

The Pharmacist Workforce

A Study of the Supply and Demand for Pharmacists

Department of Health and Human Services
Health Resources and Services Administration
Bureau of Health Professions



Report to Congress
The Pharmacist Workforce:
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EXECUTIVE SUMMARY

In December 1999, in response to mounting concern regarding a possible shortage of licensed pharmacists in the United States, Congress directed the Secretary of Health and Human Services, through the appropriate agencies of the Public Health Service, to

- conduct a study to determine whether and to what extent there is a shortage of licensed pharmacists;
- seek comments from appropriate public and private entities regarding any such shortage.

This requirement, set forth in Section 5 of the Healthcare Research and Quality Act of 1999 (Pub.L.106-129), mandated a report to Congress, within one year of enactment of the statute, conveying the study findings. This report is the Secretary's response to that mandate.

The evidence clearly indicates the emergence of a shortage of pharmacists over the past two years. This shortage is considered a dynamic shortage since it appears to be due to a rapid increase in the demand for pharmacists coupled with a constrained ability to increase the supply of pharmacists. The factors causing the current shortage are of a nature not likely to abate in the near future without fundamental changes in pharmacy practice and education.

Pharmacists represent the third largest health professional group in the U.S. with about 196,000 active pharmacists in 2000. Pharmacists are the health professional specifically trained in dispensing prescription medications and providing a growing number and range of pharmaceutical care services that are critical to high quality health care and medication use. Most pharmacists are employed and practice in community pharmacies or drug stores, hospitals and medical centers, other retail stores with pharmacies (grocery stores and mass merchandising stores), and other institutional settings such as long-term care facilities. Smaller numbers of pharmacists are employed by pharmaceutical manufacturers, managed care and health insurance plans, governments, consulting groups, home health care, and universities.

ORGANIZATION OF KEY FINDINGS

This Report consists of an executive summary, introduction, five chapters, and an appendix. The first chapter describes the current acute shortage of pharmacists and highlights factors associated with the shortage. The second chapter addresses the factors influencing the demand for pharmacists in various work settings. Chapter 3 describes the range of services provided by pharmacists and their important role in assuring quality and prevention of errors in pharmaceutical care. The fourth chapter takes a broad perspective in describing the supply of pharmacists and their education and training. The fifth chapter summarizes the comments received from almost fifty public and private sector respondents. The Appendix shows numbers of graduates by pharmacy schools for each State.

Chapter 1: The Pharmacist Shortage

While the overall supply of pharmacists has increased in the past decade, there has been an unprecedented demand for pharmacists and for pharmaceutical care services, which has not been met by the currently available supply. This current shortage may reflect an extension of a less serious shortage reported during the 1988 to 1994 period.

The most striking evidence of a pharmacist shortage, and the extent of the shortage, are the

- demonstrably increased vacancy rates, difficulties in hiring, and other phenomena commonly associated with shortages; and
- unprecedented increases in the volume and range of activities demanded of today's pharmacist. The increased volume is manifested most convincingly by the sharply increased number of prescriptions filled each year in retail settings. The increased range is manifested by the substantially expanded roles and responsibilities of pharmacists in both retail and institutional settings.

Factors identified as contributing to the shortage include

- increased use of prescription medications;
- market growth and competition among retail pharmacies resulting in increased pharmacist positions, expanded store hours, and new store openings;

- expansions in pharmacy practice and pharmacists' roles and professional opportunities;
- increased access to health care and the increased number of health care providers authorized to prescribe medications;
- changes in the pharmacist workforce, including the greater number of women pharmacists and their shorter work patterns; and
- the double impact of increased insurance coverage for prescription drugs, resulting in an increase in both prescription volume and the number of third-party payment issues that need to be resolved.

Consequences of the shortage include a negative impact upon the profession and the public resulting in

- reduced time for pharmacists to provide patient counseling - a role of increasing importance in light of the expanded use and complexity of medications;
- job stress, inadequate working conditions, and reduced professional satisfaction due to longer working hours and lesser flexibility in scheduling, and introducing fatigue-related factors that increase the potential for medication error;
- service restrictions particularly affecting underserved or otherwise vulnerable sectors of the population such as the elderly, residents of rural communities, individuals with mental illness who are on medication, and persons dependent on publicly-supported services such as Native Americans and veterans;
- recruitment of pharmacy practice faculty away from schools and colleges of pharmacy, hampering schools' ability to increase class size.

Several key associations within the pharmacy profession have presented their perspectives on the shortage, with the following comments:

"The demand for pharmacists is accelerating at a rate unanticipated just a few years ago." (Association of American Colleges of Pharmacy, Argus Commission)

"Pharmacy will, within the next decade, transform itself from a primarily product-centered profession to a patient-care oriented profession." (American College of Clinical Pharmacy)

"The (pharmacy) manpower shortage is a long-term problem for which there is no single solution." (National Association of Boards of Pharmacy)

A white paper issued jointly by the National Association of Chain Drug Stores, American Pharmaceutical Association, and National Community Pharmacist Association emphasized the need for augmenting the pharmacist's resources through the appropriate use of pharmacy technicians and the enhanced use of technology (automation, robotics, electronic transmission of prescriptions). The need for improving the efficiency with which third-party payment matters are handled, through the use of a standard pharmacy benefit card, standard electronic billing, and payment for pharmacist services other than dispensing, was also emphasized.

Chapter 2: Factors Influencing the Demand for Pharmacists and Pharmaceutical Care Services

Each employment sector for pharmacists has shown evidence of increasing demand for pharmacists with increasing demand in one sector affecting the supply of pharmacists available to other sectors. Thus technology advances, market changes, and other professional opportunities have all contributed to a dynamic employment market for pharmacists within the last few years. Some of the most notable chapter findings include the following:

- The number of retail prescriptions dispensed per year in the United States increased 44% between 1992 and 1999, from 1.9 billion in 1992 to 2.8 billion prescriptions in 1999. The estimated annual number of prescriptions filled per pharmacist in retail pharmacies grew from 17,400 in 1992 to 22,900 in 1999, an increase of 32%.
- A key factor hampering the ability of retail pharmacists to respond to the sharp increase in prescription volume is the concomitant growth in third-party payment and the administrative time burden thereby generated, taking an estimated 10 to 20% of their time.

- The growth in demand for pharmacists in hospital settings is largely due to the increased complexity of medication therapy and the need for proper drug selection, dosing, monitoring and management of the entire drug use process to assure quality and cost-conscious use patterns. The demand for pharmacists in the institutional sector, including both long-term care and home care, remains strong.
- Pharmacy vacancy rates in the Federal sector have risen dramatically in recent years, reaching 11% in the Public Health Service and 15-18% in the armed forces. The Department of Veterans Affairs and Native American health centers have some facilities with less than half of their authorized pharmacist positions filled. Efforts to recruit and retain pharmacists are hampered by substantial disparities between public and private compensation packages. These problems were also reported as adversely affecting public hospitals and rural pharmacies.

Chapter 3: Expanding Professional Roles, Quality of Pharmaceutical Care, and Prevention of Medication Errors

The pharmacist practicing today provides a much broader range of services than was offered even ten years ago. The profession has embraced the concept of pharmaceutical care which extends the pharmacist's role to providing medication therapy that continues through to the goal of improved patient outcomes. Pharmacists are engaged in efforts to improve the quality of the drug use process and to identify ways to reduce medication errors. Key findings relevant to these issues include the following:

- The issue of quality of care as it pertains to pharmacists is particularly relevant at this time, in light of the existing shortage. A 1999 Institute of Medicine report, "To Err is Human: Building a Safer Health System," noted the important role that pharmacists play in reducing medication error. The report emphasized the importance of human factors - maintaining reasonable working hours, workloads, and staffing ratios, and avoiding distractions - in keeping errors to a minimum.
- The expanding role of pharmacists increases as medications become increasingly complex and diverse, and the potential for their misuse continues to grow. In addition to counseling patients on the proper use of medication, the role of today's pharmacist includes drug monitoring and disease management for defined conditions; participating in multidisciplinary clinical care teams; consulting on drug utilization programs, supporting health services research on outcomes of care; providing drug information; patient education; formulary management; and furthering public health initiatives such as smoking cessation programs, diabetes education and immunizations.
- New drugs are appearing on the market at a faster rate. Some of these new drugs have gained almost immediate widespread acceptance, requiring continual updating of the pharmacists' information base and maintaining ongoing skills in counseling patients and other members of health care teams.
- With the unprecedented increase in drug diversity and complexity, medication error in the United States has reached alarming proportions. According to one source, adverse drug reactions may be responsible for more than 7,000 deaths annually. The overall cost of drug-related morbidity and mortality has been estimated to be between \$77 billion and \$136 billion per year.
- Studies have shown that pharmacists can contribute to reducing the cost of healthcare while at the same time improving patients' use of medications and health outcomes. The savings have been demonstrated both in the hospital and ambulatory settings.
- Studies have also shown that pharmacists have an important role in preventing medication errors. Further investigation of ways to maximize this role is critical for both institutional and community pharmacy practice.

Chapter 4: The Supply of Pharmacists and Pharmacy Education and Training

The overall number of active pharmacists is expected to grow by 28,500 in the next ten years, from 196,000 in 2000 to 224,500 in 2010. This is slightly less than the total growth the past decade (29,300). But given the current shortage this decline in growth rate takes on greater significance. Issues related to the number of active pharmacists include the following:

- One cause of the slower growth has been the changes in pharmacy graduates. The recent decline in pharmacy graduates (in the late 1990s) has been accompanied by a corresponding decline in numbers of applications to pharmacy schools. The number of applications in 1999 was 33 percent lower than it had been in 1994, the high point over the past decade.

- As with many professions, pharmacy has seen increasing numbers of women enter the profession over the last three decades. In 1970, women pharmacists accounted for 13% of the workforce progressing to 18% in 1980, 32% in 1990 and 46% in 2000. This advance had occurred primarily because of increases in women graduates from pharmacy schools. In the setting of a workforce shortage, the tendency of women pharmacists to elect part-time work and to work fewer hours has become an important issue.
- Pharmacist supply, expressed as a ratio with respect to population, varies considerably from State to State. In 1991, during the last nationwide census, the number of pharmacists per 100,000 population varied from a low of 39 in Alaska to a high of 103 in Nebraska. The nationwide average was 68, up from 65 in 1978. Among States with the largest populations, California, with only 54 pharmacists per 100,000, was well below the national average.
- The majority (slightly over 60%) of the nation's pharmacists are employed in the retail or community pharmacy sector and about 29% are employed in institutional settings, principally hospitals.
- The education of pharmacists has been changing to emphasize the optimal use of medications in the care of patients. Related to this, there has been a nationwide conversion from the Bachelor of Science in pharmacy to the Doctor of Pharmacy (PharmD) degree--a change that has lengthened the education program and increased the amount of practice experience. This conversion, which is now almost complete, has required additional faculty and other resources within schools of pharmacy and has reduced the number of graduates throughout the transition period.
- Pharmacy residencies and fellowships, postgraduate professional programs, are an important mechanism for the training of pharmacy practice faculty, clinical practitioners with specialized skills, and researchers in the medication use process. Despite the importance of these programs, for the past nine years, the demand for these programs has been less than the supply. This situation could constrain the ability to increase the supply of pharmacists by expanding schools.
- The shortage has further augmented the strong competition for pharmacists trained at the residency or fellowship level. Schools of pharmacy, managed care organizations, pharmaceutical corporations and hospitals compete for the employment of these pharmacists, resulting in sector shortages that are particularly threatening to those working under economic constraints--particularly schools and hospitals.

Chapter 5: Summary of Comments from Public and Private Sectors

Responses to the Federal Register announcement (March 16, 2000) inviting comments on the pharmacist shortage were received from 48 respondents (20 from pharmacies or organizations representing pharmacies; 15 from pharmacists or organizations representing pharmacists; and the rest from members of the pharmacist educational and/or licensing community, and a variety of other stakeholders). The key elements of these comments to critical questions were as follows.

Does a shortage exist? Of those that responded to this issue, all but one were decidedly of the opinion that a shortage exists. Evidence was offered in the form of reductions in store hours, salary increases, sign-on bonuses and other hiring incentives, and increased vacancy rates and time required to fill vacant positions.

What are its causes? Belief on the part of respondents that the increased demand for pharmacists was reflective of a true shortage, rather than simply the result of increased competition, was evidenced by the many comments made (by 20 of the 48 respondents) concerning a sharp increase in per capita prescription volume in recent years. The increase was commonly ascribed to a combination of the following: aging of the American population; growth in the percentage of persons with prescription drug coverage in one form or another; and emergence of new and innovative drug therapies.

Other factors judged to be instrumental in creating and/or exacerbating the shortage were identified as: the expanded roles and responsibilities of pharmacists in an increasingly patient-oriented, quality-of-care-sensitive environment; the increased administrative burdens placed upon pharmacists resulting from the growth in third-party coverage; reductions in the average number of hours worked per week resulting from the increased percentage of pharmacists that are women; transition to the entry-level PharmD degree across a large number of schools of pharmacy all within the same time period; and expanded career choices and expectations for PharmD graduates.

What can be done about it? -- While the use of technicians and the application of automation and technology were viewed as useful first steps toward alleviating the shortage, neither was judged to be a comprehensive, long-term

solution. It was emphasized by some that the use of technicians must be accompanied by suitable training in how to use them effectively.

Other recurring themes voiced by respondents included concern regarding the impact of the shortage upon medication errors and quality of patient care; the need to expand enrollment in schools and colleges of pharmacy; compelling need to develop and implement a uniform prescription benefit card to relieve the administrative burdens associated with third-party payment; and greater reciprocity among States and greater use of foreign-trained graduates.

INTRODUCTION

The use of prescription drugs and other pharmaceutical care services has grown significantly in the U.S. in recent years. Medications offer an effective means to treat and cure or control many acute and chronic medical conditions, and offer life-saving therapies for a sizable number of Americans. Pharmacists represent the health professional specifically trained in dispensing prescription medications. Pharmacists also provide a growing number and range of pharmaceutical care services that are critical to high quality health care and medication use. Pharmacists have a key role in assuring the safety of medication use and reduction of medication errors. In the past two years, there has been concern about the emergence of a shortage of pharmacists. This situation prompted Congress to request a study of the pharmacist workforce to describe the nature and characteristics of the shortage if there was one.

While automation and technology advances in the medication dispensing process can improve the pharmacist's dispensing efficiency, the overall work involved with providing pharmaceutical care services will continue to grow as volume and complexity of medications increases. For example, increased per capita use of medications and a larger population base requires greater patient counseling efforts, and more complex medications require greater oversight to prevent complications from drug interactions. Thus, throughout this study, the growth of prescription medication use is considered a reasonable proxy measure of the growth in needed pharmaceutical care services. However, the critical issue is the delivery of all needed pharmaceutical care services to consumers, not simply the dispensing of prescriptions.

Pharmacists represent the third largest health professional group in the U.S. with about 196,000 active pharmacists in 2000. Most pharmacists are employed and practice in pharmacies or drug stores, hospitals and medical centers, other retail stores with pharmacies (grocery stores and mass merchandising stores), and other institutional settings such as long-term care facilities. Smaller numbers of pharmacists are employed by pharmaceutical manufacturers, managed care and health insurance plans, consulting groups, home health care, and universities. In the 1990s, the pharmacy profession extended the educational requirements to a doctorate level entry degree, requiring additional clinical training and expanded practice skills, thus preparing pharmacists to take on more complex clinical roles such as counseling patients, advising other health professionals on drug use issues, and participating in disease management programs.

As with many professions including medicine, law and dentistry, pharmacy has seen increasing numbers of women enter the profession over the last three decades. In 1970, women pharmacists accounted for 13% of the pharmacy workforce progressing to 18% in 1980, 32% in 1990 and 46% in 2000. This advance had occurred primarily because of increases in women graduates from pharmacy schools. In the setting of a workforce shortage, the tendency of women pharmacists to elect part-time work has become an important issue.

One of the key indicators for increased pharmacist services has been the growth in the number of prescriptions written and dispensed. Between 1990 and 1999, the number of prescriptions dispensed in ambulatory settings increased by 44%, from 1.9 billion to 2.8 billion. Pharmaceutical manufacturers prescription drug sales, to retail pharmacies and institutions, was \$102 billion in 1998, a 16% increase from 1997, and were expected to increase to \$121 billion in 1999 (NACDS Industry Profile). Factors contributing to this growth have been identified as population growth, new medication release and expanded uses for medications, increased insurance coverage, growth in the elderly population - high users of prescription medications - and direct advertising of medications to the public.

There has been intense market competition and consolidation among providers of pharmaceutical services. In the retail pharmacy sector, the notable changes have been seen in closures of local independent pharmacies, and growth in pharmacies located in supermarkets and mass merchandise stores. While the overall number of chain drug store outlets has been relatively stable, there have been increased prescription volumes, market competition, and corporate ownership changes. In the short-term, the market competition has pushed demand for pharmacists to staff expanded hours of operations and new stores.

The growing complexity of medication use and pharmaceutical care has increased the potential for errors and for less than optimal medication benefit due to under use and poor compliance among individuals on medication therapy. For the past twenty years, there have been a growing number of demonstrations of the expanded clinical practice role for pharmacists, including greater collaboration with other clinicians, and in counseling individual patients about medica-

tion use. Whether in hospital, retail, or public health settings, pharmacists play an important role in counseling patients, reducing medication errors, and providing assistance with clinical disease management programs. The role of pharmacists is thus far greater than simply filling and dispensing prescription medications. This Report will describe examples of newer practice models for pharmacists and discuss how expanded clinical practice may affect the future demand for pharmacists.

A STUDY OF THE PHARMACIST SHORTAGE

This Report represents the response of the Secretary of Health and Human Services to a requirement initiated by Congress in December 1999 to conduct a study of whether and to what extent a pharmacist shortage exists in the United States. The Secretary delegated this task to the Health Resources and Services Administration (HRSA), Bureau of Health Professions.

CONDUCT OF THE STUDY AND INFORMATION SOURCES

The study was conducted and the Report prepared by analysts and pharmacists within HRSA, university-based health workforce researchers, health care consultants, and pharmacists from the Food and Drug Administration (FDA). Designed to be data-driven and evidence-based, the study draws upon three major sets of data sources: published articles from peer-reviewed journals; reports of academic, governmental, and private research groups; and analyses and reports commissioned or conducted by professional associations. Additionally, a series of structured interviews and site visits were conducted with major pharmacy associations and pharmacists. Site visits were also conducted with organizations providing pharmaceutical care and education such as medical center and hospital pharmacies, a school of pharmacy, and an automated central-fill distribution site for the Veterans Administration.

Data on pharmacy schools and graduates were obtained from the American Association of Colleges of Pharmacy. Data on recent graduates and applicants were obtained from a survey of deans of colleges and schools of pharmacy conducted in Spring 2000. Data on the employer-perceived demand for pharmacists throughout the United States were obtained from a survey of pharmacy employers known as the Aggregate Demand Index (ADI) project. Relevant literature was obtained from, and personal communications maintained with, key health information organizations such as IMS Health and the SMG Marketing Group. Other groups that provided useful information and/or insights included the American Pharmaceutical Association, the American Society of Health-System Pharmacists, the American Society of Consultant Pharmacists, the National Association of Chain Drug Stores, the National Community Pharmacists Association, the National Wholesale Druggists' Association, the Academy of Managed Care Pharmacy, Cardinal Health, Inc., the Public Hospital Pharmacy Coalition, the National Association of Public Hospitals and Health Systems, the University HealthSystem Consortium, and the University of Maryland School of Pharmacy. While these groups are singularly noted, this listing is not intended to omit recognition of the many other groups and individuals that assisted in the preparation of this Report. As part of the overall coordination process, the task force responsible for the preparation of this Report held two meetings with the Pharmacy Manpower Project (PMP), a voluntary consortium of thirteen national associations, to discuss important aspects of the study.

LIMITATIONS OF THE STUDY

While ample data were obtained for use in this study concerning vacancy rates, difficulties in hiring, and other measures commonly associated with a shortage, quantitative evidence concerning the factors that caused these measures to take on the dimensions of a shortage were more difficult to come by. Reliable data on the number of prescription drugs dispensed in retail settings were available from IMS Health, the foremost collector of such information in the United States; the task force was unable, however, to obtain comparable data for institutional settings, principally hospitals. Data concerning the use of pharmaceuticals in hospitals and other institutions are typically characterized by two factors that limit the validity of year-to-year comparisons: (a) utilization is commonly expressed in terms of medication orders rather than prescriptions, with a single medication order capable of representing anywhere from one to twenty separate prescriptions. and (b) utilization in the aggregate is commonly expressed in terms of dollars, a measure of lesser utility than prescription volume in studying temporal variations in demand.

Other data limitations include:

- Lack of reliable quantitative measures concerning the increased roles and responsibilities of pharmacists in both retail and institutional settings
- Lack of current data on the number and distribution of pharmacists (last census survey conducted in 1991)
- Lack of reliable current data on pharmacist salaries
- Limited data on number of hospital pharmacists
- No centralized reporting of applicants to pharmacy schools, an important measure for judging the likelihood of future increases in class size.

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CHAPTER 1

THE PHARMACIST SHORTAGE

While the overall supply of pharmacists has increased in the past decade, with the average annual growth rate surpassing the population growth rate, the demand for pharmaceutical care services has grown more rapidly. Between 1991 and 2000, the number of active pharmacists in the United States increased by roughly fourteen percent, from 172,000 to 196,000, while the population grew by only nine percent. The number of active pharmacists per 100,000 population, a standard measure of supply, increased by five percent, from slightly under 68 per 100,000 in 1991 to slightly over 71 in the year 2000.

This relatively minor increase in supply, however, was vastly outpaced by an unprecedented increase in demand. The increase in *demand* has become increasingly evident in the past two years and has two major components:

- a) A sharp increase in the demand for pharmacists, as evidenced by demonstrably increased vacancy rates and difficulties in hiring, and
- b) An even sharper increase in the demand for pharmaceutical care services, as evidenced by documented increases in prescription drug volume and in the expanded roles and responsibilities of today's pharmacist.

As a result of these developments, this study has concluded that there is currently an acute shortage of pharmacists in the United States. The shortage is termed "acute" because its onset is relatively recent, its severity significant, and its occurrence not clearly expected.

OCCUPATIONAL SHORTAGE DEFINED

A simple definition of an occupational shortage was presented in a recent paper published by the Bureau of Labor Statistics (BLS): "Shortages occur in a market when the demand for workers for a particular occupation is greater than the supply of workers who are qualified, available, and willing to do that job. Jobs remain vacant as employers seek to hire more workers than are willing to work at the prevailing wage or salary." (Veneri, Monthly Labor Review, March 1999).

Economists would consider this to be a definition of a short-run shortage because the market has not had time to react. In general, labor shortages lead to increased wages, and these induce employers to substitute other productive inputs for labor and induce workers to enter the occupation, thereby alleviating the shortage. The severity of a shortage is determined by the job market's capacity to supply workers. If years of education and specialized training are required of an occupation, then capacity to supply workers is constrained, and a rapid rise in demand leads to a "*dynamic shortage*" despite increases in wages.

Based on the evidence at hand, a dynamic shortage would appear to accurately describe the current pharmacist workforce:

- Recent rapid growth in prescription volume and strong market competition within the retail dispensing industry are significant contributors to, and indicators of, *a rapid and persistent rise in demand* for pharmacists.
- Compensation packages currently being offered to pharmacists are consistent with commonly described efforts of employers facing a shortage. Anecdotal reports and systematic assessments of employers describe recent *higher salary increases for pharmacists and the use of other economic incentives* (signing bonuses, leases on automobiles, and reimbursement of relocation expenses).
- *Supply response to the changes in demand is constrained* by several factors. The training period for pharmacists has increased to the doctorate level, generally requiring four years of professional school. In addition, the number of women pharmacists has increased substantially and all else equal, there is a greater likelihood of women selecting part-time work status. Access to jobs by pharmacists from other countries has been restricted.

EVIDENCE OF A SHORTAGE DATA ON VACANCY RATES AND DIFFICULTY IN HIRING

Evidence of increased vacancy rates and difficulty in hiring has been convincingly documented in several recent studies. A prime example are the five semiannual surveys of chain drug store pharmacies conducted by the National Association of Chain Drug Stores (NACDS) in the past 2-1/2 years, each disclosing a substantially greater number of unfilled positions than the one before. The NACDS estimated that there were 30,300 chain drug stores in the country employing about 74,300 full time and 10,900 part-time pharmacists in 1998. During the period February 1998 - February 2000, the projected number of unfilled pharmacist positions reported by NACDS rose as shown in Table 1-1.

Table 1-1. NACDS Surveys, 1998 to 2000: Unfilled Positions*

Date	Estimated Number of Unfilled Positions*	
	Full-Time	Full and Part-Time
February 1998	2,160	2,670
August 1998	2,862	3,510
February 1999	3,453	4,477
August 1999	4,679	5,942
February 2000	5,971	6,920

*Data from NACDS member surveys, 1998-2000

These numbers represent a reported vacancy rate in February 2000 of between 6 and 7%. The corresponding rate in 1998 was about 4%.

Hospital and health-system pharmacies. - Surveys conducted in 1999 and 2000 by the American Society of Health-System Pharmacists (ASHP) showed a substantial rise in the percentage of pharmacy directors who reported their current vacancy rate was higher than it had been five years earlier. In 1999, 30% of respondents said their current rate was higher than it had been five years ago as opposed to 15% who said it was lower, a ratio of two to one. Within the space of one year, the ratio of those who said it was higher to those who said it was lower had increased to over four to one, standing at 43 and 10% respectively. The relevant numbers are shown below:

Table 1-2. ASHP Surveys: Current Vacancy Rates Compared to Five Years Ago*

Compared to 5 years ago, the percentage of respondents who reported that their current vacancy rate was	1999	2000
Much higher	12%	22%
Somewhat higher	18%	21%
About the same	55%	47%
Somewhat lower	11%	6%
Much lower	4%	4%

*Data from ASHP press release, "ASHP Survey Reveals Increase in Open Positions at Hospital and Health-System Pharmacies," July 25, 2000.

Asked to rate the adequacy of supply of front-line pharmacist practitioners, respondents had a decidedly more pessimistic outlook in the year 2000 than in 1999. With respect to entry-level practitioners, 40% of respondents described the shortage as "severe" in the year 2000, compared to only 20% the year before. For practitioners beyond the entry level, the percentages were even greater: 70% of respondents called the shortage of experienced practitioners "severe" in the year 2000, as opposed to 48% the year before.

The reported vacancy rate for ASHP members in the year 2000, for experienced and entry-level practitioners combined, was slightly over 9%, ranging from 7.2% in the West to 10.8% in the Northeast. Comparable rates for earlier years were not available.

Public hospitals and other safety net providers. - Pharmacies in public hospitals and other "safety net" providers reported vacancy rates even greater than those for hospitals in general. Safety net providers treat individuals with limited ability to pay and often receive modest public funding to carry out this mission. A March 2000 survey conducted by the Public Hospital Pharmacy Coalition (PHPC), acting in concert with the National Association of Public Hospitals and Health Systems (NAPH) and University HealthSystem Consortium (UHC), resulted in a reported average vacancy rate of eleven percent. Again, comparable rates for earlier years were not available.

The survey also reported an "average time to fill vacancies" greater than six months, with 18% of respondents reporting it takes over twelve months to fill vacant positions and another 33% reporting it takes between six and twelve months.

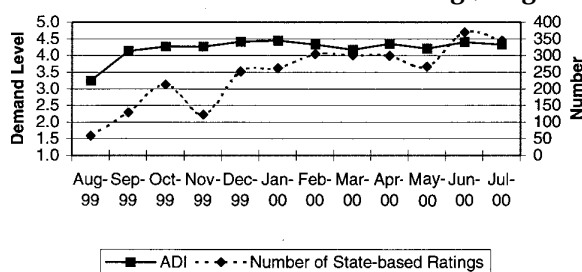
THE AGGREGATE DEMAND INDEX: A SYSTEMATIC SURVEY OF THE DEMAND FOR PHARMACISTS

In 1999, as the current pharmacist shortage was first evidenced, the paucity of data about the demand for pharmacists led the Pharmacy Manpower Project (PMP) to sponsor a project to systematically gather data about the demand for pharmacists and to share the resulting data widely. The result was the Aggregate Demand Index (ADI), a Web-based report of the National demand for pharmacists as reported monthly through surveys of those who hire pharmacists. The ADI project, described below, has resulted in a longitudinal database about the demand for pharmacists, capable of exploring geographic variations as well.

The survey data for the ADI project are collected from a panel of individuals who are directly involved in the hiring of pharmacists across the United States. Panelists are selected to represent the major areas of pharmacy practice as well as different geographic areas. Each month, the panelists respond to a survey about the ease or difficulty they experienced in filling pharmacist positions in each State where they hire during the past month. The ADI project began reporting data in August 1999 at which time the panel, responsible as a whole for the hiring of approximately 800 pharmacists, generated 59 State-based ratings in 43 States plus the District of Columbia. Since that time, the panel has been expanded. As of August 2000, the panel as a whole had responsibility for maintaining over 27,000 pharmacy positions in 50 States plus the District of Columbia, generating more than 300 State-based ratings in each of the two most recent months. The ADI Web site can be accessed at <http://www1.uop.edu/pharmacy/adi/index.html>.

Figure 1-1 shows the mean pharmacist ADI for the Nation as a whole, adjusted for population, for the period August 1999 through July 2000. The data are based on the following rating system used to describe demand levels: 5=high demand, difficulty in filling open positions; 4=moderate demand, some difficulty in filling open positions; 3=demand in balance with supply; 2=demand somewhat less than the available pharmacist supply; and 1=demand much less than the available pharmacist supply. After all surveys for a given month are collected, an index of demand at the State level is calculated by determining the mean of the ratings submitted by panelists who hire in that State. An ADI is then calculated by averaging the indices for all States plus the District of Columbia, with adjustment for population. These are the values shown in Figure 1-1, along with the number of ratings on which they are based.

Figure 1-1. Aggregate Demand Index and Number of State-Based Ratings, August 1999 through July 2000.



ADI (solid line) indicates average monthly rating across all panelists. Number of state-based ratings (dotted line) indicates total state-based ratings across all panelists.

Over the period studied, the population-adjusted ADI for the Nation as a whole consistently fell between the moderate and high demand levels (ratings 4 and 5), indicating there was at least moderate difficulty in filling open

positions. The only month that was an exception was August 1999, the first month of the survey, which may be discounted because of the small number of ratings involved.

Because the panel continued to expand throughout the data-gathering period, a separate "track" was maintained for each separate cohort of panelists added each month. This record showed that new panelists caused fluctuations in the monthly ADIs. Nevertheless, the overall plot over one year remained between "4" and "5" indicating a persistent unmet demand for pharmacists across several practice settings.

Table 1-3 presents the demand ratings by region of the United States. Three regions, the Midwest, the South and the West, had mean values over the entire year in the vicinity of 4.3, indicating moderate to high levels of demand while the mean rating for the Northeast, not including the month of August 1999 which was a statistical outlier, was just above 4.0 (moderate).

Table 1-3. Population-adjusted Mean Ratings of Pharmacist Demand: August 1999 to August 2000.*

	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00
Midwest	3.3	4.1	4.3	4.3	4.5	4.6	4.4	4.4	4.5	4.4	4.6	4.5	4.4
Northeast	2.6	3.8	4.0	4.2	4.3	4.2	4.2	3.9	4.1	3.7	4.0	3.9	4.1
South	2.9	4.3	4.4	4.3	4.5	4.5	4.5	4.2	4.4	4.2	4.4	4.3	4.3
West	4.3	4.1	4.3	4.2	4.3	4.4	4.1	4.2	4.3	4.4	4.5	4.5	4.5

*Data from Aggregate Demand Index, Pharmacy Manpower Project, 2000

Seven States had ratings ranging in mean value between 4.5 and 5 for the year, indicating a high level of demand. These States were, in rank order, Minnesota, Iowa, Kentucky, California, Wisconsin, West Virginia, and Florida. The States in this group accounted for 24.5% of the national population. All have at least one school of pharmacy and there is no apparent commonality among them that would seem to relate to a pharmacist shortage.

