Impact of the Health Professions Educational Assistance Act on Specialty Distribution Among First-Year Residents

ITZHAK JACOBY, PhD

THE HEALTH PROFESSIONS EDUCATIONAL ASSISTANCE ACT, Public Law 94–484, which went into effect in October 1976, represents a major shift in public policy concerning physician manpower. Throughout the 1960s and early 1970s, the goal of increased numbers of physicians was equated with expanded health services and improved health of the population. Emphasis in training policy was therefore put on increasing the number of physicians by liberalizing admission policies to this country for foreign medical school graduates and enlarging the size of medical school classes.

In contrast, the mid-1970 law states, "there is no longer an insufficient number of physicians and nurses in the United States." The law then redefines the problem of manpower shortage as an "inadequate number of physicians engaged in the delivery of primary care." With Public Law 94–484, Congress aimed specifically to correct this perceived specialty maldistribution by increasing the proportion of primary care physicians practicing in the United States. To stimulate this increase, the law has established targets and incentives for expanding the number and size of graduate training programs in the primary care specialties—family practice, internal medicine, and pediatrics. (All physicians, to be eligible for licensure and to engage in patient care, must complete at least 1 additional year of training, referred to as graduate medical education (GME) which includes internships and residencies.)

After lengthy debate, Congress rejected the option of establishing strict quotas on specialty distribution among residency positions and monitoring these quotas by region. Instead, the law establishes minimum requirements for percentages of first-year residency positions in the primary care specialties which must be met in the aggregate nationally as follows:

Year	*National percentage of first-year residencies in primary care*
1977	35
1978	40
1979	50

If in any year the requirement is not met or exceeded nationally, each school must then meet that criterion the following year in order to retain eligibility for capitation grant assistance. Some incentive is inherent in these requirements, since all medical schools receive capitation grant assistance and rely upon these awards for 3 to 5 percent of their total revenues. Also, the capitation grant program was used similarly in the past to provide incentives for medical schools not to decrease the size of their classes.

In summary, the intent of the law was to bring about a change in the specialty distribution among practitioners—specifically to increase the proportion of practitioners in the primary care specialties. To effect this

Tearsheet requests to Dr. Itzhak Jacoby, Chief, Research and Analysis Section, Manpower Supply and Utilization Branch, Division of Medicine, Bureau of Health Manpower, Health Resources Administration, Rm. 2–63, Center Bldg., 3700 East-West Highway, Hyattsville, Md. 20782. The data for this report were collected by Thomas Nelson, program analyst, Division of Medicine.

change in the specialty distribution of first-year residency positions, capitation grant assistance was denied if certain minimum requirements for first-year residencies in primary care were not met. These minimum requirements were intended to represent a significant increase over the proportions believed to exist in medical schools when the law became effective. The discussion which follows deals with the results of the analysis of data obtained from medical schools regarding the specialty distribution in their first-year residency programs for the first year that Public Law 94–484 was in effect.

Methodology

To implement Public Law 94–484, the Bureau of Health Manpower, Health Resources Administration, requested each medical school to report (during August 1977) the distribution of its first-year residency slots among the various specialties as of July 15, 1977, and all of its direct and affiliated training programs (*1*). Only medical residency training programs approved by the Liaison Committee on Graduate Medical Education (LCGME) were reported. The term "medical residency training program" excluded residency training programs in osteopathic hospitals. Medical schools submitted data regardless of their intent to participate in the capitation grant program.

Because all 120 accredited medical schools complied with this request (and since the number of residencies in nonaffiliated programs is decreasing rapidly), we estimate that the direct and affiliated residency count represents about 95 percent (*2*) of all first-year residencies in the United States.

To avoid counting the same resident more than once in programs affiliated with more than one school, the number of first-year residents in such programs was divided by the number of affiliations. In other words, the number of first-year residents was prorated across the affiliated medical schools to prevent double counting.

Programs sponsored by departments of family practice, internal medicine, and pediatrics, as well as flexible first-year positions in programs sponsored exclusively by any combination of these three departments, were defined as the primary care programs. In establishing the total number of first-year residents, schools reported the number of first-year positions in obstetrics and gynecology, pathology, general surgery, and flexible first-year positions in programs sponsored by other than the three primary care specialty departments. In addition, schools reported the number of residents who are in their first year of graduate medical education (PGY–1) in a specialty program other than those just mentioned. However, the first postgraduate year of training in a particular specialty or subspecialty may not be a student's first year of graduate medical education. For example, having completed 1 year of general internal medicine training (PGY–1), the student may be in his or her first year of residency in obstetrics and gynecology (PGY–2).

