Supplemental materials

Supplemental figures

Supplemental tables

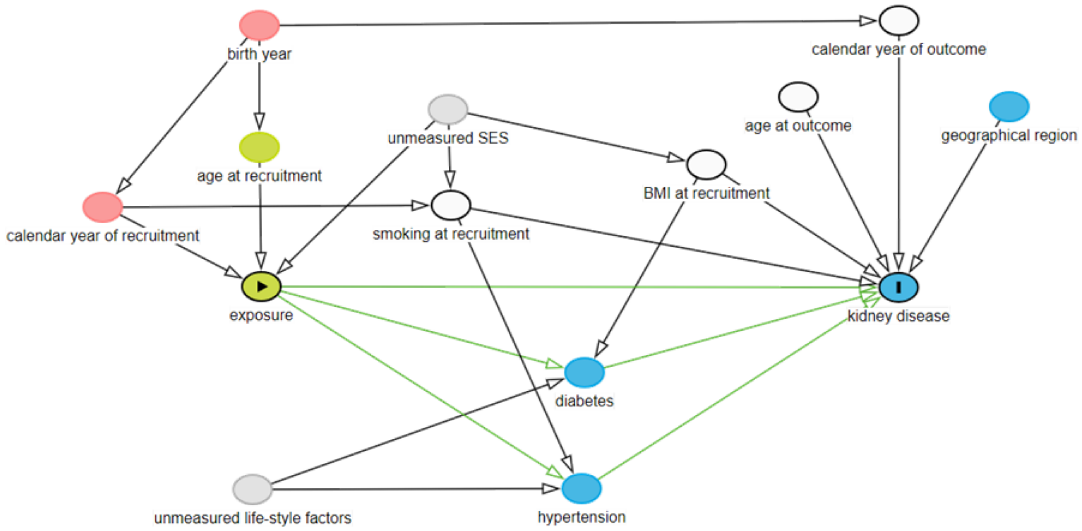

Figure S1. Directed acyclic graph

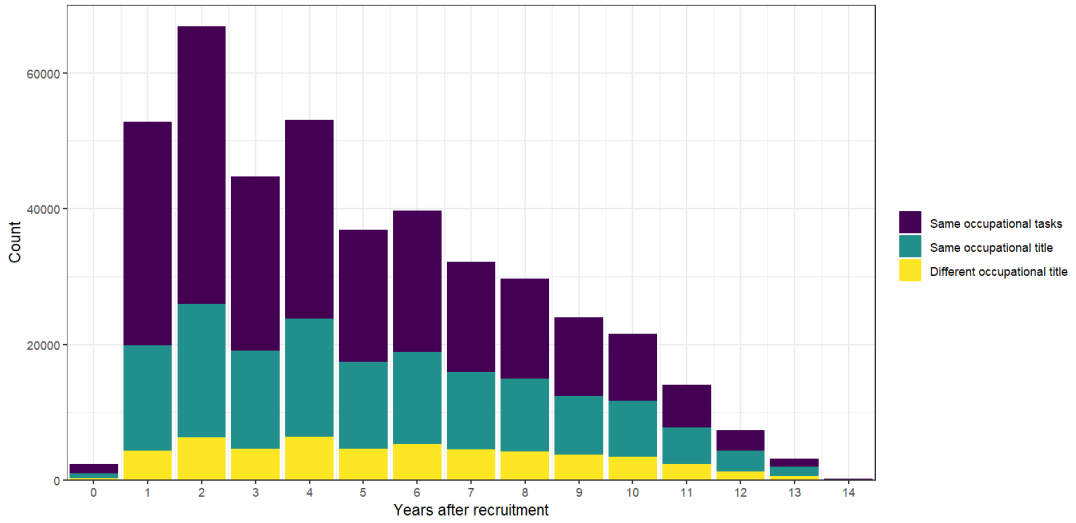

Figure S2. Participants reporting same occupational tasks or same occupational title among participants partaking in re-examinations before 1985

