Supplementary Online Content

Etminan N, Chang H-S, Hackenberg K, et al. Worldwide incidence of aneurysmal subarachnoid hemorrhage according to region, time period, blood pressure, and smoking prevalence in the population: a systematic review and meta-analysis. *JAMA Neurol*. Published online January 19, 2019. doi:10.1001/jamaneurol.2019.0006

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Summary of all 75 included studies and 84 study periods, according to ascending midyear of study

Study Population	Region	Midyear of Study	Person-years	No SAH Patients	Incidence Per 100.000 py (95% CI)	Additional Case Finding Methods[a]	CT Rate of Patients (%)	Additional Diagnostic Criteria[b]
Rochester[1]	USA	1955	331 081	29	8.8 (6.1 to 12.6)	adhjm	0	AB
Rochester[1]	USA	1965	451 611	52	11.5 (8.8 to 15.1)	adhjm	0	AB
Frederiksberg[2]	Denmark	1972	197 542	13	6.6 (3.8 to 11.3)	abe	0	ABCF
Espoo[3]	Finland	1972	226 200	42	18.6 (13.7 to 25.1)	ae	0	BF
Rochester[c1]	USA	1975	543 561	61	11.2 (8.7 to 14.4)	adhjm	58[d]	ABD
Shibata[e4]	Japan	1977	225 564	31	13.7 (9.7 to 19.5)	abjm	0	ABCF
Söderhamn[5]	Sweden	1977	96 690	13	13.5 (7.8 to 23.2)	abdem	1	ABF
Tilburg[e6]	Netherlands	1979	302 712	24	7.9 (5.3 to 11.8)	abdeij	58	ABCF
Kuopio[7]	Finland	1979	159 033	24	15.1 (10.1 to 22.5)	abeim	8	ABC
Espoo[3]	Finland	1979	273 700	33	12.1 (8.6 to 17.0)	ae	11	BF
Auckland[c8]	New Zealand	1982	1 658 908	148	8.9 (7.6 to 10.5)	abeim	61[f]	ABCEF
Lund-Orup[9]	Sweden	1984	474 777	28	5.9 (4.1 to 8.5)	im	89[f]	AB
Israel north[10]	Israel	1984	600 000	85	14.2 (11.5 to 17.5)	adej	21	ABC
Oxford[11]	UK	1984	420 000	33	7.9 (5.6 to 11.1)	abejm	64[f]	ABF
North-Karelia[c12]	Finland	1984	1 890 000	407	21.5 (19.5 to 23.7)	aim	41[f]	ABCF

Copenhagen[13]	Denmark	1984	315 168	49	15.6 (11.8 to 20.6)	ak	[g]	ABDEF
Söderhamn[5]	Sweden	1985	92 208	10	10.9 (5.8 to 20.2)	abdem	37	ABF
Rochester[c1]	USA	1985	617 554	43	7.0 (5.2 to 9.4)	adhjm	85[d]	ABD
Izumo City A[c,e14]	Japan	1985	807 490	170	21.1 (18.1 to 24.5)	ai	98.8[f]	ABCE
Umbria[15]	Italy	1988	147 654	15	10.2 (6.1 to 16.9)	abej	60	A
King County[c16]	USA	1988	2 800 000	171	6.1 (5.3 to 7.1)	befjm	97[f]	ACE
Valley d'Aosta A[17,18]	Italy	1989	114 325	6	5.3 (2.4 to 11.7)	abdefhijkm	82	ABCDF
Frederiksberg[19]	Denmark	1990	85 611	2	2.3 (0.6 to 9.3)	abde	74	AF
Perth[e20]	Australia	1990	208 062	18	8.7 (5.5 to 13.7)	abcdefijkm	74[d]	ABDF
Espoo[3]	Finland	1990	269 608	39	14.5 (10.6 to 19.8)	aeh	60	BF
Asturias[21]	Spain	1991	417 033	28	6.7 (4.6 to 9.7)	bj	85.7[f]	F[g]
Belluno[e22]	Italy	1992	211 389	12	5.7 (3.2 to 10)	abefjk	90	ABF
Novosibirsk[23]	Russia	1992	158 234	14	8.9 (5.2 to 14.9)	abehijm	0[h]	ABC
Ahmadi[24]	Kuwait	1992	873 597	4	0.5 (0.2 to 1.2)	ab	100	AF
Auckland[c25]	New Zealand	1992	1 890 738	163	8.6 (7.4 to 10.1)	aei	95[f]	ABCE
Sweden north[c26]	Sweden	1993	8 212 800	1,547	18.8 (17.9 to 19.8)	abhk	86.7[f]	ABCF
Shimokita[c27]	Japan	1993	899 910	201	22.3 (19.5 to 25.7)	ai	100[f]	AC
Dijon[c28]	France	1995	3 303 036	86	2.6 (2.1 to 3.2)	abfhjk	95.3[f]	ACDF

