The global pharmacy workforce : a systematic review of the literature

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Abstract

Introduction

The importance of health workforce provision has gained significance and is now considered to be one of the most pressing issues worldwide, across all health professions. Against this background, the objectives of the work presented here were to systematically explore and identify contemporary issues surrounding expansion of the global pharmacy workforce in order to assist the International Pharmaceutical Federation working group on workforce.

Method

International peer and non-peer reviewed literature published between January 1998 and February 2008 was analysed. Articles were collated by performing searches of appropriate databases and reference lists of relevant articles, additionally key informants were contacted. Information which met specific quality standards and pertained to the pharmacy workforce was extracted to matrices and assigned an evidence grade.

Results

Sixty-nine papers were identified for inclusion (forty-eight peer reviewed and twenty-one non-peer reviewed). Evaluation of evidence revealed the global pharmacy workforce to be composed of increasing numbers of females who were working fewer hours; this decreased their overall full-time equivalent contribution to the workforce compared to male pharmacists. Distribution of pharmacists was uneven with respect to location (urban/rural, less-developed/ more-developed countries) and work sector (private/public). Graduates showed a preference to complete pre-registration training near where they studied as an undergraduate; this was of considerable importance to rural areas. Increases in the number of pharmacy student enrolments and pharmacy schools occurred alongside an expansion in the number and roles of pharmacy technicians. Increased international awareness and support existed for the certification, registration and regulation of pharmacy technicians and accreditation of training courses. The most common factors adding to the demand for pharmacists were increased feminization, clinical governance measures, complexity of medication therapy and increased prescriptions.

Conclusions

To maintain and expand the future pharmacy workforce, increases in recruitment and retention will be essential as will decreases in attrition were possible, however scaling up the global pharmacy workforce is a complex, multi-factorial responsibility that requires coordinated action. Further research into; feminisation, decreasing demand for postgraduate pharmacy training, how effective existing interventions are at expanding the pharmacy workforce and more coordinated monitoring of pharmacy workforce worldwide (particularly in developing countries) is required.

Introduction

Shortages of pharmacists have been reported since the early 1990s however it was not until the following decade, and in particular the publishing of The World Health Report in 2006[1], that health workforce issues gained sufficient momentum to merit widespread investigation and action to bring about changes. This report was a major driving force for expansion of the international health workforce in order to meet the health related Millennium Development Goals. The Global Health Workforce Alliance was established to accelerate progress towards these goals by identifying and implementing solutions to the shortages[2]. The international shortage of healthcare professionals exists in different severities and has different root causes dependent on the particular health profession and the country of origin. Therefore the healthcare priorities change between countries and a universal health system would

invariably not provide the required healthcare efficiently to all those that need it. The Global Pharmacy Workforce and Migration Report was the first of its kind to investigate specific workforce issues affecting the international pharmacy profession as a whole[3]. This review will focus upon the issues facing the expansion of the global pharmacy workforce and by gathering together past and present literature a platform for discussion, planning and action will be provided to enable the management of current problems and the foresight of future challenges worldwide. The main objectives of this report were to systematically identify and review the contemporary issues surrounding the global pharmacy workforce and more specifically to explore the methods used to expand the workforce. This work was intended to aid the International Pharmaceutical Federation's working group on pharmacy workforce with their work in this area.

Methods

Relevant peer reviewed and non-peer reviewed international literature were initially identified via searches on electronic databases. The databases searched included; MEDLINE, EMBASE, International Pharmaceutical Abstracts, PubMed and The Cochrane Library. The search terms used were "pharmacy workforce", "pharmacy manpower", "human resources for health" AND "pharmacy", "human resources" AND "pharmacy" and "pharmacist shortage". Key informants from the International Pharmaceutical Federation working group on pharmacy workforce provided country specific literature on the United States and Canada. Additionally, reference lists of relevant articles were searched. Copies of all the evidence included in the review were obtained.

The criteria for inclusion was; that the literature related to pharmacists, pharmacy technicians or pharmacy assistants from any country worldwide, published between January 1998 and February 2008 and satisfied the Health Development Agency Evidence Base 2000 standards[4] (with some noted exceptions). The review excluded; workforce imbalances within pharmacy specialties (such as the mental health pharmacy workforce), literature published relating to historical data, non-English language literature, human resource matters concerned with delivering therapy for specific diseases (for example HIV and AIDS) and workforce issues surrounding emergency situations (such as natural disasters, conflict and epidemics). Once the relevant papers and reports were identified for inclusion each document was ascribed an evidence grade used by the Department of Health in National Service Frameworks[5] and key data relating to the pharmacy workforce were extracted to matrices see Tables 1 and 2 which were independently checked by the second author. The evidence that did not meet all the Evidence Base 2000 standards were clearly annotated in the matrices.

Results

In total sixty-nine papers were identified for inclusion into the review: 48 peer reviewed papers and 21 non-peer reviewed reports. The majority of the evidence gathered was in the B3 category which was also the highest evidence grade achieved in this review. Details of the peer reviewed evidence are located in Table 1 and details of the non-peer reviewed literature can be found in Table 2. The reports revealed several key areas important in workforce planning and expansion, these are detailed below.

Demographics

The proportion of females within the pharmacy workforce was found to either predominate as observed in Great Britain[6], Canada[7], New Zealand[8], the Republic of Ireland[9] or be increasing as seen in the United States of America between 2000 and 2004[10][11]. The age of practising pharmacists was another important demographic issue presented in the national pharmacist workforce data from these countries. In general the largest proportion of pharmacists was aged between 30 and 45 years[6][7][8][11][12] and the majority of male pharmacists tended to be older than females this was the case in New Zealand[8], UK[6], US[11], Ireland[9] , Australia[12] and Canada[7]. Generally male pharmacists predominated above the age of fifty.

Education

One response to the shortage of pharmacists was found to be a planned expansion of the number of pharmacy graduates which occurred or was recommended in the UK[13], US[14], Australia[12], Canada[15], the Republic of Ireland[9] and Northern Ireland[16]. Expansion was indicated by; an increase in the number of pharmacy schools or increases in enrolments at existing schools or increased numbers of entrants to the profession. However this expansion presented many concerns regarding quality of teaching, the number of available pharmacy-trained faculty and the academic standard of applicants. Additionally, alignment of pharmacy curricula with pharmacy practice was considered important for job satisfaction[17][18] and hence retention of pharmacists.

Distribution
Four important types of distribution became apparent within the pharmacy workforce: urban and rural; private sector and public sector; international migration and movement between workplace sectors. Distribution of pharmacists was found to be uneven with respect to fewer pharmacists employed relative to population in rural or remote locations compared to urban environments[12][3], public or federal sector posts were less likely to be filled compared to private sector positions[19][20][21] and there was greater migration from less developed countries to more developed countries[3][22]. The pharmacist workforces of African countries were disproportionately affected by these trends. Graduates also showed a preference to complete pre-registration training near where they studied as an undergraduate[23][24]; this was of considerable importance when planning recruitment to rural areas in Australia.

Pharmacy technicians
The relative importance of pharmacy technicians within the contemporary pharmacy workforce has been amplified, largely as a reaction to pharmacist shortages. As such, their numbers and responsibilities have been increased [25][26][27]. There was also found to be increased international awareness and support for the certification, registration and regulation of pharmacy technicians, and accreditation of the relevant training courses[28][29][30].

Feminisation
The aforementioned increased proportion of female pharmacists in many countries brought to light specific issues surrounding their work patterns, particularly workforce participation. The prevalence of part-time work amongst female pharmacists was found to be much greater than that of their male counterparts in several countries[16][31] and as a result the full time equivalent contribution of females was lower than males[32]. Females were found to be over-represented in the hospital sector[9][11][16][30] and under-represented in higher status roles such as management in the US[11] and Great Britain[31]. The number of female pharmacy students graduating was also noted to have increased thus giving weight to the fact that female workforce issues will become increasingly important in the future. Reports of females comprising approximately two thirds of all pharmacy graduates were not uncommon[7][21][33][34].

Graduate trends
Graduate trends were important to investigate as they may be used to predict and prepare for future workforce planning issues. A large proportion of pharmacy graduates in the UK intended to take a career break[35] and graduates also showed a preference to complete pre-registration training near to where they studied as an undergraduate[23][24]. The university at which undergraduate training was completed in the UK was also revealed to potentially influence which sector of pharmacy that graduates decided to pursue in their future careers[36]. Growing numbers of young pharmacists and pharmacy graduates originated from ethnic minorities in Great Britain[33][34][37].

Job satisfaction
Job satisfaction was viewed to be an important indicator of staff turnover and retention. Factors increasing pharmacist retention in the US were identified as good remuneration, good relationships with co-workers and flexible schedules. Factors increasing staff turnover included high stress, insufficient or unqualified staff and poor salary[38].

Supply and demand factors
Increased demand or limited supply of pharmacists constrains the ability of the workforce to expand. Many different supply and demand factors that influenced the pharmacy profession

were identified, the majority of which were common to most countries. The most common factors increasing demand for pharmacists were increased feminisation, increased clinical governance measures through continually reviewing and improving the quality of patient care, increased numbers of prescriptions and increased complexity of medication therapy. The most common factors mitigating demand for pharmacists included increased use of technology, expansion in the numbers and roles of pharmacy technicians and increased numbers of pharmacy graduates[9][12][15][16][21][39][40][41].

Discussion

This review adds significantly to the current understanding of the international pharmacy workforce by bringing together and evaluating the relevant literature from around the world. Most of the papers identified for inclusion were of sound methodological quality and each added value to understanding the factors surrounding the expansion of the pharmacy workforce.

The issues surrounding planning and expansion of the pharmacy workforce elucidated from the literature will be discussed in relation to recruitment, retention and attrition.

Recruitment

There are four relatively distinct areas of recruitment, as seen in Figure 1, which may be relied upon as routes to expand the pharmacy workforce; undergraduate, postgraduate, re-entry and foreign pharmacy graduates. The first of these, undergraduate recruitment, is the only process that will lead to expansion of the overall number of qualified pharmacists. The literature suggests that the main methods used to increase the number of qualified pharmacists was to expand the number of students enrolled in current pharmacy courses and increase the overall number of pharmacy courses. Maintaining the quality and prestige of the pharmacy profession by retaining high quality applicants was viewed with great importance and therefore measures should be undertaken to increase the applicant pool in order to select the best candidates for pharmacy. Nevertheless it seems inevitable that if enrolments increase significantly, a lower academic standard of pharmacists will result, especially if the expansion of student numbers is much greater than the expansion of the applicant pool. The academic standards at which the course is set will probably not be achieved by less capable individuals (unless this standard is lowered) increasing the possible numbers which drop-out of the course or those unable to pass a licensing exam where one exists. Also a UK report noted that pharmacy enrolments may also be adversely affected by the increase in the number of medical school positions with the medical profession similarly trying to increase enrolments to redress shortages[13]. Therefore expansions in the number of alternative science-based degree courses may also be a factor limiting the expansion of suitable applicants to pharmacy. Another important issue in the recruitment of pharmacists was the lack of male students entering the pharmacy degree course, the workforce implications of having a high female component have been extensively relayed however the reasons why males and females choose to study pharmacy or choose not to study pharmacy remain unknown.

There was a lack of pharmacy students choosing to undertake post-graduate pharmacy education. This may worsen the pharmacy faculty shortages identified in both the UK and US literature and a decline in the pharmacist to student ratio or a reduced rate of expansion may result if more pharmacist faculty were not also recruited.

Another valuable area for pharmacy recruitment is the current inactive or part-time workforce. However the literature indicates that the capacity for increasing the participation of this proportion of the workforce is minimal either because of the high proportion of female pharmacists with family responsibilities, the high desirability of career breaks and part-time hours or the increasingly early age of (phased) retirement.

The final route of increasing the size of one particular country's pharmacy workforce is to recruit from another country's pool of pharmacy graduates which can be inherently controversial. The increasing migratory flow of the healthcare workforce was of particular concern in developing countries as the majority of migrating pharmacists moved to more

developed countries. While this was seen to benefit the individual for a variety of reasons, when emigration occurred disproportionately it severely hampered the provision of adequate health care to the home nation. Nevertheless, despite the human resource crisis in developing countries the opinion acknowledged by this investigation was not to prevent the flow of migration (partly due to the importance of remittances received by the families of expatriates) but instead to emphasize the need for exchange of professional expertise.

Retention

Retention was frequently reported as being a problem and a number of reasons, illustrated in Figure 2, were identified as being partly responsible for these difficulties. The first to be discussed is the effect of job satisfaction on retention. A theme echoed throughout the literature studied was that alignment of career expectations, aptitude and the pharmacy course content with the actual realities of practising pharmacy was imperative to ensure career satisfaction. Another key issue revealed by the literature regarding pharmacy curricula was that the curricula taught in developing countries was similar to that of developed countries and while this produced highly competent individuals it did not necessarily prepare them for the realities of a career in their own country thus disillusionment and frustration may result in increased emigration to more developed countries, facilitated by the similarity of degree course.

Training and career advancement was also predominant in the literature, especially surrounding the retention of female pharmacists and pharmacy technicians. Female pharmacists, although making up the majority of the workforce were underrepresented in management positions which was shown to be a result of their personal choices influenced by family responsibilities in the UK[42]. In terms of the pharmacy technician workforce, the lack of a 'career ladder' or opportunities for career progression was the most frequent cause of dissatisfaction.

While wider roles were generally welcomed by pharmacists as a chance to make use of a greater breadth of their training it may also be prudent to mention the potential of role overload which may result due to high expectations for service delivery, unless sufficient resources and staffing occur simultaneously or a shifting of roles and responsibilities occur.

Working conditions and workload were also shown to have a significant impact on retention encompassing a wide range of intrinsic and extrinsic factors. Only a limited number of factors adversely affecting working conditions and workload can be tackled by individual employers but wider ranging alterations may call for changes in government legislation or company policy.

Attrition

The loss of participating pharmacists from the workforce needs to be taken into account to obtain a more accurate understanding about the net change in size of the workforce. As seen in Figure 3, three broad forms of attrition were identified from the literature as; temporary, temporary or permanent and permanent loss. In the case of temporary removal from active participation in the workforce, the most significant factor seemed to be the high preference for career breaks within the pharmacy profession. The reasons for this should be explored further; however it may be postulated that with increasing proportions of female pharmacists present in the workforce more females will take time off to raise a family. This may even be facilitated by the growing numbers of chain pharmacies as they are likely to have greater capacity to support maternity or paternity leave compared to independent owner/manager pharmacies. Another factor involved in temporary attrition of the workforce is involvement in training courses. When pharmacists, pharmacy technicians or pharmacy assistants are engaged in a training course they are not providing a service and unless these courses take place outside the hours of normal work they reduce the capacity of the workforce to expand as substitutes will be required to fill these positions. This factor is likely to grow in significance with the sustained emphasis on continuing professional development, continuing education and risk management measures.

Factors affecting the loss of participation in the pharmacy workforce that may either be temporary or permanent were classified as part-time working and migration. The increasing trend of part-time working was largely due to the increased proportion of female pharmacists however it was noted in the US that the number of male pharmacists working part-time also increased between 2000 and 2004, this may not be part of a growing trend but nonetheless this situation should be monitored. Possible reasons for increased part-time working amongst males may be increased salaries due to pharmacist shortages making part-time working more economically viable or perhaps the most likely reason may have been the self-implementation of phased retirement as the majority of male pharmacists were in the older age groups. Nevertheless increased part-time working whether undertaken by male or female pharmacists is a concern for workforce expansion as more pharmacists will be needed to maintain current levels of service provision due to reduced pharmacist full-time equivalent contributions.

International migration of pharmacists can result in a net loss or gain of pharmacists. The exchange of knowledge and skills are valuable, however large or continuous net losses can have serious detrimental affects to the source workforce and in order to minimise the potential damage while maximising the advantages a sound understanding of pharmacist migration must be achieved.

Permanent loss from the workforce: true attrition, was attributed to changing employment to a field outside pharmacy, retirement or death. Not much was known about the numbers of qualified pharmacists working outside pharmacy as unless they remain registered there is no way of tracking these individuals however, a factor increasing the demand for pharmacists was the movement of pharmacists into non-traditional areas of work. The identification of this trend clearly meant that pharmacists involved in these fields remained registered nevertheless, if this set of circumstances changes leakage of pharmacists to ‘other’ employment sectors may go unnoticed.

Retirement can also only be estimated as retired, inactive pharmacists do not legally have to remain registered; however those who do and are over the state pension age have provided very interesting information about the pharmacy workforce. A concerning development was that male pharmacists were generally predominant in the workforce by a considerable margin after the age of fifty and considering that male pharmacists in the overall workforce were in the minority it appears that female pharmacists leave the profession at a much younger age than their male counterparts. Despite this, the majority of pharmacists were found to be aged between thirty and forty-five years therefore, as long as adequate numbers of newly qualified pharmacists and pharmacy technicians enter the workforce to maintain the high proportion of the workforce in younger age groups pharmacy should not be expected to become an ageing profession.

Finally, the death of pharmacists was another factor in the permanent attrition of pharmacists from the workforce. Although the death of pharmacists was not reported to be a problem in any of the literature included in the review, most of the literature was from developed countries with relatively low death rates compared to less developed countries. However, the World Health Report in 2006 revealed that deaths due to HIV and AIDS were alarmingly high within the health workforce in several African countries[1] This raises the question: if healthcare professionals cannot get access to effective treatment what hope do the rest of the population have?

Limitations

This review of literature found a significant amount of information detailing the characteristics of the pharmacy workforce in industrialised countries, however there was significant shortfalls of published information regarding the pharmacist workforce in developing nations and also that relating to the effectiveness of any interventions used to expand the pharmacy workforce. There was also a shortfall of literature relating specifically to the global pharmacist workforce as a whole, the only other international report on the pharmacy workforce was the Global Pharmacy Workforce Report[3] commissioned by the International Pharmaceutical Federation.

Research implications

Further research into why males are increasingly choosing not to study pharmacy and more coordinated monitoring of pharmacy workforce worldwide (particularly in developing countries) is needed. Also, research into why pharmacy students are increasingly not pursuing postgraduate education and what measures can be taken to encourage careers in academia should be undertaken.

Conclusions

To maintain and expand the future pharmacy workforce, increases in recruitment and retention will be essential as will decreases in attrition were possible, however scaling up the global pharmacy workforce is a complex, multi-factorial responsibility that requires coordinated action. The repercussions of any changes made to the pharmacy workforce need to be considered carefully and optimal use of the current workforce should take place.

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For a copy of the full review please contact Prof Claire Anderson
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'The author(s) declare that they have no competing interests'

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Table 1. Record of peer reviewed evidence

Reference	Methodology, research design & evidence category	Key findings
Pharmacist Participation in the Workforce: 1990, 2000, and 2004 Mott DA, Doucette WR, Gaither CA, Kreling DH, Pedersen CA, Schommer JC Journal of the American Pharmacists Association 2006; **46**(3)322-330 US	Three cross-sectional, descriptive studies based on data collected from national studies of the pharmacist workforce conducted in 1990, 2000 and 2004. B3	Over 86% of pharmacists were actively practicing pharmacy at the time of these surveys. There has been a reduction in pharmacists' participation in the workforce between 2000 and 2004 as illustrated by a decrease in the full time equivalent (FTE) contribution which decreased between 2000 and 2004; 0.87 to 0.81 for women and 0.99 to 0.91 for men. The proportion of pharmacists working part time has increased in each year of the survey from 16% in 1990 to 20.6% in 2004. The 31-45 age group contained the highest proportion of male pharmacists in 1990 but in 2004 this was true of the 46-60 age group.
Community Pharmacist's Work Environments: Evidence from the 2004 National Pharmacist Workforce Study Kreling DH, Doucette WR, Mott DA, Gaither CA, Pedersen CA, Schommer JC Journal of the American Pharmacists Association 2006; **46**(3)331-339 US	Cross-sectional study of community pharmacists (independent, chain, mass merchandiser and supermarket settings) based on data collected from the 2004 National Pharmacist Workforce Survey and compared with data obtained from the 2000 National Pharmacist Workforce Survey where possible. B3	Pharmacists were working with more pharmacy technicians in 2004 compared to 2000. The number of prescriptions personally dispensed per pharmacist per day increased significantly between 2000 and 2004 across all settings. The effect of workload on motivation and job satisfaction received the most positive ratings whereas the opportunity to take adequate breaks received the majority of negative ratings. Equipment used in dispensing was more common than that used in patient care. Interestingly approximately half of the pharmacists reported a "neutral" effect of equipment and technology on time spent on dispensing.

Pharmacists' Desired and Actual Times in Work Activities: Evidence of Gaps from the 2004 National Workforce Study Schommer JC, Pedersen CA, Gaither CA, Doucette WR, Kreling DH, Mott DA Journal of the American Pharmacists Association 2006; **46**(3):340-347 US	Cross-sectional study of pharmacies in the US using data collected from the 2004 National Pharmacist Workforce Survey which was compared with data extracted from the 2000 National Pharmacist Workforce Survey where applicable. B3	Pharmacists in chain and independent settings were more likely to report discordance between desired and actual time spent in certain work activities compared with those in hospital or other patient care. Working with other pharmacists or having a higher proportion of pharmacy staff did not appear to alter the desired or actual time spent on the measured work activities. Practice settings were found to be the most influential factor concerning pharmacists' work activities. Across all practice settings there was a desire to spend more time on consultation and drug use management and less time on medication dispensing.
Evaluation of Community Pharmacy Service Mix: Evidence from the 2004 National Pharmacist Workforce Study Doucette WR, Kreling DH, Schommer JC, Gaither CA, Mott DA, Pedersen CA Journal of the American Pharmacists Association 2006; **46**(3):348-355 US	Cross-sectional study of community pharmacy settings (independent, chain, mass merchandiser and supermarket) using the data obtained from the 2004 National Workforce Survey. B3	The most common product related service provided was general/simple compounding. Four pharmacy care services; diabetes management, immunization, smoking cessation and health screening were offered in over 10% of pharmacies. The most widespread information service available was a drug information service. 54.4% of the community pharmacies did not offer any pharmacy care services. Only 10.1% of pharmacies reported receiving payment for non-dispensing services. A positive correlation was discovered between the number of pharmaceutical care services available in community pharmacies and when there were at least 3 pharmacists on duty, the innovativeness of the pharmacy and the status as an independent or supermarket pharmacy.

Should I stay or should I go? The influence of individual and organisational factors on pharmacists' future work plans Gaither CA, Nadkarni A, Mott DA, Schommer JC, Doucette WR, Kreling DH, Pedersen CA Journal of the American Pharmacists Association 2007; **47**(2):165-173 US	Cross-sectional study using data collected from the 2004 National Pharmacist Workforce Survey. B3	The future work plans of 15% of respondents were to leave their current employer within the next year. More than half of the respondents perceived their workload as high to excessively high and that it had increased over the past 12 months. Logistic regression analysis showed that unmarried individuals were 1.7 times more likely to leave than married respondents and non-white pharmacists were twice as likely to leave compared to white respondents. When one main factor influenced leaving commonly it was found to be insufficient and/or unqualified staff and similarly when one main factor influenced staying, flexible scheduling was the most influential.
A Four-State Summary of the Pharmacy Workforce Mott DA, Sorofman BA, Kreling DH, Schommer JC, Pedersen CA Journal of the American Pharmaceutical Association 2001; **41**: 693-702 US	A cross-sectional descriptive survey design was used to collect data on pharmacists in Ohio, Iowa, Minnesota and Wisconsin. Survey participants were selected using random selection in Ohio and systematic random selection in Minnesota, Iowa and Wisconsin. The number of pharmacists surveyed was relative to the resources available in each state. The survey was 12 pages in length except surveys in Iowa which were 4 pages, however it had identical core questions contained in the surveys administered in the other three states. B3	A response rate of 52.4% was achieved. The majority of respondents were male (56%). 24.2% of females worked less than 31 hours per week compared with 6.3% of males. Hourly wage rates for part-time and full-time pharmacists were similar. Management positions accounted for 49% of male pharmacists working full-time compared to 30.4% of female pharmacists. The largest proportion of women was aged between 31 and 45 years whereas the largest proportion of men was aged 46 to 60 years. Out of actively participating pharmacists, 11.4% held an additional job as a pharmacist.

ACCP White Paper- A Vision of Pharmacy's Future Roles, Responsibilities and Manpower Needs in the United States† Maddux MS, Dong BJ, Miller WA, Nelson KM, Raebel MA, Raehl CL, Smith WE Pharmacotherapy 2000; **20**(8): 991-1020 US	A report compiled over two years containing observations, analyses and recommendations regarding the future roles and workforce requirements of the US pharmacy workforce. D	Key findings relating to future pharmacy manpower: A shortage or a surplus may result in the US future pharmacy workforce; dependent upon the extent of increased efficiency in drug distribution with minimum pharmacist engagement and adaptation of the profession to engage in patient care activities. Various factors were identified as either amplifying or diminishing demand for pharmacists. There was a shortage of pharmacy faculty highlighted due to the increased number of pharmacy schools and students, the static number of faculty training programmes and an increased number of pharmacy faculty taking up employment in industry. Increased efforts to recruit more individuals into academic careers were advocated.
Pharmaceutical Education and the Pharmacy Workforce. Should We Expand our Programs? Report of the AACP Argus Commission 1999-2000 *† Cohen JL, Kabat HF, Knapp DA, Koda-Kimble MA, Rutledge CO American Journal of Pharmaceutical Education 2000; **64**: 4S-7S US	A report by the Argus Commission outlining pharmacy workforce issues and how these affect pharmacy education. The Argus Commission consisted of the five most recent past presidents of the American Association of Colleges of Pharmacy (AACP). D	Scaling up pharmacy education by either commissioning new schools or expanding existing schools of pharmacy was recommended to meet an increased demand for pharmacy services. The need and ability for the expansion of pharmacy education was recognised to be determined by local factors. The number of pharmacy applicants has declined since 1995. The shortage of academic pharmacists necessitates enhanced promotion of careers in this area. There was a perceived need for more emphasis on the responsibilities of managing dispensing and drug distribution which was seen to be overshadowed by clinical training.

ASHP national survey of pharmacy practice in hospital settings: Prescribing and transcribing – 2001 Pederson CA, Schneider PJ, Santell JP American Journal of Health-System Pharmacy 2001; **58**(23): 2251-2266 US	A questionnaire was designed and administered to pharmacy directors at 1091 general and children's medical-surgical hospitals. This sample of 1091 hospitals was randomised and stratified by hospital size. B3	A response rate of 49.0% was achieved. Key findings relating to staffing: Averages of 9 FTE pharmacists and 8 FTE pharmacy technicians per hospital were established, however these varied with respect to hospital size. The ratio of pharmacists to technicians was similar across all hospital sizes (range, 1.02 to 1.19). This ratio was described as suboptimal.
ASHP national survey of pharmacy practice in hospital settings: Dispensing and administration – 2002 Pederson CA, Schneider PJ, Scheckelhoff DJ American Journal of Health-System Pharmacy 2003; **60**(1): 52-68 US	A questionnaire was designed and administered to pharmacy directors at 1101 general and children's medical-surgical hospitals. This sample of 1101 hospitals was randomised and stratified by hospital size. B3	A response rate of 46.7% was achieved. Key findings relating to staffing: The average number of FTE pharmacy technicians per hospital was 8 but this varied depending on hospital size. There was an 8.5% decrease in pharmacy staffing between 2001 and 2002. An estimated vacancy rate of 7% was established. There was a decline in pharmacist-to-technician ratio suggesting greater use of pharmacy technicians.
ASHP national survey of pharmacy practice in hospital settings: Monitoring and patient education – 2003 Pederson CA, Schneider PJ, Scheckelhoff DJ American Journal of Health-System Pharmacy 2004; **61**(5): 457-471 US	A questionnaire was designed and administered to pharmacy directors at 1173 general and children's medical-surgical hospitals. This sample of 1173 hospitals was randomised and stratified by hospital size. B3	A response rate of 47.1% was achieved. Key findings relating to staffing: The number of FTE pharmacists per hospital rose substantially from the previous year from an average of 8.6 FTEs in 2002 to 9.4 FTEs in 2003. The average number of FTE pharmacy technicians was 8.6 per hospital, but varied with hospital size. Pharmacist vacancy rate decreased from 7.3% in 2002 to 4.3% which correlated to an estimated 1,846 FTE pharmacist vacancies in hospitals in 2004.

ASHP national survey of pharmacy practice in hospital settings: Prescribing and transcribing – 2004 Pederson CA, Schneider PJ, Scheckelhoff DJ American Journal of Health-System Pharmacy 2005; **62**(4): 378-390 US	A questionnaire was designed and administered to pharmacy directors at 1183 general and children's medical-surgical hospitals. This sample of 1183 hospitals was randomised and stratified by hospital size. Non-responders were contacted up to a maximum of six times. B3	A response rate of 41.7% was achieved. Key findings relating to staffing: The number of FTE pharmacists and FTE pharmacy technicians per hospital varied significantly by hospital size but averaged 9.8 and 9.1 respectively. The FTE pharmacy vacancy level was reported to be 6.3% which correlated to an estimated 3,085 FTE pharmacist vacancies in hospitals in 2004.
ASHP national survey of pharmacy practice in hospital settings: Dispensing and administration – 2005 Pederson CA, Schneider PJ, Scheckelhoff DJ American Journal of Health-System Pharmacy 2006; **63**(4): 327-345 US	A questionnaire was designed and administered to pharmacy directors at 1173 general and children's medical-surgical hospitals. This sample of 1173 hospitals was randomised and stratified by hospital size. Non-responders were contacted up to a maximum of six times. B3	A response rate of 43.5% was achieved. Key findings relating to staffing: The number of FTE pharmacists and FTE pharmacy technicians per hospital varied significantly by hospital size but averaged 10.1 and 9.7 respectively. These staffing levels correlated with increasing numbers of pharmacists and pharmacy technicians in the previous three years. The proportion of vacant FTE pharmacist positions was estimated to be 5.6% which correlated to an estimated 2,759 vacancies at any one time in 2005.
ASHP national survey of pharmacy practice in hospital settings: Monitoring and patient education – 2006 Pederson CA, Schneider PJ, Scheckelhoff DJ American Journal of Health-System Pharmacy 2007; **64**(5): 507-520 US	A questionnaire was designed and administered to pharmacy directors at 1178 general and children's medical-surgical hospitals. This sample of 1178 hospitals was randomised and stratified by hospital size. Non-responders were contacted up to a maximum of six times. B3	A response rate of 39.0% was achieved. Key findings relating to staffing: The number of FTE pharmacists and FTE pharmacy technicians per hospital varied significantly by hospital size but averaged 9.8 and 9.0 respectively. An average of 4.6% of FTE pharmacist positions were vacant.

Challenges To The Pharmacist Profession From Escalating Pharmaceutical Demand† Cooksey JA, Knapp KK, Walton SM, Cultice JM Health Affairs 2002; **21**(5): 182-188 US	Journal article which presented data describing the pharmacist shortage, responses to the shortage and pharmacists' expanding roles. C1	Increased drug use and spending alongside an increased variety of pharmaceutical employment contributed to increased demand for pharmacists. Responses to the shortage of pharmacists included, increasing the number of pharmacy graduates thus moderating supply issues and increasing the use of pharmacy technicians and technology to increase productivity. Increased wages may have attracted new student applicants and the re-entry of pharmacists previously not practising pharmacy. The expanded roles and responsibilities of pharmacists progressed slowly, especially in community where a lack of training was a perceived barrier.
Pharmaceutical services in rural hospitals in Illinois – 2001 Schumock G, Walton S, Sarawate C, Crawford SY American Journal of Health-System Pharmacy 2003; **60**(7): 666-674 US	A questionnaire was designed and mailed to all 71 rural hospital pharmacy directors in Illinois whose acute care facility met the inclusion criteria. Non-responders were contacted on a maximum of five additional occasions. Non-response bias was analysed. B3	Completed questionnaires were returned by 47 participants (response rate of 66%). A greatly increased proportion of hospitals offered more patient care services in 2001 compared to 1991. A vacancy rate of 14% for pharmacist positions and 3% for support staff positions was determined. The most common reasons stated as the cause of vacancies was geographic location and inadequate salary. In response to vacancies, a reduction in clinical pharmacy services and an expansion in technician roles commonly occurred. Vacancies were also reported to affect job satisfaction of pharmacy staff, reduce physician and nursing satisfaction with pharmacy services and increase pharmacy-related medication errors amongst other factors. Rural hospitals were fewer in number, size and patient volume in 2001 compared with 10 years previous but no similar decrease in pharmacy staff had occurred. The ratio of pharmacist FTEs to support staff FTEs was 1.0 to 1.08 and the ratio of pharmacist FTEs to operational beds was 1.0 to 22.6.

Assessment of pharmacy manpower and services in West Virginia* Robinson ET, Bowyer D Research in Social and Administrative Pharmacy 2006; **2**: 359-369 US	A 32 question survey was mailed to a random sample of 548 active pharmacists living in West Virginia, this represented approximately one third of the active register. The survey was followed up with a reminder postcard two weeks after the initial mailing. B3	A response rate of 32.8% was obtained. The gender of respondents was evenly distributed and the proportion working full-time was 78.5%. Out of the disease management programmes surveyed, diabetes management was most commonly offered (38.4%). It was reported that more pharmacists would like to offer disease management services than the proportion of pharmacists who already provided these services. Inadequate staffing levels were viewed by 70% of respondents to be the main barrier to implementing disease management services. The proportions of respondents who reported trying to fill vacant pharmacist and pharmacy technician positions in the last six months was 55.4% and 63.8% respectively. There was a perceived shortage of pharmacists and pharmacy technicians in West Virginia by 81.5% and 54% of respondents respectively. The majority believed the shortage of pharmacists was worse in rural areas.

Update on he national pharmacist shortage: National and state data through 2003* Knapp KK, Quist RM, Surrey MW, Miller LM America Journal of Health-System Pharmacy 2005; **62**: 492-499 US	42 panellists representing organisations employing community pharmacists, institutional pharmacists, and integrated health systems with multiple pharmacist positions provide monthly reports on the difficulties of filling pharmacist vacancies in each state. The Aggregate Demand Index (ADI) is then calculated. Time series analysis was conducted on the data provided to identify trends in ADI from September 1999 to September 2003. National and state trends were identified and time trends for the distribution of ratings and the demand index by practice site were also examined. B3	A very slight downward trend was observed in the severity of the pharmacist shortage from 1999 to 2003; there were slight decreases in ADI ratings equivalent to excess demand, slight increases in those reporting a balance between supply and demand and a slight increase in ratings reporting excess supply. However, 72% of respondents indicated experiencing excess demand for pharmacists which was supported by the fact that the majority of the population (88-98%) lived in areas where filling vacancies was at least moderately difficult. Least difficulty was experienced in filling community pharmacist vacancies and greatest difficulty filling vacancies was reported in organisations. States with the largest populations generally reported the most severe shortages, and states with smaller populations tended to report lower levels of shortages. The ADI in 17 states improved whereas in 30 states it remained the same and in 4 states the ADI worsened between 1999 and 2003.
Predicting the impact of Medicare Part D implementation on the pharmacy workforce Meissner B, Harrison D, Carter J, Borrego M Research in Social and Administrative Pharmacy 2006; **2**: 315-328 US	Univariate and multivariate forecasting models were constructed using retrospective data. The Aggregate Demand Index was the dependent variable. Estimates were calculated for the ADI from January 2006 through December 2009. Historical data on independent variables such as prescription volume among others used in the multivariate forecast were taken from March 2001 through December 2005. B3	The ADI had been decreasing slowly towards a balance of supply and demand. The univariate model predicted that the ADI would continue to decrease levelling out between 3 and 3.5 by 2009 (3 signified a balance of supply and demand) however, relatively large confidence intervals were quoted. Prescription volumes had increased between 2001 and 2005 during which period the ADI had declined slightly. Further increases in prescription volume were estimated following the implementation of Medicare Part D. The demand-to-supply ratio for pharmacists was found to be decreasing alongside increases in prescription volume. The multivariate analysis produced similar results to univariate analysis and indicated that no significant increase in future pharmacist workforce demand would result from Medicare Part D implementation.

An overview of the main findings from the 2003 pharmacy workforce census The Royal Pharmaceutical Society of Great Britain's research and development division The Pharmaceutical Journal 2004; **272**: 750-751 UK	Data from the 2003 pharmacy workforce census were used to produce a summary of the findings. The census excluded pharmacists with overseas addresses, pharmacists above the state pension age and pharmacists who reported they were not employed in the 2002 census. B3	There was an overall response rate of 74.6%. 56% of the respondents were female. 21% of the respondent workforce was not actively participating in pharmacy. Out of the active workforce 72.5% held a position in community pharmacy. More than twice as many women as men work less than 33 hours per week.
Overview of main census findings Hassell K, Shann P The Pharmaceutical Journal 2003; **270**: 314-315 UK	Data from the Pharmacy Workforce Census 2002 were processed and used to present a summary of the findings relating to pharmacists present on the register of the Royal Pharmaceutical Society of Great Britain. B3	There was an overall response rate of 86.2%. Slightly over half of the respondents were female. Twice as many women as men work less than 33 hours per week. Approximately 20% of respondents were not actively participating in pharmacy. 73% of active pharmacists work in community pharmacy and 20% work in a hospital setting. However, just under half of community pharmacists are employed in non-permanent positions.
The national workforce census: (2) Older pharmacists and the pharmacy workforce in Britain Hassell K, Shann P The Pharmaceutical Journal 2003; **270**: 833-834 UK	Data from the Pharmacy Workforce Census 2002 were used to present the findings relating to pharmacists living in England, Scotland and Wales (present on the home register). B3	16.6% of pharmacists on the home register were over the state pension age; of these, 35% were still active in pharmacy and 84% worked less than 33 hours per week. A large proportion of the pharmacy workforce is also approaching retirement age; 15% are aged 50-59.
The national workforce census: (3) The part-time pharmacy workforce in Britain Hassell K, Shann P The Pharmaceutical Journal 2003; **271**: 58-59 UK	Data from the Pharmacy Workforce Census 2002 were used to present the findings relating to part-time pharmacists living in England, Scotland and Wales (present on the home register). B3	33% of pharmacists in Great Britain work less than 35 hours per week (part-time) and of these 73% are female. Part-time work patterns correlate with age and gender however, the reasons for participating in a part-time capacity are wide-ranging.

The national workforce census: (4) Overseas pharmacists- does the "globalisation" of pharmacy affect workforce supply? Hassell K, Nichols L The Pharmaceutical Journal 2003; **271**: 183-185 UK	Data from the Pharmacy Workforce Census 2002 were used to present the findings relating to pharmacists living outside England, Scotland and Wales (present on the overseas register). B3	Overseas respondents accounted for 10.8% of pharmacists registered in Great Britain, of which 8.4% qualified in Great Britain. Migration of other health professionals seems to be of a similar magnitude. Destination of overseas pharmacists is most commonly the United States (14%), Australia (12%), Canada (11%), Hong Kong (11%) and other British destinations. Emigration of pharmacists qualified in Great Britain is greater than immigration of overseas-qualified pharmacists. Overseas-qualified pharmacists constitute 5.5% of the home register.
The national workforce census: (5) The primary care workforce in Britain Mullen R, Hassell K The Pharmaceutical Journal 2003; **271**: 326-327 UK	Data from the Pharmacy Workforce Census 2002 were used to present the findings relating to pharmacists employed in the primary care sector living in England, Scotland and Wales (present on the home register). B3	Primary care pharmacists contribute 6% to the active Great British pharmacist workforce. The majority of this group was white, female and aged 30-39. Approximately half of all primary care pharmacists work in community pharmacy, thereby minimising the impact that the growing primary care sector has on the employment of pharmacists to the community setting.
The national workforce census: (6) The gendered nature of pharmacy employment in Britain Hassell K The Pharmaceutical Journal 2003; **271**: 550-552 UK	Data from the Pharmacy Workforce Census 2002 were used to present the findings relating to the differences between the male and female pharmacist workforce in Great Britain. B3	Females make up 52% of the pharmacist workforce in Great Britain. Twice as many women work less than 33 hours per week when compared to men. Female respondents were slightly under represented in community and academic settings and disproportionately over represented in hospital and primary care settings. Women also seemed to be under represented in hospital management positions.

Career choices, working patterns and the future pharmacy workforce Willis S, Shann P, Hassell K The Pharmaceutical Journal 2006; **277**: 137-138 UK	Data were collected from a longitudinal cohort study conducted on students from 14 schools of pharmacy in Great Britain who were in their third year and would make up the 2006 pharmacy graduate cohort. B3	A 67% response rate was achieved. Women were significantly more likely to be "very certain" that they would be working in hospital in 10 years time whereas the same was true for men who had entrepreneurial intentions. There was a concern that if students' failed to realise their career expectations then exit from the pharmacy workforce may result. Only 8.1% of respondents did not expect to have a career break. A larger proportion of students were "very certain" of practising pharmacy abroad in 10 years time compared to the current proportion of the register living or working abroad (13.6% and 9.5% respectively).
Who will be tomorrow's pharmacists and why did they study pharmacy? Willis S, Shann P, Hassell K The Pharmaceutical Journal 2006; **277**: 107-108 UK	Data were collected from a longitudinal cohort study conducted on students from 14 schools of pharmacy in Great Britain who were in their third year and would make up the 2006 pharmacy graduate cohort. B3	The overall response rate to the survey was 67%. The respondents were predominantly female (71.5%) which supported the growing trend of increased female pharmacy graduates. Another pattern identified was an increase in numbers of both young pharmacists and pharmacy students who originated from ethnic minority groups. The most compelling reason for choosing to study pharmacy at undergraduate level was because it was a science-based subject. However, caution was noted due to a possible misalignment between scientific career expectations and the social science involved in actual pharmacy practice.

Graduate destinations- choices made about preregistration training Willis S, Shann P, Hassell K The Pharmaceutical Journal 2006; **277**: 164-165 UK	Data were collected from a longitudinal cohort study conducted on students from 14 schools of pharmacy in Great Britain who were in their third year and would make up the 2006 pharmacy graduate cohort. B3	The response rate was 67%, of these, 92.7% intended to take up pre-registration training in Britain immediately after graduation. The proportion of preferred pre-registration placements in hospital and community were approximately equal, however hospital placements were more popular among female respondents. Students generally wanted to complete pre-registration training within region or country where they studied which may create recruitment issues outside of these catchment areas. Extrinsic influences primarily impacted on choice of pre-registration posts.
Workforce update – joiners, leavers, practising and non-practising pharmacists on the 2005 Register Hassell K, Eden M The Pharmaceutical Journal 2006; **276**: 40-42 UK	Data regarding the demographics of all pharmacists listed on the 2005 Register of Pharmaceutical Chemists were extracted and presented. C1	The total number of pharmacists on the Register decreased by approximately the same amount that it had been growing during the previous three years (2.5%). This was due to an increase in the proportion leaving the Register and not a decrease in the proportion of new entrants. The proportion of female pharmacists continued to increase albeit more modestly than observed in previous years. Almost 14% joined the non-practising Register Approximately two thirds of new entrants were female, new entrants were also more ethnically diverse compared to the complete Register.

Workforce update – joiners, leavers, practising and non-practising pharmacists on the 2006 Register Hassell K, Seston L The Pharmaceutical Journal 2006; **277**: 576-578 UK	Data regarding the demographics of all pharmacists listed on the 2006 Register of Pharmaceutical Chemists were extracted and presented. C1	There was a growth in the number of pharmacists on the Register of 1.4%. The proportion of female pharmacists showed an increase compared to the previous year. There was also a larger proportion (16%) of pharmacists present on the 2006 non-practising Register than in 2005. The number of new entrants to the Register rose by 8% (an increasing proportion of these had overseas addresses), and in comparison to the previous year the number of pharmacists leaving the Register decreased considerably.
Workforce update – joiners, leavers, practising and non-practising pharmacists on the 2007 Register Seston E, Hassell K, Schafheutle E The Pharmaceutical Journal 2007; **279**: 691-693 UK	Data regarding the demographics of all pharmacists listed on the 2007 Register of Pharmacists were extracted and presented. C1	The Register of Pharmacists grew by 1.9% since the previous 12 months. The percentage of pharmacists on the non-practising Register increased from 16% in 2006 to 17.4% in 2007. The number of pharmacists entering the Register dropped by 319 compared to the previous year. Out of the entrants to the Register in 2007, 95.7% appeared to be “newly qualified” and the remainder were considered to be “re-entrants”. The numbers of pharmacists leaving the Register decreased compared to the previous year and interestingly, roughly equal proportions of men and women left the register, whereas in the past men were significantly more likely to leave than women. There were 142 independent prescribers and 1,257 supplementary prescribers on the Register.

Destination, future intentions and views on practice of British-based pharmacists 5 and 10 years after qualifying Hassell K Pharmacy World of Science 2006; **28**(3): 116-122 UK	A postal questionnaire was sent out to registered pharmacists with addresses in Great Britain in 2003. Overseas pharmacists and pharmacists who were over state pension age or not working at the time of the previous census were omitted. Data relating to two specific cohorts were analysed and compared: those who had been on the Register for five years (qualified in 1997/8) and ten years (qualified in 1992/3). B3	The response rates received from the 1993 and 1998 qualification cohorts was 62% and 58% respectively. The economic activity of a notable proportion of female pharmacists decreases relatively shortly after qualifying, with 13% of the 1993 and 8% of the 1998 qualified respondents being economically inactive in 2003 and 41% of females with 10 years' experience worked part time, compared with 14% of those with 5 years' experience in 2003. Pharmacists with 10 years' experience were more likely to work in primary care and younger pharmacists were more likely to work abroad. Pharmacists working in a community setting were more likely to have a weak desire to practise pharmacy or regret becoming a pharmacist than those working in either hospital or primary care sectors.
A pharmacy study in the West Midlands: (1) Current work profiles and patterns Blenkinsopp A, Boardman H, Jesson J, Wilson K The Pharmaceutical Journal 1999; **263**: 909-913 UK	A questionnaire was designed and posted to all pharmacists up to the age of 65 (and those over 65 years who were still working in pharmacy) within the West Midlands region. B3	The response rate was 68.8%, 90% of the respondents were actively working in pharmacy. 53.1% of respondents were female. Pharmacists in non-white ethnic groups were over represented in community and under represented in hospital sector employment. The majority of respondents worked between 31 and 40 hours per week. One third of locum pharmacists reported working over 30 hours per week. Slightly more than a quarter of respondents described working part-time; the vast majority of these were female.

A pharmacy study in the West Midlands: (2) Changes made and planned for the future Boardman H, Blenkinsopp A, Jesson J, Wilson K The Pharmaceutical Journal 2000; **264**: 105-108 UK	A questionnaire was designed and posted to all pharmacists up to the age of 65 (and those over 65 years who were still working in pharmacy) within the West Midlands region. B3	The response rate achieved was 68.8%. The level of inter-sector mobility between hospital and community settings was small with the majority of pharmacists changing sector being under thirty. Almost a quarter of respondents had reduced their hours. The most common reason reported for changes made to working habits in the last three years was “seeking more interesting work/greater job satisfaction”. 14.4% of the respondents exhibited a preference to change sector of employment and 18.8% reported a desire to leave the profession to pursue another career, in both cases non-white pharmacists were over represented.
A pharmacy workforce study in the West Midlands: (4) Morale and motivation* Boardman H, Blenkinsopp A, Jesson J, Wilson K The Pharmaceutical Journal 2001; **267**: 685-690 UK	A questionnaire was designed and posted to all pharmacists up to the age of 65 (and those over 65 years who were still working in pharmacy) within the West Midlands region. A purposive sample of 80 of the questionnaire respondents were contacted to take part in a semi-structured telephone interviews. B3	The response rate obtained for the questionnaire was 68.8%. Pharmacy was revealed as the first choice of career for approximately two thirds of respondents and 46.1% described their career as satisfying. Interestingly pharmacists working in the community sector were the least satisfied with their careers compared to pharmacists in all other settings. One third of respondents were satisfied with their working conditions and a similar proportion didn’t feel challenged enough by their work. The majority of pharmacists wanted to work more closely with other healthcare professionals (60.4%). Approximately half of the respondents (47.3%) were apathetic towards the future of the profession.

Does community pharmacy offer women family-friendly working conditions and equal opportunities? The accounts of female community pharmacists over the age of 30 Gidman WK, Hassell K, Day J, Payne K International Journal of Pharmacy Practice 2007; **15**: 53-59 UK	Thirty face-to-face, semi-structured interviews were conducted with female pharmacists. These pharmacists were, female, over the age of thirty and living in North West England. Two hundred and forty-two recruitment letters and consent forms were sent to those meeting the sample requirements and a reminder was sent to non-responders. Interview transcripts were analysed until thematic saturation was reached. B3	A response rate of 40% was achieved for the consent forms and from this a purposive sample of thirty respondents were interviewed. Approximately two thirds of interviewees acted as carers for other family members (n=21) and worked part-time (n=19). Many interviewees reported changing their employment patterns due to a change in marital status and family responsibilities. Intrinsic factors such as "age and number of children, availability of informal childcare, views on formal childcare provision, husband's job and contribution to domestic workload" were very important in determining working patterns. Extrinsic factors such as "inflexible working conditions, limited availability of family-friendly contracts, antisocial working hours, long hours, allocation of annual leave, supervisory requirements, remuneration, high-pressure working environment and incompatibility of pharmacy working with formal childcare" were important influences in female work patterns. Discriminatory employment practices were not perceived to be a problem. Employers and policy makers were recommended to reduce extrinsic barriers to female participation in the workforce.

The Implications of Increasing Student Numbers for Pharmacy Education*† Taylor KMG, Bates IP, Harding G Pharmacy Education March 2004; **4**(1): 33-39 UK	Discussion of relevant literature relating to the issues surrounding increasing pharmacy student enrolments. D	There was an increase in the overall number of students attending university from the 1970s to 2000. This increase in numbers was mirrored in pharmacy school intake levels; however there was not a corresponding increase in resources. The demand for pharmacists remained higher than the supply of newly qualified pharmacists despite increased student numbers. New schools of pharmacy were planned to open. The academic standard of applicants was presumed to decrease which may lead to a ”dumbing down” of the course. Computer technology had increased in importance in delivering the course. The number of pharmacy trained academic staff had declined. The number of pre-registration places did not increase in line with the increased number of pharmacy graduates. The implementation of a two tier pharmacy education was perceived.
Pharmacy in Developing Countries* Felicity Smith (2001). In: Pharmacy Practice. Taylor K, Harding G, editors. London: Taylor & Francis, p95-96. UK	A summary of pharmacy education and services in developing countries. D	Egypt was recognised as a country that exports trained healthcare workers, such as pharmacists, to the Middle East, USA, Canada and Western Europe. Pharmacy education varied from country-to-country to adapt to the healthcare needs of the local population. This was evidenced in China where elements of Western and traditional Chinese medicine were taught alongside each other. Universities were predominantly located in urban areas and as such students generally had limited contact, understanding and skills to address health problems in rural areas.

Snapshot of the Australian Public Hospital Pharmacy Workforce in 2005* O'Leary KM, Allinson YM Journal of Pharmacy Practice and Research 2006; **36**(2): 103-106 Australia	A questionnaire was sent to 198 public hospitals identified as having at least 50 beds and who provided hospital pharmacy services. This was followed up by a reminder letter to non-respondents. B3	Responses were received from 99 out of 198 hospitals, however this varied across hospital type and location. There was a decrease in the number of full-time equivalent pharmacist vacancies in 2003 to 7%, however this may be attributed in part to a decrease in the number of positions or non-response bias. There was a slight reduction in the number of pharmacists working part-time (31% in 2005 and 34% in 2003), and a decline in the proportion of pharmacists with postgraduate qualifications (28% in 2005 and 30% in 2003). Despite an increase in pharmacy graduates there was no corresponding increase in the number of pre-registration positions available in public hospitals. The proportion of pharmacy technicians with formal qualifications increased from approximately 38% in 2003 to 45% in 2005. There was a decline in the numbers of pharmacy technicians and relevant support staff in every type of hospital. This may have been due to an increased use of technology, improved efficiency and the introduction of the Pharmaceutical Benefits Scheme.

Snapshot of the Australian Public Hospital Pharmacy Workforce in 2003* O'Leary KM, Allinson YM Journal of Pharmacy Practice and Research 2004; **34**(2): 104-108 Australia	A questionnaire was sent to 303 hospitals with hospital pharmacy services (239 public hospitals and 64 private hospitals). The response rate from private hospitals was too low to be used in the analysis and thus all data analysed related to the 128 public hospital pharmacy service providers that responded. B3	An overall response rate of 54% was obtained however this varied across hospital classification and location. There was a reduction in the number of vacant full-time equivalent pharmacist positions from 2001 (14% reduced to 10%). Approximately one in three pharmacists worked part-time and a similar proportion held postgraduate qualifications. The ratio of pre-registrant positions to full-time equivalent pharmacists was higher in 2003 than in 2001 (1 to 7.8 and 1 to 10.2 respectively). More than 60% of pharmacy technicians did not have any formal qualifications. Important recruitment strategies included; increasing the exposure of pharmacy students to hospital pharmacy during training and registration, accelerated pay within the hospital pharmacy award, using the internet to advertise vacancies and the employment of overseas pharmacists.
Snapshot of Hospital Pharmacy Workforce in Australia O'Leary KM, Allinson YM, Kirsa SW, Jackson JK, Burgess NG Journal of Pharmacy Practice and Research 2002; **32**(1): 72-76 Australia	Hospital pharmacy services were identified in 279 of over 1000 registered hospitals in Australia. A questionnaire was sent to 248 hospital pharmacy services (contact details were unavailable for 31 pharmacy services). B3	101 questionnaires were received which represented a response rate of 41% of those surveyed and 36% of all hospital pharmacy services nationwide. Responses varied by hospital type and location. Vacancies for full-time equivalent pharmacists represented 14% of establishment positions. An average of 32% of hospital pharmacists worked part-time and as such 1.2 pharmacists were required to cover every 1 full-time equivalent pharmacist. The respondents revealed that one third of all hospital pharmacists had postgraduate qualifications. The ratio of pre-registrant positions to full-time equivalent pharmacists was 1 to 10.2. The surveyed respondents reported that pharmacists' time was divided so that 41% was spent on clinical services, 39% on distribution services and 16% on management services. Interestingly 9% of support staff also performed management activities.

Factors affecting the recruitment and retention of pharmacists to practice sites in rural and remote areas of New South Wales: A qualitative study Harding A, Whitehead P, Aslani P, Chen T Australian Journal of Rural Health 2006; **14**: 214-8 Australia	Qualitative semi-structured in-depth interviews conducted on a purposive sample of 12 out of 13 contacted community pharmacists in rural or remote areas of New South Wales. B3	The majority of respondents regarded that having “previously lived in rural areas, availability of better business opportunities, and economic reasons” were the principal motivators for rural recruitment. Retention factors identified for rural pharmacists included; job satisfaction resulting from an extended role, close relationships with customers and other healthcare professionals and rural customers’ increased willingness to accept advice. Factors that negatively impact on recruitment were high workload and the limited availability of locums and face-to-face Continuing Professional Education. The shortage of rural and remote pharmacists was attributed to the increasing proportion of females in the workforce and the difficulty of finding their partner employment, negative preconceived ideas of rural life and pharmacy practice and the rural shortage of doctors.
The First Graduate Cohort at Charles Sturt University: What Impact on the Rural Pharmacist Shortage?* Simpson MD, Wilkinson JM Journal of Pharmacy Practice and Research 2002: **32**; 69-71 Australia	A descriptive study based on data collected from a questionnaire completed in 1999 by pharmacy students in their second and third years at Charles Sturt University and an abbreviated version of the questionnaire filled in by final year students in 2000. In 1999, 69 out of 93 second and third years completed the full questionnaire and in 2000 all of the fourth year students (37) completed the shortened questionnaire. C1	In 1999 the questionnaire results revealed that 65% of respondents wanted a career in community pharmacy, whereas 3-6% were interested in careers in research, industry or hospital and 22% were unsure as to their career preference. The majority of students favoured a career in a rural location (56%), approximately a quarter of students wanted to work in metropolitan areas, no respondent reported wanting to work in a remote area, and 20% were undecided regarding their future career location. The primary reason that influenced the choice of career location was lifestyle (45%). Rural areas accounted for 62% of the confirmed pre-registration location for final year students and 38% obtained placements in metropolitan areas.

Workforce and Service Delivery Analysis across New Zealand Hospital Pharmacy Departments* Plant EA, Norris PT, Tordoff JM Journal of Pharmacy Practice and Research 2006; **36**(4): 271-274 New Zealand	A questionnaire was designed and sent to the chief pharmacist in all thirty public hospitals which employed at least one pharmacist. It was administered in November 2001 and again in November 2003 (with an additional question relating to salaries). B3	The response rate was 83% for both surveys. The number of funded FTE pharmacist increased between 2001 and 2003. Vacancies for pharmacists decreased from 24% to 15% and vacancies for technicians increased from 10% to 14% between 2001 and 2003. The majority of pharmacists and pharmacy technicians were female in 2003 (78% and 95% respectively). Key workforce issues identified were: difficulties recruiting/retaining suitably experienced staff; poor salaries compared to community sector; poor funding; high staff turnover; large number of young pharmacists leaving to work abroad; high dependency on temporary overseas pharmacists; high proportion of females. Also in 2003 it was noted that higher wages for hospital pharmacists existed in Australia, there was a lack of structured career path for technicians and there were high expectations for service delivery but limited funding available.

Pharmacy manpower in Lebanon: An exploratory look at work-related satisfaction* Salameh P, Hamdan I Research in Social and Administrative Pharmacy 2007; **3**(3): 336-350 Lebanon	Cross-sectional descriptive study of registered Lebanese pharmacists actively practising in Beirut and the surrounding suburbs. A systematic random sample was selected where every second name was chosen as a potential participant. These participants were then interviewed and the resulting data was analysed using SPSS software, version 12.0 (SPSS Inc., Chicago, IL)	Out of the 243 selected pharmacists, 229 participated. There were more female than male participants and more single than married pharmacists. Recently graduated pharmacists were present in higher proportions in community and medical representation settings. A small proportion of pharmacists (20%) experienced difficulties in obtaining employment, however, the vast majority of interviewees (96.1%) believed that there was "a lack of opportunities in the pharmaceutical sector". There was a belief that the employment market was saturated. Pharmacists with additional post-graduate qualifications appeared to be employed as a pharmacist for longer than those without additional qualifications. Approximately half of the respondents had remained in their initial job especially academic pharmacists, none of which had changed their career orientation. Pharmacy education curricula were not unified; there were doctorate and bachelor of science degree programmes allowing entry to the same work settings. Curricula were not always aligned with employment activities, especially seen in clinical pharmacy which was taught in some universities but has not yet been implemented in Lebanese hospitals.

Effect of pharmacist emigration on pharmaceutical services in southern Africa†* Katerere DR, Matowe L American Journal of Health-System Pharmacy 2003; **60**: 1169-1170 US	A descriptive journal article providing information about the extent and affect of pharmacist migration in southern Africa. D	Approximately 1000 pharmacy students graduate each year in South Africa and about 40 pharmacists a year qualify in Zimbabwe. In 2001 alone, 600 pharmacists registered in South Africa and 60 pharmacists in Zimbabwe emigrated. Botswana invested in sponsoring students to train in pharmacy abroad, due to having no schools of pharmacy in the country, however few of these students return. Unlike physician consultations, pharmacist advice was delivered free of charge. Public sector and academic pharmacists were in great need. The exchange of professional expertise was favoured as opposed to limiting the free movement of pharmacists.

Migration of health professionals in six countries: a synthesis report* Awases M, Gbary A, Nyoni J, Chatora R World Health Organisation 2004 Available at: http://www.hrhresourcecenter.org/node/61 (accessed 22.03.08) Africa	The study was conducted in Cameroon, Senegal, Ghana, South Africa, Uganda and Zimbabwe. Data was collected using eight different methods: • Questionnaire for Country Survey on Secondary Data on Trends of Migration • Interviews with Professional Informants in the Health System • Questionnaire for Individual Health Workers • Focus Group Discussions with Key Community Stakeholders • Interviews with Key Informants in the Community • Questionnaire for Refugees/Migrants Living Outside their Home Countries • Questionnaire for Returnees • Interviews with internal Migrants, viz. professionals who had moved to the private sector.	The number of health professionals had increased in all six countries studied from 1991-2000, however the increase in the number of pharmacists was less prominent than those observed among dentists and doctors. From 1991-2000 the number of pharmacists registered in Cameroon increased by 79%, in Senegal an increase of 52% was reported and an increase of 8% was experienced in South Africa. There was a marked decrease in the proportion of pharmacists employed in the public sector in South Africa (decrease of 41% from 1998-2002), and in Uganda (decreased from 167 pharmacists in 1993 to 37 in 2000), whereas in Ghana the decrease was marginal. Nevertheless there was a large increase in the number of pharmacists working in the public sector in two Francophone countries; the proportion in Cameroon increased by 71% between 1991 and 2000, and by 83% for Senegal between 1993 and 2000. Additionally the number of pharmacists working in the private sector increased in Cameroon from 50 in 1991 to 90 in 2000 and increased in Senegal from 210 in 1993 to 306 in 2000. The total number of registered pharmacists in Cameroon expanded rapidly during the 1990s. Senegal experienced a fall in the number of pharmacists in the public sector from 1993-1996 to a low of 5% however this improved to 18% in 2000. In South Africa the total number of registered pharmacists increased, however the number working in the public sector decreased from 22% of total pharmacists in 1998 to 12% in 2001. Almost all pharmacists in Uganda work in the public sector. No data on the registration of pharmacists were available from 1991-2000 in Zimbabwe. The number of pharmacists trained in South Africa and Ghana increased over the period studied (increases of 167% and 35% respectively). Ghana didn't produce any pharmacists in 1995 due to industrial action taken by academic staff. Healthcare professionals in different countries and professions cited many migration factors; each had varying levels of importance.

Please note that:
* Denotes that funding was not explicitly declared
† Denotes that no methodology was described

Table 2. Record of non-peer reviewed evidence

Reference	Methodology, research design & evidence category	Key findings
The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists* (December 2000) Department of Health and Human Services, Health Resources and Services Administration and Bureau of Health Professions Available from: http://bhpr.hrsa.gov/healthworkforce/reports/pharmacist.htm (accessed 18.03.08) US	Report to congress conducted by the Health Resources and Services Administration. Data source included published articles from peer-reviewed journals, reports from academic, governmental and private research groups and analyses and reports conducted or commissioned by professional associations and pharmacists. C1	Pharmacists are the third largest group of healthcare professionals in the United States. In the year 2000 there were approximately 196,000 active pharmacists in the US. A shortage of pharmacists existed which was primarily due to an increase in demand together with a limited supply of pharmacists. Demand factors such as prescriptions, administrative volume and complexity of medication therapy all increased. There were increased vacancy rates (especially in the federal sector) coupled with difficulties hiring pharmacists and an increasing workload. The number of active pharmacists was expected to grow from 196,000 in 2000 to 224,500 in 2010.
National Pharmacist Workforce Survey: 2000 Pedersen CA, Doucette WR, Gaither CA, Mott DA, Schommer JC Pharmacy Manpower Project, August 2000 Available at: http://www.aacp.org/site/page.asp?TRACKID=&VID=1&CID=503&DID=3897 (accessed 05.03.2008) US	A questionnaire was designed and delivered to a systematic sample of 5000 pharmacists, 4,895 were presumed to have received the survey. Non-respondents were contacted up to a maximum of 5 times. B3	The response rate was 46%. 88.2% of respondent pharmacists were actively participating in pharmacy 44% of active pharmacists were female. The average age of male full time pharmacists was 46.2 whereas females averaged 37.4 years. The full time pharmacists worked an average of 44.2 hours per week. Second jobs were more prevalent in those working part-time 18% than full-time 12.3%

National Pharmacist Workforce Survey: 2004 Mott DA, Doucette WR Gaither CA, Kreling DH, Pedersen CA and Schommer JC. Pharmacy Manpower Project, March 2006 Available at: http://www.aacp.org/Docs/MainNavigation/Resources/7295_final-fullworkforcereport.pdf (accessed 05.03.2008) US	A random sample of 6,000 pharmacists was obtained these were allocated at random into six groups of 1,000; one group were a hold-back sample, another group received a core survey and three groups received the core survey and one of three supplemental surveys. The final group received the core survey and composite supplemental survey. Non-respondents were contacted up to a maximum of 5 times. B3	The response rate was 33.8%. 86% of respondent pharmacists were actively participating in pharmacy, of these, 45.9% were female. The average number of hours worked per week by full time pharmacists was 43.4. The proportion of pharmacists working with 3 or more technicians increased between 2000 (33%) and 2004 (46%). There was an increase in the proportion of pharmacists personally dispensing more than 160 prescriptions daily; 23% in 2000 and 36% in 2004. Pharmacists generally were more positive towards work in 2004 and turnover intention decreased in all sectors except supermarkets.

Workforce Trends of Pharmacists for Selected Provinces and Territories in Canada Canadian Institute for Health Information 2006 (Ottawa: CIHI, 2007) Available from: http://www.icis.ca/cihiweb/dispPage.jsp?cw_page=hhr_pharm_e (accessed 18.03.08) Canada	Includes information from submissions of annual registration forms from actively registering pharmacists as of October 1 2006. Pharmacists applying for inactive registrations were excluded and data from Manitoba, New Brunswick, Newfoundland and Labrador and Quebec and from the territory of Nunavut were not available. B3	It was revealed that 87.7% of the pharmacy workforce was actively employed in pharmacy. The distribution of pharmacists between urban, rural and remote settings varied greatly across the provinces and territories; the largest proportion of pharmacists in urban settings were in Ontario and British Columbia (91.6% and 89.9% respectively) whereas the largest proportion of pharmacists in rural areas was on Prince Edward Island (19.1%) and the largest percentage in remote areas were in Saskatchewan (21.2%). The percentage of female workforce was greater than male in all the territories/provinces analysed, except in the Northwest Territories where their numbers were equal. The age distribution across the province/territories varied slightly with a higher proportion of pharmacists aged 20-29 years in the Northwest Territories. At least 2/3rds of all new graduates in Ontario, Alberta, British Columbia and Saskatchewan were female. The majority of pharmacists had a single employer and a permanent position. Approximately one third of pharmacists were pharmacy managers in their primary employment position. Community pharmacists account for over 75% of the workforce in all selected provinces.

Hospital Pharmacy in Canada – 2005/06 Annual Report Wilgosh C, Hall KW, Babich M, Johnson N *et al.* 2007 Personal communication Canada	A list of 203 hospital pharmacies was collated; 193 of these met the inclusion criteria which included hospitals with more than 50 acute beds and more than a total of 100 beds. Mental health facilities were excluded. An online questionnaire was designed and Directors of Pharmacy were provided with details of how to log on to the survey website. Resultant data from questionnaires were only included in analysis if more than 25% of key questions were answered. Non-responders received weekly email reminders. B3	The response rate achieved was 74%. Key findings relating to pharmacy human resources: The number of management, pharmacist and pharmacy technician positions increased since the previous survey. The skill mix of the pharmacy workforce and the proportion of pharmacists' time spent on various activities hadn't altered much compared to earlier years. The annual average growth in salary for FTE pharmacy staff had decreased compared to previous years. Pharmacist vacancies were detailed by 73% of respondents, a pharmacist vacancy rate of 13.3% was reported and a reduction in the duration of vacancies decreased to 182 days on average. The technician vacancy rate increased to 2.1%. 11.8% of all pharmacists, 16.2% of management staff and 8.4% of pharmacy technicians were expected to retire within 5 years.

The Pharmacy Technician Workforce in Canada: Roles, Demographics and Attitudes **Part I – Responses to National Survey of Pharmacy Technicians and Assistants** **Part II – Responses to National Survey of Pharmacists (Owners and Managers)** Vision Research March 2007 Available at: http://www.pharmacyhr.ca/ResearchAndReports.aspx (accessed 18.03.08) Canada	A representative sample of 3000 pharmacists were contacted directly and asked to direct the most senior manager or owner to complete a questionnaire designed for them and to pass on another questionnaire to pharmacy technicians on their staff. The findings from the two different questionnaires were interpreted and reported on separately. The response rate varied regionally.	**Part I – Responses to National Survey of Pharmacy Technicians and Assistants:** 2087 completed questionnaires were received from pharmacy technicians. A massive majority of technician respondents were female (94%). Similar proportions of technicians worked in community settings (53%) as in hospital or long-term care facilities (44%). Only 13% of the pharmacy technician workforce reported working less than 30 hours per week. Nearly two thirds of technicians reported intending to remain in the workforce for at least 10 years. The level of education and training of technicians varied greatly. 1.13 full-time equivalent (FTE) technicians per pharmacist were reported in community settings, whereas 1.32 FTE technicians per pharmacist were reported in hospital settings. Generally job satisfaction among technicians was high except relating to opportunities for career development. 84% supported national accreditation of community college programmes and 73% supported mandatory completion of one of these courses. Voluntary certification was supported by 70% of technicians whereas mandatory certification was supported by 62%. At least 84% were somewhat interested in becoming a regulated pharmacy technician. **Part II – Responses to National Survey of Pharmacists (Owners and Managers):** 973 completed pharmacist questionnaires were received. A ratio of 1 technician FTE per pharmacist FTE in community was reported, and a ratio of 1.1 technician FTEs per pharmacist FTE was reported in hospital settings. These ratios were lower than expected. Hospital respondents were twice as likely to have college-educated or certified technicians on their staff as community respondents. Similar proportions of pharmacists and technicians supported national accreditation of technician training programmes (86% and 84% respectively). 65% of pharmacists supported either voluntary or mandatory certification. More experienced pharmacists were generally more willing to support technician's expanded roles and responsibilities.

An Environmental Scan of Pharmacy Technicians (Roles and responsibilities, education and accreditation, and certification) September 2006 Blackburn J, Blackburn and Associates Available from: http://www.pharmacists.ca/content/about_cpha/whats_happening/cpha_in_action/pdf/PharmacyTechniciansEnvironmentalScan.pdf (accessed 21.03.08) Canada	A descriptive report on the demographics, roles and responsibilities and capacity for advancement of pharmacy technicians on a provincial, national and international level. D	Many national organisations have supported and developed policies for expanding the roles of pharmacy technicians, national accreditation of technician courses, regulation, certification, examination and registration. In Alberta pharmacy technicians who passed a voluntary examination became certified. In Ontario technicians may also become certified. Québec had an official category of Assistant-Technique en Pharmacie who had obtained a diploma from a pharmacy assistance course and were allowed to complete a list of delegated tasks. In Australia there were various levels of certification (I-IV) via completion of nationally accredited courses. In Denmark 'pharmaconomists' are qualify after successfully completing a three year course after which they may dispense prescriptions, provide advice on drugs and sell drugs independently of a pharmacist. In New Zealand, pharmacy technicians must hold or be studying for an approved certificate issued by the Pharmaceutical Society of New Zealand which enables them to compound and dispense medication under pharmacist supervision. In the UK voluntary registration of pharmacy technicians with the Royal Pharmaceutical Society of Great Britain was available. In the United States a national, voluntary certification programme was developed through the Pharmacy Technician Certification Board.

Environmental Scan of Pharmacy Technicians * September 2001 MacInnis M, Power B, Cooper J Available at: http://www.pharmacists.ca/content/hcp/resource_centre/practice_resources/pdf/pharmacy_technicians.pdf (accessed 21.03.08) Canada	A report on the roles, responsibilities, training and certification of pharmacy technicians nationally, provincially and internationally. D	There was no national body responsible for accrediting pharmacy technician-training programmes. It was recognised that technicians required more specialised skills to work in hospital settings and that their roles were more defined than community pharmacy technicians. Ontario and Alberta were the only two provinces to have developed voluntary certification programmes. The United States had a national, voluntary certification exam and accredited pharmacy technician-training programmes. The United Kingdom had nationally recognised courses for medicines counter assistants, dispensing assistants and dispensing technicians. Australia had a four-level, nationally recognised, accredited training programme for pharmacy assistants. In New Zealand a pharmacy technician must hold a certificate from the Pharmaceutical Society of New Zealand and a National Certificate in Pharmacy (Technician).

A Situational Analysis of Human Resource Issues in the Pharmacy Profession in Canada May 2001 Prepared by Peartree Solutions Inc. Available at: http://www.pharmacyhr.ca/Articles/Eng/68.pdf (accessed 18.03.08) Canada	Review of the relevant literature on pharmacist workforce issues in Canada. Data included was from relevant literature, internet sites and public databases. Twenty three pharmacists were also interviewed to gather their views on issues affecting the pharmacy workforce. B3	Nearly 80% of Canada's pharmacists worked in the community sector. Traditional signs of a labour shortage in pharmacy were evident such as, low rates of unemployment, increased numbers of vacancies which took longer times to fill, increased overtime and increased wages in excess of the cost of living. It appeared that there was increased difficulty in recruitment and retention of pharmacists in rural areas. Increasing demand for pharmacists was thought to be due to several professional and business related factors. Supply factors were also explored. The average retirement age in Canada had dropped below the age of sixty. A key barrier to the expansion of pharmacists' roles beyond dispensing services was the lack of compensation. There was no available evidence regarding the cause of the pharmacist shortage or the predictable future demand and supply issues. Data available were often "inconsistent, incomplete and, therefore [an] incoherent picture of the labour market for pharmacists". More data were required to prepare a model for the future demand and supply of pharmacists.

Blueprint for Pharmacy revised draft 5.6†* February 2008 Personal communication Canada	Development of a strategic plan for the future pharmacy profession in Canada. Draft based on pharmacy consultation, no methodologies detailed. D	Five strategic areas requiring action were identified to fulfil future advancement of the pharmacy profession in Canada these included; pharmacy human resources, education and continuing professional development, information and communication technology (ICT), financial viability and sustainability and legislation, regulation, and liability. With regards to pharmacy human resources the strategy included; gaining a better understanding of job satisfaction of pharmacists and pharmacy technicians, supporting international pharmacy graduates, promotion of best practices to improve efficiency of the workforce and increasing the level of qualification, responsibility and accountability of pharmacy technicians.

Pharmacy workforce census 2005: Main findings Hassell K, Seston L, Eden M August 2006 Available at: http://www.rpsgb.org.uk/pdfs/census05.pdf (accessed 07.03.2008) UK	A comparative analysis was conducted on all registered pharmacists using data extracted from the Register on 6th August 2004 and 5th August 2005. The second component of the census was a postal questionnaire sent out to registered pharmacists with addresses in Great Britain. Overseas pharmacists were excluded from the census.	There was a slight decline in membership numbers between 2004 and 2005 which was largely attributed to the introduction of a two part register of practising and non-practising pharmacists. Notably there was an increase of 300 entrants in 2005 compared to 2004. As observed in previous years, the 30 to 39 age bracket accounts for the majority of pharmacists. The response rate to the mailed survey was 76.6%. Since the survey in 2003 there was an increase in the participation of pharmacists in 2005 (78.8% and 81.2% respectively). 14% of registered pharmacists were recorded on the non-practising Register. The proportion of pharmacists employed in the community sector has decreased since 2003 by approximately 2% but was still the sector employing the majority of pharmacists (70.1%). The average hours worked per week for active pharmacists in Great Britain was 35 hours. This represented an increase of three hours from 2003. There was a slight decrease in the proportion of pharmacists working part-time compared to 2003. Generally high levels of job satisfaction were reported.

Pharmacy workforce census 2003: Main findings Hassell K July 2004 Available at: http://www.rpsgb.org/pdfs/census0309.pdf (accessed 07.03.2008) UK	A comparative analysis was conducted on all registered pharmacists using data extracted from the Register on 10th August 2002 and 8th August 2003. The second component of the census was a postal questionnaire sent out to registered pharmacists with addresses in Great Britain. Overseas pharmacists and pharmacists who were over state pension age or not working at the time of the previous census were omitted. B3	The Register exhibited a growth of 2.4% from the previous year (equivalent to 1118 pharmacists). The pharmacist workforce consisted of 52.2% female members. Similarly to last year the largest proportion of pharmacists was aged between 30 and 39 years, although the less than 29 age group saw the largest increase in number, possibly due to increased student numbers. The questionnaire elicited a response rate of 74.6%. The proportion of pharmacists actively contributing to pharmacy declined from 2002 to 79%. The community sector was still the largest employer of pharmacists. However the hospital and primary care sectors had increased the number of employment opportunities for pharmacists and as a result the number of pharmacists employed within these sectors increased over the year studied. There was low cross-sector mobility observed when compared with 2002 data. There was a decrease in the average number of hours worked per week in the active pharmacy profession during 2002-2003 (35 and 32 hours per week respectively). The desire to practice pharmacy was generally “strong”, however this seemed to decrease with advancing age.

Pharmacy Workforce Census* Hassell K, Shann P February 2003 Available at: http://www.rpsgb.org/pdfs/census03.pdf (accessed 07.03.2008) UK	All pharmacists registered with the Royal Pharmaceutical Society in August 2002 were requested to complete a postal survey. B3	A high response rate of 86.2% was obtained. 52.6% of the respondents were female. The largest proportion of pharmacists were aged 30-39 years. Approximately 20% of the workforce were not actively participating in pharmacy. Of those in active pharmacy employment 73% work in the community, 20% in hospital, 6% in primary care and 12% in other settings (some respondents had more than one job). Almost two thirds of primary care pharmacists have two or more jobs. The majority of pharmacists (39.6%) work between 33 and 40 hours per week. More than double the proportions of females work less than 33 hours per week compared to males (40.3% and 19.4% respectively).
Future Pharmacy Workforce Requirements; Workforce Modelling and Policy Recommendations Executive Report Guest D, Battersby S, Oakley P March 2005 Available at: http://www.rpsgb.org/pdfs/futphwfreqexecrept.pdf (accessed 10.03.2008) UK	The report is based on data collected through a many different techniques, these included; an analysis of published and unpublished literature, interviews with a sample of representatives from different pharmaceutical sectors, a Delphi exercise among the Advisory Group and attitude surveys among samples of pharmacists and pharmacy technicians. B3	A dynamic pharmacy workforce model based on predefined assumptions and demand/supply factors was established. There were three key issues highlighted that increased cross-sector demand for pharmacists; “Professional Quality Assurance”, “Organisation of Pharmacy Provision” and “Healthcare Expansion”. Sector-specific assumptions of factors affecting the supply and demand of pharmacists were listed. Projections of the demand and supply of pharmacists revealed a deficit of 16,752 by 2013. Recommendations were made to alter the supply and demand assumptions that the workforce model was based on in order to cause convergence of demand and supply.

