aamc association of american medical colleges

TASK FORCE ON PHYSICIAN SUPPLY

Status Report to the Council of Deans, Council of Academic Societies, and Council of Teaching Hospitals at their 1988 Spring Meetings

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Association of American Medical Colleges

TASK FORCE ON PHYSICIAN SUPPLY

Status Report

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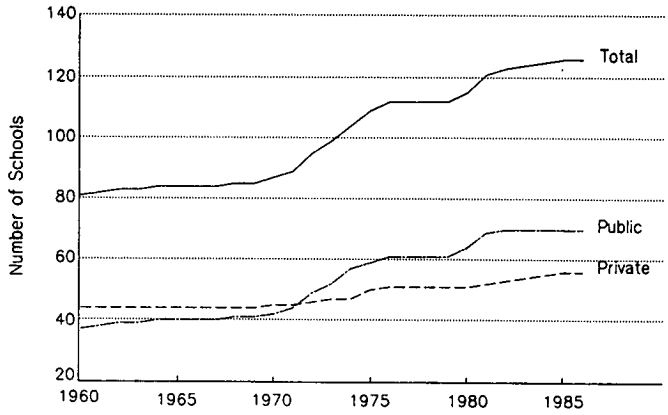
Physician Supply - What We Know In A Nutshell

SUPPLY

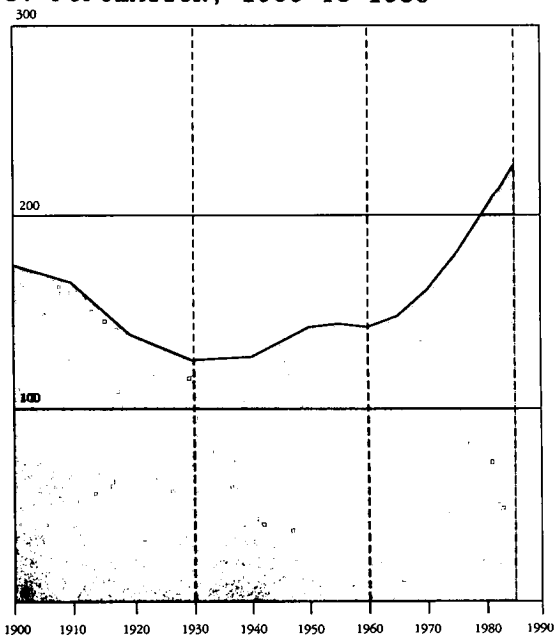
ACCREDITED UNITED STATES MEDICAL SCHOOLS, 1960-1987

1. The widely perceived shortage of physicians in the 50's and 60's produced an energetic response. The number of medical schools rose from 86 in 1960 to 127 in 1982; the number of 1st year students (new entrants) rose from 7,845 in 1960 to 16,660 in 1981-82.



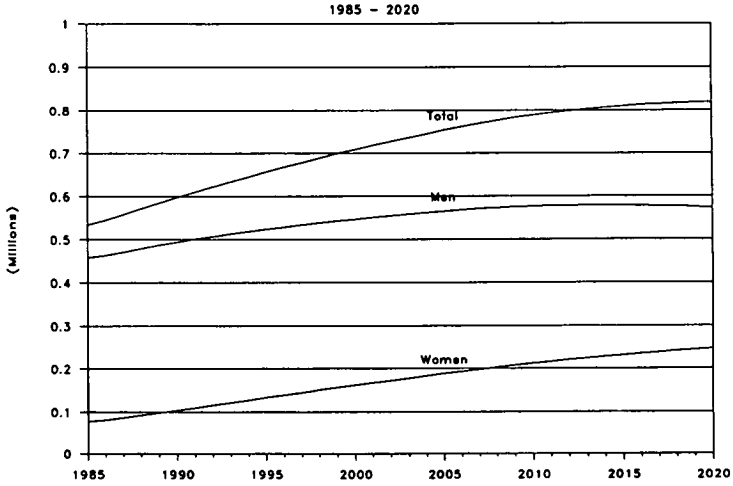
ACTIVE PHYSICIANS PER 100,000 U.S. POPULATION, 1900 TO 1985

2. The physician/population ratio is currently at an unprecedented level. The number of M.D.'s per 100,000 population has been raised from 140 in 1960 to 214.2 in 1985; with no change in U.S. educational capacity and a reduction of the FMG proportion from the current 22.0% to 19.4%, the M.D./100,000 population is projected to reach 254.9 by the year 2000.



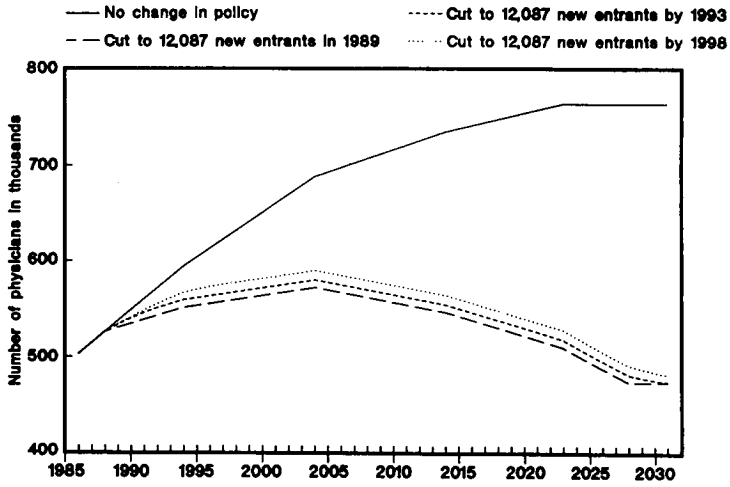
PROJECTED TOTALS OF M.D.'s & D.O.s

3. The total number of M.D.'s and D.O.'s in the U.S. will continue to rise; given certain assumptions about career length and maintenance of the current production capacity, a new steady state would be reached in the year 2020 at over 800,000 physicians.



ALLOPATHIC PHYSICIANS

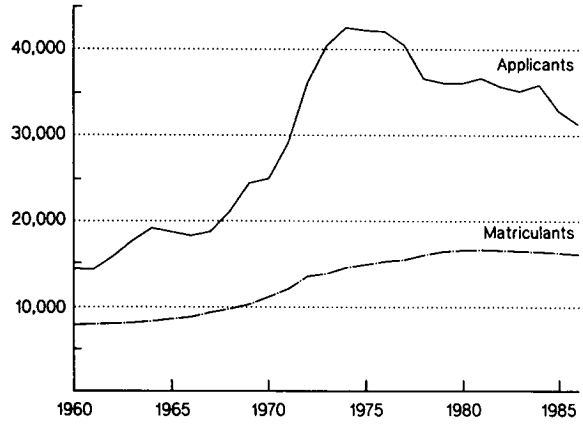
4. Because of the long time constants involved (length of training, length of physician careers) even a radical reduction in entering class size would not effect a downturn in the number of physicians in practice until 2004; return to current levels would be achieved in approximately 2020 if a 25% reduction were effected in the next several years.



APPLICANTS

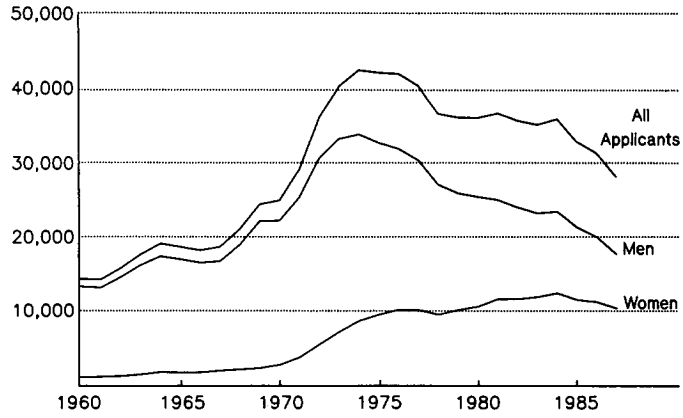
NUMBER OF MEDICAL SCHOOL APPLICANTS AND MATRICULANTS 1960 TO 1986

5. The number of applicants to medical school has been declining since reaching a peak of 42,624 in 1974-75; 1987-88 applicants numbered 28,123. The applicants to acceptance ratio has dropped from 2.8 to 1.7 over the period.



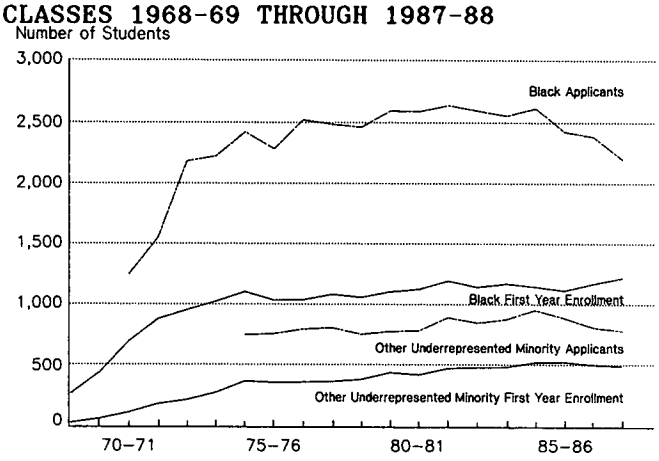
APPLICANTS TO MEDICAL SCHOOL

6. The level of interest in medical school among men and women displays quite different patterns. The number of women applicants rose to a peak of 12,476 in 1984-85 representing 34.7 percent of the total. While the number of women has dropped to 10,411, this represents 37.0 percent of the total in 1987-88.



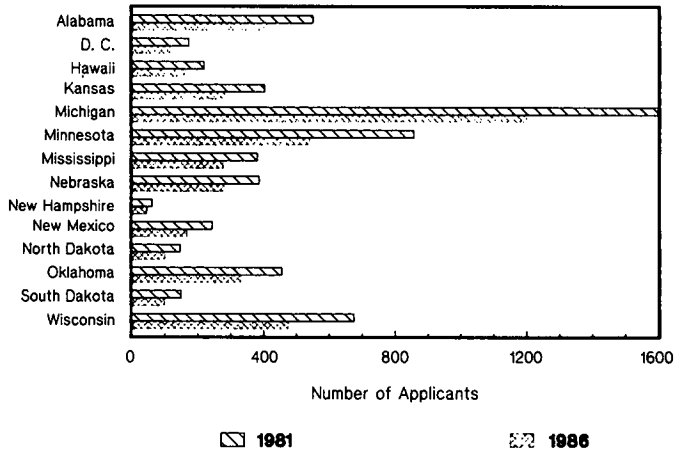
MINORITY APPLICANTS AND ENROLLMENT IN FIRST-YEAR MEDICAL SCHOOL CLASSES 1968-69 THROUGH 1987-88

7. The number of minority applicants remained nearly flat during the decade 1975-85; it has dropped in the last several years.



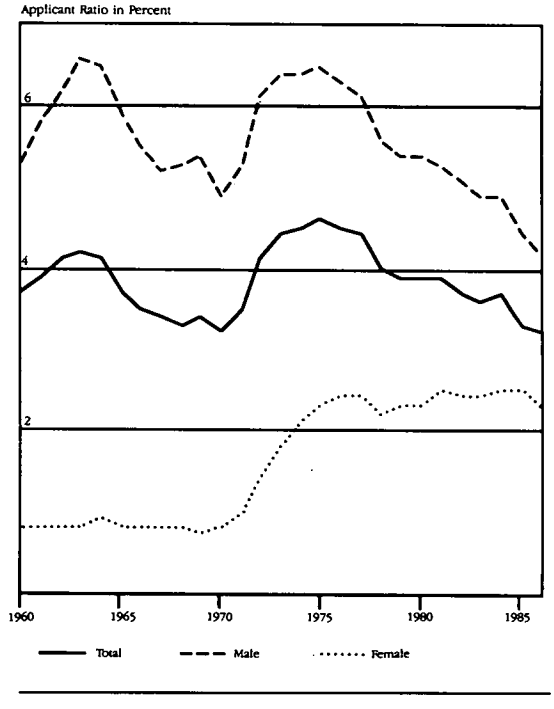
STATES HAVING A 25 PERCENT DECLINE OR MORE IN APPLICANTS BETWEEN 1981 AND 1986

8. Fourteen states experienced a decline in applicants of 25 percent or more between 1981 and 1986.



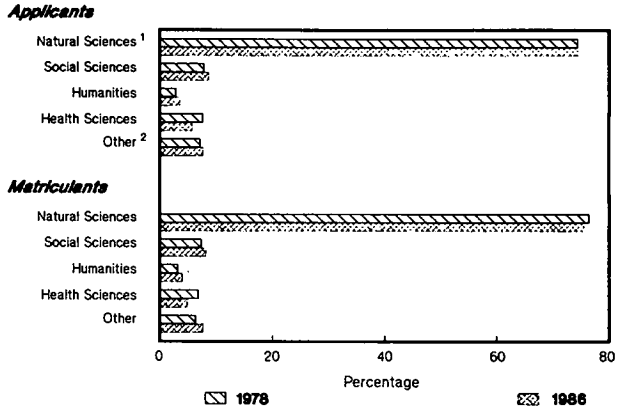
RATIO OF MEDICAL SCHOOL APPLICANTS TO COLLEGE GRADUATES OF PREVIOUS YEAR, 1960-85

9. The proportion of male college graduates applying to medical school is approaching 4 percent. It is now lower than at anytime since 1960. Female applicants rose above 2 percent of college graduates in 1974 and have remained there since; their number has been dropping since 1985.



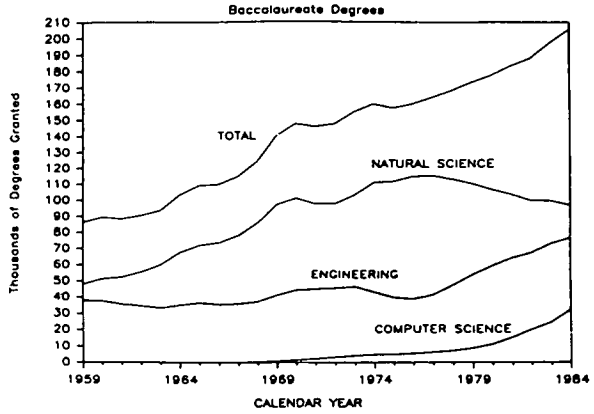
UNDERGRADUATE MAJOR OF APPLICANTS AND MATRICULANTS 1978 AND 1986

10. Natural sciences continue to constitute a vast proportion of both medical school applicants and matriculants in 1986; there is a small but discernable increase in the social sciences and humanities majors in the latter year.



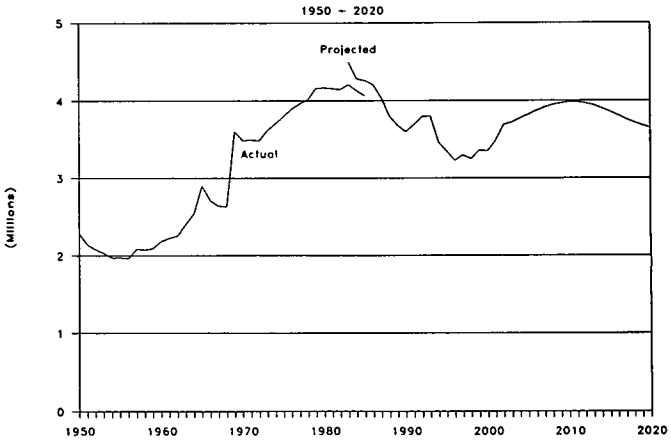
NATURAL SCIENCE AND ENGINEERING

11. The decline of interest in medicine may have some relationship to a decline in interest in natural science at the baccalaureate level as compared with engineering and computer science.



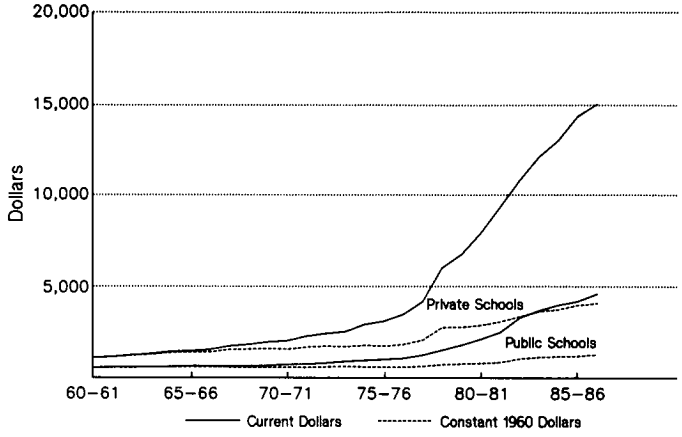
22-YEAR-OLD POPULATION
1950 - 2020

12. The number of 22 year olds in the population peaked in 1983 and is projected to decline until 1996. Thus, while this number does not explain the drop in applicants, it may act as a constraint on efforts to increase that number.



MEDIAN TUITION AND FEES FOR FIRST YEAR MEDICAL STUDENTS 1960-61 THROUGH 1986-87

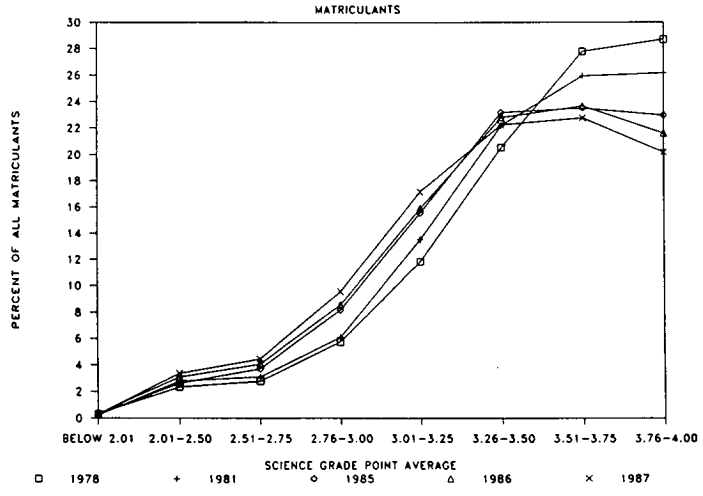
13. Medical school tuition has risen substantially since 1960; when adjusted by the CPI to 1960 dollars, median private school tuition has risen from $1,050 to $4,058 ($15,023 in 1987-87 dollars); while public school tuition has risen from $830 to $2,603 ($9,636 in 1987-87 dollars)



Source: Association of American Medical Colleges

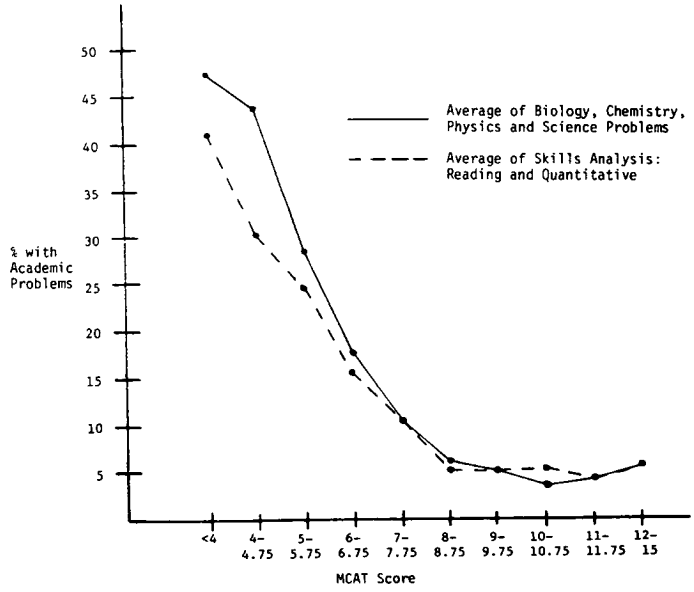
DISTRIBUTION OF SCIENCE GPA

14. One impact of the declining applicant pool appears to be that the proportion of the matriculating class with the highest science GPA's is decreasing while the proportion of those with the lowest are increasing.



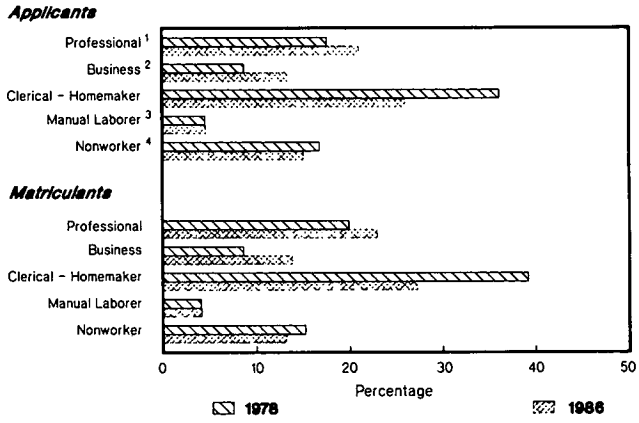
PERCENTAGE OF STUDENTS HAVING ACADEMIC PROBLEMS IN MEDICAL SCHOOL BY MEDICAL COLLEGE ADMISSION TEST (MCAT) SCORES 1978 AND 1979 ENTERING CLASSES

15. There is a demonstrable relationship between MCAT sciences scores below 8 and the probability of academic difficulty in medical school.



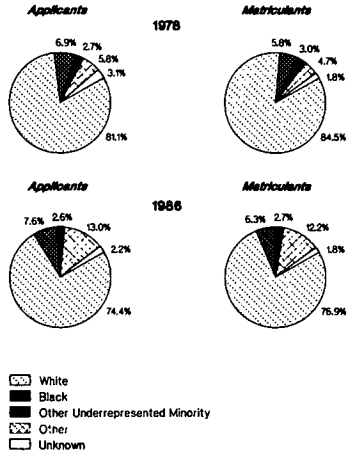
MOTHER'S OCCUPATION OF APPLICANTS AND MATRICULANTS 1978 AND 1986

16. There was relatively little shift between 1978 and 1986 in the occupation of the fathers of either applicants or matriculants. There was a discernable and perhaps significant shift in the occupations of mothers of both applicants and matriculants between 1978 and 1986.



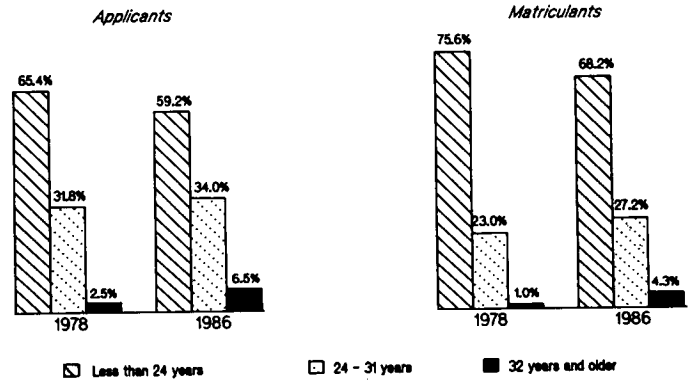
ETHNICITY OF APPLICANTS AND MATRICULANTS 1978 AND 1986

17. In 1978 blacks made up 6.9 percent of the applicants and 5.8 percent of the matriculants; in 1986 they were 7.6 of the applicants and 6.3 percent of the matriculants. Whites were 84.5 and 76.9 percent of the matriculants in the two years noted.



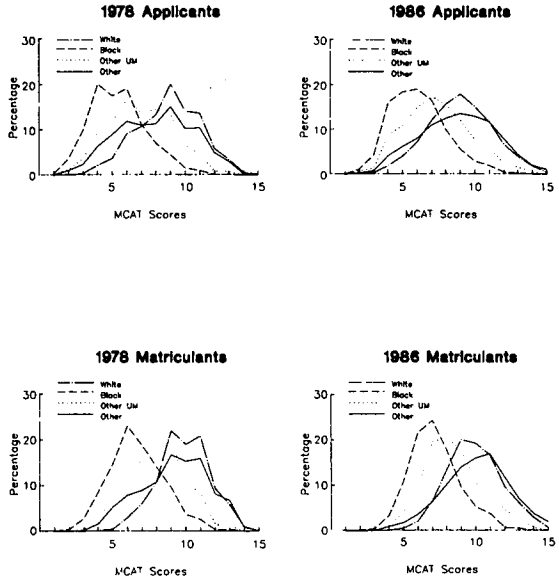
AGE OF APPLICANTS AND MATRICULANTS 1978 AND 1986

18. Older persons constituted a greater proportion of both applicants and matriculants in 1986 as compared with 1978.



MCAT SCIENCE SCORES BY ETHNICITY FOR APPLICANTS AND MATRICULANTS 1978 AND 1986

19. The distribution of MCAT Science Scores varied significantly by ethnic category for both applicants and matriculants in both 1978 and 1986.



PRACTICE

AVERAGE ANNUAL NET INCOME AMONG NON-FEDERAL PATIENT CARE PHYSICIANS (EXCLUDING RESIDENTS) BY PHYSICIAN AGE AND SPECIALTY, 1981-85

20. By AMA calculations, physicians in general were earning, on an inflation adjusted basis, 2.9 percent more in 1981 than in 1985 ($95,700 compared to 93,000) but less than in 1983 ($97,100). Surgery and other specialties have increased their income (6.3 and 6.1 percent) while general practice has dropped 8.8 percent; medical specialties have experienced a return to 1981 levels.

INFLATION-ADJUSTED INCOME (1981 DOLLARS)	1981	1982	1983	1984	1985	Percent Change 1981–85
Total Population	$ 93,000	$ 93,800	$ 97,100	$ 94,900	$ 95,700	2.9%
Age						
35 and under	67,300	69,100	70,300	69,100	72,000	6.8
36–45	101,000	102,000	100,600	102,700	98,700	−2.3
46–55	108,900	109,800	122,000	113,200	114,400	5.0
56–65	95,800	93,700	94,100	91,100	97,400	1.7
Over 65	65,500	60,600	65,700	68,500	70,900	8.3
Specialty						
General Practice	72,200	67,700	62,500	62,200	65,900	−8.8
Medical Specialties	78,900	77,000	78,100	81,500	78,800	−0.1
Surgical Specialties	116,800	119,400	126,800	124,700	124,100	6.3
Other Specialties	93,900	99,200	102,800	97,500	99,600	6.1*

*Statistically significant at 95% confidence level based on two-tailed t test.
**Statistically significant at 99% confidence level based on two-tailed t test.

SOURCE: Socioeconomic Monitoring System Core Surveys.

AVERAGE PATIENT VISITS PER WEEK AMONG NON-FEDERAL PATIENT CARE PHYSICIANS (EXCLUDING RESIDENTS) BY PHYSICIAN AGE AND SPECIALTY, 1982-86

21. Physicians report spending slightly more time in their practices (0.9 percent increase in average hours of work in professional activities and 1.9 percent more weeks per year). They see fewer patients. Between 1982 and 1986 the average number of patient visits per week dropped from 130.8 to 118.0.

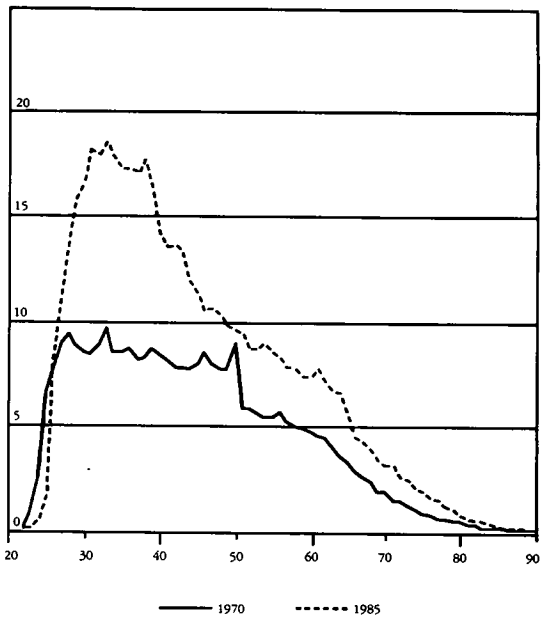
	1982	1983	1984	1985	1986	Percent Change 1982–86
Total Population	130.8	125.3	120.4	118.4	118.0	−9.8%**
Age						
35 and under	126.8	121.8	119.8	117.6	120.0	−5.4
36–45	129.5	125.9	118.5	118.9	121.0	−6.6*
46–55	141.1	135.0	132.4	125.6	122.8	−13.0**
56–65	134.2	129.0	122.2	120.1	112.0	−16.5**
Over 65	110.3	96.2	92.2	94.2	100.0	−9.3
Specialty						
General Practice	162.0	148.8	143.6	139.0	138.2	−14.7**
Medical Specialties	122.4	121.6	114.9	113.7	118.3	−3.3
Surgical Specialties	118.4	115.0	112.4	109.2	107.0	−9.6**
Other Specialties	138.9	123.8	118.8	119.2	113.8	−18.1*

*Statistically significant at 95% confidence level based on two-tailed t test.
**Statistically significant at 99% confidence level based on two-tailed t test.

SOURCE: Socioeconomic Monitoring System Core Surveys.

AGE DISTRIBUTION OF ACTIVE PHYSICIANS, 1970 AND 1985, PHYSICIANS IN THOUSANDS

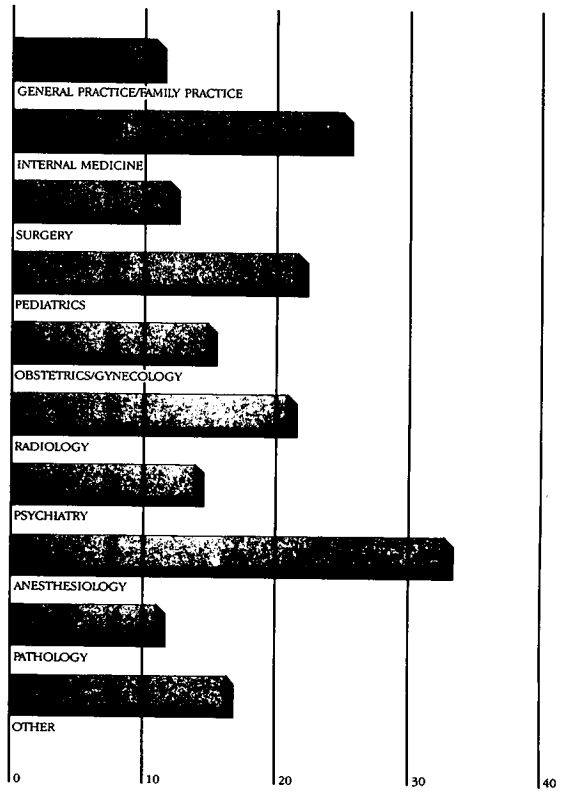
22. The practicing physician population of 1985 was substantially younger than the 1980 population.



SOURCE: 1970-85 AMA Phsyician Masterfile

PERCENT GROWTH IN ACTIVE PHYSICIAN POPULATION BY SPECIALTY, 1980-85

23. All specialties have experienced growth in the number of active physicians since 1980 in excess of 10 percent. Anesthesiology in excess of 30 percent; internal medicine, pediatrics and radiology in excess of 20 percent.



SOURCE: 1980-85 AMA Physician Masterfile.

U.S. MEDICAL STUDENTS IN THE 1983 GRADUATING CLASSES WHO PREFERRED EACH OF 21 SPECIALTIES AND THIRD-YEAR RESIDENTS IN 1986 WHO WERE IN THESE SPECIALTIES.

24. Specialty preference of medical school seniors reported on the AAMC graduation questionnaire represents a reasonable basis on which to estimate the number of U.S. graduates who will be in residencies three years later.

TABLE 1

Numbers and Percentages of 9,533 U.S. Medical Students in the 1983 Graduating Classes Who Preferred Each of 21 Specialties and Numbers and Percentages of 14,887 Third-Year Residents in 1986 Who Were in These Specialties*

Specialty	Students		Residents	
	No.	Percentage	No.	Percentage
Allergy and immunology	30	0.3	0	0.0
Anesthesiology	457	4.8	814	5.6
Dermatology	127	1.3	114	0.8
Emergency medicine	263	2.8	280	1.9
Family practice	1,444	15.1	2,004	13.8
Internal medicine	2,087	21.9	4,057	27.9
Neurosurgery	97	1.0	107	0.7
Neurology	146	1.5	197	1.4
Nuclear medicine	6	0.1	3	0.0
Obstetrics-gynecology	718	7.5	1,011	7.0
Ophthalmology	337	3.5	377	2.6
Orthopedic surgery	540	5.7	552	3.8
Otolaryngology	198	2.1	229	1.6
Pathology	252	2.6	418	2.9
Pediatrics	762	8.0	1,352	9.3
Physical medicine and rehabilitation	73	0.8	143	1.0
Preventive medicine	18	0.2	12	0.1
Psychiatry	450	4.7	761	5.2
Radiology	525	5.5	777	5.3
Surgery	852	8.9	1,145	7.9
Urology	151	1.6	185	1.3
Total	9,533	100.0	14,538	100.0

* Data on the students were from the 1983 Graduation Questionnaire of the Association of American Medical Colleges (AAMC), and data on the residents were from the AAMC Student and Applicant Information Management System. Data were unavailable on 948 students and 2,634 residents.

TABLE 2

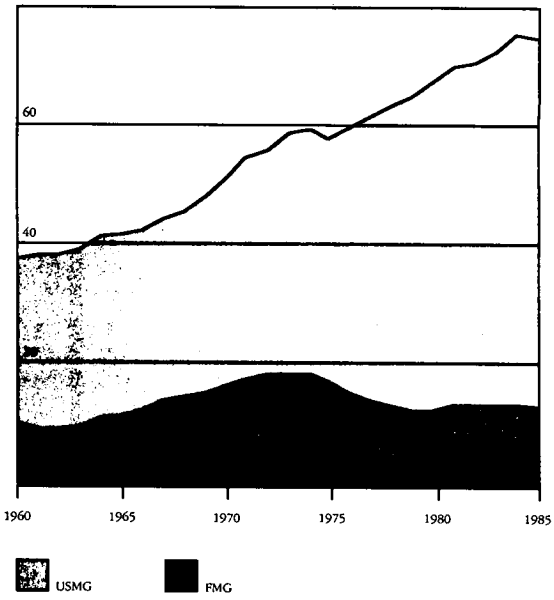
Percentages of 1983 U.S. Medical School Graduates Who Preferred Each of 21 Specialties Who in 1986 Were in Residencies Leading to Their Preferred Specialty*

Specialty	Percent (n = 8,250)
Allergy and immunology	0.0
Anesthesiology	89.4
Dermatology	63.3
Emergency medicine	65.0
Family practice	93.9
Internal medicine	92.9
Neurosurgery	74.1
Neurology	71.6
Nuclear medicine	0.0
Obstetrics-gynecology	87.1
Ophthalmology	86.5
Orthopedic surgery	74.3
Otolaryngology	79.9
Pathology	90.7
Pediatrics	92.3
Physical medicine and rehabilitation	88.4
Preventive medicine	25.0
Psychiatry	92.0
Radiology	88.0
Surgery	79.3
Urology	75.0
Overall	87.2

* Data on the students were from the 1983 graduation questionnaire of the Association of American Medical Colleges (AAMC), and data on the residents were from the AAMC Student and Application Information Management System.

NUMBER OF RESIDENT PHYSICIANS BY COUNTRY OF MEDICAL SCHOOL GRADUATION, 1960-85

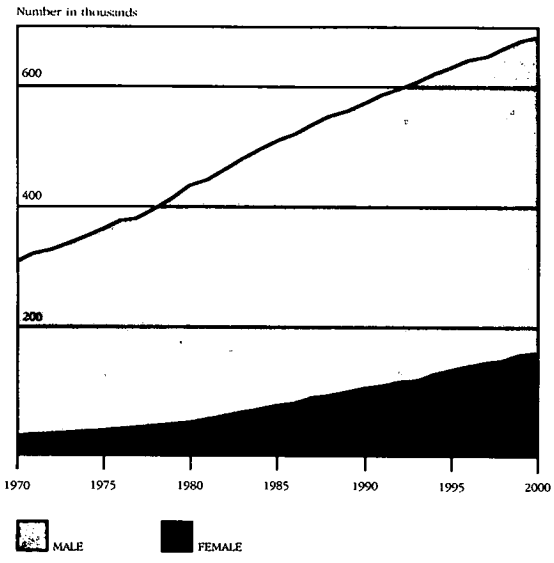
25. Although the number of FMGs in residency training remained fairly stable between 1980 and 1985, the size of the two FMS components changed significantly. USFMGs now comprise a larger proportion of the total FMG population. The number of USFMGs in residency training increased 43.4 percent in 1980-85, while the number of alien FMGs decreased 22.6 percent. The proportion of USFMGs in the population of all resident physicians increased from 7.8 percent to 9.2 percent in 1980-85 and the proportion of alien FMGs decreased from 11.9 percent to 7.6 percent.



SOURCE: Selected JAMA Medical Education Issues

BASE PROJECTION: NUMBER OF PHYSICIANS BY COUNTRY OF GRADUATION 1970-75 (ACTUAL) AND 1985-2000 (PROJECTED)

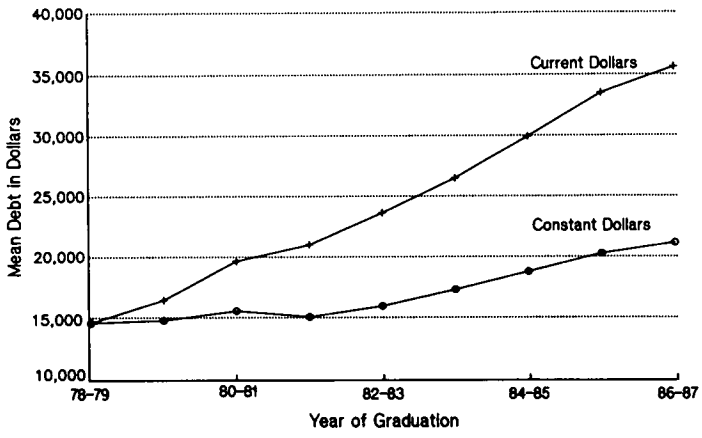
26. In 1970-85, the FMG population grew faster than the USMG medical population, and consequently the proportion of FMGs increased from 17.9 percent to 22.0 percent. By 2000, the proportion will have decreased to 19.4 percent. The USMG physician population is projected to grow at a much faster rate than the FMG population. During the 15 year projection period, the number of USMGs will increase 38.2 percent in contrast to 17.4 percent for FMGs. The projected growth rate shows extremely wide variation among the two components of the FMG population. The number of USFMGs is projected to grow 124.1 percent during the projection period, while the number of alien FMGs is projected to remain almost constant, decreasing 0.7 percent.



SOURCE: AMA Center for Health Policy Research, 1987

MEAN DEBT OF INDEBTED MEDICAL SCHOOL GRADUATES
1978-79 THROUGH 1986-87
CURRENT AND 1978 DOLLARS

27. Senior medical students are experiencing increasing debt loads. 82% of the 1986 graduates had debt; among them, the mean debt level was $33,499.



REFERENCES TO TABLES AND FIGURES

1. Association of American Medical Colleges.

2. American Medical Association. Center for Health Policy Research. Demographics of Physician Supply: Trends and Projections. By Kletke, Phillip R., Marder, William D., and Silberger, Anne B. Chicago, Illinois: American Medical Association, 1987. (ix + 62 pp.), page 6.

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8. Association of American Medical Colleges. Trends in Medical School Applicants and Matriculants, 1978-1986. By Tudor, Cynthia G., and Beran, Robert L. Washington, D.C.: Association of American Medical Colleges, 1987. (xii + 77), page 10.

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12. U.S. Bureau of the Census.

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17. Ibid., page 4.

18. Ibid., page 2.

19. Ibid., page 69.

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21. Ibid., page 32.

22. Ibid., page 26.

23. Ibid., page 25.

24. Dial, Thomas H., and Lindley, Diane W. Predictive Validity of Specialty Choice Data from AAMC Graduation Questionnaire. J. Med. Educ., 62:955-958, 1987.

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26. Ibid., page 44.

27. Association of American Medical Colleges

Selection Zones and the Dynamics of Admissions Policy

An important weakness in much discussion of applicant quality is the common implicit assumption that quality can be nationally defined and institutional selectivity levels are similar. The attached depicts selectivity levels for a sample of ten medical schools. Column two gives the average MCAT science and average MCAT Skills Analysis scores where the probability of being admitted to a medical school is fifty-fifty, that is, these are the score points where an applicant to an institution has a .5 probability of being offered an acceptance. As the table shows, there is wide variation among schools on this index. An applicant with a 6.8 MCAT science average has a .5 probability of acceptance at one institution. At another, a science average of 13.2 results in a fifty-fifty chance of acceptance. The median science average for this sample is 10.25.

The third and fourth columns show the proportion of the applicant group at each institution that falls in three selection zones: (1) a low zone, where most applicants are rejected, i.e. where the probability of acceptance is less than .25; (2) an uncertain zone, where on average, acceptance is a fifty-fifty proposition ($.25 \lesssim p \lesssim .75$); and (3) a high zone, where most applicants are likely to be accepted ($p > .75$). The institutional policy issues, as well as the practical problems of selection, are notably different in these three zones. If many of a medical school's applicants are in the high zone, as they are for the last institution graphed, for example, a sizable proportion of applicants will be admitted. If most are in the low zone, as they are for the initial institution, most will be rejected. Only a small percentage have an uncertain probability of acceptance.

These graphs show that some medical schools are very limited in how much they can affect their entering classes by manipulating selection policy. The fact that these ten medical schools have notably different proportions of applicants in the three zones shows that applicant quality and the character of the admissions process varies in important respects from institution to institution.

School	Score where Probability of Accept is .50	Proportion of Applicants in SCIENCE Selection Zones			Proportion of Applicants in SKILLS Selection Zones		
	Science/Skills	Low[a]	Uncertain[b]	High[c]	Low	Uncertain	High
A	12.6/12.0						
B	12.2/12.5						
C	13.2/12.8						
D	10.4/10.3						
E	9.1/ 8.5						
F	10.1/10.4						
G	8.4/ 8.3						
H	11.7/11.4						
I	6.8/ 6.4						
J	7.2/ 6.7						

[a] $p < .25$ [b] $.25 \leq p < .75$ [c] $p \geq .75$

AAMC MODELING ACTIVITIES

I. Phase One

In support of the work of its Task Force on Physician Supply, the Association of American Medical Colleges is carrying out a series of modeling activities relating demographic, education, practice and policy variables. The purpose of these activities is to inform the AAMC constituency and to illuminate policy discussions of the Task Force.

The scope of the modeling effort is divided into five stages of physician career development, as follows:

A. Modeling the applicant pool

B. Modeling the acceptance and matriculation process, giving new first-year students

C. Modeling progress through medical school, giving dropouts and graduates

D. Modeling residency and fellowship training, giving new practitioners

E. Modeling immigration, retirement and death, giving aggregate numbers

As each stage is carried out, it provides input to the next stage. The approach of the existing or planned activity for each stage is summarized below:

Stage One - Applicants

The number of and distribution of applicants by age, sex and race will be based on population projections of the Census Bureau, coupled with historical application rates for each stratum of the pool. Since these age, sex and race specific application rates have varied and are expected to continue to do so, the model will have as adjustable parameters some aggregated form of these rates. For example, at one time the number of applicants to medical school was equal to 0.012 times the number of 22-year-olds in the population, but at other times this factor has been below 0.007. Projections an be based on an assumed value for this parameter, which can be varied to develop alternative scenarios.

The firm preliminary version of the stage one model has been completed, based only on the numbers of 22-year-olds. It is intended to do a more comprehensive model based on the expected numbers of individuals of each age, race and sex. The more comprehensive approach has been demonstrated, and the first results are expected near the end of January, 1988.

The distribution by academic credentials of the applicants will be based on historical experience, using the SAIMS database. The percentage of applicants with each combination of academic credentials (suitably aggregated) will be assumed to be the same in the future as in the past. With this

assumption, a P percent reduction overall leads to a P percent reduction in the number of applicants with each combination of MCAT scores and GPA.

Stage two - Matriculants

The admissions policies of the schools are applied to an applicant pool to determine who is accepted at that school. Students who are accepted at more than one school apply their own criteria in selecting which school to attend. For the first phase of this model, a national approach is used, where academic qualifications of the applicant, together with age, race and sex, are assumed to determine whether the applicant is accepted or not. For simplicity, a simple fraction is applied to determine the number of accepted applicants who decline to matriculate. All of these parameters can be based on historical experience. Potential refinements include taking into account the state of residence of the applicant and whether he or she applies to a public school in his or her own state.

The technique of logistic regression has been applied to applicant data for 1987 to determine equations describing this national acceptance process. Results of the Stage two model are described elsewhere.

Stage three - Graduates and Dropouts

Most students gradate four years after matriculation, but some stay in school for longer periods, and some drop out. The SAIMS data base allows one to determine the dropout and delayed graduation rates by age, sex and race. Applying this stage of the model to the matriculants produced in stage two will allow prediction of the number of graduates of U.S. medical schools each year. Progress on the stage three model is described elsewhere.

Stage four - Residency and Fellowship Training

The AAMC has extensive data on residency choices of graduates of each class since 1983, and this data is being integrated into SAIMS, the Association's student data base. Using SAIMS, patterns of career development can be followed, allowing determination of the fraction of first-year internal medicine residents who go into dermatology in the second year, subspecialization fractions, and the like.

The SAIMS data base for residents is not limited to U.S. graduates, but includes all residents in programs accredited by the Accreditation Council on Graduate Medical Education (ACGME). This takes into account foreign medical graduates and osteopathic graduates, as well as graduates of U.S. schools.

AAMC has a two-year contract from the Health Resources and Services Administration to study specialty choice through the graduate medical education years, and the results of the HRSA project will be used to develop the stage four model.

Stage five - Practicing Physicians

At the completion of the residency process, individuals enter practice or

an alternative, non-patient care activity. The end product of the modeling activity is a predicted number and distribution by age, sex and race of practicing physicians.

AAMC's approach to stage five is to utilize the existing model of the Bureau of Health Professions, Health Resources and Services Administration. This model has been replicated on AAMC microcomputers, and it can be used to adjust predictions to take account of new predictions of numbers of U.S. graduates and numbers of foreign medical graduates entering the system. Alternative expectations of retirement rates can also be included.

II. Phase Two

The AAMC modeling project began with an attempt to describe the medical education system at a national level, using national applicant and matriculant pools and predicting success in admission using national standards. Important features of the actual medical education system are omitted by this approach, including the effect of state of residence. Furthermore, it offers only general assistance to individual schools, since its predictions are national in character. A second phase of the project will model the process on a school by school basis, aggregating individual school results to obtain the national picture.

The five-stage model developed in phase one predicted in succession the number of applicants, matriculants, graduates, individuals completing residencies and practicing physicians. The phase two model will use the same five stages, but will be developed in more detail in at least the first three stages.

Stage 1 - Applicants

Applicants for the national model were predicted based on population data and college completions. One could go so far as to utilize regional population data and college completions for each medical school's feeder colleges to predict applications to that school. A less complicated and more easily achieved approach is proposed instead, which will be described in the following paragraph.

I will be assumed that applicants in the future will be distributed geographically, by academic qualifications, and by schools applied to in the same way that they have been distributed in the past, but that the aggregate number of applicants will change. An applicant pool will be artificially generated with the historical distributions for each race and sex, but with a smaller total. The aggregate numbers for each race and sex can be modeled separately. Thus, one will generate fourteen applicant pools: white males, white females, black males, black females, Mexican-American males, Mexican-American females, Puerto Rich males, Puerto Rican females, Other Hispanic males, Other Hispanic females, Asian males, and Asian females.

One could fit the historically observed distributions for each of the fourteen pools with equations, then use mathematical procedures to generate an applicant pool with the desired characteristics, but there is an easier and

perhaps better way: use the SAIMS database of past applicants as if it were a pool of potential applicants for the future. By drawing at random a sample of the desired size from each of the fourteen populations, one can obtain an applicant pool of exactly known characteristics, down to the particular combination of schools applied to.

The overall numbers of applicants from each of the fourteen populations can be predicted as before, based on population and college completion data.

Stage 2 - Matriculants

To determine the number of matriculants at each school, it is necessary to model both the school's process for selecting students and the student's process for selecting schools (where multiple acceptances are offered).

Historical data from SAIMS can again be used to model the student's process for selection of schools. Already tabulated for the 1986 application year are all cases where a student matriculated at one school after being offered acceptance at one or more other schools. These data have been used to produce a preference matrix, containing the number of cases where students have preferred school A over school B, and the number of cases where students have preferred school B over school A, for all pairs of schools. If we have certain number of students in the applicant pool who are accepted by both school A and school B, they will be distributed in proportion among schools A and B. For students who are accepted at more than two schools, the binary distribution fractions will be combined to produce n-ary distribution fractions.[1] In this way, acceptance by the schools will be converted into matriculations.

The acceptance process by the school will have to be based on a model of the admissions process. After dividing up the applicant pool into under-represented minority residents, underrepresented minority non-residents, other residents and other non-residents, an academic score will be derived using a

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[1] Let x(a,b)=fraction of students who prefer school a over school b, and x(b,a)=fraction of students who prefer school b over school a. Then

$$x(a,b) + x(b,a) = 1$$

Similarly, for the relationship between school a and school c and for the relationship between school b and school c, we have

$$x(a,c) + x(c,a,) = 1$$
$$x(b,c) + x(c,b,) = 1$$

Now define $y(a|b,c)$ = fraction of students who prefer a over both b and c if accepted to all three; similarly for $y(b|a,c)$ and $y(c|a,b)$. We must have

$$y(a|b,c) + y(b|a,c) + y(c|a,b) = 1$$

By requiring also

$$y(a|b,c)/y(b|b,c) = x(a,b)/x(b,a)$$
$$y(a|b,c)/y(c|a,b) = x(a,c)/x(c,a)$$
$$y(b|a,c)/y(c|a,b) = x(b,c)/x(c,b)$$

it is possible to solve for the y. This approach is based on the assumption that being accepted to school c does not change the relative desirability of school a over school b.

combination of MCAT and GPA values. Minimum qualifications for each of the four pools will be established for each school. It will be assumed that the school then rank orders those students in each pool who meet the minimum criteria, accepting them from the top until the class is filled. Policy variables for each school will include the desired fraction of in-state residents and the desired fraction of minorities. As an alternative to a minority quota, minorities could be given a bonus for ranking along with other students. The parameters for each school can be determined from historical data, but it will also be possible to vary these for studies of alternative future policies.

The use of rank ordered lists of students preferred by each school and preferences of schools by each student is similar to the operation of the National Residency Matching Program. Indeed, this model would be useful in studying the effect of a medical student matching program.

Stage 3 - Graduates

It may not be necessary to model progress through medical school on an individual basis. One could assume that a student with given academic qualifications would have an equal chance of graduating on time at any school. If this assumption were made, then national data on student progress from phase one could be used. If necessary, drop-out and delay rates could be particularized for each school.

Benefits of the Individual School Approach

The stage two model will allow prediction of the applicant and matriculant pools for each institution, some of which will have problems more severe than others. Competition among schools for medical students will be taken into account. Adjustments involving relaxation of state residency variables or reduction in minimum academic credentials can be investigated.

THE AAMC TASK FORCE ON PHYSICIAN SUPPLY

Preamble

Issues associated with the supply and deployment of physicians in the United States will hold a prominent position on the health policy agenda over the next decade. United States medical schools are now experiencing a decline in their applicant pool and are concerned that this may portend a decline in the quality of future physicians and biomedical scientists.

Accordingly, the Association is now undertaking a thorough examination of the ramifications of physician supply and demand issues for the purpose of formulating guiding principles to assist its constituent members and others in addressing these issues in the period ahead. It is particularly important that the Association now becomes more fully engaged in this national debate to assure continuing attention to the quality of undergraduate medical and graduate medical education, biomedical science and patient care in this nation.

Charge to the Task Force

The AAMC Executive Council established the Task Force on Physician Supply with the charge of reviewing physician supply and production, considering the necessary manpower mix for provision of services in teaching hospitals, facilitating access to health care services, and assuring a sufficient number of appropriately trained researchers in biomedical and behavioral sciences. Toward that end, the Task Force will develop a report designed to:

1) Provide the leadership of the AAMC with information and policy guidelines on the supply and demand for physicians and medical scientists;

2) Inform and offer guidance to member institutions—medical schools, teaching hospitals, academic specialty societies—and others in the development of their policies and programs of education for medicine and medical science;

3) Provide information and analytic approaches to formulating public policy for educating physicians and medical scientists;

4) Inform and guide potential applicants for medical schools and graduate schools on issues affecting career choices; and

5) Assist the profession of medicine in understanding and responding to the demands of the contemporary environment.

In developing its report, the Task Force will be cognizant of the related but differing needs of the intended audiences: those within the community of academic medicine—AAMC member institutions, their faculties and academic leaders, and those with whom the community of academic medicine must and should engage in continuous dialogue—university officials and governing boards, the state and local communities and their political leaders, members of the medical profession and those who aspire to join it as well as those who search for a deeper understanding of biology and behavior and those who wish to join them. The varying perspectives from which these groups view issues affecting the public welfare together with their differing stakes in the outcomes of public policy determinations require that the work of the Task Force and its committees be thorough dispassionate and scholarly if it is to contribute significantly to public understanding and the advancement of the commonwealth.

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COMMITTEE IDENTIFICATION

(1) Implications of Physician Supply Issues for Medical Student Education
(2) Implications of Physician Supply Issues for Resident and Fellow Education
(3) Implications of Physician Supply Issues on Programs for the Education of Biomedical Scientists
(4) Relationship of Foreign Medical Schools and Graduates to Domestic Programs and Educational Standards

COMMITTEE ON IMPLICATIONS OF PHYSICIAN SUPPLY ISSUES FOR MEDICAL STUDENT EDUCATION

Charge to the Committee

The committee is charged to examine the relationship between estimates of the future supply of physicians and requirements for providing high quality health care to the American people. Toward this end the committee should review and critique the adequacy of current data and projections, develop additional analyses as appropriate, and guide AAMC staff in the refinement of models developed by the Health Resources and Services Administration and the American Medical Association.

Of particular concern to the committee should be:

I. the attractiveness of medicine as a profession identified with the life sciences;

II. the personal characteristics of physicians, particularly the qualities of commitment to public service and integrity;

III. the relationship of such factors as the cost and duration of the education program to adequacy and quality of applicants and matriculants;

IV. the implications of these issues to minority access to the profession; and

V. the implications of any future changes in entering class size to medical schools (e.g., financing and program quality) and to society (e.g., cost and availability of physician's services).

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COMMITTEE ON IMPLICATIONS OF PHYSICIAN SUPPLY ISSUES FOR RESIDENT AND FELLOW EDUCATION

Charge to the Committee

This committee is charged to explore the implications of changing educational and service needs and roles which confront graduate medical education programs and training facilities. The committee will review trends in the number of medical school graduates; their choices for graduate medical education; the professional opportunities available to residents upon completion of graduate medical education, including distribution by specialty, geography, and organizational and financial settings; and the complex issue of societal requirements for physicians of various kinds.

The committee will develop a report which:

I. considers evolving societal requirements for physicians of various specialties and for geographic distribution of physicians.

II. examines different sets of forces which influence the nature of graduate medical education opportunities and the production of trained physicians:

   A. The changing clinical activites within hospitals and the resulting influence on the environment and the opportunities for both graduate medical education and teaching by residents;

   B. The concomitant pressures on those in graduate medical education programs for the fulfillment of changing service roles in patient care and their possible conflict with the requirements for ideal educational content;

   C. The evolving environment of regulation with relation to the deployment and supervision of housestaff, and its impact on educational, financial and programmatic aspects of graduate medical education and teaching hospitals;

   D. The impact and limits of developing opportunities for graduate medical education in settings other than hospital inpatient units;

   E. The changing interface between physicians and other health professionals and any resulting impact on physician manpower needs;

   F. The nature and extent of influence and control of graduate medical education by the various interested parties such as specialty boards, residency review committees, the individual hospital, the individual medical school, etc., and the impact of changing requirements with relation to training imposed by any of these.

III. considers the economics of graduate medical education from a variety of relevant viewpoints including those of the hospital, the resident, the faculty, and the several payers of hospital care. The committee will also focus on the objective of equity, that is, the provision of access in graduate medical education to under-represented minority and economically disadvantaged physicians in training.

IV. considers the implications of possible future changes (1) in the number and type of residents in training and (2) the requirements and site of training programs for the delivery of patient care services provided by teaching hospitals.

V. includes recommendations:

   A. for actions by the AAMC;

   B. which may help provide guidance for individual programs, hospitals, medical schools, program directors and specialty organizations;

   C. which may help provide guidance to organizations responsible for the accreditation, approval and/or control of graduate medical education; and

   D. which may help provide guidance for federal and state governments and others who shoulder the costs of medical care and graduate medical education.

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IMPLICATIONS OF PHYSICIAN SUPPLY ISSUES ON PROGRAMS FOR THE EDUCATION OF BIOMEDICAL SCIENTISTS

Charge to the Committee

The 127 academic medical centers that educate physicians for the practice of medicine also account for the lion's share of the nation's non-proprietary biomedical research expenditures and train the majority of the nation's biomedical scientists. In light of the co-existence and interdependence in these institutions of responsibility for training students for both practice and research careers, this committee is charged to examine the capacity of academic medical centers for training biomedical, behavioral and cognate scientists in the context of such factors as the availability of challenging scientific problems and opportunities, the anticipated levels of support for science from the federal government and the private sector, and the actual as well as potential employment opportunities for such scientists in academia, government and industry. In particular, this committee should concern itself with the adequacy of current mechanisms to train physician investigators to conduct biomedical research, including an exploration of whether recruitment, selection and retention policies in conjoint advanced degree (e.g., the M.D.-Ph.D.) programs are efficient and effective.

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RELATIONSHIP OF FOREIGN MEDICAL SCHOOLS AND GRADUATES TO DOMESTIC PROGRAMS AND EDUCATIONAL STANDARDS

Charge to the Committee

This committee is charged to consider the implications for domestic educational programs, at both the medical school and resident and fellow level, of the influx of foreign medical students and graduates. Particular attention should be paid to adequacy of assessment mechanisms for determining the suitability of both U.S. and alien foreign medical graduates to enter resident and fellow programs, to provide safe and effective patient care and to sit for licensure. This committee should consider the status of development of a comprehensive clinical assessment examination which was endorsed by the AAMC in 1981 as the most appropriate mechanism for ensuring that foreign medical graduates possess the requisite skills and personal qualifications for entry into graduate medical education and licensure. It should also consider ways to assist and enhance cultural exchange programs in the training of physicians who would return to their home countries.

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Committee on Implications of Physician
Supply Issues to Medical Student Education

(Farber Committee)
Conclusions

I. There promises to be an abundance of physicians in the future. The committee has not concluded that this should be defined as a surplus. However, in classical economic terms, there are discernable indicators of a developing surplus:

   A. There is a decline in the number of applicants to medical school.

   B. In real terms, physician incomes are beginning to decline.

II. A concern for the welfare of society suggests that a surplus should be defined as a number of physicians which interferes with the quality of medical care given.

   A. The committee has found no evidence on which to conclude that there is now a surplus, so defined.

   B. There are a variety of careers associated with medicine, currently under-supplied, which may absorb more M.D.'s in the future. This development would, on balance, probably improve quality of care.

   C. Overdoctoring and erosion of clinical skills are signs of a possible surplus which should be monitored.

   D. Failure to attract capable students to medicine would be cause for alarm and action.

   E. Inadequate support for high quality education would be cause for alarm.

III. Decisions about the number of doctors to be educated, medical school class size, is a fundamentally local decision.

   A. Local, institutional and personal decisions are superior if made with timely and accurate information.

   B. Medical schools should maintain the quality of their student bodies, and reduce in size rather than compromise quality.