Perth B[29]	Australia	1995	136 095	5	3.7 (1.5 to 8.8)	abdfhjk	78.4[d]	BCDF
North Manhattan[c30]	USA	1995	571 700	53	9.3 (7.1 to 12.1)	bdefghijklm	100[f]	ABCE
Izumo City B[c,e14]	Japan	1995	763 686	188	24.6 (21.3 to 28.4)	ai	98.4[f]	ABCE
Malmo[e31]	Sweden	1995	2 674 144	197	7.4 (6.4 to 8.5)	abde	89	ABF
Erlangen[e32]	Germany	1995	202 900	12	5.9 (3.4 to 10.4)	abdejk	97	DF
L'Aquila[c,e33]	Italy	1996	1 488 225	118	7.9 (6.6 to 9.5)	abcdefhjkm	96.6[f]	ABCDF
Takashima[34]	Japan	1996	887 216	190	21.4 (18.6 to 24.7)	aehijk	89.6	DF
Sweden south[35]	Sweden	1996	1 141 752	106	9.3 (7.7 to 11.2)	a	100[d,f]	ABCF
Melbourne[e36]	Australia	1996	133 816	12	9.0 (5.1 to 15.8)	bdg	91[d]	ABF
South London[37]	UK	1996	938 132	77	8.2 (6.6 to 10.3)	abefij	88[d]	ABF
Valentia[e38]	Italy	1996	179 186	12	6.7 (3.8 to 11.7)	abdejk	96	BF
Valle d'Aosta[39]	Italy	1997	118 723	14	11.8 (7.0 to 19.9)	abdej	97[d]	ABCDF
Melbourne B[e40]	Australia	1998	613 262	56	9.2 (7.1 to 11.9)	abcdefghjk	88.7[d]	ABDF
Martinique[41]	Caribbean	1998	360 000	20	5.6 (3.6 to 8.6)	abeijk	92.8	F[g]
Kumamoto[e42]	Japan	1998	9 300 000	2,115	22.7 (21.8 to 23.7)	bj	100[f]	ACDE
Porto rural[43]	Portugal	1999	74 178	6	8.1 (3.6 to 18)	abdefhijklm	96	ABCF
Porto urban[43]	Portugal	1999	172 046	17	9.9 (6.1 to 15.9)	abdefhijklm	97.4	ABCF
Orebro[44]	Sweden	1999	123 503	11	8.9 (4.9 to 16.1)	abdefkm	84	ABF

