

The Long-Term Financial Impacts of the Decision to Pursue a Neurosurgical Career

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ABSTRACT

OBJECT: There is this perpetuating idea amongst neurosurgeons in this generation that the financial endpoint may not be worth the time investment. We examine the income and wealth consequences of a neurosurgeon's delayed entry into the workforce. Our analysis focuses on the financial trajectories of a variety of career paths for a college age student and examines the effects of subsidized medical education.

METHODS: We characterized the schooling and training for multiple career paths and computed income, student debt, and return on savings for each year for each possible career path. We used data from the BLS, Forbes and the AAMC, and utilized benchmark economic variables in our analysis and compared the age at which a neurosurgeon breaks even with alternative careers in terms of the present day value of cumulative income (less cost of education) and net worth.

RESULTS: Neurosurgical careers match the cumulative income of MBA careers between their mid-30's to mid-40's. However, a neurosurgeon's net worth does not match that of MBA-healthcare and MBA-finance tracks until ages 45 and 51 respectively. Neurosurgeons who pursue a year of research will match the wealth of the MBA-healthcare track at age 53 and never match the wealth of a MBA-finance tracks. If both research and fellowship are pursued, a neurosurgeon will never match the wealth of either MBA track. Subsidized medical education has little to no effect on lifetime income and wealth.

CONCLUSION: The analysis shows neurosurgeons do not match the wealth accumulation of high pay alternative careers until their early-50s, if ever. The time and cost of a neurosurgeon's education and training delays their ability to build wealth. Even when the cost of medical education is subsidized, there is little effect on wealth and income. This analysis suggests that the decision to pursue a career in neurosurgery requires extreme patience, as the economic returns will not be realized for several decades, if ever.

INTRODUCTION

CBS News¹⁴ published an article titled “\$1 million mistake: Becoming a doctor,” which warned those considering medical careers to think twice. Surveys showed less than half would choose a career in medicine again for reasons such as increased paperwork burden and time spent completing administrative tasks. When increasing cost of medication education, declining average salaries and length of time necessary to attain independence are considered, the decision not to pursue a career in medicine seems like a “no-brainer.”

On August 16, 2018, The New York Times⁹ and The Wall Street Journal¹³ both reported the NYU School of Medicine announced they would cover tuition in perpetuity for all of its medical students, regardless of financial situation. NYU began this initiative, a first among USA’s major medical schools, citing concerns about overwhelming financial debt facing graduates at a time when the affordability of higher education is in question.

Neurosurgeons are among the highest paid physicians and surgeons due to the complex and demanding nature of their work. However, their lengthy training delays their entry into the workforce. When the cost of medical education, lower pay during residency and the higher salary of alternative high education occupations are also considered, there are ramifications on their income and net worth. These are likely not understood at the time the decision is made to pursue the career.

This study models and analyzes how the delayed entry of a neurosurgeon into the workforce affects their income and lifetime earnings when compared to alternative careers. The impact of subsidized medical education on a neurosurgeon’s lifetime income and net worth is considered and examined.

METHODS

Career Paths

We characterized the schooling and training for neurosurgical career paths, and other career paths in law, business and chemistry. All career paths last 50 years and assume retirement at age 68. Total number of years worked is calculated from this age and the age of entry into the workforce for these career paths.

The first career path is that of a public high school graduate entering the workforce at age 18. The second career path is a college undergraduate pursuing a bachelor’s degree in chemistry at a public university before entering the workforce as a chemist at age 22. The third career is similar to the last, but with the additional pursuit of a PhD in chemistry which requires 5 years to

complete, and enters the workforce at age 27. Careers requiring professional degrees such as business (masters in business administration; MBA) and law (Juris Doctor; JD) are also considered. MBA healthcare and finance career tracks are examined. Both tracks require a 2-year MBA degree before entering the workforce at age 24. The law path assumes completion of a 3-year law program after completing college and workforce entry at age 25.

Multiple career paths are available for neurosurgeons from the time they enter medical school. All these paths assume after completing a 4-year bachelor's degree, a medical degree (MD) is completed in 4 years and neurosurgical residency is completed in 7 years. The first neurosurgical path considered is without pursuit of research or fellowship. The second option adds one additional year dedicated to research sometime before residency. The third adds two additional years of training dedicated to a subspecialty fellowship. Neurosurgeons following these career paths total 15, 16 and 18 additional years of training and enter the workforce at ages 33, 34 and 36 respectively. The last neurosurgical option is that of a 7-year MD/PhD program before completing a 7-year training residency. This path totals 18 additional years and workforce entry occurs at age 36. Our model assumes neurosurgeons enter the workforce at the level of assistant professor. After 5 years in the workforce, an assistant professor becomes an associate professor, and after 12 years in the workforce, one becomes a full professor. After 22 years in the workforce, a full professor becomes a chair or chief at their respective institution.

Starting Salary and Salary Growth

The starting salary for high school graduates was set to \$36,100⁷ and chemists with a bachelor's degree at \$76,280⁵. Starting salaries for the MBA-Healthcare and MBA-Finance careers were set to \$157,000 and \$265,000 respectively,¹¹ which represent the sum of median base salary, median signing bonus and median guaranteed compensation. Lawyers were set to \$160,000¹ and that of a Chemistry PhD industry job was set to \$126,000.¹⁸ Annual salary growth of 1% is assumed for all of these career paths. Neurosurgical starting salaries were set based on median values and assumed to grow stepwise as they progress from assistant professor to chairs, as described above. Assistant professors earn \$511,000, associate professors earn \$611,000, full professors earn \$624,000 and chairs earn \$972,000.²

The authors set annual earnings while in school to \$5,000 for college undergraduates, \$10,000 for JD and MBA candidates and \$30,000 for PhD candidates. Salaries for residents and fellows were set on a sliding scale from \$54,107 (year 1) to \$71,167 (year 8).³

