

New Pharmacist Supply Projections: Lower Separation Rates and Increased Graduates Boost Supply Estimates

Katherine K. Knapp; James M. Cultice

J Am Pharm Assoc. 2007;47(4):463-470. ©2007 American Pharmacists Association
10/05/2007

Abstract and Introduction

Abstract

Objective: To revise the 2000 Bureau of Health Professions Pharmacist Supply Model based on new data.

Design: Stock-flow model.

Setting: United States.

Participants: A 2004 estimate of active pharmacists reported by the Bureau of Labor Statistics was used to derive the base count for the 2007 supply model.

Interventions: Starting with a 2004 base of active pharmacists, new graduates are added to the supply annually and losses resulting from death and retirement are subtracted.

Main outcome measures: Age- and gender-based pharmacist supply estimates, 2004–2020

Results: Increased U.S. pharmacist supply estimates (236,227 in 2007 to 304,986 in 2020) indicate that pharmacists will remain the third largest professional health group behind nurses and physicians.

Increases were driven by longer persistence in the workforce (59%), increased numbers of U.S. graduates (35%), and increases from international pharmacy graduates (IPGs) achieving U.S. licensure (6%). Since more pharmacists are expected to be working part time the full-time equivalent (FTE) supply will be reduced by about 15%. The mean age of pharmacists was projected to decline from 47 to 43 by 2020. Because of unequal distribution across age groups, large pharmacist cohorts approaching retirement age will result in fewer pharmacists available to replace them. The ratio of pharmacists to the over-65 population is expected to decrease after 2011 and continue to fall beyond 2020; this is likely a reflection of baby boomers passing through older age cohorts.

Conclusion: The revised estimated active U.S. pharmacist head count in 2006 is 232,597, with equivalent FTEs totaling approximately 198,000. The substantial increase over the 2000 pharmacist supply model estimates is primarily attributable to pharmacists remaining in the workforce longer and educational expansion. U.S. licensed IPGs account for less than 6% of overall increases. The pharmacist work-force is projected to become younger on average by about 4 years by 2020. Coincident demands for more physicians and nurses over the same period and shortages in all three professions stipulate that active steps be taken, including continued monitoring of work trends among pharmacists and other health professionals.

Introduction

The federal government's 2000 National Pharmacist Work-force Survey of the supply and demand for pharmacists found clear evidence of a shortage of pharmacists and an increase in prescription volume that outpaced the growth in supply of pharmacists.^[1] Since then, while the shortage appears to have been moderated by declines in the ambulatory prescription growth rate and changes in pharmacy practice involving wider use of pharmacist technicians and technology, concern remains over the adequacy of the future supply to meet expected demand.^[2] The numbers of pharmacists working part time has been increasing, even while pharmacists appear to be staying in the workforce longer.^[3] The workload on the individual pharmacist continues to increase, with more time spent in dispensing and administrative duties, usurping the time available for counseling and clinical activities.^[4] In addition, while the vacancy rate in community pharmacies has declined since the government's 2000 study, the downward trend appears to have reversed in the past year toward a more severe national shortage level.^[5]

With more than 230,000 pharmacists currently in practice, pharmacy is the third largest health profession in the United

States behind nurses (2.4 million) and physicians (830,000).^[6] All three of these health professions have reported a supply shortage relative to the demand for services.^[1,7,8] Unless key factors affecting the balance between supply and demand change considerably, the continued aging of the baby boomer cohort in the U.S. population is likely to sustain or exacerbate existing health care personnel shortages in the near future.

The Bureau of Health Professions (BHP) Pharmacist Supply Model estimates the size, age, and gender distribution of the active pharmacist workforce in the United States.^[9] The model is revised periodically to reflect new or changed source data and has been expanded to estimate the full-time equivalent (FTE) supply, as well as head counts. The present study examines the current and future supply of pharmacists through trends in numbers of new graduates entering the workforce, new schools being built and expansion of existing programs, annual hours worked, age and gender distribution of the pharmacist population, and losses through death and retirement.

Model revision at this time is relevant because events related to the pharmacist shortage could affect key variables used to project the supply of pharmacists. A prime example is age-related separation rates, which reflect the proportion of men and women pharmacists who stop working as pharmacists at each year of age. Under shortage conditions, job-related stress, which tends to increase the likelihood of leaving pharmacy work, and rising salaries, which tend to decrease the likelihood of leaving pharmacy work, were coexistent and may have resulted in new work participation patterns and intrinsically related separation rates. The 2000 Census, which included an expanded work-related sample survey, provided an opportunity to tap into pharmacist work patterns during the peak of the shortage. The current study uses these data to calculate a new set of separation rates. We also used the National Pharmacist Workforce Surveys for 2000 and 2004, which reported pharmacy work participation rates, to corroborate our findings.^[3,10]

Another reason for revision is the post-2000 expansion of pharmacy's educational enterprise through the formation of new schools and the expansion of existing programs—a trend that was not adequately foreseen in the 2000 supply model. The 2000 supply model assumed the addition of three new schools with approximately 95 graduates per year during each decade going forward and no expansion of existing programs. In reality, many more new programs have been launched since 2000 than the last model revision predicted. Of note, American Association of Colleges of Pharmacy and Accreditation Council for Pharmacy Education data show that the expansion of existing programs is making, now and in the near future, a much greater contribution to the number of new pharmacy graduates than graduates from new schools and colleges of pharmacy (personal communication, Peter Vlasses, PharmD, BCPS, Accreditation Council for Pharmacy Education, Chicago). Distributive education, with the formation of satellite campuses and classes offered on the Internet, has also contributed to training more pharmacists. The 2007 supply model reflects updated U.S. graduate projections.

