

The Adequacy of Pharmacist Supply: 2004 to 2030

Department of Health and Human Services
Health Resources and Services Administration
Bureau of Health Professions
December 2008



Acronyms Used in Report

AACP	American Association of Colleges of Pharmacy
ASHP	American Society of Health-System Pharmacists
BHPr	Bureau of Health Professions
BLS	Bureau of Labor Statistics
B.Pharm	Bachelors of pharmacy degree
FTE	Full time equivalent
HRSA	Health Resources and Services Administration
NABP	National Association of Boards of Pharmacy
NACDS	National Association of Chain Drug Stores
NAMCS	National Ambulatory Medical Care Survey
NHAMCS	National Hospital Ambulatory Medical Care Survey
NCPA	National Community Pharmacists Association
NPWS	National Pharmacist Workforce Survey
Pharm.D	Doctorate of pharmacy degree
PhSRM	BHPr's Pharmacist Supply and Requirements Model

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EXECUTIVE SUMMARY

The U.S. Department of Health and Human Services, Health Resources and Services Administration's (HRSA's) 2000 report on the pharmacist workforce documented the current and growing shortfall of pharmacists. Health care providers and professional organizations have continued to report signs of a moderate current shortage of pharmacists, as indicated by persistent vacancy rates, difficulty recruiting and retaining pharmacists, growing dissatisfaction by pharmacists with long hours worked, and rising costs to employ pharmacists.

Since the 2000 report, the U.S. Bureau of the Census has revised upward its projections of population growth, the Federal Government enacted the Medicare Part D program which expands prescription drug coverage to more elderly; technology continues to advance, minimum credentials for entry into the workforce for new pharmacists changed from baccalaureate to doctorate degrees, the Nation's educational capacity to train new pharmacists and pharmacy technicians continues to expand and enrollment in schools of pharmacy is at an all time high. The role of pharmacists in providing care to patients continues to evolve as well.

Acknowledging the Federal government's role and interest in ensuring an adequate supply of pharmacists, Congress issued in Senate Report 108-345 a directive to

...encourage the Department [HHS] to begin a study on comprehensive pharmacy services in light of changes in technology, distance and distributive learning models, the aging of the population and the Department's study on the severe pharmacist shortage in order to analyze how they may influence the nature of pharmaceutical education and interventions in healthcare.

In response to this directive, HRSA's Bureau of Health Professions developed the Pharmacist Supply and Requirements Model (PhSRM) to examine the current and projected future adequacy of pharmacist supply in the United States. The PhSRM was used to generate a best-estimate baseline forecast of the future balance between supply and demand, as well as to provide a range of projections based on possible alternate scenarios that use different assumptions about factors affecting pharmacist education and productivity, and demand for pharmaceuticals. This work also reflects findings from a literature review, original empirical analysis, and discussions with representatives from pharmaceutical associations and subject matter experts to develop supply and demand scenarios.

Key findings from this study include the following:

- **The supply of pharmacists is growing significantly faster than was previously projected.** The total active pharmacist supply is projected to grow from 226,000 in 2004 (the base year for the projection model) to 305,000 by 2020 and 368,000 by 2030. The number of full time equivalent (FTE) pharmacists is projected to grow from 191,200 in 2004 to 260,000 by 2020 and 319,000 by 2030. These projections are higher than those in the HRSA 2000 report and primarily result from updated retirement patterns, the opening of new pharmacy programs, and increased enrollment at existing programs.
 - The number of colleges and schools of pharmacy with accredited professional degree programs rose from 82 in 2000 to 92 by 2005. The American Association of Colleges of Pharmacy predicts that 103 programs will be open by Fall 2007 and 110 by Fall 2010.

- The number of entry-level degree graduates from schools of pharmacy has increased from 7,300 in 2000 to 9,100 in 2005. This number will likely continue to increase to about 12,000 graduates per year by 2030.
- The use of distance learning models in pharmacy education has expanded since the 2000 report, and has contributed to the growth in existing training programs.
- Raising the minimum education level (to a Pharm.D) for new pharmacists does not appear to have reduced the desirability of pharmacy as a career. Applications to pharmacy programs are at an all time high.
- **The demand for pharmacists continues to grow.** Changing population demographics are expected to increase demand to 256,000 pharmacists by 2020 and 295,000 by 2030 if per capita consumption of pharmaceuticals were to remain unchanged; supply and demand would remain roughly in balance. Per capita consumption will likely increase, however, as new drugs become available. Under a scenario with moderate growth in per capita consumption of pharmaceuticals, demand would likely reach 289,000 by 2020 and 357,000 by 2030. The major demand determinants are:
 - Population growth—especially growth of the elderly population.
 - Rising per capita consumption of pharmaceuticals (controlling for changing demographics).
 - Increased need for pharmacists to counsel and educate patients as drugs become more complex and a growing portion of the population receives care for chronic conditions.
 - Increased use of pharmacy technicians and technology that can improve productivity, dampening the growth in demand for pharmacists.
- **There is currently a moderate shortfall of pharmacists.** Vacancy rates of 8 percent and higher that were common in the early 2000s have moderated. In 2004 the overall vacancy rate was approximately 5 percent, which is equivalent to a shortfall of approximately 10,400 pharmacists. Factors that contributed to this reduction in the vacancy rate include:
 - Rising salaries for pharmacists, which has a positive impact on supply and a negative impact on demand for pharmacists (with pharmacies scaling back on the number of hours they are open and scaling back on staff due to rising labor costs);
 - Increased use of pharmacy technicians and technology that have boosted pharmacist productivity; and
 - An expansion in the scope of work performed by pharmacy technicians that has reduced the amount of time pharmacists spend dispensing medications.

Anecdotal evidence suggests that the vacancy rate has started to rise again and it is projected that the Nation will continue to experience a moderate shortfall of pharmacists.

- **The future supply of pharmacists is projected to grow at a rate similar to the projected growth in demand from changing demographics.** If per capita consumption of pharmaceuticals (adjusting for changing demographics) remains unchanged, then projected future supply will be adequate to meet the demands of a growing and aging population.

- If per capita consumption continues to grow at rates seen in the past few years, then the current shortfall will continue to grow.
- The baseline supply scenario assumes that expansion of the Nation's educational capacity will occur as planned, with output from the Nation's pharmacy programs increasing by approximately 100 new graduates per year (equivalent to approximately one new school of pharmacy per year).

The "best estimate" demand scenario assumes that the role of pharmacists will remain largely unchanged, and that increased time spent counseling and educating patients will be offset by increased productivity through greater use of pharmacy technicians and technology to improve dispensing efficiency. Over the next 2 decades, the projected average annual increase in demand for pharmacists will grow by approximately 1.4 percent per year due to population growth and aging. Increasing per capita consumption of pharmaceuticals could add another 2 percent to the annual growth. With moderate (approximately 1 percent) annual growth in pharmaceutical consumption per capita, demand could reach 289,000 in 2020. Supply is projected to be 260,000 pharmacists, resulting in a shortfall of 29,000 pharmacists (10 percent). By 2030 demand is projected to be 357,000; supply is expected to be 319,000 resulting in a shortage of 38,000 pharmacists (11 percent).

- **Supply and demand are projected with a level of uncertainty. Only under an optimistic supply projection combined with a conservative demand projection is future supply adequate to meet demand.**
 - If the planned expansion in the number and size of pharmacy programs fails to materialize (e.g., because of a faculty shortage), then supply might be lower than projected.
 - The demand projections are sensitive to assumptions of annual growth in per capita consumption of pharmaceuticals.
 - If the role of pharmacists changes where pharmacists spend substantially more time providing patient care management services, then demand will be higher than projected.
- **Additional findings** include the following:
 - Women constitute a growing proportion of active pharmacists. Currently, half of all active pharmacists are women. By 2020, approximately 62 percent of active pharmacists are expected to be women. Female pharmacists tend to work fewer hours per year than their male colleagues, so the full-time equivalent supply will grow at a slightly lower rate than active supply.
 - Racial minorities continue to be underrepresented in the pharmacist workforce. In the 2000 Census, 25 percent of the population indicated they are in a racial minority group, while only 18 percent of self-identified pharmacists indicated they are in a racial minority group. The percent of pharmacists who were Hispanic or Latino was 3.2 percent, compared to 12.5 percent of the U.S. population that was Hispanic or Latino in 2000.
 - Technologies that automate prescription dispensing and order processing are used by a majority of pharmacies. Most community pharmacies have automated pill-counting devices and can accept prescriptions through fax, interactive voice response systems, or over the Internet (e-prescribing), resulting in moderate increases in productivity, safety,

and convenience. Hospitals, mail order pharmacies, and larger volume pharmacies are increasing investing in sophisticated robotics systems, which can significantly increase pharmacist productivity but at a cost that is prohibitive for lower volume operations.

- The future role of pharmacists is linked to the adequacy of supply and to reimbursement rates. With competing demands on pharmacists' time, the work that must get done (dispensing) generally takes priority over work that pharmacists report wanting to do more of, such as patient education and monitoring. A greater role for pharmacists in patient care management is feasible only with a reimbursement system that compensates pharmacists for such services.

Although this study focused on the national adequacy of pharmacist supply, geographic disparities exist in access to pharmacist services. Consequently, there continues to be a role for programs such as the National Health Service Corps Chiropractor and Pharmacist Loan Repayment Demonstration that use financial aid as a means to recruit and retain pharmacists in hard-to-employ locations such as rural areas, low-income urban areas, and select Federal institutions such as prisons.

Projections of future supply and demand are made with some level of uncertainty about what the future holds. For example, advances in biotechnology and the impact on individualized drug therapy; the development of new pharmaceuticals; and development of improved methods for ordering and dispensing medications all have the potential to affect demand for pharmacists. Changes in government policies and programs, and changes in insurer approaches to manage prescription drug costs can affect demand for prescription drugs. On the supply side, the number of new graduates might deviate from projected levels, work patterns can change towards desiring to work fewer hours, and retirement patterns can change. The implications of uncertainty regarding these future trends is that supply and demand projections become less certain as the projection horizon increases. This uncertainty highlights the need to update the projections every few years to reflect changes in policies and trends.

The overall conclusion of this study is that the Nation has responded to earlier predictions of a growing shortfall of pharmacists, and to market forces that have raised pharmacist earnings, by expanding supply and increasing the use of technology and technicians. Still, the increase in supply will only be sufficient to keep pace with a rising demand due to changing demographics. Supply would need to increase further than currently projected to meet the demand caused by growth in per capita consumption of pharmaceuticals. Improvements in productivity through further employment of pharmacy aides and technicians and the application of evolving technologies should continue to help the supply meet these increases in demand.

I. BACKGROUND

The U.S. Department of Health and Human Services (HHS), Health Resource and Service Administration's (HRSA's) 2000 report on the pharmacist workforce documented the current and growing shortfall of pharmacists.¹ Health care providers and professional organizations also report evidence that suggests in recent years there has been a moderate shortfall of pharmacists, including reports of increased difficulty recruiting and retaining pharmacists, growing dissatisfaction by pharmacists with long hours worked, and rising costs to employ pharmacists.²

Since the 2000 report, the U.S. Bureau of the Census has revised upward its projections of population growth, the Federal Government enacted the Medicare Part D program which expands pharmacy insurance to more elderly, technology continues to advance, and minimum credentials for entry into the workforce for new pharmacists changed from baccalaureate to doctorate degrees. The Nation's educational capacity to train new pharmacists and pharmacy technicians continues to expand, enrollments in schools of pharmacy are at an all time high, and the role of pharmacists in providing care to patients continues to evolve.

Acknowledging the Federal Government's role and interest in ensuring an adequate supply of pharmacists, Congress issued a directive to

*...encourage the Department [HHS] to begin a study on comprehensive pharmacy services in light of changes in technology, distance and distributive learning models, the aging of the population and the Department's study on the severe pharmacist shortage in order to analyze how they may influence the nature of pharmaceutical education and interventions in healthcare.*³

In response to this directive, HRSA's Bureau of Health Professions conducted a study and developed the Pharmacist Supply and Requirements Model (PhSRM) to examine the current and projected future adequacy of pharmacist supply under alternate supply and demand scenarios. The trends and research underlying these forecasts, as well as supply and demand projections, are presented in this report. Section II describes the current supply of pharmacists, trends in supply determinants, and supply projections. Section III presents similar information for pharmacists requirements—current demand, trends in demand determinants, and projections. Section IV discusses the current and future adequacy of supply. Section V discusses key findings and implications, as well as the study strengths and limitations.

¹ *The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists* (Washington, D.C.: HRSA, Dec. 2000).

² *Supply of Selected Health Workers: Adequacy of Pharmacy, Laboratory, and Radiology Workforce Supply Difficult to Determine.* (Washington, D.C.: GAO-02-137R, Oct. 2001).

³ Senate Report 108-345.

II. PHARMACIST SUPPLY

An estimated 230,000 to 250,000 pharmacists currently practice in the United States accounting for approximately 86 percent of the estimated 280,000 licensed pharmacists.⁴ With all time highs in pharmacy school enrollment coupled with a relatively young pharmacy workforce, the supply of pharmacists is projected to continue rising both in total number of pharmacists and in terms of the pharmacist-to-population ratio. Some indicators of a pharmacist shortfall have moderated in recent years, but substantial growth in supply is still needed over the next 2 decades to meet the projected surge in demand for pharmacist services.

A. Current Supply

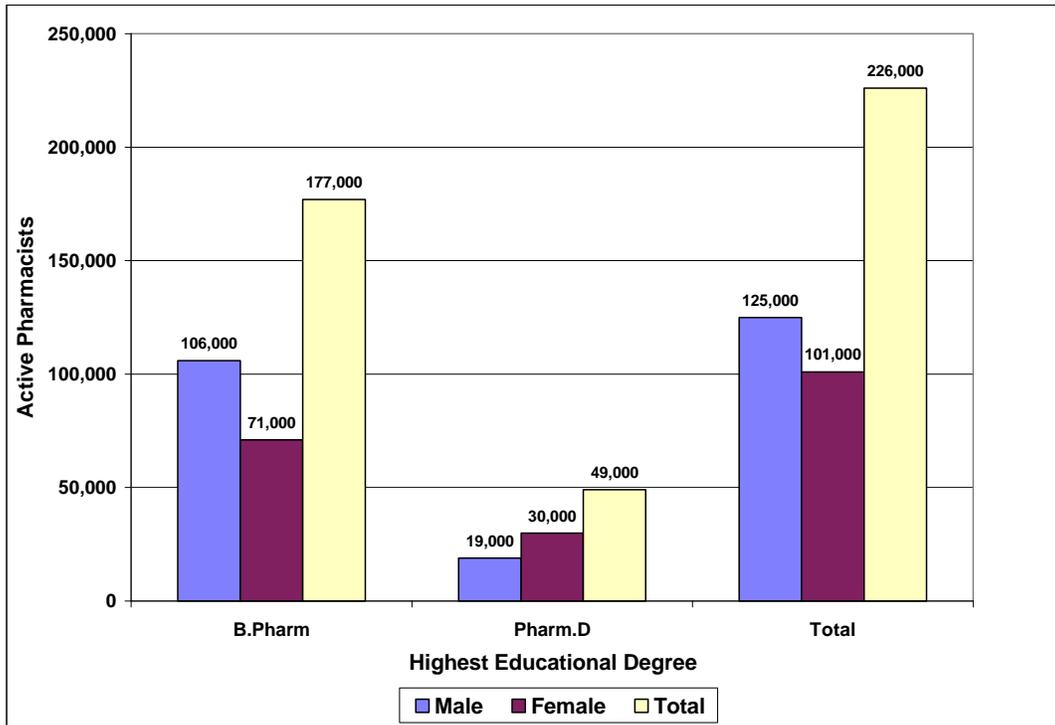
The current supply of pharmacists can be characterized in terms of their number, demographics, practice setting and practice patterns. In 2004, the base year for the PhSRM, there were an estimated 226,000 practicing pharmacists (*Exhibit 1*).⁵ Applying to this supply estimate the gender and age distribution of pharmacists as determined by the 2004 National Pharmacist Workforce Survey (NPWS), approximately 125,000 pharmacists (55 percent) are men, and 49,000 (22 percent) are prepared at the doctoral (Pharm.D) level. Reflecting the rising proportion of women entering pharmacy and the new minimum education level set at the Pharm.D degree, approximately 61 percent of pharmacists prepared at the Pharm.D level are women, while 40 percent of pharmacists prepared at the baccalaureate (B.Pharm) level are women.

Although a slight majority of active pharmacists are men, male pharmacists tend to be older (median age=51) than female pharmacists (median age=43) (*Exhibit 2*). Women constitute the majority of new pharmacy graduates, while men constitute the majority of older pharmacists (with older pharmacists often reducing their workload as they near retirement). Consequently, within the next few years the majority of full-time-equivalent (FTE) pharmacists will be women.

⁴ U.S. Bureau of Labor Statistics, Occupational Employment Statistics for May 2005, estimate there are approximately 230,000 pharmacists employed in the United States. Medical Marketing Service Inc's list of pharmacists as of June 2005 contains approximately 247,000 pharmacists. The estimate that 86 percent of licensed pharmacists are active comes from the Midwest Pharmacy Workforce Research Consortium (Mott et al.) report entitled *Final Report of the National Sample Survey of the Pharmacist Workforce to Determine Contemporary Demographic and Practice Characteristics*. September 2005.

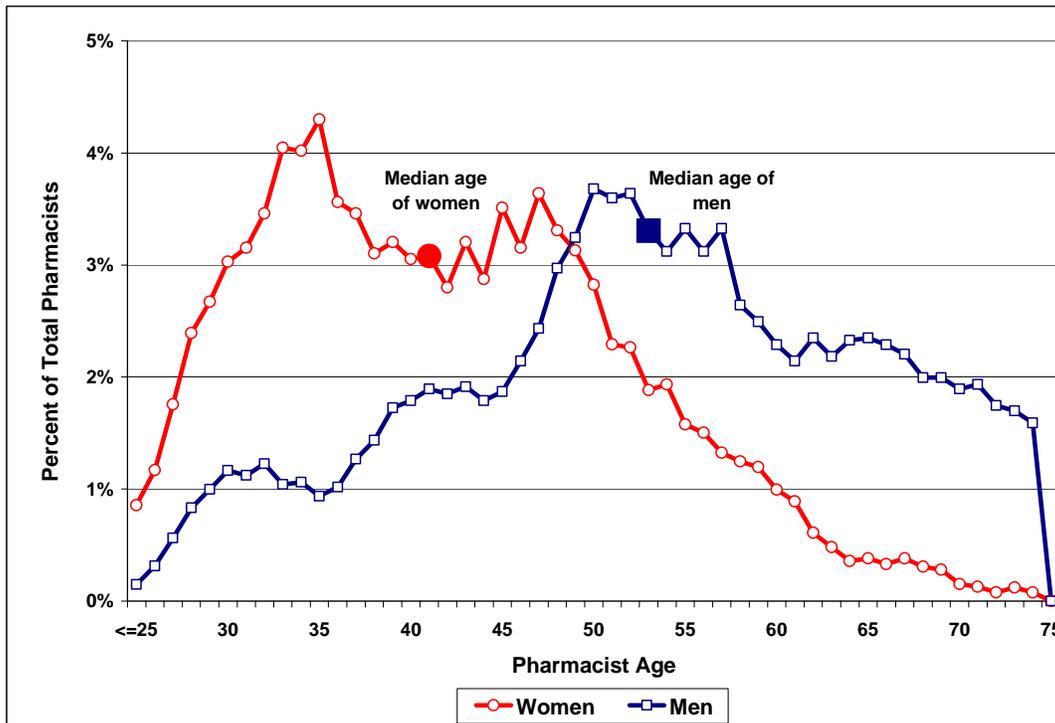
⁵ U.S. Bureau of Labor Statistics, Occupational Employment Statistics for November 2004.

Exhibit 1. Estimated Active Pharmacists, by Gender and Education: 2004



Source: Gender and education distribution based on analysis of the 2004 NPWS.

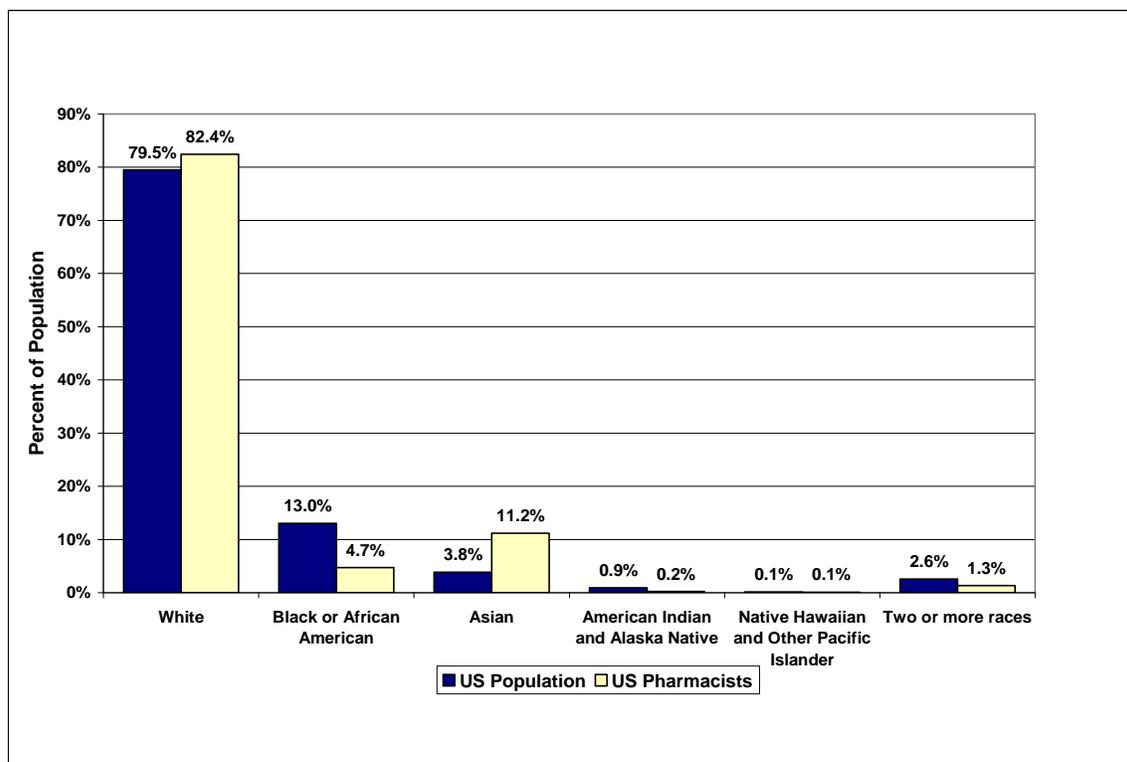
Exhibit 2. Pharmacist Age Distribution: 2004



Source: Analysis of the 2004 NPWS.

Racial minorities (with the exception of Asians) continue to be underrepresented in the pharmacist workforce (*Exhibit 3*). In the 2000 Census, 25 percent of the U.S. population indicated they are in a racial minority group, while only 18 percent of individuals self-identified as pharmacists indicated they are in a racial minority group. The percent of pharmacists who were Hispanic or Latino was 3.2 percent, compared to 12.5 percent of the U.S. population that was Hispanic or Latino in 2000.