Annual Cost of Education

The annual cost for a bachelor's degree at a public university was set to \$25,290,¹⁰ which is the sum of the cost of in-state tuition room & board, books and transportation. The annual cost of an MBA was set to \$78,029, which represents the combined average costs of annual tuition (\$59,229) and room & board (\$18,800) of the top 25 business schools.⁸ The cost of tuition for

law school was estimated using the average public school tuition for residents (\$26,425)¹⁵ and is combined with the same cost of room & board for students in business school (\$18,800) for a sum of \$45,225. The cost of a research-based doctorate (PhD) was set to \$36,600.¹⁹

The annual cost of medical education was set to \$68,502, which includes both the cost of medical school tuition, fees and health insurance costs at a public medical school (\$49,622)⁴ and the cost of room & board we have used for business and law schools (\$18,800). In the case of MD/PhD students, we assume no cost for tuition, fees and health insurance, and an annual \$30,000 stipend. We also reconsider the case where medical tuition is subsidized and students only pay room & board in all neurosurgical career paths.

Key Economic Variables and Definitions

Two important parameters for this model are total discounting and savings because they capture the changing value of money over time. Discounting is the process of determining the present day value of future payments. It accounts for the time value for money, which is the concept that a sum of money available today is worth more than the identical sum in the future. Based on the authors' experience with financial models, the discount rate for this model was set to 1.6%. Inflation is also considered, as it represents the general increase in prices, and the relative fall in the purchasing power of money. In this model, this rate is set to 2.5%, based on the Consumer Price Index (CPI) from the U.S. Federal Reserve Economic Data (FRED).⁶ When the discount and inflation rate are summed, the total discount rate is set to 4.1%.

There are two assumptions about savings: (1) Savings start from the moment a career begins, but not while in school/training and (2) the savings rate is constant at 10% of pre-tax income in a tax deferred account, such as a 401k or IRA. We also consider the savings rate of 20%. We set the average annual real return on these savings to 6%. This is important because this rate affects the compound returns from these savings and can have a significant effect on net worth calculations.

Total Cost of Education, Cumulative Income, and Net Worth

The total cost of education was calculated, assuming the annual cost of education is covered by loans. Rutgers Office of Financial Aid was consulted for loan information. Loans were broken into two types: subsidized and unsubsidized. Subsidized loans have a 4.66% interest rate for undergraduate studies, 6.21% interest rate for graduate studies and are available up to \$3,500 per year. Subsidized loans do not accrue interest while the borrower maintains full time student status and follow a 10-year repayment schedule. Unsubsidized student loans have a 7.21% rate and do accrue interest while in school. These loans follow a 20-year repayment schedule.

Income was calculated for each year of work for each career path, based on starting salary, taking into account the 1% annual income growth and 4.1% total discounting described above. For neurosurgical careers, we utilize stepped salary growth instead of the 1% income growth, as

described above. Cumulative income is defined as the income earned over the course of the career. In this model, it is calculated by summing all income earned each year and subtracting the total cost of education. Lifetime earnings is defined as the total income earned until retirement. At retirement, cumulative income equals lifetime earnings.

Net worth is defined as the value of all savings (including returns) minus all debts. In this model, net worth is calculated for each year of every career by summing annual savings and subtracting the loan balance. Annual savings is calculated by taking 10% of pretax income each year and considering 6% real return on savings and 4.1% total discounting.

RESULTS

Data containing starting salaries, annual cost of study, total years in the workforce, total years of training and annual earnings during training for each career path is represented in Table 1.

Total Cost of Education

Figure 1 represents the total cost of education, which was calculated, accounting for loans, interest rates and discounting. The total cost of higher education for a high school degree is \$0, \$109,521 for undergraduate degrees, \$285,225 for MBAs, \$261,575 for JD and \$144,146 for PhD.

Total cost of education for neurosurgeons is \$392,734. This increases to \$426,265 with a year of research and \$447,010 with both research and fellowship. In the case of subsidized medical education, the costs for these neurosurgical paths are \$123,891, \$130,670 and \$134,635, respectively. These costs of education increase due to the effects of accrued interest and discounting. Total cost of education for neurosurgeons pursuing the MD/PhD track is \$127,485. On average, subsidizing medical education reduces costs by \$292,271.

Lifetime Earnings and Cumulative Income

Lifetime earnings, calculated as described above, is represented in Figure 2. Lifetime earnings is \$1,407,789 for the high school graduate, \$2,285,468 for the college graduate, \$3,401,639 for the MBA-Healthcare career, \$4,450,519 for the MBA-Finance career, \$3,972,820 for the law career and \$2,925,360 for the PhD career.

By comparison, lifetime earnings for neurosurgeons is \$6,984,844. With research alone, this decreases to \$6,582,735. Lifetime earnings further decrease to \$5,867,813 with both research and fellowship. For subsidized medical education, lifetime earnings for these careers path increase to \$7,253,688, \$6,878,331 and \$6,180,187 respectively. The lifetime earnings of a neurosurgeon pursuing the MD/PhD track is \$6,197,571.

Cumulative income over time was graphed in Figure 3. The neurosurgeon who does not pursue research or fellowship matches the cumulative income of the MBA-healthcare track at age 35 and the MBA-finance track at age 38. The neurosurgeon pursuing research matches the cumulative income of the MBA-healthcare track at age 37 and the MBA-finance track at age 40. The neurosurgeon pursuing research and fellowship matches the cumulative income of the MBA-healthcare track at age 40 and the MBA-finance track at age 45.