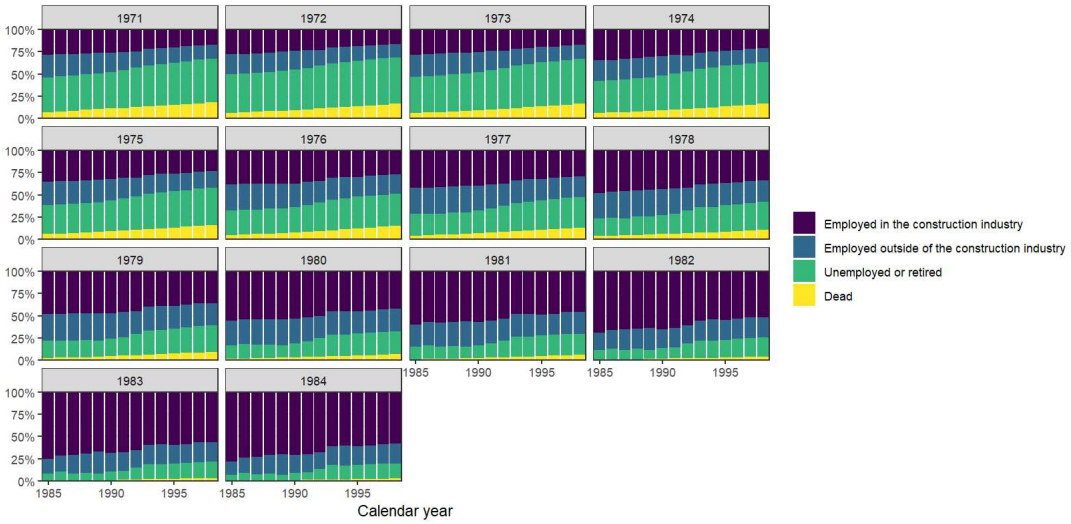

Figure S3. Retention in the construction industry after 1985 among participants with only one examination before 1985, by enrolment year

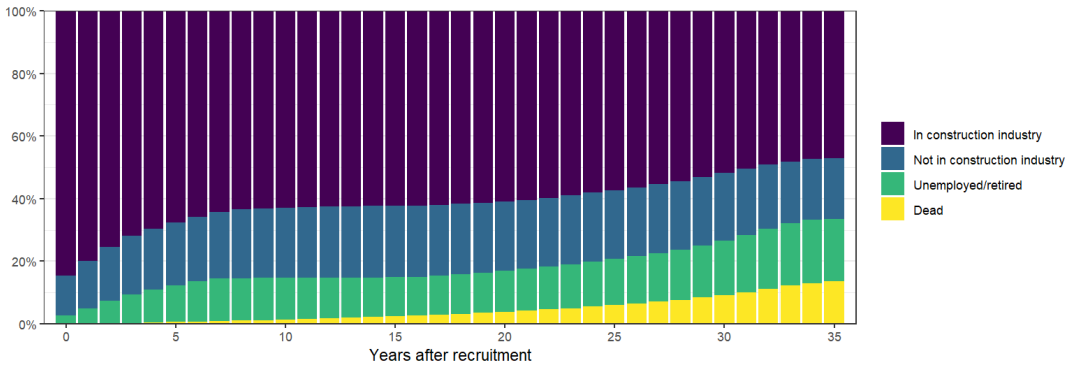

Figure S4. Retention in the construction industry after enrolment among participants enrolled after 1985

Table S1. Number of included and excluded cohort participants

Included	286 089
Excluded	103 043
Missing exposure assessment	44 045
Missing smoking or BMI data	32 581
Office workers	19 736
Female	19 418
Censored before age 30 years[1]	11 808
Age >65 years at enrolment	1779
Reused personal identification number[2]	282
Age <15 years at enrolment	1
Missing date of death	1

[1] Among participants not excluded for other reasons
[2] In the Swedish personal identification number system, immigrants are sometimes given identification numbers from deceased individuals with the same sex and birth date. To avoid registry mis-linkages, these individuals were removed.

Table S2. Occupational exposure limits (OEL) at the time of the construction of the job-exposure matrix (JEM)

Particulate exposure	**OEL**	**1974**	**1978**
Cement dust Concrete dust	Inorganic dust (total dust)	10 mg/m^3	10 mg/m^3
Welding fumes	Inorganic dust (respirable dust)	5 mg/m^3	5 mg/m^3
Quartz dust		0.2 mg/m^3	0.1 mg/m^3
Diesel exhaust	Nitrogen dioxide	–	3.5 mg/m^3
Asphalt fumes		–	–
Wood dust		–*	4 mg/m^3
Asbestos		2 fibres/mL	1 fibre/mL
MMMF		–	–

