The Future Role of Foreign Medical Graduates in U.S. Medical Practice: Projections into the 1990s

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Projections of the effect of actual and hypothesized declines in the proportion of foreign medical graduates (FMGs) in residency training on the future distribution of physicians are explored. We find potential proportionate declines in the eventual location of physicians in rural areas and small towns in the North Central regions, and in solo and partnership arrangements in the Northeast, North Central, and Southern regions. Reductions in FMG house officers now could also lead to an increased proportionate presence of physicians in subspecialty practices in the largest U.S. cities. These changes might happen despite the current perception that there is a "surplus" of physicians.

It is frequently argued that the United States would be better served by a reduction in the number of foreign medical graduates (FMGs) who train in and practice medicine here. In addition to the controversy surrounding the quality of care FMGs provide [1, 2], there is the assertion that FMGs contribute to the "oversupply" of physicians in this

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country [3]. Their continued numerical presence is a fact. Our own work has demonstrated that after a decline throughout the mid- and late 1970s, physician migration to the United States has leveled off [4]. In 1983–1984, FMG residents numbered about 18.3 percent of all residents [5]. Furthermore, the Graduate Medical Education National Advisory Committee (GMENAC), in conjunction with the Educational Commission for Foreign Medical Graduates (ECFMG), estimated an annual inflow of FMGs until 1987 to be in excess of 4,000 [6].

In this paper, we argue that notwithstanding the belief that a reduction in the number of FMGs would assist in bringing physician supply back into balance with requirements, a diminution of the role of FMGs may be more consequential to the distribution of physicians than is generally thought. We base this on estimates of what would happen to future distributions of physicians if cutbacks of various sizes were made now among FMGs in house officer positions. In light of GMENAC's and the ECFMG's predictions mentioned above, the probability of drastic curtailments might seem remote. On the other hand, we do not know how many of these FMGs will remain in the United States *after* training. Studies based on earlier samples suggest that two-thirds to three-fourths of any cohort of FMGs will remain in the United States [7]. However, whether these retention rates will be maintained is an open question.

Two new major forces, one actual, the other proposed, may make it difficult for FMGs not only to immigrate in the first place but also to remain in the United States once here. First, the ECFMG has implemented the new 2-day Foreign Medical Graduate Examination in the Medical Sciences (FMGEMS) [8]. It is recognized to be more difficult than previous examinations the ECFMG has administered. FMGs must pass this examination before they may apply for an Exchange Visitor visa or take a residency position. Results of the first round of examinations, held in July 1984, suggest that FMGs may be less successful than in the past in entering into U.S. medical practice: of the 7,423 FMGs (including U.S. citizen FMGs) taking the entire examination, only 1,291 (17.4 percent) passed [9]. This number is substantially lower than the success rates for the former examinations administered by the ECFMG, and if this result holds up, fewer FMGs will be eligible for U.S. residencies.

Second, efforts are underway in the U.S. Congress to restrict the role of FMGs; this is exemplified by S. 1158, sponsored by Senators Dole, Durenberger, and Bentsen, which would amend Title XVIII of the Social Security Act regarding Medicare payments for the direct

costs of approved educational facilities [10]. Among other things, the legislation, if enacted, would cut off Medicare reimbursement to hospitals where care is provided by house officers who are FMGs. Were such a bill to pass in Congress, hospitals hard-pressed to maintain operating revenues would probably be reluctant to lose this source of income by keeping FMGs as house staff.

Hence, we believe it realistic to conclude that FMG cutbacks are in the offing and that it is important to raise questions about the potential distributional consequences of these or similar policy actions.

Our research, based on a 10-year follow-up study of a cohort of interns and residents in training in 1973–74, has collected data which support the view that FMGs in 1983 were differentially distributed across measures of specialization, geographical location, and type of practice [7]. In particular, FMGs were more likely than United States medical graduates (USMGs) to be found in solo and partnership practice arrangements and less likely to be found in group practice settings. FMGs were more likely to be located in the North Central group of census regions and less likely in the Western group of census regions. Although specialty distributions of postresidency FMGs and USMGs appeared to be similar, a more detailed analysis showed that among the two groups in the Northeastern census regions, FMGs were more likely to be found in primary care specialties and less likely to be found in secondary and tertiary specialties (subspecialties), whereas in the Western regions, the opposite situation prevailed [11].

We also determined that FMGs tended to locate relatively more often in non-Standard Metropolitan Statistical Areas and in Standard Metropolitan Statistical Area (SMSA) towns with fewer than 50,000 inhabitants. FMGs and USMGs were equally likely to be found in the largest U.S. cities, i.e., those with populations of 1 million or more.

When medical practice patterns of postresidency physicians were analyzed in a more sophisticated fashion, FMG-USMG differences became more specific. We already noted how specialization patterns varied according to continental geography. Other examples included the strong tendency of FMGs to be more likely than USMGs to enter solo and partnership arrangements in the Northeast and the South, but not in the North Central and the West. There was a tendency for FMGs to have selected non-SMSA communities in the Northeast and the North Central regions (but not in the South) more frequently than USMGs. In the West, the relationship was reversed.

