Variations in geographical distribution of foreign and domestically trained physicians in the United States: ‘safety nets’ or ‘surplus exacerbation’?

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Abstract

In the United States, a debate has existed for decades about whether foreign-trained physicians (known in the US as ‘international medical graduates’ or ‘IMGs’) and US medical graduates (USMGs) have been differentially distributed such that IMGs were more likely to be found in locales characterized as high in need or medical underservice. This ‘safety net’ hypothesis has been countered by the IMG ‘surplus exacerbation’ argument that IMGs have simply swelled an already abundant supply of physicians without any disproportionate service to areas in need. Through an analysis of the American Medical Association Physician Masterfile and the Area Resource File, we classified post-resident IMGs and USMGs into low and high need counties in each of the US states, compared the percentage distributions, and determined whether IMGs were found disproportionately in high need or underserved counties. Using four measures (infant mortality rate, socio-economic status, proportion non-white population, and rural county designation), we show that there were consistently more states having IMG disproportions than USMG disproportions. The magnitude of the differences was greater for IMGs than for USMGs, and there was a correlation between IMG disproportions and low doctor/100,000 population ratios. These findings are shown to exist simultaneously with two empirical facts: first, not all IMGs were located in high new or underserved counties; second, IMGs were more likely than USMGs to be located in states with a large number of physicians. The juxtaposition of an IMG presence in ‘safety net’ locales and of IMGs’ contribution to a physician abundance is discussed within the context of the current debate about a US physician ‘surplus’ and initiatives to reduce the number of IMGs in residency training. © 1999 Elsevier Science Ltd. All rights reserved.

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Introduction

For one-half century, a continuous arrival of

foreign-educated physicians into the US health care system has existed. The migration of foreign physicians can be traced back to the beginning of the century (Stevens and Vermeulen, 1972), but it was in the 1930s that the phenomenon accelerated when roughly 5000–7000 foreign-trained physicians, often Jewish, fled to the United States from European countries threatened by National Socialism (Edsall and Putnam, 1941).

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Fig. 1. International medical graduates in the US physician workforce, 1950–1997.

However, the phenomenon of physician migration as it is known today in the United States was post-war, facilitated by the US Information and Educational Exchange Act of 1948 and its exchange-visitor visa program. The Act allowed foreign students, including medical graduates seeking residency training, to enroll in a US government-approved program and to stay in the United States until the program was finished. For US hospitals, the willingness of foreign students to come to the United States for advanced study was an unexpected but fortuitous conjunction with their need for physician personnel. By 1954, about 800 hospitals had obtained approval for the training of foreign-educated physicians (Diehl et al., 1954). The law explicitly stated that students in the exchange-visitor visa category were *not* intended to help hospitals, or other organizations, to meet their staffing needs although numerous observers regard this as precisely why foreign-trained physicians have been permitted to enter the US health care system.

What began as a small stream of foreign-educated physicians became a major component of the growth in the US supply of physicians. Fig. 1 shows for the past 50 years both the total number of foreign-trained physicians (known today as 'International Medical Graduates' or 'IMGs') and the annual number of IMG house officers (interns and residents) in the United States. Over time, the annual totals of IMGs produced an ever increasing linear slope. By 1996, the active post-resident physician workforce (i.e., physicians hav-

ing finished graduate training) totaled 520,928. Of this 122,092, or 23.4%, were foreign trained.

Countless articles and publications have addressed this massive and seemingly never ending migration of physicians (Mick and Pfahler, 1995), but increasing interest occurred between 1990 and 1996 when the number of physicians trained outside the United States more than doubled in US residency programs (Council on Graduate Medical Education, 1997). IMG residents increased at an annual rate of 16.7% over the years 1988–1989 to 1995–1996.

Within both public and private physician workforce policy circles, the recent increase in IMG residents has rekindled a decades-old debate, with the following reasons, some old, some new, typically invoked for this concern. The old ones include: (1) the United States has too many physicians and that it is time to heed the warnings of 'surplus' of the Graduate Medical Education National Advisory Committee (GMENAC) (1980). Simulations of the future needed supply of physicians suggest that without strict controls of IMG immigration, a phased in reduction in domestic medical school production is likely to be offset by a growth in the IMG component of the physician workforce (Kindig and Libby, 1996; Salsberg et al., 1996). (2) Not enough primary care physicians are being educated, and any increase to specialization by IMGs, whether or not in greater proportion than USMGs, is a cause for concern. (3) The nation is paying too much for graduate medical education, especially through the Medicare Program

(US General Accounting Office, 1989; Congressional Budget Office, 1995).

The new reasons for renewed concern about IMGs stem from the growth of managed care plans, particularly since the early 1990s. The idea is that because managed care plans use physicians more efficiently than fee-for-service medicine, fewer overall physicians are needed in the workforce. Further, IMGs have had little or no previous exposure to the style of medical practice that managed care emphasizes (Institute of Medicine, 1996). The conclusion is that cuts in the IMGs are imperative (Pew Health Professions Commission, 1995; Institute of Medicine, 1996).

A second and related reason for renewed interest in IMGs is the perception that foreign-trained physicians may be ‘crowding out’ US medical graduates in an ever constrained market for physician services (Miller et al., 1997), although little direct evidence has been produced in this vein. Whatever the reality, preferred post-residency employment opportunities have been more difficult to obtain for both US and foreign-trained medical graduates (Miller et al., 1998a, b).

In brief, the conjunction of a number of issues directly and indirectly related to IMGs has sparked a sometimes contentious discussion of their place in US medicine. The debate includes several underlying policy issues, one of the most important of which concerns the roles played by foreign-trained physicians in the US health care system.