The accumulation of earnings over time with subsidized medical education is graphed in Figure 4. The neurosurgeon who does not pursue research or fellowship matches the cumulative income of the MBA-healthcare track at age 35 and the MBA-finance track at age 37. The neurosurgeon pursuing research matches the cumulative income of the MBA-healthcare track at age 36 and the MBA-finance track at age 39. The neurosurgeon pursuing research and fellowship matches the cumulative income of the MBA-healthcare track at age 39 and the MBA-finance track at age 43.

Net Worth and Savings

Net worth was calculated for neurosurgical and MBA career tracks. Figure 5 represents the growth of the net worth of neurosurgical career paths and the MBA career tracks over time when 10% of income is saved. Neurosurgeons pursuing neither research nor fellowship match the net worth of the MBA-healthcare and MBA-finance tracks at ages 46 and 52 respectively. With research, neurosurgeons match the net worth of the MBA-healthcare track at age 52 and never match the net worth of the MBA-finance track. The neurosurgeon pursuing both research and fellowship never matches the cumulative income of either MBA career track.

Figure 6 represents the growth of the net worth of neurosurgical career tracks and the MBA career tracks over time when medical education is subsidized. A neurosurgeon matches the net worth of the MBA-healthcare track at age 41 and the MBA-finance track at age 51.

Neurosurgeons pursuing research match the net worth of the MBA-healthcare track at age 50 and never match the net worth of the MBA-finance track. Just as in the case of unsubsidized medical education, neurosurgeons pursuing research and fellowship never match the net worth of either MBA career track.

Table 2 highlights these ages at which neurosurgeons “break even” with MBA career tracks as described in both Figure 5 and Figure 6.

DISCUSSION

This study assesses how the delayed entry of neurosurgeon into the workforce affects their income and wealth compared to other high earning careers. This model accounts for important economic variables and focuses on the financial trajectories for some career paths available to

college age students. It also examines how subsidized medical education affects neurosurgeons' income and wealth.

All neurosurgical career paths match the cumulative income of MBA careers between ages 35 to 45. However, the net worth of neurosurgeons without research or residency does not match that of MBA-healthcare and MBA-finance tracks until ages 46 and 51 respectively. Even after matching the MBA-finance track, the net worth of these career paths remains very close until retirement. Neurosurgeons pursuing research match the wealth of the MBA-healthcare track at age 52 and never match the wealth of the MBA-finance track. If both research and fellowship are pursued, a neurosurgeon will never match the wealth of either MBA track.

These findings show extending a neurosurgeon's education and training affects their future net worth. One additional year to pursue research in a neurosurgical career added 6 years to match the net worth of the MBA-healthcare career. The neurosurgical path without research matched the net worth of the MBA finance career at age 51, but an additional year for research meant that it was impossible to match the net worth of the MBA-finance career. Given that retirement is at age 68, this means adding just one year to a neurosurgeon's training effectively meant adding at least 17 more years in order to match the net worth of the MBA-finance career. This is largely due to the effects of discounting. Essentially, the earnings and wealth of someone entering the workforce at a later point of time will be more discounted than someone entering the workforce sooner. Our model's total discount of 4.1% is consistent with the 2016 Willis Towers Watson's WTW Pension 100, which also estimates the average to be 4.1%.¹⁷

Discounting impacts a neurosurgeon's ability to accumulate wealth. Although neurosurgeons begin to outearn both MBA career paths upon finishing their training, they enter the workforce at a later time. Someone with an MBA enters the workforce at least 9 years earlier than a neurosurgeon. The delayed timing of a neurosurgeon's earnings means they are further discounted. Furthermore, the longer length of neurosurgical training means there is less time to accrue savings and increase net worth during those years. Lastly, since the salary of a neurosurgeon is stepped, every additional year in training is the equivalent of the loss of a year of salary at the level of a chair (albeit highly discounted). Thus, pursuing additional research or fellowship – which further delays a neurosurgeon's entry into the workforce – profoundly affects their ability to generate wealth.

Subsidized medical education reduces the age at which neurosurgeons match the income of MBA careers by 1-2 years and the age at which neurosurgeons match the wealth of MBA careers by 1-5 years. The difference in total cost of education between subsidized and unsubsidized medical education is small enough to be paid for by 1-2 years of a neurosurgeon's salary, depending on the specific career path. In fact, we can observe that the difference in the total cost of education between subsidized and unsubsidized medical education in Figure 1 is equivalent to

the differences of lifetime earnings in Figure 2. This suggests both total cost of medical education and subsidization have relatively minor effects on a neurosurgeon's cumulative income. When examining the effect of subsidized medical education on wealth, the largest reduction in break-even age between neurosurgical and MBA careers was 5 years. This is observed in the case of neurosurgeons pursuing neither research nor fellowship during their training and the MBA-healthcare track. This is best explained by the fact that since only 10% of a neurosurgeon's income is saved each year, far less time is needed to overcome the lower student debt balance when medical education is subsidized. They can begin to earn savings with less discounting, allowing them to catch up to the wealth of the MBA-healthcare career at an earlier age. However, subsidized medical education hardly changes the outcomes of the other neurosurgical career paths.

When the savings rate was doubled from 10% to 20% for all careers, we find the value of savings is also doubled at any given age. Thus, it has little impact on our findings.

This analysis suggests that a career in neurosurgery requires considerable "financial patience," as realizing the economic returns may take several decades, if ever at all. Compared to MBA career paths, a neurosurgeon experiences a much longer period of time with lower earnings and accrues substantially larger debt. Once neurosurgeons complete their training, they may accumulate high income and net worth and surpass the MBA careers. However, these findings change if research or fellowship is pursued. When medical education is subsidized, there is some benefit on both income and net worth on economic returns, but not enough to outweigh the effects of discounting due to the later entry of neurosurgeons into the workforce.

