Global Epidemiology of Stroke with Special Reference to Sub - Saharan Africa

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Learning Objectives

- In this session we will:

- **Remind** ourselves of the recent definition of stroke.

- **Appreciate** the trend of global and African epidemiology of stroke

- **Understand the drivers** of the changing stroke epidemiology

- Be **inspired** to identify where/how we can fit in, to tackle the growing burden of stroke in Africa.

Outline

- Stroke - definitions
- Epidemiology of Stroke _ Global
- Epidemiology of Stroke _ Africa
- Risk factors for Stroke
- Drivers of Changing Stroke Epidemiology
- Is Genetics important to Stroke in Africa ?
- Tackling the growing Stroke burden in Africa
- Conclusion

Stroke Definition

(Before Now)

- Global or focal disturbance of cerebral function resulting only from a vascular cause with dysfunction lasting more than 24 hours or resulting in death.

- Included in this definition are: cerebral infarction, intracerebral haemorrhage, subarachnoid haemorrhage

WHO, 1988.

Revised Definition

- Stroke is defined as a sudden global or focal neurological deficit resulting from spontaneous hemorrhage or infarction of the central nervous system with objective evidence of infarction/hemorrhage irrespective of duration of clinical symptoms. *AHA/ASA 2009.*

  - CT/MRI necessary to increase diagnostic accuracy.

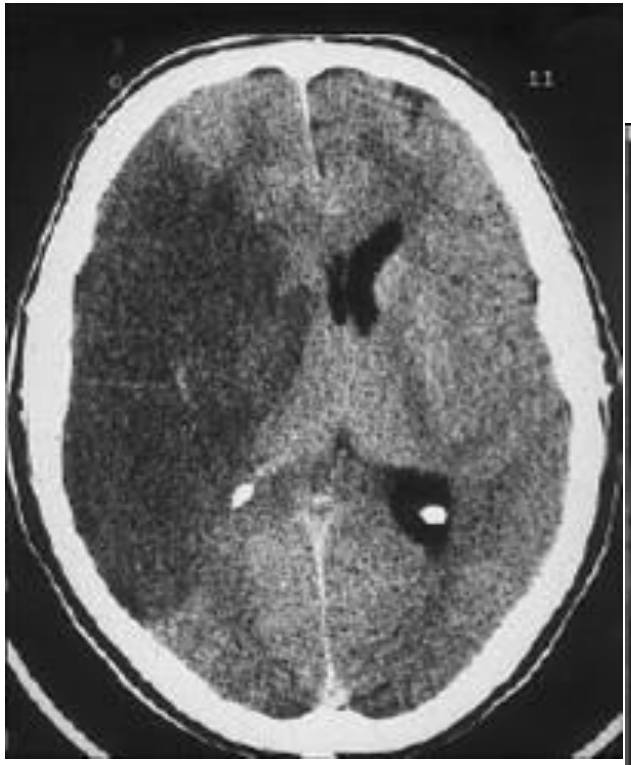
Easton D et al. Stroke 2009; 40: 2276

Current concepts

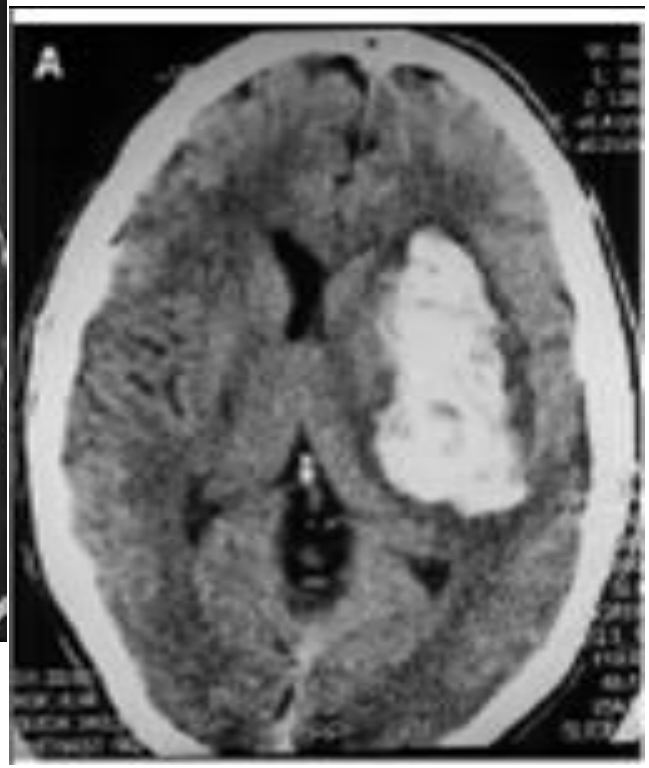
- **TIA**: New definition classifies TIA as **a transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without evidence of acute infarction**. No objective evidence of acute infarction in the affected region of brain or retina. *Sorensen et al Neuroimaging Clin N Am. 2011 ; 21(2): 303–313.*

- **Stroke** : Stemming from the new tissue-based definition of transient ischemic attacks (TIA), stroke can be defined as a sudden global or focal neurological deficit resulting from spontaneous hemorrhage or infarction of the central nervous system with objective evidence of infarction irrespective of duration of clinical symptoms. CT/MRI necessary to increase diagnostic accuracy. *Sacco RL et al Stroke. 2013;44:00-00.*
  (cf Angina pectoris vs Myocardial infarction).

Major Stroke Types



Ischaemic stroke



Haemorrhagic stroke

Subarachnoid haemorrhage

Trends in Global Stroke Epidemiology

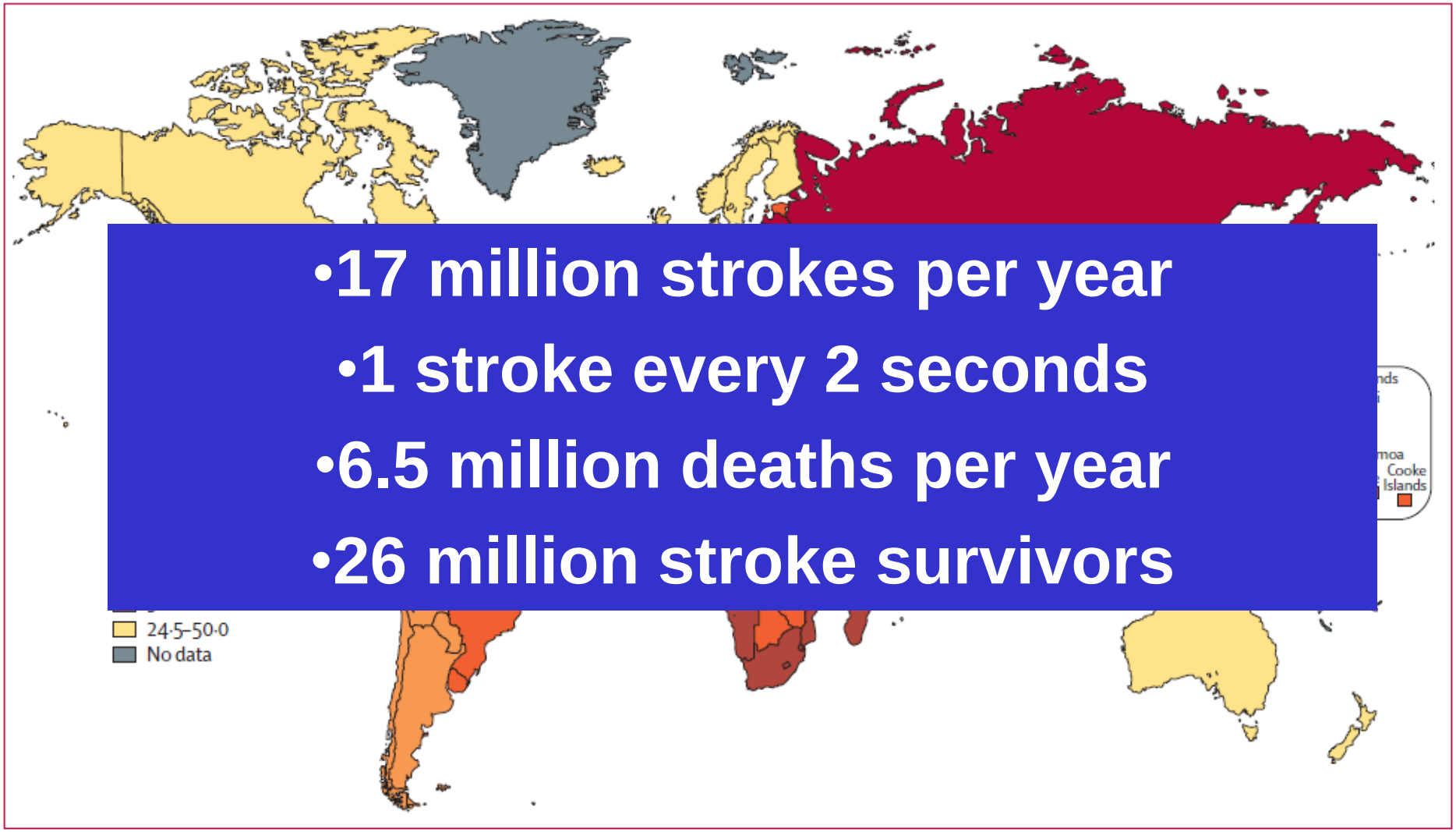
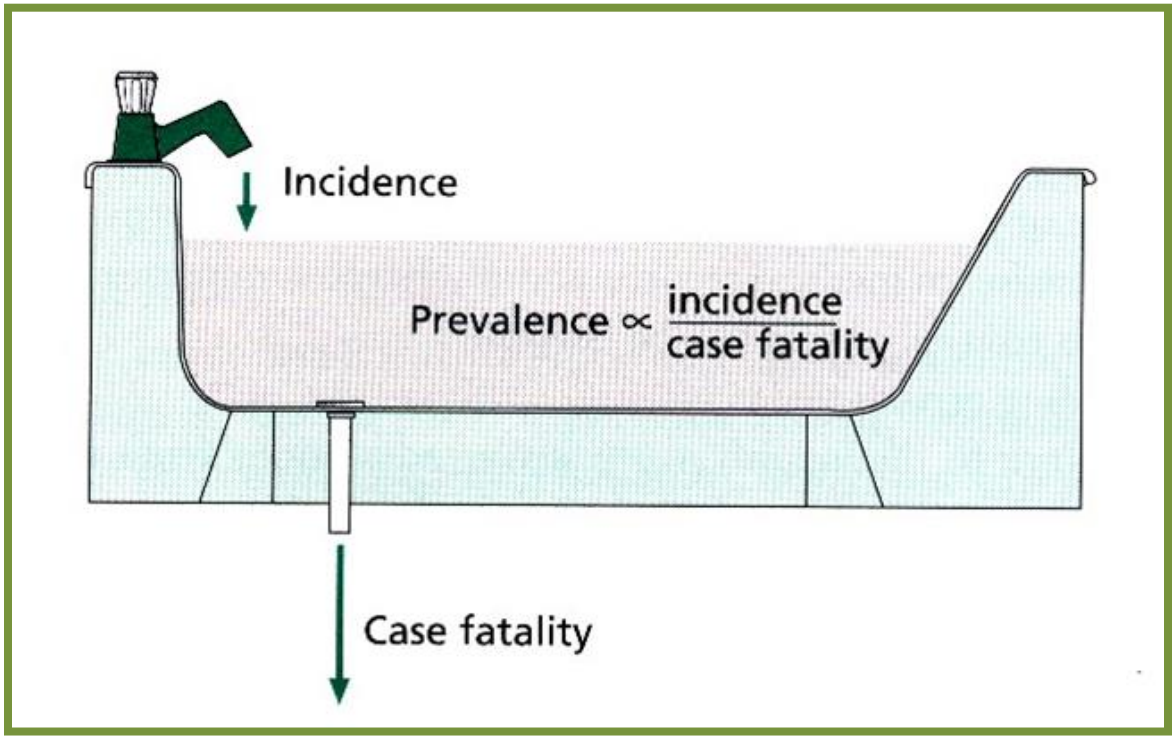


Figure 1: **Age-adjusted and sex-adjusted stroke mortality rates**
Rates are highest in eastern Europe, north Asia, central Africa, and the south Pacific.

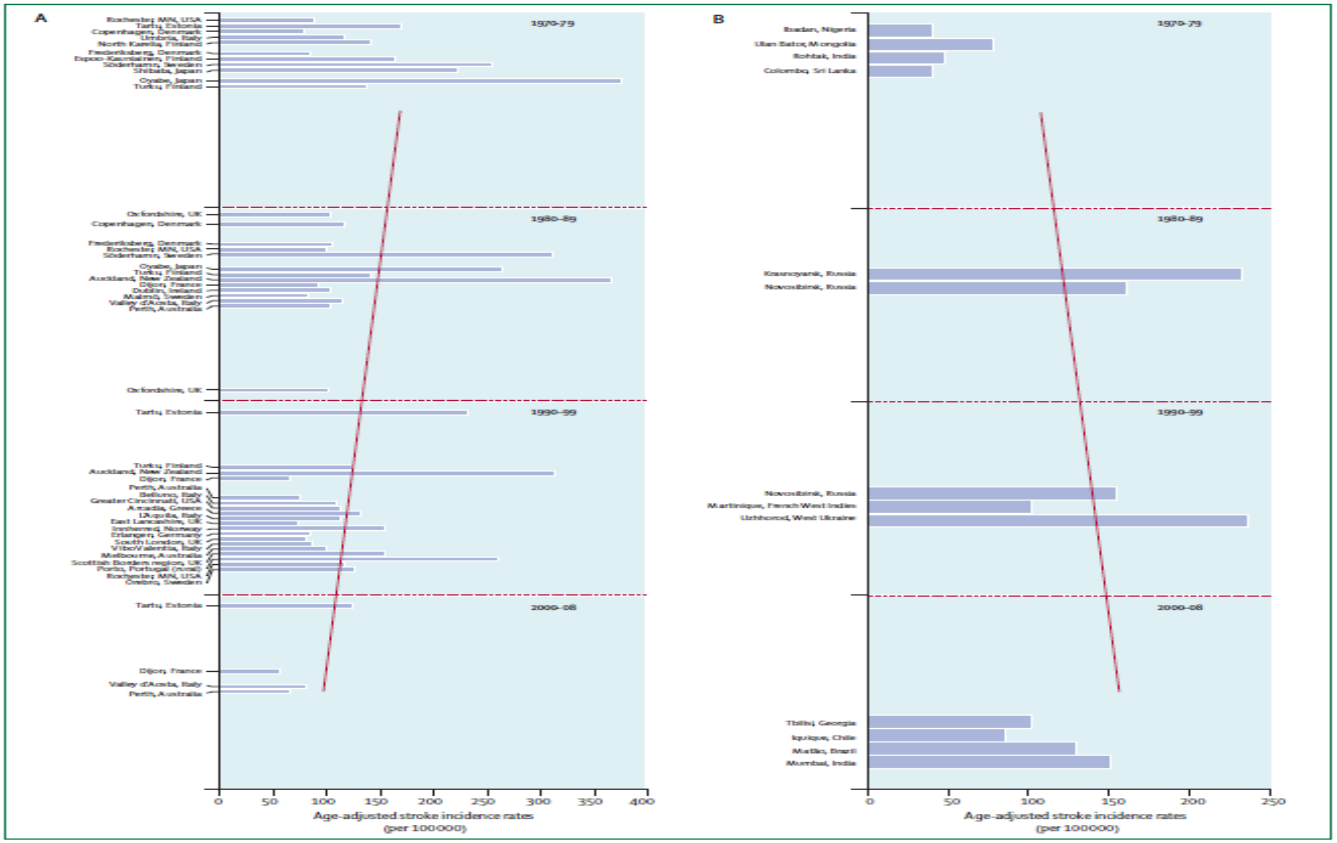
The burden of stroke in population



Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review

Valery L Feigin, Carlene M M Lawes, Derrick A Bennett, Suzanne L Barker-Collo, Varsha Parag

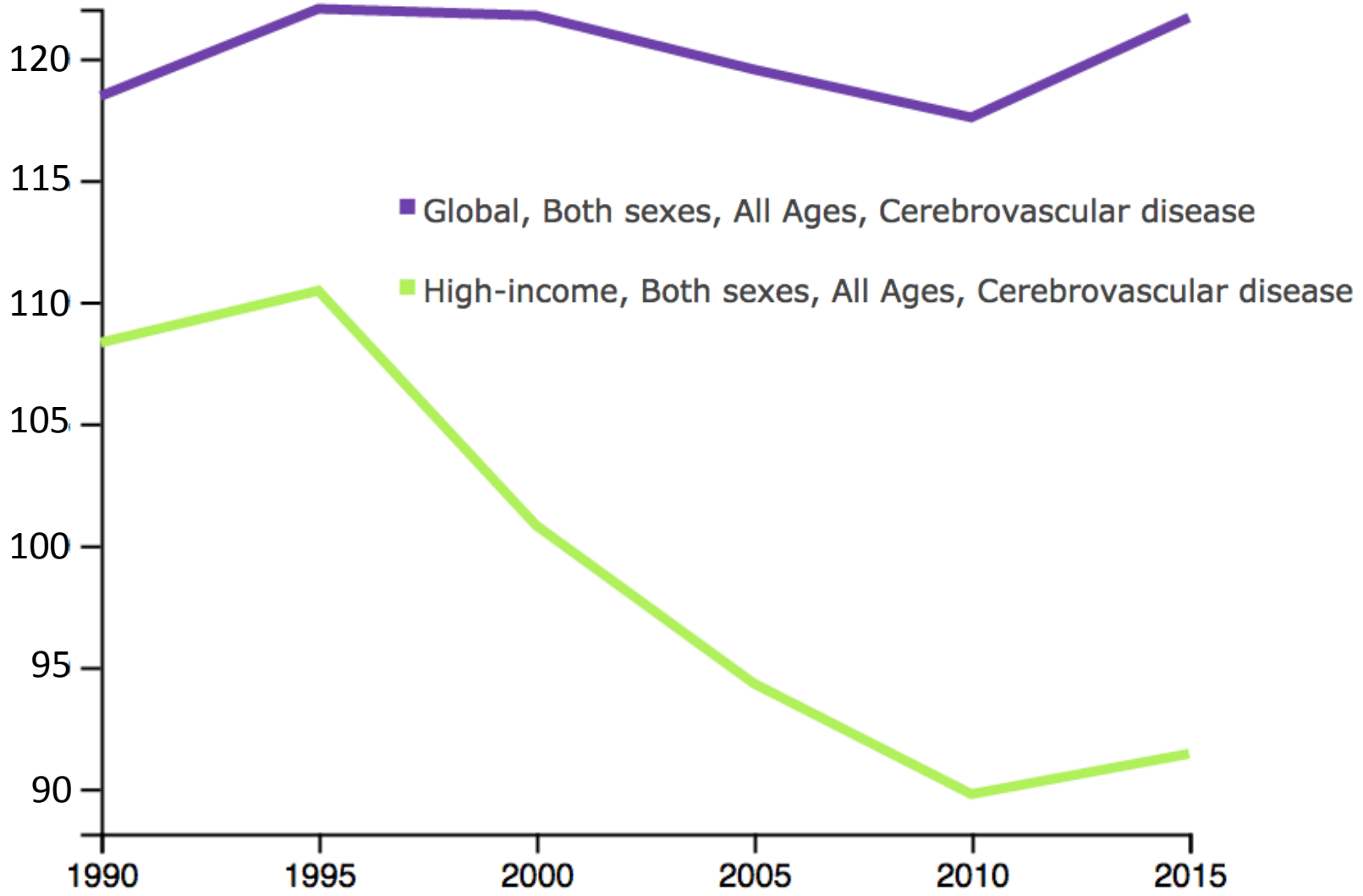
Lancet Neurol 2009; 8: 355–69



Stroke incidence rates over four decades (1970- 2010), with a 42% ↓ in HIC and ↑ 100% LMIC . In 2000–08, overall stroke incidence rates in LMIC, for the first time, exceeded HIC by 20% . - *Feign et al, 2009*

Global trends in stroke incidence rates per 100,000 person-years (1990-2015)

-Feigin et al, 2016



Global and regional burden of first-ever ischaemic and haemorrhagic stroke during 1990–2010: findings from the Global Burden of Disease Study 2010

*Rita V Krishnamurthi, Valery L Feigin, Mohammad H Forouzanfar, George A Mensah, Myles Connor, Derrick A Bennett, Andrew E Moran, Ralph L Sacco, Laurie M Anderson, Thomas Truelsen, Martin O'Donnell, Narayanaswamy Venketasubramanian, Suzanne Barker-Collo, Carlene M M Lawes, Wenzhi Wang, Yukito Shinohara, Emma Witt, Majid Ezzati, Mohsen Naghavi, Christopher Murray, on behalf of the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group**

