

## Supplementary appendix

## Appendix 1

### Country respondents and affiliations

<b>Albania</b>	<b>M Petrela</b>	- Head of Department of Neurosciences, Mother Teresa University Hospital, Tirana, Albania
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<b>Herzegovina</b>		
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	<b>I Staikov</b>	- Professor of Neurology, Head of the Department of Neurology and Sleep Medicine with Stroke Unit, Hospital Board of Directors Member, Acibadem City Clinic Tokuda Hospital, Sofia - Member of the Bulgarian Society of Neurology, member of the European Stroke Unit Committee
<b>Croatia</b>	<b>H Budincevic</b>	- President of the Croatian Stroke Society - Stroke and Intensive Care Unit, Department of Neurology, Sveti Duh University Hospital, Zagreb, Croatia.; School of Medicine, J.J. Strossmayer University of Osijek, Osijek, Croatia
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<b>Iceland</b>	<b>B Thorarinnsson</b>	- Cashier , Icelandic Neurological Society - Specialist in Internal Medicine & Neurology, Dep. Neurology, University Hospital Reykjavik
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	<b>M Ribeiro</b>	- Chief of the Interventional Radiology Unit, Neuroradiology Department, Centro Hospitalar de Vila Nova de Gaia e Espinho, Vila Nova de Gaia
<b>Romania</b>	<b>C Tiu</b>	- Elected future president of the Romanian Society of Neurology (starting 2020) - University of Medicine and Pharmacy “Carol Davila”
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	<b>V Svigelj</b>	- Assoc. Prof. of Neurology, former Head of NeuroICU, University Medical Centre Ljubljana, Neurology Clinic, Dept. of Vascular Neurology and Neurological Intensive Care, Ljubljana - National Coordinator in Safe Implementation of Treatment in Stroke
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<b>Switzerland</b>	<b>M Arnold</b>	- President, Swiss Stroke Society - Chairman Stroke Center, University Hospital Bern
<b>Sweden</b>	<b>M Mazya</b>	- Chair, Swedish Acute Neurology Society - Dept. of Neurology, Karolinska University Hospital, Stockholm Sweden
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<b>Turkey</b>	<b>N Uzuner</b>	- President of the Turkish Cerebrovascular Disease Society - Director of Neurosonology unit and Head of Cerebrovascular Disease Department, Department of

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	<b>L Gungor</b>	- Member of Turkish Cerebrovascular Diseases Society - Assoc. Prof. of Neurology, Ondokuz Mayıs University Medical Faculty, Samsun
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<b>United Kingdom</b>	<b>H Rodgers</b>	- President, British Association of Stroke Physicians - Professor of Stroke Care, Institute of Neuroscience and Newcastle University Institute for Ageing
	<b>J Dawson</b>	- Scottish representative on executive, member, British Association of Stroke Physicians - Clinical Lead Scottish Stroke Research Network / NRS Stroke Research Champion
	<b>P White</b>	- UK Neurointerventional Group Secretary - Institute of Neuroscience Newcastle University
<b>Ukraine</b>	<b>Y Flomin</b>	- Board member, Ukrainian Anti-Stroke Association - Medical Center 'Universal Clinic «Oberig»', Kyiv, Ukraine
	<b>D Shcheglov</b>	- Head of Non-Governmental Organization “Allukrainian Association of Endovascular Neuroradiology”; - Member of the Ukrainian Association for the Stroke - Director of SO “Scientific-Practical Center of endovascular neuroradiology of NAMS of Ukraine”

**Appendix 2**  
**Questionnaire**



## ESO/ ESMINT/ EAN / SAFE Survey on Endovascular Therapy for Ischaemic Stroke

### I. National

1.

<b>Name</b> ( <i>Last, First</i> ):		<input type="checkbox"/> M <input checked="" type="checkbox"/> F	<b>Date:</b>
<b>Career level:</b>	<input type="checkbox"/> Senior Physician <input type="checkbox"/> Chief/Chair of Department	<b>Specialization:</b>	<input type="checkbox"/> General neurologist <input type="checkbox"/> Stroke physician <input type="checkbox"/> General /Neuro radiologist <input type="checkbox"/> Interventional radiologist
<b>e-mail :</b>			
<b>Current Position in European Stroke/Neurology organization:</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, please indicate organization: <input type="checkbox"/> ESO <input type="checkbox"/> ESMINT <input type="checkbox"/> EAN <input type="checkbox"/> Other: _____			
<b>Current position in national Stroke/Neurology organization:</b>			
<b>Affiliation</b>			
<b>Institution</b>			
<b>City</b>		<b>Country</b>	

2.

<b>Name</b> ( <i>Last, First</i> ):		<input checked="" type="checkbox"/> M <input type="checkbox"/> F	<b>Date:</b>
<b>Career level:</b>	<input type="checkbox"/> Senior Physician <input type="checkbox"/> Chief/Chair of Department	<b>Specialization:</b>	<input type="checkbox"/> General neurologist <input type="checkbox"/> Stroke physician <input type="checkbox"/> General /Neuro radiologist <input type="checkbox"/> Interventional radiologist
<b>e-mail :</b>			
<b>Current Position in European Stroke/Neurology organization:</b> <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please indicate organization: <input type="checkbox"/> ESO <input type="checkbox"/> ESMINT <input type="checkbox"/> EAN <input type="checkbox"/> Other: _____			
<b>Current position in national Stroke/Neurology organization:</b>			
<b>Affiliation</b>			
<b>Institution</b>			
<b>City</b>		<b>Country</b>	

3.

<b>Name</b> ( <i>Last, First</i> ):		<input type="checkbox"/> M <input type="checkbox"/> F	<b>Date:</b>
<b>Career level:</b>	<input type="checkbox"/> Senior Physician <input type="checkbox"/> Chief/Chair of Department	<b>Specialization:</b>	<input type="checkbox"/> General neurologist <input type="checkbox"/> Stroke physician <input type="checkbox"/> General /Neuro radiologist <input type="checkbox"/> Interventional radiologist
<b>e-mail :</b>			
<b>Current Position in European Stroke/Neurology organization:</b> <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please indicate organization: <input type="checkbox"/> ESO <input type="checkbox"/> ESMINT <input type="checkbox"/> EAN <input type="checkbox"/> Other: _____			
<b>Current position in national Stroke/Neurology organization:</b>			
<b>Affiliation</b>			
<b>Institution</b>			
<b>City</b>		<b>Country</b>	

**REPRESENTATION:**

<b>Name of the country you represent</b>
<b>Population of the country you represent</b>

<b>PART 1. ORGANISATION OF (ACUTE) STROKE SYSTEMS OF CARE</b>	
<b>NATIONAL LEVEL</b>	
<b>Please indicate the estimated annual number of incident ischaemic strokes in your country?</b> (Latest estimate available) _____ Year: _____	
Please indicate annual number incident strokes (all types) if data for ischaemic stroke is lacking _____ <input type="checkbox"/> National registries <input type="checkbox"/> Extrapolation of local numbers to national level <input type="checkbox"/> Estimation	
<b>Is this information based on registries or estimates?</b>	
<b>Please indicate the source of the mentioned data</b> _____	
<b>How many patients with acute ischaemic stroke are admitted in your country annually?</b> (Please indicate approximate number or write unknown) _____	
<b>In your country, is there an established/defined plan/programme/strategy to address stroke care recommendations?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
<b>The stroke plan/program/strategy operates at what level?</b> (Tick as many as apply)	<input type="checkbox"/> Country-wide <input type="checkbox"/> Region-wide <input type="checkbox"/> Local <input type="checkbox"/> Other _____
<b>Duties of the Stroke Programme/ Strategy in your country</b> (Tick as many as apply)	<input type="checkbox"/> Health planning (stroke priorities) <input type="checkbox"/> Quality of stroke care assessment/ improvement <input type="checkbox"/> Hospitals' reimbursement
	<input type="checkbox"/> Implementation/ organisation of stroke systems of (acute) care <input type="checkbox"/> Design and/or parameterisation of stroke registries and/or registry data analysis <input type="checkbox"/> Community education
	<input type="checkbox"/> Emergency medical service / stroke physicians' liaison <input type="checkbox"/> Cost of stroke care analysis <input type="checkbox"/> Professionals' education
<b>In your country, is there an established/defined acute stroke care pathway (including the Emergency Medical System)?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
<b>What does the acute stroke care pathway in your country cover?</b> (Tick as many as apply)	<input type="checkbox"/> Stroke prevention <input type="checkbox"/> Emergency admission <input type="checkbox"/> Acute hospital care <input type="checkbox"/> Neurorehabilitation <input type="checkbox"/> Post stroke care <input type="checkbox"/> Other, specify: _____
<b>Which guidelines are implemented in your country?</b> (Tick as many as apply)	<input type="checkbox"/> ESO <input type="checkbox"/> AHA/Stroke <input type="checkbox"/> National <input type="checkbox"/> Others <input type="checkbox"/> None
<b>How many Hospitals in your country admit patients with acute stroke?</b>	Please indicate the number _____ <input type="checkbox"/> Unknown
<b>How many stroke units are available in your country?</b>	Please indicate the number _____ <input type="checkbox"/> Unknown
<b>Do you have national requirements for stroke units?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
<b>Are you currently running a certification program for stroke units?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
<b>Is the healthcare system in your country public (paid via taxation or compulsory health care insurance) or private (private health insurance)?</b>	<input type="checkbox"/> Public    % _____ <input type="checkbox"/> Private    % _____
<b>Which specific stroke therapies are reimbursed (the hospital receives payment for) in your country?</b>	<input type="checkbox"/> Stroke unit <input type="checkbox"/> EVT (endovascular treatment) <input type="checkbox"/> iv rtPA <input type="checkbox"/> Unknown
<b>If the costs of the EVT are currently not reimbursed at a Governmental level (in public healthcare based systems) are there plans for this to change?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> Does not apply <input type="checkbox"/> No <input type="checkbox"/> Unknown
<b>Is stroke care treatment organized on regional level?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>If stroke care is organized on a regional level, how many different areas do you have?</b>	Yes: number of regions _____
<b>Are there major differences in stroke care among the different regions?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Is EVT still unavailable in any region?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No



PART 2. PRE-HOSPITAL CARE	
NATIONAL LEVEL	
What type of ambulance is generally dispatched to attend patients with suspicion of acute stroke? <i>(Tick as many as apply)</i>	<input type="checkbox"/> Medicalised (doctor) <input type="checkbox"/> Non-medicalised (Nurse or paramedic)
Do EMS (emergency medicine services) ambulances have strict orders to transfer acute stroke patients to hospitals providing IVT?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
Is there an official/public instruction (document) describing the Stroke Protocol for the EMS operating in your country/region?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
If you answered yes to the prior question, is your Stroke Protocol activated whenever stroke is suspected or does it have any limitations regarding (Please describe criteria used)	Age? <input type="checkbox"/> Yes _____ <input type="checkbox"/> No Time from stroke onset? <input type="checkbox"/> Yes _____ <input type="checkbox"/> No <input type="checkbox"/> Concomitant diseases? <input type="checkbox"/> Yes _____ <input type="checkbox"/> No Pre-stroke disability? <input type="checkbox"/> Yes _____ <input type="checkbox"/> No
Does your Stroke Protocol apply a "by-pass local hospital" policy according to stroke patient's baseline features (i.e. are patients with suspected large vessel occlusion directly brought to the next hospital providing endovascular therapy)?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you have STEMO-like mobile stroke units on the field (with portable CT and a stroke physician)?	<input type="checkbox"/> Yes, covering _____% of pop. <input type="checkbox"/> No