Results such as these suggest that understanding the role of FMGs in U.S. medical practice beyond residency training is more subtle than bivariate descriptions of data have generally permitted. The implica-

tions of such analyses, including the addition of other variables, such as the medical graduate's sex, have been discussed elsewhere [12]. However, they may be summarized as suggesting, first, that FMGs have filled specific roles apparently eschewed by USMGs, and second, that increases in the number of USMGs and decreases in the number of FMGs have not necessarily meant that the former group has undertaken the medical practices which the latter had disproportionately filled.

In this article, we take these findings as points of departure by presenting projections of early to mid-1990s medical practice patterns of FMGs versus USMGs through simple simulation techniques on longitudinal data of physicians who were house officers in 1973–1974. The goal is to provide a series of projections—across several dimensions of medical practice—of the comparative distribution a decade from now of FMGs and USMGs currently in residency training.

METHODS

SAMPLE

A representative stratified probability sample of all U.S. house officers (interns and residents) in the 1973–1974 training year comprised the study group. Seven hundred thirty-two FMGs (690 foreign national or alien FMGs and 42 U.S. citizen FMGs or USFMGs) and 133 USMGs were given a personal survey in April–May 1974, and the methods and results of this research were reported in Stevens, Goodman, and Mick [13].

Disproportionate stratified sampling was used to ensure representation of both FMGs and USMGs from communities outside those with 1 million or more inhabitants. Another stratum based on country of medical education was used not only to overrepresent FMGs as opposed to USMGs, but also to underrepresent among FMGs the graduates of the major "donor" nations of India, the Philippines, and South Korea. This ensured that FMGs from other nations would be present in the sample. Hence, the observed data in this study underrepresented (1) FMGs and USMGs who trained in the largest U.S. cities, (2) USMGs as a group, and (3) Indians, Filipinos, and South Koreans. Resulting from this procedure was the necessity of using weighted data when making population inferences. Since comparisons were made between FMGs and USMGs, adjustments have been made only for the city-size stratum and, within the FMG group, for the three Asian nations mentioned above versus all other FMGs.

The major requirement of the study was to trace the location of these 865 medical graduates. Starting with the addresses from the original study, we used numerous sources in locating the participants and achieved locational rates of 91.1 percent for the alien FMGs, 98.4 percent for USMGs, and 97.6 percent for the USFMGs, or an overall 92.6 percent for the study group. As part of this locational follow-up, we collected information on the medical graduates' locations, specialties, and types of practices.

The second step in the study was distribution of a mail questionnaire to each located participant. We sent pretested instruments to FMGs found both in the United States and abroad, to USMGs, and to USFMGs. This report focuses only on those foreign national FMGs found in the United States (N = 530) and USMGs (N = 132). After multiple follow-up mailings and telephone prompting, 386 FMGs (72.8 percent) and 103 USMGs (78.0 percent) returned usable questionnaires.

The omission of USFMGs from this report is due to the small number and proportion (5.2 percent) originally in the study group and the even smaller number of eventual respondents. Since 52.9 percent of foreign-trained house officers were USFMGs in 1983–1984 [5], the argument can be made that projections must account for the changing composition of the foreign-trained pool. This depends upon the purpose of the projections, and in the case here, the argument centers exclusively on foreign citizen FMGs, not only because they are much more widely distributed across the United States [14], but also because they are still a physician manpower component of considerable magnitude. Large numbers of USFMGs have only recently been prevalent [4], and a large cutback in their number due to their inability to pass the FMGEMS may already be underway—of the 1,196 USFMGs who took the entire July 1984 examination, only 45 (3.8 percent) passed both sections [9].

The increasing ratio of USFMGs to FMGs strengthens our argument regarding the potential impact of FMG declines over the last decade and serves to make the projection estimates conservative. If roughly one-half of the current pool of trainees consists of USFMGs, the actual decline of FMGs over the last decade is higher than the basic percentage decline we use in this report.

RESEARCH DESIGN

As a cohort design, the generality of this study is formally limited to medical graduates training in 1973–1974. However, since many mem-

bers of the 1973–1974 cohort will have been members of the 1972–1973 or 1974–1975 cohorts, for example, it seems unlikely that contiguous cohorts would be very different from that of the study. This means that our findings are probably more general and the projections more potentially enduring than formally indicated. Also, as a cohort design, the findings and projections refer to a subset of the physician population, and the impact of the changes in the proportion of FMGs should be viewed within a wider context. As we shall see, these outcomes would be adding to trends already underway, e.g., migratory flows of physicians to the West and the Sunbelt, away from declining Central and Northeastern industrial areas [15].

MEASUREMENT

The physician's type of practice was derived from the questionnaire and was determined for 379 of the 386 FMG respondents and all of the 103 USMG respondents. We grouped solo and partnership arrangements into one category, all forms of group practice (including prepaid group practice) into a second, and all other forms of practice into a third.

