The Arizona Physician Workforce Study: Part II

1994-2005

Mary E. Rimsza, MD, FAAP, FSAM

William G. Johnson, PhD

Mark Speicher, MHA

Center for Health Information & Research

School of Computing and Informatics

Ira A. Fulton School of Engineering

Arizona State University

Michael Grossman, MD, MACP

Associate Dean for Graduate Medical Education

Executive Director, Arizona Medical Education Consortium (AzMEC)

and University of Arizona Health Sciences Center

Sponsored by: St. Luke's Health Initiatives, Flinn Foundation, & BHHS Legacy Foundation

Contents

Acknowledgements

The authors gratefully acknowledge the cooperation of Mr. Tim Miller and Ms. Bernadette Phelan, PhD, the Director and the former Associate Executive Director, respectively, of the Arizona Medical Board and Mr. Jack Confer, the Executive Director of the Arizona Board of Osteopathic Examiners. Additionally, we express our thanks to Lori Kemper, DO, Associate Dean, Graduate Medical Education of Midwestern University, Arizona College of Osteopathic Medicine. This study could not have been accomplished without their assistance and the cooperation of their staffs. We would also like to thank the members of Arizona State University's (ASU) Center for Health Information & Research (CHIR): Wade Bannister, Data Analytics Manager; Amy Bartels, Senior Research Analyist; Miwa Edge, Senior Application Systems Analyst; Kathleen Russell, Program Manager; Anika Chartrand, Graphic Designer; and Tameka Jackson, Administrative Specialist for their contributions.

Introduction

This report is the second in a series of reports on the Arizona Physician Workforce. *The Arizona Physician Workforce Study Part I: The Numbers of Practicing Physicians*, our first report published in May 2005 (Johnson et al., 2005), described trends in the physician population in Arizona from 1992 through 2004, physician population ratios by county in 2004, summarized previous reports on the physician workforce, and discussed the relationship between attending medical school or residency in Arizona and developing a practice here, as well as the time lag in increasing the supply of physicians.

Key findings in our first report were:

- The Arizona physician-to-population ratio in 2004 was 207 physicians per 100,000 people, less than the national average.[1]
- There are large disparities in the urban/rural distribution of Arizona physicians with physician-to-population ratios ranging from a high of 276 physicians per 100,000 individuals in Pima County to a low of 48 physicians per 100,000 individuals in Apache County in 2004.
- Out-of-state medical schools provide 90% of Arizona's allopathic physician workforce in Arizona.

Our current report provides updated information on the supply of Arizona physicians in 2005, results of a 2005 graduating resident physician survey, and a 2005 survey of newly licensed physicians. The report also includes an analysis of the practicing Arizona physician workforce by specialty and discusses trends in physician productivity. Finally, we review current models used to determine physician supply and demand and apply the models to forecast the supply of physicians in Arizona over the next 15 years.

The key findings in our current report are:

- The number of practicing physicians (Medical Doctors [MDs] and Doctors of Osteopathy [DOs]) in Arizona increased from 12,024 in 2004 to 13,215 in 2005.
- Although the number of practicing physicians in Arizona increased 10% from 2004 to 2005, the physician per 100,000 population ratio only increased by approximately 6%—from 207 in 2004 to 219 in 2005—and remains well below the national average.
- The disparate urban/rural distribution of physicians in Arizona continued in 2005, with physician-to-population ratios ranging from a high of 292 in Pima County to a low of 50 in Apache County (Table 1).

1 Physician-to-population ratios are the most common measures of the physician supply, but differences in how physicians are counted (all physicians, licensed physicians, "active" (in clinical practice) physicians, and other methods) lead to rather large differences in ratios. Last year, we used an estimate by the Health Resources and Services Administration (HRSA) for FTE physicians in the year 2000, which was 283/100,000 for the entire United States (U.S.); the HRSA prediction for 2005 was 293/100,000. In contrast, the Government Accounting Office found 239 physicians/100,000 population nationally in 2001 and 207/100,000 in Arizona. The Kaiser Family Foundation found 281 non-federal physicians/100,000 nationally in 2004, while the American Association of Medical Colleges found the 2005 ratio to be about 246/100,000. Our report measures physicians holding an active Arizona license, with a practice address in Arizona, as outlined in the "Methodology" section of our report.

Table 1. Physician Supply in Arizona by County, 2005

County	Number of Physicians	2005 Population	Physicians per 100,000 Population
Apache	37	73,775	50
Cochise	147	131,790	112
Coconino	335	130,530	257
Gila	81	54,445	149
Graham	40	35,455	113
Greenlee	7	8,300	84
La Paz	21	21,190	99
Maricopa	8501	3,648,545	233
Mohave	268	188,035	143
Navajo	122	109,985	111
Pima	2798	957,635	292
Pinal	184	246,660	75
Santa Cruz	35	44,055	79
Yavapai	363	205,105	177
Yuma	242	189,480	128
Entire State	13,215	6,078,359	219

Source: Arizona Medical Board (AMB) and Arizona Osteopathic Board (AOB) data, 2005; Population data from U.S. Census Bureau data.

Note: The total number 13,215 includes 38 physicians whose address was listed as "Arizona" but no county or zip code was provided. It excludes four physicians whose address was not an in-state address but who gave a zip code that was mapped to an Arizona county. Additionally, because physicians working in federal facilities (e.g., Indian Health Service hospitals) are not required to have an Arizona license, the size of the physician workforce in counties with these facilities may be underreported.

This report is divided into five sections. Section I describes influences on the physician supply in Arizona, emphasizing specialty distribution, the impact of Arizona residency training programs on physician supply, and changes in the physician population. Section II reviews factors impacting physician productivity and describes changes in physician productivity over the past decade. Section III reviews existing models of the demand for health care providers. Section IV discusses existing models for the supply of and demands for health care providers, and predicts the demand for and supply of physicians in Arizona. Section V includes a brief summary and recommendations for further study.

Data Sources

The results in this report are based on licensing data from the Arizona Medical Board (AMB), the Arizona Board of Osteopathic Examiners in Medicine and Surgery (The Arizona Osteopathic Board, or AOB), and survey questions that are included in the initial license applications and license renewal applications submitted by physicians to the AMB and AOB. Licensure data on physician assistants (PAs) were provided by the Arizona Medical Board for the Arizona Regulatory Board of Physician Assistants. Licensure data on advanced practice nurses (APNs) were provided by the Arizona State Board of Nursing (AZBN). Additional data were also obtained from past studies that also were based on the AMB and AOB licensing data and surveys conducted from 1992 – 1997 with the support of the Flinn Foundation (Johnson et al., 1992, 1999, 2004; Thornton, Johnson, & Quiroz, 1998).

Three surveys are utilized for this report:

- the Practicing Physician Survey (PPS) surveying physicians renewing their Arizona licenses,
- the New Physician Survey (NPS) surveying physicians applying for an Arizona license for the first time, and
- the Graduating Resident Survey (GRS) surveying resident physicians graduating from Arizona residency training programs approved by Accreditation Council of Graduate Medical Education (ACGME).