Thus, in implementing this program, the term "first-year position" was used in three ways: (*a*) all first-year positions in family practice, internal medicine,

pediatrics, obstetrics and gynecology, pathology, and general surgery, with family practice, internal medicine, and pediatrics defined as primary care, (*b*) all first-year positions in flexible first-year medical residency training programs, with programs sponsored exclusively by family practice, internal medicine, or pediatrics defined as primary care, and (*c*) all positions in medical residency training programs that are filled by persons in their first year of GME, regardless of specialty. This detailed discussion of the definitions and terminology used in the collection of the data should eliminate any ambiguity concerning the relationship between this data set and other published data.

The data were processed and edited for consistency. For this analysis, the record was expanded to include, in addition to the residency count just described, information describing the medical school and socioeconomic data describing the characteristics of the health systems agency (HSA) in the area where the school is located.

For each medical school, the following variables were defined for the purpose of the multivariate statistical analysis:

- Percentage of first-year residents in direct and affiliated programs in primary care training (primary care as defined earlier).
- Percentage of first-year residents in primary care who are being trained in family medicine.
- Percentage attrition from primary care in the school's residency program, which is defined as the number of residents who were in first-year primary care training in 1976 but left primary care training in 1977, as a percentage of first-year primary care students in 1977.
- Ratio of active physicians in the HSA to the population of the HSA. (Number of physicians per 1,000 people.)
- Percentage of the active physicians in the school's HSA who are listed as primary care practitioners in the American Medical Association (AMA) master file under general practice, family practice, internal medicine, pediatrics, or obstetrics and gynecology.
- Number of short-term hospital beds per 1,000 people in the school's HSA.
- Income per capita in the school's HSA.
- Medical school enrollment—all years (1977–78).
- Medical school enrollment—first year only (1977–78).
- Medical school ownership, public or private.
- Percentage of school's students who are residents of the school's State.
- The group (type I through type X) to which the medical school belongs in a typology of 107 medical schools. This typology is based on five dimensions of variation: size, eminence, clerkship versus basic science requirements, elective emphasis, and services versus science funding. Further explanation of the derivation of this typology and a listing of the groups and examples of schools that belong to each group appear in the box on page 30. Note that the classification is based on only 107 schools; in the analysis involving this variable, therefore, 13 schools are missing. However, it

Table 1. The typology of medical schools, as described by mean values of selected characteristics

Medical school group	Number of schools in group	Active physician to population ratio	Percent active physicians in primary care	Short-term hospital beds per 1,000 people	Per capita income	Medical school enrollment	Medical school enrollment, first year
I	5	1.69	44.9	4.9	$5,073	283	82
II	6	1.18	51.3	4.6	4,407	232	69
III	9	1.15	48.2	4.6	3,852	271	86
IV	5	1.70	45.0	4.0	4,907	369	114
V	10	2.17	44.7	4.4	4,724	399	102
VI	19	2.03	43.8	4.9	4,683	620	160
VII	39	2.13	43.4	5.1	4,648	553	144
VIII	13	2.39	42.2	4.4	4,547	481	120
IX	5	2.08	41.7	5.2	4,671	781	237
X	5	2.13	44.4	5.0	5,098	1,092	275
All	116	1.99	43.8	4.7	$4,564	498	133

NOTE: The typology used here is described on page 30; its development preceded this analysis.

is sufficient to study the relationship we are interested in with only 107 schools.

• Ratio of the HSA's population living in urban areas to the total population of the HSA. This variable serves as an index of urbanicity and is based on the 1970 census.

Statistical Analyses and Results

In the multivariate statistical analysis of the data, the first three variables in the preceding list were considered to be the dependent variables. The objective of the analysis was to determine some relationships between each of these three dependent variables and the remaining independent variables. The following two analyses were undertaken:

Descriptive and correlational analysis. This analysis was performed to determine the significant relationships between a dependent variable and one of the array of independent variables. A significant positive correlation indicates that one variable increases in value when the other increases and decreases when the other decreases. A significant negative correlation indicates that the value of one variable will increase while the other decreases. For this analysis, simple Pearson correlation coefficients were used (*3*).