The specialty of the physician was determined by responses to the earlier locational phase of the study. Hence, the sample size was larger as we obtained usable results from 500 of the 530 U.S.-located FMGs and 122 of the 132 USMGs. We coded specialty according to primary care, hospital-based, and secondary/tertiary (or subspecialty) care specialties. Included in primary care were general and family medicine, pediatrics, general internal medicine, obstetrics/gynecology, and emergency medicine. Hospital-based specialties consisted of anesthesiology, therapeutic and diagnostic radiology, pathology, and forensic medicine. Subspecialties included all forms of surgery and the subspecialties of internal medicine, the various forms of psychiatry, and all other specialties.

Community size was also obtained from the locational phase of the study and was determined for all FMG and USMG respondents, save one, who were located in 1983. The exception was a naval officer with a fleet post office address in New York. Medical graduates were grouped into three categories: non-SMSA communities (by definition under 50,000 inhabitants), small SMSA communities (fewer than 250,000 inhabitants), and large SMSA cities (at least 250,000 inhabitants).

Finally, we used a four-category classification of the nine U.S. census regions of the nation. The four groupings included the North-

east, consisting of the New England and mid-Atlantic states; the North Central, the East and West North Central states; the South, the Atlantic and the East and West South Central states; and the West, the Mountain and Pacific states.

STATISTICAL ANALYSIS

The principal statistical technique employed was linear-flow graphing and its associated simulation procedure [16]. The former permits modeling of categorical data in a manner analogous to path analysis; the latter permits the use of parameters estimated by the former for the purpose of predicting trends. Because linear-flow graphing is not a widely used procedure in health services research, we present a brief description of it but refer the reader to Davis [16] for a complete discussion. Figure 1 presents a simple two-variable graph. The independent or "source" variable is the type of medical graduate, here divided into FMGs and USMGs. FMG is the category shown in the graph, whereas the USMG category is defined as the "base" against which values of the various dependent or "sink" variables are compared. In the instance of a dichotomous independent variable such as the one used here, FMG may be considered analogous to a dummy variable in regression and USMG would be analogous to the intercept term or constant. The arrows from the source variable to the sink variable (a typology of the two variables, community size and U.S. region, in Figure 1) depict the imputed causal effect. The value at each arrow is the percentage difference between FMGs and USMGs with regard to the given value of the sink variable. In Figure 1, the uppermost category "Northeast non-SMSA" has a value of .057, which means that in the study sample, FMGs were 5.7 percent more likely to be found in Northeast non-SMSA communities than were USMGs. Using the procedure recommended by Davis, we calculated that the difference, also called a *d* coefficient (analogous to a regression coefficient), was statistically significant beyond the .02 level.

For this same category of the sink variable, the base is calculated as .021. This means that 2.1 percent of the USMG sample were located in Northeast non-SMSAs, and if the medical graduate were an FMG, an additional 5.7 percent (the percentage difference), or a total of 7.8 percent of the FMGs were located in these places. From this exposition, it can be seen that the linear-flow graph system derives from simple contingency tables and uses the familiar percentage difference as the key statistic.

Table 1 contains the results of selected simulations for categories of

Figure 1: Linear Flow Graph: Type Medical Graduate by U.S. Region and Community Size, 1983

