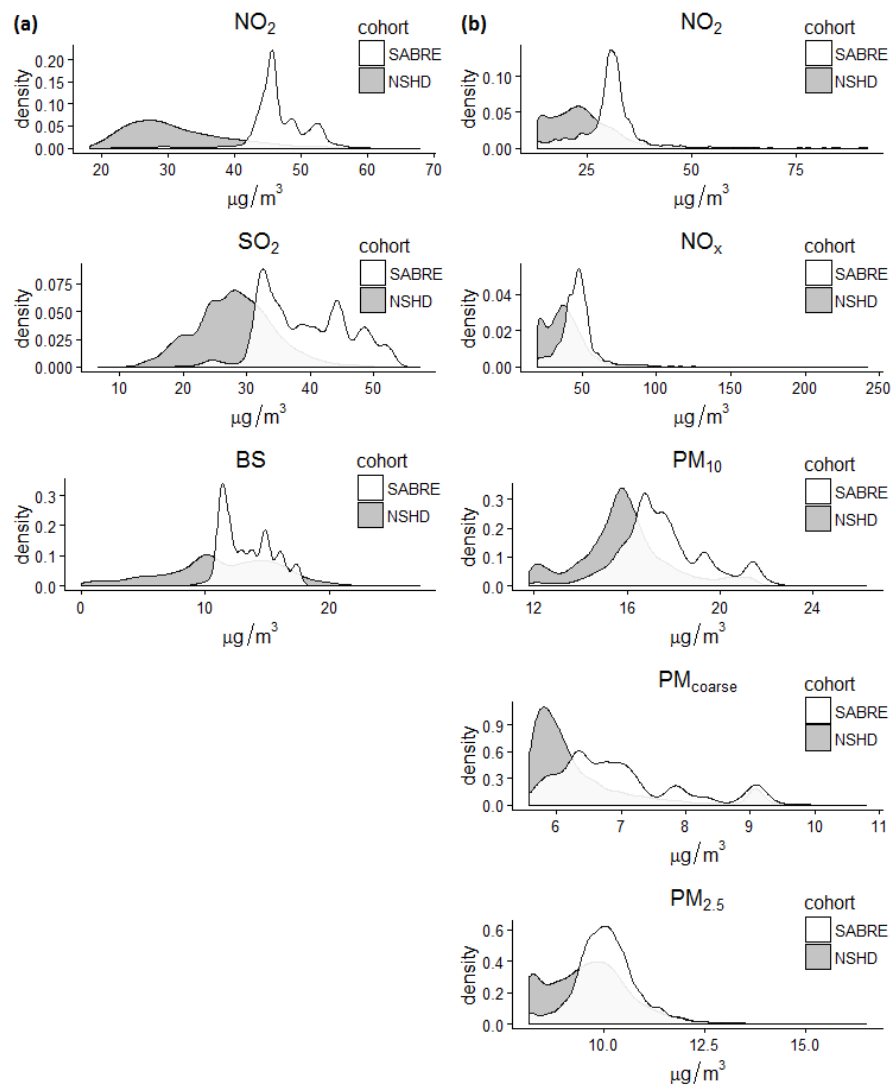


Supplemental material

Air pollution and cardiovascular mortality with over 25 years follow-up: A combined analysis of two British cohorts

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Supplemental Figure 1: Histograms of air pollutants for SABRE and NSHD participants. (a): contemporaneous 1991 estimates. (b): ESCAPE 2010-11 estimates



Supplemental Table 1: Two-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 $\mu\text{g}/\text{m}^3$ for the continuous variables, between air pollution exposure to BS + NO₂ and SO₂ + NO₂ and CVD mortality (1989-2015). M1: model adjusted only for cohort to which the participant belongs. M4 (fully-adjusted model): M2 + age, gender, diabetes, smoking status, ethnicity, type of employment, 1991 Carstairs index and baseline CVD.

