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Title: An analysis of the pharmacist workforce capacity in Ireland over the past 15 years

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Abstract

Background: The FIP 2018 global pharmacy workforce report identified that the pharmacy workforce is facing increasing capacity challenges and predicted that globally, the pharmacy workforce would grow by 40% over the next 15 years. The purpose of this report was to specifically examine the pharmacist workforce in Ireland over the last 15 years with reference to a number of developments that have both directly and indirectly affected the capacity of the pharmacy sector. A second objective was to benchmark the pharmacy workforce capacity in Ireland against other countries of similar demographic and economic standing in order to assess how Ireland compares.

Methods: Data was collected from PSI Annual Reports, Eurostat, OECD, PHARMINE Reports, UCAS, CSO Census Reports, WHO and FIP Global Pharmacy Workforce Reports regarding the pharmacy workforce in Ireland and selected comparison countries. Comparison countries were chosen based on population, GDP/capita, healthcare expenditure and HDI values. The data was analysed and presented using graphs and tables.

Results: The number of pharmacists in Ireland has increased by 90% over the last 15 years. Despite two new Schools of Pharmacy opening in 2002 (RCSI) & 2003 (UCC), 57% of new registrants to the PSI over the last 15 years qualified via the EU route, predominately from the UK. Since the first graduates from RCSI and UCC qualified, PSI registrants via the national route range between 27-56% of total additions annually. Ireland's output of pharmacy graduates per population is 40% lower than the UK and the number of pharmacy graduates per school of pharmacy in the UK is over twice that of Ireland. Ireland has the second highest number of pharmacies per 100,000 population out of 10 comparator countries. Ireland also has the joint highest number of pharmacists per 100,000, based on the total number of pharmacists registered with the PSI. This includes 5.5 % of PSI registrants who are in non-patient facing roles, 2.5% who are not-practicing/other and 21.5% of registrants who do not state their area of practice, with only 70.5% of registrants declaring as 'patient-facing'.

Conclusions: The pharmacy workforce in Ireland is highly dependent on new registrants applying via the EU mutual recognition route, predominantly from the UK. Any interruption to mutual recognition of pharmacists between the EU and UK, as a result of Brexit, would significantly affect the capacity of pharmacy services in Ireland. Compared to similar EU countries, pharmacists/pharmacies per head of population is relatively high. However, estimates of pharmacy workforce in Ireland based on all pharmacists registered with the PSI

may overestimate capacity in Ireland. In order to meet global trends of the increasing number of patients needing access to pharmacy related services and diversification of pharmacist roles, ongoing review of capacity in pharmacy is essential.

Key Highlights

- The number of pharmacists in Ireland has increased by 90% over the last 15 years.
- There has been a 47% increase in the number of pharmacies in Ireland during the same time.
- Despite the opening of RCSI and UCC Schools of Pharmacy in 2002 and 2003 respectively, 57% of new PSI registrants over the last 15 years qualified via the EU route, predominately from the UK.
- Ireland's output of pharmacy graduates per population is 40% lower than the UK and the number of pharmacy graduates per school of pharmacy in the UK is over twice that of Ireland.
- Any risk to the free movement and mutual recognition of pharmacists between the UK and EU as a result of Brexit would lead to significant shortages of pharmacists in Ireland.
- Of 10 comparator EU countries, Ireland has the joint highest number of pharmacists and the second highest number of pharmacies per head of population.
- Pharmacy workforce estimates in Ireland are based on total registrants on PSI, which may overestimate capacity given that 21.5% of pharmacists do not state their area of practice.

Introduction

Numerous WHO reports have identified an increasing demand from patients for healthcare services and the availability of a well-educated, competent healthcare professionals is crucial to meeting the pharmaceutical care needs of patients. Pharmacists are a key component of the healthcare workforce, and are usually the most accessible healthcare profession. In Ireland, over two million people visit a community pharmacy each month and twenty million prescriptions are filled annually (*1*). The pharmacist is uniquely positioned at the key interface between medicines and the patient in a primary care setting. Meeting the pharmaceutical care needs of patients can only be maintained with an adaptable pharmacy workforce, equipped with the necessary knowledge, skills, expertise and resources. The WHO estimates that there is a global healthcare workforce shortage of 7.2 million due to numerous factors including increasing national populations, longer life expectancies, increasing healthcare costs, and rapidly growing demands for health services and burden of chronic diseases (*2*). Specifically, in pharmacy services, the 2018 FIP report identified that pharmacy workforce is facing increasing capacity challenges and predicted a 40% growth of the global pharmacy workforce over the next 15 years (*3*).

It is over two decades since Peter Bacon and Associates were commissioned by the Higher Education Authority to prepare a report on pharmacy workforce in Ireland 'against a backdrop of evidence, both formal and anecdotal, that the Irish pharmacy profession had been experiencing excess demand for labour'(*4*). The 'Bacon report' confirmed that there was a shortage of pharmacists across community, hospital and industry settings and the existing output of pharmacists in Ireland from Trinity College Dublin was not sufficient. The recommendations of the report were that the HEA should invite proposals from other 3rd level institutions for new schools and complete a costs-benefit evaluation of the proposals. Following on from this report, two new pharmacy schools were opened, The Royal College of Surgeons (RCSI) School of Pharmacy in 2002 and University College Cork (UCC) School of Pharmacy in 2003.

Since then, there has been no independent systematic study on the pharmacy workforce in Ireland to assess the impact of these two new schools of pharmacy on the pharmacist workforce in Ireland. This study examines pharmacist and pharmacy numbers in Ireland over the last 15 years in conjunction with economic and demographic data to allow improved understanding and trending of pharmacy workforce descriptors in Ireland. By examining the evolution of the

workforce, conclusions can be drawn regarding factors that have impacted the supply of pharmacists and forecasts can be made regarding factors that may impact pharmacist numbers into the future.

