

Supplementary Table S1. 2019 GBD world population age standard

Age group (years)	Percent of population (%)
< 1	2.03
1 to 4	7.91
5 to 9	9.57
10 to 14	8.99
15 to 19	8.32
20 to 24	7.87
25 to 29	7.63
30 to 34	7.33
35 to 39	6.81
40 to 44	6.14
45 to 49	5.51
50 to 54	4.92
55 to 59	4.35
60 to 64	3.68
65 to 69	2.99
70 to 74	2.27
75 to 79	1.61
80 to 84	1.11
85 to 89	0.62
90 to 94	0.26
95 plus	0.08

Note. In GBD 2019, the age standardized rates were calculated with a global age structure called the GBD world population age standard, which had been updated in 2019. The standard was developed based on the non-weighted mean of the age-specific proportional distributions for national locations with populations greater than 5 million in 2019.

Supplementary Table S2. ICD codes for stroke categories

Stroke category	ICD-9 Codes	ICD-10 Codes
Ischemic Stroke	433–435.9, 437.0–437.1, 437.5–437.8	G45–G46.8, I63–I63.9, I65–I66.9, I67.2–I67.3, I67.5–I67.6, I69.3
Intracerebral Hemorrhage	430.1, 430.3–432.9, 437.2	I61–I62.9, I67.0–I67.1, I68.1–I68.2, I69.0–I69.2
Subarachnoid Hemorrhage	430.2	I60

Note. ICD, International Classification of Diseases.

Supplementary Table S3. The global and Chinese age-standardized DALY rates for stroke attributable to ambient PM_{2.5} during 1990–2019

Year	Age-standardized DALY rate for stroke (95% CI)		P value
	Global	China	
1990	319.34 (219.46, 433.52)	490.54 (231.12, 832.24)	0.293
1991	319.70 (220.57, 429.91)	496.64 (242.61, 816.42)	0.256
1992	323.03 (224.97, 428.21)	507.67 (254.89, 815.97)	0.225
1993	330.08 (231.51, 437.22)	521.41 (266.31, 824.00)	0.207
1994	334.68 (235.39, 442.02)	532.17 (283.45, 840.87)	0.193
1995	335.99 (238.71, 442.40)	547.48 (294.24, 838.56)	0.154
1996	337.33 (238.81, 436.70)	566.04 (315.03, 849.87)	0.116
1997	340.25 (244.15, 440.26)	584.45 (337.86, 855.05)	0.084
1998	343.63 (249.49, 440.95)	607.10 (362.37, 873.20)	0.058
1999	350.66 (259.30, 448.59)	634.62 (398.11, 902.02)	0.039
2000	357.21 (261.28, 451.72)	667.22 (420.74, 925.66)	0.024
2001	359.92 (266.75, 452.11)	684.72 (445.93, 932.95)	0.015
2002	363.71 (268.51, 454.27)	703.40 (463.93, 940.04)	0.009
2003	364.33 (271.87, 455.74)	713.74 (488.38, 944.41)	0.005
2004	362.62 (268.66, 448.21)	726.17 (498.61, 937.17)	0.003
2005	361.52 (269.28, 445.26)	720.96 (498.16, 933.87)	0.003
2006	355.44 (268.82, 431.59)	699.78 (506.75, 871.31)	<0.001
2007	355.40 (272.48, 429.80)	696.28 (510.25, 861.19)	<0.001
2008	359.71 (279.55, 432.60)	706.65 (538.57, 857.47)	<0.001
2009	361.66 (284.53, 430.63)	718.94 (550.96, 866.33)	<0.001
2010	364.26 (288.42, 434.02)	729.51 (559.72, 866.96)	<0.001
2011	364.23 (289.53, 434.60)	731.53 (577.11, 873.19)	<0.001
2012	364.48 (292.78, 429.67)	727.08 (579.63, 859.85)	<0.001
2013	363.73 (289.29, 428.62)	721.62 (573.14, 852.03)	<0.001
2014	361.68 (292.64, 423.64)	712.49 (577.01, 840.95)	<0.001
2015	359.45 (287.64, 416.52)	698.51 (561.12, 821.39)	<0.001
2016	352.87 (284.60, 413.35)	681.39 (550.14, 799.00)	<0.001
2017	345.24 (278.75, 404.15)	659.52 (531.04, 777.30)	<0.001
2018	344.23 (280.67, 401.24)	648.46 (518.63, 768.28)	<0.001
2019	348.06 (283.29, 404.35)	647.63 (525.39, 772.78)	<0.001

Note. DALY, disability-adjusted life year; CI, confidence interval; P-value: z test.

Supplementary Table S4. The global and Chinese age-standardized DALY rates for IS attributable to ambient PM_{2.5} during 1990–2019

Year	Age-standardized DALY rate for IS (95% CI)		P value
	Global	China	
1990	130.81 (93.18, 169.76)	141.06 (67.56, 238.25)	0.830
1991	130.46 (93.63, 167.76)	144.85 (71.38, 236.53)	0.755
1992	131.35 (95.59, 168.61)	150.06 (77.38, 241.97)	0.684
1993	134.60 (98.62, 172.10)	155.81 (80.70, 247.05)	0.648
1994	135.95 (99.86, 174.25)	159.58 (86.07, 249.25)	0.606
1995	135.15 (99.11, 172.77)	164.92 (89.06, 252.42)	0.515
1996	134.06 (99.18, 169.53)	172.47 (96.79, 256.18)	0.387
1997	133.63 (99.50, 167.89)	179.56 (103.79, 259.74)	0.290
1998	133.55 (99.59, 166.50)	188.20 (113.32, 270.07)	0.209
1999	135.46 (102.41, 168.85)	199.18 (126.47, 282.61)	0.141
2000	137.33 (104.40, 170.61)	212.59 (136.21, 294.21)	0.085
2001	138.49 (105.46, 170.95)	222.27 (146.72, 300.86)	0.049
2002	139.91 (107.86, 170.86)	231.20 (154.77, 310.75)	0.033
2003	140.89 (108.34, 172.44)	241.06 (166.64, 317.02)	0.016
2004	140.51 (108.68, 171.43)	250.83 (175.67, 321.93)	0.007
2005	140.86 (109.24, 170.88)	254.25 (178.73, 325.10)	0.005
2006	138.69 (109.39, 166.64)	251.04 (183.50, 312.89)	0.002
2007	138.86 (110.21, 167.10)	253.23 (187.52, 312.23)	0.001
2008	140.99 (113.02, 168.01)	260.86 (200.17, 315.97)	< 0.001
2009	142.41 (115.10, 168.67)	270.80 (211.75, 324.26)	< 0.001
2010	144.42 (117.19, 170.28)	281.51 (218.68, 334.98)	< 0.001
2011	145.13 (117.15, 171.40)	289.36 (228.68, 344.84)	< 0.001
2012	145.96 (118.90, 171.63)	294.30 (237.01, 347.05)	< 0.001
2013	146.92 (119.21, 172.39)	300.29 (239.87, 354.34)	< 0.001
2014	147.34 (120.71, 172.35)	303.55 (246.17, 356.72)	< 0.001
2015	147.48 (121.36, 172.16)	303.22 (245.37, 357.34)	< 0.001
2016	145.49 (118.54, 170.53)	299.56 (242.11, 352.04)	< 0.001
2017	143.49 (117.64, 167.04)	294.61 (238.83, 346.71)	< 0.001
2018	144.00 (117.55, 168.91)	292.40 (234.36, 345.35)	< 0.001
2019	146.16 (119.78, 171.23)	294.05 (239.00, 352.73)	< 0.001

