

Supplemental Material

Table S1. The lexis diagram of GBD data for the APC model

Period (median)	Age groups												Birth cohort (median)
	40- 44	45- 49	50- 54	55- 59	60- 64	65- 69	70- 74	75- 79	80- 84	85- 89	90- 94	95- 99	
												X	1891-1899 (1895)
											X	X	1896-1904 (1900)
										X	X	X	1901-1909 (1905)
									X	X	X	X	1906-1914 (1910)
								X	X	X	X	X	1911-1919 (1915)
							X	X	X	X	X	X	1916-1924 (1920)
						X	X	X	X	X	X		1921-1929 (1925)
					X	X	X	X	X	X			1926-1934 (1930)
				X	X	X	X	X	X				1931-1939 (1935)
			X	X	X	X	X	X					1936-1944 (1940)
		X	X	X	X	X	X						1941-1949 (1945)
	X	X	X	X	X	X							1946-1954 (1950)
1990-1994 (1992)	X	X	X	X	X								1951-1959 (1955)
1995-1999 (1997)	X	X	X	X									1956-1964 (1960)
2000-2004 (2002)	X	X	X										1961-1969 (1965)
2005-2009 (2007)	X	X											1966-1974 (1970)
2010-2014 (2012)	X												1971-1979 (1975)
2015-2019 (2017)													

Note: X denotes mortality data of each age group from the corresponding period. For instance, the DALYs rate of age 40-44 years in 1992 is filled in the square with a bold X (see table), and this square belongs to the cohort 1946-1954 (1950).

Table S2. Time trends in CAVD mortality in 99 countries, 1990-2019

SDI	Country	Population		Deaths		All-age mortality		Age-standardized mortality		Net drift of mortality from APC model, % per year
		Number in 2019	Percent change 1990-2019, %	Number in 2019	Percent change 1990-2019, %	Rate in 2019	Percent change 1990-2019, %	Rate in 2019	Percent change 1990-2019, %	
Low	Bangladesh	159259850 (141199841,177852818)	46.0	933 (616, 1326)	232.7 (96.3, 486.6)	0.59 (0.39, 0.83)	127.8 (34.4, 301.7)	0.85 (0.56, 1.22)	17.4 (-26.8, 103.3)	0.52 (-0.02, 1.06)
Low	Pakistan	224062847 (207077327,241657356)	98.6	791 (511, 1072)	108.7 (64, 179)	0.35 (0.23, 0.48)	5.1 (-17.4, 40.5)	0.92 (0.61, 1.22)	20.3 (-5.7, 60.0)	0.41 (-0.06, 0.87)
Low	Democratic Republic of the Congo	87670444 (61748630,112590350)	127.2	270 (174, 400)	136.9 (65.8, 249.6)	0.31 (0.20, 0.46)	4.3 (-27.0, 53.9)	0.97 (0.66, 1.38)	1.8 (-26.2, 44.7)	-0.02 (-1.06, 1.03)
Low	Ethiopia	107591164 (92024285,122776186)	109.4	241 (177, 334)	78 (2.7, 281.3)	0.22 (0.16, 0.31)	-15.0 (-51.0, 82.1)	0.71 (0.53, 1.01)	-15.7 (-48.8, 61.6)	-1.23 (-2.33, -0.11)
Low	United Republic of Tanzania	56736116 (50495485,63230443)	119.0	214 (146, 303)	115.9 (44.2, 233.3)	0.38 (0.26, 0.53)	-1.4 (-34.2, 52.2)	1.06 (0.70, 1.49)	-5.8 (-36.2, 40.8)	-0.60 (-1.61, 0.43)
Low	Nepal	30416382 (26611408,34238807)	55.7	159 (111, 221)	247.2 (140.3, 426.3)	0.52 (0.36, 0.73)	123.0 (54.4, 238.1)	0.89 (0.61, 1.27)	37.2 (-2.3, 109.1)	0.87 (-0.44, 2.19)
Low	Yemen	31502896 (26596895,36775107)	129.5	119 (80, 168)	185.7 (94.6, 349.1)	0.38 (0.25, 0.53)	24.5 (-15.2, 95.7)	0.93 (0.64, 1.28)	0.4 (-29.5, 55.3)	-0.03 (-1.77, 1.74)
Low	Afghanistan	38277536 (26161826,50468583)	235.2	112 (57, 180)	94.4 (39.1, 192.8)	0.29 (0.15, 0.47)	-42.0 (-58.5, -12.7)	0.87 (0.44, 1.31)	-1.9 (-29.2, 47.6)	-0.17 (-1.78, 1.46)
Low	Madagascar	26690344 (20373798,32844324)	123.3	105 (69, 148)	78.6 (28.8, 154)	0.39 (0.26, 0.55)	-20.0 (-42.3, 13.7)	1.17 (0.81, 1.58)	-4.9 (-30.8, 34.5)	-0.42 (-1.78, 0.97)
Low	Uganda	41117856	137.5	102	127.4	0.25	-4.2	0.89	6.7	-0.20

		(37023696,44955511)		(75, 139)	(61.8, 222.1)	(0.18, 0.34)	(-31.8, 35.6)	(0.63, 1.26)	(-24.2, 49.8)	(-1.63, 1.25)
Low	Mozambique	29528037 (27057907,31808337)	125.9	97 (67, 131)	148.5 (77.4, 265.2)	0.33 (0.23, 0.44)	10.0 (-21.5, 61.7)	1.12 (0.80, 1.57)	31.1 (-7.3, 94.2)	1.23 (-0.31, 2.79)
Low	Angola	30138521 (27054840,33116641)	192.1	87 (66, 115)	210.8 (101.7, 416.1)	0.29 (0.22, 0.38)	6.4 (-30.9, 76.7)	1.06 (0.80, 1.38)	17.1 (-22.9, 89)	0.29 (-1.77, 2.39)
Low	Haiti	12402099 (10373558,14713362)	95.1	73 (42, 114)	95.4 (40.7, 179.1)	0.59 (0.34, 0.92)	0.1 (-27.9, 43.0)	1.22 (0.73, 1.82)	-10.5 (-36.7, 28.7)	-0.31 (-1.95, 1.35)
Low	Burkina Faso	22691773 (19383320,26173262)	137.4	65 (37, 102)	166.5 (98.4, 271.9)	0.29 (0.16, 0.45)	12.3 (-16.4, 56.7)	0.73 (0.44, 1.14)	26.9 (-4.4, 75.8)	1.17 (-1.76, 4.18)
Low	Côte d'Ivoire	26171532 (23573125,28872979)	114.1	60 (36, 94)	154.5 (76.3, 276)	0.23 (0.14, 0.36)	18.9 (-17.6, 75.6)	0.56 (0.34, 0.84)	-1.4 (-27.4, 40.1)	-0.13 (-3.08, 2.92)
Low	Malawi	18442238 (17149774,19745167)	93.0	54 (39, 73)	111.5 (41.0, 217.4)	0.29 (0.21, 0.40)	9.6 (-27.0, 64.5)	0.91 (0.65, 1.27)	7.3 (-25.5, 56.2)	0.13 (-1.85, 2.15)
Low-middle	India	1390706968 (1237773390,1558771721)	62.5	6862 (5181, 8945)	191.2 (121.2, 312.3)	0.49 (0.37, 0.64)	79.2 (36.1, 153.7)	0.73 (0.56, 0.94)	-2.8 (-24.7, 34.2)	-0.22 (-0.48, 0.05)
Low-middle	Nigeria	214823786 (193132521,236573636)	138.2	427 (292, 617)	51.3 (-4.2, 173.4)	0.20 (0.14, 0.29)	-36.5 (-59.8, 14.8)	0.51 (0.36, 0.69)	-23.7 (-50.4, 31.4)	-1.27 (-1.95, -0.58)
Low-middle	Morocco	35952186 (32338676,39427377)	42.1	283 (196, 376)	156.3 (92.1, 282.7)	0.79 (0.55, 1.05)	80.3 (35.2, 169.2)	1.03 (0.69, 1.37)	14.5 (-13.9, 72.4)	0.44 (-0.42, 1.30)
Low-middle	Venezuela (Bolivarian Republic of)	28068986 (24769383,31423834)	49.1	270 (202, 364)	205.5 (119.1, 335.6)	0.96 (0.72, 1.30)	104.9 (47.0, 192.2)	0.97 (0.72, 1.30)	2.6 (-26.0, 45.5)	-0.42 (-1.3, 0.47)
Low-middle	Viet Nam	96372928 (83066414,109007012)	41.8	245 (179, 341)	106.6 (51.3, 195.4)	0.25 (0.19, 0.35)	45.6 (6.7, 108.2)	0.29 (0.22, 0.41)	-8.5 (-32.4, 30.6)	-0.43 (-1.23, 0.38)
Low-middle	Syrian Arab Republic	14491247 (12173713,16795620)	12.4	186 (129, 268)	21.8 (-18.3, 88.4)	1.29 (0.89, 1.85)	8.4 (-27.3, 67.6)	1.81 (1.28, 2.57)	-41.9 (-61.5, -8.1)	-3.16 (-3.98, -2.33)
Low-middle	Sudan	40808425 (35356109,46009715)	102	163 (108, 242)	106.8 (36.6, 241.4)	0.40 (0.26, 0.59)	2.4 (-32.4, 69.0)	0.88 (0.59, 1.27)	0.4 (-32, 61.1)	-0.13 (-1.36, 1.11)
Low-middle	Kenya	50227709 (43651058,56751223)	116.6	151 (116, 196)	199.6 (130.2, 289.7)	0.30 (0.23, 0.39)	38.3 (6.3, 79.9)	0.92 (0.67, 1.25)	25.4 (-5.6, 65.2)	0.73 (-0.54, 2.02)

Low-middle	Philippines	112142764 (101580880,121868835)	77.2	136 (111, 166)	332.5 (215.2, 436.1)	0.12 (0.10, 0.15)	144.1 (77.9, 202.6)	0.20 (0.16, 0.24)	39.2 (5.9, 70.3)	1.59 (-0.06, 3.28)
Low-middle	Myanmar	54676901 (48907818,60236349)	33.0	102 (78, 144)	71.7 (13.0, 171.9)	0.19 (0.14, 0.26)	29.1 (-15.1, 104.4)	0.25 (0.19, 0.34)	-14.5 (-40.4, 30.7)	-0.78 (-2.14, 0.61)
Low-middle	Ghana	31536232 (27445271,35185758)	110.0	89 (55, 139)	203.8 (125.6, 341.8)	0.28 (0.18, 0.44)	44.7 (7.4, 110.4)	0.59 (0.38, 0.88)	20.8 (-8.8, 70.2)	0.81 (-1.33, 3.00)
Low-middle	Cameroon	29101868 (24782960,33604810)	180.1	82 (49, 132)	217.7 (117.9, 391.0)	0.28 (0.17, 0.45)	13.5 (-22.2, 75.3)	0.68 (0.43, 1.04)	14.5 (-18.0, 71.4)	0.41 (-1.83, 2.71)
Low-middle	Dominican Republic	10881855 (9629751,12279753)	51.1	75 (58, 97)	183.0 (110.7, 279.6)	0.69 (0.53, 0.89)	87.3 (39.5, 151.3)	0.85 (0.66, 1.09)	12.5 (-15.8, 50.2)	1.45 (-0.33, 3.27)
Low-middle	Bolivia (Plurinational State of)	12011750 (10641659,13418191)	87.1	71 (50, 100)	187.8 (95.9, 370.1)	0.59 (0.42, 0.83)	53.9 (4.7, 151.3)	0.88 (0.62, 1.22)	6.4 (-27.1, 70.8)	0.09 (-1.80, 2.01)
Low-middle	Zambia	18237683 (15885855,20473278)	129.6	67 (49, 90)	236.3 (135.6, 408.9)	0.37 (0.27, 0.49)	46.5 (2.6, 121.6)	1.27 (0.95, 1.67)	44.1 (2.2, 116.2)	1.27 (-0.91, 3.51)
Low-middle	Democratic People's Republic of Korea	26232861 (22628875,29910477)	24.6	62 (46, 86)	67.9 (19.0, 135.0)	0.24 (0.18, 0.33)	34.8 (-4.5, 88.6)	0.20 (0.15, 0.28)	-16.6 (-39.4, 13.4)	-0.85 (-2.66, 0.99)
Middle	Brazil	216664814 (189879232,242502434)	45.6	3467 (3001, 4003)	130.0 (107.1, 160.1)	1.60 (1.38, 1.85)	58.0 (42.2, 78.7)	1.54 (1.33, 1.78)	-15.6 (-24.0, -4.0)	-0.73 (-0.96, -0.49)
Middle	China	1422350422 (1239302360,1597063538)	20.2	2799 (2225, 3396)	91.5 (23.6, 235.2)	0.20 (0.16, 0.24)	59.3 (2.9, 178.9)	0.15 (0.12, 0.18)	-17.1 (-46.9, 45.8)	-0.83 (-1.15, -0.51)
Middle	MexICO	124940175 (108607132,140630348)	46.1	823 (686, 980)	237.0 (179.3, 298.0)	0.66 (0.55, 0.78)	130.6 (91.1, 172.3)	0.73 (0.61, 0.87)	23.9 (1.8, 45.2)	0.39 (-0.19, 0.97)
Middle	Colombia	47776679 (44174337,51539501)	46.8	664 (478, 933)	159.6 (88.9, 259.3)	1.39 (1.00, 1.95)	76.8 (28.7, 144.8)	1.25 (0.90, 1.76)	-15.5 (-38.7, 16.8)	-0.01 (-0.60, 0.59)
Middle	Egypt	99069551 (90571861,107515771)	77.9	658 (471, 929)	128.7 (62.3, 245.5)	0.66 (0.48, 0.94)	28.6 (-8.7, 94.3)	1.11 (0.79, 1.54)	6.4 (-25.9, 63.3)	0.28 (-0.42, 0.99)
Middle	Iran (Islamic Republic of)	84297882 (77330567,91935910)	44.0	629 (564, 761)	161.0 (114.9, 242.9)	0.75 (0.67, 0.90)	81.3 (49.2, 138.2)	0.90 (0.80, 1.11)	-13.8 (-29.6, 14.2)	-0.52 (-1.14, 0.11)

Middle	Indonesia	259465835 (226843397,291997879)	40.0	540 (362, 748)	150.0 (70.8, 248.0)	0.21 (0.14, 0.29)	78.6 (22.0, 148.6)	0.30 (0.21, 0.42)	18.0 (-16.1, 61.3)	0.49 (-0.15, 1.13)
Middle	Thailand	70111586 (61328965,78909536)	23.3	360 (264, 473)	303.7 (175.3, 480.1)	0.51 (0.38, 0.67)	227.5 (123.4, 370.6)	0.37 (0.27, 0.49)	29.0 (-11.1, 83.9)	0.09 (-0.74, 0.93)
Middle	South Africa	55588425 (49169682,62724694)	50.9	349 (284, 395)	95.0 (66.6, 124.3)	0.63 (0.51, 0.71)	29.2 (10.4, 48.6)	0.96 (0.79, 1.09)	3.6 (-10.1, 18.4)	-0.30 (-1.00, 0.40)
Middle	Uruguay	3436137 (3031175,3876964)	9.5	343 (287, 392)	150.1 (110.5, 194.6)	9.98 (8.35, 11.4)	128.5 (92.3, 169.2)	5.18 (4.38, 5.88)	43.1 (21.4, 68.0)	0.87 (-0.21, 1.95)
Middle	Algeria	41847290 (36020518,47461912)	65.5	294 (191, 400)	144.1 (65.2, 263.0)	0.70 (0.46, 0.96)	47.5 (-0.2, 119.3)	0.98 (0.65, 1.30)	-16.8 (-43.4, 23.5)	-0.59 (-2.19, 1.03)
Middle	Cuba	11358510 (10094746,12738845)	4.9	195 (152, 258)	106.8 (58.6, 172.0)	1.72 (1.34, 2.27)	97.2 (51.3, 159.4)	1.03 (0.80, 1.37)	11.9 (-14.3, 46.6)	0.39 (-0.57, 1.35)
Middle	Sri Lanka	21854452 (19445064,24139979)	26.9	152 (111, 206)	69.9 (20.1, 147.0)	0.69 (0.51, 0.94)	33.9 (-5.3, 94.6)	0.63 (0.46, 0.86)	-32.0 (-52.1, -1.5)	-1.58 (-2.71, -0.45)
Middle	Ecuador	17588392 (15403894,19749863)	75.4	123 (93, 160)	295.7 (184.0, 455.6)	0.70 (0.53, 0.91)	125.6 (61.9, 216.7)	0.86 (0.66, 1.11)	45.4 (4.1, 104.0)	1.88 (0.17, 3.63)
Middle	Paraguay	6930455 (5699198,8110997)	71.3	116 (86, 149)	355.9 (227.6, 533.5)	1.67 (1.25, 2.14)	166.1 (91.2, 269.8)	2.20 (1.64, 2.82)	80.8 (31.0, 147.3)	2.59 (1.06, 4.14)
Middle	Tunisia	11571604 (10423733,12757923)	37.1	108 (69, 154)	151.4 (74.5, 267.9)	0.93 (0.60, 1.33)	83.4 (27.3, 168.3)	0.92 (0.59, 1.31)	-4.5 (-33.2, 39.5)	-0.17 (-1.73, 1.41)
Middle	Peru	33995397 (31120105,36626226)	56.4	97 (70, 131)	55.1 (-0.5, 145.5)	0.29 (0.21, 0.39)	-0.8 (-36.4, 56.9)	0.30 (0.22, 0.41)	-42.3 (-61.6, -9.7)	-2.26 (-3.44, -1.07)
Middle	Iraq	42119490 (31429294,52981880)	139.4	79 (54, 104)	242.2 (121.6, 466.4)	0.19 (0.13, 0.25)	43.0 (-7.4, 136.6)	0.35 (0.25, 0.46)	18.7 (-21.5, 93.2)	0.60 (-1.25, 2.50)
Middle	Uzbekistan	33677096 (25411001,42319371)	60.8	68 (50, 96)	496.0 (229.7, 1126.6)	0.20 (0.15, 0.28)	270.7 (105.1, 663.0)	0.46 (0.33, 0.66)	342.3 (133.5, 866.2)	6.40 (3.82, 9.05)
Middle	Costa Rica	4716744 (4164759,5271508)	55.2	67 (51, 87)	284.7 (187.8, 408.4)	1.43 (1.09, 1.84)	147.9 (85.5, 227.6)	1.31 (1.00, 1.69)	27.7 (-4.6, 69.6)	0.94 (-0.91, 2.83)
High- middle	Spain	46021218 (42087988,49981539)	18.7	5153 (4177, 6116)	205.6 (161.9, 54.6)	11.20 (9.08, 13.29)	157.5 (120.7, 198.9)	4.00 (3.30, 4.68)	24.6 (9.2, 42.3)	-1.18 (-1.51,-0.84)

