

Status of Lung Cancer Data Collection in Europe

INTRODUCTION

The European nations have diverse political, economic, cultural, and geographic characteristics. These characteristics have, and will continue to have, important influences on the development and delivery of health care, which result in striking variations.

DEVELOPMENT OF THE EUROPEAN UNION

The European Union (EU) began as the European Economic Community (EEC) in 1967 with six founder members: Belgium, the Federal Republic of Germany, France, Italy, Luxembourg, and the Netherlands. The first expansion of the EEC was in 1973, when Denmark, Ireland, and the United Kingdom joined, followed by Greece in 1981 and then Portugal and Spain in 1986.¹ The composition and function of the EU have changed dramatically during the past 30 years along with several major political events. These include the fall of the Berlin wall (1989), the dissolution of the Union of Soviet States of Russia (1991), the division of Czechoslovakia (1993), and the break-up of Yugoslavia into seven independent countries (war torn period, 1991-2001). The number of independent countries in Europe has almost doubled, and the number members of the EU has increased from 12 to 28 (Appendix [Table A1](#)).

There are 24 official languages in the EU, an additional five semiofficial languages, and 42 minority languages. Within some countries, such as Belgium, Romania, Spain, and Switzerland, multiple languages are spoken. This linguistic diversity creates a unique challenge for any unified analysis in which data definitions are essential. This is particularly relevant to collection of health care data.

EUROPEAN HEALTH CARE INFRASTRUCTURE AND LUNG CANCER SERVICES

A comparative assessment of health care infrastructure of European countries is an essential

element of the assessment of health care provision and outcomes. A survey performed by a European Respiratory Society taskforce in 2011 collected information on health care infrastructure and the lung cancer pathway in 37 European countries.² The survey reported that, in 25 of the 37 countries, health care provision was funded through a form of National Health Service, which was based on income tax contributions or a mandatory health insurance program. This means that either the consultation at primary or secondary care is free for everyone or that a nominal fee is paid. [Table 1](#) lists the different methods used to access a primary care physician, which remains the usual first point of contact for an individual with lung cancer. Greece and Cyprus, however, do not have universal coverage with primary care physicians, and an individual must choose to either pay to see a primary care physician privately or present themselves directly to secondary care. Additional inequality was identified in Bulgaria, where a primary care physician has a quota on the number of patients they can refer to secondary care each month. This introduces a delay in the diagnostic pathway. Variation was also seen in which specialist provided treatment of patients with lung cancer, with the exception of radiotherapy, which was provided universally by radiation oncologists. Chemotherapy was provided either by oncologists alone or by oncologists and respiratory physicians, sometimes in equal measure. Surgery was provided by a combination of pure thoracic surgeons, mixed cardiothoracic surgeons, and even general surgeons. Palliative care was not a recognized specialty in some countries and was provided by respiratory physicians, oncologists, and primary care physicians as well as by specific palliative care specialists. Not every country had multidisciplinary teams or lung cancer nurse specialists, and the definitions of these groups varied. Available resources, both diagnostic and therapeutic, were also highly variable. [Table 2](#) lists the variation in access to positron emission tomography (PET)/computed tomography (CT) scanning across 350 hospitals

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Table 1. Access to Primary Care According to a 2011 Survey of ERS Task Force