Several limitations exist in this model and analysis. Assumptions made in order to create our model do not fully capture the variability of both career paths and the potential earnings of those career paths. We consider some of the most common neurosurgical career paths in our analysis, but only consider two MBA paths, one PhD and one undergraduate career path. Per the source for MBA salaries, careers in finance are the most common paths for MBA graduates and tie with consulting as the highest MBA career starting salaries. By comparison, a career in healthcare following business school is less common and has a lower base salary compared to the average for all MBA career paths. If all of these paths or more common MBA careers were selected, we might observe results more similar to those of the MBA-finance career track rather than the MBA-healthcare track. There are a wide variety of career paths for those with a bachelor's degree or PhD to pursue. Our model assumes the pursuit of degrees in chemistry. However, this likely does not affect these findings, as CNN reports that the average starting salary for the graduating class of 2018 at \$50,390,¹⁶ which is significantly lower than the salary of \$76,280 we found for chemists with a bachelor's degree.

The model utilizes average or median base salaries of these career paths as starting salaries, and assumes both stepped salary growth for neurosurgeons and 1% salary growth for other careers. For neurosurgical career paths, we assume the salary for a neurosurgeon will be the same, regardless of what research or fellowship was pursued. Since fellowship provides additional training, those that complete fellowship potentially could earn salaries higher than the average neurosurgeon. The model sets specific neurosurgical career path from assistant professor to chair that may not be applicable for all neurosurgeons. Since every step is associated with increased salary, deviations from this path in the model will affect the income and net worth of a neurosurgeon. However, it is virtually impossible to account for every possible neurosurgical career path in a meaningful way. This model accounts for a number of what the authors felt were the most common neurosurgical career options.

For other career paths, such as in business or law, assumptions about starting salaries and 1% salary growth may not be fully representative and comparable to neurosurgery. Those in these career paths could experience changes to both salary and salary growth by receiving promotions, receiving bonuses and changing jobs. An article in Forbes that discussed the findings of a study of MBA pay and salary growth found that by the end of five years post-MBA, salary growth could be as high as 80%.²⁰ Salaries at many top, large law firms start at \$190,000 for first year associates and increase to \$340,000 for eighth year associates.²¹ Furthermore, if a lawyer is promoted to partner at one of these firms, their annual earnings continue to increase throughout their career. Thus, our model could be underestimating the salaries for MBA and law careers.

This model does not consider how neurosurgeons compare to other medical careers in terms of income and net worth. Further study should be aimed at exploring and comparing the long-term financial impacts of other medical specialties and subspecialties to neurosurgical careers. It would be useful both to further understand how discounting affects the pursuit of a medical career and as a tool for medical students in comparing potential career choices.

The assumption of constant and fixed economic variables in this model (such as total discount rate, interest rate on savings and the percentage of annual income saved) is important to make meaningful comparisons between career paths, but may be unrealistic. Economic variables fluctuate and that can affect the value of future earnings. For instance, if the discount rate is higher during training and lower after neurosurgeons enter the workforce, neurosurgeons may sooner catch up to the earnings and wealth of MBA careers. Furthermore, it may be unrealistic to expect a fixed percentage of all income earned to go to savings each year, as higher income workers likely save a greater percentage of their income compared to low income workers. However, because neurosurgeons' earnings start much later than other careers, a greater fraction of their income must be saved in order to accrue similar levels of wealth to other careers.

It is important to recognize this study only focuses on economic and financial variables and endpoints. It should not in any form equate to happiness on any level, and one rarely puts a price on doing what they love. In fact, one study finds no association between income and happiness past \$95,000.¹² Most neurosurgeons rarely enter the field purely driven by finances, but rather to pursue a higher inner calling and a passion for something greater.

CONCLUSION

The analysis shows neurosurgeons do not match the income or wealth accumulation of high pay alternative careers until their early-50s, if ever. The time and cost of a neurosurgeon's education and training delays their ability to build wealth. Even when the cost of medical education is subsidized, there is little effect on wealth and income. This analysis suggests that the decision to pursue a career in neurosurgery requires extreme patience, as the economic returns will not be realized for several decades, if ever.

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Figure 1. Total Cost of Education. (a) Total cost of education is represented for each career path. (b) Total cost for neurosurgical career paths is represented for both unsubsidized and subsidized medical education.