The FIP global pharmacy workforce analyses identified that pharmacy workforce capacity varies considerably between developed and low income/developing countries and regions and generally correlates with population- and country-level economic indicators(*3*). Therefore, there is a need at a national level to compare pharmacy workforce in Ireland to comparable countries. This study aims to benchmark Ireland against countries with similar demographic and economic descriptors in order to draw accurate and representative conclusions. By comparing the pharmacist workforce in Ireland to other countries under headings including workforce capacity descriptors, pharmacy education, and population dynamics, it is possible to see where Ireland lies on a scale relative to other countries. Analysis of resulting variations and/or correlations between Ireland and countries of similar economic, demographic and social standing, will support informed decision making regarding the capacity of pharmacist workforce, identify potential capacity gaps and predict pharmacy workforce training needs into the future.

Methods

A literature review was conducted using the Web of Science database. Keywords and terms such as ‘pharmacy workforce’, ‘pharmacy workforce Ireland’, ‘manpower in pharmacy’, ‘pharmacist shortage’, ‘pharmacy in EU’, ‘UK pharmacist workforce’, ‘Brexit’ etc. were used.

Data was gathered from sources including: The Pharmaceutical Society of Ireland (PSI) Annual Reports 2004-2016, Eurostat (the statistical office of the EU), The Organisation for Economic Co-operation and Development (OECD), The PHARMINE Report 2011, The Central Statistics Office (CSO) Census Reports 2002, 2006, 2011, 2016. The World Health Organisation (WHO), International Pharmaceutical Federation (FIP) Workforce Reports, The Universities and Colleges Admissions Service (UCAS). All of these sources were available online. Further information and clarification and breakdown of PSI Annual Reports was obtained from a contact in the PSI Communications Unit. All collected data was input into Microsoft Excel for further analysis. Analysed data was presented using graphs and tables.

It was decided that comparison countries should be part of the EU/EEA and the OECD. The countries chosen were selected based on the following criteria: total population, GDP/capita ($), % of GDP spent on healthcare, % of total government spending on healthcare and Human Development Index (HDI) values. For each of these variables a list was made of countries with values similar to that of Ireland. The lists were cross referenced and any country that appeared on three of more of the lists was included for comparison.

Table 1. Table showing selection criteria for comparison countries. Countries shaded occur in three or more of the lists and are therefore selected for comparison.

Population (millions) *World Bank (5)*	**GDP/capita ($)** *World Bank*	**% GDP spent on healthcare** *OECD (6)*	**% government spending spent on healthcare** *Eurostat(7)*	**HDI** value** *United nations(8)*
Ireland (4.773)	Ireland (61,606)	Ireland (7.8)	Ireland (19.3)	Ireland (0.923)
Norway (5.233)	Denmark (53,418)	Czech Rep. (7.3)	Czech Republic (18.2)	Denmark (0.925)
Slovakia (5.429)	Belgium (41,096)	Hungary (7.60	Netherlands (17.7)	Germany (0.926)
Finland (5.495)	Netherlands (45,295)	Greece (8.3)	UK (17.8)	Netherlands (0.924)
Denmark (5.731)	UK (39,899)	Iceland (8.6)*	Norway (17.2)	Switzerland (0.939)
Switzerland (8.372)	Austria (44,177)	Italy (8.9)	Germany (16.3)	Norway (0.949)
Austria (8.747)	Sweden (51,600)	Portugal (8.9)	Denmark (15.6)	Sweden (0.913)
Sweden (9.903)	Finland (43,090)	Slovenia (8.6)	Austria (15.5)	Iceland (0.921)*
	Iceland (59,977)*	Estonia (6.7)	Belgium (14.2)	UK (0.909)
	Switzerland (78,813)	Luxembourg (6.3)	France (14.3)	France (0.897)
	Germany (41,936)	Poland (6.4)		Luxembourg (0.898)
		Slovakia (6.9)		Belgium (0.896)
				Austria (0.893)
				Finland (0.895)

*Iceland omitted – population too small to draw accurate conclusions
** HDI – Human Development Index