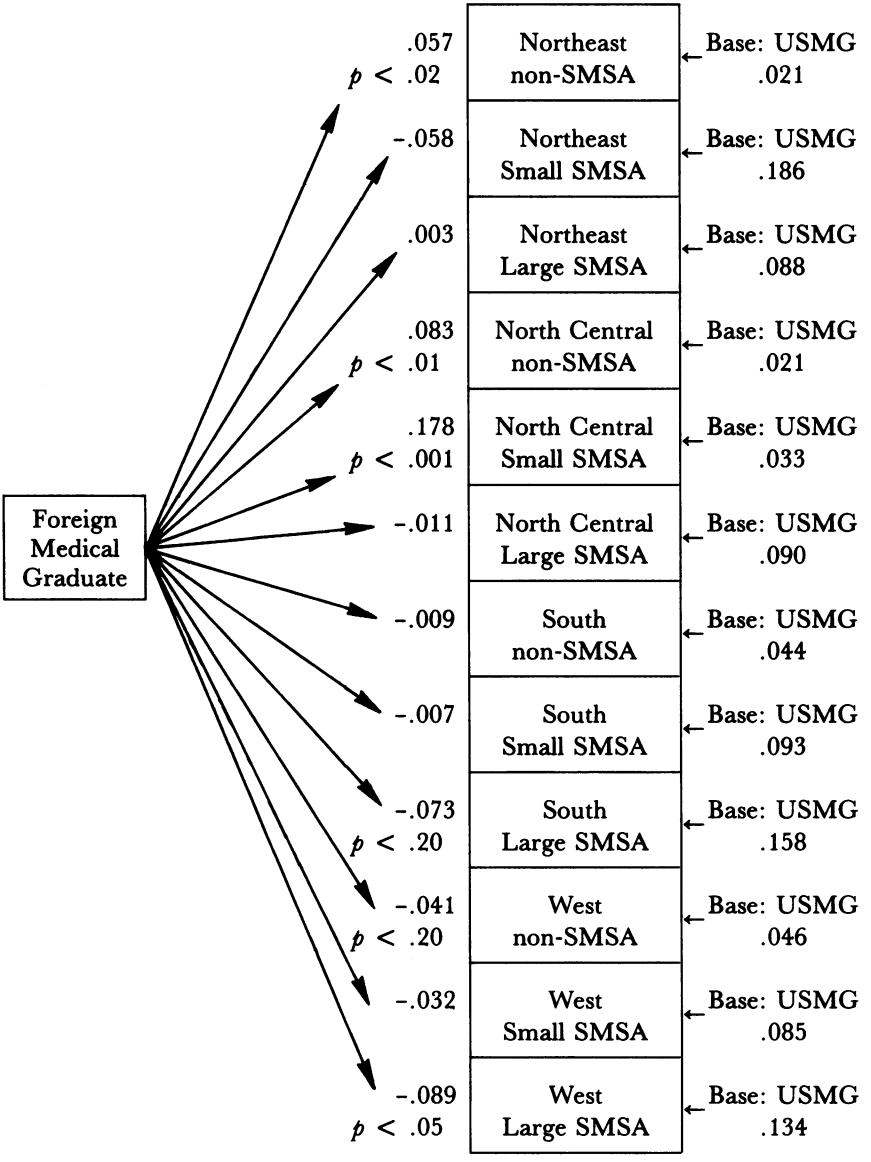

Figure 1 that produced statistically significant *d* coefficients. An *alpha* level of .20 was used to determine significance, and the rationale for this will be provided later. There were six statistically significant *d* coefficients (Figure 1), and these are the ones examined in Table 1. Referring again to the uppermost category of the sink variable in Figure 1, Northeast non-SMSA, the reader has seen that there were two parameters which were estimated: the base and the *d* coefficient. These may be placed in a simple formula which closely resembles a common regression equation:

$$\text{Proportion of Medical Graduates in Northeast non-SMSAs} = \text{Proportion Base: USMGs} + d\,(\text{Proportion FMGs}) \quad (1)$$

or

$$\text{Proportion of Medical Graduates in Northeast non-SMSAs} = .021 + .057\,(\text{Proportion FMGs}) \quad (2)$$

Now, one can construct an equation that predicts change in the proportion of the medical graduates in the Northeast non-SMSA places in the following way:

$$\text{Proportion Change in Medical Graduates in Northeast non-SMSA} = .057\,(\text{Proportion Change in FMGs}) + \text{Proportion Change of Medical Graduates in Northeast non-SMSA places from any other source} \quad (3)$$

In this article, we have omitted the latter term or source of potential change in order to highlight the specific effect of changes, if they occur, in the proportion of FMGs.

Using this estimation technique, we have made the assumption that the ten-year change between 1973–1974 and 1983–1984 (when we completed the data collection) will be replicated between 1983–1984 and 1993–1994. That is, we have assumed that FMGs in recent residency training, i.e., in the 1983–1984 training year, would display the same differential patterns in comparison to USMGs ten years from now as our actual study group did who were in residency training ten years ago. The critical question is: what effect, if any, will increases or reductions in the proportion of FMGs in the pool of all residents *now* have on the relative distribution of FMGs versus USMGs in dimensions of medical practice in the early to mid-1990s, *ceteris paribus*.

Any simulation technique requires that assumptions be made which may well prove in time to have been invalid. However, the data provide a benchmark for refinement and opposing empirical study. All point estimates of *d* coefficients are accompanied by the upper and

Table 1: Simulations of Increase or Decrease in 1993 of Proportion of Medical Graduates in Categories of U.S. Regions and Community Size as a Function of Observed and Hypothetical Proportionate Declines of Foreign Medical Graduate House Officers