* Organic dust 5 mg/m^3; MMMF, man-made mineral fibres

Table S3. Occupational titles per exposure category [n (column percentages)] according to the original job-exposure matrix (JEM) (note that the Total row sums to more than the total number of participants, because some participants were exposed to multiple exposure factors)

Occupational title	**Unexposed**	**Inorganic dusts and fumes**	**Wood dust**	**Fibres**
Asphalt pavers	–	3619 (2)	–	–
Bricklayers	–	9843 (6)	–	364 (2)
Chauffeurs	–	4018 (3)	–	25 (0)
Concrete workers	7200 (7)	26 862 (17)	–	1913 (8)
Crane operators	3064 (3)	–	–	–
Electricians	31 085 (30)	1869 (1)	–	–
Flooring installers	–	–	4971 (25)	–
Foremen	26 461 (25)	–	–	–
Glass workers	2484 (2)	–	–	–
Ground workers	370 (0)	10 473 (7)	–	–
Insulators	–	2439 (2)	–	2501 (11)
Machine operators	–	9490 (6)	–	–

Miners	–	3025 (2)	–	–
Painters	3402 (3)	19 501 (12)	–	–
Pipe workers	977 (1)	21 699 (14)	–	4014 (18)
Refrigeration installers	276 (0)	894 (1)	–	894 (4)
Repairers	–	2377 (2)	–	–
Roofers	–	1171 (1)	–	–
Sheet metal workers	6435 (6)	4414 (3)	–	2795 (12)
Carpenters	13 786 (13)	31 913 (20)	14 679 (75)	9477 (42)
Other	9609 (9)	4603 (3)	–	837 (4)
Total	*105 149 (100)*	*158 210 (100)*	*19 650 (100)*	*22 820 (100)*

Table S4. Number of cases, person-years, and incidence rates for each exposure category and age stratum

	CKD			RRT		
	Person-years	**Cases**	**Incidence rate***	**Person-years**	**Cases**	**Incidence rate***
Unexposed						
30–39 y	526 706	23	4.4	527 286	19	3.6
40–49 y	716 014	103	14.4	716 872	67	9.3
50–59 y	722 301	242	33.5	723 425	116	16.0
60–69 y	580 666	675	116.2	582 764	182	31.2
70–79 y	365 601	1381	377.7	369 684	242	65.5
80–89 y	133 974	1299	969.6	137 569	90	65.4
Inorganic dust and fumes						
30–39 y	699 629	48	6.9	700 349	38	5.4
40–49 y	959 399	167	17.4	960 536	103	10.7
50–59 y	1 005 102	415	41.3	1 006 977	189	18.8
60–69 y	834 819	1045	125.2	838 163	323	38.5
70–79 y	582 398	2092	359.2	588 743	359	61.0
80–89 y	263 698	2055	779.3	269 153	162	60.2
Wood dust						
30–39 y	101 752	6	5.9	101 919	2	2.0
40–49 y	130 844	17	13.0	131 083	10	7.6
50–59 y	119 458	36	30.1	119 672	12	10.0
60–69 y	90 515	85	93.9	90 767	29	31.9
70–79 y	62 502	214	342.4	63 082	28	44.4
80–89 y	29 899	199	665.6	30 399	12	39.5
Fibres						
30–39 y	117 330	3	2.6	117 452	5	4.3
40–49 y	154 775	18	11.6	154 892	12	7.7
50–59 y	159 728	67	41.9	159 983	24	15.0
60–69 y	119 211	143	120.0	119 638	46	38.4
70–79 y	71 132	249	350.1	71 913	34	47.3
80–89 y	30 461	208	682.8	30 958	18	58.1
Inorganic dust and fumes, excluding quartz dust						
30–39 y	473 645	34	7.2	474 172	27	5.7
40–49 y	631 297	110	17.4	632 036	74	11.7
50–59 y	640 093	278	43.4	641 336	115	17.9
60–69 y	507 938	649	127.8	510 033	193	37.8
70–79 y	344 248	1218	353.8	348 011	210	60.3
80–89 y	156 608	1179	752.8	159 746	91	57.0

CKD, chronic kidney disease; RRT, renal replacement therapy; * incidence rate per 100 000 person-years

Table S5. Adjusted hazard ratios for exposure and CKD and RRT from the main model without age stratification