Results

Pharmacy workforce over the past 15 years – an Irish Perspective

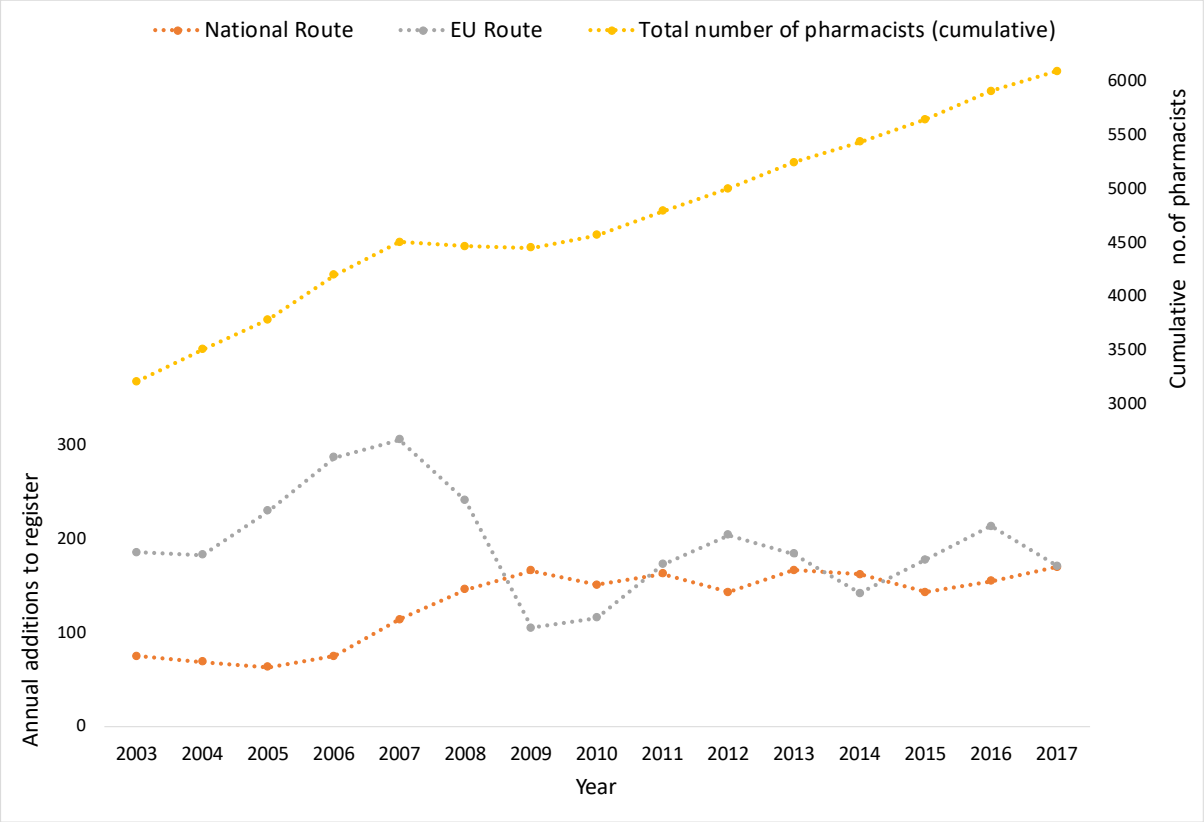


Figure 1. Graph showing total number of pharmacists added to the PSI register annually via national and EU routes and total number of pharmacists in Ireland (cumulative) between 2003 and 2017. Data taken from PSI Annual Reports 2004-2016 and PSI Statistics(9).

The total number of pharmacists in Ireland increased from 3,208 in 2002 to 6,097 in 2017 – an increase of 90%. On an annual basis, the average number of new additions to the PSI register is 341, qualifying by either the national, EU or 3rd country routes. Pharmacists that have trained at one of the three schools of pharmacy in Ireland register via the national route. The number of pharmacists added via the national route annually has increased from an average of 71 from 2003-2006 to an average of 153 from 2007-2017. This is primarily a reflection of the increase in pharmacy graduates nationally coming from RCSI and UCC Schools of Pharmacy, which opened in 2002 and 2003 respectively. An initial spike in registration via the national route was seen in 2007 when the first year of RCSI graduates registered with the PSI. This further increased in 2008 when the first UCC graduates were added. Since then numbers have remained constant, ranging between 140-170 each year. Fluctuations within these limits represent differences in the uptake of the BPharm degree by CAO applicants and varying drop-out rates during the course of study.

Under Directive 2005/36/EC there is mutual recognition of professional qualifications which enables the free movement of pharmacists between EU member states. The number of pharmacists that registered with the PSI via the EU/EEA route has seen substantial fluctuation over this 15 year period. Numbers increased dramatically from 2004, peaking in 2007 (306 registrants), most likely coinciding with the high demand for pharmacists, driven in no small part by the 'Celtic Tiger' economy of the time. The addition of ten new EU countries in 2004 meant that under Directive 2004/38/EC citizens of these countries could now move and reside freely within any member state without obtaining a work permit. Immigration flows in Ireland exceeded 100,000 per year between 2006-2007 (*10*). These higher levels of immigration into Ireland brought increased demand for pharmacy related services and increased demand for pharmacists, resulting in a peak in the number of EU/EEA registrants at the same time. The numbers of EU registrants sharply declined from 2007-2009 as Ireland was hit by recession, reduced healthcare budget cuts and net migration out of Ireland. The number of EU pharmacists registering with the PSI fell by 66% between 2007-2009. Despite the downturn in EU registrants during 2007-2009, total pharmacist numbers in Ireland remained relatively static as the decrease in registrants via the EU route was counteracted by the increase in registrants via the national route at the same time. Registrant numbers via the EU route have recovered since 2009 and stabilized at between 43% to 58% each year since. The flexibility and adaptability of the EU professional workforce to match local demand is clearly a positive outcome of the EU mutual recognition agreement, allowing for flexible workflows across the EU and movement of the workforce to match the natural fluctuations in economic cycles of the various countries across Europe.

In terms of registration from other '3rd countries', the overall number of registrations via this route are relatively few, with an average of only 4 pharmacists per year registering via this route since 2010. The third county route of registration commenced in 2010 through which pharmacists outside the EU/EEA register with the PSI. Prior to 2006, reciprocal registration agreement operated on the basis that pharmacist qualifications were mutually recognized between Ireland-New Zealand and Ireland-Australia. Between 2003-2006 an average of 49 pharmacists per year registered via this reciprocal registration approach. However, this route was terminated in June 2006(*9*).

Brexit - A potential risk to the Irish Pharmacy workforce

Despite the increase in pharmacists qualifying nationally in recent years, it is clear from the above data that the pharmacist workforce in Ireland is heavily reliant on pharmacists that are qualifying outside of Ireland, with the vast majority training in the UK. Since 2003, 62% of new registrants to the PSI have qualified outside of Irish universities, with 57% via the EU route and 5% via 3rd country and reciprocal routes. The vast majority of EU qualified new registrants are trained in the UK/Northern Ireland (i.e. in 2017 113 out of 170 EU qualified registrants were trained in UK/NI) and it would seem reasonable to assume the majority are Irish students who studied pharmacy at a UK university.

Leaving aside the socioeconomic debate surrounding the national policy on limiting pharmacy places in Irish universities to less than 50% of the current labour market needs, it is clear that pharmacy services remain highly reliant on Irish students training at schools of pharmacy in the UK. It is unclear as of yet the extent to which the free movement and mutual recognition of pharmacy qualifications will be upheld/withdrawn when the UK leaves the EU. However, any restrictions to this free movement will have a substantial impact on the pharmacist workforce. For this reason, Brexit poses a significant risk to the future capacity of the pharmacist workforce in Ireland.

The uncertainty around Brexit is also likely to impact on the numbers of Irish students applying to study in the UK through UCAS(*11*). Since June 2016, the overall number of applicants has fallen from 5,680 in 2015 to 4,100 in 2018. This represents 28% decrease in students, and while this study did not examine precise figures on the number of Irish students registering at schools of pharmacy in the UK, it is reasonable to assume that there will be a significant reduction in the number of Irish students qualifying as pharmacists in the UK from 2020/21 onwards. While the implications of Brexit are as of yet uncertain, the risk of Brexit to pharmacy capacity is real, given how reliant the pharmacist workforce in Ireland is on UK trained pharmacists.