The Practicing Physicians Survey includes questions that can be used to measure physician productivity (e.g., clinical work hours, patient panel) and practice patterns (e.g., time spent in non-clinical care). The New Physician Survey includes questions on motivations for practicing in Arizona. The Graduating Resident Survey provides information on the factors that influenced graduating residents' choice of practice location (Table 2).

Table 2. Data Sources

Data Source and Coverage / Measures of Interest
AMB and AOB Licensure Data —Statewide, 1990-91; 1992-97, 2002-05
1. Office locations of MDs, PAs and DOs
2. Medical specialties
3. Demographic data
AZBN (Arizona State Board of Nursing) Licensure Data – Statewide, 2005
1. Office locations of APNs
PPS—Statewide, 1992-97, 2003-05
1. Productivity measures
2. Characteristics of practice
3. Effects of managed care
4. Other practice changes over time
NPS—MDs only, Statewide, 2004-05
1. Reasons for application for licensure in AZ
2. Reasons for choosing to practice in AZ
GRS—MDs and DOs completing residency training in ACGME-approved Arizona programs, statewide, 1993-95, 2005
1. Intent to practice in AZ
2. Reasons for choosing first practice

The productivity of physicians is influenced by the extent to which they are assisted by non-physician clinicians (NPCs) such as advanced practice nurses and physicians assistants. This report includes data on the number and geographic distribution of NPCs utilizing licensure data. However, because surveys are not available for NPCs, we cannot assess their productivity or practice patterns. We hope to include ongoing survey information on NPCs as part of their licensing process in future reports in order to obtain a better picture of their role in provision of health care services.

Methodology

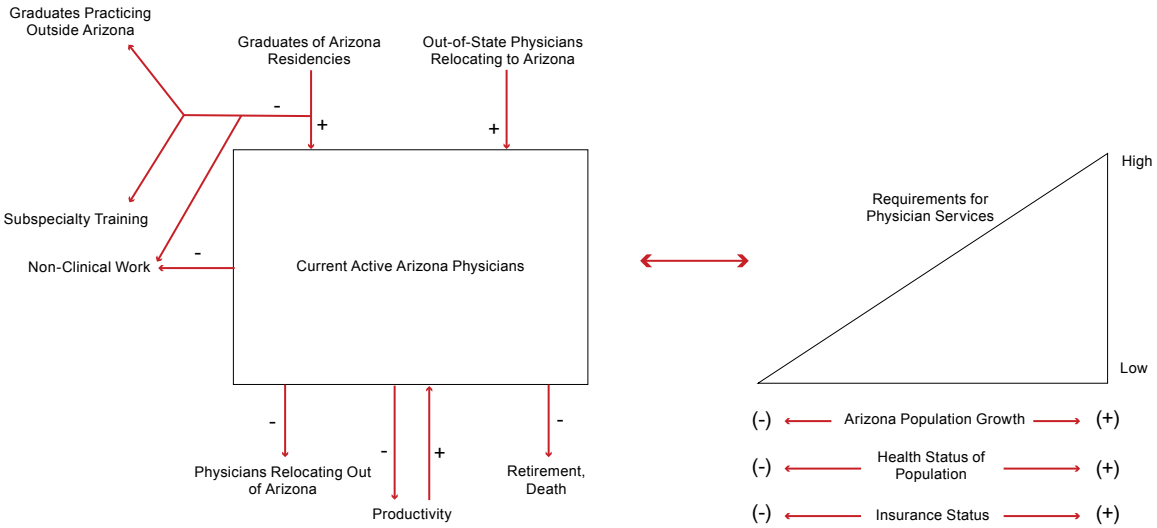
Concepts and Definitions

In this report, we define an Arizona physician as an MD or DO who has an active Arizona license and lists a practice address in the state of Arizona. For convenience, we use the term physician supply to refer to numbers of physicians. The number of physicians is not, however, synonymous with the supply of physician services — a more appropriate measure of supply. We define the supply of physician services as the product of the number of physicians, their hours of work, and some measure of productivity (such as the number of patients seen per hour of work). It will also be necessary to consider the type of health care services provided by physicians in defining the supply of physician services. The supply of physician services can be defined by specialty area (e.g., pediatrics, obstetrics), patient population served (e.g., children, adults, pregnant women), or nature of services (e.g., inpatient services, preventive health, acute medical care). The demand for the physician's services also varies and is influenced by the demographic characteristics and prevalence of disease in the community where the physician chooses to practice. For example, the demand for pediatricians can be expected to be lower in a community where the majority of residents are retirees than in a rapidly growing community with young families.

Additionally, if physician productivity is measured in terms of number of patients seen per hour of work, productivity can be expected to vary by physician specialty. For physicians in some specialties (e.g., oncology), the majority of their patients have complex diseases (e.g., cancers) which require more time per patient visit than is needed to provide care to healthier patients who may require only preventive care. Also, the type of services provided by the physician will affect the number of patients seen per day and the demand for physician services. For example, a surgeon who is performing minor surgery (e.g., vasectomy) in an ambulatory surgery center may be able to complete more procedures per day than a physician who is performng major surgery (e.g., coronary artery bypass) in a hospital operating room.

The current supply of active Arizona physicians is increased by both new physicians who graduate from Arizona residencies and choose to enter practice in Arizona and out of state physicians who relocate to Arizona either immediately after completing residency training or after practicing in other states (Figure 1). Conversely, the supply of active Arizona physicians is reduced by the retirement, death, or relocation of physicians who had been practicing in Arizona as well as the loss of physicians who leave clinical medicine for non-clinical pursuits such as research or administration. The factors contributing to the overall supply of physicians are discussed in Section II of the report. The demand for physician services changes with population growth as well as in response to changes in demographics, health status, and insurance coverage of the Arizona population. The manner in which we predict the demand for physician services is discussed in Section III of the report, and future trends in supply and demand are discussed in Section IV.

Figure 1. Factors Affecting the Supply and Demand for Physicians



Source: Adapted from Shipman, Lurie, & Goodman, 2004, p. 436.

Surveys

The New Physician Survey was distributed to 1,308 allopathic physicians[2] applying for a license in Arizona in 2005. A total of 808 surveys were returned for a response rate of 62%. The Graduating Resident Surveys were sent to Arizona residency program directors for distribution to the 366 residents graduating from ACGME-approved programs in Arizona in 2005; 144 Graduating Resident Surveys were returned for a response rate of 39%. Response rates for the surveys are discussed in greater detail in Appendix A.

The Practicing Physician Survey was distributed to all physicians with an "active" license who were required to renew their licenses during the years 2003 through 2005. Because the license renewal cycle is never longer than two years, every licensed physician in Arizona received at least one Practicing Physician Survey but some physicians may have received two surveys during the time period. If two surveys were completed by a physician between 2003 and 2005, the more recently completed survey was used for our results. The data from the Practicing Physician Surveys were matched to the demographic data on each respondent so that survey data could be analyzed by gender, age group, specialty, and practice location.

In discussing the future of the Arizona physician workforce, we begin with the present-day factors that determine the supply of physicians according to the model expressed in Figure 1. In determining the supply of physicians, we look first at the total changes in the number of physicians that was present in 2004.