Exhibit 3. Pharmacist Race Distribution: 2000



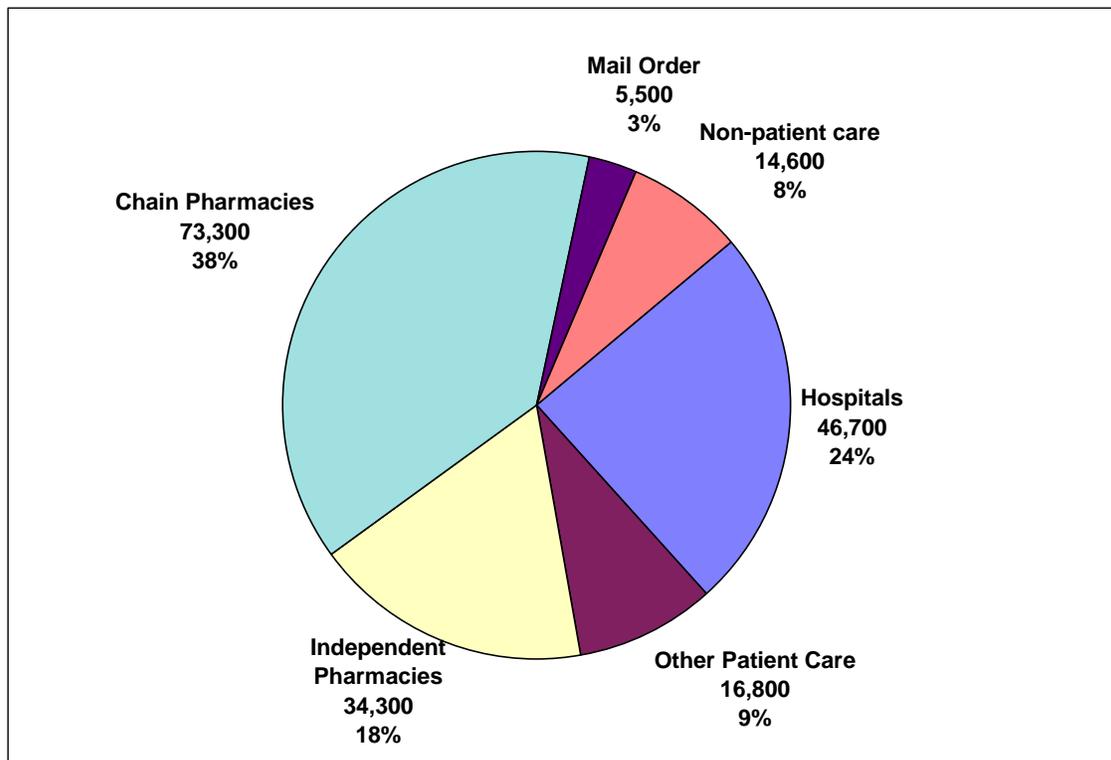
Source: 2000 U.S. Census

Note: The 2000 Census allows respondents to write in "some other race" in place of selecting the standard OMB single race categories included on the questionnaire. Of the 5.5 percent of the U.S. population who selected this category, 97 percent are of Hispanic origin. People in the "some other race" category are distributed across the standard OMB categories based on each standard category's prorated share of the total U.S. population.

Many of the estimated 226,000 active pharmacists in 2004 worked part time. Defining a FTE pharmacist as one who works, on average, approximately 1890 hours per year (40 hours per week times 47.2 weeks per year), the number of FTE pharmacists in 2004 was approximately 191,200 (*Exhibit 4*). Approximately 14,600 of these FTEs are primarily in non-patient care activities (e.g., teaching, research and administration), resulting in an estimated 176,600 FTEs in patient care. The majority of FTE pharmacists provide patient care work in community retail pharmacies (73,300 in chain pharmacies and 34,300 in independent pharmacies); an estimated

46,700 work in hospitals; 16,800 work in other patient care settings (e.g., nursing homes, clinics); and 5,500 work in mail order.⁶

Exhibit 4. Distribution of FTE Pharmacists by Dispensing Setting: 2004



Source: Analysis of the 2004 NPWS.

B. Trends in Supply Determinants

The size of the pharmacist workforce continually changes depending on the number of entrants and reentrants to the pharmacist workforce, as well as the number of pharmacists who leave the workforce either temporarily or permanently. Major trends with implications for the future supply of pharmacists include interest in becoming a pharmacist, the capacity of schools of pharmacy to train new graduates, the changing demographics of the pharmacist workforce (particularly the increasing proportion of pharmacists who are women), pharmacist work hours, and attrition from the pharmacist workforce.

⁶ The major dispensing settings modeled in this study include hospitals (non-government hospitals, HMO-operated pharmacy, government hospitals), independent pharmacies, chain drug stores (which includes supermarkets and mass merchandisers), mail order, other patient care (clinic pharmacies, home health, nursing homes), and non-patient care (industry, MCB/PBM, Armed Services, education, government, other).

1. New Graduates and Training Capacity

In 2004, 8,158 people graduated from schools of pharmacy with entry-level degrees, of which two thirds (n=5,437) were women.⁷ The year 2004 saw the final graduating class of pharmacists prepared at the baccalaureate level (n=338), with the remainder (n=7,770) prepared at the Pharm.D level. From 2005 onward all new graduates will be prepared at the Pharm.D level, the new minimum credential for entry into the workforce. Each year approximately 600 foreign-trained pharmacists begin practice in the United States.⁸

Since HRSA's 2000 report, there have been significant increases in the capacity of pharmacy schools due to both growth in existing programs and creation of new programs. The number of colleges and schools of pharmacy with accredited professional degree programs rose from 82 in 2000 to 92 by 2005. By Fall 2010 there will likely be 110 programs in operation.⁹ Projections of new pharmacy degrees conferred in future years (and used in the baseline supply projections presented in this report) are based on the number of students currently enrolled in schools of pharmacy and the assumption that the number of degrees conferred will increase by approximately 100 per year after 2008. One hundred new graduates per year is equivalent to opening about one new school of pharmacy per year and is consistent with current plans to expand the Nation's capacity to train new pharmacists by opening new programs and expanding current programs through expansion of traditional programs and the use of distance and distributive learning models. The projected number of Pharm.D degrees conferred in 2008 is approximately 10,000, and under the above assumptions this number would gradually increase to approximately 12,000 per year by 2030 (*Exhibit 5*). Since 1994, approximately 2 out of every 3 new graduates are women, and this trend will likely continue.

Alternate supply projections presented make different assumptions about the future number of new graduates to show how the future adequacy of supply would be affected by a deviation from continued efforts to expand the Nation's educational capacity.

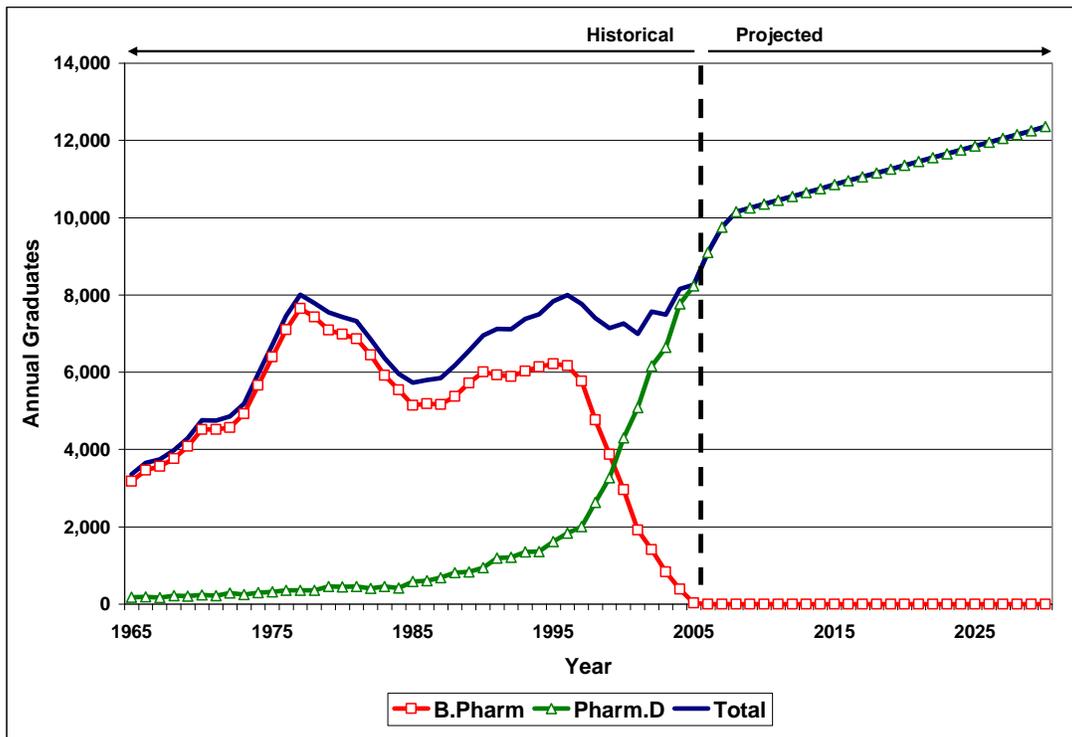
Each year a small percentage of pharmacists trained at the baccalaureate level return to school to complete a Pharm.D degree. With the discontinuation of the B.Pharm degree and a diminishing number of pharmacists prepared at the baccalaureate level interested in completing a doctorate degree, the number of pharmacists completing a post-baccalaureate Pharm.D degree is projected to decline rapidly. In 2000, 1269 post-baccalaureate Pharm.D degrees were awarded. This number fell to 668 in 2005 and is likely to continue declining (*Exhibit 6*). Analysis of the National Pharmacist Workforce Survey (NPWS) finds that workforce participation and retirement patterns for pharmacists prepared at the baccalaureate (B.Pharm) level are similar to patterns for pharmacists prepared at the doctoral (Pharm.D) level, so the education distribution of the workforce does not affect projections of overall supply of pharmacists.

⁷ American Association of Colleges of Pharmacy (AACP) Profile of Pharmacy Students (Fall 2005).

⁸ Source: Based on discussions with the National Association of Boards of Pharmacy (NABP).

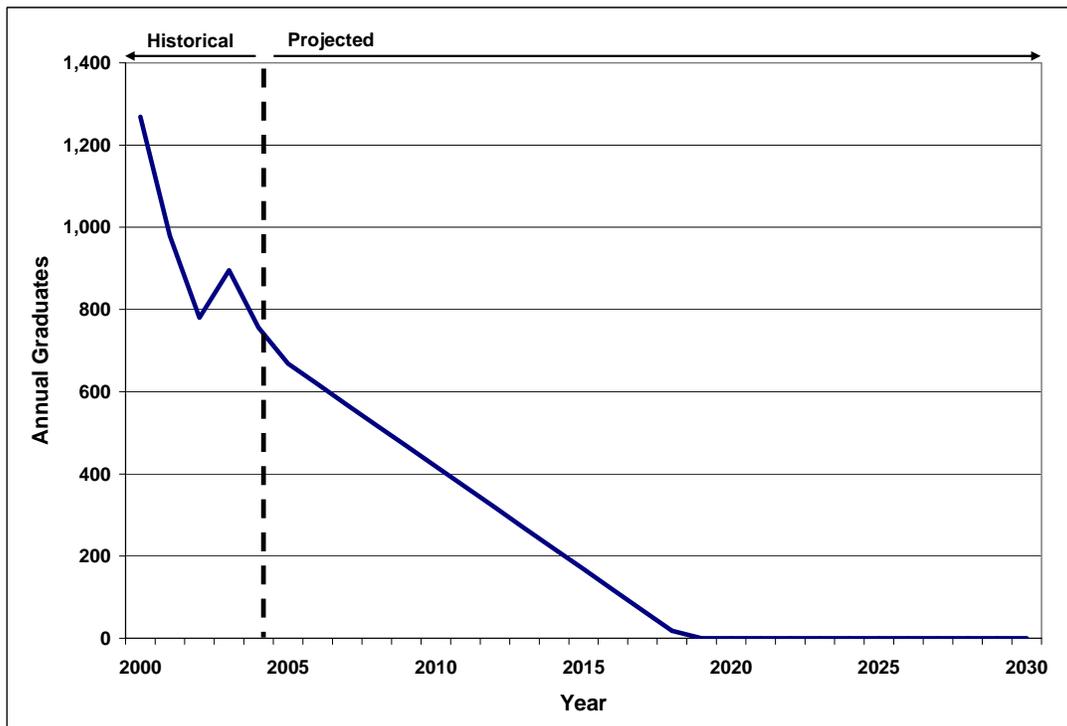
⁹ Source: Estimates for 2007 and 2010 are based on personal communication with Lucinda Maine, AACP.

Exhibit 5. Number of First-time Pharmacy Degrees Conferred



Source: Historical (1965 to 2005) data from AACPS Profile of Pharmacy Students (Fall 2005).

Exhibit 6. Number of Post-baccalaureate Pharm.D Degrees Conferred



Sources: Historical data from AACPS Profile of Pharmacy Students (Fall 2005).

2. Distance and Distributive Learning Models

The use of distance learning models in pharmacy education has expanded since the 2000 report and has contributed to the growth in existing training programs. Distance or distributed learning is defined as a separation between the student and the instructor by time or place. U.S. pharmacy schools first began applying a distance-learning model of education nearly 20 years ago in programs designed to increase the practice competency of working pharmacists.

The distance-learning model also has been used for many years to offer continuing education classes to practicing pharmacists or classes that confer certification in a particular practice competency. For example, States such as Wisconsin require continuing education credits for license renewal. The University of Wisconsin School of Pharmacy offers continuing education teleconference courses each year that reach every county in the State.¹⁰

Against a backdrop of growing concern about a significant shortage of pharmacists, the use of distance learning has been expanded in recent years to first-degree Pharm.D programs at a number of institutions around the country. Currently, at least five programs offer a distinct distance-learning pathway for their first-degree Pharm.D programs (*Exhibit 7*). These schools are Creighton University, Nova Southeastern University, the University of Florida, the University of Minnesota, and the University of Oklahoma. Overall, about 400 students are enrolled each year in a distinct distance-learning pathway under the first-degree Pharm.D programs at these five schools.

Exhibit 7. Programs with Distinct Distance Learning Pathways for First Pharm.D

First-Degree Pharmacy Program	Distance Learning Slots
Creighton University	55
University of Florida	170
University of Minnesota	54
Nova Southeastern University	60
University of Oklahoma	60
Total	399

Source: Individual school Web sites accessed June 2006

According to information published on the individual pharmacy program Web sites, Creighton University enrolls about 110 students each year on their main campus and an additional 55 students in a Web-based pathway. Nova Southeastern University enrolls 120 students at the main campus in Ft. Lauderdale and another 60 in West Palm Beach and other distant locations. The University of Florida enrolls about 130 students on the main campus in Gainesville, and an additional 170 students in satellite locations in Jacksonville, Orlando, and St. Petersburg. The University of Minnesota enrolls about 105 students at the main campus in the Twin Cities, and another 54 students at the Duluth campus of the university. Finally, the University of Oklahoma enrolls about 78 students on the main campus in Oklahoma City, plus an additional 60 students in Tulsa.

¹⁰ Bruskiwitz MS, DeMuth J. Availability and Acceptability of Distance-Learning Delivery Systems for Continuing Pharmaceutical Education. *American Journal of Pharmaceutical Education*. 2005; 69(2): Article 25.

Creighton's distance learning program is unique in offering an almost entirely Web-based program, allowing the student to earn their degree largely out of their home location.¹¹ The Creighton program requires attendance at 1- to 2-week lab sessions during the summer on campus. Eight 5-week clinical rotations are required, and are offered at a variety of locations around the country. Students applying to Creighton for pharmacy school may apply either to the regular campus-based program or the Web-based program, but not both.

The distance-learning model offered at Nova, Florida, Minnesota, and Oklahoma offers students the opportunity to study out of a satellite location separate from the main campus. Often some portion of the course material is delivered via distance learning technologies such as interactive television.¹² Generally, students apply to the program as a whole, and indicate or rank their choice of location.

In addition to the first-degree pathways offered by these schools, many other Pharm.D programs offer a distance-learning component to their first-degree programs, particularly in the later years of study. For example, Texas Tech offers third and fourth year Pharm.D students the opportunity to complete their training at a regional site such as Dallas or Lubbock, after spending the first 2 years at the main campus in Amarillo.

It is likely that the greater use of distance learning models in pharmacist education has contributed to the expansion in pharmacy program enrollments in recent years. Together, Creighton, Nova, Florida, Minnesota, and Oklahoma have grown their first degree enrollments by 85 percent since 2000, going from 2,013 enrollments in 2000 to 3,714 in 2005 (*Exhibit 8*). During this same time period, total enrollments at all schools increased by 35 percent from 34,481 to 46,527.

Exhibit 8. First Degree Enrollments at Pharmacy Schools with Distinct Distance Learning Pathways

	2000	2001	2002	2003	2004	2005
University of Florida	484	507	661	836	992	1,147
Creighton University	402	463	518	591	651	663
University of Oklahoma	232	290	346	393	455	514
Nova SE University	504	569	647	714	792	807
University of Minnesota	391	383	418	466	530	583
Total	2,013	2,212	2,590	3,000	3,420	3,714

Source: AACP Profile of Pharmacy Students (Fall 2005).

Distance learning models address a number of potential constraints to increasing enrollment. First, these programs allow pharmacy schools to offer students greater flexibility in their study location, making the programs more attractive to applicants. Second, where space constraints exist on the main campus, these pathways offer a way to expand by adding facilities in other locations, or, in the case of Web-based pathways, requiring only technical infrastructure

¹¹ Malone P, Glynn G, Stohs S. The Development of Structure of a Web-based Entry-level Doctor of Pharmacy Pathway at Creighton University Medical Center, *American Journal of Pharmaceutical Education*, 2004; 68(2): Article 46.

¹² Ward C, Rey J, Mobley C, Evans C. Establishing a Distance Learning Site for a Traditional Doctor of Pharmacy Program. *American Journal of Pharmaceutical Education*. 2003; 67(1): Article 20.

A third constraint to increased enrollments has been faculty shortages in pharmacy education.¹³ Where distance learning may be particularly effective in leveraging scarce faculty is in allowing faculty with specialized knowledge or experience to share that expertise with larger numbers of students. However, it should be noted that early experiences with these models have shown that they do not require fewer faculty as much as a different deployment of faculty. Adding a distance-learning component to a campus-based class may actually increase the workload for existing staff, especially when the program is first implemented. A greater commitment to course planning and course readiness is required, and the expectations of remote students regarding immediate electronic access to faculty need to be managed. In addition to instructional staff, satellite locations may require liaisons, facilitators, and counselors. A technical staff is also needed to implement and maintain the distance learning tools and technologies

As distance learning in pharmaceutical education continues to expand, it will be important to continue to monitor and evaluate the quality of such programs and to share lessons learned. Researchers at the Nova Southeastern University School of Pharmacy published a comprehensive white paper in 2003 on issues relevant to ensuring excellence in distance pharmaceutical education.¹⁴ The Accreditation Council for Pharmacy Education (ACPE) released revised accreditation standards guidelines in February 2006 that contain explicit guidelines on the use of distance learning in a pharmacy education program.¹⁵

Studies to date have found that outcomes from distance learning programs are comparable to traditional campus-based programs.¹⁶ The first graduating classes coming out of these programs are passing licensure exams at rates equal to or better than traditional students. Because students currently self-select for participation in distance learning pathways, there will be a continued need to monitor and evaluate the impact on performance, especially if students have less choice about participating. Given the success of distance learning in increasing enrollment while maintaining outcomes, these technologies will likely continue to play a role in pharmaceutical education.

3. Increasing Number of Women in Pharmacy

The proportion of pharmacists who are women has increased from below 13 percent in 1970 to almost half of all pharmacists today. Because two thirds of new graduates are women and because most pharmacists nearing retirement are men, the proportion of pharmacists who are women will continue rising. By 2025, two out of three pharmacists are likely to be women (*Exhibit 9*).

¹³ Traynor K, Staffing Shortages Plague Nation's Pharmacy Schools. *American Journal of Health-System Pharmacy*. 2003; 60: 1822.

¹⁴ Hunter RS, Deziel-Evans, L, March WA. Assuring Excellence in Distance Pharmaceutical Education. *American Journal of Pharmaceutical Education*. 2003; 67(3): Article 94.

¹⁵ Accreditation Council for Pharmacy Education (ACPE). *Accreditation Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree*. Adopted: January 15, 2006. Effective: July 1, 2007.

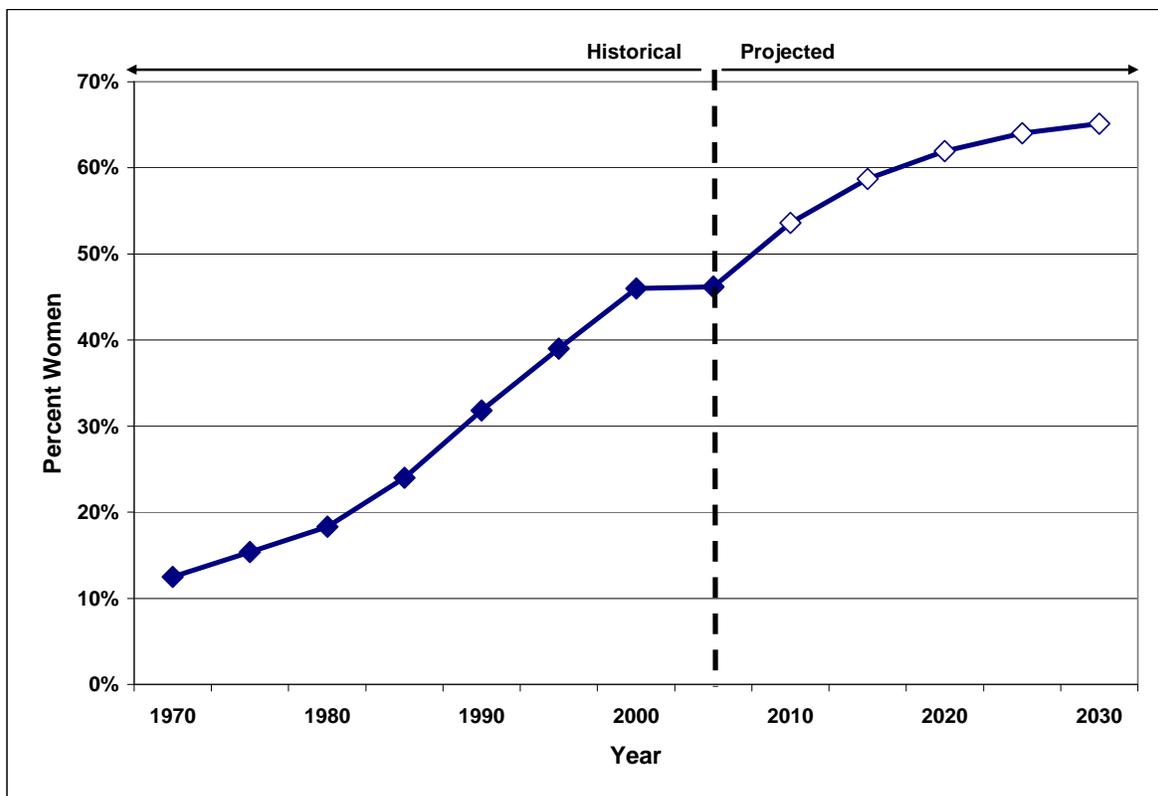
¹⁶ Faulkner TP, Christoff JJ, Sweeney MA, Oliver N. Pilot Study of a Distance-Learning Methodology Used on Campus for First Professional Degree Pharmacy Students in an Integrated Therapeutics Module. *American Journal of Pharmaceutical Education*. 2005; 69(1): Article 7.

Ried LD, McKenzie M. A Preliminary Report on the Academic Performance of Pharmacy Students in a Distance Education Program. *American Journal of Pharmaceutical Education*. 2004; 68(3): Article 65.

Breslow RM. A Comparison of Academic Performance of Off-Campus Nontraditional PharmD Students With Campus-Based PharmD Students. *American Journal of Pharmaceutical Education*. 2005; 69(1): Article 8.

Women are more likely than their male colleagues to work part time, so in percentage terms total hours of pharmacist services supplied will rise more slowly than the number of active pharmacists.

Exhibit 9. Percent of Pharmacists who are Women



Sources: HRSA (2000) and projections from the PhSRM.