Country by Level of Provided Insurance	Remark
Free for everyone	
Austria	—
Belarus	—
Denmark	—
Hungary	—
Ireland	Only for those individuals with a medical card
Italy	—
Kyrgyzstan	—
Lithuania	—
Malta	—
Poland	—
Portugal	—
Spain	—
Turkey	—
Ukraine	—
United Kingdom	—
Free but insurance pays	
Albania	Single level of health insurance, which is mandatory to allow access to public hospitals; additional voluntary health insurance to access private hospitals
Bosnia	Public health care organized at the cantonal level; insurance paid by employers to the public fund
Croatia	Two levels of health insurance, basic and additional
Czech Republic	—
Estonia	State-run health insurance
Netherlands	Mandatory basic level of health insurance, which is paid by everyone in employment; voluntary supplements available
Romania	National public health insurance agency
Serbia	Mandatory social health insurance scheme
Slovakia	Mandatory health insurance (N = 3), paid for by employer (n = 2 private options) or state (n = 1 option)
Slovenia	Health insurance scheme run by the government
Switzerland	Compulsory basic level of health insurance; additional complementary health insurance available
Pay at time of consultation	
Bulgaria	1.2E if individual paid contributions to the National Health Fund; 10-15E if contribution unmet
Cyprus	50E for private visit to primary care physicians (because inadequate number of providers)
Germany	10E per visit, or 40E per year and consultations are free
Iceland	4E; remainder covered by Department of Health via taxation

(Continued on following page)

in 37 countries in 2011; a similar variation was seen for access to thoracic surgery.²

HISTORY OF CANCER DATA COLLECTION IN EUROPE

The use of data to evaluate trends in cancer incidence and outcome in European countries has undergone significant development in the past 25 years. In 1989, during his presidency of the EU, Francois Mitterrand initiated a health program on cancer prevention and patient information from which the EUROCORE studies have arisen.³ These studies use Europe-wide population-based cancer registries to calculate incidence, estimate prevalence, and report variation in survival. This information can be used for health care planning and to correctly allocate funding and resources. The first publication from EUROCORE was in 1995 and used data from 30 registries in 12 countries (1978-1984); it demonstrated striking variations in cancer survival among countries.⁴ Low survival rates were found in Eastern Europe, intermediate in Denmark and the United Kingdom, and higher in other Western European populations. An additional four monographs have reported EUROCORE data in the past 20 years, and each one reported population-based cancer registry data for specific time periods. The latest, which addressed those patients diagnosed between 1999 and 2007, was published in 2014.⁵ There will inevitably be a delay in publication of results that are based on cancer survival, because 5-year survival remains the marker of cure in many cancer types; however, the delay has been reduced from 11 to 6 years.⁶ With time, the numbers of countries and cancer registries involved with the project have increased; the EUROCORE-5 database contains approximately 22 million patients from 26 countries who were diagnosed with cancer between 1978 and 2007, with a follow-up date of December 31, 2008.⁵ The survival differences first described in EUROCORE has narrowed, and improvement has been observed in those countries with a historically low survival rate.⁶

A number of limitations exist with the EUROCORE data. In several countries, the coverage provided by cancer registration represents only a small proportion of the total population.^{7,8} Therefore the data cannot be assumed to be representative of the whole population. This is true for the Czech Republic, Germany, Italy, Poland, and Spain.^{6,9} In Italy, for example, there is better

Table 1. Access to Primary Care According to a 2011 Survey of ERS Task Force (Continued)

Country by Level of Provided Insurance	Remark
Ireland	60E without medical card; some or all can be claimed from private insurance scheme (involves 50% of population)
Norway	22E per visit, up to maximum of 260E per year, which includes primary and secondary care appointments, prescription charges, and more; in-patient stay is free; some of government-collected income tax goes to Department of Health
Sweden	24E per visit, up to maximum of 180E per year
Pay a certain amount/proportion	
Belgium	10% paid by patient, 90% paid by social security program
Finland	13.7E per visit for first three visits, then free
France	23E at time of appointment, but 70% per individual can be reclaimed from social security program
Greece	3-10E
Luxembourg	20% of 39.9E (ie, 8E) per individual; compulsory public health and long-term care insurance, so government pays 80% of primary and secondary care consultation costs

Abbreviations: E, Euro; ERS, European Respiratory Society.

