The 2011 PHARMINE report on pharmacy and pharmacy education in the European Union

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ABSTRACT
The PHARMINE consortium consists of 50 universities from European Union member states or other European countries that are members of the European Association of Faculties of Pharmacy (EAFP), EU partner associations representing community (PGEU), hospital (EAHP) and industrial pharmacy (EIPG), together with the European Pharmacy Students' Association (EPSA) are also part of the consortium.

The consortium surveyed pharmacies and pharmacists in different settings: community, hospital, industry and other sectors. The consortium also looked at how European Union higher education institutions and courses are organised.

The PHARMINE survey of pharmacy and pharmacy education in Europe produced country profiles with extensive information for EU member states and several other European countries. These data are available at: http://www.pharmine.org/losse_paginas/Country_Profiles/.

This 2011 PHARMINE report presents the project and data, and some preliminary analysis on the basic question of how pharmacy education is adapted to pharmacy practice in the EU.

Keywords: Education, Pharmacy, Pharmaceutical Services, European Union, Europe.

INFORME PHARMINE 2001 SOBRE LA FARMACIA Y LA FORMACIÓN EN FARMACIA EN LA UNIÓN EUROPEA

RESUMEN
El consorcio PHARMINE se compone de 50 universidades de estados miembros de la Unión Europea que son miembros de la Asociación Europea de Facultades de Farmacias (EAFP). También hacen parte del consorcio asociaciones representando a las farmacias comunitarias (PGEU), hospitalarias (EAHP), e industrias (EIPG), así como la Asociación Europea de Estudiantes de Farmacia (EPSA).

El Consorcio encuestó a farmacias y farmacéuticos en diferentes ámbitos: comunidad, hospital, industria y otros sectores. El consorcio también revisó como se organizan las instituciones de educación superior y los cursos en la Unión Europea.

El cuestionario PHARMINE de farmacia y educación farmacéutica en Europa produjo perfiles de países con información exhaustiva de los estados miembros de la UE y otros países europeos. Estos datos están disponibles en http://www.pharmine.org/losse_paginas/Country_Profiles/.

Este Informe PHARMINE 2011 presenta el proyecto y los datos, y algunos análisis preliminares sobre la cuestión básica de cómo se adapta la educación farmacéutica a la práctica de la farmacia en la UE.

Palabras clave: Educación en Farmacia. Servicios farmacéuticos. Unión Europea. Europa.

INTRODUCTION
In 1994 the EAFP, under the direction of P. Bourlioux, University Paris XI, France, brought out a document surveying the state of pharmacy education in the EU of that time (document available at: http://enzu.pharmine.org/media/filebook/files/Bourlioux_full_report.pdf). In 2006 the EAFP decided to repeat this study and enlarge it to European pharmacy practice. To this end the PHARMINE consortium was created amongst EAFP members.

The PHARMINE consortium, created in 2008, consists of 50 universities from EU member states or other European countries that are members of the European Association of Faculties of Pharmacy (EAFP). EU partner associations representing...
community (PGEU), hospital (EAHP) and industrial pharmacy (EIPG), together with the European Pharmacy Students’ Association (EPSA) are also part of the consortium.

The consortium surveyed pharmacies and pharmacists in different settings: community, hospital, industry and other sectors. The consortium also looked at how EU higher education institutions, courses and traineeship were organised. An empirical – based on statistical analysis of data - rather than an intuitive approach was used to avoid anecdotal conceptualisation. The fundamental question asked was: is pharmacy education adapted to needs?

This is the 2011 report for the EU. Further reports will be edited in the future as the data for EU member states are completed, data from other European countries are obtained, situations in individual countries change, etc.

METHODS.

The survey ran between the spring of 2009 and the summer of 2011. An electronic version was sent out to at least 2 faculties per country (excepting countries with only 1 faculty e.g. Estonia). We planned for a balanced design and obtained data from at least 1 faculty per country; in some cases we did not obtain data from 2 faculties.

In some cases, data were expressed per population (in millions, M). The population of the different member states used in the analysis was that as of 1st January 2009 given in the European Commission Eurostat demography report for 2011 http://epp.eurostat.ec.europa.eu/portal/page/portal/population/documents/Tab/report.pdf.

Statistical analysis.

Data (n=25) were obtained from the 27 EU member states excepting Cyprus and Luxembourg that do not have full pharmacy degree courses. When data were obtained from 2 faculties in the same country, the data from the larger faculty was used.

Results are expressed as medians with 10 and 90% percentiles. The Kolmogorov–Smirnov (KS) test for deviations of distribution from normality was significant with positive skewness – a bunching of values below the mean with a long tail above: one-tailed percentage points for skewness =0.711 (n=25 and α=0.05). Skewness was due to the uneven distribution of population in the EU. Twenty % of the population of the EU live in 17 smaller countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, Portugal, Slovakia, Slovenia and Sweden, and 80% in 8 larger countries; medians are 1545 (percentiles 879, 2382) and 1628 (percentiles 977 and 6,097), giving a ratio compared to the estimate of 23,133/19,280 =1.20 (see table 6). France therefore has 1.2 times more pharmacies than to be expected from the EU linear regression estimation or EU “average”.

Statview® (http://statview.com/), GraphPad® (www.graphpad.com) and nQuery® (www.statistical-solutions-software.com) programs were used.

Complete data for each country can be obtained on the PHARMINE website at: http://www.pharmine.org/losse_paginas/Country_Profiles/. These profiles were written by the various members of the PHARMINE consortium (see below). Data were checked by JA with that available on the internet, where possible.

RESULTS

EU population and number of pharmacists.

The population of the 25 EU member states under consideration is 501 million. A total of 419,353 pharmacists work in these 25 countries, with 81% in community pharmacy, 5% in hospital pharmacy, 7% in industrial pharmacy and 10% in other occupations (tables 1 and 2). Tasks carried out in each of the 4 sectors, as reported, are given in table 3. The median values for population, number of pharmacists and population per pharmacist are 10 million, 6,278 and 1,593 (tables 1, 2, 4 and 5).

When the data (population versus pharmacists) are plotted separating into larger (n=8) and smaller (n=17) EU member states with a cut-off after The Netherlands (16.6 M), results are similar with slopes of 758 ± 202 and 728 ± 155 (t-test for difference between slopes: P>0.05) for larger and smaller countries; medians are 1545 (percentiles 879, 3,282) and 1628 (percentiles 977 and 6,097), respectively.

Thus in the above and almost all of the following cases there are no significant differences in results
Community pharmacies, pharmacists and assistants

Reported numbers of community pharmacists expressed as a ratio of the EU linear regression estimation, gives a median value (0.92, percentiles 0.25 and 1.49) not significantly different from 1 (P=0.05) (tables 6, 7). Belgium (1.64) and Sweden (0.22) are outside the limits. Thus Belgium has more and Sweden less community pharmacists than the EU linear regression estimation.

The median number of pharmacies is 2380. Ratios compared to the EU linear regression estimation (tables 6, 7) showed 4 countries outside the percentile limits (0.32, 1.86): Greece (3.23), Bulgaria (1.99), Denmark (0.19) and Slovenia (0.18). Thus Greece has more than 3-fold, Bulgaria twice, and Denmark and Sweden one-fifth, the number of pharmacies. There are 3585 persons per pharmacy.

There are 2.10 (percentile limits 1.27, 3.02) pharmacists per pharmacy in Europe. Most countries show values grouped within a narrow range from 1.0 (Greece) to 2.4 (France). Three northern central European countries have larger values: Denmark: 3.0, Slovenia: 3.1, and Austria: 4.1.

There are 4,598 assistants per country (percentiles 481, 30,516). Ratios compared to the EU linear regression estimation (table 6, 7) show 4 countries outside percentile limits: The Netherlands (2.21), Sweden (1.58), Ireland (0.26) and Slovenia (0.18). The median number of assistants per pharmacy is 1.63 (percentiles 0.43, 9.59, table 5) with a minimum of 0.3 (Ireland) and a maximum of 10.1 (Denmark) (table 4).