The IMG ‘safety net’ hypothesis

The question this paper addresses is why, under the circumstances just outlined, including the perception of a physician ‘surplus,’ medical graduates from around the world have flocked and continue to flock to the United States¹. To many, the answer, based on a body of theory and some supporting empirical evidence, rests in the special roles that foreign-trained physicians are thought to play in the US health care system. These roles consist of specialties and of practices in certain organizational settings and in certain geographical locations that US-educated physicians tend to avoid. This perspective is called various things such as ‘gap filling’, ‘IMG dependency’, or ‘safety net’ roles. In this paper, we use the last term, but whatever the term, the idea of foreign-trained physicians doing what US medical graduates (USMGs) do *not* do, is decades old.

For instance, Dublin (1972, p. 876) argued that because some 35,000 of 61,000 approved residency positions were being filled by US and Canadian medical graduates, IMGs were being induced to come to the United States to “... satisfy [hospital] staffing requirements...” which were

... redicated more on pressing manpower needs to render patient-care services than on the capacity of these institutions to provide a graduate education of high quality or on the suitability of hospital training in the United States as preparation for the practice of medicine in developing countries

The American Hospital Association stated that “underlying and economic pressures in the US health care system make it difficult for some hospitals to recruit USMGs ... leading them to depend on foreign medical graduates (FMGs) as their primary health care providers ...” (Koska, 1988, p. 60). Similar views were voiced by Way et al. (1978); Stimmel (1980); Goodman and Wunderman (1981) and Swick (1987), among others.

At a more theoretical level, there has been an emphasis on global interdependencies that lead IMGs to migrate to the United States (and other economically developed countries). Ozlak and Caputo (1973) discussed the linkages of Latin American economies and medical systems with those of the United States and asserted that the structure of supply and demand of medical services between the United States and Latin American countries was intimately connected. It then seemed inevitable that graduates from scientifically oriented Latin American medical schools would have little desire to remain in their home countries but would migrate to the United States (Demkowski, 1977). Furthermore, the production of physicians in Latin American countries was considered to be a misplaced national expense in view of their need for more basic public health and economic development measures, and thus, as the theory argued, the real loss was not in the emigration of their physicians but in the wealth wasted in training them in the first place (Horn, 1977). Gish and Godfrey (1979) extended a similar argument to all of the world’s less developed nations which experienced high levels of emigration of physicians. In a nation like Iran, Joorabchi (1973) argued that the economy of that country was unable to absorb all the physicians trained, particularly those who had come to the United States for residency training and then returned. West (1964) made the same argument for the Philippines, as well as other economically developing agrarian nations. Mason (1973) noted that the argument held up well for the large cities and suburbs of such countries, but that in rural areas or poverty-ridden parts of cities, practically no physicians

¹ The migration of physicians is, of course, not simply limited to the United States. Many countries, e.g. UK, Canada, France, New Zealand and Australia, have been either the destination or intermediate stages of international physician flows (Mejia et al., 1979; Barnett, 1988; Miller et al., 1998a).

were present, underlining the issue of whether training cadres of specialized physicians was an appropriate national policy for such countries.

Irigoyen and Sambrana's (1979) hypothesis linked these arguments to structural deficiencies of the US health care system to attract IMGs to this country only to marginalize and victimize them upon arrival. The logical conclusion of this line of theory was that the less developed 'donor' nations had a structural asymmetric relationship to the developed world, so that physician migration had become an integral component of the 'host' country. Once here, as Irigoyen and Zambrana pointed out, IMGs "... have filled those positions that were least appealing to American-trained physicians both in terms of lack of prestige and in terms of population served" (1979, p. 781).

Underlying these theoretical propositions is the idea that imbalances in physician distribution across various dimensions of US physicians' work created unfilled demand for physicians which, in turn, opened up opportunities for IMGs. These opportunities occurred at two levels: first, in the hospital residency training programs; second, in post-resident medical practice positions for IMGs who have completed their residency training and obtained a license to practice medicine. A key empirical question is, then, whether IMGs have in fact filled roles that would have otherwise gone unfilled.

Surprisingly, given the weight attached to it, this question has not been as carefully studied as might be expected. Mason (1974) found that 60.1% of IMGs were in office-based practice (versus 78.1% of USMGs) and 27.0% were in hospital-based practice (versus 11.5% of USMGs). Fox and Richards (1977), using licensure data, stated that "the most dominant [USMG] physicians' movement are the most predictable and the most tied to rewards, the least dominant physicians (new IMGs) are most tied to availability of work" (Fox and Richards, 1977, p. 372). Politzer (1976), studying IMG and USMG location within the state of Maryland, found that "... regardless of level of significance attained, practice setting, year of study, or whether primary care practitioners or total supply is being examined, IMGs are more evenly distributed when compared with populations than USMGs" (Politzer, 1976, p. 169). The United Hospital Fund (1978) revealed how dependent New York City was on IMG house staff. Butter et al. (1978) demonstrated that IMGs were disproportionately overrepresented in the Detroit area, especially in residencies, but also in hospital staff and administrative, teaching, and research posts. Nishi and Wang (1985) found that health professionals of Asian origin in New York were concentrated in inner cities with over one-half of them concentrated in central city locations. Mick (1987) found that IMGs trained in lower prestige hospitals

than did USMGs, which in turn was associated with IMGs entering into less prestigious medical practices, including IMGs trained in some economically developed countries like France (Mick and Lee, 1998a). Finally, Mick and Lee (1997a, b) found that primary care IMGs were often located disproportionately in poor and needy counties in the United States and that IMGs in general were potentially bearing a relatively greater burden of service to the poor and needy in rural sections of the United States (Baer et al., 1998; Mick and Lee, 1999).

The IMG 'surplus exacerbation' hypothesis

On the other hand, there is a countervailing argument that IMGs have simply added to the aggregate number of physicians (Council on Graduate Medical Education, 1995, 1998; Pew Health Professions Commission, 1995; Whitcomb, 1995; Institute of Medicine, 1996), leading to what some have called the 'exacerbation hypothesis' (Barnett, 1988). In some US states such as New York, 'surplus exacerbation' is reckoned to be quite high (Salsberg et al., 1996).

Some empirical studies supporting this view include that of Butter and Schaffner (1974) who noted that IMGs were possibly adding to the over supply of physicians in metropolitan areas. More recently, Mullan et al. (1995) presented data confirming that IMGs tended to congregate in urban areas, particularly the largest urban areas. Politzer et al. (1998), in a comparative IMG-USMG analysis based on GINI indices, concluded that "... IMGs by and large aggravate the condition of uneven distribution ... [which] ... challenges the wisdom of policies that promote their admission into US practice in the hope that they will mitigate problems of geographic access to medical care" (1998, p. 127–128). The central problem in most of these studies is that they examined aggregate national or state-level data only and ignored possible distributional differences of IMGs and USMGs within these boundaries.

Thus, there appears to be a fundamental conflict between the IMG 'safety net' and the IMG 'surplus exacerbation' hypotheses: the former argues that IMGs are remedying distributional imbalances; the latter, that IMGs add to the 'surplus' of physicians with no particular 'safety net' role. The present study attempts, first, to determine the validity of the 'safety net' hypothesis by examining a key feature of IMG and USMG distribution: their geographical location categorized according to various measures of need. Second, the study places the distributional findings within the perspective of 'surplus exacerbation.'

Data and methods

Study population

The data set derived from the 1997 American Medical Association (AMA) Physician Masterfile. Using the county code of each allopathic physician's mailing address, we merged information about each physician with county socio-demographic data contained in the Area Resource File (ARF), which also included osteopathic physician data for 1995. IMGs were identified on the AMA data through use of medical school codes. All osteopaths were considered USMGs because no osteopaths licensed in the United States were trained abroad (Baer et al., 1998).

Excluded from the analysis were physicians who were inactive or otherwise no longer in medicine. Second, it excluded Canadian medical graduates because Canadians have not been required to obtain certification from the Educational Commission for Foreign Medical Graduates, the organization that oversees the examination and credentialing of foreign-trained physicians in the United States. This is because the Liaison Committee on Medical Education (LCME) accredits Canadian and US medical schools similarly, both sets of institutions being considered equivalent. Third, it excluded all physicians currently undertaking residency training because our focus was on the long-

term roles of IMGs in US medicine, and postresident physicians were more likely to be permanent additions to the US physician workforce. Fourth, it excluded physicians in Alaska and the District of Columbia. Each of these jurisdictions constituted a single county (Bureau of Health Professions, 1996), and a minimum of two counties in each state was necessary to examine whether intra-state distributions of IMGs and USMGs differed between high and low need counties.

Measures of need

Four measures of need were used in this study, all derived from the ARF. In order to have a stringent test of the IMG 'safety net' hypothesis, we employed relatively extreme values of health and socio-economic status variables commonly used in measuring need (Krieger et al., 1997). For each variable, we dichotomized all counties in each state into two groups based on the national county value at the 75th percentile. The four variables included infant mortality, a composite measure of socio-economic status, proportion of non-white population, and rural versus urban location².

Infant mortality (deaths within one year after birth per 1000 live births) is a universally used health status measure of a population (Geronimus, 1986; Nersensian, 1988; Centers for Disease Control, 1991). The 75th percentile was ≥ 11.0 deaths/1000 live births. Socio-economic status (SES) is a composite measure based on a factor analysis of four county-level variables³: unemployment rate, per capita income, poverty level, and educational attainment. Unemployment has been shown to be strongly associated with many adverse health outcomes (Wilson and Walker, 1993; Jin and Svoboda, 1995). Low per capita income is a proxy for limited financial access to health services, for being uninsured, and for low levels of health (Knickman and Foltz, 1984; Smith et al., 1996). Poverty, although a normative concept, has strong associations with poor health (Hahn et al., 1996). The variable we used is the proportion of persons below the Federal poverty level. Educational attainment is reported to be one of the most consistent predictors of health status (Feldman et al., 1989; Reis, 1991; Shi, 1992; Elo and Preston, 1996). It was measured by the proportion of persons 25 years of age and older with less than nine years of schooling⁴. The mean of the composite factor score was zero with a standard deviation of ± 1.0 . The cutpoint was ≤ -0.56 . The third variable was the non-white percentage (e.g., African-American, Hispanic-American, Native-American) of the population. It was used because this group generally displays lower health status than the white population (National Center for Health Statistics, 1994), experiences barriers to access that are cultural

² Using the state as the unit of analysis, we computed the pair-wise correlations among the proportion of IMGs in counties high in infant mortality, low in socio-economic status, high in proportion non-white, and rural county location. The only statistically significant ($p < 0.05$) correlations were between rural location and socio-economic status (SES) (+0.51), and between rural location and infant mortality (+0.41). That is, for rural counties across the states, a disproportion of IMGs was associated with both a disproportion of IMGs in low SES counties and a disproportion of IMGs in high infant mortality rate counties. Thus, of the six possible pair-wise comparisons, only two were significant with the rural-urban distinction being the common thread in each case. In short, most of the measures we used were independent of one another, providing multiple tests of the 'safety net' hypothesis.