The ADI data showed 39 States and the District of Columbia with mean ratings between 3.5 and 4.5 for the year, indicating a moderate demand level and difficulty in filling pharmacy positions. The States in this group represented 73.8% of the national population and included representation from all four regions of the country. The remaining four States, New Hampshire, Nebraska, Wyoming and Hawaii, had mean ratings between 3 and 3.5 for the year, indicating a balance between supply and demand for pharmacists. These States represent only 1.7% of the national population.

The results of tracking the demand for pharmacists in the United States through the Aggregate Demand Index Project show a high demand for pharmacists in most regions of the country. The difficulty in filling open positions was found to be moderate to high, since August 1999, in nearly every State and the District of Columbia. More than 98% of the population live in these jurisdictions and can therefore be regarded as subject to the adverse effects of the shortage. No States reported having a surplus of pharmacists.

Although the ADI is an instrument that is still in development, it has been useful as a tool for capturing information about the geographical distribution of the pharmacist shortage during the past year.

SUMMARY OF EVIDENCE POINTING TO THE EXTENT OF THE SHORTAGE

From a quantitative standpoint, the extent of the pharmacist shortage can be seen in the expanding vacancy rates reported in every sector of the pharmaceutical distribution system. As noted earlier in this report, retail pharmacies are reporting increasingly large numbers of positions waiting to be filled, over twice as many in February 2000 as in February 1998. Within the past year, 70% of hospital pharmacies termed the shortage of experienced pharmacists "severe" as opposed to 48% the year before. For public hospitals in particular, vacancy rates averaging 11% were reported, with 48% of respondents noting that it currently takes at least six months to fill unfilled positions. As for federal pharmacists, a topic to be addressed at greater length in Chapter 2, vacancy rates in the Public Health Service are averaging 11% compared to

5% in 1996; the three branches of the military services report vacancy rates in the range of 15 to 18%, and the Department of Veterans Affairs notes that some of its facilities have over half of their pharmacist positions currently unfilled.

Lending support to these numbers, Chapter 2 will also document an unprecedented increase in the number of prescriptions filled each year in the nation's retail pharmacies - a 44% increase in the past seven years for an average growth of 5.3% per year, over three times the 1.6% annual rate of growth in the number of pharmacists. While comparable figures are unavailable for institutional pharmacies, there is reason to believe, based on the increased vacancy rates reported, that demand is outpacing supply in those settings as well, due in large measure to the increased clinical- - as opposed to dispensing -- responsibilities faced by pharmacists in today's institutional setting.

FACTORS CONTRIBUTING TO THE SHORTAGE OF PHARMACISTS

Key factors that have contributed to the shortage of pharmacists include the following. Subsequent chapters of the report will discuss each of these developments in greater detail.

- Increased use of prescription medications, due to
 - o Increased insurance coverage for prescription drugs
 - o Aging of the population
 - o Continued development of new and effective medications
 - o Discovery of expanded uses for existing medications
 - o Direct marketing to consumers by pharmaceutical manufacturers
 - o Increased consumer access to medical care
 - o Increased numbers of physicians and other health care providers who prescribe medications.
- Market demand factors, such as
 - o Market growth and competition among retail pharmacies resulting in expanded hours and new store openings
 - o Increased pharmacist time spent verifying insurance or managed care coverage, as well as other aspects of third-party payment.
- Expansion of pharmacy practice and pharmacists' roles
 - o Increased complexity of medication management in the hospital, long term care, and home health care settings
 - o Increased demand for clinical disease management in outpatient settings
 - o Increased responsibilities in assuring quality in all steps of the drug use process and in prevention of medication errors
 - o Growth of employment opportunities in pharmaceutical and clinical research and in the pharmaceutical business sector such as insurance, managed care, and pharmaceutical benefits management.
- The changing pharmacists workforce
 - o Increased number of female pharmacists, with higher rates of part-time employment
 - o Adoption of the PharmD as the entry-level degree for pharmacists, with a transition period loss of new graduates
 - o The increasing difficulty recruiting pharmacists to practice in rural areas and other underserved settings.

CONSEQUENCES OF THE PHARMACIST SHORTAGE

The pharmacist shortage has had significant consequences in terms of the provision of pharmaceutical services and the professional practice of pharmacists. These include the following:

- Restricted services in some pharmacies due to inability to fill vacant positions and achieve full staffing. Although restrictions of this nature have not been systematically documented, a number of examples (see Chapter 5) were cited in response to the Federal Register announcement soliciting public and private comment on the existence of a pharmacist shortage. Examples include shorter hours of operation as well as delays in opening new stores. Often, pharmacists were reported to be diverted, because of excessive workload, from the necessary task of providing patient counseling. All types of pharmacy services seem to be at risk, from small rural hospitals to large academic medical centers.

- Job stress, inadequate work conditions, and reduced professional satisfaction due to longer working hours and less flexibility in scheduling work. Both public comment (Chapter 5) and numerous surveys conducted by the pharmacy profession support that this situation is fairly widespread.
- Potential for increased risks of medication errors due to pharmacist fatigue and inadequate time to provide patient counseling and/or check for errors.
- Increased vulnerability of populations and communities that are medically underserved or otherwise at risk. These populations include individuals with mental illness who are on medication, rural residents who lack ready access to physicians, and individuals dependent on publicly supported services such as Native Americans and Veterans.
- Critical vacancies among faculty in pharmacy schools, in part due to alternative recruitment by the pharmaceutical manufacturing industry and other employment settings. Shortage of faculty may in turn be expected to restrict expansion of pharmacy school class size.

Each of these consequences has a decidedly negative impact in terms of the interests of the American public. Other consequences of the shortage, such as increased salaries, signing and retention bonuses, and expanded opportunities for continuing education, are of positive benefit to pharmacists in active practice but place employers who cannot match the financial competition at a disadvantage. They may, however, over time induce more students to pursue a career in pharmacy.

PUBLIC AND CONSUMER PERSPECTIVE ON THE PHARMACIST SHORTAGE

The effect of the shortage has been reported in a number of States. In 1999, for example, the North Carolina Board of Pharmacy responded to media reports on the shortage of pharmacists by examining their State's experience from 1992 to 1998 (Raleigh News and Observer, Dec. 21, 1999, website). The Board found that within the space of six years, the number of prescriptions filled had increased by 52%, while the number of pharmacists licensed in the State grew by only 23%. Meanwhile, the number of pharmacists working in retail pharmacies had decreased by 6%, matching a similar decrease in the number of retail pharmacies. Consumers noted long waiting periods for prescriptions. Pharmacists reported that their major complaints were (a) difficulties with managed care and other third-party payors and (b) being caught in the middle between patients and insurers or drug manufacturers on the matter of prescription prices.

The October 1999 issue of Consumer Reports (CR) presented the results of a survey of 15,000 readers on their experience with purchasing prescription drugs at chain and independent drug stores. As in the case of the North Carolina study, long waits for service were commonly reported. In the words of CR:

"One in four readers we surveyed complained about the time they had to wait for service. Many others said that prescriptions weren't ready when promised."

A second issue addressed in the survey, of relevance to this Report, is the matter of medication error:

"One in ten readers complained that at least once during the past year, their pharmacy gave them a drug different from what their doctor ordered."

CR did note, however, that medication errors were rarely serious, consisting in the main of generic substitutions for brand-name products. In their words:

"Fewer than one in 100 respondents said the pharmacist made a change in their prescription that caused serious side effects."

No attempt was made by CR to ask their readers to link medication errors to the shortage of pharmacists; their article does, however, cite a study by a psychology professor at the University of Cincinnati which reported that stress and overwork -- the inevitable by-products of a shortage -- are key risk factors in the commission of such errors.

THE PHARMACY PROFESSION'S RESPONSE

Several pharmacy professional associations have assessed the pharmacist shortage and presented their perspectives within the past eighteen months, often with recommendations to address the shortage or the factors contributing to the shortage. Several examples follow.

Association of American Colleges of Pharmacy (AACP) Argus Commission The 1999/2000 Argus Commission, consisting of the five most recent past-presidents of the AACP, studied the relation between pharmaceutical education and the pharmacy workforce. Noting that "the demand for pharmacists is accelerating at a rate unanticipated just a few years ago," the commission concluded the following:

"The remarkable increase in demand for medications by a population with growing needs for them has led to a concomitant increased demand for pharmaceutical care services. Moreover, the increasing age of the population and increasing potency, effectiveness, cost, and risk of drug products leads the Argus Commission to believe that we do not have enough pharmacists to meet this demand over the coming decades. Therefore, we urge that AACP provide its member schools with the necessary information so that they may move rapidly (if they choose) to increase their capacity so that more pharmacists may be educated. Such expansion may be essential to graduate enough pharmacists of high quality to provide critical health care services to society. It is also essential that we educate pharmacists to practice in efficient environments with appropriate supervision of drug distribution systems for the more effective utilization of pharmacists in the work force."

American College of Clinical Pharmacy (ACCP) In May 2000, the ACCP Board approved a white paper in which it explored the future roles, responsibilities, and workforce needs of the pharmacy profession. Predicting that pharmacy will, within the next decade, "transform itself from a primarily product-centered profession to a patient-care oriented profession," the group noted the importance of addressing the pressing quantitative workforce problems through efforts on the qualitative aspects of professional pharmacy practice. They note that the changing pharmacists' professional role and practice will help shape the workforce needs in the next decade. The paper also foresaw a future in which technology will be increasingly deployed to (a) dispense most prescriptions, (b) provide drug information to patients, and (c) facilitate the exchange of patient-specific data. The need for certification of pharmacy technicians was also highlighted.

National Association of Boards of Pharmacy In 1999, the National Association of Boards of Pharmacy (NABP), whose members include all State boards of pharmacy, charged their Task Force on Manpower Shortage to (1) review available data to assess the impact on the public health of the current and future availability of pharmacists; and (2) examine whether changes in regulation are needed to address constraints or barriers placed by the system on the availability of pharmacists to serve the public health. The Task Force concluded "that the manpower shortage is a long-term problem for which there is no single solution." They identified several ways to lessen the effects of the shortage:

- Develop an accurate and continuous method to track supply and demand side workforce issues.
- Eliminate the State mandated pharmacist-to-technician ratios and delegate all dispensing functions, with the exception of the final check, to technicians. Retain all clinical and judgmental functions with the pharmacist.
- Develop model language that would enable operation of central fill pharmacies.
- Eliminate unnecessary delays in offering testing to pharmacists for State licensure.
- Support the development of a standardized prescription benefit card that may be used by all insurance and third party payers.
- Encourage manufacturers to supply medications in standardized unit of use packaging to facilitate the drug distribution process.
- Encourage the integration and consistent use of standardized bar code technology in the drug distribution process.

National Association of Chain Drug Stores, American Pharmaceutical Association, National Community Pharmacist Association In their August 1999 white paper on meeting the demand of community pharmacy practice, this group noted the important dual role of pharmacists in dispensing medications and patient care which they describe as educating, monitoring and providing pharmaceutical care to patients. This study identified three challenges to providing quality care.

- Pressures from the growing volume of prescriptions, difficulties with third party program administration, and demands for additional patient care services.
- The impact of prescription benefit programs - with burdensome billing requirements and the need for the professional pharmacist to resolve issues of benefit coverage, formulary restrictions, days of supply, and prior authorization.
- The transformation of the education of pharmacists toward clinical practice opportunities that are more available in institutional settings or nontraditional jobs than in community pharmacy practice.

The paper recommends ways to address the challenges and invokes all stakeholders (insurers, educators, employers, regulators, manufacturers of drugs, packaging firms, and community pharmacies) to accept responsibility to help solve the problems through the following:

- Enhance the pharmacists' resources - particularly through appropriate use of pharmacy technicians and enhanced use of technologies such as automation and robotics and electronic transmission of prescriptions.
- Improving third party benefits designs and efficiencies such as use of a standard pharmacy benefit card and standard electronic billing and payment for non-dispensing pharmacy services.
- Examining the disconnects in the Nation's medication use system and working with all components to improve the quality and efficiency of the system.

AN EARLIER PHARMACIST SHORTAGE

In the past 20 years, there has been evidence of a shortage beginning around 1988 (Manasse, 1988). The shortage appeared to have abated somewhat by 1994. However, the current shortage could be considered an extension of this earlier shortage, since many of the contributing factors have persisted into the present. In the late 1980s, -as now- the shortage was unanticipated and triggered the realization that available data about the pharmacy workforce could not explain the loss of balance between supply and demand.

How was the shortage of a decade ago eased and could such forces come into play to ease today's shortage? The research involved in preparing the present study provided data that enabled us to examine market forces operative during the early 1990s that may have served to abate, if not fully resolve, the earlier shortage. Specifically, we identified events that influenced the demand, the supply and the productivity of pharmacists during the early 1990s. We did this as part of assessing the likelihood and the extent to which the current shortage might resolve itself through market forces.

Number of Graduates. The supply of graduates, which had dropped from 7,432 in 1980 to 5,735 in 1985, a 23% decline in five years, was undoubtedly a major factor in creating this earlier shortage. However, by the early 1990s, graduates were again rising steadily, reaching 7,832 by 1995 and 8,003 in 1996. Therefore, although the supply did not increase greatly due to this graduate turnaround, at least the workforce returned to a pattern of steady growth.

Number of Pharmacies. The number of retail pharmacies had decreased from 58,642 in 1990 to 52,155 in 1995, chiefly due to a reduction in independent pharmacies. The decline, along with the earlier increase in graduates, may have served to ease the demand for pharmacists during this period.

The Hospital Industry. The hospital industry changed dramatically during the 1990s--mostly through contraction. As shown in Chapter 2 (Table 2-12), decreases in hospitals, hospital beds, and average length of stay were occurring steadily through the first half of the decade and would have eased demand for pharmacist services. These decreases, not surprisingly, were balanced by increases in ambulatory visits through outpatient facilities--if fewer ill patients are admitted to the hospital, other avenues of care would be more heavily accessed. More outpatient visits would increase demand for pharmacy services.

Increased Practice Roles and Expectations. In terms of practice roles, although clinical roles for pharmacists within hospitals were established nationally, the new roles fostered by a shift in emphasis from the acute care to the ambulatory care sector and the growth of managed care had not yet emerged. In community pharmacies, mandatory counseling was emerging but not yet widely implemented by the States. Thus, pharmacists were just beginning to

experience demands based on new and expanded practice roles. At the same time, pharmacists were benefiting from the widespread implementation of computer systems which reduced paper work; and the deluge of clerical work related to third party claims, while growing, was at low levels compared to today (55% of 2.2 billion prescriptions in 1994 versus 78% of 2.9 billion prescriptions in 1999).

Comparing Last Decade's Shortage to Today's Shortage. It would appear that the principal differences between the earlier shortage and today's environment are related to demand issues. The two demand issues that dominate today are the sharp upward trends in the use of prescription and non-prescription medications and the new and expanded roles that pharmacists have assumed in today's healthcare environment. The factors which may have operated in the early 1990s to reduce demand such as declining numbers of pharmacies and large-scale reductions in the hospital industry are unlikely to play a major role in ending today's workforce problems. On the other hand, automation, better use of technology (Smart cards, electronic prescription entry and central fill, for example) and the improved utilization of technicians are more realistic options for enhancing productivity in today's work place and could play a major role in improving the balance between supply and demand in this decade.

WILL THE CURRENT SHORTAGE BE A LONG-TERM PROBLEM?

The expected duration of the pharmacist shortage cannot be predicted at this time. However, there are a number of factors associated with the shortage that have a long time horizon, that are likely to affect both the supply and demand for pharmacists.

Factors influencing the demand for pharmacists:

- The growth in prescription volume is expected to continue. Factors contributing to the growth, as mentioned earlier, include aging of the population, development of new medications, and unprecedented growth in insurance coverage (including managed care).

Pharmacists are expected to take on new and expanded roles in reducing medication errors and in counseling patients about medications.

- Pharmacists are being recruited to work in roles away from direct patient care, such as pharmaceutical research, sales and administrative roles for pharmaceutical manufacturers, administrators for managed care, pharmacy benefit managers (PBMs), and other health sectors. These employment opportunities are expected to remain strong.
- The use of over-the-counter medications, herbal and alternative therapies is expected to grow and pharmacists will be asked to counsel on their use.
- Market pressures on store openings and expanded hours of operation are expected to continue in the short-term, although their long-term duration is unknown.
- The ability to substitute adequately trained and supervised technicians for some tasks now performed by pharmacists will alleviate, to an extent currently unknown, the demand for pharmacists.
- Use of mail order and internet pharmacies is not expected to have a significant impact on the demand for pharmacists.
- Greater use of automation in the dispensing functions could reduce the demand for pharmacists. Again, the extent to which such relief is achievable is currently unknown.

Factors influencing the *supply* of pharmacists:

- The output of graduates from schools of pharmacy, which had been declining since 1996, appears to be stabilizing or increasing due to a) schools completing the transition to the PharmD training program; and b) many schools increasing their first year class size by five to ten percent in response to the shortage. However, the impact of increases in the size of the entering class will not be felt for four years. The growth may be further limited by the size of the applicant pool that has been down in the past several years.
- Greater retention of pharmacists in practice, by offering higher salaries, improving work conditions, and allowing continuing education and clinical practice opportunities, should have a modest effect on supply.

- International pharmacy graduates (IPGs) are pharmacy graduates of schools outside the United States. There are significant barriers to their achieving U.S. licensure. Estimates of the number of IPGs achieving licensure annually average slightly over 300 for the past three years. The issues related to IPG licensure are more fully explored in Chapter 4.
- Most States offer reciprocal licensure through NABP requiring pharmacists only to pass a State-based law examination in order to practice in a new State. Only Florida requires pharmacists to retake the NABPLEX and pass a law examination. California does not reciprocate with any other State and has its own examination. Barriers by virtue of denied reciprocity prevent the influx of pharmacists to Florida and California and influence their supply.

In summary, many of the critical demand factors are expected to persist during at least the next five to ten years. As will be discussed in Chapter 4 of this Report, the supply of pharmacists is expected to grow only modestly. Thus, we can expect that the demand for pharmacists will continue to be greater than the supply.

CHAPTER 2

FACTORS INFLUENCING THE DEMAND FOR PHARMACISTS AND PHARMACEUTICAL CARE

INTRODUCTION

The roles and responsibilities of pharmacists have expanded greatly in the past decade. Pharmacists in retail settings have become increasingly involved in patient counseling and other activities separate and distinct from the dispensing function; pharmacists in institutional settings have become increasingly involved in clinical activities and in all phases of the medication use process. In this chapter, we will describe issues affecting the demand for pharmacists considering the settings where pharmacists work and the market factors driving demand over the last several years.

According to data from the Bureau of Labor Statistics (BLS), about 60 percent of pharmacists were employed in retail stores in 1998 - primarily drug stores but also a small but growing component of food stores and general merchandise stores. Self-employment has declined over the years, representing only three percent of all pharmacists in 1998, with most self-employed pharmacists expected to be owners of independent pharmacies, adding their numbers to those working in retail or community pharmacy settings.

About 30 percent of pharmacists were employed in healthcare institutions, predominantly hospitals, with smaller numbers in long-term care facilities, and home health care. Pharmacists are also employed within the pharmaceutical manufacturing industry, universities, Federal and local government, and throughout the business sector in managed care, insurance industry, and pharmaceutical benefits management programs.

This review of pharmacist demand by various professional practice settings demonstrates the existence of strong demand factors (particularly in community pharmacy settings due to prescription growth). The substantial growth in medication expenditures in retail and institutional settings increases the economic stake held by pharmacists and accentuates the impact of the pharmacist shortage upon the Nation's overall health care economy. Increasing demand for pharmacists in one employment sector can affect the supply of pharmacists available to other sectors. Thus technology advances, market changes, and other professional opportunities have all contributed to a dynamic market for pharmacists within the last few years.

The chapter concludes with a discussion of the increased demand for pharmacists in practice settings particularly vulnerable to the shortage -- rural communities and pharmacies operated by the Federal Government such as the armed services, Veterans Administration, and Public Health Service.

DEMAND FOR PHARMACISTS IN COMMUNITY PHARMACIES

Retail Employment Settings. Most Americans encounter a pharmacist in the community setting, usually in a drug store, where the public purchase their prescription medications and receive a range of pharmaceutical care services. As noted above, retail pharmacies, also called community pharmacies, employ almost 63% of all pharmacists. The retail pharmacy industry has undergone substantial changes in the last ten years - a shift in the types of pharmacies, greater prescription dispensing volume yet lower profit margins, more third party contracting for payments (health insurance, managed care, and pharmacy benefit managers or PBMs), greater over-the-counter drug availability, growth in herbal and vitamin, mineral and nutritional supplements, and recent difficulties in meeting staffing requirements.

The four major components of the community pharmacy industry include the following.

- 1) independent pharmacy -- often owned by a pharmacist, usually with less than four outlets;
- 2) chain drug stores -- usually defined as a corporate ownership with four or more outlets; with the two largest chains having almost 4,000 stores each;

- 3) supermarkets or grocery store pharmacies; and
- 4) mass merchandiser pharmacies -- pharmacies located in large warehouse stores or merchandisers such as Wal-Mart, Kmart, Target, and others.

Table 2-1 indicates the changes between 1990 and 1998 in the number of pharmacies (stores) and the aggregate number of prescriptions filled by each component of the community pharmacy industry. Overall, there was a loss in this period of almost 6,700 stores, with most of this loss occurring in the early 1990s. Independent pharmacies experienced a substantial loss of more than 11,000 stores, representing over one-third of all stores. The supermarket and mass merchants both had substantial growth in the number of stores, while the total number of chain drug stores was relatively stable.

Table 2-1: Community Pharmacies: Number of Stores, and Number of Prescriptions (in millions), 1990-1999

Year	Chain		Independent		Mass Merchant		Supermarket		Mail Order		Total Stores	
	Stores	RXs	Stores	RXs	Stores	RXs	Stores	RXs	Stores	RXs	Stores	RXs
1990	18,638		31,879		3,484		4,641				58,642	
1991	18,607		30,503		3,589		4,796				57,495	
1992	17,806	730	27,305	795	3,994	186	4,948	173	NA**	188	54,053	2,072
1993	18,039	780	26,227	780	4,331	195	5,424	175	NA	212	54,021	2,142
1994	18,103	815	24,862	770	4,559	225	5,719	200	NA	236	53,243	2,246
1995	18,165	900	23,112	732	4,851	254	6,027	228	NA	258	52,155	2,372
1996	18,523	937	22,006	692	4,693	252	6,155	242	NA	295	51,377	2,418
1997	19,119	999	20,844	685	4,914	254	6,293	269	NA	328	51,170	2,535
1998	19,108	1,087	20,641	693	5,254	272	6,963	306	NA	368	51,966	2,726

*Data from NACDS publication, Industry Profile, 2000.

**NA= not applicable

Within the community pharmacy sector, each category of store has special characteristics, such as the volume of prescription medications dispensed, the total sales volume, and value of other commodities sold (Table 2-2). For example, in aggregate and on average, chain drug stores have a greater volume of prescriptions dispensed and medication sales. In 1999, chain stores accounted for 41% of prescription volume, independent drug stores about 25%, and each of the three remaining sectors slightly over ten percent each. In 1999, of the estimated \$121.6 billion in community pharmacy prescription medication sales, the distribution by store tended to match their share of volume. Due to differences in the number of other products sold by each type of entity, pharmacy sales ranged from 90% of total sales in the case of independents to less than 6% for mass merchants.

Table 2-2: Community Pharmacies: Prescriptions Dispensed, Pharmacy Sales, Percent of Total Store Sales that are Pharmacy Sales, 1999*

	Prescriptions Dispensed * (millions)	Percent of Total Prescriptions	Pharmacy Sales (Billions of Dollars)	Percent of Total Store Sales that are Pharmacy Sales
Independent	721	24.4%	\$29.7	90.3%
Chain Drug Stores	1,208	41.0%	\$49.4	48.4%
Mass Merchandizers	302	10.2%	\$2.4	5.7%
Supermarkets	355	11.7%	\$14.3	10.4%
Mail Order	389	12.6%	\$15.3	
Total	2,970	100.0%	\$121.6	

*Data from National Community Pharmacist Association publication, The State of Community Pharmacy, 2000.

Changes in the community pharmacy marketplace have affected the demand for pharmacists. The closure of more than one-third of independent pharmacies and the relatively smaller staffing level of these stores has reduced the job

openings in this sector. However, efforts to capture local markets, ownership consolidation, and new growth efforts among many chain drug stores has led to growth of job opportunities within chain drug stores. For example, one of the largest chain drug stores has articulated a strategic plan that calls for the opening of 3,000 new stores, or the equivalent of almost one new drugstore per day, over the next ten years. Large numbers of drug stores are expanding their hours of operation, with some increasing this to 24-hours per day. Since State pharmacy laws require a pharmacist on site when prescription medications are dispensed, both new store openings and expanded hours put pressure on hiring and employing more pharmacists.

Pharmacists Employed in Retail Settings Over Time. Table 2-3 presents an estimate of the number of pharmacists employed in community pharmacies for the years 1992 through 1998. This estimate is calculated by multiplying the total number of active pharmacists by the estimated percent of pharmacists working in the retail sector. Based on this estimate, over the six year time period, the number of pharmacists working in community pharmacies grew by 9,000, from about 111,400 to 120,400.

However, the estimated growth in employment in retail pharmacy fails to reflect the true growth in demand. The fact that there is a current shortage means that employers would employ more pharmacists if they could find them and that employment therefore understates demand.

Table 2-3. Numbers of Community Pharmacists: 1992-1998

Year	Total Pharmacists*	Percent Retail †	Community Pharmacists ‡
1992	172,940	64.4%	111,373
1993	176,060	64.1%	112,854
1994	179,180	64.3%	115,213
1995	182,300	64.7%	117,948
1996	185,042	64.5%	119,352
1997	187,784	62.8%	117,929
1998	190,527	63.2%	120,413

*Data from BHP_r Pharmacist Supply Model

†Data from Bureau of Labor Statistics

‡Calculated by multiplying total pharmacists by percent retail

The Relationship Between Prescription Growth and Demand for Pharmacists. One measure of the demand for pharmacists and their workload that has been consistently documented is the growth in prescription medication use and the volume of prescription drugs dispensed in drug stores and other retail outlets. Although an incomplete measure of demand, prescription volume serves as a useful starting point for measuring changes over time in the level of activity required on the part of the Nation's retail pharmacists. Any increase in the number of prescriptions filled is inevitably accompanied by a corresponding increase in other related functions as well, including the number of prescriptions filled by others that must be checked, the number of occasions on which patient counseling is called for, the number of occasions on which third-party payment issues must be resolved, and so on.

The analysis of prescription demand that follows begins with an examination of recent trends in the demand for prescriptions at the retail level. The rapid growth in prescription volume that has taken place in recent years is clearly a major contributor to the current pharmacist shortage. It is crucial to understand why this growth has occurred so that the likelihood of continued growth may be assessed. Prescription medication use has increased as more diseases and medical conditions are treatable by medications. The analysis considers other factors such as the size and demographics of the population, the extent and nature of third-party prescription drug insurance, the introduction of new and innovative drugs, the burgeoning phenomenon of direct-to-consumer advertising, and the booming U.S. economy. It is concluded, based on the analysis, that the unprecedented growth in prescription volume that has taken place thus far is likely to continue.

Retail Sector Prescription Expenditures. Growth in spending within the retail sector has been amply documented. Table 2-4 presents data published by the Health Care Financing Administration (HCFA). It shows spending on prescription drugs more than doubling between 1993 and 2000 (projected), rising from \$ 51 billion to \$ 112 billion. As a percentage of total health care expenditures, spending on prescription drugs is expected to go from 5.6% in 1993 to 8.5% in 2000 and to 10.3 % by 2005. These estimates reflect retail sales only; the cost of drugs consumed in hospitals is subsumed under hospital care spending in the HCFA numbers and not broken out separately.

Table 2-4: Retail Spending on Prescription Drugs, Percent of National Health Care Expenditures, 1993-2005*

Year	Prescription Drug Spending (\$billions)	Share of Total Health Spending
1993	50.6	5.6%
1997	78.9	7.2%
2000	112.1	8.5%
2005	185.2	10.3%

*Data from Health Care Financing Administration

The increase in expenditures for prescription medications is a composite of several factors and not simply growth in medication use. Changes in expenditures each year reflect growth in prescription volume (which has a demonstrable impact upon the level of pharmacist activity required and thus upon the shortage), changes in the cost mix of drugs prescribed (which may or may not have an impact upon the level of activity required), and price inflation.

The accelerating rate of growth in retail drug spending stands in sharp contrast to the reduced rate of growth for the two largest categories of health care costs -- hospital care and physician services. As seen in Table 2-5, the annual rate of growth in prescription drug expenditures trailed the growth rate in these other spending categories in the 1970s and 1980s but now outpaces them both by far and has for the past decade.

Table 2-5. Rates of increase in national health expenditures, annual percentage change, 1970 -1998*

Years	Prescription drugs	Physician Services	Hospital Care
1970-1980	7.4	9.9	11.7
1980-1990	8.1	12.8	13.9
1990-1991	12.2	11.8	8.9
1995-1996	10.5	4.6	3.4
1996-1997	13.0	3.3	3.6
1997-1998	13.9	4.5	3.0
1998-1999	15.4	5.4	3.4

*Data from Prescription Drug Trends - a Chartbook, Kaiser Family Foundation as presented in the Health Care Financing Administration Website.

An important consideration of this substantial growth in medication expenditures is the increased value of the health spending that pharmacists have a direct role in producing and managing. This growth increases the economic stake held by pharmacists and accentuates the impact of the pharmacist shortage upon the Nation's overall health care economy.

Expenditures for individual prescription medications have reached a level where many single drugs have sales revenue over one billion dollars. Data on the top selling prescription drugs are expressed as sales dollars and prescriptions dispensed, with drugs often having different rankings in dollars as opposed to prescription volume, owing to differences in cost. Table 2-6 shows the top ten drugs in terms of sales in 1998, with each of the top two having sales greater than \$2 billion and the next eight all exceeding \$1 billion.

Table 2-6: Top ten prescription medications in sales, 1998*

Medication	Medication Use	Sales (\$ billions)
Prilosec	Anti-Ulcer	\$ 2.93
Prozac	Anti-depressant	\$ 2.18
Lipitor	Cholesterol lowering	\$ 1.54
Zocor	Cholesterol lowering	\$ 1.48
Epogen	Blood stem cell stimulator	\$ 1.46
Zoloft	Anti-depressant	\$ 1.39
Prevacid	Anti-ulcer	\$ 1.24
Paxil	Anti-depressant	\$ 1.19
Claritin	Anti-histamine	\$ 1.15
Norvasc	Anti-hypertensive	\$ 1.09

* Data from IMS Health and Prescription Drug Trends - a Chartbook, Kaiser Family Foundation as presented in the Health Care Financing Administration Website.

Retail Sector Prescription Volume. Shifting from expenditures to prescription volume, information on the number of retail sector prescriptions filled each year between 1992 and 1999 is provided in Table 2-7. Between those years, the number of retail prescriptions dispensed per year is seen to have increased from 1.9 billion to 2.8 billion, a 44 percent increase or a growth rate of over five percent per year. The growth rate would actually appear to be increasing, with a seven percent increase in 1998 and a nine percent increase in 1999.