International pharmacy graduates (IPGs) who achieve U.S. pharmacist licensure are another source of supply. The 2007 supply model includes new IPG estimates based on recent data from the Foreign Pharmacy Graduate Equivalency Examination (FPGEE) and the North American Pharmacist Licensure Examination (NAPLEX).

Modeling the pharmacist supply has been critically important to the pharmacist workforce research effort because no strategies for dynamic supply determination currently exist. The most recent past pharmacist census, which was based on state licensure data and reported in 1994, produced supply estimates that closely matched those of the BHP at that time.^[11] Annual estimates from the Bureau of Labor Statistics (BLS) have, on the other hand, varied significantly from year to year, probably as a result of the small numbers of pharmacists in randomly selected population samples. The BHP supply model is therefore an important touch stone for pharmacist workforce research and planning.

Objective

Our objective was to elucidate key findings from the 2007 supply model. Based on new data, we sought to further refine the head count estimates generated by the 2007 supply model using FTE participation rates by gender to project estimates of the available pharmacist workforce over time.

Methods

The base count for the 2007 supply model is drawn from a 2004 estimate of active pharmacists reported by BLS. The total count is distributed into 50 age groups by gender using data from the 2004 National Pharmacist Workforce Survey.^[10] The model projects these numbers forward in time by (1) adding, each year, the projected number of new entrants and (2) subtracting, each year, the projected number of both base-year pharmacists and new entrants who will die or retire. At any point in time, the composite of base-year pharmacists and new entrants who have neither died nor retired constitutes the active pharmacist supply. The 2004 National Pharmacist Workforce Survey found that men worked 91% and women 81% of a 40-hour work week, together averaging 84% of an FTE workweek.^[3] We applied these factors by gender to estimate the projected FTE pharmacist supply.

Separation factors for men and women, composed of estimated deaths and retirements for ages 24 through 74 years, are based on Current Population Survey (CPS) data collected in a 5% sample of the 2000 Census population (approximately 10,000 surveys). The rates are based on the experiences of pharmacists in the sample. By comparison, separation rates in the 2000 supply model were based on 5-year averages of pharmacist work participation. The model was constructed to "retire" all pharmacists by age 75; therefore, we excluded all pharmacists 75 or older when making the projections.

The model includes estimates of IPGs and U.S. graduates. The National Association of Boards of Pharmacy provided data on pharmacists educated outside the United States who achieved U.S. licensure, specifically the number of pharmacists who had successfully completed both the FPGE and the NAPLEX. National Association of Boards of Pharmacy data were available only for 2003 through August 2006. IPGs achieving U.S. licensure numbered 470 in 2003, 875 in 2004, 763 in 2005, and 883 in 2006. Data for 2006 were prorated to a full year based on actual data through August 2006. The mean for the 4 years was 738 new U.S. licensees per year. The U.S.-licensed IPG variable was modeled as a constant, as in the 2000 supply model, with the conservative estimate of 600 IPGs per year based on the limited global resource of eligible IPGs and shortages in countries other than the United States providing competition for these pharmacists.^[12] U.S. graduate estimates were based on the assumption that the maturation of new schools and the expansion of existing U.S. PharmD programs would result in an additional 100 graduates each year; this is roughly equivalent to one new school starting to graduate pharmacists each year.

The relative contributions of separation rates, U.S. graduates, and IPGs toward the increase in predicted numbers of pharmacists in 2020 were calculated by using the updated model while first substituting the separation rates used in the earlier model and then substituting both the earlier separation rates and earlier U.S. and IPG graduate trends with the new separation rates and updated post-2004 graduates. Differences in year-to-year projections resulting from the new separation rates and updated trends in U.S. graduates and IPGs were then calculated for each year from 2005 through 2020 and the relative contributions averaged across the projection period.

We developed two alternative supply projections based on different retirement patterns. A basic series used the same separation rates as the 2007 Supply Model. We developed a low series that reflects retirement 2 years earlier and a high series that reflects retirement 2 years later.

To investigate the impact of supply changes in the 2007 supply model relative to population, we calculated pharmacist-to-population ratios for the total U.S. population and the population older than 65 years. The rationale for investigating the over-65 ratio is that the elderly are the largest per capita

consumers of prescription medications, which have been shown to be a significant predictor of demand as reflected by pharmacy positions.^[13]

Results

The supply model projected about 236,000 active pharmacists by 2007, and this increases to almost 305,000 by 2020 (Table 1). The projected supply of active pharmacists for the years 2010, 2015, and 2020 is 14%, 20%, and 27% higher, respectively, than estimates from the 2000 supply model. The model predicts that men and women pharmacists will be equal in number sometime during 2006 or 2007 and that the workforce will become increasingly female, with more than 62% women pharmacists by 2020. Projections of U.S. graduates exceed 2000 supply model estimates by 546 (7%) in 2005, 2,323 (29%) in 2010, 2,662 (32%) in 2015, and 3,003 (36%) in 2020. IPG estimates exceed 2000 supply model estimates by 286 (91%) each year.