Note. DALY, disability-adjusted life year; IS, ischemic stroke; CI, confidence interval; P-value: z test.

Supplementary Table S5. The global and Chinese age-standardized DALY rates for ICH attributable to ambient PM_{2.5} during 1990–2019

Year	Age-standardized DALY rate for ICH (95% CI)		P value
	Global	China	
1990	152.22 (98.85, 215.36)	273.64 (128.05, 466.76)	0.184
1991	152.66 (99.61, 214.12)	274.42 (131.87, 457.77)	0.167
1992	154.80 (102.86, 213.47)	279.04 (138.00, 455.76)	0.148
1993	158.05 (105.33, 216.99)	284.88 (143.97, 459.21)	0.137
1994	160.91 (108.52, 220.23)	290.39 (151.43, 460.47)	0.122
1995	162.70 (110.23, 220.15)	298.80 (158.70, 461.82)	0.098
1996	165.39 (112.20, 224.08)	310.76 (171.89, 467.64)	0.072
1997	169.10 (117.42, 226.73)	323.93 (186.47, 477.62)	0.051
1998	172.85 (120.44, 228.46)	339.59 (202.00, 496.04)	0.039
1999	178.31 (126.20, 235.96)	359.04 (224.12, 510.30)	0.021
2000	184.13 (130.46, 242.06)	383.78 (241.32, 538.82)	0.014
2001	187.63 (132.76, 242.40)	399.91 (258.43, 545.74)	0.007
2002	191.98 (136.48, 246.55)	417.95 (273.52, 566.03)	0.005
2003	193.58 (138.97, 247.37)	426.36 (286.40, 565.95)	0.002
2004	193.83 (139.74, 242.68)	434.72 (297.12, 566.20)	0.001
2005	193.21 (139.72, 243.27)	429.50 (293.38, 557.42)	0.001
2006	189.87 (141.01, 235.07)	413.83 (301.25, 521.18)	< 0.001
2007	189.83 (142.51, 233.70)	409.24 (299.85, 507.05)	< 0.001
2008	191.88 (147.21, 233.63)	412.02 (311.44, 502.13)	< 0.001
2009	192.39 (147.41, 232.53)	413.99 (313.77, 500.19)	< 0.001
2010	192.74 (149.62, 232.46)	413.28 (315.71, 493.65)	< 0.001
2011	191.76 (149.46, 231.12)	406.73 (319.03, 486.22)	< 0.001
2012	191.00 (151.98, 227.96)	396.40 (311.94, 471.62)	< 0.001
2013	189.03 (148.80, 225.51)	384.29 (303.07, 456.72)	< 0.001
2014	186.43 (148.17, 219.49)	371.38 (298.00, 441.92)	< 0.001
2015	184.05 (145.45, 215.37)	357.81 (285.70, 421.04)	< 0.001
2016	179.85 (142.58, 213.49)	344.72 (277.55, 408.95)	< 0.001
2017	174.81 (138.17, 206.50)	329.10 (261.82, 391.35)	< 0.001
2018	173.41 (140.41, 205.04)	320.93 (253.91, 381.95)	< 0.001
2019	174.82 (140.07, 206.00)	318.40 (255.96, 382.95)	< 0.001

Note. DALY, disability-adjusted life year; ICH, intracerebral hemorrhage; CI, confidence interval; P-value: z test.

Supplementary Table S6. The global and Chinese age-standardized DALY rates for SAH attributable to ambient PM_{2.5} during 1990–2019

Year	Age-standardized DALY rate for SAH (95% CI)		P value
	Global	China	
1990	36.32 (22.06, 54.88)	75.85 (31.51, 135.05)	0.154
1991	36.58 (22.17, 55.36)	77.37 (32.95, 133.25)	0.130
1992	36.87 (22.41, 53.42)	78.57 (34.79, 130.93)	0.106
1993	37.43 (23.18, 53.89)	80.72 (37.77, 135.48)	0.097
1994	37.83 (23.60, 54.65)	82.19 (38.37, 135.47)	0.088
1995	38.14 (24.05, 54.56)	83.75 (39.21, 133.79)	0.072
1996	37.89 (24.02, 53.39)	82.81 (40.62, 129.65)	0.060
1997	37.53 (24.57, 51.99)	80.96 (41.61, 124.67)	0.052
1998	37.23 (24.69, 50.59)	79.31 (41.35, 120.37)	0.047
1999	36.88 (25.11, 50.00)	76.39 (42.06, 114.17)	0.042
2000	35.75 (24.61, 48.10)	70.85 (39.84, 104.02)	0.044
2001	33.80 (23.57, 44.79)	62.54 (37.35, 89.32)	0.045
2002	31.83 (22.28, 42.14)	54.26 (34.37, 75.79)	0.056
2003	29.85 (21.20, 39.77)	46.32 (30.05, 63.30)	0.090
2004	28.29 (20.42, 37.24)	40.62 (26.86, 54.25)	0.133
2005	27.44 (19.93, 35.94)	37.21 (24.92, 49.59)	0.193
2006	26.88 (19.55, 35.25)	34.91 (24.23, 45.00)	0.227
2007	26.71 (19.60, 34.86)	33.81 (24.07, 42.77)	0.249
2008	26.84 (19.90, 34.74)	33.77 (25.06, 42.12)	0.230
2009	26.86 (20.23, 34.43)	34.15 (25.67, 42.54)	0.195
2010	27.09 (20.58, 34.52)	34.72 (26.31, 43.17)	0.172
2011	27.34 (20.94, 34.50)	35.45 (27.14, 43.74)	0.138
2012	27.52 (21.32, 34.61)	36.38 (27.95, 44.47)	0.101
2013	27.77 (21.40, 34.75)	37.04 (28.23, 45.03)	0.090
2014	27.90 (21.58, 34.66)	37.56 (29.09, 45.59)	0.072
2015	27.92 (21.72, 34.46)	37.48 (28.25, 45.07)	0.076
2016	27.54 (21.53, 34.10)	37.11 (27.95, 45.29)	0.080
2017	26.94 (21.31, 32.89)	35.81 (27.16, 44.01)	0.089
2018	26.82 (21.20, 32.78)	35.13 (26.25, 43.82)	0.122
2019	27.08 (21.35, 32.74)	35.18 (26.18, 44.60)	0.143