Scotland[45]	UK	1999	212 708	23	10.8 (7.2 to 16.3)	abfl	90.6	BF
Perth C[29]	Australia	2000	143 417	12	8.4 (4.8 to 14.7)	abdfhjk	89.1[d]	BCDF
Sicilian Aeolian Archipelago[46]	Italy	2000	40 293	1	2.5 (0.4 to 17.6)	abehjk	82.2	F[g]
Aconcagua Valley [c,e47]	Chile	2001	688 824	33	4.8 (3.4 to 6.7)	beghikm	61[f]	ABCE
Acquaviva, Puglia[e48]	Italy	2001	77 470	3	3.9 (1.3 to 12.0)	abdehjk	100[d,f]	ACDF
Lund-Orup B[49]	Sweden	2001	234 505	17	7.3 (4.5 to 11.7)	abdehjkm	[g]	ABDF
South London B[50]	UK	2001	1 780 038	94	5.3 (4.3 to 6.5)	abefghkl	89.8[d]	ABDF
Iquique[e51]	Chile	2001	396 311	15	3.9 (2.3 to 6.3)	abdefgh	91	ABF
Auckland C[e52]	New Zealand	2002	897 882	87	9.7 (7.9 to 12.0)	abdegiklm	91.1[d]	ABDF
Barbados[53]	Caribbean	2002	478 136	13	2.7 (1.6 to 4.7)	abefghjklm	95.4[d]	ABDF
Tartu[54]	Estonia	2002	202 244	18	8.9 (5.6 to 14.1)	abehjm	90	BF
Tbilisi[e55]	Georgia	2002	140 940	23	16.3 (10.8 to 24.6)	aehijl	78[f]	AF
Matão[e56]	Brazil	2004	75 053	1	1.3 (0.2 to 9.5)	abdefhjk	100[f]	ABF
Oxford B OXVASC[c,e57]	UK	2005	546 636	38	7.0 (5.1 to 9.6)	abcefijkm	94.7[d,f]	ABCF
Joinville A[e58]	Brazil	2005	974 094	55	5.7 (4.3 to 7.4)	abefhijkl	93.1	ACF
Mumbai[59]	India	2005	313 722	14	4.5 (2.6 to 7.5)	abdefghil	89.2	BF
IBERICTUS[60]	Spain	2006	1 440 979	59	4.1 (3.2 to 5.3)	abjk	99.1	F[g]
Dublin[61]	Ireland	2006	294 529	26	8.8 (6.0 to 13.0)	abdefhijkm	93.8[d]	ABDF

Ludwigshafen[62]	Germany	2006	335 812	17	5.1 (3.2 to 8.1)	abcdehijk	97.7	AF
North Iwate Prefecture[e63]	Japan	2006	1 176 400	328	27.9 (25.0 to 31.0)	bdeh	99[d]	DF
Valley d'Aosta C[e64]	Italy	2006	625 515	44	7.0 (5.2 to 9.5)	abdefhijkm	93	ABDF
Mashhad (MSIS)[e65]	Iran	2007	450 229	15	3.3 (2.0 to 5.5)	abdeghijkl	98.4[d]	ABF
Iceland[66]	Iceland	2008	238 984	23	9.6 (6.4 to 14.5)	bdefk	97[d]	DF
Varaždin[e67]	Croatia	2008	368 230	30	8.2 (5.7 to 11.7)	abdefhijkm	87	ABCDF
Durango (BASID)[e68]	Mexico	2008	247 665	20	8.1 (5.2 to 12.5)	aejk	89.5[d]	ABDF
Udine[69]	Italy	2008	306 624	25	8.2 (5.5 to 12.1)	abcdefhjk	97.3	DF
Baotou[c,e70]	China	2010	3 652 384	226	6.2 (5.4 to 7.1)	aefhikm[i]	97[f]	ABCD
Adelaide[71]	Australia	2010	148 028	7	4.7 (2.3 to 9.9)	abcdefghj	95	DF
Island of Lesvos[72]	Greece	2010	86 436	5	5.8 (2.4 to 13.9)	abefhijm	92.4[d]	BDF
Adelaide rural[73]	Australia	2010	192 072	5	2.6 (1.1 to 6.3)	abcdefhj	100[f]	F[g]
Akure, Ondo[e74]	Nigeria	2011	491 033	20	4.1 (2.6 to 6.3)	abeghjkl	[g]	F[g]
Joinville B[75]	Brazil	2012	1 073 318	52	4.8 (3.7 to 6.7)	abefhijk	99	ACF
Tandil[e76]	Argentina	2014	261 180	17	6.5 (4.1 to 10.5)	befghjkm[i]	94.3	ABF

Abbreviations: CI, indicates confidence interval; CT, computerized tomography; Py, person-years; SAH, subarachnoid hemorrhage.

[a]Case finding methods. Inclusion criteria were involvement of all hospitals in the region and at least a or b. a= death certificates; b= general practitioners; c= rehabilitation; d= nursing homes; e= regular search (this term has been used in studies published before 2005; in current studies this suggests repetitive search/contact); f= review/screening of radiology reports; g= media attention (television, newspaper, radio); h= outpatient

clinics, health centers; i= sudden deaths; j= emergency rooms, ambulance, on call medical services; k= explicit use of ICD-codes; l= door-to-door, home visits, social services; m= autopsy reports.

[b]Additional diagnostic criteria, besides CT. For inclusion, a CT/neuroimaging rate of at least 80% was necessary or at least A or B. A= lumbar puncture; B= autopsy; C= angiography; D= MRI; E= surgery; F= WHO definition of stroke/SAH.

[c]Studies based primarily on SAH, in contrast with general stroke studies.

[d]Studies not providing the exact proportion of CT, but the proportion of CT and/or MRI and/or autopsy.

[e]Study also included for age- and sex-specific analyses (total n=34). Additionally, following studies were included: Takashima, Japan - 4 study periods86, Arcadia, Greece88 and ACROSS87.

[f]Studies providing proportion of CT/MRI use in SAH patients exclusively, in contrast with CT rate in patients with stroke in general.

[g]Proportion of neuroimaging or diagnostic criteria unknown, but inclusion after discussion among authors of this review.

[h]CT was available after 1992, and before 1992, all patients were diagnosed with lumbar puncture or autopsy.

[i]Verbal autopsies were defined as the acquisition of further information on a patient's death through contact of close family members, e.g. when there were sudden, out-of-hospital deaths or inconclusive death certificates. In some cases, the family physician was further contacted or home visits were performed.

Note: Diagnostic criteria and case finding methods were only listed above when explicitly specified by the authors; thus, some studies may have used additional diagnostic criteria or case finding methods that were not specifically mentioned.

eTable 2. Characteristics of the overall and age-specific and sex-specific datasets

	Overall	**Age- and sex-specific**
Study periods (no of studies)	84 (79)	34 (29)
Person-years	67,746,051	17,029,016
SAHs	8,176	2,133
Crude incidence ($*10^{-5}$)	7.9	10.3
Mean age (years)	38.6*	47.4
Women (%)	50.8†	51.8
Mean midyear of study	1996	2000
Contribution to person-years (%)		
Europe	46.1	17.4
Finland	4.2	0.0
Europe to not Finland	42.0	17.4
Asia	29.7	33.7
Japan	20.8	17.5
Asia to not Japan	8.9	16.2
Australia/New Zealand	8.9	34.2
North America	8.2	1.5
South/Middle America	6.4	11.1
Africa	0.7	2.2

*Estimate based on 64 studies, †estimate based on 66 studies

eTable 3. Crude SAH incidence with 95% CIs and risk ratios for SAH in the age-specific and sex-specific dataset

	Overall (34 study periods)	**Europe (12 study periods)**	**Japan (8 study periods)**
Crude SAH incidence (95%CI)	10.3(9.0 to 11.9) I^2=86.3%	11.6 (9.8 to 13.7) I^2=38.1	21.1 (16.4 to 27.1) I^2=91.0%
	RR (95% CI)		
Men			
0-24 years	0.03 (0.01 to 0.07)	--	--
25-44 years	0.32 (0.21 to 0.50)	0.47 (0.20 to 1.12)	0.37 (0.25 to 0.56)
45-54 years	Reference	Reference	Reference
55-74 years	1.24 (0.86 to 1.78)	1.26 (0.79 to 2.03)	1.12 (0.82 to 1.53)
≥75 years	1.54 (1.03 to 2.32)	1.4 (0.87 tot 2.60)	1.16 (0.77 to1.74)
Women			
0-24 years	0.05 (0.02 - 0.11)	--	0.02 (0.00 to 0.08)
25-44 years	0.32 (0.21 to 0.49)	0.51 (0.22 to 1.22)	0.25 (0.16 to 0.39)
45-54 years	0.98 (0.64 to 1.50)	0.84 (0.45 to 1.57)	0.77 (0.44 to 1.36)
55-74 years	1.52 (1.06 to 2.17)	1.51 (0.95 to 2.40)	1.66 (1.04 to 2.64)
≥75 years	2.38 (1.64 to 3.45)	1.49 (0.91 to 2.46)	2.98 (1.02 to 4.88)

Abbreviations: RR indicates risk ratio; SAH, aneurysmal subarachnoid hemorrhage

eTable 4. Overall and age-specific risk ratios in women vs men in the age-specific and sex-specific dataset (34 study periods)

	Overall (34 study periods)	Europe (12 study periods)	Japan (8 study periods)
	Risk ratio (95% CI)	**Risk ratio (95% CI)**	**Risk ratio (95% CI)**
All ages	1.27 (0.98 to 1.66)	1.10 (0.82 to 1.48)	1.26 (0.78 to 2.06)
0-24 years	1.40 (0.56 to 3.47)	--	--
25-44 years	0.99 (0.63 to 1.56)	1.08 (0.38 to 3.09)	0.67 (0.40 to 1.45)
45-54 years	0.96 (0.65 to 1.42)	0.82 (0.43 to 1.66)	0.86 (0.63 to 1.18)
55-74 years	1.23 (0.93 to 1.62)	1.19 (0.87 to 1.63)	1.42 (1.08 to 1.85)
≥75 years	1.54 (1.06 to 2.24)	1.00 (0.66 to 1.51)	2.15 (1.52 to 3.05)

The limited number of studies from the remaining continents did not permit comparison of differences in age- and sex-specific SAH incidence over time, by age, sex or between continents.

Abbreviations: RR indicates risk ratio; CI, confidence interval

eTable 5. Time trends in SAH incidence in the in the age-specific and sex-specific dataset (34 study periods)

	Overall (34 study periods)	**Europe (12 study periods)**	**Japan (8 study periods)**
SAH incidence per 100,000 py (95% CI)	10.3 (9.0 to 11.9)	11.6 (9.8 to 13.7)	21.1 (16.4 to 27.1)
Midyear and range	1998 (1977 to 2014)	1996 (1979 to 2008)	1994 (1997 to 2006)
Annual decline (95% CI)			
Crude	2.2% (0.6 to 3.7)	2.0% **(-**0.1 to 4.0)	-4.3% (-7.3 to -1.3)*
Sex-adjusted	2.2% (0.7 to 3.7)	2.0% (-0.1 to 4.0)	-4.2% (-7.2 to -1.3)*
Age-adjusted	2.3% (1.2 to 3.3)	0.7% (-1.3 to 2.7)	-0.9% (-2.4 to -0.6)*
Time trend by sex			
Women	1.4% (-0.9 to 3.6)	0.5% (-2.4 to 3.2)	-6.8% (- 11.4 to -2.4)*
Women (age-adjusted)	1.3% (- 0.3 to 2.8)	-0.8% (-3.5 to 1.8)	-2.4% (-4.3 to -0.5)*
Men	3.1% (1.0 to 5.1)	3.9% (0.9 to 6.8)	-1.7% (-5.4 to -2.0)*
Men (age-adjusted)	3.4% (1.9 to 4.8)	2.6% (-0.4 to 5.5)	-1.0% (-1.1 to -3.0)*

The limited number of studies from the remaining continents did not permit comparison of differences in age- and sex-specific SAH incidence over time, by age, sex or between continents.