The education of assistants is carried out at a university faculty in three cases (Finland, Romania and Sweden); in all other cases education is given in a technical college or high school.

Hospital pharmacies and pharmacists

There are 115 hospital pharmacies per country (percentiles: 10, 662, n=23) and 375 hospital pharmacists (97, 4,159, n=24; table 2). There are 92,174 persons per industrial pharmacist and 28,669 per hospital pharmacist (tables 8, 9).

Ratios compared to the EU linear regression estimation show 4 countries outside percentile limits (0.36, 2.50) for hospital pharmacies: Denmark (0.19), Italy (0.35), Finland (2.96) and France (2.86), and 4 for hospital pharmacists: Slovenia (0.28), Bulgaria (0.29), Ireland (2.03) and Malta (5.77), (tables 10, 11).

Industrial pharmacists

The median number of industrial pharmacists is 737 (percentiles 35, 5,276) with 13,831 (percentiles of 7,188 and 53,338) persons per industrial pharmacist (table 2).

Other activities and occupations

The median number of pharmacists in other occupations is 400 (percentiles 75, 6,877) (table 2).

Higher education institutions (HEIs).

There are 195 public HEIs in the EU with 144 (74%) in the 8 larger countries (tables 12, 13). There are 12 private HEIs: 1 each in Ireland and Romania, 4 in Portugal and 6 in Spain. Ratios compared to the EU linear regression estimation show 3 countries outside percentile limits (0.55, 2.36): Czech Republic (0.51), The Netherlands (0.33) and Malta (6.76) (tables 14, 15). It should be noted that the actual numbers of HEIs in these 3 countries are low.

In 12 countries (Czech Republic, Denmark, Finland, France, Hungary, Italy, Latvia, Poland, Slovakia, Slovenia, Spain and Sweden) HEIs are independent faculties. In 5 countries (Austria, Germany, The Netherlands, Portugal and United Kingdom) HEIs are part of a science department. In 7 countries (Belgium, Bulgaria, Estonia, Ireland, Lithuania, Malta and Romania) HEIs are part of a medical department. In Greece Athens has an independent faculty, Thessaloniki and Patras have faculties within the school of Health Sciences.

Staff

An EU country has 185 staff teaching pharmacy (percentiles: 18.4, 1.437) with 62 staff per HEI (percentiles: 14.5, 141) (table 13). Ratios compared to the EU linear regression estimation show 2 countries outside percentile limits (0.31, 2.10): Austria (0.26) and Portugal (3.44) (table 14).

Students

An EU country has 400 pharmacy students (percentiles: 48, 3,337) with 8 students per staff member (percentiles: 3.0, 24) (table 13). Ratios compared to the EU linear regression estimation show no countries outside percentile limits (tables 14, 15). There are 0.068 students per working pharmacist (percentiles: 0.031, 0.174) (table 13).

Courses

In opposition to the data above, data relating to percentage of the 7 subject areas in the course were almost all of normal distribution (tables 16, 17). Medical sciences (MEDSCI) represent the main subject area (28%) followed by chemical sciences (CHEMSCI: 24%), pharmaceutical technology (PHARMTECH: 15%), biological sciences (BIOSCI: 11%), physics/mathematics (PHYSMATH: 6.4%), generic subjects (GENERIC: 6.4%) and law/society/ethics (LAWSOC: 6.2%). When subject area percentages were tested for correlations amongst them, the only significant correlation (negative) emerging was that between medical and chemical sciences (figure 1). Some countries had a more “medical” course: MEDSCI % / CHEMSCI % = 2.38 for France, 1.85 for Estonia and 1.79 for Poland. Others had more “chemical” courses: MEDSCI % / CHEMSCI % = 0.71 for Germany, 0.40 for Greece, 0.38 for Denmark, 0.36 for Austria.
Traineeship
Traineeship was mainly in community pharmacy (56%) with 26% in hospital and 16% in industrial settings (details see tables 18 through 23 and figure 2). Traineeship was mainly in the fifth year (74%) but some countries such as Finland, France, Germany, Hungary and Malta started significant traineeship early - in the first or second year.

Analysis revealed medians that were often equal to zero given the large number of zeros in a given category.

DISCUSSION
A total of 419,353 pharmacists work in the 25 EU countries surveyed. This gives a mean value of 16,774 pharmacists per country with a median of 6,278. The mean and median are very different as the distribution of the data is highly skewed. This is due to the fact that the population of the EU (n=25) - 501 million - is roughly distributed into larger and smaller countries. Twenty % of the population of the EU lives in 17 smaller countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, Portugal, Slovakia, Slovenia and Sweden, and 80% lives in 8 larger countries: France, Germany, Italy, The Netherlands, Poland, Romania, Spain and United Kingdom. As a consequence of this, many of the analyses are presented using medians. Furthermore, data were also analysed by separating countries into two groups – larger and smaller countries – but no significant differences were observed between the two groups.

Community pharmacies and community, hospital and industrial pharmacists are unevenly distributed in the EU (table 24), some countries having ratios of reported number / EU linear regression estimation of >0.5 (i.e. less than half the number to be expected from the population of the country), and some with ratios of >1.5 (i.e. 1.5x or more the number expected).

Most (70%) of pharmacists work as community pharmacists with the tasks reported in table 3. In order to evaluate whether pharmacy education and training is adapted to needs, correlations were calculated between the numbers of community pharmacists and the number of HEIs and pharmacy students. These were highly significant in both cases: r²=0.77 (P<0.0001) and 0.75 (P<0.0001), respectively. Thus in terms of numbers of future pharmacists, EU HEIs appear to be connected to the needs.

Pharmacists working in hospitals and industry have clearly identified roles and competences (table 3). In order to evaluate whether pharmacy education and training is adapted to such needs, correlations were calculated between the ratios of hospital and industrial pharmacists (reported number / EU linear regression estimation) and the ratio CHEMSCI+PHARMTECH / MEDSCI. It was argued that countries with higher numbers of hospital pharmacists would have courses more oriented towards medical sciences: MEDSCI (human anatomy and physiology, medical terminology, pharmacology, pharmacognosy, pharmacotherapy / therapeutics, toxicology, pathology, histology, microbiology, nutrition, non-pharmacological treatment, haematology, immunology, parasitology, hygiene, emergency therapy, clinical chemistry / bio-analysis (of body fluids), radiochemistry, dispensing process, drug prescription, prescription analysis (detection of adverse effects and drug interactions), generic drugs, planning, running and interpretation of the data of clinical trials, medical devices, orthopaedics, OTC medicines, complementary therapy, at-home support and care, skin illness and treatment, homeopathy, phytotherapy, drugs in veterinary medicine, pharmaceutical care, pharmaceutical therapy of illness and disease). Likewise those with higher numbers of industrial pharmacists would have courses more oriented toward chemical sciences: CHEMSCI (general, organic & inorganic chemistry, analytical chemistry, pharmaceutical chemistry / pharmaceoepia analysis, medicinal physic-chemistry / SAR / drug design) and pharmaceutical technology: PHARMTECH (galenic formulation / pharmacetics, drug disposition and metabolism (ADME) / pharmacokinetics, novel drug delivery systems, drug design, pharmaceutical R&D, drug production, quality assurance in production, drug / new chemical entity registration and regulation, common technical document (quality (pharmaceutical), safety (safety pharmacology and toxicology), efficacy (preclinical and clinical studies)), ophthalmic preparations, medical gases, cosmetics, management strategy in industry, economics of the pharmaceutical industry and R&D). In neither case were correlations significant: hospital pharmacists r²=0.15, P=0.069, industrial pharmacists r²=0.12, P=0.115. At the extremes, however, courses were oriented. Thus Ireland with a ratio for hospital pharmacists of 2.03 (twice as many hospital pharmacists as to be expected from the EU linear regression estimation) had a CHEMSCI+PHARMTECH / MEDSCI ratio of 0.38. Denmark with a ratio for industrial pharmacists of 4.47 (4.5 times as many industrial pharmacists as to be expected from the EU linear regression estimation) had a CHEMSCI+PHARMTECH / MEDSCI ratio of 3.63.