PART 3. SPECIFIC STROKE TREATMENT	
NATIONAL LEVEL	
Is intravenous thrombolysis available in your country?	<input type="checkbox"/> Yes and broadly used <input type="checkbox"/> Yes, but only for a subset of eligible patients (e.g. private insurance) <input type="checkbox"/> Yes, but not widely available <input type="checkbox"/> No <input type="checkbox"/> Other: _____
What is the estimated number of iv thrombolysis per year in your country? Please indicate the number and corresponding year	No. of IV thrombolysis _____ Year of the estimate: _____
How many centres offer intravenous thrombolytic therapy for ischaemic stroke in your country? Please indicate the number	_____ <input type="checkbox"/> Unknown
If not widely available, what are the reasons for not receiving intravenous thrombolysis in your country? Please select all options that apply	<input type="checkbox"/> Most patients with late arrival at hospital <input type="checkbox"/> Brain imaging not available <input type="checkbox"/> Other missing facilities, please specify _____ <input type="checkbox"/> lack of stroke expertise on site <input type="checkbox"/> Medication is not approved in the country <input type="checkbox"/> Costs <input type="checkbox"/> Insurance reasons <input type="checkbox"/> Other: _____
Do you have access to endovascular stroke therapy in your country?	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
How many centres do perform endovascular stroke therapy in your country? Please indicate the number	_____ <input type="checkbox"/> Unknown
Is endovascular stroke therapy available 24h a day/ 7 days per week?	<input type="checkbox"/> Yes, please indicate number _____ and % _____ of centres <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
What is the estimated proportion of patients with acute ischaemic stroke in your country that have around-the-clock access to endovascular stroke treatment? Please indicate the estimated proportion	_____% <input type="checkbox"/> Unknown
Do the available centres cover the need for endovascular stroke therapy in your country?	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown



<p><b>If yes, select which data can be derived from your registry</b> (Please tick all that apply)</p>	<input type="checkbox"/> N. of acute stroke patients assessed <input type="checkbox"/> Subtypes of stroke <input type="checkbox"/> N. of thrombolysis <input type="checkbox"/> N. of EVT <input type="checkbox"/> Door to needle time <input type="checkbox"/> Door to puncture time <input type="checkbox"/> Door-to-recanalization time <input type="checkbox"/> Recanalization rate <input type="checkbox"/> Stroke outcome at discharge <input type="checkbox"/> Stroke outcome at 90 days <input type="checkbox"/> Stroke outcome at other date_____
<p><b>In your country, does the Health Administration apply any "pay for performance" strategy that is based on performance measures for acute stroke care?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown

**PART 5. STROKE AWARENESS CAMPAIGNS**

**NATIONAL LEVEL**

<p><b>Do you have regular public stroke awareness campaigns in your country?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown
<p><b>If yes, at what level?</b></p>	<input type="checkbox"/> Primary Care <input type="checkbox"/> Pharmacies <input type="checkbox"/> TV <input type="checkbox"/> Radio <input type="checkbox"/> Posters <input type="checkbox"/> Newspapers <input type="checkbox"/> Other (specify)_____ <input type="checkbox"/> Internet <input type="checkbox"/> Primary school
<p><b>Which tools are used for dissemination of knowledge about stroke? (Please tick all that apply)</b></p>	<input type="checkbox"/> Ads (TV, radio) <input type="checkbox"/> Posters <input type="checkbox"/> Handouts <input type="checkbox"/> Other_____
<p><b>Is the impact of stroke awareness campaigns assessed in any way?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> Planned <input type="checkbox"/> No <input type="checkbox"/> Unknown

## Appendix 3 – Supplementary figures and tables

### Supplementary figures

Figure 1: Geographical coverage of the ESO ESMINT EAN SAFE survey on stroke care in Europe

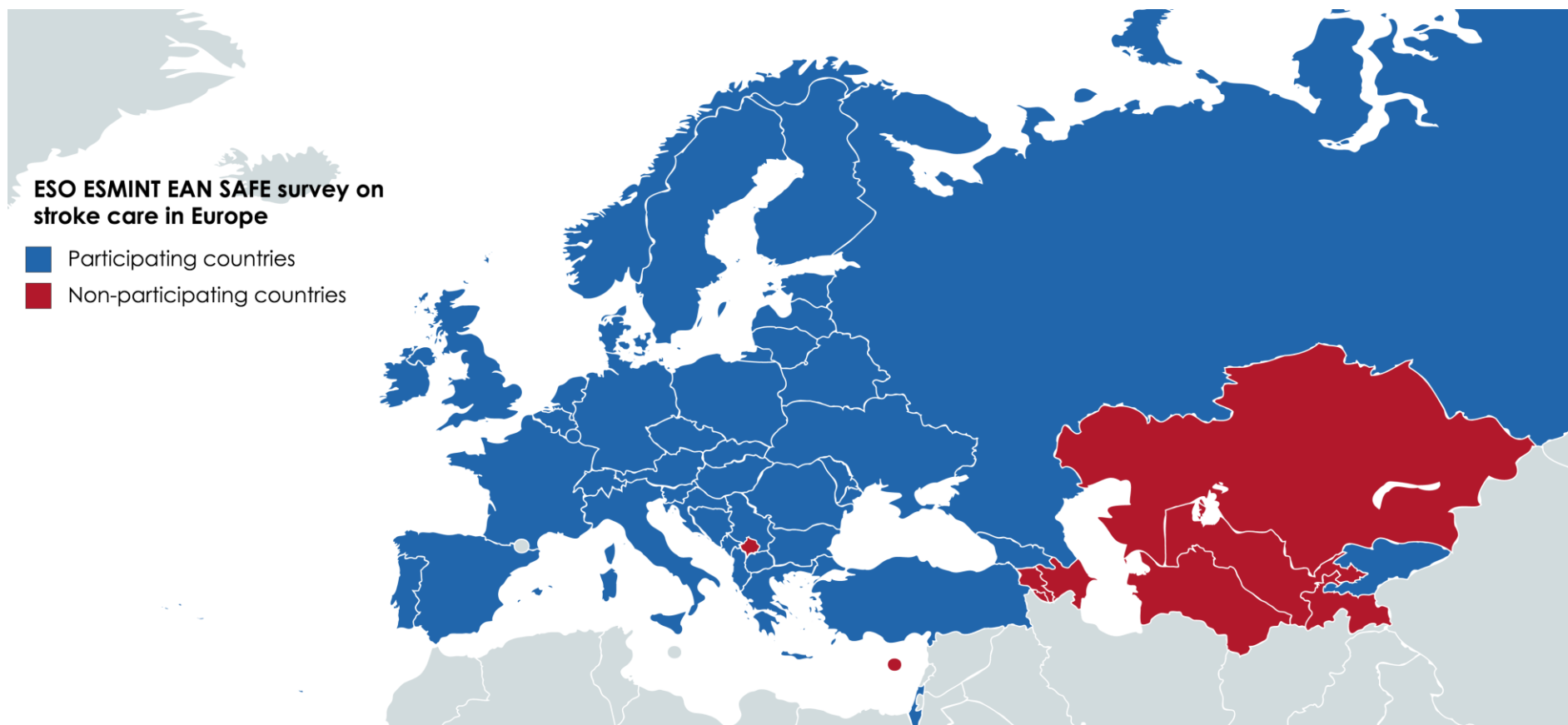
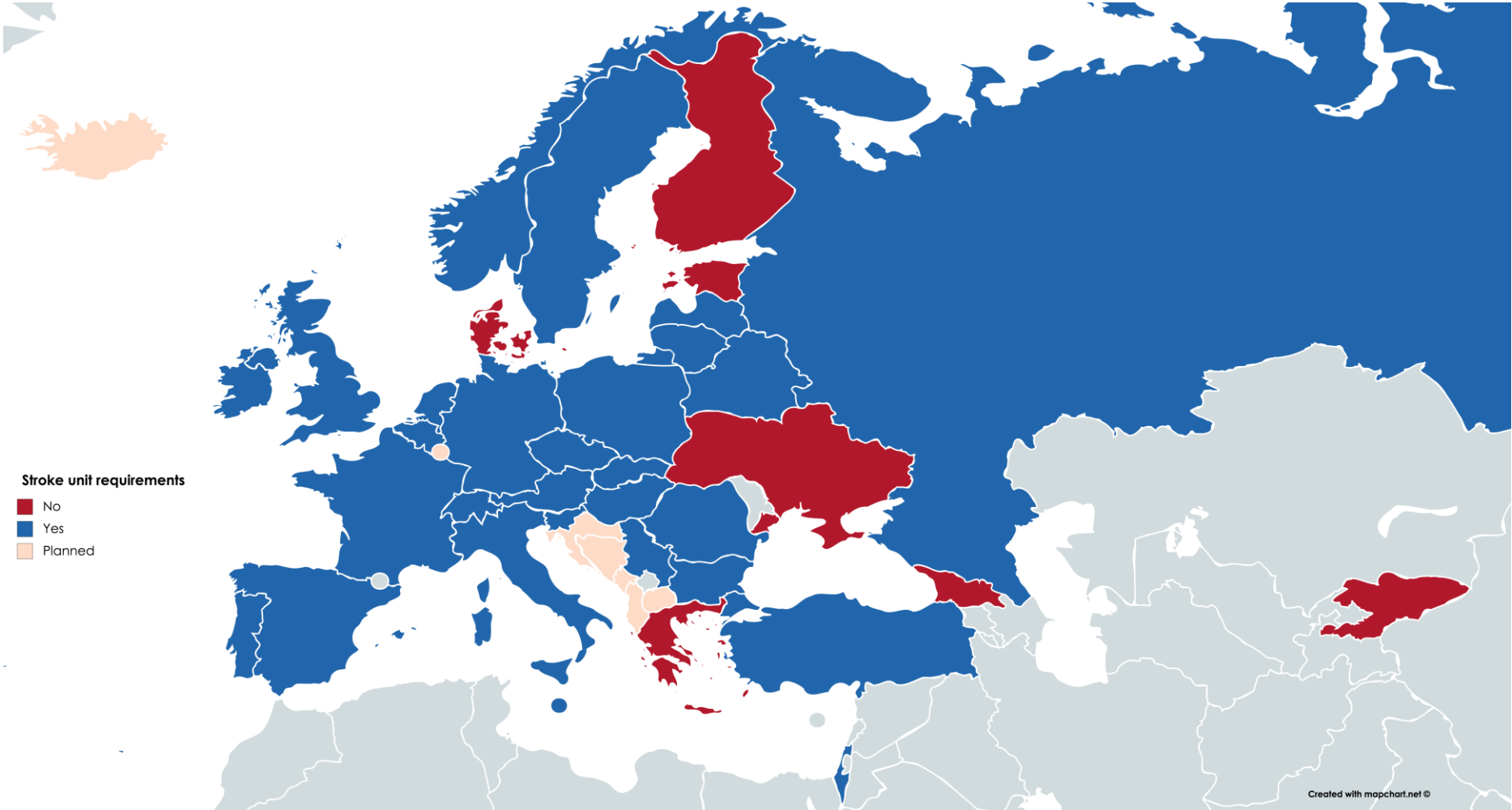
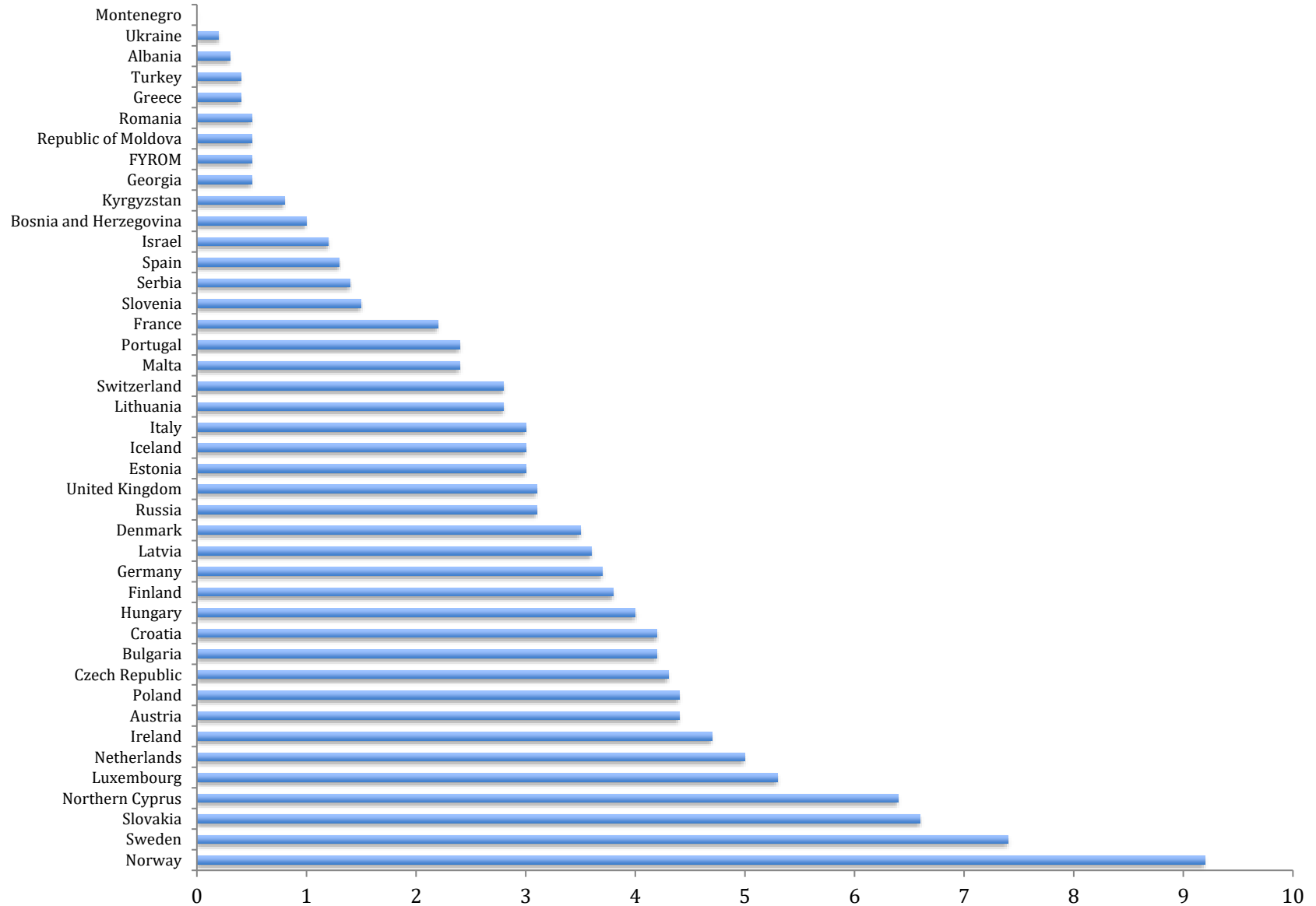