Table 2-7: Community Pharmacy Prescription Volume, 1992-1999*

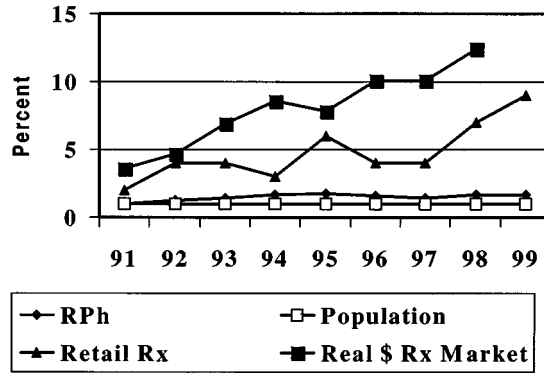
Year	Prescriptions (millions)	Annual Change	Cumulative Change
1992	1,942		
1993	2,033	4.7%	4.7%
1994	2,172	6.8%	11.8%
1995	2,203	1.4%	13.4%
1996	2,298	4.3%	18.3%
1997	2,394	4.2%	23.3%
1998	2,565	7.1%	32.1%
1999	2,799	9.1%	44.1%

*Data from IMS Health

These numbers include both original prescriptions and refills. The proportion that is refills rose from 43.5 percent in 1995 to 46.9 percent in 1999. While not a major increase, the slight difference may be indicative of a trend, precipitated by managed care, toward shorter prescription durations and therefore a greater frequency of refill. It might also reflect an increase in medications used over longer time periods, necessitating a greater total number of refills.

From the standpoint of understanding the pharmacist shortage, the 44 percent growth in prescription volume between 1992 and 1998 is vastly greater than the growth, within the same time period, in either the general population (7 percent) or in number of active pharmacists (12 percent). To determine if this sharply steeper growth is likely to continue, it is useful to investigate its underlying causes.

Figure 2-1. Growth of Pharmacist, Population, Retail Prescriptions and the Real Dollar Prescription Market: 1991-1999.



Relative growth of pharmacists (RPh) using BHPPr Pharmacist Supply Model, U.S. population using Census Bureau data, retail prescriptions and real dollar prescription market using IMS data.

Causes of Historic Prescription Growth. Factors affecting prescription growth may be considered as related to growth and aging of the population and to factors that would cause prescription volume to grow regardless of these population changes. Some of these factors include increased prescription drug insurance coverage, the introduction of new drugs for new treatments, the effects of direct advertising to consumers, and the unparalleled economic growth experienced in recent years. Some of these effects, such as population growth and aging, clearly will continue into the future; others may not. All are discussed below.

Population Growth and Aging. Of the 44 percent increase in prescription volume noted between 1992 and 1998, about seven percent can be attributed to population growth. Between 1992 and 1999, the U.S. population grew by about seven percent, a little less than one percent per year.

To estimate the incremental effect of aging, it is necessary to consider how the demand for prescriptions varies by age. Table 2-8 contains age- and sex-specific per capita prescription rates for persons with health insurance as computed from the 1996 Medical Expenditure Panel Survey (MEPS). While these rates pertain strictly to those with health insurance, they convey a useful sense of utilization differentials by age.

Table 2-8: 1996 Annual Prescriptions Per Person With Health Insurance, By Age and Sex*

Age	Men	Women
<5	5.6	5.2
5 to 9	3.6	2.5
10 to 14	3.3	2.4
15 to 19	2.8	4.1
20 to 24	3.2	5.7
25 to 29	2.6	7.0
30 to 34	4.7	7.6
35 to 39	4.3	8.7
40 to 44	4.3	8.5
45 to 49	7.1	12.3
50 to 54	8.4	15.6
55 to 59	12.7	20.1
60 to 64	13.4	17.8
65 to 69	21.5	20.5
70 to 74	19.4	21.7
75 to 79	22.1	22.1
80 to 84	24.4	24.3

*Data from Medical Expenditure Panel Survey

As expected, older age groups exhibit a considerably greater use of prescriptions. Since the composition of the U.S. population is gradually shifting into older age groups, a natural consequence of this "graying of America" is an increase in the per capita demand for prescriptions. The rates presented in table 2-8, combined with the observed aging of the U.S. population between 1992 and 1999, suggest that the incremental effect of aging (apart from growth in population size) is in the neighborhood of three percent.

Thus the estimated combined effect of population growth and aging over this seven-year period was ten percent, with seven percent due to population growth and three percent to aging. Since the total due to these two factors alone is considerably less than the 44 percent increase, there are clearly additional factors at work. These factors are discussed below.

Increased Third-Party Prescription Coverage. Perhaps one of the most important factors influencing prescription medication use growth has been increased third-party prescription coverage. Prescription coverage increased dramatically during the 1990s, due to the provision of such benefits by private health insurance and managed care plans. Table 2-9 shows that in 1992 less than half of all prescriptions were paid by third parties whereas by 1999, that figure had grown to almost four out of five.

Table 2-9: Third Party Share of Retail Prescriptions*

Year	Percent Retail Prescriptions Paid by Third Party
1992	44%
1993	49%
1994	55%
1995	62%
1996	67%
1997	71%
1998	75%
1999	78%

*Data from IMS Health

Growth of the economy. The U.S. economy has been growing rapidly. As incomes rise, people demand more goods and services, and especially health care (much of this effect is captured by the spread of third party coverage which is essentially a mechanism for purchasing more prescriptions).

Introduction of new and innovative drug therapies. In 1998, new drugs (defined as those introduced since 1992) accounted for almost one-third of all retail drug expenditures. New branded drugs accounted for two-thirds of the increase in retail spending between 1993 and 1998 (NACDS Industry Profile p 40. If these new drugs are simply more effective replacements for older drugs, their impact on overall demand is offset to a degree by the associated decrease in demand for the drugs they replace. However, if a new drug addresses a healthcare problem not previously treatable, then more of the demand for that drug is a net addition to demand. For example, the introduction of the new medications (reductase inhibitors) that can lower blood cholesterol levels represent a new drug for a disease previously having limited treatment. This new class of drugs now represents some of the most frequently prescribed medications.

Direct-to-consumer marketing. In 1997, the Food and Drug Administration revised their guidelines for advertising medications to the public, allowing pharmaceutical companies greater flexibility in reaching American consumers. Prior to that time, most pharmaceutical marketing efforts were directed to physicians who prescribed medications. The growth in direct-to-consumer (DTC) marketing of prescription medication has been explosive, with 1999 spending estimated at \$1.9 billion. (Wilkes, 2000)

Although the consequences of this dramatic change in prescription drug marketing are still evolving, several recent findings are of note. First, advertising for specific brand name medications to treat common conditions seems to be effective in increasing consumer demand for specific medications. Marketing for Claritin, an anti-allergy medication,

had the highest consumer marketing expenditures with expected significant impact on the total U.S. sales - over \$1.1 billion in 1998. While DTC marketing presents an opportunity to increase public awareness and education about medications and medical conditions, it can also present a biased view about the benefits of specific medications and reduce interest in other non-medication related behaviors to improve health. The effect of greater consumer awareness may yield positive benefits where there is underutilization of effective medications and negative effects when medications are used inappropriately or when safer or less costly alternatives are available. An increased time demand for both physicians and pharmacists in discussing marketing materials with their patients has been reported.

Greater frequency of refill, resulting in part from growth in managed care. As noted previously, managed care may be causing reductions in the average period covered by prescriptions. This would result in a greater number of refills in order to obtain the same total amount of medication.

Increased number of prescription providers. The per capita number of physicians and other primary care providers with prescriptive authority, such as nurse practitioners, continues to grow. For example, the number of active patient care physicians increased from 503,900 in 1990 to 621,700 in 1998 (AMA Physician Characteristics and Distribution in the US 2000), an increase from 201.0 per 100,000 to 228.9 per 100,000 persons. As these numbers increase, the number of contacts between patients and physicians increase, with these new contacts representing additional opportunities for a prescription to be ordered.

Prescription Growth and the Shortage of Community Pharmacists. In order to better understand the impact of prescription growth on the demand for pharmacists in community pharmacies, it is informative to compare the growth in employment (Table 2-3) with the growth in number of prescriptions dispensed (Table 2-7). Table 2-10 provides such a comparison, revealing that the volume of prescriptions has grown much more rapidly than the number of pharmacists. The estimated average number of prescriptions per pharmacist per year increased by 31 percent between 1992 and 1999, with the greatest increase (7.6%) taking place in the last year.

Table 2-10: Estimated Average Annual Prescriptions per Retail Pharmacist*

Year	Retail Pharmacists	Number of Pharmacists x (millions)	Prescriptions Per Pharmacist	Annual Prescription Increase	Cummulative RX/RPh Increase
1992	111,373	1,942	17,438		
1993	112,854	2,033	18,017	3.3%	3.3%
1994	115,213	2,172	18,850	4.6%	8.1%
1995	117,948	2,203	18,676	-0.9%	7.1%
1996	119,352	2,298	19,251	3.1%	10.4%
1997	117,929	2,394	20,298	5.4%	16.4%
1998	120,413	2,565	21,300	4.9%	22.1%
1999	122,146	2,799	22,914	7.6%	31.4%

*Data were extracted from Tables 2-3 and 2-7.

This estimated increase in prescriptions per pharmacist is clearly linked to other evidence of a pharmacist shortage. It shows that in recent years, pharmacists have been required to oversee the delivery of more and more prescriptions. The next section addresses various strategies for coping with this requirement for increased pharmacist productivity.

Issues Affecting Pharmacists' Productivity in Community Pharmacies

The estimated growth in prescriptions dispensed per pharmacist as shown in Table 2-10 would appear to indicate that pharmacists productivity has increased by almost a third in the past seven years. However, other factors that are used at times of a labor shortage have also been reported and these may account for some productivity growth. These include pharmacists working longer hours, and substitution of other workers for some of the pharmacists' tasks, such as pharmacist technicians. Pharmacists also report that they are not offering the full services they are qualified to provide since they have more limited time available for patient counseling.

Productivity enhancement in the workplace has been introduced through various types of automation products. Robotics and other systems have been developed for retail, institutional, mail order, and central fill pharmacies. These systems can count pills, place them in containers or packaging, label the product, and deliver it to an appropriate check point for pharmacists final review. The productivity enhancements afforded by these systems can be substantial. The Veterans Administration's Consolidated Mail Outpatient Pharmacies (CMOPs), for example, are designed to handle the dispensing and mailing of 10,000 prescriptions in an 8 hour workday. This level of productivity can be compared to the daily volume of 500 prescriptions for a moderate sized chain store with 2 to 3 pharmacists and technicians.

A critical burden facing pharmacists in the retail sector, and one that has had a negative affect on pharmacists' productivity has been brought about through the growth in third-party insurance coverage for prescription medications. A survey of community pharmacies in 1996 reported that 58 minutes of the average community pharmacist's day was devoted to "dealing with third-party plans, their administrators, and their formulary requirements." (June 10, 1996 Drug Topics). This represented about ten percent of the average workday reported as 9.6 hours. For pharmacists aided by technicians, the percentage was slightly lower (9.5 percent) while for those lacking technician support it rose to 11.8 percent. A survey in 1999 again reported the 10 percent figure (Drug Topics, April 1999). A 1999 survey of chain store pharmacists reported that 20% of pharmacist time is spent solely on activities directly related to third party issues such as entering information from the patient's identification card and resolving conflicts related to restrictions on insurance coverage ("Non-patient-care activities dilute pharmacists' time," news article in American Journal of Health-System pharmacy, Feb. 1, 2000, p. 202.; Andersen, 1999).

The adoption of a uniform prescription drug benefit card has been proposed as a vehicle for reducing the administrative burden associated with third-party coverage. The National Council for Prescription Drug Programs developed guidelines for implementation of a Pharmacy ID Card reflecting over two years work on this issue. (NCPDP 1998) This card would provide consistent information that could be used in pharmaceutical drug claims industry and would give pharmacists the information needed to submit prescription claims.

The use of pharmacy technicians could be optimized to relieve pharmacists of other burdens as well, keeping in mind that technicians would have to be properly trained, certified, and supervised. As noted earlier and elsewhere in this Report, several groups have suggested, as a partial solution to the shortage problem, removing State regulations that limit the allowable ratio of technicians to pharmacists. However, others note that pharmacists have not yet been trained to work optimally with technicians and that improving this working relationship is essential to increasing overall productivity. The National Association of Boards of Pharmacy, for example, set forth a number of key functions that pharmacists-in-charge must perform in order to assure the appropriate utilization of technicians.

Another enhancement that is expected to improve pharmacist efficiency is greater use of electronically entered and transmitted prescription orders. Many teaching hospitals use electronic medication order systems, and these systems have been shown to reduce errors due to illegible physician orders. More advanced electronic order entry systems can intercept potential medication errors through checks with patient medical data and alert the ordering physician and pharmacist about potential problems. This may reduce the amount of time pharmacists must spend in verifying and discussing orders with physicians, currently usually done over the telephone.

Future Prescription Growth

If recent growth rates in prescription volume continue, the number of prescriptions per community pharmacist will also continue to increase, and the current shortage will likely worsen. Thus, it is important to consider factors affecting future prescription growth.

Several factors affecting the past growth in prescription medication use are expected to continue into the future. The population growth and aging are projected to continue with the overall population growth is projected to be slightly less than it was in the 1990s, but the slight decline is offset by a slightly greater aging effect over the next decade.

During the first decade of 2000, continued growth in prescription drug coverage will be an important factor, particularly if a Medicare benefit is enacted. The type of prescription drug coverage offered in the future may have a slight depressing effect on utilization, since there is evidence that co-payments, deductibles, and the use of three levels of co-

payments for medications, are increasing. If this trend continues, any increase in demand due to expanded coverage might be offset by downward pressures as out-of-pocket costs increase for those already covered.

A health care information consulting firm has estimated that prescription medication volume will grow from 2.8 billion to 3.6 billion in the year 2004, an increase of 29% (IMS Health personal communication). This represents an annual growth rate of 5.2%, virtually identical to the 5.3% growth rate observed between 1992 and 1999, although it represents a slight slowing compared to the 8% growth experienced in the two most recent years (1998-1999). This growth is certain to have a significant impact on the pharmacist shortage since it implies an additional 20 percent increase in the number of prescriptions per community pharmacist relative to 1999 levels, given current projections of pharmacist supply through 2004.

This analysis supports the need for the dispensing of prescriptions to be re-engineered to require less pharmacist time, while maintaining quality controls, to bring the demand for pharmacists' time closer into alignment with supply. This would also allow pharmacists increased time to carry out patient counseling and other necessary pharmaceutical care functions (described in Chapter 3). It is clear that in the absence of such improved processes, the projected 20 % increase in prescription volume per pharmacist -- the increased number of prescriptions needed to be filled each year -- will simply mark the degree of the shortage and may be accompanied by various quality problems (addressed in Chapter 3) and consumer dissatisfaction.

INSTITUTIONAL DEMAND FOR PHARMACISTS

Institutional Employment Settings. Approximately 30 percent of pharmacists are employed in hospitals, health systems, long term care, and other organized health care settings. According to a survey conducted in 2000 by the Pharmacy Manpower Project, 24 percent of active pharmacists are currently employed in hospitals, 3.8 percent in long term care facilities, and 2.4 percent in home care (AACP website).

Pharmacists involved in institutional care are commonly called upon to perform a variety of clinical functions and to participate in organizational efforts to monitor and evaluate the drug use process. Hospitals and medical centers are also the sites for treatment of seriously ill patients and those with complicated medical conditions. Patients may have life-threatening conditions where complex medication therapy is an essential component of their management, often delivered while patients are critically ill. In referral medical centers, it is routine for pharmacists to be members of clinical teams specializing in organ transplantation, cancer care, advanced heart disease management, and complicated trauma and post-surgical care. As a consequence, any effort to base the increased demand for such pharmacists upon increased numbers of prescriptions, medication orders, or the like, ignores the reality that today's hospital, long term care, and home care pharmacists devote less than half of their time to dispensing medications and the rest to other clinical and management activities.

Pharmacists Employed in Institutional Settings Over Time

Data from the BLS suggest that during the 1990s, institutional demand for pharmacists kept pace with retail sector demand. According to BLS, 29.2 percent of all pharmacists worked in the health services sector (mainly hospitals) in 1991. The comparable figure for 1998 is 29.1 percent. Thus, the retail sector, despite the burgeoning growth in prescription volume as well as in number of retail outlets, has apparently been unable to entice large quantities of pharmacists away from the institutional sector, seeming to indicate strong institutional demand and/or commitment. As shown in Table 2-11, the total institutional pharmacist employment has been about 31%, with an estimated two percent in long-term care facilities.

Table 2-11: Numbers of Institutional Pharmacist

Year	Total Pharmacists*	Percent Institutional†	Institutional Pharmacists
1992	172,940	31.0%	53,629
1993	176,060	30.8%	54,174
1994	179,180	30.6%	54,901
1995	182,300	30.0%	54,672
1996	185,042	30.3%	56,086
1997	187,784	31.1%	58,401
1998	190,257	30.8%	58,739

*Data from the BHP_r Pharmacist Supply Model

†Data from BLS estimates of percent of pharmacists in institutional practice settings

DEMAND FOR PHARMACISTS IN ACUTE CARE HOSPITALS

Hospital Time Trend Data. Over the past two decades, scientific advances, technology changes, financing pressures, and expansions in alternative sites for care have brought about the significant change in the nature of the care provided in hospitals. This has led to a general reduction in the overall hospital days of services, yet an increase in the complexity of care delivered and the acuity of illness of hospitalized patients. As shown in table 2-12, the number of community hospitals and beds in the U.S. has declined steadily between 1990 and 1998. Hospital admissions declined in the early 1990s but then showed an upturn, to about 31,812,000 in 1998. However, due to reductions in average length of stay, the total annual hospital days has decreased from about 224,500,000 in 1990 to about 190,900,000 in 1998. These numbers do not assess the acuity level of care provided in hospitals, which has been reported to be increasing. The declining inpatient volume contrasts with dramatic increases in hospital outpatient visits. Throughout this time period, the overall number of full time equivalent hospital employees has increased continuously, from 3.42 million employees in 1990 to 3.83 employees in 1998.

These trends in hospital patient volumes reflect in part the financial incentives of prospective payment and managed care that reward fewer hospital admissions and shorter stays. Hospital employment has remained strong, however, in part because of the increased outpatient workload and in part because, on average, inpatients require more intensive care.

Table 2-12: Historical Data on Community Hospitals: 1990-1998*

Year	Hospitals	Beds X 1000	Admissions X 1000	Average Length of Stay (days)	Visits	FTEs† X 1000
1990	5,384	927	31,181	7.2	301,329	3,420
1991	5,342	924	31,064	7.2	322,048	3,535
1992	5,292	921	31,034	7.1	348,522	3,620
1993	5,261	919	30,748	7.0	366,885	3,677
1994	5,229	902	30,718	6.7	382,924	3,692
1995	5,194	873	30,945	6.5	414,345	3,714
1996	5,134	862	31,099	6.2	439,863	3,725
1997	5,057	853	31,577	6.1	450,140	3,790
1998	5,015	840	31,812	6.0	474,193	3,831

*Data from the American Hospital Association Hospital, Statistics 2000

†FTEs = full-time equivalents

Expenditures for Hospital Demand for Pharmacists in Hospitals. A major factor in the expanded role of pharmacists in hospitals and other organized systems of care is the growth in number of complex diseases and conditions treatable by medication. Patients in hospitals are often, because of their illnesses or state of consciousness, least able to

protect themselves from medical errors or less than optimal decisions about their therapies, including the use of medications. Likewise, the treatment of serious illness, such as cancer or life-threatening infections, often involves the use of potent and potentially toxic drugs that must be administered with great caution, careful timing and attention to the patient's response to the medications. Moreover, health professionals in hospitals must attend to these challenges in an intensely cost-conscious environment where escalating drug costs are a source of constant attention.

Physicians are generally the initiators of medication orders in hospitals and are ultimately responsible for patient outcomes. Nurses generally play the lead role in the administration of medications and monitoring the patient's progress. Pharmacists are responsible for reviewing medication orders, preparation and dispensing of medications and varying degrees of monitoring and consultation on the effectiveness of therapy. Pharmacy technicians assist in these functions. The team concept of healthcare emphasizes these health professionals working together so that the use of medications is appropriate and the patient benefits optimally. At discharge, the same team members play different roles in transitioning the patient to the ambulatory setting.

Because of the risks involved in medication use in the hospital setting, systems have evolved that are more sophisticated and time-consuming than we observe in community pharmacies and other healthcare settings. A 1999 survey of over 500 hospitals reviewed the steps taken at each point in the medication use process and the extent to which those procedures involving pharmacy were present (Ringold, 2000).

In this 1999 ASHP survey, the average number of full-time equivalent (FTE) pharmacists was 10.1 and the average number of FTE pharmacy technicians was 8.1. Variations in staffing by bed size are shown in Table 2-13. In the context of the current shortage, the survey shows that while automation is present in hospitals to support many medication use processes, automation is not yet pervasive and many labor-intense activities are performed by pharmacists. The survey reports an overall ratio of pharmacy technicians to pharmacists less than 1:1, which is substantially less than allowed by law in most States.

Table 2-13. Pharmacist and Pharmacist Technician Staffing in Acute Care Hospitals, 1999*

Hospital Bed Size	Average Number of Pharmacists	Average Number of Pharmacist Technicians	Technicians per Pharmacist
Less than 50	2.86	2.75	0.96
50-99	5.22	4.73	0.91
100-199	10.47	8.84	0.84
200-299	19.51	15.07	0.77
300-399	20.29	14.71	0.72
400 or more	45.10	32.61	0.72
All hospitals combined	10.12	8.11	0.80

*Data from Ringold et al., ASHP national survey of pharmacy practice in acute care settings: dispensing and administration. *Am J of Health-System Pharm.*2000;57:1773.

The following survey findings of the steps taken to assure quality in the pharmaceutical dispensing and administrative process in hospitals could be construed to exacerbate pressure on pharmacists already working under conditions of short-staffing and pressure to reduce costs.

- n Pharmacists enter more than 75% of medication orders in over 90% of hospitals. Physicians or other authorized staff initiate medication orders but, even though pharmacy computer systems are almost universally present, only 13% of systems allow for direct, electronic physician order entry.
- n The medication dispensing process is strengthened by the presence of a number of processes that, while they increase pharmacist labor and overall cost, reduce the possibility of errors. These include the following procedures which occur to varying frequencies in hospitals.
 - o Pharmacists check the order before dispensing
 - o The pharmacy computer indicates the time and date the drug is dispensed
 - o Two pharmacists check for high-risk patients or drugs

- o Automated storage and dispensing linked to the pharmacy computer
- o Technicians check the work of other technicians (tech check tech).
- n There is wide agreement that the safest form of medication administration is the unit dose; that is, the medication dose dispensed from the pharmacy that is ready to be administered to a patient with no further dosage calculation or manipulation required. The survey found that a minority of patients but a significant number, even in critical care units, was not receiving medications in unit dose form. This practice could relate to decreased labor availability or cost reduction pressures.
- n Non-pharmacy personnel handle some of the preparation of medications. More than half of respondents reported that between 1% and 24% of sterile fluids for intravenous use were prepared by non-pharmacy personnel. This could be due to a shortage of pharmacists. The report notes that pharmacy-prepared intravenous solutions are considered the benchmark for patient safety making the practices described less than optimal for safety considerations.
- n A Medical Administration Record (MAR) keeps track of medications received by a patient. Maintenance of a complete log of data is labor-intensive but important particularly in critically ill patients with numerous medications and/or medications requiring careful administration timing. The study found several tasks not routinely performed and none performed by pharmacists the majority of the time.
- n A high percentage of hospitals reported quality improvement processes for medication preparation and dispensing operations and, in most cases, 75% or more reported actual improvements. Examples of areas subjected to analysis include the sterility of intravenous solutions, accuracy and safety of cancer drug preparation, accuracy of pharmacy's patient medication record, accounting for missed doses and personnel education and training. Thus, it is possible to make further improvements if sufficient staff with appropriate training were available.

DEMAND FOR PHARMACISTS IN LONG-TERM CARE AND HOME HEALTH CARE

Long Term Care Facilities. According to the American Society of Consultant Pharmacists (ASCP), in the year 2000, the number of long-term care facilities serviced by pharmacy providers was 32,093, compared to 26,266 in 1998, a 29% increase in two years. The volume of care provided by the Nation's long-term care pharmacy providers is substantial, covering 2.4 million beds and over 103 million prescriptions annually. The number of long-term care pharmacy providers increased to 3,128 in 2000, compared to 2,875 in 1998, an 11% increase (American Society of Consultant Pharmacists personal communication).

Services provided by consultant pharmacists, the term used for pharmacists serving long term care facilities, include many beyond the distributive and dispensing functions (ASCP, 1995).

Drug regimen review (DRR). DRR is required monthly by Federal law but is often routinely performed on an ongoing basis with intervention as necessary to address the real or potential problems of individual residents.

Utilization management. This includes the development and management of a suitable formulary for the facility, based on an understanding of the special therapy needs of the residents. It also includes therapeutic interchange (substitution of cost-effective therapeutic equivalents, including generics, when possible), drug utilization review (systematic analysis of aggregate utilization patterns), and disease management (working with other health professionals to develop guidelines for, and to manage, both drug and non-drug treatment of chronic diseases).

In-service training programs. These programs are designed to train other health professionals in improving drug therapy. Nurses are trained in monitoring patient outcomes, identifying side effects, and in the proper administration of medications. Professional discussions are held with dietitians on drug-food interactions, and with facility staff on efficient methods for handling medications and medication records.

The volume and character of medications administered in long-term care facilities is understandably unique. The top three medications prescribed in nursing homes fall into the psychotropic category (SMG Market Trends, February 2000). These include anti-depressants, prescribed for 26% of nursing home residents, followed by anti-psychotic drugs (16%), and anti-anxiety drugs (13%). Antibiotic drugs (6%) are a distant fourth. National surveys conducted

in 1993, 1994, and 1997 show a similar pattern of drug use except for a lower percentage of long-term care residents for whom anti-depressants were prescribed (Tobias, 1994a, b; Tobias,1997).

Other signs of increased prescriptive activity in long-term care facilities include the following: in 1993, the average number of active medication orders per resident was 5.2; by 1997, the number had increased to 5.8. On a regional basis, the increase was greatest in the West and North Central regions; in the West, it rose from 4.4 to 5.6 and in the North Central region, from 5.1 to 6.2. There were increases in the other regions as well but of a lesser magnitude; in the South, the average number of active medication orders per resident went from 5.7 to 5.9 and in the Northeast from 5.3 to 5.5.

Home health care. Home health care has been one of the most rapidly growing health care sectors. In 1992, an estimated 1.23 million individuals received home health care services and by 1996 this number had almost doubled to 2.43 million individuals (Health US 1999, table88). In 1996, 27% of individuals served by home health care were under 65 years of age, and the remainder were over 65, with the age 75 to 84 year olds making up 35% of all patients. The medical conditions requiring home health services included many that rely upon chronic medication therapy such as heart disease, diabetes, respiratory conditions, cancer, stroke and other neurological conditions.

Pharmacists play an increasingly important role in preparing medications for use in the home. Pharmacy services are currently offered by 37% of all home health services (SMG Market Trends, February 2000). In 1998, the corresponding percentage was 32%. Many independent drug stores have offered a home health pharmacy service.

The range of pharmaceutical services provided through home health care may be quite broad and include complex therapies. For example, infusion therapy is delivered through intravenous routes, and used for treatment of serious infections, cancers, nutritional supplements, and other complex conditions. The annual volume of this particular pharmaceutical service and the demand it places on pharmacists' time is difficult to measure. The American Society of Health-System Pharmacists (ASHP) noted that a single infusion order could consist of many doses of medication but that for billing purposes, a multiple order of this nature is considered a single "prescription". ASHP also noted that only 36.1% of a home infusion pharmacist's time is taken up with compounding activities and that such activities are considerably more extensive, intricate, and time-consuming than simple "dispensing".

PHARMACIST SALARIES

Shifts in the balance between supply and demand are often marked by changes in compensation; therefore, a review of pharmacist salaries over the recent past was considered essential for this study. Because of the recent nature of the shortage, there are few salary data available after 1997 that are drawn from large, national, rigorously conducted surveys, for example, data from the Bureau of Labor Statistics. The data that are available come from less rigorous sources, for example, from surveys run through trade journals and Websites. We compared data from all these various sources to obtain insights into salary values and trends. Fortunately, we found agreement among the various data sources and this gave us more confidence in including the data from smaller and/or less rigorously conducted surveys. The data support three findings:

- n Through the 1990s to 1998, pharmacist salaries have been rising steadily and modestly;
- n Chain pharmacy incomes are consistently higher than incomes in either hospitals or independent pharmacies;
and
- n Since 1998, there are anecdotal reports of large jumps in salaries paid to attract pharmacists to open positions.

Drug Topics Longitudinal Surveys, 1992 to 1998. Drug Topics is a trade journal that conducts annual salary surveys across practice settings; for example, in 1999, 6,400 surveys were sent to pharmacists practicing in independent pharmacies (1,750), chain pharmacies (1,400), hospitals (750), supermarkets (750), mass-merchandise pharmacies (750) and HMOs (750). The response rate was 26%. The reported incomes include overtime pay and bonuses. Mass merchandisers such as Wal-Mart and Costco were not included in the survey until 1996. Table 2-14 reports findings from four surveys. The data, as reported here, are not corrected for inflation.

Table 2-14. Average Total Income (\$) of Pharmacists by Employment Settings: 1992-1996.*

Year	Independent	Chain	Mass Merchandiser	HMO	Hospital	Supermarket
1992	47,524	54,267	--	--	51,482	--
1994	51,415	59,176	--	--	55,258	--
1996	54,110	65,495	64,957	70,197	62,048	61,319
1998	59,657	68,648	69,964	69,870	62,510	67,177

*Data from Drug Topics Salary Surveys, 1993-1999

The survey data illustrate that income has risen steadily at an annual income growth rate of approximately 4% between 1992 and 1998 and chain pharmacies generally offer higher incomes than independent pharmacies or hospitals. Pharmacists in mass-merchandise pharmacies and supermarkets have comparable pay to chains. HMO pharmacists registered high but not rising income from 1996 to 1998.

Longitudinal Survey II: Current Population Survey (CPS), 1990-1995. A recent study addressed pharmacists' labor market characteristics from 1968 to 1996 using data from the Current Population Survey (Shih YC, 1999b). Trend in full-time pharmacists' labor market characteristics. JAPhA. 2000, 40:26-35). The CPS is a monthly survey conducted by the Bureau of the Census for the Bureau of Labor Statistics. Table 2-15 presents data excerpted from the study for years 1990-1995. The data are adjusted for inflation and are "smoothed" over a 3-year period for the purposes of exploring trends. The smoothing process obscures year-to-year fluctuations; for example, the "smoothed" value for the 1993 salary is calculated by averaging the salaries for 1992, 1993 and 1994. The data are useful in this report, however, for corroboration with data collected from smaller samples or less rigorously. Salary values were found to be consistent with the reported incomes from the Drug Topics surveys (Table 2-15).

Table 2-15. Mean Annual Salary, 1990-1996 (Adjusted to 1996 \$)

Year	Annual Salary (rounded to nearest \$100)
1990	51,600
1991	53,200
1992	51,900
1993	53,100
1994	55,100
1995	55,700

*Data from reference: Shih, YT, 2000

Bureau of Labor Statistics, 1997. The Bureau of Labor Statistics reports the following median annual salaries for pharmacists working in the industries employing the largest numbers of pharmacists: \$67,000 (grocery stores), \$63,400 (drug stores and proprietary stores), \$62,600 (hospitals) and \$61,700 Federal Government. These values are similar to Drug Topics survey data for the same time period. Because independent and chain pharmacies are combined as "drug stores and proprietary stores", comparisons among independent, chain and hospital practice settings are not possible.