High-middle	Italy	60313170 (55356080,64983929)	6.2	4376 (3436, 4957)	281.3 (173.6, 331.3)	7.25 (5.70, 8.22)	259.1 (157.6, 306.2)	2.30 (1.83, 2.59)	78.1 (28.6, 100.4)	-0.28 (-0.61, 0.05)
High-middle	Argentina	45115284 (39507183,51073381)	36.2	2166 (1869, 2414)	95.8 (69.3, 127.1)	4.80 (4.14, 5.35)	43.7 (24.3, 66.7)	3.87 (3.34, 4.30)	-1.3 (-14.6, 14.1)	-0.46 (-0.80, -0.12)
High-middle	Poland	38434445 (35378981,41364935)	0.7	1522 (1122, 1932)	1487.9 (790.8, 2540.8)	3.96 (2.92, 5.03)	1476.4 (784.3, 2521.8)	2.05 (1.52, 2.61)	791.8 (402.6, 1397.9)	8.46 (7.66, 9.27)
High-middle	Greece	10337172 (9070617,11489319)	-0.5	1077 (907, 1241)	210.8 (161.6, 282.8)	10.42 (8.77, 12.01)	212.3 (163.0, 284.7)	3.33 (2.83, 3.83)	36.2 (15.2, 67.4)	0.37 (-0.36, 1.10)
High-middle	Portugal	10651263 (9433153,11909037)	5.1	955 (778, 1081)	425.4 (327.8, 571.8)	8.96 (7.31, 10.15)	400.1 (307.2, 539.3)	3.18 (2.61, 3.59)	121.1 (85.9, 188)	1.88 (1.11, 2.65)
High-middle	Turkey	81359693 (71366134,91236684)	36.1	851 (632, 1093)	82.3 (25.1, 210.0)	1.05 (0.78, 1.34)	33.9 (-8.1, 127.7)	1.03 (0.76, 1.32)	-28.9 (-51.7, 21.4)	-1.65 (-2.06, -1.23)
High-middle	Hungary	9674413 (8515522,10788963)	-6.9	820 (641, 997)	159.7 (102.0, 231.7)	8.47 (6.62, 10.3)	179.0 (117.0, 256.3)	3.95 (3.11, 4.80)	77.2 (37.1, 124.7)	1.24 (0.69, 1.80)
High-middle	Israel	9309583 (8164697,10550907)	87.6	488 (396, 555)	201.3 (151.1, 249.0)	5.25 (4.25, 5.97)	60.6 (33.8, 86.0)	3.68 (3.02, 4.18)	-3.8 (-16.9, 9.5)	-1.00 (-2.13, 0.15)
High-middle	Serbia	8746785 (7829777,9730592)	-6.9	443 (339, 574)	278.9 (164.3, 502.7)	5.07 (3.88, 6.57)	307.1 (184.0, 547.5)	2.84 (2.20, 3.70)	140.7 (65.9, 291.5)	2.90 (1.94, 3.88)
High-middle	Chile	18198359 (16753483,19617223)	37.0	335 (294, 385)	134.6 (101.7, 173.2)	1.84 (1.62, 2.11)	71.2 (47.2, 99.4)	1.41 (1.24, 1.62)	-10.0 (-22.2, 4.2)	-0.39 (-1.15, 0.38)
High-middle	Romania	19237066 (17030070,21542480)	-17.8	299 (236, 364)	98.6 (53.8, 154.8)	1.55 (1.23, 1.89)	141.5 (87.0, 209.9)	0.77 (0.61, 0.94)	32.0 (1.5, 69.8)	0.36 (-0.54, 1.27)
High-middle	Croatia	4247902 (3748360,4764237)	-13.3	298 (208, 382)	793.3 (214.6, 1478.6)	7.01 (4.89, 8.99)	930.6 (263.0, 1721.1)	3.04 (2.13, 3.89)	435.2 (89.5, 831.8)	6.74 (5.09, 8.42)
High-middle	Ukraine	44042431 (35745535,52268016)	-16.4	185 (154, 221)	87.7 (48.6, 146.6)	0.42 (0.35, 0.50)	124.4 (77.6, 194.9)	0.25 (0.21, 0.30)	74.9 (36.7, 130.5)	1.79 (0.81, 2.78)
High-middle	Malaysia	31301402 (27339262,35190542)	77.3	120 (93, 155)	267.4 (174.4, 396.5)	0.38 (0.3, 0.49)	107.2 (54.8, 180.1)	0.52 (0.40, 0.66)	34.1 (0.4, 81.5)	1.33 (-0.13, 2.82)
High-middle	Bosnia and Herzegovina	3299982 (2949576,3649228)	-27.3	81 (62, 107)	154.2 (79.7, 287.6)	2.45 (1.87, 3.24)	249.5 (147.2, 433.0)	1.45 (1.11, 1.89)	36.4 (-5.6, 103.3)	0.92 (-0.83, 2.71)

High-middle	Bulgaria	6934625 (6359976,7553856)	-20.1	69 (52, 89)	187.8 (66.3, 337.5)	1.00 (0.75, 1.28)	260.3 (108.1, 447.7)	0.48 (0.36, 0.62)	127.6 (30.3, 249.4)	3.52 (0.95, 6.14)
High-middle	Lebanon	5177069 (4455291,5928542)	58.1	58 (39, 84)	118.1 (56.6, 226.2)	1.11 (0.75, 1.63)	37.9 (-0.9, 106.4)	1.11 (0.74, 1.61)	-14.2 (-39, 29.2)	-0.64 (-2.49, 1.24)
High	United States of America	327978730 (285959303,369324168)	29.3	24826 (20354, 27718)	100.5 (83.8, 113.8)	7.57 (6.21, 8.45)	55.0 (42.1, 65.3)	3.73 (3.11, 4.12)	1.8 (-5.2, 7.7)	-1.67 (-1.83, -1.52)
High	Germany	84914056 (77688648,92219489)	6.2	13154 (11099, 15132)	115.9 (80.7, 155.9)	15.49 (13.07, 17.82)	103.3 (70.1, 140.9)	5.47 (4.61, 6.26)	18.1 (0.2, 38.7)	-0.39 (-0.76, -0.01)
High	Japan	127788411 (115774123,139878471)	1.5	12868 (8512, 15732)	209.9 (137.4, 252.6)	10.07 (6.66, 12.31)	205.2 (133.8, 247.3)	2.14 (1.49, 2.55)	-23.9 (-38.4, -14.1)	-2.57 (-2.85, -2.29)
High	France	66204315 (60093850,72433669)	14.6	8029 (6387, 9225)	81.3 (54.1, 106.8)	12.13 (9.65, 13.93)	58.2 (34.5, 80.4)	4.04 (3.28, 4.61)	-18.8 (-29.5, -8.4)	-2.46 (-2.74, -2.18)
High	United Kingdom	67220447 (60468668,73925429)	17.0	5409 (4572, 5893)	81.4 (61.8, 104.8)	8.05 (6.80, 8.77)	55.1 (38.4, 75.1)	3.62 (3.09, 3.94)	13.3 (3.3, 27.2)	-0.65 (-0.92, -0.38)
High	Canada	36519840 (33331463,39599796)	34.0	2359 (1901, 2649)	205.2 (160.9, 244.6)	6.46 (5.21, 7.25)	127.8 (94.7, 157.2)	2.93 (2.40, 3.28)	18.7 (2.8, 33.4)	-0.78 (-1.23, -0.32)
High	Netherlands	17156788 (15675163,18613311)	15.0	2054 (1614, 2412)	152.5 (83.6, 210.7)	11.97 (9.41, 14.06)	119.6 (59.7, 170.2)	5.26 (4.15, 6.14)	32.3 (-3.1, 62.6)	-1.12 (-1.68, -0.57)
High	Belgium	11419166 (10536911,12317981)	14.4	1703 (1323, 1960)	157.2 (102.9, 204.2)	14.91 (11.59, 17.17)	124.7 (77.3, 165.8)	5.44 (4.33, 6.21)	28.3 (2.7, 51.6)	-1.25 (-1.95, -0.54)
High	Australia	24568113 (22510058,26779186)	45.7	1435 (1167, 1648)	136.8 (107.7, 162.9)	5.84 (4.75, 6.71)	62.5 (42.6, 80.4)	2.89 (2.36, 3.31)	-12.2 (-22.2, -3.2)	-1.79 (-2.36, -1.22)
High	Russian Federation	146717427 (128850161,165171807)	-2.9	1249 (1015, 1503)	209.5 (147.8, 323.2)	0.85 (0.69, 1.02)	218.6 (155.0, 335.6)	0.54 (0.44, 0.66)	126.8 (82.3, 206.8)	3.50 (3.05, 3.96)
High	Sweden	10222546 (9312312,11127453)	19.0	1209 (979, 1406)	78.7 (58.9, 102.3)	11.83 (9.58, 13.75)	50.1 (33.5, 70.0)	4.39 (3.63, 5.06)	9.5 (-1.5, 22.9)	-0.97 (-1.74, -0.18)
High	Austria	8916185 (8169639,9666456)	14.8	980 (787, 1133)	184.5 (135.6, 250.2)	10.99 (8.83, 12.71)	147.9 (105.3, 205.1)	4.31 (3.52, 4.96)	51.5 (26.7, 85.1)	-0.59 (-1.33, 0.16)
High	Switzerland	8775204	27.8	746	90.5	8.50	49.0	3.18	-6.1	-1.39

		(8021728,9564584)		(581, 880)	(61.8, 126.5)	(6.62, 10.03)	(26.6, 77.2)	(2.52, 3.71)	(-19.8, 11.0)	(-2.41, -0.37)
High	Finland	5534095	10.5	744	153.5	13.45	129.5	4.90	19.9	0.10
		(5086541,5991975)		(595, 863)	(106.7, 206.7)	(10.74, 15.6)	(87.1, 177.7)	(3.95, 5.67)	(-0.6, 44.1)	(-0.75, 0.95)
High	Norway	5348847	25.9	691	62.3	12.92	28.8	5.72	3.1	-0.98
		(4936723,5754787)		(548, 785)	(42.9, 78.3)	(10.25, 14.67)	(13.5, 41.6)	(4.56, 6.45)	(-8.0, 13.1)	(-1.98, 0.03)
High	Republic of Korea	53398252	20.4	664	486.5	1.24	387.0	0.83	58.4	0.71
		(48441017,58407132)		(536, 787)	(341.6, 707.9)	(1.00, 1.47)	(266.6, 570.8)	(0.67, 0.98)	(21.2, 117.9)	(-0.15, 1.57)
High	Denmark	5802733	12.8	604	161.7	10.40	132.0	4.53	73.5	0.94
		(5329985,6262192)		(485, 687)	(123.6, 203.9)	(8.37, 11.84)	(98.3, 169.4)	(3.69, 5.15)	(49.7, 101.0)	(-0.12,2.02)
High	Czechia	10643487	3.4	598	1481.4	5.62	1430.0	2.69	853.5	7.30
		(9779074,11500126)		(437, 777)	(626.7, 2681.3)	(4.10, 7.30)	(603.1, 2590.9)	(1.97, 3.51)	(333.6, 1559.1)	(6.06, 8.55)
High	New Zealand	4495667	31.6	431	161.4	9.58	98.7	4.79	8.2	-1.10
		(4005504,4968118)		(346, 490)	(123.1, 191.4)	(7.70, 10.89)	(69.6, 121.5)	(3.88, 5.41)	(-5.4, 19.7)	(-2.19, 0.00)
High	Taiwan (Province of China)	23620243	15.8	370	435.1	1.57	362.1	0.91	42.7	0.25
		(21658624,25443226)		(280, 472)	(225.3, 621.9)	(1.18, 2.00)	(180.9, 523.4)	(0.69, 1.16)	(-12.1, 92.0)	(-0.83, 1.34)
High	Slovenia	2074271	5.2	364	512.1	17.53	481.7	6.77	159.9	1.94
		(1914446,2243231)		(262, 483)	(334.2, 752.6)	(12.65, 23.28)	(312.6, 710.1)	(4.92, 8.94)	(84.9, 258.1)	(0.47, 3.43)
High	Ireland	4910357	36.4	239	101.5	4.86	47.8	3.04	0.3	-1.28
		(4483761,5355859)		(200, 272)	(72.8, 129.5)	(4.07, 5.54)	(26.7, 68.3)	(2.55, 3.47)	(-13.4, 13.5)	(-2.45, -0.10)
High	Slovakia	5437223	2.9	135	552.3	2.48	533.8	1.48	317.8	6.86
		(4969934,5923604)		(101, 172)	(244.8, 796.1)	(1.87, 3.17)	(235.0, 770.7)	(1.12, 1.89)	(121.4, 471)	(4.86, 8.90)
High	Cyprus	1313477	68.8	134	126.9	10.22	34.4	8.20	-19.7	-1.72
		(1162096,1476217)		(112, 158)	(74.6, 200.7)	(8.54, 12.03)	(3.4, 78.1)	(6.86, 9.76)	(-39.0, 8.3)	(-3.92, 0.53)
High	Saudi Arabia	35731972	122.7	98	238.3	0.27	51.9	0.65	13.2	0.42
		(31175706,40192039)		(74, 133)	(116.1, 529.9)	(0.21, 0.37)	(-2.9, 182.8)	(0.48, 0.84)	(-25.2, 100.7)	(-1.18, 2.04)
High	Puerto Rico	3521431	-2.5	94	90.0	2.66	95.0	1.14	-20.3	-1.05
		(3106914,3986032)		(71, 119)	(46.0, 144.9)	(2.02, 3.37)	(49.8, 151.3)	(0.87, 1.45)	(-38.2, 3)	(-2.56, 0.49)
High	Estonia	1312361	-16.3	80	852.0	6.13	1038.0	2.57	496.7	7.59
		(1204372,1415452)		(59, 108)	(558.1, 1396.4)	(4.50, 8.27)	(686.6, 1688.7)	(1.89, 3.45)	(318.4, 835.8)	(4.49, 10.79)
High	Luxembourg	618550	62.2	56	139.3	9.05	47.5	4.71	4.7	-0.75

		(568118,666377)		(45, 67)	(94.6, 186.5)	(7.20, 10.77)	(20.0, 76.6)	(3.78, 5.57)	(-13.7, 24.1)	(-3.61, 2.19)
High	United Arab	9241704		52	707.6	0.56	63.6	0.95	-21.1	-1.18
	Emirates	(7764642,10592699)	393.7	(27, 80)	(415.7, 1190.0)	(0.29, 0.86)	(4.5, 161.3)	(0.52, 1.47)	(-44.6, 9.8)	(-12.66, 11.82)

There were 99 countries with at least 50 deaths.

CAVD, calcific aortic valve disease; 95% UI, 95% uncertainty intervals; 95% CI, 95% confidence interval; SDI, Socio-demographic Index; APC, age-period-cohort.

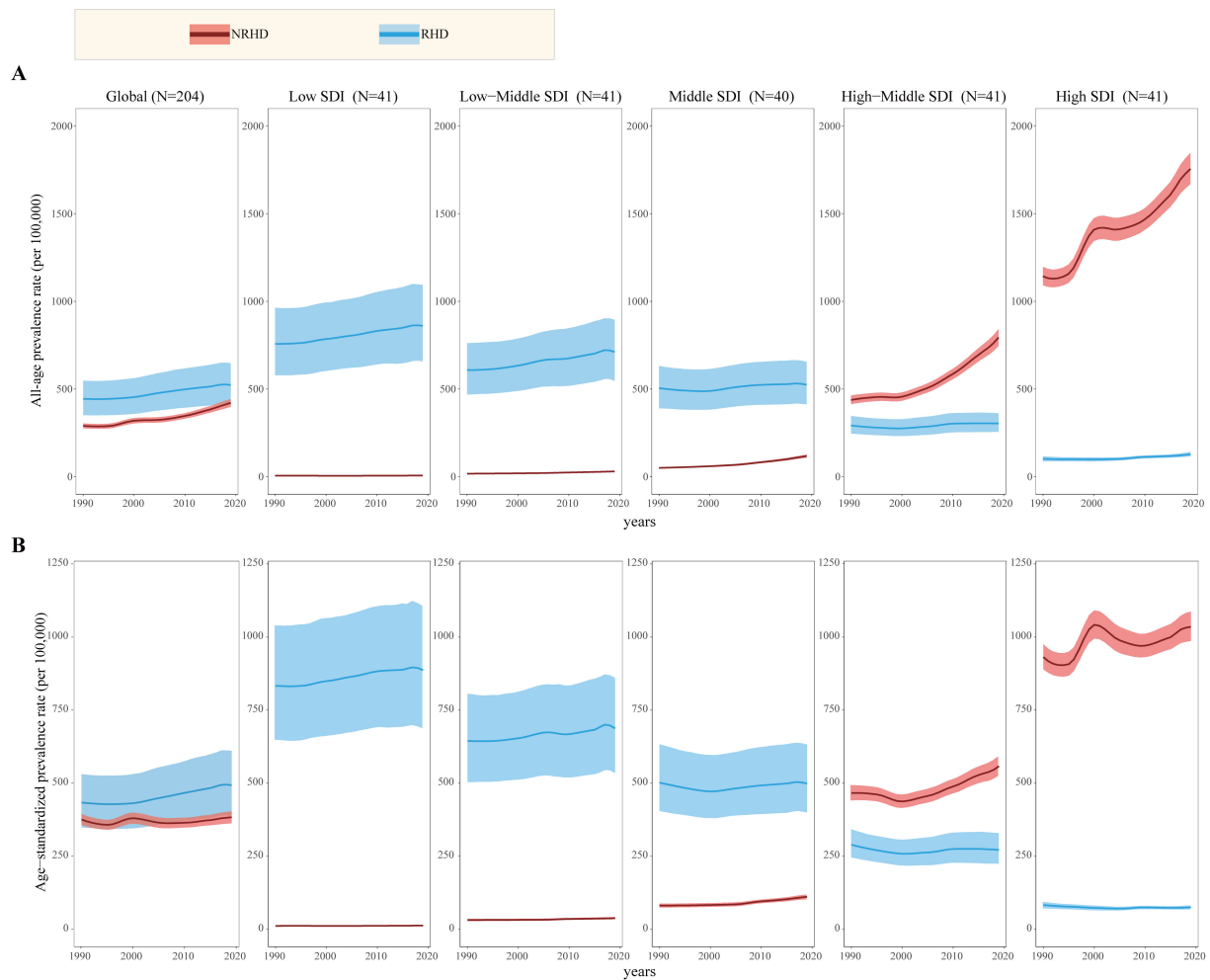


Figure S1. Changes in all-age prevalence rate (A) and age-standardized prevalence rate (B) of RHD and NRHD by SDI quintiles, 1990 to 2019. RHD have been prevalent in low, low-middle, and middle SDI regions in the past 30 years. In comparison, NRHD showed an increasingly high all-age/age-standardized prevalence rate in high and high-middle SDI regions. The shaded areas show the 95% confidence intervals. NRHD, non-rheumatic heart diseases; RHD, rheumatic heart diseases; SDI, Socio-demographic Index.

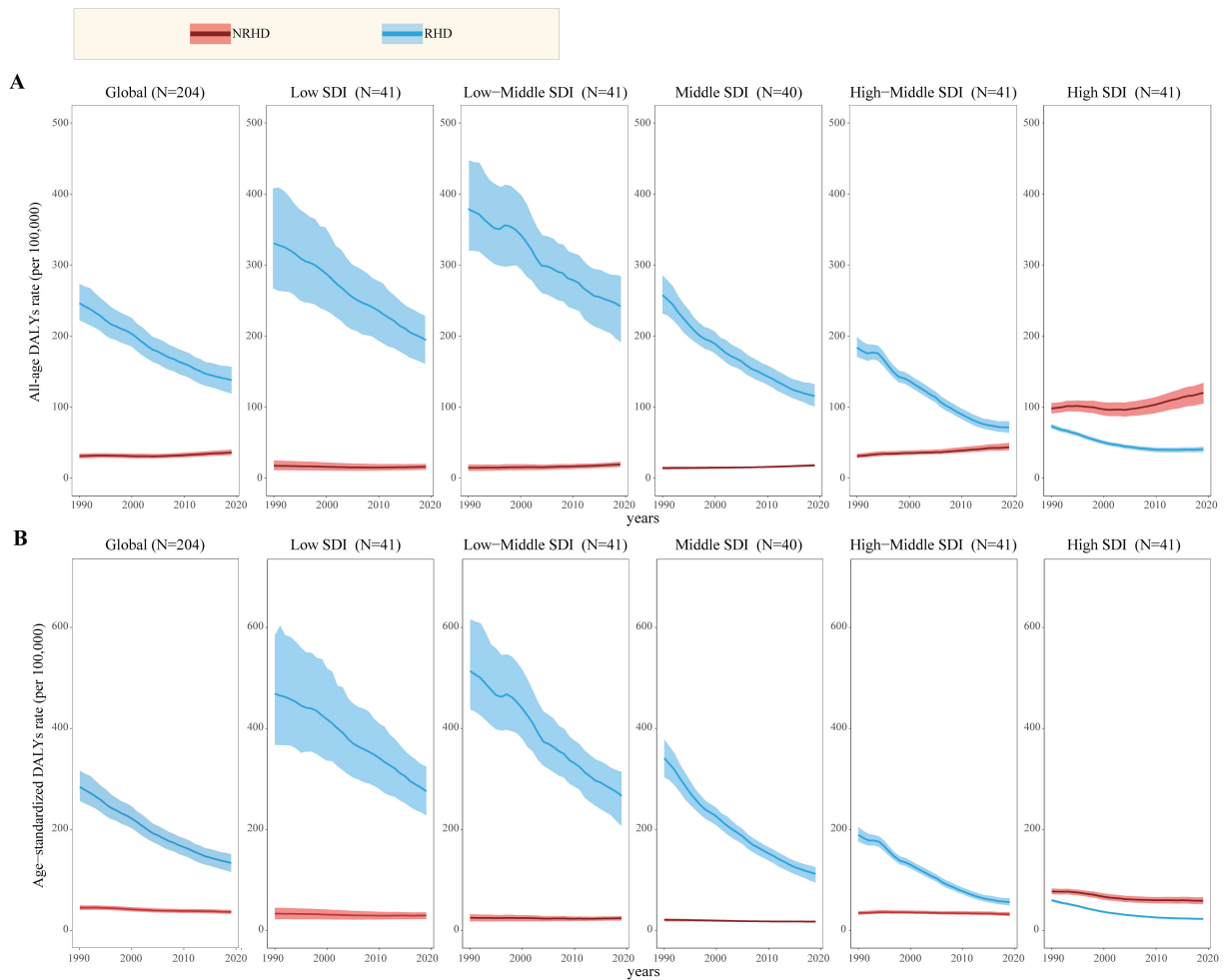


Figure S2. Changes in all-age DALYs rate (A) and age-standardized DALYs rate (B) of RHD and NRHD by SDI quintiles, 1990 to 2019. The DALYs rates of RHD decreased dramatically in the past 30 years, with a decline of 44.0% (95% UI 36.2 to 52.0) and 53.1% (95% UI 46.4 to 60.0) in the all-age and age-standardized DALYs rates, respectively. The shaded areas show the 95% confidence intervals. NRHD, non-rheumatic heart diseases; RHD, rheumatic heart diseases; SDI, Socio-demographic Index; UI, uncertainty interval.