2 No record was kept of the names of those to whom the survey was distributed. Since the respondents did not yet have Arizona licenses, they cannot be matched to our license number database. This number likely underestimates the true response rate of those who applied for an Arizona license and came to Arizona to practice.

Section I – Supply of Arizona Physicians

The supply of physicians in Arizona increased 10% from 12,045 in 2004 to 13,215 in 2005. Table 3 shows the changes in supply by specialty. The proportion of physicians in each specialty category remained relatively constant except the "other/unknown" specialties.[3] This finding differs from national studies reporting that a smaller percentage of graduating physicians are choosing to practice primary care (Brotherton et. al., 2001; Newton & Grayson, 2003) though this trend may have leveled off (Brotherton et. al., 2005). The number of allopathic physicians (MDs) increased from 10,787 to 11,616, almost 8%, while the number of osteopathic physicians (DOs) increased almost 30%, from 1,237 to 1,599. The proportion of total physicians who are DOs increased from 10% in 2004 to 12% in 2005. The number of MDs in urban counties increased by almost 8% from 9,307 in 2004 to 9,999 in 2005 (Figure 2); the number of MDs in rural counties increased by 10% from 1,473 to 1,617 (Figure 3). This year, for the first time, we have measured the increase in osteopathic physicians in rural and urban areas.[4] For DOs, there was a 29% increase in physicians in urban counties (from 1,006 to 1,299) and a 26% increase in physicians practicing in rural counties (from 238 to 300).

Table 3. Changes in Physician Supply by Specialty Groups, 2004 – 2005[5]

Specialty	*Number of Physicians, 2004 (Percent of Total Physicians)*	*Number of Physicians, 2005 (Percent of Total Physicians)*	*Percent Change, 2004 – 2005*
Total Physicians	12,024(100%)	13,215 (100%)	10%
Primary Care	5,498 (46%)	6,139 (46%)	12%
Surgical Specialties	1,881 (16%)	2,127 (16%)	13%
Hospital-Based Specialties	2,294 (19%)	2,498 (19%)	9%
Medical Specialties	1,429 (12%)	1,572 (12%)	10%
Pediatric Specialties	141 (1%)	154 (1%)	9%
Other/Unknown Specialties	781	725	-7%

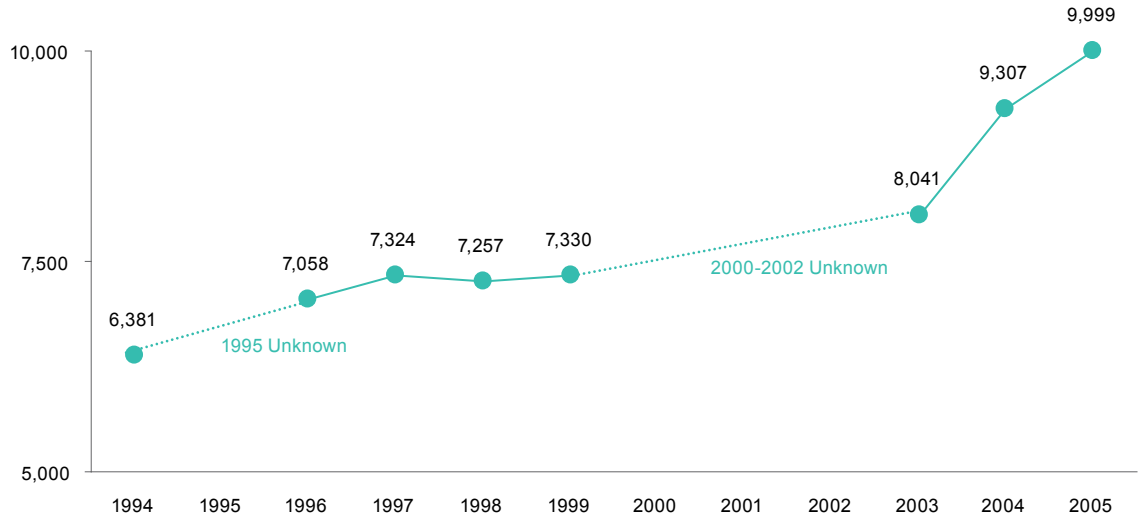
Source: AMB and AOB, 2004-2005.

3 The decrease in this category must be interpreted with caution. Because the category includes physicians who did not list a specialty, this decrease could have been caused by better response to the specialty question in 2004 than 2005.

4 The Arizona Board of Osteopathic Examiners in Medicine and Surgery did not participate in most previous studies or surveys of Arizona physicians, so licensure data is not available on osteopathic physicians for 1995 – 2003.

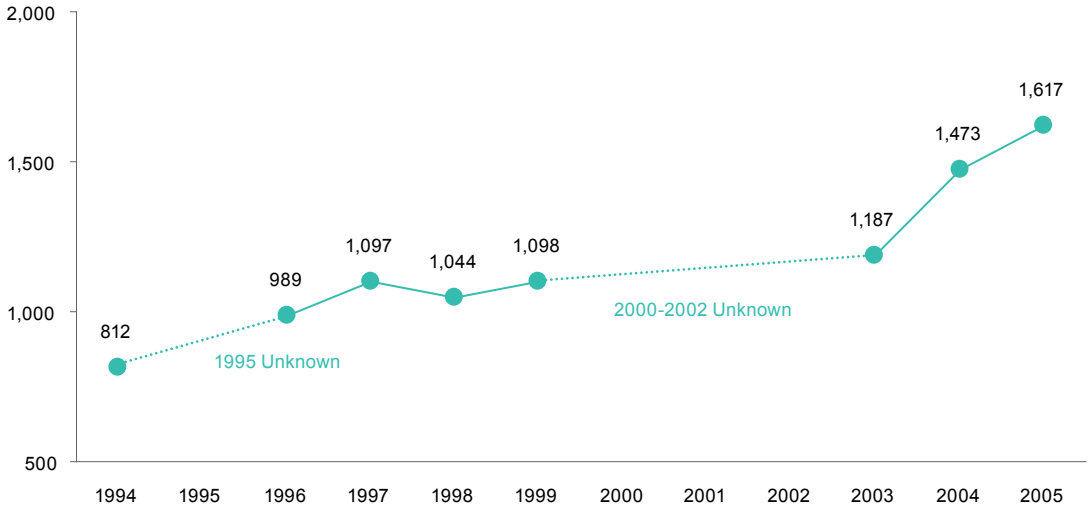
5 Based on responses to our first report, we re-categorized specialties into six categories; the manner in which specialties are assigned to categories is described in Appendix C.

