96, 1.18)	11.49
Jung, CR.	2015		1.01 (0.98, 1.04)	32.65
D+L Overall (I-squared = 57.4%, p = 0.016)			1.05 (1.01, 1.09)	100.00
I-V Overall			1.04 (1.03, 1.05)	

NOTE: Weights are from random effects analysis

Figure.S4 Forest plot for the pooled *RR* and 95 %*CI* of studies on $PM_{2.5}$ exposure (per 5 μg/m^3 increment) with cognitive impairment (excluding two studies that contributed to the between-study heterogeneity). The size of the grey box is positively proportional to the weight assigned to each study, and horizontal lines represent the 95%*CI*
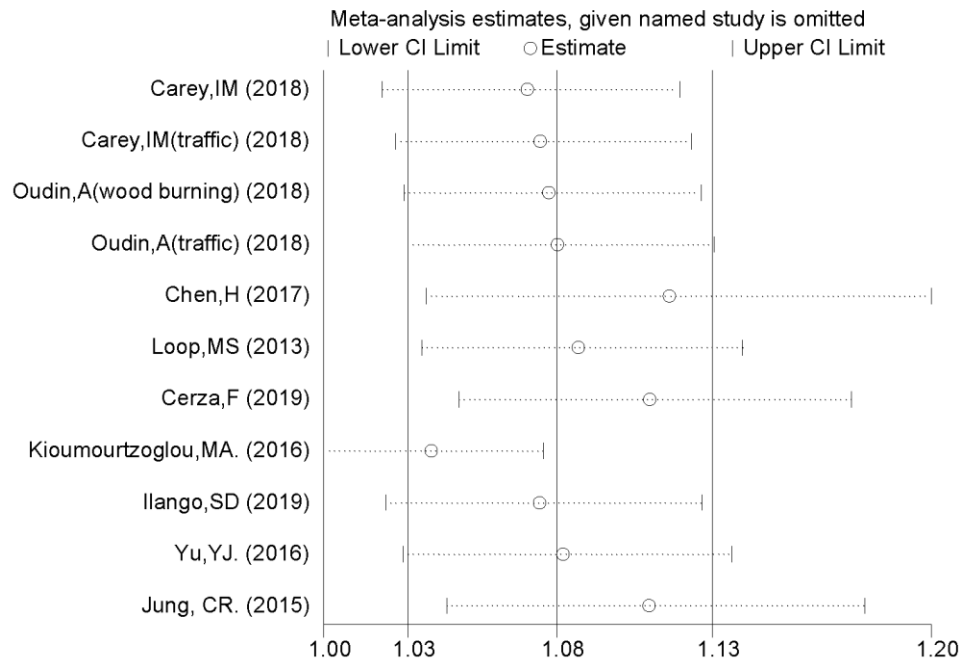
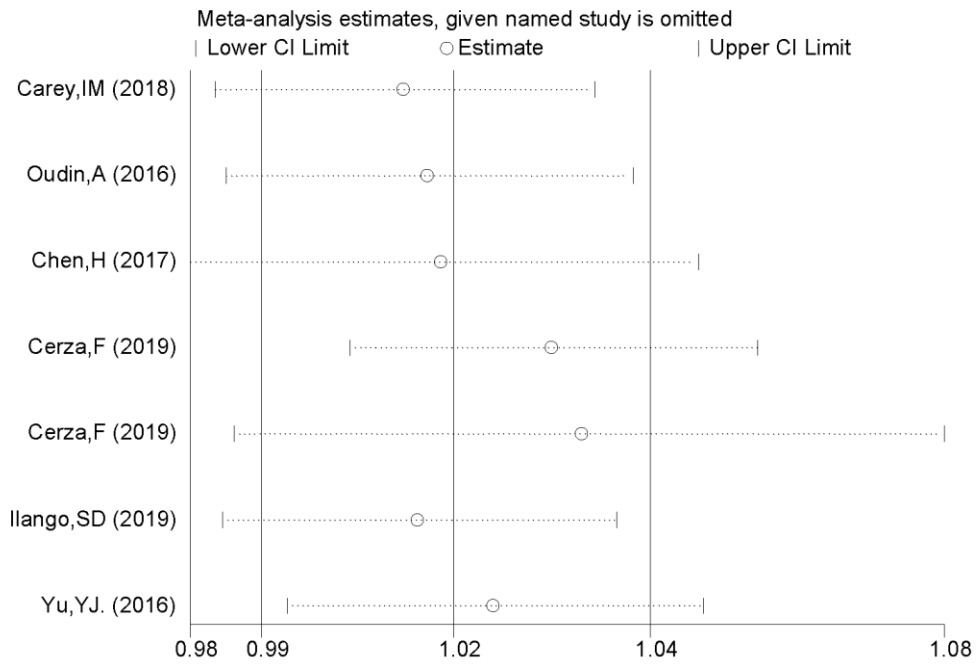**Figure.S5** Influence analysis of 11 studies on PM$_{2.5}$ and the risk of cognitive