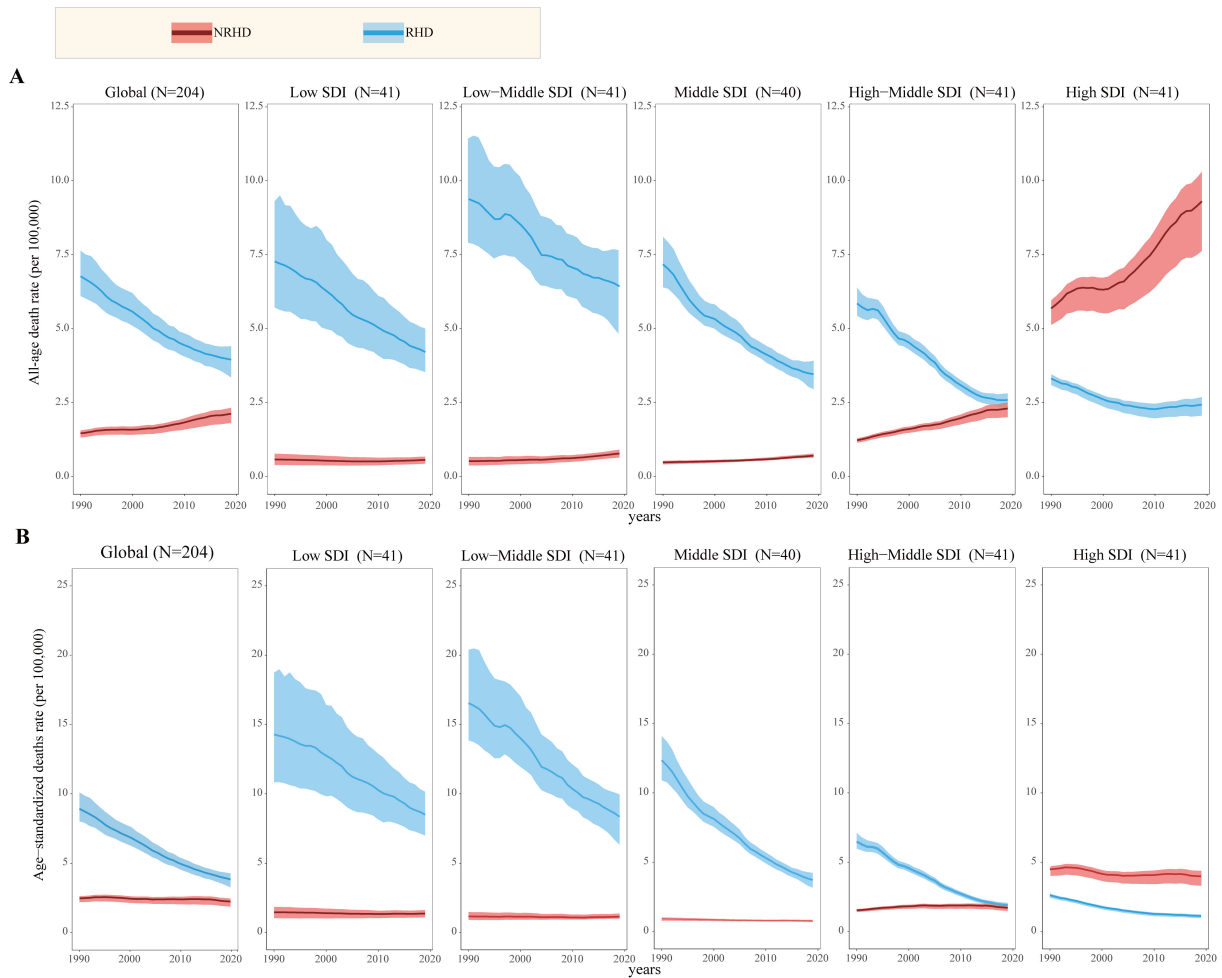


Figure S3. Changes in all-age death rate (A) and age-standardized death rate (B) of RHD and NRHD by SDI quintiles, 1990 to 2019. The death rates of RHD decreased dramatically in the past 30 years, with a decline of 41.6% (95% UI, 32.3 to 51.9) and 56.9% (95% UI 49.8 to 64.7) in the all-age and age-standardized death rates, respectively. The shaded areas show the 95% confidence intervals. NRHD, non-rheumatic heart diseases; RHD, rheumatic heart diseases; SDI, Socio-demographic Index; UI, uncertainty interval.

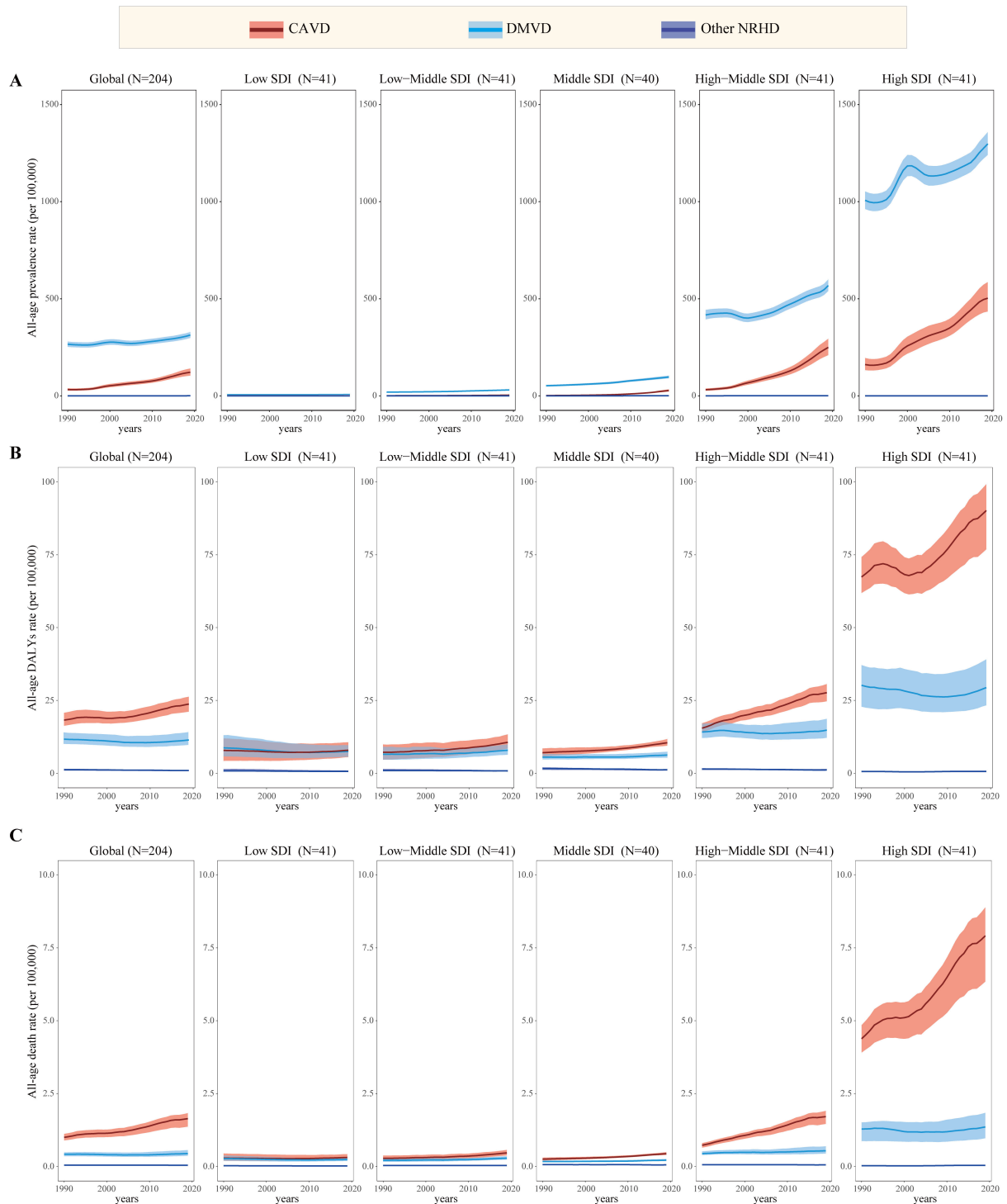


Figure S4. Changes in all-age prevalence rate (A), DALYs rate (B), and death rate (C) of three forms of NRHD by SDI quintiles, 1990 to 2019. For the all-age rates, although both DMVD and CAVD were increasingly prevalent, CAVD exhibited an obvious increase in DALYs and deaths, while DMVD was well controlled. The shaded areas show the 95% confidence intervals. CAVD, calcified aortic valve disease; DMVD, degenerative mitral valve disease; NRHD, non- rheumatic heart diseases; SDI, Socio-demographic Index.

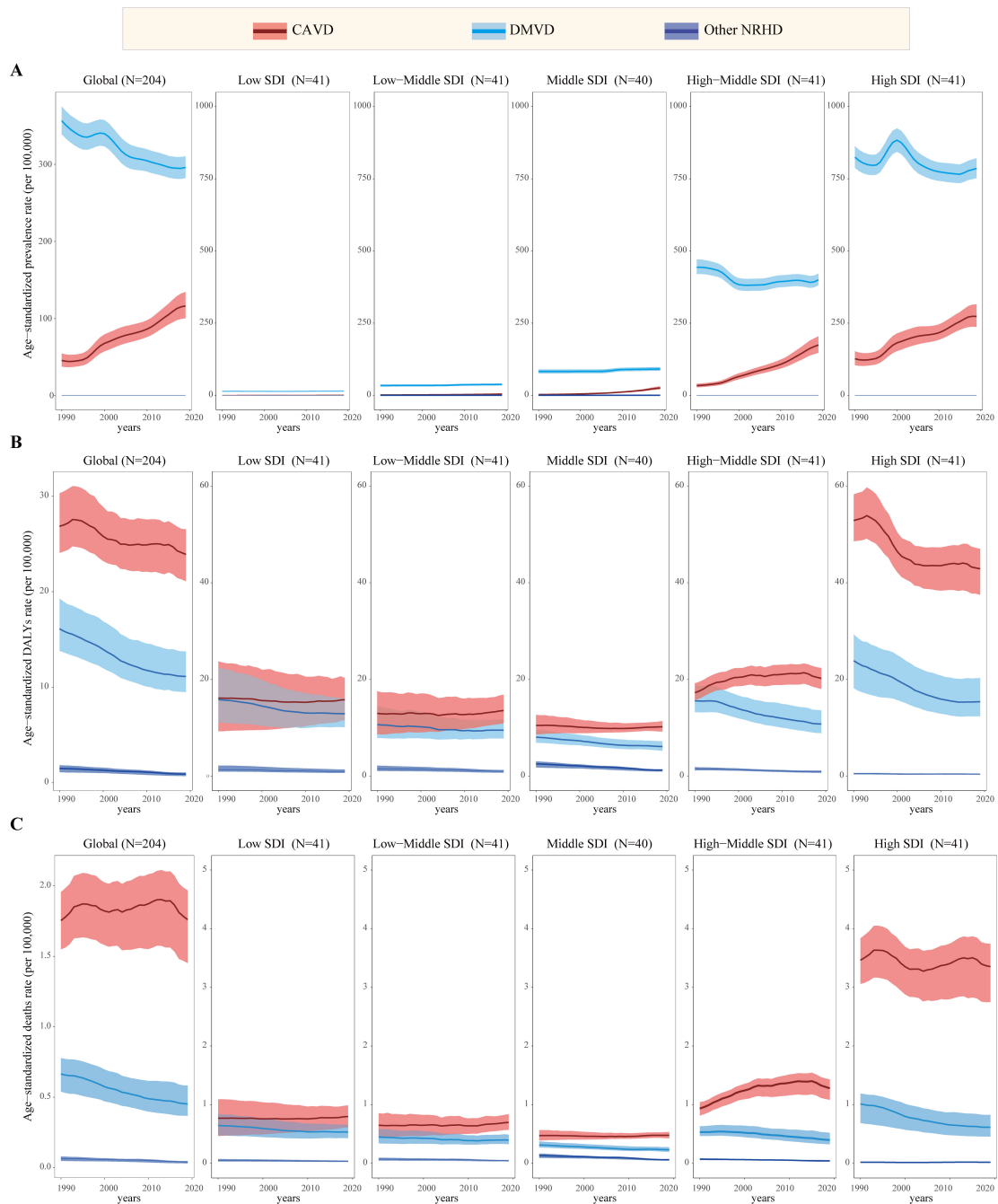


Figure S5. Changes in age-standardized prevalence rate (A), DALYs rate (B), and death rate (C) of three forms of non-rheumatic heart disease by SDI quintiles, 1990 to 2019. For the age-standardized rates, DMVD showed a decreasing trend in prevalence, DALYs, and death rates globally and in nearly all SDI regions. In contrast, CAVD exhibited an increased prevalence rate and not well-controlled DALYs and death rates globally and in most SDI regions, especially in high-middle and high SDI regions. The shaded areas show the 95% confidence intervals. CAVD, calcific aortic valve disease; DMVD, degenerative mitral valvular disease; SDI, Socio-demographic Index.

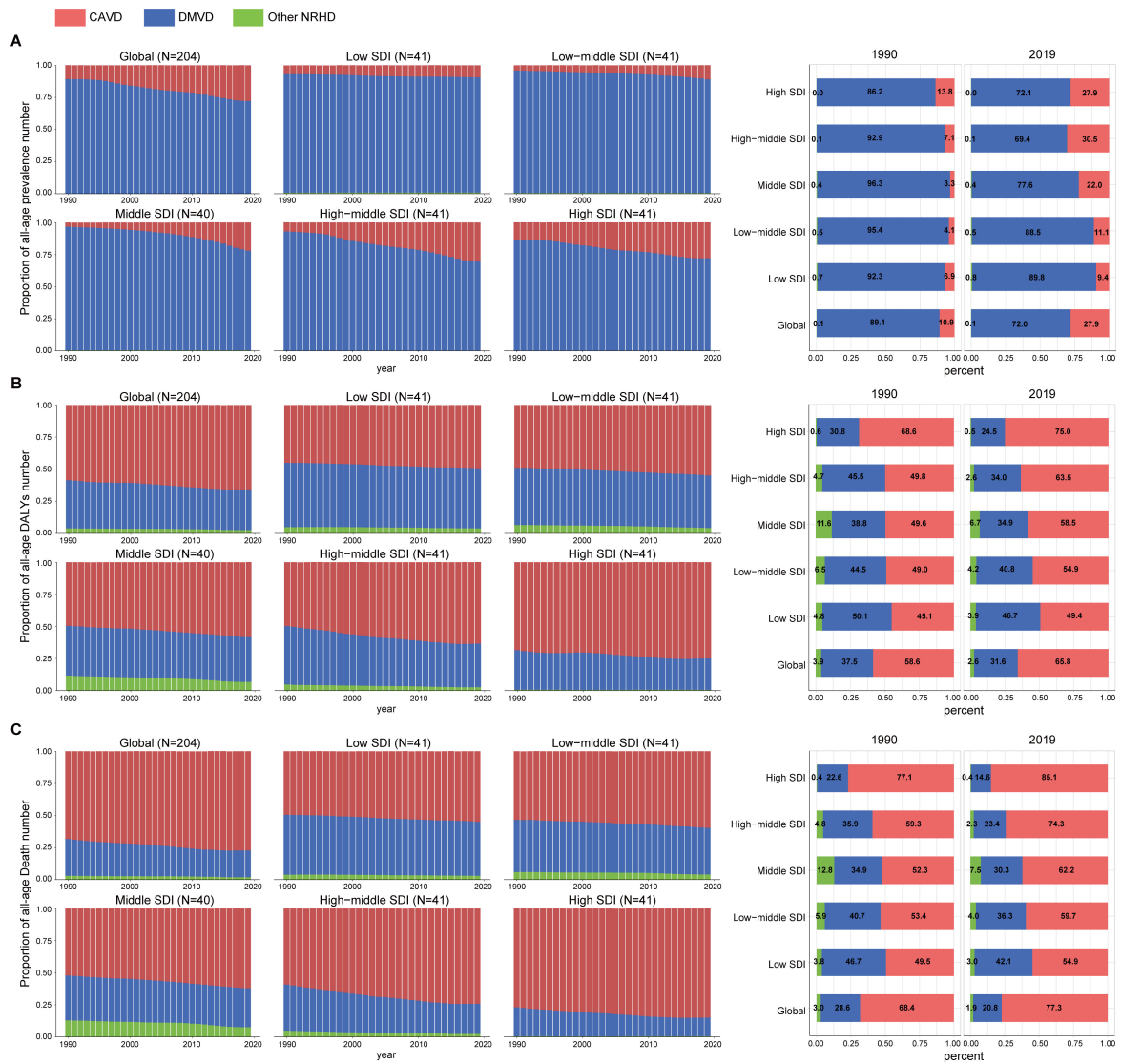


Figure S6. Relative proportion of three forms in prevalence rate (A), DALYs rate (B), and death rate (C) by SDI quintiles of NRHD, 1990 to 2019. (A) Although CAVD accounts for a lower prevalence percentage than DMVD, it showed an increasing tendency, from 11.3% in 1990 to 28.2% in 2019 on the global scale. **(B, C)** CAVD accounted for a higher percentage of DALYs and death numbers than DMVD, and the gap tended to increase further globally and in each SDI region. CAVD, calcified aortic valve disease; DMVD, degenerative mitral valve disease; NRHD, non- rheumatic heart diseases; SDI, Socio-demographic Index.

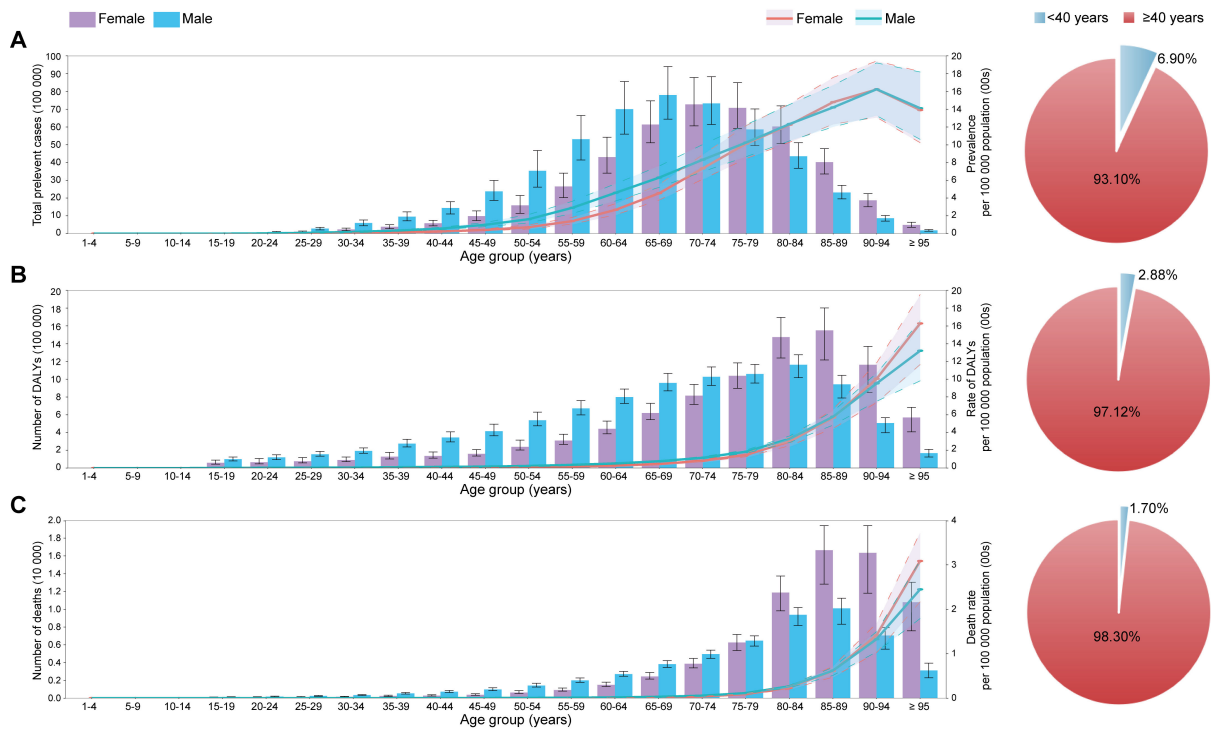


Figure S7. Number and rate of prevalence (A), DALYs (B), and death (C) of CAVD by age and sex in 2019 globally. The left panels show the numbers (bars with 95% uncertainty intervals) and rates (lines with 95% uncertainty intervals), and the right panel show the proportions for two age groups (<40 years and \geq 40 years). CAVD, calcific aortic valve disease.

