

A History of Medical Student Debt: Observations and Implications for the Future of Medical Education

S. Ryan Greysen, MD, MA, Candice Chen, MD, MPH, and Fitzhugh Mullan, MD

Abstract

Over the last 50 years, medical student debt has become a problem of national importance, and obtaining medical education in the United States has become a loan-dependent, individual investment. Although this phenomenon must be understood in the general context of U.S. higher education as well as economic and social trends in late-20th-century America, the historical problem of medical student debt requires specific attention for several reasons.

First, current mechanisms for students' educational financing may not withstand debt levels above a certain ceiling which is rapidly approaching. Second, there are no standards for costs of medical school attendance, and these can vary dramatically between different schools even within a single city. Third, there is no consensus on the true cost of educating a medical student, which limits accountability to students and society for these costs. Fourth, policy efforts to

improve physician workforce diversity and mitigate shortages in the primary care workforce are inhibited by rising levels of medical student indebtedness. Fortunately, the current effort to expand the U.S. physician workforce presents a unique opportunity to confront the unsustainable growth of medical student debt and explore new approaches to the financing of medical students' education.

It is difficult to determine exactly when the practice of borrowing to pay for medical education began. Following the publication of the Flexner Report in 1910, U.S. MD education completed its move to a nationally standardized, university-based model, and tuition for the learning experience normalized as well.¹ Over the next 50 years, teaching was still the dominant activity for most medical schools, tuition and fees remained stable,² and the overall costs to students were low enough that students were able to cover costs with the help of gifts and loans from family without taking on private or government loans.³ In the early 1960s, family contributions still accounted for 83% of students' total income, and only 31%

of students incurred any educational debt whatsoever.⁴

Over the following 50 years (1960–2010), medical student debt became a problem of national importance.^{5–7} By 1984, medical education had become a loan-dependent, individual investment with over 86% of students graduating in debt.⁸ During that same period, the medical student body doubled while average individual indebtedness more than quadrupled. From 1985 to present, the proportion of medical students graduating with debt has not changed substantially, but total amounts of debt have spiked alarmingly above inflation to a mean of \$158,000 per individual or approximately \$2.3 billion per graduating class.⁹ These figures are even more troubling considering that total amounts may be two to three times higher with interest over payback periods of 25 to 30 years.

Now, as U.S. MD-granting schools respond to a call by the Association of American Medical Colleges to expand overall capacity by 30% by 2015, causes for this upward trajectory of student indebtedness must be carefully considered. Equally important are potential consequences of rising debt burdens: unsustainable financing mechanisms for students, insufficient transparency and accountability in determining educational costs, and barriers to diversifying the physician workforce with regard to racial/ethnic and socioeconomic backgrounds.

Here, we explore the problem of U.S. medical student debt in historical context from three perspectives. First, we focus on broad social and economic trends in late-20th-century America. Next, we describe the explosive growth of U.S. medical schools and uncertainty of educational costs in the context of expansionism in American higher education. Finally, we view student debt through the lens of workforce diversity and primary care.

U.S. Medical Student Debt in the Context of American Social and Economic Trends

Post–World War II American society has increasingly embraced a consumer-driven economy, and as loans became socially acceptable, higher education became a service that individuals financed largely through personal loans.

Government has also played an important role in shaping higher education in postwar American society. The G.I. Bill (1944), for example, catalyzed an unprecedented influx of students, many of whom were older than prewar students had tended to be and were often married, leading to a more autonomous lifestyle among students.¹⁰ The subsequent generation of “baby boomers” pushed for even greater independence. These trends were widely observed in American higher education

Dr. Greysen is Robert Wood Johnson Clinical Scholar, Yale University School of Medicine and West Haven VA Medical Center, New Haven, Connecticut.

Dr. Chen is assistant professor of pediatrics and health policy, George Washington University School of Medicine and Health Sciences, Washington, DC.

Dr. Mullan is Murdock Head Professor of Medicine and Health Policy, George Washington University School of Public Health and Health Services, Washington, DC.