   C. The problem of underrepresentation by certain minorities in medicine deserves aggressive action.

   D. An increase in the number of physicians has historically been linked to an increase in total national expenditures devoted to physician and other health services. This is likely to continue into the future. Society may decide it can no longer afford to devote a continuingly larger share of the GNP to this purpose.

Recommendations

I. AAMC data collection and analytic efforts should be continued and strengthened.

II. The AAMC should initiate a major marketing campaign to attract able students, particularly those from minority backgrounds.

A. The message should be factual and well balanced, emphasizing that medicine offers:

- o an opportunity for service,
- o intellectual challenge and stimulation,
- o a sense of continuous accomplishment,
- o social respect, and
- o economic well being.

B. The message should also include an accurate portrayal of:

- o the current practice environment,
- o areas of need and under service, and
- o realistic income expectations.

III. Improving access for minorities will also require:

A. Renewed commitment to affirmative action in recruitment, admissions and academic enrichment.

B. Long term relationships with community organizations.

C. Academic enrichment at the junior high and high school level.

D. A dramatic and symbolic commitment to removing financing barriers.

E. The preservation and expansion of existing federal, state and local programs.

Committee on Implications of Physician Supply Issues for Resident and Fellow Education

(Rabkin Committee) Recommendations

I. As a prerequisite for licensure for independent practice, all medical school graduates should be required to complete an accredited residency program.

II. The academic component residency programs should be recognized and strengthened. Recommendations designed to accomplish this are under consideration. The most controversial ideas are to require that residency programs be conducted only:

- o by hospitals where the program director is appointed by the chairman of the department in the affiliated medical school, and
- o where there are at least four residency programs.

III. The committee is not taking a position on the number of physicians required. Instead, it recommends:

- o that there be developed a process of reporting physician supply and developing biennial estimates of physician requirements in which estimates should be data-based and specialty focused.
- o that the AAMC lead efforts to develop a coordinating committee to assemble, review and comment on manpower recommendations of others.
- o that the AAMC work with appropriate organizations and agencies, e.g., state licensing boards, to effect change in licensure requirements;
- o that the AAMC work to establish coordinated and shared databases on student and resident characteristics; and
- o that the AAMC publish an annual report for medical schools, teaching hospitals, students and the concerned public on the supply of physicians, characteristics of new graduates, and estimates of societal requirements for new physicians.

IV. The committee report will discuss the problem created by the increasing specialization of medical manpower in the face of a medical care system which seeks more integration of resources. This section will conclude that generalists are needed to coordinate and manage care and suggest that divergent trends suggest more generalists and fewer specialists are needed.

Relationship of Foreign Medical Schools and Graduates to Domestic Programs and Educational Standards

(Moy Committee)
Conclusions

I. Applying an appropriate, standardized method for evaluating foreign medical schools appears to be no more feasible now than thirty years ago. The variability in cultures, in resources, in missions and motivations among the world's medical schools is so great that applying the educational standards and the method used by the LCME to accredit U.S. and Canadian schools cannot now, nor in the foreseeable future, be used to determine whether foreign medical graduates are qualified to enter graduate medical education in this country.

II. During this decade, the development of methods to evaluate candidates' clinical skills with direct observational techniques using standardized patients has progressed to a point that their application to large scale testing appears feasible. The ECFMG has conducted two pilot experiments using a very limited technique. Even this limited evaluation has demonstrated a deficiency in clinical skills among foreign medical graduates as compared to U.S. graduates. The development of a sophisticated method that can be used to evaluate the clinical skills of foreign medical graduates must be a high priority for the Educational Commission for Foreign Medical Graduates. The AAMC and other founding organizations of the ECFMG should provide assistance to the ECFMG in accomplishing this task.

III. In 1986, the AAMC adopted the position that funding for graduate medical education should be limited to graduates of medical schools approved by the Liaison Committee on Medical Education or the American Osteopathic Association. This position is based on the view that the number of physicians now being graduated in the United States is sufficient for domestic needs and the belief that if resources to support graduate medical education become constrained, LCME and AOA graduates must have priority for access to graduate medical education positions.

IV. Foreign medical graduates who seek to practice in this country must be distinguished from medical scholars who come to the United States for the education and training they need to contribute to medical research or to the practice of medicine in their home countries. Often they are on the faculties of medical schools or in the ministries of health or education. The U.S. medical community recognizes both the contributions foreign medical graduate scholars have made to this country and the contributions this country can make to other nations through our medical education resources.

V. The maintenance of physicians' clinical abilities in an era of rapidly changing medical knowledge and techniques is of concern. Sixteen American specialty certifying boards have established policies and procedures for time-limited certification. Ten of these require examination.

Recommendations

I. The eligibility of foreign medical graduates to enter accredited medical education programs as qualified residents should be determined by examination administered by the Educational Commission for Foreign Medical Graduates.

The examination sequence should consist of four parts:

- o A cognitive examination in the basic science disciplines
- o A cognitive examination in the clinical disciplines
- o An assessment of the ability to use English as a spoken language
- o An evaluation of clinical skills

The FMGEMS examination should be phased out, and foreign medical graduates should eventually take Parts I and II of the National board of Medical Examiners sequence as the cognitive examinations in the basic and clinical disciplines. The development of a reliable and valid method to evaluate the clinical skills of foreign medical graduates should be given a high priority by the ECFMG and all organizations involve din graduate medical education.

II. When the rigorous examination system outlined in the section on educational credentials has been developed, it is expected that only a small number of well-qualified foreign medical graduates will be eligible for certification by the ECFMG. The AAMC should monitor the quality and effectiveness of the evolving ECFMG certification program and consider revising its position on financial support at a later date.

III. The AAMC, as a founding member of the International Medical Scholars Program, should support the development and advancement of its programs.

IV. The AAMC should encourage the development of recertification policies by American specialty certifying boards. All diplomates, both domestic and foreign medical graduates, should be periodically recertified.

Implications of Physician Supply Issues on Programs for the Education of Biomedical Scientists

(Korn Committee)

Recommendations

The role of academic medical centers in their conjoint mission of conducting biomedical research and training biomedical scientists should be reaffirmed and recognized as a unique function that is separate from and of equal importance to their roles in training practicing physicians and rendering patient services.

Federal support for biomedical research and research training should be reaffirmed as a high priority element of public policy and recognized as a valuable national investment that merits increased levels of support.

The array and structure of federal biomedical research training programs should be carefully reviewed and modified to attract the most able candidates to research careers. Particular attention should be paid to the development and implementation of effective mechanisms to train an expanded cadre of high caliber physician-scientists.

Careers in the biomedical sciences, both in academe and in industry, must offer sufficient opportunity for personal and professional satisfaction to enable successful competition for the most talented student in a finite pool.

TIME LINE FOR TASK FORCE ON PHYSICIAN SUPPLY

December, 1986	Officers Retreat --Annual Meeting topic --Task Force recommended
January, 1987	Executive Council authorizes Task Force
February, 1987	AAMC President & Chairman meet Task Force Chairman
March, 1987	Initial Steering Committee Meeting - Decision to Expand Membership
	CAS Spring Meeting - Physician Supply Discussed
April, 1987	COD Spring Meeting - Physician Supply Discussed
May, 1987	Initial discussions with foundations for potential support
	Task Force & Committee Chairmen meet
	Steering Committee meets (May 28)
June, 1987	Foundation visits continue
July, 1987	Committee meetings - July 9-10 (Rabkin); July 10 (Korn)
August, 1987	Committee meetings - Aug. 7 (Farber); Aug. 26 (Korn)
September, 1987	Committee meetings - Sept. 4 (Moy), Sept. 11, (Rabkin)
October 1, 1987	Steering Committee meets
	Committee meets - Oct. 12 (Farber)
November 9, 1987	AAMC Annual Meeting - Dr. Tosteson Reports to AAMC Special Session
	AAMC Annual Meeting - Steering Committee meets - Nov. 10
January, 1988	Committee meetings - Jan. 15 (Korn); Jan. 24-25 (Rabkin); Jan. 28-29 (Farber)
February 1, 1988	Steering Committee meets - review Progress Report of each committee
March 2, 1988	Committee meets - (Moy)

Time Line continued:

April, 1988	CAS/COD/COTH Spring Meetings - Progress Report
	Committee Meets - Apr. 24-25 (Rabkin)
May 24, 1988	Steering Committee Meets - Washington, D.C.
June, 1988	Steering Committee Meets - First Draft Interim Report
September, 1988	Steering Committee Meets - Interim Report Revised
October, 1988	Interim Report to Annual Meeting
January, 1989	Task Force Draft Final Report
	COD/CAS/COTH Spring Meeting - Draft Report Reviewed
May/June, 1989	Task Force - Final Report Approved
September, 1989	Final Report Distributed

(Rev. 1/11/88)