The Lazarus Survey, 2000. Table 2-16 presents data from the Lazarus Surveys, a longitudinal survey series based on responses from 44 large hospitals distributed across the U.S. In 2000, two sets of salary data were reported—one in March and one in September. Both datasets track salary rises in entry-level hospital positions over a very recent six-month period. The data show an 8.5% increase in average entry-level salaries in a 6-month period. The report also notes, "The highest entry salary reported (\$81,120) is 12.6% higher than the maximum entry salary in that region in March." These data suggest that the shortage has driven entry-level salary increases.

Table 2-16. Average Annual Salary (\$) Paid to New, Inexperienced Pharmacists, 2000*

Survey	Average Salary (\$)	Range (\$)
March, 2000	56,000	43,000 to 71,850
September, 2000	60,740	50,000 to 81,120

*Data from Lazarus H. The Lazarus Report, 2000. Birmingham, AL; 2000 March and September

Pharmacy Week Internet Survey. Pharmacy Week is a trade publication that provides information about pharmacist job openings mostly in institutional settings across the country. In 2000, the publication set up an on-line salary survey that collected data about type of practice and geographic area. The resulting database is available on the Web at <http://www.pharmacyweek.com> for salary information and comparisons. Table 2-17 lists average annual salaries by type of position for those positions with at least 85 respondents reporting.

Table 2-17. Average Annual Income (\$) by Type of Position, 2000*

Practice Setting	Average Annual Income (\$)	Number of Respondents in This Category
Hospital staff	63,866	346
Hospital clinical	68,705	121
Hospital management	75,349	489
Hospital administration	82,734	85
Retail chain	71,100	198
Retail management	74,782	92

*Data from Pharmacy Week Website, <http://www.pharmacyweek.com>

The *Pharmacy Week* data show a large differential in 2000 hospital staff salaries and retail chain salaries. Hospital clinical salaries, while higher, still fall short of the retail chain salaries. Hospital management and retail management salaries are similar.

DEMAND FOR PHARMACISTS IN FEDERAL SERVICES

Federal Pharmacy, which includes the Air Force, Army, Navy, Public Health Service (PHS), and Department of Veterans Affairs (DVA), has been directly impacted by the national pharmacist shortage. It has become increasingly more difficult to recruit and retain pharmacists over recent years. The Federal services employ approximately three percent of the Nation's pharmacists. These pharmacists provide pharmaceutical care to veterans, active duty men and women and their dependents, uniformed service retirees and their dependents, Native American and Alaskan Natives, Federal Bureau of Prisons' inmates and Immigration and Naturalization Service detainees, as well as elected officials including the President of the United States and members of Congress. They are also an integral part of disaster response, bioterrorism preparedness, and the Nation's increasing support of humanitarian efforts in this country and throughout the world. (1,2,3,4,5)

Federal Pharmacy has been a major leader for change in the profession of pharmacy in areas such as automation, technology, credentialing, patient counseling (10), disease state management, and pharmaceutical care (8). They have also been the forerunner in the establishment and use of central fill facilities, filling prescriptions directly from the patients medical record (6,7), and the intensive use and education of pharmacy technicians. Pharmacy technicians in the uniformed services undergo an intensive education program where they learn every aspect of the prescription filling process, which enables pharmacists in the uniformed services to utilize their technicians to a greater extent and in expanded roles than possible in the private sector. Even though these highly trained technicians are able to take care of many of the tasks that pharmacists are often faced with, there are not enough pharmacists to sufficiently monitor and supervise these technicians due to the pharmacist shortage in the uniformed services. Federal pharmacies serve as major training facilities for undergraduate pharmacy education (clinical rotations) and graduate pharmacy education (residencies and fellowships). Many of the innovative practices to improve patient care and training sites are being reduced or

curtailed due to the pharmacist shortages. This shortage is expected to continue to rise as the national shortages continue and the pharmacist pay in the private sector continues to rise faster than in the public sector.

Pharmacist vacancy rates across all of the Federal services have risen dramatically in the last few years. Vacancy rates in the Federal services are as high as 18%. The PHS currently has more than 90 vacancies specific to pharmacists. This does not include vacancies for a number of multidisciplinary positions for which pharmacists are one of the qualified disciplines. This vacancy rate represents 11% of the pharmacy positions in the PHS as compared to a 5% vacancy rate in 1996. PHS provides health care to the Federal Bureau of Prisons, which plans to open 30 new prisons by 2006. Each facility will require at least one pharmacist. The Navy will be facing a vacancy rate of 18%, with a total of 29 vacancies for the 158 authorized positions by the end of FY00 due to current vacancies and planned separations. The Army has a vacancy rate of 16% reflecting a total of 25 vacancies for its 153 authorized positions as of July 2000 and anticipates 20 or more vacancies to continue among its commissioned officers. The Air Force has a vacancy rate of 15% facing 39 vacancies for its 250 authorized positions this fall. The Department of Veterans Affairs (DVA) is faced with similar vacancy rates across the board with some facilities running with less than 50% of the authorized pharmacist positions filled.

It is anticipated that the need for additional pharmacists in the Federal services will increase as the Nation focuses on the Institute of Medicine's medical errors report, bioterrorism threats, prescription drug coverage for Medicare patients, and optimizing prescription drug benefits for Federal beneficiaries.

The problems faced by Federal pharmacy to recruit and retain pharmacists, lies heavily on the pay disparities between the salaries that can be offered by the services when compared to salaries in the private sector. Federal services offer a starting salary of approximately \$39,000, while salaries in the private sector are often twice this amount ranging from \$70,000 to \$100,000. These private sector salaries are supplemented with various sign-on bonuses and school loans repayment. In the DVA alone, the cost of special salary rates grew 32 percent in the first four months of calendar year 2000. Twenty-five percent of the DVA pharmacists have reached the regulatory maximum salary rate which is still 20 percent below the maximum private sector salaries. So far during calendar year 2000, virtually every DVA facility has requested increased special salary rates for their pharmacists just to be able to compete with private sector salaries. Retention bonuses of up to \$10,000 have also been given to supplement the salaries of many DVA pharmacists. Sometimes these bonuses are given to every pharmacist at a facility. Even after taking these measures to work through their pharmacist shortage problems, the DVA feels that it is still "fighting an uphill battle." Although Federal pharmacy has many opportunities for advancement and a unique quality of practice, it is becoming increasingly difficult to find pharmacists willing to work in this setting as the pay disparity continues to grow.

Federal pharmacy is addressing the pharmacist shortage by cutting back or eliminating services. They are cutting back in hours of operation or having pharmacists work longer hours which tends to increase medication errors, adverse events and staff burnout. Federal pharmacy is also utilizing contract pharmacists where available. While this may temporarily fix staffing problems for the Federal facilities, it incurs a much larger cost to the tax payer than pharmacist positions filled by commissioned officers or civilian pharmacists. Contract pharmacist pay varies by geographic location, but typically exceeds \$100,000 per pharmacist per year.

As a result of the pharmacy staffing shortages, all of the Federal services have had to cut back or curtail pharmacy programs or services. These services are often related to special patient groups suffering from diseases such as asthma, coronary artery disease, diabetes, high cholesterol, and hypertension. Without the pharmacist's counseling services, there may be increased or inappropriate medication usage. Decreased monitoring of drug therapy can lead to increased health care costs due to preventable drug related hospital admissions (9). The shortage has forced existing monitoring programs to be reduced or eliminated, as well as preventing the start-up of new programs. Information from facilities where programs have been cut, has found that fewer patients have optimal drug therapies and lab values that are within normal ranges. Facilities are also reporting increased medication errors, adverse drug events and increased patient waiting time which directly relate to staffing shortages.

DEMAND FOR PHARMACISTS IN RURAL AREAS

The demand for pharmacists for practice in rural areas is, as elsewhere, a derived demand based on consumer demand for prescription medication and other services of these providers. Factors which differentiate rural consumers' demand include demographics (age, education), general health status, and economics (income and health insurance). In addition, access to other health care providers, especially primary care physicians, is a factor. A lack of access to routine and specialized medical care would reduce the level of prescription demand by rural residents. Shortages of medical personnel that prevail in rural medically underserved areas (MUAs) force residents to seek care elsewhere and, most likely, this would include their medication purchases.

The employment sectors for pharmacists in rural areas are primarily retail pharmacy outlets, comprised of independent and chain stores, hospitals and, to a lesser extent, long term care facilities, and a limited number of others (prisons). Rural employers face substantial competition from others in their efforts to hire and retain pharmacists. This competition has translated into higher compensation and other bonuses being offered; these may disadvantage smaller independent rural retail outlets and hospitals.

Characteristics of the rural population. Differences between the population base of rural areas and non-rural areas have implications for the demand for pharmacy products. One component is age because the elderly tend to use more health care products and services, including prescription medicines. The median age of the non-metropolitan population is nearly two full years greater than those in metropolitan areas, and the proportion of those over age 65 is 15.0%, compared with 12.8% (Ricketts, Johnson-Webb & Randolph, 1999).

Health status of rural residents, a factor in the demand for services, has been well documented as generally worse for rural residents compared with those elsewhere. Analysis of this factor is complex due to its relationship with economics, education, and other variables. In rural areas there are higher rates of chronic disease; injuries, especially those related to occupation; and age-adjusted mortality (ibid.)

Economic factors, including earned income and insurance coverage, are important variables in the demand for pharmacy products and other health care services. The long period of sustained economic growth experienced throughout the country has not offset the lag in incomes for rural residents due to downturns in mining, timber, agriculture and other rural industries. In Illinois, the discrepancy between earnings from similar jobs in metro and rural areas is growing. In 1980 the average earnings per job was \$5,203 less per year for rural workers than for those in metro areas. This gap had widened to \$7,589 by 1998 (Straub, 1999).

Employment is less likely to come with health insurance when located in a rural setting. A national household survey found that 54 percent of rural residents were covered through employment, while this figure was 63 percent for urban residents to have public insurance or to be without any insurance. Other features of insurance further differentiate by location; private coverage for rural residents increases with proximity to a more populous county. A study of Nebraska residents found that the lengths of time without insurance coverage has increased and those without insurance in rural areas experienced longer spells than those in urban areas (Mueller 1997).

These and other characteristics of the rural population suggest their demand for pharmacy products may differ from those elsewhere, although the pattern is not straightforward. A higher percentage of elderly and persons in poor health status indicates more demand for prescriptions, while the income and insurance factors mitigate this demand. Research certifies that rural residents in Illinois use alternative medicines and therapies; these may serve as substitutes for prescription drugs and alter demand (Straub & Henley, 2000). Consumers may also elect to purchase their prescription through mail order outlets and the Internet. The dynamics of these characteristics and behaviors of the population affect the accuracy of predictions about the demand for pharmacists in rural communities.

Demand variables. Compensation is a main variable in employer demand for workers. The ability to pay higher rates of pay and benefits to attract pharmacists varies among types of rural employers. Small rural hospitals, already in jeopardy regarding profit margins, have difficulty competing with large retail pharmacy chains that are currently in a

growth mode. These outlets are fueling their demand for pharmacists with offers of generous starting salaries and bonus packages. Smaller independent outlets and hospitals cannot back up their demand in this way.

All rural employers are competing with those in non-rural settings as well. A comparison of average earnings for pharmacists in Illinois in 1996 shows those in rural areas earn less than the Statewide average at entry level and at the median, but slightly more if experienced. Pharmacist earnings, Statewide, are slightly higher than those for dentists at entry level, but the differential is reversed at the median and experienced levels.

When employers are unable to meet their demand for pharmacists, this can be offset by initializing substitute resources. Potential options include: pharmacy technicians and aides, automated and centralized dispensing, and contract services. The ability to use pharmacy technicians and aides varies among States according to the scope of practice designation for these positions. There is some evidence that pharmacy technicians are not utilized as extensively by rural pharmacists as by those in urban areas. One study of Nebraska pharmacists found that pharmacists in urban areas, versus rural areas, felt that technicians were useful in freeing up the pharmacist's time for patient counseling and questions.

A recent study of rural pharmacists in three Midwestern States found that 83 percent of rural retail pharmacies had at least one pharmacy technician on staff. The most common pattern (in 58 percent of the outlets) is for three to four technicians. The study also found that use of these technicians varied among the three States, from 92 percent in Minnesota pharmacies reporting at least one technician, to 68 percent in North Dakota. Staffing patterns varied by ownership, with chain pharmacies much more likely to employ pharmacy technicians than independents. Barriers that inhibit the use of pharmacy technicians include lack of time by pharmacists, limited clinical skills or pharmacists, and employer and public acceptance.

Another factor affecting the demand for local pharmacists is consumer substitution, such as consumers' use of other outlets for drug purchases; primarily, these are retail stores located elsewhere, mail order, and the Internet. Mail order shopping, traditionally a standard for rural residents, is now used for prescriptions. Internet access continues to increase in rural areas. When residents of rural Illinois were surveyed in 1996, 37 percent of respondents had a computer and 17 percent had Internet access but its use for prescription drugs was negligible (Straub & Tripp, 2000). Results of the 2000 survey of these residents show that 57 percent had a computer and 72 percent of these had Internet access. For those, 34 percent use it for health care information, but only 4 percent do so for drug purchases. Mail order purchases of drugs were made by 16 percent of respondents (*ibid*).

CHAPTER 3

EXPANDING PROFESSIONAL ROLES, QUALITY OF PHARMACEUTICAL CARE, AND PREVENTION OF MEDICATION ERRORS

INTRODUCTION

The practice of pharmacy has as a historical foundation the safe and accurate use of medications. However, the pharmacist practicing in the year 2000 provides a much broader range of services to meet this goal than was provided only ten years ago. This chapter will describe some of the important roles of pharmacists in health care delivery and research. The expanded roles for pharmacists in part relate to increased clinical training and participation in medical teams applying scientific advances and new biomedical technology. Pharmacists are involved with treating more medical conditions as the use of drug therapy has expanded. The efforts to contain medical care costs and employ efficient management principles throughout the health care system have included pharmacists.

The concept of pharmaceutical care expands the pharmacist's role beyond dispensing medications to providing drug therapy with a goal of assuring a beneficial patient outcome and improved quality of life for patients (Helper & Strand 1990). As more pharmacists have been trained in clinical pharmacy practice, their role in health care delivery is expanding to include drug monitoring and disease management for defined conditions; participation in clinical care teams with physicians, nurses and allied health care providers; consultation in drug utilization programs; and health services research on outcomes of care.

The growth in new prescription medications and expanded uses of existing medications require that pharmacists keep abreast of these developments. Pharmacists have an important role in assuring that patients understand the proper use of medications and can follow the treatment plan. Pharmacists may also assist physicians in discussing new drugs and changes in indications for existing medications. Pharmacists also answer questions about over-the-counter or non-prescription medications and a growing array of vitamin, mineral, and nutritional supplements and non-traditional therapies such as herbals and other products.

With increased use of prescription medications, the potential for medication-related problems also increases. The role of pharmacists in assuring safety and high quality of pharmaceutical care is critical. The 1999 Institute of Medicine report "To Err is Human: Building a Safer Health System" brought attention to the serious problem of medication errors and the associated costs in terms of lives lost, medical complications, and health care expenditures. Pharmacists have long recognized and studied the serious problem of medication errors, a portion of which has been identified as their responsibility. Pharmacists have a major role in identifying improvements in the drug use and distribution process and other steps that can be taken to reduce the likelihood of medication errors. Carrying out this responsibility is particularly challenging during a time of pharmacist shortage.

EXPANDING CLINICAL ROLES FOR PHARMACISTS IN AMBULATORY SETTINGS

This section will highlight the expanding role of pharmacists in community pharmacy and ambulatory settings by describing emerging areas of pharmacy practice. Disease management programs allow pharmacists to assist physicians and patients in medication management, counseling, and monitoring of chronic medical conditions. Pharmacists advise health care systems and other organizations, in both ambulatory and institutional settings, on selecting appropriate medications to include in a drug formulary (the generally available medication list) and other steps to contain costs while assuring the quality of medication therapy. Pharmacists have also taken on a wide range of clinical activities offered within the pharmacy to promote and educate the public on healthy lifestyles, early screening for health problems, and prevention programs such as immunizations.

PHARMACIST ROLE IN DISEASE MANAGEMENT PROGRAMS

Disease management programs are offered by trained pharmacists to patients with chronic conditions such as diabetes, asthma, high cholesterol, high blood pressure, and anti-coagulant therapy (blood thinning to prevent blood clots or strokes). Through these programs and with physician collaboration, pharmacists can provide a range of services including assessing the patient, ordering drug-therapy related laboratory tests, administering drugs, and selecting, monitoring, and adjusting medication regimens. These programs usually involve a series of regularly scheduled visits with the pharmacist and often follow disease-specific management guidelines.

A critical issue for the profession of pharmacy is having this service recognized as a cognitive health care service that is billable to third party insurers. As these programs are developed, many have included fees charged to the patient, employer or insurance plan. Another issue of concern to the pharmacy profession is the status of State Pharmacy Practice Acts with regard to this type of collaborative practice between pharmacists and physicians. Many States have expanded the practice acts to cover this practice and others are considering these changes.

Three programs merit special discussion since they are seen as relatively large scale efforts that have been well studied. In 1998, the State of Mississippi Medicaid program instituted a program for pharmacists to counsel Medicaid beneficiaries with certain conditions. The goal of the program was two-fold - to improve medication use and to reduce costs to the Medicaid program. This program was developed by the University of Mississippi School of Pharmacy, the Mississippi Pharmacists Association, and the Mississippi State Board of Pharmacy and was approved by HCFA. Credentialed pharmacists work with the patient's physician to manage patients with diabetes, asthma, high cholesterol, and anti-coagulant therapy. Pharmacists bill Medicaid \$20 per visit up to 12 visits and they provide patient education and help patients keep to a medication plan developed by the physician and pharmacist.

The Ashville, North Carolina project was begun in 1997 to offer diabetes disease management by clinical pharmacists to employees of the City of Ashville. The City wanted to improve health care services and outcomes for its City employees and also hold down health care costs for diabetes care (Snowden, 2000). This program was well designed and implemented with collaborating physicians and trained pharmacists, and it received support from the employer, employees, physicians, and community pharmacists. Program evaluation concluded that improved diabetes management had been achieved, with patients reporting higher quality of life scores. The program also reduced overall diabetes care costs. In 1998, the City of Ashville decided that the program's success warranted offering a similar program to employees for asthma management.

A national study was conducted from 1996 through 1999 for community pharmacists to counsel patients with high cholesterol and fat levels who were at risk for heart disease. This program, known as Project IMPACT (Improve Persistence and Compliance with Therapy), was offered in 26 communities across the country (Blumi, 2000). The program had four goals - to improve patient compliance with their medication program; to increase communication and information flow between physicians, pharmacists and patients; to improve cholesterol levels of patients; and to increase the number of patients who could maintain the desired therapeutic goals, thus leading to a reduced risk for heart disease. Pharmacists identified patients at risk for heart disease, tested for cholesterol levels, and worked with physicians in the patient's care. The pharmacists met with patients for an initial evaluation and then monthly for three months and quarterly for up to two years. Outcomes for almost 400 patients showed a much higher rate of compliance with medication plans (90% of patients), with 63% of patients reaching the target level of control for their cholesterol level. This rate compared favorably to other studies where full cholesterol control was only achieved with 8 to 33% of patients.

Across the country pharmacists are engaged in programs such as these to work with patients and physicians to improve management of many of the most common chronic medical conditions. The adequate and unmonitored use of medications for chronic medical conditions is a serious and costly problem that has had only limited study. As more pharmacists are trained and able to carry out these programs, it is expected that the health care outcomes for these conditions should improve; however, careful evaluation studies are needed.

PHARMACIST RESPONSIBILITIES IN HEALTH CARE SYSTEMS

Within health care systems, pharmacists are involved in a variety of roles that affect clinical patient care or system-level management of drug use, such as those involving drug formularies, reviews of the appropriateness of medication use, and cost containment efforts. The systems-level responsibilities deal with quality improvement and performance analysis of pharmaceutical care. Health care systems include some of the most advanced, largest and most complex healthcare organizations, such as academic medical centers and large regional health systems. A 1999 survey of ambulatory care pharmacists working in health care systems noted the following functions performed by at least 50% of pharmacist respondents. (ASHP Survey of managed care... 1999).

- n Patient care activities
 - o Providing written and oral information with new prescriptions
 - o Monitoring patient compliance with medication use
 - o Conducting wellness and preventive health programs

- n Management activities
 - o Using pharmacoeconomic data for making formulary decisions
 - o Conducting medication management programs
 - o Tracking adverse drug reactions
 - o Negotiating pharmaceutical contracting
 - o Conducting academic detailing (this involves meeting with physicians and discussing medication use to affect prescribing patterns)
 - o Making pharmaceutical decisions for large populations based on pharmacoepidemiology
 - o Designing pharmacy benefits.

The 1999 survey also identified emerging functions related to patient care, not reported in past surveys, with varying numbers of pharmacists reporting the activity.

- n Providing information or consulting through a call center
- n Determining patients' use of herbal products and dietary supplements
- n Dispensing emergency contraceptives
- n Providing immunization screening and administering immunizations.

While the expanding role of pharmacists has been developing over many years, the current pharmacist shortage may affect further growth in these important areas. The list of 24 activities surveyed in this study included a large number not considered "traditional" pharmacist activities such as designing pharmacy benefits and conducting wellness and preventive health programs. Thirteen of these functions were being performed in over 200 of the responding integrated health systems and represented a significant amount of pharmacist work time. Moreover, the new work performed by pharmacists had the support of the medical staff and senior management and this appeared to increase demand for additional services. An upward spiral of pharmacist demand could reasonably be postulated as long as pharmacists continued to perform satisfactorily in new roles.

As pharmacists became part of interdisciplinary teams, they were more involved in patient care and population-based activities. As other healthcare workers and management became aware of the knowledge and skills of pharmacists, they tended to identify work activities where these knowledge and skills were needed. Expanded use of pharmacists was most likely to occur in integrated healthcare systems. This recognition of the potential utility of pharmacists could then extend to community pharmacies where the majority of pharmacists work, thus leading to a substantial growth in demand for services.

PHARMACIST ROLE IN COST CONTAINMENT FOR MEDICATION THERAPY

As noted in Chapter 2 of this Report, expenditures for medications have been one of the fastest growing components of national health care expenditures, currently exceeding the rate of growth for hospital care and physi-

cians' services. Since pharmacists are involved in the entire drug use process, they have been increasingly involved in efforts to assess costs of drug use and identify safe ways to reduce unnecessary costs and inappropriate drug use patterns.

A review of over 100 studies published between 1988 and 1995 described the economic impact of clinical pharmacy services provided in a variety of settings, including community pharmacies and managed care organizations (Schumock Pharmacotherapy 1996). This analysis concluded that a small number of well designed studies demonstrated a clear cost benefit of pharmacists' interventions (monitoring drug therapy, targeted drug programs). However, this group recommended that economic evaluations should continue and that careful research design was needed.

Another approach to assessing the role of pharmacists in cost containment examined the interventions of California pharmacists practicing under managed care plans (Knapp et al., 1998). This study, of over 93,000 prescriptions and almost 600 interventions, showed that community pharmacists interventions could resolve a variety of drug-related problems, with the most common being drug selection. Where there was an opportunity to suggest an equivalent drug with a lower cost, the savings per medication was about \$20 or 65% of the prescription cost. This group estimated that about four percent of prescriptions could have such an intervention.

PHARMACISTS AND MANAGED CARE

With the growth of managed care over the last decade, many Americans' healthcare benefits include a prescription drug component. The annual expenditure for the "drug benefit" has increased faster than the other components of care, leading to emphasis on cost containment within managed care organizations (MCOs). Because of pharmacists' knowledge of both the science and the economics of medications, MCOs often find it beneficial to include pharmacists in decision-making and management related to the prescription drug benefit.

Depending on their structure, MCOs tend to use pharmacists differently. "Closed" MCOs, such as Kaiser Permanente and the Veterans Affairs health systems, can develop system-wide strategies such as the use of formularies, automation and more use of mail order pharmacy services to contain drug benefit costs. A 1999 survey of 400 MCOs found pharmacists in these systems, as well as staff-model HMOs and hospital-based integrated health systems, performing a wide range of non-traditional activities to improve the use of medications. These activities included conducting specialized pharmacist-managed clinics, tracking adverse drug reactions, preparing home infusion, and monitoring patients' use of herbal products and dietary supplements (Knapp, Blalock & O'Malley, 1999).

"Open" systems, on the other hand, such as integrated provider associations (IPAs), the most dominant form of MCO, find it particularly difficult to contain the escalating costs of the drug benefit for several reasons. The IPA may receive payment from multiple payors each of whom may have different drug benefit guidelines. Also, IPAs generally do not have the level of control over the drug benefit that closed systems do. For example, IPAs do not have their own pharmacies and must work through local or regional pharmacies and/or a prescription benefit management (PBM) organization. The same 1999 survey cited above found that IPAs are hiring pharmacists to help develop formularies and in other ways to make the drug benefit more affordable and yet satisfactory to their members. The survey showed pharmacists in IPAs to be highly involved in making pharmaceutical decisions on the basis of pharmacoepidemiology, conducting wellness and preventive health programs, using pharmaco-economic data for making formulary decisions, collecting data on quality measures (Health Plan Employer Data and Information Set, HEDIS), and designing pharmacy benefits.

Additionally, many MCOs develop contractual relationships with pharmacy benefit managers. The PBMs, in turn, develop contracts with community pharmacies so that health plan members can conveniently have their prescription filled. The PBMs hire pharmacists to participate in the management of drug benefit programs; for example, pharmacists in PBMs contribute to formulary development and management, review the substitution of non-formulary medications and perform drug utilization reviews.

The number of pharmacists working in positions related to managed care has paralleled the growth of the managed care industry. Further growth of the industry and continuing problems with the growth rate of prescription drug benefit programs make it likely that the demand for pharmacists in this area will continue to grow.

PHARMACIST ROLE IN ASSURING QUALITY CARE IN HOSPITALS

Pharmacists carry out many activities within hospitals that go beyond preparing and dispensing medications. While these functions may not be apparent to patients or the public, they are critical to assuring that medications are delivered under safe and high quality conditions. The national pharmacist association representing over 30,000 pharmacists practicing in these settings (the American Society of Health-System Pharmacists) has developed standards of care and pharmacy practice guidelines known as "best practices" which provide detailed and updated information to pharmacists to assure high quality practice.

The range of services covered by these guidelines is quite broad and includes the following as examples.

- Responsibilities for selecting and purchasing medications from manufacturers and suppliers of drugs and related supplies.
- Responsibilities for preparation and special handling of products that 1) are hazardous (such as radioactive or cytotoxic substances), 2) are prepared and maintained under sterile conditions (to prevent risk of infection), 3) require special compounding or individualized preparation steps, or 4) are life-sustaining such as parenteral nutrition.
- Assuring quality of medication care by 1) providing medication information to the clinicians and staff of the facility, and where appropriate, to patients and families; 2) serving with the medical staff on hospital committees that monitor and evaluate the use of drugs, such as the Pharmacy and Therapeutics Committee, which determines which medications will be on the hospital's formulary (list of medications stocked) and the Drug Utilization Review Committee, which evaluates how drugs are prescribed and used and the outcomes of their use; and 3) assuring that any drug products that should not be used (recalled, outdated, defective) are removed.
- Advising and maintaining the systems of drug distribution within the facility. In many hospitals this includes a unit-dose packaging system that includes the specific dose of medication ordered for the patient.
- Responsibility for assuring that controlled substances (regulated medications with a high potential for misuse, such as narcotics) are properly accounted for and controlled.

PHARMACIST ROLE IN LONG-TERM CARE FACILITIES

The pharmacist role in assisting in the care of individuals in long-term care facilities has expanded over the past fifteen years, in part through Federal regulatory mandates. All patients in nursing facilities must have their drug regimen reviewed by a pharmacist on a monthly basis, and identified problems must be reported to the prescribing physician and director of nursing (ASCP website). A critical concern for patients in nursing homes has been the potential for the use of unnecessary drugs - excessive doses, inadequate monitoring, or inadequate indications for drug use. In 1999 HCFA required that all nursing care facilities regularly report on quality indicators that may identify quality problems. Five of the 24 required indicators deal with medication use within the facility. Reporting must include the number of patients with symptoms of depression without antidepressant therapy; the number of patients who take nine or more medications; the prevalence of anti-psychotic drug use; the prevalence of anti-anxiety drug use; and the prevalence of using sleeping pills more than twice a week.

The pharmacist professional association for those who specialize in care of the elderly, the American Society of Consultant Pharmacists (ASCP) has supported a multiyear project involving long-term care facilities. This project, known as the Fleetwood project, will study the impact of pharmacists on patient outcomes and health care costs in nursing homes. The first study resulting from this effort identified the projected cost savings from pharmacists conducting drug regimen reviews for patients in nursing homes (Johnson, 1995). Cost savings estimates were substantial

(projected at \$6.3 billion) as were improvements in clinical outcomes. Further studies are underway to develop prospective interventions for patients at high risk of medication related problems.

THE IMPACT OF DEVELOPMENTS IN PRESCRIPTION MEDICATIONS AND OTHER THERAPEUTICS ON PHARMACY PRACTICE

Pharmacists have a critical role in maintaining a current knowledge of new drug developments and awareness of expanded uses of established drugs. This involves their own responsibility to stay current, and their role in advising physicians and patients on appropriate and safe use of new and established medications. This section will review the issues of new drug development, expanded uses of established drugs, and the growing interest and use of over-the-counter medications and other products.

NEW DRUG DEVELOPMENT

Research by pharmaceutical companies drives new drug development, with domestic companies investing about \$17 billion in research and development activities in 1998 (Kaiser, 2000). The percentage of sales revenue devoted to R&D activities is increasing, from 9% in 1975 to almost 17% in 1998. Basic research discoveries are also funded by the Federal Government (National Institutes of Health).

A measure of new drug development is the number of new entities approved by the Food and Drug Administration (FDA). From 1992 through July 2000, the FDA approved 277 new drugs (about 33 per year), compared to 189 new drugs approved in the comparable timeframe of 1984 through 1991 (about 24 per year). In 1999, 35 new drugs received FDA approval. These new drugs each contain a new and different active ingredient or entity that had never before been approved in the United States.

A change in the FDA review process has accelerated the pace at which new drugs enter the marketplace. Approval time is down from 20.5 months in 1996 to 12 months in 1999. These improvements in FDA's review process were brought about in part by the passage in 1992 of the Prescription Drug User Fee Act, which authorized FDA to collect user fees from companies that produce human drug and biological products. As a part of this program, FDA agreed to meet a set of review performance goals that became more stringent each year. The goals applied to review of original new product applications, resubmissions of original applications, and supplements to approved applications. By 2002, the FDA is to review and act on 90 percent of priority new drug and biological product applications and efficacy supplements within 6 months; and standard new drug and biological product applications and efficacy supplements within 10 months.

The impact of new drugs on prescription drug sales can be significant. One of the new drugs approved in December 1996 was Lipitor, which reduces elevated cholesterol. By 1998, Lipitor was ranked the number three drug product in the US, based on total sales (\$1.5 billion) and was seventh based on the total number of prescriptions dispensed (26 million). By 1999, Lipitor sales were over 37 million prescriptions and its sales were approximately \$3 billion (Latner, 2000).

The impact of new drug approvals on the practice of pharmacy is also significant. Patients and health care professionals expect pharmacists to be current on the safe use, doses and suspected adverse reactions of new drugs and to advise both physicians and patients on the medication and its use. This requires pharmacists to continually acquire new information through professional journals, reference books and advertisements. When patients with chronic conditions are changed from one drug to a new drug to manage their conditions, it is particularly important that they be informed about the intended effects, dosage schedule, and possible side effects.

EXPANDED USE OF PRESCRIPTION MEDICATIONS

Existing medications often have expanded uses beyond the original intended use. The term “off-label” is applied if the new use has not yet received FDA approval, although manufacturers frequently submit applications for drugs to be approved for new use. Pharmacists are expected to keep abreast of these changes, and may need to counsel both physicians and patients about the new medication use. The FDA approved 124 new uses for drug products in 1998 and 97 new uses in 1999.