³ Factor analysis was performed using the principal components technique in the FACTOR procedure in the SAS Computational Program (SAS Institute, 1989). Each variable loaded on one factor: employment (0.638), per capita income (−0.799), poverty (0.868), and education (0.782). Details may be obtained by writing to the senior author.

⁴ The cutpoint of fewer than nine years of schooling is the only criterion of low educational attainment available in the Area Resource File (ARF). Nevertheless, the ARF cutpoint does indicate a low level of schooling by US standards: the proportion of a county population with no high school education whatsoever.

Table 1

Example of the statistical procedure comparing the proportion of US physicians and osteopaths to IMGs in counties having a high infant mortality in the state of Arkansas, 1997^a

	USMGs		IMGs		Difference between proportions	<i>p</i>
	%	<i>n</i>	%	<i>n</i>		
Counties < 11/1000 inf. mort.	49.7	1774	42.1	135	-7.6%	<i>p</i> < 0.05
Counties ≥ 11/1000 inf. mort.	50.3	1799	57.9	186		
All counties	100.0	3573	100.0	321		

^a Source: 1997 AMA Physician Masterfile and Area Resource File (ARF).

(Williams, 1997), and there is evidence that these effects are independent of income (Commonwealth Fund, 1995; Gornick et al., 1996). New research suggests that stress produced by perceived discrimination itself accounts for some white versus black differences in reported physical and mental health status measures (Williams et al., 1997). The cut point was ≥ 19.6% non-white. Finally, whether a county was classified as rural (non-metropolitan statistical area) or urban (metropolitan statistical area) was the final need indicator. Rural areas of the United States, compared to urban areas, are characterized by lower income and greater poverty, lower education levels, fewer health

resources including adequately trained health professionals, and in the more remote and sparsely populated sections, lower levels of health particularly for non-whites (Beaulieu and Berry, 1994; Ricketts, 1994).

Controlling for physician-osteopath to population ratio

The physician-osteopath to population ratio is a universally used gauge of physician availability relative to population size with low ratios being indicative of physician need (Donabedian, 1973). Mick and Lee

Source: 1997 AMA Physician Masterfile and Area Resource File (ARF)

Fig. 2. Difference between proportion of US physicians and osteopaths (USMGs) and proportion of IMGs in high infant mortality counties by US state, ranked low to high by doctor to 100,000 population ratio, 1997.

(1997b) demonstrated that there was a high disproportion of IMGs relative to USMGs in US counties with fewer than 120 physicians per 100,000 population, particularly for states with large rural populations, but holding true for all but nine states out of 44 analyzed. Hence, there was reason to believe that exploring the relationship of this ratio with other measures of need was important in the present analysis. We have presented the distribution of US states in rank order of low to high physician-osteopath to population ratios to add a second dimension to the analysis of comparative IMG–USMG location distribution. The logic is that if there is a negative correlation between IMG location in areas characterized as high on the four need

variables and the physician-osteopath to population ratio, this would constitute supporting evidence of the IMG ‘gap filling’ hypothesis. It would, as well, suggest that the IMG ‘surplus exacerbation’ hypothesis is more subtle than generally believed.

Statistical approach

The test of IMG and USMG distributional similarities or differences was based on two proportions: the number of IMGs in the needy counties of a state divided by the total number of IMGs in all the state’s counties subtracted from the analogous proportion of USMGs⁵. A negative value indicated an IMG disproportion whereas a positive value indicated a USMG disproportion. In either case, the difference of proportions was subjected to a statistical test using the Z distribution and a significance level of α less than 0.05 (Blalock, 1972)⁶.

The procedure is illustrated in Table 1 in which USMG and IMG distributions were compared according to their location in Arkansas’ counties with low and high infant mortality rates⁷. First, there were over 11 times as many USMGs in Arkansas counties than there were IMGs. Second, there were over 9 times as many USMGs than IMGs in high infant mortality counties in Arkansas. The third point, however, is that, with a difference of proportions of -7.6% , IMGs were 1.15 times ($57.9\%-50.3\%$) more likely than USMGs to be located in that state’s counties high in infant mortality. This directly addresses the question whether IMGs distributed themselves differently than USMGs. For each need measure, the procedure shown in Table 1 was repeated for each state categorized by its respective physician-osteopath to population ratio.

Results

Infant mortality

Fig. 2 shows the distribution of 42 states that qualified for analysis, i.e., that had counties with an infant mortality rate ≥ 11 deaths per 1000 live births. For the United States as a whole, there was an IMG disproportion of -2.4% , a statistically significant percentage difference. When this figure is disaggregated by state, 25 had IMG disproportions in their high infant mortality counties, and of these states, 18 registered significant disproportions. Of the 17 states with USMG disproportions, eight were statistically significant. Inspection of Fig. 2 also shows that the IMG disproportions were generally of greater magnitude than the USMG disproportions. Finally, the data of Fig. 2 are displayed by ranking the states left to right from low to high physician and osteopath to 100,000 population

⁵ In each state, the actual count of IMGs (and USMGs) in each county that was ‘high’ according to a given need variable was summed together for an overall state count of IMGs (and USMGs) in such counties. The same was done for IMGs (and USMGs) in ‘low’ need counties. For example, even if only one ‘high’ need county in a state was ‘excessive’, that is, it had a disproportion of IMGs (or USMG), it was still included with other ‘high’ need counties that were not. We did not engage in a county-specific analysis within each state because the number of IMGs and USMGs was too small in most individual counties to permit analysis.