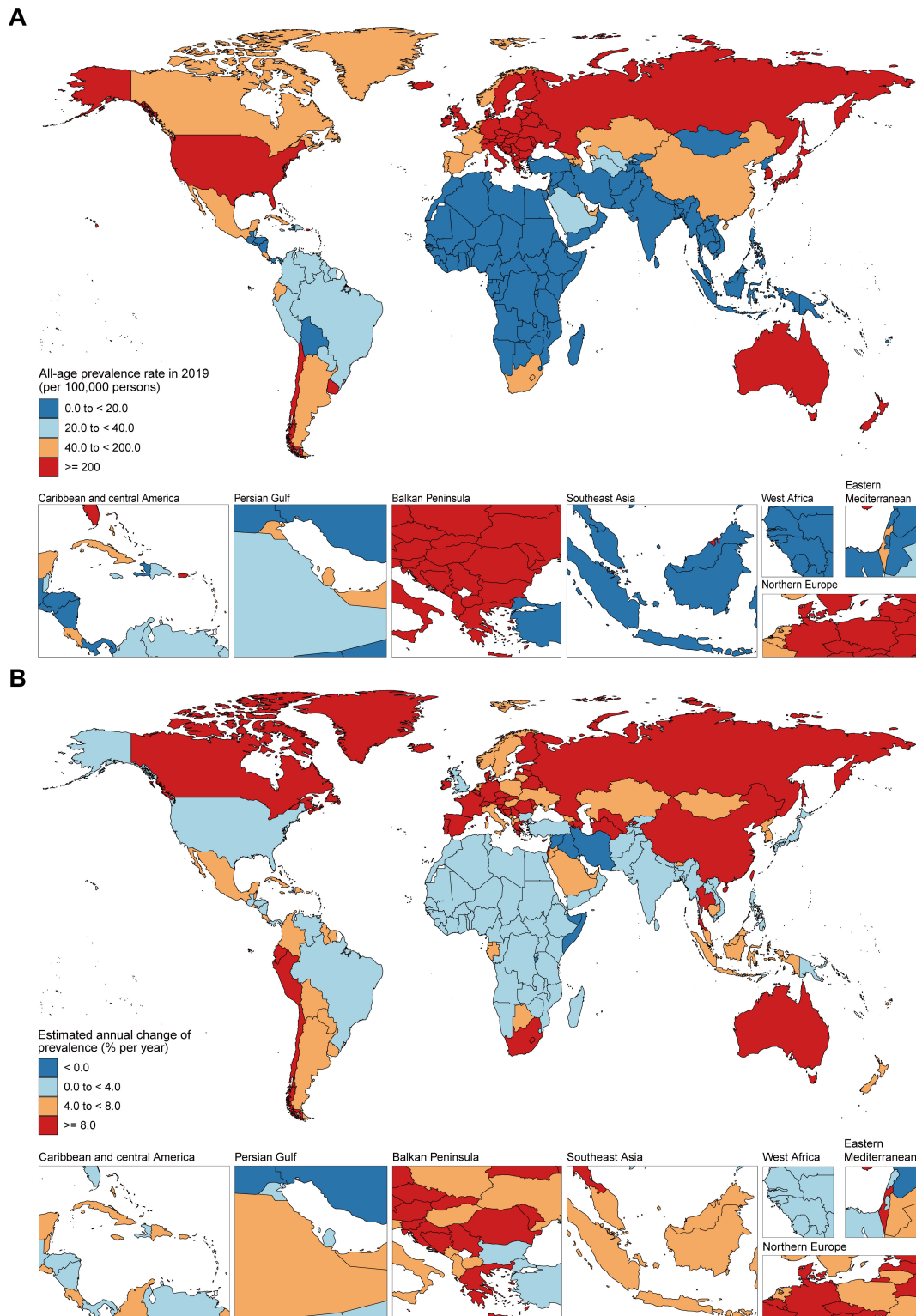


Figure S8. All-age prevalence rate in 2019 (A) and net drift of prevalence rate during 1990–2019 (B) for CAVD in 204 countries and territories. CAVD, calcific aortic valve disease.

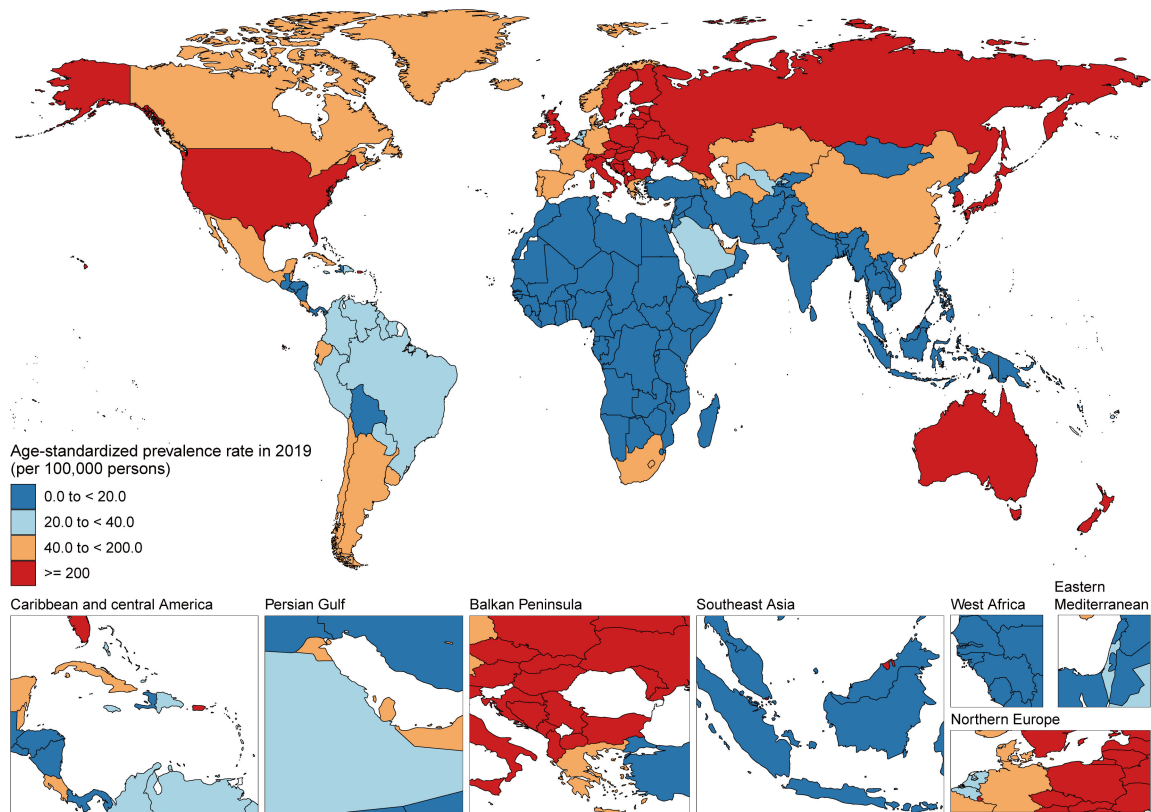


Figure S9. The age-standardized prevalence rate in 2019 for CAVD in 204 countries and territories. CAVD, calcific aortic valve disease.

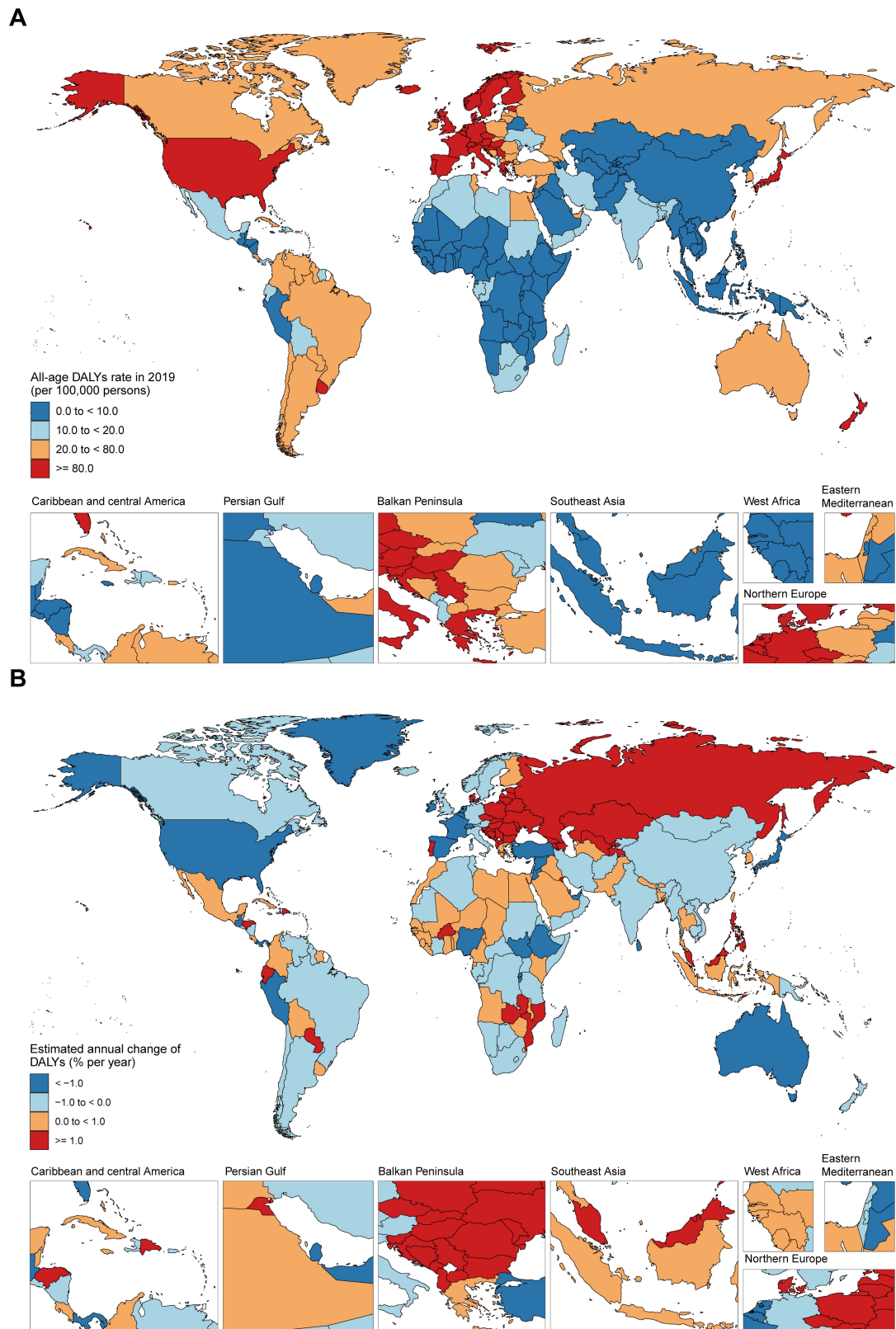


Figure S10. All-age DALYs rate in 2019 (A) and net drift of DALYs rate during 1990–2019 (B) for CAVD in 204 countries and territories. CAVD, calcific aortic valve disease.

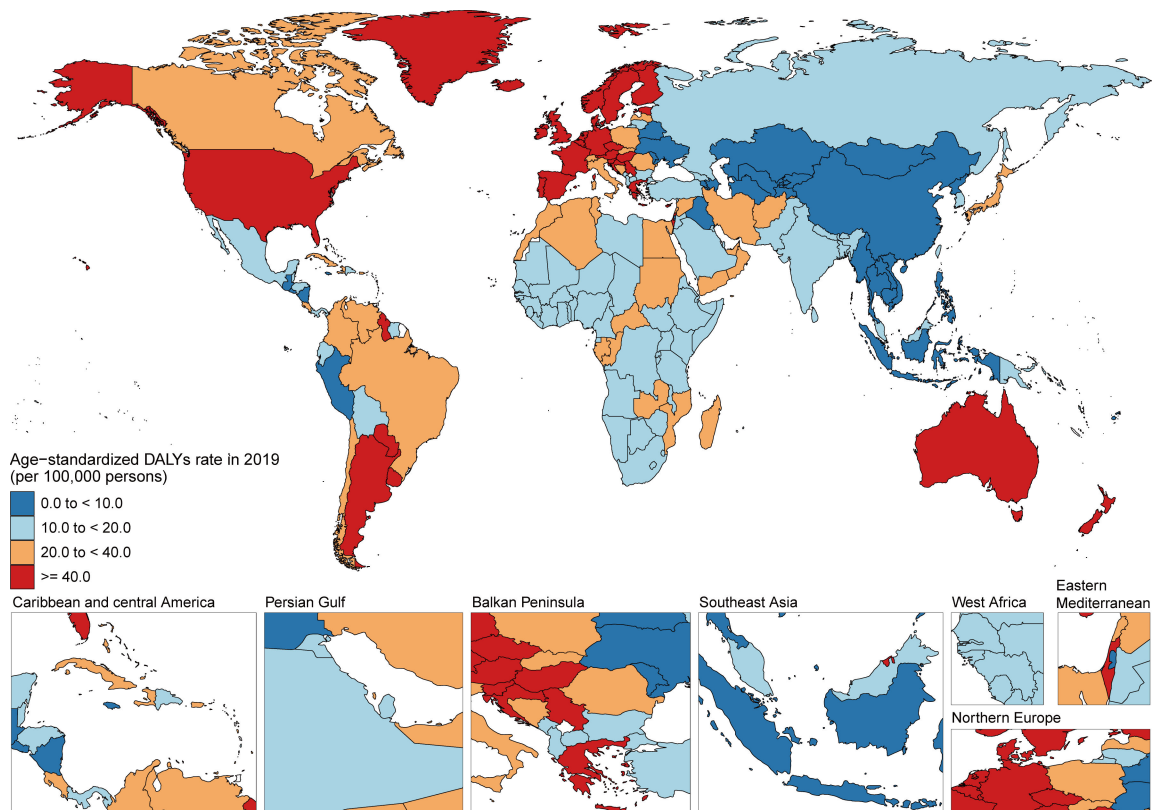


Figure S11. The age-standardized DALYs rate in 2019 for CAVD in 204 countries and territories. CAVD, calcific aortic valve disease.

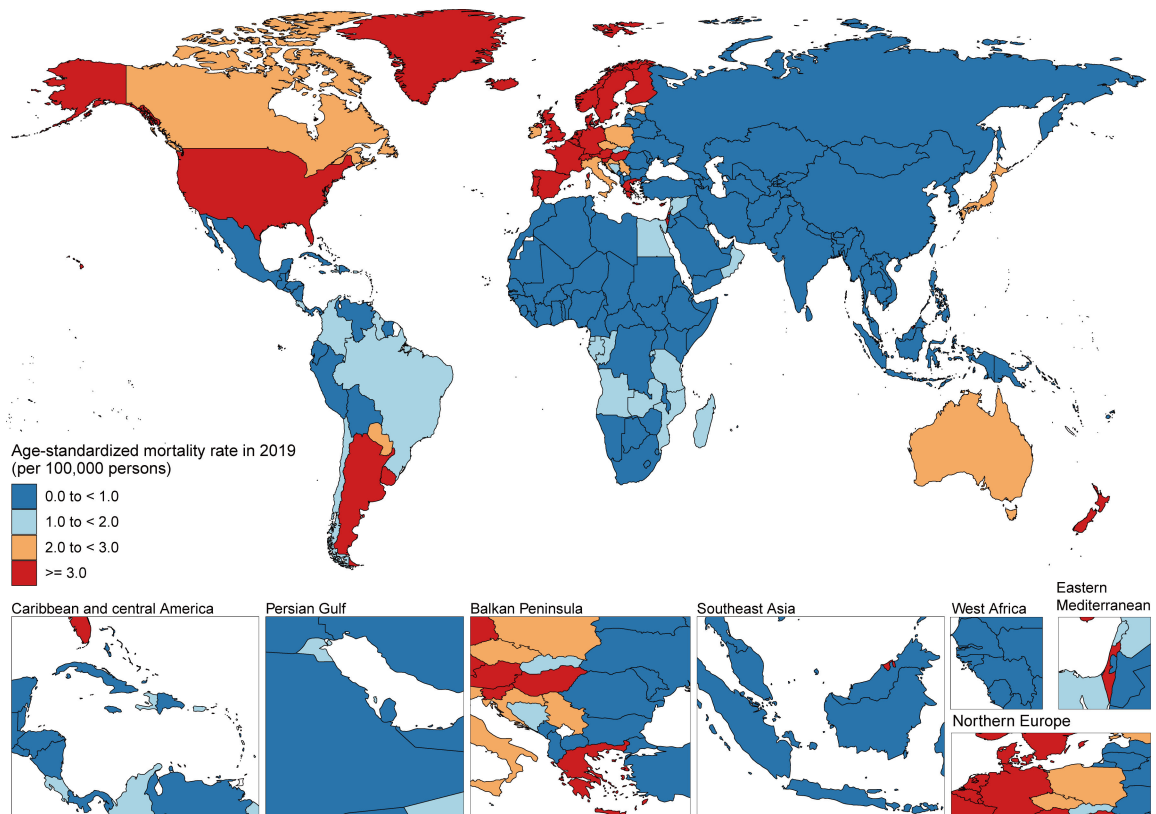


Figure S12. The age-standardized death rate in 2019 for CAVD in 204 countries and territories. CAVD, calcific aortic valve disease.

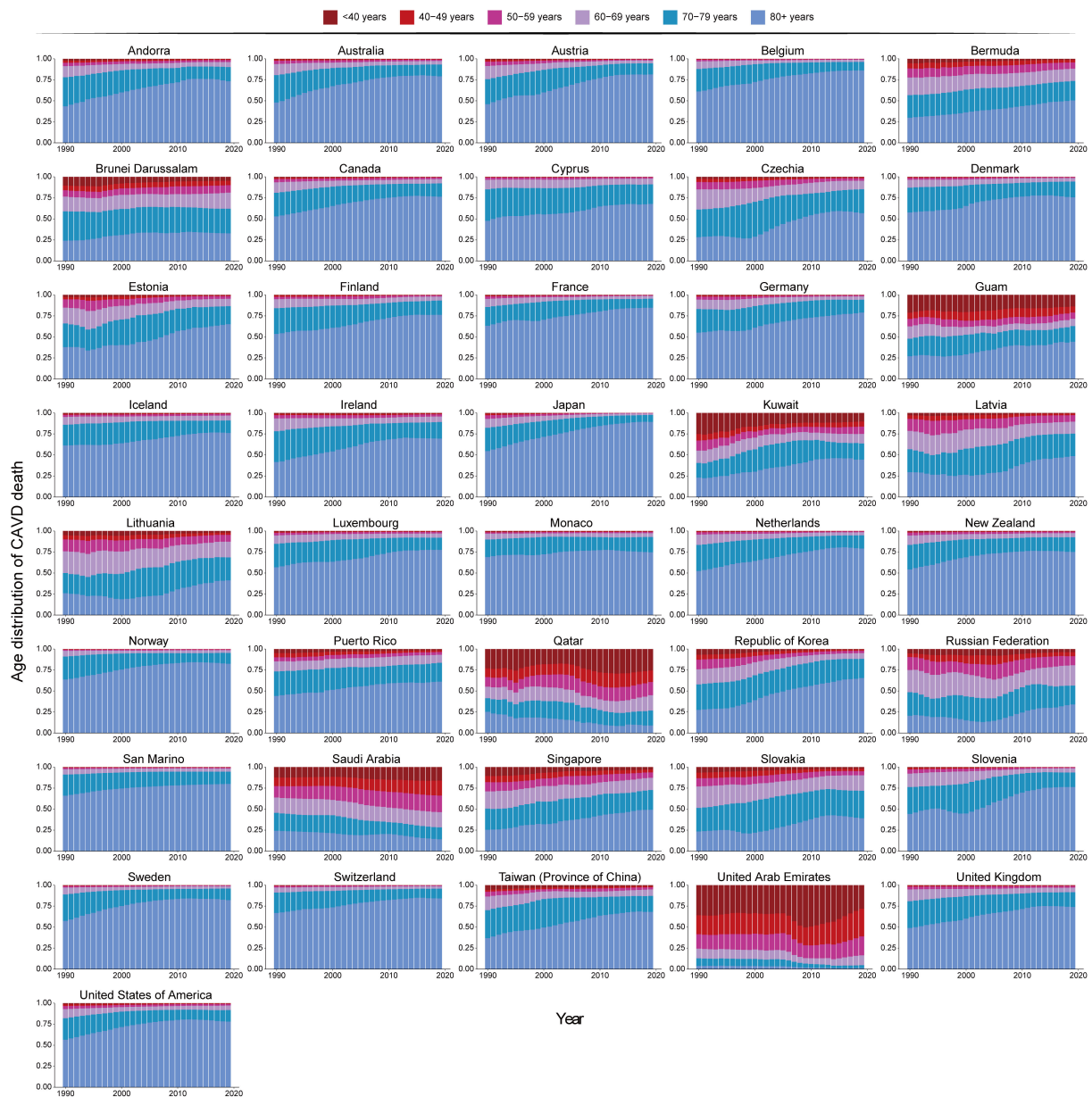


Figure S13. Age distribution of deaths from CAVD in high SDI countries, 1990-2019.
CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