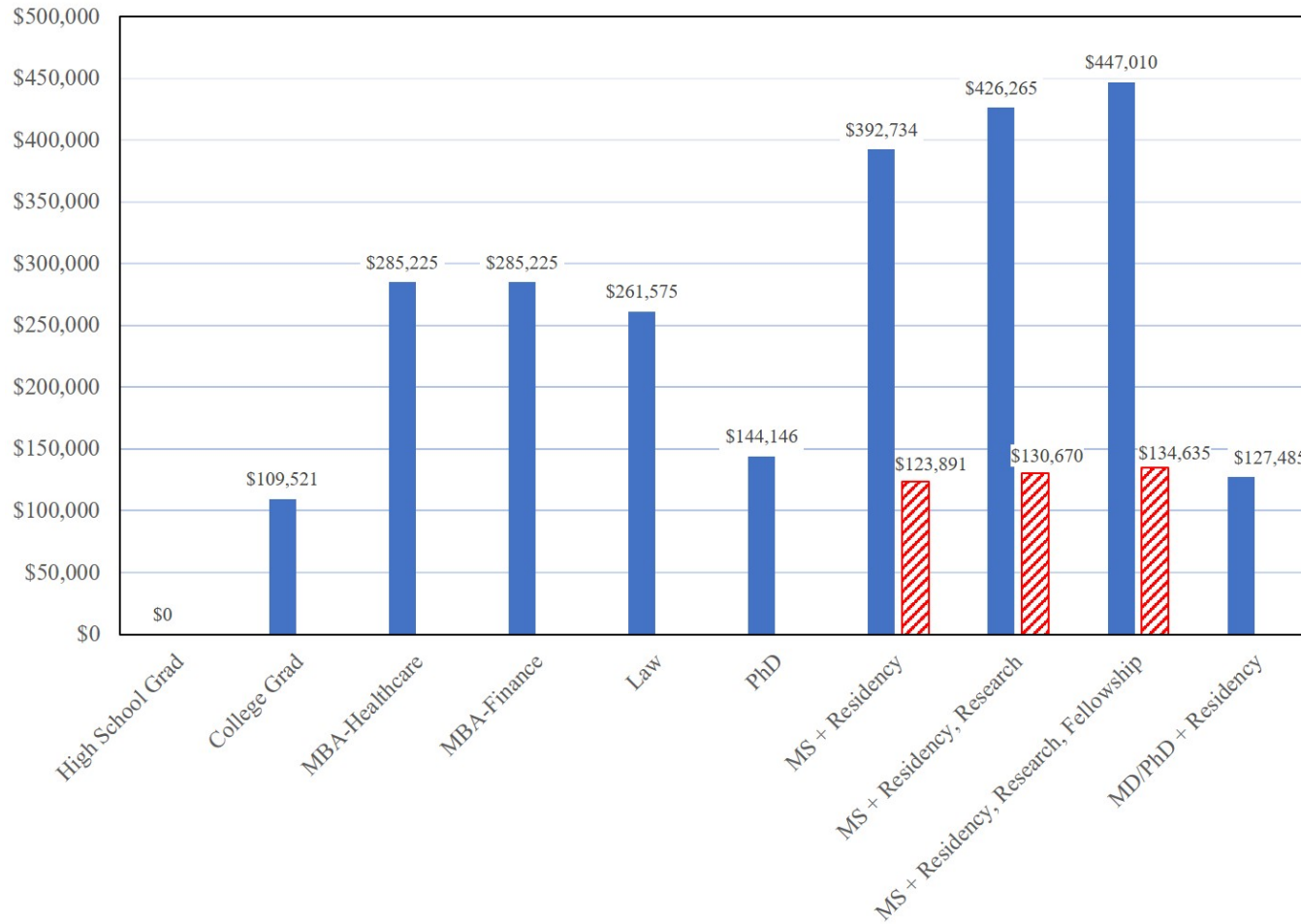


Figure 2. Lifetime Earnings. (a) Lifetime earnings is represented for each career path. (b) Lifetime earnings for neurosurgical career paths are represented for both unsubsidized and subsidized medical education.

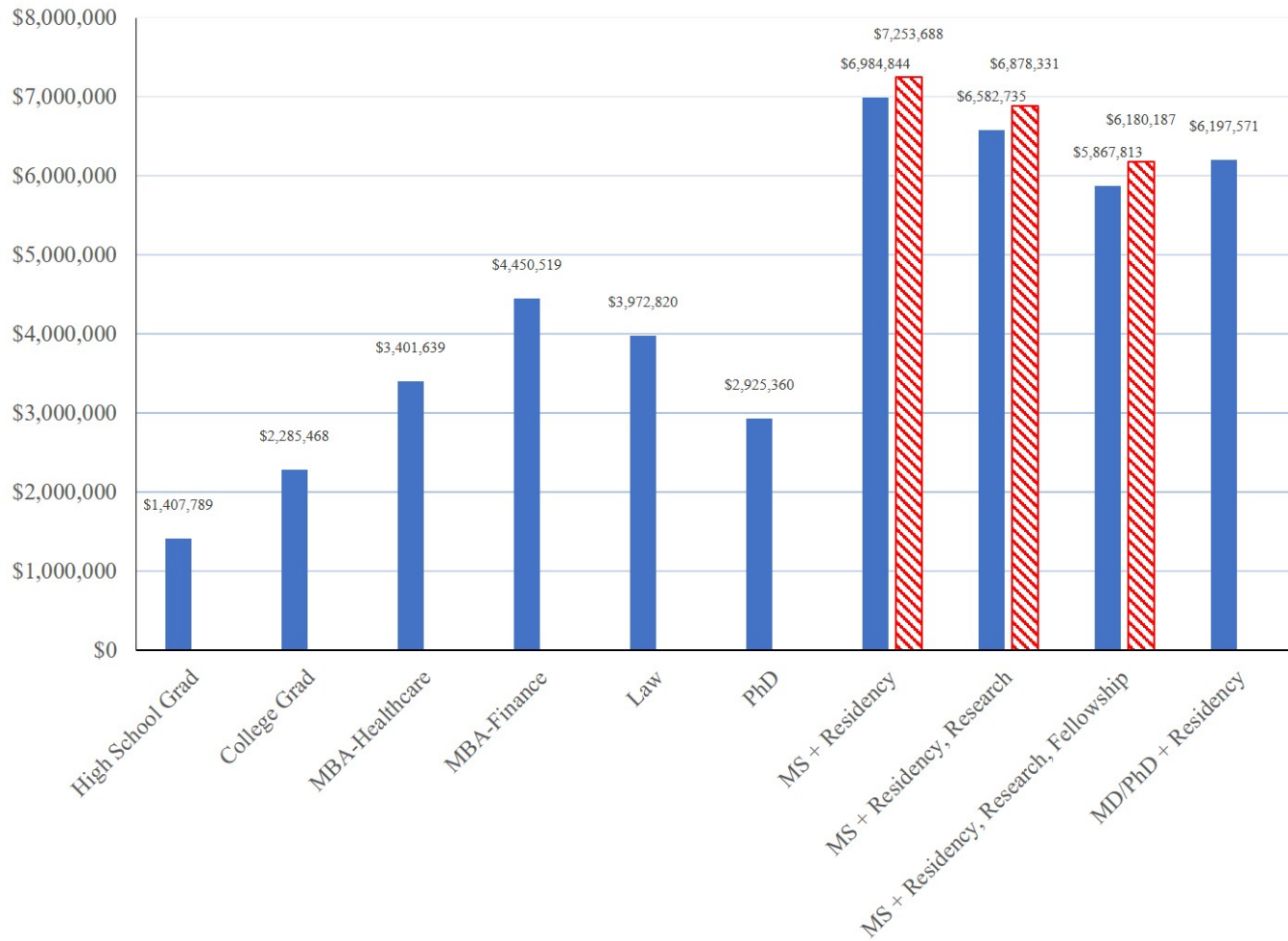


Figure 3. Cumulative Income. The accumulation of income annually is represented for all neurosurgical and high paying non-neurosurgical careers, from the age of 18 to age 68 (retirement).