4. Pharmacist Hours Worked

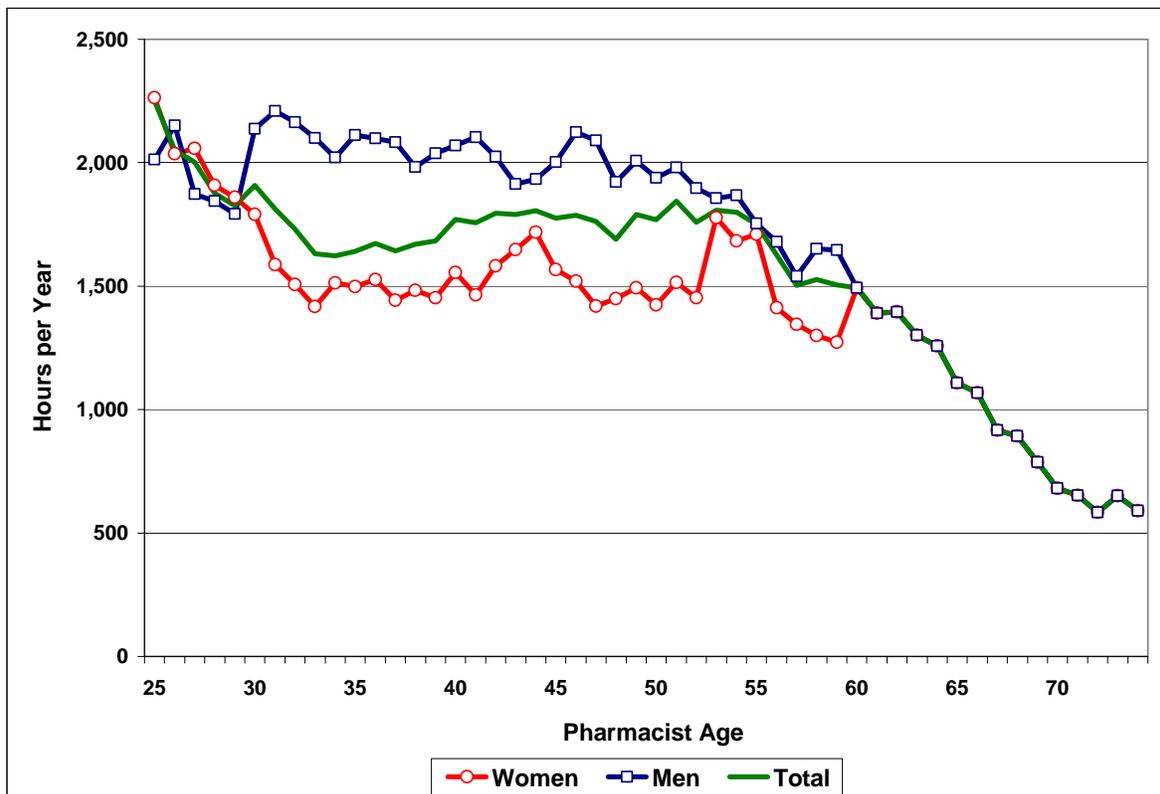
In 2004, an estimated 20.6 percent pharmacists worked part time (defined as working 30 or fewer hours per week). For this study a FTE pharmacist is defined as one providing approximately 1890 hours per year of pharmacist-related services. This estimate was obtained through an analysis of the 2004 NPWS by estimating the average weeks worked per year for pharmacists working 40 or more hours per week (47.2 weeks), and multiplying this number by 40 hours per week. Pharmacists age 28 and younger, on average, work more than 1890 hours per year. Among active pharmacists, average hours worked tends to decrease with age (*Exhibit 10*).

Many pharmacists work more than 1890 hours per year, either through long hours on their primary job or by working multiple jobs. Male pharmacists tend to work more than 1890 hours per year and, on average, are counted as slightly more than one FTE through age 55.¹⁷ Female

¹⁷ Pharmacists working more than 1890 hours per year are counted as greater than 1 FTE, while pharmacists working less than 1890 hours per year are counted as a partial FTE. The total number of FTE pharmacists of a the formula: $\text{Total FTEs}_{\text{age}} = \left(\text{Total Active Pharmacists}_{\text{age}} \right) \times \left(\frac{\text{Average annual hours}_{\text{age}}}{1890} \right)$

pharmacists are more likely to be working part time and, on average, count as approximately 0.8 FTE between the ages of 32 and 60. For pharmacists age 60 and older, the sample size in the 2004 NPWS is relatively small so FTE rates for men and women are combined for modeling.

Exhibit 10. Average Hours Worked per Year: 2004



Source: Analysis of the 2004 NPWS. Note: Hours for women and men age 60 and older are combined because small sample size makes gender-specific rates unreliable.

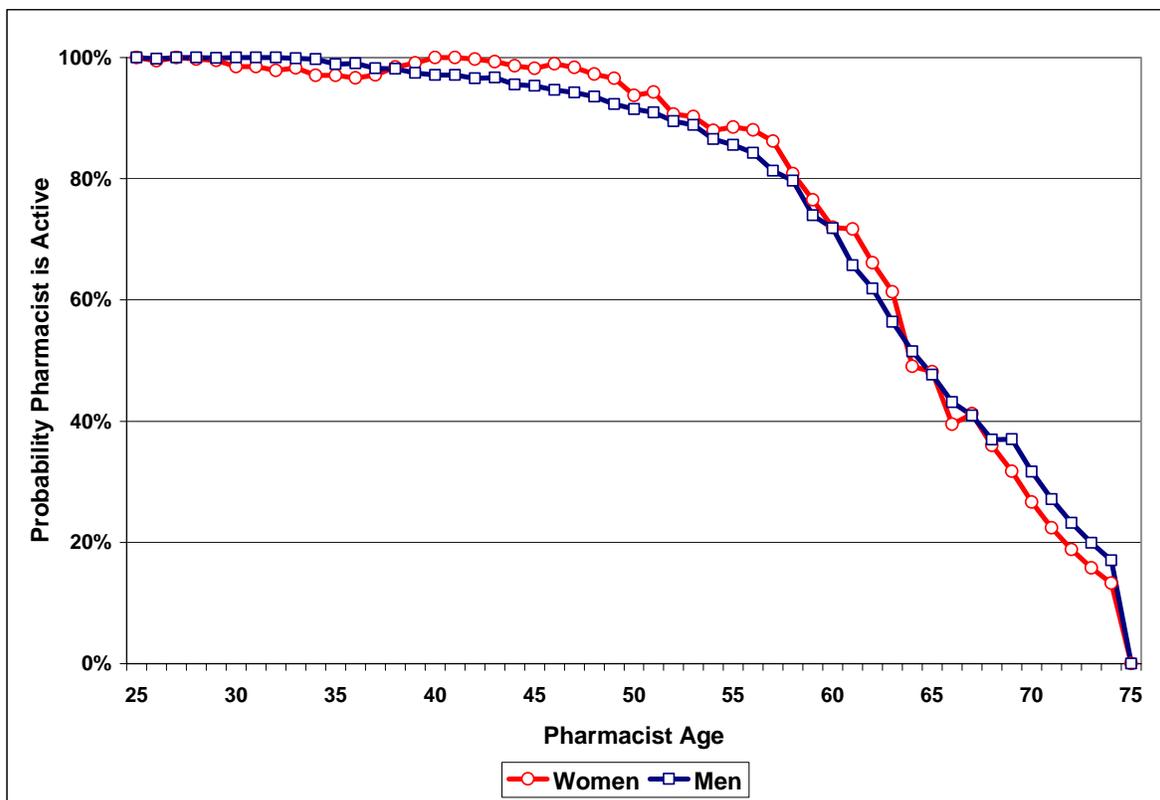
In addition to differences in average hours by pharmacist age and gender, anecdotal evidence suggests that average hours worked might be declining over time—in part due to lifestyle choices. A comparison of NPWS findings shows a drop in FTE rates for both male and female pharmacists between 2000 and 2004, although it is uncertain whether this drop is due to lifestyle choices, market conditions, or other factors.

5. Attrition from the Pharmacist Workforce

Few sources provide data on pharmacist retirement patterns, and for this analysis data from the 2000 Census were analyzed to estimate the probability that a pharmacist was employed during the previous year. The Census data on occupation and employment status are self reported, and the assumption is made that a person who self-identifies as a pharmacist and reports that they are working is, in fact, working in a pharmacy-related job. This information is supplemented with data from the Centers for Disease Control and Prevention on the mortality risk for men and women, which is used as a proxy for mortality rates of pharmacists.

Most pharmacists remain active in their profession for 35 or more years (*Exhibit 11*). Over 85 percent of pharmacists who reach age 55 are still active, but this percentage declines to less than 50 percent by age 65. Between age 65 and age 75, the likelihood that a pharmacist is still active declines precipitously, and for modeling purposes it is assumed that by age 75 all pharmacists have retired. Labor force activity rates for male and female pharmacists of the same age are relatively similar, although women age 30 to 37 are slightly less likely than men to be active and women age 40 to 65 are slightly more likely than men to be active.

Exhibit 11. Probability Pharmacist is Active in Pharmacy



Source: Analysis of 2000 U.S. Census and CDC mortality statistics. Note: All pharmacists assumed retired by age 75.

C. The Future Pharmacist Supply

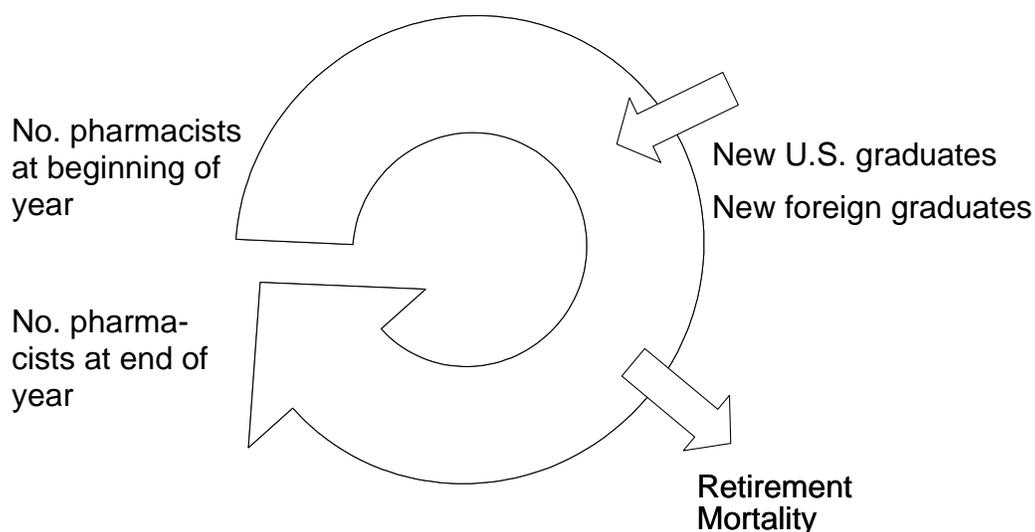
Numerous factors influence the decision to become a pharmacist and the decisions by pharmacists regarding how many hours to work, where to work, and when to retire. The supply model tries to capture the major trends that affect supply. Following a brief description of how future supply is modeled, projections through 2030 for a baseline and alternate scenarios are presented.

1. Modeling Future Supply

Future supply is projected using an inventory model that tracks the number of active and FTE pharmacists by age, gender, education level, and year. An inventory model starts with the number of active pharmacists in a particular age, gender and education level (*Exhibit 12*). Each

year new entrants are added to the pharmacist workforce using an age and gender distribution that reflects current and projected trends. Also, each year some pharmacists separate from the workforce due to retirement and mortality, with the probability of separating increasing with age. The number of pharmacists at the beginning of the year plus the net change in number of pharmacists during the year determines the supply of pharmacists at the end of the year (which becomes the starting point for the next projection year).

Exhibit 12. Inventory Model of Supply

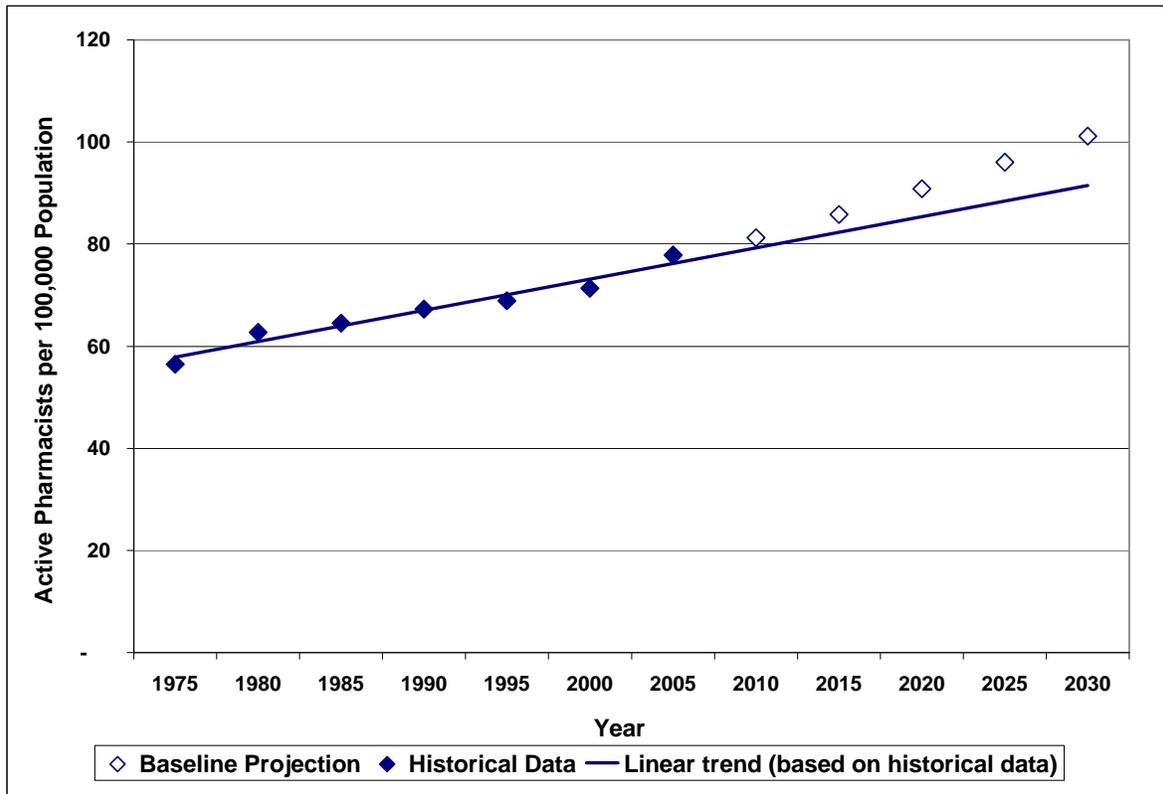


2. Baseline Supply Projections

The baseline scenario is our best estimate of future supply under the assumptions presented above regarding the number of new pharmacist graduates, average hours worked, and separation rates. This scenario assumes that the number of entry-level degree graduates from schools of pharmacy will experience moderate growth, that pharmacists of a given age and gender will continue to work the same number of hours as their counterparts today, and that retirement patterns will remain unchanged over time.

Under this scenario, the number of active pharmacists will grow at a slightly faster rate than the overall resident population. The number of pharmacists per 100,000 population grew from approximately 56 in 1975 to a current estimate of approximately 78. This number is projected to increase to approximately 101 by 2030 (*Exhibit 13*). These projections through 2030 are slightly higher than suggested by a linear projection of the pharmacist-to-population ratio based on data from 1975 to present.

Exhibit 13. Active Pharmacists per 100,000 Resident Population in the US

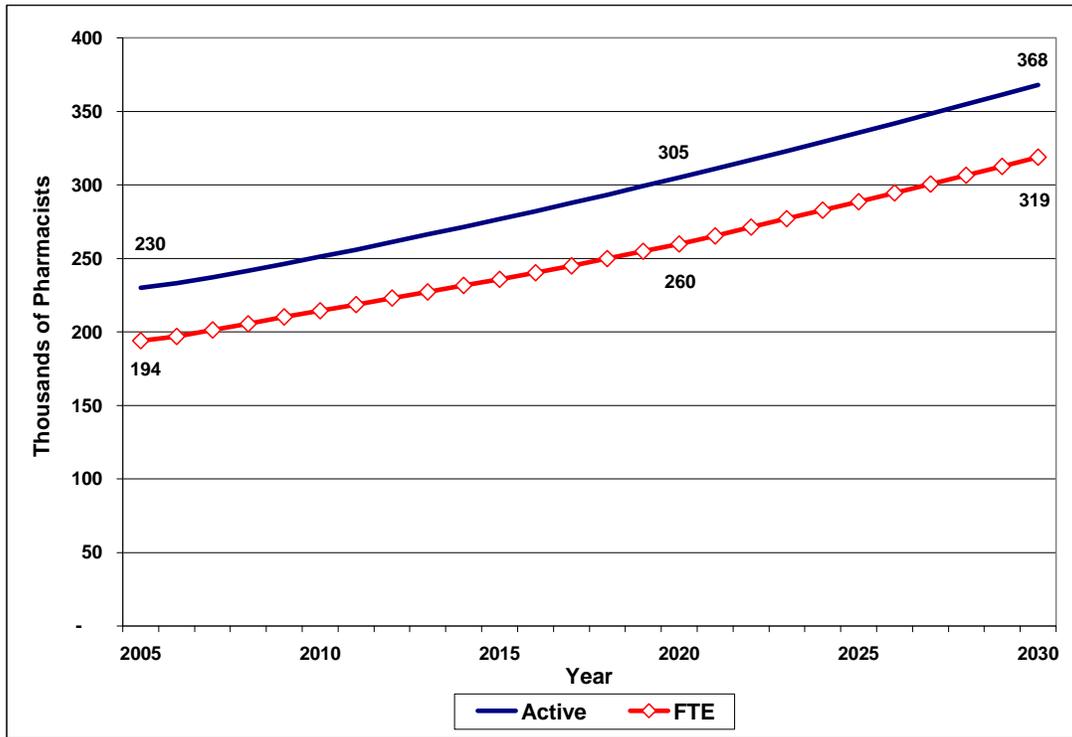


Source: Historical data combines U.S. Bureau of Labor Statistics data on pharmacists with U.S. Census Bureau population estimates. Projections from the PhSRM.

The baseline supply projections suggest that the number of active pharmacists will increase from approximately 230,000 in 2005 to 305,000 by 2020 and 368,000 by 2030 (*Exhibit 14*). The FTE supply estimates remain approximately 85 percent of active supply over this projection horizon, increasing from 194,000 in 2005 to 260,000 by 2020 and 319,000 by 2030.

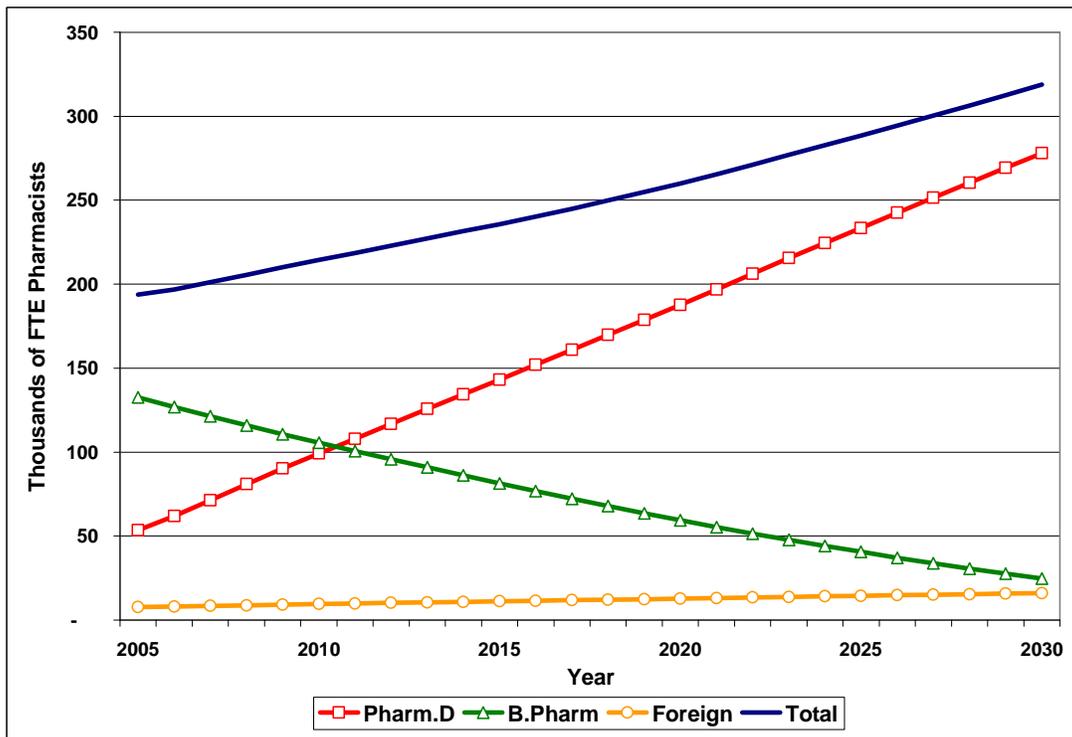
All entry-level degree graduates of pharmacy schools now graduate with a Pharm.D degree. In addition, each year hundreds of pharmacists originally prepared at the baccalaureate level earn their Pharm.D degree through distance learning and other programs. The percentage of pharmacists trained at the Pharm.D level is projected to continue rising from its current level of 30 percent to an estimated 90 percent by 2030 (*Exhibit 15*).

Exhibit 14. Total Active and FTE Pharmacists: Baseline Supply Projections



Source: Projections from the PhSRM.

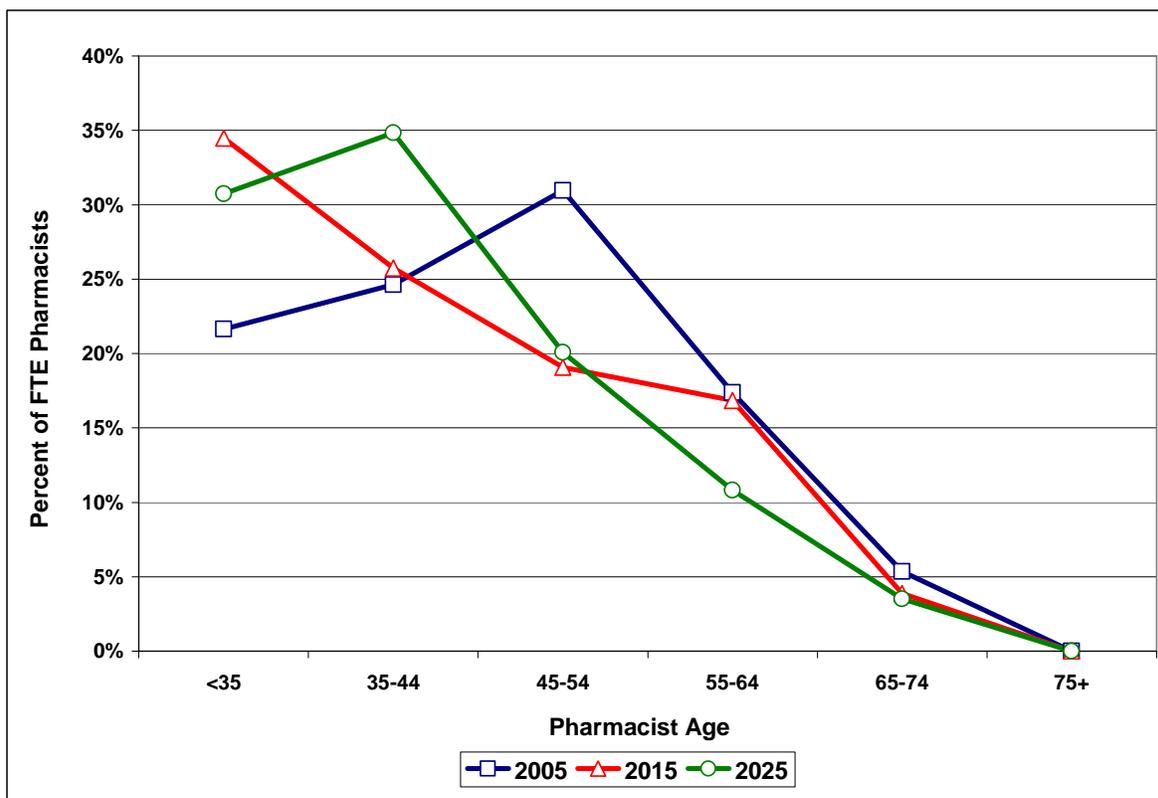
Exhibit 15. Total FTE Pharmacists: Baseline Supply Projections



Source: Projections from the PhSRM.