Supply Of and Demand For The Pharmacy Workforce In Great Britain Hassell K May 2003 Available at: http://www.pharmacy.manchester.ac.uk/cpws/publications/Reports/supply.pdf (accessed 13.03.2008) UK	This report was used to inform decisions regarding recommendations to end the control of entry regulations for community pharmacies in the UK. Data were obtained from several sources, these included; The Pharmacy Workforce Census conducted in 2002, Universities and Colleges Admissions Service, the Royal Pharmaceutical Society of Great Britain, The Pharmaceutical Journal and the Office of Fair Trading report titled The control of entry regulations and retail pharmacy services in the UK, 2003. C1	The proportion of inactive pharmacists in the UK pharmacy workforce was 30%, consisting of pharmacists who lived or worked overseas, unemployed pharmacists and those registered pharmacists who work outside pharmacy. Approximately 14% of "inactive" pharmacists and those working outside pharmacy thought they would return to pharmacy within 12 months. The rate of entry of overseas pharmacists increased in 2001 and 2002 compared to previous years. The numbers of pharmacists trained in Great Britain leaving the UK to work overseas exceeded the numbers of overseas pharmacists joining the Register. There appeared to be a shortage of pharmacists to meet the pre-existing level of demand in community pharmacy, if demand was added to by removal of the entry regulations this may worsen the shortage.

Comprehensive Review of the Pharmacy Workforce KPMG Consulting for the Department of Health, Social Services and Public Safety. May 2001 Available at: http://www.dhsspsni.gov.uk/wfp_comprehensive_review_of_the_pharmacy_workforce.pdf (accessed 10.03.08) UK	This review of the pharmacy workforce was conducted in Northern Ireland. Data was collected from a variety of sources including; a literature review and desk research, twenty semi-structured face-to-face key informant interviews, focus groups included forty five participants and a Pharmacist Workforce Telephone Survey which consisted of a structured questionnaire was administered to a cross-section of 500 pharmacists in Northern Ireland during the period of February to April 2001. B3	The Pharmaceutical Society of Northern Ireland (PSNI) had 1699 registered pharmacists with male and females represented in equal proportions. 69% of these were actively practising pharmacy. 109 pharmacists joined the PSNI register while 105 pharmacists left the register in the previous 12 months. Out of the survey respondents the majority of active pharmacists worked full-time (78%) and in the community (81%) where 58% reported working in an independent pharmacy. 21% of respondents reported pharmacist vacancies at their workplace (with a larger proportion for hospital pharmacists). Almost one fifth (18%) of respondents reported intentions of leaving active pharmacy either for a career break or to retire. The factors most likely to motivate retention of pharmacists were reported to be, “Increase in salary and benefits” (84%), “More opportunity to use and develop clinical skills” (73%), “Closer working relationships with other healthcare professionals” (72%) and “More flexible working practices” (70%). The majority of pharmacists reported perceived levels of under-staffing of both pharmacists and pharmacy technicians.

Assessing Supply in Relation to Prospective Demand for Pharmacists in Ireland Report to the Higher Education Authority Peter Bacon and Associates 1999 Previously available at: http://www.hea.ie/uploads/pdf/Pharm%20Report.pdf (accessed 13.03.2008) Ireland	A series of interviews with relevant organisations and individuals was conducted and data was collected from the Pharmaceutical Society of Ireland register amongst other appropriate sources. A brief questionnaire was also used to survey Health Boards and Hospitals to gather an indication as to how many pharmacist posts were filled or vacant in this sector. B3	It was suggested that the admission criteria to the pharmacy degree programme was above the level of academic ability required to carry out a career in pharmacy and as a result may lead to pharmacists' aspirations being unfulfilled. The number of registered pharmacists did not correlate with the number of pharmacists actually working or available to work in Ireland. There was an increase in the proportion of younger, female pharmacists registering, however as a large number of these weren't employed in Ireland therefore the actual age of the workforce was older. Female pharmacists appeared to have a longer working life than their UK counterparts. The community sector was the largest employer of pharmacists. There was a large shortage of hospital pharmacists and many hospitals operated without any pharmacist cover. An increase in the number of Irish pharmacy graduates by 50 each year was recommended to meet future manpower requirements.

Study of Demand and Supply of Pharmacists, 2000-2010 Health Care Intelligence Pty Ltd, Australia February 2003 Available at: http://www.guild.org.au/uploadedfiles/Research_and_Development_Grants_Program/Projects/2001-501_fr.pdf (accessed 10.03.2008) Australia	Quantitative and qualitative data obtained from primary and secondary sources. The main source of primary data collection involved two questionnaires mailed to a stratified sample of pharmacists; other sources included interviews with key informants, two workshops with the National Pharmacy Workforce Reference Group and a survey of hospital pharmacy services. Secondary data sources included net migration data, current and future graduate supply, data from the Australian Institute of Health and welfare regarding registration data and distribution of pharmacists between sectors and Australian Bureau of Statistics for labour force data from 1996. B3	The supply data estimated a growth rate in the pharmacy workforce of between 1.98% and 2.38% depending on workforce loss by 2010. An overall demand was predicted to increase from 13,100 full-time equivalent pharmacists in 2000 to 17,200 in 2010. A shortfall of approximately 3,000 full-time equivalent pharmacists was predicted by 2010. Five main targets to increase supply were identified; increase the numbers of pharmacists entering the Australian labour workforce from overseas, increase the graduate supply, decrease loss from the workforce, increase the emphasis of labour substitution and further pharmacy rationalisation.

Pharmacy council of New Zealand Workforce Demographics as at 30 June 2007*† Pharmacy Council of New Zealand Available at: http://www.pharmacycouncil.org.nz/news/documents/WebsiteReportJuly07_000.pdf (accessed 25.03.2008) New Zealand	Information from the public Register of pharmacists as of 30th June 2007 was presented. C1	The Register consisted of three parts; practising, non-practising and interns. The proportion of practising pharmacists had grown by 3% since 2006. Females comprised 57% of the practising Register. There was more than double the number of female pharmacists than male pharmacists in the 36-45 age groups. This trend was reversed in the 56-65 age groups. A very small proportion of the practising Register (0.2%) was recorded as living overseas. Community pharmacy accounted for 74% of pharmacists' place of work and hospital accounted for 12%. There was a 70% reduction in the number of Certificates of Identity issued, which were required to register overseas. This was most likely due to changes in the regulations for pharmacist registration in the UK and Ireland. The number of pharmacists who registered in New Zealand via reciprocal or legislative agreements numbered 40.

Skilled health professionals' migration and its impact on health delivery in Zimbabwe Abel Chikanda Centre on Migration, Policy and Society Working Paper No. 4 University of Oxford, 2004 Available at: http://www.compas.ox.ac.uk/publications/Working%20papers/WP0404.pdf (accessed 18.03.08) Zimbabwe	A questionnaire survey involving face-to-face interviews was completed by respondents selected from the Ministry of Health and Child Welfare, individual health workers, key informants, migrant and returnee health workers and people who use the health system. One tertiary hospital, five regional and six district hospitals, two schools of nursing and the Medical School at the University of Zimbabwe were included in the study. B3	Data about pharmacist staffing patterns in public health institutions were largely unavailable. At the beginning of 1997 there were 524 pharmacists registered in Zimbabwe however only 18.7% of the required public health sector posts were filled. This was worsened by recruitment drives from overseas countries, notably the UK. 68% of survey respondents were considering leaving the country; the majority of these, 29%, reported the UK as their preferred destination. The most common reasons for emigration of healthcare professionals were economic (largely to receive better remuneration) and also to achieve better living conditions. It was noted by 87% of respondents that public sector salaries were not competitive. The questionnaire revealed that the main factors motivating the retention of healthcare professionals in Zimbabwe were better salaries, better fringe benefits and a more pleasant and caring work environment. It was inferred that a proportion of health professionals migrate into the private sector in order to obtain adequate resources to allow migration overseas.

Global Pharmacy Workforce and Migration Report – a Call for Action* Chan XH, Wuliji T 2006 Available at: http://www.fip.org/www2/subsections/index.php?page=menu_resourcesforhealth (accessed 09.03.2008) International	Surveys were sent out to all International Pharmaceutical Federation (FIP) Member Organisations. Three surveys were developed to focus on; pharmacy workforce, Continuing Professional Development (CPD) and Continuing Education (CE) and migration of pharmacists. B3	**Pharmacy workforce survey** 34 out of 83 member organisations responded. There were a greater number of pharmacists per 100,000 in higher income countries. This ratio varied hugely between countries. Gender imbalances vary geographically; the highest female proportion was in Europe (63%), the highest male proportion was in the Western Pacific/South East Asia region (59%). The majority of pharmacists worked in the community or hospital with Europe having the highest proportion in community pharmacy, and the Western Pacific/South East Asia having greatest numbers in hospital pharmacy. However, there were large amounts of missing data. Urban/rural and public/private sector disparities existed in pharmacist distribution. In Central Uganda approximately 90% of the pharmacists serve a quarter of the population. A significant number of trained pharmacists were unemployed. In 13 of the respondent countries there was a legal requirement for the certification of all pharmacy technicians. **Continuing Professional Development and Continuing Education survey** 17 countries out of 34 countries that responded to the workforce survey replied. Only 3 countries identified having specific CPD systems in place (Japan, UK and Portugal). CPD/CE is not mandatory in the majority of countries. Accreditation of CPD/CE providers was mandatory in only three countries. **Migration of pharmacists** There was a lack of detailed information regarding migratory data for pharmacists. Migration affected low income source countries the most. Greater migration was observed between countries which had reciprocal agreements in place.

Please note:
* Denotes that funding was not explicitly declared
† Denotes that no methodology was described

Figure 1. Potential areas of recruitment to the pharmacist workforce

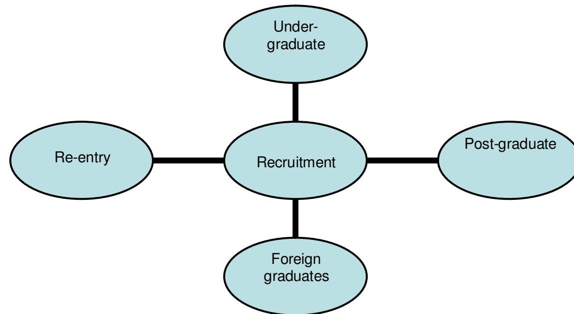

Figure 2. Factors affecting pharmacist retention

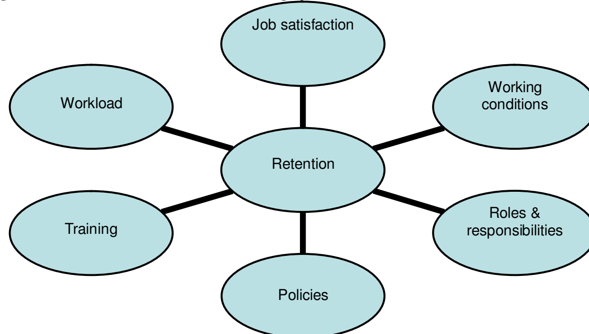

Figure 3. Forms of attrition in the pharmacy workforce