Figure 2. MDs in Practice in Urban Areas of Arizona (1994 – 2005)



Source: AMB, 1994-2005

Figure 3. MDs in Practice in Rural Areas of Arizona (1994 – 2005)



Source: AMB, 1994-2005

Arizona Medical Schools and Residency Training Programs

There are two sources of new physicians for our state: physicians trained in Arizona who remain in Arizona to practice, and in-migration of practicing physicians from other states or countries. Arizona currently has one private osteopathic medical school and one public allopathic medical school. The osteopathic college, Arizona College of Osteopathic Medicine (ACOM) in Glendale, AZ (an affiliate of Midwestern University in Downers Grove, Illinois), currently graduates approximately 130 new physicians each year. The University of Arizona College of Medicine (UA) currently graduates approximately 110 new physicians each year. However, both schools have announced plans for expansion of their class sizes in the near future. In addition, a private osteopathic medical school affiliated with A.T. Still University is scheduled to open in Mesa, Arizona in 2007. Because of the small number of graduates from Arizona schools and our rapidly growing population, Arizona cannot rely solely upon its own medical schools as a source of future physicians. Indeed, analysis of licensure data indicates that the majority (89%) of today's Arizona physicians graduated from medical schools located outside of Arizona (Table 4).

Table 4. Percent of Active Arizona Physicians Born or Trained in Arizona

Percent of All Active Arizona Physicians Who…	In Arizona	Outside Arizona
Were Born	647 (6%)	10,969 (94%)
Graduated from Medical School	1,259 (11%)	10,357 (89%)
Completed a Residency Training Program	1,944 (17%)	9,611 (83%)

Source: AMB and AOB, 2005.

After completion of medical school, graduates begin residency training at a teaching hospital. Although it is possible to practice medicine as a general practitioner without completing a residency (i.e., after completing only one year of post-medical school training), many insurers will not credential these physicians and hospitals often will not grant these physicians staff privileges. Thus, almost all medical school graduates today enter a residency. ACGME accredits allopathic residency training programs in the United States. There are 8,037 ACGME-accredited resident training programs in the U.S. and 101,810 residents in training. ACGME programs train both MD and DO physicians. The majority of Arizona MDs completed their residency training in a program located outside of Arizona (Table 4). Because Arizona has only 1% of the total ACGME-accredited programs in the country (Table 5), even if the number of programs or "slots" for additional residents were to dramatically increase, Arizona will continue to rely upon residency training programs outside of Arizona as its major source for new physicians.

Table 5: Arizona Residency Training Programs, 2005

Specialty	Number of Programs	Total Approved Resident Positions	Actual Number of Residents	Percent of Positions Unfilled
Anesthesiology	1	30	30	0%
Emergency Medicine	2	78	62	5%
Family Practice	6	135	129	4%
Internal Medicine	5	268	238	11%
Neurosurgery	2	20	16	20%
Obstetrics	3	74	74	0%
Orthopedics	2	30	26	13%
Pathology	2	26	22	18%
Pediatrics	3	133	104	22%
Psychiatry	3	62	57	8%
Radiology	3	44	42	5%
General Surgery	4	118	108	9%
Cardiovascular Disease	3	30	27	10%
Gastroenterology	3	25	21	16%
Neurology	3	36	20	11%
Other	42	157	139	12%
Total	**87**	**1,266**	**1,115**	**12%**

Source: Accreditation Council for Graduate Medical Education (ACGME), www.acgme.org, 2005 data, accessed June 21, 2006.

Factors that influence a medical school graduate's choice of a specialty and residency program may include the nature of the workload of the training program (e.g., nights on call), as well as the educational quality of the available programs. Choice of residency is also influenced by the future income potential and lifestyle of practicing physicians (e.g., irregular work hours, night call) in each specialty (Newton, Grayson, & Thompson, 2005). For example, the percentage of practicing physicians in pediatrics, family medicine, internal medicine, and psychiatry in the lowest quartile of earners is higher than for other specialties (Gonzalez, n.d.). Also, physicians who practice pediatrics, obstetrics, surgery, and internal medicine can expect to have irregular work schedules and extensive night call responsibilities whereas physicians who practice dermatology, emergency medicine, and pathology are more likely to work fewer hours per week and have limited night call. The factors that influence a graduating medical student's choice of residency ultimately define the availability of specialists in different medical fields. Some residency programs in specialties (e.g., family practice, internal medicine) with low potential income and heavy workloads are having difficulty filling all available residency positions. In contrast, some specialties have more applicants than they can accommodate because of the popularity of the specialty and/or the limited numbers of residency positions in a specialty (e.g., dermatology).

From the late 1980s to the early 1990s, there was a marked decrease in the proportion of medical school students specializing in primary care (except pediatrics), which led to some education and recruiting efforts in the mid 1990s to boost the number of generalist physicians (Council on Graduate Medical Education [COGME], 1992; Institute of Medicine [IOM], 1996; Newton & Grayson, 2003). The market for generalist physicians also improved at this time due to the increasing presence of managed care plans. The downward trend in primary care interest reversed itself in 1993 and peaked in 1998; the proportion of U.S. medical

school students matched to primary care slots then declined again and continues to decline (Newton & Grayson, 2003).

In addition to a smaller proportion of new primary care physicians nationally (a trend not reflected in Arizona), there is a new awareness that lifestyle factors (e.g., control of work hours, allowing time for family and leisure, and providing ample income, among other factors) increasingly influence the choice of specialty (Newton et al., 2005). In Newton's study of fourth year medical school students at East Carolina University, specialties including radiology, emergency medicine, and anesthesiology were identified as "lifestyle friendly;" many primary care specialties, pediatric subspecialties, and orthopedic surgery were "lifestyle intermediate;" and general surgery and obstetrics and gynecology were "lifestyle unfriendly." Studies of physician attrition show generally that earnings and satisfaction with the community are most closely related to remaining in practice in a particular location (Pathman, Williams, & Konrad, 1996; Pathman et al., 2002).

The number of specialists in a field is also limited by the size of residency programs. The size of allopathic residency training programs is limited by the ACGME residency review committee for each specialty and is based on standards for education appropriate to the profession. Other factors that influence the number and types of residency programs include state and federal funding available to support the programs, access to faculty, and the availability of patients which are necessary for adequate clinical experience. ACGME has approved 1,266 residency positions for the 87 Arizona programs. The largest number of residency positions is in primary care specialties such as internal medicine, family medicine and pediatrics (Table 5).

The National Resident Matching Program (NRMP) matches medical school graduates with residency training programs annually. In March, 2006, 26,715 applicants participated in the "match" (National Resident Matching Program [NRMP], 2006). The percent of specialty positions that are filled in the match by U.S. medical school graduates is a good indicator of the specialty's popularity. For example, in 2006, family medicine continued its five year decline with only 41% of the available positions filled by U.S. medical school graduates. In contrast, 83% of general surgery positions and 72% of obstetrics/gynecology positions (two programs considered "lifestyle unfriendly") were filled with U.S. graduates (NRMP, 2006), contradicting the findings that "lifestyle-unfriendly" specialties would have increasing trouble matching residency slots. Programs that cannot fill all their positions with U.S. medical graduates often try to recruit qualified international medical school graduates.

Positions may also not be filled because the residency training program has insufficient funding, teaching faculty, facilities, or teaching patients to support the approved number of residents. Thus, increased funding for residency training positions often requires corresponding funding for the faculty, facilities, and teaching patients necessary to provide the resident with a good educational experience. Because physician faculty usually teach both medical students and residents, as the number of medical students in a community increases, the available patients and faculty that can assist with training residents decreases.