	# events / n (%)	M1: model adjusted for cohort only	M4: fully-adjusted model
BS + NO₂			
Continuous			
NO ₂	610 / 7529 (8.1%)	1.03 (0.90 to 1.19)	0.97 (0.81 to 1.16)
BS	610 / 7529 (8.1%)	1.67 (1.19 to 2.33)	1.11 (0.76 to 1.60)
Quartiles			
NO ₂ -q1:[18.2-31.4]	62 / 1974 (3.1%)	1	1
NO ₂ -q2:(31.4-44.4)	142 / 1909 (7.4%)	0.99 (0.70 to 1.40)	0.80 (0.54 to 1.18)
NO ₂ -q3:(44.4-46.6)	224 / 1868 (12.0%)	1.15 (0.78 to 1.71)	0.87 (0.56 to 1.34)
NO ₂ -q4:(46.6-67.9)	182 / 1778 (10.2%)	1.13 (0.77 to 1.66)	0.92 (0.59 to 1.43)
BS-q1:[0.08-11.2]	82 / 2000 (4.1%)	1	1
BS-q2:(11.2-12.5)	151 / 1776 (8.6%)	0.96 (0.71 to 1.28)	0.99 (0.73 to 1.34)
BS-q3:(12.5-14.9)	217 / 2182 (9.9%)	1.27 (0.96 to 1.69)	1.06 (0.79 to 1.44)
BS-q4:(14.9-27.2)	160 / 1581 (10.1%)	1.62 (1.22 to 2.14)	1.32 (0.98 to 1.79)
SO₂ + NO₂			
Continuous			
NO ₂	610 / 7529 (8.1%)	1.03 (0.89 to 1.2)	0.97 (0.81 to 1.16)
SO ₂	610 / 7529 (8.1%)	1.27 (1.13 to 1.42)	1.05 (0.91 to 1.22)
Quartiles			

NO ₂ -q1:[18.2-31.4]	62 / 1974 (3.1%)	1	1
NO ₂ -q2:(31.4-44.4)	142 / 1909 (7.4%)	0.89 (0.62 to 1.28)	0.77 (0.52 to 1.14)
NO ₂ -q3:(44.4-46.6)	224 / 1868 (12.0%)	0.88 (0.59 to 1.33)	0.72 (0.46 to 1.12)
NO ₂ -q4:(46.6-67.9)	182 / 1778 (10.2%)	1.01 (0.68 to 1.50)	0.87 (0.56 to 1.34)
SO ₂ -q1:[6.5-29.2]	60 / 1974 (3.0%)	1	1
SO ₂ -q2:(29.2-33.0)	113 / 1820 (6.2%)	1.07 (0.74 to 1.53)	0.93 (0.63 to 1.37)
SO ₂ -q3:(33.0-41.2)	213 / 2069 (10.3%)	1.67 (1.17 to 2.39)	1.30 (0.89 to 1.92)
SO ₂ -q4:(41.2-57.3)	224 / 1666 (13.4%)	1.81 (1.27 to 2.58)	1.17 (0.78 to 1.76)

Supplemental Table 2: Single-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 µg/m³ for the continuous variables, between air pollution exposure to BS, SO₂ and NO₂ and CVD mortality and morbidity (1989-2011) in SABRE. Fully-adjusted model: model adjusted for cohort, age, gender diabetes, smoking status, ethnicity, type of employment, 1991 Carstairs index and baseline CVD.

	# events / n (%)	Fully-adjusted model
Continuous		
NO ₂	1412 / 4050 (34.9%)	0.97 (0.81 to 1.16)
SO ₂	1412 / 4050 (34.9%)	1.05 (0.91 to 1.22)
BS	1412 / 4050 (34.9%)	1.11 (0.76 to 1.61)
Quartiles		
NO ₂ -q1:[22.1-44.6]	381 / 1015 (37.5%)	1
NO ₂ -q2:(44.6-45.8]	426 / 1073 (39.7%)	1.15 (0.99 to 1.32)
NO ₂ -q3:(45.8-48.8]	345 / 952 (36.2%)	1.09 (0.94 to 1.27)
NO ₂ -q4:(48.8-63.0)	260 / 1010 (25.7%)	0.91 (0.76 to 1.10)
SO ₂ -q1:[16.4-32.9]	276 / 1117 (24.7%)	1
SO ₂ -q2:(32.9-38.5]	371 / 1051 (35.3%)	1.19 (1.00 to 1.42)
SO ₂ -q3:(38.5-44.2]	398 / 978 (40.7%)	1.14 (0.94 to 1.38)
SO ₂ -q4:(44.2-52.5]	367 / 904 (40.6%)	1.14 (0.94 to 1.37)
BS-q1:[1.31-11.4]	254 / 1015 (25.0%)	1
BS-q2:(11.4-12.9]	394 / 1138 (34.6%)	1.16 (0.97 to 1.38)
BS-q3:(12.9-14.9]	440 / 1111 (39.6%)	1.08 (0.89 to 1.30)
BS-q4:(14.9-19.4]	324 / 786 (41.2%)	1.12 (0.92 to 1.36)

Supplemental Table 3: Single-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 $\mu\text{g}/\text{m}^3$ for the continuous variables, between between ESCAPE air pollution estimates of NO_2 , NO_x , PM_{10} , $\text{PM}_{\text{coarse}}$, $\text{PM}_{2.5}$ and CVD mortality and morbidity (1989-2011) in SABRE. Fully-adjusted model: model adjusted for cohort, age, gender diabetes, smoking status, ethnicity, type of employment, 1991 Carstairs index and baseline CVD.

