

# Medical Schools And Their Applicants: An Analysis

If more physicians are required, can medical schools fill the gap?

by **Richard A. Cooper**

**PROLOGUE:** In the early 1960s medical educators, organized medicine, and policymakers arrived at the conclusion that the United States was a doctor-short nation. That consensus, combined with a robust economy and assertive political leadership, led to a doubling of the output of U.S. medical schools from 1965 to 1980. Chastened by the success of the initiative, the Graduate Medical Education National Advisory Committee (GMENAC) declared an impending doctor glut in its 1979 report, and allopathic medical education has flatlined its enrollment since then. In reality, physician oversupply has not emerged, and, in fact, allopathic medical school graduates have been joined in practice by international medical graduates, graduates of osteopathic medical schools, and nonphysician clinicians (nurse practitioners and physician assistants).

Why has the predicted glut not materialized? A number of factors were not apparent to the workforce analysts of earlier years: new technologies and the specialists to go with them; changing patterns of medical work, with more salaried positions and more women in practice; and unanticipated population growth. These factors all remain very much in play and raise questions about the future demand for physicians.

Richard Cooper, director of the Health Policy Institute at the Medical College of Wisconsin, has been the leading proponent of the belief that economic growth correlates with the consumption of medical care and that rising national per capita income surely will lead to an increased demand for medical services (see Cooper et al., *Health Affairs*, Jan/Feb 2002, 140–154). A longtime medical educator and former dean, he writes here about the challenge of expanding current medical school placements and concludes that even if new slots were available, there would be problems finding enough candidates to fill them. In the Perspectives that follow, David Blumenthal of the Harvard Medical School discusses additional strategies for expanding the health care workforce and for placing physicians where we need them most. Fitzhugh Mullan, a contributing editor of *Health Affairs*, suggests a national commission to provide a map for future investment in medical education. Then Joan Reede of Harvard's Office for Diversity, James Hallock and colleagues of the Educational Commission for Foreign Medical Graduates, and Douglas Wood of the American Association of Osteopathic Medical Colleges discuss specific aspects of expansion.

**ABSTRACT:** Shortages of physicians have existed periodically throughout U.S. history. In response, medical school capacity has been increased, by either building new schools or expanding existing ones. Each strategy has encountered the obstacles of time, money, and applicants. If the United States chooses to increase its infrastructure for medical education again, these past experiences offer lessons that can be drawn upon. The most instructive ones are how long this process will take, how important public sponsorship and financing will be, and how much it will depend on antecedent dynamics within K-12 and baccalaureate education to assure an adequate flow of applicants, all of which makes the need to develop strategies for the future ever more pressing.

**B**ASED ON ECONOMIC AND DEMOGRAPHIC TRENDS, my colleagues and I have predicted that the demand for physician services will grow more rapidly than physician supply.<sup>1</sup> Indeed, when consideration is also given to the impact of female physicians on overall physician work effort, per capita supply will actually decline. By 2025 the resulting shortfall could be as great as 200,000, requiring the training of as many as 10,000 additional physicians annually. Even if the shortfall is half this size, it will be difficult to respond.

Three main options are available to address this problem. The first is to delegate more responsibility to nonphysician clinicians (NPCs), a practice that is already prevalent but that has further potential.<sup>2</sup> The second is to rely on greater numbers of international medical graduates (IMGs), despite existing concerns about this practice.<sup>3</sup> The third is to expand the training capacity of U.S. medical schools.

Expanding medical school capacity has been a recurring challenge throughout U.S. history. During some periods, the emphasis was on building new schools, while during others, enlarging existing schools was the rule. In the 1960s and 1970s both strategies were employed. Each strategy benefited from state sponsorship and federal support, and their combined output was further enhanced by a progressive decrease in attrition during medical school. But the most important element governing the success of this expansion was dramatic growth in baccalaureate education, which swelled the number of qualified applicants.

An examination of these experiences in the context of current realities points to a series of obstacles to increasing medical student output. Establishing new schools is costly, and most are small. Conversely, the ability to expand existing schools is limited by the large size to which most have already grown. Also, there is no margin for gain by further reducing medical student attrition. Public financing is likely to be difficult in the current fiscal environment. Moreover, even if such financing were to materialize, little impact of any expansion would be felt before 2020. These structural limitations are further complicated by the realities that the number of college-age individuals is not growing appreciably and that the current systems of K-12 and college education are not yielding their full potential of medical school applicants. This paper explores these dynamics in an attempt to assess whether, if more physicians are needed, medical schools can fill the gap.

## Evolution Of Medical School Capacity

■ **Initial growth and consolidation: 1765–1900.** There are 126 allopathic and 20 osteopathic medical schools in the United States and Puerto Rico.<sup>4</sup> The first four allopathic schools were founded in the eighteenth century, and nine more were established in the first three decades of the nineteenth.<sup>5</sup> The ensuing proliferation lasted for seventy-five years, culminating in 1905 with 161 active schools, only 60 of which still exist. Many were independent colleges or departments of universities, but most were proprietary, and some were simply diploma mills. Although the majority followed the “heroic” teachings of allopathic medicine, 20 percent were based on various “natural” healing philosophies, including osteopathy. In 1906 the American Medical Association’s (AMA’s) Council on Medical Education classified only half as “acceptable,” and three years later Abraham Flexner was even more critical.

■ **The first new wave: 1900–1915.** Even before Flexner, a new breed of university-based medical schools had begun to develop. The form of education in these schools was lengthier and costlier, but the product was seen as more desirable.<sup>6</sup> Indeed, state licensing acts made their standard a requirement after 1910. As a result, students shunned the older schools, causing most to close or merge with schools of higher quality. Between 1885 and 1915 twenty-five new four-year schools were established, and twice that number of older schools adopted the modern form. Together with seven osteopathic schools and a residual group based on natural healing, these schools constituted the infrastructure for medical education in 1920. However, because the new schools opened more slowly than substandard ones closed, total output fell. Whereas the 161 schools existing in 1905 produced 5,400 graduates, the 81 schools operating in 1922 graduated fewer than 3,000. Physician supply contracted accordingly, from 168 per 100,000 population in 1905, a level that was clearly excessive, to 137 per 100,000 in 1920, a number that was barely sufficient and that left many small towns without a doctor.<sup>7</sup>

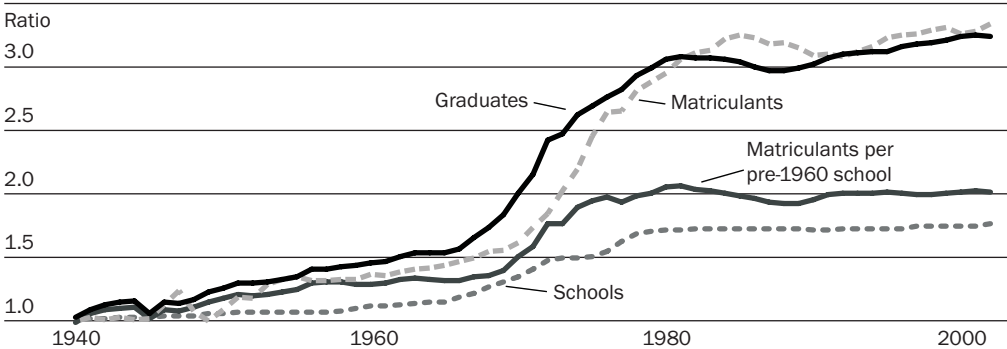
■ **A second wave: the 1920s.** These circumstances caused the AMA to withdraw its previous objections, and growth began again.<sup>8</sup> This time, however, the strategy was not to build more schools but to expand the class sizes in existing ones, a strategy that would be embraced again twice before the century’s end. With greater numbers of qualified applicants flowing from an enlarged system of university education, average class size grew from fifty in 1920 to eighty in 1930, and the annual output of graduates returned to 5,400, as it had been in 1906. But the U.S. population was now growing more quickly than before. By 1930 physician supply had declined to 125 per 100,000 population, a number that the Committee on the Costs of Medical Care concluded was 10 percent too small but that the Commission on Medical Education viewed as too large.<sup>9</sup> With a resurgence of opposition from the AMA and the hurdles of a depression followed by World War II, only two additional schools were established. The numbers of matriculants and graduates remained essentially unchanged, at approximately 6,300 and 5,400, respectively, through the end of the war.

■ **Growth following World War II.** After the war, demand for physicians was high, and efforts were undertaken once again to increase medical school capacity (Exhibit 1). As in the 1920s, the first strategy was to expand existing schools, from an average of seventy-five students per class, to which it had slipped during the 1930s, to ninety-five in 1956. With only two additional schools, aggregate enrollment increased to 8,250. But this was not enough. In 1959 the “Bane Report,” issued by the Surgeon General’s Consultant Group on Medical Education, recommended further growth and proposed federal subsidies to make it happen.<sup>10</sup> However, federal help came slowly, in part because of opposition from the AMA, which feared that newer doctors would affect the incomes of older ones and that parallel efforts might be made to establish universal health insurance.<sup>11</sup>

■ **Doubling capacity: 1960–1980.** In 1963 the Health Education Facilities Act created a small allotment of federal matching funds for expanding older medical schools and building new ones. By 1971 the magnitude of funding had been increased three times and included both capitation and basic improvement grants, but, in 1976, only five years later, the federal government declared that the physician shortage was over and redirected these funds to expand primary care training and move clinical education to community sites.<sup>12</sup> However, even before the first federal funds were appropriated, state-based efforts were under way. By 1963 six new allopathic schools were admitting students, and ten more were in various stages of development. By the time the process had ended, in 1980, fifty-four new schools had been established, forty-four of which were allopathic and ten osteopathic, bringing the totals to 126 and 15, respectively—the first major increase in medical schools since 1920.

Like schools in the 1950s, the new allopathic schools tended to be relatively small, averaging ninety students per class. More capacity was gained by expand-

**EXHIBIT 1**  
**Medical Schools, Matriculants, And Graduates, Allopathic And Osteopathic, 1940–2002**



**SOURCES:** American Medical Association, American Osteopathic Association, and Association of American Medical Colleges.  
**NOTES:** Data are expressed as a ratio to the levels that existed during the period 1935–1940 (1935–1940 = 1.0). Both allopathic and osteopathic schools are included. “Pre-1960 school” refers to schools existing before 1960, as a way of measuring the impact of newly constructed medical schools as compared with increased class sizes in existing medical schools.

ing older schools. By 1976 their average class size had grown to 149, yielding an additional 4,700 matriculants, an increment that was 15 percent greater than from new schools. Together with parallel growth among osteopathic schools, the dual effects of construction and expansion more than doubled the number of matriculants from 8,250 in 1956 to 18,200 in 1980—5,000 more than the Bane Report had proposed.

An unanticipated phenomenon during this period was a decline in the rate of attrition of matriculated students, from 13–15 percent, as it had been in the 1950s, to 4 percent by 1975. As a result, 1,500 more students graduated each year than would have under the old system, an increment that is equivalent to having built sixteen additional medical schools. Had education policy not changed in this manner, there would be 50,000 fewer physicians today. Indeed, this shift in policy accounted for 15 percent of the increase in medical school output, while 45 percent resulted from enlarging class size and only 40 percent was attributable to new schools.

■ **Academic birth control: 1980–2000.** In 1981, just as the last new medical school admitted its first student, the Graduate Medical Education National Advisory Committee (GMENAC) predicted that the nation was headed for massive physician surpluses, a notion that was perpetuated by its successors, the Bureau of Health Professions and the Council on Graduate Medical Education, and that dominated health planning for the next two decades.<sup>13</sup> Against that background, growth among allopathic schools ceased. Only recently has it resumed, with a new school in Florida, planning for a small school in Ohio, and early discussions concerning construction or expansion in Texas and elsewhere. Balancing this is the closure of a religious-based allopathic school that operated briefly in the 1980s and the merger of two Philadelphia schools in 1995. In contrast, armed with a mandate for more primary care physicians, osteopathic medicine resumed growth in 1992, establishing five new schools over the next decade, which has brought their total to twenty.

■ **Time.** A striking feature of each period of medical school growth was its duration. The development of four-year medical schools in the late 1800s and early 1900s spanned more than twenty years. It took the full decade of the 1920s for those schools to expand their capacity and another decade, following World War II, for them to expand again. When this proved to be insufficient, a new effort was undertaken, spanning the period 1960–1980 (Exhibit 1). This one was more complicated, because it involved both expanding the class sizes of existing schools and constructing new ones. The former was quicker, but it still took more than a decade. Building new schools took twice as long. Moreover, each growth period was preceded by periods of discussion. It is noteworthy that almost twenty years ago, at the zenith of the most recent expansion and as future physician surpluses were being widely heralded, J.R. Schofield, secretary to the Liaison Committee on Medical Education (LCME), prophesied that “around 2010 A.D., the population increase could run ahead of physician supply and a whole new build-up could begin again.”<sup>14</sup> In the two

decades that followed, others echoed this belief, but most did not, and only now are discussion and debate beginning again in earnest.<sup>15</sup>

■ **Financing.** History also shows how closely medical school growth is tied to resources. It was largely a quest for greater tuition revenue that fueled the expansion of class size in the 1920s, and it was the availability of state and federal subsidies that stimulated schools to further increase their class sizes in the 1960s and 1970s, after having done so in the 1950s. Although federal support during this period is often highlighted, it proved to be smaller in magnitude and briefer in duration than had been anticipated, and, as many had feared, it increasingly intruded into matters of curricular content and conduct.<sup>16</sup> In contrast, the role of philanthropy is often ignored, although much of the initial support for new schools during this period came from foundations and other private sources. But the states were the most important funding source. They ultimately sponsored 80 percent of the new allopathic schools and six of the ten new osteopathic schools (five of which were state-mandated) and provided funds to many private schools as well.<sup>17</sup>

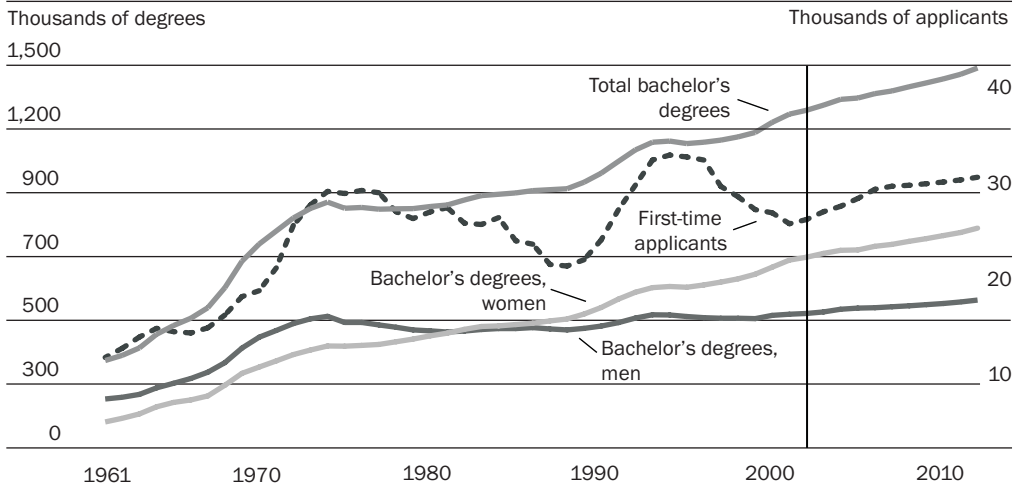
This prominent state government role contrasts with the more even distribution of public and private sponsorship that had previously characterized allopathic schools and with the completely private, even proprietary, nature of the osteopathic schools before 1970 and again after 1990. As allopathic medicine tentatively reenters a growth phase, state sponsorship again prevails, both for the new school in Florida and for planned schools in Texas. Only in Ohio is the source of funds private, but that effort is small and research-focused. The lesson is that while osteopathic medicine may continue to look to private sources, future growth of allopathic medical schools is likely to rely on federal and state funds, a reality that makes consensus development all the more important.

## The Changing Applicant Pool

Applicants have always been important in the medical education equation. The collapse of proprietary schools in the early 1900s, a desirable outcome, was largely driven by insufficient interest among potential applicants.<sup>18</sup> Conversely, the expansion of class sizes in the 1920s was facilitated by growing numbers of college-prepared applicants.<sup>19</sup> In like manner, growth of medical school capacity in the early 1950s benefited from the surge of college enrollment spawned by the GI Bill of Rights, and the major expansion of medical school capacity thereafter was facilitated by the public's huge investment in postsecondary education and the sharp rise in college participation that accompanied it. Between 1960 and 1975 the number of baccalaureates grew 2.5-fold, and the number of medical school applicants grew proportionately (Exhibit 2).<sup>20</sup> It is difficult to imagine how the latter could have occurred without the former.

■ **Gender mix in college.** Before World War II, men predominated in both college and medical school, although the percentage of college students who were men had been decreasing throughout the previous century. Following the war, this de-

**EXHIBIT 2**  
**Bachelor's Degree Recipients And Allopathic Medical School Applicants, 1961-2002**  
**And Projected To 2012**



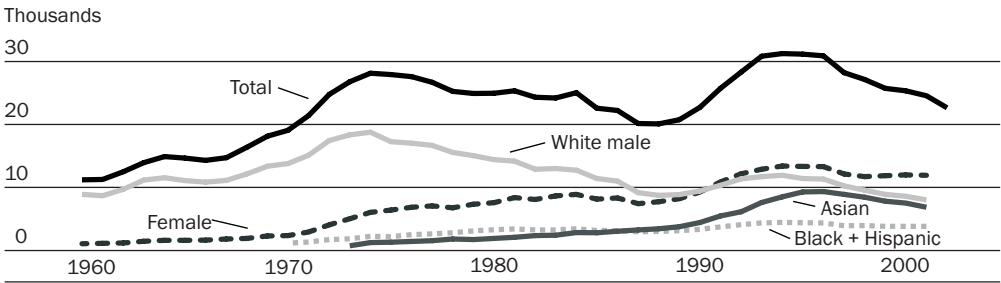
**SOURCES:** National Center for Education Statistics (NCES) and Association of American Medical Colleges.  
**NOTES:** Projections of the number of bachelor's degrees are the middle series from the NCES. Author's calculations of projected medical school applicants were based on the NCES middle-series projections of male and female bachelor's degree recipients and trends in rates of application to medical school among men and women over the period 1975-2000. Vertical line denotes the beginning of projected trends. Dotted line pertains to the right y axis; solid lines pertain to the left y axis.

cline was arrested, as large numbers of men entered college, initially under the GI Bill, which supported veterans from both World War II and the Korean War, and later as a consequence of the Vietnam War draft, which offered deferments to those enrolled in college (Exhibit 2).<sup>21</sup> When the effects of the draft ended in the mid-1970s, the number of men receiving bachelor's degrees declined, but the number of female baccalaureates continued to increase, surpassing the number of male baccalaureates in 1982 and widening the gap ever since.

■ **Gender mix among medical school applicants.** Reflecting the dynamics at the baccalaureate level, white men, who had been the dominant group among medical students, accounted for most of the increase in medical applicants in the 1950s and 1960s. But by the mid-1970s their numbers began to decline, and, except for a brief upturn in the early 1990s, the number of white men applying to medical school has fallen ever since (Exhibit 3).<sup>22</sup> This was only in part a consequence of fewer men obtaining bachelor's degrees. The percentage of male baccalaureates who applied to medical school also decreased, from a level that was more than double that of female baccalaureates in the 1960s to one that approximates the steady level that white women have maintained (Exhibit 4). Only Asian baccalaureates apply to medical school at a higher rate, which over the past fifteen years has exceeded that of white men by more than threefold.

The decline in applications by white men would have crippled medical education were it not for the fact that, beginning in the early 1970s, more women applied

**EXHIBIT 3**  
**First-Time Applicants To Allopathic Medical Schools, 1960–2002**

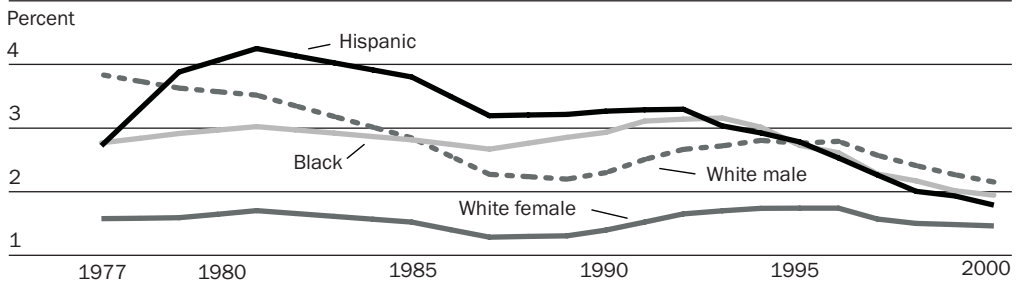


**SOURCE:** Association of American Medical Colleges.  
**NOTES:** Data from before 1982 and for 2002 were extrapolated based on relationships between first-time and total applicants during periods of rising and falling applications. Numbers of white male applicants were extrapolated from data on males and whites.

to medical school (Exhibit 3), paralleling their increased participation in college (Exhibit 2). The numbers of both women and white men dipped in the mid-1980s, causing the overall applicant-to-acceptance ratio to fall to its lowest level in twenty-five years. However, this circumstance proved to be short-lived, as the number of female applicants increased again, this time coupled with large numbers of Asian applicants. Thus, women and then Asians emerged to counterbalance the progressive decline in interest among white men. These trends are not unique to medicine but are also reflected in other advanced degree programs.<sup>23</sup>

■ **Race and ethnicity.** Blacks and Hispanics currently account for fewer than 15 percent of medical school applicants but for more than 30 percent of the college-age population.<sup>24</sup> Despite this disparity, progress has been made. Excluding schools in Puerto Rico, first-time Hispanic applicants increased from fewer than 400 in 1973 to approximately 900 throughout the 1980s and by another 65 percent in the mid-1990s. Similarly, the number of first-time black applicants increased from 1,000 in 1970 to approximately 1,600 throughout the 1980s and by another 50 percent in the

**EXHIBIT 4**  
**First-Time Medical School Applicants As A Percentage Of Baccalaureates, 1977–2000**



**SOURCES:** Association of American Medical Colleges and National Center for Education Statistics.  
**NOTES:** Data are for the fifty states only; Commonwealth of Puerto Rico schools are excluded. Series are derived from biennial data between 1977 and 1989 (1983 omitted) and annual data from 1989 to 2000. Data for missing years were estimated by linear interpolation.

mid-1990s (Exhibit 3). However, following the *Hopwood* case in Texas and California's Proposition 209, which restricted affirmative action, the numbers of both Hispanic and black applicants declined to levels midway between their 1980s plateaus and their 1995 peaks.<sup>25</sup> At the same time, their gender mix has become more sharply skewed toward women.

The growth of minority medical applicants in the 1980s closely tracked similar successes of minorities at the baccalaureate level, which in turn correlated with prior successes in narrowing the academic achievement gaps that have separated both blacks and Hispanics from whites in grades K–12.<sup>26</sup> However, after narrowing in the 1970s, these gaps have undergone little further improvement. Indeed, the gap has widened for blacks at the highest levels of math and science proficiency. Similarly, Hispanics, who represent the fastest-growing segment of the college-age population, continue to have high dropout rates from high school and low rates of college enrollment.<sup>27</sup> Even among high school graduates, blacks and Hispanics have disproportionately low rates of entry into college; enter two-year instead of four-year colleges; or enter four-year colleges but fail to graduate, mainly for financial reasons. Yet once members of either group attain bachelor's degrees, their frequency of application to medical school is similar to that of white males (Exhibit 4).

Although it is widely believed that the numbers of medical school applicants fluctuate with economic cycles, this view is not well supported by the data (Exhibit 3).<sup>28</sup> Rather, the observations above indicate that the availability of applicants reflects trends that are deeply rooted in early education and expectations. Indeed, more than half of medical applicants report having decided on medicine before leaving high school.<sup>29</sup> These early trends are ultimately displayed as long-term trends in the rates of college participation and medical school application, which differ among gender, ethnic, and racial groups.<sup>30</sup> The number of medical school applicants in any given year reflects the aggregate of these various trends.

## Applicant Quality

■ **Numbers and quality of applicants.** In recent years, the total number of applicants has fallen from a peak of 47,000 in 1996 to 32,100 in 2002. First-time applicants have declined to 23,000, a decrease of 28 percent from their recent peak, and the ratio of first-time applicants to acceptances has fallen from 1.8 to almost 1.3. When this ratio fell below 1.5 in the late 1980s, medical schools matriculated 2–3 percent fewer students and the percentage of matriculants who graduated dipped by another 2–3 percent, resulting in a cumulative deficit of more than 5,000 graduating physicians over the period 1986–1994 (Exhibit 1). Pass rates on the Part I exam of the National Board of Medical Examiners (NBME) tracked the decreasing size of the applicant pool, falling to a low of 85 percent, compared with a norm of more than 90 percent.<sup>31</sup> These experiences gave insight into the applicant-to-acceptance ratio that may be necessary to maintain quality, and they raise questions of whether

the recent declines in applicants may be affecting quality again, a concern that is reinforced by the increasing failure rates of allopathic students on U.S. Medical Licensing Examination (USMLE) Step 1 exams, the exam that has replaced the NBME Part I exam.<sup>32</sup>

Students admitted to osteopathic schools have mean college grade point averages (GPAs) that are approximately 0.2 points lower than among allopathic students, and their Medical College Admissions Test (MCAT) scores average 1.5 points lower. As many as one-third of these students had been rejected by allopathic schools. As the admission metrics predict, failure rates among osteopathic students who elected to take the USMLE Step 1 exam have been more than three times those of allopathic students.<sup>33</sup> Their better performance on their own National Board of Osteopathic Medical Examiners (NBOME) exam has been attributed to its greater emphasis on clinical context.<sup>34</sup>

■ **Predictors of physician performance.** Despite correlations between MCATs and Step 1 licensing exams, correlations between the latter and clinical performance are weak.<sup>35</sup> Performance as a physician correlates better with proficiency in the humanities and with personal characteristics such as motivation, conscientiousness, integrity, empathy, and a robust psychological constitution.<sup>36</sup> While the Flexnerian emphasis on scientific methods and principles was profoundly important in transforming medical education a century ago, areas of inquiry such as sociology, epidemiology, anthropology, and health economics have acquired importance in contemporary medicine. It is unclear how large the applicant pool would be if the route to medicine followed different paths and demanded different spheres of knowledge and expertise. An indication that it might be larger is provided by the increased numbers of osteopathic and, to a lesser extent, allopathic applicants who were social science majors after the MCAT exam was broadened in the early 1990s.<sup>37</sup> It is also uncertain how changes in emphasis might affect both the cost of establishing and operating tomorrow's medical schools and the curriculum that they would follow.<sup>38</sup>

## Testing The Possibilities For Growth

■ **Expanding existing schools.** If a mandate to increase physician training existed, how much could be accomplished? The answer is sobering. Because most schools are already large, gains that could be realized from expanding class sizes are much more limited than they were in the 1960s and 1970s. While many of the schools that were built after 1960 are smaller, there are fewer of them. Although it has been suggested that smaller schools could readily grow by 10 percent, only thirty-eight schools have fewer than 100 students and only sixty-two have fewer than 125.<sup>39</sup> Even if the average class size of all schools were increased to 149 students, as the pre-1960 schools are today, the yield would be only 2,400 additional graduates each year. Moreover, there is little opportunity to increase the output further by decreasing attrition, as happened in the 1960s.

■ **Building new schools.** Because new schools tend to be smaller, averaging

ninety students per class, they contribute proportionately less. For example, building thirty such schools would be a formidable undertaking, their yield would be only 2,600 graduates annually. Combining this with the potential yield of 2,400 from class-size expansion, the total output of graduates could increase by 5,000 annually, a 30 percent increment over the number who currently graduate from allopathic medical schools but only 20 percent more than the number of physicians (U.S. medical graduates plus IMGs; allopathic plus osteopathic) who currently complete residency training. Moreover, few would enter practice before 2020, by which time the U.S. population will be 20 percent larger than today and the percentage of physicians who are women will have doubled. Thus, while 5,000 is a substantial number, it would not even maintain the current per capita effort of physicians.

■ **Adequate numbers of applicants.** Whether or not 5,000 is enough or even desirable, it is useful to question whether there would be adequate numbers of applicants to achieve that goal. Projected forward, the college-age cohort is expected to grow by approximately 10 percent between 2002 and 2015 and slowly decline thereafter.<sup>40</sup> The number of bachelor's degree recipients will outpace this growth, but by only a few percentage points (Exhibit 2). However, a higher percentage of these baccalaureates will be women, whose application rates to medical school have been comparatively low and whose inclinations in this regard are rising only slowly, while there will be a stable number of baccalaureate men, whose level of interest in medicine is slowly approaching that of women (Exhibit 4).<sup>41</sup> These trends predict that by 2005 the number of first-time medical school applicants will be sufficient to raise the applicant-to-acceptance ratio in allopathic schools above 1.5, the level at which quality concerns existed in the past (Exhibit 2). By 2010 there will be approximately 30,000 first-time applicants, a number that could sustain 20,000 acceptances, 2,500 more than now are accepted but less than half of what would be needed to generate 5,000 additional graduates.

Thus, neither enlarging medical school capacity nor assuring adequate numbers of qualified applicants is likely to be a simple task. The former will certainly require a consensus and public funds, but assuring sufficient numbers of applicants poses an even more serious challenge. To the extent that publicity about physician surpluses has been a deterrent, focusing attention on the need for more physicians may stimulate young people to view medicine as an attractive career. But they face the prospects of high debt, and they see the profession beleaguered by excessive regulation, insufficient reimbursement, and the ever-present threat of litigation. Although it is true that compensation for physicians is rising, particularly in high-technology specialties, skill is rewarded in America, and medicine is not alone in offering opportunities for skilled students.<sup>42</sup> Yet none of these may be the key factors. Trends in early education rather than more proximal events in clinical practice appear to have played a larger role in governing the availability of applicants in the past. Currently, only 40 percent of college-age whites, 30 percent of blacks, and 20 percent of Hispanics are enrolled in college.<sup>43</sup> More graduate from

high school but lack the fiscal resources for college, and many more could graduate but lack the motivation and skills that rigorous early education could impart.

There are other ways to meet future needs for physicians. The United States could rely on larger numbers of IMGs, as occurred during the early 1970s, or more of the services that physicians now perform could be provided by NPCs. Each has its own complexities and costs. Or, as some economists and health planners have urged, physician supply could simply remain constrained in an effort to ration care, an option that history shows cannot be undertaken for long.<sup>44</sup> If on the other hand the United States chooses to expand its infrastructure for undergraduate medical education, lessons from the past can be drawn upon. Probably the most instructive ones are how long this process is likely to take, how much it will rely upon governmental financing, and how dependent it will be on America's investment in K-12 and baccalaureate education. The public takes for granted that there will be enough physicians, and medical educators assume that there will be more than enough qualified applicants, but without vigorous efforts to strengthen the infrastructure of K-12 education, adequate support for students to succeed in postsecondary education, and effective long-term planning of the medical education enterprise, these assumptions may prove to be incorrect.

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## NOTES

1. R.A. Cooper et al., "Economic and Demographic Trends Signal an Impending Physician Shortage," *Health Affairs* (Jan/Feb 2002): 140-154.
2. R.A. Cooper, P. Laud, and C.L. Dietrich, "Current and Projected Workforce of Nonphysician Clinicians," *Journal of the American Medical Association* 280, no. 9 (1998): 788-794; R.A. Cooper, T. Henderson, and C.L. Dietrich, "Roles of Nonphysician Clinicians as Autonomous Providers of Patient Care," *Journal of the American Medical Association* 280, no. 9 (1998): 795-802; and R.A. Cooper and S.J. Stoflet, "Diversity and Consistency—The Challenge of Maintaining Quality in a Multidisciplinary Workforce," *Journal of Health Services Research and Policy* (forthcoming).
3. F. Mullan, "The Case for More U.S. Medical Students," *New England Journal of Medicine* 343, no. 3 (2000): 213-217; and P.E. Bundred and C. Levitt, "Medical Migration: Who Are the Real Losers?" *Lancet* 356, no. 9226 (2000): 245-246.
4. Data on medical school applicants, matriculants, and graduates were obtained from "Medical Schools in the United States," *Journal of the American Medical Association* 286, no. 9 (2001): 1085-1093 and previous years; A. Singer, "Undergraduate Osteopathic Medical Education," *Journal of the American Osteopathic Association* 101, no. 11 (2001): 646-652 and previous years; Association of American Medical Colleges, *AAMC Data Book: Statistical Information Related to Medical Schools and Teaching Hospitals* (Washington: AAMC, 2002); V.W. Lippard, *A Half-Century of American Medical Education: 1920-1970* (New York: Josiah Macy Jr. Foundation, 1974), 116-117; and W.G. Rothstein, *American Medical Schools and the Practice of Medicine* (New York: Oxford University Press, 1987), 142-143. The numbers of students, graduates, and so forth presented in these various sources were not always the same, and the figures quoted are attempts to reconcile these differences.
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6. Ludmerer, *Learning to Heal*, 100.

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