	Exposure	Adjusted hazard ratios (95% CI)	p-value[1]
CKD	Inorganic dust and fumes	1.03 (0.99, 1.08)	0.35
	Wood dust	0.96 (0.88, 1.05)	0.04
	Fibres	0.95 (0.87, 1.03)	0.44
RRT	Inorganic dust and fumes	1.06 (0.97, 1.17)	<0.01
	Wood dust	0.80 (0.65, 1.00)	0.02
	Fibres	0.94 (0.79, 1.13)	0.06

CKD, chronic kidney disease; RRT, renal replacement therapy; CI, confidence interval

[1]p-value for test of proportional hazards assumption (test for null slope in Schoenfeld residuals)

Table S6. Adjusted hazard ratios from exposure and CKD in models with calendar year on time axis (table 3) and with age year on time axis, main regression model

		Adjusted hazard ratios (95% CI)	
	Exposure	Age <65 years	Age ≥65 years
Calendar year on time axis (in manuscript)	Inorganic dusts and fumes	1.15 (1.05, 1.26)	1.01 (0.97, 1.06)
	Wood dust	0.85 (0.68, 1.05)	0.99 (0.90, 1.09)
	Fibres	1.01 (0.85, 1.21)	0.93 (0.85, 1.02)
Age year on time axis	Inorganic dusts	1.15 (1.03, 1.28)	1.03 (0.98, 1.08)
	Wood dust	0.83 (0.66, 1.03)	1.00 (0.90, 1.10)
	Fibres	0.94 (0.76, 1.16)	0.98 (0.88, 1.09)

Table S7. Adjusted hazard ratios for exposure and CKD and RRT from the main model without adjustment for BMI and with additional adjustment for geographical region of recruitment

			Adjusted hazard ratios (95% CI)	
	Exposure	Covariate model	Age <65 years	Age ≥65 years
CKD	Inorganic dust and fumes	Main[1] without BMI	1.19 (1.08, 1.30)	1.03 (0.98, 1.07)
		Main[1] with region	1.16 (1.06, 1.27)	1.01 (0.97, 1.06)
	Wood dust	Main[1] without BMI	0.84 (0.68, 1.05)	0.96 (0.87, 1.05)
		Main[1] with region	0.85 (0.68, 1.06)	0.99 (0.90, 1.09)
	Fibres	Main[1] without BMI	1.02 (0.85, 1.22)	0.93 (0.85, 1.02)
		Main[1] with region	1.02 (0.85, 1.22)	0.94 (0.86, 1.03)
RRT	Inorganic dust and fumes	Main[1] without BMI	1.19 (1.04, 1.37)	1.02 (0.90, 1.14)
		Main[1] with region	1.17 (1.01, 1.34)	1.00 (0.89, 1.13)
	Wood dust	Main[1] without BMI	0.85 (0.61, 1.18)	0.74 (0.56, 0.99)
		Main[1] with region	0.86 (0.61, 1.20)	0.78 (0.59, 1.03)
	Fibres	Main[1] without BMI	0.99 (0.75, 1.30)	0.91 (0.71, 1.15)
		Main[1] with region	0.98 (0.74, 1.29)	0.91 (0.72, 1.16)

CKD, chronic kidney disease; RRT, renal replacement therapy; CI, confidence interval
[1]The main model included adjustment for age, smoking status, smoking intensity, and BMI.

Table S8. Number of cases and person-years for each exposure category and age stratum for chronic glomerulonephritis (cGN), diabetic nephropathy (DN), and hypertensive nephropathy (HN)

	cGN		DN		HN	
	Person-years	Cases	Person-years	Cases	Person-years	Cases
Unexposed						
30–39 y	526 663	30	527 259	34	527 322	15
40–49 y	716 040	47	716 730	60	716 957	37
50–59 y	722 799	72	723 386	120	923 567	82
60–69 y	582 531	73	582 449	213	582 540	174
70–79 y	369 900	49	369 263	253	369 235	252
80–89 y	137 793	5	137 276	120	137 069	140
Inorganic dust and fumes						
30–39 y	699 482	52	700 300	38	700 275	36
40–49 y	959 411	79	960 478	92	960 421	70
50–59 y	1 006 146	111	1 006 864	196	1 006 865	140
60–69 y	837 807	106	837 519	360	837 590	290
70–79 y	588 794	84	587 675	440	587 408	414
80–89 y	269 308	18	268 663	199	268 365	218
Wood dust						
30–39 y	101 732	2	101 898	9	101 913	1
40–49 y	130 901	3	130 968	14	131 087	7
50–59 y	119 607	11	119 600	17	119 652	13
60–69 y	90 750	14	90 690	21	90 713	25
70–79 y	63 026	8	62 986	32	62 964	35
80–89 y	30 384	2	30 340	18	30 318	19
Fibres						
30–39 y	117 308	7	117 461	7	117 450	4
40–49 y	154 746	11	154 838	21	154 901	8
50–59 y	159 850	13	159 826	31	159 972	22
60–69 y	119 593	16	119 542	37	119 543	33
70–79 y	71 934	13	71 819	45	71 751	49
80–89 y	31 015	2	30 904	26	30 884	21

cGN, chronic glomerulonephritis; DN, diabetic nephropathy; HN, hypertensive nephropathy

Table S9. Adjusted hazard ratios (main covariate model) for CKD and RRT, exposed vs. unexposed (to all listed exposures) workers, from separate regression models for the nine particulate exposures

		Adjusted hazard ratios (95% CI)	
	Exposure	**Age <65 years**	**Age ≥65 years**
CKD	Cement dust	1.20 (1.01, 1.43)	1.07 (0.99, 1.15)
	Concrete dust	1.11 (1.01, 1.22)	1.01 (0.96, 1.05)
	Quartz dust	1.06 (0.95, 1.19)	0.99 (0.94, 1.04)
	Welding fumes	1.05 (0.90, 1.22)	0.96 (0.89, 1.03)
	Diesel exhaust	1.14 (1.00, 1.30)	1.04 (0.98, 1.10)
	Asphalt fumes	0.91 (0.65, 1.26)	0.95 (0.83, 1.10)

	Wood dust	0.78 (0.63, 0.96)	0.99 (0.90, 1.08)
	Asbestos	0.89 (0.71, 1.12)	0.96 (0.86, 1.07)
	MMMF	0.96 (0.81, 1.13)	0.92 (0.84, 1.01)
RRT	Cement dust	1.19 (0.92, 1.53)	1.08 (0.90, 1.31)
	Concrete dust	1.09 (0.95, 1.25)	0.95 (0.85, 1.07)
	Quartz dust	1.08 (0.92, 1.28)	1.00 (0.88, 1.14)
	Welding fumes	1.07 (0.86, 1.33)	0.96 (0.80, 1.16)
	Diesel exhaust	1.17 (0.97, 1.41)	1.07 (0.93, 1.24)
	Asphalt fumes	0.76 (0.45, 1.29)	0.99 (0.68, 1.46)
	Wood dust	0.77 (0.56, 1.06)	0.78 (0.59, 1.02)
	Asbestos	0.73 (0.50, 1.05)	0.99 (0.75, 1.31)
	MMMF	0.91 (0.70, 1.18)	0.87 (0.69, 1.10)

CKD, chronic kidney disease; RRT, renal replacement therapy; MMMF, man-made mineral fibres

Table S10. Adjusted hazard ratios (main covariate model) for CKD and RRT, exposed vs. unexposed (to all listed exposures) workers, from a combined ('multipollutant') regression model including all nine particulate exposures

		Adjusted hazard ratios (95% CI)	
	Exposure	**Age <65 years**	**Age ≥65 years**
CKD	Cement dust	1.12 (0.96, 1.32)	1.07 (1.00, 1.14)
	Concrete dust	1.08 (1.02, 1.15)	1.02 (0.99, 1.05)
	Quartz dust	0.97 (0.87, 1.09)	0.99 (0.95, 1.04)
	Welding fumes	1.02 (0.93, 1.11)	0.98 (0.94, 1.02)
	Diesel exhaust	1.09 (0.99, 1.21)	1.03 (0.99, 1.08)
	Asphalt fumes	0.93 (0.78, 1.11)	0.97 (0.90, 1.04)
	Wood dust	0.85 (0.69, 1.04)	1.02 (0.93, 1.11)
	Asbestos	0.83 (0.65, 1.07)	1.16 (1.00, 1.34)
	MMMF	1.02 (0.85, 1.23)	0.87 (0.77, 0.98)
RRT	Cement dust	1.06 (0.84, 1.33)	1.09 (0.93, 1.28)
	Concrete dust	1.07 (0.98, 1.17)	0.97 (0.89, 1.04)
	Quartz dust	1.03 (0.87, 1.21)	1.00 (0.88, 1.13)
	Welding fumes	1.01 (0.89, 1.14)	0.98 (0.88, 1.10)
	Diesel exhaust	1.09 (0.94, 1.26)	1.00 (0.90, 1.13)
	Asphalt fumes	0.83 (0.63, 1.10)	0.98 (0.80, 1.20)
	Wood dust	0.82 (0.60, 1.12)	0.80 (0.61, 1.04)
	Asbestos	0.66 (0.44, 0.99)	1.09 (0.73, 1.63)
	MMMF	1.09 (0.83, 1.44)	0.88 (0.65, 1.21)

CKD, chronic kidney disease; RRT, renal replacement therapy; MMMF, man-made mineral fibres

Table S11. Adjusted hazard ratios (main covariate model) for CKD and RRT, exposed vs. unexposed (to all listed exposures) workers with each particulate exposure divided into low- and high-exposed groups, from separate regression models for the nine particulate exposures

		Adjusted hazard ratios (95% CI)			
		Age <65 years		Age ≥65 years	
	Exposure	Low	High	Low	High
CKD	Cement dust	1.22 (1.01, 1.49)	1.35 (0.85, 2.16)	0.84 (0.77, 0.92)	0.95 (0.81, 1.11)
	Concrete dust	1.07 (0.94, 1.21)	1.15 (1.01, 1.31)	0.94 (0.88, 1.00)	0.89 (0.84, 0.95)
	Quartz dust	1.09 (0.95, 1.25)	1.08 (0.83, 1.42)	0.90 (0.84, 0.95)	1.01 (0.91, 1.12)
	Welding fumes	1.19 (0.59, 2.40)	1.08 (0.91, 1.27)	0.99 (0.71, 1.37)	0.90 (0.83, 0.97)
	Diesel exhaust	1.18 (1.00, 1.40)	1.08 (0.87, 1.36)	0.87 (0.81, 0.94)	0.98 (0.90, 1.07)
	Asphalt fumes[1]	–	0.93 (0.66, 1.30)	–	1.04 (0.90, 1.20)
	Wood dust	0.81 (0.64, 1.01)	1.27 (0.53, 3.06)	1.24 (1.12, 1.37)	0.77 (0.50, 1.20)
	Asbestos	1.02 (0.78, 1.35)	0.73 (0.48, 1.11)	0.89 (0.78, 1.02)	1.54 (1.27, 1.87)
	MMMF	1.07 (0.87, 1.33)	0.86 (0.65, 1.16)	0.84 (0.75, 0.94)	1.17 (1.01, 1.36)
RRT	Cement dust	1.28 (0.96, 1.70)	1.13 (0.56, 2.29)	0.77 (0.61, 0.96)	1.24 (0.86, 1.79)
	Concrete dust	1.00 (1.00, 1.00)	1.16 (0.96, 1.41)	0.89 (0.75, 1.05)	0.80 (0.68, 0.94)
	Quartz dust	1.12 (0.91, 1.37)	1.23 (0.86, 1.77)	0.86 (0.73, 1.01)	0.90 (0.69, 1.17)
	Welding fumes	1.78 (0.73, 4.31)	1.12 (0.87, 1.42)	0.91 (0.45, 1.83)	0.83 (0.68, 1.03)
	Diesel exhaust	1.30 (1.02, 1.66)	1.05 (0.76, 1.46)	0.83 (0.68, 1.00)	0.97 (0.77, 1.23)
	Asphalt fumes[1]	–	0.80 (0.47, 1.37)	–	1.24 (0.84, 1.83)
	Wood dust	0.83 (0.59, 1.17)	1.16 (0.29, 4.65)	0.92 (0.69, 1.23)	0.86 (0.28, 2.67)
	Asbestos	0.90 (0.58, 1.39)	0.57 (0.27, 1.20)	1.27 (0.93, 1.74)	1.00 (0.50, 2.01)
	MMMF	1.11 (0.81, 1.54)	0.77 (0.48, 1.24)	0.79 (0.59, 1.05)	1.12 (0.74, 1.71)

CKD, chronic kidney disease; RRT, renal replacement therapy; MMMF, man-made mineral fibres

[1]No participant was classified as having low exposure to asphalt fumes.