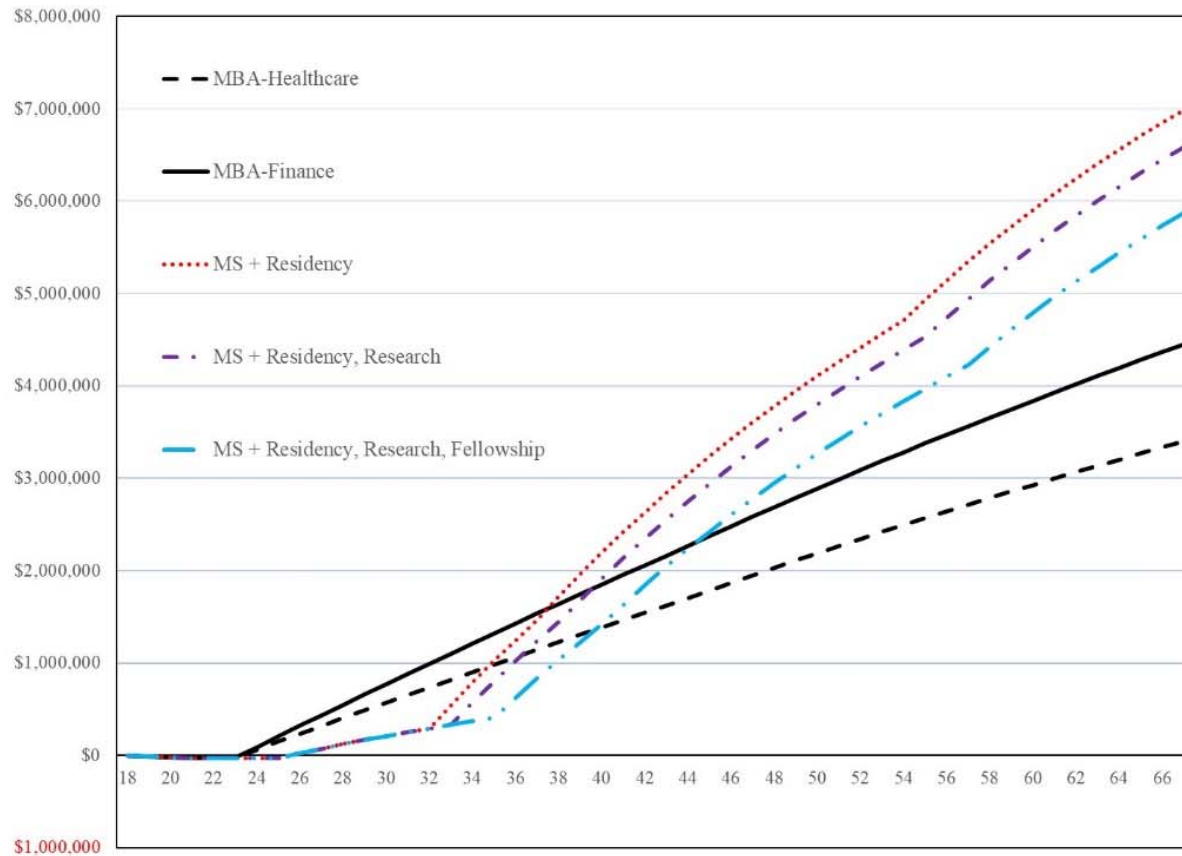


Figure 4. Cumulative Income (Subsidized Medical Education). The accumulation of income vs. time is plotted for neurosurgical and high paying non-neurosurgical careers, from the age of 18 to age 68, in case the of subsidized medical education.