Note. DALY, disability-adjusted life year; SAH, subarachnoid hemorrhage; CI, confidence interval; P-value: z test.

Supplementary Table S7. The trends in age-standardized rates of DALY for stroke attributable to ambient PM_{2.5} for males and females in China during 1990–2019 using Join-Point regression

Variables	Males				Females		
	Segments	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value
Stroke	1	1990–1994	1.93 (1.21, 2.66)	< 0.001	1990–1996	2.22 (1.80, 2.64)	< 0.001
	2	1994–2001	3.92 (3.53, 4.32)	< 0.001	1996–2003	3.76 (3.33, 4.18)	< 0.001
	3	2001–2004	1.80 (−0.46, 4.12)	0.110	2003–2007	−1.31 (−2.50, −0.11)	0.034
	4	2004–2007	−1.16 (−3.35, 1.09)	0.283	2007–2011	0.40 (−0.81, 1.62)	0.494
	5	2007–2012	1.85 (1.13, 2.58)	< 0.001	2011–2019	−1.65 (−1.91, −1.39)	< 0.001
	6	2012–2019	−2.16 (−2.45, −1.86)	< 0.001	—	—	—
	AAPC (95% CI)	1990–2019	1.05 (0.70, 1.40)	< 0.001	1990–2019	0.76 (0.50, 1.02)	< 0.001
IS	1	1990–1995	3.12 (2.60, 3.64)	< 0.001	1990–1997	3.49 (3.16, 3.81)	< 0.001
	2	1995–2004	4.51 (4.25, 4.77)	< 0.001	1997–2001	6.45 (5.20, 7.72)	< 0.001
	3	2004–2007	−0.12 (−2.36, 2.18)	0.914	2001–2004	4.52 (2.08, 7.02)	0.001
	4	2007–2011	4.31 (3.13, 5.50)	< 0.001	2004–2007	0.40 (−1.95, 2.79)	0.723
	5	2011–2014	2.12 (−0.17, 4.46)	0.067	2007–2013	2.25 (1.71, 2.79)	< 0.001
	6	2014–2019	−1.33 (−1.83, −0.83)	< 0.001	2013–2019	−0.31 (−0.71, 0.09)	0.113
	AAPC (95% CI)	1990–2019	2.48 (2.12, 2.85)	< 0.001	1990–2019	2.62 (2.23, 3.00)	< 0.001
ICH	1	1990–1995	1.79 (1.23, 2.36)	< 0.001	1990–1996	1.88 (1.47, 2.30)	< 0.001
	2	1995–2001	5.43 (4.85, 6.02)	< 0.001	1996–2003	4.95 (4.52, 5.37)	< 0.001
	3	2001–2004	2.85 (0.33, 5.43)	0.029	2003–2011	−1.66 (−1.97, −1.34)	< 0.001
	4	2004–2007	−1.79 (−4.20, 0.67)	0.139	2011–2017	−4.02 (−4.53, −3.50)	< 0.001
	5	2007–2011	0.91 (−0.33, 2.17)	0.138	2017–2019	−0.91 (−3.27, 1.50)	0.43
	6	2011–2019	−3.25 (−3.51, −2.99)	< 0.001	—	—	—
	AAPC (95% CI)	1990–2019	0.72 (0.32, 1.12)	< 0.001	1990–2019	0.18 (−0.05, 0.42)	0.133
SAH	1	1990–1996	2.16 (1.79, 2.52)	< 0.001	1990–1995	1.89 (1.39, 2.39)	< 0.001
	2	1996–2000	−3.58 (−4.60, −2.56)	< 0.001	1995–2000	−3.46 (−4.13, −2.79)	< 0.001
	3	2000–2004	−13.85 (−14.76, −12.93)	< 0.001	2000–2004	−13.64 (−14.58, −12.68)	< 0.001
	4	2004–2007	−6.03 (−8.00, −4.02)	< 0.001	2004–2007	−6.46 (−8.49, −4.38)	< 0.001
	5	2007–2014	2.43 (2.07, 2.80)	< 0.001	2007–2014	1.06 (0.68, 1.43)	< 0.001
	6	2014–2019	−1.79 (−2.25, −1.32)	< 0.001	2014–2019	−1.10 (−1.59, −0.62)	< 0.001
	AAPC (95% CI)	1990–2019	−2.46 (−2.75, −2.17)	< 0.001	1990–2019	−2.89 (−3.18, −2.60)	< 0.001

Note. DALY, disability-adjusted life year; IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.

Supplementary Table S8. The trends in age-standardized percents of DALY for stroke attributable to ambient PM_{2.5} in China during 1990–2019 using Join-Point regression