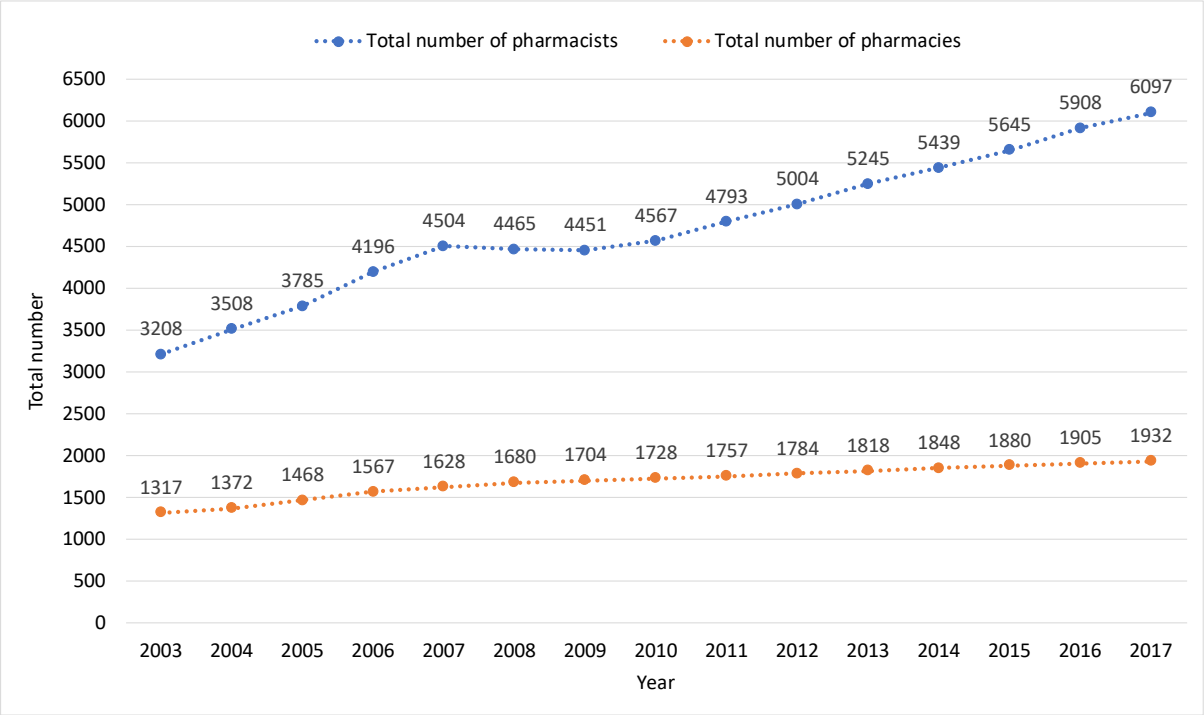


Figure 2. Total number of registered pharmacists and pharmacies in Ireland between 2003-2017 (9).

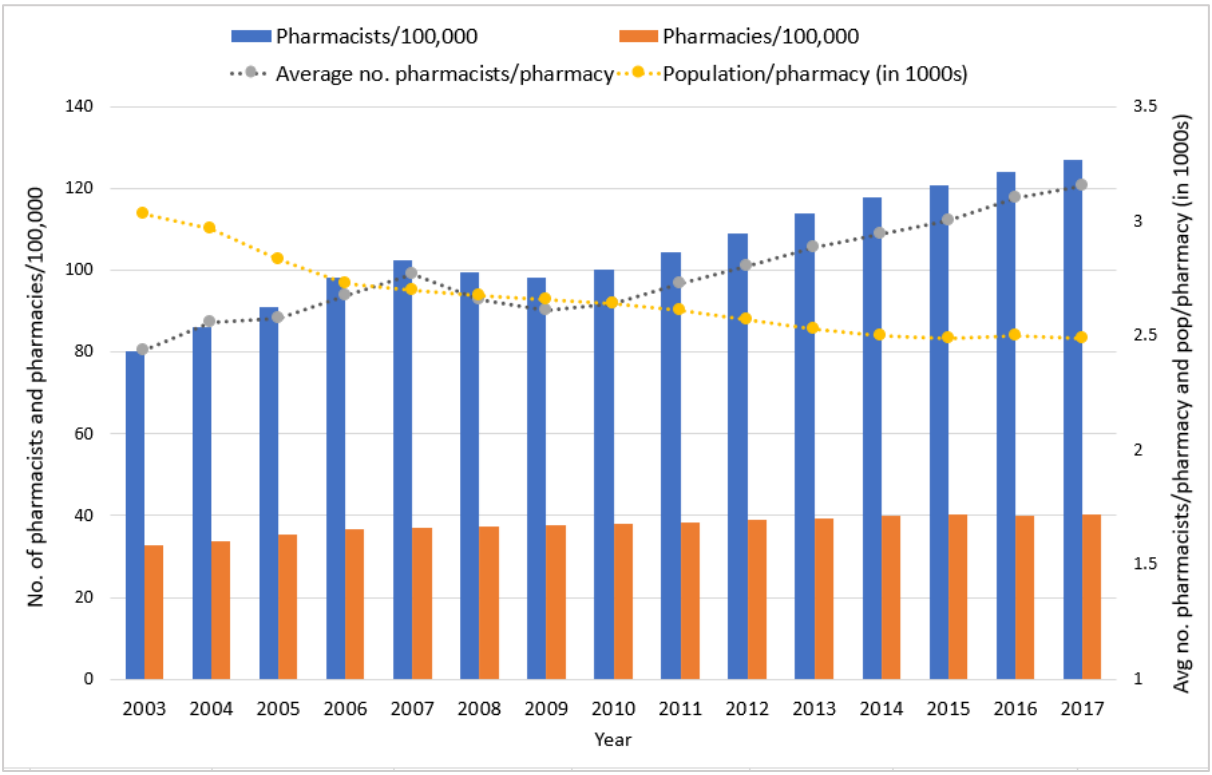


Figure 3. Graph showing the number of pharmacists per 100,000 population, number of pharmacies per 100,000 population, average number of pharmacists per pharmacy and population per pharmacy in Ireland between 2003-2017 (9).

As a result of the increase in the number of pharmacists in Ireland over recent years, the number of pharmacists per 100,000 population has increased from 80 to 127 between 2003-2017. The number of pharmacists per pharmacy increased from 2.4 to 3.16 over the same period. The total number of pharmacies in Ireland has consistently increased in Ireland over the last 15 years. In 2003 there were 1'317 pharmacies, by the end of 2017 this number increased to 1'932. As a result of this the number of pharmacies per 100,000 population has increased from 33 to 40.2. As the number of pharmacies has increased, the population per pharmacy has reduced. In 2003 the population per pharmacy was 3'034, which has decreased to 2'487 by the end of 2017. This has resulted in increased patient access to pharmacists in a community setting, facilitating greater provision of primary healthcare services, and has also increased competition in the sector.

Pharmacy capacity in Ireland compared to other EU countries

With the aim of benchmarking the pharmacist workforce in Ireland to other countries a number of comparison countries were chosen based on a range of demographic and economic descriptors, as described the methods section. This ensured that the chosen countries broadly share common goals in terms of economic, environmental, social and healthcare standards, therefore, justifying that comparisons between these countries are appropriate.

Population density of Pharmacists and Pharmacies in comparison countries

Table 2. Pharmacist and pharmacy statistics in comparison countries

Country	**Pharmacists per 100,000 population (2015)** *OECD**(6)***	**Pharmacies per 100,000 population (2015)** *OECD**(6)***	**Number of Pharmacists/ Pharmacy (2015)** *Calculated*	**Population /pharmacy** *Calculated*
Austria	71	15.4	4.61	6,494
Belgium	121	43.9	2.76	2,278
Denmark	51	3.9	13.08	25,641
Finland	110	14.9	7.38	6,711
Germany	64	24.8	2.58	4,032

Ireland	121	40.2	3.0	2,488
Netherlands	21	11.7	1.80	8,547
Norway	74	15.0	4.93	6,667
Sweden	76	13.3	5.71	7,519
Switzerland	54	21.3	2.54	4,695
UK	83	22.1	3.76	4,525
Median	**74**	**15.4**	**3.76**	**6,494**

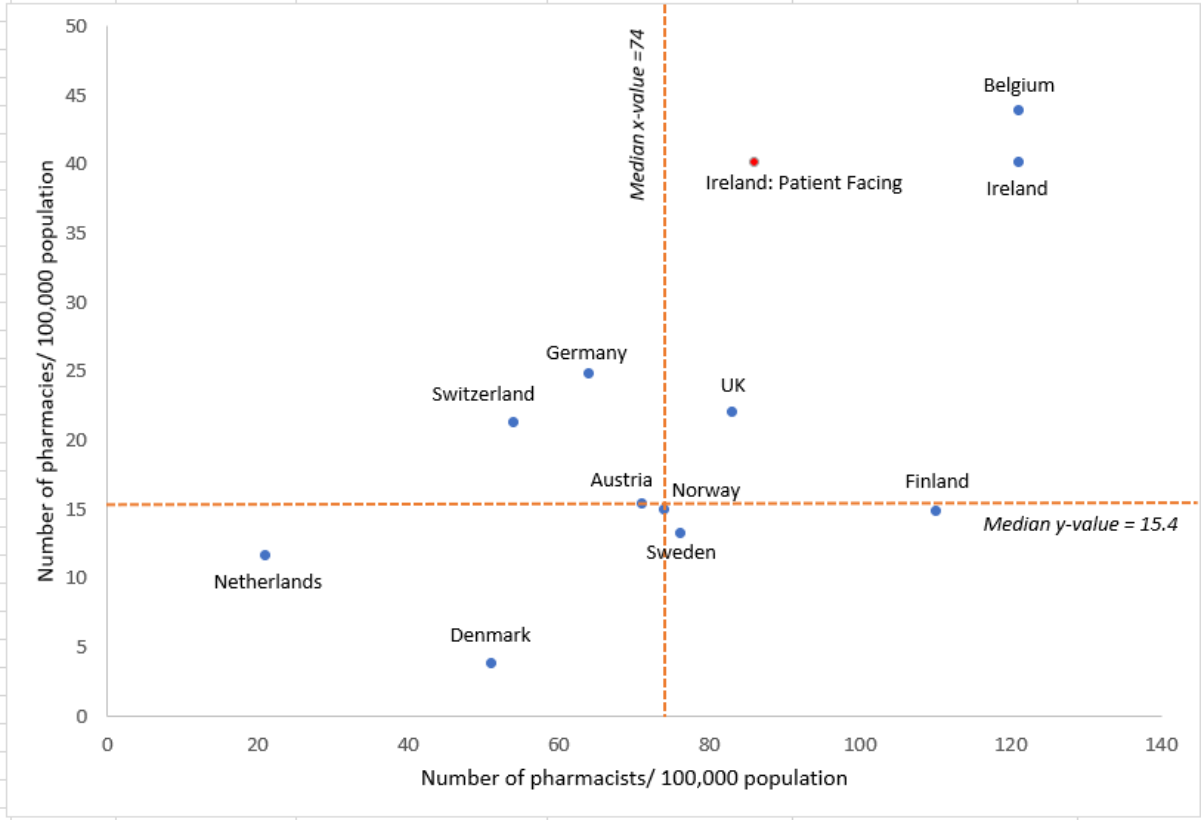


Figure 4. Number of pharmacists and pharmacies per 100,000 population (2015) in comparison countries. Patient facing pharmacists in Ireland (i.e. community and hospital based) also shown.

Ireland and Belgium have the joint highest number of pharmacists per 100,000 population (121) while the Netherlands has the lowest (21). However, it should be noted that the data for Ireland represents all pharmacists licenced to practice – i.e. all pharmacists on the PSI register. As a result, pharmacists that are not practicing in patient facing roles, such as industry, academia, regulation etc. are included, which may over-estimate pharmacy workforce capacity. As of the 1st of October 2018, 70.5% of registered pharmacists identified as working in patient facing roles (i.e. community or hospital pharmacy), 5.5% identified as working in non-patient facing roles (i.e. academic, industry, regulatory), 2.5% identified as non-practicing or 'other'.

However, 21.5 % of pharmacists did not state their area of practice(*12*). This is a substantial proportion and leaves much room for error when estimating the total percentage of patient facing and non-patient facing pharmacists in Ireland and pharmacy capacity predictions.

Therefore, using the total number of pharmacists when comparing to other countries leads to a misleading assessment of the capacity of the patient-facing sectors of pharmacy practice. Based on the total number of registrants on the PSI register, Ireland is significantly above the median in terms of the number of pharmacists per population. Using the adjusted figure of 70% reporting as 'patient facing' brings the overall figure in line with the comparison countries. It was unclear if the figures given for the comparison countries reflect all pharmacists registered with the national professional body or registered to practice on in 'patient facing' roles, and is therefore a limitation of the current study. While 'non-patient' facing pharmacists roles are varied and may contribute indirectly to improving accessibility to medicines, clearly segmentation of the data to allow comparisons of 'patient facing' pharmacist density between countries will allow more reliable benchmarking in the context of access of patients to pharmacy related services.

Ireland has the second highest number of community pharmacies per 100,000 population (40.2) after Belgium (43.9). Denmark has the lowest (3.9). However, it is important to be cognisant of the national requirements level of regulation of the pharmacy sector in each country before drawing conclusions. Table 3 compares the regulation of ownership, location of pharmacies and sale of OTC medicines across the comparator countries.

Table 3. Restrictions on ownership and location of pharmacies and sale of OTC medicines. Taken from PHARMINE Reports (13) and (14)

Country	Ownership limited to pharmacists	Restrictions on pharmacy ownership	Restrictions on pharmacy location	OTC Pharmacy exclusivity
Austria	✓	✓	✓	✓
Belgium	X	X	✓	✓
Denmark	✓	✓	✓	X
Finland	✓	✓	✓	✓
Germany	✓	✓	X	✓
Ireland	X	X	X	X

Netherlands	X	X	X	X
Norway	X	✓	✓	X
Sweden	X	X	X	X
Switzerland	X	X	X	X
UK	X	X	X	X

In Denmark, the establishment of pharmacies is highly regulated and it has the lowest number of pharmacies per 100,000 population at 3.9. In Denmark, only pharmacists can own pharmacies, multiple ownership is not permitted and there are no pharmacy chains (*15*). The average population per pharmacy in Denmark is ~25,641 – this is over 10 times the Irish average. The average number of pharmacists per pharmacy in Denmark is by far the highest of the comparison countries at 13.08 in order to cater for the large volume of patients in each pharmacy.

The pharmacy sector in Ireland is deregulated, there are limited restrictions on the ownership and location of pharmacies (*13*, *15*). The average population per pharmacy in Ireland is the second lowest at 2,488 after Belgium. The average population per pharmacy in the other countries (excluding Denmark) ranges from 4,000 to 8,000 which indicates that Ireland's numbers are below the European average. The aim of deregulating the establishment of pharmacies is to improve accessibility to medicines and improve competition on the price of medicines. However, it can often lead to an irregular spread of pharmacies, favouring development in urban areas over rural areas (*15*). Even though the establishment of pharmacies in Ireland is deregulated, when compared with other countries with a similar level of deregulation (UK, Sweden, Netherlands) Ireland still has a much higher number of pharmacies per 100,000 population. This demonstrates that this is not simply a product of deregulation and there are other factors involved.

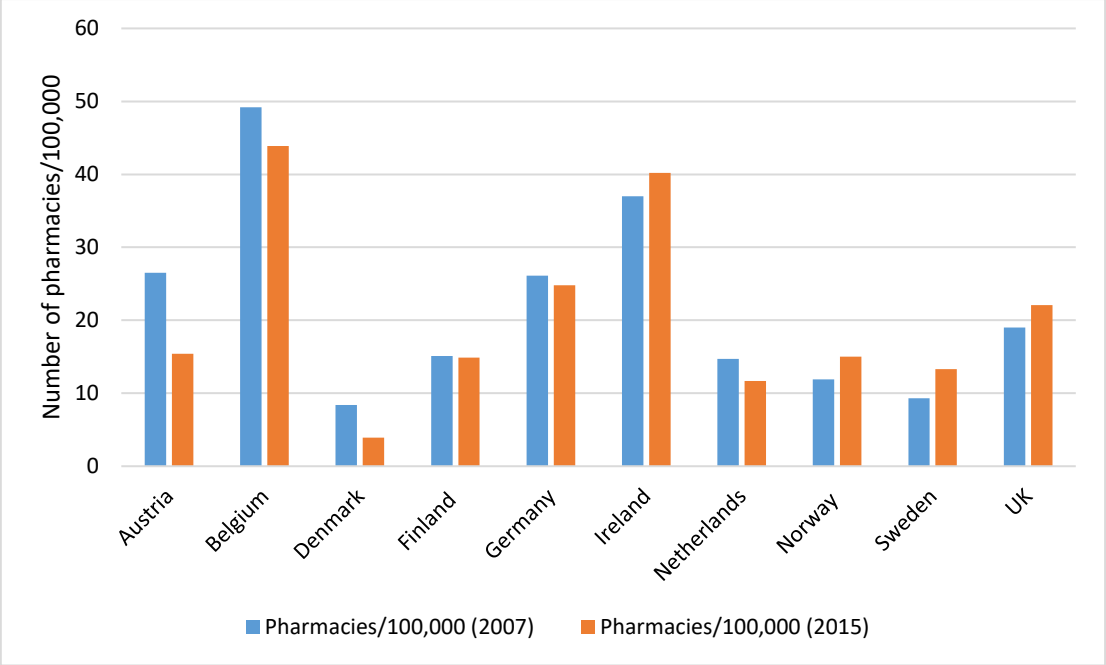


Figure 5. Number of pharmacies per 100,000 population in 2007 and 2015 in comparison countries(6).

At a glance, it is clear that Belgium has the highest number of pharmacies per 100,000 population, followed by Ireland. However, it is important to note that pharmacy numbers have decreased in Belgium between 2007-2015 while numbers are continuing to increase in Ireland. This illustrates that even though Belgium has the highest number of pharmacies currently, if current trends continue Ireland will overtake it. Even though other countries (Norway, Sweden, UK) have shown increases in pharmacy numbers in recent years, their numbers are still far below Ireland. The total number of pharmacies per 100,000 population in Ireland is still twice that of the UK.