Figure 2: Countries with established national requirements for stroke units

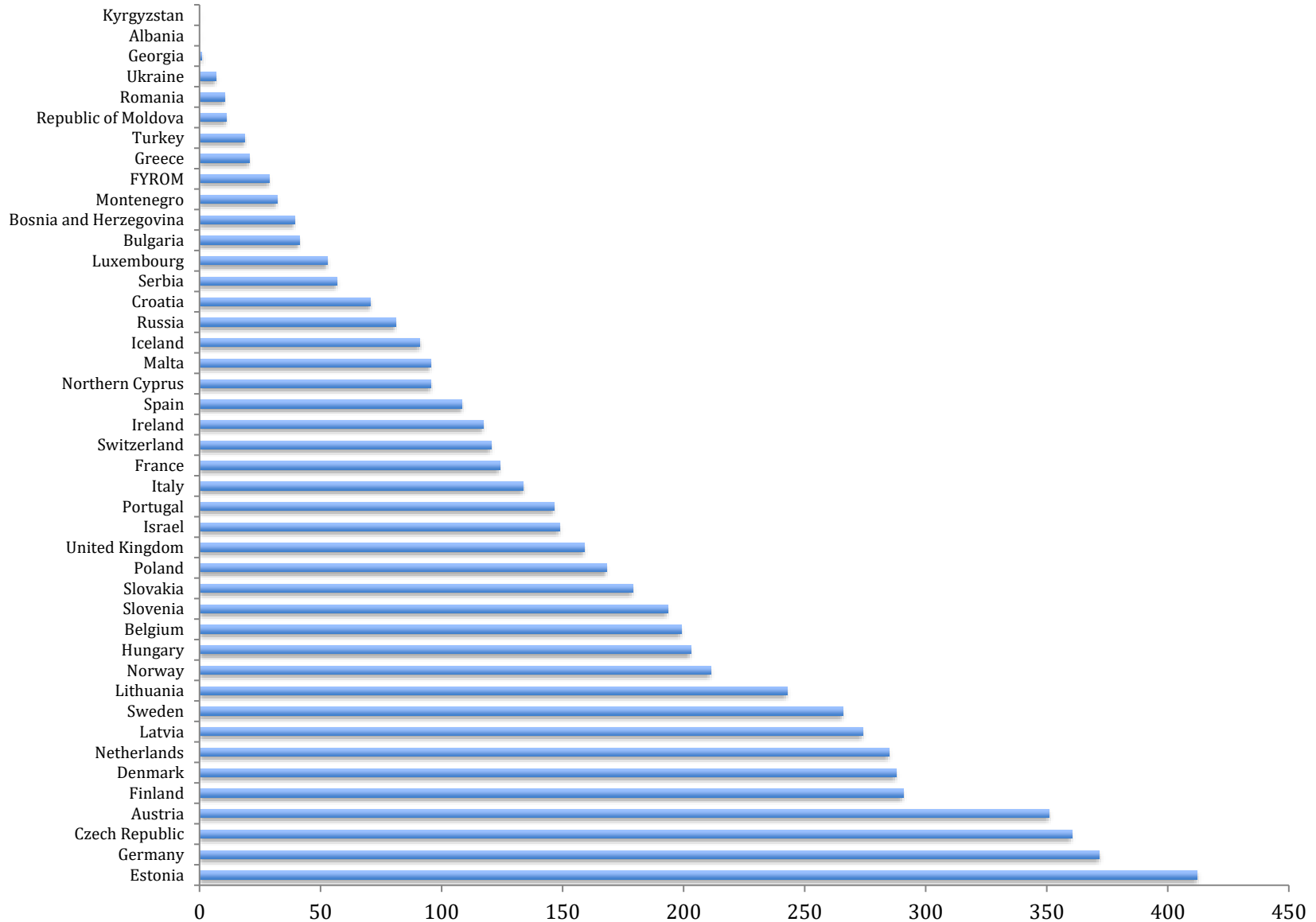


**Figure 3: Number of stroke units per million population in 42 European countries**



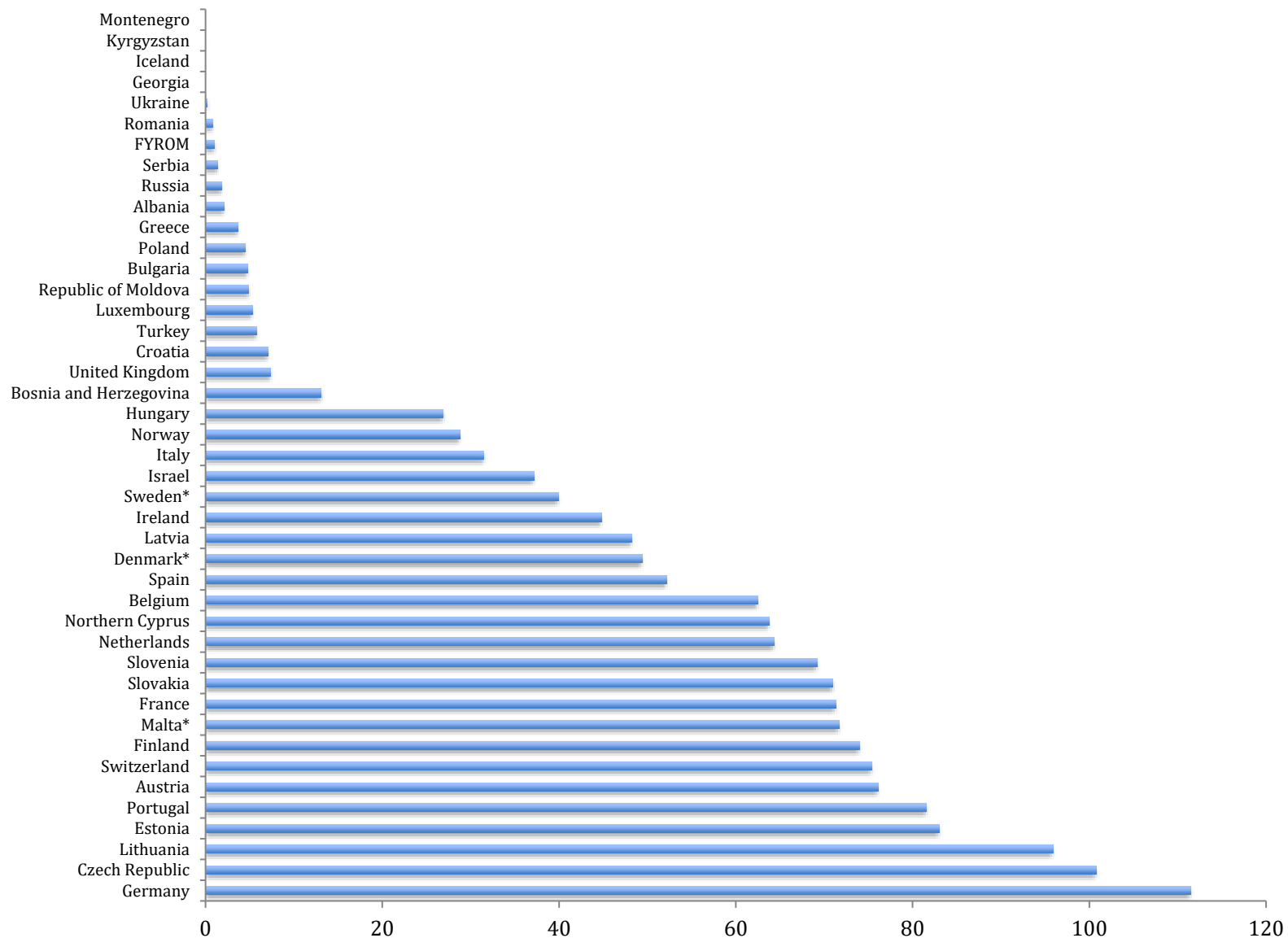
FYROM, Former Yugoslav Republic of Macedonia.

**Figure 4: Contemporary annual rates of intravenous thrombolysis (IVT) per million population in 42 European countries**



FYROM, Former Yugoslav Republic of Macedonia.

