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Fewer and More Specialized: A New Assessment of Physician Supply in California

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I. Executive Summary

THIS REPORT PRESENTS THE FINDINGS OF the first comprehensive study of the Medical Board of California survey data on practicing physicians in the state. The goal of the study was to use this Medical Board survey data to enumerate, more accurately than had been done previously, patient care physicians with MD degrees who were actively practicing in California in 2008, for the state overall and by individual county.

Key Findings

1. The overall supply of MD physicians in the state is lower than previous estimates.

The supply of MD physicians in California estimated from Medical Board data is 17 percent lower than that estimated from American Medical Association (AMA) Physician Masterfile data. Based on Medical Board data, there were 66,480 physicians with MD degrees actively practicing in California in 2008. By contrast, AMA data estimates that there were just under 80,000.

2. The number of primary care physicians actively practicing in California is at or below estimated needs.

Of active patient care physicians in California, 34 percent reported that they were in primary care, which is 20 percent fewer than the number of primary care physicians estimated from the AMA data. On a per capita basis, this figure amounts to only 59 primary care MD physicians in active patient care per 100,000 population, below what a number of studies have estimated is a range of 60 to 80 needed. If an estimate of the number of Doctors of Osteopathic Medicine

(DOs) in primary care is added to this count, California has 63 active primary care physicians in patient care per 100,000 population, at the bottom end of the estimated need range. Moreover, the state's supply of primary care physicians is poorly distributed. Only 16 of California's 58 counties fall within the needed supply estimate for primary care physicians, and in eight counties the supply is less than half this range.

3. There is an abundance of specialists practicing in the state.

Of active patient care physicians in California, 67 percent reported that they were non-primary care specialists. The number of specialists per 100,000 population in California (115) is well above the upper range (105 per 100,000) of most assessments of need, and more than half of the state's 58 counties are above the bottom estimated need level for specialists (85 per 100,000 population).

4. Rural counties suffer from low physician practice rates, and from a diminishing supply of primary care physicians.

In general, rural counties tend to have far fewer physicians per capita than urban counties; counties in the Central Valley and Inland Empire are particularly likely to have a low supply of physicians. Several rural counties face the additional predicament of an aging physician primary care workforce, and an apparent difficulty recruiting younger physicians to take their place.

If current trends continue, the shortage of primary care physicians in California is likely to worsen, exacerbated by a shrinking interest in primary care nationally among graduates of U.S. medical schools. Such a further deterioration poses a significant threat to health care access in the state.

Steps for State Policymakers to Consider

There are a number of steps California policymakers might consider in order to encourage primary care physicians to practice in the state, and particularly in underserved areas. Policymakers also might support redesigns in the delivery of medical care to improve the effectiveness of the existing physician workforce. These steps include:

- Providing greater financial incentives to encourage primary care physicians to practice in California, especially in underserved areas, such as higher reimbursement for primary care services by Medi-Cal and other state programs; advocacy for other payers, such as Medicare and private health plans, to increase primary care payments; and increased funding for loan repayment programs linked to practice in underserved communities.
- Increasing the number of new providers entering primary care and practice in underserved areas by supporting specifically targeted training programs, such as the University of California's Program in Medical Education (UC PRIME) for medical students, and the Song Brown Program for primary care residents.
- Preventing further erosion of the physician workforce in underserved areas by establishing programs that include financial and technical assistance to primary care physicians and other health care providers working in underserved

areas, in particular permitting them to modernize their practices.

- Supporting efforts to redesign the delivery of medical care to more productively utilize the state's existing physician workforce, particularly in primary care where shortages are significant. One critical infrastructure need is investment in information technology to support systems improvements and to enable connections across practices for shared decision-making and learning.
- Investing in the continued monitoring of the state's health care workforce, building upon the success of the Medical Board survey by gathering other timely policy-related data and by implementing similar relicensure surveys for DOs and other health care professionals.

II. Introduction

CALIFORNIA POLICYMAKERS FACE THE challenge of ensuring that the state has a sufficient number of physicians distributed well among practice specialties and geographic settings. There is concern about a physician shortage nationally, particularly with regard to primary care physicians;¹ such a shortage of physicians may impede patients' access to needed health services, compromising the health of the state's residents. On the other hand, a surplus of physicians in any one area may result in the provision of unnecessary care and fuel health care inflation.²

Accurate assessment of the adequacy of the state's physician workforce depends on having reliable data on physicians practicing in California. Traditionally, health workforce analysts have relied on data collected by the American Medical Association (AMA) to enumerate and characterize physicians in the United States and California.^{3,4} However, some critics have questioned the AMA Physician Masterfile data, arguing that these data do not accurately track the number of practicing physicians.⁵ In response to the debate over physician supply data, the California Medical Association supported Assembly Bill 1586 (Negrete McLeod), enacted in 2001. This law for the first time required the Medical Board of California to survey physicians when they renewed their licenses every two years. The Medical Board survey includes questions on hours worked per week in patient care, race, ethnicity, languages, specialty, zip code of the primary practice location, and training status.

This report presents findings from the first comprehensive analysis of the Medical Board survey data. The goal of the study was to use the Medical Board data to enumerate—more accurately than has been possible with AMA data alone—active,

patient care physicians with MD degrees practicing in California in 2008. (Physicians with Doctor of Osteopathic Medicine [DOs] degrees are licensed by a different state board and so are not included in the Medical Board data.) The report provides summary information on:

- The total number of active, patient-care MD physicians in California, and in each county in the state;
- The supply of physicians per capita in the state and each county;
- The number of physicians in each county by specialty; and
- The age distribution of physicians in each county.

The report also compares the overall count of California physicians in 2008 derived from Medical Board data with the count from the AMA Masterfile.