In a 1995 unpublished FDA study, the following question was posed: “What proportion of the most frequently used drugs in 1995 were prescribed for diagnoses that did not correspond to the indications in the FDA approved labeling?” The study examined the 64 most frequently prescribed drug products by office-based physicians, concluding that the average proportion of off-label prescribing was 5% for patented and 2% for off-patent drug products. Only seven products had off-label uses amounting to more than 10% of total use in 1995. The study concluded that at least for the most commonly used drugs, off-label use was minimal, comprising not more than 5% of total use.

OVER-THE-COUNTER AND NON-TRADITIONAL THERAPEUTICALS

As Americans continue to participate more actively in their health care decisions, many medications are also purchased over-the-counter (OTC). Pharmacists frequently counsel on the use and selection of OTC drugs. Currently there are more than 100,000 OTC products on the market. More than 600 OTC products use ingredients and dosages available only by prescription 20 years ago.

The expanding availability of OTC drugs reclassified from prescription status offers consumers greater choices. However, with these choices and greater selection opportunity come confusion and questions and/or advice for which consumers consult their pharmacists. These consumer-generated questions are important in providing good pharmaceutical care, but also increase the number of distractions and decrease the time available for prescription pharmaceutical care.

It has been estimated that one in three Americans uses a non-traditional therapy each year (Eisenberg NEJM 1998 and 1993). Many of these therapies are found in community pharmacies and drug stores and pharmacists must become knowledgeable about their use. Dietary supplements, which may include vitamins, minerals, herbal products, amino acids, and other products, are among the most commonly used products. The use of some herbal and supplemental products can interfere with prescription medications leading to serious medical problems. Estimated expenditures on herbal products were \$3 billion in 1997.

MEDICATION ERRORS AND THE INSTITUTE OF MEDICINE REPORT

The landmark 1999 Institute of Medicine report “To Err is Human: Building a Safer Health System” brought to the Nation’s attention the high rate of medical errors and the costs of these errors. This study concluded that the number of errors of all types in health care was at unacceptably high levels and the costs, in terms of dollars and deaths, were extremely significant. Through extrapolation from hospital-based studies, the report estimated between 44,000 and 98,000 patient deaths annually from all medical errors combined and the cost in lost income, disability, and health care expenses associated with such errors to be between \$17 and \$29 billion annually.

Medication errors, or adverse drug events, represent one of the medical errors studied by the IOM. Tragic reports of deaths due to medication errors have seized the public’s attention, such as the 1994 death of a 39-year-old health care columnist for the Boston Globe, who died of a four-fold overdose in the amount of chemotherapy drug she was receiving at a major cancer institute. Investigation found that the chemotherapy drug dose was incorrectly given for four days – an error not caught by the doctors, nurses, or pharmacists involved in the care of the patient (Leskovsek, 1999).

Medication errors result from improper prescribing, dispensing, and use of medications. A wide body of research has been reported on medication errors. A 1993 study estimated that about 7,000 deaths annually are due to medication errors (Phillips, 1998). Preventable medication errors were estimated to increase hospital costs by about \$2 billion nationwide. Problems related to the use of medications were estimated to account for nearly 10 percent of all hospital admissions and to significantly contribute to increased morbidity and mortality in the United States (Bates, 1995a, b). A 1991 study of hospitals in New York State indicated that drug complications represent 19 percent of all adverse events, and that almost half were due to medication errors. In this study, 30 percent of the individuals with drug-related complications died (Leape, 1991). One study estimated the total drug-related morbidity and mortality in the United States at \$76.6 billion to \$136 billion annually (Johnson, 1995). A study of medication error reported that adverse events occur to approximately 3–4 percent of patients (Brennan, 1991).

In another study, the average intensive care unit (ICU) patient was reported to experience almost two errors per day (Leape, 1994). Although this error rate translates to an approximate 99% proficiency level, one out of five errors were potentially serious or fatal. If 99.9% performance levels (a ten-fold improvement compared to the 99% rate found in ICUs) were the standard for the airline and banking industries, those industries would be allowed two dangerous landings per day at O'Hare International Airport and 32,000 checks deducted from the wrong account per hour (Leape, 1994).

Although medication errors may be perceived as the result of specific individual failures, in reality most result from complex interactions within the health care system. In many circumstances, implementing proper safety designs could decrease the potential for injury. Medication mishaps can occur anywhere in the drug use process: prescribing...transcribing...repackaging...dispensing...administering...monitoring. Causes of errors include poor communication; ambiguities in product names, directions for use, and medical abbreviations/writing; poor procedures or techniques; lack of knowledge or experience; and patient misuse resulting from a poor understanding of the use of the product.

A number of researchers have investigated the potential reasons why dispensing errors occur in pharmacies. Reasons for dispensing error include: pharmacy workplace noise levels and number of interruptions (Allan, 1994) and differences in the amount of staffing available and the extreme workload placed on individual staff members. (Guernsey, 1983) Several case reports, focusing on community pharmacy medication errors, including fatalities, have identified pharmacist error as the cause.. Several of these studies acknowledged the unreasonable hours and inadequate work environments that many pharmacy staff members are faced with daily. These factors may be compounded by the care provider's lack of sleep, job stress, inadequate staffing, noise and/or other distractions, or inadequate policies and procedures. These are the types of conditions reported by many pharmacists as resulting from inadequate staffing and overwork.

In some cases, changing these contributing factors within the system can prevent medication errors. The IOM report discussed the need for respecting human limits in process design. The report stated that designing jobs with attention to human factors means attending to the effect of work hours, workloads, staffing ratios, sources of distraction, and an inversion in assigned shifts (which affects workers' circadian rhythms) and their relationship to fatigue, alertness, and sleep deprivation.

The Food and Drug Administration has received approximately 15,000 medication error reports since 1992. In 1999, the FDA adopted the National Coordinating Council for Medication Error Reporting and Prevention's Taxonomy of Medication Errors. With this taxonomy, 46 reports were attributed to a shortage of pharmacists between 1995 and mid-2000, including one in which the patient received an accidental overdose of morphine. Although the FDA has classified only 46 such cases as connected to the pharmacist shortage, the number of instances in which the shortage was a contributing factor is believed to be substantially higher. Prior to 1999, the FDA did not extensively classify causes or contributing factors to an error; thus, a substantial number of reports may not have been in accordance with the new taxonomy that would have linked a reported medication error to a specific pharmacy or staffing issue.

PHARMACIST INTERVENTIONS IN REDUCING MEDICATION ERRORS

A major point of the IOM Report was that system approaches were necessary to reduce the likelihood of errors. In a hospital-based study that involved 264 preventable adverse drug events (ADEs), it was determined that seven out of sixteen system failure types accounted for most of the errors. The leading system cause (29%) involved the dissemination of drug knowledge, followed by dose and identity checking, patient information availability, order transcription and checking for allergies. (Leape, 1995) Within the study, staffing and work assignment deficiencies were deemed to be major causes of a large number and variety of errors. The hospitals that participated in this study implemented a number of system changes. One of these was an enhancement of the role of the pharmacist by increasing his or her participation on the unit as a member of the patient care team, including participation in physicians' rounds. (Leape, 1995)

Another study that evaluated 696 errors found the most common system causes were inadequate drug knowledge (30%), inadequate information about the patient (29%); calculation errors (18%) and nomenclature issues (incorrect drug names, dosage form, or abbreviations)(13%). (Lesar, 1997) This study shed light on the important but often unnoticed role of the hospital pharmacist in detecting and averting errors. The study recommended computerization of the drug prescribing process, improved and refocused prescriber education, standardization of the process, reduction of system complexity, and expanded use of the expertise of the pharmacist through better integration with the health care team. (Lesar, 1997) An editorial in the Journal of the American Medical Association noted that "few physicians appreciate the quiet yet vital role played by pharmacists" (Avorn, 1997).

In a 1999 study that measured the effect of pharmacist participation on medical rounds in the Intensive Care Unit, the rate of preventable adverse drug events decreased by 66%. This demonstrated that the presence of a pharmacist on rounds as a full member of the patient care team in a medical ICU was associated with a substantially lower rate of ADEs caused by prescribing errors.

In 1989 the difficulty in determining the rates of medication errors and the morbidity and mortality associated with errors in the ambulatory population was discussed. (Manasse, 1989) More recent reviews have acknowledged the need for more and better designed studies of errors in the community setting (Singhal, 1999). For example, a 1995 study of 19 community pharmacies in rural and urban Nebraska and Iowa asked pharmacists to document their interventions over a four-week period. A total of 712 interventions were analyzed and found to include identification of possible side effects/toxicities/allergic reactions, patient counseling, discovery of prescribing errors by other health care professionals, and drug interactions with other prescription and/or over-the-counter medications. Researchers concluded that in 59% of the pharmacist's interventions, the prescription was clarified or modified, or the drug was not distributed, thus avoiding potential medication errors (Fincham, 1995).

A study performed in 1990 concluded that pharmacists provide value to the health care team by creating positive patient outcomes and avoiding negative outcomes. Eighty-nine community pharmacies in Indiana, New Jersey, Ohio, Texas, and Washington identified and documented prescribing-related problems that were corrected by pharmacists before dispensing errors occurred. The results revealed that 28% of the recognized problems could have caused patient harm had the pharmacist not intervened to remedy the problem. (Rupp, 1992)

RECOMMENDATIONS BY PROFESSIONAL ASSOCIATIONS

Various organizations have published guidelines for pharmacists in preventing medication errors. In order to implement these recommendations, an adequate staffing level is of paramount importance.

The American Society of Health-System Pharmacists issued guidelines in 1993 on preventing medication errors in hospitals, noting that "sufficient personnel must be available to perform tasks adequately. Policies and procedures should ensure that reasonable workload levels and working hours are established and rarely exceeded." (ASHP Board of Directors, 1993) Within these guidelines, fifteen recommendations were made, including several pertaining to pharmacists' consultative roles such as 1) pharmacists should participate in drug therapy monitoring and drug utilization review activities; 2) pharmacists

should make themselves available to prescribers and nurses to offer information and advice about therapeutic drug regimens and the correct use of medications.

The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) was established in 1995 to address the growing concerns related to medication errors and help bring the health care community together in a unified problem-solving effort. To avoid the error-prone aspects of dispensing medications NCC MERP recommended: 1) that prescriptions always be reviewed by a pharmacist prior to dispensing and that prescriptions be clarified when necessary, 2) that patient profiles be current to allow the pharmacist to assess the appropriateness of a prescription, 3) re-design of the dispensing area to reduce fatigue-inducing environmental conditions, minimize distractions, and provide sufficient resources for workload, 4) that pharmacists counsel patients, and 5) that pharmacies collect data regarding actual and potential errors for the purpose of continuous quality improvement.

The American Medical Association implemented the National Patient Safety Foundation (NPSF) in 1997 to encourage health care professionals to work together to reduce the risk of medication errors. The NPSF believes the following recommendations are necessary in safe medication practices: 1) standardization of drug packaging, labeling, and storage, 2) avoidance of abbreviations, 3) computerization of drug order entry, 4) use of unit-dose drug packaging, 5) use of pharmacy-based IV and drug mixing programs, 6) limited access to, and use of special procedures for, high hazard drugs, 7) documentation of allergies and medications on patient records, 8) required bar code labeling, 9) increased patient education, and 10) instruction of patients to tell their health care providers about all medications they are taking and to ask for information in terms they understand before accepting medications. (IOM, 1999)

THE SUPPLY OF PHARMACISTS AND PHARMACY EDUCATION AND TRAINING

INTRODUCTION

Even such a simple issue as the number of pharmacists in the United States has historically been debated. As recently as 1988, questions were raised whether the number of pharmacists in the United States was accurately known. The questions arose because there was at that time another unpredicted shortage and the possibility was raised that the shortage was due to an earlier overestimate of the number of pharmacists. The debate highlighted the need to corroborate different sources of data about the pharmacist supply. A national count of pharmacists has periodically been compiled or estimated based on data collected by State boards of pharmacy (termed pharmacist census studies and conducted in 1973, 1978 and 1989-1991). Other sources of pharmacist count data have included modeling data from the Bureau of Health Professions (BHP), and employment survey data from the Bureau of Labor Statistics (BLS).

An examination of these data sources, conducted for the purpose of this Report, shows the numbers reported by each to be in reasonably close agreement. The number of pharmacists in the U.S. in 2000 is approximately 196,000. The background section at the end of this chapter reviews in greater detail the methodology and findings underlying these estimates.

We organized this chapter to present first those issues we judged to be most important in explaining the current shortage. These issues are:

- The national growth rate of the pharmacy workforce,
- Fluctuations in graduates over the last 20 years,
- Current weakness in the applicant pool and
- The increasing numbers of women pharmacists.

We then explore other topics important to the adequacy of the supply of pharmacists but not necessarily pivotal in explaining today's problems. These include the following issues:

- A historical review of comments on the pharmacist workforce from past Federal reports,
- Measuring the pharmacist supply: methods and findings,
- Work settings and wages of pharmacists,
- Rural supply issues,
- The educational process for pharmacists: schools and graduates,
- Residencies and fellowships: a training ground for future pharmacy faculty and researchers, and
- Pharmacy technicians as extenders of services provided by pharmacists

THE NATIONAL SUPPLY OF PHARMACISTS, 1970 - 2010

Table 4-1 lists estimates of active pharmacists from 1970 to 2010 and annual growth rates. The period of most rapid growth, 3.2% annually from 1975 to 1980, is attributed to Federal capitation programs that supported the expansion of pharmacy programs during the 1970s. Growth slowed dramatically after 1980. Starting in the latter half of the 1980s, thanks to a temporary resurgence in number of graduates, the rate once again began to climb but has since tapered off and is projected to continue to do so. The supply numbers shown in the table are retrospective through 1985 (HRSA Factbook, 1999) and either estimated or projected through 2010 (BHP pharmacist supply model). The figure for 1991, derived from the national survey of pharmacists completed in that year, serves as the baseline for the supply model projections described later in this chapter.

Table 4-1. The U.S. Supply of Active Pharmacists: 1970-2010

Year	1970	1975	1980	1985	1991	1995	2000	2005	2010
Pharmacists*†‡	112,600	121,800	142,400	153,500	171,600	180,959	196,011	210,321	224,524
Annual growth rate over previous value		1.6	3.2	1.5	1.9	1.3	1.5	1.4	1.3

*Data from HRSA Factbook for 1970-1985

†Data from Pharmacy Manpower Project Census of Licensed Pharmacists for 1991

‡Data from BHPPr Pharmacist Supply Model for 1992-2010

When considering the adequacy of the supply of pharmacists, the growth rate relative to population is an important supply issue and data addressing this relationship are presented in Table 4-2. These data show that since 1980, pharmacists have consistently grown faster in number than the population. How then do we account for the two pharmacist shortages that have occurred during this 20-year period? The incongruence between the linearly increasing supply of pharmacists and the non-linear market events marked by two periods of labor shortages in the last 20 years suggests that supply factors are not the primary forces explaining today's pharmacist workforce problems. Indeed, demand issues such as the more rapid growth rate for prescription medications and the increasing demand for pharmacist services described in earlier chapters most likely played a more pivotal role.

Table 4-2. Annual Growth Rates (Percent) of Pharmacists and U.S. Population by Decade: 1980-2010

	1980-1990	1990-2000	2000-2010
Pharmacists*†	1.6%	1.6%	1.4%
U.S. Resident Population ‡	0.9%	0.9%	1.0%

*Data from HRSA Factbook for 1980-1990

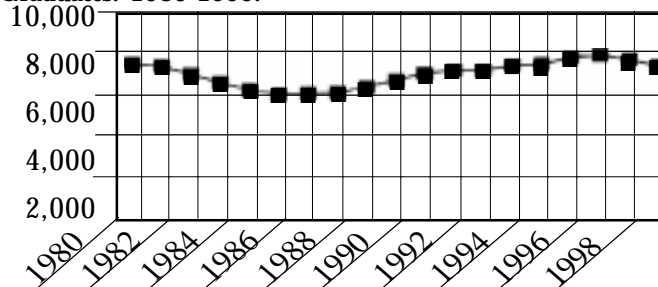
†Data from the BHPPr Pharmacist Supply Model for 2000-2010

‡Data from the U.S. Bureau of the Census

U.S. PHARMACY GRADUATES OVER THE PAST 20 YEARS, 1980 - 2000

Despite the gradual increase in the size of the pharmacist workforce over the past 20 years, the growth pattern for new graduates has been somewhat erratic. There were approximately 36,000 graduates in the 1960s, 63,000 in the 1970s, 64,000 in the 1980s and 74,228 between 1990 and 1999. Figure 4-1 shows the number of pharmacy graduates for the period 1980 to 1999. The numbers show a substantial trough in the 1980s and another decline in the late 1990s.

Figure 4-1. U.S. Pharmacy Graduates: 1980-1999.



Data are from the American Association of Colleges of Pharmacy, 2000

Review of data from individual schools of pharmacy identified at least two factors that contributed to these declines. First, during the early 1980s, with the end of Federal capitation and a reduction in applicants across several health professions, there was a widespread reduction in pharmacy class size across the Nation; i.e., schools were operating

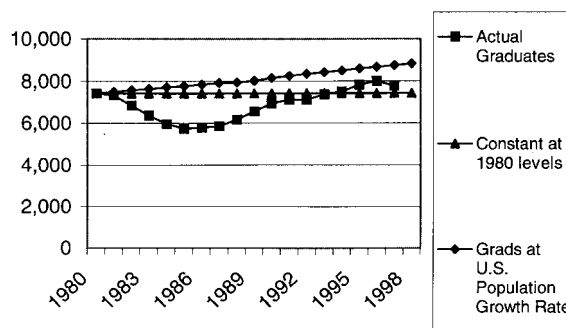
below capacity. This reduction is still not fully understood, however, for there was an economic recession during this period and recessions generally coincide with increased applicant pools. Second, there was a reduction in the number of graduates resulting from the conversion from Bachelor of Science to Doctor of Pharmacy (PharmD) as the entry-level degree for pharmacists. Not all schools undertook the conversion at the same time. Of today's 81 schools and colleges of pharmacy, all but eleven made the transition during the 1990s; of the remaining eleven, two had converted to the PharmD prior to 1980, four completed the transition during the first half of the 1980s (1981-1985) and five during the second half (1986-1989).

Nine new schools of pharmacy were launched between 1980 and 2000; some have not yet graduated their first class. No schools closed during the period although five schools closed in the 1970s (Columbia, Fordham, Long Island, Brooklyn College of Pharmacy and Union). Given those closures, the reduction in graduates would assuredly have been more serious and the current shortage more severe had the nine new schools not been added.

We used data from a 2000 survey of deans of U.S. schools and colleges of pharmacy to extend our impressions of graduate trends to the current year. The survey data, described in more detail later in the chapter, suggest that total U.S. pharmacy graduates will remain at about 7,000 annually through the first half of the upcoming decade (2000-2005), not an optimistic prediction given the current workforce problems. The founding of new schools could modify this estimate by only a few hundred.

Figure 4-2 compares the number of actual graduates to the numbers that would have been attained had graduating classes been able to keep pace with the U.S. population growth from 1980 through 1998. Had the number of graduates remained at the level attained in 1980, there would have been more than 10,000 additional graduates by year 1998. Had graduates kept pace with population growth after 1980, approximately 23,000 more graduates would have been produced over the 18-year period, certainly a number that could have helped meet the challenges presented by today's shortage. Had the number of graduates grown at even *half* the population growth rate, an additional 16,500 graduates would have been produced. Of these unrealized graduates, about 58% were due to decreased numbers of graduates in the 1980s, about 42% to decreases in the 1990s.

Figure 4-2. Actual and Unrealized Graduate Numbers if Pharmacy Graduates Had Kept Pace with U.S. Population Growth or Remained at 1980 Levels: 1980-1998



Sources: American Association of Colleges of Pharmacy (graduates), Census Bureau (population)

A lesson was learned from analyzing the enrollment downturns of the past 20 years. The effects of a degree conversion, while painful, can be planned and spread out over time. While the negative impact of developments such as these are counterbalanced by the new knowledge and skills brought to the work place, widespread and unexplained downturns in enrollments and graduates from pharmacy schools such as those seen in the early 1980s are without benefit to the profession or society and should be avoided if possible. The need for attention to trends in applicant pool numbers and adequate recruitment efforts is clearly indicated.

TRENDS IN APPLICATIONS TO PHARMACY SCHOOLS AND IMPLICATIONS FOR FUTURE GRADUATES

An issue closely related to the number of graduates produced is the number of applications to pharmacy schools. These numbers are shown, for the period 1990-1999, in Table 4-3. The rise in applications for admission during the early 1990s is seen to parallel the rebound in graduates that occurred shortly thereafter. A decline in applications began in 1995 and persisted through 1999, the most recent date for which these data were available. By 1999, applications had fallen over 33% from the 1994 peak. Given the lesson from the downturn of the 1980s and today's shortage, the fall-off in applicants after 1994 is an obvious cause for concern.

Table 4-3. Pharmacy Program Applications: 1990-1998*

Pharmacy Applications (x 1000) for the Academic Year Ending										
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Number	17.7	23.3	28.9	32.9	34.2	32.7	33.9	29.1	25.2	22.8

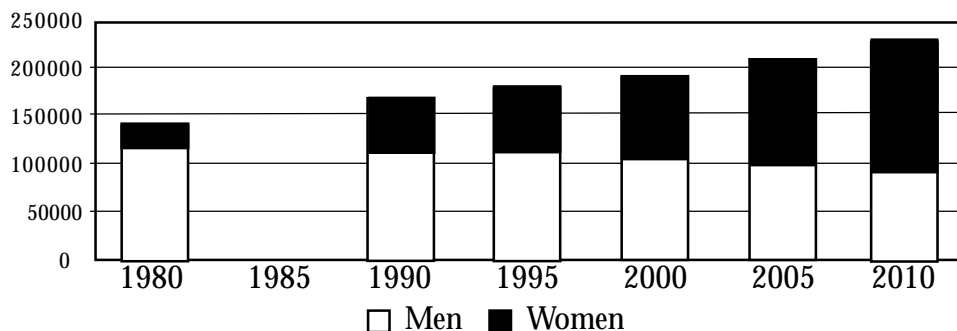
*Data from the American Association of Colleges of Pharmacy

We used data from a 2000 survey of U.S. deans of schools and colleges of pharmacy to extend our impressions on this topic to the current year. An e-mail survey of deans of schools of pharmacy by University of the Pacific in Spring 2000 asked the status of the applicant pool for year 2000 in comparison to 1998. Survey responses, described in further detail later in this chapter, found 52% of the deans reporting the pool to be “slightly or substantially less than 1998”, 18% reporting the pool “about the same as 1998” and 30% reporting that their 2000 applicant pool was “substantially or slightly higher than 1998”. The responses suggest that the downturn in applications that began in 1995 has not yet ended. This finding implies that even with new schools, there is no guarantee that the number of graduating pharmacists will increase in the short term.

WOMEN IN THE PHARMACY WORKFORCE

Over the past twenty years, women pharmacists have increased from 18% of the active workforce. Figure 4-3 illustrates how the balance between men and women has shifted and how the shift is projected to continue. As one would expect, the changing balance has been primarily due to increased numbers of women pharmacy students and their entrance into practice, with modest decreased numbers of men.

Figure 4-3. Men and Women Pharmacists in the United States: 1980-2010.



Data are from the HRSA Factbook for 1980 to 1990 and from the BHPPr Pharmacist Supply Model from 1995 to 2010.

Table 4-4 shows the number and gender distribution of the pharmacy workforce between 1980 (actual) and 2010 (projected). It is estimated that eventually the pharmacy workforce will be approximately two-thirds women which has been the gender ratio for pharmacy classes nationally for several years.

Table 4-4. Estimated Number and Proportion of Active Women Pharmacists in the U.S. by Year

Year	Active Women Pharmacists*†	Percent Women Pharmacists
1970	14,075	12.5
1980	26,060	18.3
1990	53,000	31.8
1995	70,333	38.9
2000	90,793	46.1
2005	110,589	52.6
2010	129,418	57.6

*Data from the HRSA Factbook 1970-1990

†Data from the BHPPr Pharmacist Supply Model 1995-2000

Notwithstanding its positive aspects in terms of gender equality, the noted gender shift has obvious implications in terms of productivity, which is important in analyzing a workforce shortage. Part-time work as a pattern for women pharmacists has been studied and documented (Quiñones, 2000; Walton, 2000). An analysis of data from the Bureau of the Census' Current Population Survey (CPS) showed that over the period 1979 to 1998, responding pharmacists reported an average of 41.8 hours per week, with women averaging 37.2 hours per week and men 44.1 (Walton, 2000). Overall, 28% of the women reported working less than 35 hours a week as opposed to 11% of the men; almost ten percent of the women worked less than 20 hours a week as opposed to four percent of the men.

The difference of 6.9 hours per week associated with the CPS sample amounts to a roughly 15% differential in the *average* productivity of women and men. Any estimate of the growth in the supply of pharmacists over the years must therefore be qualified by the recognition that there is a gender shift in operation as well. If, for simplicity, 44.1 hours is regarded as the average workweek for men pharmacists and 37.2 as the average for women, it follows that in any year in which women constitute 18% of the total supply (as they did in 1980), the average workweek for all pharmacists combined would be 42.9 hours. When women constitute, as they will in the very near future, 50% of the workforce, the average workweek will drop to 40.6 hours, a decline of over five percent compared to 42.9.. Any assessment of the adequacy of pharmacist supply *must* take this factor into account; supply must be judged in full-time-equivalent terms rather than simply headcount.

BACKGROUND ON PHARMACIST SUPPLY ISSUES

REPORTS TO CONGRESS ON HEALTH PERSONNEL IN THE UNITED STATES, 1978-1993

An authoritative source of historical information about pharmacists is the series of Congressional reports that the Bureau of Health Professions prepared biennially from 1978 to 1992 (Bureau of Health Professions, 1978 to 1993). These Reports have included analyses on supply and demand of all major health professions, including pharmacists. Following is a summary of the highlights of each Report as related to pharmacists.

Report to the President and Congress, 1978

While some growth in numbers of pharmacists has taken place in recent years, substantial growth in the number of pharmacists is expected in the future. Growth in the number of new pharmacists will be mitigated somewhat by the fact that an increasing proportion of pharmacy graduates will be women, and may be somewhat less likely than men pharmacists to work on a full time basis. In recent years, pharmacy education has evolved towards a more clinically based program, largely brought about by concern over the underutilization in their restricted role of compounding, counting and pouring drugs.

Report to the President and Congress, 1980

Both the number of active pharmacists and the ratio of practitioners to population have continued to increase substantially in the last few years with the increase for women far greater than that for men. In comparison with other health professions, the distribution of pharmacists is relatively even between metropolitan and non-metropolitan counties.

Report to the President and Congress, 1982

The proportion of pharmacists working in independently owned pharmacies has decreased significantly in recent years. At the same time, the proportion of pharmacy practitioners working in chain pharmacies rose significantly. In essence, in less than 20 years, pharmacy has changed from a profession characterized by practitioners who were pharmacy owners to one in which pharmacists were predominately employees.

Report to the President and Congress, 1984

One of the most dramatic trends of the profession has been the tremendous increase in the number and percentage of women pharmacists. Among younger pharmacists, there appears to be a sharp trend away from independent pharmacies toward chain pharmacies and hospitals.

Report to the President and Congress, 1986

The impact of the increasing number and proportion of women pharmacists is likely to be felt in all areas of pharmacy, but especially in hospitals. Women now comprise an estimated 40 percent of hospital pharmacists. Pharmacists are playing an increasing role in preventive health care through interaction with patients.

Report to the President and Congress, 1988

The number of pharmacists has increased nearly 40 percent since 1971; the nature of the profession has changed, as most pharmacists are now employees rather than owners of pharmacies. The number of residency programs offered to pharmacy graduates is increasing. Enrollments in pharmacy schools have begun to increase following the sharp declines of the late 1970's and early 1980's. Many schools are offering entry level PharmD programs rather than baccalaureate programs.

According to a survey by the American Society of Hospital Pharmacists, there were an estimated 1,200 vacancies for pharmacists, most at the staff level, and 500 vacancies for technicians. The overall projected shortage of hospital pharmacists is equivalent to about one-third of new pharmacists who graduate annually.

Report to the President and Congress, 1990

Two decades ago the traditional role of the pharmacist was almost solely preparation of the drug product. Today the pharmacist increasingly is the source of drug information and expertise for patients. According to a recent survey, a national shortage of hospital pharmacists and technicians exists. Newspaper and pharmacy professional journals have shown a marked increase in the number of job advertisements and level of benefits for pharmacists.

In 1987 there were an estimated 2,300 vacancies for hospital pharmacists, most of which were at the dispensing and multi-duty level. The vacancy rate for all hospital pharmacists was 5.2 percent, of which 14 percent were clinical positions.

Report to the President and Congress, 1991

The profession continues to see a significant growth in the number and percentage of women pharmacists. There is a continuing indication that the supply of pharmacists is not meeting current demand. Although the entry-level degree program provides a sound basis for the practice of pharmacy, the complexity of pharmaceuticals and the diversity of practice settings fosters the need for additional training that has become available in an expanding number of postgraduate and specialty training programs. The report also notes that at least 20 States require some form of counseling of patients, a trend that will likely become a requirement in the majority of States and the number of third party covered prescriptions has grown to nearly 40 percent by the end of the 1980's.

A survey by the American Society of Hospital Pharmacists in 1990 estimated that there were 1,900 vacancies for pharmacists representing an average hospital vacancy rate of 4.6 percent. In addition, another study by the National Association of Chain Drug Stores found the vacancy rate in that setting in 1989 to be 6.2 percent.

Report to the President and Congress, 1993

Despite years of having a patient to population ratio of about 64 per 100,000, evidence commonly associated with shortages suggests that the demand for pharmacists in the recent past may have exceeded supply. Factors possibly contributing to the need for more pharmacists include the growing population, increased use of prescription drugs especially among the growing aged population and pharmacy's expanding role under recent Medicaid regulation requiring review of patient drug use and patient counseling.

These Reports documented several developments in the supply and demand for pharmacists, which are of critical concern today. One of the most dramatic trends was the substantial increase in the number and proportion of women pharmacists. Another trend noted was the movement, particularly among recent graduates, away from independent pharmacies toward employment in chain pharmacies and hospitals. Women were more likely than men to be employed in hospitals. In the early 1990s, it was noted that the supply of pharmacists was not meeting the then-current demand. The Reports also took note of the increasing role of pharmacists as the source of drug and medication information and medication counseling for patients and consumers.

MEASURING THE NATIONAL SUPPLY OF ACTIVE PHARMACISTS: 1975-2010

According to data from several sources, there are approximately 196,000 active pharmacists in the United States in 2000 making pharmacists the third largest health professional group in this country after nurses and physicians. Historically, a primary source of the estimates of active pharmacists has been the Bureau of Health Professions (BHP) of the Health Resources and Services Administration (HRSA). Other sources with recent data on pharmacist numbers and/or pharmacy positions include the Bureau of Labor Statistics and the Census Bureau (Bureau of Labor Statistics, 1998; Census Bureau, 1998). BHP recently developed a new Pharmacist Supply Model which provided estimates used in this report (Gershon, Cultice, Knapp, 2000).

HRSA estimates of pharmacist numbers from 1975 to 2010 are presented in Table 4-5. The table also shows that growth of pharmacists relative to the population. The pharmacist count estimates are based on national census surveys of U.S. pharmacists that occurred in 1973, 1978, and 1989-1991. Each census employed State-level surveys completed by pharmacists at the time of relicensure. Because relicensure occurs every two or three years in some States, sometimes the survey process extended over two or three years. Other groups involved with these surveys included the American Association of Colleges of Pharmacy (AACP), the National Association of Boards of Pharmacy (NABP), the National Center for Health Statistics (NCHS), and for the third survey, the Pharmacy Manpower Project (PMP). The most recent survey, completed in 1991, identified a total of 194,570 licensed pharmacists of whom 171,611 (88.2%) were actively practicing (Vector Research Inc., 1993). There has not been a national census of pharmacists since that time.