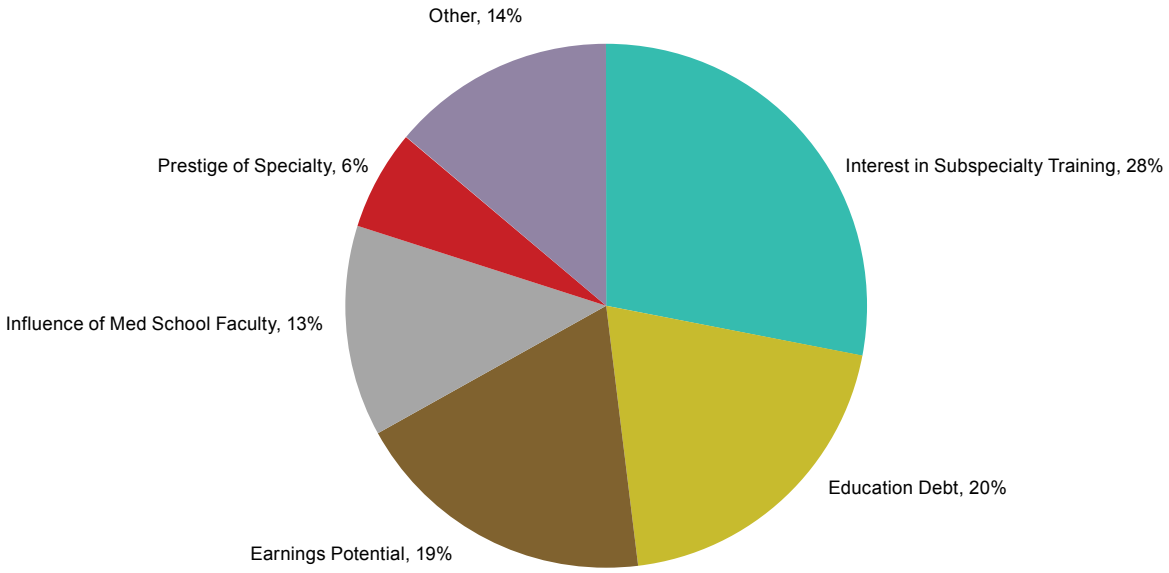
Approximately 12% of the ACGME-approved residency positions in Arizona were not filled in 2005. As noted above, the selection of specialty field by incoming residents, and the number of residents a training program can accommodate, is related to the number of specialists being trained and, in the future, the number of specialists available. ACGME programs train both MDs and DOs whereas programs accredited by the American Osteopathic Association (AOA) only train DOs. There are four AOA accredited osteopathic residency programs in Arizona which trained 13 residents in 2005 (Kemper, 2006). These residents are not included in the 2005 or 2006 Graduating Resident Survey, but we hope to include them in future surveys.

Concerns about the specialty and geographic distribution of physicians in Arizona have led to the study of Arizona resident physicians' choices of residency programs and their clinical practice locations. Because there is a general desire to improve access to primary care specialists and other frequently- or urgently-needed specialists (e.g., gynecologists) in rural areas (IOM, 1996), information about specialty choice is important for policymakers. In this section we provide some data from the Graduating Resident Survey on residency (specialty) choice, and on choice of the first practice location.

Graduating Resident Survey

The Graduating Resident Survey asks residents to recall their most important considerations in choosing a residency program. Respondents were provided with a list of 12 influences on their choice of residency programs (Appendix I). Each respondent was asked to rate each influence on a scale from five ("Very Important") to one ("Not Important") and were permitted to respond "Does Not Apply." The factors of influence receiving the highest ratings overall were the "lifestyle-friendly" factors of regular hours and family-lifestyle match, as well as availability of practice opportunities and interest in subspecialty training. Survey respondents were then asked to choose the single biggest influence on their choice of residency program (Figure 4). Although lifestyle factors were listed by many to be "Very Important," they were not the single biggest influence on residency choice. Interest in subspecialty training was the single biggest influence for most respondents followed by concern about their ability to pay off educational debt and earnings potential. This may help explain why fields such as general surgery and obstetrics/gynecology, associated with high income potential but not "lifestyle friendly," remain popular choices.

Figure 4. Single Biggest Influence in Residency Choice, 2005 (N = 135)



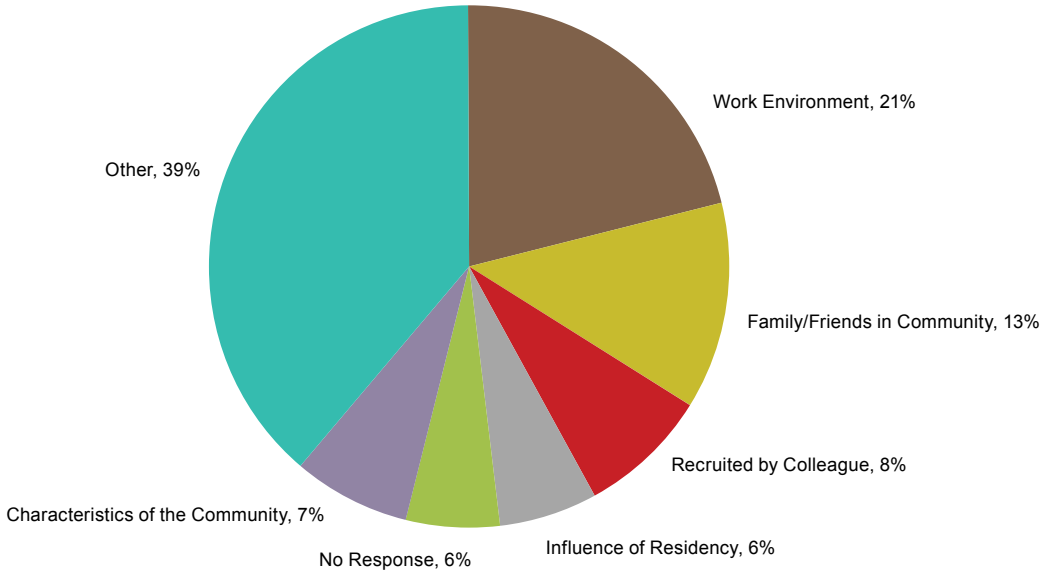
Source: GRS Data, 2005.

Note: 'Other' includes responses less than 5% of total response: regular hours, family lifestyle match, availability of practice opportunities, spouse's career match, availability of resident positions, and influence of rural rotations.

Thirty-seven percent of graduating residents grew up in a large metropolitan area, 23% in a medium-sized city, 28% in a small city or town, and 11% in a rural area. Forty-two percent took out traditional loans to finance their medical education; 39% had a scholarship. The average amount of educational debt for residents completing their training in 2005 was almost $190,000.

In addition to asking about reasons impacting the choice of residency program, the Graduating Resident Survey also asks graduating resident physicians to provide information about their initial position(s) as a practicing physician. Graduating residents responding to the survey were offered an average of 3.62 positions at graduation. In deciding where to practice, the highest-rated influences included the work environment (mean = 4.46, with 5 being "very important"), spouse's preferences in a place to live (4.25), the characteristics of the community (4.24), good benefits (3.90), professional contacts (3.84), and compensation (3.82).