	# events / n (%)	Fully-adjusted model
Continuous		
NO_2	1233 / 3682 (33.5%)	0.96(0.89 to 1.05)
NO_x	1233 / 3682 (33.5%)	0.98(0.94 to 1.01)
PM_{10}	1233 / 3682 (33.5%)	0.97(0.72 to 1.31)
$\text{PM}_{\text{coarse}}$	1233 / 3682 (33.5%)	1.01(0.56 to 1.82)
$\text{PM}_{2.5}$	1233 / 3682 (33.5%)	0.54(0.26 to 1.13)
Quartiles		
NO_2 -q1:[12.9-28.4]	297 / 933 (31.8%)	1
NO_2 -q2:(28.4-30.7]	332 / 915 (36.3%)	1(0.84 to 1.18)
NO_2 -q3:(30.7-32.6]	345 / 933 (37.0%)	1.05(0.89 to 1.24)
NO_2 -q4:(32.6-91.8)	259 / 901 (28.7%)	0.95(0.8 to 1.14)
NO_x -q1:[19.7-40.9]	303 / 922 (32.9%)	1
NO_x -q2:(40.9-46.8]	304 / 920 (33.0%)	0.88(0.75 to 1.03)
NO_x -q3:(46.8-51.6]	336 / 921 (36.5%)	0.95(0.81 to 1.12)
NO_x -q4:(51.6-242)	290 / 919 (31.6%)	0.94(0.79 to 1.11)
PM_{10} -q1:[11.8-16.5]	298 / 969 (30.8%)	1
PM_{10} -q2:(16.5-17.3]	296 / 893 (33.1%)	1.03(0.87 to 1.21)
PM_{10} -q3:(17.3-18.5]	346 / 930 (37.2%)	1.05(0.89 to 1.25)
PM_{10} -q4:(18.5-25.8]	293 / 890 (32.9%)	1(0.85 to 1.18)
$\text{PM}_{\text{coarse}}$ -q1:[5.6-6.3]	335 / 1094 (30.6%)	1

PM _{coarse} -q2:(6.3-6.8]	229 / 747 (30.6%)	1.05(0.88 to 1.24)
PM _{coarse} -q3:(6.8-7.3]	374 / 938 (39.9%)	1.24(1.06 to 1.46)
PM _{coarse} -q4:(7.3-10.8]	295 / 903 (32.7%)	1.03(0.88 to 1.21)
PM _{2.5} -q1:[8.2-9.6]	331 / 960 (34.5%)	1
PM _{2.5} -q2:(9.6-10.0]	315 / 911 (34.6%)	0.99(0.84 to 1.16)
PM _{2.5} -q3:(10.0-10.5]	338 / 1009 (33.5%)	0.92(0.78 to 1.07)
PM _{2.5} -q4:(10.5-16.5]	249 / 802 (31.0%)	0.92(0.77 to 1.09)

Supplemental Table 4: Single-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 µg/m³ for the continuous variables, between air pollution exposure to BS, SO₂, NO₂ (contemporaneous 1991 estimates) and CVD mortality (1989-2015). Comparison of results between competing risk regression modelling and Cox modelling. M1: model adjusted only for cohort to which the participant belongs. M2: M1 + age, gender. M3: M2 + type of employment, 1991 Carstairs index. M4 (fully-adjusted model): M3 + diabetes, smoking status, ethnicity, baseline CVD.

	M1	M2	M3	M4
NO₂				
Competing risk	1.03 (0.90 to 1.18)	1.06 (0.91 to 1.23)	0.94 (0.79 to 1.12)	0.97 (0.81 to 1.16)
Cox	1.04 (0.89 to 1.21)	1.06 (0.90 to 1.25)	0.94 (0.78 to 1.12)	0.96 (0.80 to 1.15)
SO₂				
Competing risk	1.27 (1.13 to 1.42)	1.19 (1.05 to 1.34)	1.07 (0.94 to 1.23)	1.05 (0.91 to 1.22)
Cox	1.27 (1.13 to 1.43)	1.18 (1.04 to 1.33)	1.06 (0.93 to 1.21)	1.05 (0.91 to 1.21)
BS				
Competing risk	1.66 (1.19 to 2.32)	1.44 (1.02 to 2.04)	1.16 (0.81 to 1.65)	1.11 (0.76 to 1.61)
Cox	1.66 (1.21 to 2.27)	1.42 (1.03 to 1.95)	1.13 (0.81 to 1.57)	1.09 (0.77 to 1.55)

Supplemental Table 5: Single-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 $\mu\text{g}/\text{m}^3$ for the continuous variables, between ESCAPE 2010-11 air pollution estimates of NO_2 , NO_x , PM_{10} , $\text{PM}_{\text{coarse}}$, $\text{PM}_{2.5}$ and CVD mortality (1989-2015). Comparison of results between competing risk regression modelling and Cox modelling. M1: model adjusted only for cohort to which the participant belongs. M2: M1 + age, gender. M3: M2 + type of employment, 1991 Carstairs index. M4 (fully-adjusted model): M3 + diabetes, smoking status, ethnicity, baseline CVD.

	M1	M2	M3	M4
NO_2				
Competing risk	1.06 (0.93 to 1.20)	1.10 (0.96 to 1.26)	1.00 (0.86 to 1.17)	1.03 (0.89 to 1.20)
Cox	1.06 (0.93 to 1.22)	1.12 (0.97 to 1.29)	1.02 (0.87 to 1.18)	1.04 (0.90 to 1.21)
NO_x				
Competing risk	1.01 (0.96 to 1.07)	1.03 (0.97 to 1.09)	1.00 (0.93 to 1.07)	1.01 (0.94 to 1.07)
Cox	1.01 (0.95 to 1.07)	1.04 (0.98 to 1.10)	1.00 (0.94 to 1.07)	1.01 (0.95 to 1.08)
PM_{10}				
Competing risk	1.28 (0.82 to 2.01)	1.36 (0.86 to 2.15)	1.12 (0.68 to 1.85)	1.16 (0.70 to 1.92)
Cox	1.29 (0.79 to 2.09)	1.40 (0.86 to 2.30)	1.14 (0.68 to 1.91)	1.13 (0.68 to 1.90)
$\text{PM}_{\text{coarse}}$				
Competing risk	1.02 (0.40 to 2.60)	1.12 (0.43 to 2.91)	0.82 (0.29 to 2.33)	0.89 (0.31 to 2.55)
Cox	1.03 (0.38 to 2.76)	1.19 (0.44 to 3.20)	0.85 (0.30 to 2.42)	0.90 (0.32 to 2.54)
$\text{PM}_{2.5}$				
Competing risk	1.52 (0.52 to 4.46)	2.10 (0.69 to 6.44)	1.15 (0.35 to 3.81)	1.30 (0.39 to 4.34)
Cox	1.52 (0.50 to 4.69)	2.28 (0.72 to 7.22)	1.20 (0.36 to 4.02)	1.17 (0.35 to 3.88)

Supplemental Table 6: Single-pollutant hazard ratios (HR) and 95% confidence intervals (CI), per increase of 10 $\mu\text{g}/\text{m}^3$ for the continuous variables, between air pollution exposure to BS, SO₂, NO₂ (contemporaneous 1991 estimates), between ESCAPE 2010-11 air pollution estimates of NO₂, NO_x, PM₁₀, PM_{coarse}, PM_{2.5}, and CVD mortality (1989-2015). M4 (fully-adjusted model): model adjusted for cohort, age, gender, type of employment, 1991 Carstairs index, diabetes, smoking status, ethnicity, baseline CVD.

	M4	M4 minus adjustment for diabetes and baseline CVD
Contemporaneous 1991 estimates		
NO ₂	0.97 (0.81 to 1.16)	0.99 (0.83 to 1.17)
SO ₂	1.05 (0.91 to 1.22)	1.03 (0.89 to 1.19)
BS	1.11 (0.76 to 1.61)	1.11 (0.76 to 1.61)
ESCAPE 2010-11 estimates		
NO ₂	1.03 (0.89 to 1.20)	1.03 (0.89 to 1.21)
NO _x	1.01 (0.94 to 1.07)	1.01 (0.94 to 1.08)
PM ₁₀	1.16 (0.70 to 1.92)	1.16 (0.70 to 1.91)
PM _{coarse}	0.89 (0.31 to 2.55)	0.88 (0.31 to 2.50)
PM _{2.5}	1.30 (0.39 to 4.34)	1.27 (0.38 to 4.28)