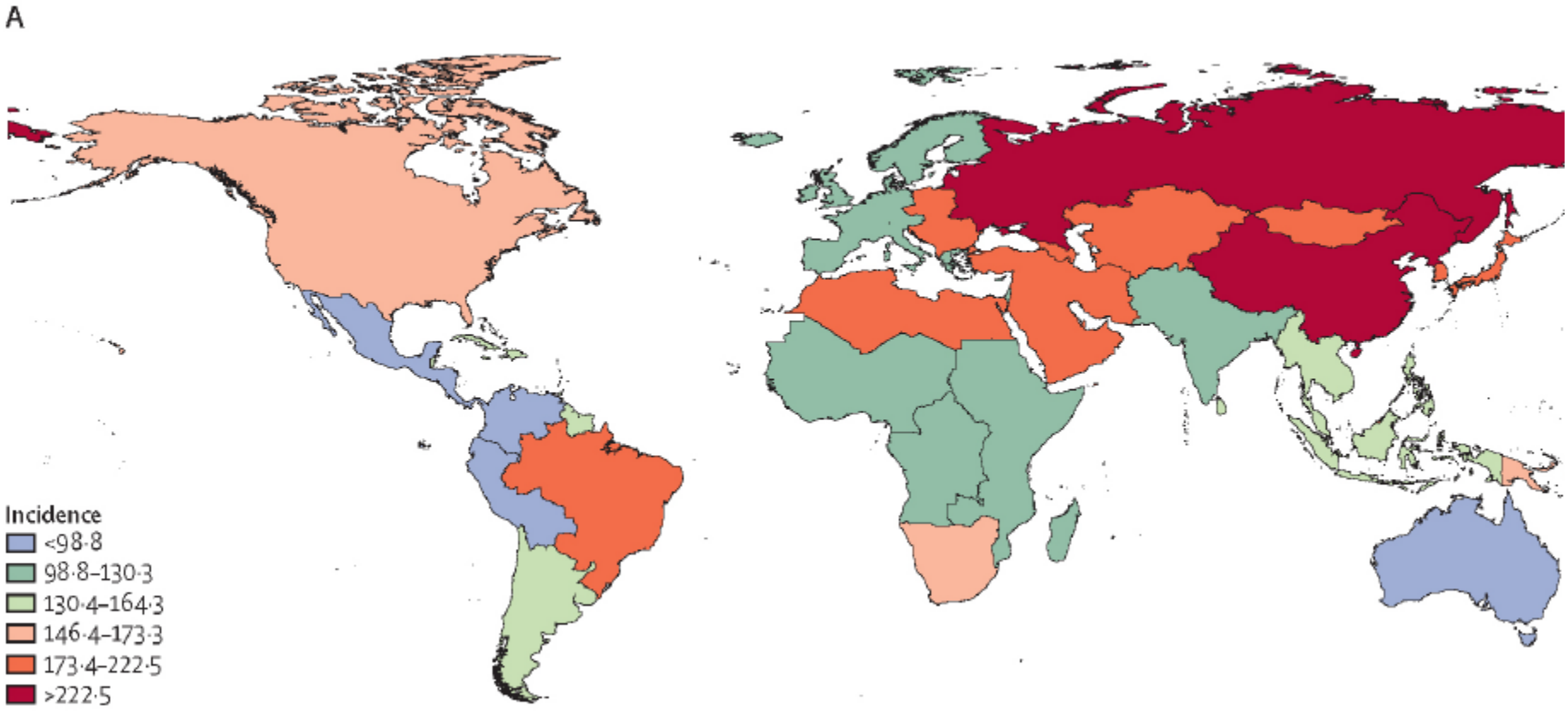
Krishnamurthi RV Lancet Glob Health 2013;1: e259–81

Global and regional burden of stroke during 1990–2010: findings from the Global Burden of Disease Study 2010

*Valery L Feigin, Mohammad H Forouzanfar, Rita Krishnamurthi, George A Mensah, Myles Connor, Derrick A Bennett, Andrew E Moran, Ralph L Sacco, Laurie Anderson, Thomas Truelsen, Martin O'Donnell, Narayanaswamy Venketasubramanian, Suzanne Barker-Collo, Carlene M M Lawes, Wenzhi Wang, Yukito Shinohara, Emma Witt, Majid Ezzati, Mohsen Naghavi, Christopher Murray, on behalf of the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group**

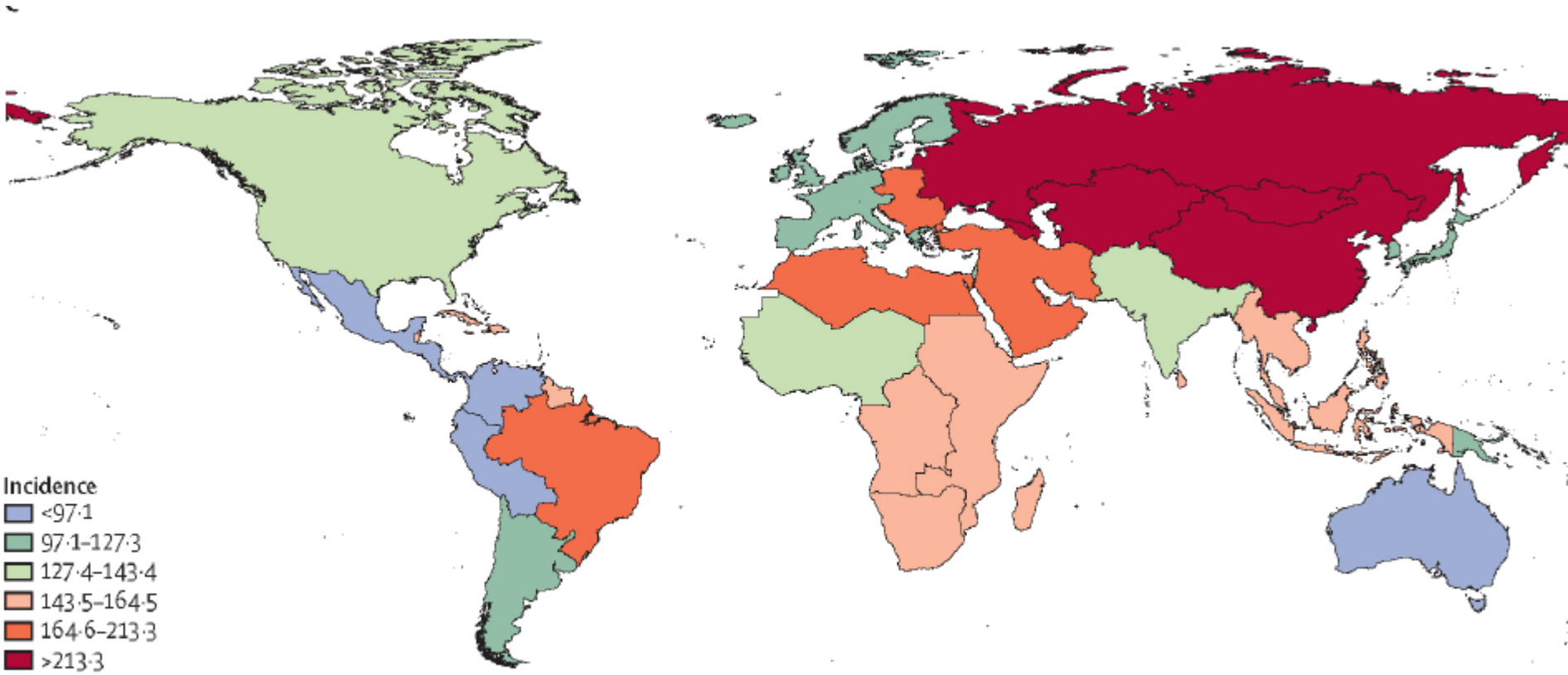
Feigin VL Lancet. 2014 ;383:245-54.

The global burden of disease used multi-state models implemented in the software program DisMod III. *Neuroepidemiology 2012;38:30–40, Mathers CD British Medical Bulletin 2009; 92: 7–32*



Age standardized Incidence of Ischemic Stroke 1990

Krishnamurthi RV Lancet Glob Health 2013;1: e259–81



Age standardized Incidence of Ischemic Stroke 2010

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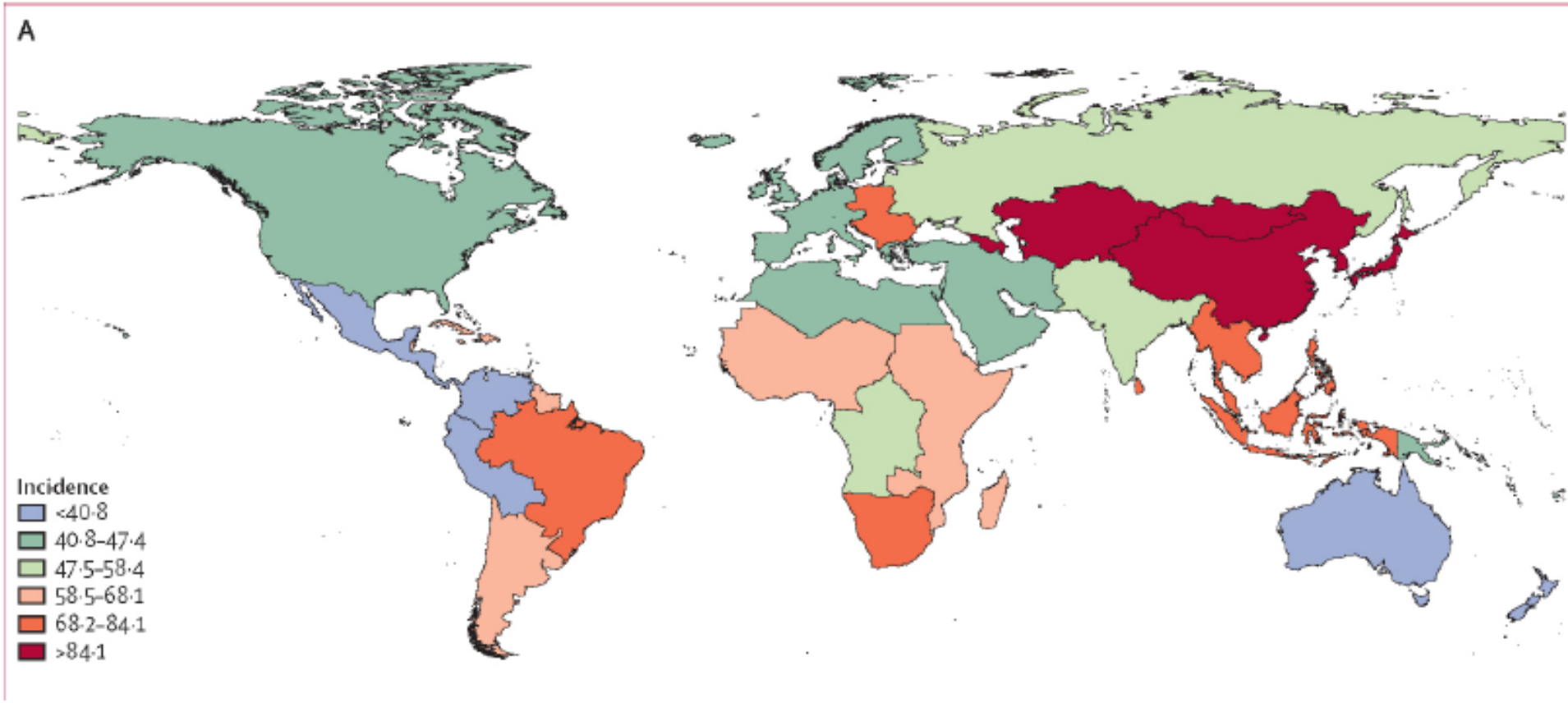
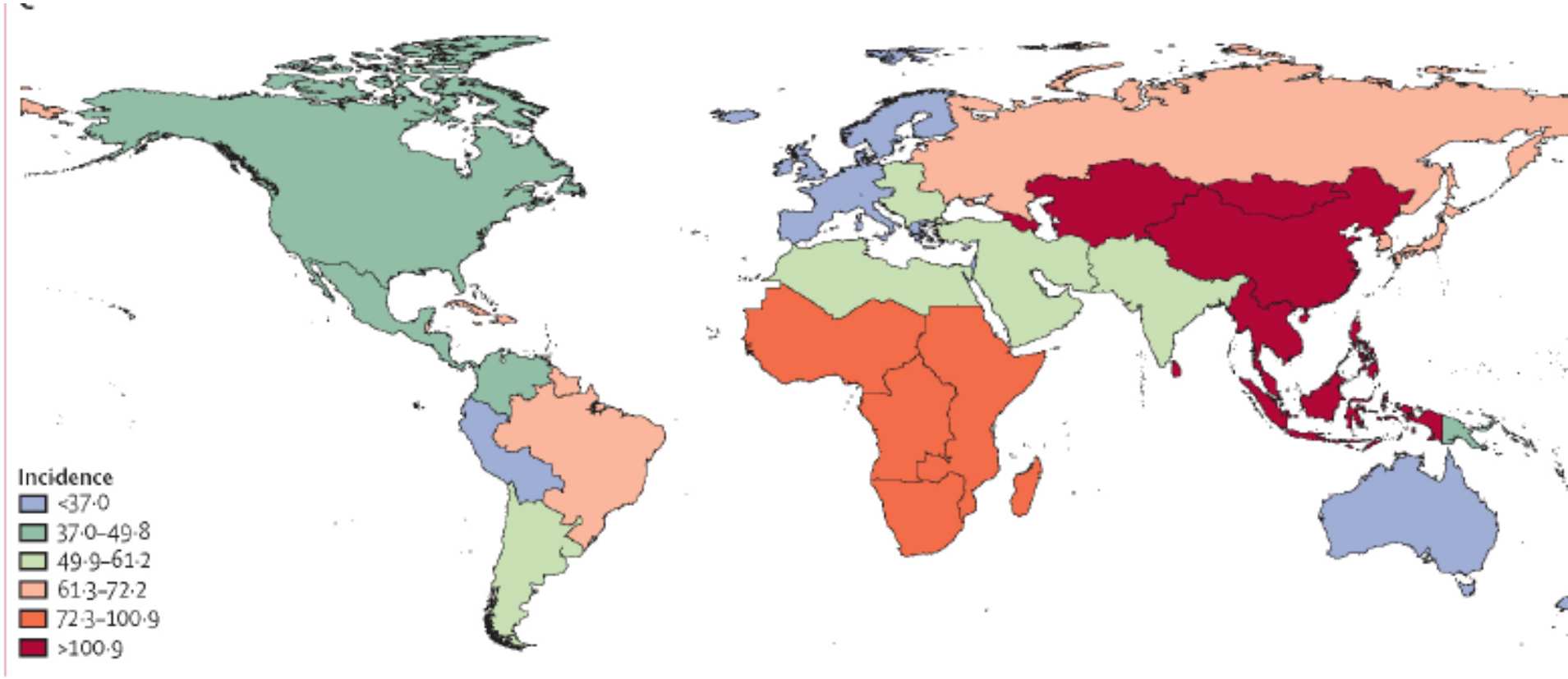


Age standardized Incidence of Hemorrhagic Stroke 1990

Krishnamurthi RV Lancet Glob Health 2013;1: e259–81



Age standardized Incidence of Hemorrhagic Stroke 2010

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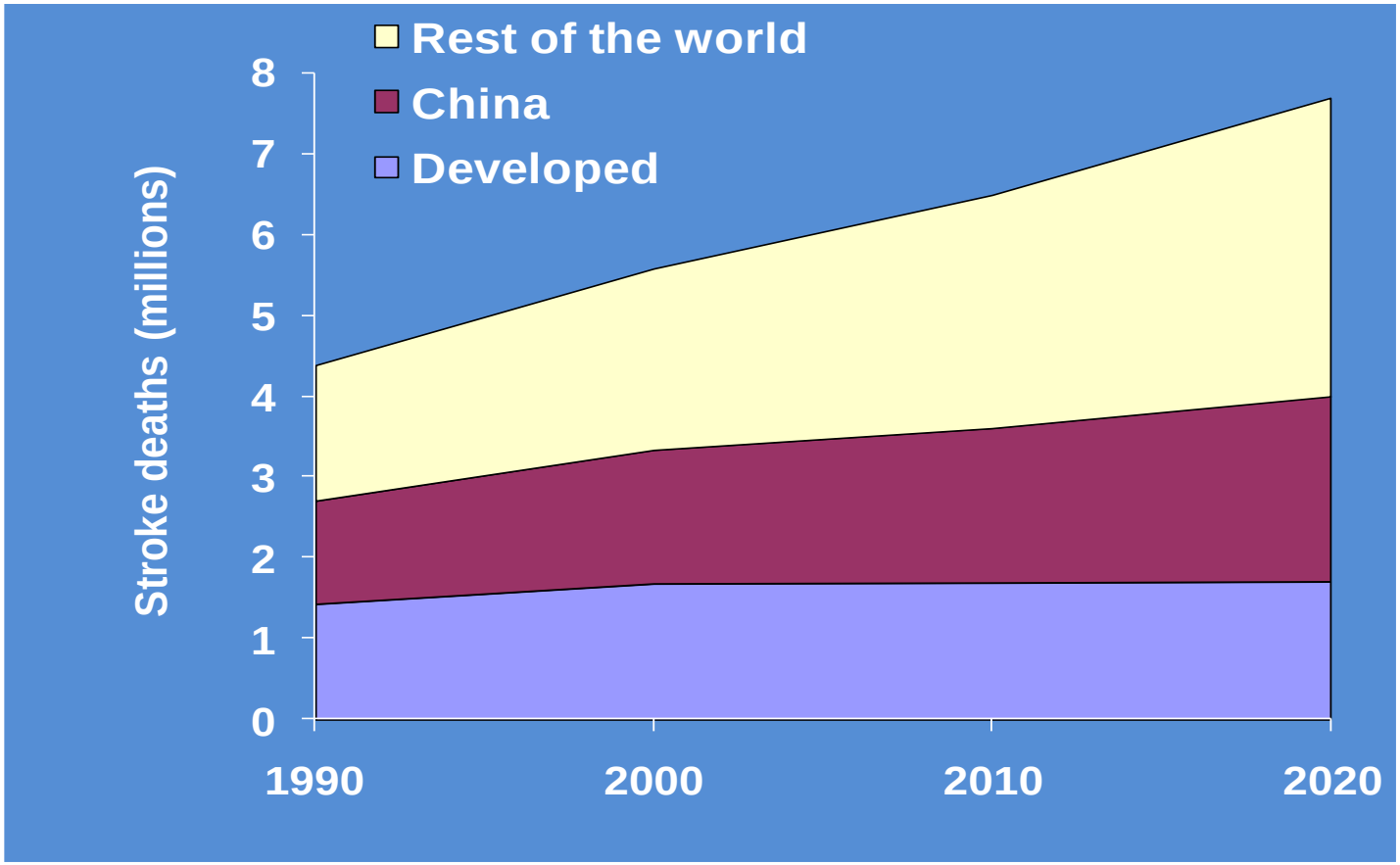
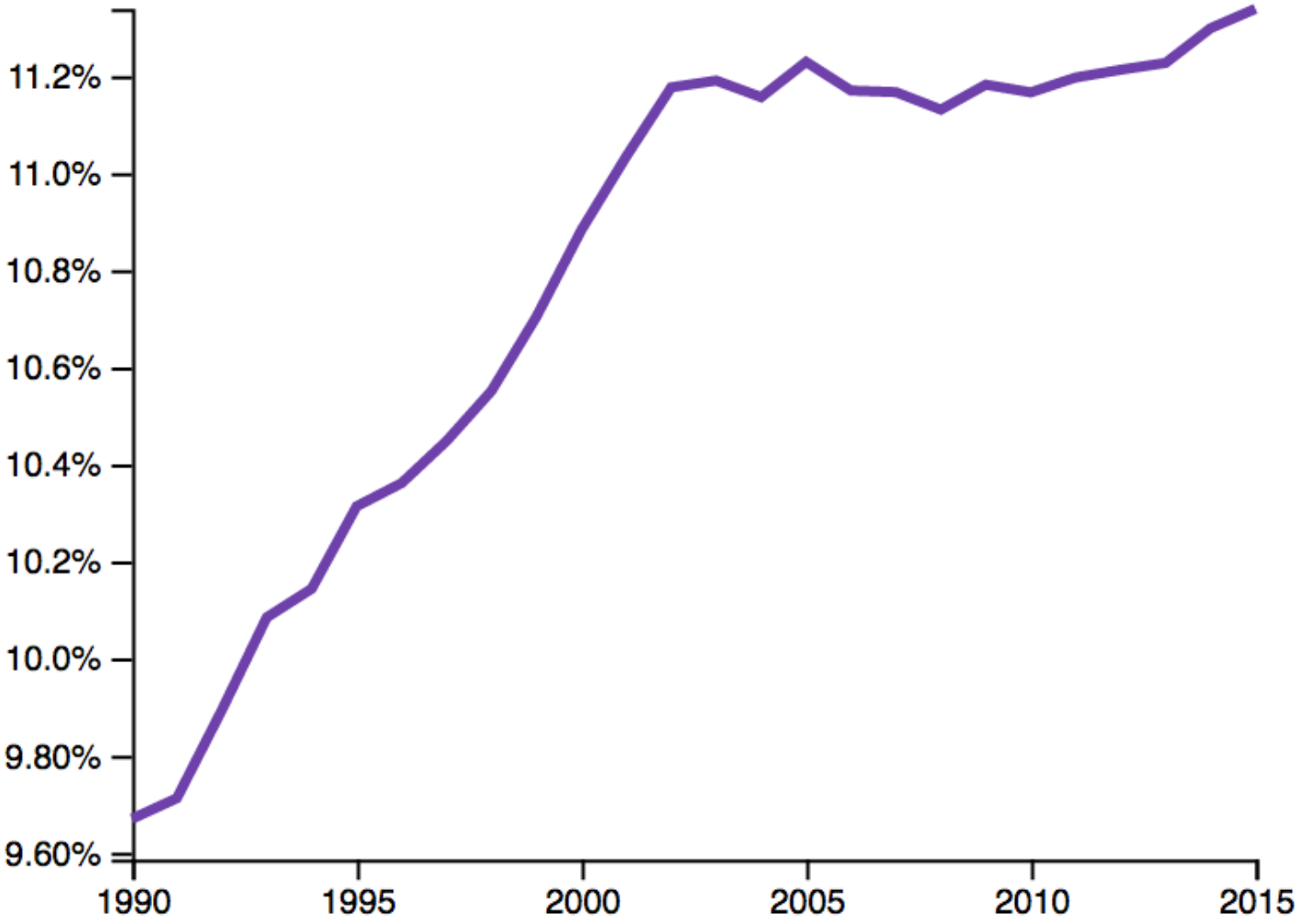
Global stroke deaths 1990- 2020



Reference: WHO. Atlas of Heart Disease and Stroke. www.*WHO*.int 2004

Proportional contribution of deaths from stroke to all causes of deaths in the world (1990-2015)