⁶ Because the data covered all 1997 active post-resident physicians, they constituted a complete, or near complete, count of all physicians, excepting the explicitly excluded groups mentioned in the text. Ordinarily, with census or population data of this type, one would not use inferential statistics to estimate whether sample differences are real. However, many readers expect the reporting of statistical tests even when population data are reported, sometimes on the presumption that a ‘population’ is either a sample of some larger population of counts, e.g., of an earlier year’s census, or an imperfect count that some other data collection technique might have improved upon. Thus, we have elected to report statistical significance. As will be seen, the data presented in Figs. 2–9 consist of 162 Z tests, of which 102 (about 63%) were statistically significant. If the expectation were that in 20 Z tests, one would be significant by chance alone, then for 162 Z tests, about 8 would be significant. This is far fewer than what was found, and adjustments to penalize for multiple Z tests were not considered warranted.

⁷ The number of Arkansas counties with high infant mortality rates was 28 of a total of 75 counties in the state. More generally, states varied widely in the number of counties that qualified as ‘high’ need depending on which measure was used. For example, of a random sample (to save space) of ten of the 42 states used in the analysis in Figs. 2 and 3, the following figures indicate the number of high infant mortality counties and the total number of counties, respectively, in each state: Delaware, 1 and 3; Indiana, 16 and 92; Maryland, 5 and 24; Missouri, 39 and 115; Montana, 19 and 57; New York, 5 and 62; Tennessee, 30 and 95; Washington, 7 and 39; West Virginia, 15 and 55; Wisconsin, 8 and 72. These figures are typical across all analyses.

ratios. For example, Idaho and Mississippi had low ratios of 135.5 and 135.7 doctors/100,000 population, respectively, whereas New York and Maryland had 291.4 and 319.3 doctors/100,000 population, respectively. Using the state as the unit of analysis, there is a positive but statistically non-significant correlation of 0.22 between the percentage differences and the doctor/population ratio. That is, there is a weak tendency for greater IMG disproportions to be associated with lower doctor/population ratio in states high infant mortality counties.

Fig. 3 is a US map that shows the geographical distribution of IMG versus USMG disproportions across the states. Here it is seen that IMG disproportions tended to clump together in the northern tier of states in the mid-west and west, in a contiguous cluster in the very central part of the nation stretching south to

north from the Gulf Coast to Michigan. The two coasts had no IMG disproportions whatsoever.

Socio-economic status

Fig. 4 displays states in the same way but for the percentage difference of USMGs and IMGs in states' low SES counties. For the nation as a whole, there was a small but statistically significant IMG disproportion of -1.2% . However, for the 35 states that qualified for analysis, most (32) had IMG disproportions, and of these, 23 were statistically significant. Three states had USMG disproportions, and only one was significant. Inspection of Fig. 4 shows the overwhelming tendency of the IMG disproportions to be of greater magnitude than the USMG disproportions. Finally, the correlation between the percentage differ-

Fig. 3. US map showing US physician and osteopath (USMG) and IMG difference of proportions for high infant mortality counties in US states, 1997.

ence and the doctor/100,000 population ratio was 0.39, statistically significant beyond the 0.05 level. Interpreted means that the greater the IMG disproportion, the lower the doctor/population ratio in states' counties with low SES.

These results are displayed graphically in the map in Fig. 5. Overriding all else is the visual confirmation of the statistical finding that, unlike infant mortality, most states had IMG disproportions wherever they were geographically situated. The strongest IMG disproportions are seen in several of the Mexico border states, in the deep south, and in Appalachia.

Non-white population

In Fig. 6, the USMG and IMG percentage differences are shown according to high proportion non-white population counties. The national average was a significant -3.8% . Of the 41 states qualifying for analysis, a majority of 29 had IMG disproportions, and of these, 18 were statistically significant. Twelve states had USMG disproportions, and five of these were significant. There was a small positive but non-

significant correlation of 0.08 between the percentage differences and the doctor/100,000 population ratios.

Fig. 7 maps the results for the United States. States with high IMG disproportions often had large segments of the population that are Hispanic-American (California, Texas, Florida) or that have had large recent immigrant populations (New York). Two Mexico border states, Arizona and New Mexico, had high USMG disproportions that seems to contradict this tendency; however, both states have large Native American populations served in great measure by the Indian Health Service which has a substantial number of USMGs in it. Much of the upper mid-west had IMG disproportions as did all the mid-Atlantic states (New York, New Jersey, Pennsylvania).

Rural–urban

Although the average for the United States was a significant 1.4% USMG disproportion, Fig. 8 shows that most (29) of the qualifying 44 states had IMG disproportions in their rural counties. Among the IMG disproportion states, 20 were statistically significant. Of the 15 USMG disproportion states, eight registered

Source: 1997 AMA Physician Masterfile and Area Resource File (ARF)

Fig. 4. Difference between the proportion of US physicians and osteopaths (USMGs) and proportion of IMGs in low SES counties by US state, ranked low to high by doctor to 100,000 population ratio, 1997.

Fig. 5. US map showing US physician and osteopath (USMG) and IMG difference of properties for low SES counties in US states, 1997.

statistical significance. Inspection of Fig. 8 repeats the pattern of IMG disproportions being of generally greater magnitude than USMG disproportions. Finally, the correlation between the percentage differences and the doctor/100,000 population ratios was a significant 0.30 ($p < 0.05$).