Correspondence should be addressed to Dr. Greysen, Robert Wood Johnson Clinical Scholar, Yale University School of Medicine, 333 Cedar Street, SHM 1E-61, New Haven, CT 06510; e-mail: Ryan.Greysen@yale.edu.

Acad Med. 2011;86:840–845.
First published online
doi: 10.1097/ACM.0b013e31821daf03

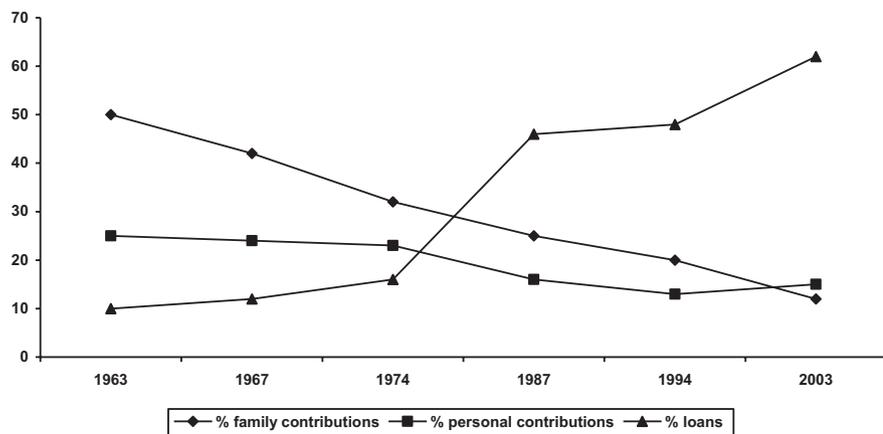


Figure 1 Sources of medical student income, 1963–2003. Sources: Jolly P. Medical School Tuition and Young Physician Indebtedness (Washington, DC: Association of American Medical Colleges; 2004. <https://www.aamc.org/download/105366/data/msttuitionoriginal.pdf>. Accessed March 22, 2011); Altenderfer ME, West MD. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1963–1964 (Washington, DC: U.S. Department of Health, Education, and Welfare; 1965); Remund Smith LC, Crocker AR. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1967–1968 (Washington, DC: U.S. Department of Health, Education, and Welfare; 1970); Crocker AR. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1973–1974 (Washington, DC: U.S. Department of Health, Education, and Welfare; 1974).

but had particular effects on medical education. As one historian of medicine has noted, “More and more [medical] students lived away from the school, the fraternity system declined. . . . Students had outside interests and lives of their own.”¹¹

Not surprisingly, with increased independence and rising costs of attendance, the proportion of individual and family contributions to medical student education began trending downward in the 1960s and 1970s, as loans become more widely available (Figure 1). The proportion of students who worked during medical school also declined in this period. In 1963, 45% of medical school seniors worked an average of 16 hours a week; in 1971, 34% of seniors worked an average of 14 hours a week; and, by 1974, only 26% of seniors worked an average of 10 hours per week. In 1963 and 1967, over 40% of all students held paying clinical or research “fellowships” (mostly between academic terms), and over 50% of seniors held paying “externships.” By 1974, data on these fellowships and externships were no longer collected.^{4–7} Combined with increased length of training for specialized practice, the outcome of these changes was the rise of the “professional student” in medical education—individuals who could not complete their training until well into their 30s, long after their contemporaries in other professions were working autonomously and earning enviable

salaries. Keeping pace with consumer culture, by the early 1980s medical students began to eschew the previous generation’s view of “deferred gratification” and lived more like young professionals than older students. More recently, moonlighting during residency has been an option for early debt repayment, but new duty hours regulations will likely curtail this activity.¹²

Left unchecked, rising aggregate debt burdens may soon outstrip the ability or willingness of lenders to extend credit. With nearly 25% of graduates owing over \$200,000 and nearly 10% owing over \$250,000, a significant number of students may exceed federal borrowing caps.¹³ The situation may be further complicated by fallout from the current economic crisis, such as fewer lenders willing to stay in the student loan business.¹⁴ Variability in financial aid awards at schools is also important when considering student financing—lack of standardization in nontuition costs of attendance can result in award differences ranging from \$16,000 to over \$50,000 between schools in one city or region.¹⁵

Innovative approaches to these problems could include reducing costs to students by raising funds from alumni, reorganizing the curriculum to allow graduation in three instead of four years, capping tuition and fees at the institutional level, and expanding state or federal loan-forgiveness programs

in exchange for public service.¹⁶ Several medical schools have also recently expanded “return-of-service” programs that offer tuition and expenses in exchange for service to underserved communities during or after residency training. Greater standardization in loan distribution across similarly situated schools may also help control the inflationary tendency of costs of attendance by obligating students and financial aid officials to account for award amounts above the average for their city or region. At the federal policy level, the recent American Recovery and Reinvestment Act of 2009 and the Patient Protection and Affordable Care Act (PPACA) of 2010 have substantially increased overall funding to the National Health Service Corps and similar workforce programs run by the Health Resources and Services Administration.¹⁷ Finally, it may be time to revisit the idea of allowing students to work off more of their educational costs *during* medical school. Much as PhD students contribute service to their departments that supports their development as teachers and scholars, medical students could take more active roles in teaching underclassmen or students in other health professions programs. They might also fulfill needed roles on the wards and in clinics by assisting in care coordination and patient education, activities which would also build useful skills for future careers as proactive communicators and team leaders in health care.

Uncertainty of Educational Costs in the Context of Expansionism in American Higher Education

Whereas problems with medical student debt have been discussed for nearly 30 years,^{18,19} broader changes in university culture and tuition setting remain largely unexamined. Fueled by federal dollars, the post–World War II diversification of university functions in American society created a trend of perpetual growth in size and complexity at institutions of higher learning.²⁰ Again, these effects were seen across the spectrum of higher education in America but were particularly important for medical education.

From 1947 to 1966, the National Institutes of Health budget rose from \$449 million to \$13.2 billion (2009 dollars),¹¹ and medical schools became pillars of the “research university” model,²¹ often representing a portion of

university budgets far exceeding the proportion of students they educated. By 1972, medical schools accounted for as much as 10% of total expenditures in higher education but educated only about 0.5% of all students.²² The second major area of budgetary growth for medical schools was through clinical practice plans, largely driven by the enactment of Medicare in 1965.¹¹ A third major stimulus for university expansion came in 1963, through the Health Professions Educational Assistance Act which, between 1964 and 1983, provided over \$11.8 billion (2009 dollars) to expand and improve medical education.²³ In essence, these federal initiatives helped academic medicine to expand its role and capacity but did not enable long-term financial solutions as medical education became more complex, more technological, and more expensive to support.

Moreover, the growingly complex finances of medical schools have made it increasingly unclear how much it actually costs to educate a medical student, who should bear that cost, and how much of the burden of supporting the other missions of the medical school should fall to the student.^{24–26} In the absence of data on true costs, increases in tuition often lack transparency or accountability for students. Often, these increases are initiated at the level of a medical school's parent university, university system, or even state legislature.

Workforce expansion presents a tremendous opportunity to create transparency in determining educational costs and setting tuition and fees. One innovative approach involves “capping” tuition and fees at current rates or guaranteeing one rate for a class through graduation. Several schools have already implemented tuition caps,²⁷ and others have ambitious goals to provide free education to all their students,¹³ but, overall, greater accuracy for actual costs of education at all schools is needed to inform new approaches to reducing debt burdens.

These strategies, along with more generalized attempts to inform prospective and current students on how tuition is set and where it goes, should take high priority, especially given several important differences between the last workforce expansion from 1965 to 1985 and the one currently under way. First,

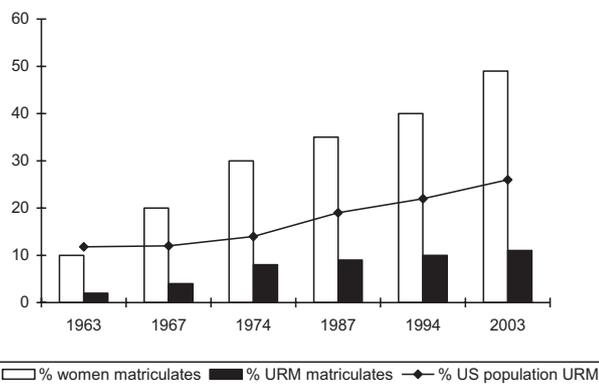


Figure 2 Enrollment of women and underrepresented minorities (URM) in medical school, 1963–2003. The Association of American Medical Colleges (AAMC) gives the following definition for URM: “Underrepresented in medicine means those racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population.” (Source: AAMC. Definition of underrepresented in medicine. <https://www.aamc.org/initiatives/urm/54,288/urm.html>. Accessed March 22, 2011.) Note that whereas the percentage of women students has approached parity with the U.S. population (about 50%), the gap for URM enrollment narrowed between 1963 and 1974 but has widened substantially since. Sources: Association of American Medical Colleges. AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals (Washington, DC: American Association of Medical Colleges; 2007); U.S. Census Bureau Population Estimates Archives (<http://www.census.gov/popest/archives>. Accessed March 22, 2011).

new medical schools will be funded primarily with state and private resources rather than federal dollars, and, second, long-term availability of research funding for medical schools through grants or new biotechnology may be less available than desired in the context of the current economic downturn.^{28,29}

Should external funding fail to achieve anticipated levels, the rate of tuition increases will likely exceed current projections, and debt burdens could reach crisis levels. Indeed, if tuition and debt continue to increase at rates out of proportion to both the consumer price index and increases in average physician income, approximately 50% of physicians' after-tax income could be consumed by loan payments for average debt burdens approaching seven figures by 2030.¹⁵ The scenario could be even worse if physician incomes hold stable or trend slightly downward as they did from 1984 to 2000.³⁰

To increase transparency and accountability in the setting of tuition and fees for medical education, new research is needed to elucidate the nature of educational costs to U.S. MD-granting schools. Besides closer study of these institutions themselves, a better understanding of costs in other systems may be helpful as well. Although DO students also face problematic tuition

and debt levels, there is some evidence that institutional costs of education may be lower for these schools than for the MD model. Similarly, despite important system differences, reformers of medical education might draw lessons about educational cost containment from abroad just as reformers of the U.S. health care system have done.

U.S. Physician Workforce Expansion in the Context of Debt, Diversity, and Primary Care

Before 1950, black medical students constituted only 2% to 3% of enrollment nationwide,¹ and women represented between 6% and 11% from 1950 to 1970.³¹ During the workforce expansion from 1965 to 1985, women and minority students entered mainstream medical education in unprecedented numbers. Between 1969 and 1973, the percentage of women and minority students more than doubled. Since that time, enrollment by gender increased toward parity, but representation of minority students has stagnated (Figure 2). Of course, social movements for civil rights and women's rights were the underlying force for these changes, but medical education expansion was an important enabling policy.¹¹

Similarly, though the general practice model of medical care had been in decline for years, two decades of

workforce expansion helped bolster the concept of “primary care” and the growth of family medicine as a specialty. Again, expansion was only an enabling policy which now faces opposing trends in medical school characteristics, such as high emphasis on specialty training,³² and students’ own perceptions of higher career satisfaction and better lifestyle through specialty practice.³³

Unfortunately, one group that did not benefit from this expansion was students of lower socioeconomic status (SES). In 1971, 27% of students came from families in the lowest two quintiles (lowest 40%) of household incomes nationally.⁶ By 1987, this important segment of medical school enrollees had dropped to 15%, and, by 2004, it was only 10%.³⁴ Similarly, in 1974, 66% of students came from the top two quintiles (top 40%) of household incomes but these percentages increased to 70% in 1987 and to 75% by 2004.^{7,34}

Although the first era of expansion made medical education more accessible to underrepresented minority (URM) and lower-SES students, debt levels have frustrated subsequent efforts to create a diverse and representative workforce.^{35,36} Indeed, recent evidence indicates that cost is the number one deterrent for potential URM applicants to medical school.³⁰ Further, although lower-SES and URM students have benefited from grants, loans seem to preferentially incentivize higher-SES students.³⁷

To address these concerns, many schools have implemented pipeline programs to provide greater financial support in the form of scholarships or equipment support (e.g., books, computers, etc.) as well as academic support in the form of tutoring and mentoring,^{38,39} but more efforts are needed in both existing and future schools. As diversity becomes increasingly accepted as a core strategy for excellence,⁴⁰ initiatives to repay debt burdens may also help to retain URM and lower-SES graduates in academic medicine.

Another unintended consequence of rising medical student debt is the potential financial disincentive it places on students considering careers in primary care.^{41,42} Although the results of prior studies on debt and specialty choice are mixed,^{43,44} recent analyses show that the income gap between primary and

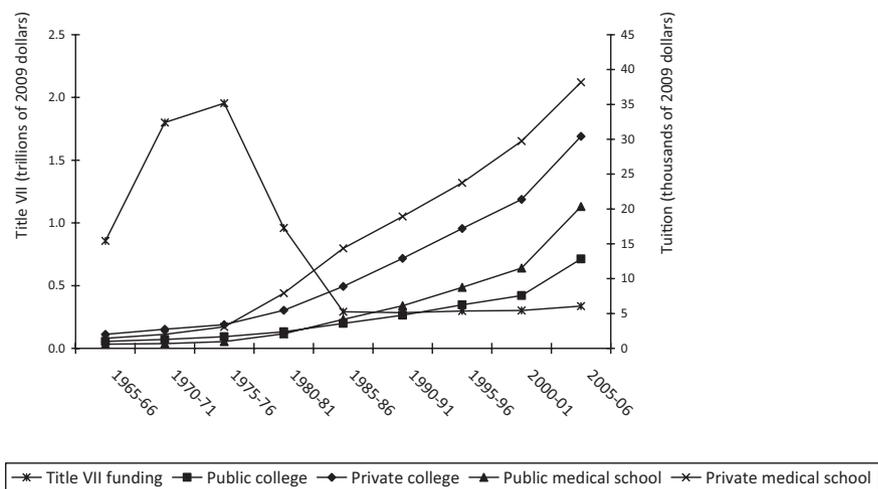


Figure 3 Inflation-adjusted tuition averages in undergraduate colleges, medical schools, and Title VII funding, 1965–2005. Sources: National Center for Educational Statistics (http://nces.ed.gov/programs/digest/d07/tables/dt07_320.asp. Accessed March 22, 2011); Association of American Medical Colleges. AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals (Washington, DC: American Association of Medical Colleges; 2007); Title VII information obtained from personal communication with Patricia Stroup, senior advisor, Health Resources and Services Administration Healthcare Systems Bureau, March 2, 2006.

specialty care has significantly deterred career choices in primary care, with worsening effect over time.⁴⁵ Moreover, by the early 1990s, students could already expect a poorer financial return on their educational investment if they chose a career in primary care rather than one in business, law, or dentistry.⁴⁶

Although payment reform in primary care will likely be a necessary precondition to attracting more students of all backgrounds to primary care,⁴⁷ changes in the funding and structure of graduate medical education are also planned with the implementation of the PPACA, including incentives to hospitals, residency programs, and even directly to residents to make training in primary care more attractive.^{48,49} This legislation also supports the creation of “teaching community health centers” to incentivize careers in primary care, including practice in underserved areas and in academic medicine.⁵⁰ Still, the relationships between educational debt and specialty choice will clearly require more extensive study—including prospective studies—as health care reform legislation is implemented over the next decade.⁵¹

Learning From the Past and Facing Forward

There are at least two important conclusions to be drawn from this consideration of medical student debt in

historical context. First, by examining the growth of debt in the context of broader changes within American society, the pressure on universities and medical schools to expand can be appreciated. The educational manifestation of this expansion called on medical students to help fund their education in new ways, and this has, unfortunately, led to the rapid growth of educational debt. Similar trends can be observed for college students (Figure 3), further suggesting that medical school debt may simply represent the extreme of a system-wide complication of expansion in American higher education. The second and related conclusion is that unintended consequences have occurred over the last 50 years as a result of this expansion, including increased overall costs of education, lack of transparency and accountability in determining those costs, and disincentives for further workforce diversification with regard to racial/ethnic and socioeconomic backgrounds.

If the current expansion of U.S. MD-granting schools is to reach its full potential, new and bold approaches to addressing student debt will need to become more important in the planning and execution of this expansion. To reduce the overall costs of education, some recent proposals have suggested reducing the time to complete medical school to three years.^{13,52} Others have proposed increasing the roles of nonacademic ambulatory clinical

settings, nonphysician clinical educators, and educational technology to reduce overall costs.⁵³ These ideas are promising, but much greater urgency is needed in piloting these and other proposals, developing innovative new proposals, and rapidly implementing successful programs that will ultimately “bend the cost curve” of medical education.

Although there may not be a single obvious solution to reign in the problem of medical student debt, the current situation is clearly unsustainable.⁵¹ Ultimately, if current costs for medical education are too tightly linked to the research and clinical missions of academic medical centers, they may rise perpetually along with the costs of these two missions. Current expansion of the U.S. physician workforce presents a unique opportunity to interrupt this half-century trend of rising educational costs to students. In light of what we know about the relentless growth of medical student debt over the last 50 years, now is the time to face forward and envision what the financing of medical education can and should look like 50 years from now.

Acknowledgments: The authors would like to thank Kenneth Ludmerer, Richard Krugman, Deborah Powell, Michael Whitcomb, and Chester Burns (deceased) for critical input on earlier versions of this paper.

Funding/Support: The authors would like to thank the Robert Wood Johnson Clinical Scholars program, the Department of Veterans Affairs, and the Josiah Macy Jr. Foundation Medical Education Futures Study for support of their work.

Other disclosures: None.

Ethical approval: Not applicable.

References

- Ludmerer KM. Learning to Heal: The Development of American Medical Education. Baltimore, Md: Johns Hopkins University Press; 1985.
- Weiskotten HG, Schwital A, Cutte WD, Anderson HH. Medical Education in the United States: 1934–1939. Chicago, Ill: American Medical Association; 1940.
- Narzaday JF. Into the deep well: The evolution of medical school loan debt. *JAMA*. 1998;280:1881–1883.
- Altenderfer ME, West MD. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1963–1964. Washington, DC: U.S. Department of Health, Education, and Welfare; 1965.
- Remund Smith LC, Crocker AR. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1967–1968. Washington, DC: U.S. Department of Health, Education, and Welfare; 1970.
- Crocker AR. How Medical Students Finance Their Education: Results of a Survey of Medical and Osteopathic Students, 1973–1974. Washington, DC: U.S. Department of Health, Education, and Welfare; 1974.
- Survey of How Medical Students Finance Their Education. Washington, DC: Association of American Medical Colleges; 1975.
- Association of American Medical Colleges. AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals. Washington, DC: Association of American Medical Colleges; 2007.
- Association of American Medical Colleges. Medical Student Education: Cost, Debt, and Resident Stipends Facts. AAMC Debt Fact Card. October 2010. <https://www.aamc.org/download/152968/data/10debtfactcard.pdf>. Accessed March 31, 2011.
- Greenberg M. The GI Bill: The Law That Changed America. West Palm Beach, Fla: Lickle Publishing Inc; 1997.
- Ludmerer KM. Time to Heal: American Medical Education From the Turn of the Century to the Era of Managed Care. New York, NY: Oxford University Press; 1999.
- Ulmer C, Miller D, Wolman M, Johns ME, eds. Resident Duty Hours: Enhancing Sleep, Supervision, and Safety. Washington, DC: National Academies Press; 2008.
- Steinbrook R. Medical student debt—Is there a limit? *N Engl J Med*. 2008;359:2629–2632.
- Fuchs E. As economy flags, student lenders close or suspend business. *AAMC Reporter*. June 2008. https://www.aamc.org/newsroom/reporter/june08/78968/june08_lenders.html. Accessed March 31, 2011.
- Association of American Medical Colleges. Medical Educational Costs and Student Debt: A Working Group Report to the AAMC Governance. Washington, DC: Association of American Medical Colleges; 2005. <https://www.aamc.org/initiatives/48648/studentdebt>. Accessed March 31, 2011.
- Macy Foundation. Revisiting the Medical School Education Mission in a Time of Expansion. http://www.josiahmacyfoundation.org/documents/Macy_MedSchoolMission_10_08.pdf. Accessed November 9, 2010.
- Steinbrook R. Health care and the American Recovery and Reinvestment Act. *N Engl J Med*. 2009;360:1057–1060.
- Sandson JI. A crisis in medical education: The high cost of student financial assistance. *N Engl J Med*. 1983;308:1286–1289.
- French FD. The financial indebtedness of medical-school graduates. *N Engl J Med*. 1981;304:563–565.
- Veysey LR. The Emergence of the American University. Chicago, Ill: University of Chicago Press; 1965.
- Graham HD, Diamond N. The Rise of American Research Universities. Baltimore, Md: Johns Hopkins University Press; 1997.
- Hogness JR, Arkin GC. Administration of education programs in academic health centers. *N Engl J Med*. 1977;296:656–663.
- Institute of Medicine. Medical Education and Societal Needs: A Planning Report for the Health Professions. Washington, DC: National Academy Press; 1983.
- Institute of Medicine. Costs of Education in the Health Professions. Washington, DC: National Academy of Sciences Press; 1974.
- Millis JS. A Rational Public Policy for Medical Education and Its Financing. New York, NY: National Fund for Medical Education; 1971.
- Carnegie Council on Policy Studies in Higher Education. Progress and Problems in Medical and Dental Education: Federal Support Versus Federal Control. Washington, DC: Jossey-Bass Publishers; 1976.
- Croasdale M. Kentucky medical school will freeze tuition for each class. *American Medical News*. May 7, 2007. <http://www.ama-assn.org/amednews/2007/05/07/prsc0507.htm>. Accessed March 31, 2011.
- Cartwright J, Mayer H. Signs of Life: The Growth of Biotechnology Centers in the U.S. Washington, DC: The Brookings Institution Center on Urban and Metropolitan Policy; 2002.
- Dalton R. Medicinal properties. *Nature*. 2007;446:971–972.
- Jolly PR. Medical school tuition and young physicians' indebtedness. *Health Aff (Millwood)*. 2005;24:527–535.
- More ES. Restoring the Balance: Women Physicians and the Profession of Medicine, 1850–1995. Cambridge, Mass: Harvard University Press; 1999.
- Senf JH, Campos-Outcalt D, Watkins AJ, Bastacky S, Killian C. A systematic analysis of how medical school characteristics relate to graduates' choices of primary care specialties. *Acad Med*. 1997;72:524–533. http://journals.lww.com/academicmedicine/Abstract/1997/06000/A_systematic_analysis_of_how_medical_school.20.aspx. Accessed March 31, 2011.
- Dorsey ER, Jarjoura D, Rutecki GW. Influence of controllable lifestyle on recent trends in specialty choice by US medical students. *JAMA*. 2003;290:1173–1178.
- Jolly PR. Diversity of U.S. medical students by parental income. *AAMC Analysis in Brief*. 2008;8(1). https://www.aamc.org/download/142770/data/aibvol9_no10.pdf. Accessed March 31, 2011.
- Ayers WR, Stangert AC, Dennis MJ, Henry JB. Impact of high tuition on medical school applicants and enrollees. *J Med Educ*. 1981;56:795–802.
- Institute of Medicine. In the Nation's Compelling Interest: Ensuring Diversity in the Health-Care Workforce. Washington, DC: National Academies Press; 2003.
- Heller DE. Student price response in higher education: An update to Leslie and Brinkman. *J Higher Educ*. 1997;68:624–659.
- Dalley B, Podawiltz A, Castro R, et al. The joint admission medical program: A statewide approach to expanding medical education and career opportunities for disadvantaged students. *Acad Med*. 2009;84:1373–1382. http://journals.lww.com/academicmedicine/Fulltext/2009/10000/The_Joint_Admission_Medical_Program_A_Statewide.20.aspx. Accessed March 31, 2011.
- Smith SG, Nsiah-Kumi PA, Jones PR, et al. Pipeline programs in the health professions, part 1: Preserving diversity and reducing health disparities. *J Natl Med Assoc*. 2009;101:836–840.
- Association of American Medical Colleges. Striving Toward Excellence: Faculty Diversity in Medical Education. <https://services.aamc>

- org/publications/index.cfm?fuseaction=Product.displayForm&prd_id=275&prv_id=336. Accessed March 31, 2011.
- 41 Ebell MH. Future salary and US residency fill rate revisited. *JAMA*. 2008;300:1131–1132.
 - 42 Rosenblatt RA, Andrilla CH. The impact of U.S. medical students' debt on their choice of primary care careers: An analysis of data from the 2002 medical school graduation questionnaire. *Acad Med*. 2005;80:815–819. http://journals.lww.com/academicmedicine/Fulltext/2005/09000/The_Impact_of_U_S_Medical_Students_Debt_on_Their.6.aspx. Accessed March 31, 2011.
 - 43 Colquitt WL, Zeh MC, Killian CD, Cultice JM. Effect of debt on U.S. medical school graduates' preferences for family medicine, general internal medicine, and general pediatrics. *Acad Med*. 1996;71:399–411. http://journals.lww.com/academicmedicine/Abstract/1996/04000/Effect_of_debt_on_U_S_medical_school_graduates_.23.aspx. Accessed March 31, 2011.
 - 44 McDonald FS, West CP, Popkave C, Kolars JC. Educational debt and reported career plans among internal medicine residents. *Ann Intern Med*. 2008;149:416–420.
 - 45 Robert Graham Center. Specialty and Geographic Distribution of the Physician Workforce: What Influences Medical Student & Resident Choices? <http://www.graham-center.org/online/graham/home/publications/monographs-books/2009/rgcmo-specialty-geographic.html>. Accessed March 31, 2011.
 - 46 Weeks WB, Wallace AE, Wallace MM, Welch HG. A comparison of the educational costs and incomes of physicians and other professionals. *N Engl J Med*. 1994;330:1280–1286.
 - 47 Bodenheimer T, Grumbach K, Berenson R. A lifeline for primary care. *N Engl J Med*. 2009;360:2693–2696.
 - 48 Medical Education Futures Study—Policy Brief: Medical Education Expansion and the Future of Primary Care. <http://www.medicaleducationfutures.org/uploads/MedicalEducationExpansionandtheFutureofPrimaryCare.pdf>. Accessed March 31, 2011.
 - 49 Medical Education Futures Study—Policy Brief: Graduate Medical Education: The Key to the Future of Primary Care? <http://www.medicaleducationfutures.org/uploads/GMETheKeytotheFutureofPrimaryCare.pdf>. Accessed March 31, 2011.
 - 50 Chokshi DA. Ensuring progress in primary care—What can health care reform realistically accomplish? *N Engl J Med*. 2009;361:e43.
 - 51 Adashi EY, Gruppuso PA. Commentary: The unsustainable cost of undergraduate medical education: An overlooked element of U.S. health care reform. *Acad Med*. 2010;85:763–765. http://journals.lww.com/academicmedicine/Fulltext/2010/05000/Commentary_The_Unsustainable_Cost_of.13.aspx. Accessed March 31, 2011.
 - 52 Dorsey ER, Ninic D, Schwartz S. An evaluation of four proposals to reduce the financial burden of medical education. *Acad Med*. 2006;81:245–251. http://journals.lww.com/academicmedicine/Fulltext/2006/03000/An_Evaluation_of_Four_Proposals_to_Reduce_the.7.aspx. Accessed March 31, 2011.
 - 53 Shomaker TS. For-profit undergraduate medical education: Back to the future? *Acad Med*. 2010;85:363–369. http://journals.lww.com/academicmedicine/Fulltext/2010/02000/For_Profit_Undergraduate_Medical_Education_Back.41.aspx. Accessed March 31, 2011.