Variables	Total population				Males			Females		
	Segments	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value
Stroke	1	1990–1995	3.78 (3.50, 4.06)	< 0.001	1990–1995	3.39 (3.15, 3.62)	< 0.001	1990–1995	4.13 (3.83, 4.43)	< 0.001
	2	1995–1999	4.89 (4.27, 5.52)	< 0.001	1995–1999	4.52 (3.98, 5.05)	< 0.001	1995–1999	5.34 (4.66, 6.02)	< 0.001
	3	1999–2014	3.09 (3.03, 3.15)	< 0.001	1999–2014	2.73 (2.68, 2.78)	< 0.001	1999–2014	3.43 (3.37, 3.49)	< 0.001
	4	2014–2017	−0.82 (−1.99, 0.37)	< 0.001	2014–2017	−0.83 (−1.83, 0.19)	0.104	2014–2017	−0.73 (−2.01, 0.56)	0.246
	5	2017–2019	0.50 (−0.69, 1.70)	< 0.001	2017–2019	0.33 (−0.69, 1.35)	0.509	2017–2019	1.01 (−0.29, 2.32)	0.120
	6	—	—	—	—	—	—	—	—	—
	AAPC (95% CI)	1990–2019	2.86 (2.69, 3.03)	< 0.001	1990–2019	2.54 (2.40, 2.69)	< 0.001	1990–2019	3.20 (3.02, 3.39)	< 0.001
IS	1	1990–1995	3.58 (3.45, 3.7)	< 0.001	1990–1995	3.25 (3.10, 3.39)	< 0.001	1990–1995	3.93 (3.77, 4.09)	< 0.001
	2	1995–1999	4.59 (4.31, 4.88)	< 0.001	1995–2000	4.02 (3.81, 4.23)	< 0.001	1995–1999	5.08 (4.71, 5.45)	< 0.001
	3	1999–2009	3.05 (3.00, 3.11)	< 0.001	2000–2014	2.50 (2.47, 2.53)	< 0.001	1999–2009	3.49 (3.42, 3.55)	< 0.001
	4	2009–2014	2.74 (2.56, 2.91)	< 0.001	2014–2017	−0.95 (−1.58, −0.32)	0.006	2009–2014	2.97 (2.74, 3.20)	< 0.001
	5	2014–2017	−0.79 (−1.33, −0.24)	0.008	2017–2019	0.26 (−0.37, 0.90)	0.396	2014–2017	−0.60 (−1.30, 0.10)	0.085
	6	2017–2019	0.37 (−0.18, 0.93)	0.165	—	—	—	2017–2019	0.78 (0.07, 1.49)	0.033
	AAPC (95% CI)	1990–2019	2.71 (2.63, 2.79)	< 0.001	1990–2019	2.37 (2.28, 2.46)	< 0.001	1990–2019	3.07 (2.97, 3.18)	< 0.001
ICH	1	1990–1993	3.53 (2.85, 4.22)	< 0.001	1990–1994	3.41 (3.03, 3.79)	< 0.001	1990–1993	3.90 (3.09, 4.71)	< 0.001
	2	1993–2000	4.62 (4.39, 4.86)	< 0.001	1994–2000	4.30 (4.03, 4.57)	< 0.001	1993–2000	5.00 (4.73, 5.28)	< 0.001
	3	2000–2005	2.55 (2.12, 2.98)	< 0.001	2000–2005	2.27 (1.89, 2.64)	< 0.001	2000–2005	2.88 (2.38, 3.39)	< 0.001
	4	2005–2009	3.75 (3.06, 4.43)	< 0.001	2005–2009	3.33 (2.73, 3.93)	< 0.001	2005–2009	4.10 (3.29, 4.92)	< 0.001
	5	2009–2014	2.97 (2.54, 3.40)	< 0.001	2009–2014	2.68 (2.30, 3.06)	< 0.001	2009–2014	3.15 (2.64, 3.66)	< 0.001
	6	2014–2019	−0.12 (−0.41, 0.18)	0.404	2014–2019	−0.20 (−0.46, 0.06)	0.125	2014–2019	0.17 (−0.18, 0.52)	0.319
	AAPC (95% CI)	1990–2019	2.92 (2.76, 3.08)	< 0.001	1990–2019	2.63 (2.49, 2.77)	< 0.001	1990–2019	3.23 (3.05, 3.42)	< 0.001
SAH	1	1990–1994	3.67 (3.45, 3.88)	< 0.001	1990–1994	3.28 (3.06, 3.50)	< 0.001	1990–1995	4.10 (3.90, 4.31)	< 0.001
	2	1994–2000	4.56 (4.41, 4.72)	< 0.001	1994–2000	4.01 (3.85, 4.17)	< 0.001	1995–1999	5.23 (4.77, 5.70)	< 0.001
	3	2000–2010	3.89 (3.82, 3.95)	< 0.001	2000–2010	3.43 (3.37, 3.50)	< 0.001	1999–2010	4.35 (4.28, 4.42)	< 0.001
	4	2010–2014	2.93 (2.59, 3.27)	< 0.001	2010–2014	2.71 (2.36, 3.06)	< 0.001	2010–2014	3.13 (2.68, 3.58)	< 0.001
	5	2014–2017	−0.19 (−0.84, 0.47)	0.550	2014–2017	−0.28 (−0.96, 0.40)	0.389	2014–2017	0.01 (−0.87, 0.89)	0.985
	6	2017–2019	0.98 (0.31, 1.65)	0.007	2017–2019	0.72 (0.04, 1.41)	0.040	2017–2019	1.49 (0.61, 2.39)	0.003
	AAPC (95% CI)	1990–2019	3.23 (3.13, 3.33)	< 0.001	1990–2019	2.85 (2.75, 2.95)	< 0.001	1990–2019	3.60 (3.47, 3.74)	< 0.001

Note. Percent, the age-standardized proportion of stroke burden attributable to ambient PM_{2.5} within the total stroke burden; IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.

Supplementary Table S9. The trends in numbers of DALY for stroke attributable to ambient PM_{2.5} for males and females in China during 1990–2019 using Join-Point regression