cancer registration in the more affluent north than in the poorer south, where cancer survival is known to be worse.¹⁰ This will cause a bias in the results for Italy depicted in EUROCORE publications. Local criteria exist for registration of patients; in some countries, these are based on the pathologic confirmation of cancer, whereas other countries will accept registrations on the basis of a clinical diagnosis. This difference will generate a significant influence on the population denominator from which calculations of survival are based. Those patients without pathologic confirmation are frailer, have more advanced disease, and are unlikely to receive active cancer treatment.¹¹ The reliance on cancer registration via secondary care will also exclude those patients who remain under the care of primary care physicians. Furthermore, not all cancer registries accept diagnoses made on the basis of death certificates only. The absence of any occurrences with only a death certificate means that cancers with a short survival, like lung cancer, will not be adequately captured by the cancer registration process. This will create a systematic bias that causes survival figures to appear better than they are for the whole population of individuals with lung cancer. The EUROCORE authors

acknowledge some concern that countries in Eastern Europe submit incomplete follow-up data, and this is particularly relevant for rapidly fatal cancers, like lung cancer.¹² Failure to record death in a timely manner, again, will lead to a survival bias. However, the main limitation of the EUROCORE database lies in the absence of clinical details, especially stage of disease and performance status. These two patient features are crucial to compare cancer outcome measures, such as resection rate and survival.

CANCER REGISTRIES ACROSS EUROPE

EUROCORE forms part of a number of inter-related projects that have been established since 1990 (Table 3).¹³⁻¹⁵ The European Network of Cancer Registries was established in 1990 within the framework of Europe Against Cancer Program funded by the EU.³ It promotes collaboration between existing cancer registries, defines data standards,¹³ offers training to registry personnel, and disseminates information thorough publication in peer review journals. EUROCORE (Europe Against Cancer: Optimization of the Use of Registries for Scientific Excellence in Research) was an EU-funded program designed to improve the networking between researchers and cancer registry personnel, and several other projects stem from this. EUROCHIP (European Cancer Health Indicator Project) is one of these projects, and one particular work package of EUROCHIP-3 is relevant here. The objective was to improve information about the collection and comparability of health indicators across Europe. Three key clinical indicators were chosen: stage at diagnosis, treatment delay, and compliance with cancer guidelines. The final report of EUROCHIP-3 (in 2013) states that only 15% of 103 participating cancer registries collect all three data items. Although 80% collect data about stage, less than 30% collect sufficient information about treatment and compliance. Furthermore, almost 25% had no interest in collection of additional data items. Lack of resources—both finances and qualified staff—were cited as reasons for this.¹⁶ The disparity in the quality of data collection among cancer registries poses a significant challenge to the role of registries in epidemiologic and health care research.¹⁷ The European Cancer Observatory is another example of a collaborative program developed at the International Agency

Table 2. Access to PET/CT Scanner at Individual Hospitals Across Europe According to 2011 ERS Survey

Country	No. of Hospitals								
	Total Participating (N = 350)	Not Responding (n = 66)	By Distance to Travel (km)				By Time to PET/CT (weeks)		
			0* (n = 122)	< 50 (n = 107)	50-100 (n = 23)	> 100 (n = 32)	< 2 (n = 198)	2-4 (n = 66)	> 4 (n = 20)
Albania	1	1							
Austria	4	1	2	1			2	1	
Belarus	1					1			1
Belgium	11	2	5	4			7	2	
Bosnia-H	2	1				1			1
Bulgaria	4	1	2			1		2	1
Croatia	3	1	1	1			1	1	
Cyprus	1	1							
Czech	3	1	1	1			2		
Denmark	8		7		1		6	1	1
England	53	1	13	32	6	1	50	2	
Estonia	1		1						1
Finland	10	1	5		1	3	5	4	
France	59	6	23	21	5	4	32	20	1
Germany	36	7	16	12	1		25		4
Greece	2	2							
Hungary	5	1		3		1		4	
Ireland	4			3		1	3	1	
Israel	1			1			1		
Italy	5		3	1	1		2	3	
Lithuania	3	2				1			1
Luxembourg	1		1				1		
Malta	1		1				1		
Netherlands	13	1	11	1			11	1	
Norway	18	3	1	4	4	6	4	5	6
Poland	3	2		1				1	
Portugal	10	3	3	3		1	5	2	
FYROM	1			1			1		
Republic of Serbia	5	2	1		1	1		3	
Romania	4	1		2		1	1	1	1
Scotland	11	2	1	6	1	1	9		
Slovakia	3	3							
Slovenia	4	2	1	1			1	1	
Spain	32	11	8	5	2	6	11	10	
Sweden	1	1							
Switzerland	7	2	4	1			5		
Turkey	18	4	11	1		2	12		2
Wales	1			1				1	