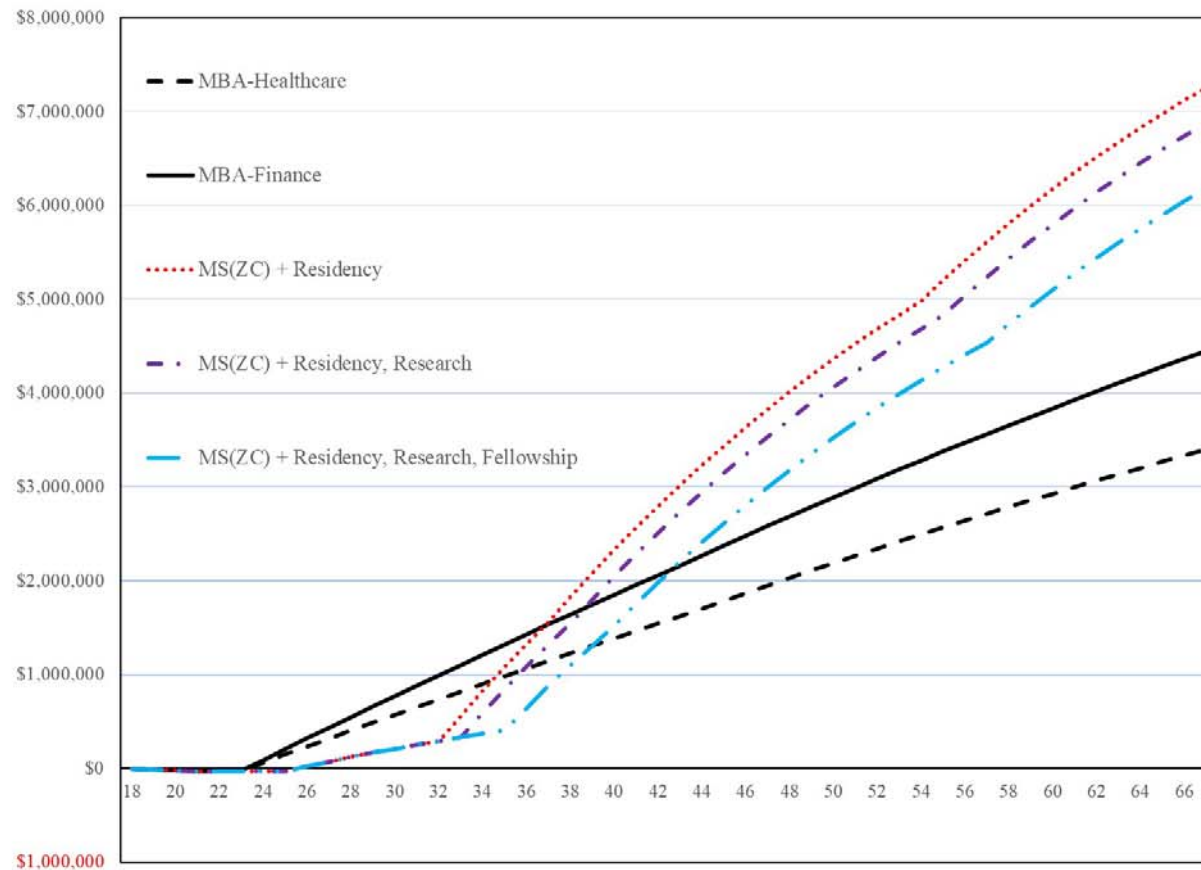


Figure 5. Net Worth of Career Paths (10% Savings). The growth of net worth vs. time is plotted for neurosurgical and high paying non-neurosurgical careers, from the age of 18 to age 68.

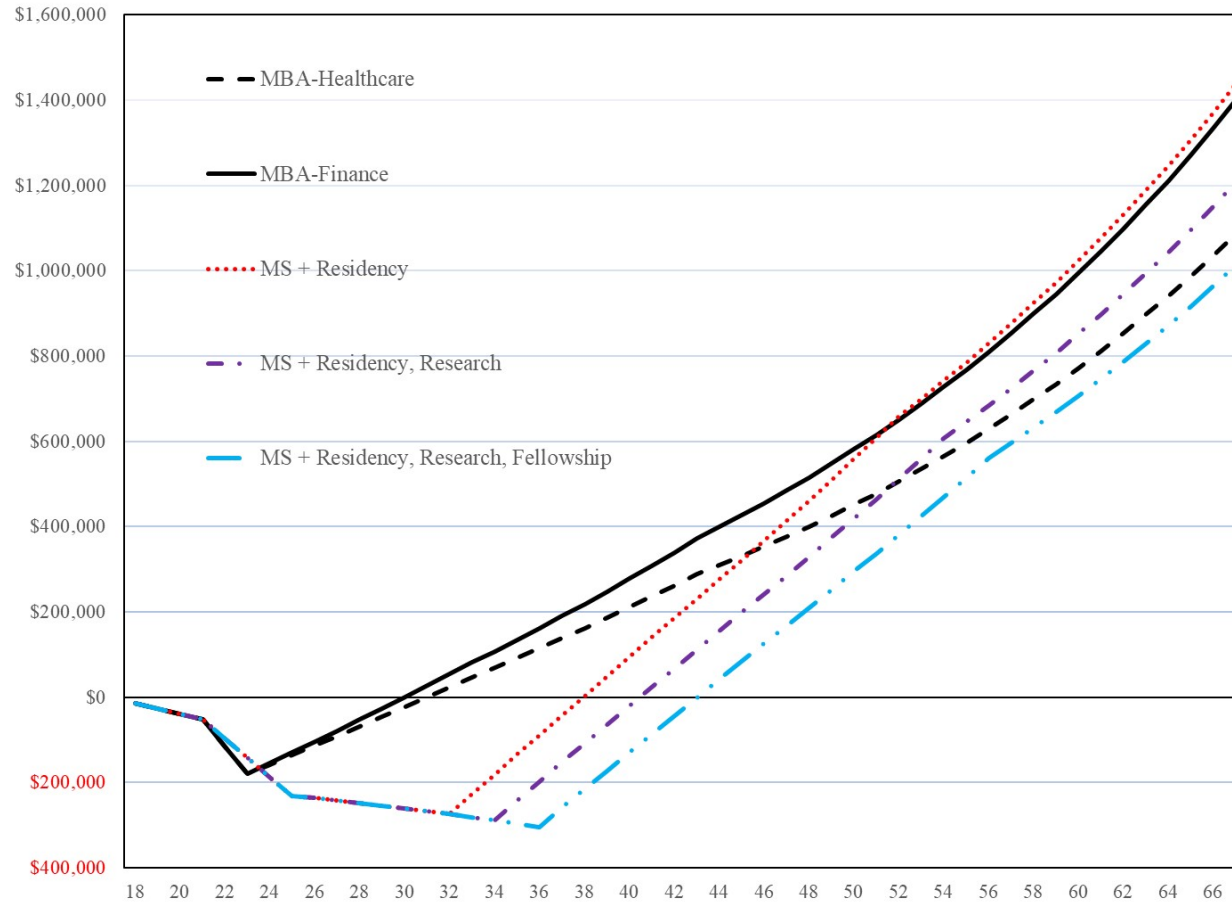


Figure 6. Net Worth of Career Paths (Subsidized Medical Education). The growth of net worth vs. time is plotted for neurosurgical and high paying non-neurosurgical careers, from the age of 18 to age 68, in the case of subsidized medical education.