Variables	Males				Females		
	Segments	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value
Stroke	1	1990–1994	4.73 (3.99, 5.48)	< 0.001	1990–1996	5.04 (4.63, 5.45)	< 0.001
	2	1994–2001	6.94 (6.53, 7.34)	< 0.001	1996–2001	7.19 (6.41, 7.97)	< 0.001
	3	2001–2004	4.76 (2.44, 7.13)	0.001	2001–2004	4.57 (2.18, 7.01)	0.001
	4	2004–2007	1.83 (−0.42, 4.14)	0.104	2004–2007	1.30 (−1.01, 3.67)	0.248
	5	2007–2012	4.72 (3.98, 5.46)	< 0.001	2007–2011	3.55 (2.36, 4.75)	< 0.001
	6	2012–2019	0.78 (0.48, 1.08)	< 0.001	2011–2019	1.77 (1.52, 2.03)	< 0.001
	AAPC (95% CI)	1990–2019	3.98 (3.63, 4.34)	< 0.001	1990–2019	3.85 (3.46, 4.23)	< 0.001
IS	1	1990–1995	6.06 (5.54, 6.59)	< 0.001	1990–1997	6.33 (6.03, 6.64)	< 0.001
	2	1995–2004	7.66 (7.40, 7.92)	< 0.001	1997–2000	10.08 (7.75, 12.46)	< 0.001
	3	2004–2007	2.88 (0.61, 5.20)	0.016	2000–2004	7.79 (6.64, 8.95)	< 0.001
	4	2007–2011	7.38 (6.18, 8.58)	< 0.001	2004–2007	3.27 (1.09, 5.51)	0.006
	5	2011–2014	5.61 (3.28, 7.99)	< 0.001	2007–2013	5.72 (5.22, 6.23)	< 0.001
	6	2014–2019	2.27 (1.76, 2.78)	< 0.001	2013–2019	3.52 (3.14, 3.89)	< 0.001
	AAPC (95% CI)	1990–2019	5.69 (5.32, 6.06)	< 0.001	1990–2019	5.88 (5.52, 6.24)	< 0.001
ICH	1	1990–1995	4.60 (3.84, 5.36)	< 0.001	1990–1995	4.42 (3.85, 5.00)	< 0.001
	2	1995–2002	8.58 (7.99, 9.18)	< 0.001	1995–2003	7.75 (7.40, 8.11)	< 0.001
	3	2002–2012	2.90 (2.59, 3.20)	< 0.001	2003–2011	1.36 (1.02, 1.69)	< 0.001
	4	2012–2019	−0.84 (−1.27, −0.41)	0.001	2011–2017	−0.72 (−1.27, −0.18)	0.013
	5	—	—	—	2017–2019	2.20 (−0.29, 4.74)	0.080
	6	—	—	—	—	—	—
	AAPC (95% CI)	1990–2019	3.61 (3.38, 3.84)	< 0.001	1990–2019	3.23 (2.98, 3.48)	< 0.001
SAH	1	1990–1996	4.97 (4.59, 5.34)	< 0.001	1990–1995	4.78 (4.27, 5.30)	< 0.001
	2	1996–2000	−0.68 (−1.72, 0.37)	0.186	1995–2000	−0.27 (−0.96, 0.43)	0.425
	3	2000–2004	−10.78 (−11.71, −9.83)	< 0.001	2000–2004	−10.95 (−11.93, −9.96)	< 0.001
	4	2004–2007	−3.18 (−5.19, −1.12)	0.006	2004–2007	−3.52 (−5.63, −1.36)	0.004
	5	2007–2014	5.07 (4.70, 5.44)	< 0.001	2007–2014	3.77 (3.38, 4.16)	< 0.001
	6	2014–2019	0.44 (−0.03, 0.92)	0.064	2014–2019	1.60 (1.10, 2.10)	< 0.001
	AAPC (95% CI)	1990–2019	0.27 (−0.03, 0.57)	0.075	1990–2019	−0.04 (−0.35, 0.26)	0.778

Note. DALY, disability-adjusted life year; IS ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.

Supplementary Table S10. The trends in age-standardized mortality of stroke attributable to ambient PM_{2.5} in China during 1990–2019 using Join-Point regression