Abbreviation: FYROM, Former Yugoslav Republic of Macedonia

*No PET/CT was available at the diagnosing hospital.

Table 3. Main European Union Initiatives to Develop Cancer Registries

Initiative	Date	Details
ENCR, established as joint venture between European Commission's Europe Against Cancer program, Nordic Cancer registries, International Association of Cancer Registries, the Latin Language Registry Group, and IARC	1990 to present	Supports the member registries with training, defines data standards, ¹³ and reports cancer data through its own platform (ie, EUOCIM) or in collaborations (EUROCARE, EUROCOURSE)
ECHI funded by European Commission in collaboration with member states	1995-2012	Created a list of 88 indicators that served to benchmark health and health care systems ¹⁴ ; two indicators derived from cancer registries are cancer survival rates and cancer treatment quality
EUROCHIP	2001-2012	Network of organizations who observed three work-streams to try to develop a common cancer control plan for Europe
The European Council conclusions for the new European Health Strategy (2008-2013), published as a white paper in October 2007 ¹⁵	2004-2007	The strategy focused on increasing prevention and early diagnosis of cancer and identified the need for national cancer control programs, within which a cancer registry is a statutory requirement
EUROCOURSE	2009-2012	Aimed to improve the use of registries and encourage exchange of information and benchmarking of best practice
European Partnership for Action Against Cancer	2009-2014	Generated recommendations on the legal and methodologic aspects of establishing a good-quality registry; reminded member states of the need to develop a cancer registry
European Cancer Observatory, a joint venture between ENCR and IARC within the framework of EUROCOURSE	2012 to present	Three components: EUREG examines descriptive cancer data from registries; EUCAN reports key epidemiologic facts in 24 specific cancers; and EUROCIM will offer extractable data for researchers

Abbreviations: ECHI, European Core Health Indicators; ENCR, European Network of Cancer Registries; EUCAN, European Cancer National estimates; EUREG, European REGistry data; EUROCARE, EUROpean CAncer REgistry; EUROCHIP, European Cancer Health Indicator Project; EUROCIM, EUROpean downloadable data; EUROCOURSE, Europe Against Cancer: Optimization of the Use of Registries for Scientific Excellence in Research; IARC, International Agency for Research on Cancer.

for Research on Cancer in partnership with the European Network of Cancer Registries within the framework of the EUROCOURSE project. The observatory has three main components with individual web sites and regular publication of results.¹⁸

LUNG CANCER DATA COLLECTION: CURRENT PICTURE

The majority of European countries have data collection at the national level, but this is not the

case in Albania, Bosnia Herzegovina, Italy, Spain, and Switzerland. The Albanian Respiratory Society collects data about patients with lung cancer via a physician-completed paper record, which is not linked to survival data and which does not allow evaluation of outcome measures. Italy has a number of local cancer registries, but these do not collect data about all age groups or all types of cancer. Bosnia Herzegovina, Spain, and Italy have regional data collection that is based on political boundaries (Bosnia Herzegovina) or on specific health care regions (Spain and Italy). Of 30 countries that reported national data collection in lung cancer as part of a survey in 2015, all had cancer registries, and six—Denmark, Germany, Hungary, the Netherlands, Slovenia, and United Kingdom—had an additional lung cancer-specific data collection, or audit, program.¹⁹

Data collection is mandatory in the majority of European countries but not in Germany, the Republic of Ireland, the Netherlands, or Turkey, although these countries report at the national level. Additional variation exists with respect to patient consent. In 2015, seven countries reported consent as a requirement for data collection to a national program. This took the forms of written consent in four countries (Estonia, Germany, Moldova, and Spain) and of implicit verbal consent in three (Italy, Luxembourg, and the Netherlands). Three more countries—Belgium, Slovakia, and Slovenia—reported no consent requirement for data submission to the national cancer registry, but they did require consent for data used in a hospital/regional lung cancer program.