Figure 5. Single Most Important Reason for Choosing First Practice, 2005



Source: GRS data, 2005.

Note: 'Other' includes responses less than 6% of total response.

Rural areas seem to fare worse than urban areas in recruiting physicians graduating from Arizona residencies to their communities. Only 16% of Arizona physicians practicing in rural counties completed their residency training in Arizona compared to 29% of physicians practicing in urban counties. Rural areas have been more successful in recruiting primary care and hospital-based physicians from Arizona residency programs than medical or surgical specialists. Only 10% of medical subspecialists and 11% of surgical specialists currently practicing in rural counties trained in Arizona (Table 6). Because rural communities usually do not have sufficient faculty, clinical experiences and research opportunities to serve as locations for medical schools or residency training programs, required short-term clinical rotations in rural communities during their medical education may be the only way to provide those who grew up in urban areas with clinical experiences in rural settings. Some medical schools and residency training programs do provide either voluntary or required short-term clinical experiences in rural settings, but the percentage of residents who have these rural experiences is still limited. For example, in medical school, only 17% of the graduating residents reported to have had clinical experiences in a rural or underserved area. The percentage of Arizona training program graduates who report these experiences is 38%. The effect such experiences have on choice of practice location, however, is not clear (Table 6).

Table 6. Physicians by Specialty Group, County of Practice, and Residency Location

	Urban Counties			Rural Counties		
Specialty Group	*Total Physicians*	*Residency in Arizona*	*Percent Trained in Arizona*	*Total Physicians*	*Residency in Arizona*	*Percent Trained in Arizona*
Primary Care	5,137	1,875	37%	1,002	186	19%
Medical Subspecialties	1,374	375	27%	184	18	10%
Surgical Specialties	1,825	315	17%	302	34	11%
Pediatric Subspecialties	147	29	17%	7	3	27%
Hospital Specialties	2,173	489	23%	325	52	16%
Other/Unknown	642	157	25%	97	13	14%
Total Physicians	11,298	3,240	29%	1,917	306	16%

Source: AMB and AOB, 2005. "Trained in Arizona" includes any training program (not just the program from which the physician graduated) in the data listed as "in-state".

Newly Licensed Physicians

For both urban and rural Arizona, physicians moving to Arizona from outside the state are the primary new source of physician manpower for Arizona. There were 1,346 new physicians (1,304 new allopathic and 42 osteopathic physicians) licensed in 2005, representing more than 10% of the total number of active Arizona physicians. Approximately 95% of the new physicians completed medical school outside the state and 86% of the new physicians completed residency training outside the state (Table 7). The most common specialties of the new licensees were internal medicine, family practice, anesthesiology, and radiology (Table 8).

Of the 808 respondents to the New Physician Survey, 479 were newly graduated medical residents; 107 of these newly graduated residents who responded to the survey (22% or 13% of all respondents) were from Arizona programs. Over one-third of all New Physician Survey respondents came from only four states: California (12%), Ohio (7.7%), New York (7.4%), and Pennsylvania (7.4%). These states are among those with the highest percentage of residents in the country (New York has about 14.9% of resident physicians, California 8.8%, Pennsylvania 6.7%, Illinois 5.4%, and Ohio and Massachusetts each have 4.7%. Arizona has 1.1% of the country's total resident physicians (Journal of the American Medical Association [JAMA], 2005, p.1132-3).

Table 7. Newly Licensed MDs and DOs with Training in Arizona

	Licensed in 2005	*Medical School in Arizona*	*Residency Training in Arizona*
MDs	1,304	66 (5%)	188 (14%)
DOs	42	6 (14%)	7 (17%)
Total Physicians	1,346	72 (5%)	195 (14%)

Source: AMB and AOB, 2005.

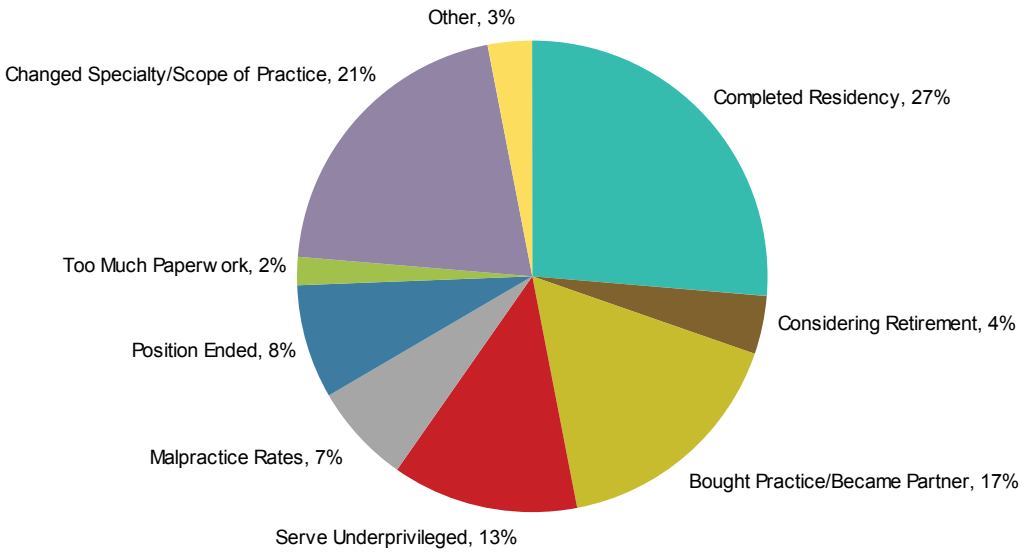
Table 8. New MD and DO Licensees by Specialty, 2005

Specialty	Number of New Licensees
Anesthesiology	114
Cardiovascular Disease	3
Emergency Medicine	64
Family Practice	119
General Pediatrics	72
General Surgery	36
Internal Medicine	277
Neurology	33
Neurosurgery	7
Obstetrics	50
Orthopedics	46
Pathology	38
Psychiatry	43
Diagnostic Radiology	112
All Other Specialties	332
TOTAL	1346

Source: AMB and AOB, 2005.

The New Physician Survey respondents stated that the most important factors influencing their practice location were characteristics of the community (e.g., schools, the cost of living, urban or rural lifestyle amenities), the existence of adequate health care facilities (e.g., hospitals, emergency rooms), and a good work environment. Least important factors were that they completed military service in the area, grew up in the area, or that their residency program was located in the area. In competing with other areas of the state and country for physicians, communities may do well to look at their own characteristics and their ability to meet the needs of physicians in both the personal and professional realms.

Figure 6. Reasons Physicians Decide to Relocate to Arizona, 2005 (N = 793)



Source: NPS data, 2005.

New Arizona physicians are needed to replace Arizona physicians who leave medicine. Physicians may leave medicine due to retirement, death, relocation to another state, or career change (e.g., leaving medicine to work in another field). First we consider physician retirement.