Parameters for		*Change in Proportion of FMG House Officers*		
		Observed Decline: -.122*	*-.122 Decline + -.178 Additional Decline: -.300*	*-.122 Decline + -.378 Additional Decline: -.500*
			Δ Northeast, non-SMSA =	
Northeast, non-SMSA			(Parameter × Δ FMG)	
Lower interval†	.010	-.001	-.003	-.005
Point estimate	.057	-.007	-.017	-.029
Upper interval†	.104	-.013	-.031	-.052
			Δ North Central, non-SMSA =	
North Central, non-SMSA			(Parameter × Δ FMG)	
Lower interval	.033	-.004	-.010	-.017
Point estimate	.083	-.010	-.025	-.042
Upper interval	.133	-.016	-.040	-.067
			Δ North Central, Small SMSA =	
North Central, Small SMSA			(Parameter × Δ FMG)	
Lower interval	.111	-.014	-.033	-.055
Point estimate	.178	-.022	-.053	-.089
Upper interval	.245	-.030	-.074	-.123
			Δ South, Large SMSA =	
South, Large SMSA			(Parameter × Δ FMG)	
Lower interval	-.178	.020	.050	.084
Point estimate	-.073	.009	.022	.037
Upper interval	.021	-.003	-.006	-.011
			Δ West, non-SMSA =	
West, non-SMSA			(Parameter × Δ FMG)	
Lower interval	-.091	.011	.027	.046
Point estimate	-.041	.055	.012	.021
Upper interval	.009	-.001	-.003	-.005
			Δ West, Large SMSA =	
West, Large SMSA			(Parameter × Δ FMG)	
Lower interval	-.175	.026	.053	.088
Point estimate	-.089	.013	.027	.045
Upper interval	-.003	.000	.001	.002

*On September 1, 1973, the proportion of FMG house officers to all house officers was .305; the analogous proportion on September 1, 1983, was .183; hence, a decline of .122 [17, 18].

†The lower and upper intervals around each point estimate of the *d* coefficient represent the extreme *d*-values of the 95 percent confidence band.

lower bounds of the 95 percent confidence interval, and a range of projections is therefore provided.

Finally, because the determination of statistical significance of the coefficients derived from linear-flow graphing is stringent, particularly in the case of complex samples like the one used in this paper, we have used a liberal *alpha* level as already noted. Additionally, this study is exploratory and conjectural without deductively derived hypotheses. Therefore, it is wise not to insist on too conservative an *alpha* level when it might result in Type II errors, always a problem in smaller-sample and exploratory studies.

FINDINGS

REGION AND COMMUNITY SIZE

Figure 1, as noted, shows that FMGs were more likely than USMGs to be found in Northeastern non-SMSAs, North Central non-SMSAs, and North Central small SMSAs. FMGs were less likely than USMGs to be found in large SMSAs in the South, non-SMSAs, and large SMSAs in the West. The next question is, what would be the effect of a reduced proportion of FMGs training now, on the proportion of medical graduates practicing in each of these six locations in the early to mid-1990s?

Table 1 gives an estimate of this. First, a decline has already been observed in the proportion of FMGs among all residents over the last ten years—from 30.5 percent to 18.3 percent, a difference of -12.2 percent [17, 5]. Thus, the figures in the left-hand column of Figure 1 are based on substituting -.122 into each equation for each of the statistically significant categories of the community size and U.S. region typology. For the Northeast non-SMSA places, the observed decline of 12.2 percent of FMGs among the total pool of house officers would yield a 0.7 percent decline ten years from now in the total proportion of the 1983–1984 training cohort. The lower estimate yields a mere 0.1 percent decline, and the upper estimate yields a 1.3 percent decline. None of these values is particularly high even if the original parameter was statistically significant. In fact, in this column, none of the point estimates or their 95 percent confidence bounds of the other five locations yield particularly high estimates of proportionate change.

If, in addition to the already registered 12.2 percent decline of FMGs among all house officers, there were very soon another decline of approximately 18 percent, the effect on the current cohort with respect to future medical practice patterns becomes elevated. Suppose

that events continue to restrict the inflow of FMGs such that within a year or two the FMG pool declines a total of 30 percent. The results are found in the middle column of Table 1. Especially for the higher-valued boundary, the ultimate effects that might occur would be strong, particularly for small SMSA towns in the North Central region, where a decline of 7.4 percent of the current crop of young doctors might be registered. If the lower estimate is taken for large SMSAs in the South, there could be a 5.0 percent increase of the current pool locating there as well as a 5.3 percent increase in large SMSA communities in the West.

In a "worst case" situation—a 50 percent decline in the proportion of FMGs among the current residents—the estimates are even more pronounced: a 6.7 percent decline in non-SMSAs in the North Central region, a 12.3 percent decline in small SMSA communities in the same area, an 8.4 percent increase in the largest Southern cities, and an 8.8 percent increase in the largest Western cities. Note that these estimates were based on the parameter being one of the boundaries of the relevant 95 percent confidence interval.

REGION AND TYPE OF PRACTICE

An analysis of the type of medical graduate by regional patterns of practice arrangements yielded seven significant d coefficients.[1] Interpreted, they show that FMGs more than USMGs were likely to be found in solo or partnership arrangements in the Northeast (d = 7.0 percent, $p < .02$), the North Central region (d = 8.7 percent, $p < .10$), and the South (d = 6.3 percent, $p < .20$). This did not hold for solo or partnership arrangements in the West. FMGs were less likely than USMGs to be in "all other" practices in the West region (d = -9.9 percent, $p < .10$). In all three categories of North Central practice arrangements, FMGs were relatively more likely to be found than were USMGs: solo or partnership, d = 8.7 percent, $p < 10$; group practice, d = 6.3 percent, $p < .02$; "all other" practices, d = 6.9 percent, $p < .20$.