**Figure 5: Contemporary annual rates of endovascular treatments (EVT) for ischaemic stroke per million population in 43 European countries**

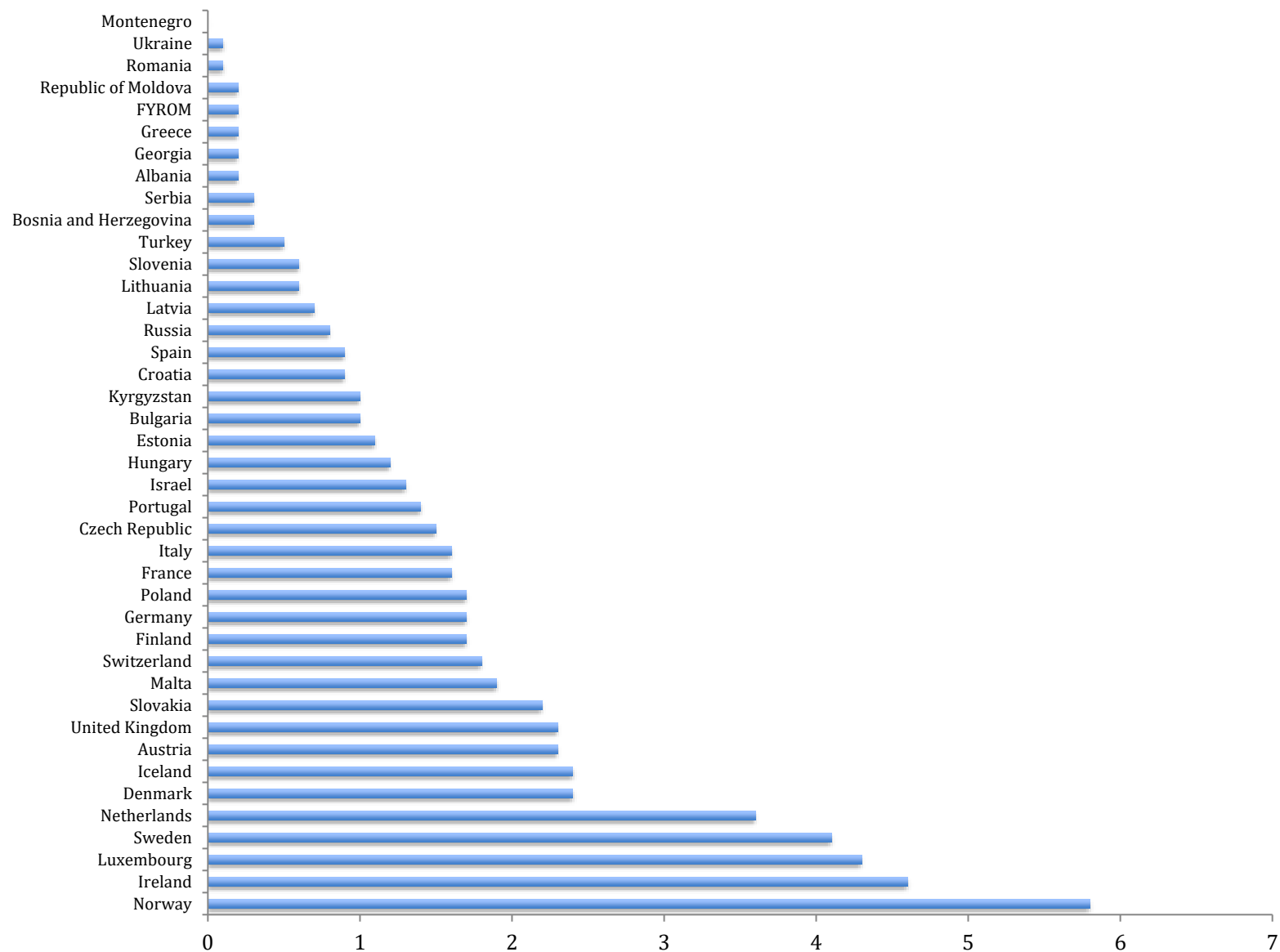


\*2015

FYROM, Former Yugoslav Republic of Macedonia.

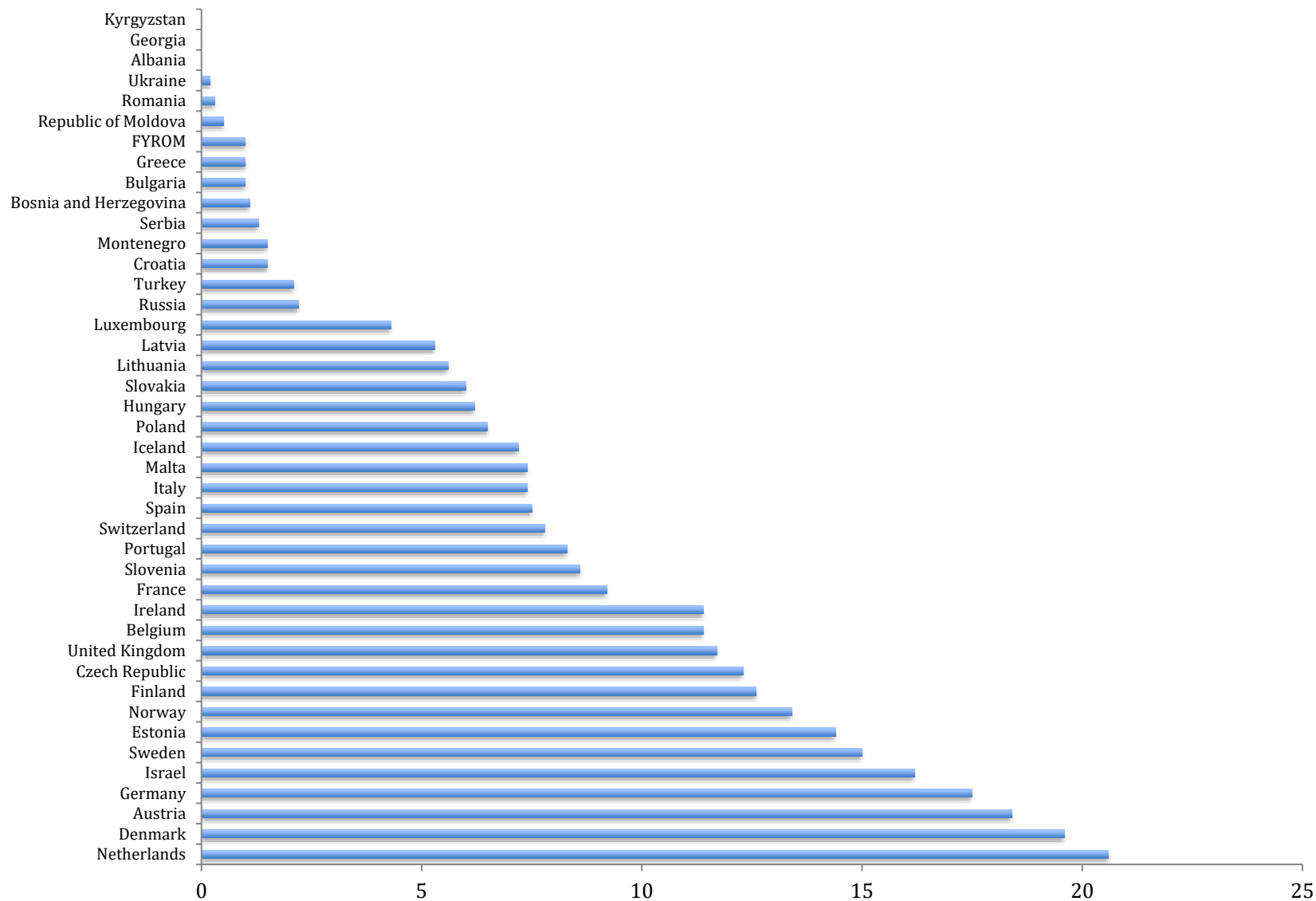


**Figure 6: Number of stroke units per 1000 annual incident ischaemic strokes in 42 European countries**



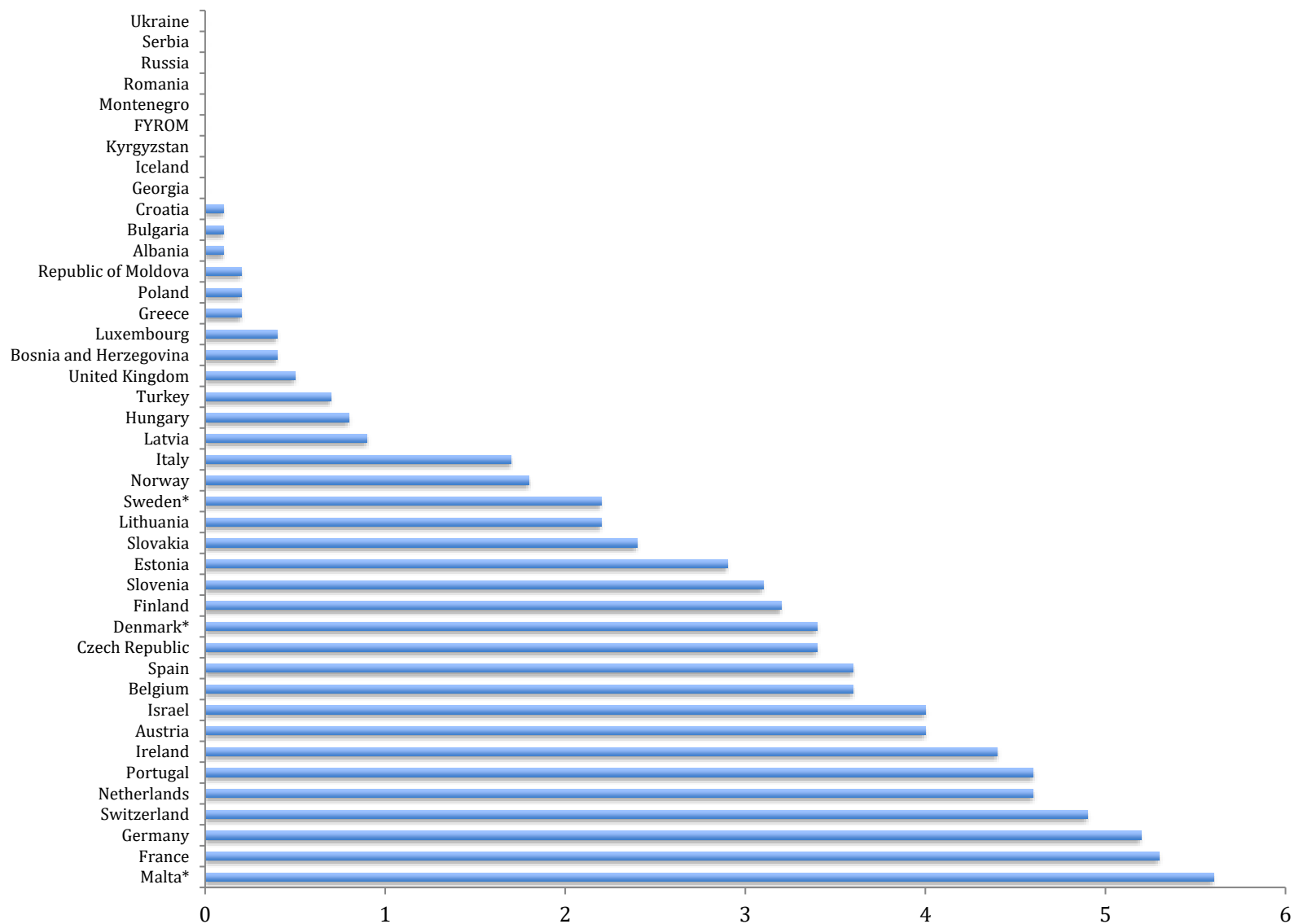
FYROM, Former Yugoslav Republic of Macedonia.

**Figure 7: Contemporary annual estimates of the proportion of patients with incident ischaemic stroke treated with intravenous thrombolysis (IVT) in 42 European countries**



FYROM, Former Yugoslav Republic of Macedonia.