Table 4-5. The U.S. Supply of Active Pharmacists and Pharmacists Per 100,000 Resident U.S. Population: 1975-2010

Year	1975	1980	1985	1991	1995	2000	2005	2010
Pharmacists*†	121,800	142,400	153,500	171,600	180,959	196,011	210,321	224,524
Pharmacists 100,00 population‡	56.1	62.2	64.1	67.7	68.9	71.2	73.1	74.9

*Data from the HRSA Factbook for 1975-1985

†Data from the BHP Pharmacist Supply Model for 1991-2010

‡Data from the Bureau of the Census for resident U.S. population)

Table 4-5 also presents estimates of the ratios of pharmacists per 100,000 population. These ratios allow for comparisons and interpretation in the changes in the supply of pharmacist over time and are most often expressed as a ratio of the number of professionals per 100,000 population. The gradual increase portrayed by the data reflects the fact that pharmacist numbers are growing somewhat faster than the U.S. population. As noted earlier, however, pharmacist demand factors have grown faster than either the population or the pharmacist supply.

BUREAU OF HEALTH PROFESSIONS PHARMACIST SUPPLY MODEL

We must have reliable estimates of the current and future supply of pharmacists if we are to make responsible observations about the adequacy of the pharmacy workforce. Unfortunately, the pharmacy profession lacks the comprehensive databases maintained by the professions of medicine and dentistry. Both the American Medical Association (AMA) and the American Dental Association (ADA) maintain comprehensive databases through surveys of all M.D. physicians (AMA Masterfile) or dentists (ADA Surveys), irrespective of their membership in the national associations.

The pharmacy profession has relied upon modeling (or estimating) the pharmacist workforce to answer many questions about present and future supply. The BHP, which has developed supply models for pharmacists several times over the last thirty years, recently created a new pharmacist supply model to generate estimates of pharmacist numbers in the United States through year 2020 (Gershon, Cultice, Knapp, 2000). The revised pharmacy supply model operates by taking base-year counts of active pharmacists from the 1992 Pharmacy Manpower Project census, which was conducted in 1989 thorough 1991. The number of pharmacists from this base count were projected forward in time by (i) adding, each year, the projected number of new entrants and (ii) subtracting, each year, the projected number of both base year pharmacists and post-1991 new entrants who will die or retire. At any point in time, the total of the count of base year pharmacists, plus new entrants, less those who leave the profession, constitutes the active pharmacist supply. The model employs variables for new entrants into the workforce including U.S. graduates and international pharmacy graduates and for those leaving the workforce by reason of death or retirement. Further detail on each of these variables is provided below since these factors are critical to supply estimates.

New Entrants New entrants each year include both the graduates of U.S. pharmacy schools and a small number of pharmacist graduates from other countries, known as international pharmacy graduates, who become licensed to practice in the United States. Most new entrants into the practice of pharmacy in the U.S. are graduates of U.S. pharmacy schools. The number of such graduates increased from 3,526 in 1960 to 4,758 in 1970 and 7,432 in 1980. Since 1980, however, the growth has been erratic with a decline during the early 1980s, a rebound until 1996, then another decline in the late 1990s. The model's estimates of future graduates include consideration of the transition to the entry-level PharmD degree and the opening of new schools. A section later in this chapter will provide further discussion of these issues.

Graduates of pharmacy schools outside the United States who come to the U.S. to practice are another source of new entrants into the pharmacy workforce. Under defined conditions, these international pharmacy graduates (IPGs) can become licensed to practice in the United States. Although there is no source of data for an accurate estimate of the number of licensed IPGs in practice in the United States, they are currently believed to comprise less than five percent of the active pharmacist workforce.

The number of IPGs passing the national licensure exam in the past three years has increased each year, from 163 (1997) to 261 (1998) and 358 (1999) (personal communication, National Association of Boards of Pharmacy, 2000). Over the same time period, the California State Board of Pharmacy reported that about 50 IPGs passed the California licensure examination annually (personal communication, California State Board of Pharmacy, 2000). This upward trend in newly licensed IPGs may not continue, however, because of an anticipated increase in academic requirements to five years of pharmacy school training (from four years) after 2003. The new requirement will parallel the increase in U.S. pharmacy school requirements related to the Doctor of Pharmacy degree. However, very few foreign pharmacy programs exceed four years in length; and therefore, unless new programs are developed to make up for the extra year and coursework, the ability of IPGs to achieve U.S. pharmacy licensure will be diminished.

Despite the difficulties of achieving a pharmacist license in the United States, increased recruiting efforts, due to the shortage, have been reported (Ukens, 1999). The big lure: chains here courting foreign pharmacists to meet manpower shortages in their pharmacies. *Drug Topics*. 1999;143(23):48.) According to this report, a larger employer had been recruiting pharmacists to the U.S. from Canada and South Africa, countries with similar pharmacy curricula and English as the primary language.

Losses due to death, retirement, and leaving practice. Losses or separations from the workforce are primarily due to death and retirement. Estimates of annual losses are based on separation rates that have been developed by studying the behavior of workers. The separation rates are generally specific for gender and age and sometimes for a specific occupation. Separation rates specific for pharmacists have not been developed; but the BHPPr, in developing its revised Pharmacist Supply Model, compared several sets of separation rates and selected the set that best predicted the actual workforce changes observed for pharmacists from 1978 through 1990. These rates were drawn from the Bureau of Labor Statistics (Gershon, Cultice, Knapp, 2000). Table 4-6 provides data about the losses from the workforce over the period 1995 projected through 2010. Over this period, the model shows the losses to be predominantly men pharmacists as women pharmacists are present in higher numbers in the younger cohorts and in lower numbers in the older cohorts where the separation rates are higher.

Table 4-6. Estimates of Losses to the Pharmacy Workforce Due to Death and Retirement by Gender: 1995-2010 in Five-Year Increments*

Year	Loss of Men	Loss of Women	Total Losses	Percent of Total Workforce
1995	4338	902	5240	2.9
2000	3882	1158	5040	2.6
2005	3711	1578	5289	2.5
2010	3553	2203	5756	2.6

*Data from the BHPPr Pharmacist Supply Model

In the model, additions to the workforce by virtue of new graduates and licensure of IPGs exceed losses due to death and retirement, thus resulting in a net increase in the number of active pharmacists as shown earlier.

The model has a basic series projection and also allows for high and low alternative estimates which include a total projected supply ranging from 220,800 (the low estimate) to 225,800 (high estimate) in 2010, a difference of 2.2%. The alternative series projects the pharmacist-to-population ratio to range between 55 to 76 pharmacists per 100,000 in 2010 as opposed to 74.9 in the basic series.

OTHER SOURCES OF DATA ON THE SUPPLY OF PHARMACISTS

There are other sources of information that have been used to study the pharmacist supply at the national, regional and State level. Several of the key sources are briefly presented along with the limitations of their use. Several of these sources are also used in other sections of this Report to characterize special attributes of the workforce. While these other sources may not provide the most reliable counts of pharmacists, they do provide other useful information that is generally considered reliable within the limits of the survey methods, and with care in understanding the definition of what is counted. For example, the BLS data counts pharmacist job positions that are filled; thus a pharmacist working two jobs would be counted twice.

The U.S. Bureau of the Census, through its decennial Census, records all individuals who self-report their occupation (Bureau of the Census, www.census.gov). While the decennial Census is not often used to describe the pharmacist workforce, other special surveys conducted by the Bureau of the Census that collect more detailed employment (and unemployment) data have been used to study the pharmacist workforce. For example, a national sample population survey of households, known as the Current Population Survey (CPS), is conducted monthly by the Bureau of the Census and analyzed by the Bureau of Labor Statistics (BLS).

The CPS data that estimate the counts of pharmacists tend to vary from year to year due to the small size of the pharmacist sample used to estimate the total population count. For example, CPS estimates of pharmacists were 200,000 in 1997, 173,000 in 1998 and 215,000 in 1999. However, special surveys conducted through the CPS are a very useful source of information on employment data such as hours worked, wages, and work setting. These data are often used to examine time trends since they have been collected for many years.

The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor contracts with State employment security agencies to conduct State-level surveys of employers. This process yields estimates of current employment by occupation (for example, pharmacists or pharmacy technicians) and by industry (for example, retail drug stores or hospitals). The survey data also are included in complex modeling programs to estimate the projected employment by occupation and industry ten years into the future at both the State and national level (Bureau of Labor Statistics, the National Industry-Occupational Employment Matrix, 2000). The Bureau of Labor Statistics reported 184,388 employed pharmacists in 1998 (Table 4-10). This count is quite comparable to the BHP estimate of 189,697 active pharmacists in 1998.

State licensure data can provide a count of all licensed pharmacists in each State, a ready source of data for each State. This information is collected and summarized in reports prepared by the National Association of Boards of Pharmacy, the NABP (National Association of Boards of Pharmacy, 2000). However, State licensure data are not considered a reliable source for counting pharmacists for several reasons; the most important is that many pharmacists are licensed in more than one State, leading to duplicate counting. One method of editing the data to be more closely aligned to the actual unduplicated count is to include only pharmacists who list an in-State address on their relicensure application. For example, as of June 1999, the NABP total count of licensed pharmacists (summing up each State count, and including pharmacists holding more than one license, and including Washington DC) listed 327,588 licensed pharmacists. The count of pharmacists with in-State licenses only was estimated at 232,857. If one applies to this estimate the ratio estimate of active pharmacists to in-State licensed pharmacists found in the 1991 pharmacist census survey (88%), one derives an estimated count of active licensed pharmacists of 204,914 for 1999. This can be compared with the HRSA projection count of 192,793 for the year 1999, noting a reasonably close approximation.

GENDER SHIFTS WITHIN THE PHARMACY WORKFORCE

As noted earlier, one of the most striking changes in the profession of pharmacy over the past thirty years has been the number of women entering the profession. Data presented earlier in this chapter track that growth.

Without the increased pursuit of pharmacy by women, the overall workforce could not have experienced sustained growth through the 1980s and 1990s and today's shortage would be much more severe. As the pharmacy workforce becomes increasingly dependent upon its women members, it is important to understand differences in women's work patterns and preference where they exist. Studies that include consideration of gender have consistently found that women pharmacists work fewer hours per week than men, that women pharmacists are more likely to work in hospitals, and in a recent study, that women change jobs more often. The pattern of part-time participation is particularly important during a period of shortage and therefore this behavior is considered in more detail in the next section.

ESTIMATES OF FULL-TIME EQUIVALENTS: PART-TIME, FULL-TIME AND SUPPLEMENTAL EMPLOYMENT

The supply estimates for pharmacists require additional information on employment characteristics to be able to describe the effective, or full-time equivalent (FTE), labor force. The conversion from a headcount to an FTE estimate is important for estimating the productivity of the workforce. To make the conversion, data about the relative number of full-time and part-time employed pharmacists and the average hours worked for full-time, part-time and overtime status are used. Information about this topic (although not always complete or usable) were available from several sources including 1) the periodic national census surveys of all pharmacists (1973, 1978, and 1989-91); 2) targeted surveys of active pharmacists conducted by researchers and selected States at relicensure; 3) national surveys of populations or households that ask employment information (U.S. decennial census or Current Population Survey, CPS); 4) surveys of employers (Bureau of Labor Statistics); and 5) surveys of association members, either pharmacists or employers.

The studies of pharmacist work patterns attest that pharmacists tend to work on average about one to two more hours than the forty-hour workweek. In fact, the Bureau of Labor Statistics in describing pharmacists' work in its *Occupational Outlook Handbook* offers as a "significant point" that "... (pharmacist) earnings are very high, but some pharmacists work long hours, nights, weekends and holidays." (BLS Occupational Outlook Handbook, 2000) Reports of the average hours worked by pharmacists include the following:

- 41.2 hours per week (Vector Research, 1993);
- 42.8 hours per week for full-time and 21.8 hrs for part-time (National Association of Chain Drug Stores, 1998);
- 41.8 hours per week overall with 44.1 hours for men and 37.2 hours for women (Walton, 2000, unpublished data based on data from the 1979 through 1998 Current Population Survey data, 2000); and
- Full-time pharmacists (73.3% of the workforce) work 44.2 hours per week and 48.7 weeks per year; part-time pharmacists (14.9% of the workforce) work 19 hours per week and 44.2 weeks per year (National Pharmacist Workforce Survey, 2000).

Part-time work patterns influence the effective supply of pharmacists. A significant percentage of pharmacists work part-time either as a second job in addition to a full-time position (moonlighting) or as their only position. In addition, some pharmacists work in more than one part-time position. Studies of pharmacist work patterns have reported these findings over time:

- An analysis of work patterns of over 5,000 surveyed pharmacists compiled from the 1979 to 1998 CPS found that 17% of pharmacists worked less than full-time with more women (28%) working part-time than men (11%). Additionally, six percent of pharmacists worked half-time, i.e., less than 20 hours per week, with more women (10%) working half-time than men (4%) (Walton, unpublished data, 2000).
- A 1990 survey found that 14% of pharmacists worked less than full-time (Schondelmeyer, 1992).
- A national survey conducted in 1995 found that 32% of active pharmacists had working patterns other than a single full-time job. Fourteen percent worked less than part-time at a single job (65% of these women pharmacists); 13% moonlighted, i.e., held a full-time position plus another position with another employer (70% of these men pharmacists), and 5% worked more than one part-time job and no full-time job. The moonlighters worked an average of 10 hours per week at their second job while the part-timers worked 20 hours per week on average (Quiñones, 2000).
- A survey of pharmacists working in chain pharmacies showed that 14% of pharmacists worked part-time with an average of 21.8 hours per week (NACDS, 1998).
- A national survey of pharmacists in 2000 found that 14.9% of the workforce worked part-time; 21% of women pharmacists worked part-time while 9.9% of men pharmacists worked part-time (National Pharmacists Workforce Survey, 2000).

These studies repeatedly documented that women pharmacists were more likely to work part-time than men. As noted earlier in this chapter, the lesser number of hours worked by women has an impact on the effective size of the workforce. Between 1980, when women constituted 18% of the total, and 2003, when they are projected to constitute 50%, the reported 15% differential in workweek between women and men translates into an overall 5% reduction in the full-time-equivalent (FTE) composition of the workforce.

The fairly common practice of moonlighting among pharmacists works in the opposite direction, that is to increase productivity and FTEs, and may be offsetting some of the adverse impacts of the current shortage. For example, the 13% of moonlighting pharmacists, by contributing an average 10 hours per week to a second job, offset by almost half the 14% of part-time pharmacists who work an average of only 20 hours per week (Quiñones & Mason, 2000). In fact, moonlighting has been described as an “elasticity factor”, providing additional productivity during times of shortage when additional work is available (Knapp, 2000). Moonlighting, however, should not be considered a long-term solution to a workforce shortage since the intensity of working as a pharmacist is well-documented and adequate breaks and rest are important to good patient outcomes.

SUPPLY OF PHARMACISTS BY REGION OF THE COUNTRY AND BY STATE

The supply of health professionals varies by State and by region of the country. Table 4-7 lists the supply of pharmacists by U.S. census region, showing the total count of pharmacists and the number of pharmacists per 100,000 population based on surveys conducted in 1973, 1978, and 1989-1991.

Table 4-7: Active Pharmacists by U.S. Census Region, Total Count and Pharmacist- to-100,000 Population Ratios (1973, 1978, 1991)

Active Pharmacists (Pharmacists-to100,000 Population Ratio*)					
Year	Northeast	Midwest	South	West	National
1973	29,237 (59)	31,900 (55)	33,694 (50)	20,744 (56)	115,575 (55)
1978	31,428 (64)	35,695 (61)	43,932 (60)	24,143 (58)	135,198 (65)
1991	37,246 (73)	42,524 (71)	60,778 (70)	31,064 (57)	171,612 (68)
Change 1973-1991 Total	8,009	10,624	27,084	10,320	56,037

*Data from the HRSA Factbook

The table demonstrates that the South had the highest overall count of pharmacists in each of the years and also the greatest growth. The Northeast region, however, had the highest ratio of pharmacists to population. The West, by contrast, had both the lowest count and population-adjusted ratios. Between 1978 and 1991, the West failed to increase its number of pharmacists relative to population and in 1991, had only 57 pharmacists per 100,000 population while the other regions had between 68 and 73. More recent State-based counts of pharmacists were not available to observe whether this pattern has persisted.

Among States, the supply of pharmacists shows a greater range in terms of both the total supply and the population-adjusted ratio (the preferred measure to compare States, due to the population size differences among States). Table 4-8 shows the low and high ratio States and the ratios in several States with large populations.

Table 4-8. Pharmacists Per 100,000 Population by Year and State*

	1973		1978		1991	
National Ratio	54.7		64.6		68.1	
Low States	Hawaii	28.9	Hawaii	36.6	Alaska	39.3
	Maine	39.1	Alaska	39.3	Hawaii	48.1
	West Virginia	40.4	West Virginia	49.0	Maine	52.2
High States	Massachusetts	72.8	Nebraska	70.0	Nebraska	102.6
	Nebraska	77.6	Massachusetts	75.1	Iowa	91.5
	Wyoming	67.2	North Dakota	75.0	Indiana	84.2
Large States						
New York	59.1		61.8		70.9	
California	52.8		53.4		53.8	
Texas	50.8		59.4		64.4	
Florida	47.2		59.5		69.8	
Illinois	57.5		59.8		65.6	

*Data from the HRSA Reports to Congress and the Pharmacy Manpower Project, 1994

The lack of more recent State-based data limits our ability to draw conclusions about the effect of having more or fewer pharmacists available in a particular State. We observe, however, that among the States with low ratios, Hawaii, Maine and Alaska do not have schools of pharmacy. Among the States with high ratios, all the States except Wyoming and North Dakota have two schools of pharmacy. Among the large States, California's ratio was substantially lower than the other large States. Also, when these State-level supply data are compared to the current demand for pharmacists as expressed by the Aggregate Demand Index (see Chapter 1, Aggregate Demand Index), we found some paradoxical results. Some "low ratio" supply States like Hawaii reported a balance between supply and demand during the last year while Iowa, a "high ratio" State, had one of the highest demand index values. The findings emphasize that supply data alone do not explain the current shortage of pharmacists.

WHERE PHARMACISTS WORK: PROFESSIONAL WORK SETTINGS

Pharmacists work in a wide variety of settings, most associated in some way with medications. The majority of pharmacists practice in community or retail pharmacies or drug stores (these terms are used here interchangeably). Their patients are ambulatory and these patients may purchase prescription and/or over-the-counter (non-prescription) medications. The second most common practice site is the hospital or medical center where patients are more acutely ill and drug administration is often more complex involving, for example, intravenous administration and potent and potentially toxic medications. Other sites where larger numbers of pharmacists practice are long-term care facilities; in home health care; in the pharmaceutical industry in areas such as basic research, sales and marketing, manufacturing, and clinical trials; in schools and colleges of pharmacy; and more recently, in managed care organizations.

The distribution of pharmacists across these work sites is important during a shortage in that the competition among sectors for available workers can leave some patient populations underserved. Information about the distribution of pharmacists across work sites is continually compiled and reported by BLS. Additionally, sample surveys and census surveys fielded by professional associations and researchers frequently request information about site of practice or work. For this section of the report, we primarily relied upon census surveys and BLS data to describe pharmacist work sites.

Table 4-9 recounts the distribution of pharmacists across different work settings as shown by various surveys conducted by the profession. The community sector has consistently been the primary work site. Within the community

sector, there has been a reduction in independent pharmacy practice and a gradual growth in pharmacists working in supermarkets and mass merchandise facilities such as Wal-Mart, K-Mart and Costco.

Table 4-9. Percent Distribution of Pharmacists by Work Site, various years

Study	Community/- Retail	Hospital	Long Term Care	Managed Care	Other
PMP Census (1989-1991)*	63.0%	24.2%	3.5%	1.9%	17.4%
National Pharmacists Workforce Survey 2000†	55.4%	24.1%	Industry Other practice with patient care Other practice non-patient care		2.4% 13.9% 4.2%

*Data from the Pharmacy Manpower Project, 1994 (PMP Census)

†Data from the National Pharmacists Workforce Survey, 2000 as presented on the American Pharmaceutical Association Website, <http://www.aphanet.org>

Through the Occupational Employment Statistics survey program, BLS contracts with each State to survey employers and to collect employment and wages information by occupation and by industry. The BLS uses this information and other sources of data to develop projections of occupational and industry employment. Using a complex series of interactive models, the overall gross domestic product, GDP, is estimated and then apportioned among industries to further estimate the occupational employment. The current model, known as the National Industry-Occupational Employment Matrix, is used to develop employment estimates for even-numbered years with projections ten years into the future.

The 1998 estimate of employed pharmacists by industry is shown in Table 4-10. Since the BLS surveys do not capture information about the self-employed, data from the Bureau of the Census, the CPS is used to estimate the numbers of self-employed individuals by occupation.

Estimates in the employment of pharmacists by industry over the time period 1983 through 1998, based on data from the BLS, are shown in Table 4-10. The number of employed pharmacists is seen to have increased by 45,778 between 1983 and 1998, a 33% increase over the fifteen years, an average annual growth rate of 1.9%. The percent of pharmacists who were self-employed decreased substantially over this period, from 9.4% to 3.4%. The most likely situation for self-employed pharmacists is to be owners of independent drug stores, and the number of independent pharmacies had declined during this period.

The largest number of new jobs was seen in the retail trade sector (21,308) with drug stores (12,624) and food stores (5,779) having large gains. Within the services sector, health services gained 20,536 jobs, most of this in the hospital industry. Other sectors in health services include skilled nursing facilities and home health care organizations. The business services industry includes insurance companies, managed care organizations and pharmaceutical corporations. Table 4-10 also illustrates that in 1998, a growing percentage of pharmacists were employed in non-traditional industries such as business services, wholesale trade, and government. While the composite percentage of pharmacists in these industries is small, it increased from 3.1% in 1983 to 7.6% in 1998.

These numbers become more significant when we consider that much of the migration to the business services sector has involved the most experienced and highly educated pharmacists who are often lost to patient care services.

Table 4-10. Percentage Distribution of Pharmacists by Industry, 1983-1998*

	1983	1985	1990	1995	1998
Total pharmacists in all Industries	138,610	145,880	167,450	172,618	184,388
Percentage total, all Industries	100.0	100.0	100.0	100.0	100.0
Self-employed pharmacists	9.4	8.9	9.0	5.8	3.4
Employed Pharmacists by industry	90.6	91.1	91.0	94.2	96.6
Retail Trade	62.7	64.4	60.8	58.9	59.8
General Merchandise	2.2	2.2	1.3	2.0	2.7
Food Stores	3.8	3.9	2.8	4.8	6.0
Drug Stores	56.4	57.8	56.2	50.7	49.2
Health Services	23.9	23.5	26.5	29.6	29.1
Government	2.5	2.4	2.6	3.9	3.3
Business Services	0.2	0.2	0.2	0.4	1.7
Wholesale Trade	0.4	0.4	0.4	1.1	2.6
Other	0.9	0.2	0.5	0.3	0.1

*Data from the Bureau of Labor Statistics

PHARMACIST SUPPLY AND PRACTICE IN RURAL AREAS

Rural areas have been disadvantaged for several decades, relative to other locations, in attracting sufficient numbers of health care providers (Schur & Franco, 1999). Two studies have shown that pharmacists have a better distribution in rural areas than other health professionals (Politzer, 1978; Knapp et al., 1998). The second of these studies showed that while pharmacist presence in rural areas is less than their average presence nationally, pharmacists have a higher presence in rural areas than primary care physicians, physician assistants, nurse practitioners and nurse midwives (ibid.). Because of the perception that the pharmacist supply in rural areas is more adequate than other professions, pharmacists are not among the professions included in the National Health Service Corps program to encourage practice in underserved areas. However, the situation for rural pharmacists has changed in recent years with losses in pharmacies in many communities and the national shortage of pharmacists (Trustee, 2000). Because pharmacists have historically been more available than other health professionals in rural areas, a threat to the rural pharmacist supply has more dire implications since in many cases, the pharmacist may be the only available health professional.

There are several factors that distinguish rural pharmacy practice and add to the problem of maintaining adequate supply. Remoteness, isolation from other professionals, lower economic returns, reduced opportunities for advancement, and other rural practice characteristics remain obstacles in attracting providers. Proximity to schools of pharmacy, along with availability of rural training sites and willingness of students to accept these due to higher costs (unless living expenses are covered), are other considerations. Recently, the ability to attract pharmacists has been hampered by the economic status of community pharmacies (low profit margins), rural hospitals that are in transition, and the persistence of medically underserved areas. The extreme difficulty in attracting pharmacists to rural practice sites in New Mexico was cited in a response to the Federal Register request for comments related to this study (see Chapter 5).

Certain features about the current supply of pharmacists, such as the increase in women, may further disadvantage rural areas in competing for new graduates. Both the professional and personal needs of women may be more difficult to satisfy in a rural community. These include attitudes of other professionals, the presence of other women professional colleagues; job opportunities for a spouse; parenting benefits, such as time off for child bearing and adequate day care; and acceptance by patients and other community members. While the effect of these factors on women pharmacists has not been thoroughly documented, research about the unique needs of women physicians in rural practice has identified their significance (O'Brien-Gonzales, 2000). One outcome is the higher rate of rural outmigration for women physicians compared to that for men.

Historically, earnings have been lower in rural settings, a fact that may prevent new graduates from accepting employment in rural areas. Additionally, the smaller staff size and tight budgets in rural hospitals make it more difficult to free pharmacy staff for continuing education and training for advancement. The significance of these factors is reflected in responses to an exit survey of recent graduates (Spring 2000) of one Midwestern pharmacy school. The majority of these eighty-plus students indicated that economics and location were the main determinants in their choice of a position, which was in retail pharmacy (Winkler & Straub, 2000).

Research addressing trends in the national rural supply of pharmacists is scarce. On the State level, pharmacy services and the market for pharmacists in rural Illinois have been the subject of research since the mid-1990s. This research verified a decline in pharmacies; for example, the 74 rural counties lost 17 percent of their pharmacies in the previous two decades, while at the same time, experiencing an increase in the number of active licensed pharmacists, suggesting a higher number of pharmacists per pharmacy (Straub & Holmes, 1997). The trend for consolidation of pharmacies toward larger population centers may decrease access for rural residents.

A study on access to pharmacy services in rural Illinois conducted in 1997 with more than 1,800 rural residents reported good access from the perspective of consumers; 77 percent had a local pharmacy and a high percentage used this as their source for prescriptions (Straub & Straub, 1999). The local pharmacy was preferred based on convenience, quality, and cost; travel to obtain medications was a significant problem. By contrast, survey results from pharmacists in the rural counties presented a less optimistic view regarding the future and the possibility that more pharmacies would close. A major reason given was that managed care demands for discounts and excluding some pharmacies from prescription benefit contracts were eroding profitability. This was reflected in the finding that over 80 percent of these pharmacies had experienced declining profits in the previous ten-year period (*ibid.*). A follow-up study in 1999 found some reversal of this trend; the number of pharmacies in these rural counties had actually increased slightly and fewer reported having experienced declining profits (Straub & Tripp, 2000).

Historically, rural areas have had a higher ratio of independent to chain pharmacies and many of the independent pharmacies have had a solo pharmacist/owner. In this situation, the pharmacist/owner's inability to secure a replacement upon retirement may result in the loss of that pharmacy to the rural community. Rural hospitals are also threatened; as their pharmacies function at less than full staff during the shortage, those who remain may become less satisfied with that setting. Overall, even with increases in the supply of pharmacists, the situation for many rural communities may remain threatened. Schools of pharmacy could play an important role in encouraging more of their students to consider rural practice by working with mentors and preceptors who promote the positive aspects and rewards of serving rural communities.

Ongoing research to monitor trends in rural pharmacy practice will be important to help ensure that rural communities retain an adequate supply of this critical health care component. The expanded role of community pharmacists, as mandated in the Federal Omnibus Budget Reconciliation Act of 1990, gives them greater responsibility for preventing and resolving drug-related problems (Kimberlin et al., 1993). This role is especially valuable for pharmacists in rural areas where access to health care providers and services is more limited.

THE EDUCATIONAL PROCESS FOR PHARMACISTS

Until 2004, there will be two degree programs that are eligible for accreditation by the American Council of Pharmaceutical Education (ACPE): the Bachelor of Science (BS) in Pharmacy and the Doctor of Pharmacy (PharmD). Both of these degrees meet the requirements of State boards of pharmacy allowing graduates to be examined for licensure. The first of these, the BS degree, is gradually being phased out throughout the U.S. and the ACPE will only accredit PharmD programs after 2003. The Doctor of Pharmacy program requires at least eight semesters of professional-level course work, usually over a four-year period, including at least two semesters of supervised practice experience. Eligibility for entry into the Doctor of Pharmacy program requires successful completion of a series of college-level prepharmacy requirements that generally take at least two years to complete. Therefore, the Doctor of Pharmacy is frequently described as a six-year program although many candidates entering PharmD programs already hold Bachelors degrees with majors such as biology and chemistry. It is also possible to pursue the Doctor of Pharmacy degree after completing a Bachelors degree in pharmacy. This option is often called a post-BS PharmD degree.

The pharmacy curriculum includes required and elective coursework in these areas:

- Normal and pathologic human biology including the study of human anatomy and physiology, pathologic disease processes, and the study of immunology and other defense mechanisms against disease.
- Chemistry including biochemistry particularly as it applies to the structure and function of medications.
- Pharmacology which is the study of the biological actions of medications with emphasis on the mechanism of drug action.
- Pharmaceutics which includes the study of the various dosage forms for medications, the processes of drug absorption, distribution, metabolism and excretion, the preparation of medications and the requirements for handling, storing, preparing and dispensing prescription medications in the United States.
- Social and administrative courses that address health care systems in the United States, communications,

- biomedical ethics, legal issues surrounding the practice of pharmacy and the economics of medication use.
- The therapeutics of medication use including medication selection, dosing, monitoring and determining whether a desired therapeutic outcome has been achieved for both prescription and non-prescription (over-the-counter) medications.
 - Experiential courses that engage the student in actual pharmacy practice experiences under the guidance of a preceptor. The experiential component is distributed throughout the curriculum with a full-time concentration during the last semesters. The clerkship lasts at least two semesters and consists of a series of rotations of four or more weeks in length in various practice settings including community and institutional sites. This portion of the curriculum is particularly labor-intensive requiring skilled practitioners and a high faculty-student ratio.

In 1992, following extensive consideration and debate, the House of Delegates of the American Association of Colleges of Pharmacy (AACCP) adopted the Doctor of Pharmacy (PharmD) as the entry-level degree. Because of the planning and expense required to convert to the PharmD degree, the transition to the new requirement has been gradual.

By 1992, a minority of schools had already made the conversion to the entry level PharmD degree. Two schools made the conversion by 1980 and nine completed the conversion during the 1980s. The remaining 70 schools made the conversion during the 1990s or into the early 2000s. Most of the newer schools of pharmacy opened offering only the PharmD degree.

During the conversion process, graduate numbers are decreased because of the extra year involved in the Doctor of Pharmacy program. If a school transitions gradually, the impact on graduate numbers is spread out over time but if a school begins the new program for an entire class in a single year, there will be a year when there are no graduates. During the latter 1990s, a number of schools have had years with zero graduates, creating problems for employers during the time when the current shortage was developing as the demand for pharmacists was escalating. Several responses to the Federal Register request for comments noted employer difficulties in coping with reduced numbers of graduates at the same time as an overall shortage.