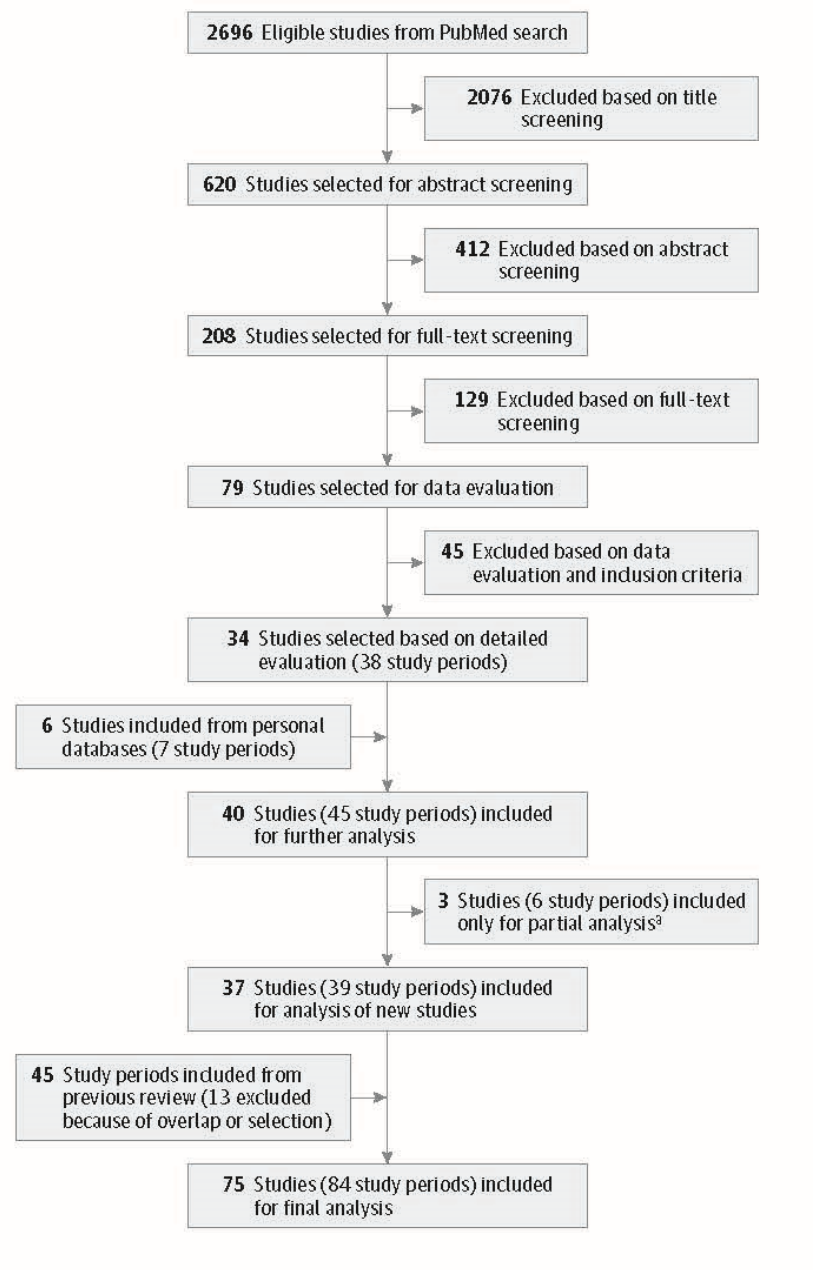
Abbreviations: CI indicates confidence interval. * a negative decrease implies an increase.

eTable 6. Estimated blood pressures in 1980 and 2010 for women and men aged 45-54 years and 55-74 years including annual change from 1977 to 2014

		BP 1980	95% CI	BP 2010	95% CI	Annual change BP	95% CI
Age 45-54 years							
	Systolic BP						
	Men	136.2	134.8 to137.6	129.1	128.1 to 130.1	-0.24	-0.30 to -0.17
	Women	133.5	132.0 to134.9	126.3	125.3 to 127.4	-0.24	-0.30 to -0.17
	Diastolic BP						
	Men	79.6	78.5 to 80.7	78.9	78.1 to 79.8	-0.02	-0.08 to 0.03
	Women	77.4	76.3 to 78.5	76.7	75.9 to 77.5	-0.02	-0.08 to 0.03
Age 55-74 years							
	Systolic BP						
	Men	145.2	143.8 to 146.6	138.1	137.0 to 139.1	-0.24	-0.30 to -0.17
	Women	142.4	141.0 to 143.8	135.3	134.2 to 136.3	-0.24	-0.30 to -0.17
	Diastolic BP						
	Men	81.7	80.6 to 82.8	81.0	80.2 to 81.8	-0.02	-0.08 to 0.03
	Women	79.5	78.4 to 80.6	78.8	78.0 to 79.6	-0.02	-0.08 to 0.03