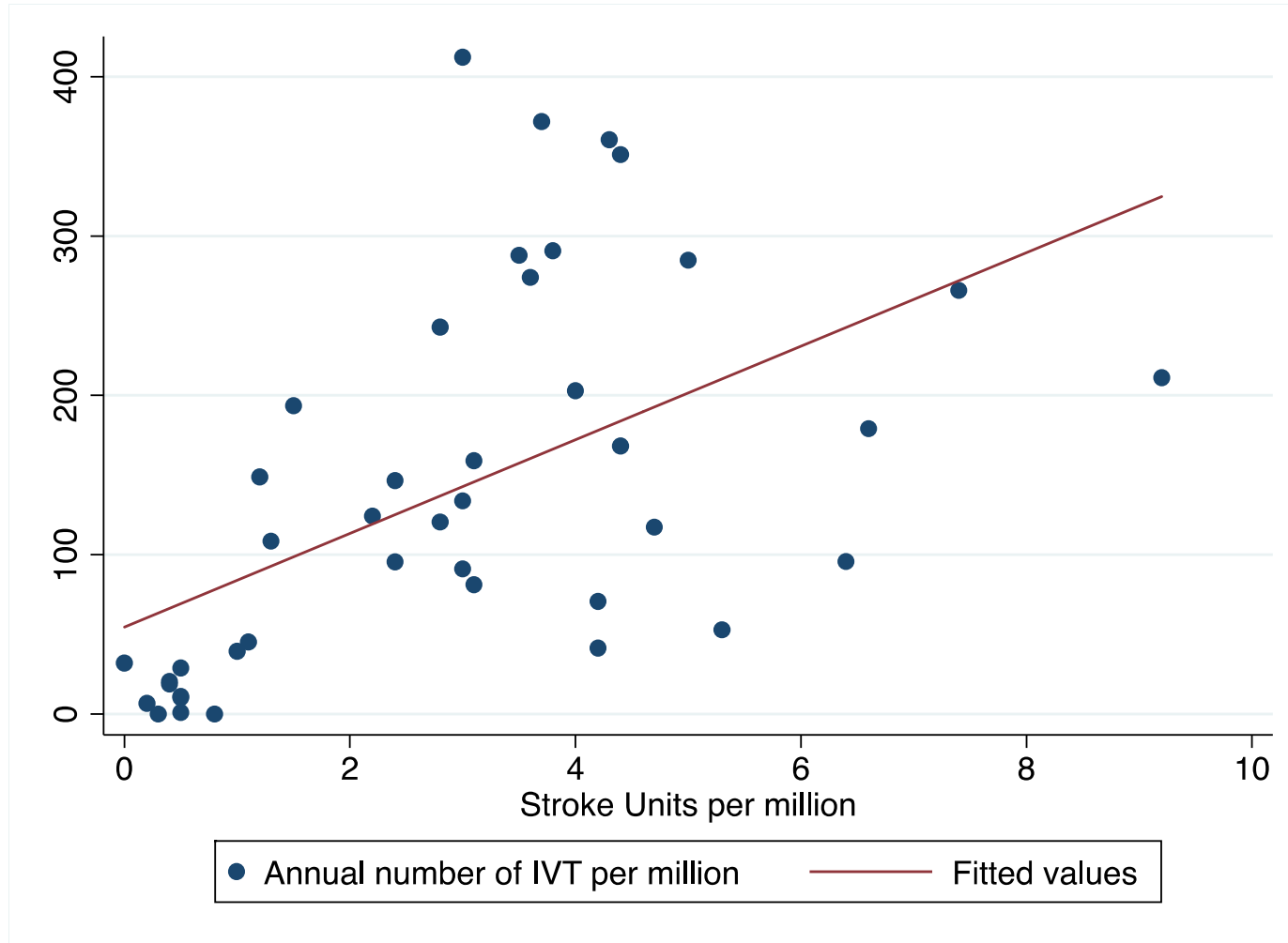
**Figure 8: Contemporary annual estimates of the proportion of patients with incident ischaemic stroke receiving endovascular treatment (EVT) in 42 European countries**



\*2015

FYROM, Former Yugoslav Republic of Macedonia.

**Figure 9: Scatter plot showing the relationship between the number of stroke units per one million inhabitants and the number of IVTs provided per million inhabitants (Pearson correlation coefficient 0.54,  $p=0.0002$ )**



## Supplementary tables

Supplementary Table 1. National programmes for stroke care

Country	National programme to address stroke care recommendations	National protocol for endovascular treatment
Albania	yes	planned
Austria	yes	yes
Belarus	yes	yes
Belgium	no	no
Bosnia and Herzegovina	–	no
Bulgaria	yes	no
Croatia	yes	yes
Czech Republic	yes	planned
Denmark	yes	no
Estonia	yes	yes
Finland	yes	yes
France	yes	yes
Georgia	yes	no
Germany	yes	no
Greece	no	no
Hungary	yes	yes
Iceland	yes	planned
Ireland	yes	no
Israel	yes	yes
Italy	yes	no
Kyrgyzstan	no	planned
Latvia	yes	planned
Lithuania	yes	no
Luxembourg	no	planned
FYROM	yes	yes
Malta	yes	yes
Montenegro	yes	yes
Netherlands	yes	planned
North Cyprus	no	planned
Norway	yes	yes
Poland	yes	yes
Portugal	yes	planned

<b>Republic of Moldova</b>	yes	yes
<b>Romania</b>	yes	no
<b>Russia</b>	yes	no
<b>Serbia</b>	yes	planned
<b>Slovakia</b>	yes	yes
<b>Slovenia</b>	yes	yes
<b>Spain</b>	yes	yes
<b>Sweden</b>	yes	yes
<b>Switzerland</b>	yes	yes
<b>Turkey</b>	yes	no
<b>Ukraine</b>	no	no
<b>United Kingdom</b>	yes	yes
<b>Total (Yes)</b>	<b>37</b>	<b>20</b>

FYROM, Former Yugoslav Republic of Macedonia

**Supplementary Table 2. Countries that currently have full coverage of the overall national needs for endovascular treatment (EVT)**

Country	Full EVT coverage*	No. of EVT centres
Albania	no	1
Austria	yes	11
Belarus	planned	1
Belgium	unknown	17
Bosnia and Herzegovina	no	1
Bulgaria	planned	4
Croatia	no	2
Czech Republic	yes	15
Denmark	yes	3
Estonia	yes	3
Finland	yes	5
France	no	37
Georgia	no	0
Germany	yes	135
Greece	no	6
Hungary	no	6
Iceland	planned	0
Ireland	planned	2
Israel	yes	9
Italy	no	50
Kyrgyzstan	no	0
Latvia	no	2
Lithuania	yes	6
Luxembourg	planned	1
FYROM	yes	1
Malta	yes	1
Montenegro	no	0
Netherlands	yes	20
North Cyprus	yes	2
Norway	planned	5
Poland	no	21
Portugal	no	9
Republic of Moldova	no	0
Romania	no	2
Russia	planned	134
Serbia	no	4
Slovakia	yes	7

<b>Slovenia</b>	yes	1
<b>Spain</b>	no	37
<b>Sweden</b>	planned	6
<b>Switzerland</b>	yes	9
<b>Turkey</b>	no	21
<b>Ukraine</b>	no	4
<b>United Kingdom</b>	no	28
<b>Total (Yes)</b>	<b>15</b>	<b>629</b>

FYROM, Former Yugoslav Republic of Macedonia

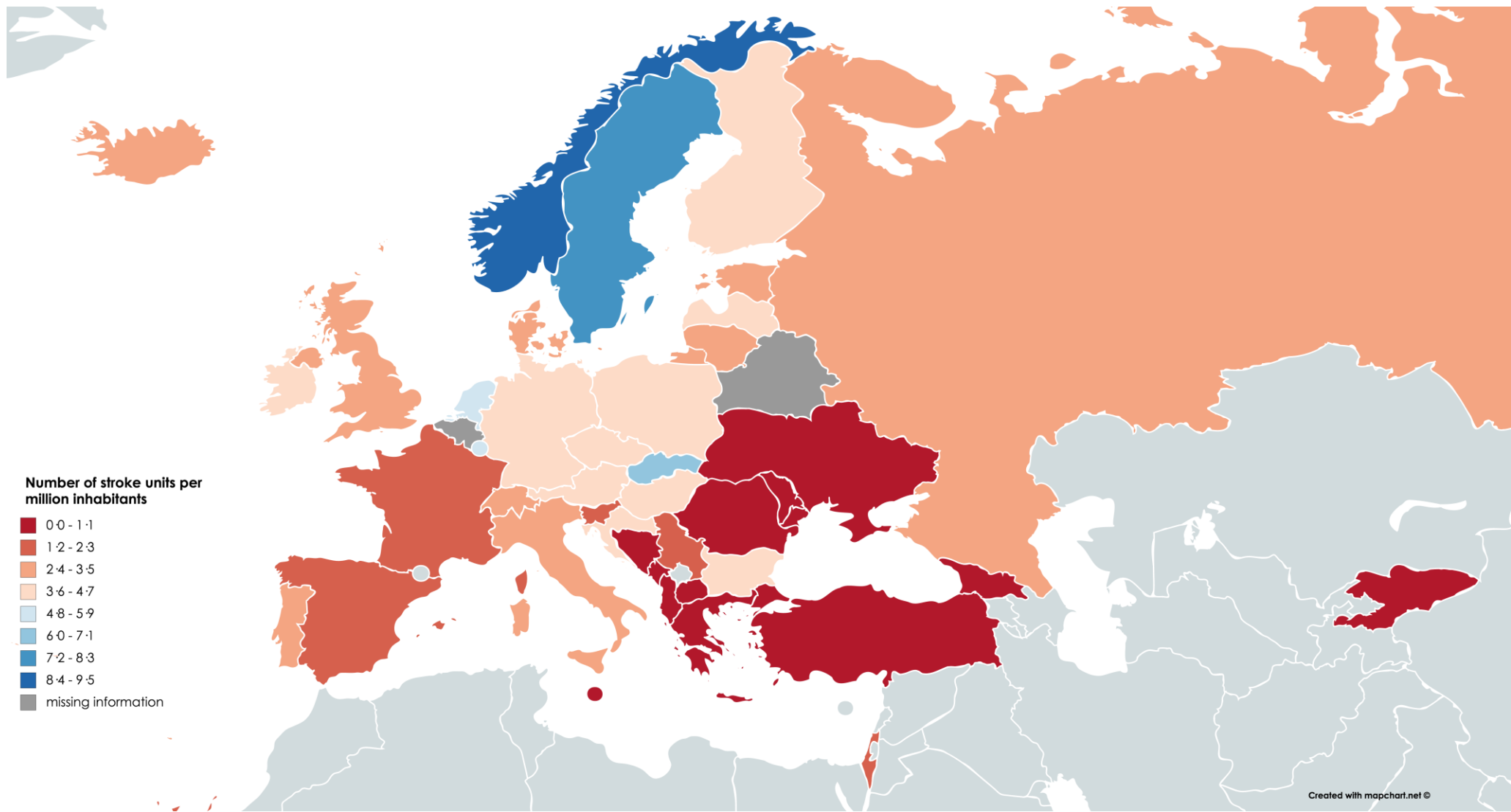
\*Question: "Do the available centres cover the country's overall needs for EVT?"