The impact of the entry-level PharmD conversion is now nearing completion and, barring another downturn in enrollment like that of the 1980s, graduate numbers should stabilize at 7,000 to 8,000 graduates annually. The adequacy of this number of graduates needs to be evaluated. The BHPr model projects a slowly rising number of graduates through 2010 at an annual growth rate of approximately 1.4%—greater than the population growth rate but far less than the recent growth rate for prescriptions and medication expenditures.

SCHOOLS AND COLLEGES OF PHARMACY IN THE UNITED STATES AND NUMBERS OF GRADUATES

In 2000, there were 82 schools and colleges of pharmacy in the United States including Puerto Rico. The 82nd school, a new campus of Massachusetts College of Pharmacy and Allied Health Sciences, opened in September 2000 and data from this school were not available for any of the analyses in this report. The number of graduates over time was discussed earlier in this chapter. A table showing numbers of schools and graduates by Program type for each State in 1998 appears in the Report's Appendix.

Of the 50 States plus the District of Columbia, forty-four have at least one school of pharmacy. Puerto Rico also has a school of pharmacy. States without pharmacy schools include Alaska, Delaware, Hawaii, Maine, New Hampshire, Nevada and Vermont. When compared by Census Regions, the Northeast has 15 schools, the South has 29, the Midwest has 23 and the West has 14. When compared to regional populations, the ratio of graduates annually to 100,000 population is 5.3 for the Northeast, 2.5 for the South, 2.8 for the Midwest and 1.6 for the West. For schools in

transition, we used post-transition estimates of graduates and for new schools, we assumed 80 graduates per year.

Dean's Survey. As discussed earlier, we used data from a five-question email survey of the deans of the 81 schools and colleges of pharmacy in May 2000 to learn more about the current shortage as it relates to new graduates. Seventy-five of 81 deans (92.6%) representing 93.2% of graduates in 1998 responded to the survey. The respondents reported a total of 7,630 graduates in 2000. The sum included three schools with no graduates due to PharmD transitioning and six schools which had not yet graduated a class. The BHPPr model estimate for the year 2000 is 7,945 graduates.

Looking forward, deans were asked their goals for entering class size for 2000, 2001 and 2002. Table 4-11 lists aggregate responses with modifications for non-respondents. For each of the five non-responding schools with graduates in 1998, we divided the 1998 number of graduates by 0.89, to account for an 11% attrition rate calculated from AACCP data, and used that number to represent the entering class size for each of the three years 2000-2002. For the two non-responding new schools, we estimated entering classes of 100 students in years 2000-2002, the same estimate used in the BHPPr model. In moving from entering class to graduates four years later, we again used an attrition rate of 11% based on AACCP data. The resulting estimates do not include the school that opened in Massachusetts in September 2000; they also did not include corrections for the two schools with accelerated programs. Overall, it appears, as shown in Table 4-11, that deans of pharmacy schools envision lower numbers of graduates than the BHPPr model has estimated.

Table 4-11 Deans' Goals for Future Class Size, Estimates of Graduates and Comparison to BHPPr Model Projections*

Year	Entering Class Based on Dean's Goals	Estimate of Graduates Based on Dean's Goals	Responses/Estimate of Graduates from BHPPr
2000	7,723		7,945
2001	7,824		7,494
2002	7,774		7,485
2004		6,873	7,965
2005		6,963	8,054
2006		6,919	8,054

*Data from University of the Pacific survey of pharmacy deans, 2000

Table 4-12 outlines the responses to questions about the applicant pool, employer recruitment efforts and entry-level salaries for graduates. Earlier in the report, the applicant pool was discussed. Responses to the other two questions indicate a stronger demand for new graduates—another evidence of the rise in demand for pharmacists.

Table 4-12. Deans' Responses to Questions about the Applicant Pool, Employer Recruitment Efforts and Entry-Level Salaries of New Graduates*

Item	Number Selecting this Rating				
	Substantially higher than	Somewhat higher than	About the same	Somewhat lower	Substantially lower than
The application pool for the class entering my school or college	9 (12%)	14 (18%)	14 (18%)	27 (36%)	12 (16%)
The number of employees who are attempting to recruit and/or hire graduating seniors in my school or college	38 (52%)	27 (37%)	5 (7%)	3 (4%)	0 (0%)
The entry-level salaries for graduating seniors at my school or college	51 (72%)	20 (28%)	0 (0%)	0 (0%)	0 (0%)

*Data from University of the Pacific survey of pharmacy deans, 2000

The Applicant Pool. It was noted at the beginning of this chapter that AACP data show the applicant pool for pharmacy programs has been decreasing over the past four years. Table 4-12 extends the AACP data on applicants by adding the impressions of pharmacy deans about the size of the applicant pool in 2000 compared to 1998. As noted, a majority of deans (52%) reported a lower applicant pool in 2000 than two years earlier as opposed to 18% who reported a similar and 30% who reported a larger applicant pool. While the reason for the recent decline in applicants is not explained, the trends appear to parallel those of medical school applicants: medical school applicants went from a trough in 1989-1990 of 26,915 to a peak of 46,968 in 1996-97, then declined steadily to 38,529 in 1999-2000. (Barzansky, 2000).

With pharmacist salaries rising as a consequence of the current shortage and many jobs available, there should be an eventual rebound in applications after the lag period currently being experienced. In the meantime, efforts to discover the reasons for the decline in applications should be researched and remedied where possible.

Gender of Graduates. The gender shift issue has already been described as an important supply-related issue that is playing a role in the current shortage. Data describing the growth of women pharmacists in the workforce and an estimate of the impact on the effective supply of pharmacists were presented earlier in the chapter.

Ethnic Makeup of the Pharmacy Student and Graduate Population. Annual surveys of schools by AACP have provided a longitudinal database on the racial and ethnic composition of pharmacy students and graduates. Table 4-13 describes the breakdown for 5-year intervals from 1980 to 1995 and for one-year intervals from 1995 to 1998. The data illustrate a gradual reduction in the percentage of entry-level graduates who are White. There has been a striking, almost a five-fold, percentage increase, in the category of “Asian or Native Hawaiian or Other Pacific Islander” graduates. There has also been a near doubling in the percentage of Black or African American graduates since 1980, while Hispanic or Latino graduates have remained stable at less than four percent.

Four schools of pharmacy have enrolled and graduated predominantly African American students. These are Howard University, Florida A&M, Texas Southern University and Xavier University in New Orleans. In 1998, these

schools graduated a total of 163 African American students, slightly over 70% of the total of 232 African American students graduated nationally.

Table 4-13. Ethnicity of Pharmacy Graduates: 1980-1998*

Year	White	Black or African American	Hispanic or Latino	Asian or Native Hawaiian or Other Pacific Islander	American Indian or Alaskan Native	Other/Unknown	Foreign
1980	85.2	3.4	3.7	3.9	0.1	0.7	3.0
1985	80.1	4.4	4.3	5.6	0.1	0.1	5.5
1990	76.2	5.3	3.7	8.4	0.2	1.3	5.0
1995	71.3	5.7	3.6	14.8	0.4	0.6	3.7
1996	69.1	6.6	3.3	16.6	0.3	0.7	3.4
1997	69.0	5.7	3.6	17.5	0.4	0.6	3.1
1998	68.1	6.0	3.6	19.0	0.4	0.8	2.4

*Data from AACP Institutional Research Report Series: Profile of Pharmacy Students, 1999

When compared to the national population in 2000, there have been some notable changes toward pharmacy graduates becoming more representative of the U.S. population at large since 1980. Specifically:

- The percentage of white graduates has grown closer to the population value (72%), actually falling below that value starting in 1995.
- The percentage of Black or African American graduates in 1998, while greater than in 1980, was still only about half the population value (13%).
- The percentage of Hispanic or Latino graduates (less than 4%) has remained significantly below population values (11%).
- The percentage of Asian or Native Hawaiian or Other Pacific Islander graduates (19% in 1998) exceeds this population's percentage (4%) almost five fold.
- American Indian or Alaska Native graduates are somewhat underrepresented.

Post-Graduate Professional Training of Pharmacists.

Background. Postgraduate professional training in pharmacy is offered to pharmacists who choose to complete additional training after graduation from pharmacy school. Traditionally, these highly educated pharmacists have served as clinicians in healthcare institutions, faculty members in schools and colleges of pharmacy, and researchers in the clinical use of medications to treat disease. Increasingly, this cohort is extending activities to the care of ambulatory patients through clinics and in community settings and to working within pharmaceutical corporations.

Post-graduate professional (as opposed to graduate) programs include residencies and fellowships. The most available and most frequently selected postgraduate professional program is the pharmacy practice residency. The pharmacy residency is defined by the American Society of Health-System Pharmacists (ASHP) as "...an organized, directed, postgraduate training program in a defined area of pharmacy practice". ASHP acts as an accrediting agency for many residency programs in two categories: the pharmacy practice residency (generalist pharmacy practice training) and the specialty residency. A pharmacy practice residency is generally the first postgraduate experience; specialty residencies, if pursued, generally are embarked upon after a pharmacy practice residency has been completed.

ASHP-accredited residencies are generally one year in length although some residencies extend for two years. Pharmacy practice or generalist residencies include required experiences in acute patient care, ambulatory patient care, drug information, drug use policy development and practice management. Specialty residencies focus on targeted areas of

practice, some of which are described later in this section. A large number of other residency programs also exist and can be identified through the American College of Clinical Pharmacists, other professional associations and individual sponsors of programs.

An increasingly emphasized type of residency is the community pharmacy residency. Although these programs have existed in small numbers for over ten years, the expanded roles of pharmacists in community or ambulatory settings plus the history of pharmacy as a predominantly community-based healthcare profession have increased the demand for advanced training in this practice arena. In 1999, the ASHP, the American Pharmaceutical Association, the National Association of Chain Drug Stores and the National Community Pharmacists Association developed joint recommendations and support for growth of community pharmacy residency programs.

The fellowship is a second type of post-graduate professional training that focuses on research skills and generally lasts two years. The American College of Clinical Pharmacists (ACCP) annually publishes a directory of pharmacy fellowships and listed 105 fellowship positions in 1999. Fellowship training has been an important development in raising pharmacists' ability to participate in research, particularly research that addresses pharmacotherapeutic issues. Fellowship training has also been an important factor in providing the research skills that pharmacy practice faculty members in schools of pharmacy need in order to succeed in the scholarly activities that are expected of most university faculty.

Historically, the number of post-graduate professional programs available has been the limiting factor for advanced training in practice. ASHP reports that applications to residency programs have exceeded the number of programs for the past 9 years. In 1999, ASHP, APhA, and the ACCP joined forces to increase the number of residencies. They identified funding of residency programs as an important component of the growth process. At present, Federal support for resident stipends occurs primarily through Medicare funding as it does for medical residencies (Ray, 1999). These programs need to be expanded and other funding sources need to be identified for programs that do not meet Medicare funding guidelines. Within the profession, the presence of a sufficient number of pharmacists trained beyond the first professional degree is viewed as essential to continuing the progress in optimizing the use of medications in America.

Supply and Demand Issues Related to Post-Graduate Professional Programs. The following list identifies factors that influence the demand for post-graduate professional training programs and the supply of pharmacists trained in these programs.

- Post-graduate training in pharmacy is not required as it is in medicine. At the present time, about 20% of graduates, less than 1,500 pharmacists, pursue these programs each year.
- The demand for residencies has grown as PharmD graduates have increased. The American Society of Health-System Pharmacists, which accredits the largest share of residency programs, reports that for the past nine years there have been more applicants to residency positions than there are positions available.
- Pursuit of a residency, the most common type of post-graduate program, is a highly competitive process since there are more applicants than there are programs available. Fellowships are also competitive.
- The salaries in residency programs average about \$30,000 per year. This salary is similar to that of medical residents (where training is required) and represents less than 50% of entry-level pharmacist salaries. Modest residency salaries can be a disincentive to students with educational debt.
- Most post-graduate professional programs are institutional experiences although there is a recent growth in community pharmacy residencies and ambulatory care experiences in traditional residencies. Like medical residencies, the shift of training sites to the locale where patients are increasingly treated has been slow.
- Pharmacists with advanced training in residencies, fellowships and graduate programs are the backbone of the pharmacy practice faculty in schools and colleges of pharmacy. Expansion of schools and founding of new schools is dependent upon an adequate supply of pharmacists with advanced training.
- The shortage has further augmented the strong competition for pharmacists trained at the residency or fellowship level. Schools of pharmacy, managed care organizations, pharmaceutical corporations and hospitals compete for the employment of these pharmacists resulting in sector shortages that are particularly threatening to those working under economic constraints—particularly schools and hospitals.
- Despite the fact that the number of pharmacists trained to this advanced level is small compared to the overall pharmacy workforce (estimated at 7,500 in 1995), these pharmacists have provided leadership in both practice

and education at a disproportionately high level.

Types of Residency Programs. Table 4-14 is provided as an example of the variety of post-graduate residency programs and the relative availability of advanced programs with a more specialized focus. This table shows the number of residents completing training in 1999. As noted earlier, the pharmacy practice residency is the most available program. **Table 4-14. Number of Pharmacists Completing Residencies by Residency Type: 1999.***

Type of Residency	Number Completing Program in 1999
Pharmacy Practice residency	591
Primary care residency	98
Drug information residency	34
Psychiatric or psycholpharmacy residency	20
Critical care residency	19
Geriatric residency	16
Pediatric residency	15
Oncology residency	14
Managed care residency	9
Infectious disease residency	5
Other: hospital administration, nuclear pharmacy, adult internal medicine, pharmacotherapy, home care, pharmacy practice management, community pharmacy, management, long term care, clinical pharmacokinetics, nutrition support	22
Total	843

*Data from Roster of residents completing ASHP-accredited programs in calendar year 1999. Am J Health-System Pharm.2000;56:1001-8.

PHARMACIST TECHNICIANS

Pharmacy technicians are individuals who work in a pharmacy under the supervision of licensed pharmacists and assist in a number of pharmacy activities. Technicians work with pharmacists in most practice settings. Respondents to this study (see Chapter 5) emphasized the need to include technicians, appropriately trained and utilized, when considering measures to increase the productivity of pharmacists. Respondents also emphasized the importance of optimizing the pharmacists/technician working relationship and the need for pharmacists to be better trained in how to work with technicians.

As with pharmacists and to an even greater extent, data describing the pharmacist technician workforce are sparse. Anecdotally, it has been reported that there is currently a shortage of technicians that parallels the shortage of pharmacists, thereby limiting the options for addressing the latter.

There is no single, reliable source of estimates of the number of pharmacy technicians. The BLS Occupational Employment Statistics (OES) survey reports State and national estimates for both pharmacy technicians and pharmacy aides, two occupational categories that have overlapping descriptions (BLS, 1997). Table 4-15 shows the estimated national counts of both of these occupations in 1996 and 1998. The BLS data suggest a somewhat lower number of technicians and aides combined than pharmacists. Supporting these data, ASHP surveys of hospital pharmacists have consistently shown technician-to-pharmacist ratios slightly less than one-to-one (see Table 2-13).

Table 4-15. Number of Employed Pharmacy Technicians and Pharmacy Aides, 1996 and 1998*

Position	1996	1998
Pharmacy Technicians	82,650	108,690
Pharmacy Aides	47,200	61,031
Pharmacy Techs. and Aides	129,850	169,721

*Data from the Bureau of Labor Statistics

BLS data also show that technicians and aides are employed in most sectors of the pharmacy industry. In 1996, recognizing the overlap between these two categories as previously defined, BLS adopted a common definition for both. Included in the definition was the following statement:

“(Pharmacy technicians and aides) fill orders for unit doses and prepackaged pharmaceuticals and perform other related duties under the supervision and direction of a pharmacist supervisor or staff pharmacist.” (BLS, 1998.)

Table 4-16 lists hourly and annual wage estimates for pharmacy technician and aides, as estimated by BLS.

Table 4-16. Pharmacy Technician/Aide Wage Estimates, 1998*

	25th percentile	Median	75th percentile
Hourly Wage	\$7.09	\$8.65	\$10.69
Annual Wage	\$14,750	\$18,000	\$22,230

*Data from the Bureau of Labor Statistics

Pharmacy technicians are an integral participant in many pharmacies, enabling a greater output of prescriptions as well as allowing the pharmacist more time to concentrate on clinical duties. The vast majority of technicians work in either community or hospital pharmacies, which dictates the primary functions that technicians perform. The most frequent assignments in the community setting include: ringing up customers' purchases, stocking shelves and assisting in the filling of prescriptions. Filling a prescription consists of: entering patient information into the computer, retrieving the medication from the shelf, counting the medication and labeling the container. In the hospital, technician duties include: preparing and delivering medications to patients, maintaining inventory and performing clerical tasks. In both areas of practice, technicians need to have good interpersonal skills to be able to communicate well with customers, coworkers and health care professionals. Basic math and computer skills are beneficial as well.

The practice scope, supervisory requirements, and training/certification process for pharmacy technicians have been key national and State pharmacy policy issues. Training for technicians is varied but in many cases directed by State law. Twenty-three States require some form of instruction. On-the-job training is the most common way for a pharmacy technician to be educated. Formal education is also available through some hospitals, vocational schools and community colleges, for technicians whose employers do not have on-the-job training programs or for technicians who want a structured curriculum for learning. In addition to training, a national certification exam was established in 1995. Its goal is to enable pharmacy technicians to work more effectively with pharmacists to offer greater patient care and service. As of March 2000, there were 60,849 certified technicians.

Regulation of pharmacy technicians occurs at the State level with the degree of regulation differing widely from State to State. Documentation, which includes registration, licensure or certification, is required in about half the States. Sixty-nine percent of the States enforce a working ratio of pharmacy technicians to licensed pharmacists. The most common ratio is two technicians to one pharmacist, but the ratio varies from one-to-one up to four-to-one. Some States do not specify a maximum ratio of technicians to pharmacists.

Overall, the role of the pharmacy technician is becoming more important with the growing demands being put on the pharmacist. Increased recognition and regulation by State governments as well as the development of a national certification exam show the evolution of a profession that is developing a more complex skill set. The role of the pharmacy technician is expanding, making it a more recognized and valued part of the healthcare field.

CHAPTER 5

SUMMARY OF COMMENTS FROM THE PUBLIC AND PRIVATE SECTORS

THE COMMENTARY PROCESS AND RESPONDENTS

FEDERAL REGISTER ANNOUNCEMENT

In the March 16, 2000 *Federal Register*, in an announcement entitled “Study Regarding Shortages of Licensed Pharmacists”, the Department of Health and Human Services’ Health Resources and Services Administration invited comments from public and private sources. Comments were solicited in ten areas:

- The shortage of pharmacists,
- Difficulties communities may be experiencing in accessing pharmacy service
- How pharmacies and employers are addressing a shortage of pharmacists,
- The use of pharmacy technicians,
- The impact of the growth of managed care and third-party coverage of prescriptions on pharmacy practice,
- Problems or adverse events connected with a shortage of pharmacists,
- The impact that a drug benefit for the Medicare population might have on prescription volume and the demand for pharmacists;
- Uses of automation or technology to assist pharmacists,
- The impact of the Internet and mail order pharmacies on the demand for pharmacists, and
- Information on the current pharmacist education process.

THE RESPONDENTS

A total of 48 public and private organizations and individuals responded to the announcement excluding replies that consisted solely of requests for information. The respondents fell broadly into seven categories: pharmacies or organizations that speak for pharmacies (20 responses), pharmacists or organizations that speak for pharmacists (15 responses), members of the pharmacist educational and/or licensing community (5 responses), suppliers of pharmacy-related products and services (4 responses), consultants (3 responses), consumers or organizations that speak for consumers (2 responses) and students (1 response). These numbers sum to 50 rather than 48 since one organization had subsidiaries that fell into three different categories. Table 5-1 identifies the responding organizations and the geographic location of individual respondents.

Type of Respondent

Respondents

Pharmacies or organizations that speak for pharmacies (20 responses)

Retail: Bartell Drugs (Washington), Cardinal Health (Medicine Shoppe International), CVS, Eckerd Corporation, Hartig Drug Stores (Iowa), National Association of Chain Drug Stores, Pharm-Mor (Ohio), Publix Supermarkets, Rite Aid, Thrifty White Drug (Minnesota) and Walgreens

Hospital or other: American Society for Healthcare Human Resources Administration of the American Hospital Association, Blessing Hospital (Illinois), Cardinal Health (Owen Healthcare), Crusader Clinic (Illinois), Eastern New Mexico Medical Center (New Mexico), Federal Bureau of Prisons, Harris Methodist (Texas), Joint reply from the National Association of Public Hospitals and Health Systems, Public Hospital Pharmacy Coalition and University HealthSystem Consortium, and York Hospital (Pennsylvania)

Type of Respondent	Respondents
Pharmacies or organizations that speak for pharmacists (15 responses)	<p><i>Pharmacists:</i> responses came from Florida (5), California(2), Kentucky (1), Illinois (1) and Washington (1)</p> <p><i>Organizations:</i> American College of Clinical Pharmacy, American Pharmaceutical Association, American Society of Health-System Pharmacists, National Community Pharmacists Association and U.S. Public Health Service Pharmacy Professional Advisory Committee</p>
Members of the pharmacist educational and/or licensing community (5 responses)	<p><i>Schools or colleges of pharmacy:</i>Midwestern University College of Pharmacy (Arizona), University of Maryland School of Pharmacy, University of Oklahoma School of Pharmacy</p> <p><i>Educational organization:</i> American Association of Colleges of Pharmacy</p> <p><i>Licensing organization:</i> South Dakota Board of Pharmacy</p>
Suppliers of pharmacy-related products and services(4 responses)	Cardinal Health (PCI Services, Renlar Systems, Pyxis, etc.), Healthcare Compliance Packaging Council, KVM Technologies, Inc., TechRx
Consultants (3 responses)	Arthur Andersen LLP (a report funded and submitted by the National Association of Chain Drug Stores Education Foundation), drug and nutrition consultant (Florida) and pharmacist consultant (Kansas)
Consumers and organizations that speak for consumers (2 responses)	<p>Consumer: Medicare beneficiary in Florida</p> <p>Organization: National Consumers League</p>
Student (1 response)	Pre-pharmacy student in Florida currently in the process of switching to nursing

COMMENTS ADDRESSING THE TEN ISSUES IDENTIFIED IN THE FEDERAL REGISTER

SHORTAGE OF PHARMACISTS

Two-thirds of the respondents (32 out of 48) explicitly addressed the shortage issue, in many cases presenting compelling evidence of its existence. Sample comments follow:

“I employ 20 pharmacists, should employ 24, and as a result, have been juggling like crazy to try to continue to serve our patients... Last August, I had to cut store hours from 83 to 58 hours per week, instituted an aggressive \$25,000 sign-on bonus plan, (and) beefed up staff salaries by 12%.” (Hartig Drug Stores, Iowa)

“Four years ago, it was common for us to have every pharmacy position filled for months at a time... We have not been fully staffed with pharmacists one day in the last three years.” (Thrifty White Drug, Minnesota)

“Presently, within Rite Aid, we have averaged in excess of 500 vacant positions per month. This time last year we had 400 vacant positions and two years ago we only had 250.”

Comments of this nature were received from every pharmacy chain that responded. They were not alone, however; other employers of pharmacists and the organizations that represent them were equally forthcoming. A joint reply from the National Association of Public Hospitals and Health Systems, Public Hospital Pharmacy Coalition, and

University HealthSystem Consortium (hereinafter referred to as the “NAPH/PHPC/UHC Coalition”) reported, for example, that a mail survey of their members, conducted in March 2000, had shown the following:

“The average time to fill a position was more than 6 months. Eighteen percent reported taking more than twelve months to fill open positions (and) 33 percent reported taking 6-12 months.”

The Federal Bureau of Prisons conveyed a similar picture:

“Pharmacist vacancy rates in the Bureau of Prisons are higher than any time in the past 10 years. Current vacancies represent 15% of pharmacist positions.”

while Harris Methodist, a Fort Worth hospital, noted that the Dallas Fort Worth Hospital Council, which tracks open positions across member hospitals, had reported

“... a 29% increase in open positions for pharmacists from 1997 to 1999”.

Further evidence that a shortage exists may be found in the vast accumulation of data provided by the National Association of Chain Drug Stores (NACDS), including the results of that organization’s last several surveys of its members. In August 1998, NACDS members reported a projected nationwide total of 2,862 full-time and 648 part-time pharmacist vacancies; by February 2000, those numbers had climbed to 5,971 and 949 respectively. Similar increases were reported by Walgreens:

“Currently Walgreens has 900 full-time and 200 part-time pharmacist openings vs. 650 full-time and 166 part-time pharmacist openings at the same time last year.”

Evidence that the shortage may have a regional character was provided by Cardinal Health. Speaking for their subsidiary Owen Healthcare (“the Nation’s leading provider of hospital pharmacy services with more than 400 client hospitals in 45 States”), Cardinal Health reported that the average number of days required to fill Owen Healthcare pharmacist positions had increased in the past year by 37%, but that the increase “varied significantly by region”. The figures presented were as follows:

Reported increase in "fill time" for pharmacist positions between FY 1999 and FY 2000	
Midwest/Northeast	+69%
Southeast	+35%
West	+47%

While there was virtual unanimity on the part of all concerned that a shortage of pharmacists exists, one respondent, a drug and nutrition consultant, ventured a contrary opinion. Focusing on the increasing number of pharmacists each year rather than on the expanded responsibilities and increased prescription volume that cause those numbers no longer to be adequate, he noted that "If you look at the number of graduates each year and the number that retire or die, there remains a surplus." His was a distinctly minority view, however.

DIFFICULTIES COMMUNITIES MAY BE EXPERIENCING IN ACCESSING PHARMACY SERVICES

Many respondents voiced concern regarding the difficulties that are being encountered, particularly in rural areas, in obtaining access to pharmacy services. Most of the comments were of an anecdotal nature, however, or otherwise lacking in quantitative detail. Typical of the comments received were the following:

"The shortage in rural areas has always been more extensive than in urban. It is so great that we do not consider placing pharmacists in these areas as a rule." (Publix Supermarkets)

"We are having difficulty recruiting people not because of salary but because we are in a rural hospital." (Blessing Hospital, Illinois)

Noting that their organization "loses many graduates to Sun Belt States and larger metropolitan areas that can afford to pay higher salaries because of their higher prescription volumes", the two spokespersons for Thrifty White Drug recommended the implementation of "tuition reimbursement programs to encourage students to stay in rural communities".

In addition to rural communities, two other populations with reportedly heightened service access problems were Native Americans, mentioned by both the U.S. Public Health Service Pharmacy Professional Advisory Committee and the American Association of Colleges of Pharmacy, and prison inmates. Commenting on the latter group, the Federal Bureau of Prisons noted the special risk factors faced by the Nation's prison population, adding that "...few groups require as much health care resources as inmates".

No respondents specifically singled out the service access problems of the elderly as being unique. The National Consumers League did, however, mention seniors in the context of medication error, noting that a shortage of pharmacists

"...may increase the risk of medication errors or drug interactions, especially for seniors and other vulnerable populations".

HOW PHARMACISTS AND OTHER EMPLOYERS ARE ADDRESSING A SHORTAGE OF PHARMACISTS

Of the 20 respondents who could be characterized as "pharmacies and other employers", all described the steps they had taken, positive and negative, to respond to the shortage. On the negative side, a common response, particularly for retail pharmacies, was to reduce the number of hours of operation:

“Many retailers, including Rite Aid, have found it necessary to curtail the hours of operation in many pharmacies in different parts of the country.”

“(Hartig Drug Stores) has had to cut store hours from 83 to 58 hours per week.”

“Just a few years ago, Eckerd had a goal to provide 24-hour stores in all of our major markets. Due to the shortage, we have had to curtail this initiative.”

“(Publix) has had to shorten hours of operation in a dozen stores this year.”

Hospitals and government agencies understandably have fewer options available to them. According to the Bureau of Prisons:

“The only solution in our pharmacies has been for pharmacists to work long hours...”

while Crusader Clinic, a HRSA-funded community health center in Illinois with pharmacies located at two sites, Stated that they will have to close one of the two.

On the positive side, steps taken by respondents to combat the shortage fall into four broad categories: expanded efforts to recruit, hiring incentives, incentives directed toward retention, and substitution (technicians and/or technology). Examples of each are described below:

Expanded efforts to recruit. A number of respondents Stated that they had hired professional recruitment agencies and had begun advertising in newspapers, both nationally and Statewide, as well as on the Internet and in college newspapers and professional journals. Sample comments include:

“We spent approximately \$105,000 in advertising and interview fees before hiring ... two pharmacists.” (Eastern New Mexico Medical Center)

“To adjust to the shortage, Eckerd has hired 10 new pharmacist recruiters.”

“We have been using the services of several recruiting agencies as well as several temporary agencies and have not yet been able to fill these positions even on a temporary basis.” (Blessing Hospital, Illinois)

Hiring incentives. All nine retail-based respondents and four of the five that are hospital-based (including Owen Healthcare) reported having awarded sign-on bonuses and other incentives to attract new hires. Other incentives included payment of relocation expenses, buying or leasing new cars, offers of tuition assistance and offers of continuing education programs. Similar findings were reported by the NAPH/PHPC/UHC coalition based on its March 2000 survey of members. According to the coalition:

“Several strategies are being used to fill vacancies including signing bonuses, tuition assistance/loan forgiveness, relocation allowances, and availability of flexible shifts.”

Incentives directed toward retention. These are similar in kind to those directed toward hiring, although seemingly less commonly applied. They include salary increases, stay-on bonuses, tuition assistance and provision of continuing education programs.

Substitution. Many respondents reported using technicians and/or technology to relieve the burden being placed on pharmacists and permit them to operate more efficiently. Both of these issues will be discussed in fuller detail later in this chapter as well as elsewhere in this Report.

While the four sets of activities outlined above cover essentially the full range of measures adopted by respondents to combat the existing shortage of pharmacists, one additional “coping” measure was reported by a pharmacist residing (and working) in Florida:

“Flying pharmacists into Florida from other States to work long weekends to relieve the overworked, putting them up in hotels, paying airfare and meals and double-time wages.”

USE OF TECHNICIANS

The majority of respondents who addressed this issue felt the use of technicians was a desirable — indeed essential — development. The following responses were typical:

“Implementing the prescription requires many repetitive manual tasks: inputting data into the computer, retrieving medication from the shelf, counting and affixing a label...With the increased cognitive activities of pharmacists, not the last of which is patient counseling, the technician is essential to performing those manual tests to free up the pharmacist.” (Rite Aid Corporation)

“We are seeing many independent pharmacy owners sell or close their business because they are just plain worn out. These owners are retiring early and leaving the work force entirely or choosing to work part time only. The surviving stores get busier and many older pharmacies can’t keep up with the pace (if)... State pharmacy regulations preclude adequate technician help (because of) unreasonable pharmacist to technician ratios.” (Thrifty White Drug, Minnesota)

Several respondents, however, qualified their assessment of the benefits achievable through the use of technicians. Bartel Drugs in the State of Washington noted that:

“While enhanced technician usage and automation provide some degree of relief, they in no manner will offer the degree of help necessary to ameliorate this serious and growing critical shortage of pharmacists.”

The National Community Pharmacists Association (NCPA) voiced similar reservations. While acknowledging that “well-trained technicians are a valuable part of pharmacy practice”, they cautioned that

“The majority of current State pharmacy practice acts are not as large a barrier to effective and efficient pharmacy practice as the inability of the pharmacist to maximize the responsibilities of pharmacy technicians currently permitted under (those) acts... Pharmacy graduates are frequently not trained in community pharmacy practice, including human resource management. As a result, pharmacists often underutilize the capabilities currently allowed by State pharmacy practice acts.”

NCPA further noted the following incongruity: the geographic region with the highest pharmacist demand index is the East North Central, and yet three of the seven States in the region (Illinois, Michigan, Ohio) place no limit on the number of technicians permitted per pharmacist. Based on that observation, they added:

“One could conclude that dramatically increasing technician ratios is not the answer to any staffing shortfalls.”