Some countries in Europe collect data about only those individuals with histologic confirmation of lung cancer. This is the case in Austria, Bulgaria, Croatia, Hungary (via the Koranyi pulmonology registry), Italy, Moldova, and Poland. The majority of European countries (n = 28), already collect data about those patients who have a clinical diagnosis made on the basis of imaging and in some cases also include those who have a diagnosis of lung cancer made on the death certificate, although some require a postmortem examination.

Furthermore, there is wide variation in the actual data items collected across Europe, with a paucity in clinical features, which are powerful indicators of outcome measures; this gap makes

clinical interpretation of these data difficult. In the 2015 survey, only 17 countries routinely collected data about performance status; 15, about smoking history; 10, about comorbidity details; and only eight, about the socioeconomic status of the individual. In fact, details about the treatment given to a patient are not collected in nine of the 35 countries that took part in the survey.¹⁹

SPECIFIC NATIONAL LUNG CANCER AUDIT PROGRAMS

The Danish Lung Cancer Group was formed in 1991 and originally was a voluntary multidisciplinary group of representatives from across the lung cancer pathway. The group was born out of concern among Danish health care professionals about the poor prognosis for patients with lung cancer during preceding decades,^{20,21} and the primary goal was to improve survival and clinical outcomes. After clinical practice in 90 departments across Denmark was assessed, significant variation in practice was observed.²² In response to this finding, the group began a two-pronged strategy to tackle these deficiencies. The first edition of the guidelines for clinical practice in lung cancer was published in 1998, and in the year 2000, data collection began at the national level. This data collection project tied in with the Danish National Indicator Project, which was established in 2000 as a continuous national program of data collection that was based on disease-specific standards, indicators, and prognostic factors for six disease groups (including lung cancer). A multidisciplinary team created the indicators and standards to which each institution should aspire, and data are sent electronically. There is a continuous process of evaluation of data and feedback to the individual units (clinicians and managers) about their current performance.²³ This generates an audit cycle and allows review of clinical practice and then prospective re-evaluation to improve the standard of care.

The Danish Lung Cancer Registry is an excellent example of how continuous data collection, with the correct political, financial, and professional support, can stimulate clinical improvements with real patient benefits. The database now contains detailed clinical information for more than 55,000 patients, and an annual report is published with information for the public as well as for health care professionals. There have

been a number of improvements in outcome measures: the proportion of patients who had surgery within 14 days of referral has increased; 30-day postoperative mortality has decreased; the rates of pneumonectomy have decreased; and 1-, 3-, and 5-year postoperative survival rates all have increased.²²⁻²⁴ Overall, 5-year survival has increased from 9.8% in 2003 to 12.1% in 2012,²² and this is without any proven shift toward lower-stage disease in the lung cancer cohort. This implies that the improvement is a result of better or more active treatment, rather than earlier diagnosis. The observations that support this improvement include faster diagnostic work-up, more patients identified for treatment (estimated as 60% in 2000 and 85% in 2012), and shorter wait times to start treatment. The resection rates have remained stable, so there must have been an increase in oncology and palliative care provision during this time period.²²