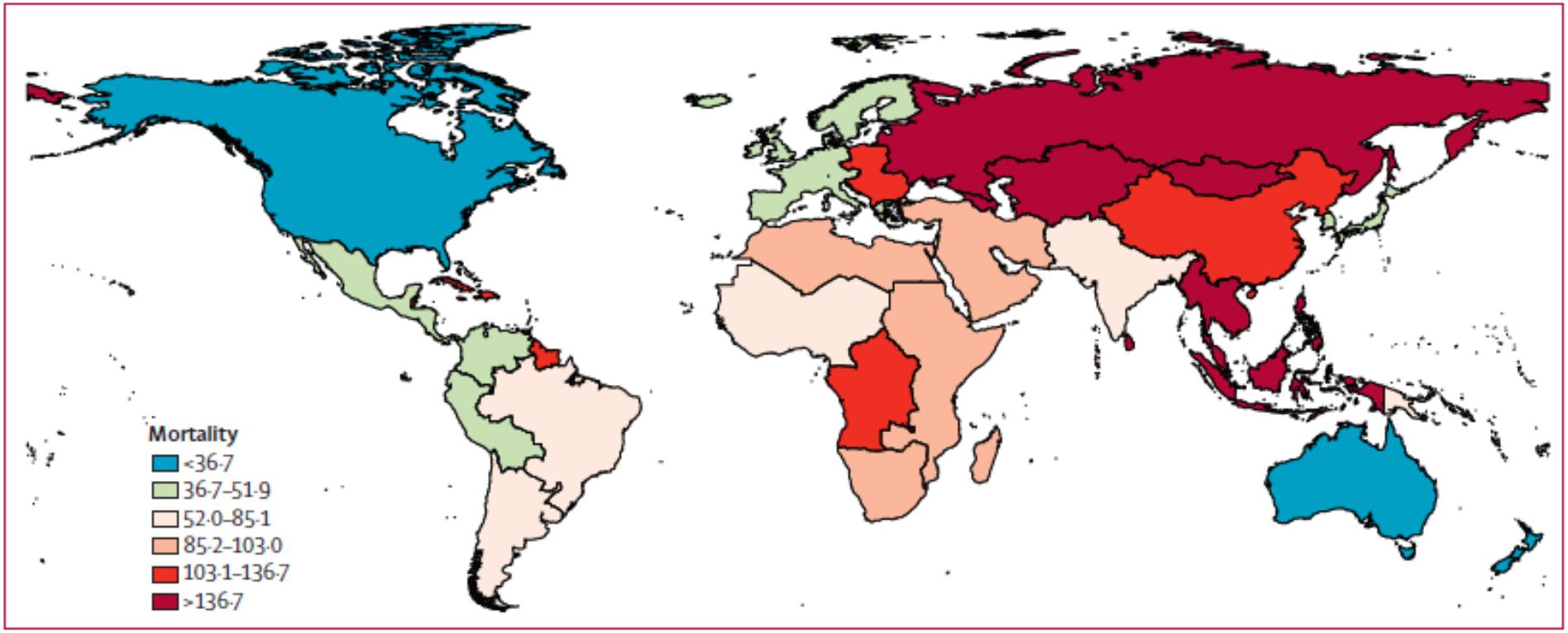
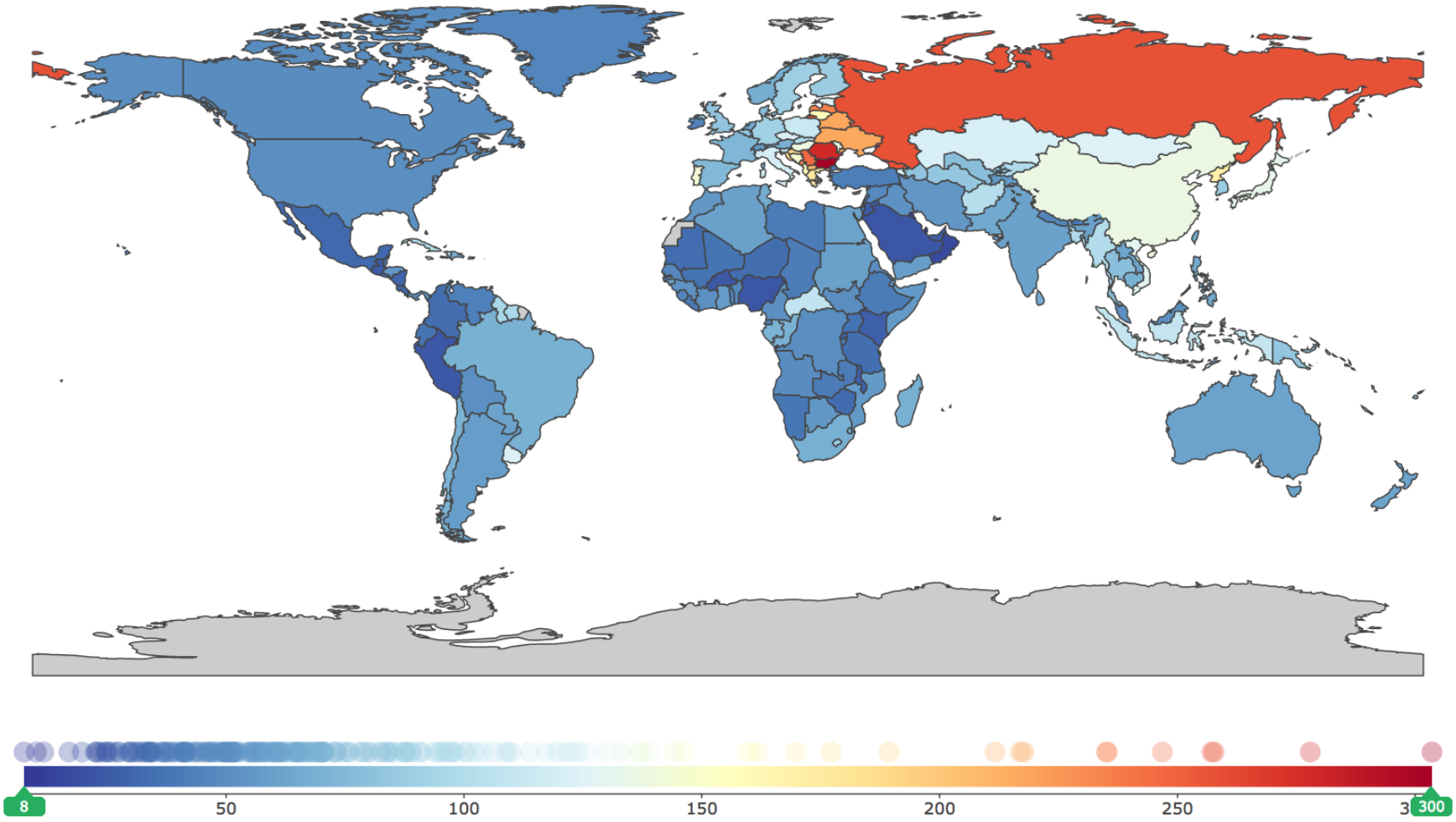


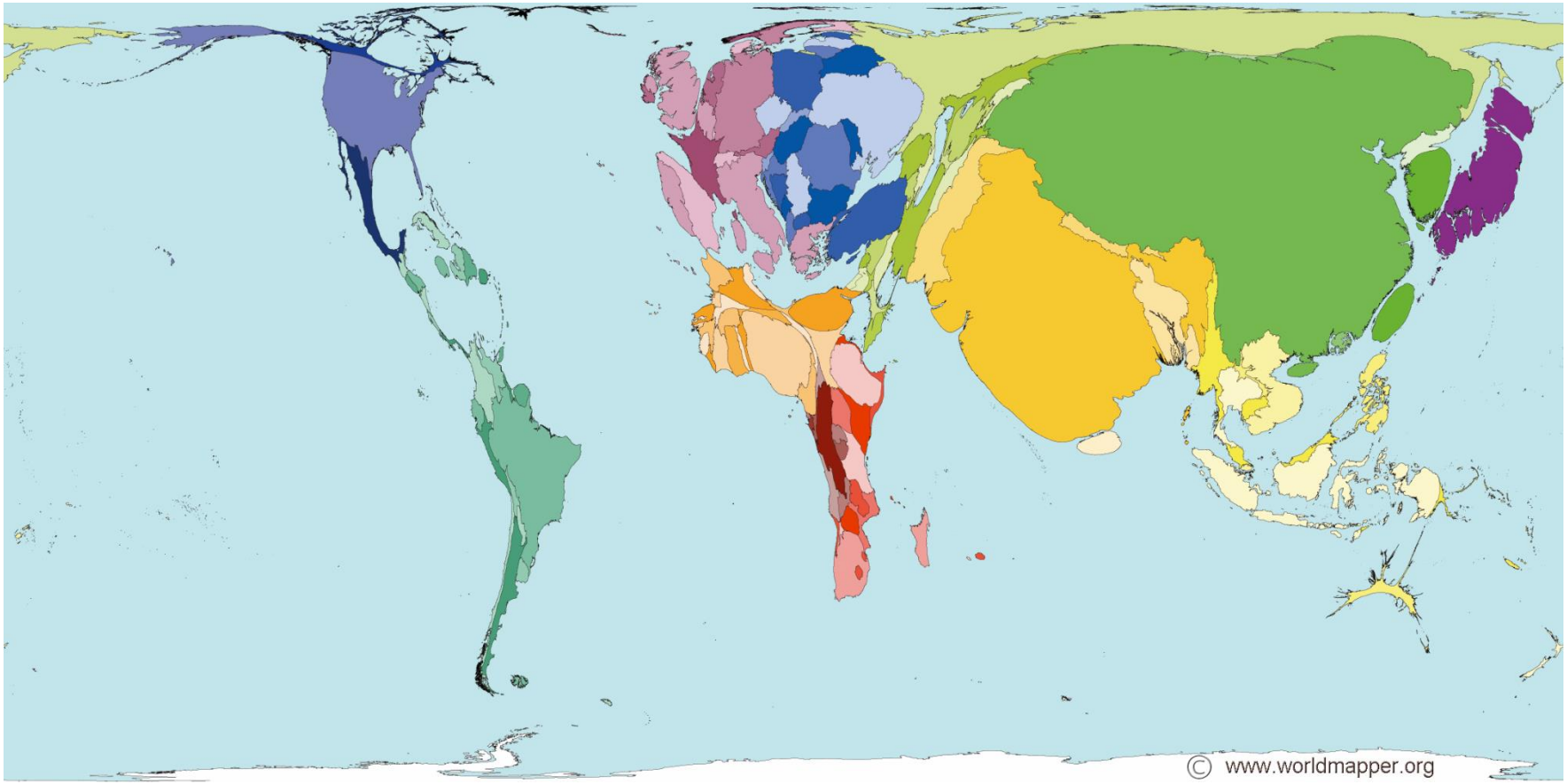
Figure 2: Age-standardised stroke mortality per 100 000 people for 2010

Feigin VL Lancet. 2014 ;383:245-54.

Geographical variations in stroke mortality rates in 2015



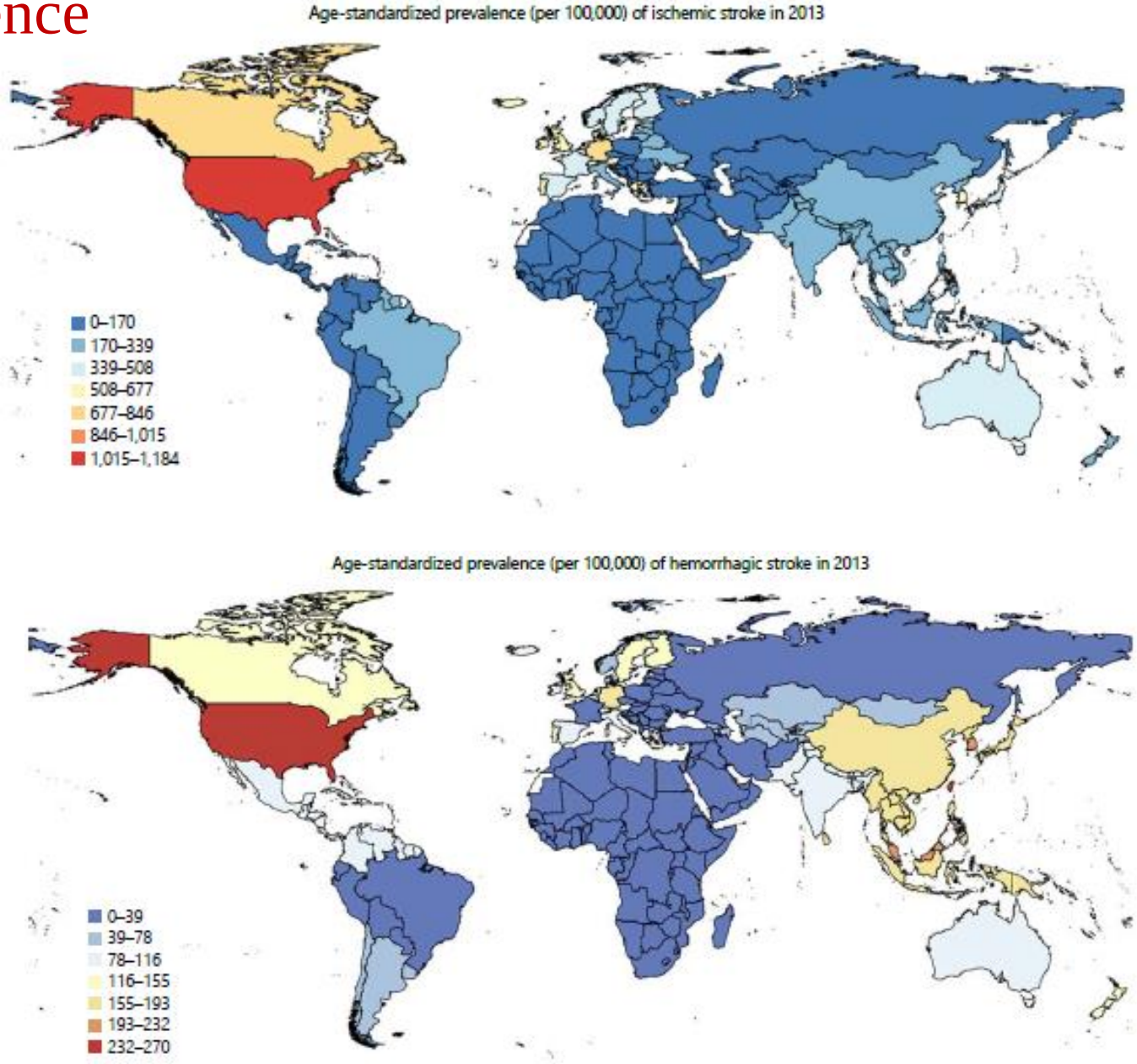
Worldwide burden of all stroke deaths



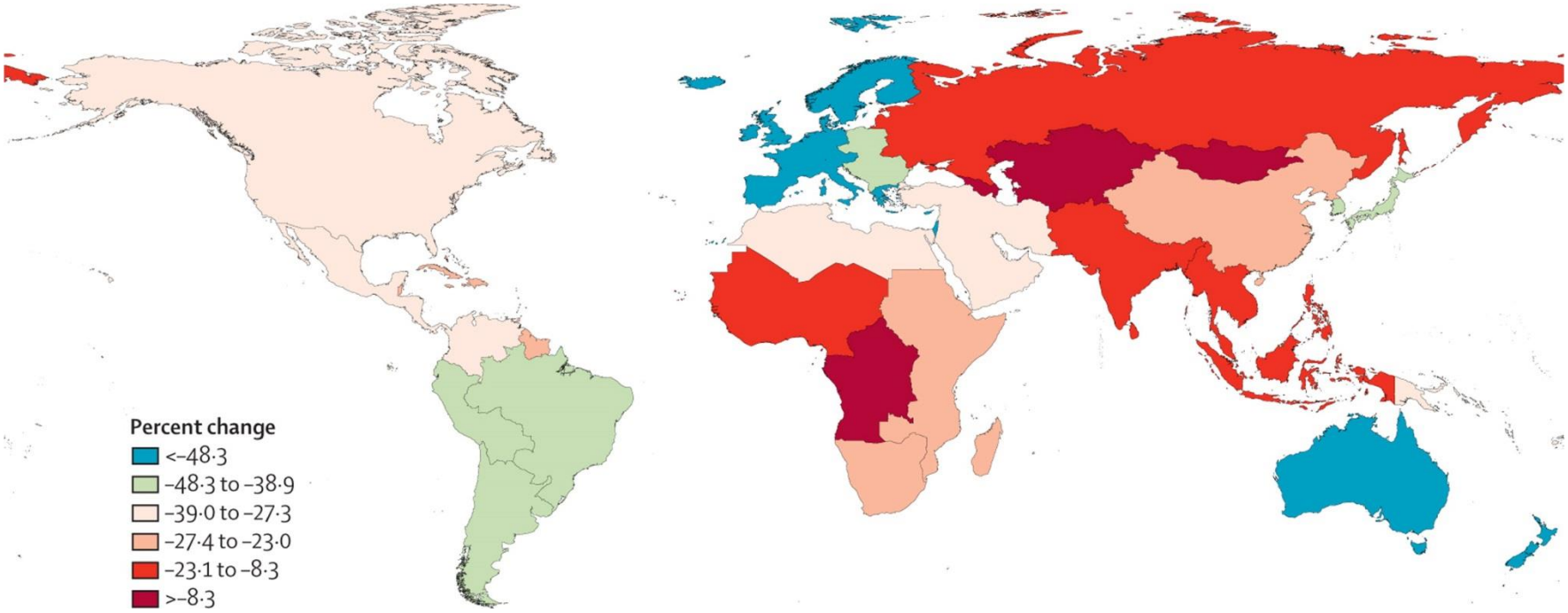
Size of country proportional to the proportion of worldwide stroke deaths in that country

The reality of health care in areas of stroke burden

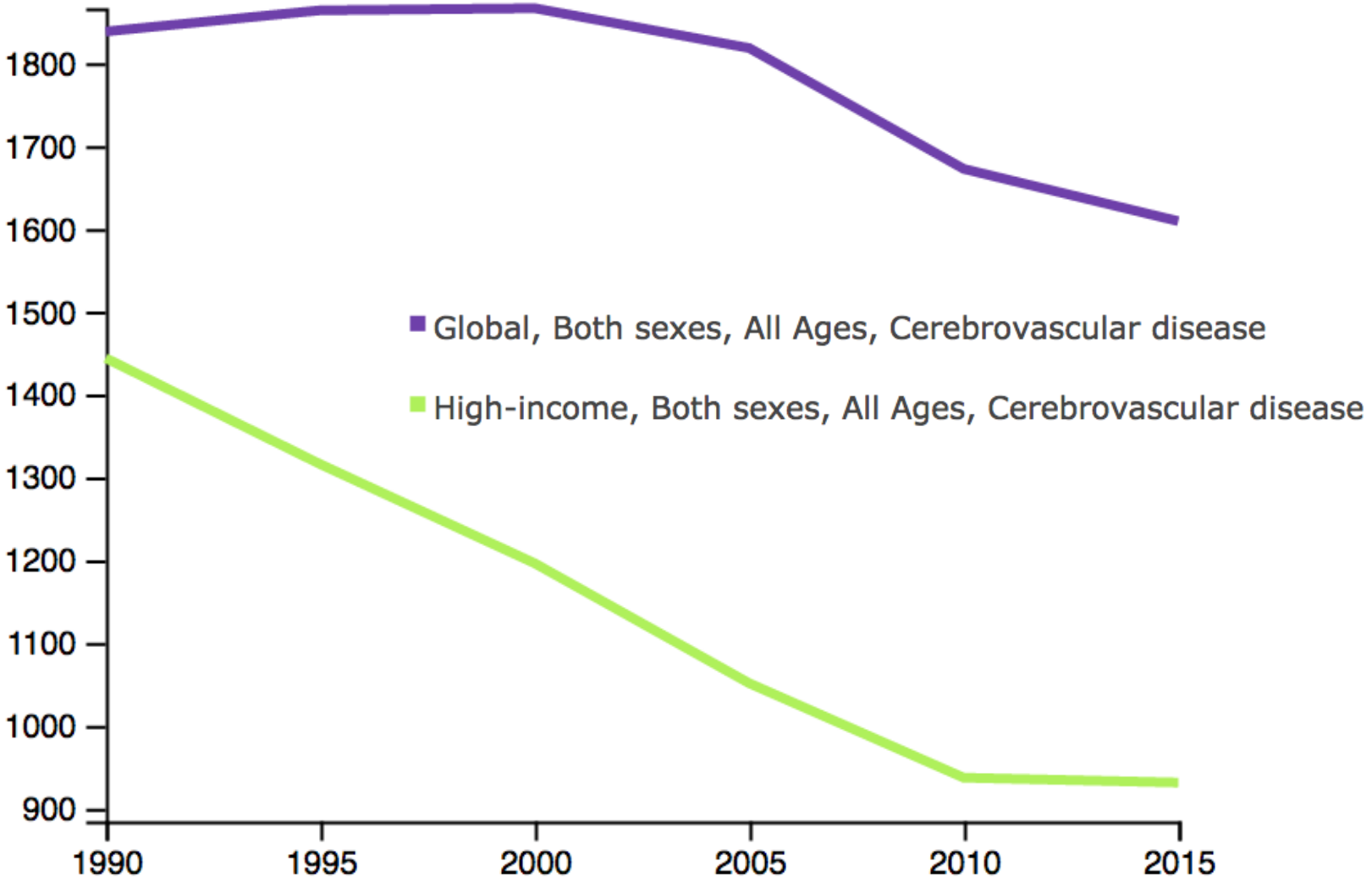
Prevalence



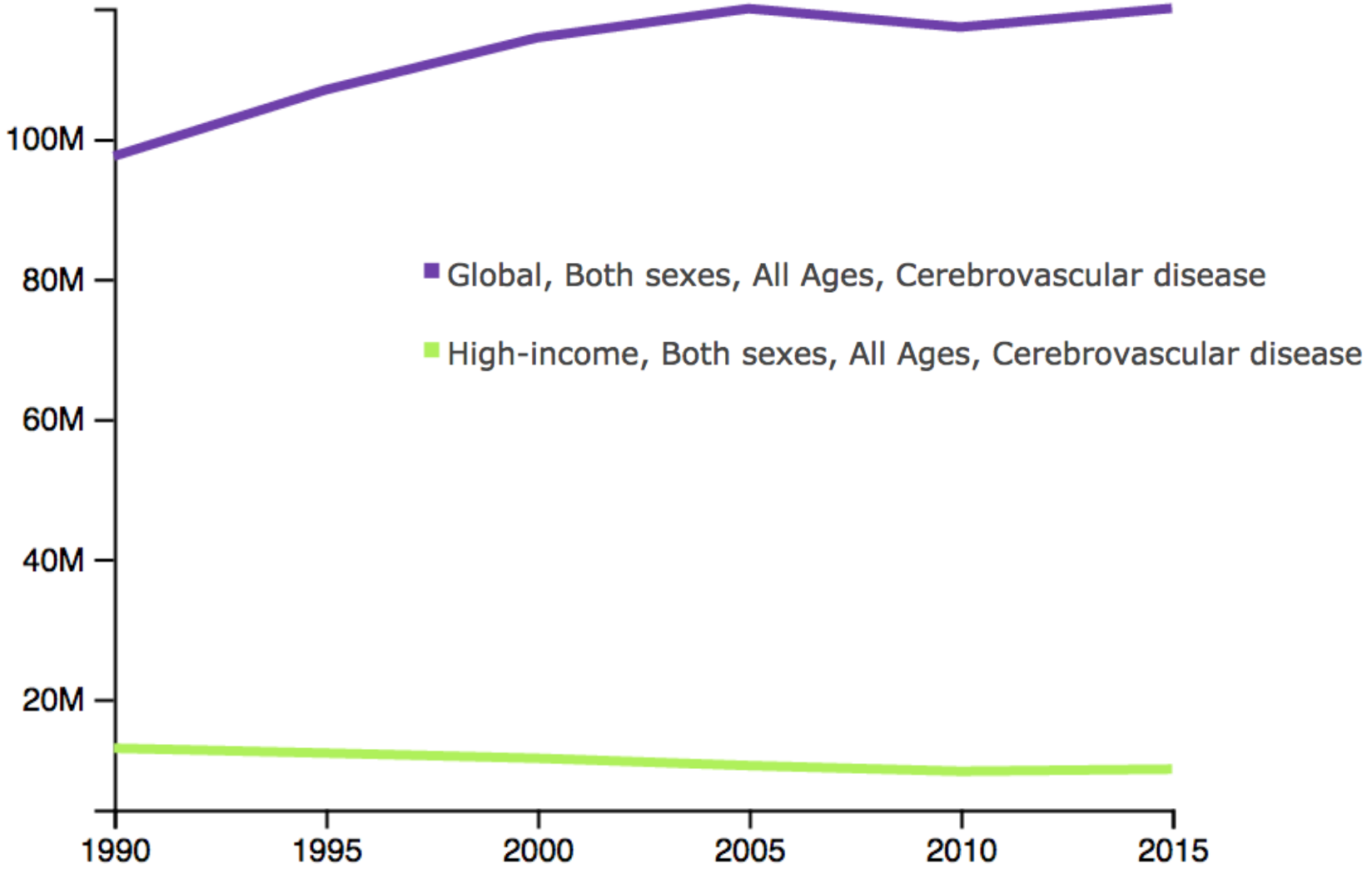
Feigin et al, 2015


Percent change
<–48·3
–48·3 to –38·9
–39·0 to –27·3
–27·4 to –23·0
–23·1 to –8·3
>–8·3

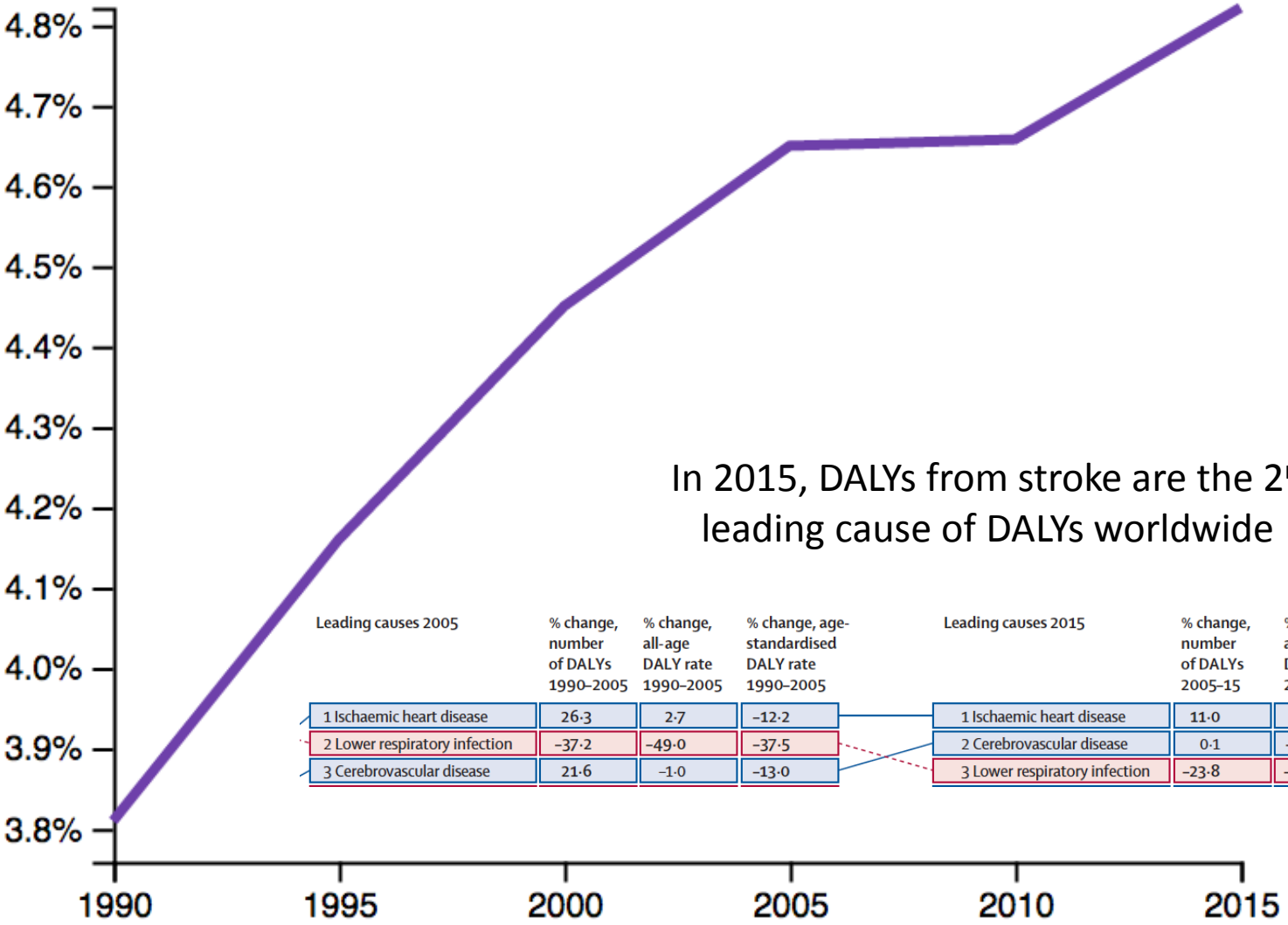
Global trends in stroke DALYs rates per 100,000 person-years (1990-2015)



Absolute number of DALYs from stroke in the world (1990-2015)



Proportional contribution of DALYs from stroke to DALYs from all causes in the world (1990-2015)

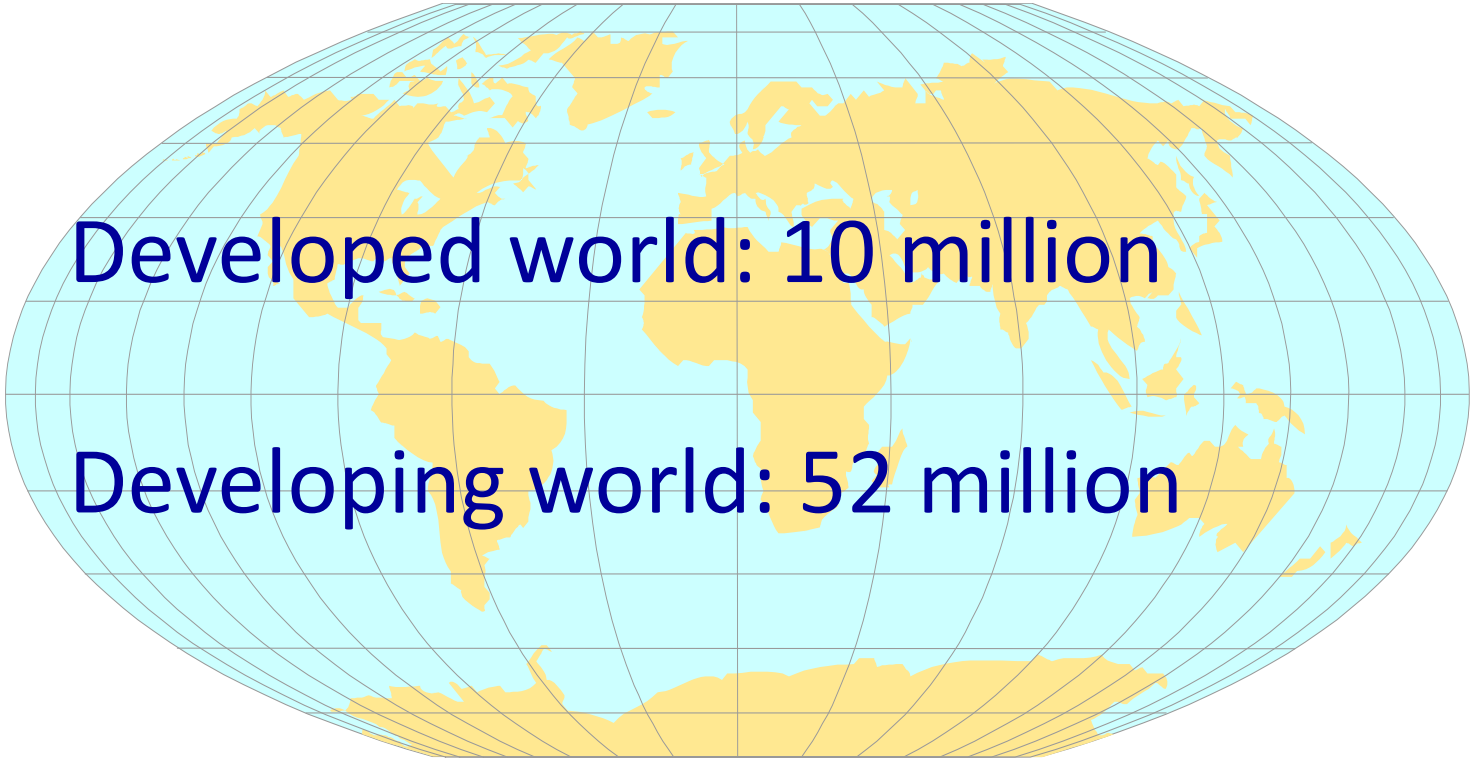


In 2015, DALYs from stroke are the 2nd leading cause of DALYs worldwide

Leading causes 2005	% change, number of DALYs 1990–2005	% change, all-age DALY rate 1990–2005	% change, age-standardised DALY rate 1990–2005
1 Ischaemic heart disease	26·3	2·7	−12·2
2 Lower respiratory infection	−37·2	−49·0	−37·5
3 Cerebrovascular disease	21·6	−1·0	−13·0

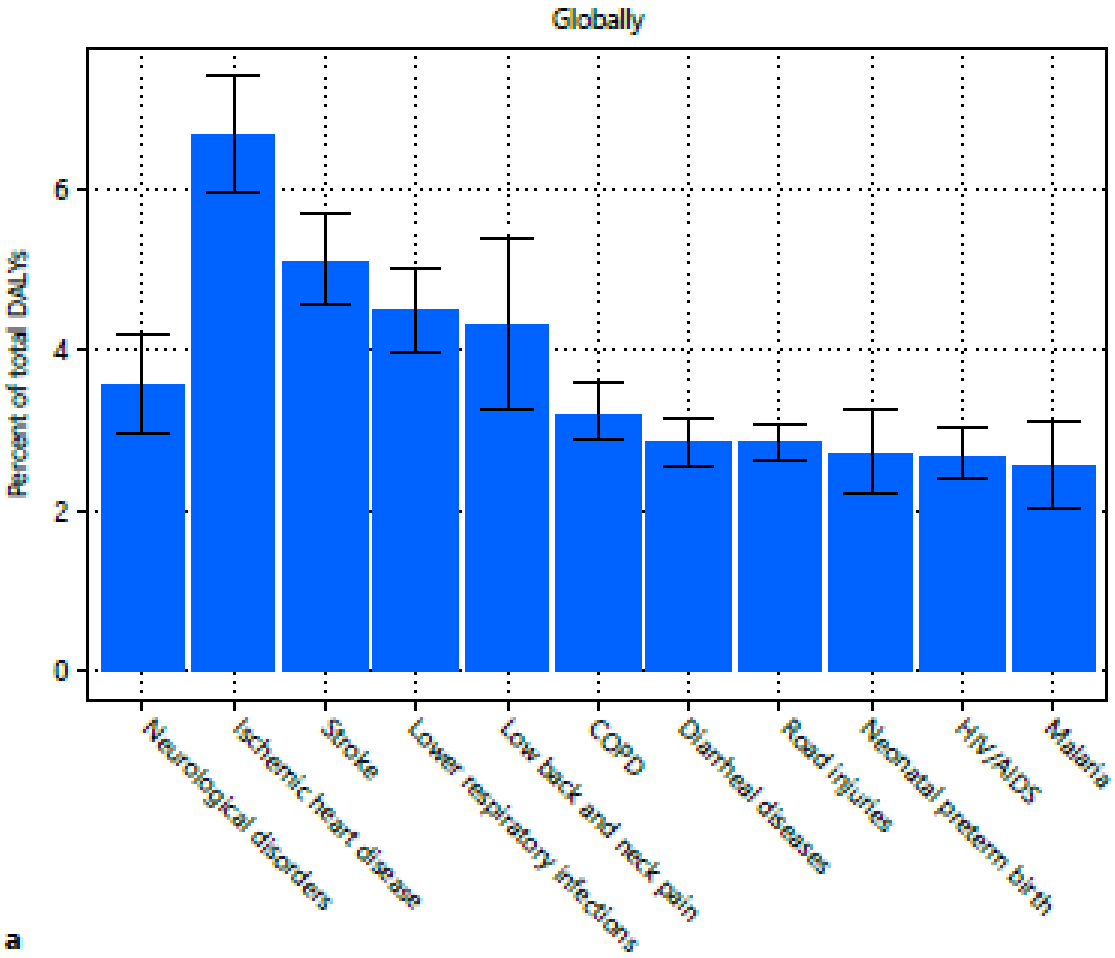
Leading causes 2015	% change, number of DALYs 2005–15	% change, all-age DALY rate 2005–15	% change, age-standardised DALY rate 2005–15
1 Ischaemic heart disease	11·0	−1·8	−14·2
2 Cerebrovascular disease	0·1	−11·3	−22·2
3 Lower respiratory infection	−23·8	−32·6	−31·0

Estimated number of disability-adjusted life-years (DALYs) lost to stroke in 2020



Total 62 million

Source: Murray and Lopez, Lancet 1997


Globally
Percent of total DALYs
0
2
4
6
Neurological disorders
Ischemic heart disease
Stroke
Lower respiratory infections
Low back and neck pain
COPD
Diarrheal diseases
Road injuries
Neonatal preterm birth
HIV/AIDS
Malaria

a

Epidemiology of Stroke in SSA

J G S	12940	WILEY	Dispatch: 31.5.14	CE: Hariharasudhan K.
Journal Code	Manuscript No.		No. of pages: 7	PE: Saranya Shree

CLINICAL INVESTIGATIONS

Contribution of Noncommunicable Diseases to Medical Admissions of Elderly Adults in Africa: A Prospective, Cross-Sectional Study in Nigeria, Sudan, and Tanzania

Rufus O. Akinyemi, PhD,† Isameldin M. H. Izzeldin, MBBS,‡ Catherine Dotchin, MD,†§ William K. Gray, PhD,§ Olaleye Adeniji, MBBS,* Osheik A. Seidi, MBBS,‡ Josephine J. Mwakisambwe, MD,¶ Carl J. Mhina, MD,¶ Florence Mutesi, MD,¶ Helen Z. Msechu, MD,¶ Kien A. Mteta, MD,¶ Mayada A. M. Ahmed, MBBS,‡ Shahd H. M. Hamid, MBBS,‡ Nazik A. A. Abuelgasim, MBBS,‡ Sumia A. A. Mohamed, MBBS,‡ Ashraf Y. O. Mohamed, MBBS,‡ Fidelis Adesina, MBChB,* Mohammed Hamzat, MBBS,* Taiwo Olunuga, MBChB,* Venance P. Maro, MMed,¶ and Richard Walker, MD†§*

RESULTS: In Africa, noncommunicable diseases (NCDs) accounted for 80.4% (n = 703) of admissions (n = 874), and tuberculosis, malaria, and the human immunodeficiency virus and acquired immunodeficiency syndrome accounted for 4.5% (n = 39). Stroke (n = 213, 24.4%) was the most common reason for admission, followed by cardiac or circulatory dysfunction (n = 155, 17.7%). Rates of hypertension were remarkably similar in the United Kingdom (45.8%) and Africa (40.0%).

Stroke Literacy among Africans

European Journal of Neurology 2009 doi:10.1111/j.1468-1331.2009.02666.x

Knowledge and perception of stroke amongst hospital workers in an African community

R. O. Akinyemi[a,b], O. S. Ogah[a], R. F. Ogundipe[a], O. A. Oyesola[c], A. A. Oyadoke[c], M. O. Ogunlana[d], F. M. Otubogun[a], T. F. Odeyinka[a], B. S. Alabi[e], J. O. Akinyemi[f], J. K. Osinfade[a] and R. N. Kalaria[b]

[a]*Department of Medicine, Federal Medical Centre, Abeokuta, Nigeria;* [b]*Institute for Ageing and Health, Newcastle General Hospital, Newcastle upon Tyne, UK ;* [c]*Department of Community Medicine and Primary Care, Federal Medical Centre, Abeokuta, Nigeria;*

- About 30% of workers in an hospital (majorly non – clinical) could not identify the brain as the organ affected in stroke
- 90% correctly identified hypertension as a risk factor
- 14% considered evil spirit/witchcraft as cause of stroke
- spiritual healing was most preferred by 13%

The burden of stroke in Africa: a glance at the present and a glimpse into the future

Mayowa O Owolabi, Sally Akarolo-Anthony, Rufus Akinyemi, Donna Arnett, Mulugeta Gebregziabher, Carolyn Jenkins, Hemant Tiwari, Oyedunni Arulogun, Albert Akpalu, Fred Stephen Sarfo, Reginald Obiako, Lukman Owolabi, Kwamena Sagoe, Sylvia Melikam, Abiodun M Adeoye, Daniel Lackland, Bruce Ovbiagele, as members of the H3Africa Consortium

Abstract

Objective: Information on the current burden of stroke in Africa is limited. The aim of this review was to comprehensively examine the current and projected burden of stroke in Africa.

Methods: We systematically reviewed the available literature (PubMed and AJOL) from January 1960 and June 2014 on stroke in Africa. Percentage change in age-adjusted incidence velocity, ischaemic stroke proportion, mean age and case fatality compared to high-income countries remain unknown.

Conclusions: While the available study data and evidence are limited, the burden of stroke in Africa appears to be increasing.

Stroke Incidence in Africa

- Hospital-based may show trends but not representative
- Community based, door-to-door, multiple case ascertainment methods, including verbal autopsies, over 3 years, age- standardized preferred. *Owolabi MO West Indian Medical Journal. 2011; 60:412-421*
- **315·9 per 100 000 (281·6–352·3) in Dar-es-Salaam (urban) Tanzania in 2006** *Walker R Lancet Neurol 2010; 9: 786–92*
- **108·6 per 100 000 (95% CI 89·0–130·9) in Hai (rural) Tanzania in 2006**
- 58.0 per 100 000 in Lagos, 2007. ?under-reporting (surveillance for 1 year, verbal autopsies not utilized, pre-hospitalization deaths not captured, patients who presented in hospitals outside the community not captured). *Danesi MA J Neurol Sci. 2013;331:43-7.*

Table 1. Studies reporting crude incidence of stroke in Africa

Year	Country/location/setting	Author	Crude incidence per 100 000 per year			
			Overall	Male	Female	Age
	Hospital-based					
1984	Libya, Benghazi, urban	Ashok[28]	63	69	58	15+
1985	South Africa: Atteridgeville and Mamelodi, suburban areas of Pretoria, urban	Rosman[29]	101	108	93	20+
1991	Zimbabwe, Harare, urban	Matenga[18]	31	30	32	All
1993	Libya, Benghazi, urban	El Zunni[30]	48	52	42	15+
2006	Mozambique, Maputo, urban	Damasceno[19]	149	174	128	15+
	Population/community-based					
1975	Nigeria, Ibadan, urban	Osuntokun[20]	26	25	13	All
1993	Egypt, Sohag, mixed*	Kandil[31]	180	100	85	All
1993	Egypt, Sohag, urban	Kandil[31]	150	90	53	All
1993	Egypt, Sohag, rural	Kandil[31]	210	97	119	All
2006	Tanzania, Hai, rural	Walker[32]	95	107	77	All
2006	Tanzania, Dares Salaam, urban	Walker[32]	108	115	100	All
2007	Nigeria, Lagos, urban	Danesi[24]	25	28	21	All
2007	Egypt, Al-Kharga, mixed*	Farghaly[22]	250	270	230	All
2007	Egypt, Al-Kharga, rural	Farghaly[22]	230	250	220	All
2007	Egypt, Al-Kharga, urban	Farghaly[22]	260	280	240	All
2012	Egypt,Al Quseir, urban	El Tallawy[21]	181	212	150	20+

*Combined rates including both rural and urban communities.

Stroke mortality in SSA

- In hospital – based studies, 1- month case fatality rate of up 50% (ICH – 72%, C I- 27%) were reported by Damasceno et al. Stroke 2010.

- In the INTERSTROKE Study, 1 – month CFR was 22% in Africa (compared to 4% in HIC)

- In the Tanzanian Incident Stroke Study, case fatality rate was 28.7% at 1 month and 84.3% at 3 years (Walker et al, 2010)

Stroke Prevalence in Africa

- Southern Africa Stroke Prevention Initiative (SASPI), demographic surveillance in **2001**, a stroke prevalence study in Agincourt, **rural** South Africa, with diagnosis of stroke based on the WHO definition of stroke, yielded an age-standardized (Segi world population) stroke prevalence of **290 per 100 000 people** over the age of 15 years.
- In men, the prevalence was 281 per 100 000 and in women, **315 per 100 000** *Connor MD, Lancet Neurol 2007; 6: 269–78.*
- Crude prevalence rate of stroke in urban Nigeria 2005/2006 was 114/100,000 *Danesi MA Neuroepidemiology 2007;28:216–23*

Population – based prevalence rates of stroke in Africa

Year	Country/location/setting	Author	Crude prevalence per 100 000			Age
			Overall	Male	Female	
1982	Nigeria, Igbo-Ora, rural	Osuntokun[37]	58	–	–	All
1985	Tunisia Kelibia, mixed*	Atia-Romdhane[41]	42	–	–	All
1988	Ethiopia, central Ethiopia, rural	Tekle Haimanot[34]	15	–	–	20–85
1993	Egypt, Sohag, mixed*	Kandil[31]	508	520	490	All
1993	Egypt, Sohag, urban	Kandil[31]	410	460	470	All
1993	Egypt, Sohag, rural	Kandil[31]	540	510	570	All
1994	Tanzania, Hai, rural	Walker[42]	127	155	103	15+
2002	South Africa: Agincourt Health and Population Unit, Limpopo province, rural	Connor[43]	243	188	296	15+
2006	Nigeria, Lagos, urban	Danesi[38]	114	151	69	All
2009	Benin, Cotonou, urban	Cossi[44]	460	610	360	15+
2009	Egypt, Al-Kharga, mixed*	Farghaly[22]	560	610	510	All
2009	Egypt, Al-Kharga, urban	Farghaly[22]	580	620	530	All
2009	Egypt, Al-Kharga, rural	Farghaly[22]	520	580	458	All
2010	Tanzania, Hai district, rural	Dewhurst[39]	2300	2971	1752	70+
2010	Egypt, Assuit, urban	Khedr[35]	963	1174	736	All
2013	Egypt, Qena, mixed*	Khedr[40]	922	1103	726	All

*Combined rates including both rural and urban communities.

Stroke Types in SSA – Data from the INTERSTROKE Study

	Overall (n=13 447)	Western Europe, North America, Australia (n=1917)	Eastern and central Europe, Middle East (n=1394)	South America (n=1471)	China (n=3987)	South Asia (n=2850)	Southeast Asia (n=855)	Africa (n=973)
Age, years	62·2 (13·6)	66·7 (13·4)	63·9 (13·4)	65·8 (14·3)	61·9 (12·5)	59·6 (12·9)	56·6 (13·0)	58·7 (15·2)
Age ≤45 years	1582 (11·8%)	141 (7·4%)	143 (10·3%)	123 (8·4%)	364 (9·1%)	451 (15·8%)	156 (18·3%)	204 (21·0%)
Women	5434 (40·4%)	781 (40·7%)	556 (39·9%)	652 (44·3%)	1606 (40·3%)	1017 (35·7%)	352 (41·2%)	470 (48·3%)
Intracerebral haemorrhage	3059 (22·7%)	128 (6·7%)	117 (8·4%)	348 (23·7%)	1102 (27·6%)	785 (27·5%)	285 (33·3%)	294 (30·2%)
Ischaemic stroke	10 388 (77·3%)	1789 (93·3%)	1277 (91·6%)	1123 (76·3%)	2885 (72·4%)	2065 (72·5%)	570 (66·7%)	679 (69·7%)
OCSP classification*								
Total anterior circulation infarct	673/10 388 (6·5%)	71/1789 (4·0%)	72/1277 (5·6%)	176/1123 (15·7%)	127/2885 (4·4%)	105/2065 (5·1%)	33/570 (5·8%)	89/679 (13·1%)
Partial anterior circulation infarct	4872/10 388 (46·9%)	809/1789 (45·2%)	631/1277 (49·4%)	404/1123 (36·0%)	1306/2885 (45·3%)	945/2065 (45·8%)	383/570 (67·2%)	394/679 (58·0%)
Posterior circulation infarct	1509/10 388 (14·5%)	353/1789 (19·7%)	265/1277 (20·8%)	146/1123 (13·0%)	372/2885 (12·9%)	258/2065 (12·5%)	63/570 (11·1%)	52/679 (7·7%)
Lacunar infarction	2789/10 388 (26·9%)	536/1789 (30·0%)	267/1277 (20·9%)	212/1123 (18·9%)	1051/2885 (36·4%)	549/2065 (26·6%)	79/570 (13·9%)	95/679 (14·0%)
Undetermined	545/10 388 (5·3%)	20/1789 (1·1%)	42/1277 (3·3%)	185/1123 (16·5%)	29/2885 (1·0%)	208/2065 (10·1%)	12/570 (2·1%)	49/679 (7·22%)

O'Donnell et al, 2016.

Why is the burden of stroke increasing in low to middle income countries?

Feigin VL et al. *Lancet Neurol* 2009; **8**:355-69

- The average age of the populations increases
- Exposure to cardiovascular risk factors increases:
  - Smoking
  - Raised blood pressure
  - Raised blood glucose concentrations
  - Westernised diets
    - Low in fruit and vegetables
    - High in fat and salt
  - Physical inactivity

Risk Factors

Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study

*Martin J O'Donnell, Denis Xavier, Lisheng Liu, Hongye Zhang, Siu Lim Chin, Purnima Rao-Melacini, Sumathy Rangarajan, Shofiqul Islam, Prem Pais, Matthew J McQueen, Charles Mondo, Albertino Damasceno, Patricio Lopez-Jaramillo, Graeme J Hankey, Antonio L Dans, Khalid Yusoff, Thomas Truelsen, Hans-Christoph Diener, Ralph L Sacco, Danuta Ryglewicz, Anna Czlonkowska, Christian Weimar, Xingyu Wang, Salim Yusuf, on behalf of the INTERSTROKE investigators**

- **10 risk factors are associated with 90% population attributable risk (PAR) risk of stroke**
- history of hypertension (OR 2·64)
- current smoking (OR 2·09)
- waist-to-hip ratio(OR 1·65 for highest *vs lowest tertile)*
- *diet risk score (OR 1·35)for highest vs lowest* tertile);
- regular physical activity (OR 0·69)
- diabetes mellitus (OR 1·36)
- alcohol intake (OR 1·51)for more than 30 drinks per month or binge drinking
- psychosocial stress (OR 1·30)
- depression (OR 1·35)
- cardiac causes (OR 2·38)
- ratio of apolipoproteins B to A1 (OR 1·89) highest *vs lowest tertile*

- Globally, 90% of the burden of stroke are attributable to modifiable risk factors
- Clusters of behavioural, metabolic and environmental risk factors:
- Behavioural (smoking, poor diet, low physical activity)
- Metabolic (↑SBP, ↑BMI, ↑FPG, ↑TC, ↓GFR)
- Environmental (household air pollution from from solid fuels, ambient particulate matter pollution, lead exposure)

Global burden of stroke and risk factors in 188 countries, during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

*Valery L Feigin, Gregory A Roth, Mohsen Naghavi, Priya Parmar, Rita Krishnamurthi, Sumeet Chugh, George A Mensah, Bo Norrving, Ivy Shiue, Marie Ng, Kara Estep, Kelly Cercy, Christopher J L Murray, Mohammad H Forouzanfar, for the Global Burden of Diseases, Injuries, and Risk Factors Study 2013 and Stroke Experts Writing Group**

Summary

Background The contribution of modifiable risk factors to the increasing global and regional burden of stroke is

Lancet Neurol 2016

Rank

1–5 | 6–10 | 11–15 | >15

Risk factor	Global	High-income Asia Pacific	Western Europe	Australasia	High-income North America	Central Europe	Southern Latin America	Eastern Europe	East Asia	Tropical Latin America	Central Latin America	Southeast Asia	Central Asia	Andean Latin America	North Africa and Middle East	Caribbean	South Asia	Oceania	Southern sub-Saharan Africa	Eastern sub-Saharan Africa	Central sub-Saharan Africa	Western sub-Saharan Africa
High systolic blood pressure	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Diet low in fruits	2	2	4	4	3	4	4	3	2	3	4	2	2	3	3	3	2	3	2	2	2	2
High body-mass index	3	6	2	2	2	2	2	2	6	2	2	6	3	2	2	2	8	2	3	5	5	4
Diet high in sodium	4	3	6	10	6	3	8	6	3	4	8	8	4	7	4	12	5	13	7	9	11	8
Smoking	5	4	5	5	5	6	5	5	4	6	6	4	6	6	8	5	7	5	5	8	10	12
Diet low in vegetables	6	5	3	3	4	5	3	4	11	5	3	3	5	4	5	4	4	4	4	4	4	5
Ambient particulate matter (2·5 μm) pollution	7	8	11	14	12	8	12	10	5	9	9	9	8	9	6	11	6	15	11	12	6	6
Household air pollution from solid fuels	8	..	..	..	..	..	15	..	7	14	12	5	12	11	14	7	3	6	8	3	3	3
Diet low in whole grains	9	7	9	8	9	7	6	7	8	7	5	7	7	5	7	6	10	7	10	10	7	9
High fasting plasma glucose	10	10	10	9	7	11	7	9	9	8	7	10	9	10	9	10	9	8	9	11	8	11
Low physical activity	11	9	8	6	8	10	11	11	13	11	13	11	13	12	10	8	12	9	13	14	12	10
Low glomerular filtration rate	12	12	7	7	13	9	10	12	14	10	10	14	10	8	11	9	11	12	6	7	9	7
Alcohol use	13	11	12	11	10	12	9	8	12	12	11	15	11	14	16	15	15	11	12	13	14	14
Lead exposure	14	14	14	13	15	14	16	15	10	15	16	12	14	15	13	13	13	14	14	6	13	13
High total cholesterol	15	13	13	12	11	13	13	13	16	13	14	13	15	13	12	14	14	10	15	15	15	15
Second-hand smoke	16	15	15	15	16	15	14	14	15	16	17	16	16	17	15	17	16	16	16	16	16	16
Diet high in sugar-sweetened beverages	17	16	16	16	14	16	17	16	17	17	15	17	17	16	17	16	17	17	17	17	17	17

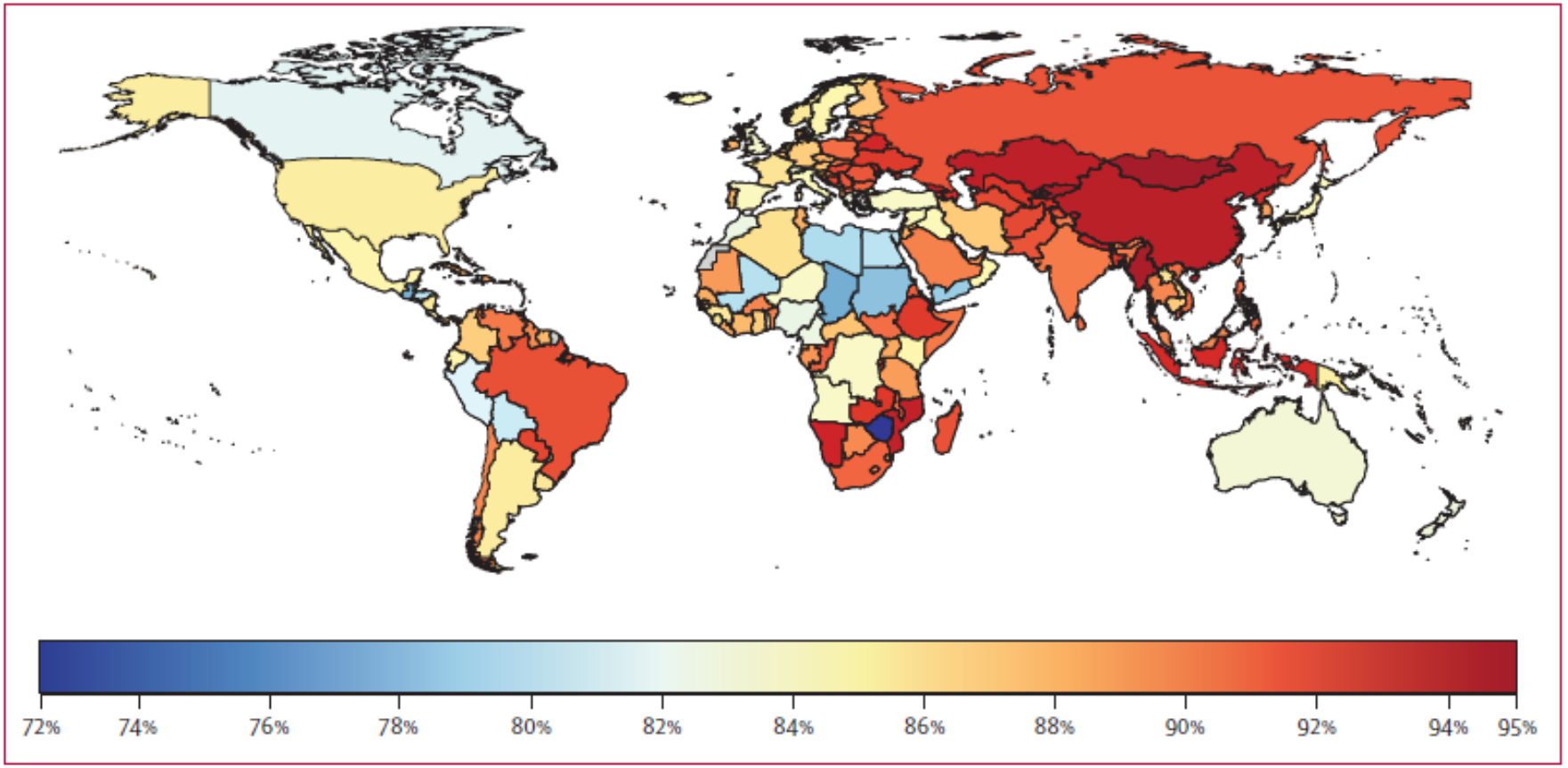
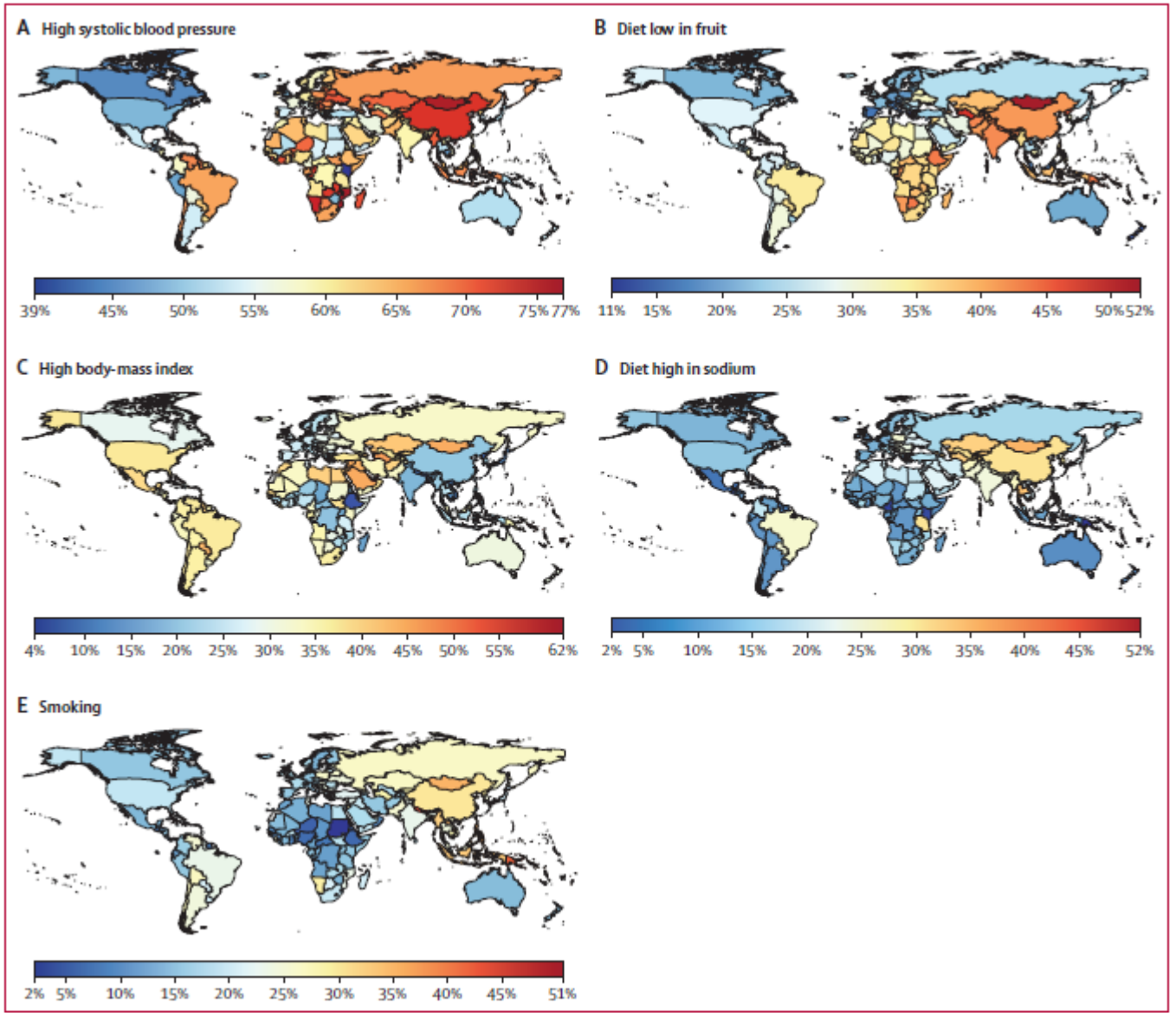
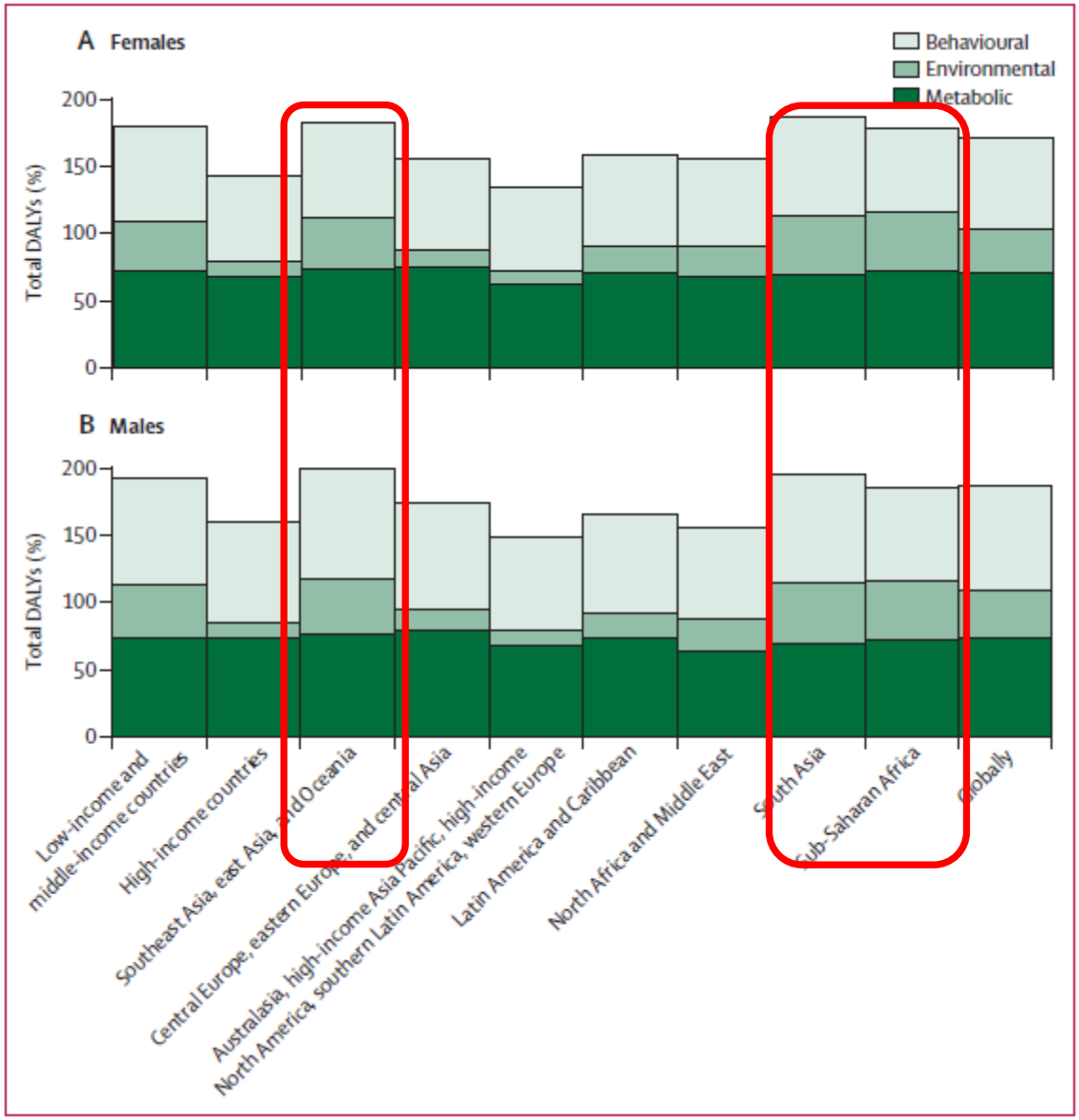


Figure 1: **Stroke-related DALYs attributable to all modifiable risk factors combined for both sexes in 2013**
DALY=disability-adjusted life-year.