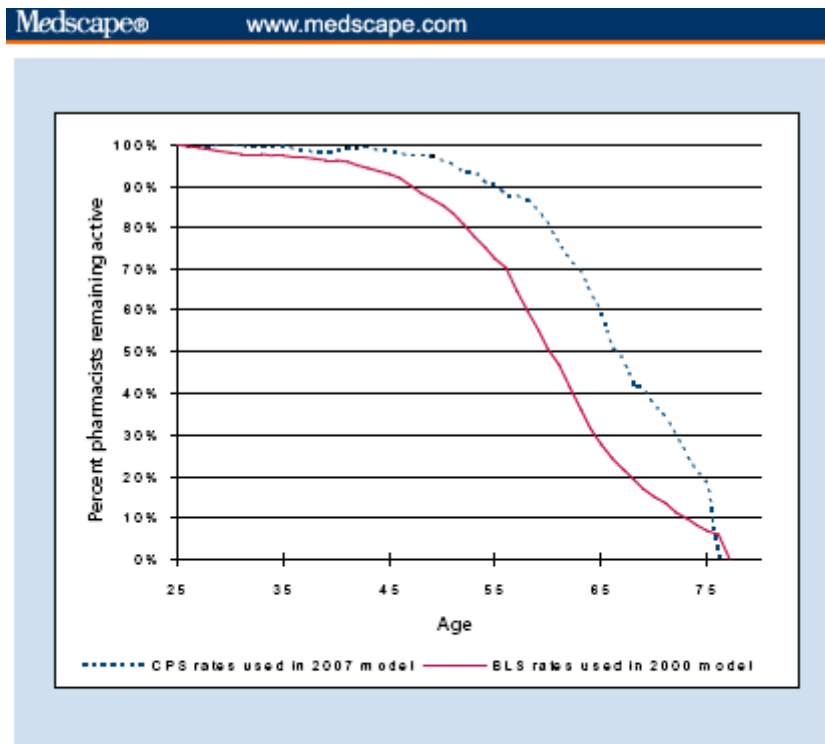


Figure 1. Separation rate–driven models of percent pharmacists remaining in the workforce from 25 to 75 years of age: Comparison of 2007 supply model versus 2000 supply model

Abbreviations used: BLS, Bureau of Labor Statistics; CPS, Current Population Survey.

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 1.

Table 2 shows a partial list of the relative contributions of older cohorts of pharmacists. The age at which 50% of the the three variables to increased supply estimates. Revised separation rates had the largest impact, accounting for 59.5% on average(range, 81.2% in 2005 to 46.6% in 2020).The increase in U.S.

graduates had the next largest impact, accounting for 34.8% on average (range, 12.3%–47.6%). IPGs, based on an estimated 600 achieving licensure annually, accounted for 5.7% (range, 6.5%–5.8%).

Based on the dominance of revised separation rates in increasing workforce estimates, we modeled the two rate sets. Figure 1 depicts the rate of work force depletion over time using a hypothetical 100,000-person workforce and the two sets of separation rates: the BLS-derived rates used in the 2000 supply model. By design, all pharmacists were considered retired by age 75. Figure 1 illustrates that the newer rates used in the 2007 supply model result in a slower depletion of the active workforce. The greatest differences in persistence patterns were among older cohorts of pharmacists. The age at which 50% of the workforce was no longer active increased from 62 years in the 2000 supply model to 64 years in the 2007 supply model. Among older pharmacists, the rate of leaving the workforce was very similar for men and women pharmacists, suggesting that both men and women pharmacists were working more in their later years (data not shown). As noted earlier, these changes in the workforce depletion rate (or reciprocally participation) were the primary reason for increased supply estimates, accounting for about 59% of supply estimate increases in the 2007 supply model. Their effect on overall increase in supply decreases substantially over time (from 81% to 47%).

Figure 2 shows mean pharmacist age by gender to 2020. Larger-sized cohorts in younger age groups exert a downward influence on the mean age of the overall workforce and on men pharmacists through 2020—despite both men and women pharmacists remaining in the workforce for more years. The model portrays an overall drop in the mean age of all pharmacists from 47 to 43 years and for men pharmacists from 52 to 46 years from 2004 to 2020. Over the same period, the mean age for women pharmacists remains at 42 years.