impairment

Figure.S6 Influence analysis of 7 studies on NO_2/NO_x and the risk of cognitive
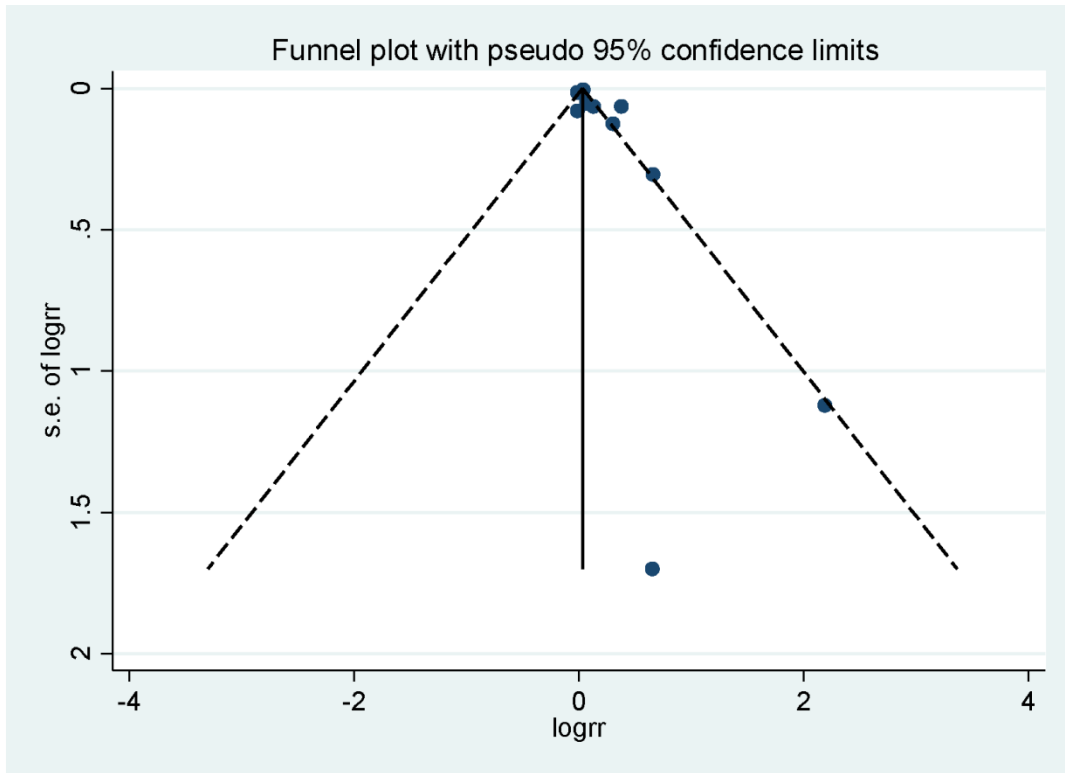
impairment

Fig.S7 Funnel plot of the relative risk of $PM_{2.5}$ exposure and cognitive impairment.
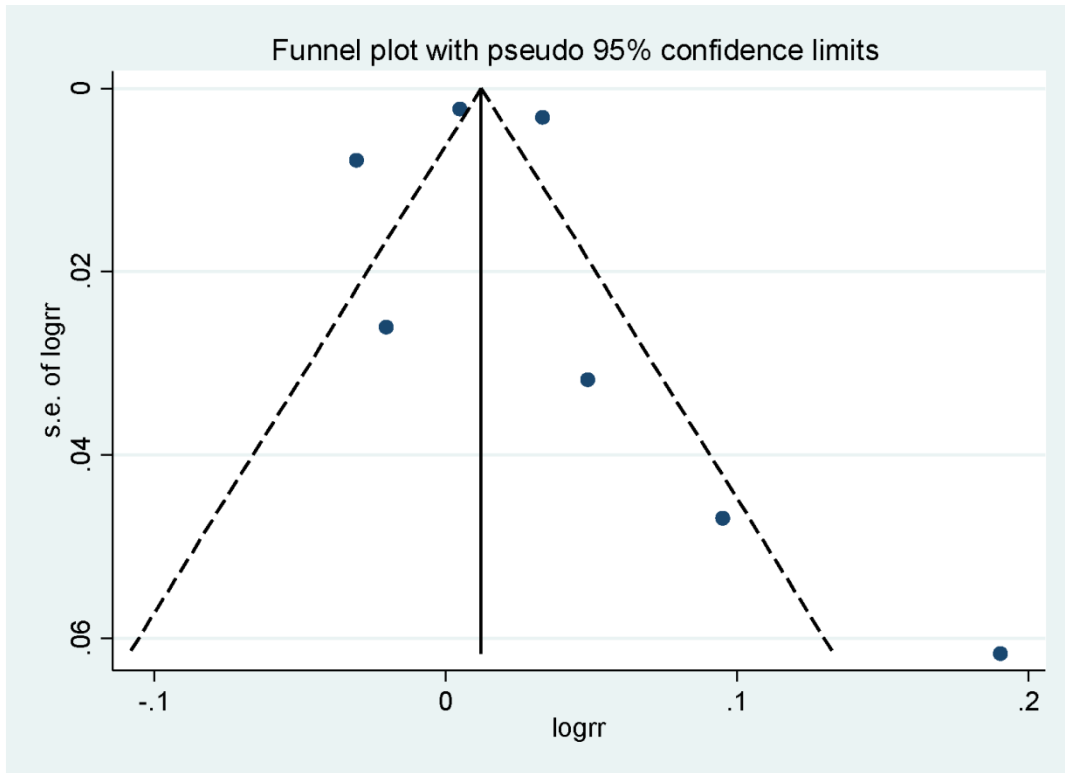
Each dot represents a different study

Fig.S8 Funnel plot of the relative risk of NO_2/NO_x exposure and cognitive impairment.

Each dot represents a different study