Retiring Physicians

Many expect that the exit of the baby boom cohort of physicians from the labor market will substantially reduce the supply of physicians in the U.S. Approximately 44% of Arizona's practicing physicians are over 50 years old. The aging of the physician population in Arizona will have an important impact on physician supply. While it is difficult to predict the retirement age of physicians, previous studies have shown that, on average, U.S. physicians decrease the number of patients seen per week after age 65 and retire when they are 69 years old (Konrad, 2005). In Arizona, the mean physician age is highest for the specialties of anesthesiology, pathology, and psychiatry (Table 11). Detailed information by age group for each specialty and county is provided in the Appendix B.

Table 8: Number of Physicians Who Will be Age 65 or Older in 2010, Specialty 1 only (N = 13,189)

Specialty	Apache[1]	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	*Maricopa*	*Mohave*	*Navajo*	*Pima*	*Pinal*	*Santa Cruz*	*Yavapai*	*Yuma*
Anesthesiology	0	2	1	0				67	1	0	24	0		5	2
Cardiovascular Disease		0						7		0	2	1			
Emergency Medicine	0	3	3	1		0	0	19	2	1	15	0	1	0	1
Family Practice	2	8	14	7	7	1	4	257	5	9	48	17	0	20	7
Gastroenterology	0	0	0	0				3			0	0			0
General Surgery		4	3	1	0		1	56	2	2	18	2	3	6	1
Internal Medicine	1	3	2	2	0		0	168	4	1	81	0	0	8	6
Neurology			0					15	1		7				
Neurosurgery		2	1					22	0	0	9	0		1	2
Obstetrics/Gynecology	1	0	2	2	0			82	2	1	21	1	1	6	2
Orthopedics		0	1	0	0			59	0	0	14	0		3	3
Pediatrics	0	2	5	1	1			97	2	2	34	4	0	3	4
Psychiatry		1	4	0		1		104	2	1	48	1		7	2

Source: AMB and AOB, 2005.

Note: Shaded squares indicate that the percent of physicians who will be age 65 or older in 2010 comprises at least 20% of the total physicians listing that specialty as their primary specialty; 26 physicians did not list any specialty.

Note: Because physicians working in federal facilities (e.g., Indian Health Service hospitals) are not required to have an Arizona license, the size of the physician workforce in counties with these facilities may be underreported.

Table 9. Number of Physicians Who Will be Age 65 or Older in 2010 (Specialty 1 only) and Percent of Total Physicians in the County Who Will be Age 65 or Older in 2010.

	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
Total physicians over 65 by 2010	4	25	36	14	8	2	5	956	21	17	321	26	5	59	30
Percent of County's total physicians	11	17	11	17	20	29	24	11	8	14	11	14	14	16	12

Source: AMB and AOB, 2005.

Note: 26 physicians did not list any specialty.

Note: Because physicians working in federal facilities (e.g., Indian Health Service hospitals) are not required to have an Arizona license, the size of the physician workforce in counties with these facilities may be underreported.

Current Distribution of Arizona Physician Specialties

Because physicians generally limit their practice to a geographic area and specialty, the access of Arizona residents to medical care is in part determined by the types of care provided in their local area. Rosenthal et al. (2005) found that overall geographic access to physician services has improved over the past decade, but that states in the south and west generally faced poorer geographic access than other regions of the United States. A number of studies have found that increased physician availability leads to better health outcomes for populations (Roetzheim et al., 1999; Roetzheim et al., 2000; Ferrante, Gonzales, Pal, & Roetzheim, 2000; Shi et al., 2003), although not necessarily to decreased use of care (Pathman et al., 2006). Nationally, a number of physician specialties have issued or provided data for reports which point to shortages in particular specialties and the impact of the aging of the "baby boom" physician workforce. These include Allergy and Immunology, Cardiology, Dermatology, Medical Genetics, Radiology, Geriatric Medicine, Neurosurgery, Psychiatry, Pediatric Subspecialties, and Endocrinology (American Association of Medical Colleges [AAMC], 2006).

In our previous report (Johnson et al., 2005), we reported the primary specialties of Arizona physicians in 2004 by dividing physicians into five types of specialties: primary care, surgical specialties, hospital based specialties, medical subspecialties, and other specialties. For this report, we have added a sixth group of pediatric subspecialties to address reports of shortages of some pediatric subspecialties. Appendix C describes the classification of specialties into the six groups. Specialties are self-reported by the physician and may not represent the specialty in which the physician received residency training, obtained board certification, or the field of medicine in which he or she provides most care. A physician is permitted to list more than one specialty on his or her license application or license renewal information. To determine the specialty in which a physician provides care, we looked at the first two specialties listed by the physician on his or her license information. One-third of physicians list more than one specialty area. For each specialty, we included each physician who listed that specialty as either a primary or secondary specialty as a member of that specialty practice group. Table 10 describes the number of physicians listing certain specialties as their primary or secondary field of practice.

Table 10. Urban/Rural Distribution of Specialties by Specialty Group, 2005

	Listed As Specialty 1		*Listed As Specialty 2*	
Specialty Group	Urban	Rural	Urban	Rural
Primary Care	5,114	998	1,208	210
Medical Subspecialties	1,387	185	805	108
Surgical Specialties	1,825	302	539	71
Pediatric Subspecialties	170	11	118	13
Hospital Specialties	2,173	325	777	114
Other/Unknown	629	96	556 (Other only)	60 (Other only)
Total Physicians	11,298	1,917	4,003 (35%)	576 (30%)

Source: AMB and AOB, 2005.

There were 13,215 physicians in practice in Arizona and an additional 8,948 physicians licensed in Arizona but residing out of state. The population in Arizona in 2005 was 6,044,985 (Arizona Department of Economic Security [DES], 2006).

In order to more completely assess the distribution of Arizona physicians, we further analyzed physicians by specialty and county. Approximately 84% of Arizona primary care specialists (pediatrics, internal medicine, and family medicine) practice in Maricopa or Pima County while 16% practice in the other more rural counties (Table 1). There are family physicians in every Arizona county, but two counties do not have a pediatrician and one county does not have an internal medicine specialist (See Appendix D). Among the surgical specialties, two counties do not have any general surgeons or obstetricians. Only four counties have a neurosurgeon. There are no specialists in either cardiovascular medicine or gastroenterology in five counties, and no neurologists in six counties. Three counties do not have an orthopedist and four counties do not have an anesthesiologist or psychiatrist. However, it is important to note that physicians who practice solely in a federal facility (e.g., Veterans Administration hospital, Indian Health Service hospital) do not have to obtain an Arizona license. Therefore, counties in which a large percentage of the physician workforce are working in these types of facilities (e.g., Apache County) may have more physicians in practice than can be determined by Arizona licensure data.

Some counties may lack the necessary medical facilities to support physicians in a specialty area and thus will neither be able to attract nor support the technical requirements of these specialists. For example, counties without a hospital or surgical center will not be able to utilize an anesthesiologist or surgical specialists and most cardiologists and gastroenterologists will require advanced radiological imaging services (e.g., fluoroscopy) in order to practice in an area.