Fig. 9 shows the US map with these results. Almost all of the mid-west, except the Great Lakes states, the deep south, the coastal south, and Appalachia had IMG disproportions. New England states, except New Hampshire, had USMG disproportions as did most of the far west.

Discussion and conclusions

Strength of empirical results

The data and results yield the following conclusions:

First, across the four measures of need, there were consistently more states having IMG disproportions than USMG disproportions. Second, the magnitude of the differences tended to be greater for IMGs than for USMGs as evidenced by the larger number of statistically significant IMG disproportions and by visual inspection of the figures and maps. Third, the correlation between the USMG and IMG percentage differences and doctor/100,000 population ratio was positive for all four need variables, but statistically significant only for SES and rural–urban analyses. Because IMG disproportions were negative and USMG were positive, this translated into a consistent relationship between IMG disproportions correlating with low physician-osteopath to population ratios. In short, the data support the hypothesis that IMGs were more likely than USMGs to locate in states' counties characterized in need. There is also support, but not as strong, for the hypothesis that in each instance of

Fig. 6. Difference between the proportion of US physicians and osteopaths (USMGs) and proportion of IMGs in high non-white proportion counties by US state, ranked low to high by doctor to 100,000 population ratio, 1997.

need, IMG location in needy counties tended to occur in states with lower doctor/population ratios.

The findings just reviewed were strongest when data were classified by states' low SES counties: the most states having IMG disproportions, the disproportions being more often statistically significant, and the strongest correlation of the disproportions with low doctor/population ratios.

Finally, the US maps revealed distinct clusters of IMG (and USMG) disproportions with some variation of these clusters according to which need measure was examined. A rough generalization is that much of the mid-west and south emerged with IMG disproportions across the four need variables. Geographically speaking, there were distinct patterns that appear to defy the idea that IMG disproportions were randomly found around the United States.

Methodological caveats

It is important to discuss several methodological limitations of this study before interpreting the findings. First, because the data set was a cross-sectional one, no causal direction between location and IMG versus USMG status can be asserted. It is uncertain whether IMGs were more limited in opportunities than USMGs except in needy counties or whether IMGs

self-selected themselves into such places. Earlier small sample research suggested that, over time, IMGs slowly assimilated themselves into patterns of medical practice set by USMGs (Mick and Worobey, 1984), but no such conclusion was possible in the present study which was limited to describing associations only.

A second issue derived from the use of geographical boundaries as the units of observation. This gives rise to the ecological fallacy: a physician located in a county high in need would not necessarily have treated persons high in need. This has been a problem generic to much physician workforce analysis in both sociology and health services research. Our assumption was that neither IMGs nor USMGs had a greater propensity to serve one needy group or another; the disproportion of IMGs (or USMGs) in such areas suggested only that IMGs (or USMGs) may have had a greater chance of serving whatever needy population one was considering.

These limitations notwithstanding, the study's three strengths should be noted: use of (1) a very large number of cases allowing an analysis at the county level within each US state, (2) data from the ARF so that common measures of need could be merged and matched with physician location, and (3) an interpretable single continuous measure summarizing IMG and

Fig. 7. US map showing US physician and osteopath (USMG) and IMG difference of proportions for high non-white proportion counties in US states, 1997.

USMG distributional similarity or difference. The results of these features have provided a comprehensive baseline for further quantitative studies.

Empirical fact and rhetoric

The 'safety net' hypothesis has offered a convenient way to reconcile the apparent paradox of the nation's having an apparent 'surplus' of physicians while at the same time continuing to favor the entry of IMGs. Arguers have noted that IMGs have helped to redress distributional imbalances and that is why IMGs have continued to arrive and stay in the United States. Further, this study's findings about a tendency of IMG disproportions in counties in need to be correlated with low physician-osteopath to population ratios suggests that the countervailing 'surplus exacerbation'

hypothesis is more subtle than the way it has typically been stated. There can be no gainsaying that, at the national level, IMGs have been more concentrated in states with large urban areas than have USMGs. In 1996, almost three-quarters of all IMGs, but only 52% of all USMGs, were located in the ten states of New York, California, Florida, New Jersey, Illinois, Texas, Pennsylvania, Ohio, Michigan and Maryland (Mick and Lee, 1996). But, as has now been shown here, where IMG disproportions were greatest in a given state's needy counties, that state's physician-osteopath to population ratio tended to be low, and vice versa. Furthermore, the US maps showed that IMG disproportions were found in many states easily characterized as rural. It may be that the IMG 'exacerbation' hypothesis applies more specifically to areas in which need was not demonstrably high.

Source: 1997 AMA Physician Masterfile and Area Resource File (ARF)

Fig. 8. Difference between the proportion of US physicians and osteopaths (USMGs) and proportion of IMGs in rural counties (<50,000 population) by US state, ranked low to high by doctor to 100,000 population ratio, 1997.

But, the data of the present study, when assessed in a slightly different fashion, also give rise to further subtleties. Consider only those IMGs and USMGs who were located within a given states' counties in need, i.e. disregard all physicians and osteopaths located in non-needy counties. An example is in Fig. 10 which shows the actual number of IMGs and USMGs located within each state's low SES counties only. Of all post-resident physicians (IMGs and USMGs) located in the United States' low SES counties, 29.5% were IMGs. This value is used as the reference against which each state is compared. For example, in Florida, IMGs consisted of over 50% of all physicians in its low SES counties, a figure that was statistically significant compared to the national average proportion of 29.5%. Toward the other extreme, in the state of Mississippi, the proportion of IMGs in low SES counties was about 13%, also statistically significant compared to the national average. Thus, in Fig. 10, of the complement of doctors in each state's low SES counties, IMGs were significantly greater than the national average in eight states. Of these eight states, seven also had IMG distributions when the IMG-USMG distributions across high and low SES counties were assessed (Fig.