## Figures

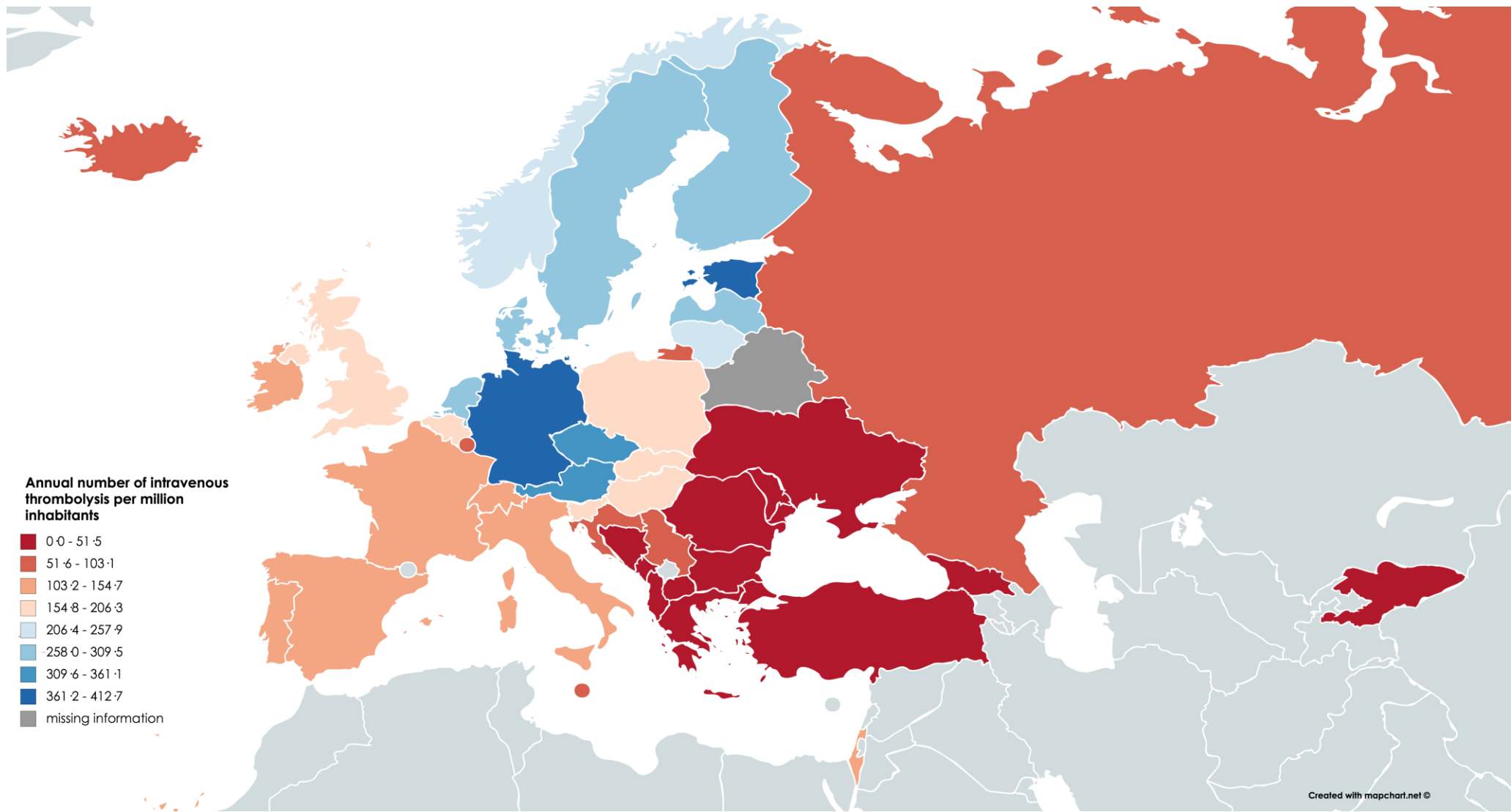
Note: Choropleth maps with bi-polar colour progression and data groups distributed in equal intervals

**Figure 1: Choropleth map showing number of stroke units per million population in 42 European countries (mean 2.9, 95% CI 2.3–3.6)**

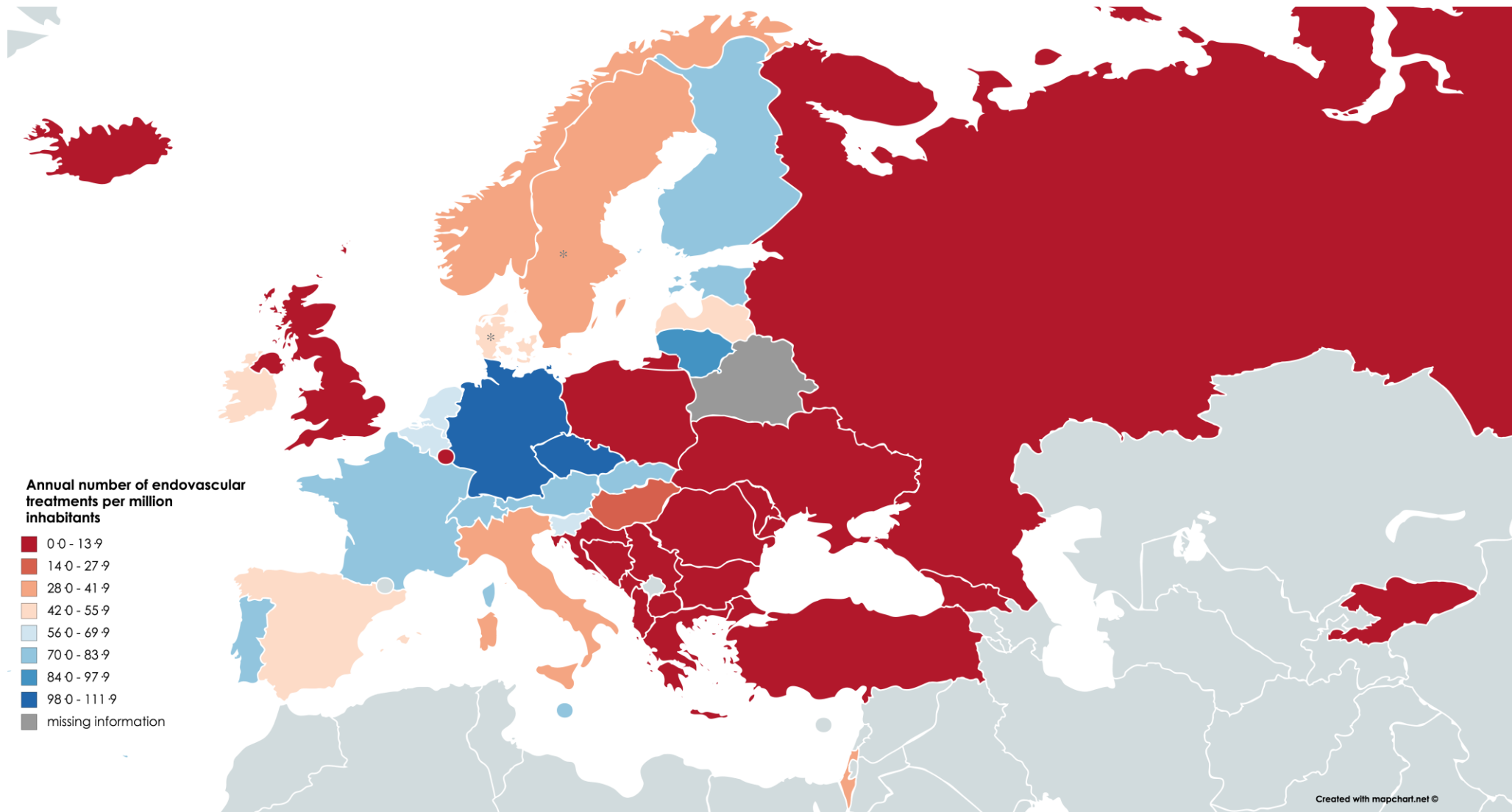




**Figure 2: Choropleth map showing contemporary annual rates of intravenous thrombolysis (IVT) per million population in 42 European countries (mean 142.0, 95% CI 107.4– 176.7)**



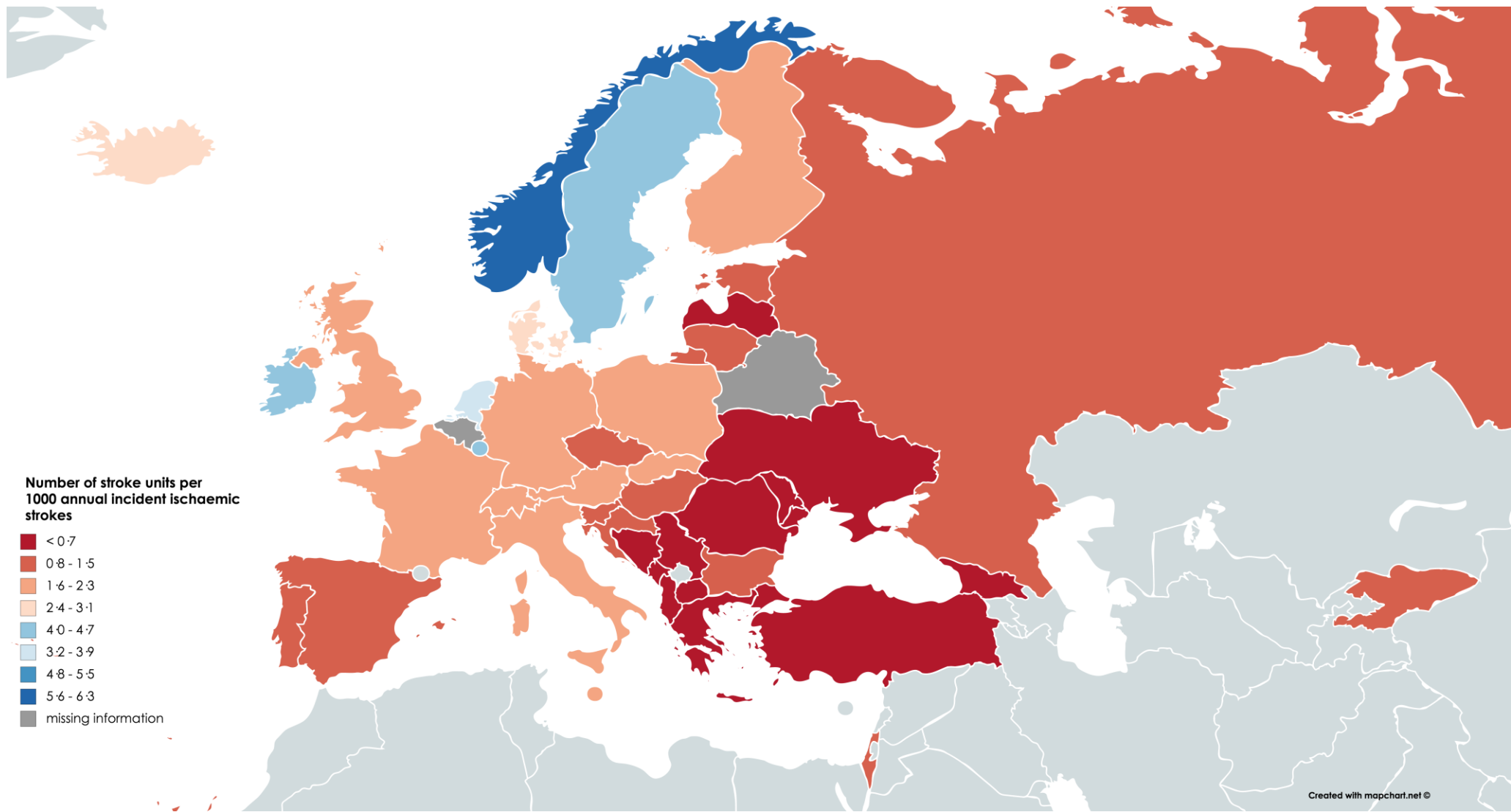
**Figure 3: Choropleth map showing contemporary annual rates of endovascular treatments (EVT) for ischaemic stroke per million population in 43 European countries (mean 37.1, 95%CI 26.7–47.5)**