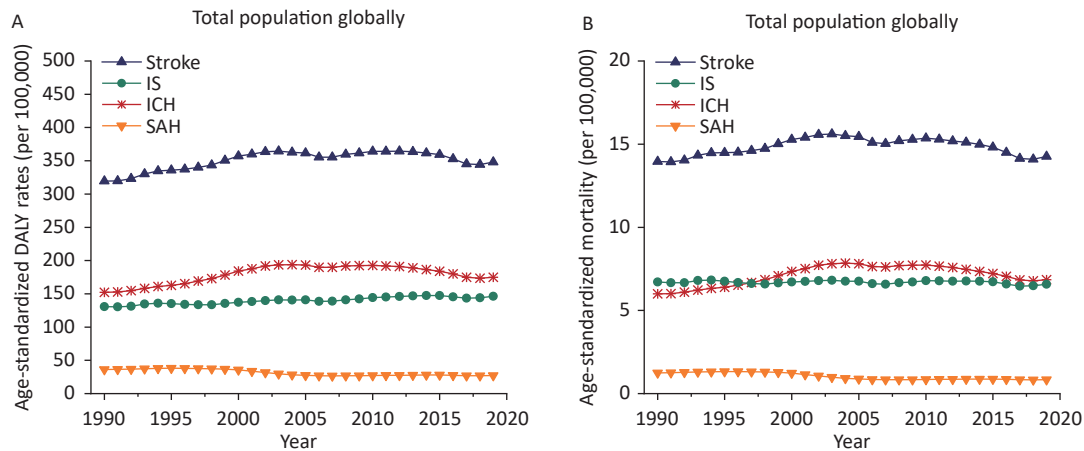
Variables	Total population				Males			Females		
	Segments	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value
Stroke	1	1990–1996	2.59 (2.17, 3.01)	< 0.001	1990–1994	2.23 (1.38, 3.07)	< 0.001	1990–1996	2.20 (1.82, 2.59)	< 0.001
	2	1996–2001	4.48 (3.68, 5.28)	< 0.001	1994–2001	4.11 (3.65, 4.57)	< 0.001	1996–2003	4.20 (3.81, 4.60)	< 0.001
	3	2001–2004	2.18 (−0.26, 4.67)	0.076	2001–2004	2.07 (−0.57, 4.77)	0.114	2003–2007	−1.35 (−2.44, −0.24)	0.021
	4	2004–2007	−1.66 (−4.01, 0.74)	0.158	2004–2007	−1.16 (−3.71, 1.46)	0.353	2007–2011	0.48 (−0.63, 1.61)	0.366
	5	2007–2011	1.65 (0.44, 2.89)	0.012	2007–2012	2.04 (1.20, 2.89)	< 0.001	2011–2017	−2.80 (−3.28, −2.32)	< 0.001
	6	2011–2019	−2.31 (−2.57, −2.06)	< 0.001	2012–2019	−2.73 (−3.07, −2.39)	< 0.001	2017–2019	−0.53 (−2.72, 1.71)	0.618
IS	AAPC (95% CI)	1990–2019	0.92 (0.53, 1.31)	< 0.001	1990–2019	1.05 (0.65, 1.46)	< 0.001	1990–2019	0.70 (0.42, 0.98)	< 0.001
	1	1990–1995	3.32 (2.66, 3.98)	< 0.001	1990–1994	3.07 (2.18, 3.96)	< 0.001	1990–1997	3.50 (3.12, 3.89)	< 0.001
	2	1995–2004	5.27 (4.94, 5.60)	< 0.001	1994–2004	4.71 (4.45, 4.97)	< 0.001	1997–2001	7.11 (5.63, 8.61)	< 0.001
	3	2004–2007	−0.52 (−3.33, 2.38)	0.703	2004–2007	0.02 (−2.67, 2.78)	0.989	2001–2004	4.75 (1.88, 7.71)	0.003
	4	2007–2011	3.78 (2.30, 5.27)	< 0.001	2007–2011	4.83 (3.41, 6.26)	< 0.001	2004–2007	−0.49 (−3.22, 2.32)	0.708
	5	2011–2014	0.65 (−2.20, 3.57)	0.636	2011–2014	1.84 (−0.90, 4.65)	0.172	2007–2011	2.72 (1.30, 4.16)	0.001
ICH	6	2014–2019	−1.45 (−2.08, −0.82)	< 0.001	2014–2019	−2.15 (−2.75, −1.56)	< 0.001	2011–2019	−0.85 (−1.15, −0.55)	< 0.001
	AAPC (95% CI)	1990–2019	2.46 (2.00, 2.92)	< 0.001	1990–2019	2.50 (2.06, 2.94)	< 0.001	1990–2019	2.37 (1.90, 2.84)	< 0.001
	1	1990–1995	1.96 (1.09, 2.84)	< 0.001	1990–1995	2.03 (1.39, 2.67)	< 0.001	1990–1996	1.89 (1.41, 2.36)	< 0.001
	2	1995–2003	5.16 (4.63, 5.70)	< 0.001	1995–2001	5.55 (4.90, 6.22)	< 0.001	1996–2003	5.46 (4.97, 5.95)	< 0.001
	3	2003–2011	−0.87 (−1.38, −0.36)	0.002	2001–2004	3.08 (0.24, 6.00)	0.035	2003–2011	−1.41 (−1.78, −1.05)	< 0.001
	4	2011–2019	−3.70 (−4.10, −3.30)	< 0.001	2004–2007	−1.98 (−4.68, 0.80)	0.146	2011–2017	−4.51 (−5.10, −3.92)	< 0.001
SAH	5	—	—	—	2007–2011	0.80 (−0.60, 2.21)	0.241	2017–2019	−0.88 (−3.59, 1.91)	0.510
	6	—	—	—	2011–2019	−3.85 (−4.14, −3.55)	< 0.001	—	—	—
	AAPC (95% CI)	1990–2019	0.44 (0.18, 0.70)	0.001	1990–2019	0.60 (0.16, 1.05)	0.008	1990–2019	0.26 (−0.01, 0.53)	0.059
	1	1990–1996	1.94 (1.53, 2.35)	< 0.001	1990–1996	2.47 (2.02, 2.91)	< 0.001	1990–1995	1.97 (1.39, 2.55)	< 0.001
	2	1996–2000	−4.47 (−5.59, −3.33)	< 0.001	1996–2000	−4.05 (−5.28, −2.81)	< 0.001	1995–2000	−4.23 (−5.00, −3.45)	< 0.001
	3	2000–2004	−15.59 (−16.58, −14.59)	< 0.001	2000–2004	−15.49 (−16.57, −14.39)	< 0.001	2000–2004	−15.89 (−16.95, −14.81)	< 0.001
SAH	4	2004–2007	−7.79 (−9.94, −5.59)	< 0.001	2004–2007	−6.93 (−9.30, −4.51)	< 0.001	2004–2007	−8.49 (−10.79, −6.13)	< 0.001
	5	2007–2014	1.74 (1.33, 2.15)	< 0.001	2007–2015	1.84 (1.49, 2.19)	< 0.001	2007–2014	1.10 (0.67, 1.54)	< 0.001
	6	2014–2019	−2.01 (−2.53, −1.49)	< 0.001	2015–2019	−3.33 (−4.12, −2.54)	< 0.001	2014–2019	−1.65 (−2.20, −1.08)	< 0.001
	AAPC (95% CI)	1990–2019	−3.29 (−3.61, −2.96)	< 0.001	1990–2019	−3.05 (−3.40, −2.69)	< 0.001	1990–2019	−3.67 (−4.00, −3.33)	< 0.001

Note. IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.

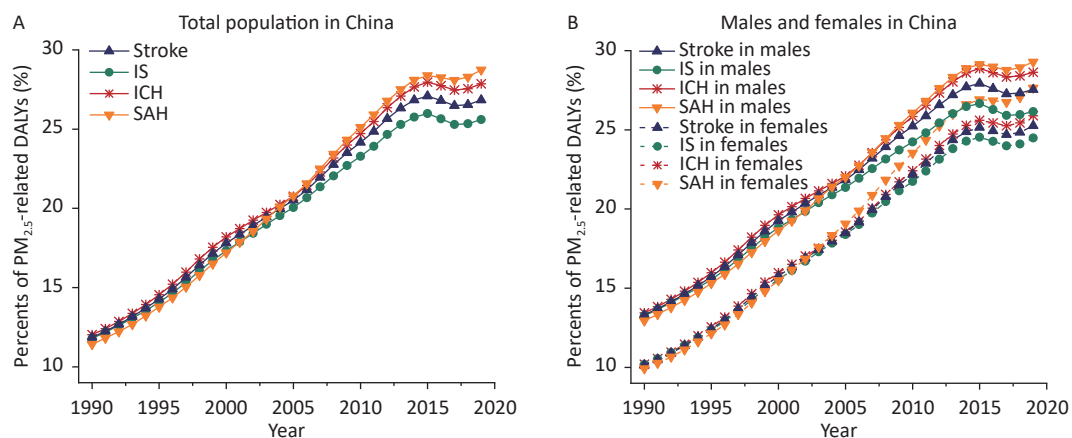
Supplementary Table S11. The trends in numbers of death for stroke attributable to ambient PM_{2.5} in China during 1990–2019 using Join-Point regression