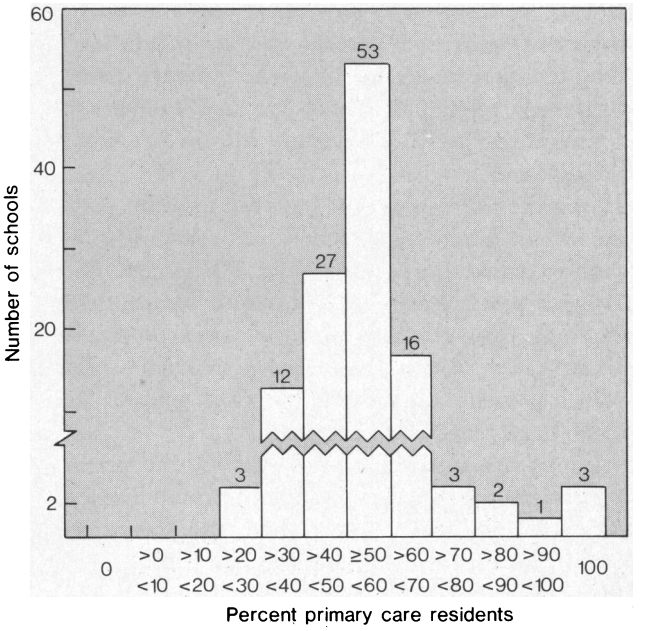
Regressional analysis. To define the relationship between each dependent variable and its correlated independent variables, a regression expression was estimated for each of these three relationships. These expressions were developed for possible use in predicting the values of the dependent variables according to the characteristics of the medical schools and HSAs in which they are located (that is, the independent variables). Because of the large number of variables involved, the stepwise regression procedure was used.

Discussions of these analyses follow:

Table 1 (continued)

Medical school ownership: 1, public 2, private	Percent of students who are State residents	Percent primary care students	Attrition rate of students in primary care	Percent primary care students in family medicine
1.2	98.1	59.6	8.8	28.3
1.0	96.9	73.1	7.9	51.8
1.0	97.3	48.9	16.1	36.7
1.0	82.6	56.4	5.5	35.7
1.9	59.6	49.2	15.7	10.6
1.4	73.9	48.7	13.4	18.4
1.4	77.1	53.3	8.5	22.8
1.6	44.2	48.7	9.1	9.8
1.4	90.1	54.1	6.9	19.8
1.0	93.5	55.2	6.1	23.5
1.4	74.3	53.7	9.3	23.1

Figure 1. Percentage of primary care residents in 120 medical schools as of July 15, 1977



Descriptive and correlational analysis. From examination of the data submitted (fig. 1 and table 1), we found that in each of the 120 medical schools at least 20 to 30 percent of the first-year residency slots are in primary care—defined as programs in internal medicine, family medicine, and pediatrics. Only 3 schools had first-year residency programs with no more than 20 to 30 percent primary care positions; on the other extreme, 3 schools topped the distribution, having first-year residency programs with 100 percent primary care positions. The modal number (that is, the largest part of the distribution) of schools studied—44 percent—had programs with between 50 and 60 percent of first-year residency positions in primary care. The mean proportion of first-year residencies in primary care was 53.7 percent.

By analyzing relationships among variables, we found that the percentage of first-year residency slots in primary care specialties correlates positively with the percentage of primary care physicians in the medical school's HSA. For example, medical schools located in HSAs having less than 40 percent of their active physicians in primary care have first-year residency programs with a mean of only 49.4 percent of slots

in primary care. In contrast, schools located in HSAs containing more than 50 percent of their active physicians in primary care have first-year residency programs averaging 66.9 percent of slots in primary care. Also, the percentage of first-year primary care slots is inversely related to school size and to the number of physicians per 1,000 people in the school's HSA (tables 2 and 3).

Regarding the subset of first-year primary care residencies in family medicine, 7 of every 10 medical schools studied have fewer than 30 percent of their first-year primary care residencies in family medicine programs (fig. 2). Although the mean proportion of primary care residencies in family medicine programs is 23.1 percent, about 1 in every 5 schools studied has no family medicine program.

Among the medical schools studied, the percentage of first-year primary care residencies in family medicine programs is significantly correlated with the percentage of physicians in primary care specialties in the school's HSA (table 4). The percentage of primary care residencies in family medicine programs, however, is inversely correlated with the number of physicians per 1,000 people in the school's HSA. For example, on the average, 37.8 percent of primary care residencies in family medicine programs are in medical schools located in HSAs having less than 1.5 physicians per 1,000 population; the mean proportion decreases to 8.6 percent in schools located in HSAs containing more than 2.5 physicians per 1,000 population (table 2). The mean percentage of first-year primary care residencies in family medicine is significantly higher in public medical schools (30 percent) than in private schools (10 percent). Schools in which State residents comprise more than 90 percent of the students have, on the average, twice the proportion of primary care residencies in family medicine (24.4 percent) as those in other schools.