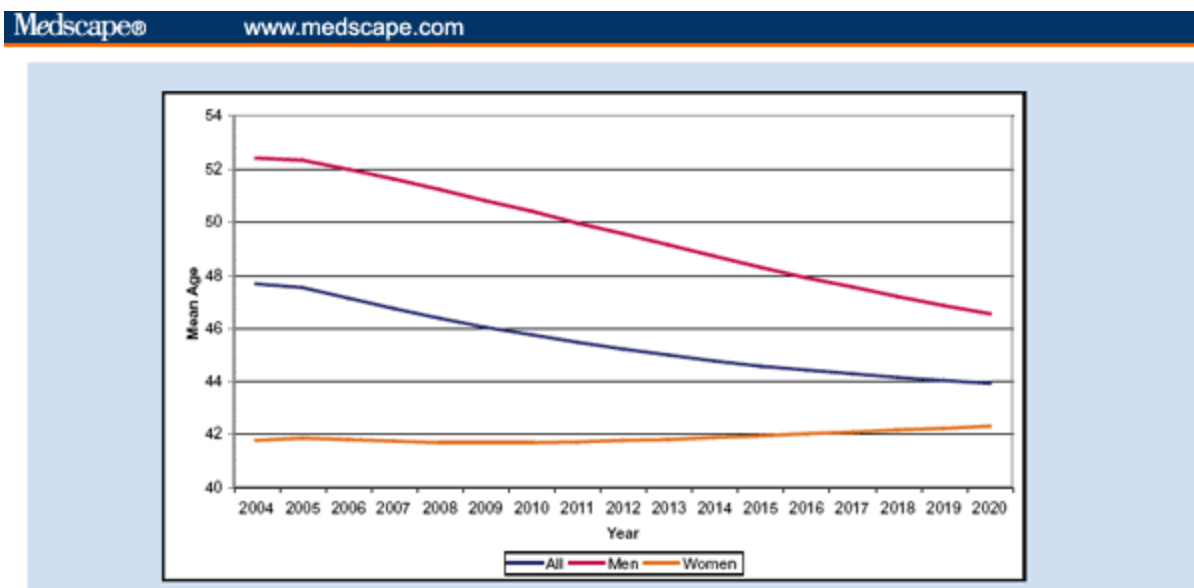


Figure 2. Mean age of pharmacists: 2004, projected to 2020

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 2.

Figure 3 shows the age distribution of pharmacists in 2006. The distribution is irregular. We note relatively higher counts from ages 48 to 55, which correlate with a period of educational expansion in the late 1970s and early 1980s. Lower counts are observed from ages 39 to 47, corresponding approximately to the decline in graduates in the mid-1980s.^[1] Graduate counts grew again in the 1990s, but the national implementation of an entry-level PharmD program in the early 2000s caused a reduction in graduates.

The youngest age cohorts have been increasing as a result of a new phase of educational expansion beginning in 2000.

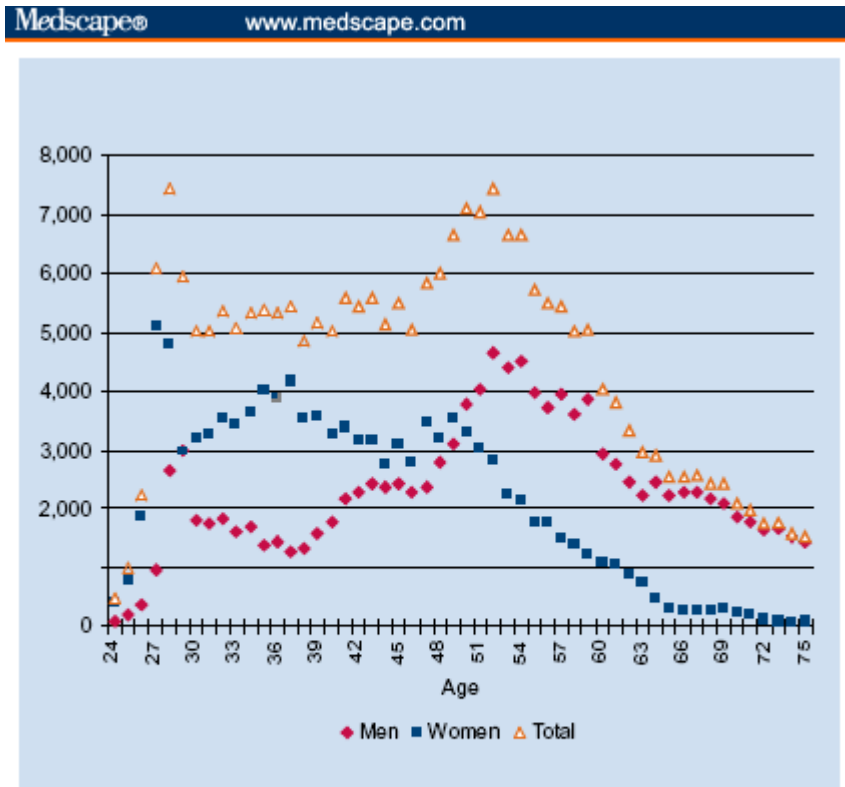


Figure 3. Active pharmacists by age: 2006

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 3.

Figure 4 shows the comparison of head counts and FTEs. As noted earlier, gender-based differences in work patterns result in an increasing gap between head count projections and FTE projections as the ratio of women to men pharmacists increases. The gap between head count and FTE is 34,489 in 2005 and increases to 45,748 by 2020. The overall head count-to-FTE supply reduction is approximately 15%.

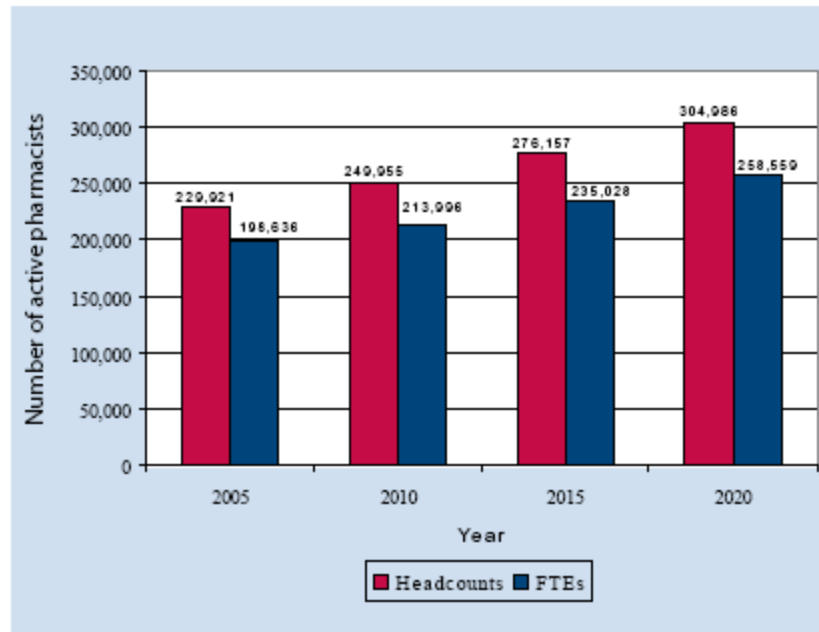


Figure 4. Projected supply of pharmacists by head count and FTEs: 5-year intervals, 2005–2020

Abbreviation used: FTE, full-time equivalent.

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 4.

Figure 5 depicts alternative series for supply estimates. The basic series was drawn from CPS data as reported earlier. The maximum impact is an increase or decrease in head count of about 10,000 pharmacists in 2020.

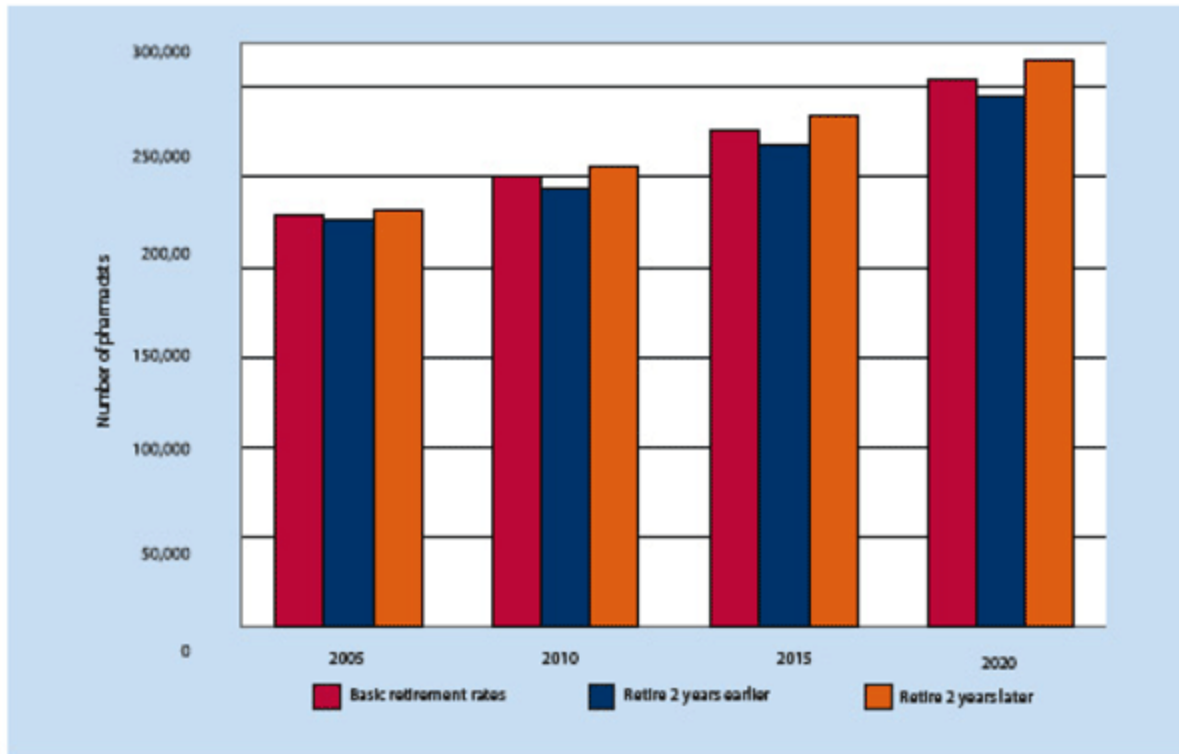


Figure 5. Alternative supply projections: 2005–2020

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 5.

Figure 6 illustrates ratios of pharmacists to population groups. The pharmacist-to-100,000-population ratio rises from 77 in 2004 to 91 in 2020. The pharmacist-to-100,000-over-65-population, however, starts at 625 in 2004, remains steady through 2011, decreases to 575 by 2020, and continues to decrease to 508 in 2030, rebounding slowly thereafter despite the sizable growth in the pharmacist supply shown by the model.

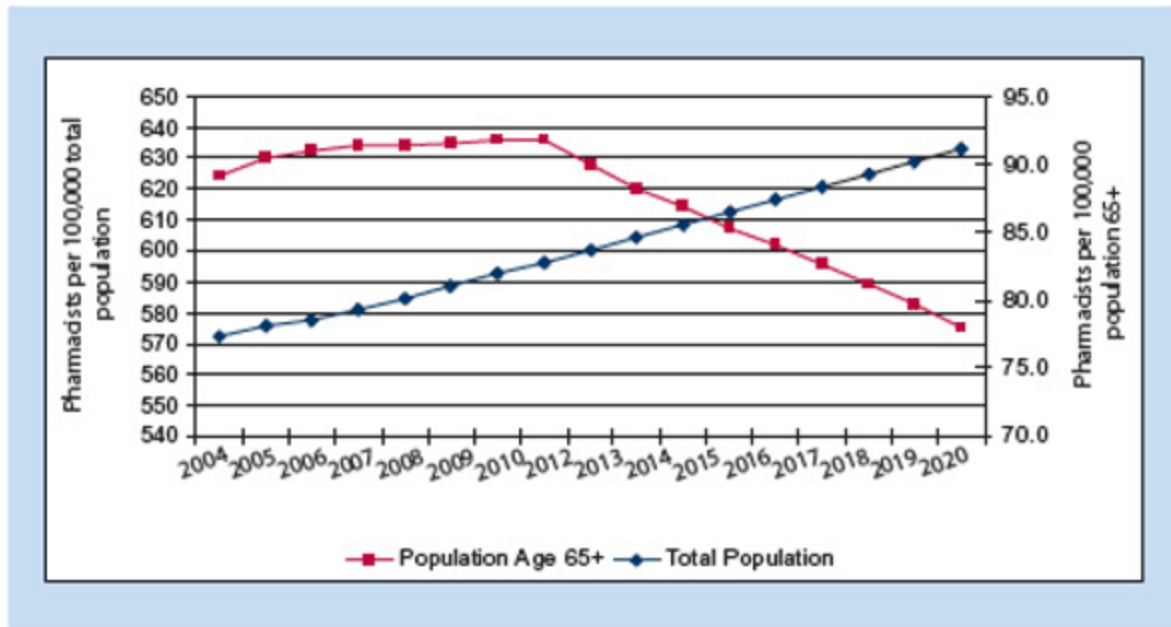


Figure 6. Ratios of pharmacists to U.S. population groups

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Figure 6.

Discussion

The principal finding of the 2007 supply model was an unexpected supply estimate increase. Increased work participation, particularly by older pharmacists, accounted for, on average, 59% of the head count increase. Corroborative data from the 2000 and 2004 National Pharmacist Workforce Surveys also found that more near-elderly pharmacists have continued to remain active in the workforce, albeit on a part-time basis.^[10] The same report observed that their remaining active may have mitigated the severity of the pharmacist shortage. Historical events that could have encouraged increased persistence in the workforce over the last decade include the rise in wages that occurred in the late 1990s as the pharmacist shortage became

severe^[14], the 2000 stock market downturn that affected retirement savings significantly,^[15] the rise in demand for pharmacists that made jobs plentiful, including part-time work, which is often attractive to older pharmacists,^[3] and increased opportunities for clinical involvement and technology advances during the 1990s that resulted in professional job satisfaction and the motivation to continue working.^[1]

Whether these new work patterns will persist or be adopted by younger pharmacists as they move closer to retirement age is impossible to predict. For this reason, frequent reassessment of work patterns will continue to be an important adjunct to supply modeling.

The educational expansion in pharmacy that began in the 1990s and continues unabated, accounting for about 35% of the increased supply, has resulted in a workforce that is projected to grow younger on average despite older pharmacists remaining employed. Generally, physician and nursing workforces are assumed to be growing older on average.^[16,17] Recently, however, a call for educational expansion in the medical profession could result in a similar downward age trend for physicians.^[8,18]

The effect of a younger pharmacist workforce has not been determined; however, in the face of shortages in other health professions, the presence of a growing, young workforce trained using today's more clinically oriented practice standards and technology advances is a positive factor for the prospect of meeting health care delivery needs through the end of the baby boomer era.

The fall in ratios of pharmacists per 100,000 over-65 population, beginning in 2011 and falling to 575 by 2020 and 508 in 2030 before rebounding slowly thereafter, despite the sizable growth in the pharmacist supply shown by the model, illustrates the challenge to pharmacies as the large baby boomer population moves through the senior age cohorts. This effect is likely to occur with other health care workers as well, compounding the difficulty in providing health care services during this era. An equally important question for future research is how the balance between supply and demand will shift once the size of the baby boomer cohort begins to decrease.

A 2002 study suggested the need for additional pharmacists by the second and third decade of the 21st century.^[19] The study did not anticipate the increased work participation of older pharmacists and educational expansion that have occurred. The new supply projections considerably lessen but do not eliminate the 157,000-pharmacist deficit projected for 2020, especially when reductions related to FTE participation are taken into account.

The unevenness of age distribution (Figure 3) poses a potential problem in the near future as the pharmacists currently in the 48-to 55-year age group, a relatively large cohort, begin to retire and turn over responsibilities to the current 39-to 47-year age group, which is much smaller in number. Sufficiency, not only in terms of numbers but also in terms of leadership and management potential and experience, may be questionable. Younger pharmacists may need to be moved more quickly into positions with higher levels of responsibility. This potential problem should draw the attention of pharmacist employers early enough to plan for its eventuality.

Limitations

The substantial change in workforce participation behavior over a retrospective 10-year period, as reflected by separation rate changes, suggests using caution when making longer-term supply predictions. Future changes in the economy and other factors could result in new shifts in workforce behaviors. In addition, the supply model assumes that the trend toward a predominantly female workforce will continue based on the current preponderance of women among student pharmacists. This distribution could possibly shift in the opposite direction. Finally, educational expansion has not proven to be predictable and is therefore difficult to model. The uncertainties in these three areas argue for continued research on work patterns and other supply issues to monitor whether model revision is indicated.

Conclusion

The revised estimated active U.S. pharmacist headcount in 2006 is 232,597, with equivalent FTEs totaling approximately 198,000. The substantial increase over the 2000 pharmacist supply model estimates is primarily attributable to pharmacists remaining in the workforce longer and educational expansion. U.S.-licensed IPGs account for fewer than 6% of overall increases. The pharmacist workforce is projected to become younger on average by about 4 years by 2020. A trend toward part-time work reduces the effective pharmacist workforce by about 15%. Although the ratio of pharmacists to the general population will increase through 2020, the ratio of pharmacists to the over-65 population will decrease after 2011 and continue to do so past 2020 as the baby boomers move through their senior years. Historical fluctuations in graduates could create a short fall of experienced, senior pharmacists during the early phase of the baby boomer retirement era. Coincident demands for more physicians and nurses over the same period and shortages in all three professions stipulate that active steps be taken, including continued monitoring of work trends among pharmacists and other health professionals.

Table 1. Estimated Number of Men, Women, and Total Pharmacists, 2004–2020

Medscape® www.medscape.com						
Years	U.S. pharmacy graduates No.	U.S.-licensed IPGs No.	Total active men pharmacists No.	Total active women pharmacists No.	Women pharmacists %	Total active pharmacists No.
2004			125,199	101,201	45	226,400
2005	8,600	600	123,998	105,923	46	229,921
2006	9,204	600	121,142	111,455	48	232,597
2007	9,857	600	118,953	117,274	50	236,227
2008	10,256	600	117,448	123,098	51	240,546
2009	10,356	600	116,201	128,891	53	245,092
2010	10,456	600	115,322	134,633	54	249,955
2011	10,555	600	114,626	140,375	55	255,001
2012	10,655	600	114,133	146,042	56	260,175
2013	10,756	600	113,748	151,668	57	265,416
2014	10,856	600	113,498	157,236	58	270,734
2015	10,955	600	113,411	162,746	59	276,157
2016	11,055	600	113,465	168,262	60	281,727
2017	11,156	600	113,716	173,723	60	287,439
2018	11,256	600	114,048	179,156	61	293,204
2019	11,355	600	114,581	184,504	62	299,085
2020	11,455	600	115,206	189,780	62	304,986

Abbreviation used: IPGs, international pharmacy graduates.

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

Table 2. Relative Contributions of The Supply Model's Source Data in Accounting for The Increase in Projections

Medscape® www.medscape.com				
Years	U.S. graduates %	IPGs %	Separation rates %	Total %
2005	12.3	6.5	81.2	100.0
2010	32.7	5.5	61.8	100.0
2015	34.4	5.5	60.1	100.0
2020	47.6	5.8	46.6	100.0
Means, 2005–2020	34.8	5.7	59.5	100.0

Abbreviation used: IPGs, international pharmacy graduates.