Feigin et al, 2016



Feigin et al, 2016



Feigin et al, 2016

Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): a case-control study

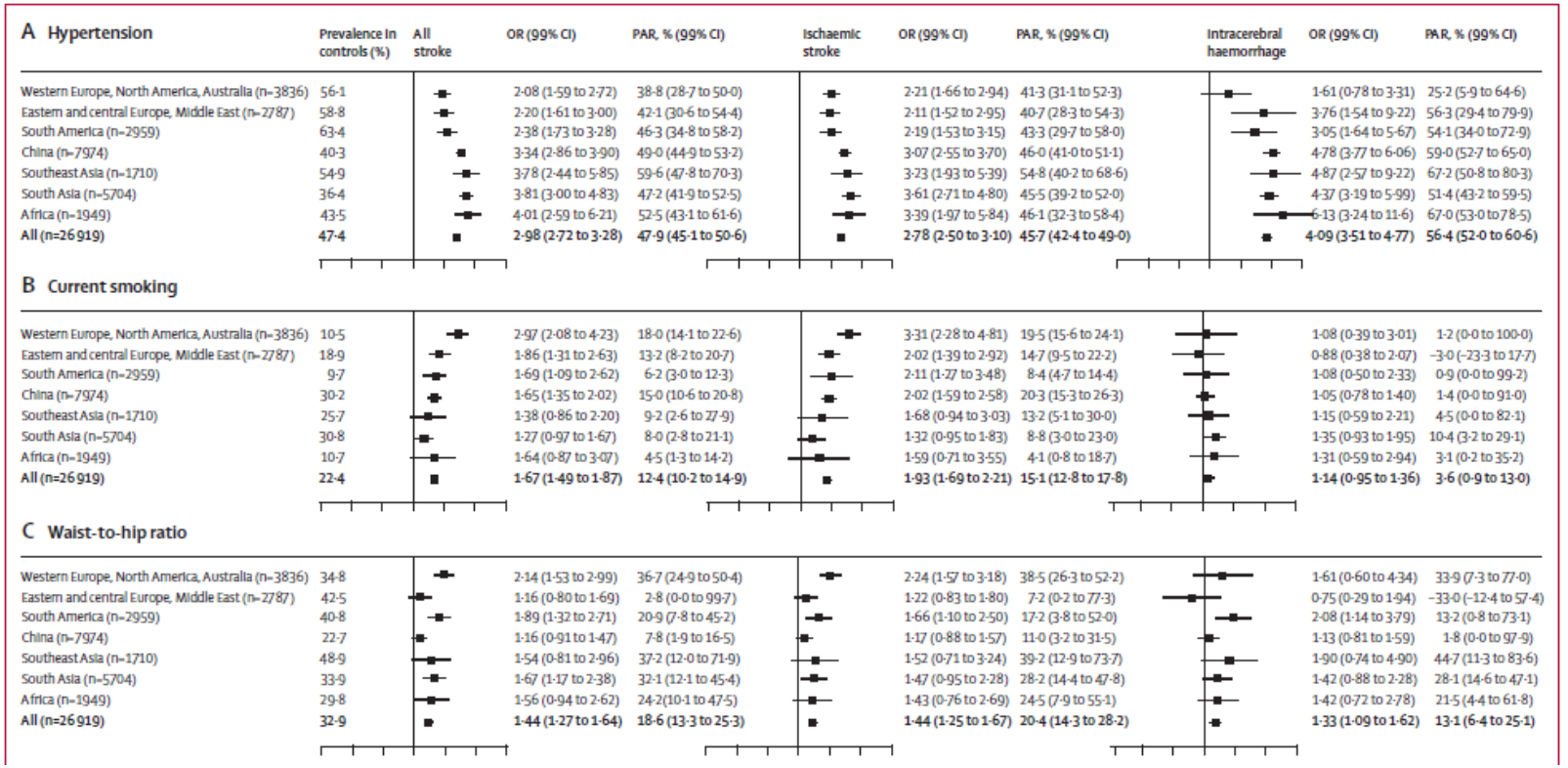
*Martin J O'Donnell, Siu Lim Chin, Sumathy Rangarajan, Denis Xavier, Lisheng Liu, Hongye Zhang, Purnima Rao-Melacini, Xiaohe Zhang, Prem Pais, Steven Agapay, Patricio Lopez-Jaramillo, Albertino Damasceno, Peter Langhorne, Matthew J McQueen, Annika Rosengren, Mahshid Dehghan, Graeme J Hankey, Antonio L Dans, Ahmed Elsayed, Alvaro Avezum, Charles Mondo, Hans-Christoph Diener, Danuta Ryglewicz, Anna Czlonkowska, Nana Pogosova, Christian Weimar, Romaina Iqbal, Rafael Diaz, Khalid Yusoff, Afzalhussein Yusufali, Aytekin Oguz, Xingyu Wang, Ernesto Penaherrera, Fernando Lanas, Okechukwu S Ogah, Adesola Ogunniyi, Helle K Iversen, German Malaga, Zvonko Rumboldt, Shahram Oveisgharan, Fawaz Al Hussain, Daliwonga Magazi, Yongchai Nilanont, John Ferguson, Guillaume Pare, Salim Yusuf; on behalf of the INTERSTROKE investigators**

Summary

Background Stroke is a leading cause of death and disability, especially in low-income and middle-income countries. We sought to quantify the importance of potentially modifiable risk factors for stroke in different regions of the world

Published Online July 15, 2016

O'Donnell, 2016



O'Donnell, 2016

- Data confirm regional/geographic variation of PAR of stroke risk factors
- Implications for region- and country- specific primary and secondary prevention

Drivers of changing stroke epidemiology

- Demographic transition (population growth and ageing)
- Urbanization and changing enviroments
- Changing risk factor pattern
- Racial (? Genetic factors, gene – gene, gene – environment interactions)

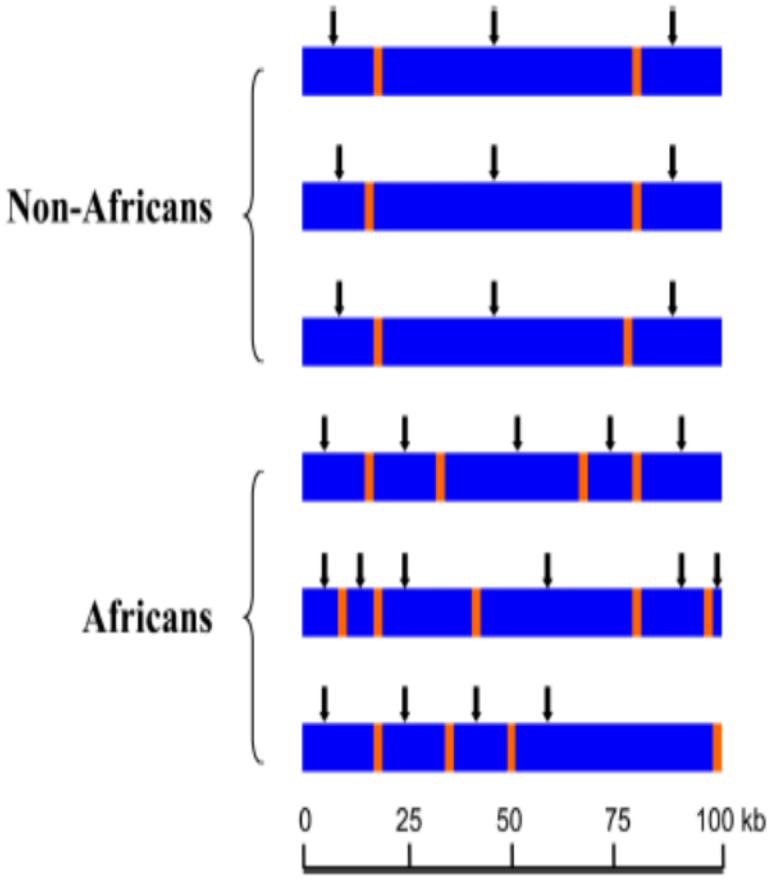
Is Genetics important for Stroke in Africa ?

Stroke Disparities and African ancestry

- Significant racial (ethnic) and geographical (environmental) disparities occur in stroke
- African Americans have a higher predisposition, worse severity and often poorer outcomes compared to Caucasian Americans (US Studies).
- Black stroke survivors had poorer cognitive outcome compared to other racial groups (South London Stroke Register Study)
- Inherited genetic variations offer a possible explanation for the observed peculiarities of stroke in populations of African ancestry

Genetic diversity of African populations

- The African population exhibits great genetic diversity.
- This contributes to variations in disease pattern eg Hbs and malaria .
- .

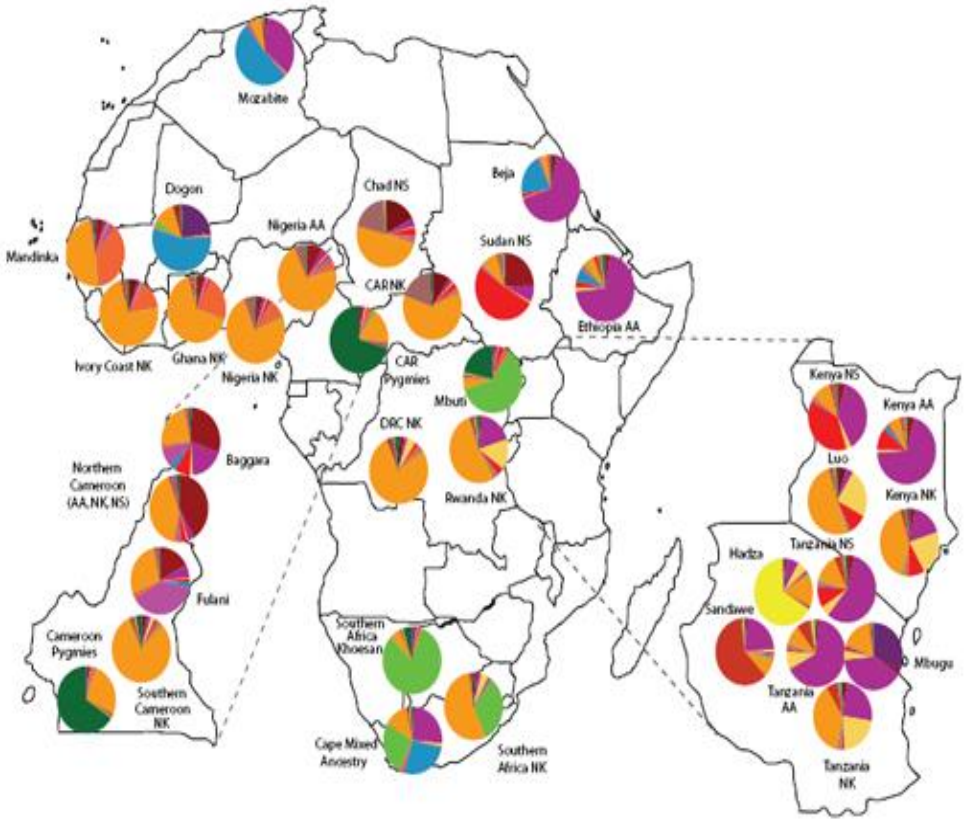


Campbell and Tishkoff; Annu Rev Genomics Hum Genet. 2008 ; 9: 403–433

Genetic diversity of African populations

- The import of this on the pathobiology, phenomics and pharmacogenomics of cerebrovascular disorders are largely unexplored.

- Exploring genomics of diseases has great potentials for deeper insight, new therapeutics, neuro-protective agents and personalized medicine



Campbell and Tishkoff; Annu Rev Genomics Hum Genet. 2008 ; 9: 403–433

Genomics and health disparities

Adapted Gene	Beneficial Trait	Negative Outcome
HBB	Confers incomplete resistance to lethal forms of malaria	Sickle Cell Trait Sickle Cell Disease
Regulatory Deficiencies of HBA and HBB	Confers incomplete resistance to lethal forms of malaria	α and β thalassemia
APOL1	Protection against Human African Trypanosomiasis	Kidney disease
ATP1A1, AQP2, CSK	Climate adaptation	Hypertension and Osmoregulation
DMD	Confers protection against Lassa fever	Duchenne Muscular Dystrophy

Rotimi et al, 2016

The burden of stroke in Africa: a glance at the present and a glimpse into the future

Mayowa O Owolabi, Sally Akarolo-Anthony, Rufus Akinyemi, Donna Arnett, Mulugeta Gebregziabher, Carolyn Jenkins, Hemant Tiwari, Oyedunni Arulogun, Albert Akpalu, Fred Stephen Sarfo, Reginald Obiako, Lukman Owolabi, Kwamena Sagoe, Sylvia Melikam, Abiodun M Adeoye, Daniel Lackland, Bruce Ovbiagele, as members of the H3Africa Consortium

Stroke genomics in people of African ancestry: charting new paths

RO Akinyemi, B Ovbiagele, A Akpalu, C Jenkins, K Sagoe, L Owolabi, F Sarfo, R Obiako, M Gebreziabher, E Melikam, S Warth, O Arulogun, D Lackland, A Ogunniyi, H Tiwari, RN Kalaria, D Arnett, MO Owolabi, for the SIREN investigators as members of the H3Africa Consortium

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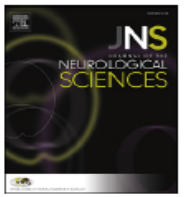


Review article

Neurogenomics in Africa: Perspectives, progress, possibilities and priorities

Rufus O. Akinyemi [a,b,*], Mayowa O. Owolabi [c], Tolulope Oyeniyi [d], Bruce Ovbiagele [e], Donna K. Arnett [f], Hemant K. Tiwari [f], Richard Walker [g], Adesola Ogunniyi [c], Raj N. Kalaria [b,**] and SIREN group of H3Africa Consortium

Stroke Investigative Research and Education Network (SIREN)

genome.gov
National Human Genome Research Institute
National Institutes of Health

NIH National Institute of Neurological Disorders and Stroke
Reducing the burden of neurological disease...

NIH National Institutes of Health
Office of Strategic Coordination - The Common Fund

SIREN: Central Hypothesis and Objective

To develop suitable interventions, the stroke epidemic in Africa needs accurate epidemiologic, phenotypic and genomic characterization (first pillar of Stroke Quadrangle).

- ✓ **Aim**: To evaluate the ***genomic and environmental risk factors for stroke in sub-Saharan Africa***, while simultaneously **building sustainable capacities** in phenomics, biobanking, genomics, biostatistics and bioinformatics.

- ✓ **Hypothesis**: Distribution of unique and novel genomic and environmental factors will account for the peculiar and hitherto unreported pattern, incidence, type, subtype and outcome of stroke among individuals of African ancestry.


BURKINA FASO
Ouagadougou
Dioulasso
BENIN
TOGO
GHANA
Kumasi
Koforidua
Accra
Takoradi
Cape Three Points
Lake Volta
Tamale
Sokode
Sokoto
Illela
Kaura Namoda
Katsina
Zamfara
Gusau
Bimin Kebbi
Kebbi
Zaria
Kano
Jigawa
Dutse
Nguru
Yobe
Damaturu
Pokiskum
Borno
Maiduguri
Oamasak
Kaduna
Bauchi
Gombe
Biu
Adamawa
Jos
Kontagora
Wawa
Niger
Minna
Bida
ABUJA
Abuja Capital Territory
Shedam
Jalingo
Yola
Kisi
Kwara
Oyo
Ilorin
Baro
Plateau
Ogbomoso
Osogbo
Ado-Ekiti
Lokoja
Wukari
Bali
Ibadan
Osun
Ekiti
Kogi
Makurdi
Taraba
Abeokuta
Akure
Benue
Ogun
Ondo
Edo
Keja
Lagos
Enugu
Ebonyi
Benin City
Anambra
Abakaliki
Enugu
Asaba
Awka
Cross River
Sapele
Imo
Abia
Delta
Umuahia
Owerri
Uyo
Calabar
Bayelsa
Rivers
Akwa Ibom
Yenagoa
Port Harcourt
GULF OF GUINEA
CAMEROON
LEGEND

- Unravel genomic and environmental risk factors for stroke in Africans.
- **CADET core**: Training and Capacity building for sustainability in all cores
- > 3000 case – control pairs

SIBS – Phenomics and Comm. Eng.

- **Accurate phenotyping**
  Cases: ***ACCESS*** *software-* ***patent***
  Controls: ***pictogram QVSFS*** *created*
- *CVD screening of >7,000 subjects during comm. outreaches (>63).*
- *Task-shifting stroke training -model of translational genomics*

SIBS - Genomics

Discovery Phase	*Candidate gene . 25 SNPs* *GWAS African custom chip 2.5M SNPs* *WES/WGS; Pathway /Network analysis*
Replication Phase	*Validate new SNPs and CNVs +/- InDels in REGARDS black sub-cohort, ISGC*
Genomic banking for future analysis	*Further analysis with next nextGenSeq, functional genomics, emerging tech.*

SIBS – Biostatistics & Bioinformatics

AIM on ClearCanvas Enriched Stroke phenotyping Software : ACCESS

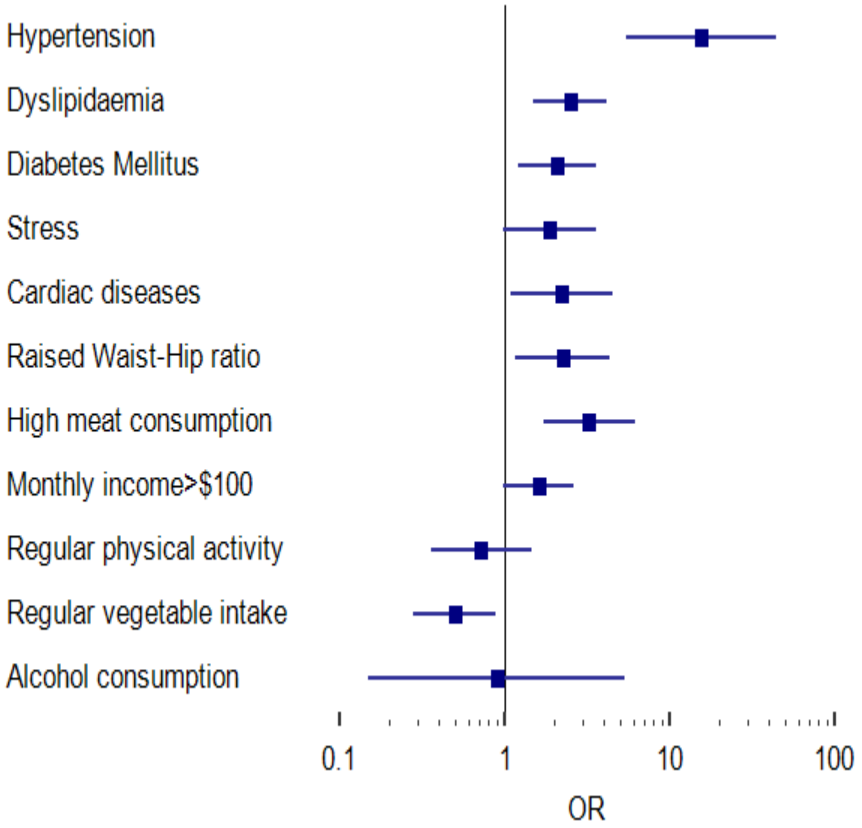
- For standard/uniform reporting templates across multiple sites in multicenter studies. **USER-FRIENDLY**

Facilitates…

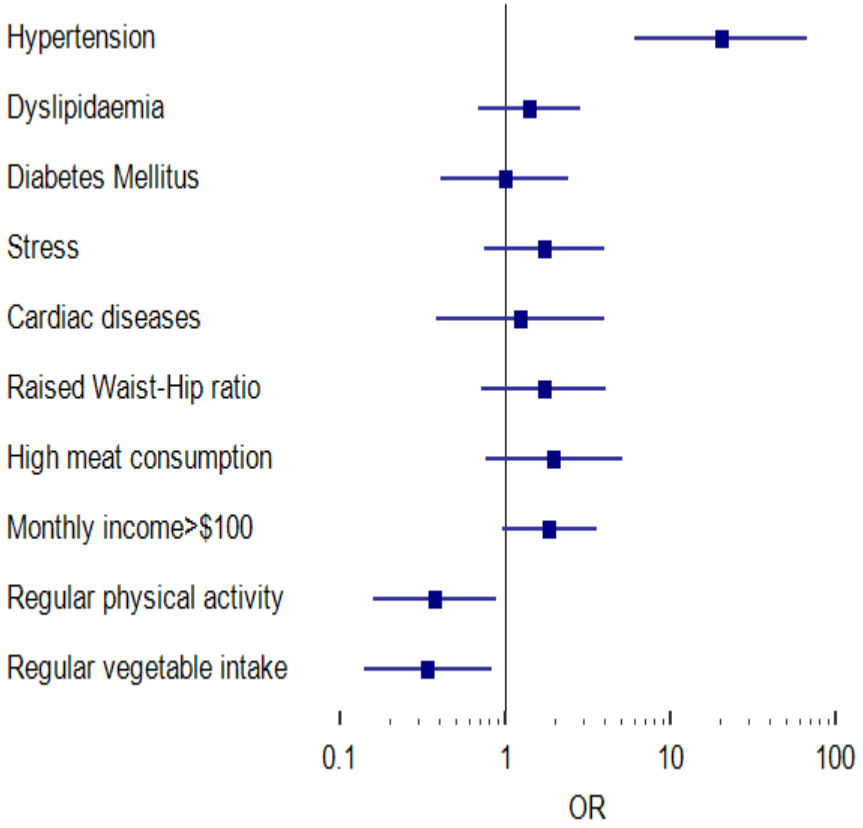
- concordant and reproducible classification of all stroke subtypes by multiple investigators
- Multi-level adjudication/ quality control of image report
- Export of image data to other formats -XML map to Excel and merges easily with REDCap database
- Archiving, backup & security