The recent increase in number of new entry-level degree pharmacy graduates is projected to result in a pharmacist workforce that in 2015 has a larger proportion of young (under age 35) pharmacists than existed in 2005 (*Exhibit 16*). While young pharmacists tend to work more hours per week than their older colleagues, a growing proportion of these new pharmacists are women who tend to work fewer hours per week than their male colleagues.

Exhibit 16. Age Distribution of FTE Pharmacists



Source: Projections from the PhSRM.

3. Alternate Supply Projections

Most people who train in a specialized field such as pharmacy remain in that profession throughout their career, so national supply projections tend to be relatively stable. Actual future supply might diverge from the baseline projections if trends in supply determinants deviate from current or expected levels. To test the sensitivity of the supply projections to key supply determinants the following alternate scenarios are modeled:

1. What is the impact on FTE supply of increasing (by 2010) the number of new graduates from pharmacy schools by 10 percent and by 20 percent above the baseline assumptions, and what is the impact if educational capacity stops growing past 2008 (*Exhibit 17*)?
2. What is the impact on FTE supply if pharmacist retirement patterns were to change such that pharmacists decided, on average, to retire 2 years earlier or to delay retirement for 2 years compared to current patterns (*Exhibit 18*)?

3. What is the impact on FTE supply if pharmacists increase/decrease their hours worked annually by 10 percent (*Exhibit 19*)?

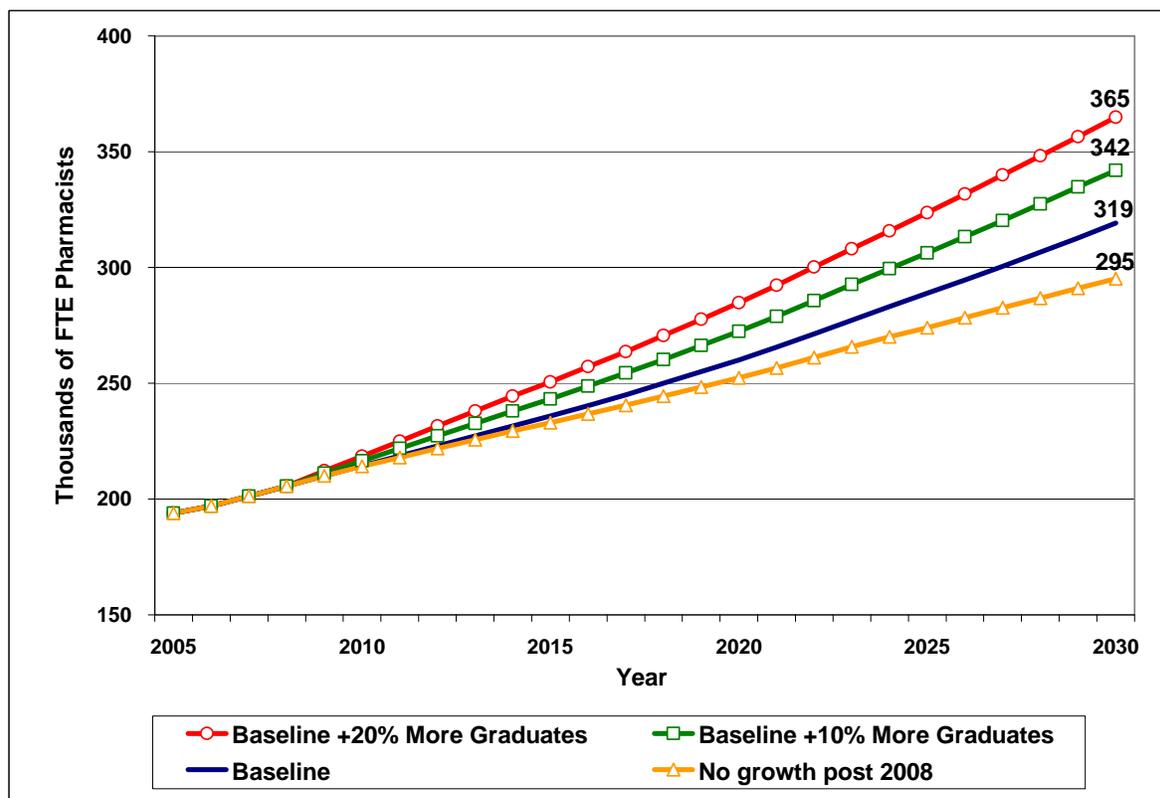
Supply projections for the baseline scenario and alternate scenarios are summarized in *Exhibits 20 and 21*.

Applications to first professional degree pharmacy programs more than tripled since the late 1990s, rising from 23,500 applications for the 1998-1999 school year to over 79,000 for the 2004-2005 school year. During this time, enrollment in first professional degree programs increased by about a third, from 34,500 in 2000 to 46,500 in 2005. The large increase in number of applicants suggests that interest in becoming a pharmacist is high, although the more moderate increase in enrollment suggests the presence of training capacity constraints. If capacity increased such that from 2010 onward the number of new U.S. graduates remained 10 percent to 20 percent above the baseline graduate assumptions, by 2030 the number of FTE pharmacists would be approximately 23,000 to 46,000 higher than the baseline projections (*Exhibit 17*).

A possible constraint to future increases in pharmacy graduates is a shortage of pharmacy faculty. According to the annual AACP Survey of Vacant Budgeted and Lost Faculty Positions, total reported vacant or lost faculty positions have increased from 354 in 2002-03 to 406 in 2004-05.¹⁸ If faculty shortages or other factors prevent further expansion of colleges and schools of pharmacy past the 2008 graduating year, then the number of FTE pharmacists would be 24,000 fewer than the baseline projection for 2030.

¹⁸ Data cited in AACP Institutional Research Briefs Vols. 5 & 6, posted on www.aacp.com, accessed March 2007. Percent of pharmacy programs responding to the survey ranged from 77 percent to 85 percent.

Exhibit 17. Sensitivity of FTE Supply to Number of Graduates from US Schools of Pharmacy

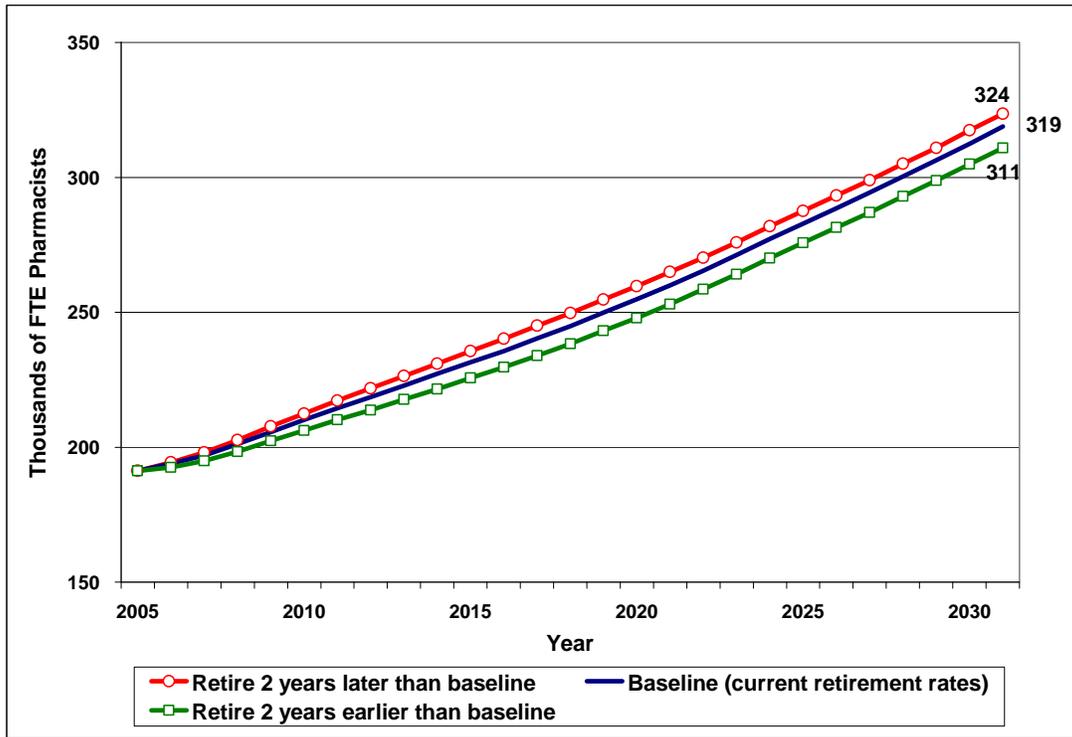


Source: Projections from the PhSRM.

Another factor that could influence supply is when pharmacists decide to retire. Factors that could delay retirement include increases in the age for Social Security and Medicare eligibility, and continued high demand for pharmacist services that raises the opportunity cost of retirement. Factors that could contribute to retiring earlier than historical patterns include the increasing number of people caring for elderly parents, lifestyle changes, and economic prosperity. Under a scenario where pharmacists retire, on average, 2 years earlier or 2 years later than historical patterns, by 2030 the number of FTE pharmacists would fluctuate by only 5,000 to 8,000 from the baseline projections (*Exhibit 18*).

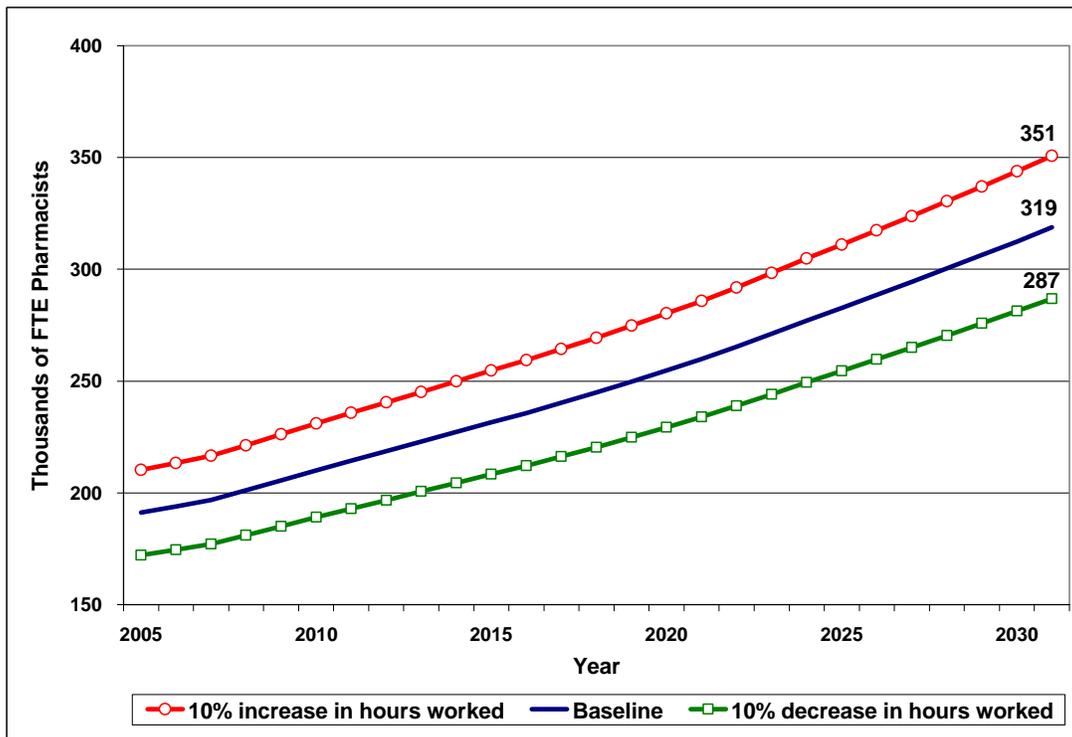
The baseline projections take into consideration the changing gender and age distribution of the pharmacist workforce and the implications for hours worked. Factors that might contribute to a change in average hours worked include lifestyle decisions and the adequacy of pharmacist supply (e.g., a shortfall might increase hourly earnings, providing a financial incentive to work more hours). If pharmacists change their hours worked by +/- 10 percent relative to the baseline assumptions, the number of FTE pharmacists will shift up/down by 10 percent reflecting some ability of supply to expand or contract (in the short term) to meet demand (*Exhibit 19*).

Exhibit 18. Sensitivity of FTE Supply to Retirement Patterns



Source: Projections from the PhSRM.

Exhibit 19. Sensitivity of FTE Supply to Shifts in Average Hours Worked



Source: Projections from the PhSRM.

Exhibit 20. Active Supply Projections (Baseline Scenario)

Year	US Pharm.D	US B.Pharm	Foreign Graduate	Total*	% Female	Pharmacists per 100,000 population
2004	49,400	168,000	9,100	226,400	45%	77.3
2005	57,800	162,900	9,400	230,100	46%	77.9
2006	67,000	156,300	9,700	233,100	48%	78.2
2007	76,800	150,100	10,100	237,000	50%	78.8
2008	86,900	144,200	10,400	241,500	51%	79.5
2009	97,000	138,400	10,700	246,200	52%	80.4
2010	107,200	132,900	11,100	251,100	54%	81.3
2011	117,200	127,400	11,400	256,000	55%	82.2
2012	127,300	122,000	11,800	261,100	56%	83.1
2013	137,400	116,700	12,100	266,200	57%	84.0
2014	147,400	111,500	12,400	271,400	58%	84.9
2015	157,400	106,400	12,800	276,700	59%	85.8
2016	167,500	101,500	13,100	282,100	60%	86.8
2017	177,600	96,700	13,400	287,700	60%	87.8
2018	187,700	91,900	13,800	293,300	61%	88.8
2019	197,900	87,200	14,100	299,200	61%	89.8
2020	208,100	82,500	14,500	305,000	62%	90.8
2021	218,300	77,900	14,800	311,000	62%	91.9
2022	228,600	73,300	15,100	317,000	63%	92.9
2023	238,900	68,700	15,500	323,100	63%	93.9
2024	249,200	64,200	15,800	329,200	64%	95.0
2025	259,500	59,800	16,100	335,500	64%	96.0
2026	269,800	55,500	16,500	341,900	64%	97.1
2027	280,100	51,400	16,800	348,300	65%	98.1
2028	290,300	47,200	17,100	354,700	65%	99.1
2029	300,500	43,300	17,500	361,300	65%	100.2
2030	310,700	39,300	17,800	367,800	65%	101.2

* Columns might not sum to total because of rounding.

Exhibit 21. FTE Supply Projections

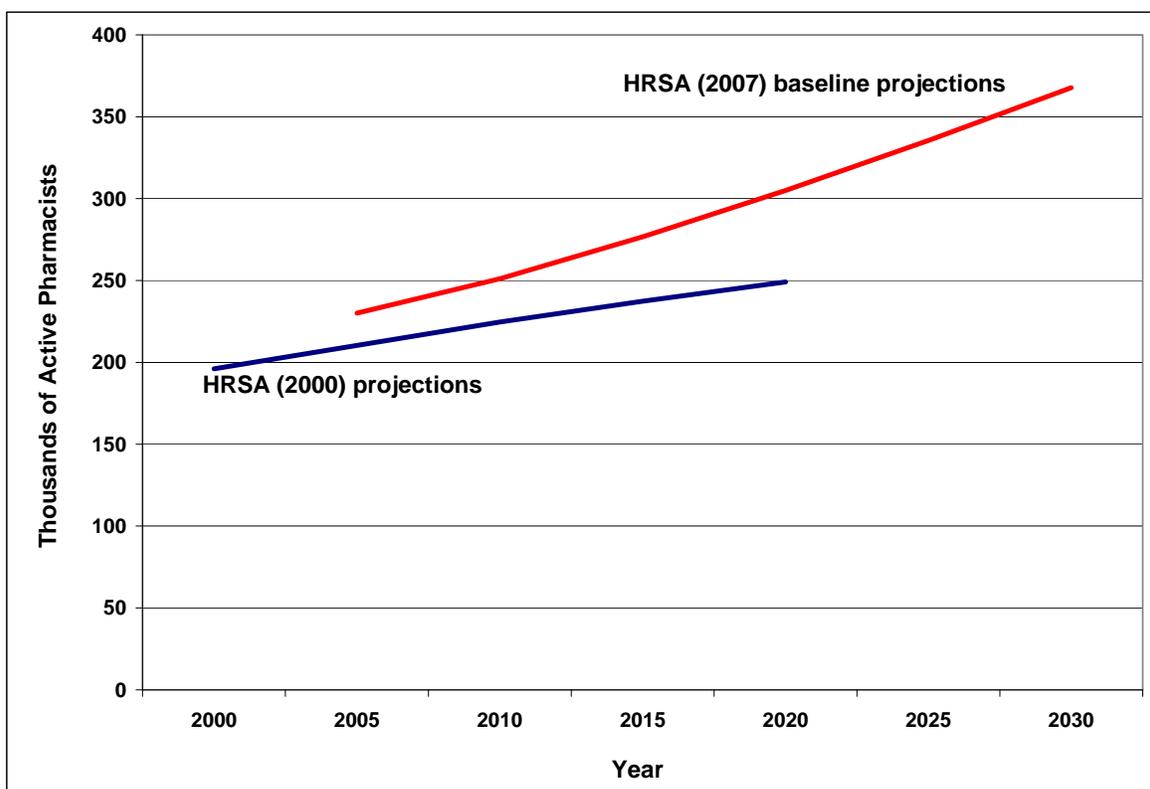
Year	Baseline Scenario		Alternate Supply Scenarios						
	Total FTE	Pharmacists per 100,000 population	No growth in educational capacity post 2008	10% More Graduates than in Baseline	20% More Graduates than in Baseline	Retire 2 years earlier than baseline	Retire 2 years later than baseline	10% increase in hours worked	10% decrease in hours worked
2004	191,200	65.3	191,200	191,200	191,200	191,200	191,200	210,300	172,100
2005	193,900	65.8	193,900	193,900	193,900	192,500	194,400	213,300	174,500
2006	196,900	66.4	196,900	196,900	196,900	194,900	198,100	216,600	177,200
2007	201,200	67.4	201,200	201,200	201,200	198,400	202,700	221,300	181,100
2008	205,600	68.4	205,600	205,600	205,600	202,400	207,700	226,200	185,000
2009	210,100	69.4	210,000	211,100	212,100	206,200	212,500	231,100	189,100
2010	214,400	70.3	214,100	216,500	218,500	210,100	217,300	235,800	193,000
2011	218,600	71.2	218,000	221,700	224,900	213,700	221,800	240,500	196,700
2012	222,900	72.0	221,900	227,100	231,300	217,700	226,400	245,200	200,600
2013	227,200	72.9	225,700	232,400	237,600	221,600	231,000	249,900	204,500
2014	231,500	73.7	229,400	237,700	243,900	225,700	235,700	254,700	208,400
2015	235,700	74.5	233,000	242,900	250,000	229,700	240,200	259,300	212,100
2016	240,300	75.4	236,700	248,400	256,600	233,900	245,000	264,300	216,300
2017	244,900	76.2	240,500	254,000	263,100	238,400	249,700	269,400	220,400
2018	249,800	77.1	244,500	259,900	270,000	243,200	254,700	274,800	224,800
2019	254,800	78.0	248,400	265,900	277,000	247,900	259,700	280,300	229,300
2020	259,900	78.9	252,400	272,000	284,100	253,000	264,900	285,900	233,900
2021	265,400	79.8	256,700	278,500	291,600	258,500	270,200	291,900	238,900
2022	271,200	80.9	261,200	285,300	299,500	264,100	275,900	298,300	244,100
2023	277,100	81.9	265,700	292,300	307,400	270,000	281,800	304,800	249,400
2024	282,800	83.0	270,000	299,100	315,300	275,800	287,600	311,100	254,500
2025	288,500	83.9	274,100	305,800	323,100	281,400	293,300	317,400	259,700
2026	294,400	84.9	278,400	312,800	331,200	287,000	299,000	323,800	265,000
2027	300,400	85.9	282,600	319,900	339,400	292,900	305,000	330,400	270,400
2028	306,400	86.9	286,700	327,000	347,500	298,800	310,900	337,000	275,800
2029	312,500	88.0	291,000	334,200	355,800	304,900	317,400	343,800	281,300
2030	318,800	89.0	295,200	341,500	364,200	310,900	323,500	350,700	286,900

4. Comparison to Previous Supply Projections

The baseline supply projections suggest that pharmacist supply will grow faster than previously predicted, with these latest projections for 2020 suggesting pharmacist supply will be 50,000 higher than projected for the HRSA (2000) report (*Exhibit 22*). This finding is not unexpected given the attention pharmacy has received since release of the 2000 report. The new projections reflect the growing interest in pharmacy as a career choice, the rise in pharmacist average annual earnings, and the Nation's renewed interest in expanding pharmacy training capacity in response to the current shortfall and earlier projections of a growing shortfall, and updated pharmacist retirement patterns.¹⁹

In the late 1990s, the Nation was graduating approximately 8,000 new pharmacists per year and the HRSA (2000) projections assumed that the annual number of new graduates would continue increasing to approximately 8,500 by 2020. In reaction to the predicted growing pharmacist shortage, enrollment in pharmacy programs rose such that the Nation will soon be graduating close to 10,000 new pharmacists per year, with plans for expansion of pharmacy schools expected to gradually increase the number of entry-level degree graduates to about 12,000 per year.

Exhibit 22. Comparison of Active Pharmacist Supply Projections



Sources: Projections from the PhSRM and HRSA (2000).

¹⁹ Katherine K. Knapp and James M. Cultice (2007). New pharmacist supply projections: Lower separation rates and increased graduates boost supply estimates. *Journal of the American Pharmacists Association*, 47(4):463-470.

III. PHARMACIST REQUIREMENTS

The term “requirements” is a broad definition of the number of pharmacists necessary to provide an adequate supply, and health workforce researchers have used various approaches to estimate future requirement. Needs-based requirements estimates are based on what someone thinks is needed or is ideal—e.g., based on epidemiological considerations and desired pharmacist work patterns. Demand-based requirements estimates are based on future projections of the number of prescriptions that consumers will want filled and the anticipated role of pharmacists to meet this demand for pharmaceuticals. For this study a demand-based definition and approach was used to estimate requirements.

National requirements for pharmacists continue to rise to meet the demands of a population that is growing and aging, increased per capita utilization of pharmacy services that accompanies technological advances in number and complexity of new pharmaceuticals, increased need for education and monitoring as patients consume more pharmaceuticals, and expanded pharmacy benefits afforded by Medicare Part D and other programs. This growth in demand is tempered somewhat by advances in dispensing technology and improved communication systems that increase pharmacist productivity, as well as increased use of pharmacy technicians. This section summarizes current demand for pharmacists and trends in demand determinants, and presents projections of pharmacist requirements under alternate scenarios.

A. Current Demand

Demand for pharmacists is derived from the demand for pharmaceuticals and the role of pharmacists in providing the dispensing, counseling, monitoring, and other services that patients require. Demand-based health workforce studies typically use recent, historical health care utilization and delivery patterns to estimate demand for services. The evidence suggests that the Nation currently has a moderate shortfall of pharmacists, and the implications of this shortfall are reflected in determining base year (2004) pharmacist requirements. These implications include that pharmacists might be working longer hours or spending less time per patient than is socially desirable, or that pharmacies have had to reduce services because of unfilled pharmacy positions.

Because rates of growth over time in demand for pharmacy services and changes in pharmacist productivity can vary across settings that employ pharmacists, the PhSRM models demand for pharmacists in six settings: hospitals, other patient care (e.g., clinics, nursing homes), chain pharmacies and food stores, independent pharmacies, mail order, and non-patient care.

In 2004, there were an estimated 191,200 FTE pharmacist positions filled and an estimated 10,400 unfilled positions (*Exhibit 23*). Estimates of the number of FTE positions filled in each dispensing setting were calculated by multiplying total FTE pharmacist supply by each setting’s proportion of FTE pharmacists (with the setting distribution determined by analysis of the 2004 NPWS).

There were an estimated 10,400 unfilled FTE positions in 2004, or a vacancy rate of approximately 5 percent. A 2004 study by the American Society of Health-System Pharmacists

(ASHP) reports that 5 percent of hospitals' budgeted pharmacist positions were vacant.²⁰ While the number of vacancies continued to decline from a recent high of 8.9 percent in 2000, a 5 percent vacancy rate suggests that approximately 2,500 budgeted positions in hospitals were unfilled. ASHP's 2005 and 2006 surveys find that vacancy rates rose to 6.2 percent in 2005 and 7 percent in 2006. A July 2004 survey by the National Association of Chain Drug Stores (NACDS) Foundation found that chain store pharmacies reported approximately 4,000 vacancies.²¹ Vacancy estimates are unavailable for "other patient care" settings (e.g., clinics), independent pharmacies, mail-order pharmacies, and non-patient care. It is assumed that the vacancy rate for other patient care settings is similar to that of hospitals; that the vacancy rate for independent pharmacies is similar to that of chain pharmacies, and that the vacancy rates for mail order and non-patient care are similar to the overall vacancy rate of 5 percent from the NACDS and ASHP combined results.

Exhibit 23. Estimated FTE Demand for Pharmacists: 2004

Setting	FTEs Positions, 2004		
	Filled ^a	Unfilled	Total Demand
Hospitals	46,700	2,500 ^b	49,200
Other Patient Care	16,800	900 ^c	17,700
Chain Pharmacies	73,300	4,000 ^d	77,300
Independent Pharmacies	34,300	1,900 ^e	36,200
Mail Order	5,500	300 ^f	5,800
Non-patient care	14,600	800 ^f	15,400
Total	191,200	10,400	201,600

Sources: (a) Analysis of 2004 NPWS and 2004 Bureau of Labor Statistics Occupational Employment Statistics. (b) American Society of Health-System Pharmacists (ASHP) 2004 Survey. (c) Assumes same vacancy rate as for hospitals. (d) National Association of Chain Drug Stores (NACDS) Foundation July 2004 Chain Pharmacy Employment Survey. (e) Assumes same vacancy rate as for chain pharmacies. (f) Assumes 5 percent vacancy rate based on average of ASHP and NACDS surveys.

B. Trends in Demand for Pharmaceuticals

Future requirements for pharmacists are dependent, in part, on the future demand for pharmaceuticals. Major trends in demand for pharmaceuticals include population growth and aging, changes in per capita utilization of pharmaceuticals due to technological advances and other factors, and the impact of Medicare's new prescription drug program.

1. Population Growth and Aging

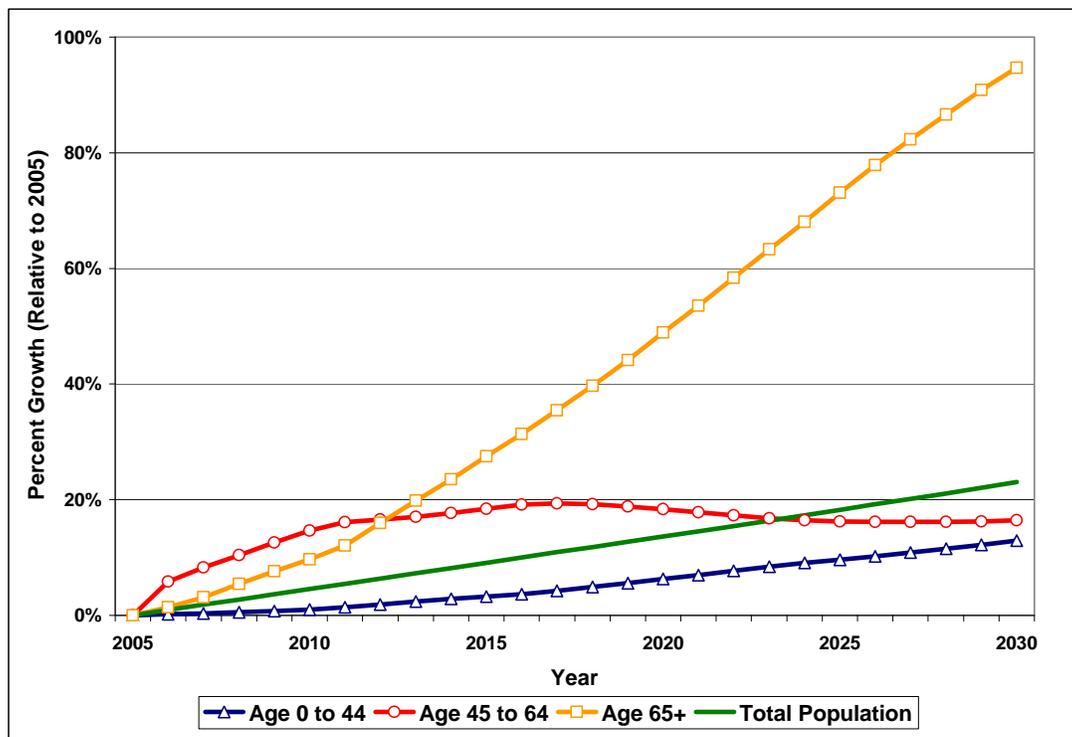
The U.S. population is growing and aging. Between 2005 and 2030, the population will grow by an estimated 68 million (23 percent). In percentage terms, the population age 65 and older is

²⁰ Annual Pharmacy Staffing Survey Results for 2004, 2005 and 2006. <http://www.ashp.org>. Accessed March 2007.

²¹ NACDS Foundation July 2004 Chain Pharmacy Employment Survey Results. <http://www.nacds.org>. Accessed March 2007.

growing significantly faster than the non-elderly population and will nearly double over the next 25 years (*Exhibit 24*).

Exhibit 24. Percent Growth in the U.S. Population: 2005 to 2030



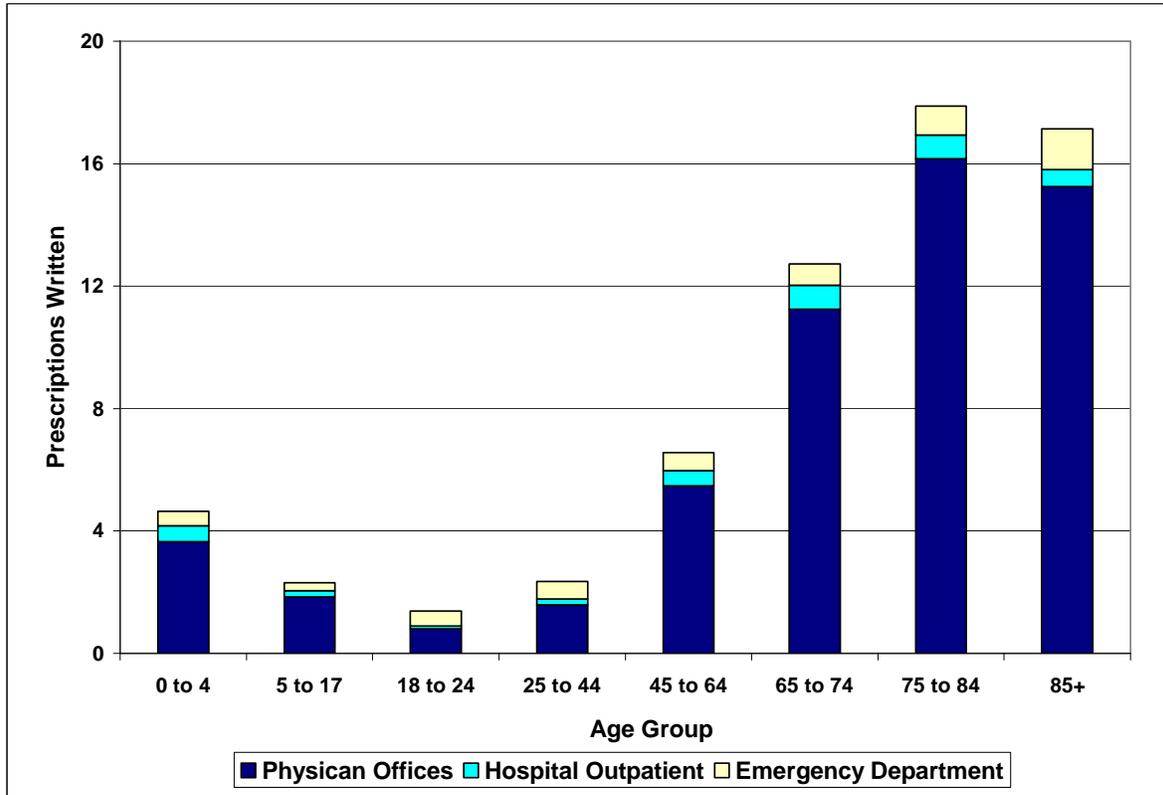
Source: U.S. Census Bureau population projections.

The elderly consume a disproportionate share of pharmacy services because of their much higher use of prescription medications and greater risk of complications and drug interactions (*Exhibits 25 and 26*). Analysis of the 2004 National Ambulatory Care Survey (NAMCS) and the 2004 National Hospital Ambulatory Care Survey (NHAMCS) provides estimates of the average, annual number of patient visits with a physician in ambulatory settings (i.e., physician office visits, and hospital outpatient and emergency visits), and the average number of prescriptions written per visit. Dividing total, annual prescriptions written for people in each age and gender group by the number of people in that population group produces estimates of average annual prescriptions per capita (excluding refills), although some prescriptions written go unfilled.

The population with the highest average, annual prescriptions per capita written in ambulatory settings is men age 75 to 84 (with 18.8 prescriptions), while the population with the lowest is men age 18 to 24 (with 1.4 prescriptions). The population under age 65, which is projected to grow by less than 20 percent between 2005 and 2030, averages 4.3 new prescriptions per person per year. The population age 65 and older, which is projected to grow by close to 90 percent between 2005 and 2030, averages 15.2 new prescriptions per person per year. Changing demographics alone is projected to increase the number of new prescriptions generated through physician office and hospital visits by approximately 44 percent between 2005 and 2030.

About half of all prescriptions filled in retail settings are refills.²² Comparison of prescriptions written during outpatient visits (and primarily filled in a retail pharmacy) with total prescriptions dispensed in a retail setting (using IMS Health data) suggests that new prescriptions written equal approximately 54 percent of total prescriptions filled in retail settings.

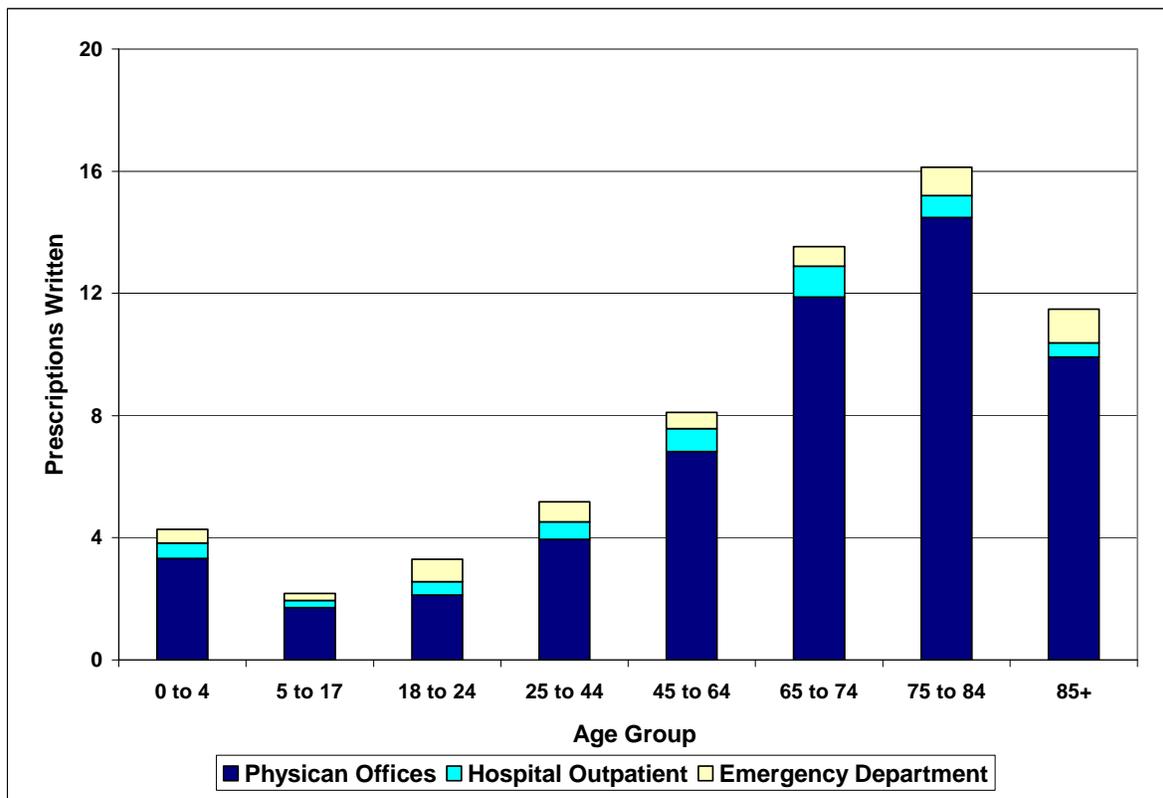
Exhibit 25. Annual Per Capita Prescriptions Written During Ambulatory Visits: Males



Source: Analysis of the 2004 National Ambulatory Care Survey and 2004 National Hospital Ambulatory Care Survey.

²² Knapp, DA. Professionally Determined Need for Pharmacy Services in 2002. *American Journal of Pharmaceutical Education*. Vol 66 (Winter 2002): 421-429.

Exhibit 26. Annual Per Capita Prescriptions Written During Ambulatory Visits: Females



Source: Analysis of the 2004 National Ambulatory Care Survey and 2004 National Hospital Ambulatory Care Survey.

2. Trends in per Capita Use of Pharmaceuticals

Accounting for demographic changes alone would likely under predict future demand for pharmaceuticals. From 1994 to 2005, the number of prescriptions dispensed increased 71 percent (from 2.1 billion to 3.6 billion), compared to population growth of 9 percent.²³ The average number of retail prescriptions per capita increased from 7.9 to 12.3 during this period. This trend of rising per capita use of pharmaceuticals will likely continue for the following reasons:

- New and More Complex Pharmaceuticals.** Scientific advancements continue to provide health professionals with the means to treat a growing range of health problems that previously were not treated with drugs. This includes new drugs to treat rare diseases, as well as new medications such as cholesterol lowering drugs to provide preventive care. Medco reports that utilization of specialty drugs—used to treat complex diseases such as rheumatoid arthritis, hemophilia, cancer, hepatitis C, anemia, cystic fibrosis, and growth hormone deficiency—grew by 19 percent in 2003, 16 percent in

²³ Prescription Drug Trends, June 2006. Henry J. Kaiser Family Foundation, publication #3057-05 at www.kff.org, accessed March 2007.

2004, and 10 percent in 2005.²⁴ Medco also reports that the world's top 50 pharmaceutical companies are currently awaiting Food and Drug Administration (FDA) approval for about 125 new and supplemental drug applications, with an estimated 100 new drugs in the pipeline that could win FDA approval by 2008. In addition, new uses are sometimes found for existing drugs.

- **Evolving societal attitudes.** Societal attitudes towards the use of pharmaceuticals have kept pace with scientific advances. Defensive medicine, direct-to-consumer advertising by drug companies, and a general acceptance to treat every ache and pain has contributed to a culture to use whatever drugs are available to alleviate health problems. Prescription drug coverage has expanded over time, and this trend will likely continue.
- **Increased affordability and availability of generic drugs.** The drop in drug prices that accompany the increase in availability of generic drugs makes many drugs more affordable, increasing both the likelihood that physicians will prescribe a medication and that patients will fill their prescription.

Counter to these trends is that some drugs previously sold only by prescription are now available over the counter. Also, as prescription drugs consume a larger proportion of health care expenditures this segment of care is coming under increasing scrutiny by insurers and employers trying to contain rising health care costs.

A Medco (2006) Drug Trend Report shows that as a trend driver of retail pharmaceutical sales, annual increases in prescriptions dispensed have been trending down in recent years. Prescriptions dispensed increased 4.6 percent 2002, 3.8 percent in 2003; 5.4 percent in 2004, and 2.7 percent in 2005 (*Exhibit 27*). Express Script (2004 and 2006) Drug Trend Reports show similar findings—a downward trend in the annual increase in volume of prescriptions dispensed.²⁵ Although the annual increases in prescriptions dispensed are shrinking, these annual increases are larger than can be explained by changing demographics alone.

Analysis of the average number of prescriptions written per visit to a physician show that prescriptions written per visit have been increasing over time for office visits (*Exhibit 28*), hospital/clinic outpatient visits (*Exhibit 29*), and emergency visits (*Exhibit 30*).²⁶ For example, for people age 65 and older the average number of prescriptions written per physician office visit grew from 1.3 to 1.7 (27 percent) between 1995 and 2004.

Projected pharmacist requirements are sensitive to assumptions of future prescriptions dispensed per capita. Demand is modeled under three scenarios: 1) a low prescription per capita growth scenario assumes that prescriptions written per physician visit remains at their 2004 levels, so increases in per capita consumption of pharmaceuticals is driven purely by changing demographics; 2) a high prescription per capita growth scenario where prescriptions written per physician visit increase annually at the historical (1995 to 2004) rate of increase for each age group modeled and for each

²⁴ Medco Drug Trend Report, 2006 (volume 8). Posted at www.drugtrend.com, accessed March 2007.

²⁵ Posted at <http://www.express-scripts.com/ourcompany/news/industryreports/>, accessed March 2007.

²⁶ These findings are based on a poisson regression analysis. The NAMCS analysis used data from 1995 to 2004, with prescriptions per office visit as the dependent variable and age group, gender, having medical insurance, and year as the explanatory variables. An analysis of prescriptions per hospital/clinic outpatient and per emergency visit uses a similar approach with data from the 1995 to 2004 NHAMCS.

outpatient setting modeled; and 3) a moderate-growth scenario which assumes that prescriptions written per physician visit increase annually at half the historical rate of increase. In support of this third scenario, Medco and Express Scripts data show that the rate of growth in prescriptions dispensed in retail settings has diminished in recent years. Also, anecdotal evidence suggests that insurers have begun to more aggressively manage pharmaceuticals in order to control rapidly rising health care costs.

Exhibits 28 through 30 show the range in projected prescriptions written per visit. The trends in prescriptions dispensed assume a one-time 6 percent permanent increase in prescriptions per visit starting in 2006 to account for the impact of Medicare Part D (discussed in more detail later).

Exhibit 27.

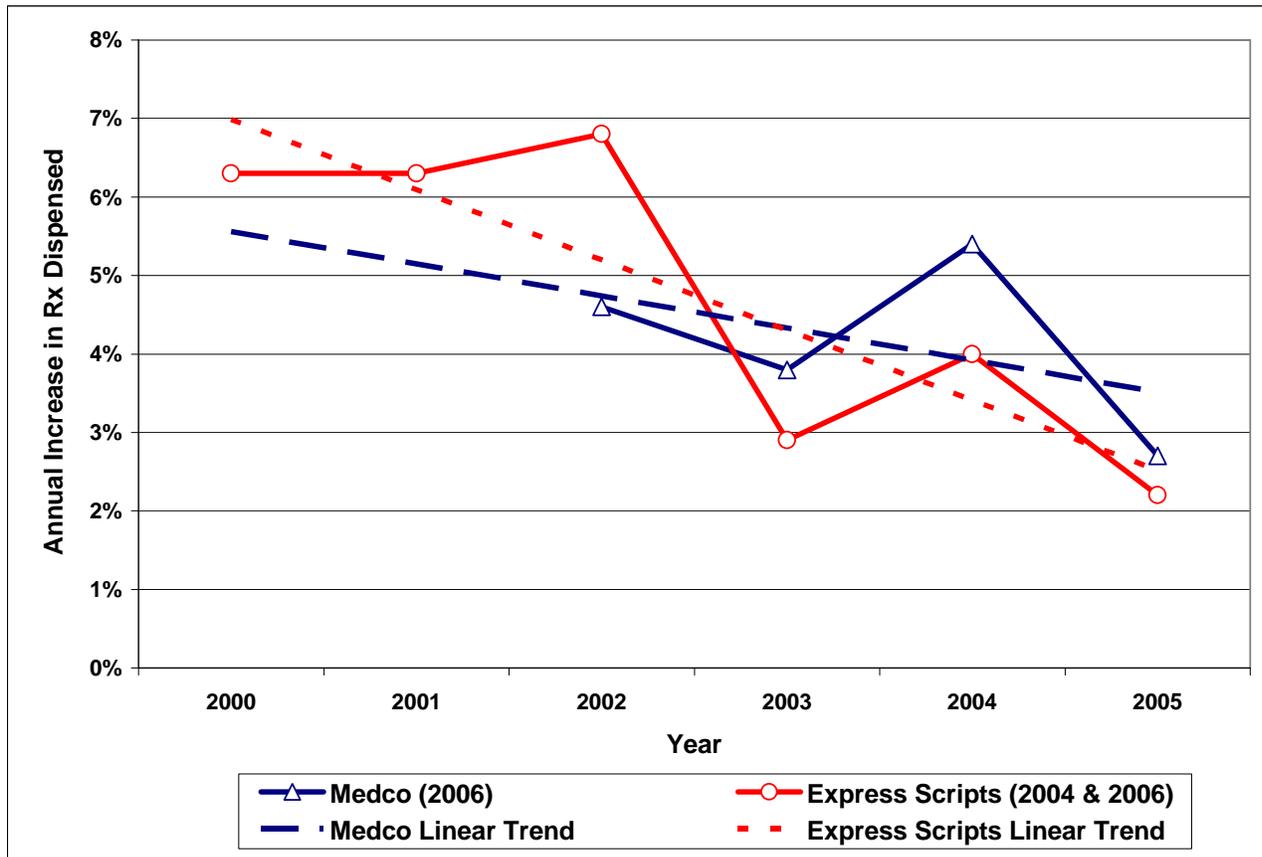
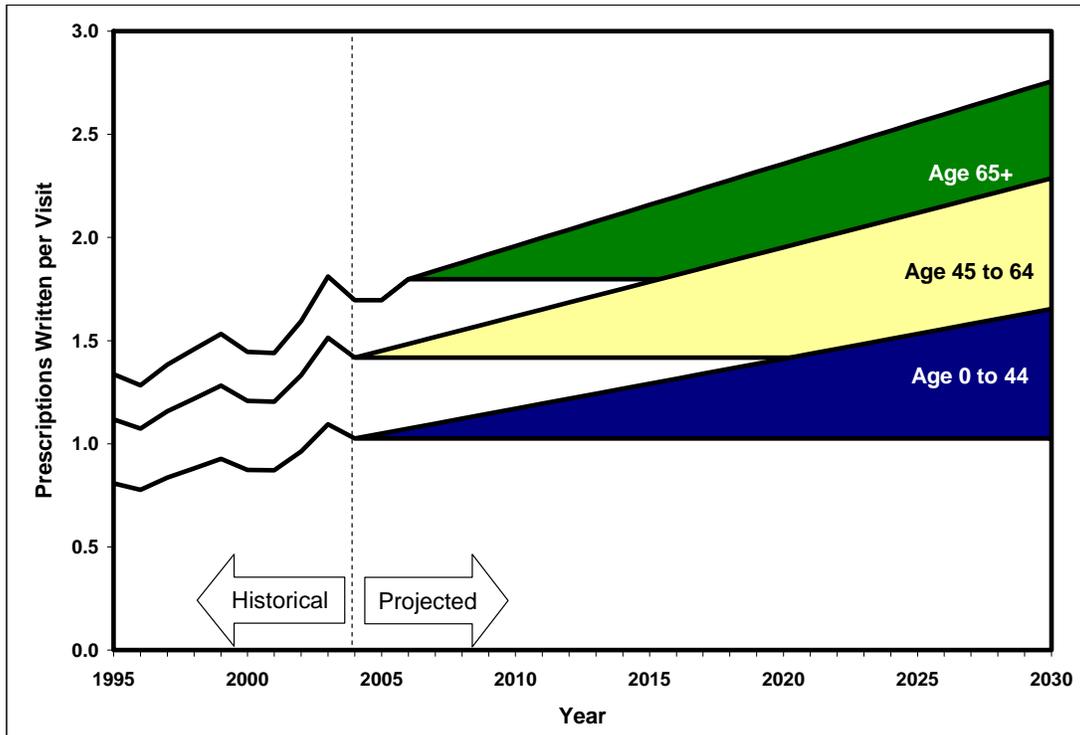
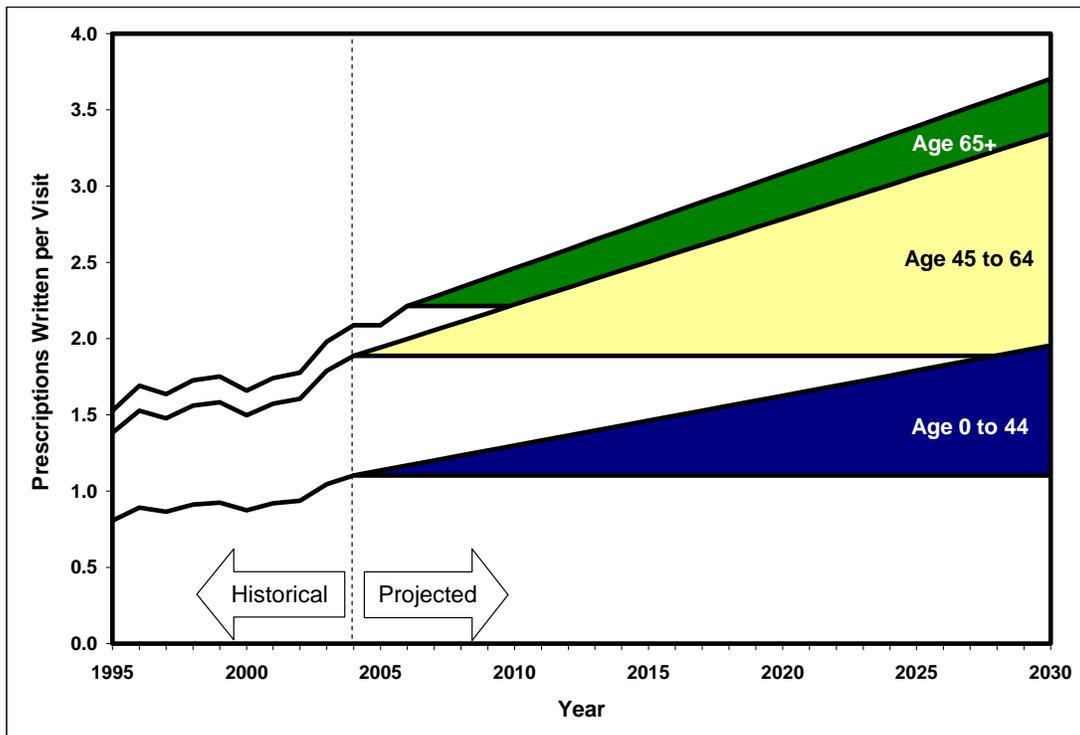


Exhibit 28. Prescriptions Written per Physician Office Visit



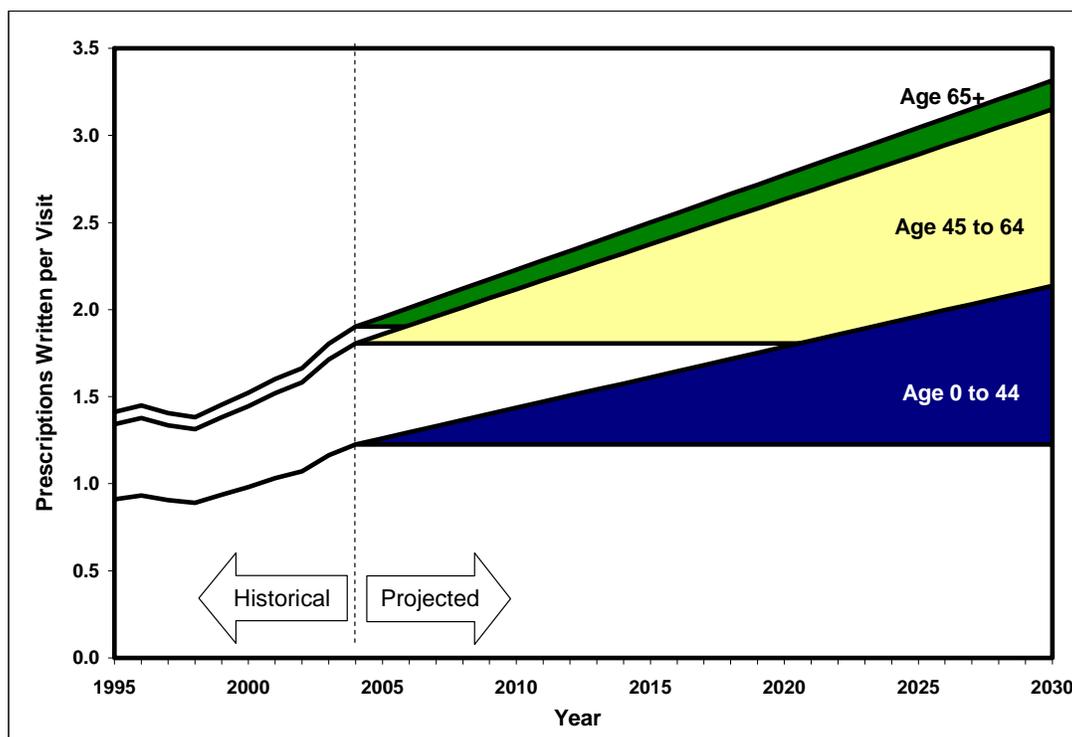
Source: Analysis of the NAMCS 1995 to 2004; trend extrapolated 2005 to 2030.

Exhibit 29. Prescriptions Written per Hospital/Clinic Outpatient Visit



Source: Analysis of the NHAMCS 1995 to 2004; trend extrapolated 2005 to 2030.

Exhibit 30. Prescriptions Written per Emergency Visit



Source: Analysis of the NHAMCS 1995 to 2004; trend extrapolated 2005 to 2030.

3. Medicare Part D

Medicare Part D, the Medicare prescription drug benefit, was implemented in January 2006, with an initial enrollment period through May 2006. According to HHS figures, as of June 2006 a total of 22.5 million people were enrolled in some type of Part D plan.²⁷ Another 15.8 million Medicare beneficiaries were reported to have creditable coverage from other sources. An estimated 4 to 5 million people, or about 10 percent of Medicare beneficiaries, have chosen not to enroll, and do not appear to have creditable prescription drug coverage.

Of the roughly 38 million Medicare beneficiaries who now have coverage through either Part D or some other creditable source, most had drug coverage in 2005, either through Medicaid, Medicare Advantage plans, or employer plans. Those most likely to have been uncovered are those who enrolled in a stand-alone Part D plan (10.4 million) or who are newly enrolled in a Medicare Advantage prescription drug plan (1.2 million). While the exact number who previously had no drug coverage is unknown, it is likely that some if not most of these 11.6 million people had no coverage prior to enrolling in a Part D plan. Numerous studies and surveys have shown that prescription drug use is higher for those with health insurance than for the uninsured.

To forecast the impact of Medicare Part D on prescription drug utilization, analysts at the Centers for Medicare and Medicaid Services (CMS) were consulted. CMS predicted that total

²⁷ Medicare Prescription Drug Coverage Enrollment Update, June 2006. Henry J. Kaiser Family Foundation, publication No. 7453, posted at www.kff.org, accessed March 2007.

retail prescription drug spending would increase by 7.7 percent between 2005 and 2006.²⁸ This estimate included the impact of Part D implementation. Without Part D, CMS analysts predicted that there would have been an 8.1 percent growth in spending. While Medicare will fund a larger share of drug expenditures under part D, the overall rate of spending growth would be reduced due to price discounts and rebates under the program on the order of 27 percent, which would more than offset the increase in utilization.

While the focus of the CMS models and analyses was on predicting changes in drug spending, not utilization, CMS analysts provided a breakdown of the components underlying the projected increases (*Exhibit 31*):²⁹

Exhibit 31. Estimated Impact of Medicare Part D

	Population Changes	Increase in Drug Prices	Residual	Total Nominal Spending Increase
With Part D	0.9%	1.5%	5.2%	7.7%
Without Part D	0.9%	3.8%	3.2%	8.1%

After accounting for population changes and increases in drug prices, the residual is an approximation of the assumed increase in prescription drug utilization. Comparing the 5.2 percent residual growth in spending with Part D to the 3.2 percent residual without Part D suggests a 2 percent increase in overall retail drug utilization attributed to Part D.

Given that the majority of Medicare beneficiaries are age 65 and older and that the elderly consume approximately 35 percent of retail prescription drugs³⁰, an increase in retail prescriptions of 6 percent for the over 65 population was found to be consistent with the 2 percent overall increase.³¹ IMS Health reports that during January 2006, prescription volume for the age 65+ population was up 4 to 5 percent over the same period last year.³² For modeling, a permanent upward shift of 6 percent in prescriptions per physician office and per hospital outpatient visit for the age 65 and older population starting in 2006 was assumed.³³

C. Trends in Dispensing Setting, Practices, and Efficiency

The efficiency with which prescriptions are dispensed and the amount of time pharmacists spend per patient determines the number of pharmacists required given the demand for pharmaceuticals. Efficiency and time spent per patient varies by dispensing setting and practice, and the proportion of total prescriptions dispensed by setting will likely change over time.

²⁸ C. Borger et al, Health Spending Projections Through 2015: Changes on the Horizon. *Health Affairs* 25 (2006): w61-w73 (published online 22 February 2006; 10.1377/hlthaff.25.w61).

²⁹ Personal communication with John Poisal, Deputy Director, National Health Statistics Group, Office of the Actuary, Centers for Medicare and Medicaid Services, April 2006.

³⁰ Analysis of MEPS 2004 data.

³¹ 35 percent * r = 2 percent, which equates to r = 6 percent

³² IMS Health press release dated February 22, 2006.

³³ The estimated 6 percent increase in utilization comes primarily from the 10.4 million beneficiaries who enrolled in a stand-alone plan, as these people were less likely to have other coverage prior to part D. These stand-alone enrollees are about a quarter of the over 65 population, so a 6 percent overall increase would correspond to a 25 percent increase in utilization for the stand-alone enrollees.

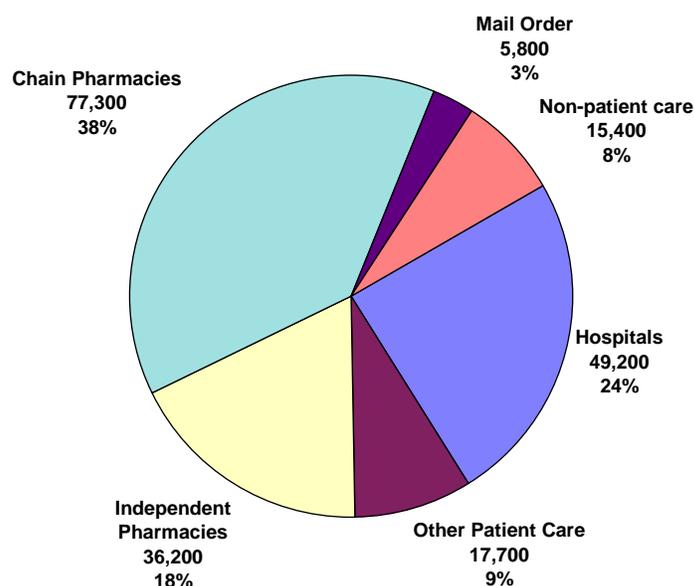
Consequently, in addition to modeling demand for pharmacists in non-patient care settings, demand for pharmacists in five dispensing settings: hospitals, independent pharmacies, chain drug stores (which is grouped with supermarkets and mass merchandisers), mail order, and other patient care (clinic pharmacies, home health, and nursing homes) were also modeled.

This section describes current practice patterns and trends in dispensing setting. Issues detailing with the role of pharmacists are discussed in a subsequent section.

1. Trends in Dispensing Location

Of the estimated 201,600 budgeted FTE pharmacist positions in 2004, the settings with the largest number of positions are chain pharmacies (77,300), hospitals (49,200), and independent pharmacies (36,200) (*Exhibit 32*).

Exhibit 32. FTE Pharmacist Demand by Dispensing Location: 2004



While demand for pharmaceuticals is projected to grow in each setting, this growth likely will be uneven for the following reasons:

- **Increase in pharmaceuticals for chronic conditions.** The elderly have higher prevalence of chronic conditions that require the continued use of pharmaceuticals. Mail order pharmacies will likely gain slightly in market share as a result of the increasing demand for medications to treat chronic conditions.
- **Efficiencies and cost competitiveness.** Hospitals and mail order pharmacies, as compared to retail pharmacies, are better able to take advantage of new technology that reduces the cost of filling prescriptions. The efficiency of mail order pharmacies allows them to fill prescriptions at lower cost than retail pharmacies. Insurers often require or set lower copays for prescriptions filled by mail order to help direct patients to use mail order when possible.

- **Market forces.** Mergers and acquisitions could result in some reallocation of market share between chain and independent pharmacies. Discount drug prices by stores such as Walmart could increase the proportion of prescriptions dispensed by mass merchandizers.

An analysis of IMS Health National Prescription Audit™ Plus data on retail (non-hospital) total dispensed prescriptions finds that each year between 2001 and 2005 market share (*Exhibit 33*):

- declined approximately 0.3 percentage points for chain pharmacies and food stores,
- declined approximately 0.4 percentage points for independent pharmacies,
- increased approximately 0.3 percentage points for nursing homes, and
- increased approximately 0.4 percentage points for mail order pharmacies.

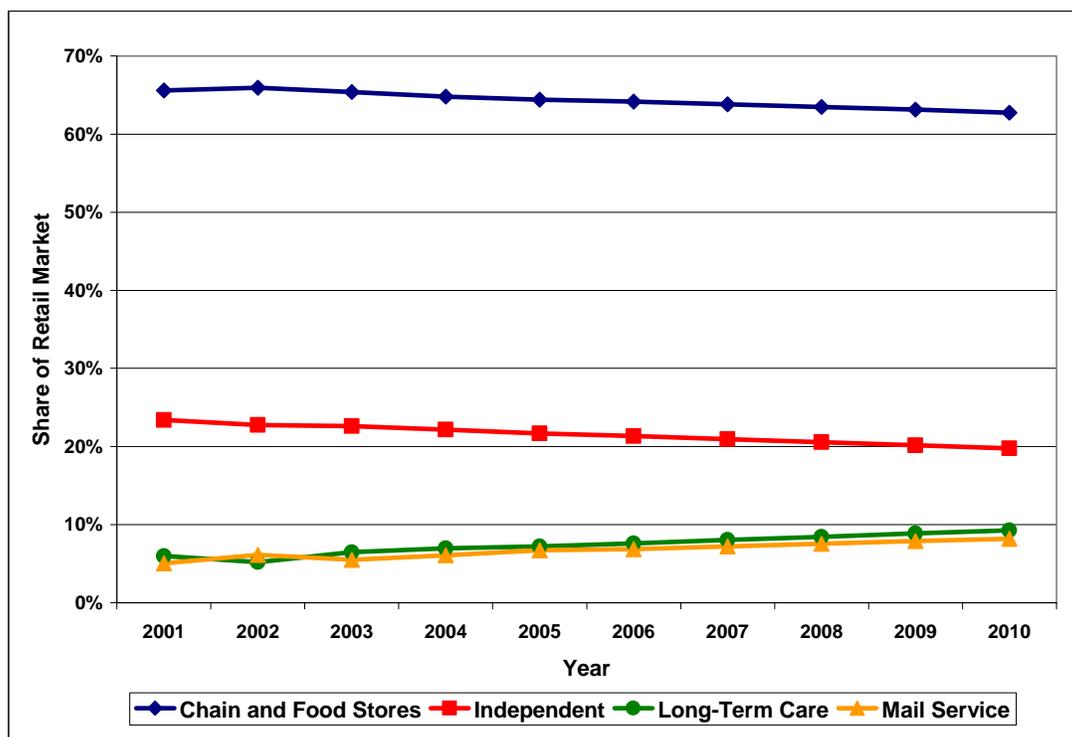
A linear trend using 2001 through 2005 data extrapolated to 2010 was modeled; it was assumed that market shares remain at their 2010 levels through 2030.

Importation of prescription products from Canada and other countries, ordered mostly through mail and courier services, accounted for less than 1 percent of total pharmacy sales in the United States in 2003.³⁴ IMS Health reports that cross-border importation of medications from Canadian Internet pharmacies declined by 23 percent between 2004 and 2005 (as measured by total sales volume in U.S. dollars), and that “importation is no longer as significant a market issue as it was two years ago.”³⁵

³⁴ U.S. Department of Health and Human Services Task Force on Drug Importation. *Report on Prescription Drug Importation*. December 2004. Posted at <http://www.hhs.gov/importtaskforce/Report1220.pdf>. Accessed March 2007. Estimates based on IMS Health data.

³⁵ IMS Health press release dated February 22, 2006.

Exhibit 33. Trend in Share of Total Dispensed Retail Prescriptions



Source: IMS Health National Prescription AuditTMPlus data for 2001 to 2005, shown with linear trend through 2010.

2. Role of the Pharmacist and Productivity Trends

Demand for pharmacists is derived largely from the demand for pharmaceuticals. For each prescription generated, pharmacists spend time dispensing the medication and counseling and educating the patient. Pharmacists also have administrative responsibilities, some of which are related to patient volume (e.g., ordering bulk medications). Pharmacists in some settings might be involved in research and other activities not directly related to patient care.

While historically the role of pharmacists has focused on dispensing, pharmacists report a desire to have greater involvement in patient education, counseling, and disease management.^{36, 37} According to the 2004 National Pharmacist Workforce Survey, pharmacists currently spend half their time dispensing medication and one-third in counseling and drug use management—but

³⁶ Knapp, DA. Professionally Determined Need for Pharmacy Services in 2002. *American Journal of Pharmaceutical Education*. Vol 66 (Winter 2002): 421-429.

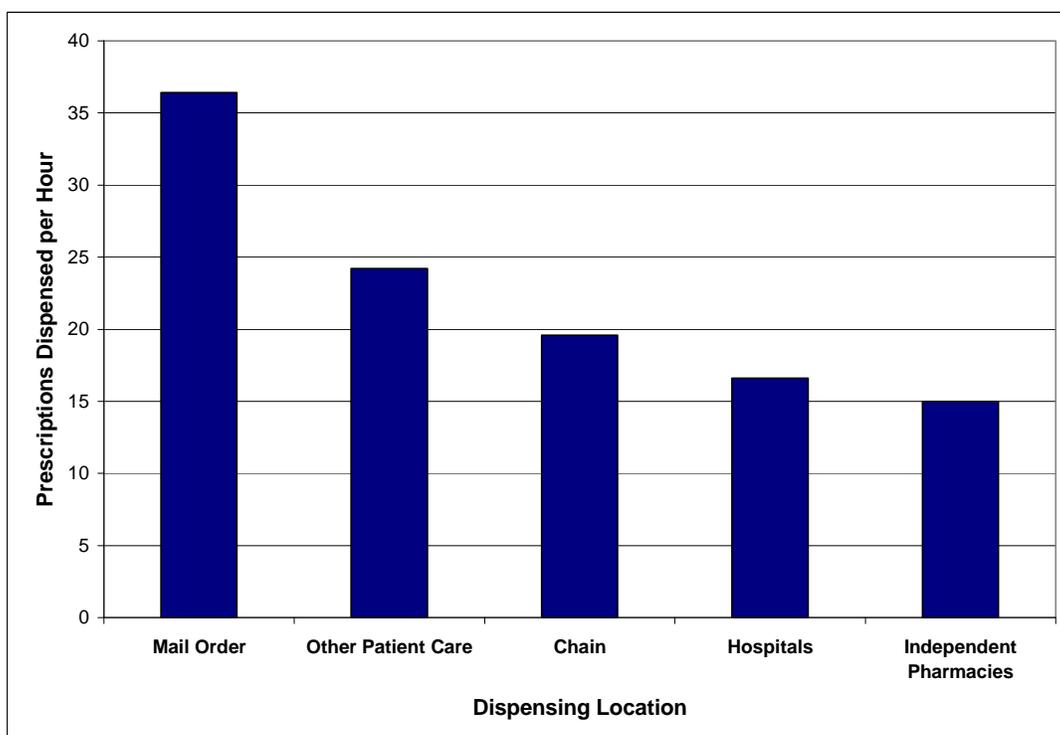
³⁷ Nester TM, Hale LS. Effectiveness of a pharmacist-acquired medication history in promoting patient safety. *American Journal of Health-System Pharmacy*. 2002;59(22):2221-2225. This study found that pharmacists were more likely to identify non-prescription medications and herbal preparations, discrepancies in previously documented allergy information, and inconsistencies and mistakes in patients' self reported medication histories than other health care professionals. The authors recommend pharmacists taking medication histories whenever possible.

they would like these proportions to be reversed.³⁸ Advances in pharmacology contribute to a need for pharmacists to interact more with patients. Drug therapy is becoming more complex, and pharmacists are often more knowledgeable than the prescribing physician regarding the possible drug interactions and side effects associated with new pharmaceuticals.

For a given level of pharmaceuticals demanded, the demand for pharmacists is dependant on the number of prescriptions filled per pharmacist—taking into account the amount of time per prescription spent dispensing, providing counseling/education, and other activities. The greater the average time spent per patient to fill a prescription, the larger the number of pharmacists required to serve a given population.

The use of automation and technology, pharmacy technicians, and other potentially productivity-enhancing activities varies by dispensing setting. In addition, the degree to which pharmacists are engaged in non-dispensing activities (e.g., consultation, management, research, etc.) varies by dispensing setting. Consequently, the average number of prescriptions dispensed per hour per pharmacist varies by dispensing setting with mail order pharmacies reporting the highest rate and independent pharmacies reporting the lowest rate (*Exhibit 34*).

Exhibit 34. Average Prescriptions Dispensed per Hour

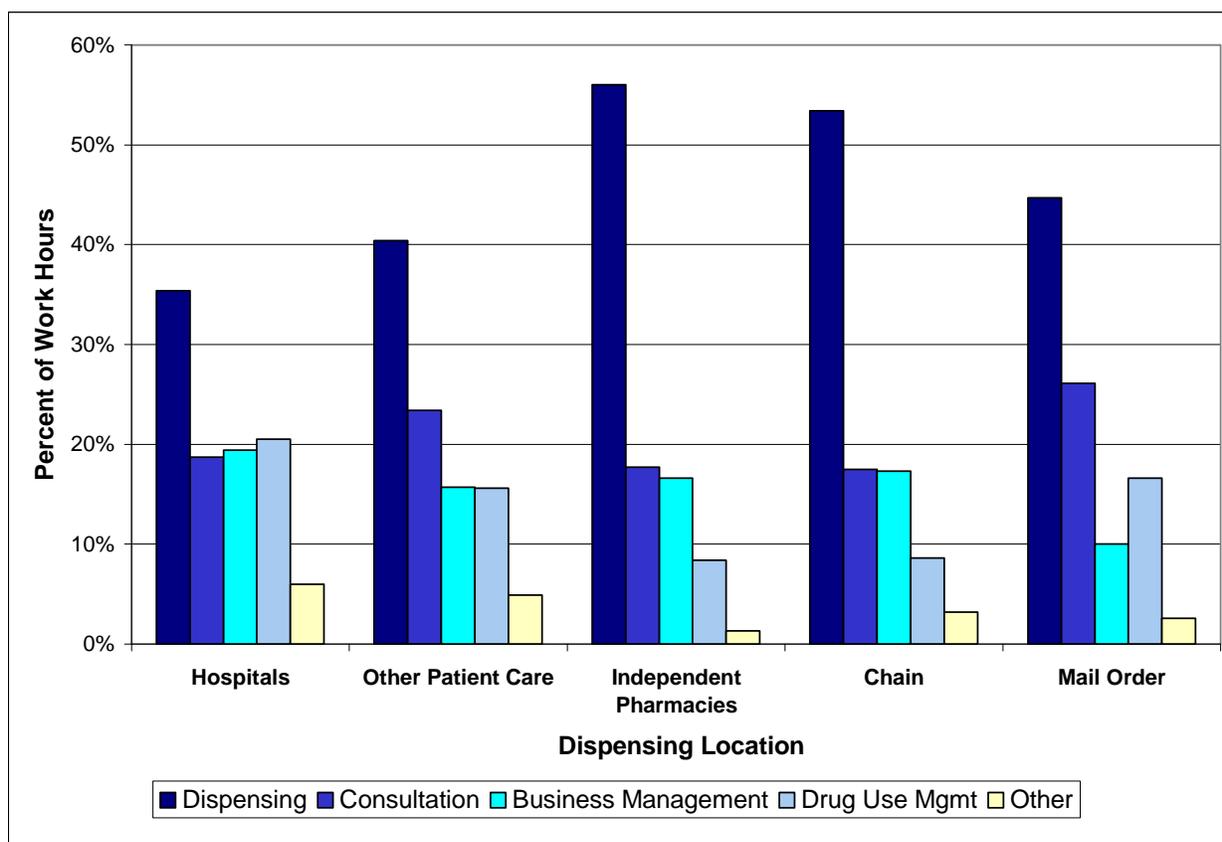


Source: 2004 NPWS analysis.

³⁸ Mott DA, Doucette WR, Gaither CA, et al. *Final Report of the National Sample Survey of the Pharmacist workforce to Determine Contemporary Demographic and Practice Characteristics*. Alexandria, VA: Pharmacy Manpower Project, Inc.; 2005.

Part of the variation in average number of prescriptions dispensed per hour is explained by how pharmacists allocate their time (*Exhibit 35*). Pharmacists in hospitals, for example, spend less time dispensing and more time in drug use management and other activities (e.g., research) compared to pharmacists in other settings. Independent pharmacies report the lowest rate of prescription dispensing per hour, yet have the largest portion of pharmacist time allocated to dispensing activities. This highlights the disparities across settings in ability to use labor-saving technologies, with automation more likely to occur in settings with high prescription volume. Mail order pharmacies, on the other hand, have the highest allocation of time to consultation and yet have the highest average number of prescriptions dispensed per hour.

Exhibit 35. Average Time Allocation Across Activities



Source: 2004 NPWS analysis.

3. Technological Advances

Technologies in use in pharmacies include automated systems for managing work flow, for receiving prescription orders, and for dispensing medications. Workflow management systems often incorporate automated checks for errors or possible drug interactions. Orders can be received using fax machines, interactive voice response systems, or over the Internet. The process of filling prescriptions can be automated to varying degrees, from counter top pill counting devices through robotic systems that count pills, fill bottles, and apply labels.

While the degree to which each type of technology is currently being used varies by setting, the vast majority of pharmacies currently use some type of automated order processing and some type of automated dispensing technology. According to a recent survey of community pharmacies in 18 metropolitan statistical areas of the United States, over 85 percent possessed at least one type of automated prescription processing technology.³⁹ The most common technology was the counter top pill counting device (62 percent). In a 2003 study, all four of the national retail chains surveyed, 85 percent of the regional chains, 73 percent of the independent pharmacies, and 92 percent of the hospitals surveyed had some kind of automated pill-counting system.⁴⁰

Many hospitals and high volume pharmacies employ costlier robotic dispensing systems. In a 2005 national hospital survey, 15 percent of hospitals used a robotic distribution system, with 40 percent of larger hospitals (those with over 400 staffed beds) using robots. The use of robots in hospitals has been steadily increasing, with only 4.5 percent of hospitals using robots in 1999, and 7.8 percent in 2002.⁴¹

Nearly all community pharmacies employ some type of automated telecommunication system for processing orders, with 85 percent using more than one source. Over 85 percent of community pharmacies have fax machines available, and 83 percent offered automated phone systems to process refills. While electronic prescribing has been slow to reach critical mass among health care providers, 65 percent of community pharmacies report Internet availability to process refill orders (Skrepnek, 2006).

Automation has the potential to both increase productivity and reduce errors. A number of before-and-after observational studies have been conducted at retail pharmacies, showing reductions in time spent dispensing medications on the order of 10 to 15 percent. Differences in pharmacist productivity across settings and the corresponding differences in use of technology would also point to productivity gains through technology. However, some studies have shown that automation increases numbers of prescriptions dispensed per pharmacist, but does not increase counseling rates or patient satisfaction.⁴²

Electronic-prescribing (or “e-prescribing”) offers the potential for moderate improvements in pharmacist productivity. A recent study measured the time to process new prescriptions (n=400) and renewed prescriptions (n=400) using four prescription submission methods: e-prescription, walk-in by the patient, phone-in by the health provider, and fax-in by the health provider.⁴³ This study found that the amount of pharmacist time needed to process a new prescription was lower for e-prescribing versus other prescription submission methods, but renewed prescriptions walk-in required less processing time than other forms of submission (*Exhibit 36*). NACDS reports

³⁹ Skrepnek GH, Workload and Availability of Technology in Metropolitan Community Pharmacies, *Journal of the American Pharmacists Association*, 2006; 46(2): 154-160.

⁴⁰ The Thompsen Group Inc., *Market Survey of Pharmacy Technology and Automation in Retail and Outpatient Pharmacy*, published online in *Retail Pharmacy Management* in November/December 2003.

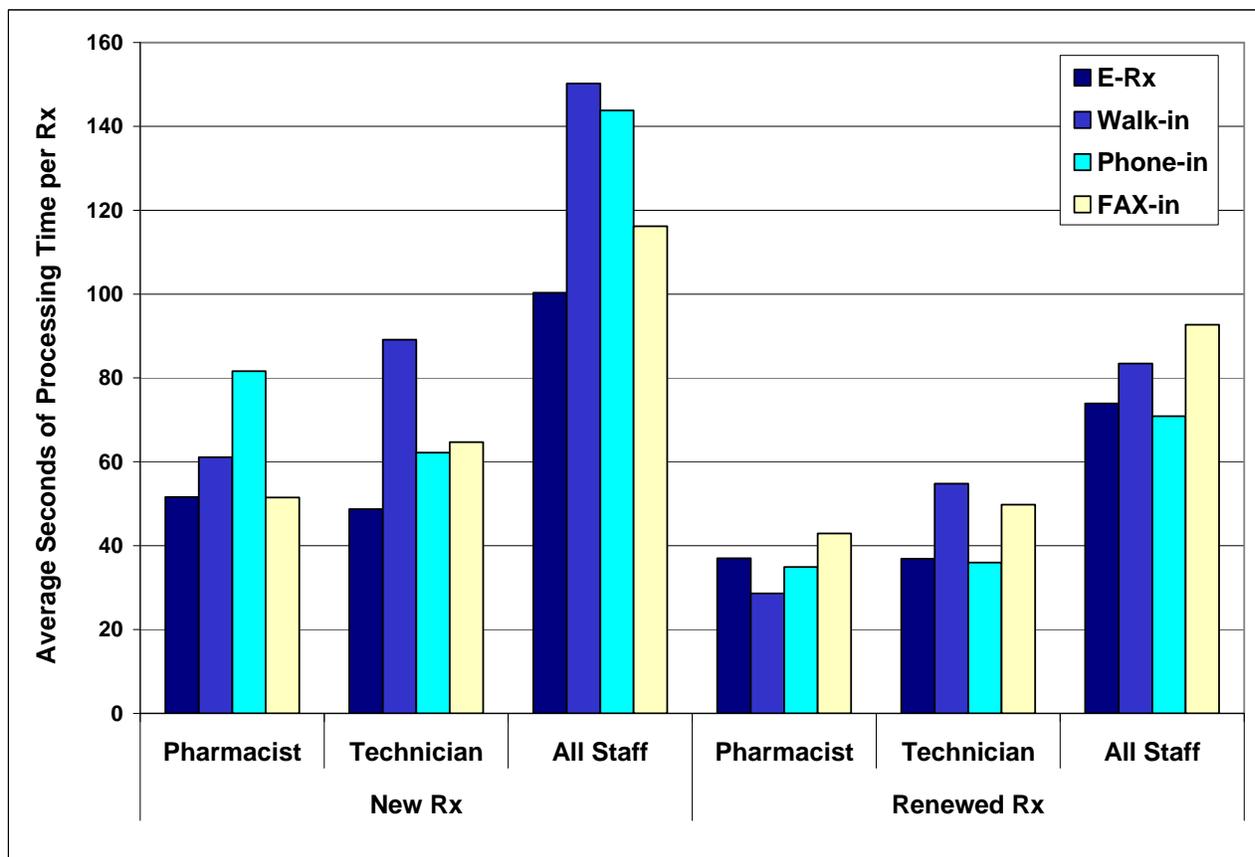
⁴¹ Pedersen CA, ASHP National Survey of Pharmacy Practice in Hospital Settings: Dispensing and Administration – 2005, *American Journal of Health-System Pharmacy*, 2006; 63(4):327-45.

⁴² Angelo LB, Impact of Community Pharmacy Automation on Workflow, Workload, and Patient Interaction, *Journal of the American Pharmacists Association*, 2005; 45:138-144.

⁴³ Rupp MT. E-Prescribing: The value Proposition. *America's Pharmacist*, 2005, 23-25.

that less than 1 percent of prescriptions written by doctors in 2004 were delivered via e-prescription. As of June 2005, 49 States allowed e-prescribing.⁴⁴

Exhibit 36. Differences in Rx Processing Time by Prescription Submission Method



Source: Rupp MT. April 2005. E-Prescribing: The value Proposition. *America's Pharmacist*.⁴⁵

The technology exists, and is already in use in some settings, to automate the majority of the dispensing process, from the transfer of the prescription, through automated checking for errors or harmful interactions, through robotic pill counting, bottle filling, and labeling, to delivery to the patient. Overseen by pharmacists and implemented by properly trained and certified pharmacy technicians, full implementation of technology would allow the pharmacist's role to be primarily one of supervision, patient and provider counseling, and medication management. Barriers to this practice model are technology investment and maintenance costs, reimbursement mechanisms for pharmacists' time, and the need for greater integration of pharmacists into the patient care team.

Robotic systems can cost upwards of \$200,000 per installation, making them cost-effective only in high volume pharmacies. Most insurance programs pay pharmacists only for drug dispensing services. There is still a lack of widespread recognition on the part of physicians, other

⁴⁴ NACDS 2005 Chain Pharmacy Industry Profile. E-prescribing is not addressed in Nebraska's regulations, and e-prescribing is prohibited in the District of Columbia.

⁴⁵ <http://www.surescripts.com/pdf/PharmacyROIDocument.pdf>. Accessed March 2007.

providers, and general public, on the use of pharmacists as the primary patient care resource for medication issues.

There is some evidence that these barriers are beginning to erode, particularly with regard to reimbursement for non-dispensing activities. The Medicare part D benefit plan requires medication therapy management services, which may be delivered by a pharmacist, for specific enrollees. It remains to be seen whether medication management will become widespread as a benefit in private drug insurance plans, and whether the profession will be successful in marketing the benefits of its expertise.

D. Future Pharmacist Requirements

Using the PhSRM, a range of future requirements for pharmacists under alternate assumptions based on numbers of prescriptions (RXs) per capita was projected:

A low Rx/capita growth scenario assumes that current patterns of pharmaceutical use and dispensing will continue into the future, incorporating the following trends:

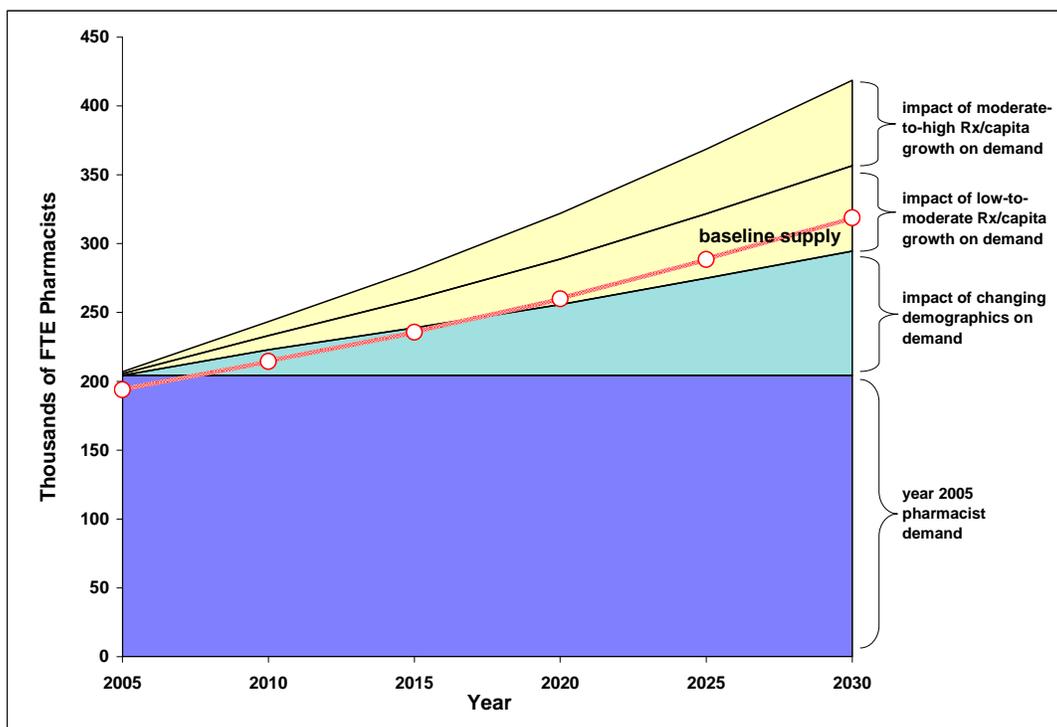
- A growing and aging population will consume more pharmaceuticals,
- No growth in prescriptions written per physician visit (controlling for age and health care delivery setting),
- Improvements in the efficiency of dispensing pharmaceuticals due to technological innovations will be offset by increases in the proportion of pharmacist time spent counseling patients, and
- The proportion of retail pharmaceuticals dispensed from mail order and nursing-home based pharmacies will rise slightly.

A high Rx/capita growth scenario is based on the above scenario, but assumes that prescriptions written per physician visit will increase over time as new medications become available (in addition to increased Rx/capita due to an aging population). The assumed annual rate of growth is the average increase in prescriptions dispensed per physician visit over the period 1995 to 2004, with the increase in per capita use of pharmaceuticals varying by age group and outpatient setting (office visit, emergency visit, hospital outpatient visit). (Prescriptions dispensed per hospital admission is modeled the same for each demand scenario, using pharmacist-to-inpatient day ratios that remain over time for each age group).

A moderate Rx/capita growth scenario takes the midpoint between the low and high Rx/capita growth scenarios, which is equivalent to an annual growth in prescriptions written per physician visit that is half the annual 1995 to 2004 average increase.

Under the low Rx/capita, moderate growth, and high growth scenarios, annual growth in demand for pharmacists between 2005 and 2020 is, respectively, 1.4 percent, 2.3 percent and 2.9 percent (*Exhibit 37*). Between 2005 and 2020, the growth and aging of the population will increase demand for pharmacists from 204,300 to 255,700 (a 51,400 increase). Moderate growth in Rx/capita will likely increase demand by an additional 33,100 pharmacists, bringing the total demand in 2020 to 288,800. High growth in Rx/capita could increase demand by an additional 33,100 pharmacists, bringing the total demand to 321,900.

Exhibit 37. Components of Growth in Pharmacist Requirements

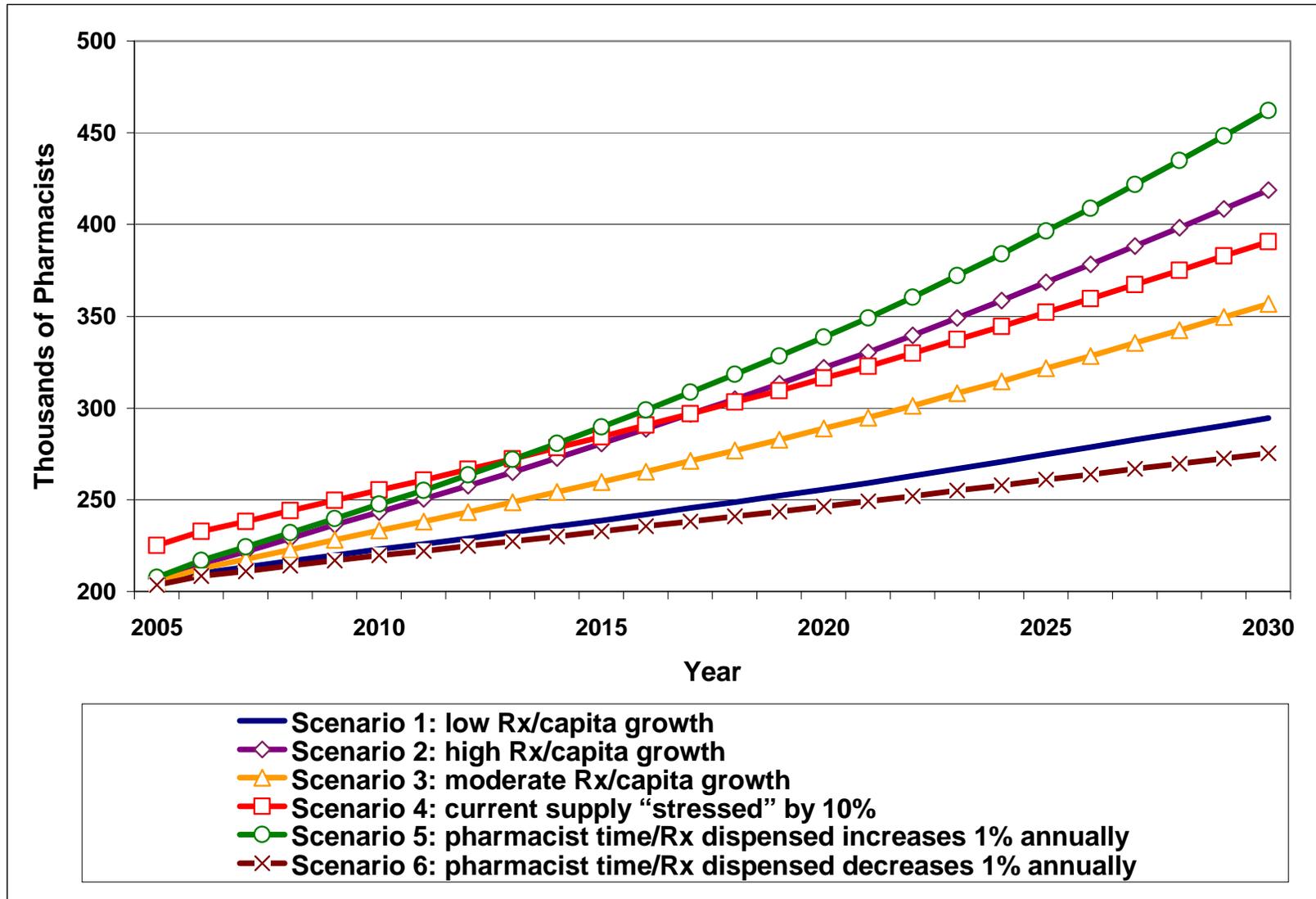


Source: Projections from the PhSRM.

- In addition to the above three scenarios for Future Pharmacist Requirements, which assumed different rates of growth in prescriptions per capita, three additional scenarios were modeled in order to test the sensitivity of the projections to alternate assumptions regarding hours worked by pharmacists and their productivity. Results are presented in *Exhibits 38* and *39*.
- **The current pharmacy system is stressed, with pharmacists working approximately 10 percent more hours per week than is desirable.** This scenario starts with the moderate growth scenario but assumes that base year demand is equal to vacancies plus 1.1 times base year FTE supply. Under this scenario the shortfall of pharmacists in the base year is 29,500 (10,400 actual vacancies plus an additional 19,100 FTE pharmacist positions filled by pharmacists working more hours than is desirable).
- **The amount of pharmacist time needed per prescription increases by 1 percent per year** (compounding to a 28 percent increase by 2030) reflecting pharmacists spending more time counseling patients to reflect a greater role of pharmacists in patient care and the increasing complexity of new drugs. This scenario starts with the moderate growth scenario but incorporates this increase in pharmacist time spent per prescription.
- **The amount of pharmacist time needed per prescription decreases by 1 percent per year** (compounding to a 22 percent decrease by 2030) reflecting productivity gains from the adoption of new technologies and increased use of pharmacy technicians.

Note that a combination of the latter two scenarios is largely offsetting; productivity gains from improved technology and use of pharmacy technicians could allow pharmacists to spend more time providing counseling to patients without affecting overall pharmacist requirements.

Exhibit 38. Projected Pharmacist Requirements Under Alternate Scenarios



Source: Projections from the PhSRM.

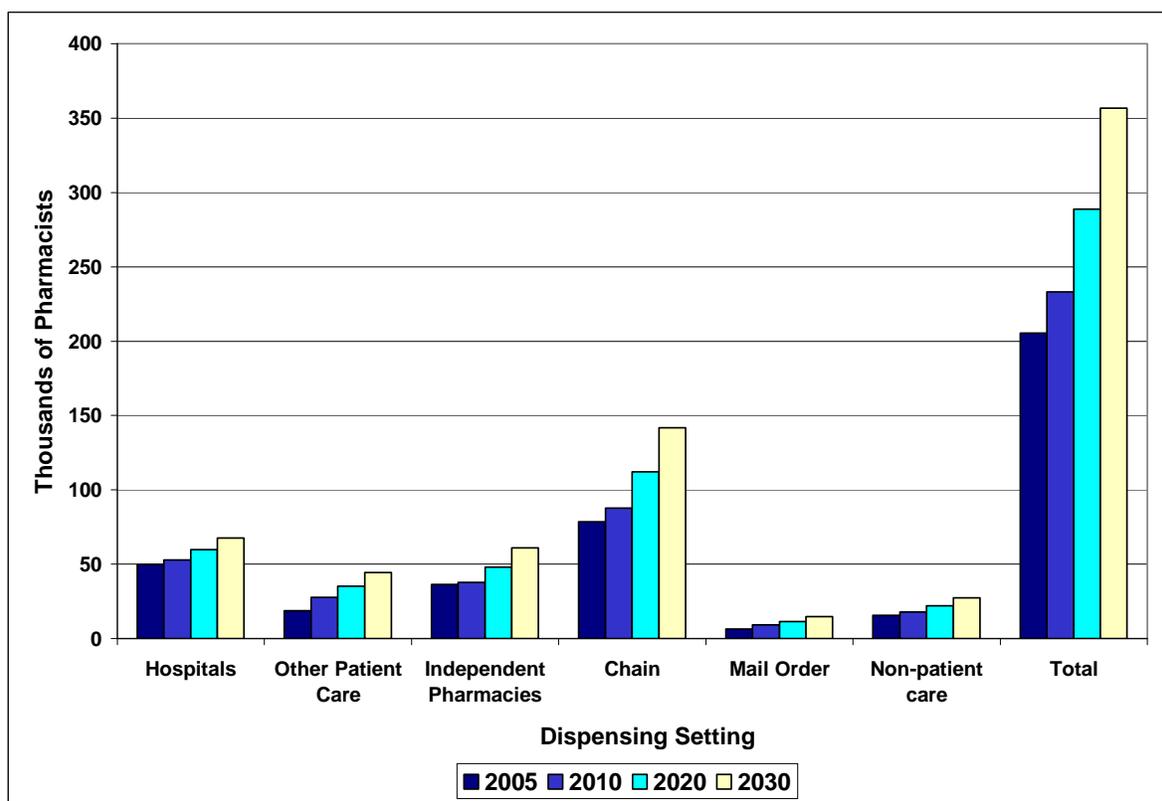
Exhibit 39. Projected FTE Pharmacist Requirements

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Year	Low Rx/capita growth	High Rx/capita growth	Moderate Rx/capita growth	Current supply “stressed” by 10%	Pharmacist time per prescription dispensed increases 1% annually	Pharmacist time per prescription dispensed decreases 1% annually
2004	201,600	201,600	201,600	220,700	201,600	201,600
2005	204,300	206,800	205,500	225,000	207,700	203,500
2006	210,000	215,200	212,500	232,700	216,800	208,400
2007	213,200	221,900	217,600	238,200	224,300	211,100
2008	216,600	229,000	222,900	244,000	231,900	214,200
2009	219,700	236,300	228,100	249,700	239,700	216,900
2010	223,000	243,400	233,200	255,300	247,700	219,700
2011	225,900	250,500	238,200	260,800	255,200	222,000
2012	228,900	257,600	243,400	266,500	263,600	224,900
2013	232,300	265,200	248,700	272,300	272,000	227,500
2014	235,500	272,800	254,200	278,300	280,700	230,100
2015	238,800	280,700	259,800	284,400	289,700	232,900
2016	242,100	288,600	265,400	290,600	299,000	235,500
2017	245,500	296,800	271,100	296,800	308,500	238,100
2018	248,700	304,900	276,900	303,200	318,400	240,900
2019	252,300	313,300	282,700	309,500	328,300	243,500
2020	255,700	321,900	288,800	316,200	338,500	246,300
2021	259,200	330,500	294,800	322,800	349,000	249,100
2022	263,000	339,700	301,300	329,900	360,500	252,000
2023	266,800	349,000	308,000	337,200	372,200	255,000
2024	270,700	358,600	314,600	344,400	383,900	257,800
2025	274,800	368,500	321,600	352,100	396,400	261,100
2026	278,700	378,400	328,400	359,500	408,900	263,900
2027	282,700	388,200	335,600	367,400	421,800	266,900
2028	286,700	398,400	342,500	375,000	434,900	269,800
2029	290,400	408,600	349,600	382,800	448,300	272,600
2030	294,500	418,800	356,700	390,500	462,000	275,300

Source: Projections from the PhSRM.