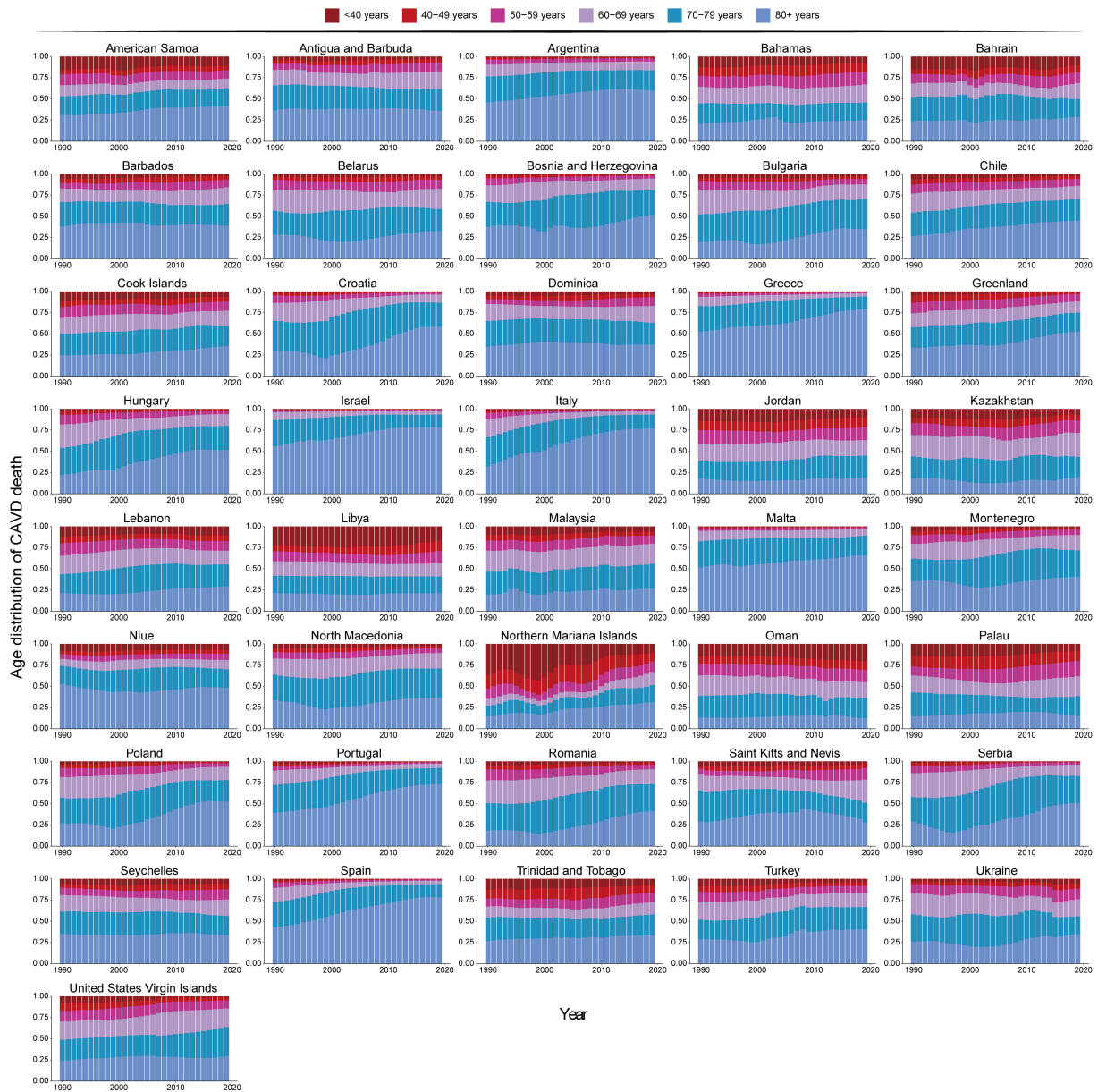


Figure S14. Age distribution of deaths from CAVD in high-middle SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

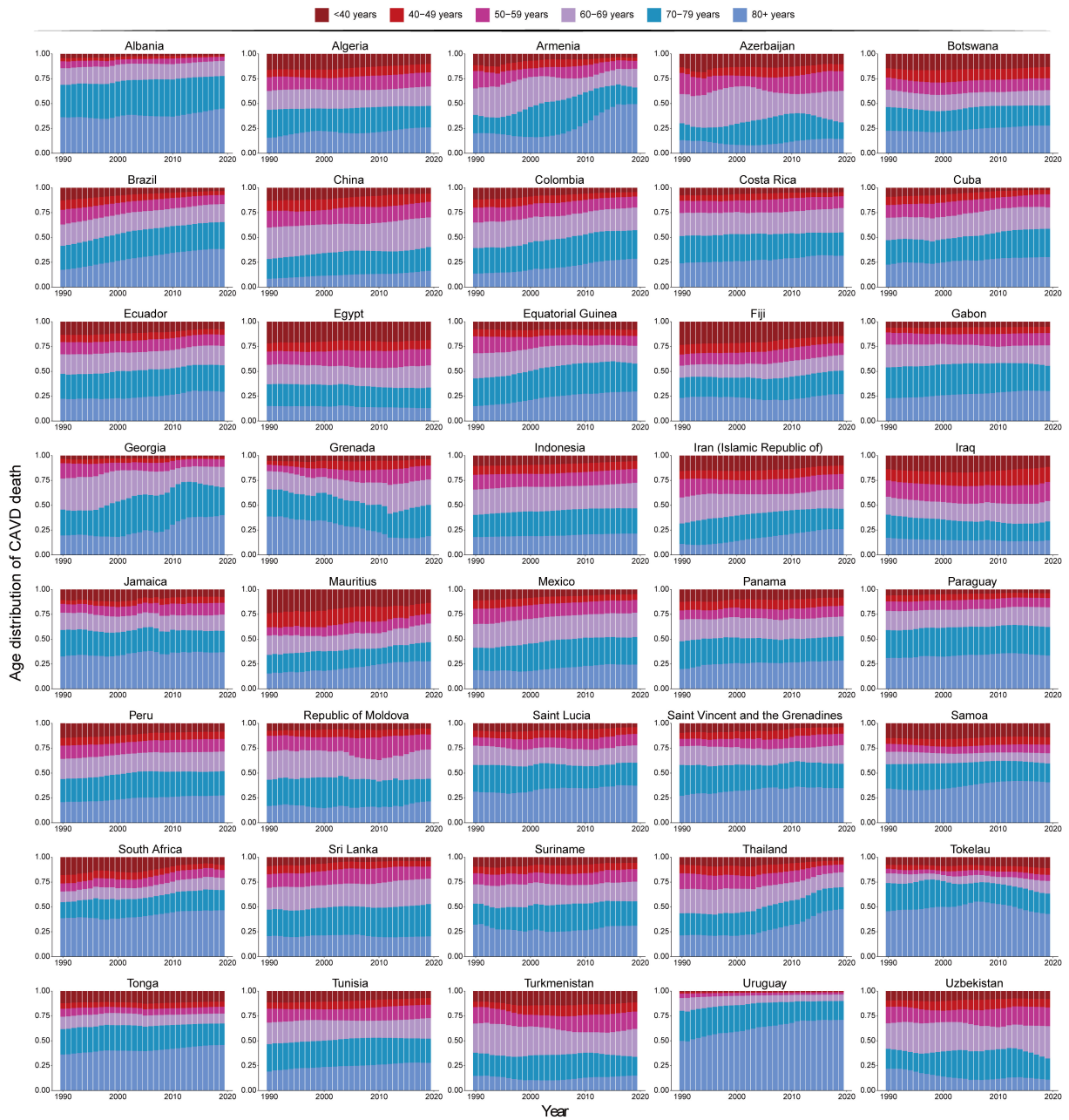


Figure S15. Age distribution of deaths from CAVD in middle SDI countries, 1990-2019.

CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

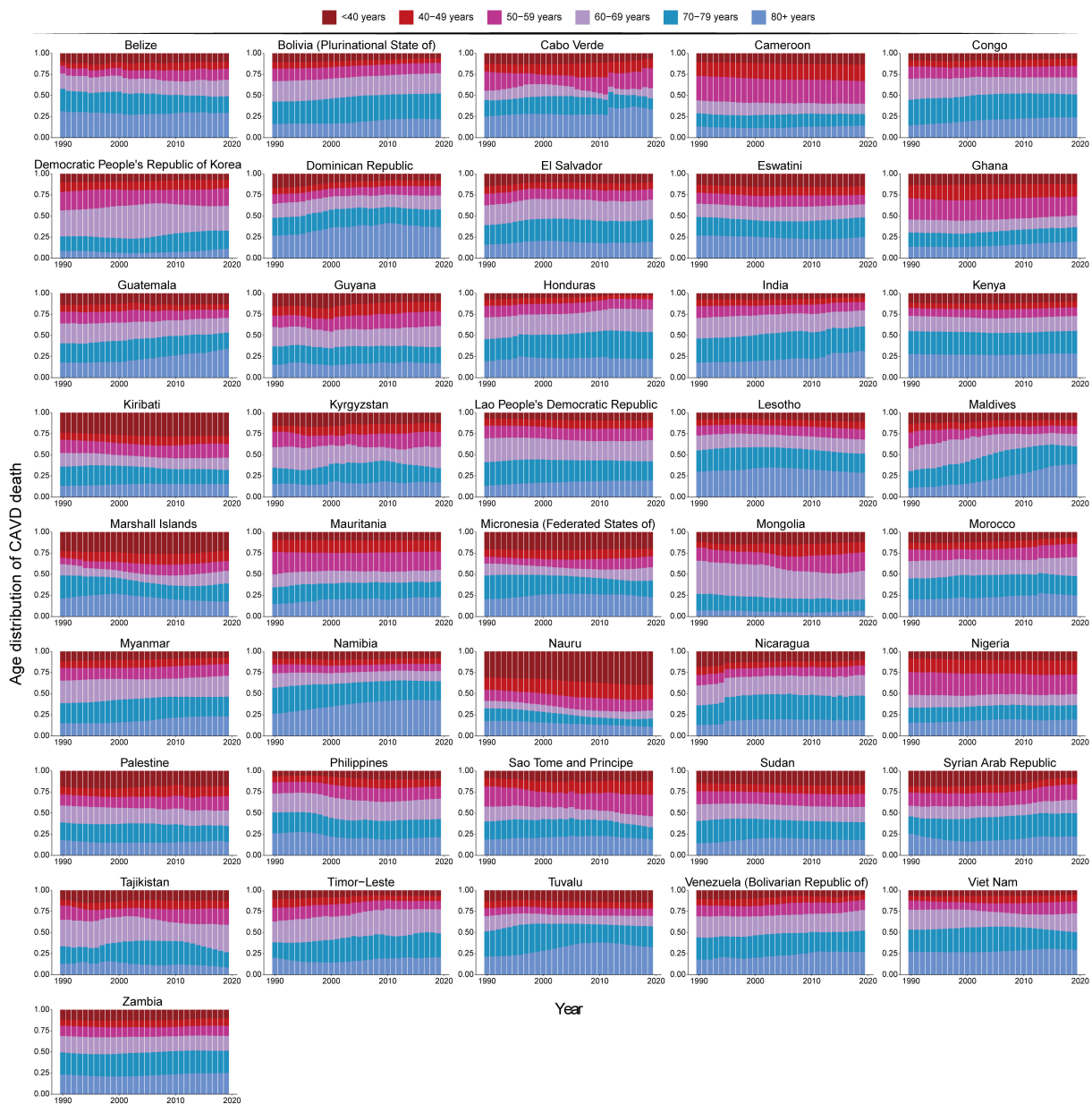


Figure S16. Age distribution of deaths from CAVD in low-middle SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.



Figure S17. Age distribution of deaths from CAVD in low SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

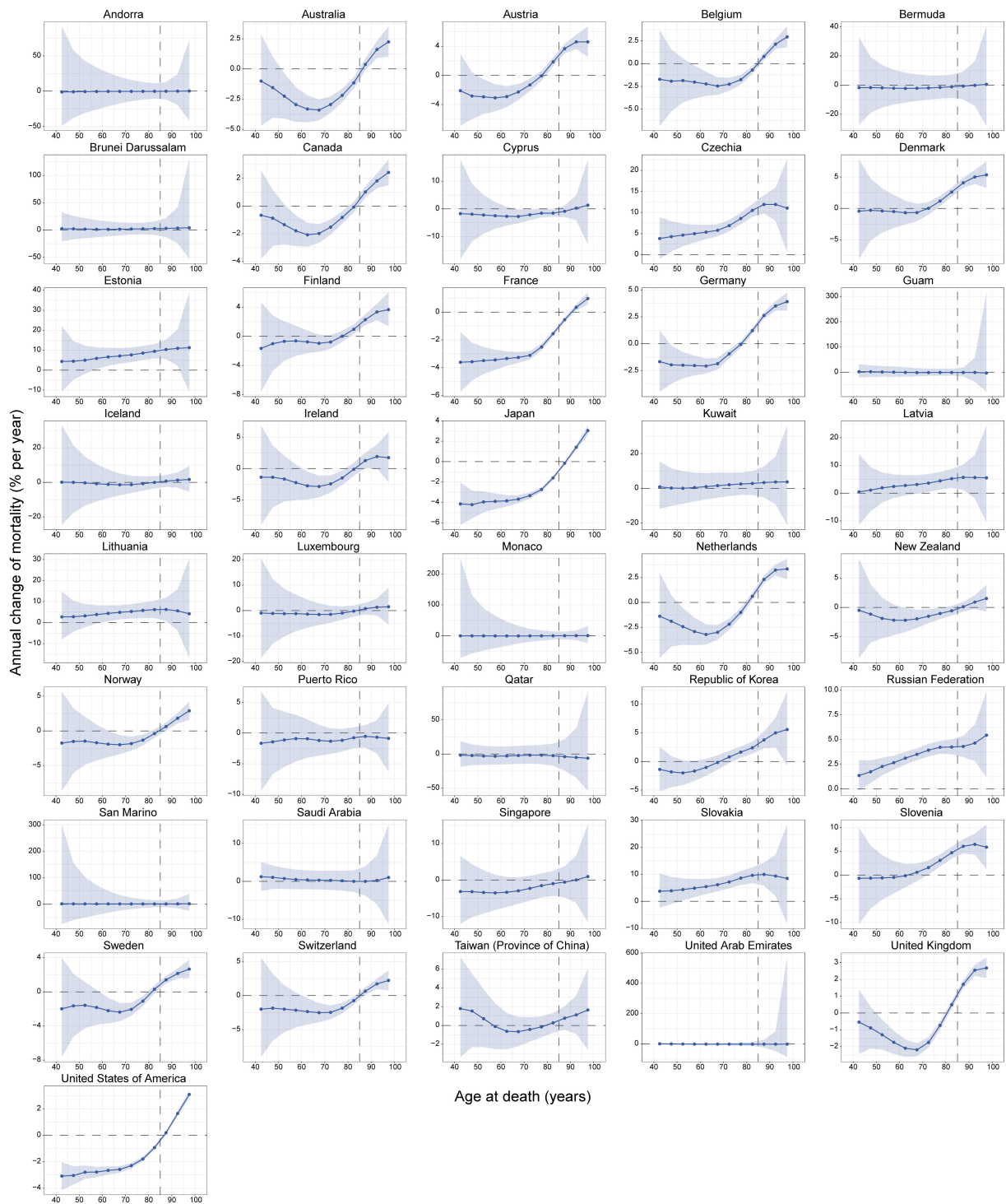


Figure S18. The local drifts of CAVD mortality in high SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

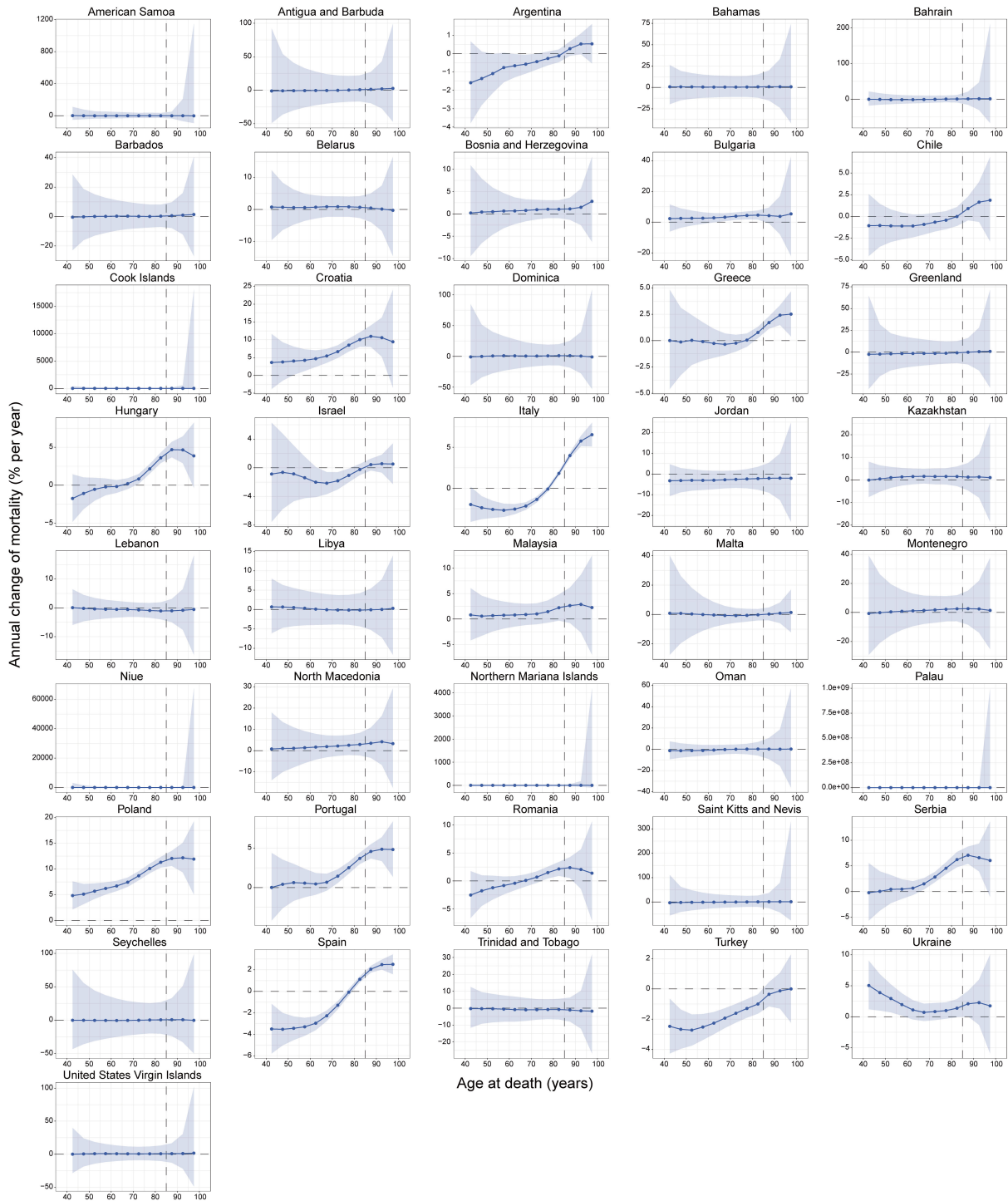


Figure S19. The local drifts of CAVD mortality in high-middle SDI countries, 1990-2019.
 CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

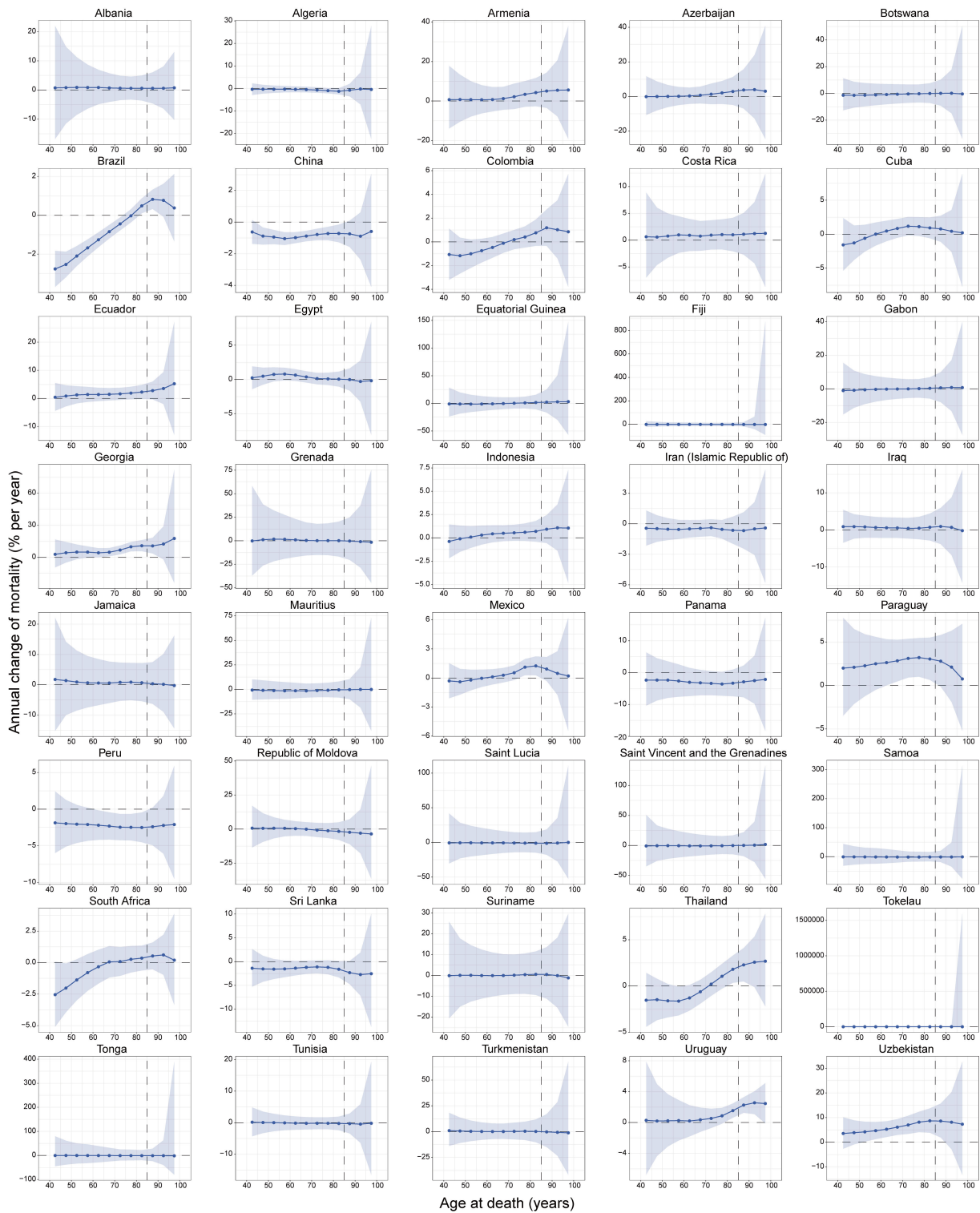


Figure S20. The local drifts of CAVD mortality in middle SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