Pharmacist training in comparison countries

Table 4. Pharmacy education statistics in comparison countries

Country	**Number of pharmacy graduates (2014)** *OECD**(6)***	**Number of pharmacy graduates/100,000 population (2014)** *Calculated*	**Number of Schools of Pharmacy** *PHARMINE 2011**(13)***	**Avg. number of graduates/ School of Pharmacy** *Calculated*
Austria	252	2.95	3	84
Belgium	626	5.58	9	70
Denmark	81	1.44	2	40.5
Finland	381	8.54	3	127

Germany	2079	2.57	22	94.5
Ireland	151	3.27	3	50.3
Netherlands	239	1.42	2	119.5
Norway	185	3.6	5	46.25
Sweden	375	3.87	2	187.5
Switzerland	208	2.54	6	34.7
UK	3545	5.49	25	141.8
Median	**252**	**3.27**	**3**	**84**

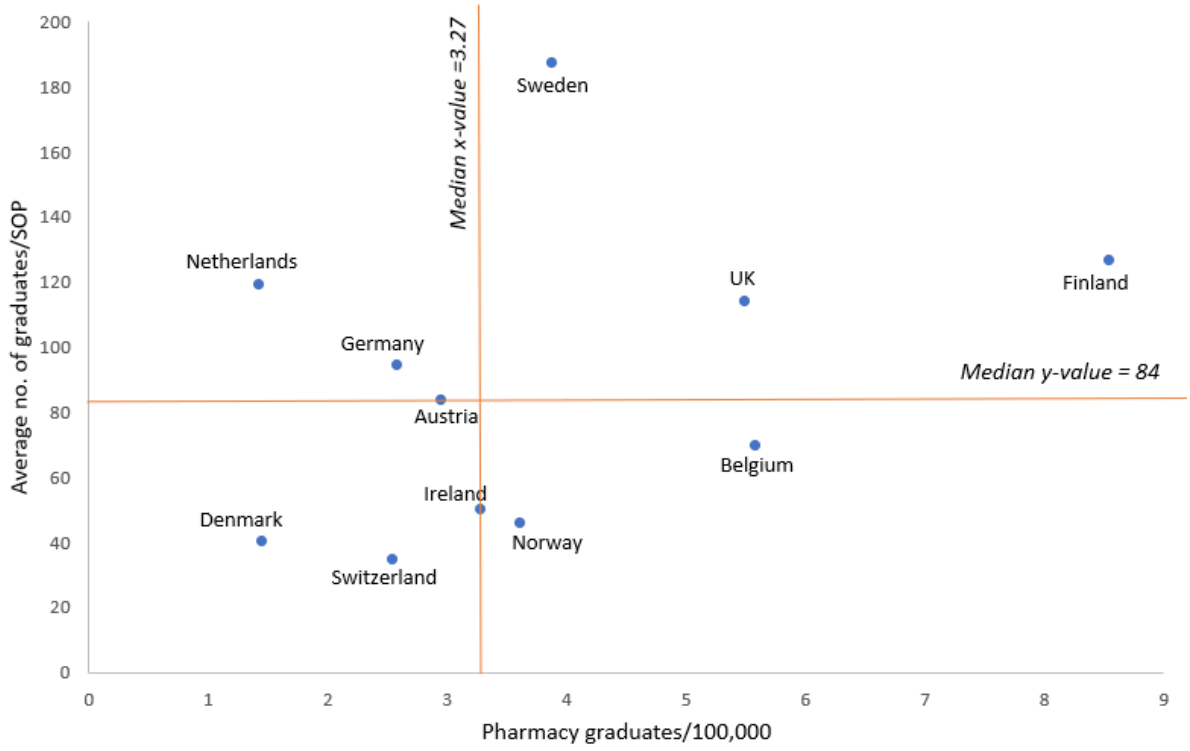


Figure 6. Number of pharmacy graduates per 100,000 population and average number of graduates per school of pharmacy (2014) in comparison countries (6, 13).

Ireland lies exactly on the median set by the comparison countries in terms of pharmacy graduates per population. However, the number of graduates per school of pharmacy in Ireland is below the median at an average of 50 graduates per school. In the UK, the average number of graduates per school of pharmacy annually is ~114 – more than double the Irish figure. These two indicators of pharmacy education in Ireland show that despite the addition of RCSI and UCC Schools of Pharmacy, Ireland's output of national pharmacy graduates is still low relative to other comparison countries. This again reinforces the point that Ireland is heavily

reliant on the movement of pharmacists into Ireland from other countries in order to meet demand and anything that would interrupt this flow of non-nationally trained pharmacists would have a significant impact on the pharmacy workforce in Ireland.

Over 65's population dynamics in comparison countries

Table 5. Population dynamics in comparison countries (65+ age group)

Country	**Percentage of the population 65+ (2016)** *Eurostat**(7)***	**Number of pharmacists/10,000 65+** *Calculated*
Austria	18.5	38.376
Belgium	18.2	66.486
Denmark	18.8	27.129
Finland	20.5	53.663
Germany	21.1	30.19
Ireland	13.2	84.09
Netherlands	18.2	11.538
Norway	16.4	51.829
Sweden	19.8	38.39
Switzerland	18	30
UK	17.9	46.928
Median	**18.2**	**38.39**