The potential impact of FMG cutbacks within each of these seven regional practice categories would be minimal. No large declines would be predicted based solely on the actual decline of 12.2 percent in the proportion of FMG house officers over the last ten years. However, if the decline were suddenly more pronounced, to 30 percent, somewhat more substantial changes would result. Notable among these would be current medical residents' eventual location in solo or partnership arrangements in the North Central region (-5.3 percent), in group

practices in the Northeast (+5.6 percent), and in "all other" practice arrangements in the West (+6.0 percent). If the "worst case" situation prevailed (a sudden 50 percent decline in the proportion of FMGs among all house officers), the range of possibilities would broaden correspondingly: potential declines in solo or partnership physicians in the Northeast (-6.4 percent), the North Central (-8.9 percent), and the South (-7.2 percent). North Central arrangements in group practices and in "all other" areas would be negatively affected (-5.6 percent and -8.0 percent, respectively). Major possible proportionate increases might also develop in group practice in the Northeast (+9.3 percent) and in "all other" practices in the West (+10.0 percent).

REGION AND SPECIALIZATION

No statistically significant d coefficients were obtained in this analysis, and therefore no data or projections are presented.

COMMUNITY SIZE AND SPECIALIZATION

Two statistically significant d coefficients were obtained: FMGs who were in training ten years ago were 6.0 percent ($p < .10$) more likely than USMGs to be found in subspecialties in non-SMSA communities, but less likely in subspecialties in large SMSA cities (-12.2 percent, $p < .05$). The simulations revealed no major impact on the future distribution of FMG-USMG differences if the decline of 12.2 percent in the proportion of FMGs were the total decline considered. Larger hypothetical declines in the proportion of FMGs among all house officers would be most noticeably felt with a small decline of medical graduates in non-SMSA subspecialties (-6.3 percent) and a surge in their proportion in subspecialty practices in major urban areas (+12.2 percent).

COMMUNITY SIZE AND TYPE OF PRACTICE

With regard to practice arrangements in various sizes of communities, we found four statistically significant d coefficients. FMGs were 4.3 percent ($p < .20$) more likely to be in group practice in non-SMSA communities. In small SMSA solo and partnership arrangements, the effect of being an FMG was very strong: 13.8 percent ($p < .01$) more FMGs than USMGs were in these places practicing independently or with a partner. In the large SMSAs, FMGs were relatively underrepresented in group practices ($d = -7.1$ percent, $p < .20$) and in "all other" arrangements ($d = -11.7$ percent, $p < .10$).

As before, the effect of the observed ten-year decline of 12.2 percent in the proportion of FMG house officers had only a marginal impact on estimates of the future distribution of the cohort of currently training physicians. One had to hypothesize either 30 percent or 50 percent declines in order to register possibly substantial impacts. A 50 percent decline in FMGs might produce declines of physicians in small SMSA solo and partnership arrangements (-11.9 percent), increases in physicians in large SMSA group arrangements (+8.3 percent) and "all other" arrangements (+12.6 percent).

SPECIALIZATION AND TYPE OF PRACTICE

The typology of specialization and type of practice produced a nine-category variable, five categories of which showed significant differences between FMG and USMG choices. Two of the categories—hospital-based specialties practiced in solo, or partnership and group arrangements—were not analyzed further because statistical significance was achieved largely due to the artifactual consequences of no study sample USMGs having practiced in these areas. Among the valid statistical findings, FMGs were more likely than USMGs to have been found in subspecialties practiced in solo or partnership arrangements and less likely in subspecialty areas practiced in groups (d = 14.9 percent, $p < .01$ and d = -15.2 percent, $p < .02$, respectively).

The actual observed decline in FMGs during the last decade produced no substantial decline or increase in any of the projections. However, 30 percent and 50 percent declines would produce noticeable effects. A 50 percent decline in FMGs might produce declines in medical graduates practicing subspecialty medicine in solo and partnership arrangements (-12.8 percent) and increases in subspecialty medicine in group arrangements (+13.9 percent).

DISCUSSION

These results may be summarized as follows: the medical practice patterns of FMGs and USMGs now in training were projected for the early to mid-1990s. These projections were based on the assumption that *current* differences between FMGs and USMGs who were in training ten years ago (1973-1974) will hold for the current cohort of trainees as their careers develop over the next ten years. Finally, the projections were based on two events, one of them factual, the other hypothetical. The first derives from the actual decline among all resi-

dents of 12.2 percent in the proportion of FMG residents between training years 1973–1974 and 1983–1984. The second derives from additional hypothesized increments in the proportionate decline of FMGs that totaled 30 percent and 50 percent.

The impact of the actual ten-year decline of FMGs would be relatively small in all of the situations analyzed. Even when the largest absolute value of the 95 percent confidence boundary was used in place of the point estimate, no changes greater than ± 3.4 percent occurred in the proportion of all current trainees in any particular segment of medical practice. Were more drastic measures enacted to reduce the proportion of FMGs, the potential outcomes could become more substantial. In the North Central region of the United States, declines in the number of physicians currently in training in non-SMSA places and in small SMSA towns might occur. The South and the West would get an even larger share of physicians in large SMSA areas, a trend well underway at the present time [15]. Solo and partnership practices would experience a decline in the Northeast, North Central, and South. In the largest cities throughout the United States, subspecialty practices would gain an appreciable share—up to 12.2 percent—of the current group of residents. Furthermore, these cities could well add 8.3 percent more to those practicing in groups and 12.6 percent more to those practicing in "all other" arrangements. Large declines in the FMG portion of residents would also imply as great a decline as 12.8 percent of doctors in solo and partnership practices carried on by subspecialists and as great an increase as 13.9 percent in group practice subspecialist doctors.

SUPPLY AND DISTRIBUTION

The appearance of certain trends would be welcomed by some people. For example, the subspecialty practice of medicine by solo and partnership physicians might be seen as an inferior context within which to practice, whereas a group setting might seem more suitable. On the other hand, the reduction of physicians in the non-SMSA communities in certain regions of the nation might not be welcome news. Nor would proportionate increases in subspecialists in the nation's largest cities, particularly in the South and the West, be viewed without alarm.

Our data and projections suggest a certain vulnerability to the provision of medical services of discrete areas of the health care system. Pro-market advocates argue that an abundance of physicians will help distribute them into traditionally "underserved" areas [18, 19].[2] However, the physician manpower pool is segmented and differentiated in

important ways, as illustrated by FMGs. Elsewhere we have suggested that these disproportions tend to follow patterns of stratification along prestige dimensions [20]. The point here is that whereas market mechanisms may have operated in alleviating physician shortages in, for example, some rural areas (defined in this study as non-SMSA areas), this may have happened *because* of the presence of FMGs in the manpower pool.

By extension, if public and private policies were to encourage a drastic and rapid reduction of the proportionate presence of FMGs in U.S. medicine, the outcomes suggested by our study include an exacerbation of underrepresentation in some "underserved" areas and of overrepresentation in some "overserved" ones. The problem might be mitigated if increases in the overall supply of U.S.-educated physicians in the country continued. However, the number of individuals applying to medical school has declined since 1978, and the number of first-year students has more recently begun to level off [21]. There also appear to be too few residency positions for the individuals seeking them [22, 23]. This may also limit the number of graduates who will ultimately find themselves in the post-residency practice of medicine. Although Crowley, skeptical of this argument, showed that there were 1.3 positions in accredited programs for each U.S. medical graduate in 1983, she concluded that:

> . . . the number of U.S. entering medical students is increasing at a much slower rate than it has increased in the past. Consequently, the number of U.S. graduates, who form the largest group of persons appointed to U.S. residency programs, has not increased appreciably in the past few years, and may actually start to decrease in the near future [24, p. 3,389].

Finally, in a recent study, the Bureau of Health Professions (DHHS), determined that although the growth in physician supply would continue to outstrip general population growth, the number of physicians would grow at a slower rate than in the 1970s [25]. Interestingly, the Bureau's forecasts assumed a larger contribution of FMGs to this growth than what we have hypothesized in this article. In short, we may have to entertain the idea that projections of a physician "surplus" past 1990 may have been overstated. If FMGs experience restrictions to their entry into U.S. medicine when the production of USMGs begins to show a decline in the rate of increase, these two trends might together contribute even more to maldistributions beyond what might be predicted.

MID-LEVEL HEALTH PRACTITIONERS

Another question raised by this study is: if FMGs are to have a limited role in providing medical services, and if USMGs do not fill the gaps, would mid-level health practitioners, e.g., physician assistants or nurse practitioners, be available to provide some of the services needed? We cannot answer this question in this study, but we can note that the sentiment has been to constrain the production of more mid-level providers—especially in light of the perception of a physician surplus. GMENAC called for extensive research on nonphysician provision of medical services and recommended that as of the early 1980s the number of physician assistants, nurse practitioners, and nurse midwives ". . . should remain stable at their present numbers" [3, p. 27]. Our study suggests that restrictive recommendations and policies might require rethinking. One of the several advantages of considering mid-level professionals is their training period, which is much shorter and less expensive than that of physicians, i.e., their supply curve is more elastic, and hence, people trained for physician assistant and other roles can respond rapidly to imbalances in health care delivery, particularly those created by the withdrawal of FMGs.

FORCES SHAPING THE FUTURE OF FMG PRACTICE

Projecting the future is always a risky undertaking. If we were certain of the *ceteris paribus* assumption, the estimates we have made would be qualified only by sampling and measurement error. However, it is doubtful that other forces will not affect physician production and distribution, and it is well to speculate on what some of these might be. First, the composition of the FMG component probably will not remain constant. In fact, as we have demonstrated elsewhere [12], women have become a growing proportionate part of the FMG manpower pool, and, since their specialty choices are different from those of FMG men, the internal composition of the FMG pool must be considered in future research. Other characteristics, e.g., country of origin, might also need to be considered more carefully.

Second, the *perception* of competition among physicians for positions in the United States could well alter the decision of physicians abroad to migrate for advanced training. Although the perception of occupational opportunity was not the most highly ranked factor in an individual FMG's decision to come to the United States, it was high on the list [13]. With the wide publicity given to the notion of a physician

"glut" in this country [3, 26], it is reasonable to speculate that it might alter the impression of an abundance of vacant residency positions and dampen the enthusiasm of people to migrate.

The structure of medical practice is also undergoing change [27, 28]. The continued strong growth of group practices [29]—especially the many forms of prepaid and capitation-based practices—and the gradual decline of solo and partnership arrangements could well limit the opportunity of FMGs to establish themselves here. Closer scrutiny of medical staff appointments also seems to be occurring [30], and the effect could be negative for FMGs. More research is required to gauge the effect of practice parameters on the practice distributions of both FMGs and USMGs.

The net effect of these and other forces on the in-migration and retention of FMGs is hard to determine. Some would reduce even more the number of FMGs training in the United States, while others would limit the opportunities, and even the need, for FMGs (and USMGs) in practices after training. For example, if physicians became even slightly more productive ten years from now, there would be a corresponding reduction in the requirement for the number of physicians one would predict on the basis of current productivity—a point clearly developed by Reinhardt [31]. Speculating about these forces is no more certain than speculating on the outcome of actual and possible reductions in FMGs. What does seem certain, however, is that unless other forces offset the FMG decline, the disproportionate distributions already identified will take place.

INFORMATION ON FMGs

Through its projections of (and educated guessing about) future trends, this study testifies to the need for better information about both USMG and FMG medical practice. More specifically, our work evidences the advisability of monitoring the outcomes of actual and envisioned reductions in the role of FMGs in U.S. medicine. A major problem is one which has always plagued physician manpower studies: a lack of recurrent data collection on the career progression of physicians. Although there might be an adequate amount of "snapshot" information on the national supply and distribution of physicians at a given time, these data say little about change, flows, and movement of physicians across dimensions of medical practice.

Not only are we missing these kind of data, there are few organizations that could collect them. Among those that could, the Immigration and Naturalization Service (INS), preoccupied as it is with the

administration and monitoring of in-migration, does not engage in the type of studies called for. In fact, it does not even collect information on individuals who leave the United States. Nor does the American Medical Association (AMA) conduct cohort studies of the type described. On one important point the AMA is like the INS: it does not have any systematic way of determining how many or which FMGs are leaving the country.

The ECFMG does have an extensive database of every individual who has ever taken its various examinations, and longitudinal reports have recently been produced from it [32], or are in preparation. These studies have compiled a sample of all FMGs from 1969 through 1982, and have matched the original information with AMA physician master file data as of 1982. This technique is amenable to the kind of analysis we feel is required; however, grouping together all FMGs over the 14-year period obscures *differential* movement of cohorts, making it impossible to isolate trends and change through comparisons of cohort behavior. Also, there is a question of the reliability of the AMA physician master file: the present study found that about 25 percent of the 1983 addresses provided by the AMA of our 1973–1974 FMG cohort were incorrect. Many of these were U.S. addresses for FMGs who had, in fact, left the country; but since 15.5 percent of the USMG addresses were also incorrect, there appears to be a substantial margin of error regardless of medical graduate background.

Nevertheless, a combined effort by the ECFMG and the AMA is the most promising way to develop a meaningful database for the monitoring of trends. Our suggestion is that, based on their merged files, small-scale longitudinal cohort studies conducted every three or four years provide the most cost-effective and timely way to determine whether predicted trends are occurring while allowing simultaneously incremental adjustments in the projections of future trends. Not only would such data help monitor the accuracy of our projections; they would also advise analysts, policymakers, and educators about shortage and surplus issues and about whether various schemes—ranging from reliance on market forces to deliberate planning—are working with regard to physician distribution.

In sum, our findings suggest that FMGs have been a critical component of the physician manpower pool of the nation. This is not a new conclusion, but the extent of the dependence revealed here is. Nowhere is this seen more clearly than in examining what would happen to the current cohort of trainees if the FMGs were suddenly removed from among their number. We are not advocating a position which either urges their replacement by USMGs or pleads for their

continued presence. Rather, we seek to clarify the current situation and to describe what might be a future state of affairs. Simplistic reliance on the assumption that a physician "surplus" now and in the future will solve physician manpower problems may prove to be unfortunate.

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NOTES

1. To save space, this and subsequent analyses are discussed without the relevant figures and tables. The logic, however, is the same. The actual data may be obtained by writing the senior author.
2. Interestingly, examples from the Schwartz/Newhouse group cited in this article [18, 19], and other publications from this group, do not distinguish between FMGs and USMGs in their analyses.

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