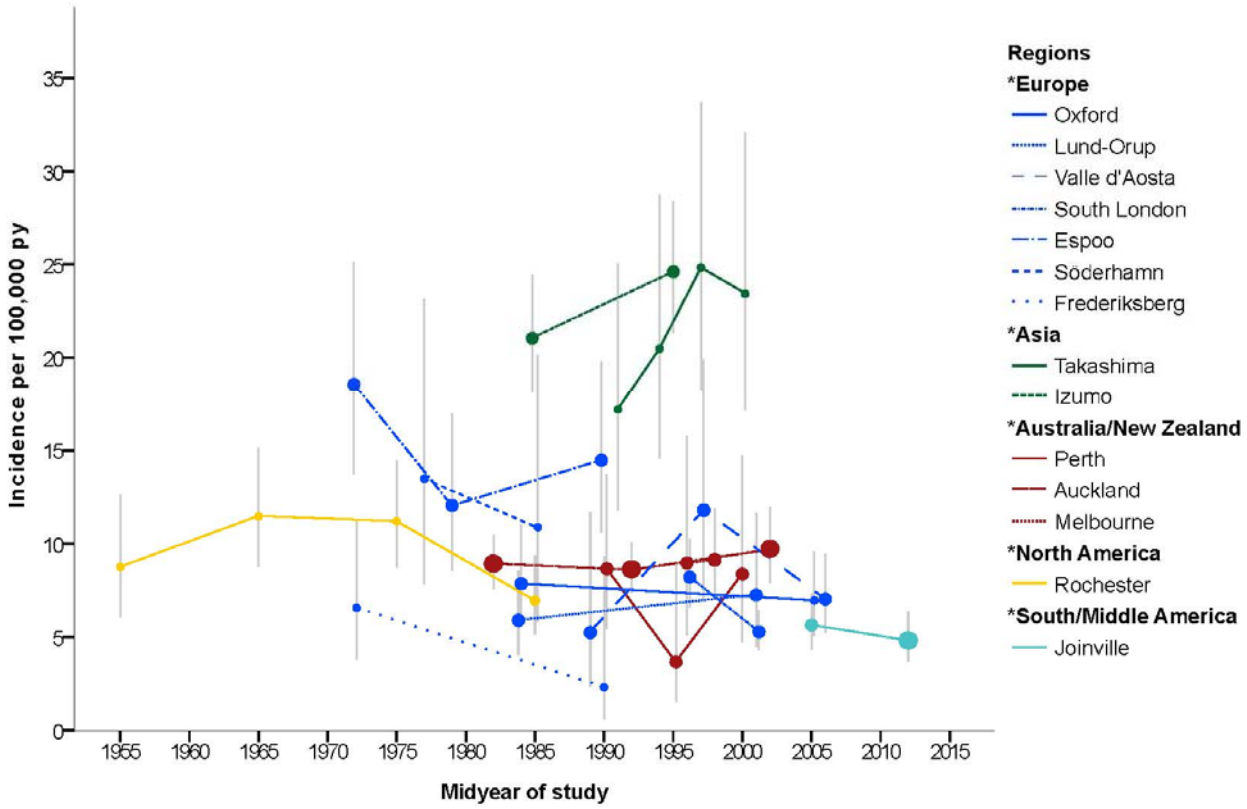
Estimates were obtained from a linear regression model in 432 observations on systolic and diastolic blood pressure specific for age, sex, midyear of study and country. The multivariable model included age, sex, midyear of study and country