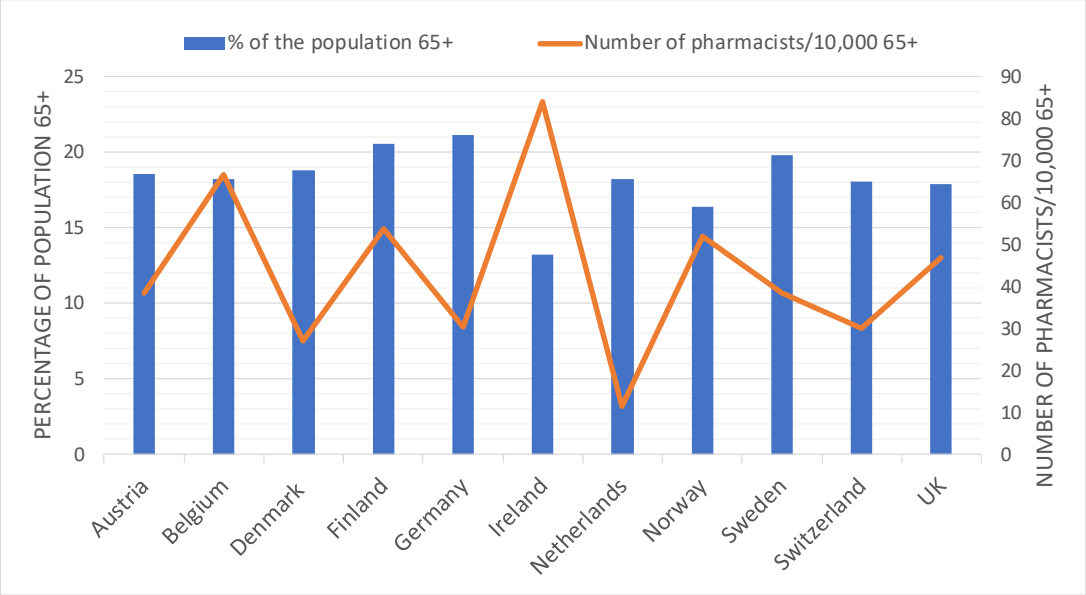


Figure 7. Graph showing the percentage of the population over 65 and the number of pharmacists per 10,000 65 and over population(16, 17).

The percentage of the population over the age of 65 is the lowest in Ireland out of the comparison countries. Despite the fact that Irelands population is the youngest of the comparator countries, between 2011-2016 this age group increased by 19.1%. This makes it the fastest growing age-group in the country. Use of prescription medicines is highest in this population, there is an exponential increase in the prevalence of disease and polypharmacy as age increases. 62% of people in Ireland over the age of 65 have one or more chronic illnesses. By 2020, 40% of the population of Ireland is expected to have a chronic illness. The supply of pharmacists must be capable of providing medicines access to meet this increasing need.

Another potential consideration affecting overall capacity in workforce is increasing feminization of the pharmacy workforce (*2*). Global trends indicate the proportion of females in the pharmacy workforce is increasing and it is predicted to exceed 72% by 2030(*3*). In Europe, % female pharmacists between 2009 and 2016 increased from ~66 to ~68%. The % females on the PSI register as of 1st November 2018 was 65%, so Ireland is marginally below European average and therefore also likely to increase. The average annual full-time equivalent contribution of females is lower than that of males, due to a larger proportion of female pharmacists who work part-time and who prefer more flexible work patterns (*18, 19*). While the increasing feminisation of the workforce suggests that pharmacy remains an attractive

career for women, gender profile is also relevant to overall workforce capacity considerations as this could lead to a lower overall capacity for the pharmacy workforce.

Key findings

- The number of registered pharmacists in Ireland has increased by 90% over the last 15 years. The number of pharmacies has increased by 46% during this time. This shows significant growth and continued demand for pharmacy services in Ireland.

- Despite two new Schools of Pharmacy opening during the 15 period, 57% of additions to the register during this time were via the EU route, predominantly from the UK. The pharmacist workforce continues to be heavily dependent on pharmacists that are trained outside of Ireland. In 2017 alone for example, ~66% of additions to the register via the EU route came from the UK. This highlights a key risk that Brexit poses. Any restriction to the free movement of pharmacists between the UK and Ireland is likely to lead to workforce shortages in Ireland and negatively impact patient accessibility to pharmacy related services.

- Estimates based on total number of PSI registrants is likely to overestimate pharmacy workforce capacity in Ireland. In order to relate pharmacist density to accessibility of medicines, there is a need for a more comprehensive breakdown of the PSI register into patient-facing and non-patient facing pharmacists. Currently, 70.5% of PSI registrants are 'patient facing' however, 21.5% of pharmacists do not state their area of practice. This results in inaccuracies when comparing pharmacy workforce capacity with other countries.

- Ireland has the second highest number of community pharmacies per 100,000 population after Belgium. However, pharmacy numbers in Belgium have decreased in recent years while numbers in Ireland have continued to increase. The total number of pharmacies per 100,000 population in Ireland is currently twice that of the UK.

- Ireland's output of pharmacy graduates nationally is below average when compared to the other countries despite the addition of RCSI and UCC Schools of Pharmacy. In the UK for example, the average number of graduates per school is over twice the Irish average.

Conclusion and future perspectives

It is almost two decades since the last systematic study was performed on the pharmacist workforce in Ireland. The economic boom, the recession, significant cuts to the pharmacy sector, EU enlargement and the opening of two new schools of pharmacy have all had a part to play in the evolution of the pharmacist workforce during this time. The impact of Brexit, the increasing clinical role of the pharmacist and the increasing and ageing population of Ireland will continue to create demands on the pharmacist workforce in Ireland into the future.

With the increasing shift towards patient centred pharmacy related services, clinical decision-making on medicine use, and expanding roles of pharmacists, it is imperative to continually evaluate the capacity of the pharmacist workforce, in order to balance the demand versus supply of pharmacists. Pharmacists now play a much more active role in optimising patient treatment, promoting the safe and rational use of medicines, diagnosis and ongoing monitoring of disease and the promotion of general health and wellbeing through public health initiatives such as vaccination programmes. However, in a baseline study of community pharmacy practice in Ireland conducted in 2011, 81.2% of responders identified dispensing prescriptions as the taking up most of their time on most days (*20*). Other key activities included counselling on the use of medications and giving advice about minor illness. This limits time available to offer expanded pharmacy services to patients. Analysing the status of the pharmacy workforce is important if workforce challenges are to be addressed and workforce risks mitigated. Global trends indicate that over the next 15 years, the pharmacy workforce needs to increase by up to 40% to meet demand for expanded pharmacy related services. While Ireland already has a high pharmacist per capita ratio relative to comparator countries, it is still likely that demand for pharmacists will continue to increase here, and workforce challenges due to Brexit and Ireland's aging population needs to be carefully considered.

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