Source: J Am Pharm Assoc © 2007 American Pharmacists Association

References

1. Health Resources and Services Administration. The pharmacist workforce: a study of the supply and demand for pharmacists. Rockville, Md.: Health Resources and Services Administration; 2000.
2. Knapp KK, Quist RM, Walton SM, Miller LM. Update on the pharmacist shortage: national and state data through 2003. *Am J Health Syst Pharm.* 2005;62:492–9.
3. Mott DA, Doucette WR, Gaither CA, et al. Pharmacist participation in the workforce: 1990, 2000, and 2004. *J Am Pharm Assoc.* 2006;46:322–30.
4. Schommer JC, Pedersen CA, Gaither CA, et al. Pharmacists' desired and actual times in work activities: evidence of gaps from the 2004 National Pharmacist Workforce Study. *J Am Pharm Assoc.* 2006;46:340–7.
5. Knapp KK. Significant trends in the pharmacist shortage 2006. Presented at the National Association of Chain Drug Stores Pharmacy and Technology Conference, San Diego, Calif., August 28, 2006.
6. Hecker DE. Occupational employment projections to 2014. Accessed at www.bls.gov/opub/mlr/2005/11/contents.htm, February 3, 2007.
7. National Center for Health Workforce Analysis, Bureau of Health Professions. Projected supply, demand, and shortages of registered nurses: 2000–2020. Rockville, Md.: Health Resources and Services Administration; 2002.
8. Cooper RA, Getzen TE, McKee HJ, Laud P. Economic and demographic trends signal an impending physician shortage. *Health Aff (Millwood).* 2002;21:140–54.
9. Gershon SK, Cultice JM, Knapp KK. How many pharmacists are in our future? The Bureau of Health Professions projects supply to 2020. *J Am Pharm Assoc.* 2000;40:757–64.
10. Mott DA, Doucette WR, Gaither CA, et al. National Pharmacist Workforce Survey: 2004. Accessed at http://aacp.org/Docs/MainNavigation/Resources/7295_final-fullworkforcereport.pdf, February 3, 2007.
11. Vector Research. Pharmacy Manpower Project: state and national survey reports. Ann Arbor, Mich.: Vector Research; 1994.
12. International Pharmaceutical Federation. Global pharmacy workforce and migration report: 2006. Accessed at www.fip.org/files/fip/HR/FIP%20Global%20Pharmacy%20and%20Migration%20report%2007042006.PDF, February 3, 2007.
13. Walton SM, Cooksey JA, Knapp KK, et al. Analysis of pharmacist and pharmacist-extender workforce in 1998–2000: assessing predictors and differences across states. *J Am Pharm Assoc.* 2004;44:673–83.
14. Mott DA, Doucette WR, Gaither CA, et al. National Pharmacist Workforce Survey: 2006. Accessed at www.aacp.org/site/page.asp?VID=1&CID=1056&DID=6195 February 3, 2007.
15. Weller C. What the crash means for your retirement. Accessed at www.epinet.org/Issuebriefs/ib156/ib156.pdf, February 3, 2007.
16. Dower C, O'Neil E. Health workforce in California: 2002. Accessed at www.futurehealth.ucsf.edu/pdf_files/CD%20Sacramento%2010-29.ppt#21, February 3, 2007.
17. National Center for Health Workforce Analysis. Changing demographics and the implications for physicians, nurses and other health workers. Accessed at <http://bhpr.hrsa.gov/healthworkforce/reports/changedemo/summary.htm>, February 3, 2007.
18. Salsberg E. Is a physician shortage looming: issues, evidence, and implications. Washington, D.C.: Center for Workforce Studies, Association of American Medical Colleges; 2005.
19. Knapp DA. Professionally determined need for pharmacy services in 2020. *Am J Pharm Educ.* 2002;66:421–9.

Sidebar: At a Glance

Synopsis: U.S. pharmacist supply estimates of 236,227 in 2007 and 304,986 in 2020 were determined using a stock-flow model based on a 2004 estimate of active pharmacists reported by the Bureau of Labor Statistics. Pharmacists will remain the third largest professional health group behind nurses and physicians. The increase over a previous supply model estimate was attributed to pharmacists remaining in the workforce longer and educational expansion. The model predicted that the pharmacist workforce will become increasingly younger (by about 4 years by 2020) and female (more than 62% women pharmacists by 2020). Reductions in ratios of pharmacists per 100,000 over-65 population from 2011 onward and continuing past 2020 are expected as the large baby boomer population cohort moves into retirement age.

Analysis: *Factors affecting pharmacist supply include new graduates entering the workforce, the creation of new schools of pharmacy and expansion of existing programs, annual hours of employment, the age and gender distribution, and losses through death and retirement. The increasing age of the U.S. baby boomer cohort is likely to further exacerbate existing healthcare personnel shortages in the near future. The loss of experienced pharmacists could accelerate the rate at which younger pharmacists are moved into positions that demand greater responsibility. Ongoing monitoring of work patterns and maintaining pharmacist supply with attention to leadership issues are of utmost importance.*

Acknowledgements

To Surrey Walton, PhD, Associate Professor, College of Pharmacy, University of Illinois at Chicago, for his assistance on this project.

Katherine K. Knapp, PhD, is Professor and Dean, College of Pharmacy, Touro University, Vallejo, Calif.

James M. Cultice, BS, is Operations Research Analyst, Bureau of Health Professions, Health Resources and Services Administration, U.S. Department of Health and Human Services, Rockville, Md.

Disclosure: The authors declare no conflicts of interests or financial interests in any product or service mentioned in this article, including grants, employment, gifts, stock holdings, or honoraria. The views expressed in this article are strictly those of the authors. No official endorsement by the Department of Health and Human Services or any of its components should be inferred.