Variables	Segment s	Total population			Males			Females		
		Period	APC (95% CI)	P value	Period	APC (95% CI)	P value	Period	APC (95% CI)	P value
Stroke	0	1990–1996	5.46 (5.04, 5.88)	< 0.001	1990–1994	5.10 (4.25, 5.96)	< 0.001	1990–1996	5.01 (4.64, 5.38)	< 0.001
	1	1996–2001	7.81 (7.01, 8.61)	< 0.001	1994–2001	7.42 (6.95, 7.88)	< 0.001	1996–2003	7.57 (7.19, 7.95)	< 0.001
	2	2001–2004	5.52 (3.07, 8.03)	< 0.001	2001–2004	5.49 (2.81, 8.24)	0.001	2003–2007	1.84 (0.78, 2.90)	0.002
	3	2004–2007	1.45 (−0.91, 3.86)	0.209	2004–2007	1.79 (−0.79, 4.44)	0.160	2007–2011	3.90 (2.83, 4.99)	< 0.001
	4	2007–2011	5.01 (3.78, 6.25)	< 0.001	2007–2012	5.06 (4.21, 5.92)	< 0.001	2011–2017	1.14 (0.67, 1.61)	< 0.001
	5	2011–2019	1.39 (1.13, 1.65)	< 0.001	2012–2019	0.97 (0.62, 1.31)	< 0.001	2017–2019	3.58 (1.45, 5.77)	0.003
	AAPC (95% CI)	1990–2019	4.24 (3.85, 4.64)	< 0.001	1990–2019	4.32 (3.91, 4.74)	< 0.001	1990–2019	4.11 (3.84, 4.38)	< 0.001
IS	0	1990–1996	6.51 (6.04, 6.98)	< 0.001	1990–1995	6.41 (5.81, 7.02)	< 0.001	1990–1997	6.40 (6.01, 6.79)	< 0.001
	1	1996–2004	8.98 (8.60, 9.36)	< 0.001	1995–2004	8.37 (8.08, 8.67)	< 0.001	1997–2001	10.92 (9.43, 12.45)	< 0.001
	2	2004–2007	2.59 (−0.05, 5.30)	0.054	2004–2007	2.81 (0.25, 5.44)	0.034	2001–2004	8.49 (5.57, 11.48)	< 0.001
	3	2007–2011	7.38 (5.99, 8.79)	< 0.001	2007–2010	8.55 (5.84, 11.33)	< 0.001	2004–2007	2.75 (−0.01, 5.59)	0.051
	4	2011–2014	4.68 (1.99, 7.45)	0.002	2010–2014	5.93 (4.60, 7.28)	< 0.001	2007–2011	6.32 (4.89, 7.78)	< 0.001
	5	2014–2019	2.69 (2.09, 3.29)	< 0.001	2014–2019	2.18 (1.60, 2.76)	< 0.001	2011–2019	3.41 (3.10, 3.71)	< 0.001
	AAPC (95% CI)	1990–2019	6.03 (5.59, 6.47)	< 0.001	1990–2019	6.04 (5.62, 6.47)	< 0.001	1990–2019	5.99 (5.52, 6.47)	< 0.001
ICH	0	1990–1995	4.77 (3.90, 5.64)	< 0.001	1990–1995	4.93 (4.28, 5.58)	< 0.001	1990–1996	4.76 (4.27, 5.25)	< 0.001
	1	1995–2003	8.53 (8.00, 9.07)	< 0.001	1995–2001	9.00 (8.33, 9.68)	< 0.001	1996–2003	8.86 (8.35, 9.36)	< 0.001
	2	2003–2011	2.45 (1.94, 2.96)	< 0.001	2001–2004	6.56 (3.65, 9.55)	< 0.001	2003–2011	1.88 (1.51, 2.26)	< 0.001
	3	2011–2019	−0.14 (−0.55, 0.26)	0.471	2004–2007	1.14 (−1.62, 3.98)	0.392	2011–2017	−0.66 (−1.27, −0.05)	0.036
	4	—	—	—	2007–2011	3.96 (2.53, 5.40)	< 0.001	2017–2019	2.95 (0.16, 5.83)	0.040
	5	—	—	—	2011–2019	−0.38 (−0.68, −0.08)	0.017	—	—	—
	AAPC (95% CI)	1990–2019	3.76 (3.50, 4.02)	< 0.001	1990–2019	3.89 (3.44, 4.35)	< 0.001	1990–2019	3.65 (3.38, 3.93)	< 0.001
SAH	0	1990–1996	4.84 (4.42, 5.26)	< 0.001	1990–1996	5.46 (5.03, 5.89)	< 0.001	1990–1995	4.76 (4.16, 5.38)	< 0.001
	1	1996–2000	−1.30 (−2.47, −0.13)	0.033	1996–2000	−0.87 (−2.06, 0.33)	0.141	1995–2000	−1.08 (−1.89, −0.26)	0.014
	2	2000–2004	−12.52 (−13.55, −11.47)	< 0.001	2000–2004	−12.36 (−13.41, −11.29)	< 0.001	2000–2004	−12.96 (−14.09, −11.82)	< 0.001
	3	2004–2007	−4.62 (−6.86, −2.33)	0.001	2004–2007	−4.08 (−6.37, −1.74)	0.002	2004–2007	−5.34 (−7.77, −2.84)	0.001
	4	2007–2014	5.06 (4.64, 5.48)	< 0.001	2007–2014	5.46 (5.03, 5.89)	< 0.001	2007–2014	4.44 (3.98, 4.90)	< 0.001
	5	2014–2019	1.24 (0.71, 1.78)	< 0.001	2014–2019	0.81 (0.26, 1.35)	0.007	2014–2019	1.93 (1.34, 2.53)	< 0.001
	AAPC (95% CI)	1990–2019	−0.13 (−0.47, 0.21)	0.442	1990–2019	0.15 (−0.19, 0.50)	0.386	1990–2019	−0.49 (−0.84, −0.13)	0.007