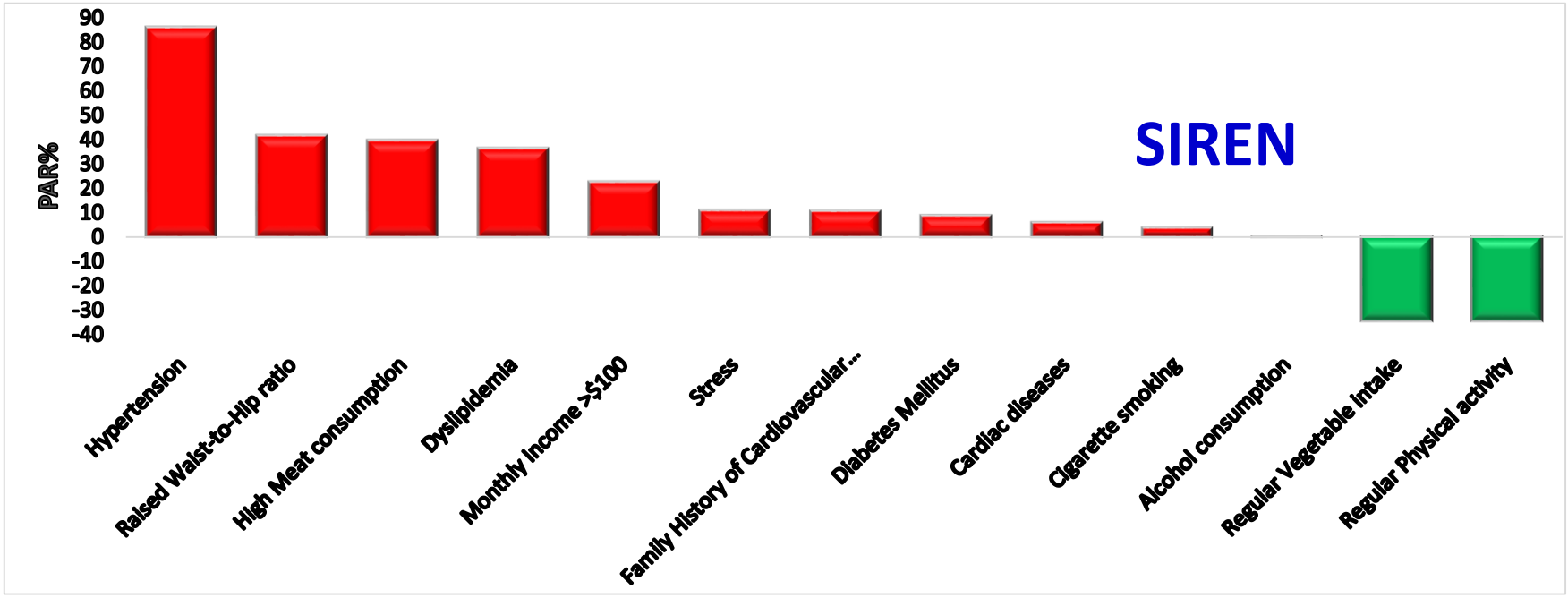
Preliminary Results

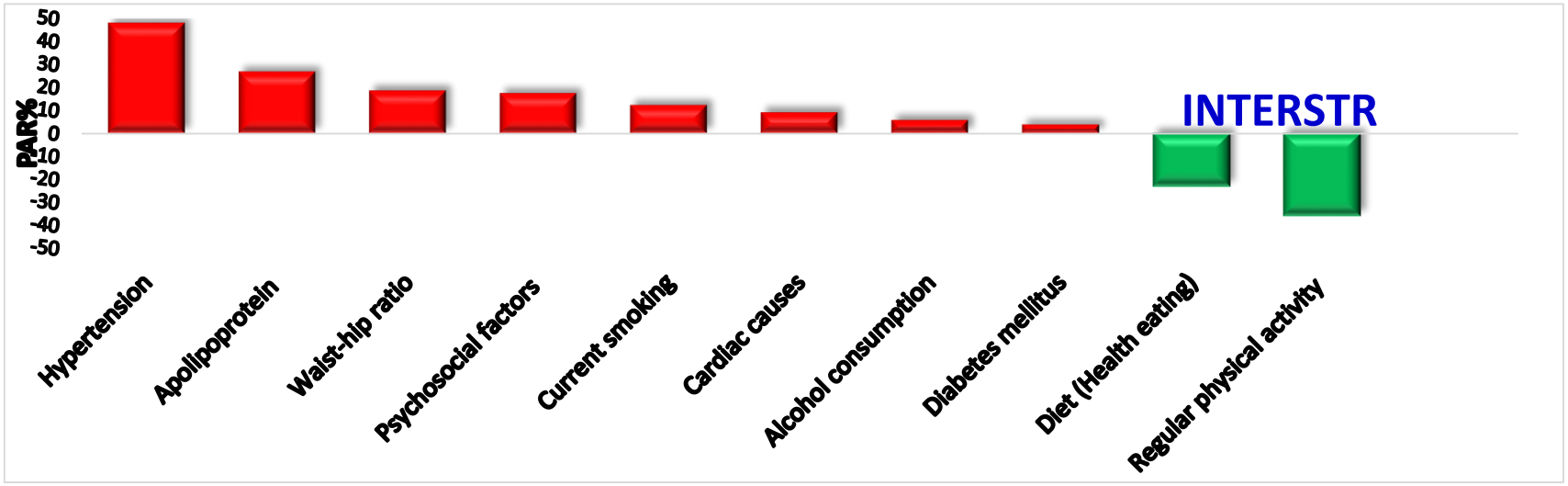
Risk factors for Ischemic stroke (64 %)



Risk factors for hemorrhagic stroke (36%)




SIREN
PAR%
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
Hypertension
Raised Waist-to-Hip ratio
High Meat consumption
Dyslipidemia
Monthly Income >$100
Stress
Family History of Cardiovascular...
Diabetes Mellitus
Cardiac diseases
Cigarette smoking
Alcohol consumption
Regular Vegetable Intake
Regular Physical activity


INTERSTR
PAR%
50
40
30
20
10
0
-10
-20
-30
-40
-50
Hypertension
Apolipoprotein
Waist-hip ratio
Psychosocial factors
Current smoking
Cardiac causes
Alcohol consumption
Diabetes mellitus
Diet (Health eating)
Regular physical activity

Comparison with REGARDS
(African Americans and European Americans)

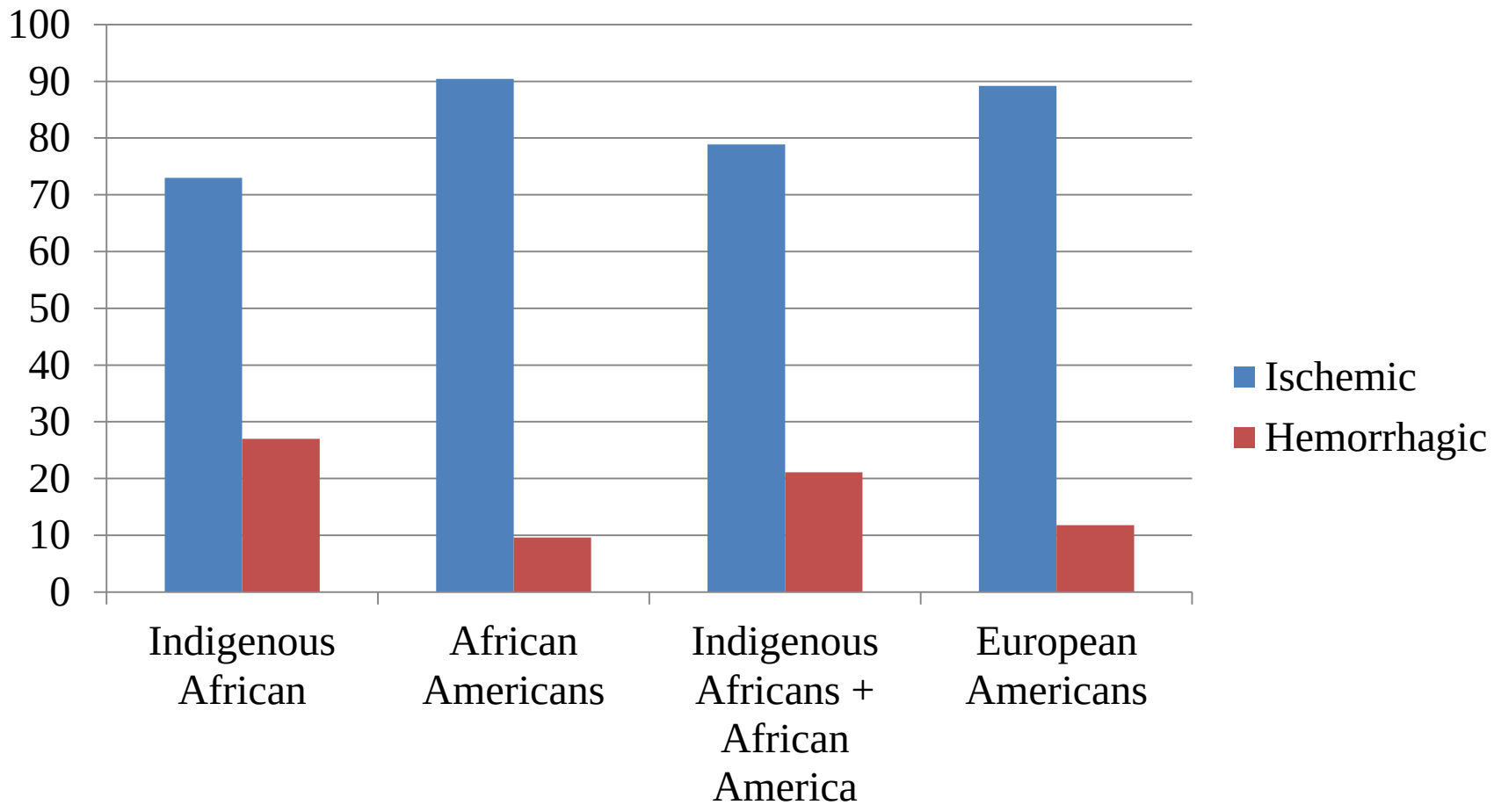
- We compared stroke type and contributions of vascular risk factors among indigenous Africans (IA), African Americans (AA) and European Americans (EA)

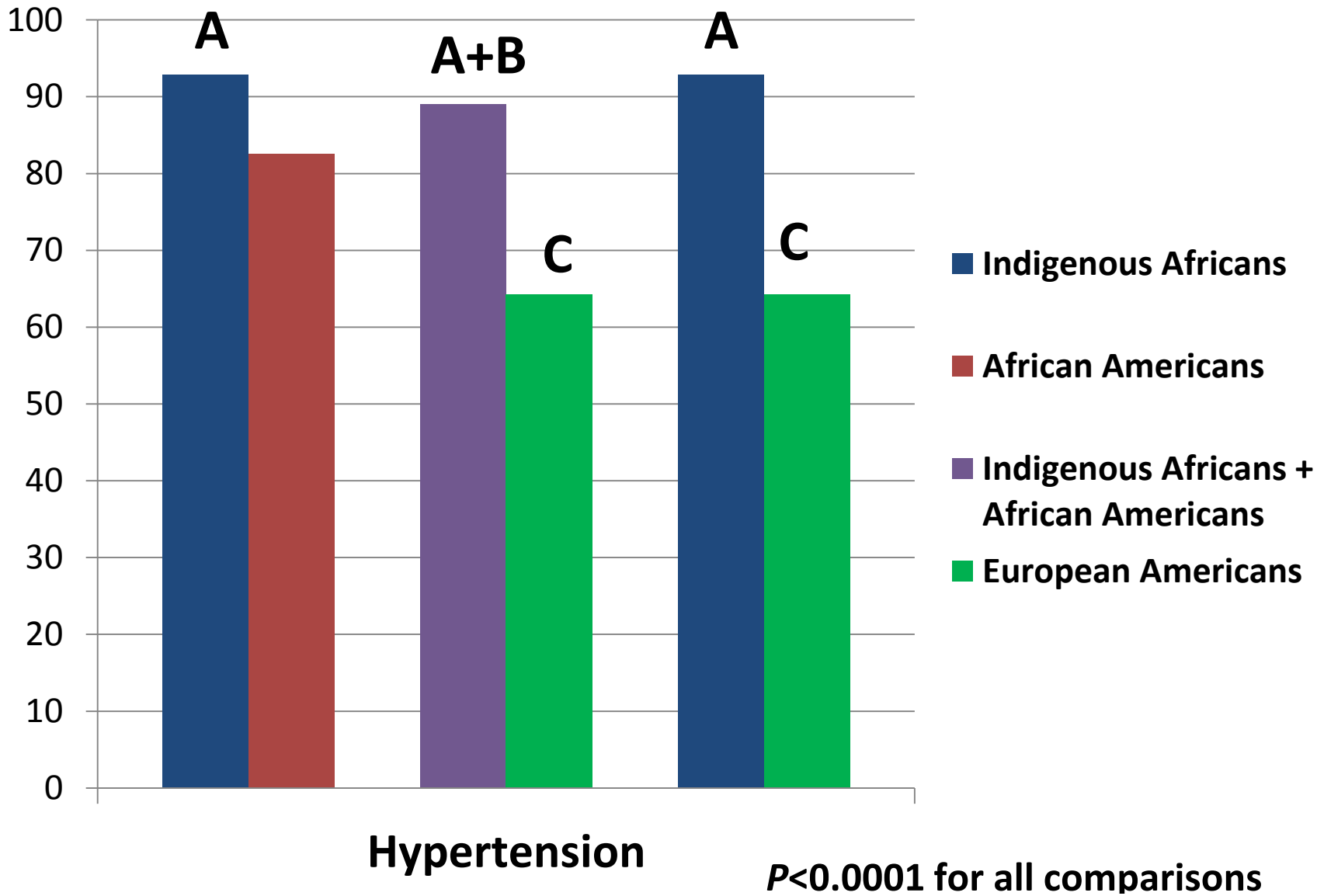
- Using harmonized assessments and standard definitions, we compared data on stroke type and established risk factors for stroke in acute stroke cases age>55 years in SIREN and REGARDS

- There were 811 IA, 452 AA and 665 EA stroke subjects, with mean age of 68.0±9.3, 73.0±8.3 and 76.0±8.3 years respectively ($p<0.0001$).

- Hemorrhagic stroke was higher in IA (27%) compared to AA (8%) and EA (5.4%; $p < 0.001$). Lacunar strokes were highest in IA (47.1%), followed by AA (35.1%), and then EA (21.0%; $p < 0.0001$).

Proportion of primary stroke types




100
90
80
70
60
50
40
30
20
10
0
A
A+B
A
C
C
Indigenous Africans
African Americans
Indigenous Africans + African Americans
European Americans
Hypertension
P<0.0001 for all comparisons

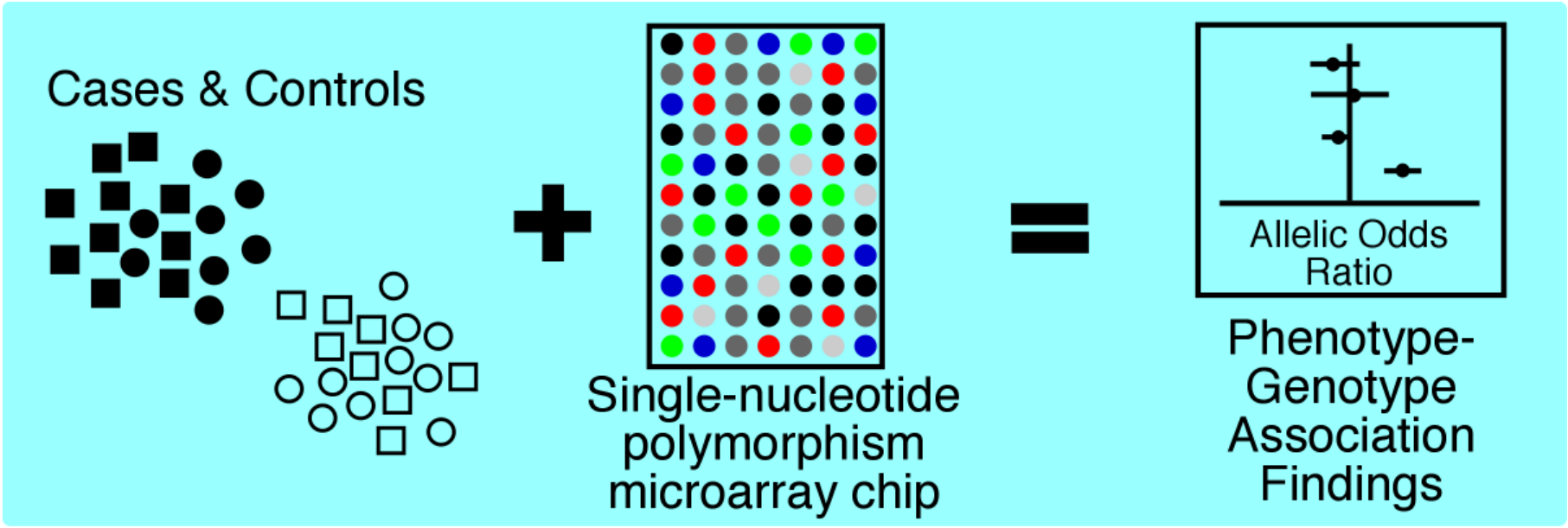
- Hypertension was highest in IA (92.8%), followed by AA (82.5%) and then EA (64.2%; $p<0.01$).
- Diabetes mellitus (DM) was similar in IA (38.3%) and AA (36.8%) but lower in EA (21%; $p<0.0001$).
- Pre-morbid sedentary lifestyle was similar in AA (37.7%) and EA (34%) but lower in IA (8%).
- Behavioural factors such as sedentary lifestyle, alcohol and smoking may contribute to the higher proportion of ischemic stroke in AA compared to IA,
- **Inherited genetic variations offer a possible explanation for the higher proportion of hypertension and DM among stroke subjects of African ancestry as well as the proportion of risk that remains unexplained by traditional and emerging risk factors alone.**

Candidate gene studies

CHR	Gene	SNP	Location Basepair	Minor Allele	OR	p-value
7	**IL6**	**rs1800796**	**22766246**	**C**	**1.54**	**0.01329**
4	PITX2	rs2200733	111710169	T	0.8239	0.08378
4	CSN3	rs3775745	71113074	G	1.192	0.09064
19	APOE	rs7412	45412079	T	1.258	0.1331
9	CDKN2A/CDKN2B	rs2383207	22115959	A	0.6124	0.1644
17	ACE	rs4343	61566031	G	1.162	0.2242
9	CDKN2A/CDKN2B	rs1333040	22083404	C	1.099	0.3574
19	APOE	rs429358	45411941	C	1.108	0.3878
7	HDAC9	rs11984041	19031935	T	0.8924	0.3938
22	CELSR1	rs6007897	46780521	T	1.093	0.3958
9	ANRIL	rs10757274	22096055	G	0.8909	0.4125
7	IL6	rs2069832	22767433	A	2.503	0.4322
5	CD14	rs2569190	140012916	A	0.9187	0.442
22	APOL1	rs73885319	36661906	G	0.9478	0.6075
7	HDAC9	rs2107595	19049388	A	0.9331	0.6105
4	PITX2	rs2634073	111665783	T	0.9512	0.6228
22	CELSR1	rs9615362	46795141	C	1.049	0.6506
9	ANRIL	rs10757278	22124477	G	1.046	0.7664
22	APOL1	rs60910145	36662034	G	0.9743	0.7858
16	ZFHX3	rs879324	73068678	A	0.9791	0.8793
1	intergenic region near TSPAN2	rs12122341	115655690	G	1.027	0.8994
16	ZFHX3	rs16971456	73013036	G	1.013	0.9263
7	HDAC9	rs28688791	19039605	C	0.9932	0.9552
11	Sickle cell (HBB)	rs334	5248232	T	NA	NA

Next Steps…….

Genome-Wide Association Study using the H3Africa Consortium Chip



- Can probe for associations between a million (+?) genetic variants (SNP) and stroke phenotypes
- May identify novel genes-i.e., genes not previously suspected of playing a role in stroke
- Multiple testing can be problematic. Candidate genes identified here must be examined in replication studies

Tackling the growing Stroke burden in Africa

Stroke Turns 40

Cerebrovasc Dis 2010;30:127–147
DOI: 10.1159/000315099
Published online: May 24, 2010

Stroke: Working toward a Prioritized World Agenda

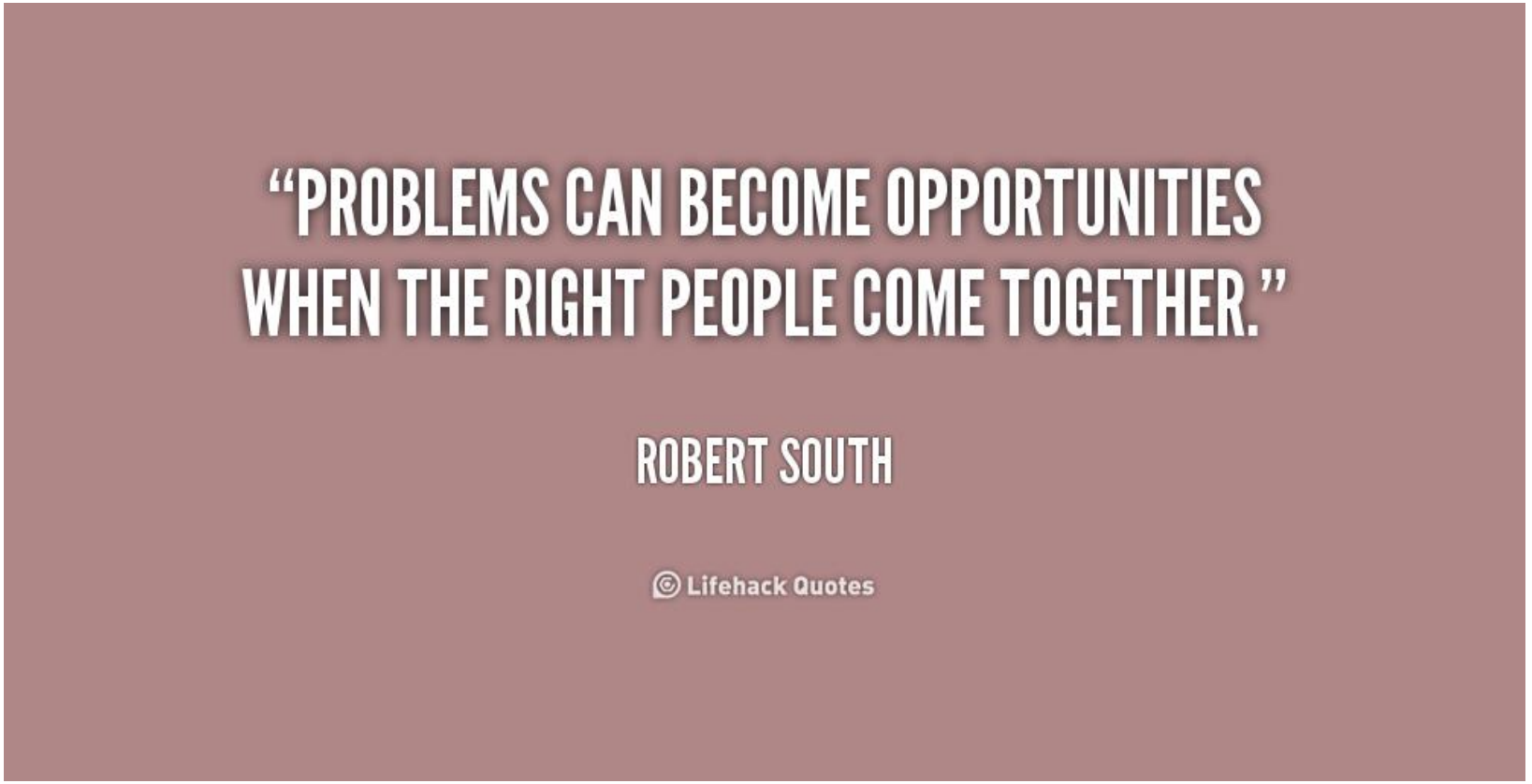
Vladimir Hachinski [1] Geoffrey A. Donnan[5, a, h] Philip B. Gorelick[8, b, h] Werner Hacke[30, c, h] Steven C. Cramer [10, d, h]

- The impact of stroke will grow into the future as populations age, and globalization grows with attendant lifestyle changes – especially in developing economies including Nigeria.