4). Thus, both analytic approaches were consistent with each other.

On the other hand, the actual number of IMGs and USMGs located in each state's low SES counties are shown in the vertical bars in Fig. 10. States like West Virginia, New York, Texas, Kentucky, and California, had over 250 postresident IMGs located in low SES counties, but other states had very few IMGs (or USMGs) in low SES counties, e.g., Florida, Pennsylvania, Illinois. In fact, most states had few IMGs to begin with. When the number of IMGs and USMGs is summed for the entire United States, the totals were 5499 and 13,172, respectively. Neither of these numbers was nearly as large as the total number of post-resident IMGs and USMGs in the United States, 126,458 and 422,362, respectively. Thus, only a minority of IMGs and USMGs were located in counties characterized as low in SES; the vast majority of physicians, regardless of origin, were located in counties not low on SES, at least in the way we have measured it here.

Taken together, these findings might seem to imply that the 'safety net' and 'surplus exacerbation' hypotheses have probably been overly dichotomized, suggesting a level of differentiation between two

Fig. 9. US map showing US physician and osteopath (USMG) and IMG difference of proportions for rural counties (< 50,000 population) in US states, 1997.

groups of medical graduates, IMGs and USMGs, that has not existed. Two issues modify this conclusion: the arbitrary cutpoint used to separate 'high' versus 'low' need counties and the heterogeneity of populations within metropolitan counties. First, we used a single cutpoint (75th percentile) to distinguish between low and high need. Had we used the median (50th percentile), a greater number of high need counties with a greater number of IMG disproportions would have emerged. Moving in the other direction, e.g., using the 90th percentile, would have yielded too few counties to analyze. Second, there was within metropolitan areas, defined in this study according to county boundaries, a high degree of heterogeneity of populations across measures of need, none of which were captured in the present study. Elsewhere, using zip codes as the unit of analysis, researchers (Mick and Lee, 1998b) have concluded that regardless of the existence of IMG dispro-

portions within metropolitan county boundaries, many metropolitan areas, especially the nation's largest cities, had a large number of IMGs located in high poverty areas, e.g., 1761 in New York, 1083 in Chicago, 830 in Los Angeles-Long Beach, 610 in Philadelphia, 559 in Boston, 513 in Detroit, 282 in Houston. Just these cities totaled to 5638 IMGs, larger than the national figure calculated in this study as having been in low SES counties. Considerations like these should be linked to the fact that we have not analyzed the organizational setting of IMGs and USMGs, e.g., public versus private hospital staff, solo versus group practice. In short, estimating the actual number of IMGs (and USMGs) who served persons in need was, in part, a function of the methodology used.

Thus, although the findings of the present study can be used to support both hypotheses showing that IMGs can both be engaged in 'safety net' roles and

Source: 1997 AMA Physician Masterfile and Area Resource File (ARF)

Fig. 10. Number and percent of all post-resident IMGs and USMGs in low SES counties, US States, 1997.

have added to the 'surplus' of physicians, the choice of a particular method to examine these questions will bear heavily on what will be found. As Bordieu (1984) has noted, social phenomena like income, pres-

⁸ Whitcomb and Miller (1995) used the following cutpoints and categories in defining what constituted 'IMG dependency': at least 50% of the complement of residents had to be IMG; a lower cutpoint would have undoubtedly expanded the number of residency programs eligible for consideration. Second, the study only included hospitals with more than two training programs and reduced the number of potential hospitals serving as principal teaching sites 'for at least one IMG-dependent program' from 314 to 157. Third, hospitals which were not the principal teaching hospital for a given training program were excluded in the analysis; historically IMGs have often been concentrated in hospitals that had only limited affiliation with a medical center and were not the principal teaching site (Knobel, 1973). Finally, the authors used an arbitrary cutpoint of 20%, rather than a range, of no-pay, Medicaid, or public assistance populations as the criteria of whether the hospital served the poor. In short, although several key phenomena used to construct an index were fundamentally continuous, arbitrary cutpoints were used which restricted the possible outcomes that the study could achieve.

tige, or poverty are generally distributed in a continuous, not categorical, fashion. Here, the actual distribution of IMGs and USMGs and the distribution of need within and between geographic boundaries were continuous ones. It was an arbitrary decision to say when an IMG distribution versus a USMG distribution had become substantively different just as it was an arbitrary decision to say when high need began and low need ended. Arbitrariness in setting measures abounds in IMG studies. For example, arbitrary decisions in what constituted an 'IMG dependent' hospital (one in which IMG residents were vital to health care provision to the poor) yielded a figure of 77 hospitals nationally, lower than what was generally believed to exist (Whitcomb and Miller, 1995). Yet, with small alterations in measures, a figure as high as about 250 would result⁸.