After the publication of EURO CARE in 1995, an audit was distributed by the Clinical Effectiveness and Evaluation Unit of the Royal College of Physicians (London) to respiratory medicine departments in England, Wales, and Northern Ireland (in 1998). This collected both retrospective and prospective data about 1,600 patients in 48 hospitals. Information about presentation, investigations, and treatment, as well as the outcome at 6 months after bronchoscopy, was recorded. The report highlighted huge variations in clinical practice and delays along the diagnostic pathway. For example, the rate of surgical resection, excluding that of small-cell lung cancer, ranged from 3% to 33%, and chemotherapy for only small-cell lung cancer ranged from 14% to 100%.²⁵ A need for political leadership on cancer care within the National Health Service (NHS) had been acknowledged, and the NHS Cancer Plan was implemented in 2000.²⁶ Some of the key features of this plan were the instigation of multidisciplinary teams to manage occurrences of suspected and proven cancer; the enforcement of wait time targets for points on the pathway; the process of peer review; and anonymous data collection. This effort was followed by the Cancer Reform Strategy in 2007²⁷ as well as the publication of guidelines for the investigation and treatment of individuals with lung cancer by the National Institute for Clinical Excellence in 2005 and 2011.²⁸

The National Lung Cancer Audit, originally called LUCADA, was established in 2004 to

anonymously collect and analyze data about individuals with lung cancer. An online data collection tool allowed hospitals to submit data about their patients individually or en masse. After a pilot phase in 2004, credibility within the clinical community increased gradually, as did data completeness (performance status and stage are now recorded for more than 90% of cases), particularly after the data set was validated in 2011.²⁹ Participation became universal despite the initially nonmandatory status of the audit. Outputs from the audit include more than 40 peer-reviewed papers; hundreds of abstracts delivered at regional, national, and international meetings; 10 annual reports; and a mesothelioma-specific report that was based on a 3-year period of data.³⁰ These outputs have charted a gradual improvement in both the process and the outcome for patients with lung cancer; highlights include an almost doubling of the (curative) surgical resection rate and an improvement in 5-year survival from 7% (in 1995) to a predicted 16% for patients diagnosed in 2013.³¹ A persistent theme in all of these outputs is the variation in standards of care across different organizations,^{30,32-34} and the use of statistical methods has shown that case-mix does not explain the majority of these variations. The National Lung Cancer Audit is now the largest clinical data set for patients with lung cancer and includes key patient features, such as performance status, comorbidity, stage, and socioeconomic status. This level of clinical detail makes it a powerful resource for research.³⁵⁻⁴¹

In part due to the success of the National Lung Cancer Audit, interest in the use of data to improve outcomes in other cancers led to the development of the Cancer Services and Outcomes Data Set in England by the National Cancer Registration and Analysis Service. Monthly submission to the data set is mandatory for all providers of cancer care. The service is able to link the data set with a number of other detailed data sets that cover hospital admissions (Hospital Episode Statistics), systemic treatment (Systemic Anti-Cancer Data Set, derived from electronic prescribing), and radiotherapy (Radiotherapy Treatment Data Set, taken from radiotherapy linear accelerators).

There are several similarities in the development of the national audit programs for lung cancer in Denmark and the United Kingdom: Both countries have an NHS, by which health care is essentially free at the point of access. Both countries were shown, from the 1990s, to have worse survival compared with other countries that had similarly advanced health care systems. In both countries, data entry was voluntary initially; with regular feedback to the clinicians, the benefit of data collection was clearly demonstrated, so—with political motivation—collection and feedback are now mandatory. This regular feedback is delivered in a manner not to highlight struggling centers but to identify areas of need and then provide the support required to improve the standard of care and reduce inequality. An example is the Improving Lung Cancer Outcomes Program.⁴²

In conclusion, the use of data to drive improvements in care for people with lung cancer has been shown to be a powerful tool, but survival remains poor.⁴³ The creation of a pan-European data set is a significant challenge but one that, if done correctly, will expose variation in practice, identify best practices, show where improvement is needed, and guide investment in resources. It is essential that data are comparable and that requires use of the same or similar data definitions and reports about the same population to avoid any systematic bias. It is time to define a minimum agreed pan-European data set and to use the iterative approach applied by Denmark and the United Kingdom: universal stakeholder engagement, investment of time and infrastructure, the publication of results at the local level, and creation of a positive audit cycle that leads to improvements in patient care and lung cancer outcomes. The European Respiratory Society has sponsored a number of taskforces with this aim in mind. A minimum data set has been created as part of a statement paper that has an expected publication date of early 2018 (Rich A, et al: submitted for publication).