III. Methodology

THE MEDICAL BOARD OF CALIFORNIA licenses physicians with MD degrees. To maintain an active license, physicians must apply to be relicensed every two years, and are instructed to complete a survey questionnaire with each such reapplication. Physicians filing their initial application for licensure in California, however, are not surveyed. The survey questionnaire was developed by the Medical Board with input from an advisory group representing medical professional associations, the California Office of Statewide Health Planning and Development, and workforce researchers from the University of California, San Francisco. (The questionnaire can be seen in Appendix A.)

Enumerating Active Patient Care Physicians

As of July 2008, the Medical Board listed 118,883 MD physicians with an active California license. Of these physicians, 105,896 (89 percent) have completed at least one relicensure survey and provided responses regarding professional hours and training status; 81 percent of the relicensure surveys were completed within the past two years. Following the AMA's definition, this study considered only physicians who reported 20 or more hours of patient care per week as being active patient care physicians.

The study created a weighted system to estimate the proportion of survey non-respondents who were active patient care physicians practicing in California. The 12,987 non-respondents include physicians obtaining their first California medical license and who therefore were not offered the survey, as well as relicensing physicians who did not return a completed questionnaire. The Medical

Board maintains certain data—including physician age, gender, and mailing address—for all licensed physicians, independent of the relicensure survey. This study calculated the probability of being an active practice care physician (not in training) based on these three elements from those who completed the survey, then applied it to estimate the number of such physicians among survey non-respondents.

Determining Physician Specialization

The study assigned physicians to a specialty based on their primary self-designation. Primary care physicians were those with a primary practice of family medicine, general practice, general internal medicine, general pediatrics, or geriatric medicine. The zip code of the practice address or, if that was unavailable, the zip code of the mailing address, was used to assign physicians to specific counties using a geocoding file provided by the California Office of Statewide Health Planning and Development. A methodology was then used to “upweight” each geo-coded confirmed patient care physician in order to account for survey non-respondents, the weights being derived from a stratified response rate analysis.

Assessing Geographic Distribution

The study also calculated the number of active patient care physicians by county of primary practice. For the 1,784 (3 percent) of active patient care survey respondents who did not report a practice zip code, this study used the physician's mailing address on file at the Medical Board to infer practice location. To calculate the supply of physicians per capita, the study used California Department of Finance estimates of state and county populations for 2008.

IV. Findings

Physician Counts at the Statewide Level

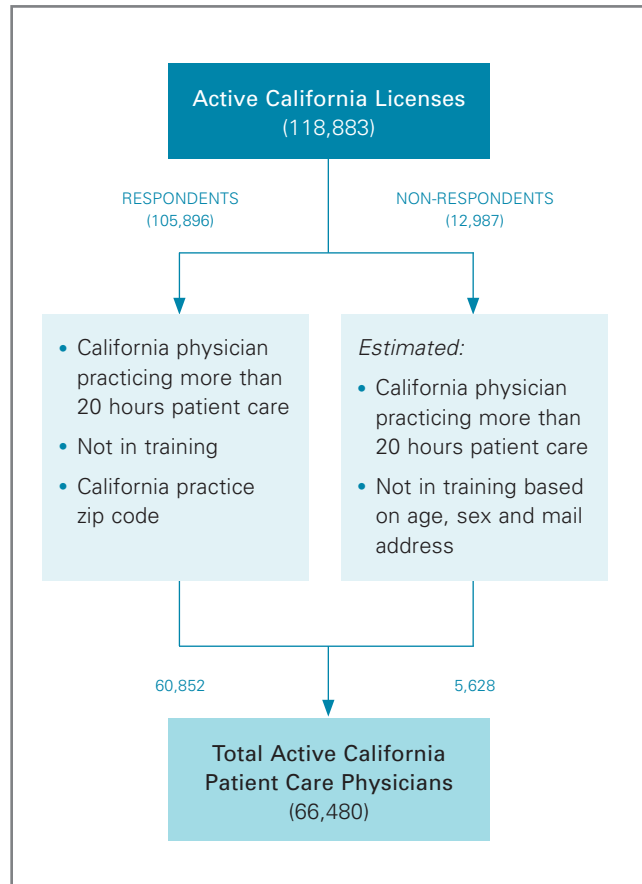
The Medical Board database showed that there were 118,883 physicians with an active license in 2008. Of those, 6,326 were still in training while 19,561 no longer in training reported a practice zip code outside California. Additionally, 19,188 respondents not in training reported fewer than 20 hours per week of patient care activity. These three groups, totaling 45,075 physicians, were excluded from the analysis, leaving 60,852 physicians active in patient care at least 20 hours per week, practicing in California, and no longer in residency or fellowship training (see Figure 1).

Applying probability estimates (described in the Methodology section, above) to the pool of licensed physicians who did not respond to the survey, the study determined that an additional 5,628 physicians were active in patient care in California. Combining these counts, the study's best estimate from the Medical Board data is that in 2008 there were 66,480 physicians with MD degrees engaging in at least 20 hours per week of patient care (not in training) in California. Of this total, 34 percent (22,528) were determined to be in primary care, while 66 percent (43,952) were non-primary care specialists.

Comparing Medical Board and AMA Data

The physician count (66,480) based on Medical Board data is 17 percent less than the number (79,813) based on the AMA Physician Masterfile data (see Table 1). The discrepancy is even greater for estimates of the number of primary care physicians, with the Medical Board data count (22,528) being

Figure 1. California Medical Board Data Physician Count



20 percent lower than the count (28,137) based on AMA data.

Table 1. Counts of California Physicians, by Source, 2008

	AMA	MEDICAL BOARD
Total MDs	79,813	66,480
Primary Care MDs	28,137 (35%)	22,528 (34%)
Specialists	51,676 (65%)	43,952 (66%)

Sources: American Medical Association Masterfile and Medical Board of California.

Medical Board and AMA Figures: Why the Difference?

When analyzing the Medical Board's data regarding physician supply in California, this study used a definition similar to that used in the AMA Physician Masterfile: MD physicians classified by the AMA as being in active patient care, who were no longer in training, not federal employees (who are not required to have an active state medical license), and had a practice address or preferred mailing address in California. Despite the similar definitions, there was a significant discrepancy between the counts based on the Medical Board data and the AMA Masterfile counts. The study researchers looked at several possible sources for these differences.

For its classification scheme of active patient care physicians, the AMA used the criterion of being active at least 20 hours per week across all types of professional activity (patient care, research, teaching, etc.), and of having a plurality of these hours being in patient care. Applying this definition to the Medical Board data resulted in a weighted total of 68,826 active patient care physicians, only slightly greater than the 66,480 total based on physicians working at least 20 hours per week in patient care, and nowhere near the AMA total of nearly 80,000.

The study's researchers also examined whether the differences might be attributable to the AMA failing to timely capture physician retirements. If this were the case, AMA over-counts would be disproportionately found among older physicians. But the AMA data produced higher counts among physicians of all ages, not just among older physicians.

Ultimately, the study's researchers were able to determine—by comparing AMA and Medical Board classifications for the same physicians by their medical license number—that there was a significant overestimation of patient care hours in the AMA data, which explained about 75 percent of the discrepancy between AMA and Medical Board figures. Another major reason for the discrepancy was that the AMA Masterfile listed many physicians as having an active California license when there was no matching license number in the California Medical Board licensure file.

If the cut-point is changed from 20 or more hours per week of patient care to 10 or more hours per week, the total number of patient care physicians in California increases from 66,480 to 72,062 (see Table 2), which is still far lower than the AMA figure. Even if every physician who practiced as little as one hour per week of patient care in California were to be included, the Medical Board physician count would still remain lower than the AMA count of California patient care physicians based on at least 20 hours per week of patient care (see Table 2).

Table 2. Medical Board MD Counts, by Patient Care Hours Per Week, 2008

	HOURS/WEEK		
	20+	10+	1+
Total MDs	66,480	72,062	77,750
Primary Care MDs	22,528	24,464	26,471
Specialists	43,952	47,598	51,279

Source: Medical Board of California.

Assessing the Adequacy of the State's Physician Supply

The Medical Board data, as analyzed in this study, indicate that prior analyses using AMA data have almost certainly overestimated the actual number of MD physicians practicing in California. The new figures prompt a reexamination of whether California has a shortage of physicians relative to the population's need. For purposes of assessing the adequacy of California's supply of physicians, based on the new Medical Board data, this report uses the estimates of physician supply needs compiled by the Council on Graduate Medical Education (COGME) in 1996. (For discussion of the COGME figures, see the box on page 8.) Whether the Medical Board data shows that California falls below or is merely near the bottom of COGME estimated supply needs, in particular with regard to primary care physicians, depends on how the COGME standards are applied.

COGME Physician Supply Estimates: Bases and Limitations

There are no universally recognized standards for “adequate” supplies of primary care and specialist physicians. Among other things, this is in large part because supply needs vary over time and place, depending on demographics and care delivery systems. However, in the 1990s a number of studies were undertaken to determine what the supply needs for physicians were likely to be in the early 21st century. Five of these studies were analyzed in 1996 by COGME:

Four of these studies are demand-based methodologies, and one large-scale effort—the Graduate Medical Education National Advisory Council (GMENAC) Study—utilized a needs-based methodology to estimate requirements for practicing physicians. The GMENAC model projected physician need based on the prevalence of illness and estimates by provider panels of physician services required to manage these illnesses. Conversely, the demand based models establish their assumptions on the manner in which medical services are paid (e.g., the percentage of capitated managed care versus fee-for-service) and current patterns of utilization. COGME places special emphasis on those demand models that assume increasing domination of the health care system by managed care arrangements. These systems use fewer patient care physicians per 100,000 population and a higher proportion of generalists than do the fee-for-service arrangements that have dominated health care delivery in this nation.⁶

Despite their different approaches, the studies arrived at similar ranges for the estimated level of need for primary care (or generalist) physicians: 60 to 80 per 100,000 population, the figure adopted by COGME. There was less agreement among the studies with regard to the estimated need for specialist physicians, ranging from 82 to 138 specialists per 100,000 population. Given the assumption that managed care (with its emphasis on primary care physicians) would continue to increase its share within the health care system, COGME concluded that 85 to 105 specialists per 100,000 population was a reasonable estimate.

The COGME physician supply level estimates do not claim to establish standards or even agreed-upon minimum needs. Moreover, they are based on data that is now more than a decade old. Nonetheless, because they are based upon the most substantial studies available, and offer a range rather than absolute figures, they are the estimates often used by studies that interpret the adequacy of physician supply, including two prominent studies of physician supply in California.⁷

The 66,480 active physicians in the state, estimated using the Medical Board data, amount to 174 physicians per 100,000 population. This breaks down as 59 primary care physicians and 115 specialists per 100,000 population (see Table 3). However, unlike the Medical Board data, the COGME figures include both MDs and DOs. If an estimate of the number of DOs in California were added to the Medical Board MD counts (using AMA Masterfile data to estimate the number of DO patient care physicians in California in primary care and specialist fields), California would have 63 primary care physicians per 100,000 population. This would put California just above the bottom end of the COGME supply need estimate of 60 per 100,000. The number of specialists per 100,000 population in

California (118), based on the Medical Board data plus estimates of DO specialist physicians, remains well above the COGME upper range supply need estimate of 105 per 100,000.

Approached slightly differently, however, the total physician figures for California appear even lower than the Medical Board’s MD-only data. The COGME figures are based on counts of full-time equivalent patient care physicians, whereas the Medical Board data in this study enumerates only physicians who work 20 hours per week or more. Adapting the Medical Board survey data on physicians’ reports of the number of hours they practiced each week to estimate the number of full-time (more than 40 hours per week) patient care MD physicians (FTEs) in California, this

Table 3. Counts of Active California Physicians with and without AMA Masterfile Estimates of Active DO Physicians, 2008

	MEDICAL BOARD	MEDICAL BOARD PLUS AMA DO ESTIMATES
Total Physicians	66,480	69,460
per 100k population	174	181
Total Primary Care Physicians	22,528 (34%)	24,124 (35%)
per 100k population	59	63
Total Specialists	43,952 (66%)	45,336 (65%)
per 100k population	115	118

Sources: American Medical Association Masterfile and Medical Board of California.

study determined that there were 63,844 patient care physician FTEs in the state. This figure is considerably lower than the 66,480 active patient care MD physicians shown by the Medical Board data based on 20 hours or more per week.

Examining County-level Physician Supply

The supply of physicians in California varies tremendously across counties. Table 4 presents the Medical Board estimates of the number of active patient care MD physicians, and number per 100,000 population, for each county. In general, rural counties have far fewer physicians per capita than urban counties; Central Valley and Inland Empire counties are particularly likely to have a low supply of physicians. Alpine and Sierra counties have zero and one physician, respectively, but they are sparsely populated (under 3,700 residents) rural counties. Of counties with a population of at least 20,000, Glenn, Colusa and San Benito counties have the lowest supply of physicians per capita. Riverside is the only county with a population above 1,000,000 to have fewer than 100 physicians per 100,000 population.

Table 4. Active Patient Care MD Physicians in California and by County, 2008

COUNTY	POPULATION	PATIENT CARE MDs	
		TOTAL	PER 100K
California	38,246,598	66,480	174
Alameda	1,530,697	3,228	211
Alpine	1,344	0	0
Amador	39,404	57	145
Butte	223,572	395	177
Calaveras	46,658	33	71
Colusa	22,830	12	53
Contra Costa	1,053,710	2,004	190
Del Norte	30,297	35	116
El Dorado	183,399	203	111
Fresno	946,353	1,281	135
Glenn	29,943	13	43
Humboldt	133,266	243	182
Imperial	179,798	144	80
Inyo	19,007	38	200
Kern	835,007	930	111
Kings	157,572	119	76
Lake	65,947	78	118
Lassen	37,231	35	94
Los Angeles	10,385,372	18,288	176
Madera	154,405	193	125
Marin	253,331	690	272
Mariposa	18,772	10	53
Mendocino	91,794	159	173
Merced	261,587	212	81
Modoc	10,562	3	28
Mono	14,351	23	160
Monterey	427,571	662	155
Napa	138,956	321	231
Nevada	101,012	172	170
Orange	3,152,642	5,827	185
Placer	333,998	731	219
Plumas	21,668	24	111

Table 4. Active Patient Care MD Physicians in California and by County, 2008, continued

COUNTY	POPULATION	PATIENT CARE MDs	
		TOTAL	PER 100K
Riverside	2,119,618	2,090	99
Sacramento	1,422,789	2,865	201
San Benito	60,768	35	58
San Bernardino	2,095,918	2,543	121
San Diego	3,138,382	5,872	187
San Francisco	810,078	3,000	370
San Joaquin	706,857	905	128
San Luis Obispo	266,205	524	197
San Mateo	731,633	1,560	213
Santa Barbara	427,016	780	183
Santa Clara	1,809,774	4,326	239
Santa Cruz	265,578	451	170
Shasta	186,540	356	191
Sierra	3,657	1	27
Siskiyou	46,620	70	150
Solano	431,525	782	181
Sonoma	487,575	973	200
Stanislaus	539,299	764	142
Sutter	97,800	166	170
Tehama	63,702	52	82
Trinity	14,844	7	47
Tulare	446,533	437	98
Tuolumne	58,156	97	167
Ventura	837,840	1,330	159
Yolo	199,279	283	142
Yuba	76,556	46	60

Note: Individual figures involve rounding, so total state figures may be slightly different.

Sources: American Medical Association Masterfile and Medical Board of California (per 100k figures).

Table 5 shows Medical Board data by county for primary care physicians and specialists. Only 16 of 58 counties reach the lower end of the COGME supply need estimate for primary care physicians (more than 60 per 100,000 population) and eight counties have a supply that is less than half the midpoint (less than 35 per 100,000 population) of the COGME range. For specialists, distribution data presents a somewhat more positive picture: 32 of 58 counties are above the lower end of the COGME range (85 per 100,000 population), and 25 counties exceed the upper range (105 per 100,000 population).

Table 5. Active Primary Care MD Physicians (PCPs) and Specialists in California and by County, 2008

COUNTY	POPULATION	PCPs		SPECIALISTS	
		TOTAL	PER 100K	TOTAL	PER 100K
California	38,246,598	22,528	59	43,951	115
Alameda	1,530,697	1,195	78	2,033	133
Alpine	1,344	0	0	0	0
Amador	39,404	21	53	36	91
Butte	223,572	116	52	278	124
Calaveras	46,658	11	24	23	49
Colusa	22,830	5	22	6	26
Contra Costa	1,053,710	726	69	1,278	121
Del Norte	30,297	13	44	22	72
El Dorado	183,399	72	39	131	71
Fresno	946,353	436	46	846	89
Glenn	29,943	12	40	1	3
Humboldt	133,266	87	65	156	117
Imperial	179,798	39	22	106	59
Inyo	19,007	16	84	22	116
Kern	835,007	373	45	556	67
Kings	157,572	57	36	62	39
Lake	65,947	38	58	39	59
Lassen	37,231	18	48	17	46
Los Angeles	10,385,372	6,072	58	12,216	118
Madera	154,405	93	60	100	65

Table 5. Active Primary Care MD Physicians (PCPs) and Specialists in California and by County, 2008, continued

COUNTY	POPULATION	PCPs		SPECIALISTS	
		TOTAL	PER 100K	TOTAL	PER 100K
Marin	253,331	206	81	485	191
Mariposa	18,772	6	32	4	22
Mendocino	91,794	64	70	94	102
Merced	261,587	98	37	114	44
Modoc	10,562	2	19	1	10
Mono	14,351	7	49	15	108
Monterey	427,571	213	50	448	105
Napa	138,956	103	74	218	157
Nevada	101,012	57	56	114	113
Orange	3,152,642	2,004	64	3,822	121
Placer	333,998	280	84	451	135
Plumas	21,668	10	46	15	68
Riverside	2,119,618	773	36	1,317	62
Sacramento	1,422,789	874	61	1,991	140
San Benito	60,768	12	19	23	38
San Bernardino	2,095,918	923	44	1,620	77
San Diego	3,138,382	1,877	60	3,995	127
San Francisco	810,078	853	105	2,146	265
San Joaquin	706,857	321	45	584	83
San Luis Obispo	266,205	158	59	366	137
San Mateo	731,633	493	67	1,067	146
Santa Barbara	427,016	248	58	532	125
Santa Clara	1,809,774	1,434	79	2,892	160
Santa Cruz	265,578	155	58	295	111
Shasta	186,540	108	58	247	132
Sierra	3,657	1	28	0	0
Siskiyou	46,620	26	56	43	92
Solano	431,525	280	65	502	116
Sonoma	487,575	337	69	636	130
Stanislaus	539,299	280	52	484	90
Sutter	97,800	58	59	108	110
Tehama	63,702	27	42	26	41
Trinity	14,844	5	35	2	14

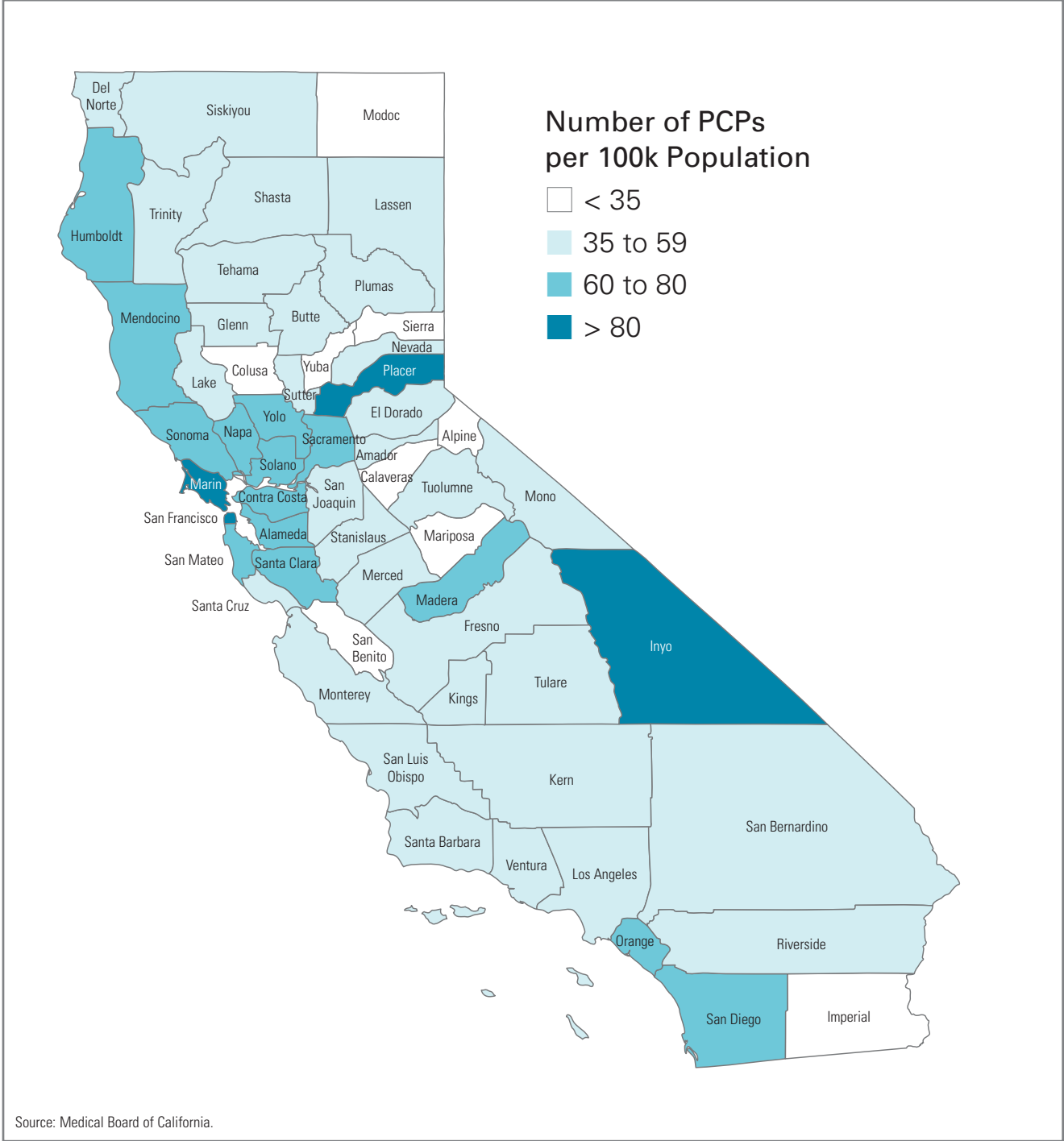
Note: Individual figures involve rounding, so total state figures may be slightly different.
Source: Medical Board of California.

For a map showing the distribution of active primary care MD physicians in California by county, see Figure 2. For a map showing the distribution of active specialist MD physicians in California by county, see Figure 3. For the number of physicians by county in more detailed specialty categories, see “Active Patient Care Physicians in California by Specialty and County” at www.chcf.org/topics/view.cfm?itemID=133954.

Aging Physicians a Problem for Rural Counties

The age distribution of physicians, by county, is presented in Appendix B. Of note in this data is that over half of all physicians practicing in Sierra, Trinity, Modoc, Lassen, Amador, Inyo, and Mendocino counties are older than 55, compared with one-third of physicians in that age group in the state as a whole. All seven of these counties are rural counties with a significantly higher percentage of general practitioners and family physicians than the state average. As their aging physicians retire, these counties are at high risk for losing their local physician infrastructure.

Figure 2. Active Primary Care MD Physicians (PCPs) in California by County, 2008



V. Conclusions and Recommendations

Key Findings

Based on results from the Medical Board's survey, the supply of physicians in California is lower than estimated from AMA Physician Masterfile data, historically the standard source of physician workforce data. Moreover, the statewide supply of primary care physicians is at or below the lower end of a commonly used estimate of the per capita need, and in most California counties is markedly inadequate. In contrast, there is an adequate number of physician specialists overall in the state, but they are not distributed in proportion to population differences across counties.

In general, rural counties tend to have far fewer physicians per capita than urban counties. Counties in the Central Valley and Inland Empire are particularly likely to have a low supply of physicians. Several rural counties also face the predicament of an aging primary care physician workforce, compounded by an apparent difficulty recruiting younger physicians to replenish it.

Study Limitations

The Medical Board survey offers a meaningful improvement in the way that the California physician workforce can be enumerated. However, data from the Medical Board survey has certain limitations. The first category of limitations has to do with the absence of any survey data for a number of physicians. In 2008, about 11 percent of licensed physicians did not provide information on their training status, practice hours or office location. Almost half of these non-respondents did not participate at all in the survey because they were

applying for their initial California medical license, a process that does not include the survey.

This study attempted to adjust its results to estimate how many of the non-respondents would meet the criteria of a physician actively practicing in California. Nonetheless, it is not possible to determine exactly how accurately the study gauged the number of non-respondents practicing in the state. The response rate to the Medical Board's survey has improved from its introduction four years ago, and with additional follow-up effort it may be possible to approach a near complete capture of all physicians undergoing relicensing. That will further improve the accuracy of the Medical Board's data, though the absence of surveys by newly licensed physicians will continue to leave a gap.

The number of DOs practicing in the state constitutes another gap in the survey data. DOs are not licensed by the Medical Board and therefore are not included in the survey. Adding an estimated number of these providers to the Medical Board data marginally increases the number of doctors practicing in California but does little to change the observed mix between primary care physicians and specialists. It would be valuable for future health care workforce assessments if the Osteopathic Medical Board of California, which licenses DOs, adopted the Medical Board's survey into its relicensing process.

A technical problem in survey reporting presents another limitation regarding this study's results. Surveys that are returned by mail are electronically scanned for data entry. Errors may occur in this process that could misclassify the practice zip code or some other information that might alter survey results. Increasingly, however, physicians are

completing the relicensing process on line, so data entry errors are less likely to be a problem over time.

Finally, it is likely that distinctions between primary care physicians and specialists may not be completely reliable. This study classified physicians as either primary care or specialist on the basis of their self-reporting, which does not necessarily reflect training or board certification. Furthermore, the actual practice of physicians may not be perfectly mirrored in the study's estimates about primary care and specialist physicians. For example, a primary care physician may function as a specialist in an emergency department, or a specialist physician may assume the role of a primary care physician for some or most patients. Market trends have led to an increasing disparity in payments between specialty and primary care, which suggests that there are probably more primary care physicians functioning in specialty roles than there are specialist physicians practicing primary care. To the extent this is true, the study probably overcounts the number of physicians truly practicing primary care and, conversely, undercounts physicians practicing specialty care.

Policy Implications

This study suggests that there may be a more serious shortage of primary care physicians in California than previously recognized. The shortage is likely to be exacerbated by a shrinking interest in the field nationally among graduates of U.S. medical schools.⁸ This declining interest has been traced to the growing pay differential between primary care and specialist physicians, plus a growing dissatisfaction by primary care physicians about managing the increasing complexity and time demands of their practices.⁹

The low, declining numbers of primary care physicians in California poses a significant threat to health care access in the state. When measured against one commonly cited estimate of

physician supply needs, many areas in California are underserved by having too few primary care physicians and, in some cases, too few specialists as well. Previous research has shown that California communities with high concentrations of low income and minority residents are especially likely to have physician shortages.¹⁰ Future erosion of the supply of primary care physicians will likely disproportionately impact these already disadvantaged communities. These same communities are also adversely affected by another trend: the widening gap between the racial and ethnic composition of the state's population and that of its physician workforce. For example, Latinos now constitute one-third of the state's population but only 5 percent of its physicians.¹¹ Physicians from underrepresented minority groups are especially likely to practice in minority communities that have relatively low levels of physician supply.¹² Thus, a decrease in the number of primary care physicians over time, as well as persistent under-representation of minorities in U.S. and California medical schools, compounds problems of health care access in disadvantaged communities.

Recommendations

California policymakers might consider a series of steps to reverse the trend of primary care physician shortages and the maldistribution of physicians across the state. Additionally, the state could support efforts to redesign the delivery of medical care, in order to improve the productivity and effectiveness of the existing physician workforce and promote more innovative and rewarding practice models in primary care.

1. Provide financial incentives to encourage primary care physicians to practice in California and especially in underserved areas.

One way this could be done is by adjusting payment rates for primary care in state-run programs such as Medi-Cal. State policymakers could also advocate for other payers, such as Medicare and private health plans, to make similar increases in payment rates for primary care relative to specialty care. The state could also incentivize trainees to enter primary care, and to practice in underserved locations, by making loan repayment assistance more available to those who choose these options, such as by increasing funding for the National Health Service Corps/California State Loan Repayment Program and a related California program, the Steven M. Thompson Physician Corps Loan Repayment Program.¹³

2. Increase the number of new physicians entering primary care and, in particular, entering primary care practice in underserved areas, by targeting support to training programs with this mission.

Funding for Song-Brown primary care training grants¹⁴ for family medicine residencies in California could be increased to better support existing programs, and to expand support for

residency training programs in all primary care fields, including family medicine, general internal medicine, general pediatrics, and geriatrics. The state should continue to ensure financial support for recently established UC PRIME¹⁵ medical student programs that focus on training students who are committed to caring for the underserved. The state should also implement plans by the University of California to create new medical schools in locations, such as Riverside and Merced, which have substantial physician shortages and ensure that these new schools emphasize service to local regions.

3. Support efforts to redesign the delivery of medical care.

Organizational innovation is required to more productively utilize the state's existing physician workforce, particularly in primary care where there are severe shortages. One critical infrastructure need is for investment in information technology that would support systems improvements, such as chronic and preventive care registries and electronic reminders, and enable connections across practices for electronic referrals, telemedicine, and opportunities for shared decision-making and learning.¹⁶ Information technology can also help enable physicians to delegate tasks to other practice staff, such as medical assistants and health workers; for example, many routine tasks in chronic and preventive care can be safely performed by these personnel with computer-assisted protocols under physician supervision.¹⁷ Innovative practice approaches are also exploring how physicians can collaborate more effectively with nurse practitioners, physician assistants, registered nurses, clinical pharmacists, mental health clinicians, and other health professionals in team-based models, so as

to better provide comprehensive primary care to the growing number of patients with chronic illness. Redesigning the delivery of medical care holds great promise for improving access to and quality of patient care as well as the professional satisfaction and efficiency of clinicians.

4. Invest in the continued measuring and monitoring of the California health care workforce.

Policymakers need to engage critical stakeholders who can collect and analyze high quality data and who can act upon the results to improve health care delivery in the state. The Medical Board of California survey data presents a substantial improvement over previous information derived from the AMA and should become the standard for physician workforce analysis in the state. California should build upon the success of the Medical Board survey by adding other timely, policy-related items to it. The state should also implement routine licensure-related surveys for other health professions, with one of the first priorities being a relicensure survey for DOs, which would contribute to a more complete enumeration of practicing physicians in California. SB 139, authored by Senator Scott and signed into law in 2007, calls for the state Office of Statewide Health Planning and Development to establish a state health care workforce clearinghouse. This clearinghouse, currently under development, offers great potential for synthesizing data from relicensure-linked surveys to produce regular, informative reports on the status of California's health professions.

Appendix B: Active Patient Care Physicians* in California by Age and County

	NUMBER OF DOCTORS								% DISTRIBUTION						
	ALL AGES	<30 YEARS	30-35 YEARS	36-45 YEARS	46-55 YEARS	56-65 YEARS	66-75 YEARS	75+ YEARS	<30 YEARS	30-35 YEARS	36-45 YEARS	46-55 YEARS	56-65 YEARS	66-75 YEARS	75+ YEARS
California	66,480	266	6,147	18,987	18,645	16,182	5,246	1,005	0.4	9.2	28.6	28.0	24.3	7.9	1.5
Alameda	3,228	9	420	981	843	729	204	42	0.3	13.0	30.4	26.1	22.6	6.3	1.3
Alpine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amador	57	0	0	9	18	24	6	0	0.0	0.0	16.3	31.4	41.4	10.7	0.0
Butte	395	0	25	94	108	127	38	3	0.0	6.3	23.8	27.4	32.2	9.5	0.8
Calaveras	33	0	1	8	14	8	1	1	0.0	4.5	24.2	41.3	24.9	3.1	3.1
Colusa	12	0	0	3	3	3	2	0	0.0	0.0	28.0	26.2	25.7	16.8	0.0
Contra Costa	2,004	4	185	632	559	466	134	24	0.2	9.2	31.5	27.9	23.3	6.7	1.2
Del Norte	35	0	1	6	12	11	5	0	0.0	4.2	16.4	33.1	32.5	14.5	0.0
El Dorado	203	0	17	67	64	45	10	0	0.0	8.2	33.1	31.5	22.2	5.0	0.0
Fresno	1,281	5	95	333	402	336	94	17	0.4	7.4	26.0	31.4	26.2	7.4	1.3
Glenn	13	0	1	2	5	4	0	0	0.0	11.3	17.2	40.3	31.6	0.0	0.0
Humboldt	243	0	13	54	78	85	13	0	0.0	5.5	22.1	32.0	35.1	5.4	0.0
Imperial	144	0	12	35	31	44	18	4	0.0	8.1	24.2	21.9	30.7	12.7	2.8
Inyo	38	0	1	10	7	14	5	0	0.0	3.9	26.5	19.6	37.9	13.3	0.0
Kern	930	0	66	237	283	244	83	16	0.0	7.1	25.5	30.5	26.2	9.0	1.7
Kings	119	0	6	29	27	36	17	3	0.0	4.9	24.6	23.0	30.3	14.5	2.5
Lake	78	0	0	15	28	28	6	1	0.0	0.0	18.8	36.4	35.6	7.8	1.3
Lassen	35	0	2	4	11	11	4	3	0.0	6.0	10.0	30.2	32.4	11.6	8.6
Los Angeles	18,288	111	1,686	4,792	4,905	4,696	1,725	372	0.6	9.2	26.2	26.8	25.7	9.4	2.0
Madera	193	0	13	50	63	56	11	1	0.0	6.8	25.7	32.6	28.8	5.8	0.5
Marin	690	0	47	187	192	182	68	15	0.0	6.8	27.0	27.8	26.4	9.9	2.2
Mariposa	10	0	2	0	4	4	0	0	0.0	19.3	0.0	41.9	41.5	0.0	0.0
Mendocino	159	0	1	30	47	60	18	2	0.0	0.9	19.0	29.7	37.4	11.5	1.3
Merced	212	0	14	48	61	63	21	5	0.0	6.4	22.8	28.7	29.6	10.0	2.4
Modoc	3	0	0	0	1	2	0	0	0.0	0.0	0.0	34.9	68.6	0.0	0.0
Mono	23	0	4	8	8	2	0	0	0.0	19.0	34.1	36.7	8.9	0.0	0.0
Monterey	662	0	35	183	193	180	57	14	0.0	5.3	27.7	29.2	27.1	8.6	2.1
Napa	321	0	16	63	103	104	26	9	0.0	5.0	19.5	32.0	32.3	8.2	2.8
Nevada	172	0	1	49	49	57	11	3	0.0	0.9	28.6	28.7	33.4	6.5	1.8

*Not in training.

NOTE: Totals may not add up due to rounding

	NUMBER OF DOCTORS								% DISTRIBUTION						
	ALL AGES	<30 YEARS	30-35 YEARS	36-45 YEARS	46-55 YEARS	56-65 YEARS	66-75 YEARS	75+ YEARS	<30 YEARS	30-35 YEARS	36-45 YEARS	46-55 YEARS	56-65 YEARS	66-75 YEARS	75+ YEARS
Orange	5,827	23	560	1,734	1,594	1,372	472	72	0.4	9.6	29.8	27.4	23.5	8.1	1.2
Placer	731	0	53	260	219	169	27	2	0.0	7.2	35.6	30.0	23.2	3.7	0.3
Plumas	24	0	0	9	5	8	2	0	0.0	0.0	37.3	22.1	34.2	8.4	0.0
Riverside	2,090	13	165	584	631	486	168	44	0.6	7.9	27.9	30.2	23.2	8.0	2.1
Sacramento	2,865	13	297	932	829	610	160	23	0.5	10.4	32.5	28.9	21.3	5.6	0.8
San Benito	35	0	4	10	8	9	2	1	0.0	12.5	28.8	24.0	26.6	5.8	2.9
San Bernardino	2,543	17	272	705	689	618	212	31	0.7	10.7	27.7	27.1	24.3	8.3	1.2
San Diego	5,872	28	579	1,761	1,765	1,289	381	67	0.5	9.9	30.0	30.1	21.9	6.5	1.1
San Francisco	3,000	5	346	927	748	665	248	62	0.2	11.5	30.9	24.9	22.2	8.3	2.1
San Joaquin	905	0	72	256	252	240	74	10	0.0	8.0	28.3	27.8	26.6	8.2	1.1
San Luis Obispo	524	0	17	148	178	147	29	4	0.0	3.3	28.2	34.0	28.0	5.6	0.8
San Mateo	1,560	0	172	516	415	322	113	22	0.0	11.0	33.1	26.6	20.6	7.2	1.4
Santa Barbara	780	0	39	197	230	222	75	17	0.0	5.1	25.2	29.5	28.4	9.6	2.2
Santa Clara	4,326	35	506	1,422	1,145	878	294	45	0.8	11.7	32.9	26.5	20.3	6.8	1.0
Santa Cruz	451	0	23	148	125	128	23	3	0.0	5.2	32.8	27.7	28.5	5.2	0.7
Shasta	356	0	11	91	148	83	19	4	0.0	3.1	25.5	41.6	23.4	5.4	1.1
Sierra	1	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Siskiyou	70	0	10	12	27	16	3	1	0.0	14.1	17.6	39.0	23.5	4.3	1.4
Solano	782	0	90	233	228	183	42	6	0.0	11.5	29.8	29.1	23.4	5.3	0.8
Sonoma	973	0	39	263	311	291	61	9	0.0	4.0	27.0	31.9	29.9	6.3	0.9
Stanislaus	764	0	56	236	231	175	57	10	0.0	7.3	30.9	30.2	22.8	7.4	1.3
Sutter	166	0	4	50	63	37	11	1	0.0	2.2	30.3	37.9	22.3	6.7	0.6
Tehama	52	0	3	8	19	17	4	1	0.0	5.6	15.1	36.3	33.6	7.9	1.9
Trinity	7	0	0	1	1	5	0	0	0.0	0.0	16.0	15.0	73.3	0.0	0.0
Tulare	437	0	18	100	121	145	45	9	0.0	4.2	22.9	27.6	33.1	10.2	2.1
Tuolumne	97	0	3	18	35	33	7	1	0.0	3.5	18.5	35.7	33.9	7.4	1.0
Ventura	1,330	4	113	334	401	341	124	14	0.3	8.5	25.1	30.1	25.6	9.3	1.1
Yolo	283	0	26	87	89	59	14	7	0.0	9.3	30.8	31.5	20.7	5.0	2.5
Yuba	46	0	1	15	18	11	1	0	0.0	3.2	32.0	38.8	24.6	2.2	0.0

*Not in training.

NOTE: Totals may not add up due to rounding

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