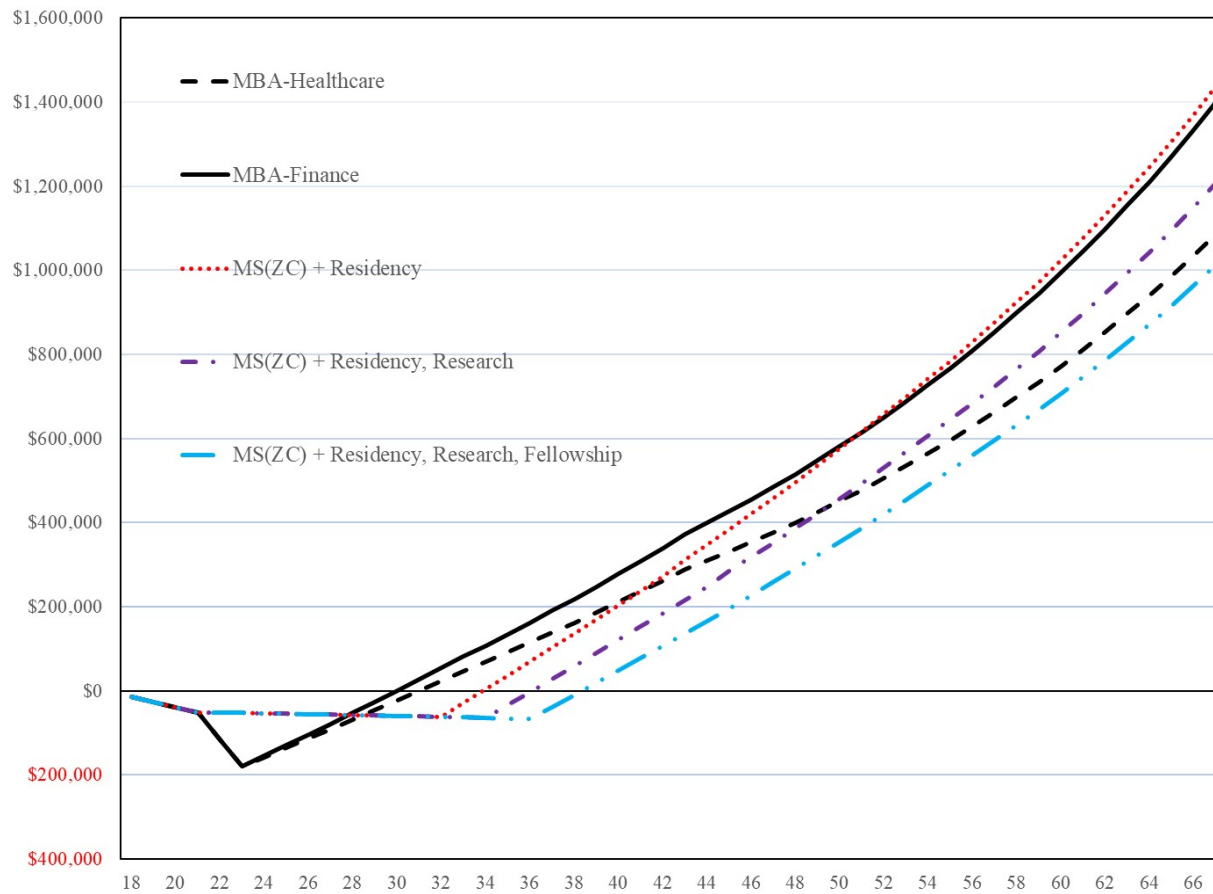


Table 1 – Key Career Data

	Total Additional Years of Schooling / Training	Age When Enter Workforce	Years of Work	Starting Salary (initial year)	Annual Earnings While in School	Cost of Study/year
High School	0	18	50	\$36,100	\$0	\$0
College Undergraduate	4	22	46	\$76,280	\$5,000	\$25,290
MBA-Healthcare	6	24	44	\$157,000	\$10,000	\$78,029
MBA-Finance	6	24	44	\$265,000	\$10,000	\$78,029
Law	7	25	43	\$160,000	\$10,000	\$45,305
PhD	9	27	41	\$126,000	\$30,000	\$36,600
Medical School + Residency	15	33	35	Stepped Salary Asst Prof (\$511K) Assoc Prof (\$611K) Prof (\$624K) Chair (\$972K)	Sliding scale from \$54,107 (year 1) to \$71,167 (year 8)	\$68,502
Medical School + Residency & Research	16	34	34			
Medical School + Residency, Research, Fellowship	18	36	32			
MD/PhD + Residency	18	36	32			

Table 2 – Age at which Neurosurgeons “Break-Even”

	Cumulative Earnings		Net Worth	
	MBA-Healthcare	MBA-Finance	MBA-Healthcare	MBA-Finance
	Unsubsidized Medical Education			
MS + Residency	35	38	46	52
MS + Residency + Research	37	40	52	Never
MS + Residency + Research + Fellowship	40	45	Never	Never
	Subsidized Medical Education			
MS + Residency	35	37	41	51
MS + Residency + Research	36	39	50	Never
MS + Residency + Research + Fellowship	39	43	Never	Never

ABBREVIATIONS

Asst = Assistant

Assoc = Associate

MBA = Masters in Business Administration

MD = Doctor of Medicine

MS = Medical School

PhD = Doctor of Philosophy

Prof = Professor