DOI: <https://doi.org/10.1200/CCI.17.00052>
Published online on ascopubs.org/journal/cci on
February 16, 2018.

AUTHOR CONTRIBUTIONS

Conception and design: Anna Rich
Manuscript writing: All authors
Final approval of manuscript: All authors
Agree to be accountable for all aspects of the work: All authors

considered compensated. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to www.asco.org/rwc or ascopubs.org/jco/site/ifc.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The following represents disclosure information provided by authors of this manuscript. All relationships are

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Appendix

Table A1. Key Facts About Countries of Europe

Country	EU Status (membership year)	2015 Population (millions)	2015 GDP (per capita PPS)	TNEH per Year, 1994-2002 (US \$)	2017 No. of Physicians per 1,000 People
Belgium	1967	11	119	2,706	3.0
France	1967	63.5	106	3,039	3.2
Germany	1967	81.7	124	3,958	4.1
Italy	1967	60.4	96	2,557	3.9
Luxembourg	1967	0.5	264		2.9
Netherlands	1967	16.7	128	2,705	3.4
Denmark	1973	5.5	127	2,861	3.6
Ireland	1973	4.4	177	1,804	2.8
United Kingdom	1973	62.0	108	2,542	2.8
Greece	1981	11.6	68		6.3
Portugal	1986	10.6	77	1,088	4.4
Spain	1986	47.1	90	1,197	3.8
Austria	1995	8.3	128	2,665	5.2
Finland	1995	5.3	109	2,198	3.0
Sweden	1995	9.4	124	2,693	4.1
Cyprus	2004	0.9	82		2.5
Czech Republic	2004	10.5	87	597	3.7
Estonia	2004	1.3	75		3.3
Hungary	2004	9.9	68		3.3
Latvia	2004	1.9	64		3.2
Lithuania	2004	3.4	75		4.3
Malta	2004	0.4	88		3.9
Poland	2004	38.2	69	427	2.3
Slovakia	2004	5.4	77		3.4
Slovenia	2004	2.0	83	529	2.8
Bulgaria	2007	7.6	47		4.0
Romania	2007	19.0	57		2.7
Croatia	2013	4.6	58		3.1
Iceland	Withdrew	0.3	123	2,906	4.0
Albania	Candidate country	2.9	30		1.3
FYROM	Candidate country		36		2.8
Montenegro	Candidate country		42		2.3
Serbia	Candidate country	7.3	36		2.5
Turkey	Candidate country	10.9	52		1.7
Bosnia-Herzegovina	Potential candidate	4.0	28		1.9
Belarus	Nonmember				4.1

(Continued on following page)

Table A1. Key Facts About Countries of Europe (Continued)

Country	EU Status (membership year)	2015 Population (millions)	2015 GDP (per capita PPS)	TNEH per Year, 1994-2002 (US \$)	2017 No. of Physicians per 1,000 People
Norway	Nonmember	4.9	160	3,063	4.4
Switzerland	Nonmember	7.8	162	4,251	4.1
Ukraine	Nonmember	45.9	NR		3.0

NOTE. Data sources: EU web site and WHO. Data on physicians per 1,000 people adapted from the WHO Global Health Observatory data repository (updated July 2, 2017). A GDP of 1 is average for countries in the European Union.

Abbreviations: FYROM, Former Yugoslav Republic of Macedonia; GDP (PPS), gross domestic product (purchasing power standard); NR, no response; TNEH, total national expenditure on health (in US dollars).