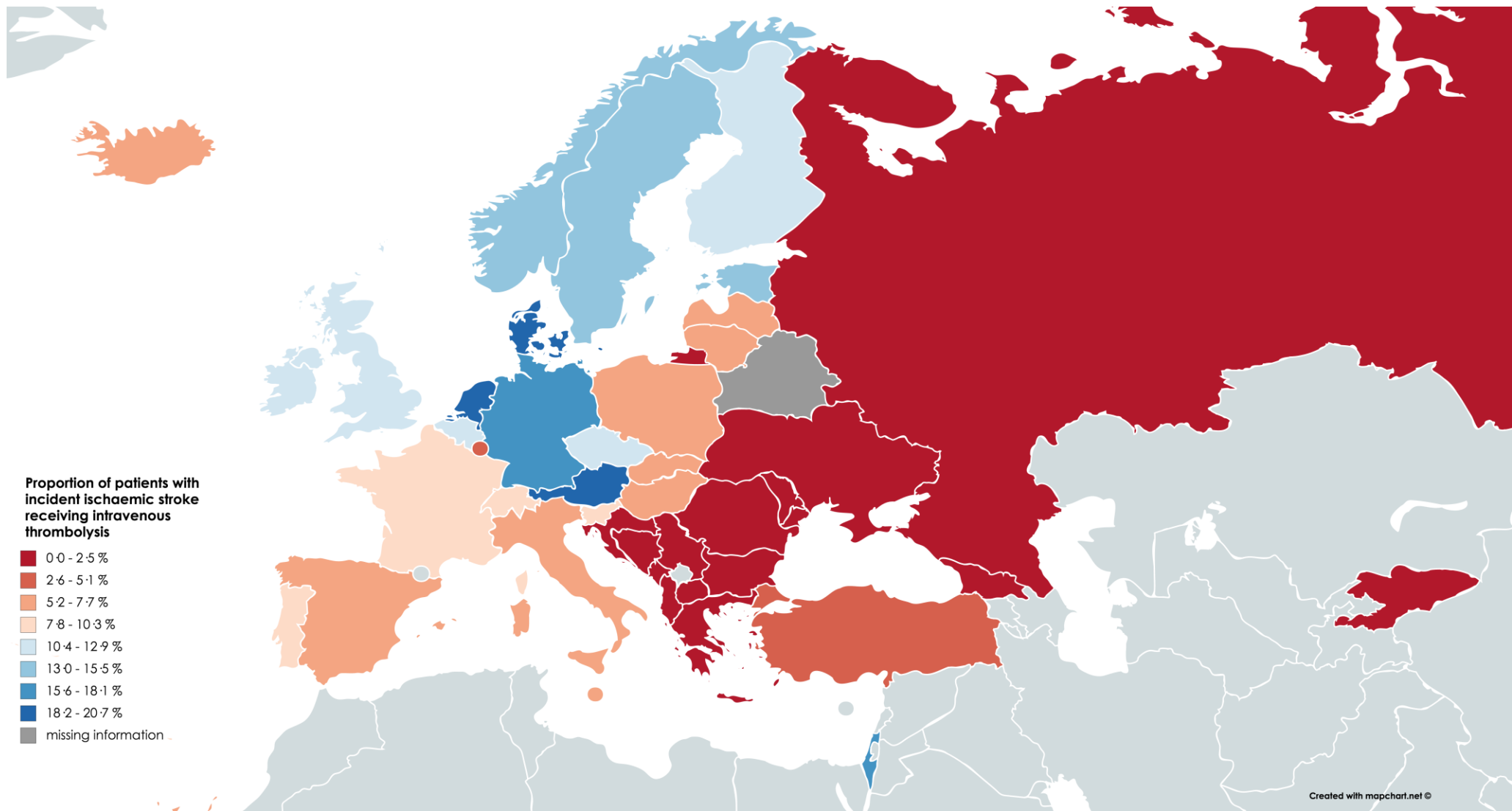
\*

\*2015

**Figure 4: Choropleth map showing number of stroke units per 1000 annual incident ischaemic strokes in 42 European countries (mean 1.5; 95% CI 1.1–1.9)**



**Figure 5: Choropleth map showing contemporary annual estimates of the proportion of patients with incident ischaemic stroke treated with intravenous thrombolysis (IVT) in 42 European countries (mean 7.3%; 95% CI 5.4–9.1)<sup>†</sup>**





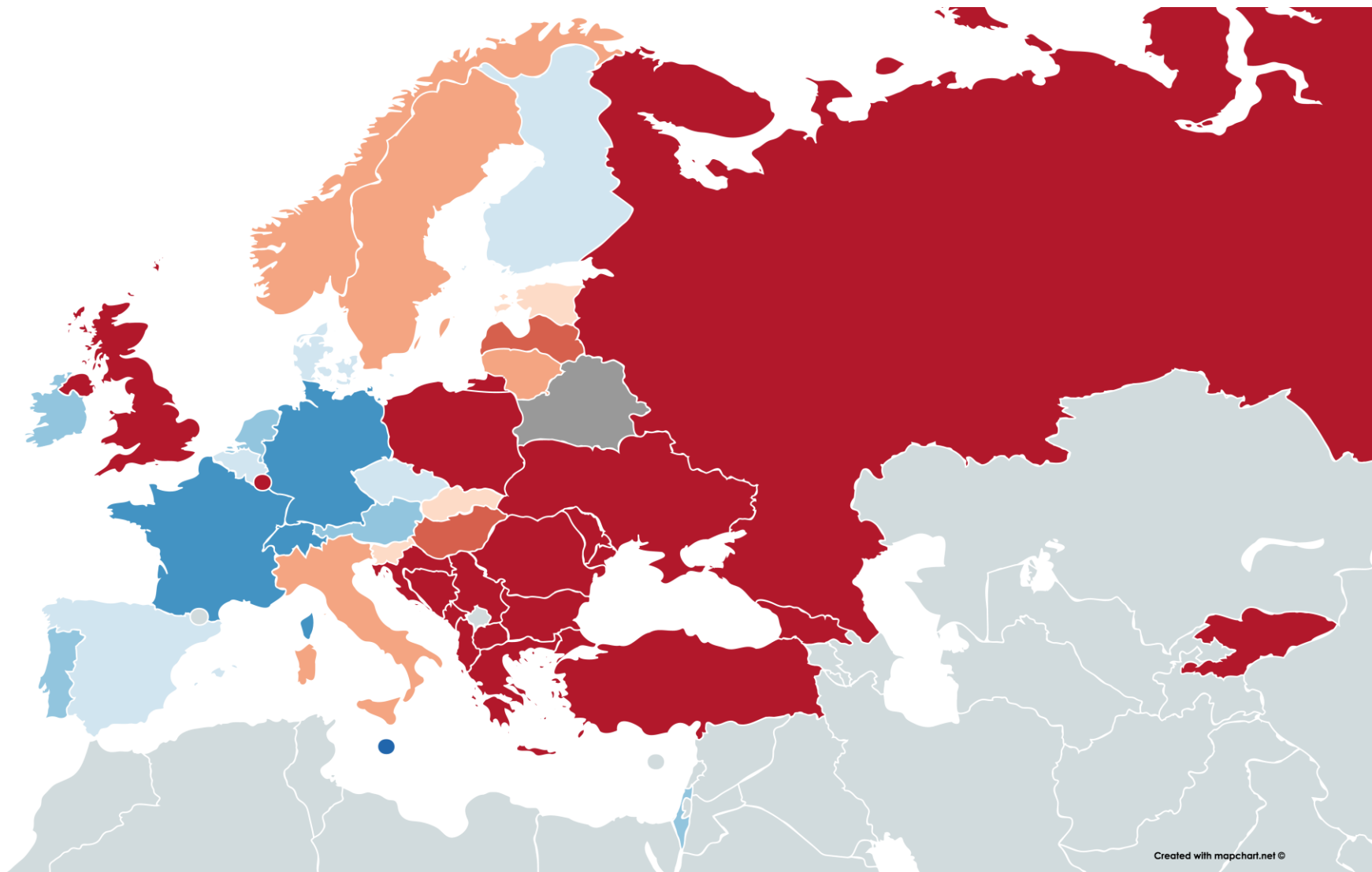
† Annual absolute number of intravenous thrombolysis in 2015 or 2016

**Figure 6: Choropleth map showing contemporary annual estimates of the proportion of patients with incident ischaemic stroke receiving endovascular treatment (EVT) in 42 European countries (mean 1.9%; 95% CI 1.3–2.5)‡**



**Proportion of patients with incident ischaemic stroke receiving endovascular treatment**

- 0.0 - 0.7 %
- 0.8 - 1.5 %
- 1.6 - 2.3 %
- 2.4 - 3.1 %
- 3.2 - 3.9 %
- 4.0 - 4.7 %
- 4.8 - 5.5 %
- 5.6 - 6.3 %
- missing information



Created with mapchart.net ©

‡ Annual absolute number of endovascular treatments (EVT) for acute ischaemic stroke performed in 2016, except Denmark, Sweden, and Malta (2015).

**Table 1: Absolute and relative numbers of stroke units per million inhabitants, annual number of intravenous thrombolysis treatments (IVT), number of IVT centres, annual number of endovascular treatments (EVT), and EVT centres per country**

Country	No. of stroke units*	Stroke units per million	Annual no. of IVT†	Annual no. of IVT per million †	No. of IVT centres	IVT centres per million	Annual no. of EVT‡	Annual no. of EVT per million ‡	No. of EVT centres	No. of EVT centres 24/7	EVT centres per million
Albania	1	0.3	0	0.0	0	0.0	6	2.1	1	0	0.3
Austria	38	4.4	3000	351.1	38	4.4	650	76.1	11	9	1.3
Belarus	–	–	–	–	12	1.3	–	–	1	1	0.1
Belgium	–	–	2250	199.1	–	–	706	62.5	17	12	1.5
Bosnia and Herzegovina	4	1.0	150	39.4	4	1.0	50	13.1	1	1	0.3
Bulgaria	30	4.2	296	41.4	28	3.9	34	4.8	4	–	0.6
Croatia	18	4.2	300	70.7	20	4.7	30	7.1	2	1	0.5
Czech Republic	45	4.3	3800	360.4	45	4.3	1063	100.8	15	15	1.4
Denmark	20	3.5	1632	287.9	10	1.8	280	49.4	3	3	0.5
Estonia	4	3.0	541	412.2	6	4.6	109	83.0	3	2	2.3
Finland	21	3.8	1600	290.7	21	3.8	407	74.0	5	5	0.9
France	140	2.2	8000	124.2	140	2.2	4589	71.3	37	–	0.6
Georgia	2	0.5	4	1.0	1	0.3	0	0.0	0	0	0.0