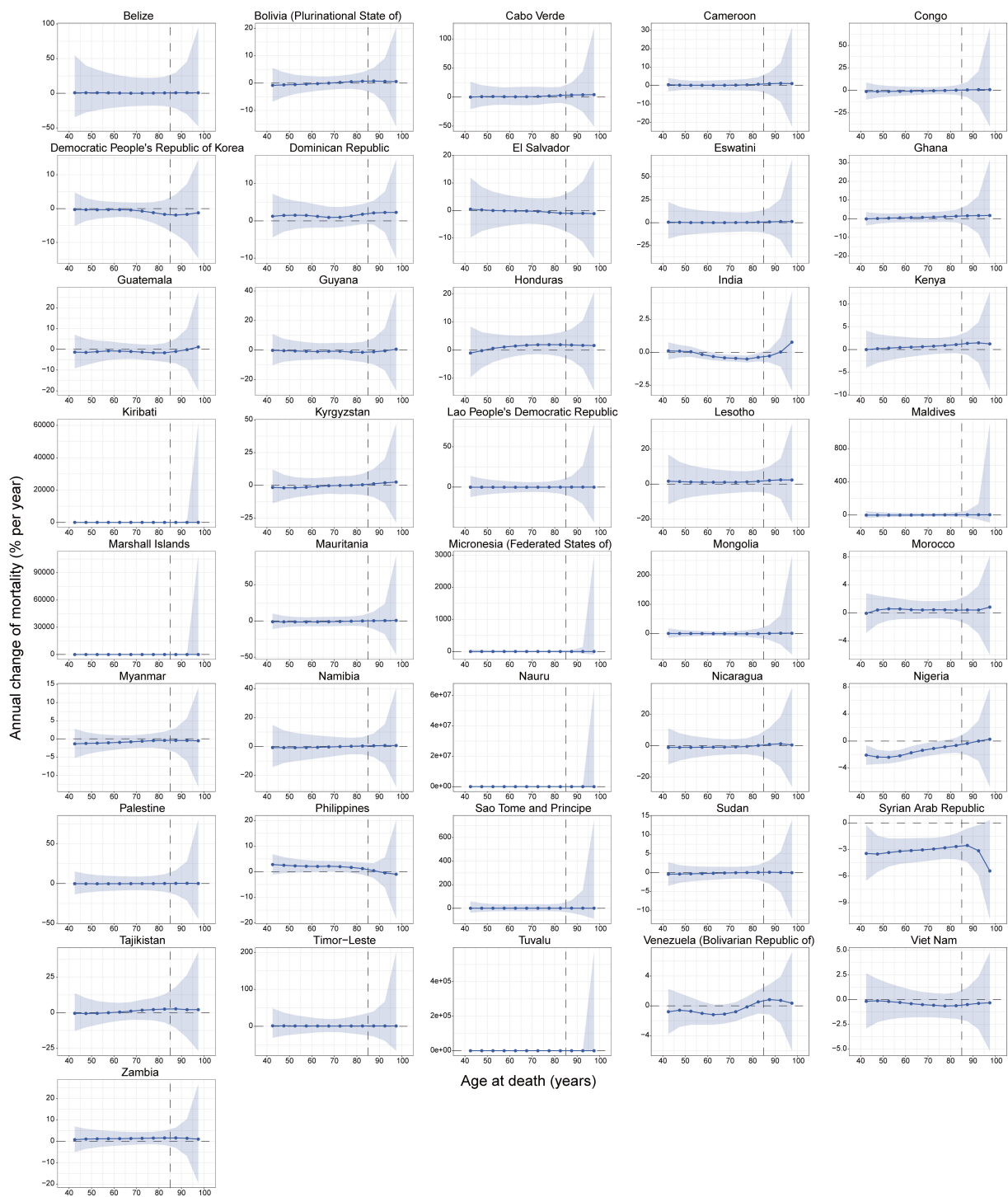


Figure S21. The local drifts of CAVD mortality in low-middle SDI countries, 1990-2019.
 CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

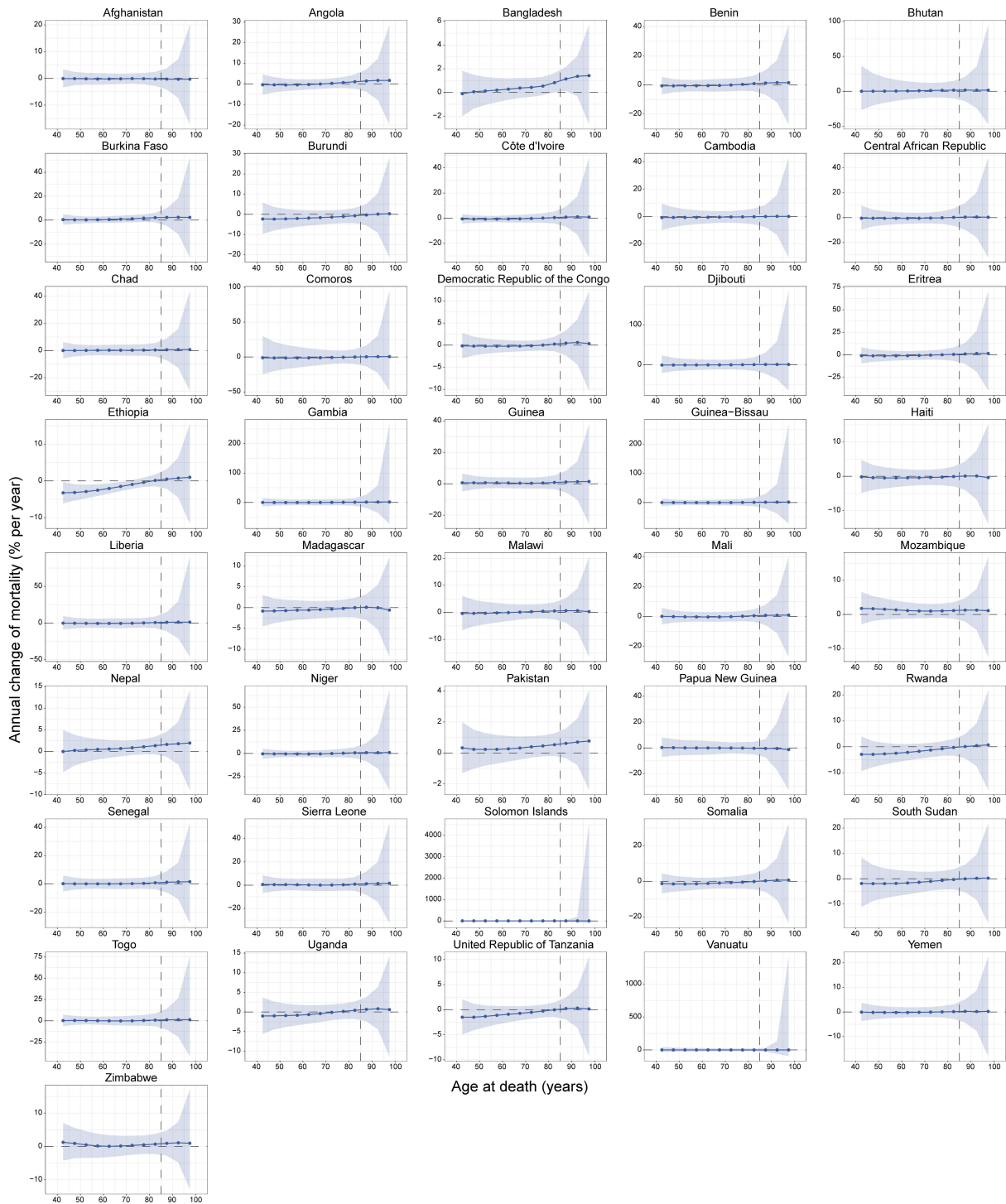


Figure S22. The local drifts of CAVD mortality in low SDI countries, 1990-2019. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

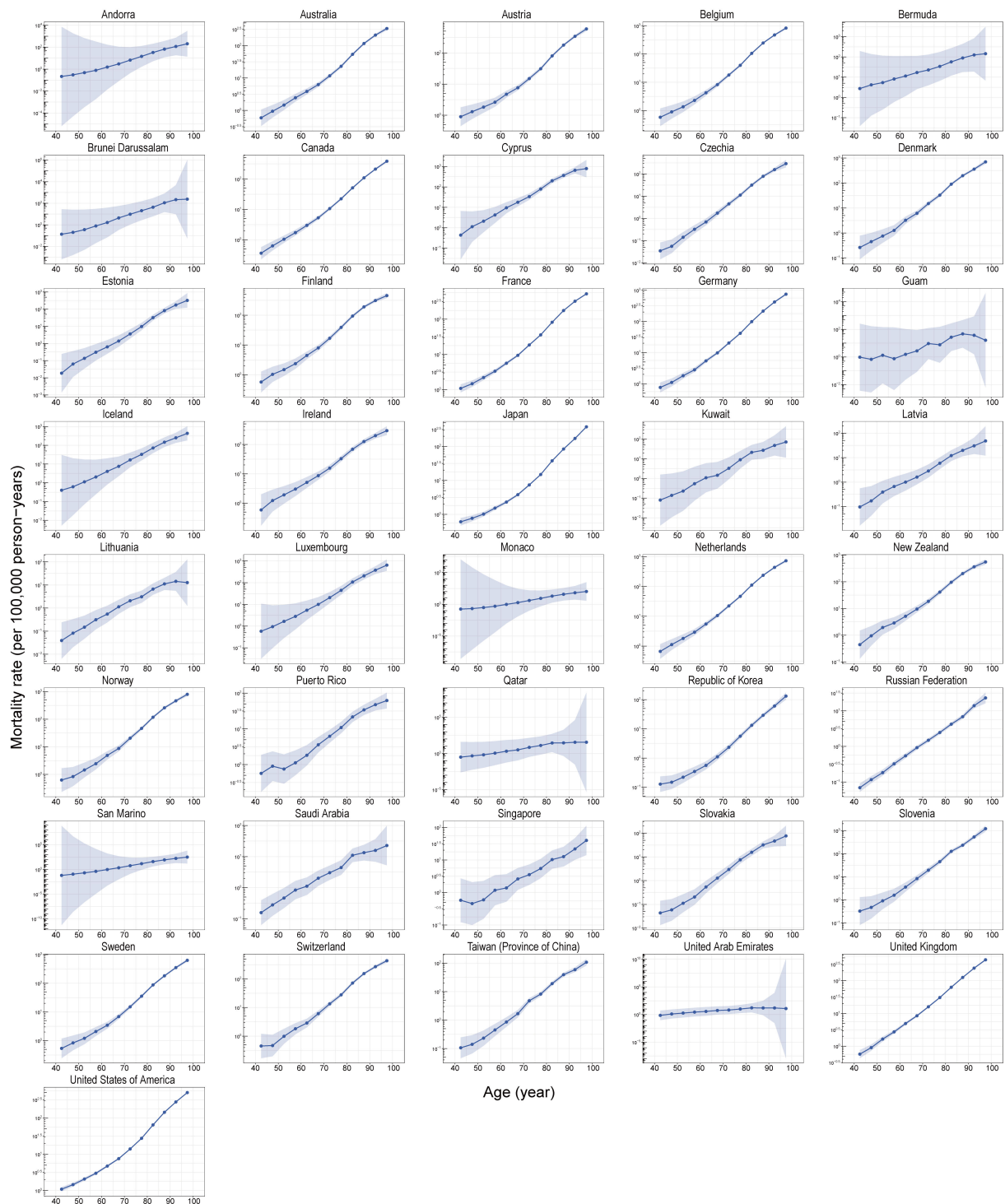


Figure S23. Age effects on CAVD mortality in high SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

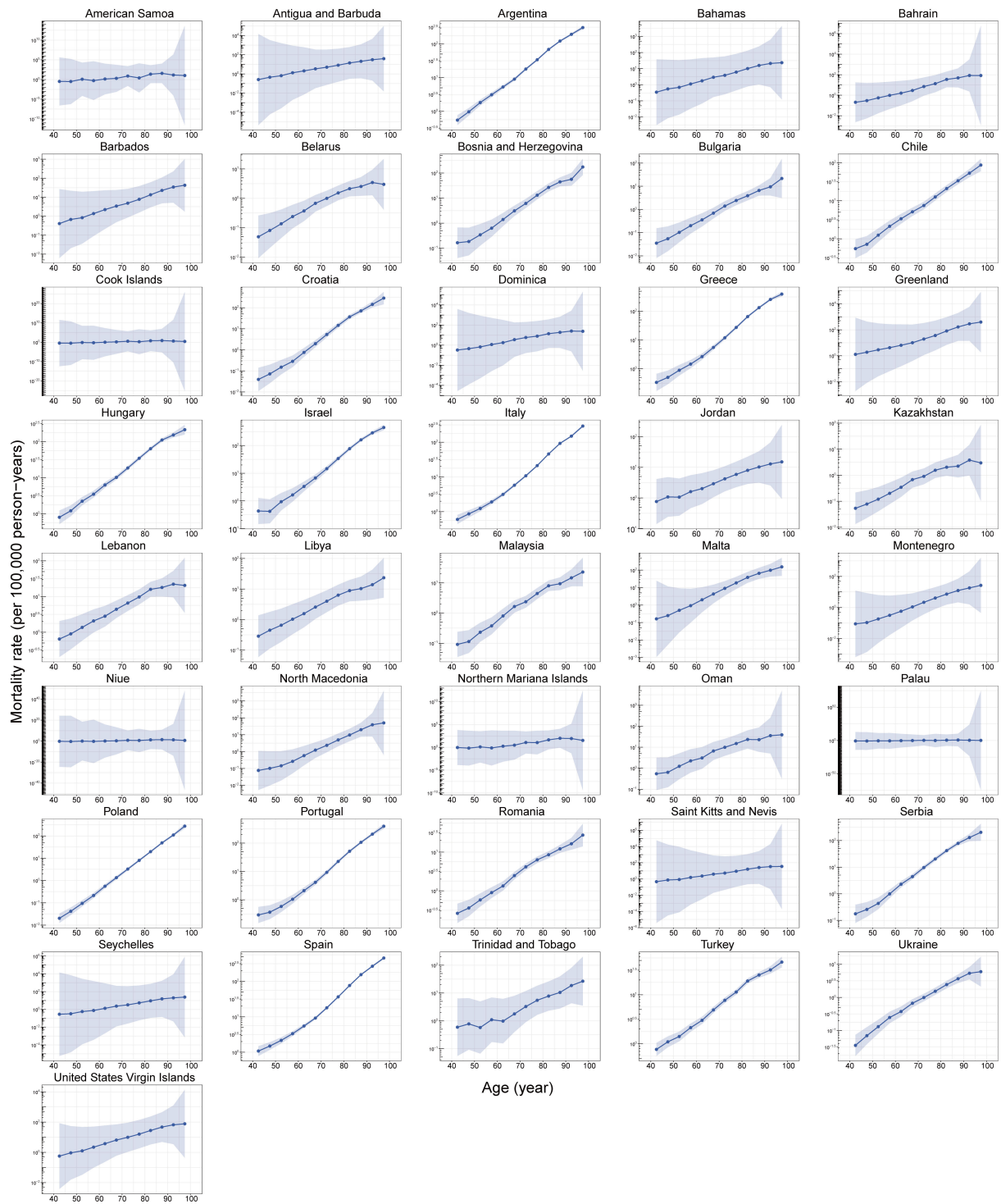


Figure S24. Age effects on CAVD mortality in high-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.



Figure S25. Age effects on CAVD mortality in middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

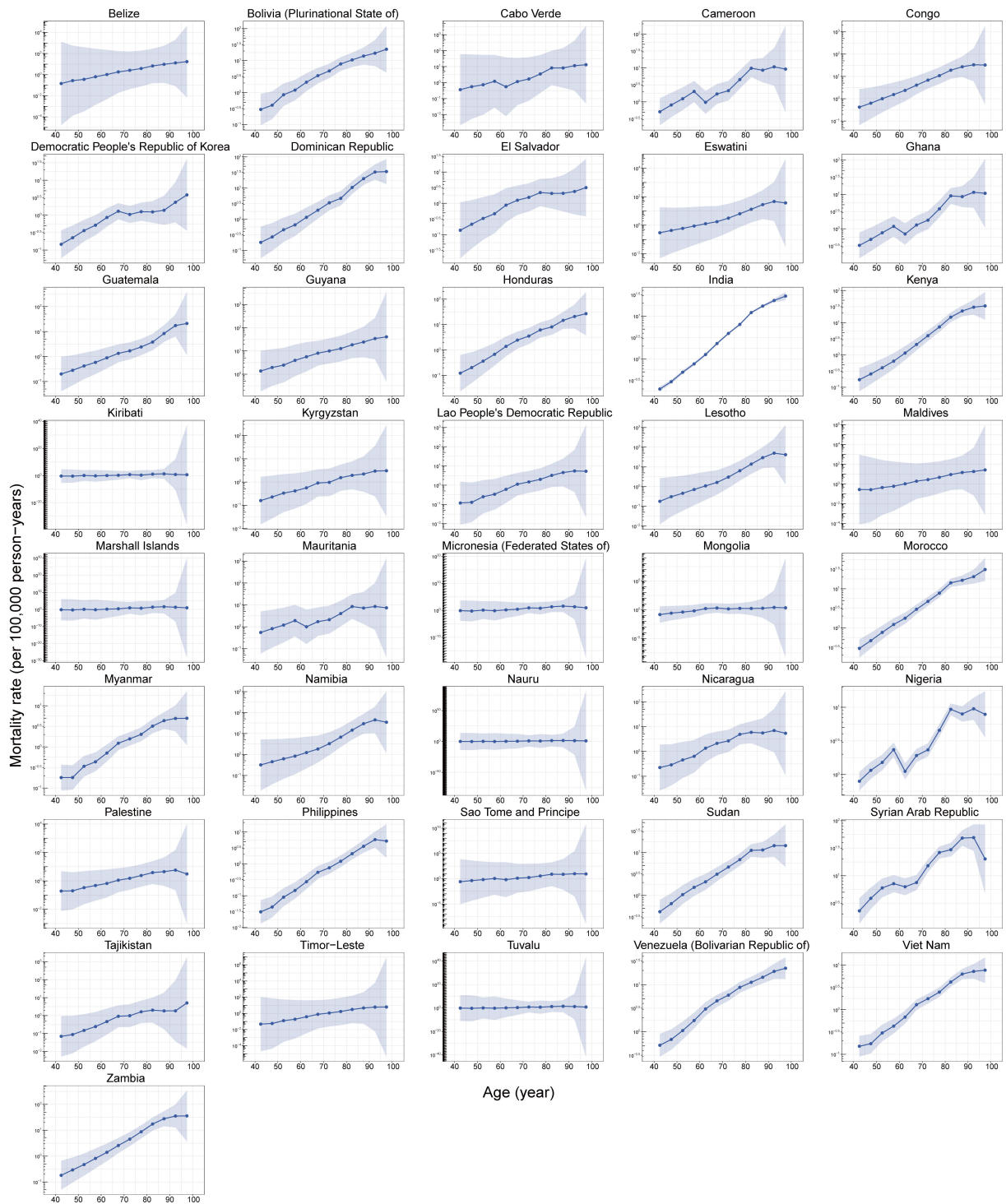


Figure S26. Age effects on CAVD mortality in low-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