As illustrated using the moderate Rx/capita growth scenario projections, chain retailers will continue to employ the majority of pharmacists, followed by hospitals, independent pharmacies, other patient care setting employers, non-patient care employers, and mail order pharmacies (*Exhibits 40*).

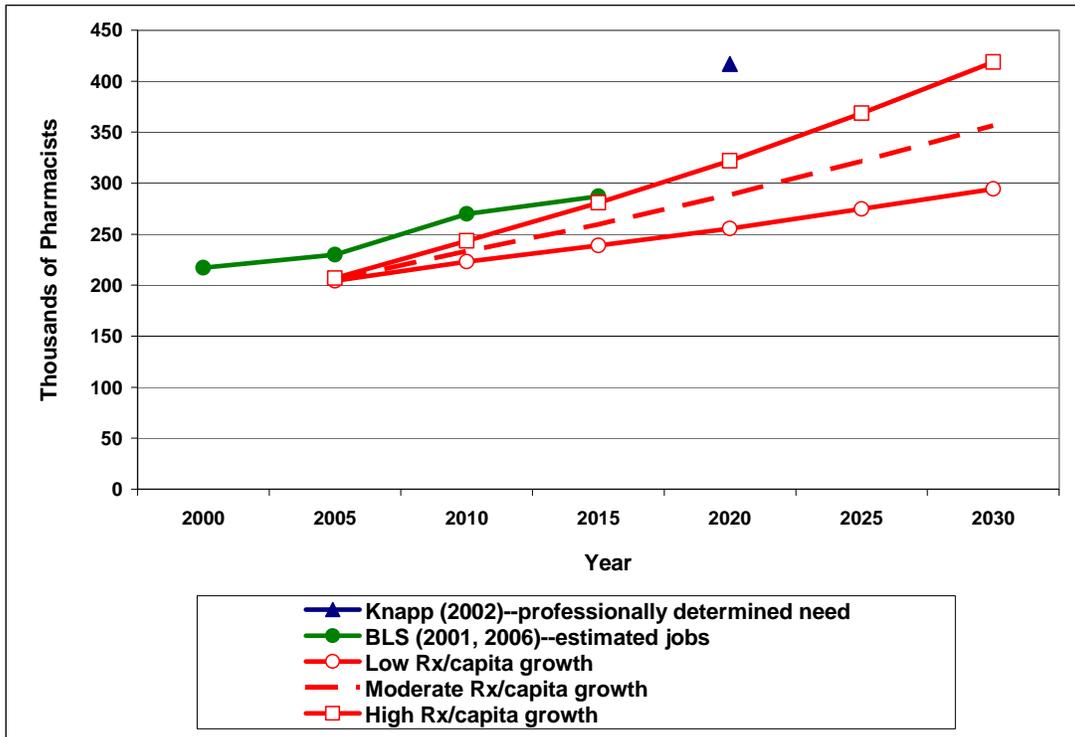
Exhibit 40. Projected Requirements by Dispensing Location: Moderate Rx/Capita Growth Scenario



Source: Projections from the PhSRM.

Few pharmacist requirements projections have been published, and the projections that have been published are not directly comparable (*Exhibit 41*). BLS (2001) estimates there were 217,000 pharmacist jobs in 2000 and projected 270,000 jobs in 2010. BLS (2006) estimates there were 230,000 pharmacist jobs in 2004 and projects 287,000 jobs in 2014. FTE positions and number of jobs are not equivalent, with some pharmacists working part-time jobs. Knapp (2002) reports that a conference attended by approximately two dozen pharmacy workforce experts concluded that by 2020 there would be an estimated need for 417,000 FTE pharmacists. This estimate assumes that in the future there will be a greatly increased need for pharmacists to provide primary services—a more than five-fold increase from the estimated 30,000 FTE pharmacists providing primary services in 2001 to 165,000 FTEs by 2020. Similarly, there would be a more than seven-fold increase in the number of FTE pharmacists providing secondary/tertiary services (130,000 FTEs in 2020 compared to 18,000 FTEs in 2001). The needs-based estimate reported by Kapp envisions a very different role for pharmacists in the future compared to the demand-based projections presented in this report.

Exhibit 41. Comparison of Pharmacist Requirements Projections



Source: Projections from the PhSRM.

IV. CURRENT AND FUTURE ADEQUACY OF PHARMACIST SUPPLY

The Bureau of Labor Statistics defines a shortage in a market economy as a situation “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.” While this report looks at the current shortfall of pharmacists, the focus of this study is to assess the future adequacy of supply taking into consideration key trends in supply and demand determinants.

While there is evidence of a current national shortage of pharmacists, the size of the shortage seems to have declined in recent years. A 2004 study by the American Society of Health-System Pharmacists reports that 5 percent of hospitals’ budgeted pharmacist positions were vacant—a decline from 8.9 percent in 2000.⁴⁶ A July 2004 survey by the National Association of Chain Drug Stores (NACDS) Foundation found that chain store pharmacies reported approximately 4,000 vacancies (a vacancy rate of 5 percent).⁴⁷ Combining information from different sources, it was estimated that in 2004 (the base year for the projection model) there were an estimated 10,400 unfilled FTE positions across all settings that employ pharmacists, or a vacancy rate of approximately 5 percent.⁴⁸

The Pharmacy Manpower Project, sponsored by a consortium of organizations interested in collecting, analyzing, and disseminating data on the adequacy of pharmacist supply, developed the Aggregate Demand Index (ADI) to track the level of employer difficulty in hiring pharmacists over time and across States. The ADI suggests that in March 2007 most employers across the Nation were experiencing some difficulty in filling open positions, with the level of difficulty down slightly from March 2006. Among the 50 States plus the District of Columbia, the ADI suggests that 46 States are experiencing some difficulty filling open positions, three States (Alabama, Kentucky and California) report significant difficulty filling open positions, and two States (Rhode Island and Vermont) report that supply seems to be in balance with demand in their State.⁴⁹ No States reported having an excess supply of pharmacists.

The shortfall of pharmacists has contributed to rising earnings for pharmacists, with an analysis of BLS data finding that average salaries for pharmacists have risen about 6 percent per year over the past several years. The median compensation for pharmacists in the United States is approximately \$100,000.⁵⁰ Rising compensation levels have the following short term impacts on supply: (1) some inactive pharmacists are drawn back into the labor force, (2) some pharmacists work more hours (e.g., working full time instead of part time, or working multiple jobs), (3) some pharmacists work fewer hours (e.g., finding that their pay is adequate working just one full time job and no longer needing to work multiple jobs), and (4) some pharmacists delay retirement. In the longer term, interest in pharmacy as a profession rises and more people enroll in schools of pharmacy. Rising salaries also depress demand for pharmacists, with some pharmacies reducing hours rather than pay higher labor costs, and some pharmacies investing in

⁴⁶ 2004 and 2005 Annual Pharmacy Staffing Survey Results. Available at <http://www.ashp.org>. Accessed March 2007.

⁴⁷ NACDS Foundation July 2004 Chain Pharmacy Employment Survey Results. Available at <http://www.nacds.org>. Accessed March 2007.

⁴⁸ Some economists might argue that a 5 percent vacancy rate does not reflect a shortfall, but rather reflects normal turnover and the normal time lag between when a position becomes available and when it is filled.

⁴⁹ Available at <http://www.pharmacymanpower.com>. Accessed March 2007.

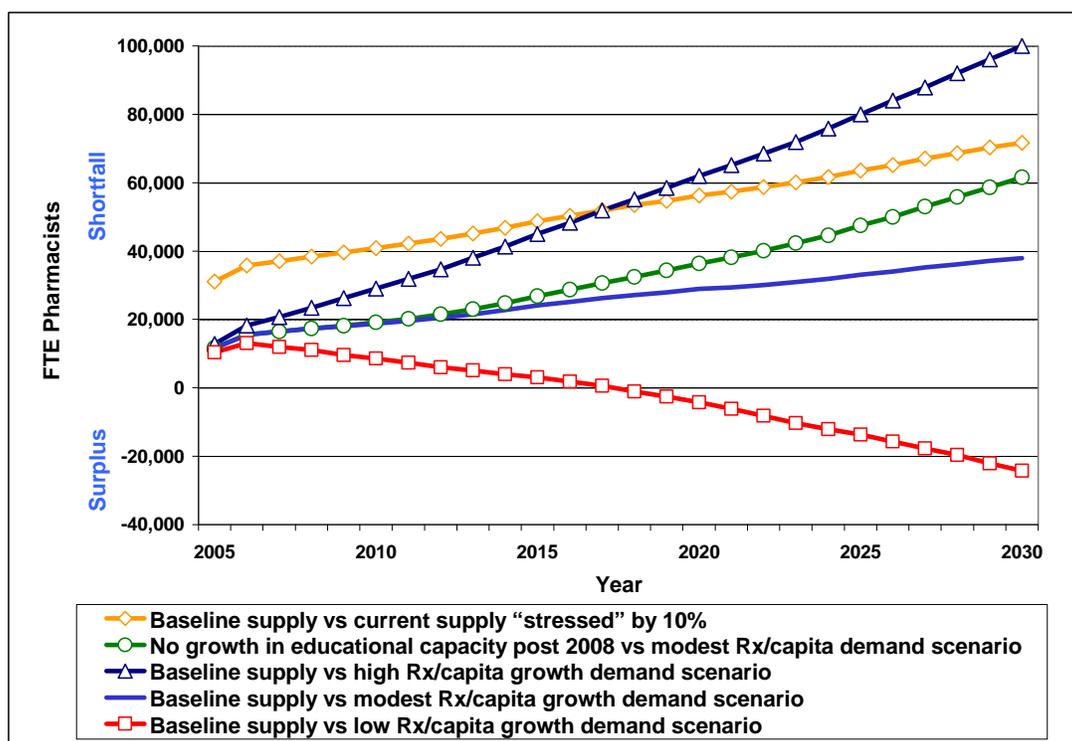
⁵⁰ Salary and benefits information obtained from <http://www.salary.com>. Accessed March 2007.

equipment and non-pharmacist labor (e.g., technicians) to increase the productivity of their existing pharmacists.

Political and regulatory forces also influence the adequacy of pharmacist supply. The National Association of Boards of Pharmacy (NABP) conducts an annual Survey of Pharmacy Law documenting the laws, rules, and regulations that govern pharmacy in each State, the District of Columbia, and Puerto Rico. Comparing the 2000-01 Survey of Pharmacy Law to the 2006 edition, eleven States, or 20 percent, have increased or eliminated the maximum allowable ratio of pharmacist technicians to pharmacists in ambulatory care settings. Between 2000 and 2006, the number of States allowing technicians to compound medications for dispensing increased from 39 to 48, and the number of States allowing technicians to call physician offices for refill authorization increased from 34 to 40. Since HRSA's 2000 *Report to Congress - The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists*, the number of pharmacy technicians employed has increased significantly. BLS reports a nearly 40 percent increase in numbers of pharmacy technicians, from about 191,000 in 2000 to nearly 267,000 in 2005. BLS figures on pharmacists over this same time period show an 8 percent increase.

Comparison of the baseline supply and demand projections produced for this report suggests that the future supply will be adequate only when combining an optimistic supply scenario with a conservative demand scenario (*Exhibits 42 and 43*). Growth in supply is sufficient to serve the projected demand of a growing and aging population only if per capita consumption of pharmaceuticals remains at current levels. Per capita consumption is likely to grow, however, as new medical advances increase the types of diseases that can be treated and new preventive medicines are discovered.

Exhibit 42. Pharmacist Shortfall under Alternate Scenarios



Source: Projections from the PhSRM.

Exhibit 43. FTE Shortfall Projections

Demand Scenario:	Likely Scenario				Shortfall Under Alternate Scenarios			
	Supply Scenario:	Moderate Rx/capita Growth	Shortfall		High Rx/capita Growth	Low Rx/capita Growth	Moderate Rx/capita Growth	Moderate Rx/capita Growth with Current System Stressed by 10%
					Baseline	Baseline	No Growth in Educational Capacity Post 2008	Baseline
2004	191,200	201,600	10,400	5%	10,400	10,400	10,400	29,500
2005	193,900	205,500	11,600	6%	12,900	10,400	11,600	31,100
2006	196,900	212,500	15,600	7%	18,300	13,100	15,600	35,800
2007	201,200	217,600	16,400	8%	20,700	12,000	16,400	37,000
2008	205,600	222,900	17,300	8%	23,400	11,000	17,300	38,400
2009	210,100	228,100	18,000	8%	26,200	9,600	18,100	39,600
2010	214,400	233,200	18,800	8%	29,000	8,600	19,100	40,900
2011	218,600	238,200	19,600	8%	31,900	7,300	20,200	42,200
2012	222,900	243,400	20,500	8%	34,700	6,000	21,500	43,600
2013	227,200	248,700	21,500	9%	38,000	5,100	23,000	45,100
2014	231,500	254,200	22,700	9%	41,300	4,000	24,800	46,800
2015	235,700	259,800	24,100	9%	45,000	3,100	26,800	48,700
2016	240,300	265,400	25,100	9%	48,300	1,800	28,700	50,300
2017	244,900	271,100	26,200	10%	51,900	600	30,600	51,900
2018	249,800	276,900	27,100	10%	55,100	-1,100	32,400	53,400
2019	254,800	282,700	27,900	10%	58,500	-2,500	34,300	54,700
2020	259,900	288,800	28,900	10%	62,000	-4,200	36,400	56,300
2021	265,400	294,800	29,400	10%	65,100	-6,200	38,100	57,400
2022	271,200	301,300	30,100	10%	68,500	-8,200	40,100	58,700
2023	277,100	308,000	30,900	10%	71,900	-10,300	42,300	60,100
2024	282,800	314,600	31,800	10%	75,800	-12,100	44,600	61,600
2025	288,500	321,600	33,100	10%	80,000	-13,700	47,500	63,600
2026	294,400	328,400	34,000	10%	84,000	-15,700	50,000	65,100
2027	300,400	335,600	35,200	10%	87,800	-17,700	53,000	67,000
2028	306,400	342,500	36,100	11%	92,000	-19,700	55,800	68,600
2029	312,500	349,600	37,100	11%	96,100	-22,100	58,600	70,300
2030	318,800	356,700	37,900	11%	100,000	-24,300	61,500	71,700

Source: Projections from the PhSRM.

V. CONCLUSIONS

This study looked at the trends in pharmacist supply and demand determinants to assess the current and future adequacy of supply. These trends include changes in technology, distance and distributive learning models, growth and aging of the population, expansion of the Nation's pharmacy school capacity, and other developments (e.g., creation of the Medicare Part D Program) that have occurred since HRSA's 2000 *Report to Congress - The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists*. This section contains a summary of key findings and their implications, as well as the study strengths, limitations, and areas for future research.

A. Summary of Key Findings and Implications

Pharmacies across the Nation continue to experience some difficulty in filling vacancies, but the severity of the shortfall appears to have diminished somewhat since HRSA's 2000 Report to Congress. Several factors help explain the improvement in adequacy of supply.

- The Nation has increased its supply of pharmacy technicians and has increased the scope of practice of these technicians. As the technician-to-pharmacist ratio increases, however, the Nation cannot continue to rely on producing more technicians to reduce the shortfall of pharmacists.
- Rising wages for pharmacists has both provided an incentive for pharmacists to remain in the workforce and for pharmacies to scale back their hiring needs.
- Improved technology continues to make pharmacists more productive.

In response to high pharmacist vacancy rates, rising pay, and concerns over a growing shortfall, the Nation's educational capacity has expanded and an increasing number of people have chosen pharmacy as a career. The Nation's educational capacity has expanded through the opening of new schools, as well as increased enrollment at existing schools. The number of colleges and schools of pharmacy with accredited professional degree programs rose from 82 in 2000 to 92 by 2005. AACP predicts that 110 programs will be open by Fall 2010. The number of graduates from pharmacy schools has increased from 7,300 in 2000 to 9,100 in 2005. The use of distance learning models in pharmacy education has expanded since the 2000 Report to Congress, and has contributed to the growth in existing training programs. Raising the minimum education level (to a Pharm.D) for new pharmacists does not appear to have reduced the desirability of pharmacy as a career. The Nation's ability to continue expanding its educational capacity is threatened by a potential shortfall of faculty, with a large proportion of faculty nearing retirement and wages for faculty falling behind the wages for pharmacists in retail settings.

The projections suggest that only when combining an optimistic supply scenario with a conservative demand scenario will future supply be adequate to meet the needs of a growing and aging population. However, under most scenarios modeled, supply will be insufficient to meet the needs of a population caused by growth in per capita consumption of pharmaceuticals.

The demand projections assume that the role of pharmacists will remain largely unchanged over the projection horizon. With the Pharm.D now the minimum educational requirement for entry into the workforce, new pharmacists have greater ability than do earlier cohorts to take on

increasing responsibilities in patient management and counseling. Participants at a 2002 conference discussed the number of pharmacists that would be needed to deliver high-quality care under a scenario where pharmacists play a larger role in patient care management. These participants concluded that an estimated 417,000 pharmacists would be needed by 2020 (approximately 128,000 more than calculated under our moderate Rx/capita growth demand scenario), which when compared to our baseline supply projections suggests a shortfall of approximately 157,000 pharmacists in 2020.⁵¹ An expanded role for pharmacists can occur only if a reimbursement mechanism is instituted to pay pharmacists for such services. The Medicare Modernization Act of 2003 has opened the door for pharmacists to receive reimbursement for medication therapy management services for a select number of high-drug-utilization Medicare beneficiaries.⁵²

Women constitute a growing proportion of active pharmacists. Currently, half of all active pharmacists are women. By 2020, approximately 62 percent of active pharmacists will be women. Female pharmacists tend to work fewer hours per year than their male colleagues, so FTE supply will grow at a slightly lower rate than active supply.

Racial minorities continue to be underrepresented in the pharmacist workforce. In the 2000 Census, 25 percent of the U.S. population indicated they are in a racial minority group, while only 18 percent of individuals self-identified as pharmacists indicated they are in a racial minority group.

The role of pharmacists in the future is closely linked to the adequacy of supply. Pharmaceuticals are becoming more complex, and with a growing elderly population an increasing number of patients take multiple medications. Consequently, the demand for counseling and education by pharmacists continues to rise. The baseline demand projections presented in this report assume that pharmacists will spend an increasing proportion of their time providing counseling and educating patients. Such a shift in work activities will be made possible by rising pharmacist productivity made possible through greater use of pharmacy technicians and improved technology that reduces the time per prescription spent dispensing and performing administrative duties.

This study focused on the national adequacy of pharmacist supply, although geographic inequities exist in access to pharmacist services. Consequently, there continues to be a role for programs such as the National Health Service Corps Chiropractor and Pharmacist Loan Repayment Demonstration that uses financial aid as a means to recruit and retain pharmacists in hard-to-employ settings such as rural areas, low-income urban areas, and select Federal institutions such as prisons.

B. Study Strengths, Limitations, and Areas for Future Research

The findings of this study reflect an extensive review of the literature, empirical analysis, and discussions with area experts. The major strengths of this study include the following:

⁵¹ Knapp, David A. Professionally Determined Need for Pharmacy Services in 2002. *American Journal of Pharmaceutical Education*. Vol 66 (Winter 2002): 421-429.

⁵² DaVanzo J, Dobson A, Koenig L, and Book R. *Medication Therapy Management Services: A Critical Review*. Report prepared by The Lewin Group for the American Pharmacist Association. May 2005.

- The pharmacist supply and demand projections come from a workforce model developed based on a wide body of literature regarding the important components of pharmacist supply and demand, as well as empirical research that reflects current trends in supply and demand determinants.
- The supply projections reflect the recent surge in enrollment and graduations from schools of pharmacy. This surge is largely in response to the current shortfall of pharmacists (with the resulting rise in wages and job opportunities) and previous studies that suggested the shortfall of pharmacists would continue to grow. Other components of the supply model have also been updated (e.g., retirement and workforce participation patterns).
- This study quantifies the projected future demand for pharmacists, whereas most previous work provides only a qualitative assessment of future demand.
- The Pharmacist Supply and Requirements Model was designed so that frequent updates of supply and demand projections could be made to quickly analyze the implications of changes in supply and demand determinants, as well as analyze the implications of policy decisions affecting supply or demand.

The major limitations of this study include the following:

- The base year demand for pharmacists is only an estimate, with demand defined as FTE employment plus FTE vacancies. If the current system is overstretched such that pharmacists are working more hours than is desirable (either from a quality of services perspective or a quality of life perspective), then this definition of current demand might underestimate true demand for pharmacists. Underestimates of demand in the base year are extrapolated into the future.
- There is substantial uncertainty regarding changes in some demand determinants—especially regarding technological growth (e.g., advances in biotechnology), growth in the number and role of pharmacy technicians, and the future role of pharmacists.
- The demand projections are highly sensitive to growth in per capita consumption of pharmaceuticals. A range of demand estimates were projected to reflect this sensitivity.

Important areas for future research to improve our understanding of the current and projected future adequacy of pharmacist supply include:

- The potential impact of new technology on pharmacist productivity,
- The potential impact of advances in biotechnology on individualized drug therapy and the resulting demand for pharmacists,
- Whether lifestyle changes are leading to patterns of fewer hours worked per pharmacist per year—irrespective of trends in demographics (age and gender) of the pharmacist workforce,
- The changing role of pharmacists, and
- The degree to which pharmacy technicians offset the demand for pharmacists and the limits of such substitution before quality is compromised.

As attributed to Mark Twain, “making predictions is risky business, especially when it involves the future.” Over time, trends in pharmacist supply and demand determinants can change. In addition to the uncertainties regarding technological advances, changes in government policies and programs and changes in insurer approaches to managing prescription drug costs can affect demand for pharmacists.

On the supply side, the number of new graduates might deviate from projected levels if a shortage of faculty threatens the Nation’s ability to train new pharmacists. Furthermore, work patterns can change toward the desire to work fewer hours, and retirement patterns can change. These uncertainties mean that the accuracy of the supply and demand projections will diminish as the projection horizon increases. This uncertainty highlights the need to update the projections every few years to reflect changes in policies and trends.

The overall finding of this study is that the Nation appears to have responded to both the current shortfall of pharmacists and predictions of a growing shortfall. Market forces (e.g., higher wages) and political forces (e.g., increased scope of practice for pharmacy technicians) have helped reduce the shortfall of pharmacists. Still, the increase in supply will only be sufficient to keep pace with rising demand due to changing demographics. If a faculty shortfall at schools of pharmacy prevents the planned expansion in the capacity of schools to graduate new pharmacists, or if per capita consumption of pharmaceuticals continues to increase, then the current shortfall of pharmacists could worsen. Likewise, technological improvements that increase pharmacist productivity and efforts to control growth in consumption of pharmaceuticals could slow the growth in demand for pharmacists to dispense medications, thus increasing the likelihood that pharmacists can play a larger role in counseling patients and providing care management.