Most respondents, however, felt that existing State laws governing pharmacist-to-technician ratios and the functions technicians are permitted to perform were indeed having a detrimental effect upon the ability of pharmacies to cope with the existing shortage of pharmacists. Expressions of this nature were received from all five nationwide drug chains as

well as the National Association of Chain Drug Stores, speaking on behalf of its members. Similar statements were made by several of the responding pharmacists and by the Southwestern Oklahoma State University School of Pharmacy. That school also shared NCPA's perception that training pharmacists in how to supervise technical support should be an important part of the pharmacy school curriculum.

IMPACT OF THE GROWTH OF MANAGED CARE AND THIRD-PARTY PRESCRIPTION COVERAGE.

There was unanimity on the part of the 18 respondents that addressed this issue: all agreed that the growth of managed care and third-party prescription coverage has been a key factor in creating and/or exacerbating the shortage of pharmacists. Two major driving forces were noted: increased prescription volume and increased administrative burden.

Increased prescription volume. Although no numbers were presented, several respondents felt that at least a portion of the increase in prescription volume over the past decade was attributable to the reduced out-of-pocket costs resulting from increased third-party prescription coverage and the prescription benefits associated with managed care.

Increased administrative burden. Even more perhaps than the increase in prescription volume, the increased administrative burden placed upon pharmacists by the growth in managed care and third-party coverage of prescriptions was felt to be a major contributing factor. As noted earlier, several respondents appended to their comments the cost and productivity study performed by Arthur Andersen LLP. Conducted in July-August 1999, the study reported that fully "one-fifth of pharmacy personnel time, including pharmacists, is spent on activities directly related to 3rd party issues". In descending order, those activities occupied the following percentages of a pharmacist's time:

Contacting doctor's office concerning approvals and to clarify scripts	2.4%
Manually entering information from ID card into the computer system	2.2%
Resolving conflicts between the patient's prescription and the Pharmacy Benefits Manager's response due to coverage restrictions (excluded drugs, preferred drugs, generics, etc.)	2.1%
Responding to insurance-related inquiries	1.8%
Entering patient's medical information into the computer system	1.5%
Communicating prescription resolutions to the customer	1.3%
Verifying 3rd party eligibility through plan manuals, computer or phone calls	1.1%
Miscellaneous other activities (completing paperwork required by 3rd parties, resolving billing conflicts, resolving payment conflicts, etc.)	7.6%
Total	20.0%

The Andersen numbers are revealing even when one discounts activities such as contacting physicians and communicating prescription resolutions, functions that are clearly important in reducing and preventing medication errors. In the past decade, third-party payment for prescription drugs, expressed as a percentage of total prescription volume, has essentially doubled, from 37% in 1990 to 75% in 1998 (IMS Health, 1999). With this two-fold expansion in third-party coverage for medication in the past decade, pharmacists are spending more and more time on third-party

issues. This helps explain why so many respondents declared this factor important.

Other ways in which managed care and third-party prescription coverage were represented as having had a detrimental effect on pharmacy practice are identified below:

Contract exclusivity. Commenting on contracts of an exclusive nature between managed care organizations and pharmacy chains, the National Community Pharmacists Association reported that:

“In some instances, the pharmacy staff may not be prepared to support a sudden and dramatic increase in prescription volume. As an example, in areas of North Carolina patients were directed to a pharmacy chain that had received an exclusive contract. The staff pharmacists at these pharmacies were suddenly faced with increased prescription volumes that, in some cases, had doubled overnight. Reportedly, patients arriving at the pharmacy were told that the wait time for their prescription would be anywhere from several hours to a day. In the meantime, other non-contract pharmacies that could have met these patients’ needs were underutilized.”

Inadequate reimbursement. According to the South Dakota Board of Pharmacy:

“Another problem is third-party reimbursement of prescriptions dispensed, often below their cost, which is having a tremendous effect on the store’s bottom line, especially with increased labor cost.”

PROBLEMS OR ADVERSE EVENTS CONNECTED WITH A SHORTAGE OF PHARMACISTS

Comments on shortage-related adverse effects ranged from the anecdotal (first quote below) to the broadly general (second quote):

“My husband brought a prescription to Walgreens for Imitrex and was given an outdated Rx.” (Medicare beneficiary residing in Florida)

“Customer complaints (to Eckerd Corporation) have increased. Average reported customer dissatisfaction has increased substantially according to our consumer research studies.”

Most fell into the latter category. The NAPH/PHPC/UHC coalition, for example, reported that 54% of the member hospitals they had surveyed reported one or more problems of the following nature:

- Closure or consolidation of pharmacy or pharmacy services,
- Increase in wait time,
- Increase in potential for medication errors,
- Decrease in patient counseling,
- Reduced formulary compliance and
- Increase in patient complaints.

Medication error was a common concern. Stating that it believes there exists “a strong correlation between pharmacist shortages and patient safety”, the American Society of Health-System Pharmacists noted that:

“Shortages in pharmacy staff may increase error hazards because of understaffed work shifts and individual workers’ work durations and volumes.”

Additional backup was provided by the American College of Clinical Pharmacy. In its response, ACCP cited two recent studies (Bond et al., 1999a, 1999b) that showed “staffing levels of pharmacists in acute care hospitals are inversely correlated with patient mortality”.

IMPACT THAT A MEDICARE DRUG BENEFIT MIGHT HAVE ON PRESCRIPTION VOLUME AND THE DEMAND FOR PHARMACISTS

Ten respondents addressed this item. All were of the opinion that a Medicare prescription drug benefit would have an impact on the Nation's need for pharmacists. Several believed the impact would be substantial:

"The anticipated impact of a new Medicare drug benefit would be far reaching. First, the expected volume increase represented by this population would require an even greater number of pharmacists to meet the patients needs. Secondly, any disease state management, drug utilization review and compliance components of such a benefit would add significantly to the pharmacist's workload. Finally, as with most prescription drug benefits, time would be required for basic plan administration and patient education." (CVS)

"Presently, 35% of seniors do not have a prescription drug benefit. As more seniors gain access to (such) benefits and cost becomes less of an issue, it is expected that the volume of prescriptions will increase... There is an ever-increasing aging population with multiple chronic diseases, necessitating multiple medications. The senior population is much more sensitive to the effects of polytherapy for multiple reasons, including the physiological changes and the greater consumption of both prescription and over-the-counter medication. It is critical that a trusted professional, like the pharmacist, be available and have the time to counsel patients on how to take their medications." (Cardinal Health)

Both of these respondents based their assessment, as did several of the others, on the concatenation of two factors: (1) an expected increase in prescription volume, and (2) expanded responsibilities on the part of the pharmacist. The National Association of Chain Drug Stores reached a similar assessment based solely on the issue of volume increase. Citing the U.S. Department of Health and Human Services' Report to the President on Prescription Drug Pricing, Coverage, and Utilization Among Medicare Beneficiaries (April 2000), NACDS noted that:

"Medicare beneficiaries with prescription drug coverage fill nearly one-third more prescriptions than those without coverage, and annual spending for Medicare beneficiaries with coverage is nearly two-thirds higher than those without coverage."

The only respondent that felt the impact of a Medicare benefit would be minor was the National Community Pharmacists Association, which stated the following:

"(While) Medicare coverage for prescription drugs may increase the volume of prescription drugs being utilized, a significant percentage of Medicare patients already have prescription coverage. Thus, drug utilization of Medicare patients is unlikely to be dramatically affected. Those Medicare patients who do not already have prescription coverage (are likely to) show some increased medication usage, but many of these patients are already taking prescription drugs. Therefore, the modest increase in the number of prescriptions used by the group of Medicare patients without prescription drug coverage would not be expected to overwhelm the current system."

Although NCPA made no explicit mention of the added burden on the pharmacist of providing patient counseling, they clearly recognized that such a burden exists, for they recommended that services of this nature be separately reimbursed, noting that

"Payment for pharmacist service would help eliminate unnecessary or duplicate drug usage and reduce costs to the healthcare system."

USES OF AUTOMATION OR TECHNOLOGY TO ASSIST PHARMACISTS

The use of automation or technology to assist pharmacists in their everyday functioning elicited comment from 17 respondents, including four that either are, or represent, suppliers of such devices and/or systems. The latter group consisted of one “supplier of automation systems used by high-volume pharmacies to automate the prescription fulfillment process” (TechRx), one “manufacturer and marketer of automated equipment designed to address the management and dispensing of medications” (KVM Technologies, Inc.), one not-for-profit trade association that seeks to promote “the many benefits of unit dose blister and strip packaging” (Healthcare Compliance Packaging Council), and one company (Cardinal Health) with subsidiaries dealing in all of the above.

Respondents that were suppliers or representatives of suppliers were unanimous in extolling the virtues of automation and technology. Respondents that were users, however, tended to be more restrained. Rite-Aid, for example, stated that

“...the addition of automated dispensing systems will not alleviate the need for additional pharmacists. In some instances, these devices have allowed for a small reduction in the number of tech hours assigned to a pharmacy but we have experienced no relief in the area of actual pharmacist hours needed to prepare a certain volume of prescriptions.”

Other retail chain respondents were similarly cautious:

“(Although) automation provides some degree of relief, technological advances do not replace pharmacists.” (Bartell Drugs, Washington)

“We do not plan to add robotics or central fill capabilities in the near future. For those companies that do plan to add them, this will alleviate the problem (but) it is not a long term solution.” (Publix Supermarkets)

“The introduction of automated systems, I feel will have reduced customer wait time for prescriptions. I do not see this as a quick solution to the shortage. However, it may help retention of pharmacists in the long term.” (Phar-Mor, Ohio)

The NAPH/PHPC/UHC coalition, on the other hand, was fully supportive, as was the National Association of Chain Drug Stores:

“Uses of new technologies could result in the development of new staffing metrics, since technological advances should improve efficiency.” (NAPH/PHPC/UHC) coalition

“The use of automation and technology contributes greatly to enhancing the efficiency of a pharmacy operation. An efficient pharmacy enables a pharmacist to address the increasing prescription volume, thereby alleviating workload, and also to reallocate the time previously spent on prescription processing. The additional time the pharmacist gains with automation and technology can be spent on patient care activities.” (National Association of Chain Drug Stores)

On balance, the use of automation and technology appears to be viewed as a plus, albeit with some reservations:

“(Rite-Aid is) very supportive of changes in State and Federal law that will facilitate the usage of concepts such as central filling of prescriptions, robotics, and other innovations.” (Rite-Aid Corporation)

“As the price of automated dispensing systems declines, it will become economically feasible for a growing numbers of pharmacists to implement these machines into their practice. Ultimately, this should result in more prescription being dispensed per pharmacist. Additionally, central fill is an area of interest among community

pharmacists but more pharmacists believe that a cost effect model is yet to be developed.” (National Community Pharmacists Association)

The Bureau of Prisons noted that it has some facilities that “...utilize automatic dispensing stations (Pyxis or Medstation), while at least one facility uses a robot filling system. The agency is currently involved in acquiring an electronic medical record system which will include electronic order submission”.

Several respondents expressed the need for additional training of pharmacists to help them achieve the full potential attainable through the use of automation and technology. For example,

“It is essential that new graduates understand the new streamlined processes and how to supervise technical support.” (Southwestern Oklahoma State School of Pharmacy)

IMPACT OF INTERNET AND MAIL ORDER PHARMACIES ON THE DEMAND FOR PHARMACISTS

Of the ten topics identified in the Federal Register, the issue of Internet and mail order pharmacies received the lowest level of response: only seven respondents referred to them. All agreed that both features have contributed to an increase in prescription volume and thus to the existing shortage of pharmacists. Most felt, however, that the impact was relatively slight. CVS reported, for example, that they were the first retail chain to integrate these features into their day-to-day operations (“Patients are provided the opportunity to order their prescriptions via the Internet and have the option to receive them by mail or pick them up at a local CVS pharmacy.”). Their conclusion was:

“Both forms of alternative pharmacy practice have had some impact on community pharmacy practice although not to the extent once anticipated.”

The National Association of Chain Drug Stores noted that Internet technology does contribute to an overall increase in prescription volume by “making it easier for consumers to obtain prescription refills” but that the reverse may hold for mail order operations. In their judgment,

“...as policymakers and benefit managers continue to recognize the economic limitations of mail order, as well as the quality of care issues, (we believe) that the rate of growth in mail order—which has already leveled off—will decrease.”

The National Community Pharmacists Association agreed that any increase in prescription volume resulting from use of the Internet would come at the cost of mail order:

“Internet pharmacy is essentially mail order pharmacy, (the only difference being that) the communication vehicle to place the order has been changed from the telephone to a computer... According to IMS Health, mail order pharmacies account for 4.7% of the U.S. prescription volume. It is estimated that Internet pharmacies not providing same-day service from their local pharmacist will share [rather than expand upon] that 4.7% market... Therefore, it is expected that Internet and mail order pharmacies will not have a substantial effect on decreasing the number of prescriptions dispensed in retail pharmacies.”

The prevailing view appeared to be that Internet and mail order pharmacies have created, and may be expected to continue to create, the need for additional pharmacists and thus to have an impact on the existing shortage of pharmacists, but the magnitude of the impact remains unknown and may not be as great as originally imagined.

INFORMATION ON THE CURRENT PHARMACIST EDUCATION PROCESS

Applications to pharmacy programs. Only one respondent provided numbers with respect to applicants. The University of Maryland School of Pharmacy reported that their applicant pool had decreased from a high of 655 in 1996 to 348 in 1999, an almost 50 percent drop in three years.

Impact of the shift to the PharmD as the first professional degree. Seventeen respondents made reference to the new requirement with all characterizing its impact as negative with respect to the shortage. Retail chains were particularly emphatic in their response:

“The mandatory six year PharmD (is) a tough nut to crack decision-wise for an 18 year old high school grad.” (Hartig Drug Stores, Iowa)

“The number of graduates available from the surrounding pharmacy schools decreased with the transition to the mandatory PharmD degree. The dean at the schools have told us that they cannot get extra funding from the States and (that) the added cost of the extra year of school forces a reduced class size. The absence of a graduating class for a year as the schools made the transition...further decreased supply.” (Thrifty White Drug, Minnesota)
“Establishment of a six-year entry level PharmD degree decreased the number of individuals considering pharmacy as a profession. The cost of obtaining a degree increased significantly. Establishment of the six-year (requirement) has greatly reduced the number of pharmacy graduates from virtually every pharmacy school and college in the United States.” (Rite Aid)

“The PharmD degree has probably done more than anything else to reduce the supply/demand curve such that salaries have gone out of sight.” (Bureau of Prisons)

“Respondents (to our March 2000 survey) indicated that the PharmD program requirements are affecting the applicant pool. Fifty-five percent of respondents noted a marked decline in both program enrollees and graduates. Additionally, while the program clearly produces more qualified pharmacists, it also produces fewer willing to work for the salaries that public hospitals and health systems are able to offer. PharmD graduates are also seeking clinical, rather than dispensing, work.” (NAPH/PHPC/UHC coalition)

Respondents cited three reasons that the PharmD requirement has contributed to the shortage:

- Cost: the added cost of obtaining a degree has severely reduced the number of applicants;
- Salary expectations: the associated increase in salary expectations has made it difficult for certain categories of employers, particularly those in a safety net capacity, to compete; and
- Job preference: given the higher level of academic attainment that the PharmD represents, a greater percentage of graduates are likely to elect career options that do not involve dispensing.

Trends in residencies. As an offshoot to the preceding discussion, several respondents noted the increased tendency for graduates to seek postgraduate residencies. According to CVS:

“The change to the PharmD curriculum has resulted in more students being encouraged to explore and ultimately being accepted into postgraduate residency programs. With an approximate 5% annual increase in the number of students entering residency programs, this negatively impacts the number of new practitioners entering traditional areas of pharmacy practice.”

Students' job preferences. Several respondents noted the ever-increasing variety of alternative career options available to pharmacists. These are described in more detail in a following section titled “Expanded Roles of Pharmacists.”

COMMENTS ADDRESSING OTHER ISSUES

DIFFICULTIES IN COMPETING

Thirteen respondents noted difficulties pharmacies are encountering in competing in today's market. The sources of those difficulties varied. For those most frequently mentioned, specific responses included the following:

- The proliferation of new pharmacies “Too many new stores in the larger cities, especially chain stores. As these chain stores compete against each other, smaller older stores are replaced. The chain stores expand their hours of business which requires more pharmacists to man their pharmacies. This could be equated to a city with too many hospitals, creating a shortage of doctors, staff, and patients.” (South Dakota Board of Pharmacy)

- Pricing practices that favor large purchasers “Unfair pricing of pharmaceuticals to smaller retail pharmacies is making it impossible for them to compete with large chains, and especially the mail order and Internet pharmacies. As smaller stores lose customers, their pharmacists’ production decreases, and pharmacists at chain and mail order facilities must work longer and harder.” (South Dakota Board of Pharmacy)

- Reduced profit margins due to the Balanced Budget Act of 1997 “Financial constraints from the Balanced Budget Act of 1997 will result in reductions in hospital payments by nearly \$119 billion from 1998 to 2004. The AHA predicts that the cumulative effect of BBA cuts will have an impact for years to come so that by 2004, nearly 60 percent of hospitals will have negative Medicare margins.” (American Society for Healthcare Human Resources Administration)

- Salary differential between the public “Private sector salaries have gotten to the point that and private sectors government job offers are commonly \$40,000 less annually.” (Bureau of Prisons)

- Salary differential between retail and hospital pharmacies “While starting retail salaries in the Dallas Fort Worth marketplace are commonly quoted at \$35 to pharmacies \$37 per hour, most hospitals begin new graduates at \$27 to \$28 per hour, making recruitment difficult.” (Harris Methodist Hospital, Fort Worth)

INCREASING REPRESENTATION OF WOMEN

Ten respondents raised as an issue of compelling importance the increasing percentage of female pharmacists. The change in gender mix, alluded to elsewhere in this Report, was seen as a significant contributing factor to the existing shortage of pharmacists, with the spokesperson for Rite Aid expressing the problem in these terms:

“Yet another factor adding to the shortage is the workforce issue of the increasing number of women entering pharmacy. Requirements from other aspects of their lives and the flexibility of providing a supplemental instead of primary income to their household have resulted in reduced work schedules for a significant number of women pharmacy graduates. Females represented 64.22 percent of the graduating class at pharmacy schools and colleges in 1998 (4,752 of 7,400 graduates). Salary incentives, a positive work environment and an unprecedented demand for pharmacists all are factors allowing the pharmacy school graduate to work reduced hours for a substantial base salary. Full-time workweek industry standards for pharmacists have been reduced from forty hours to thirty-two hours to meet the demands.”

Several respondents also saw a nexus between the change in gender mix and the possibility of misleading estimates, now and in the future, of supply. The National Association of Chain Drug Stores noted that

“...pharmacist supply (should be analyzed) by examining full-time-equivalent licensed pharmacists rather than simply the number of licensed pharmacists that are in the work force now and are expected to graduate in the future.”

The latter viewpoint has long been recognized as valid by this Department. As noted elsewhere in this Report, given the roughly 15% differential that currently exists, on average, between men and women pharmacists' workweeks, a projected doubling of the female percentage, from 30% to 60%, will have the effect of decreasing the full-time-equivalent supply by almost 5%.

EXPANDED ROLES OF PHARMACISTS

Several respondents noted the ever-increasing variety of alternative career options available to pharmacists. The American College of Clinical Pharmacy (ACCP) response noted that, “It is our opinion that future pharmacy manpower needs...will be determined at least as much by the expanded patient care giving roles ...as by the projected increase in prescription volume.” The ACCP response proceeded to identify four such areas of opportunity:

“...evolving roles of pharmacists in managed care organizations (MCO), where they participate in management of drug utilization and analyze data that address specific MCO performance outcomes;

“increasing employment of pharmacists by the pharmaceutical industry to pursue research involving drug development, disease management, outcomes measurement, and pharmacoconomics;

“increasing job opportunities in long-term, ambulatory, and home care settings, as pharmacy services continue to drift toward these sectors; and

“creation of new roles for pharmacists in the online telehealth environment, including Internet-based drug purchasing and online patient education.”

Other respondents echoed this focus on expanded roles for pharmacists both now and in the future. Their observations included the following:

“The very definition of the practice of pharmacy is being expanded to include a scope of services never before considered to be a part of pharmacy. Cognitive Services, as they are called, are a part of modern pharmaceutical care that is more concerned with the achievement of therapeutic outcomes than with product selection and dispensing. That expansion is a direct outgrowth of the pharmacist's enhanced education and training.” (Rite Aid Corporation)

“Pharmacists have more career options. With the advent of pharmaceutical care, prescription benefit management, third part administration and new pharmacy schools, the demand for pharmacists has increased without a comparable increase in the number of pharmacists available for these positions.” (Eckerd Corporation)

“While clinical and community based practice sites continue to be considered traditional opportunities, many new practice opportunities must also be considered as a factor causing the shortage. Nuclear pharmacy, manufacturing, home health care and government all offer career opportunities for the pharmacist.” (Rite Aid Corporation)

“The Bureau's study group is encouraged to consider...the extent to which the evolving health care system offers a wider range of practice opportunities (home care, managed care, physician group practices) to today's pharmacy graduates.” (American Association of Colleges of Pharmacy)

An additional perspective addressed the expanding role in human resources management related to the growing use of pharmacy technicians and the need for their effective management. Commenting on the demand that this places upon pharmacists, the National Community Pharmacists Association noted that the members of their association are:

“...repeatedly contacted by staff pharmacists looking for employment who say they are ‘burned out’ due to workload and working environment conditions. Properly managed pharmacy technicians could play an important role in assisting the pharmacist in the dispensing process and reducing the incidence of burnout. However,... pharmacists need to be trained to utilize technicians more efficiently. Quality management of technicians, not quantities of technicians, will increase dispensing precision and efficiency.”

These additional responsibilities, by adding to the time commitment required of pharmacists, were uniformly judged by respondents to be important contributing factors to the shortage.

LESS THAN IDEAL WORKING CONDITIONS FOR PHARMACISTS

A total of three respondents noted that working conditions for pharmacists were often less than ideal. The National Consumers League was sympathetic to the situation:

“We understand the often difficult working conditions many pharmacists face: long hours on their feet; few, if any, breaks; and a fast-paced, pressure-filled environment.”

The other two respondents that addressed this issue, both pharmacists with one anonymous, elaborated on what it was they found unacceptable: having to work on weekends and holidays, 14-hour workdays, drive-through window duties, having to ring up cash registers or answer phones, having to answer questions unrelated to their job, having to handle third-party matters and having to work alone.

All three respondents connected the dissatisfaction resulting from poor working conditions to the shortage, linking them to (1) the declining number of applicants to schools and colleges of pharmacy, and (2) the increasing number of graduates (and others) seeking alternative career opportunities within the profession.

MISCELLANEOUS RECOMMENDATIONS

Among the recommendations proposed by respondents for dealing with the shortage, the following were deemed particularly noteworthy and are noted elsewhere in this Report:

Uniform prescription benefit card. Seven respondents felt that a uniform prescription benefit card, by helping minimize third-party burdens and free up pharmacist time, was an excellent idea. The American Pharmaceutical Association had the following to say:

“Dealing with the administrative burdens created by inconsistent and confusing prescription drug cards creates unnecessary barriers to pharmacists providing care to their patients. APhA has worked closely with the National Council for Prescription Drug Programs (NCPDP) on the development of a standard template for the presentation of information on prescription drug cards. Although this work has led to approval of the template, the voluntary standard has not been widely implemented by insurers and pharmacy benefit managers.”

The National Association of Chain Drug Stores phrased their position in the form of the following recommendation:

“Encourage Federal payors, such as Medicare, Medicaid, FEHBP, DOD, to adopt a uniform pharmacy benefit card, using the NCPDP standard, to replace the various cards currently used under health insurance plans. This

could bring enormous efficiencies to the delivery of pharmacy services, freeing pharmacists to interact with patients to a greater degree.”

Greater reciprocity among States. Five respondents advocated expanding the available pool of pharmacists through greater reciprocity of licensing among States. Of the five, two were pharmacists (both from Florida, a State with no reciprocity), two were retail chains, and one a pharmacist consultant. One of the retail chains, Eckerd Corporation, proposed the following:

“Provide one standardized pharmacy law that all States would follow. This would increase the ability of pharmacists to move more freely from State to State (and) lower administrative costs — one license, good in all States, with no need for multiple licensure and fees.”

Greater use of foreign-trained graduates. One respondent, the National Association of Chain Drug Stores, proposed the establishment of

“...a new temporary visa program allowing pharmacists from foreign countries to practice pharmacy in the United States until the shortage is alleviated.”

Summary

While not all respondents dealt directly with the issue “Is there a shortage of pharmacists?”, those that did were decidedly of the opinion that a shortage exists. Evidence was offered in the form of reductions in store hours, salary increases, sign-on bonuses and other hiring incentives and increased vacancy rates and time required filling vacant positions.

Phenomena of this nature are commonly associated with shortages but might also be indicative of increased competition resulting from the opening of new pharmacies in communities that may or may not need them. Belief on the part of respondents that the increased demand for pharmacists was reflective of a true shortage, rather than simply increased competition, was evidenced by the many comments made (by 20 of the 48 respondents) concerning a sharp increase in per capita prescription volume in recent years. The increase was commonly ascribed to a combination of the following:

- The aging of the American population,
- Growth in the percentage of persons with prescription drug coverage in one form or another, and
- The emergence of new and innovative drug therapies.

In addition to increased per capita prescription volume, other factors judged to be instrumental in creating and/or exacerbating the shortage were identified as:

- The expanded roles and responsibilities of pharmacists in an increasingly patient-oriented, quality-of-care-sensitive environment,
- The increased administrative burdens placed upon pharmacists resulting from the growth in third-party coverage,
- Reductions in the average number of hours worked per week resulting from the increased percentage of pharmacists that are women, and.
- The transition to the entry-level PharmD degree across a large number of schools of pharmacy over the same time period, coupled with expanded career choices and expectations for PharmD graduates.

While the use of technicians and the application of automation and technology were deemed to be useful first steps toward alleviating the shortage, neither was viewed as a comprehensive, long-term solution to the problem. It was emphasized by some that the use of technicians must be accompanied by suitable training in how to use them effectively.

Other recurring themes voiced by respondents included:

- Concern regarding the impact of the shortage upon medication errors and quality of patient care,
- The need for enrollment in schools and colleges of pharmacy to expand and particularly not be held back by transition to the entry-level PharmD degree,
- A compelling need to develop and implement a uniform prescription benefit card to relieve the administrative burdens associated with third-part payment, and
- Greater reciprocity among States, and use of foreign-trained graduates.

Appendix. Schools and Colleges of Pharmacy with Entry-Level Degrees Conferred, 1998

School Name	City/State	State	BS Pharmacy Graduates	PharmD Graduates	Total Graduates*
Auburn	Auburn, Alabama	AL	93		93
Samford	Birmingham, Alabama	AL		100	100
Arkansas	Little Rock, Arkansas	AR		74	74
Glendale Midwestern	Glendale, Arizona	AZ			0
Arizona	Tucson, Arizona	AZ		54	54
Western	Pomona, California	CA			0
California-SF	San Francisco, California	CA		106	106
Southern California	Los Angeles, California	CA		183	183
Pacific	Stockton, California	CA		202	202
Colorado	Denver, Colorado	CO	124		124
Connecticut	Storrs, Connecticut	CT	102		102
Howard	Washington, DC	DC		34	34
Nova Southeastern	Ft. Lauderdale, Florida	FL	5	73	78
Florida A&M	Tallahassee, Florida	FL	29	53	82
Florida	Gainesville, Florida	FL	26	79	105
Georgia	Athens, Georgia	GA	39		39
Mercer	Atlanta, Georgia	GA		106	106
Idaho State	Pocatello, Idaho	ID		49	49
Chicago COP	Downers Grove, Illinois	IL	85		85
Illinois at Chicago	Chicago, Illinois	IL		161	161
Butler	Indianapolis, Indiana	IN	61	19	80
Purdue	West Lafayette, Indiana	IN	144	32	176
Iowa	Iowa City, Iowa	IO	30	53	83
Drake	Des Moines, Iowa	IO	71	39	110
Kansas	Lawrence, Kansas	KA		91	91
Kentucky	Lexington, Kentucky	KE		3	3
Xavier	New Orleans, Louisiana	LA		128	128
NE Louisiana	Monroe, Louisiana	LA	131		131
Northeastern	Boston, Massachusetts	MA	66	17	83
Mass COP/AHS	Boston, Massachusetts	MA	213		213
Maryland	Baltimore, Maryland	MD		98	98
Michigan	Ann Arbor, Michigan	MI		55	55
Wayne State	Detroit, Michigan	MI	95		95
Ferris State	Big Rapids, Michigan	MI	129		129
Minnesota	Minneapolis, Minnesota	MN	9	66	75
Missouri-KC	Kansas City, Missouri	MO	55	26	81
St. Louis	St. Louis, Missouri	MO	131		131
Mississippi	University, Mississippi	MS	2	34	36
Montana	Missoula, Montana	MT	30		30
Campbell	Buies Creek, North Carolina	NC		76	76
North Carolina	Chapel Hill, North Carolina	NC	55	71	126
North Dakota State	Fargo, North Dakota	ND		64	64
Nebraska	Omaha, Nebraska	NE		63	63
Creighton	Omaha, Nebraska	NE		93	93

School Name	City/State	State	BS Pharmacy Graduates	PharmD Graduates	Total Graduates*
Buffalo	Buffalo, New York	NY	95		95
Albany	Albany, New York	NY	143		143
St. John's	Jamaica, New York	NY	233		233
A&M Schwartz	Brooklyn, New York	NY	278		278
Cincinnati	Cincinnati, Ohio	OH	69		69
Toledo	Toledo, Ohio	OH	86		86
Ohio State	Columbus, Ohio	OH	118		118
Ohio Northern	Ada, Ohio	OH	125	15	140
Oklahoma	Oklahoma City, Oklahoma	OK	58		58
SW Oklahoma	Weatherford, Oklahoma	OK	98		98
Oregon State	Corvallis, Oregon	OR	93		93
Wilkes	Wilkes-Barre, Pennsylvania	PA			0
Pittsburgh	Pittsburgh, Pennsylvania	PA	83	20	103
Temple	Philadelphia, Pennsylvania	PA	129	6	135
Duquesne	Pittsburgh, Pennsylvania	PA	161		161
Philadelphia	Philadelphia, Pennsylvania	PA	297		297
Puerto Rico	San Juan, Puerto Rico	PR	67		67
Rhode Island	Kingston, Rhode Island	RI	78	10	88
Med U of S Carolina	Charleston, South Carolina	SC	41	19	60
South Carolina	Columbia, South Carolina	SC	66		66
South Dakota State	Brookings, South Dakota	SD	45		45
Tennessee	Memphis, Tennessee	TN	74		74
Texas Tech	Amarillo, Texas	TX			0
Texas Southern	Houston, Texas	TX	99	14	113
Houston	Houston, Texas	TX	95	26	121
Texas at Austin	Austin, Texas	TX	99	48	147
Utah	Salt Lake City, Utah	UT	35	8	43
Hampton	Hampton, Virginia	VA			0
Shenandoah	Winchester, Virginia	VA			0
Virginia Commonwealth	Richmond, Virginia	VA		45	45
Washington State	Pullman, Washington	WA			0
Washington	Seattle, Washington	WA			0
Wisconsin	Madison, Wisconsin	WI	99		99
West Virginia	Morgantown, West Virginia	WV	78		78
Wyoming	Laramie, Wyoming	WY			0
Total			4,768	2,632	7,400

*Schools with zero or very low numbers of graduates are either in transition to the PharmD degree or are new schools that have not as yet graduated a class.

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