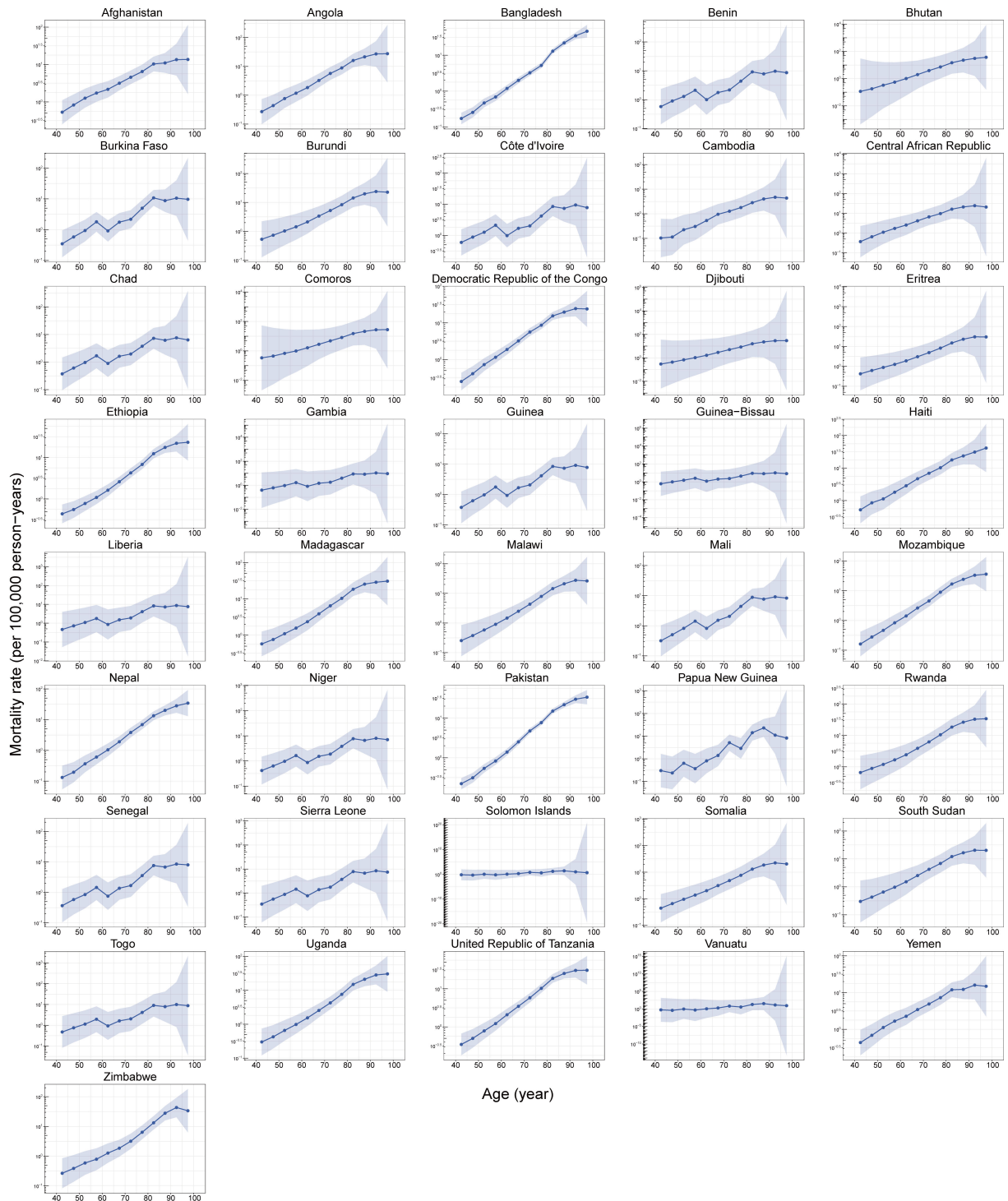


Figure S27. Age effects on CAVD mortality in low SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

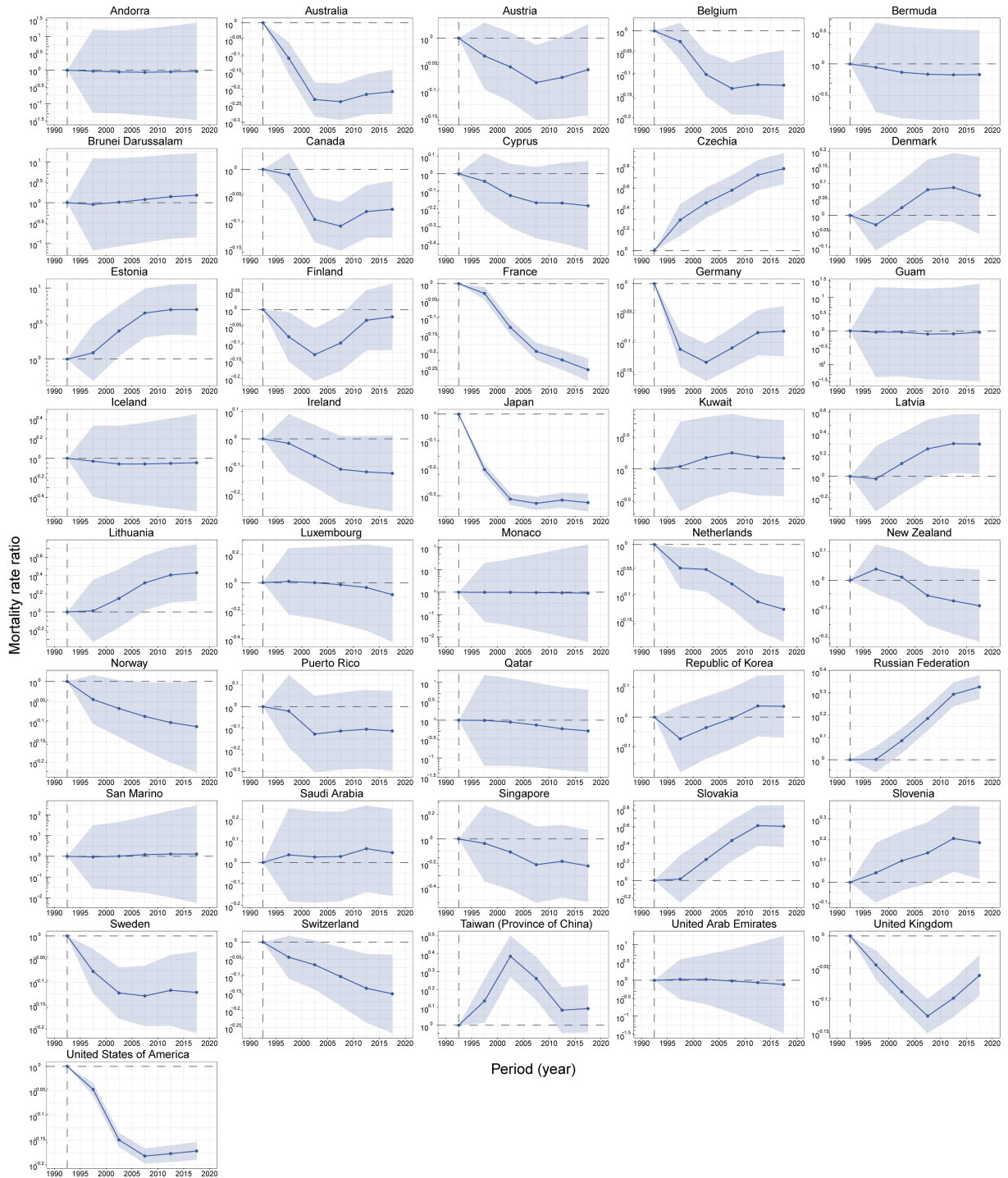


Figure S28. Period effects on CAVD mortality in high SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

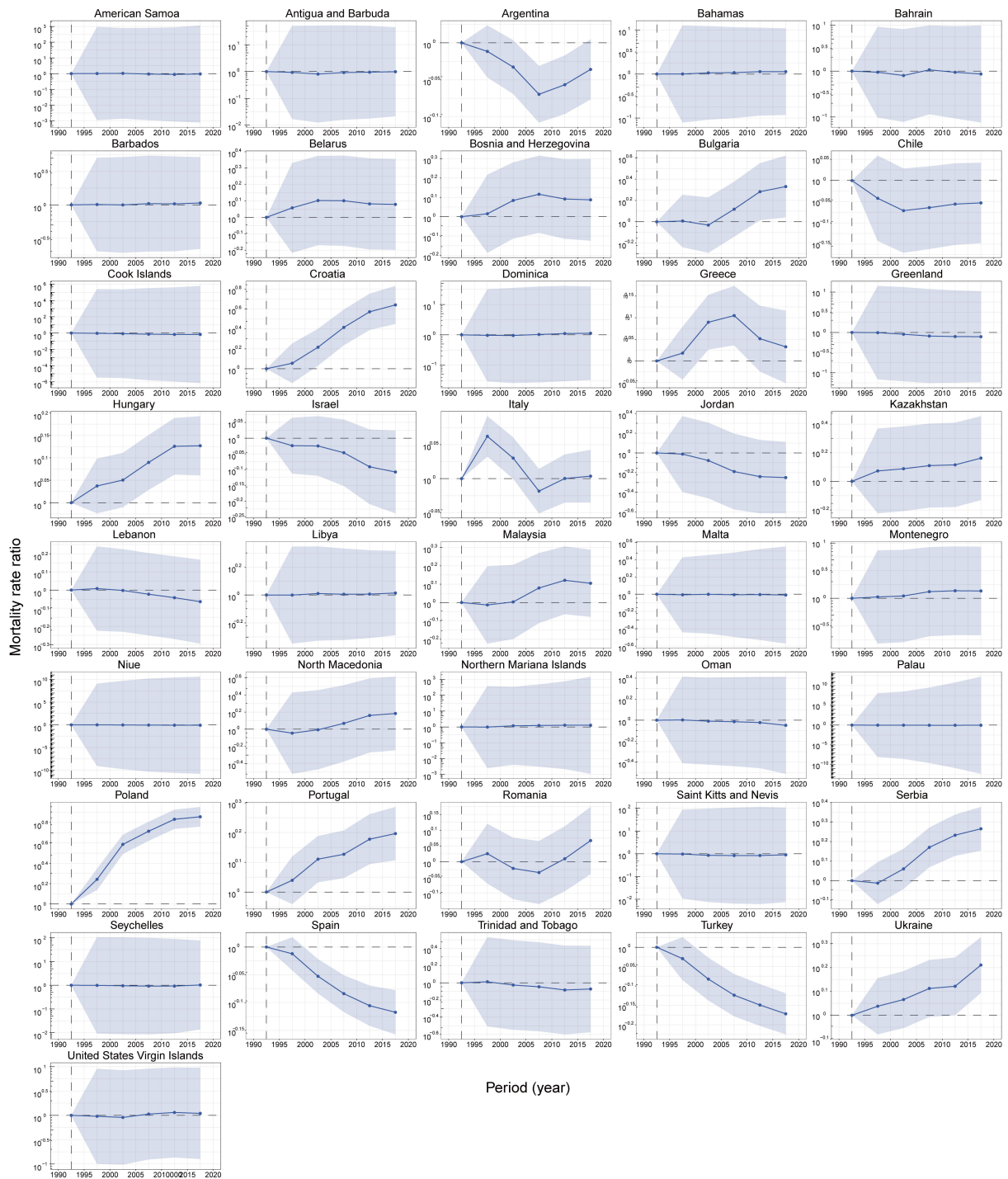


Figure S29. Period effects on CAVD mortality in high-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

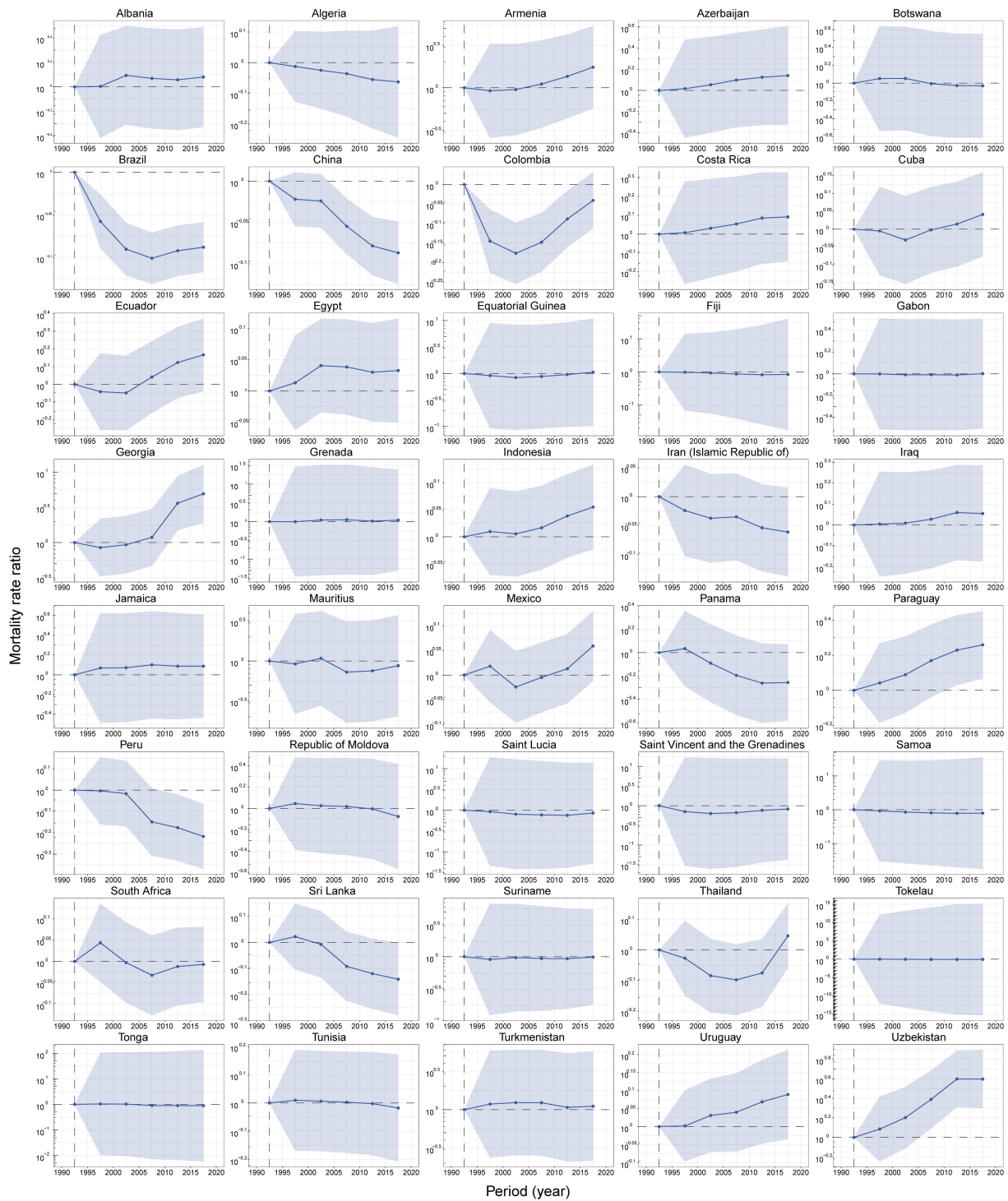


Figure S30. Period effects on CAVD mortality in middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

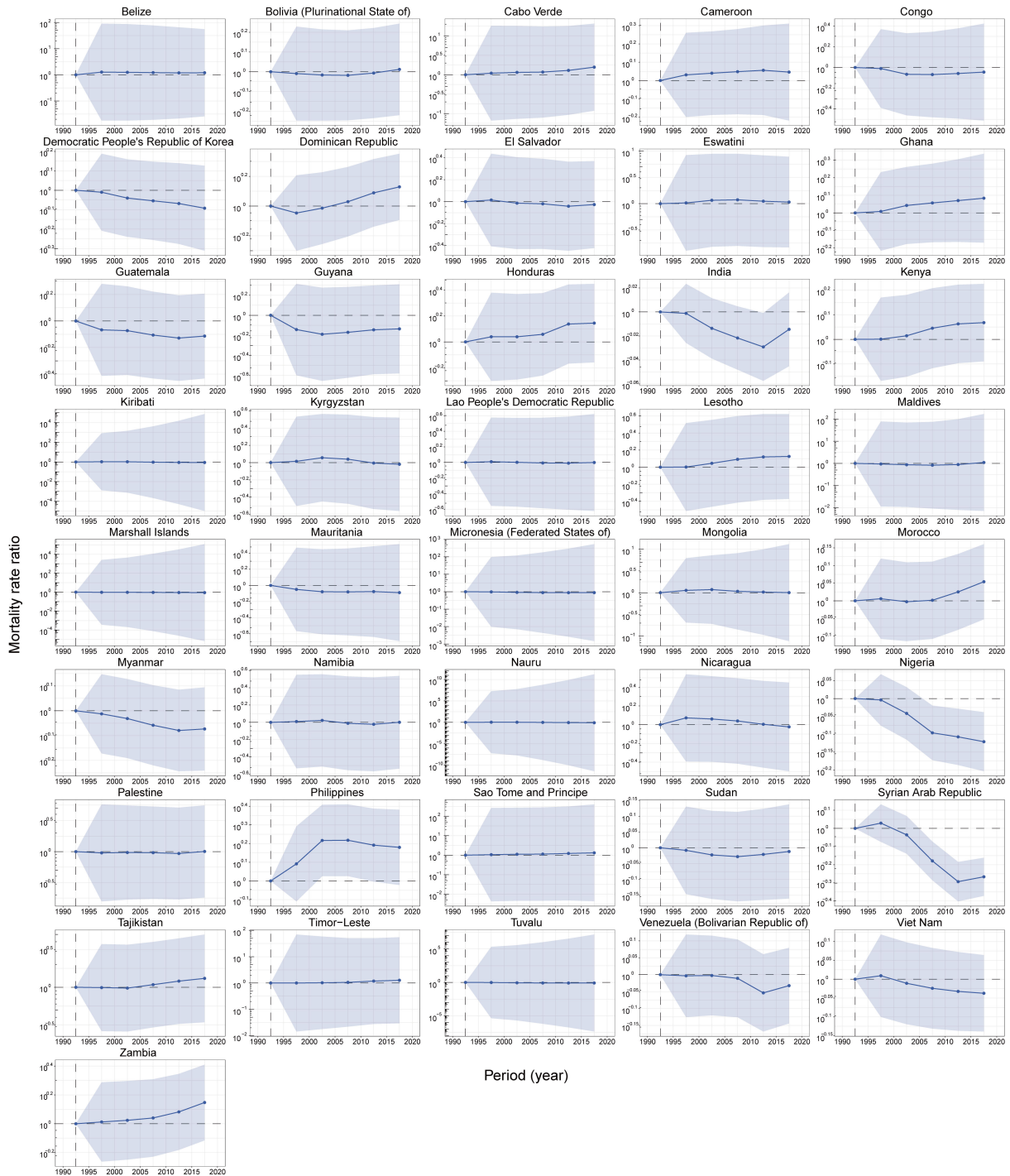


Figure S31. Period effects on CAVD mortality in low-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

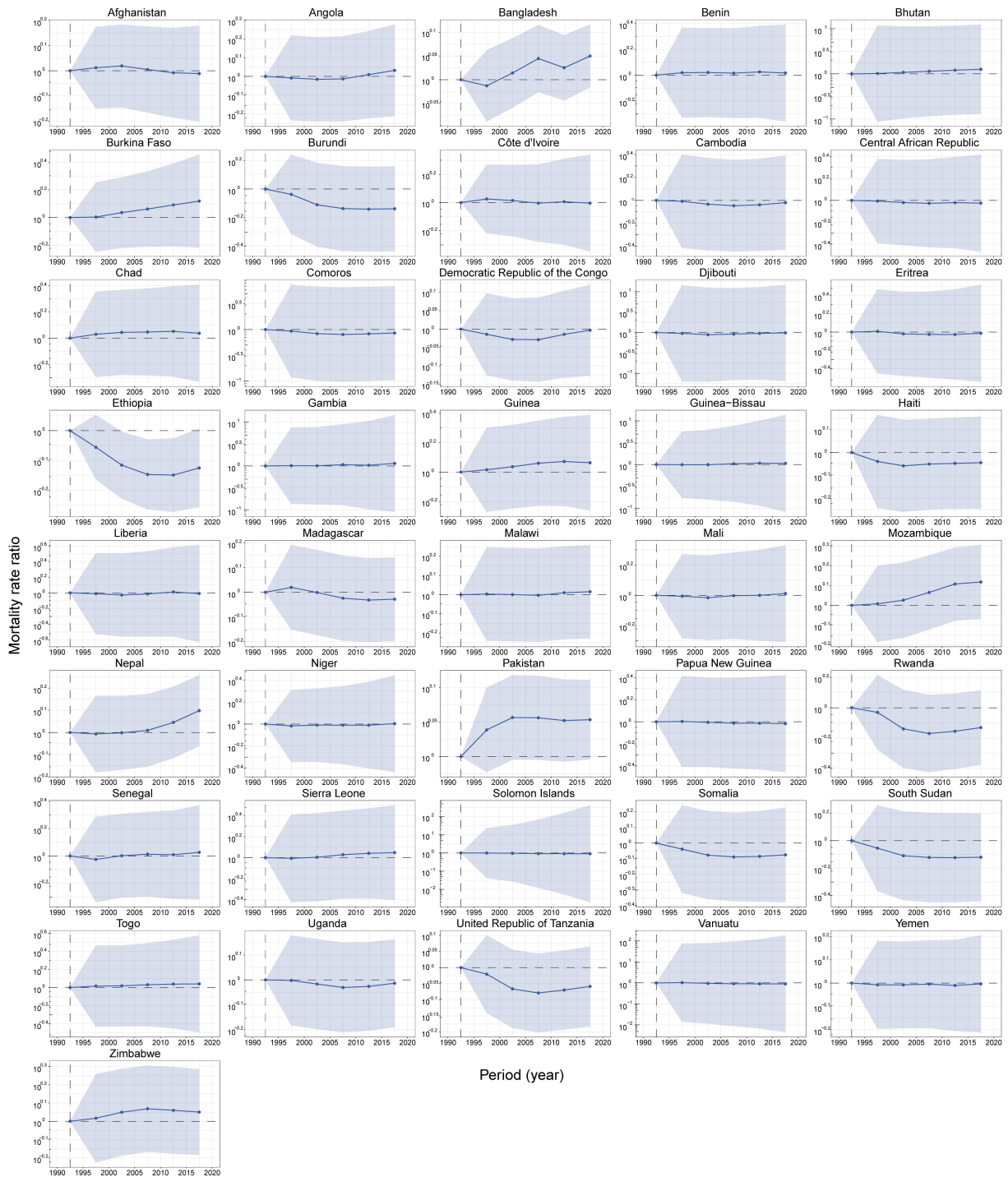


Figure S32. Period effects on CAVD mortality in low SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