Furthermore, the definition of terms like 'safety net' and 'surplus' are socially constructed and heavily value laden, 'safety nets' being good, 'surpluses' being bad. Fundamental to the notion of 'safety net' is the concept of need which is usually contingent upon health professionals' ever-changing perceptions of what persons and populations should have in the way of care (Donabedian, 1973). Key to the notion of 'surplus' is

some idea that there are more physicians than the population can use, than the population needs, or than can be supported through financing mechanisms. Long debated by health care observers, the idea of ‘surplus,’ and its obverse, ‘shortage,’ is one that is usually advanced by the medical profession itself in ways that may or may not reveal strong self interest (Reinhardt, 1996). In short, the terms ‘safety net’ and ‘surplus’ may appear self-evident, but both are highly susceptible to manipulation to advance certain agendas. Neither is based on some absolute metric.

Different methodologies and value-laden terms have come together to produce a deep conflict between IMG opponents and proponents. In its extreme version, the rhetoric behind each position is useful only for political and ideological arguments. For those persons and organizations wishing to protect the interests of US medical schools, to limit public expenditures for graduate medical education, to maintain a virtually open choice of residency programs and specialty areas for freshly graduated US medical students, to diminish the availability of an abundance of physicians from which managed care plans can find willing recruits, to reduce the number of competing health care organizations in managed care environments, and to assure wide choice of opportunities in subsequent career mobility, the arguments of physician ‘surplus’ and unwanted additions to it by IMGs are powerful and persuasive. By contrast, for those persons and organizations who wish to maintain open doors of immigration, to fill hospital residency slots, particularly in low status hospitals and specialties not popular with USMGs, and to fill positions in designated health professions shortage areas and in needed positions in certain kinds of institutions, e.g. state mental hospitals, county public hospitals, Veterans Administration facilities, the arguments of IMG ‘safety net’ roles are also powerful and effective. Neither perspective gains by relaxing its key ideological component. Furthermore, the polarized perspectives make useful compromise and policy formulation very difficult, which accounts in part for the graveyard of policy activities attempting to shape and control IMG and physician supply for several decades.

Both sides in the debate have also emphasized IMG–USMG ‘differentness,’ creating a dichotomy that, as Stevens (1999) has pointed out, imprisons discourse. Dichotomies help produce myths, which in the present case is that IMGs are one kind of doctor, and

USMGs are another kind. In fact, the initial dichotomy inherent in the term used to describe foreign-educated physicians, ‘International Medical Graduates’ or ‘IMGs’ (and formerly ‘Foreign Medical Graduates’ or ‘FMGs’), so that they are clearly distinguished from US-trained physicians has, in our view, been a corollary of the ‘safety net’ versus ‘surplus exacerbation’ dichotomy⁹.

The dichotomy between IMGs and USMGs in regard to ‘safety nets’ and ‘surpluses’ is clearly false. For as long as there have been programs such as the National Health Service Corps to place USMGs in underserved areas, incentives to coax physicians and osteopaths to practice in rural areas or inner city clinics, training programs geared to make medical students sensitive to the needs of the poor and disenfranchised, there have been USMGs in ‘safety net’ positions. That much more could be done is not denied, but the point is that ‘safety nets’ have not been the sole domain of IMGs. On the other hand, since the 1970s, there have been efforts to control physician supply and specialty choice by the development of sophisticated physician projection methodologies and their application in physician planning mechanisms. In the meantime, despite numerous warnings to the medical profession and to funders of undergraduate and graduate medical education, physician supply has continued to grow with the largest growth due to USMGs, notwithstanding substantial growth among IMGs (Mick, 1987). From 1970 to 1980, and 1980 to 1990, whereas about 39,000 and 35,400 IMGs, respectively, were added to the workforce, there were an additional 92,700 and 108,000 USMGs added. The point is that medical leaders and government officials have had many opportunities over a long period of time to stem the growth of physician supply, but very little has ever been done.

More importantly, exclusive focus on IMG ‘safety net’ roles or IMG ‘surplus exacerbation,’ misses a more fundamental point. The issue of IMG growth in the US health care system is a highly visible symptom of the open-ended expansion of the medical care system in this country, and the dominance of medical matters by medical people until recently with inroads into physician autonomy and market power by US government reimbursement schemes and by managed care entities. Growth in the workforce may rest in the almost total freedom of choice of specialty, practice setting, and geographic location that physicians, as a self-regulating profession, have conferred upon themselves. The growth has been paid for by decades of federal largesse in supporting clinical research, clinical education, and in ever-growing Medicare and Medicaid budgets. The commercial health insurance sector has also been a key player in fueling this growth. Medical advances have whetted the public’s

⁹ The uniqueness of what has been done is evident when it is realized that no one refers to foreign-trained engineers in the United States as ‘International Engineering Graduates’ or ‘IEGs,’ foreign-educated computer scientists as ‘International Computer Science Graduates’ or ‘ICSGs,’ or foreign-trained chefs as ‘International Chef Graduates’ or ‘ICGs.’

appetite for ever more services and products. In short, why IMGs have come to the United States, apart from the various factors that have induced them to leave their own countries, has been related to the numerous opportunities that growth in the US health care system has afforded, including, but not limited to, opportunities in the US 'safety net.'

Without a crisp rhetorical distinction between IMG and USMG, the issue of separate 'safety net' roles and 'exacerbation of the physician surplus' would not exist in the manner in which it does today. Why this has happened in US medicine would require a lengthy treatment in and of itself. Our objective has been to examine the empirical evidence bearing on the IMG 'safety net' hypothesis, with the result that we have demonstrated that IMGs have probably carried a disproportionate burden in this arena when geographical measures of need are the reference points. However, we have also shown that the bulk of IMGs were located in the same non-needy counties as USMGs, and these two findings should not only elicit further research for more refined analysis but also encourage a more searching exploration into the causes and consequences of both massive growth in US-educated physicians and continuous migration of those who are foreign educated.

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