eFigure 1. Selection of studies



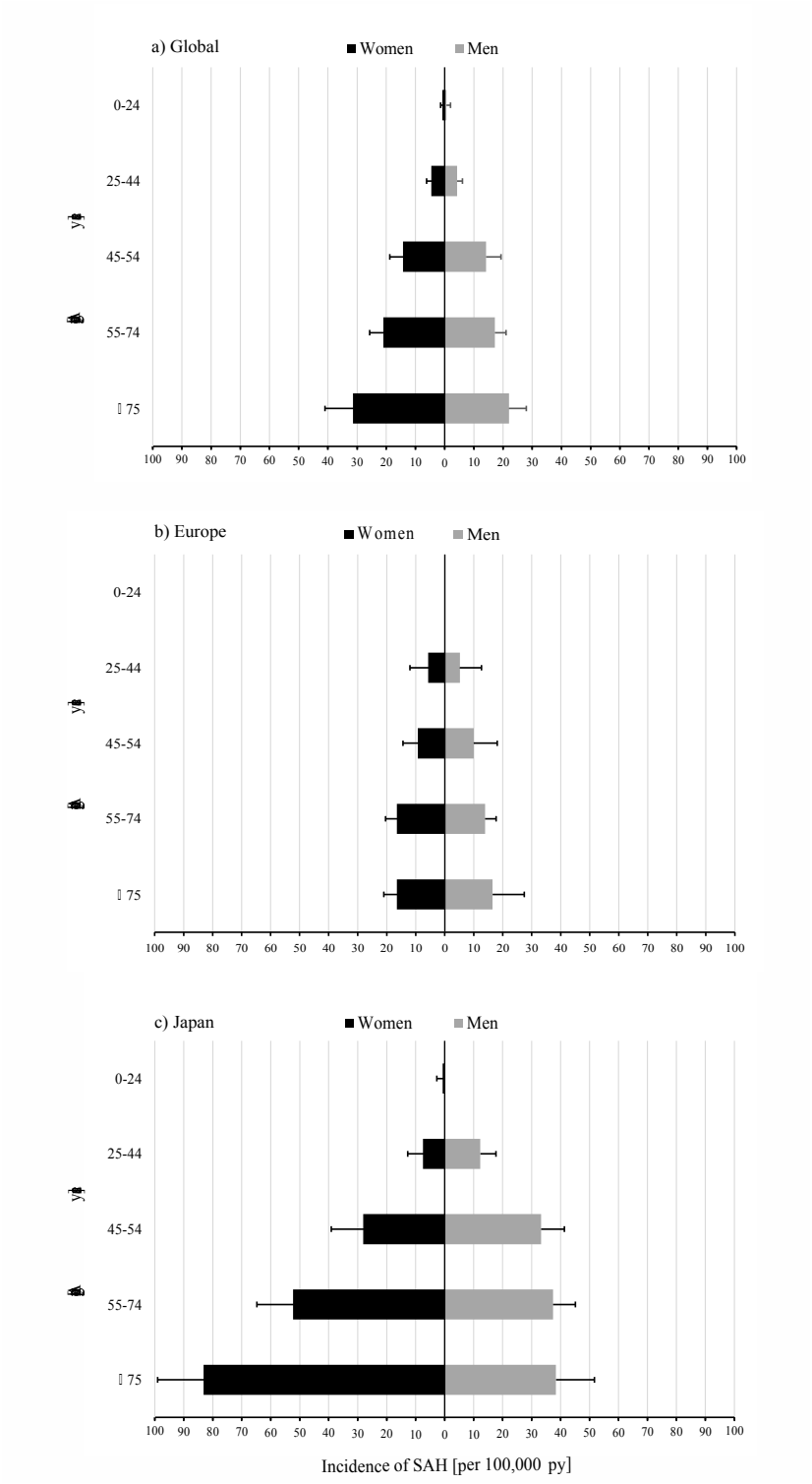
[a]Data from Eden et al[77] were only used for age-specific analyses because of age restriction older than 45 years. Data from Turin et al[78] and Kita et al[79] were only used for the age-specific or sex-specific analyses because of overlap of midyears with other studies.

eFigure 2. Regional time trends for studies reporting on consecutive SAH incidence for the same study population



Continents are specified by colors, regions are further specified by line type. The vertical gray lines depict the 95% confidence intervals for crude SAH incidence. The dot sizes are proportional to the log of the population size in each study. The small circles represent a population less than 100 000, middle sized circles less than 500 000, and the largest circles more than 500 000 persons. Abbreviation: py, person-years.

eFigure 3. Crude incidence of SAH in age-specific and sex-specific dataset overall, in Europe, and in Japan only



SAH incidences are shown per 100,000 person-years and caps highlight the upper 95% confidence interval. Age categories were defined according to the most common division.

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