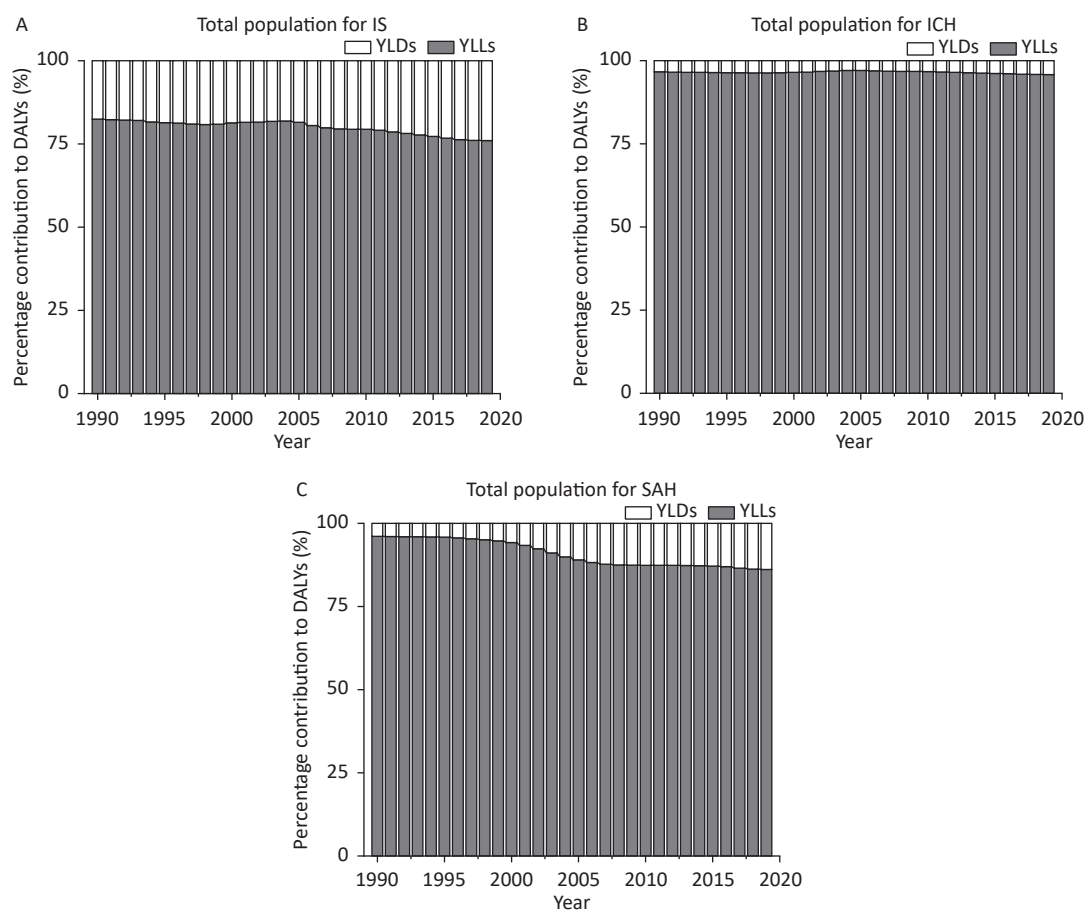
Note. IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.



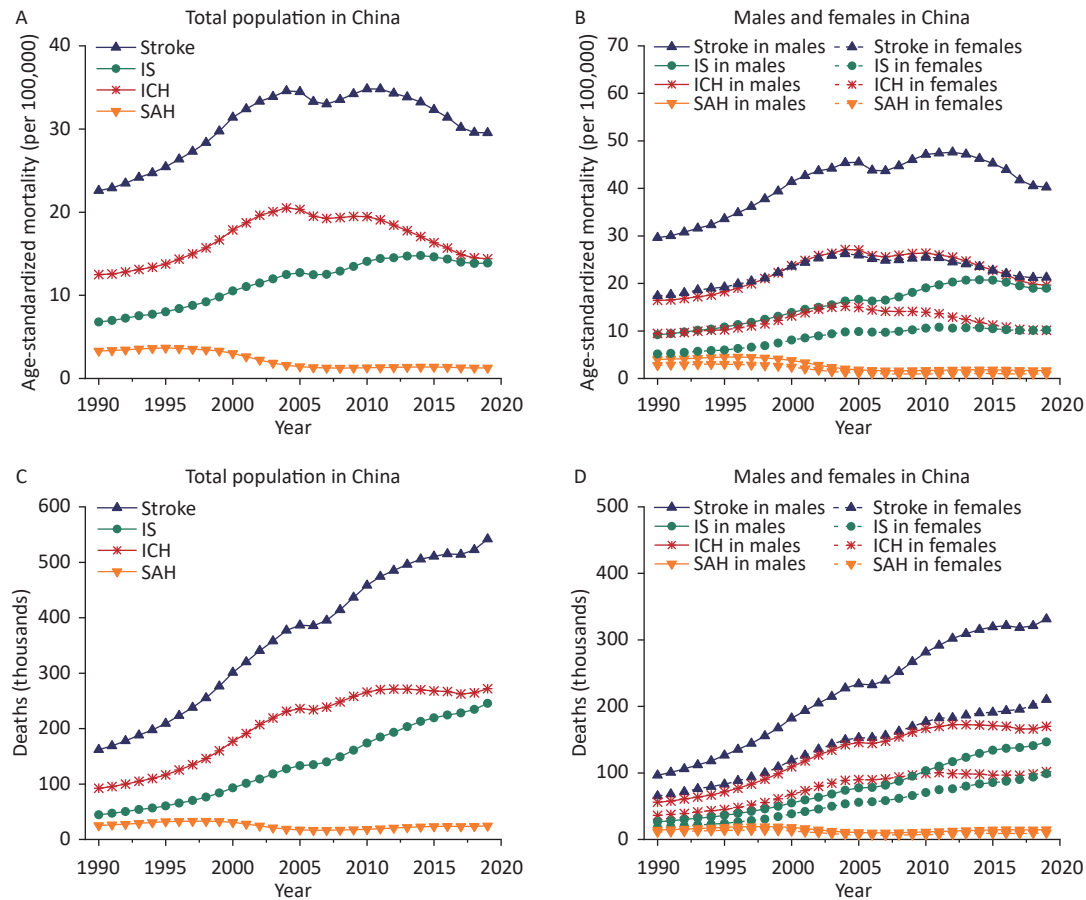
Supplementary Figure S1. Age-standardized rates of DALY and mortality for stroke attributable to ambient PM_{2.5} from 1990 to 2019 globally. (A) Age-standardized DALY rates in total population; (B) Age-standardized mortality in total population. DALY, disability-adjusted life year; IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage.



Supplementary Figure S2. Age-standardized percents of DALY attributable to ambient PM_{2.5}-related stroke in China from 1990 to 2019. (A) Age-standardized percents of DALY in total population; (B) Age-standardized percents of DALY in males and females, respectively. Percent, the age-standardized proportion of stroke burden attributable to ambient PM_{2.5} within the total stroke burden; DALY, disability-adjusted life year; IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage.



Supplementary Figure S3. Contribution of YLL and YLD to DALY for stroke attributable to ambient $PM_{2.5}$ in China during 1990-2019. (A) Contribution of YLL and YLD for IS; (B) Contribution of YLL and YLD for ICH; (C) Contribution of YLL and YLD for SAH. YLL, year of life lost; YLD, year lived with disability; DALY, disability-adjusted life year; ICH, intracerebral hemorrhage; IS, ischemic stroke.



Supplementary Figure S4. Age-standardized rates and numbers of death for stroke attributable to ambient $PM_{2.5}$ in China from 1990 to 2019. (A) Age-standardized mortality in total population; (B) Age-standardized mortality in males and females, respectively; (C) Numbers of death in total population; (D) Numbers of death in males and females, respectively. IS, ischemic stroke; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage.