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RESEARCH

Break-Even Income Analysis of Pharmacy Graduates Compared to High School and College Graduates

Marie A. Chisholm-Burns, PharmD, MPH, MBA, Justin Gatwood, PhD, MPH, Christina A. Spivey, PhD, Susan E. Dickey, BA

University of Tennessee College of Pharmacy, Memphis, Knoxville, and Nashville, Tennessee

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Objective. To project the net cumulative income break-even point between practicing pharmacists and those who enter the workforce directly after high school graduation or after obtaining a bachelor's degree.

Methods. Markov modeling and break-even analysis were conducted. Estimated costs of education were used in calculating net early career earnings of high school graduates, bachelor's degree holders, pharmacists without residency training, and pharmacists with residency training.

Results. Models indicate that over the first 10 years of a pharmacist's career, they accumulate net earnings of $716 345 to $1 064 840, depending on cost of obtaining the PharmD degree and career path followed. In the break-even analysis, all pharmacy career tracks surpassed net cumulative earnings of high school graduates by age 33 and bachelor's degree holders by age 34.

Conclusion. Regardless of the chosen pharmacy career track and the typical cost of obtaining a PharmD degree, the model under study assumptions demonstrates that pharmacy education has a positive financial return on investment, with a projected break-even point of less than 10 years upon career entry.

Keywords: break-even analysis, career path, financial analysis, income, Markov modeling

INTRODUCTION

While there is certainly value in education, not all degrees are equal when considering their financial return or economic worth. In fact, an analysis of more than 900 colleges and universities found that some institutions and concentrations of study actually have a negative return over 20 years.[1] For example, after accounting for cost of attendance, the analysis found that graduates from Bluefield College will earn $123 000 less than high school graduates over 20 years of employment whereas graduates of Carnegie Mellon University will earn $678 500 more than their high school counterparts over this time period.[1] Such analyses call significant attention to the great variance in economic outcomes that may be achieved by choosing different educational paths and careers.

The health care industry is not spared from critique regarding the value of higher education, with careers in the health professions placing among both the best and worst-ranked careers in several analyses of degree value. Specifically, an article published by *Forbes* lists physician assistant studies, occupational therapy, health care administration, and nursing among the 10 best master's degrees for jobs.[2] Conversely, a college major in nutrition, which commonly leads to a career as a dietician, is listed among eight college degrees with the worst return on investment over 30 years of employment.[3]

Salaries across health professions requiring a doctoral or professional degree (eg, audiologist, dentist, physician/surgeon, optometrist) can vary widely depending on occupation, but are all well above the 2012 US median income level ($51 371).[4] More specifically, median salaries of doctoral-level health professions range from $66 160 to more than $187 200.[5] However, the financial gains represented by high salaries in these professions are often accompanied by elevated costs involved in pursuing doctoral-level education and postgraduate training in the health professions. Asch and colleagues noted that health professions students have substantial debt-to-average annual income ratios, peaking as high as 160% for veterinary medicine.[6]

Appraisal of the financial value of many degrees is further fueled by the large number of loan defaults, as 15% of all student borrowers default within only three years of entering repayment.[7] To add additional insult, nearly one-third of students who take out loans for college eventually drop out without earning a degree, and 42% of

Corresponding Author: Marie A. Chisholm-Burns, University of Tennessee College of Pharmacy 881 Madison Ave, Ste 264, Memphis, TN 38163. Tel: 901-448-6036. Fax: 901-448-7053. E-mail: mchisho3@uthsc.edu

college graduates hold jobs that do not require a college degree.[7] Given this information alone, it is prudent to carefully weigh the pros and cons of professions of interest and assess the degrees that will help achieve success and meet expected goals.

Among the most frequently expressed concerns from those considering a college degree are topics related to job availability, growth capacity, flexibility, desirability, and security.[8] For the pharmacy profession, both the US Bureau of Labor Statistics and the US Department of Health and Human Services anticipate a steady rate of job growth over the next decade.[9,10] Despite this positive outlook for the pharmacy profession, concerns exist regarding ongoing favorability in the job market, largely because of the significant increase in supply as a result of the opening of several new pharmacy schools since 2000 and increased enrollment at existing schools.[11] While demand still outweighs supply, a decline in demand may facilitate new challenges for the workforce of today and tomorrow.

In general, the cost of postsecondary education, including health professions schools, is expensive. Programs such as student loans were created to catalyze opportunity and were once thought to help ensure a secure economic future, but have had many unintended consequences. A recent survey conducted by American Student Assistance indicated that student debt results in delayed decisions to buy a home or car, get married, have children, save for retirement or other investments, start a business, and enter a desired career field.[8] Furthermore, 36% of those between the ages of 18 to 31 are living with parents, an all-time high, with greater student debts associated with an increased likelihood of moving from independent living to parental co-residence.[12] This so-called "life delay" highlights the importance of evaluating the investment return of degree attainment, rather than entering employment directly out of high school and not obtaining a college degree.

Published studies have not explored the financial break-even point of a career in pharmacy, a field which requires a delay in entering the job market because of the length of education, in comparison to high school graduates and bachelor's degree holders who enter the job market at a considerably earlier time point. The purpose of this study was, therefore, to evaluate the short-term economic value of a pharmacy degree, considering career earnings for the time period between ages 18 and 35, which encompasses approximately 10 years of earnings following graduation with a doctor of pharmacy (PharmD) degree. Furthermore, the analysis sought to determine the break-even point, or time when net earnings of PharmD graduates equal those of individuals with a high school diploma or bachelor's of science (BS) degree in biology or chemistry, as these are common undergraduate degrees obtained by those who attend pharmacy school. Specifically, the study modeled and compared projected early career earnings (up to age 35) of traditional graduates of high school, bachelor's of science in chemistry or biology programs, and PharmD programs (7-year or 8-year programs in private or public colleges).

METHODS

Markov modeling and break-even analysis were conducted. Markov modeling is a time-sensitive model that allows for the inclusion of transitions between different states over defined periods. In the case of this analysis, using Markov chains in the model allowed for annual transitions between periods of employment and unemployment, providing probability-weighted estimates of annual incomes that mirrored what employees in each career path may experience in any given year.

Net career earnings from employment beginning at age 18 years through age 35 years (referred to as "net early career earnings") were used to determine the overall benefit of each career path: (1) immediate employment after high school graduation; (2) employment after obtaining a bachelor's degree in chemistry or biology; (3) employment as a pharmacist in a hospital or community pharmacy setting after at least three years of undergraduate study and obtaining a PharmD; and (4) employment as a hospital pharmacist following at least three years of undergraduate study, obtaining a PharmD, and completing one (PGY1) or two (PGY1 and PGY2) years of residency training. Age 35 was selected as the end age of analysis to demonstrate the economic return for each career path with at least 10 years of employment following the terminal degree (ie, 10 years post-PharmD). Net career earnings (gross cumulative career earnings less expenditures for postsecondary education) were determined using the estimated costs of education and gross salary estimates. Similar to an earlier analysis, employment in hospital or community (retail) pharmacy settings were included in the model because they represent the primary pharmacy job sectors, and salaries in these settings are well-documented.[13,14] Model inputs are listed in Table 1.[14-27] Analyses were conducted using TreeAge Pro Healthcare, v2014 (TreeAge Software, Inc., Williamstown, MA).

In the Markov models, 18 years was used as the age at which high school graduates entered the job market. Using a conservative estimate of four years to complete an undergraduate degree, bachelor's degree holders were assumed to enter the job market at age 22. Depending on years of prepharmacy education, pharmacists were assumed to graduate from pharmacy school at either 25 years of age (includes three years of undergraduate

Table 1. Data Inputs Used in Markov Models[14-27]

Variable	Value ($USD)	References
Income[a,b]		
Pharmacy School Graduates		
Community Pharmacists	102 960	14
Hospital Pharmacists	99 840	14
Pharmacy Residents	42 000 (PGY1) 50 000 (PGY2)	24
Residency-trained Pharmacists	104 000 (PGY1) 106 080 (PGY2)	Communication from medical centers, January 2014
Bachelor Degree Graduates		
Chemistry Degree Holders	32 000 (entry) 62 000 (experienced)	18
Biology Degree Holders	31 000 (entry) 56 000 (experienced)	18
High School Graduates	22 464	22
Annual Raise (%)	2.9	18
Cost-of-Living Adjustment (%)	1.5	23
Educational Costs ($)		
Immediate (Annual) Costs[c]		
Undergraduate[d]	23 066	25
Public Pharmacy School	18 713	27
Private Pharmacy School	32 967	27
Cost of Living	22 287	Communication, University of Tennessee Office of Financial Aid, February 2014
Student Loans		
Public Pharmacy School	103 829	16
Private Pharmacy School	142 849	16
Undergraduate	29 400	26
Interest Rate (%)	4.66 (undergraduate), 6.21 (graduate), 7.21 (PLUS)	15
Employment Probabilities		
Pharmacy School Graduate Positions (%)		
Community Job	56.3 (public), 59.4 (private)	16
Hospital Job	24.0 (public), 25.2 (private)	16
PGY1 Residency	19.7 (public), 15.4 (private)	Calculated from communication with ASHP, January 2014
PGY2 Residency	16.9 (public), 11.3 (private)	Calculated from communication with ASHP, January 2014
Unemployment Rate (%)		
Pharmacy Degree Holders	3.2	19
Biology Degree Holders	7.7 (entry), 4.6 (experienced)	17,18
Chemistry Degree Holders	6.6 (entry), 4.9 (experienced)	17,18
High School Graduates	8.3	17,18
Length of Unemployment (weeks)[e]		
Doctoral Degree Holders	18.7	20,21
Bachelor's Degree Holders	27.0	20,21
High School Graduates	31	20,21

ASHP=American Society of Health-System Pharmacists; PGY1=Pharmacy postgraduate year 1 residency; PGY2=pharmacy postgraduate year 2 residency

[a]Values listed are starting salaries

[b]In the model analysis, chemistry and biology degree holders were assumed to graduate from college and enter the job market at age 22. PharmD holders were assumed to: (1) graduate from 3+4 programs and enter the job market at age 25 (age 26 if completing a PGY1 residency, age 27 if completing a PGY2 residency); or (2) graduate from 4+4 programs and enter the job market at age 26 (age 27 if completing a PGY1 residency, age 28 if completing a PGY2 residency)

[c]Represents national average annual costs

[d]Includes room and board and is the national average across all (public and private) 4-year undergraduate institutions

[e]Refers to the average number of weeks between jobs, if an individual loses a job, in a given year (data for specific degree fields were not available)

education and four years of pharmacy school) or 26 years of age (includes four years of undergraduate education and four years of pharmacy school). At the point of graduation, they either entered the job market immediately or pursued residency training for one or two years.

In the break-even analysis, projected net early career earnings for all branches were examined to determine the time (age) at which estimated cumulative earnings intercepted, representing the point where a particular career choice became a net positive investment over another option. These points represent the age at which graduates of pharmacy schools have higher cumulative earnings since age 18 compared to those with only a high school diploma or an undergraduate degree, net the costs of education. Ages at the break-even point were determined using year-by-year Markov model net incomes for each of the included career tracks.

Markov cycles for each career option within the branches of the decision tree were conducted. For high school graduates, only one Markov cycle was employed and spanned all years of the analysis. The models for college graduates and PharmD graduates reflected the stage of employment for each career path: in school or training, early career, and experienced worker. Individuals were assumed to have remained in the same career path after entering the job market because of the short time horizon of the study and for model simplification.

At the base of the model, an individual could be a high school graduate, college graduate (bachelor's degree in biology or chemistry), or have chosen to attend college for either three or four years of undergraduate study, as required for acceptance by most schools of pharmacy (according to the American Association of Colleges of Pharmacy [AACP]), followed by pharmacy school at either a public or private institution.[28] Biology and chemistry were chosen as they are highly prevalent undergraduate disciplines studied by pharmacy school matriculates. To explain further, the purpose in selecting these fields was to model the outcomes of individuals on a pharmacy school trajectory (ie, college students majoring in chemistry or biology) who for whatever reason did not matriculate to a pharmacy or other professional degree program. Although chemistry and biology bachelor's degree holders may pursue professional or graduate education, they may also enter the workforce. For example, according to Ainsworth, in 2012, 33% of graduates with a BS in chemistry or biochemistry from one university found employment following graduation, with an additional 17% seeking employment.[29] This suggests that approximately 50% of these bachelor's degree holders pursued careers immediately following completion of their undergraduate studies. The career paths of these individuals were logical to model in this study as an alternative to pharmacy. Chemistry or biology degree holders were assumed to progress within the same job from graduation to age 35, receiving raises for the first 10 years and regular salary adjustments for the remaining years of the model.

The most popular postpharmacy graduation employment options were modeled: (1) immediate employment in either a community or hospital setting; (2) completion of a PGY1 residency followed by employment; or (3) completion of two years of residency (PGY1 and PGY2) followed by employment.[16] Pharmacists who obtained residencies were assumed to find employment in hospital settings because traditionally most positions requiring residency training are in hospitals or clinics. Moreover, salary data for this distinction were readily available for hospital settings, in contrast to other settings.

Pharmacy school attendance was modeled by allowing for either three or four years of prepharmacy undergraduate education followed by matriculation to either a public or private pharmacy school. Within the four resulting branches, graduates were then distributed by career choice.[14,16] Probabilities of a PGY1 residency were calculated using 2012 graduation and residency data among 4-year public and private pharmacy schools; odds of a PGY2 were then calculated among those having completed a PGY1.[16] These probabilities were included to model observed differences in career choices made by graduates of public and private pharmacy programs.

Cumulative incomes across each career path by age 35 were used to explicate the benefits of attending college and pharmacy school. Gross annual salary began to cycle at age 18 for high school graduates and in the first year immediately following graduation for those obtaining bachelor's degrees only.[22] Available salary data for chemistry and biology degree holders allowed for the imputing of mean starting salaries as well as those for experienced workers (more than five years of work experience).[18] For the first five years after graduation, the model gave these employees the national average salary increase of 2.9%. After five years, salaries were increased to the average "experienced" level and thereafter received the national average salary increase.[18] Salaries were capped after 10 years, and only national average cost of living increases (1.5%) were factored into income data to account for inflation.[23]

Pharmacy graduates were allotted starting gross salaries for hospital and community pharmacy.[14] Gross salaries for residency trained-pharmacists were obtained from several hospitals. Salaries for residents were accounted for in the model.[24] Salaries for all pharmacy positions were allowed to increase using national average raises for the first 10 years of initial employment.[22]

All cycles were probability weighted based on the unemployment rate for each branch.[17-19] Within each employment cycle, an individual was defined as "employed" or "unemployed" to weight each year's income with the odds of having been unemployed during the year. Cost and income values for unemployed individuals were adjusted using the mean length of unemployment (weeks) for those with high school, undergraduate, or doctoral degrees.[20,21] During times of unemployment, it was assumed that unemployment benefits would be sought. Rates of unemployment were adjusted to reflect reductions in these odds as a result of years of accrued work experience.[18] Unemployment benefits were assumed to be received by workers of all educational levels according to the benefit schedule by quarterly income or the maximum benefit, when reached, and adjusted annually to keep pace with inflation.[20,21] Income during periods of unemployment was the product of the weekly rate and the average number of weeks of unemployment for each level of education; income for the remaining weeks returned to regular, full-time levels for each year. The probability of unemployment was included in the analysis to mimic as closely as possible the odds of being unemployed for a defined period. In this sense, the resulting annual income is probability-weighted based on the rate of unemployment for a given career path in any given year, producing benefits of employment similar to how any other benefit that has varying odds of success or failure would be modeled. In this case, an unemployed individual would have their annual income reduced by the period of average unemployment for the career path but supplemented during this time by the federal limits on unemployment income.

National average amounts from 2012 for college tuition and room and board were used to determine the total cost of undergraduate attendance based on number of years enrolled (three or four years).[25] The difference between the total cost of attendance for each year ($23 066) and the average amount borrowed ($29 400) divided by 4 ($7350) determined the immediate (annual) cost of undergraduate attendance ($15 716).[26] As a result, the years spent in college provided a net negative economic benefit. For students completing only three years of college prior to pharmacy school, total immediate costs and amount borrowed were reduced by 25%. For public and private pharmacy schools, national average tuition and student loan amounts were provided by AACP, with cost of living included in the total cost of attendance.[16,27] The difference between the average amount borrowed and the total cost of attendance was assumed to be immediately absorbed by the student, resulting in net negative benefits for the years spent in pharmacy school.

Student loan repayment was factored into the determination of net benefits to account for long-term education costs. Cost of education was modeled as the sum of subsidized loans for undergraduate studies (at maximum amounts of $13 500 for three years of prepharmacy and $19 000 for four years of prepharmacy), unsubsidized loans for undergraduate studies (in the amounts of $8550 for three years of prepharmacy and $10 400 for four years of prepharmacy, which supplemented subsidized loans to the mean amount borrowed per year), unsubsidized loans for pharmacy school (maximum amount allowed which was $20 500 per year), and PLUS loans for pharmacy school (in the amounts of $21 828 for public pharmacy school and $60 848 for private pharmacy school, which supplemented unsubsidized loans to the mean amount borrowed). Undergraduate loans, both subsidized and unsubsidized, had interest rates of 4.66%, while graduate unsubsidized loans had an interest rate of 6.21% and graduate PLUS loans had an interest rate of 7.21%.[15] Biology and chemistry degree holders were assumed to begin repayment immediately upon graduation and complete payments after 10 years using the standard repayment schedule.[30] Among pharmacy graduates, the total amount borrowed during either seven or eight years of postsecondary education was used to determine the monthly payment, with repayment over 25 years.[30] For pharmacy graduates who pursued residency training, loans were assumed to be deferred with interest accruing at the aforementioned interest rates for the one or two years spent in residency training.

RESULTS

The economic model spanned 18 years, from age 18 through 35. This time period demonstrates projected earnings from the early years of a pharmacy career, where "early" career is defined as the first 10 years in practice, and assumes an average age of 26 at the time of completion of an 8-year PharmD program. The base case analysis was early projected career earnings with a high school diploma, which was determined to be $494 285 after 18 years post-high school graduation. For individuals earning a bachelor's degree in biology or chemistry, estimated net early (ages 22 through 35 years) career earnings were $599 127 and $662 513, respectively (Table 2).

Earning a PharmD degree resulted in net early career earnings ranging from $716 345 to $1 064 840, depending on the number of years of prepharmacy education completed, type of school attended (public or private), and subsequent pharmacy career path (community, hospital/no residency, hospital/PGY1, or hospital/PGY2). Within the pharmacy tracks, greatest projected net cumulative early career earnings were observed for public school

Table 2. Short-term Career Earnings of Pharmacy Career Paths, High School Graduates, and Bachelor's Degree Holders

Prepharmacy	School	Career	Earnings, Ages 18 through 35 ($)
3 Years	Public	Community	1 064 840
		Hospital	1 025 541
		PGY1	986 823
		PGY2	929 601
	Private	Community	980 562
		Hospital	941 261
		PGY1	904 178
		PGY2	848 938
4 Years	Public	Community	919 222
		Hospital	884 027
		PGY1	844 901
		PGY2	789 949
	Private	Community	840 585
		Hospital	815 892
		PGY1	768 725
		PGY2	716 345
Bachelor's		Biology	599 127
		Chemistry	662 513
High School			494 285

attendance with three years of prepharmacy coursework and a career in community pharmacy. Lowest pharmacist earnings were observed for private school attendance with four years of prepharmacy coursework and a career in hospital pharmacy after completing PGY1 plus PGY2 training (Figure 1a). When weighted by the career choices of recent graduates, pharmacists can expect to earn at least 1.45 times the amount that high school graduates will accumulate by age 35 and 1.08 to 1.78 times the amount of cumulative earnings by age 35 for individuals holding a bachelor's degree in chemistry or biology.

While there is an initial delay in earnings in the model, individuals with a PharmD eventually surpass the cumulative earnings of the high school-educated individual as early as four years postgraduation by practicing as a community pharmacist. As seen in Figure 1a depicting the best case scenarios (community pharmacy career and a bachelor's degree in chemistry), in comparison to high school graduates, the break-even point for undergraduate degree holders was reached around age 31 while the break-even point for pharmacy graduates varied from approximately age 29 to 31, depending on length of prepharmacy education and type of school attended (public or private). Figure 1a depicts early career earnings for ages 18-35; Figure 1b depicts a view of ages 18-28, which allows better discernment of the impact of pursuit of higher education and employment in the immediate time period postgraduation. Break-even comparisons of the four pharmacy career paths vs high school graduates, chemistry degree holders, and biology degree holders are further displayed in Table 3. When examining pharmacy career paths vs bachelor's degree holders, break-even points varied from approximately age 27 to

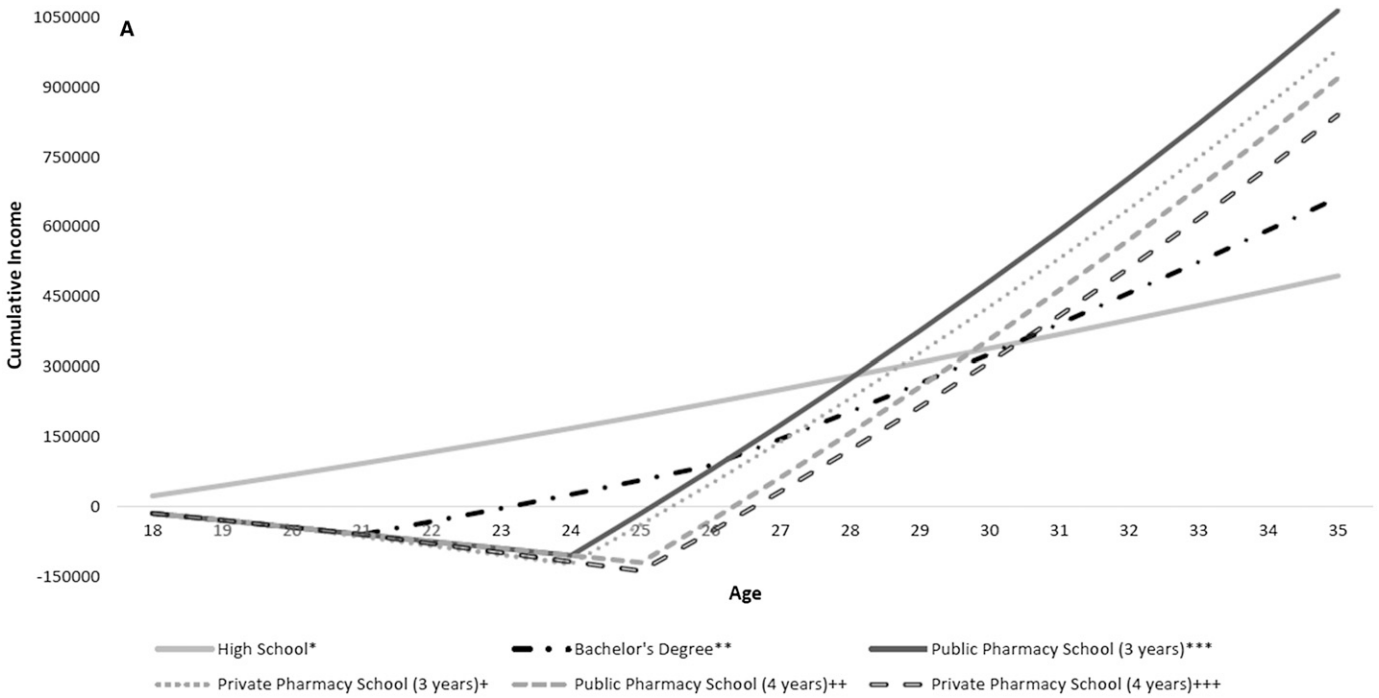
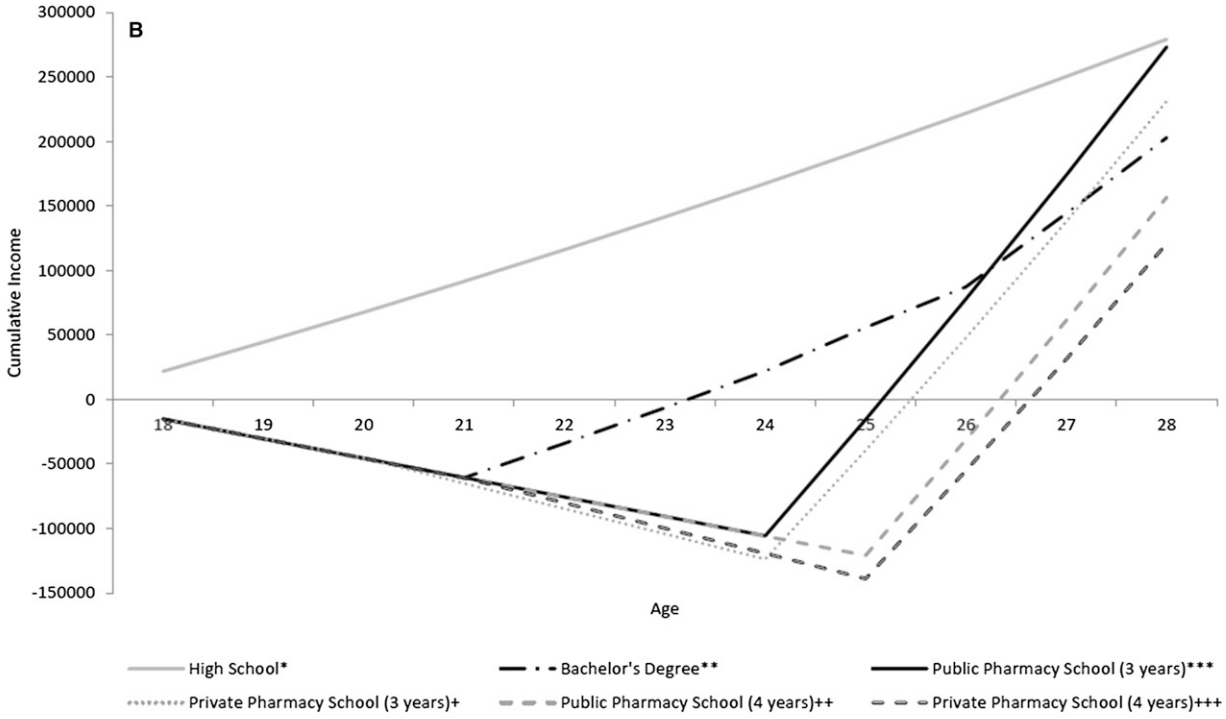


Figure 1a. Early Cumulative Earnings for Degree Holders by Educational Track, Length of Prepharmacy Education (3 or 4 year), and Type of Pharmacy School (public or private), ages 18-35.



Disclaimer: the economic models presented in this study are based on assumptions described herein; as conditions are subject to variability, these models should not be used to predict future earnings. Earnings are net the immediate and long-term costs of education. Numbers in parentheses represent years spent in college prior to pharmacy school matriculation. Income for pharmacy school graduates is based on community pharmacy salaries.
* High school diploma. **Bachelor's degree in Chemistry. ***Public pharmacy school with three years of undergraduate education. +Private pharmacy school with three years of undergraduate education. ++Public pharmacy school with four years of undergraduate education. +++Private pharmacy school with four years of undergraduate education.

Figure 1b. Early Cumulative Earnings, ages 18-28.

34 years, depending on number of years of prepharmacy education completed and type of school attended (public or private). For example, compared to individuals holding a bachelor's degree in biology, the break-even point for a community (retail) pharmacist who had four years of prepharmacy education and graduated from a public pharmacy school was age 29.

Differences in net cumulative early career earnings were observed based on educational track completed and career path chosen. Table 4 presents probability-weighted comparisons of incremental (defined as the cost difference between alternatives) net early career earnings resulting from two alternative education/career paths. Over a minimum of the first 10 years of pharmacy practice, a PharmD degree results in net incremental earnings of $222 060 to $570 555 more than what could be earned with a high school diploma. Similarly, over this time period, a PharmD degree results in net earnings of $53 832 to $465 713 more than earnings from a BS in biology or chemistry alone, depending on the discipline chosen. In each case, higher net early career earnings were observed for those who attended public pharmacy school and who had three years of prepharmacy education and a career in community pharmacy.

DISCUSSION

This analysis examined projected net cumulative earnings for the first 10 years of a pharmacy career to better understand the short-term economic impact of pursing a degree and career in pharmacy. The objective of the analysis was to compare the early career earnings from a pharmacy degree to those obtained through a high school diploma or a bachelor's degree in biology or chemistry, and quantify the break-even points wherein various pharmacy career paths become net cumulative positive investments over other options. In the break-even analysis, all pharmacy career tracks surpassed net cumulative earnings of high school graduates by age 33 and bachelor's degree holders by age 34 (Table 3). The earliest break-even point was reached at age 27 for individuals with a PharmD degree who attended a public or private school with three years of prepharmacy education (graduated pharmacy school at approximately 25 years of age). Specifically, community/retail pharmacists and hospital

Table 3. Break-Even Points by Age of Pharmacy Career Paths vs High School Graduates and Bachelor's Degree Holders

			Comparative Degree		
			High School	Biology	Chemistry
Pre-Pharmacy	School	Career	Age	Age	Age
3 Years	Public	Community	29	27	27
		Hospital	29	27	27
		PGY1	29	28	28
		PGY2	30	29	29
	Private	Community	29	27	28
		Hospital	29	28	28
		PGY1	30	29	29
		PGY2	31	30	30
4 Years	Public	Community	30	29	30
		Hospital	30	29	30
		PGY1	31	30	31
		PGY2	32	32	32
	Private	Community	31	30	31
		Hospital	31	30	31
		PGY1	32	32	33
		PGY2	33	33	34

As an example of how to interpret the table, compared to a biology degree holder, the break-even point for a hospital pharmacist with no residency training who had 3 years of pre-pharmacy education and graduated from a private pharmacy school was age 28

pharmacists with no residency training who had three years of prepharmacy education and graduated from a public pharmacy school reached the break-even point at age 27 compared to biology and chemistry degree holders; community/retail pharmacists who attended private pharmacy schools and had three years of prepharmacy education also reached the break-even point at age 27 compared to biology degree holders. In contrast, hospital pharmacists with PGY1 and PGY2 training who completed four years of prepharmacy education and graduated from a private pharmacy school vs biology and chemistry degree holders did not reach the break-even point until ages 32, 33, or 34. Yet, despite the delay in entering the job market and the additional costs involved in postsecondary education, the net earnings of pharmacists, even those completing one to two years of residency training, surpassed high school graduates and chemistry and biology degree holders less than 10 years after pharmacy school graduation and entering into the workforce as a full-time pharmacist (Table 4).

The findings of the Markov modeling further indicated that over the first 10 years of a pharmacist's career, he or she may accumulate net earnings of $716 345 to $1 064 840, depending on cost of obtaining the PharmD degree and career path followed. Given comparable years of prepharmacy education and type of pharmacy school, community pharmacists had the highest projected net early career earnings among the career paths, followed by hospital pharmacists with no residency training and then residency-trained pharmacists (who generally pursue residencies for increased clinical skills and knowledge, rather than salary considerations). Although they had up to eight fewer years of earnings in the studied time frame, pharmacists' net earnings were at least 1.45 times more than high school graduates and 1.08 to 1.78 times more than bachelor's degree holders at the age of 35.

Earnings from a career in pharmacy are clearly favorable when compared to a high school diploma or bachelor's degree in biology or chemistry, even when considering student loan repayments, which are factored into this analysis over the standard repayment periods (10 years for undergraduate loans; 25 years for loans obtained in pharmacy school). Although student loans are included in this financial analysis, it is important to consider the burden of student debt on one's early financial success. According to national averages, students earning a bachelor's degree have $29 400 in student loans,[31] whereas individuals pursuing a degree in pharmacy have significantly higher average student debt of $103 829 and $142 849 after graduating from public and private pharmacy schools, respectively.[16] Financial competency is therefore extremely important to help new graduates make prudent financial decisions while managing a substantial income that may be coupled with high student debt. As a result, a personal finance course is of great value and has been integrated into curricula as a required course at several schools of pharmacy.[32] Ideally, students should take personal finance courses as early as possible,

Table 4. Early Career Incremental Income by Pharmacy Employment

			Comparative Degree ($)		
Pre-Pharmacy	**School**	**Career**	**High School**	**Biology**	**Chemistry**
3 Years	Public	Community	570 555	465 713	402 327
		Hospital	531 256	426 414	363 028
		PGY1	492 538	387 696	324 310
		PGY2	435 316	330 474	267 088
	Private	Community	486 277	381 435	318 049
		Hospital	446 976	342 134	278 748
		PGY1	409 893	305 051	241 665
		PGY2	354 653	249 811	186 425
4 Years	Public	Community	424 937	320 095	256 709
		Hospital	389 742	284 900	221 514
		PGY1	350 616	245 774	182 388
		PGY2	295 664	190 822	127 436
	Private	Community	346 300	241 458	178 072
		Hospital	321 607	216 765	153 379
		PGY1	274 440	169 598	106 212
		PGY2	222 060	117 218	53 832

Incremental early career earnings are defined as the cost difference between alternative career/education paths. Earnings are net the immediate and long-term (student loan) costs of education and represent the additional income (up to age 35) accumulated by choosing a particular pharmacy career track vs a position out of high school or a position leveraging a bachelor's degree in biology or chemistry. Examples of how to interpret the table are as follows: At age 35, c*ommunity* pharmacists who attended *public* school after 3 years of pre-pharmacy study would have net earnings of $570 555 *more* than an individual who entered the workforce after completing high school. A *PGY-1* trained pharmacist who attended *public* school after 4 years of pre-pharmacy study would have net earnings of $245 774 *more* than an individual who entered the workforce with a Bachelor's degree in Biology. When comparing the incremental income of community pharmacists who attended public pharmacy school versus private pharmacy school following 3 years of pre-pharmacy study, the difference is $ 84 278

even during or before their undergraduate education (for example, a personal finance unit is required for high school graduation in Tennessee) to help facilitate good financial decision making.[33]

Financial outcome is not the only area where pharmacy careers perform favorably in comparison to other career paths. Job satisfaction for pharmacists is substantially higher than that reported by US workers as a whole. According to an annual job satisfaction survey, for the eighth straight year, less than half of all Americans are satisfied with their job, with only 47.7% of workers expressing job satisfaction in the 2014 edition of the survey.[34] In comparison, pharmacists working in community, long-term care, and hospital settings reported 75% overall job satisfaction.[35] Additionally, a pharmacy degree provides options for employment with flexible schedules and within numerous practice settings. This versatility may enable pharmacists to secure jobs that help meet individual needs to balance work with personal life and facilitate higher overall quality of life. The 2014 *U.S. News & World Report* "100 Best Jobs" ranks pharmacist fifth, behind software developer, computer systems analyst, dentist, and nurse practitioner.[36] The average annual salary for each of these careers is $93 280, $83 800, $163 000 and $91 450, respectively, with average unemployment rates of 2.8%, 3.6%, 1.5%, and 0.9%, respectively. In sum, pharmacy remains a well-paid profession with generally high job satisfaction.[18]

As with any study, limitations exist. The use of mean rather than median values may be considered a limitation, as the use of median values could lead to estimates less impacted by outlying values; however, mean values for all inputs were available while median estimates were not. In the spirit of consistency, we chose to rely on mean values for this analysis. Another limitation in our data sources was the lack of standard deviations for their values; therefore, we were unable to create reliable confidence intervals for our estimates. This is simply a limitation of the available data on the pharmacy workforce and labor market, and suggests areas of opportunity for future research. Despite these noted limitations, the data sources used in this study are well-established; thus, the data and models are valid under the assumptions. Dependence on data validity is a common limitation in economic models that is accepted under the described conditions and interpreted under these assumptions. We also assumed that individuals remained in the same career track; however, changes in career often occur and, in turn, earnings may fluctuate. This is another common limitation in economic models that is accepted under the

described conditions. Additionally, the study used conservative estimates of time needed to complete a degree. For example, four years to complete a biology or chemistry degree and four years to complete a PharmD degree were used in the models. In reality, time to complete a degree may vary; however, we elected to use a traditional and conservative, but realistic, time frame for degree completion in the models.

Although many assumptions were made, the models presented in this study project favorable early career earnings for pharmacists, regardless of the typical length of prepharmacy education, type of school attended, or pharmacy career path. The economic models presented in this study are based on assumptions described herein; as conditions are subject to variability, these models should not be used to predict future earnings. Future economic analyses of pharmacy education and careers should consider less traditional paths that have reliable data, for example evaluation of economic models in academic pharmacy. Furthermore, analyses of careers in pharmacy compared to careers in other facets of the health care industry would be informative to those considering careers in the health care sector.

CONCLUSION

The findings of this economic evaluation demonstrate the positive economic effects of a pharmacy education and the early years of a pharmacy career under the model assumptions. Even with the costs of education and the delay in entering the workforce, pharmacy graduates may accumulate net earnings of $222 060 to $570 555 more than high school graduates and $53 832 to $465 713 more than bachelor's degree holders by age 35. Moreover, pharmacists surpass the projected net cumulative early career earnings of high school graduates and bachelor's degree holders as early as four and two years, respectively, after graduation and working as a full-time pharmacist. Thus, a career as a pharmacist provides positive economic outcomes with a quick net break-even point compared to high school graduates and those with bachelor's degrees who entered the workforce immediately upon graduation.

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