The percentage of first-year primary care residencies in family medicine is negatively correlated with the number of short-term hospital beds per population in the HSA in which the school is located (table 4). Of interest is the significant positive correlation between the number of short-term hospital beds per population and the percentage of first-year residency slots in primary care. While more beds per population yields significantly higher percentages of first-year residency slots in primary care, given two schools with equal percentages in primary care, the school in an HSA with relatively fewer hospital beds yields a higher percentage in family medicine.

The attrition rate of students in primary care residency programs after the first year averaged 9.3 percent

Table 2. Mean values for the dependent variables disaggregated by selected characteristics, in percentages

Mean values	*First-year positions in primary care*	*Primary care positions in family medicine*	*Attrition from first-year primary care*
Physician to population ratio:			
1.5	52.8	37.8	6.9
1.5–2.5	52.0	19.3	10.2
2.5	50.0	8.6	10.6
Medical school enrollment, all:			
300	63.8	39.6	9.0
300–500	52.1	18.8	8.5
501–600	50.0	19.7	9.6
600	50.0	19.2	10.0
Percentage of active primary care physicians:			
40	49.4	16.7	8.5
40–50	53.1	21.5	9.6
50	66.9	49.5	7.0
Medical school ownership:			
Public	54.9	30.0	8.7
Private	49.4	10.0	10.7
Short-term hospital beds per 1,000 people:			
3.5	49.9	27.3	8.2
3.5–4.5	53.2	26.9	11.3
4.5–5.5	52.8	20.6	8.9
5.5	59.2	22.8	7.8
Percentage of students who are State residents:			
30	53.8	12.8	10.9
30–60	51.6	13.2	12.9
61–80	48.6	10.3	7.3
81–90	51.9	12.7	8.9
90	56.1	24.4	8.8

among the medical schools studied. Although 75 of the 120 schools studied had attrition rates of less than 10 percent—21 schools had no attrition—1 school's attrition rate exceeded 50 percent (fig. 3).

Smaller attrition rates seem to be associated with smaller concentrations of physicians in the HSAs where the medical schools are located. The attrition rate of students in primary care residency programs averages 6.9 percent in schools located in HSAs having less than 1.5 physicians per 1,000 population; this rate increases to 10.6 percent for schools in areas having more than 2.5 physicians per 1,000 population (table 2).

Table 3. Correlations with percentage of first-year positions in primary care

Variable	Correlation	Level of significance
Active physician to population ratio	−	.02
Percentage of active physicians in primary care	+	.001
Short-term hospital beds per 1,000 people	+	.04
Medical school enrollment	−	.001
Medical school enrollment, first year	−	.003
Medical school ownership: 1, public, 2, private	−	.001
Medical school group	−	.003
Percentage of people living in urban areas	−	.01

Table 4. Correlations with percentage of first-year primary care residency positions in family medicine

Variable	Correlation	Level of significance
Percentage first-year slots in primary care	+	.001
Active physician to population ratio	−	.001
Percentage of active physicians in primary care	+	.001
Short-term hospital beds per 1,000 people	−	.05
Per capita income	−	.001
Medical school enrollment	−	.002
Medical school enrollment, first year	−	.02
Medical school ownership: 1, public, 2, private	−	.001
Percentage of students who are State residents	+	.001
Medical school group	+	.05
Percentage of people living in urban areas	−	.001

Private medical schools have significantly higher attrition rates, 10.7 percent, than public schools, 8.7 percent. In addition, attrition rates are inversely correlated with the percentage of first-year residency slots in primary care; that is, schools which offer a high percent-

Figure 2. Percentage of primary residents in family medicine in 120 medical schools as of July 15, 1977

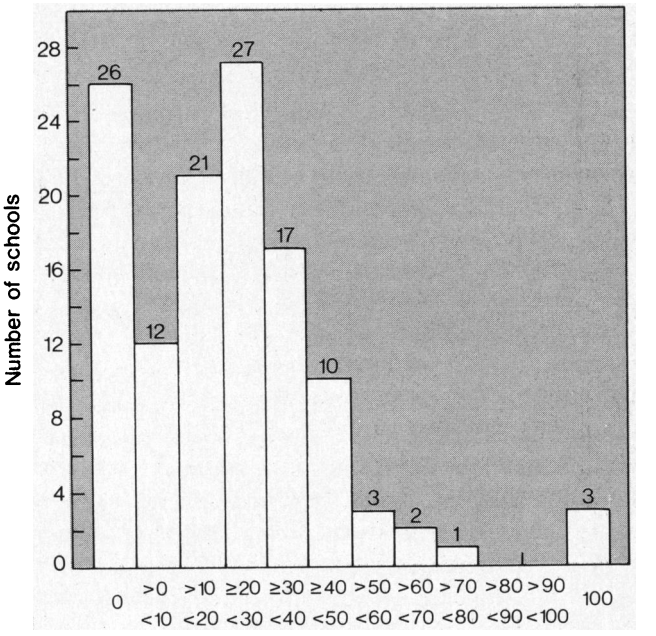
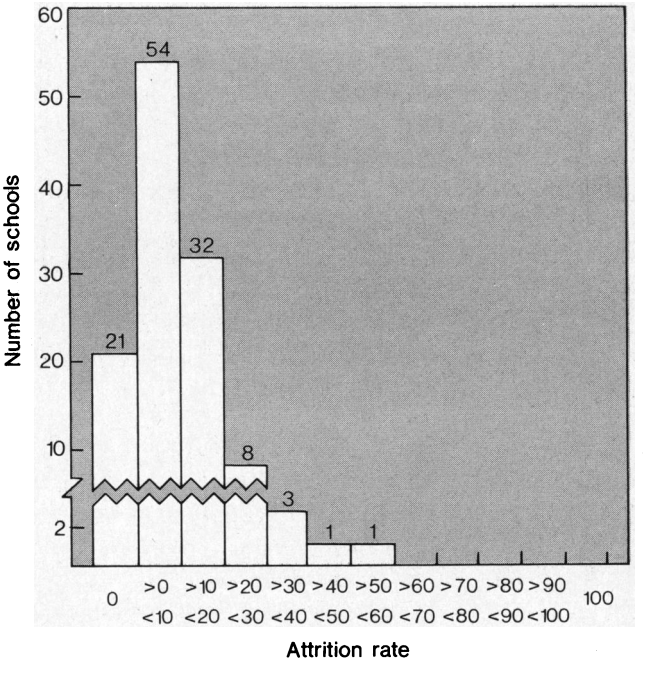


Figure 3. Attrition rate of students in primary care, July 1977 compared with July 1976



age of residencies in primary care also exhibit low attrition rates:

Variable	*Correlation*	*Level of significance*
School ownership: 1, public; 2, private	+	0.03
Percentage of first-year slots in primary care	−	0.001

Regressional analysis. The previous section on correlational analysis cataloged the significant relationships between each of the three dependent variables—percentage of family care residency slots, percentage of family medicine residency slots, and attrition rate—and some of the independent variables. With regressional analysis, we have developed explicit expressions for the relationships (assumed to be linear) between each of these dependent variables and the related independent variables. The stepwise regression procedure was chosen as the most appropriate form of analysis because of the large number of independent variables involved.

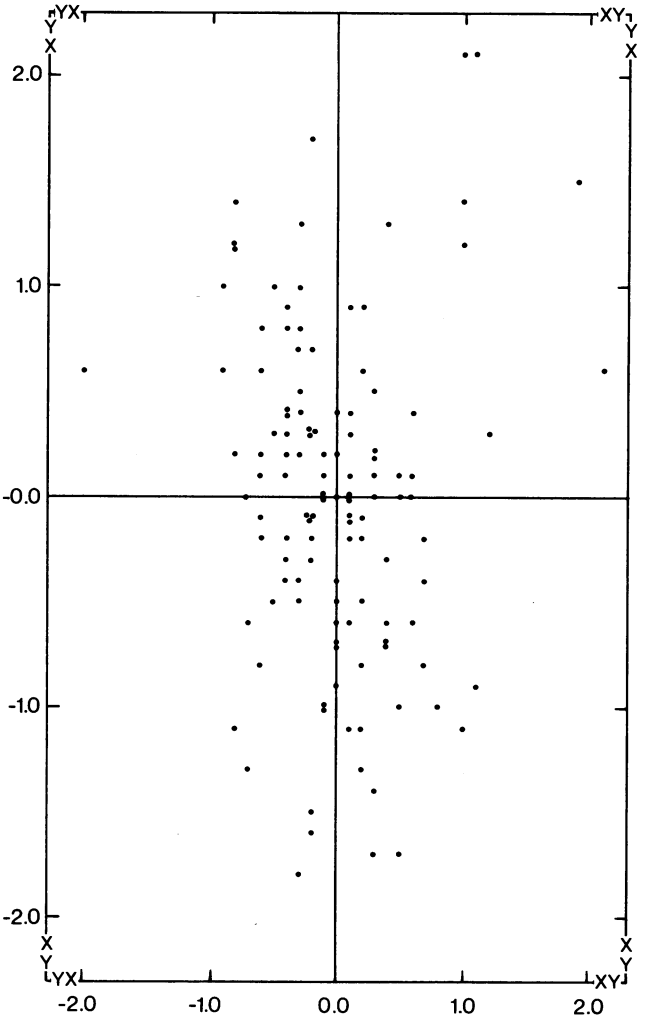
In the analysis, the SPSS (Statistical Package for the Social Sciences) (*4*) was used, with $F = 0.01$, tolerance $= 0.7$, and $n = 10$. Our choice of these values assures that the participating variables are entered at the 0.01 level of significance and are not correlated more than 0.55 with those already in the equation.

The three expressions derived follow:

1. $P1$ — Percentage of first-year residency slots that are in primary care ($R^2 = 0.34$):
   $P1 = 0.51$
   − (0.1) (school ownership)
   + (0.048) (hospital beds per 1,000 people in the school's HSA)
   (3×10^{-4}) (medical school enrollment—first year only)
   − (0.026) (active physicians per 1,000 people in the school's HSA)
   + (0.12×10^{-2}) (percentage active primary care physicians in the school's HSA)
   − (0.44×10^{-3}) (percentage State residents in student population)
   − (0.14×10^{-4}) (per capita income in the school's HSA)
2. $P2$ — Percentage of first-year residents in primary care who are being trained in family medicine ($R^2 = 0.4$):
   $P2 = 15.88$
   − (5.8) (medical school ownership)
   − (0.31) (percentage urban population in the school's HSA)
   + (0.57) (percentage active primary care physicians in the school's HSA)
   + (0.13) (percentage State residents in student population)
   − (0.4) (medical school enrollment—all years)
3. $P3$ — Percentage attrition from primary care ($R^2 = 0.1$):
   $P3 = 0.14$
   + (0.041) (medical school ownership)
   − (0.87×10^{-2}) (medical school group identification)
   − (0.024) (hospital beds per 1,000 people in the school's HSA)
   + (0.45×10^{-3}) (medical school enrollment—first year)
   − (0.24×10^{-3}) (percentage State residents in student population)

To examine the goodness of fit of these regressions visually, we can study plots where the standard residual (down) is plotted against the predicted standardized dependent variable (across). Figures 4–6 give these plots

Figure 4. Dependent variable: percentage of first-year positions in primary care



Rows, columns Y: values outside (-3.0, 3.0)
Rows, columns X: values in (-3.0, -2.05) or (2.05, 3.0)

for the three dependent variables under consideration.

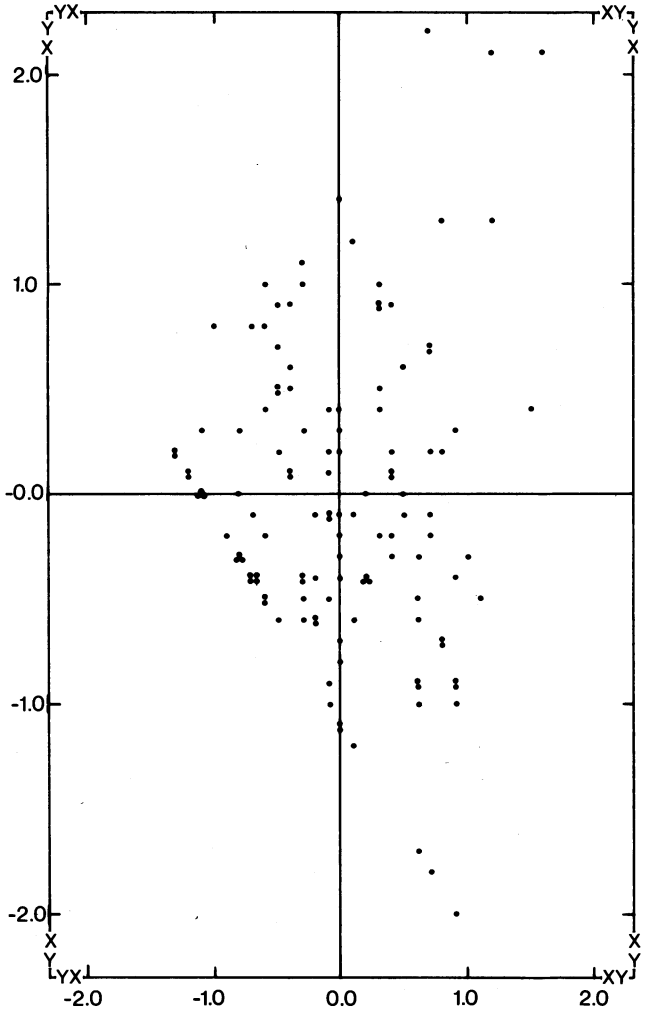
The curve fit justifies including these expressions in considerations regarding planning and policy development. These expressions will be refined as data for additional years become available.

Discussion

As mentioned earlier, Public Law 94–484 set targets for the nation's medical schools as a group regarding percentage of first-year residencies in primary care specialties. To be precise, the law requires that the proportion of all first-year residencies in primary care equal or exceed 35 percent in 1977 and 50 percent in 1979. This proportion was calculated to be 52.8 percent as of July 1977 (*5*). Further, our analysis has shown that the average percentage of first-year residency positions in primary care as of July 1977 was 53.4 percent. Unexpectedly, then, the law's 1979 target figure was exceeded in 1977. This unusual circumstance certainly diminishes the law's importance as a means of increasing the nation's supply of primary care physicians; no sooner was the law in effect than its program of incentives for training more primary care physicians was negated.

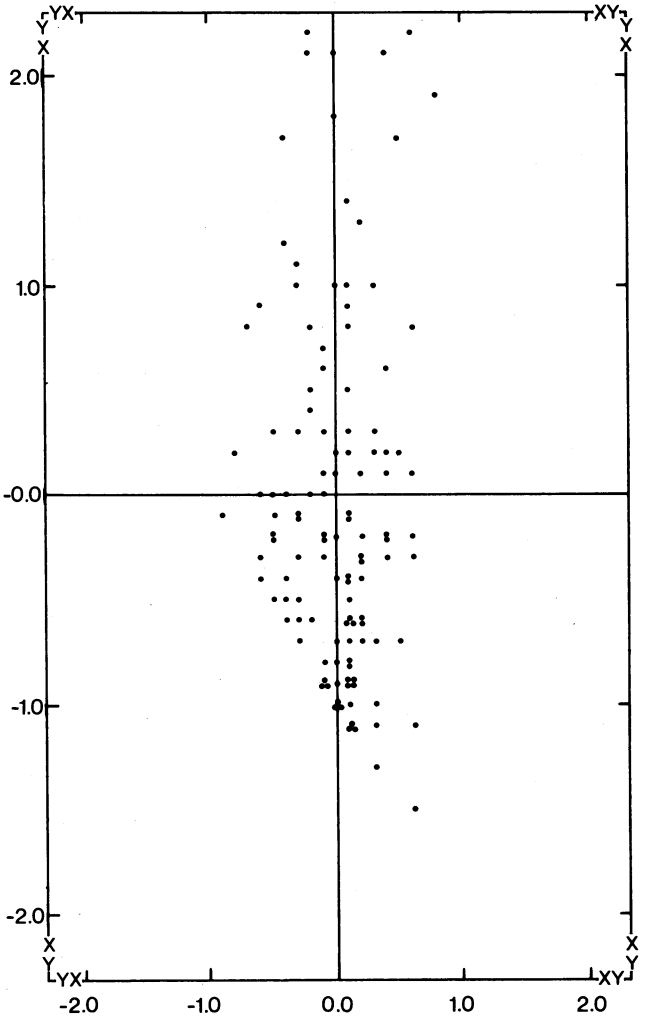
Observed trends and projections relating residencies and practitioners in primary care suggest an anticipated upturn, beginning in 1980, in the percentage of primary care specialists (*6*). To further influence these trends, the law probably will have to be revised. As two possible options, the target values for percentages of first-year residencies in primary care could be increased or the existing target values could be applied to the third (and final) year of residency training, when the percentages

Figure 5. Dependent variable: percentage of first-year positions in primary care that are family medicine



Rows, columns Y: values outside (-3.0, 3.0)
Rows, columns X: values in (-3.0, -2.05) or (2.05, 3.0)

Figure 6. Dependent variable: percentage of attrition from first-year primary care



Rows, columns Y: values outside (-3.0, 3.0)
Rows, columns X: values in (-3.0, -2.05) or (2.05, 3.0)

for primary care tend to be lower, rather than the first year.

Our analysis findings also indicated that the emphasis on primary care in medical school residency programs is far from uniform across all schools. The small, lower "eminence," as defined earlier (*7,8*), publicly owned schools offer a greater proportion of first-year training positions in primary care. In addition, the emphasis on family medicine within primary care is not uniform. In particular, the analysis suggests that increased availability of short-term hospital beds per population in a school's HSA is related to a decreased likelihood of family medicine residencies being offered. This lack of uniformity regarding emphasis on primary care training might become part of the considerations in the merit review of primary care training grant applications.

Future analysis will be aimed at identifying the characteristics associated with the provision of primary care and family medicine training slots in the teaching hospital rather than the medical school. We will also compare 1977 data with 1978 data to discover whether, because of the weakness of the law, the percentage of primary care residencies has suffered any erosion.

References

1. Bureau of Health Manpower, Health Resources Administration: Special requirements and assurances for capitation grants to schools of medicine: information for schools of medicine. Public Health Service, U.S. Department of Health, Education, and Welfare, Office of Program Operation. Revised, July 1978.
2. Directory of accredited residencies 1977–78. Liaison Committee on Graduate Medical Education, American Medical Association, Chicago, 1977.
3. Draper, N. R., and Smith, H.: Applied regression analysis. John Wiley & Sons, Inc., New York, March 1966.
4. Nie, N. H., et al.: SPSS: statistical package for the social sciences. Ed. 2, McGraw-Hill Book Company, New York, 1975.
5. DHEW Report to Congress: Report on direct and affiliated medical residency program data as required by Sec. 771(b)(2) of Title VII of PHS Act as amended by P.L. 94–484. Office of Legislation, Bureau of Health Manpower, Health Resources Administration, January 17, 1978.
6. Bureau of Health Manpower, Health Resources Administration: Supply and distribution of physicians and physician extenders. GMENAC Staff Papers No. 2. DHEW Publication No. (HRA) 78–11. Public Health Service, U.S. Department of Health, Education, and Welfare, Office of Communications, 1978.
7. Otis, G. D., Graham, J. R., and Thacher, L.: Typological analysis of U.S. medical schools. J Med Educ 50: 328–337, April 1975.
8. Department of Health, Education, and Welfare: Classification of medical education institutions. Prepared by the Association of American Medical Colleges (AAMC) under contract No. 231–75–0007. DHEW Publication No. (HRA) 76–93. Washington, D.C., December 1975.

Typology for Grouping Medical Schools

In 1975, in a pioneering effort, researchers at the Association of American Medical Colleges developed a typology for grouping the 107 U.S. medical schools in existence at that time (*7,8*). This system of classification consists of 10 groups, Type I to Type X, defined on the basis of 5 dimensions of variation: (*a*) size, (*b*) eminence (variables included in this dimension concerned relative amounts of funding, specialization, board certification rate for graduates, and student characteristics), (*c*) clerkship versus basic science requirements, (*d*) elective emphasis (reflecting the amount of elective time available in the curriculum), and (*e*) services versus science funding. The only ordinal feature of the typology is size of school. The 10 groups of the typology are as follows:

Type I. This group is composed of small schools that are relatively newer than those in the other types. These schools receive little Federal funds (indicative of low eminence ratings) and are slightly inclined toward a basic science emphasis rather than clinical clerkships, for example, University of Missouri at Kansas City.

Type II. Of the 6 schools placed in this type, 4 were 2-year medical schools. Generally small, schools in this group have relatively moderate funding from science-oriented agencies and emphasize basic sciences. Schools in this group have little emphasis on electives, for example, University of Minnesota at Duluth.

Type III. Generally small, schools in this group require from their students more clerkship time and less basic science time, have little emphasis on electives and are of average eminence. Schools in this type receive average proportions of funds from both science- and service-oriented agencies, for example, University of New Mexico, Albuquerque.

Type IV. Schools in this group are generally small, receive relatively greater proportions of their Federal funds from agencies that are service rather than science oriented, and score low in the eminence dimension, for example, Rutgers —The State University, New Brunswick, N.J.

Type V. Schools in this group are of medium size, provide moderate time for electives, are oriented toward clerkships, and score high in the eminence dimension, for example, Mount Sinai School of Medicine, City University of New York (CUNY).

Type VI. Schools in this group are of average size, oriented toward clerkships, and de-emphasize electives, for example, University of Wisconsin, Madison.

Type VII. Schools in this group are average in most dimensions with slightly higher scores in the elective emphasis, for example, State University of New York (SUNY) Upstate Medical Center, Syracuse.

Type VIII. Schools in this group are of average size, emphasize electives, and score high in the eminence dimension, for example, Yale University, New Haven, Conn.

Type IX. Generally large, schools in this type emphasize clerkships but not electives in their curriculums, for example, Ohio State University, Columbus.

Type X. Schools in this type are very large and emphasize electives and the basic sciences in their curriculums, for example, Michigan State University, East Lansing.