A couple of provisos have to be added, however. Firstly, whilst community pharmacists are registered by their national chamber and thus their numbers are accurately known, this is often not the case for hospital or industrial pharmacists and thus their numbers may be less accurate. Secondly, whilst the content of the degree course for community pharmacists is fixed by the annex of the EU directive 2005/36 (see above), this is not the case for hospital and industrial pharmacists. A large variety in the course proposed is observed. In France future hospital pharmacists have extensive pre-graduate training in hospital pharmacy and also undergo a 4-year hospital internship. In other countries there is little specific pre- or post-graduate training for either hospital or industrial pharmacists. The latter are simply defined by their place of work and their roles and responsibilities (table 3).

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The PHARMINE survey revealed that there is a median of 4598 assistants per country and 1.63 assistants/community pharmacist. Three countries were unable to reply to questions on assistants as the status of such persons is not clearly established in these countries. In most EU countries the main task of assistants is to take care of medicine storage, logistics, invoicing and management of pharmacy IT systems and other such tasks. Their training, which is performed at a high school or college, includes basic modules in chemistry and in physics, healthcare, hygiene, management, economics, bookkeeping, etc.

The education of assistants is carried out at university in three cases (Finland, Romania and Sweden). Taking the case of Finland (http://www.pharmine.org/losse_paginas/Country_P rofiles/Finland/) following the Bologna declaration (http://enzu.pharmine.org/media/filebook/files/Bolog na%20declaration.pdf), pharmacy education is divided into two parts. All the students follow the same curriculum the first three years and graduate with a bachelor degree. Approximately one third of the students continue additional two years to graduate with the master degree, devoted mainly to chemical and medical sciences, generic subjects and pharmaceutical technology, and medical sciences. Those graduating with a bachelor degree have tasks similar to those of pharmacists, but these do not include pharmacy ownership, management or in-depth scientific issues. The main focus is in customer service and patient counselling. In summary, in Finland, both B.Sc. and M.Sc. graduates are involved in dispensation and counselling. Ownership of a pharmacy and/or a position of responsible pharmacist are restricted to M.Sc. graduates.

Traineeship is mainly in a community/hospital setting (84%) and mainly in the fifth and final year, although several countries introduce traineeship earlier – some in the first year of the degree. In most countries the length of the course is 5 years. There is thus integration of traineeship into the degree course. In some countries (Austria, UK) the course is shorter. Following graduation pharmacists undergo a pre-registration training period that is validated by the national chamber or agency.

In conclusion, the PHARMINE survey of pharmacy and pharmacy education in Europe produced country profiles with extensive information for each country in the EU and several other European countries. These data are available at: http://www.pharmine.org/losse_paginas/Country_Profiles/. This 2011 PHARMINE report represents a presentation of the project and the data and some preliminary analysis on the basic question of how pharmacy education is adapted to pharmacy practice in the EU.

This is the 2011 report for the EU. Further reports will be edited in the future as the data is completed, data from other European countries are obtained, situations in individual countries change, etc. Further reports will also deal with other subjects such as the impact of the Bologna declaration and of the EC directives on organisation of university studies, and quality assurance in European pharmacy education.

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### Table 1. EU pharmacists: reported data (NA: data not available).

| Country     | Population (million) | Community pharmacists | % total | Hospital pharmacists | % total | Industrial pharmacists | % total | Other occupations | % total | Total number of pharmacists |
|-------------|----------------------|-----------------------|---------|---------------------|---------|------------------------|---------|-------------------|---------|---------------------------|
| Austria     | 8.4                  | 5,160                 | 94.6    | 292                 | 5.4     | NA                     | -       | NA                | -       | 5,452                     |
| Belgium     | 10.8                 | 12,000                | 90.2    | 500                 | 3.8     | 800                    | 6       | NA                | -       | 13,300                    |
| Bulgaria    | 13.3                 | 6,000                 | 84.3    | 114                 | 1.6     | 1000                   | 14.1    | NA                | -       | 7,144                     |
| Czech Rep.  | 10.5                 | 6,000                 | 95.6    | 220                 | 3.5     | 150                    | 0.2     | 43                | 0.7     | 6,278                     |
| Denmark     | 5.5                  | 952                   | 25.9    | 270                 | 7.4     | 1900                   | 51.7    | 550               | 15      | 3,672                     |
| Estonia     | 1.3                  | 1,165                 | 75.9    | 100                 | 6.5     | 20                     | 1.3     | 250               | 16.3    | 1,535                     |
| Finland     | 5.4                  | 1,406                 | 45.8    | 545                 | 17.7    | 800                    | 26.1    | 320               | 10.4    | 3,071                     |
| France      | 64.7                 | 55,455                | 72.9    | 5,574               | 7.3     | 4752                   | 6.2     | 10,309            | 13.5    | 76,090                    |
| Germany     | 81.8                 | 57,353                | 81.1    | 1,690               | 2.7     | 5500                   | 7.8     | 6,019             | 8.5     | 70,762                    |
| Greece      | 11.3                 | 11,342                | 87      | 302                 | 2.3     | 144                    | 1.1     | 1,250             | 9.6     | 13,038                    |
| Hungary     | 10                   | 4,900                 | 62.4    | 350                 | 4.5     | 1200                   | 15.3    | 1,400             | 17.8    | 7,850                     |
| Ireland     | 4.5                  | 3,400                 | 84.1    | 474                 | 11.7    | 85                     | 2.1     | 83                | 2.1     | 4,042                     |
| Italy       | 60.4                 | 40,346                | 85.1    | 2745                | 5.8     | 4300                   | 9.1     | NA                | -       | 47,391                    |
| Latvia      | 2.2                  | 1,624                 | 80.5    | 94                  | 4.7     | 300                    | 14.9    | NA                | -       | 2,018                     |
| Lithuania   | 3.3                  | 2,497                 | 93.5    | NA                 | -       | 85                     | 2.7     | 120               | 3.8     | 3,152                     |
| Malta       | 0.4                  | 281                   | 45      | 120                 | 19.2    | 71                     | 11.4    | 152               | 24.4    | 624                       |
| Netherlands | 16.6                 | 3,100                 | 62      | 400                 | 8       | NA                     | -       | 1,500             | 30      | 5,000                     |
| Poland      | 38.1                 | 21,534                | 95.1    | 1,100               | 4.9     | NA                     | -       | NA                | -       | 22,634                    |
| Portugal    | 10.6                 | 6,108                 | 56.4    | 738                 | 6.8     | 674                    | 6.2     | 3,313             | 30.6    | 10,833                    |
| Rumania     | 21.5                 | 13,500                | 93.8    | 692                 | 4.8     | 100                    | 0.7     | 100               | 0.7     | 14,392                    |
| Slovakia    | 5.4                  | 2,900                 | 89      | 159                 | 4.9     | 200                    | 6.1     | NA                | -       | 3,259                     |
| Slovenia    | 5.4                  | 906                   | 56.5    | 78                  | 4.9     | 470                    | 29.3    | 150               | 9.4     | 1,604                     |
| Spain       | 47.2                 | 48,000                | 77.9    | 1,612               | 2.6     | 11996                  | 19.5    | NA                | -       | 61,608                    |
| Sweden      | 10.3                 | 1,400                 | 43.8    | 209                 | 6.3     | 1200                   | 37.5    | 400               | 12.5    | 3,200                     |
| United Kingdom | 62                 | 21,712               | 69.1    | 6,213               | 19.8    | 1137                   | 3.6     | 2,372             | 7.5     | 31,434                    |
Table 2. EU pharmacists: statistical analysis.

|                        | Community pharmacists | Hospital pharmacists | Industrial pharmacists | Other occupations | % total | % total | % total | % total | % total | Total number of pharmacists |
|------------------------|-----------------------|----------------------|------------------------|-------------------|---------|---------|---------|---------|---------|---------------------------|
| Number                 | 25                    | 24                   | 24                     | 22                | 22      | 17      | 17      | 17      | 25      |                           |
| Median                 | 5,160                 | 375                  | 737                    | 932               | 1082    | 76      | 92      | 1456    | 7,284               |
| 90% Percentile         | 50,982                | 4,159                | 5,276                  | 5,733             | 6,877   | 6,570   |         |                     |
| Mean                   | 13,180                | 1,033                | 1,670                  | 2,801             | 1,667   | 1,667   |         |                     |
| Standard deviation     | 17,739                | 1,635                | 2,801                  | 2,720             | 1,667   | 1,667   |         |                     |
| Standard error         | 3,548                 | 334                  | 597                    | 660               | 660     | 660     |         |                     |
| KS normality test P    | <0.0001               | >0.10                | <0.0001                | <0.0001           | <0.0005 | >0.10   | <0.0001 |                     |
| KS distance            | 0.29                  | 0.15                 | 0.32                   | 0.34              | 0.31    | 0.12    | 0.3     |                     |
| Skewness               | 1.7                   | -0.87                | 2.5                    | 2.8               | 2.5     | 0.71    | 1.8     |                     |
| Kurtosis               | 1.6                   | -0.07                | 5.7                    | 8.7               | 6.3     | -0.09   | 2       |                     |
| Sum                    | 329,491               | 1,848                | 24,782                 | 36,749            | 28,331  | 213     | 419,353 |                     |

Table 3. Activities and occupations of pharmacists in the EU.

| Community | Hospital | Industrial | Other |
|-----------|----------|------------|-------|
| • preparation of medicines | • purchasing, stocking, distribution of drugs | • research and development of drugs | • clinical biology / chemistry |
| • dispensing of medicines | • management of drug budget | • synthesis and production | • academia |
| • substitution by generic drugs | • preparation of drugs for specific pathologies, e.g. anticancer drugs | • preclinical and clinical drug evaluation | • wholesale and distribution of medicines |
| • customer counselling on medicinal prescriptions | • specialised medical devices and material | • marketing authorisation | • armed forces, fire service, police |
| • use of self-medication medicines | • sterile preparations | • quality assurance | • communication, marketing |
| • dietetic products for adults and babies | • radiochemicals | • marketing | • state and local governments |
| • programs on addictive drug substitution | • quality assurance | • management of complaints, recalls | • insurance companies |
| • nicotine replacement drugs and strategies | • interaction and communication with others: doctors, nurses, hospital board | • food industry | • IT database and technology |
| • blood pressure, glycaemia, cholesterol monitoring/screening | • prescription of drugs under certain circumstances | • cosmetology | • family planning clinics |
| • reporting of adverse drug reactions | • participation in clinical trials | • biotechnology | • labile blood products, transfusion services |

Table based on replies from 25 member states. Not all activities and / or occupations may be present in a given country.
Table 4. Community pharmacists, pharmacies and assistants: reported data.

| Country       | Population (millions) | Community pharmacists | Population /pharmacist | Community pharmacies | Population /pharmacy | Pharmacists /pharmacy | Assistants /pharmacy |
|---------------|-----------------------|-----------------------|-------------------------|----------------------|----------------------|-----------------------|----------------------|
| Austria       | 8.4                   | 5,160                 | 1,628                   | 1,270                | 6,614                | 4.06                  | 5,278                |
| Belgium       | 10.8                  | 12,000                | 900                     | 5,729                | 1,885                | 2.09                  | 6,500                |
| Bulgaria      | 7.6                   | 6,000                 | 1,267                   | 4,500                | 1,689                | 1.33                  | NA                  |
| Czech Republic| 10.5                  | 6,000                 | 1,750                   | 2,420                | 4,339                | 2.48                  | 4,600                |
| Denmark       | 5.5                   | 952                   | 5,777                   | 318                  | 17,296               | 2.99                  | 3,200                |
| Estonia       | 1.3                   | 1,165                 | 1,116                   | 496                  | 2,621                | 2.35                  | 748                  |
| Finland       | 5.4                   | 1,406                 | 3,841                   | 805                  | 6,708                | 1.75                  | 3,839                |
| France        | 64.7                  | 55,455                | 1,167                   | 23,133               | 2,797                | 2.4                   | 35,000               |
| Germany       | 81.8                  | 57,353                | 1,426                   | 21,390               | 3,824                | 2.68                  | 12,192               |
| Greece        | 11.3                  | 11,342                | 996                     | 10,880               | 1,038                | 1.04                  | 4,032                |
| Hungary       | 10.0                  | 4,900                 | 2,041                   | 2,380                | 4,202                | 2.06                  | 5,400                |
| Ireland       | 4.5                   | 3,400                 | 1,324                   | 1,616                | 2,785                | 2.1                   | 539                  |
| Italy         | 60.4                  | 40,348                | 1,497                   | 17,617               | 3,429                | 2.29                  | NA                  |
| Latvia        | 2.2                   | 1,624                 | 1,355                   | 810                  | 2,716                | 2.00                  | 1,481                |
| Lithuania     | 3.3                   | 2,947                 | 1,120                   | 1,320                | 2,500                | 2.23                  | 1,890                |
| Malta         | 0.4                   | 281                   | 1,423                   | 204                  | 1,961                | 1.38                  | 164                  |
| Netherlands   | 16.6                  | 3,100                 | 5,355                   | 2,000                | 8,300                | 1.55                  | 17,000               |
| Poland        | 38.1                  | 21,534                | 1,769                   | 10,628               | 3,585                | 2.03                  | 20,052               |
| Portugal      | 10.6                  | 6,108                 | 1,735                   | 2,667                | 3,975                | 2.29                  | 4,596                |
| Rumania       | 21.5                  | 13,500                | 1,593                   | 5,796                | 3,709                | 2.33                  | 120,000              |
| Slovakia      | 5.4                   | 2,900                 | 1,862                   | 1,848                | 2,922                | 1.57                  | 2,080                |
| Slovenia      | 2.0                   | 906                   | 2,208                   | 296                  | 6,757                | 3.06                  | 456                  |
| Spain         | 47.2                  | 48,000                | 983                     | 21,057               | 2,242                | 2.28                  | NA                  |
| Sweden        | 9.3                   | 6,108                 | 1,735                   | 2,667                | 3,975                | 2.29                  | 4,596                |
| United Kingdom| 62.0                  | 21,712                | 2,656                   | 13,693               | 4,528                | 1.59                  | 14,838               |

NA: data not available

Table 5. Community pharmacists, pharmacies and assistants: statistical analysis.

| Community pharmacists | Population /pharmacist | Community pharmacists | Population /pharmacy | Pharmacists /pharmacy | Assistants /pharmacy |
|-----------------------|-------------------------|-----------------------|----------------------|----------------------|---------------------|
| Number                | 25                      | 25                    | 25                   | 25                   | 22                  |
| Median                | 5,160                   | 2,380                 | 5,355                | 1,807                | 2.10                |
| 10% Percentile        | 933.6                   | 309.2                 | 1,807                | 301.8                | 1.266               |
| 90% Percentile        | 90,982                  | 21,190                | 7,970                | 7,750                | 305.16              |
| Mean                  | 13,180                  | 6,163                 | 4,407                | 2.124                | 12305               |
| Standard deviation    | 17,739                  | 7,466                 | 3,315                | 0.6593               | 25,443              |
| Standard error        | 3548                    | 663                   | 0.1319               | 5424                 | 0.9885              |
| KS normality test     | 0.2949                  | 0.2802                | 0.2454               | 0.1377               | 0.3169              |
| P value               | <0.0001                 | <0.0001               | <0.0001              | >0.10                | <0.0001             |
| Passed normality test | No                      | No                    | No                   | No                   | Yes                 |
| Skewness              | 1.676                   | 1.305                 | 2.664                | 0.8499               | 3.967               |
| Kurtosis              | 1.577                   | 0.3212                | 9.159                | 1.889                | 16.94               |
| Sum                   | 329,491                 | 154,083               | 110,169              | 53.1                 | 270,705             |
Table 6. Community pharmacies, pharmacists and assistants: reported data as a ratio of the EU linear regression estimation (NA: data not available).

| Country       | Community pharmacies | Community pharmacists | Assistants |
|---------------|----------------------|-----------------------|------------|
| Austria       | 0.51                 | 0.9                   | 1.35       |
| Belgium       | 1.78                 | 1.64                  | 1.3        |
| Bulgaria      | 1.99                 | 1.16                  | NA         |
| Czech Republic| 0.77                 | 0.84                  | 0.94       |
| Denmark       | 0.19                 | 0.25                  | 1.25       |
| Estonia       | 1.28                 | 1.32                  | 1.24       |
| Finland       | 0.5                  | 0.38                  | 1.53       |
| France        | 1.2                  | 1.26                  | 1.17       |
| Germany       | 0.88                 | 1.03                  | 0.32       |
| Greece        | 3.23                 | 1.48                  | 0.77       |
| Hungary       | 0.8                  | 0.72                  | 1.16       |
| Ireland       | 1.21                 | 1.11                  | 0.26       |
| Italy         | 0.98                 | 0.98                  | NA         |
| Latvia        | 1.24                 | 1.09                  | 1.45       |
| Lithuania     | 1.34                 | 1.32                  | 1.23       |
| Malta         | 1.71                 | 1.03                  | 0.99       |
| The Netherlands| 0.4                  | 0.28                  | 2.21       |
| Poland        | 0.94                 | 0.83                  | 1.13       |
| Portugal      | 0.84                 | 0.85                  | 0.93       |
| Rumania       | 0.9                  | 0.92                  | NA         |
| Slovakia      | 1.15                 | 0.79                  | 0.83       |
| Slovenia      | 0.18                 | 0.25                  | 0.18       |
| Spain         | 1.5                  | 1.5                   | NA         |
| Sweden        | 0.43                 | 0.22                  | 1.58       |
| United Kingdom| 0.74                 | 0.52                  | 0.52       |
| NA: data not available |

Table 7. Community pharmacies, pharmacists and assistants: reported data as a ratio of the EU linear regression estimation: statistical analysis.

|                        | Community pharmacies | Community pharmacists | Assistants |
|------------------------|----------------------|-----------------------|------------|
| Number of values       | 25                   | 25                    | 21         |
| Median                 | 0.94                 | 0.92                  | 1.16       |
| 10% Percentile        | 0.316                | 0.25                  | 0.272      |
| 90% Percentile        | 1.864                | 1.488                 | 1.57       |
| Mean                   | 1.068                | 0.9068                | 1.064      |
| Standard deviation     | 0.6544               | 0.4121                | 0.4826     |
| Standard error         | 0.1309               | 0.08242               | 0.1053     |
| KS normality test      |                      |                       |            |
| KS distance            | 0.1386               | 0.1084                | 0.126      |
| P value                | >0.10                | >0.10                 | >0.10      |
| Passed normality test  | Yes                  | Yes                   | Yes        |
| P value summary        | ns                   | ns                    | ns         |
| Skewness               | 1.495                | -0.2192               | 0.01617    |
| Kurtosis               | 3.844                | -0.7203               | 0.614      |
| Sum                    | 26.69                | 22.67                 | 22.34      |
| ns: not significant    |                      |                       |            |
Table 8. Hospital pharmacies and hospital pharmacists (NA: data not available).

| Country            | Hospital pharmacies | Population / hospital pharmacy | Hospital pharmacists | Population / hospital pharmacist |
|--------------------|---------------------|--------------------------------|----------------------|----------------------------------|
| Austria            | NA                  | 292                            | 28,767               |
| Belgium            | 267                 | 40,449                         | 500                  | 21,600                           |
| Bulgaria           | NA                  | 114                            | 66,667               |
| Czech Republic     | 86                  | 122,093                        | 220                  | 47,727                           |
| Denmark            | 15                  | 366,667                        | 270                  | 20,370                           |
| Estonia            | 23                  | 56,522                         | 100                  | 13,000                           |
| Finland            | 224                 | 24,107                         | 545                  | 9908                             |
| France             | 2,594               | 24,942                         | 5,574                | 11,607                           |
| Germany            | 438                 | 186,758                        | 1,890                | 43,280                           |
| Greece             | 115                 | 98,261                         | 302                  | 37,417                           |
| Hungary            | 115                 | 86,957                         | 350                  | 28,571                           |
| Ireland            | 76                  | 59,211                         | 474                  | 9,494                            |
| Italy              | 297                 | 203,367                        | 2,745                | 22,004                           |
| Latvia             | 38                  | 57,895                         | 94                   | 23,404                           |
| Lithuania          | 54                  | 61,111                         | NA                   |
| Malta              | 8                   | 50,000                         | 120                  | 3,333                            |
| Netherlands        | 100                 | 166,000                        | 400                  | 41,500                           |
| Poland             | 708                 | 53,814                         | 1,100                | 34,636                           |
| Portugal           | 115                 | 92,174                         | 738                  | 14,363                           |
| Rumania            | 594                 | 36,195                         | 692                  | 31,069                           |
| Slovakia           | 50                  | 108,000                        | 159                  | 33,962                           |
| Slovenia           | 29                  | 186,207                        | 78                   | 68,231                           |
| Spain              | 288                 | 163,889                        | 1,612                | 29,280                           |
| Sweden             | 73                  | 127,397                        | 200                  | 46,500                           |
| United Kingdom     | 505                 | 122,772                        | 6,213                | 9,979                            |

NA: data not available

Table 9. Hospital pharmacies and hospital pharmacists: statistical analysis

| Number of values | Hospital pharmacies | Population / hospital pharmacy | Hospital pharmacists | Population / hospital pharmacist |
|------------------|---------------------|--------------------------------|----------------------|----------------------------------|
| 23               | 23                  | 24                             | 24                   |
| 115              | 92,174              | 375                            | 28,689               |
| 18               | 29,443              | 97                             | 9,701                |
| 662              | 196,723             | 4,159                          | 57,197               |
| 539              | 78,648              | 1,635                          | 17,363               |
| 112              | 163,889             | 334                            | 3544                 |
| 0,3              | 0,2                 | 0,3                            | 0,09                 |
| <0,0001          | >0,10               | <0,0001                         | >0,10                |
| No               | Yes                 | No                             | Yes                  |
| ***              | ns                  | ***                            | ns                   |
| 4                | 2                   | 2                              | 0,7                  |
| 16               | 6                   | 0,3                            | 697,669              |

ns: not significant.

***: P<0.001
Table 10. Hospital pharmacies and hospital pharmacists: actual data as a ratio of the EU linear regression estimation (NA: data not available).

| Country          | Hospital pharmacies | Hospital pharmacists |
|------------------|---------------------|----------------------|
| Austria          | NA                  | 0.67                 |
| Belgium          | 1.77                | 0.89                 |
| Bulgaria         | NA                  | 0.29                 |
| Czech Republic   | 0.59                | 0.4                  |
| Denmark          | 0.19                | 0.94                 |
| Estonia          | 1.26                | 1.48                 |
| Finland          | 2.96                | 1.94                 |
| France           | 2.86                | 1.66                 |
| Germany          | 0.38                | 0.44                 |
| Greece           | 0.73                | 0.51                 |
| Hungary          | 0.82                | 0.67                 |
| Ireland          | 1.21                | 2.03                 |
| Italy            | 0.35                | 0.87                 |
| Latvia           | 1.23                | 0.82                 |
| Lithuania        | 1.17                | NA                   |
| Malta            | 1.43                | 5.77                 |
| Netherlands      | 0.43                | 0.46                 |
| Poland           | 1.33                | 0.56                 |
| Portugal         | 0.77                | 1.34                 |
| Rumania          | 1.97                | 0.62                 |
| Slovakia         | 0.66                | 0.57                 |
| Slovenia         | 0.38                | 0.28                 |
| Spain            | 0.44                | 0.66                 |
| Sweden           | 0.56                | 0.41                 |
| United Kingdom   | 0.58                | 1.93                 |

NA: data not available

Table 11. Hospital pharmacies and hospital pharmacists: actual data as a ratio of the EU linear regression estimation: statistical analysis.

|                    | Hospital pharmacies | Hospital pharmacists |
|--------------------|---------------------|----------------------|
| Number of values   | 23                  | 24                   |
| Median             | 0.77                | 0.67                 |
| 10% Percentile     | 0.362               | 0.345                |
| 90% Percentile     | 2.504               | 1.985                |
| Mean               | 1.047               | 1.092                |
| Standard deviation | 0.7559              | 1.135                |
| Standard error     | 0.1576              | 0.2317               |
| Lower 95% CI of mean | 0.7196            | 0.6128               |
| Upper 95% CI of mean | 1.373             | 1.571                |
| KS normality test  |                     |                      |
| KS distance        | 0.183               | 0.2616               |
| P value            | 0.0443              | 0.0002               |
| Passed normality test (alpha=0.05)? | No                   | No                  |
| P value summary    | **                  | **                   |
| Skewness           | 1.359               | 3.293                |
| Kurtosis           | 1.463               | 12.98                |
| Sum                | 24.07               | 26.21                |

*: P<0.05  
**: P<0.01
## Table 12. Higher education institutions, staff and students: data (NA: data not available)

| Country          | Number HEIs | Staff | Staff / HEI | Students | Students / staff | Students / pharmacist |
|------------------|-------------|-------|-------------|----------|------------------|----------------------|
| Austria          | 3           | 58    | 19          | NA       |                  |                      |
| Belgium          | 9           | 185   | 21          | 1,000    | 27               | 0.075                |
| Bulgaria         | 3           | 200   | 67          | 334      | 8                | 0.047                |
| Czech Republic   | 2           | 190   | 95          | 430      | 11               | 0.068                |
| Denmark          | 2           | 90    | 45          | 230      | 13               | 0.063                |
| Estonia          | 1           | 14    | 14          | 48       | 17               | 0.031                |
| Finland          | 3           | 300   | 100         | 475      | 8                | 0.155                |
| France           | 24          | NA    | 3,337       |          |                  | 0.044                |
| Germany          | 22          | NA    | NA          |          |                  |                      |
| Greece           | 3           | 90    | 30          | 400      | 22               | 0.031                |
| Hungary          | 4           | NA    | NA          |          |                  |                      |
| Ireland          | 3           | 91    | 30          | 150      | 8                | 0.037                |
| Italy            | 32          | 1,354 | 42          | NA       | 0                |                      |
| Latvia           | 2           | 115   | 58          | 86       | 4                | 0.043                |
| Lithuania        | 1           | 185   | 185         | 96       | 3                | 0.030                |
| Malta            | 1           | 10    | 10          | 48       | 24               | 0.077                |
| Netherlands      | 2           | NA    | NA          |          |                  |                      |
| Poland           | 10          | 1,446 | 145         | 1,658    | 6                | 0.073                |
| Portugal         | 9           | 952   | 106         | 1,021    | 5                | 0.094                |
| Rumania          | 10          | 1,000 | 100         | 2,500    | 13               | 0.174                |
| Slovakia         | 2           | NA    | NA          |          |                  |                      |
| Slovenia         | 1           | 65    | 65          | 180      | 14               | 0.112                |
| Spain            | 19          | 1,865 | 98          | 3,168    | 8                | 0.051                |
| Sweden           | 2           | 170   | 85          | 270      | 8                | 0.084                |
| United Kingdom   | 25          | 902   | 36          | 3,500    | 19               | 0.111                |

NA: data not available

## Table 13. Higher education institutions, staff and students: statistical analysis

|                      | Number HEIs | Staff | Staff / HEI | Students | Students / staff | Students / pharmacist |
|----------------------|-------------|-------|-------------|----------|------------------|----------------------|
| Number              | 25          | 20    | 20          | 19       | 19               | 19                   |
| Median              | 3.0         | 185   | 61.5        | 400      | 8                | 0.06849              |
| 10% Percentile      | 1.0         | 18.4  | 14.5        | 48       | 3                | 0.03068              |
| 90% Percentile      | 24.4        | 1437  | 141.1       | 3337     | 24               | 0.1547               |
| Mean                | 7.8         | 464.1 | 67.55       | 996.4    | 11.47            | 0.07376              |
| Standard deviation  | 9.129       | 567.7 | 46.53       | 1213     | 7.449            | 0.04088              |
| Standard error      | 1.826       | 126.9 | 10.41       | 278.3    | 1.709            | 0.009379             |
| KS normality test   |             |       |             |          |                  |                      |
| KS distance         | 0.3014      | 0.3291| 0.136       | 0.2979   | 0.2058           | 0.1534               |
| P value             | < 0.0001    | < 0.0001| > 0.10     | 0.0001   | 0.0333           | > 0.10               |
| Passed normality test (alpha=0.05)? | No | No | Yes | No | No | Yes |
| P value summary     | ***         | ***   | ns          | ***      | *                | ns                   |
| Skewness            | 1.475       | 1.319 | 0.8929      | 1.268    | 0.6478           | 1.156                |
| Kurtosis            | 1.009       | 0.5114| 0.5792      | 0.07911  | -0.3417          | 0.9153               |
| Sum                 | 195         | 9282  | 1351        | 18931    | 218              | 1.401                |

ns: not significant
*: P<0.05
**: P<0.01
Table 14. Higher education institutions, staff and students: actual data as a ratio of the EU linear regression estimation.

| Number HEIs | Staff | Students |
|-------------|-------|----------|
| Austria     | 0.97  | 0.26     | NA       |
| Belgium     | 2.25  | 0.66     | 1.61     |
| Bulgaria    | 1.07  | 1.01     | 0.76     |
| Czech Republic | 0.51  | 0.69     | 0.71     |
| Denmark     | 0.98  | 0.63     | 0.73     |
| Estonia     | 2.08  | 0.41     | 0.64     |
| Finland     | 1.5   | 2.13     | 1.53     |
| France      | 1.00  | NA       | 0.9      |
| Germany     | 0.73  | NA       | NA       |
| Greece      | 0.72  | 0.3      | 0.62     |
| Hungary     | 1.08  | NA       | NA       |
| Ireland     | 1.8   | 0.77     | 0.58     |
| Italy       | 1.43  | 0.86     | NA       |
| Latvia      | 2.46  | 2.00     | 0.68     |
| Lithuania   | 0.82  | 2.14     | 0.51     |
| Malta       | 6.76  | 0.96     | 2.09     |
| Netherlands | 0.33  | NA       | NA       |
| Poland      | 0.71  | 1.45     | 0.76     |
| Portugal    | 2.29  | 3.44     | 1.68     |
| Rumania     | 1.26  | 1.78     | 2.02     |
| Slovakia    | 1.00  | NA       | NA       |
| Slovenia    | 1.35  | 1.24     | 1.57     |
| Spain       | 1.09  | 1.51     | 1.17     |
| Sweden      | 0.58  | 0.7      | 0.51     |
| United Kingdom | 1.09 | 0.56     | 0.98     |

NA: data not available

Table 15. Higher education institutions, staff and students: actual data as a ratio of the EU linear regression estimation: statistical analysis.

| Number of values | Number HEIs | Staff | Students |
|------------------|-------------|-------|----------|
|                  | 25          | 20    | 19       |
| Median           | 1.08        | 0.91  | 0.76     |
| 10% Percentile   | 0.552       | 0.311 | 0.51     |
| 90% Percentile   | 2.358       | 2.139 | 2.02     |
| Mean             | 1.434       | 1.175 | 1.055    |
| Standard deviation | 1.249   | 0.7993| 0.5247   |
| Standard error   | 0.2497      | 0.1787| 0.1204   |
| KS normality test|             |       |          |
| KS distance      | 0.239       | 0.1818| 0.2395   |
| P value          | 0.0007      | 0.0822| 0.0054   |
| Passed normality test (alpha=0.05)? | No | Yes | No |
| P value summary  | ***         | ns    | **       |
| Skewness         | 3.467       | 1.315 | 0.8148   |
| Kurtosis         | 14.44       | 1.897 | -0.7723  |
| Sum              | 35.86       | 23.5  | 20.05    |

ns: not significant
**: P<0.01
**: P<0.001
### Table 16. Subject areas in %: reported data.

|                | CHEMSCI | PHYSMATH | BIOLSCI | PHARMTECH | MEDISCI | LAWSOC | GENERIC |
|----------------|---------|----------|---------|-----------|---------|--------|---------|
| Austria        | 44.0    | 2.0      | 22.0    | 14.0      | 16.0    | 0.60   | 1.00    |
| Belgium        | 24.0    | 9.0      | 11.0    | 18.0      | 27.0    | 2.00   | 8.00    |
| Bulgaria       | 31.0    | 7.0      | 11.0    | 13.0      | 24.0    | 7.00   | 7.00    |
| Czech Republic | 17.0    | 5.0      | 8.0     | 22.0      | 19.0    | 13.00  | 16.00   |
| Denmark        | 42.0    | 7.0      | 7.0     | 16.0      | 16.0    | 9.00   | 3.00    |
| Estonia        | 21.0    | 4.0      | 2.0     | 21.0      | 39.0    | 10.00  | 3.00    |
| Finland        | 20.0    | 5.6      | 2.5     | 21.9      | 28.8    | 15.60  | 5.60    |
| France         | 17.6    | 9.5      | 17.9    | 5.9       | 42.0    | 2.20   | 5.00    |
| Germany        | 39.8    | 4.5      | 10.9    | 13.4      | 28.3    | 2.10   | 3.80    |
| Greece         | 39.3    | 5.8      | 14.2    | 8.2       | 15.9    | 2.70   | 14.00   |
| Hungary        | 27.2    | 5.2      | 5.2     | 16.0      | 28.5    | 3.88   | 14.22   |
| Ireland        | 13.6    | 11.1     | 7.1     | 18.3      | 35.5    | 7.30   | 7.10    |
| Italy          | 32.4    | 7.2      | 10.4    | 9.1       | 31.5    | 4.80   | 2.20    |
| Latvia         | 27.7    | 6.4      | 6.4     | 20.2      | 26.6    | 8.50   | 6.40    |
| Lithuania      | 28.0    | 2.6      | 11.7    | 11.7      | 36.4    | 9.80   | 9.80    |
| Malta          | 15.4    | 7.2      | 12.7    | 15.4      | 30.8    | 3.60   | 15.00   |
| Netherlands    | 20.1    | 3.9      | 10.6    | 14.2      | 31.1    | 8.30   | 11.80   |
| Poland         | 21.3    | 4.1      | 8.0     | 15.9      | 38.2    | 6.20   | 6.20    |
| Portugal       | 19.6    | 6.8      | 14.6    | 14.9      | 32.2    | 12.00  | 1.20    |
| Rumania        | 26.1    | 8.7      | 15.8    | 14.1      | 24.9    | 3.70   | 6.60    |
| Slovakia       | 28.8    | 8.8      | 10.9    | 14.4      | 27.6    | 3.40   | 6.00    |
| Slovenia       | 27.0    | 8.5      | 8.5     | 22.0      | 21.0    | 8.50   | 4.70    |
| Spain          | 23.5    | 5.5      | 19.9    | 11.0      | 27.6    | 5.50   | 7.00    |
| Sweden         | 18.3    | 11.3     | 12.8    | 19.5      | 21.5    | 11.80  | 5.00    |
| United Kingdom | 23.6    | 5.7      | 23.9    | 22.7      | 23.9    | 3.40   | 6.80    |

CHEMSCI: chemical sciences  
PHYSMATH: physics, mathematics  
BIOLSCI: biological sciences  
PHARMTECH: pharmaceutical technology  
MEDISCI: medical sciences  
LAWSOC: law, society, ethics  
GENERIC: generic subjects, traineeship

### Table 17. Subject areas in %: statistical analysis.

|                | CHEMSCI | PHYSMATH | BIOLSCI | PHARMTECH | MEDISCI | LAWSOC | GENERIC |
|----------------|---------|----------|---------|-----------|---------|--------|---------|
| Number         | 25      | 25       | 25      | 25        | 25      | 25     | 25      |
| Median         | 24      | 6.4      | 11      | 15        | 28      | 6.2    | 6.4     |
| 10% Percentile| 15      | 3.4      | 4.1     | 8.7       | 16      | 2.1    | 1.8     |
| 90% Percentile| 41      | 10       | 21      | 22        | 39      | 12     | 15      |
| Mean           | 26      | 6.5      | 11      | 16        | 28      | 6.6    | 7.1     |
| Standard deviation | 8.7   | 2.4      | 5.5     | 4.6       | 7.2     | 4      | 4.2     |
| Standard error | 1.7     | 0.48     | 1.1     | 0.91      | 1.4     | 0.79   | 0.85    |
| KS normality test |         |          |         |           |         |        |         |
| KS distance    | 0.13    | 0.11     | 0.13    | 0.11      | 0.081   | 0.15   | 0.22    |
| P value        | >0.10   | >0.10    | >0.10   | >0.10     | >0.10   | >0.10  | 0.004   |
| Passed normality test (alpha=0.05)? | Yes     | Yes     | Yes     | Yes       | Yes     | Yes    | No      |
| P value summary| ns      | ns       | ns      | ns        | ns      | ns     | **      |
| Skewness       | 0.7     | 0.23     | 0.55    | -0.23     | 0.071   | 0.51   | 0.78    |
| Kurtosis       | -0.29   | -0.35    | 0.19    | -0.48     | -0.5    | -0.54  | -0.13   |
| Sum            | 638     | 162      | 285     | 393       | 693     | 165    | 176     |

ns: not significant  
**: P<0.01
Table 18. Traineeship – community (hours): reported data.

| Country       | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---------------|--------|--------|--------|--------|--------|
| Austria       | 0      | 0      | 0      | 0      | 0      |
| Belgium       | 0      | 0      | 0      | 0      | 1,000  |
| Bulgaria      | 0      | 0      | 0      | 0      | 800    |
| Czech Republic| 40     | 0      | 0      | 0      | 960    |
| Denmark       | 0      | 0      | 0      | 1,040  | 0      |
| Estonia       | 0      | 48     | 0      | 0      | 410    |
| Finland       | 0      | 520    | 520    | 0      | 0      |
| France        | 0      | 320    | 80     | 80     | 0      |
| Germany       | 160    | 160    | 0      | 0      | 800    |
| Greece        | 0      | 0      | 0      | 0      | 960    |
| Hungary       | 0      | 140    | 140    | 140    | 560    |
| Ireland       | 0      | 0      | 0      | 0      | 960    |
| Italy         | 0      | 0      | 0      | 250    | 500    |
| Latvia        | 0      | 0      | 0      | 0      | 648    |
| Lithuania     | 0      | 0      | 0      | 0      | 935    |
| Malta         | 84     | 84     | 84     | 42     | 1,000  |
| Netherlands   | 0      | 0      | 0      | 160    | 0      |
| Poland        | 0      | 0      | 160    | 0      | 0      |
| Portugal      | 0      | 0      | 0      | 39     | 640    |
| Rumania       | 60     | 60     | 60     | 60     | 780    |
| Spain         | 0      | 0      | 0      | 0      | 450    |
| Slovakia      | 0      | 0      | 0      | 160    | 800    |
| Slovenia      | 0      | 0      | 0      | 0      | 720    |
| Sweden        | 0      | 0      | 0      | 0      | 1,040  |
| United Kingdom| 12     | 80     | 0      | 0      | 0      |

Table 19. Traineeship – community (hours): statistical analysis.

|                      | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|----------------------|--------|--------|--------|--------|--------|
| Number of values     | 25     | 25     | 25     | 25     | 25     |
| Median               | 0      | 0      | 0      | 0      | 648    |
| 10% Percentile       | 0      | 0      | 0      | 0      | 0      |
| 90% Percentile       | 69.6   | 224    | 148    | 196    | 1000   |
| Mean                 | 14.24  | 56.48  | 41.76  | 78.84  | 558.5  |
| Standard deviation   | 37.04  | 122.1  | 109.7  | 211.4  | 394.4  |
| Standard error       | 7.408  | 24.41  | 21.95  | 42.28  | 78.87  |
| KS normality test    | 0.4497 | 0.3582 | 0.4082 | 0.3546 | 0.2016 |
| P value              | <0.0001| <0.0001| <0.0001| <0.0001| 0.0101 |
| Passed normality test (alpha=0.05)? | No | No | No | No | No |
| P value summary      | ***    | ***    | ***    | *     |    |
| Skewness             | 3.111  | 2.902  | 3.794  | 4.247  | -0.4686|
| Kurtosis             | 10.25  | 8.957  | 16.02  | 19.49  | -1.373 |
| Sum                  | 356    | 1,412  | 1,044  | 1,971  | 13,963 |
### Table 20. Traineeship – hospital (hours): reported data.

|           | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-----------|--------|--------|--------|--------|--------|
| Austria   | 0      | 0      | 0      | 0      | 0      |
| Belgium   | 0      | 0      | 0      | 0      | 0      |
| Bulgaria  | 0      | 0      | 0      | 0      | 800    |
| Czech Republic | 0  | 80    | 0      | 0      | 0      |
| Denmark   | 0      | 0      | 0      | 0      | 0      |
| Estonia   | 0      | 0      | 0      | 0      | 90     |
| Finland   | 0      | 0      | 0      | 0      | 0      |
| France    | 0      | 0      | 0      | 0      | 960    |
| Germany   | 160    | 160    | 0      | 0      | 800    |
| Greece    | 0      | 0      | 0      | 0      | 960    |
| Hungary   | 0      | 0      | 140    | 140    | 140    |
| Ireland   | 0      | 0      | 0      | 0      | 960    |
| Italy     | 0      | 0      | 0      | 250    | 500    |
| Latvia    | 0      | 0      | 0      | 0      | 648    |
| Lithuania | 0      | 0      | 0      | 0      | 40     |
| Malta     | 0      | 0      | 80     | 500    | 0      |
| Netherlands | 0  | 0    | 0      | 0      | 0      |
| Poland    | 0      | 0      | 0      | 160    | 0      |
| Portugal  | 0      | 0      | 0      | 0      | 320    |
| Rumania   | 0      | 0      | 0      | 0      | 0      |
| Spain     | 0      | 0      | 0      | 0      | 450    |
| Slovakia  | 0      | 0      | 0      | 0      | 0      |
| Slovenia  | 0      | 0      | 0      | 0      | 0      |
| Sweden    | 0      | 0      | 0      | 0      | 0      |
| United Kingdom | 6  | 12    | 12     | 0      | 0      |

### Table 21. Traineeship – hospital (hours): statistical analysis.

|           | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-----------|--------|--------|--------|--------|--------|
| Number of values | 25    | 25     | 25     | 25     | 25     |
| Median     | 0      | 0      | 0      | 0      | 0      |
| 10% Percentile | 0    | 0      | 0      | 0      | 0      |
| 90% Percentile | 2.4  | 39.2   | 39.2   | 196    | 960    |
| Mean       | 6.64   | 10.08  | 9.28   | 42     | 266.7  |
| Standard deviation | 31.97  | 35.12  | 31.62  | 114.3  | 369.1  |
| Standard error | 6.394 | 7.024  | 6.323  | 22.86  | 73.83  |
| KS normality test | KS distance | 0.5023 | 0.4929 | 0.4954 | 0.4833 | 0.2904 |
| P value    | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Passed normality test (alpha=0.05)? | No   | No     | No     | No     | No     |
| P value summary | *** | ***   | ***    | ***    | ***    |
| Kurtosis   | 4.989  | 3.856  | 3.683  | 3.217  | 1.001  |
| Skewness   | 24.92  | 15.2   | 13.57  | 11.08  | -0.6776|
| Sum        | 166    | 252    | 232    | 1,050  | 6,668  |

***: P<0.001
### Table 22. Traineeship – industry (hours): reported data.

| Country           | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-------------------|--------|--------|--------|--------|--------|
| Austria           | 0      | 0      | 0      | 0      | 0      |
| Belgium           | 0      | 0      | 0      | 0      | 1,000  |
| Bulgaria          | 0      | 0      | 0      | 0      | 0      |
| Czech Republic    | 0      | 0      | 0      | 0      | 0      |
| Denmark           | 0      | 0      | 0      | 0      | 0      |
| Estonia           | 0      | 0      | 0      | 0      | 0      |
| Finland           | 0      | 0      | 0      | 0      | 0      |
| France            | 0      | 0      | 0      | 320    | 0      |
| Germany           | 160    | 160    | 0      | 0      | 800    |
| Greece            | 0      | 0      | 0      | 0      | 0      |
| Hungary           | 0      | 0      | 140    | 140    | 0      |
| Ireland           | 0      | 0      | 0      | 0      | 960    |
| Italy             | 0      | 0      | 0      | 250    | 500    |
| Latvia            | 0      | 0      | 0      | 0      | 0      |
| Lithuania         | 0      | 0      | 0      | 0      | 0      |
| Malta             | 0      | 0      | 80     | 500    | 0      |
| Netherlands       | 0      | 0      | 0      | 0      | 0      |
| Poland            | 0      | 0      | 0      | 0      | 0      |
| Portugal          | 0      | 0      | 0      | 0      | 0      |
| Rumania           | 0      | 0      | 0      | 0      | 0      |
| Spain             | 0      | 0      | 100    | 100    | 100    |
| Slovakia          | 0      | 0      | 0      | 0      | 0      |
| Slovenia          | 0      | 0      | 0      | 0      | 0      |
| Sweden            | 0      | 0      | 0      | 0      | 0      |
| United Kingdom    | 0      | 0      | 0      | 0      | 0      |

### Table 23. Traineeship – industry (hours): statistical analysis.

| Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|--------|--------|--------|--------|--------|
| Number of values | 25     | 25     | 25     | 25     | 25     |
| Median | 0      | 0      | 0      | 0      | 0      |
| 10% Percentile  | 0      | 0      | 0      | 0      | 0      |
| 90% Percentile  | 0      | 0      | 116    | 184    | 864    |
| Mean    | 6.4    | 6.4    | 25.6   | 39.6   | 134.4  |
| Standard deviation | 32     | 32     | 71.3   | 112.3  | 314.2  |
| Standard error  | 6.4    | 6.4    | 14.26  | 22.47  | 62.85  |
| KS normality test | **0.5393** | **0.5393** | **0.4802** | **0.4778** | **0.4656** |
| KS distance     | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** |
| P value          | No     | No     | No     | No     | No     |
| Passed normality test (alpha=0.05)? | No | No | No | No | No |
| P value summary  | ***    | ***    | ***    | ***    | ***    |
| Skewness         | 5      | 5      | 3.403  | 3.413  | 2.199  |
| Kurtosis         | 25     | 25     | 12.6   | 12.4   | 3.428  |
| Sum              | 160    | 160    | 640    | 990    | 3360   |

***: P<0.001
Table 24. Countries with extremes of ratios of reported data / EU linear regression estimation.

| Ratios of reported data / EU linear regression estimation | Community pharmacies | Community pharmacists | Hospital pharmacists | Industrial pharmacists |
|-----------------------------------------------------------|----------------------|-----------------------|----------------------|------------------------|
| 0.5 and lower                                              | Sweden, Slovenia, Denmark, The Netherlands, Finland | Sweden, Slovenia, Denmark, The Netherlands, Finland | Slovenia, Bulgaria, Czech Republic, Sweden, Germany, The Netherlands | Czech Republic, Romania, Greece, Estonia, UK, Ireland, Lithuania, Slovakia |
| 1.5 and greater                                            | Spain, Belgium       | Spain, Malta, Belgium, Bulgaria, Greece | France, UK, Finland, Ireland, Malta | Hungary, Sweden, Bulgaria, Latvia, Finland, Malta, Spain, Denmark |

Figure 1. Relationship between MEDSCI and CHEMSCI.

(CHEMSCI: chemical sciences; MEDISCI: medical sciences)
Figure 2. Traineeship: hours per year for individual countries (each bar represents a country).