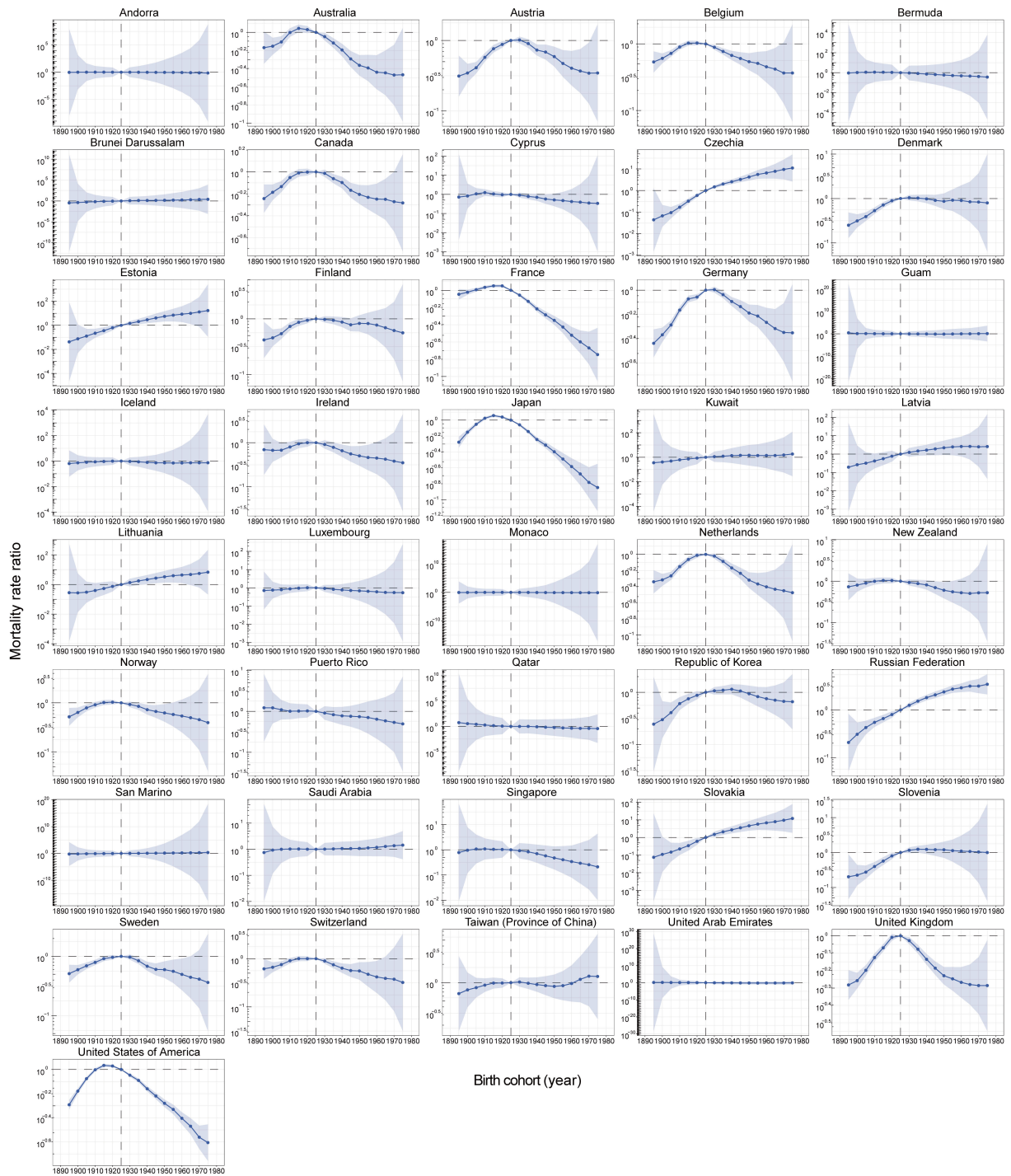


Figure S33. Cohort effects on CAVD mortality in high SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

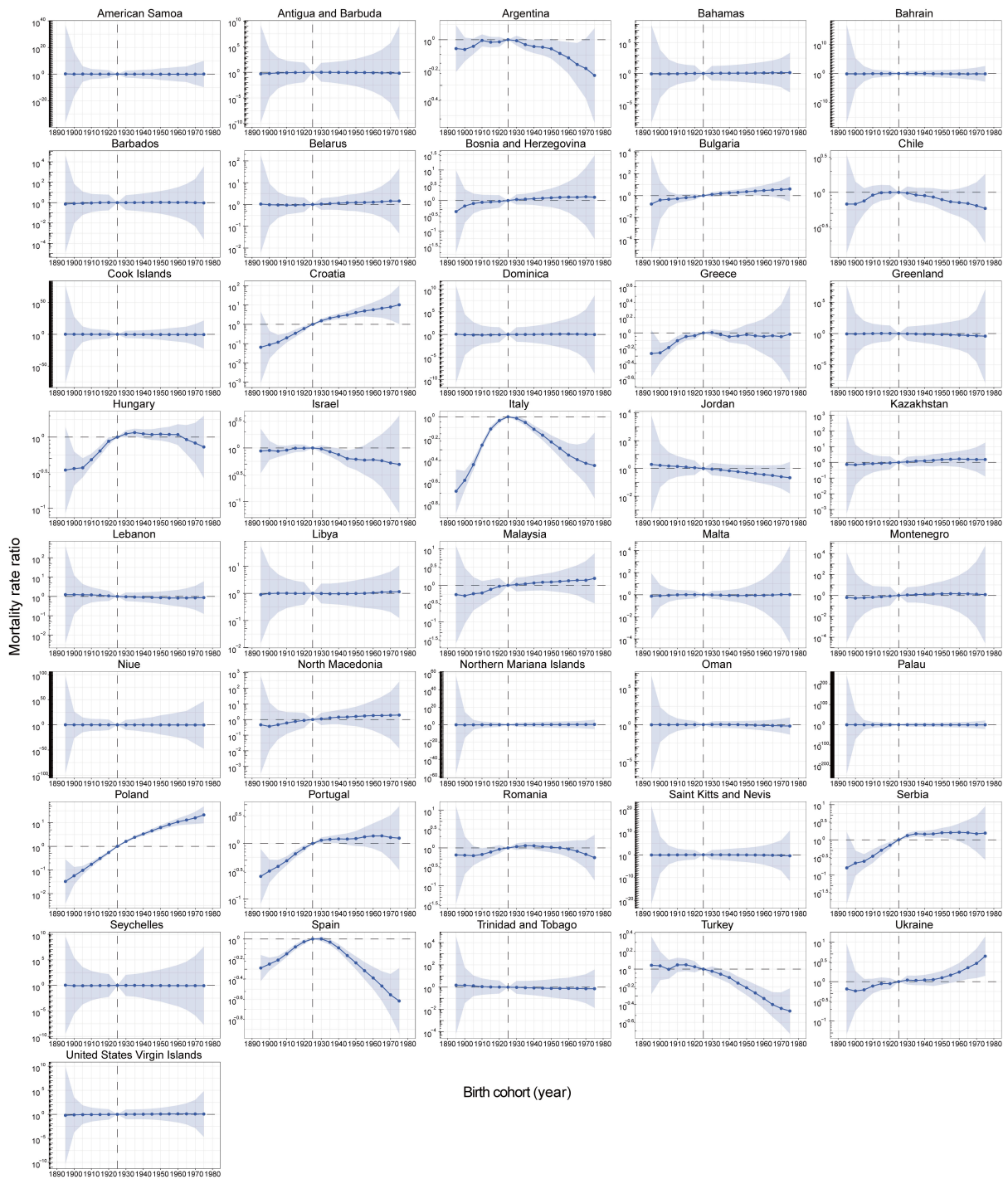


Figure S34. Cohort effects on CAVD mortality in high-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

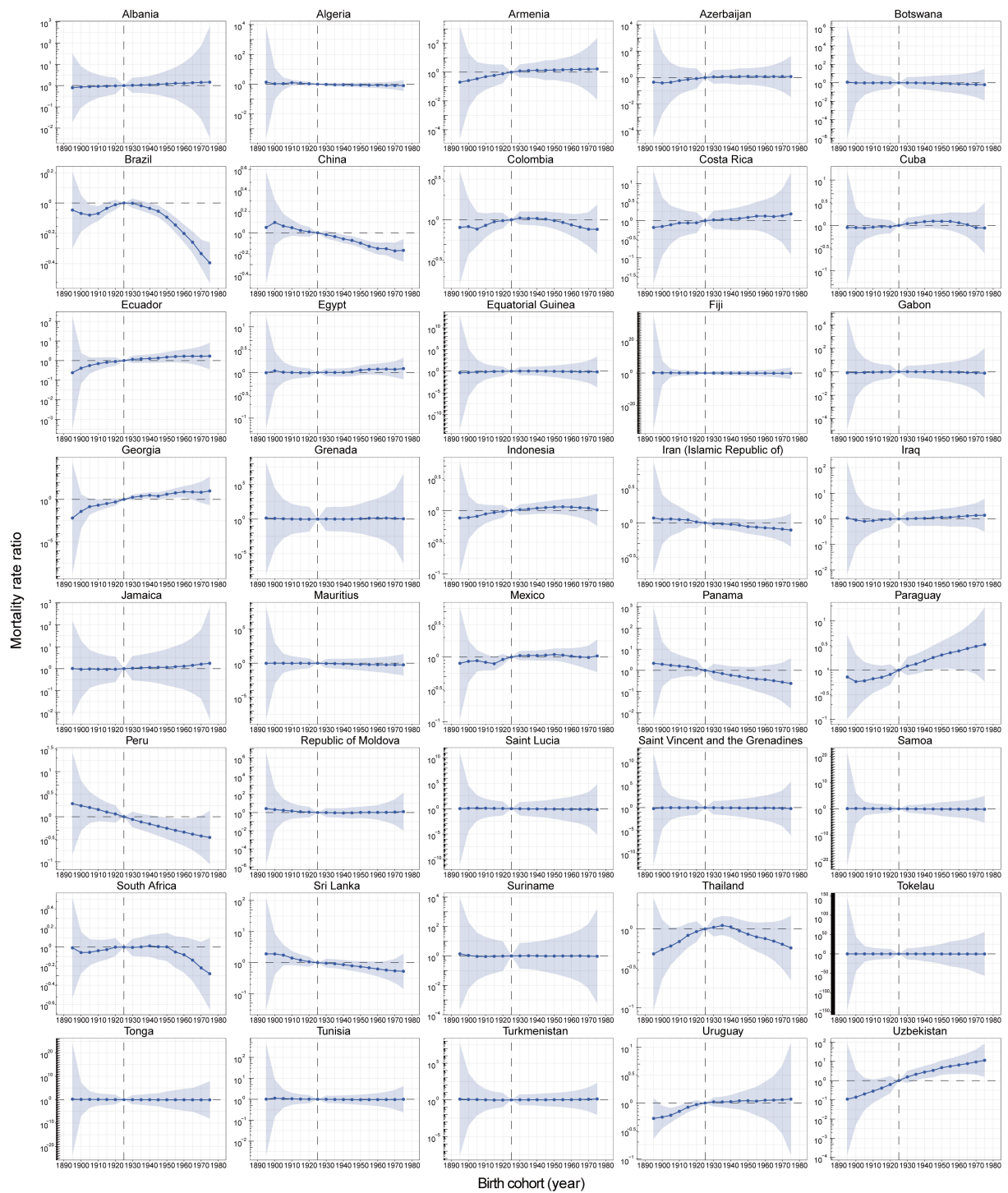


Figure S35. Cohort effects on CAVD mortality in middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

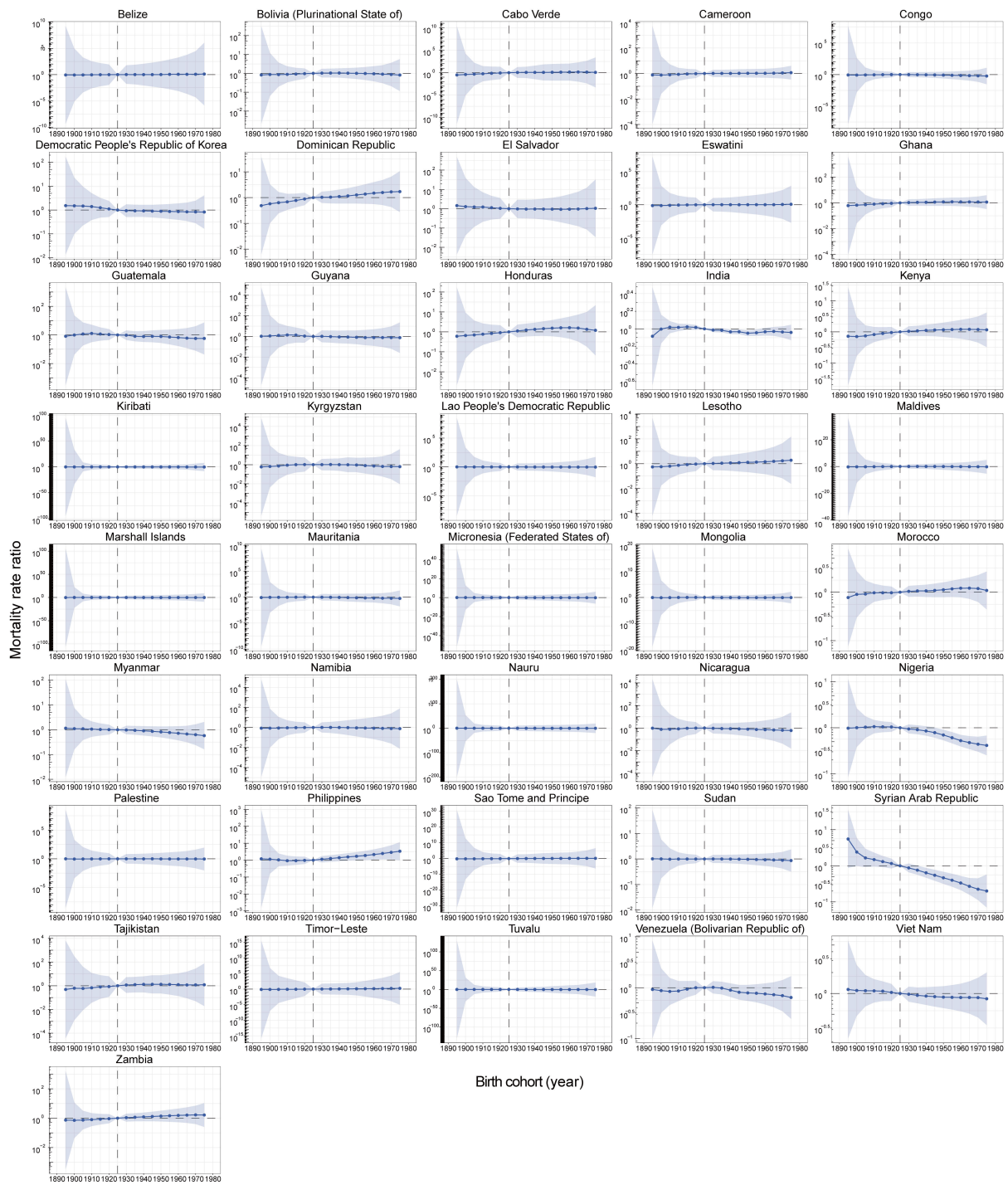


Figure S36. Cohort effects on CAVD mortality in low-middle SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.

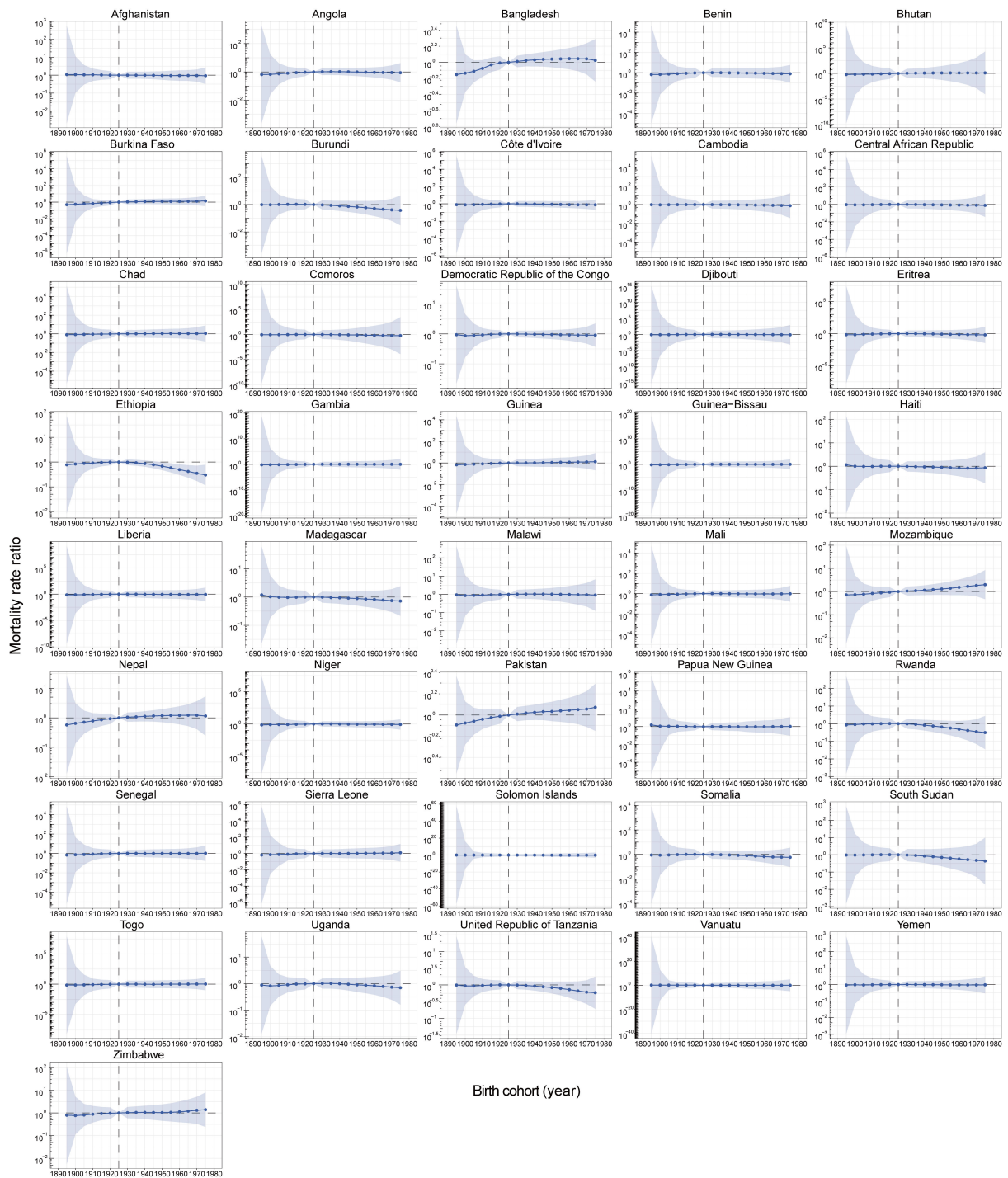


Figure S37. Cohort effects on CAVD mortality in low SDI countries. CAVD, calcific aortic valve disease; SDI, Socio-demographic Index.