<b>Germany</b>	295	3.7	30000	371.8	350	4.3	9000	111.5	135	110	1.7
<b>Greece</b>	5	0.4	225	20.5	18	1.6	40	3.7	6	1	0.5
<b>Hungary</b>	39	4.0	2000	202.9	39	4.0	265	26.9	6	3	0.6
<b>Iceland</b>	1	3.0	30	91.1	5	15.2	0	0.0	0	0	0.0
<b>Ireland</b>	22	4.7	550	117.3	24	5.1	210	44.8	2	1	0.4
<b>Israel</b>	10	1.2	1200	148.8	20	2.5	300	37.2	9	9	1.1
<b>Italy</b>	178	3.0	8000	133.8	182	3.0	1882	31.5	50	16	0.8
<b>Kyrgyzstan</b>	5	0.8	0	0.0	0	0.0	0	0.0	0	0	0.0
<b>Latvia</b>	7	3.6	540	274.0	7	3.6	95	48.2	2	1	1.0
<b>Lithuania</b>	8	2.8	699	242.8	10	3.5	276	95.9	6	3	2.1
<b>Luxembourg</b>	3	5.3	30	52.9	3	5.3	3	5.3	1	–	1.8
<b>FYROM</b>	1	0.5	60	28.9	1	0.5	2	1.0	1	0	0.5
<b>Malta</b>	1	2.4	40	95.5	2	4.8	30	71.7	1	1	2.4
<b>Montenegro</b>	0	0.0	20	32.0	3	4.8	0	0.0	0	0	0.0
<b>Netherlands</b>	85	5.0	4821	284.8	85	5.0	1088	64.3	20	20	1.2
<b>Northern Cyprus</b>	2	6.4	30	95.7	2	6.4	20	63.8	2	2	6.4
<b>Norway</b>	48	9.2	1100	211.1	49	9.4	150	28.8	5	–	1.0
<b>Poland</b>	171	4.4	6493	168.2	171	4.4	175	4.5	21	4	0.5
<b>Portugal</b>	25	2.4	1516	146.5	25	2.4	845	81.6	9	4	0.9
<b>Republic of Moldova</b>	2	0.5	45	11.1	2	0.5	20	4.9	0	0	0.0
<b>Romania</b>	10	0.5	200	10.3	10	0.5	15	0.8	2	0	0.1
<b>Russia</b>	451	3.1	11651	81.2	451	3.1	260	1.8	134	37	0.9
<b>Serbia</b>	10	1.4	400	56.8	20	2.8	10	1.4	4	3	0.6
<b>Slovakia</b>	36	6.6	972	179.1	44	8.1	385	71.0	7	3	1.3
<b>Slovenia</b>	3	1.5	400	193.5	12	5.8	142	69.2	1	1	0.5
<b>Spain</b>	60	1.3	5002	108.5	59	1.3	2408	52.2	37	35	0.8

<b>Sweden</b>	72	7.4	2600	265.9	72	7.4	390	39.9	6	3	0.6
<b>Switzerland</b>	23	2.8	1000	120.5	23	2.8	626	75.4	9	9	1.1
<b>Turkey</b>	33	0.4	1480	18.8	41	0.5	456	5.8	21	10	0.3
<b>Ukraine</b>	10	0.2	300	6.7	27	0.6	10	0.2	4	–	0.6
<b>United Kingdom</b>	200	3.1	10290	159.0	200	3.1	478	7.4	28	2	0.1
<b>Total / Mean [95% CI]</b>	<b>2139</b>	<b>2.9 [2.3–3.6]</b>	<b>113267</b>	<b>142.0 [107.4–176.7]</b>	<b>2282</b>	<b>3.6 [2.7–4.4]</b>	<b>27505</b>	<b>37.1 [26.7–47.5]</b>	<b>629</b>	<b>327</b>	<b>0.9 [0.6–1.2]</b>

FYROM, Former Yugoslav Republic of Macedonia.

\* According to the local definition of stroke unit.

† Annual absolute number of intravenous thrombolysis in 2015 or 2016

‡ Annual absolute number of endovascular treatments (EVT) for acute ischaemic stroke performed in 2016, except Denmark, Sweden, and Malta (2015).

**Table 2: Relative numbers of stroke units, annual number of intravenous thrombolysis (IVT) treatments, IVT centres, annual endovascular treatment (EVT), and EVT centres per annual incident ischaemic strokes\***

Country	Annual no. of incident ischaemic strokes*	Stroke units per 1000 ischaemic strokes	Annual no. of IVTs per 1000 ischaemic strokes	Proportion of stroke patients with IVT (%)	IVT hospitals per 1000 ischaemic strokes	Annual no. of EVTs per 1000 ischaemic strokes	Proportion of ischaemic stroke patients with EVT (%)	EVT centres per 1000 ischaemic strokes
Albania	4815	0.2	0.0	0.0	0.0	1.2	0.1	0.2
Austria	16314	2.3	183.9	18.4	2.3	39.8	4.0	0.7
Belarus	30056	-	-	-	0.4	-	-	0.0
Belgium	19689	-	114.3	11.4	-	35.9	3.6	0.9
Bosnia and Herzegovina	13580	0.3	11.0	1.1	0.3	3.7	0.4	0.1
Bulgaria	28869	1.0	10.3	1.0	1.0	1.2	0.1	0.1
Croatia	20278	0.9	14.8	1.5	1.0	1.5	0.1	0.1
Czech Republic	30877	1.5	123.1	12.3	1.5	34.4	3.4	0.5
Denmark	8339	2.4	195.7	19.6	1.2	33.6	3.4	0.4
Estonia	3757	1.1	144.0	14.4	1.6	29.0	2.9	0.8
Finland	12685	1.7	126.1	12.6	1.7	32.1	3.2	0.4
France	87372	1.6	91.6	9.2	1.6	52.5	5.3	0.4
Georgia	8973	0.2	0.4	0.0	0.1	0.0	0.0	0.0
Germany	171801	1.7	174.6	17.5	2.0	52.4	5.2	0.8
Greece	22182	0.2	10.1	1.0	0.8	1.8	0.2	0.3
Hungary	32335	1.2	61.9	6.2	1.2	8.2	0.8	0.2
Iceland	419	2.4	71.6	7.2	11.9	0.0	0.0	0.0
Ireland	4809	4.6	114.4	11.4	5.0	43.7	4.4	0.4

<b>Israel</b>	7411	1.3	161.9	16.2	2.7	40.5	4.0	1.2
<b>Italy</b>	108811	1.6	73.5	7.4	1.7	17.3	1.7	0.5
<b>Kyrgyzstan</b>	5238	1.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Latvia</b>	10282	0.7	52.5	5.3	0.7	9.2	0.9	0.2
<b>Lithuania</b>	12539	0.6	55.7	5.6	0.8	22.0	2.2	0.5
<b>Luxembourg</b>	700	4.3	42.9	4.3	4.3	4.3	0.4	1.4
<b>FYROM</b>	5939	0.2	10.1	1.0	0.2	0.3	0.0	0.2
<b>Malta</b>	537	1.9	74.5	7.4	3.7	55.9	5.6	1.9
<b>Montenegro</b>	1315	0.0	15.2	1.5	2.3	0.0	0.0	0.0
<b>Netherlands</b>	23458	3.6	205.5	20.6	3.6	46.4	4.6	0.9
<b>Northern Cyprus</b>	-	-	-	-	-	-	-	-
<b>Norway</b>	8230	5.8	133.7	13.4	6.0	18.2	1.8	0.6
<b>Poland</b>	99397	1.7	65.3	6.5	1.7	1.8	0.2	0.2
<b>Portugal</b>	18208	1.4	83.3	8.3	1.4	46.4	4.6	0.5
<b>Republic of Moldova</b>	9592	0.2	4.7	0.5	0.2	2.1	0.2	0.0
<b>Romania</b>	79247	0.1	2.5	0.3	0.1	0.2	0.0	0.0
<b>Russia</b>	538984†	0.8	21.6	2.2	0.8	0.5	0.0	0.2
<b>Serbia</b>	31632	0.3	12.6	1.3	0.6	0.3	0.0	0.1
<b>Slovakia</b>	16273	2.2	59.7	6.0	2.7	23.7	2.4	0.4
<b>Slovenia</b>	4629	0.6	86.4	8.6	2.6	30.7	3.1	0.2
<b>Spain</b>	66594	0.9	75.1	7.5	0.9	36.2	3.6	0.6
<b>Sweden</b>	17361	4.1	149.8	15.0	4.1	22.5	2.2	0.3
<b>Switzerland</b>	12896	1.8	77.5	7.8	1.8	48.5	4.9	0.7
<b>Turkey</b>	69064	0.5	21.4	2.1	0.6	6.6	0.7	0.3
<b>Ukraine</b>	160904	0.1	1.9	0.2	0.2	0.1	0.0	0.0
<b>United</b>	87594	2.3	117.5	11.7	2.3	5.5	0.5	0.3



<b>Kingdom</b>								
<b>Total / Mean [95% CI]</b>	<b>1913985</b>	<b>1.5 [1.1–1.9]</b>	<b>72.7 [54.2–91.2]</b>	<b>7.3% [5.4–9.1]</b>	<b>1.9 [1.3–2.5]</b>	<b>19.3 [13.5–25.1]</b>	<b>1.9% [1.3–2.5]</b>	<b>0.4 [0.3–0.5]</b>

FYROM, Former Yugoslav Republic of Macedonia.

\* According to Global Burden of Disease estimates (2016)<sup>18</sup>

† According to the local experts the incidence of ischemic stroke is overestimated

**Table 3: Estimated number of additional stroke units and comprehensive stroke centres required to achieve three stroke units per one million inhabitants and one comprehensive stroke centre per one million inhabitants, and estimated number of additional treatments with intravenous thrombolysis and endovascular interventions if rates of 10% and 3%, respectively, are to be achieved.**

<b>Country</b>	<b>No. of additional stroke units required</b>	<b>No. of additional comprehensive stroke centres required</b>	<b>No. of additional intravenous thrombolysis treatments per year (target rate 18%)</b>	<b>No. of additional endovascular treatments per year (target rate 5%)</b>
Albania	8	2	867	235
Austria	0	0	0	166
Belarus	–	8	-	-
Belgium	–	0	1294	278
Bosnia and Herzegovina	7	3	2294	629
Bulgaria	0	3	4900	1409
Croatia	0	2	3350	984
Czech Republic	0	0	1758	481
Denmark	0	3	0	137
Estonia	0	0	135	79
Finland	0	1	683	227
France	53	27	7727	0
Georgia	10	4	1611	449
Germany	0	0	924	0
Greece	28	5	3768	1069
Hungary	0	4	3820	1352
Iceland	0	0	45	21
Ireland	0	3	316	30

<b>Israel</b>	14	0	134	71
<b>Italy</b>	1	10	11586	3559
<b>Kyrgyzstan</b>	13	6	943	262
<b>Latvia</b>	0	0	1311	419
<b>Lithuania</b>	1	0	1558	351
<b>Luxembourg</b>	0	0	96	32
<b>FYROM</b>	5	1	1009	295
<b>Malta</b>	0	0	57	0
<b>Montenegro</b>	2	1	217	66
<b>Netherlands</b>	0	0	0	85
<b>Northern Cyprus</b>	0	0	-	-
<b>Norway</b>	0	0	381	262
<b>Poland</b>	0	18	11398	4795
<b>Portugal</b>	6	1	1761	65
<b>Republic of Moldova</b>	10	4	1682	460
<b>Romania</b>	49	18	14064	3947
<b>Russia</b>	0	9	85366 <sup>†</sup>	26689 <sup>†</sup>
<b>Serbia</b>	11	3	5294	1572
<b>Slovakia</b>	0	0	1957	429
<b>Slovenia</b>	3	1	433	89
<b>Spain</b>	78	9	6985	922
<b>Sweden</b>	0	4	525	478
<b>Switzerland</b>	2	0	1321	19
<b>Turkey</b>	203	58	10952	2997
<b>Ukraine</b>	124	41	28663	8035
<b>United Kingdom</b>	0	37	5477	3902

<b>Total</b>	<b>628</b>	<b>286</b>	<b>226662</b>	<b>67347</b>
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FYROM, Former Yugoslav Republic of Macedonia

† According to the local experts the incidence of ischemic stroke is overestimated