- To mark 40 years of the journal 'Stroke' Vladmir Hachinski, the WFN president led a synergium to advance the frontiers of stroke in all facets in all the regions of the world.

Stroke Neurologic Manpower in Africa

- No Stroke – specific postgraduate medical education programme in Africa (academic or professional)
- Most African strokologists are primarily neurologists with different levels of further training and research interest in stroke.
- Stroke units are springing up – Cape Town, Accra, Benin city, Ilorin, Cairo, with residents in Neurology, Internal Medicine and Geriatrics rotating through them.


“PROBLEMS CAN BECOME OPPORTUNITIES WHEN THE RIGHT PEOPLE COME TOGETHER.”
ROBERT SOUTH
Lifehack Quotes

Opportunities in stroke medicine in Africa

- Paucity of strokologists and allied health workers for effective MDT stroke research and practice.
- Neuroimaging challenges – availability and cost
- Lack of stroke rehab facilities
- Inequity of access to health care
- Stroke literacy and cultural beliefs
- Lack of stroke systems of care

Strategic keys to bridging the stroke training gap in Africa

- Global Health Perspective of Stroke Medicine
- African and North – South Networking and Collaborations
- Strong Leadership and Team work
- Creativity and Innovation : eg.Deploying IT
- Mentorship
- Tapping into the African Diaspora: Turning ‘Brain drain’ to ‘Brain gain’
- ‘Training – Service – Research’ Synergy

Strengthening capacity for health research in Africa

James A G Whitworth, Gilbert Kokwaro, Samson Kinyanjui, Valerie A Snewin, Marcel Tanner, Mark Walport, Nelson Sewankambo

Kaddumukasa *et al. Human Resources for Health* 2014, **12**:75
http://www.human-resources-health.com/content/12/1/75

CASE STUDY **Open Access**

Global medical education partnerships to expand specialty expertise: a case report on building neurology clinical and research capacity

Mark Kaddumukasa[1*], Elly Katabira[1], Robert A Salata[2], Marco A Costa[3], Edward Ddumba[4], Anthony Furlan[5], Angelina Kakooza-Mwesige[6], Moses R Kamya[1], James Kayima[1], Chris T Longenecker[2], Harriet Mayanja-Kizza[1], Charles Mondo[1], Shirley Moore[7], Svetlana Pundik[8], Nelson Sewankambo[9], Daniel I Simon[2], Kathleen A Smyth[10] and Martha Sajatovic[11]

World Stroke Academy (WSA)

- The World Stroke Academy is a global online educational resource aimed at major stroke issues for CME of healthcare professionals

- Professional section:
  - Case based adaptive e-Learning
  - Interactive eLearning lectures
  - Webcast/podcast past congresses
  - Article reviews
  - Guidelines
  - CME certification

- Patient/carers section:

World Stroke Academy

https://mg.mail.yahoo.com/neo/b/message?sMid=98&fid=Inbox&fidx=1&sort=date&order=down&startMid=50&filterBy=&ac=6kb1_6DYfSW0OnA_zHTimlstqIo-&.rand=5413241

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To: rufusakinyemi@yahoo.com

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WSO Clinical Exchange Application

Deadline for submission: December 1, 2016

Dear WSO Members,

This is a call for applicants for the WSO Clinical Exchange Programme for Young Stroke Professionals!

The WSO Brief Clinical Exchange Scholarships are designed to expose young stroke professionals from medical, nursing and allied health backgrounds to best practice clinical

8:42 AM
10/28/2016

Guidelines

World Stroke Organization Global Stroke Services Guidelines and Action Plan

Patrice Lindsay[1,2,*,†], Karen L. Furie[3,4,†], Stephen M. Davis[5,6,†], Geoffrey A. Donnan[6,7,†], and Bo Norrving[8,†]

Int J Stroke 2014;9:4-13

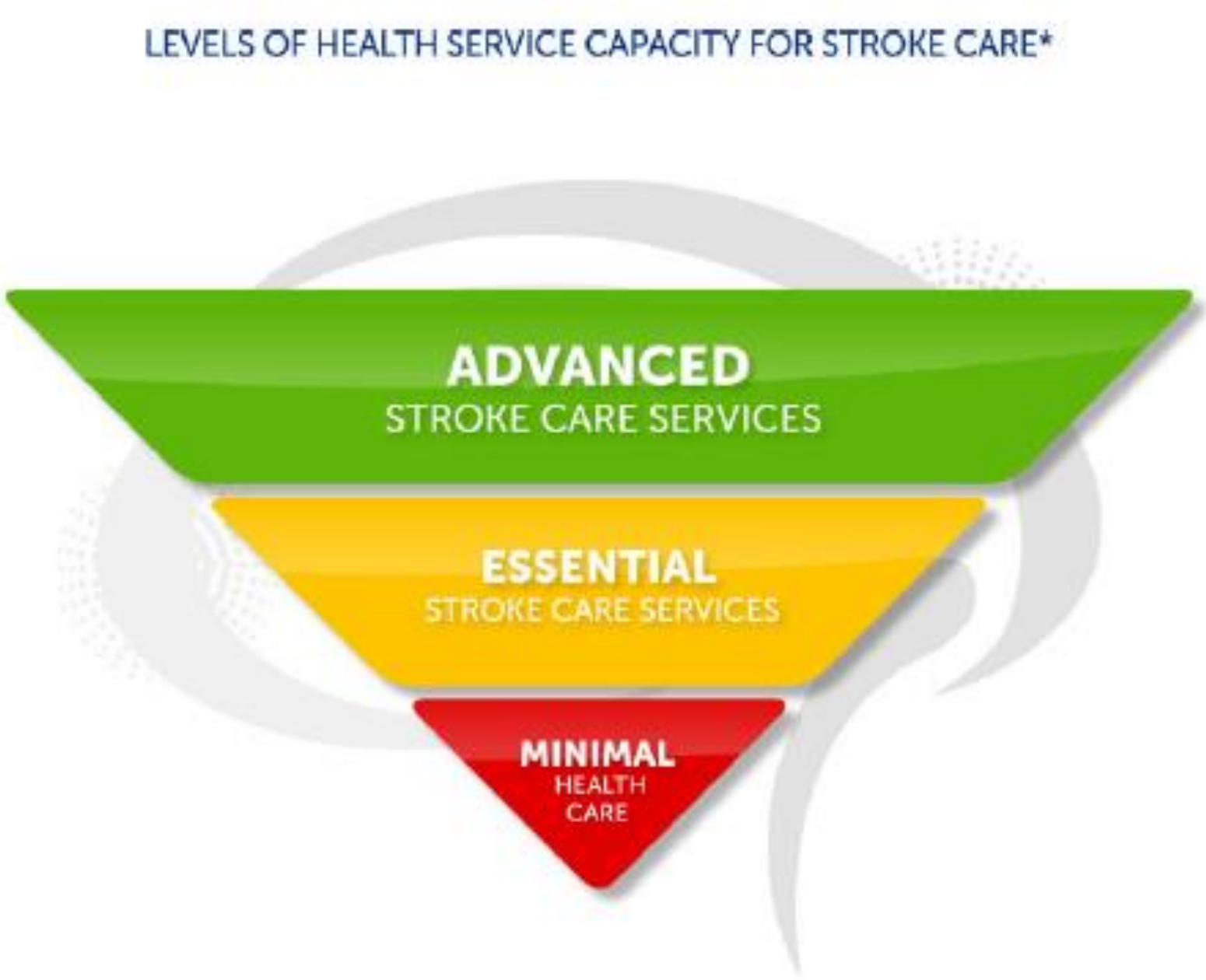

Fig. 1 Levels of health service capacity for stroke care.[2]

Table 1 Health service capacity for stroke care checklists*

Advanced stroke services	Essential stroke services	Minimal healthcare services
❑ Access to advanced diagnostic services ❑ Access to physicians with stroke expertise ❑ Access to advanced interventions in addition to tPA, such as interventional radiology and neurosurgery ❑ Access to specialist rehabilitation therapists ❑ Access to community programs for recovery after stroke ❑ Fully coordinated stroke care provided across geographically discrete regions	❑ Access to basic diagnostic services – laboratory, ECG, CT scan, ultrasound ❑ Access to nurses ❑ Access to physicians, although may not be stroke specialists ❑ Access to acute thrombolysis with tPA ❑ Access to elements of stroke unit care, including members of an interdisciplinary stroke team ❑ Access to rehabilitation services ❑ Access to stroke prevention therapies such as aspirin, lifestyle change recommendations, blood pressure management ❑ Limited coordinated stroke care provided across geographically discrete regions	❑ Variable access to healthcare workers (nurses or lay workers) ❑ Very limited access to physicians ❑ No access to diagnostic services or hospital care ❑ Limited access to the most basic lifestyle preventative advice ❑ Care provided in local communities without coordination across defined geographic regions

*These checklists should be used for self-assessment and for stroke services planning. The goal is to achieve as many checkmarks as possible and continually strive to provide the highest level of stroke services that is realistically and reasonably attainable, given local and regional resources and circumstances.

CT, computed tomography; ECG, electrocardiogram; tPA, tissue plasminogen activator.

Stroke medicine sub-specialty interest among young African neurologists and trainees

- 77 young African neurologists and trainees
  (IWGYNT – African group database)
- 10 African countries
- Sub –specialty interest (multiple choices)
  - Stroke medicine : 35 (45.5%)
  - Epileptology : 28 (36.4%)
  - Movement disorders : 21 (27.3%)
  - Neuroinfections : 17 (22.1%)
  - Cognitive Neurology : 10 (13.0%)

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inuing medical education
courses have always been
as many participants from
his is an ideal opportunity
the world to cooperate in

Organised by EAN - European Academy of Neurology

In cooperation with:

African Academy of Neurology

American Academy of Neurology

International Brain Research Organisation

International PD and Movement Disorder Society

World Federation of Neurology

World Stroke Organisation

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WORLD NEUROLOGY

THE OFFICIAL NEWSLETTER OF THE WORLD FEDERATION OF NEUROLOGY

Nigeria-Florida Alliance Focuses on Training

BY DIANA M. SCHNEIDER, PH.D.

A new alliance between the Florida Society of Neurology and the Nigerian Society of Neurological Sciences and Nigerian Stroke Society – the Nigeria-Florida Neuroscience Partnership – aims to develop neurology training and services in the West African country and eventually to expand to include research collaborations, exchange programs, mentoring, patient management, teleconferencing, and other collaborative efforts.

The Nigerian Stroke Society (NSS) is an affiliate of the Nigerian Society of Neurological Sciences (NSNS) and the World Stroke Organisation. All NSNS members interested in stroke are NSS members. It was inaugurated in 2009. Prof. Yomi Ogun is president, Dr. Njide Okubadejo is vice president, and Dr. Bamidele Osalusi is secretary-general.

The partnership was forged in response to recent study findings demonstrating that Nigeria's high stroke and associated mortality rates, coupled with a shortage of trained neurologists and a lack of understanding of stroke in patients and health care providers alike, put the country at risk for further straining its already diminished resources.

Nigeria – Florida Neuroscience Partnership

The organizers also plan to focus on the development of clinical programs such as stroke units, independent subspecialty clinics, neurosurgical subspecialties, as well as the creation of guidelines for how neurological emergencies can be approached by neurologists and neurosurgeons, and by practitioners in pediatrics, internal medicine, emergency medicine, and general surgery when neurologists and neurosurgeons are not available.

COURTESY KOLAWOLE WAHAB

Dr. Susan Naselli of the Florida Neurological Society presents a neurological Tool Kit to a participant at the partnership meeting.

The first Nigeria-Florida Neuroscience Partnership (NFNP) conference was held Nov. 2-5 in Lagos, Nigeria. The Joint Steering Committee was co-chaired by Dr. Michael Finkel, representing the Florida Society of Neurology (FSN) and the World Neurology Foundation (WFN); Prof. Yomi Ogun of the NSNS, with the help of Dr. Njide Okubadejo, Dr. Rufus Akinyemi, and Dr. Bunmi Ogunrin, all members of both the NSNS and NSS; and Dr. Hubert Fernandez, Dr. Ali Malek, and Dr. Susan Naselli, all of the FNS.

See **Nigeria-Florida** • *page 5*

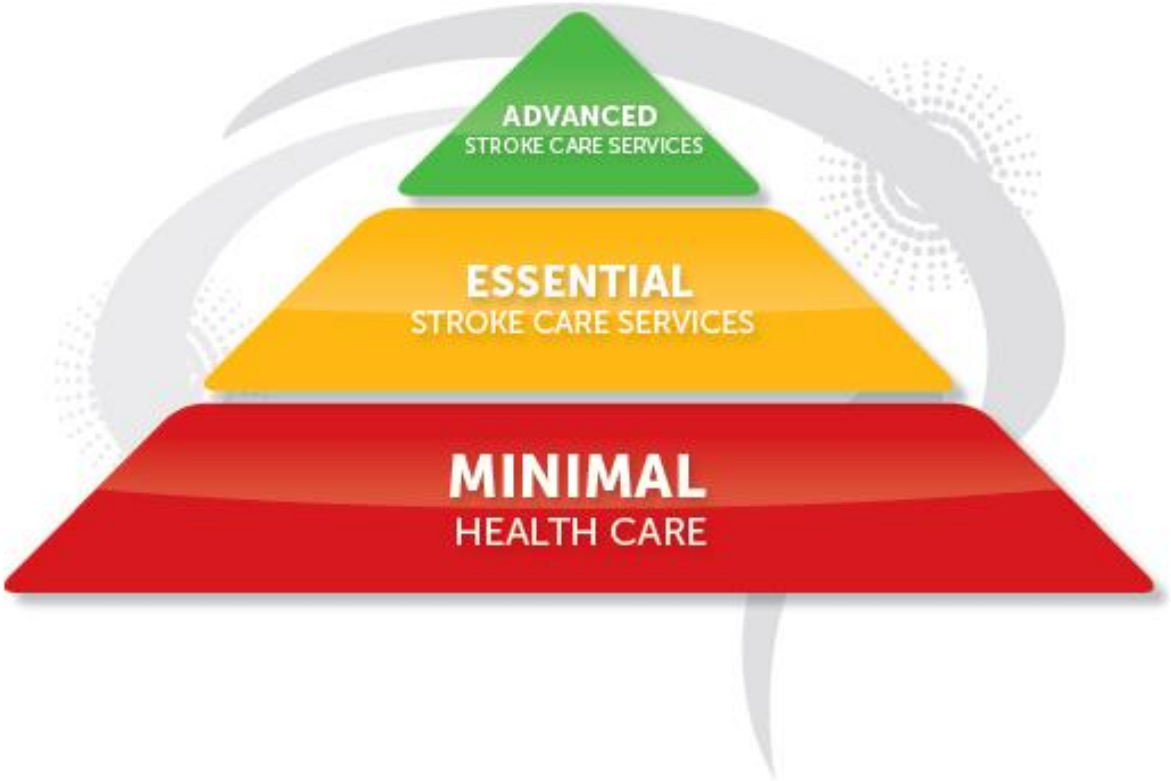
INSIDE

India
A WFN Association of Parkinsonism and Related Disorders-sponsored teaching course aimed to update neurologists on advances in the field and encourage medical students to consider it as a specialty.
PAGE 3

Europe
A recent report says many aspects of epilepsy care in Europe are seriously underresourced.
PAGE 6

Travelling Fellowships
The WFN invites applications for the 2011 Junior Travelling Fellowships, and last year's Fellows share their experiences and lessons learned at their selected conferences.
PAGES 2 AND 8

What about allied stroke professionals ?



Nurse - centered discharge planning may be effective for home – based rehabilitation

Comprehensive Discharge Planning and Home Follow-up of Hospitalized Elders

A Randomized Clinical Trial

Mary D. Naylor, PhD
Dorothy Brooten, PhD
Roberta Campbell, MSN
Barbara S. Jacobsen, MS
Mathy D. Mezey, EdD
Mark V. Pauly, PhD
J. Sanford Schwartz, MD

Context Comprehensive discharge planning by advanced practice nurses has demonstrated short-term reductions in readmissions of elderly patients, but the benefits of more intensive follow-up of hospitalized elders at risk for poor outcomes after discharge has not been studied.

Objective To examine the effectiveness of an advanced practice nurse–centered discharge planning and home follow-up intervention for elders at risk for hospital readmissions.

Design Randomized clinical trial with follow-up at 2, 6, 12, and 24 weeks after index hospital discharge.

Setting Two urban, academically affiliated hospitals in Philadelphia, Pa.

JAMA, February 17, 1999—Vol 281, No. 7

Conclusion: An advanced practice nurse–centered discharge planning and home care intervention for at-risk hospitalized elders reduced readmissions, lengthened the time between discharge and readmission, and decreased the costs of providing health care.

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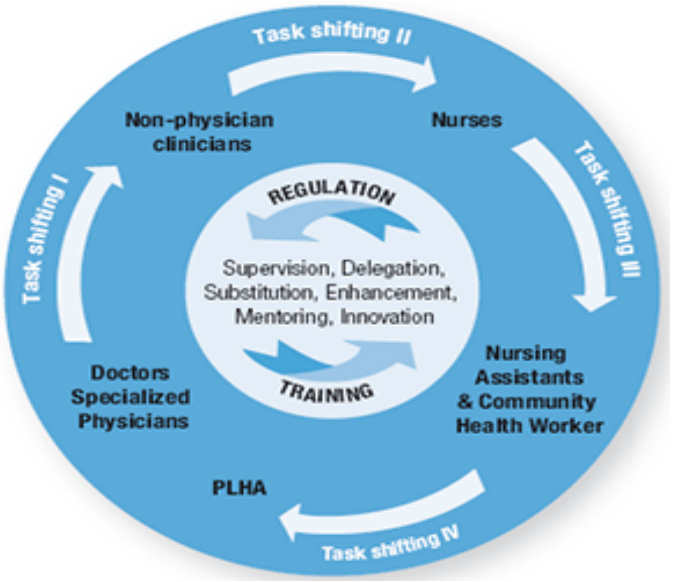
journal homepage: www.elsevier.com/locate/jns

Task-shifting training improves stroke knowledge among Nigerian non-neurologist health workers

Rufus O. Akinyemi [a,g,*], Mayowa O. Owolabi [b], Philip B. Adebayo [c], Joshua O. Akinyemi [d], Folajimi M. Otubogun [a], Ezinne Uvere [b], Olaleye Adeniji [a], Osimhiarherhuo Adeleye [a], Olumayowa Aridegbe [a], Funmilola T. Taiwo [f], Shamsideen A. Ogun [e], Adesola Ogunniyi [b]



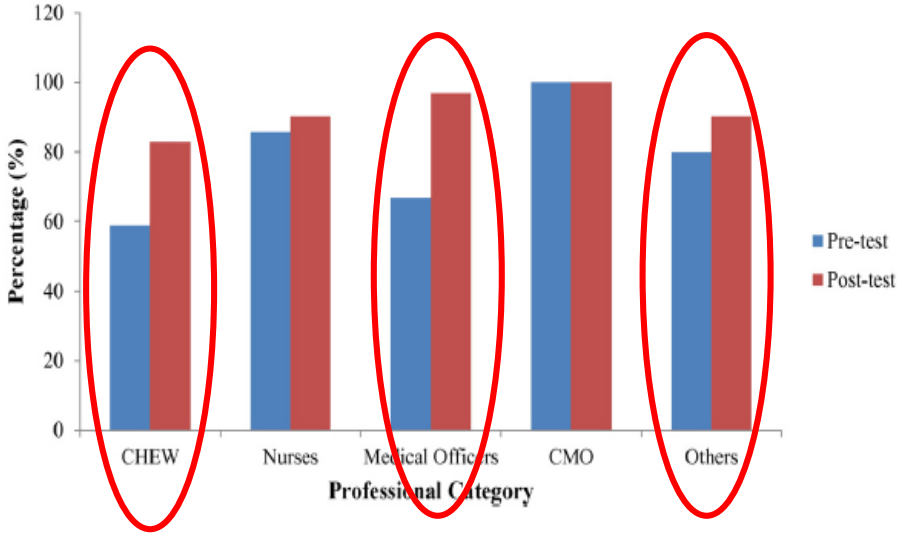


Fig. 3. Association between respondents' professional category and knowledge of thrombolysis before and after the training.

Final words……..

Building neurological services in Africa

International institutions will need to work in partnership with Africa to meet the growing burden of neurological disorders across the continent. Many see the creation of the World Federation of Neurology's Africa Committee as an important step in the right direction. Rebecca Craven reports.

www.thelancet.com/neurology Vol 8 January 2009

Faculty at EAN RTC in Dakar, Senegal, July 2013

✓" With the trainees on the ground telling us what should happen, people are very positive about the future"

- Prof. Raj Kalaria.

✓" My African colleagues feel very optimistic about the future of neurological sciences in Africa"

- Prof. Alfred Njamnshi.

✓"I like the dreams of the future better than the history of the past"

- Thomas Jefferson.

✓ "The future belongs to those who believe in the beauty of their dreams"

-Eleanor Roosevelt

Summary

- An increase in global stroke burden with regional variations , LMIC being worst affected
- Growing burden of Stroke in Africa
- The current epidemiology is driven by certain modifiable and non – modifiable factors
- Capacity building, including task – shifting approaches and stroke services devp are needed to curtain the growing burden in Africa.

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Mayowa Ogunrombi

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