In addition, some counties do not have a sufficient patient population to support physicians in many specialty areas. It is unlikely, for example, that a neurosurgeon would have a sufficient number of patients to maintain her/his practice in rural areas. Also, some counties may have a sufficient number of patients for one physician but cannot support two or more physicians. In these cases, it will be difficult to attract a physician because the solo physician must be available every night and weekend for their patients which can be mentally and physically exhausting. As noted in Appendix D, many counties have only one or two physicians available in a specialty area; these counties may be at risk of losing these physicians because of the heavy night and weekend call schedules and little vacation time. These physicians find it difficult to take a vacation, because they often must hire a physician from outside their community to cover their practice in their absence or leave the community without a physician in their absence.

For some rural communities, the burgeoning field of telemedicine can help address their physician shortages by providing the opportunity for the local physicians to consult with specialists either by video conferencing or electronic transfer of patient information. For example, a community that does not have a radiologist can obtain a report on an x-ray performed in their community by electronically transmitting the x-ray to a radiologist working in another community. Similar techniques can be used to send electrocardiograms and pathological specimens to specialists outside the community who then can electronically send a report back to the physician. This approach will, however, be helpful primarily to those specialties who do not require direct contact with patients.

Despite the increase in the supply of physicians in 2005, the Arizona physician-to-population ratio is still far below the national average. Arizona's community characteristics and practice opportunities are the two most important reasons physicians consider when they move to this state, and the vast majority of new physicians continue to come from outside of Arizona.

While all of Arizona saw increases in physician supply, the disparate geographic distribution of physicians continues. This disparity is even more evident when distribution by specialty is examined; some rural counties have no physicians in one or more specialty groups. This geographic disparity in physician distribution is compounded by the likely retirement of elderly physicians in several specialties in a number of rural counties, especially for specialties where the average age of their specialists is 60 years old or more. Although we did not study out-migration of physicians to practice elsewhere, this is also a factor in attempting to predict physician supply and is a part of our planned future efforts.

The concerns over physician distribution—especially distribution by specialty—raised in this report indicate the reasons why physicians choose their specialty and practice location needs to be assessed if we wish to improve Arizonans' access to care and health outcomes. There is some evidence that the size and specialty distribution of the physician workforce correlates with the overall health of a community (Roetzheim et al. 2000).

A simple "headcount" of Arizona physicians, however, is an incomplete measure of the supply of physician services. Ricketts et al. (2000) found, by using data similar to our data from the states of North Carolina and Washington and national estimates of productivity data, that estimates of Full-Time Equivalent (FTE) physicians were 14 % lower than the headcount in North Carolina and 10 % lower in Washington. Without a discussion of productivity, our counts of physicians may under- or over-estimate the availability of physician services to Arizonans. Thus, in the following section, we have utilized the findings of our physician surveys to assess physician productivity.

Section II – Physician Productivity

The supply of physician services in Arizona depends not only on the number of physicians but also their productivity. The most common method used to measure physician productivity in the workforce literature is by determining the number of patient visits per week per physician. It is important to recognize, however, that using patient visits per week as a measure of productivity does not capture all the clinical work of physicians since they also provide care for patients, for example, via phone and email. In addition, some physicians may choose to schedule patients for longer visits and address all of the patient's problems in one visit while others might choose to have shorter visits more frequently.

Previous studies have shown that physician productivity also varies with practice setting (e.g., group vs. solo practice), age, and gender of the physician. There are wide variations among physicians in the number of patient visits per week that may be related to differences in physician training, community resources, physician specialty, level of inpatient activities, physician experience, and their scope of practice (Larson et. al., 2003). Obviously, the number of patients seen per week is also related to the number of hours per week that a physician chooses to work

Among PCPs, the average family physician provides 105 ambulatory patient visits each week, a general pediatrician 95, and a general internist about 65 (Randolph, Seidman, & Pasko, 1997, in Larson et al., 2003). PCPs often have shorter visits and more visits per week on average compared to specialists such as surgeons who may perform a long and complicated procedure during a single visit.

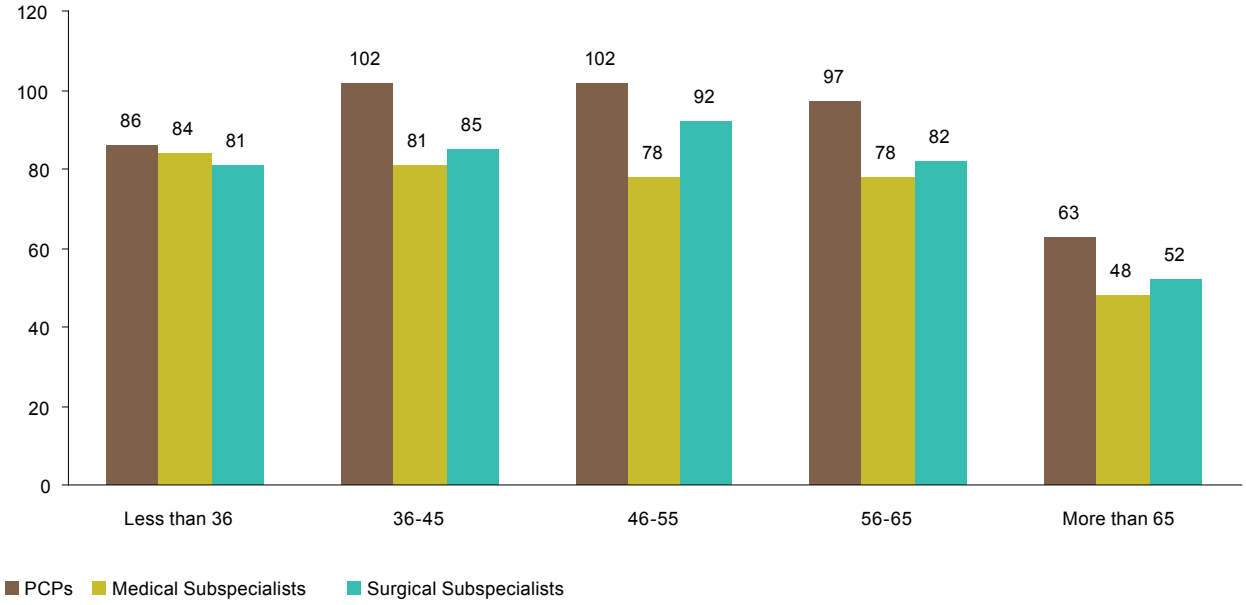
The Arizona Practicing Physician Survey asked physicians to estimate the number of hours worked per week, weeks worked per year in clinical practice, and the average number of patients seen per week. Analysis of this survey revealed that:

- The average number of patients seen per week increased from 69 patient visits per week in 1994 to 84 in 2004-2005.[6]
- The number of patients seen per week varied by specialty. For example, anesthesiologists reported an average of 37 patient visits per week, cardiologists 106, family practitioners 95, internists 85, obstetricians 90, and surgeons 52.
- The number of patients seen per week in rural areas was significantly higher than in urban areas.
- The mean number of patient visits per week varied with practice setting.

Figure 7 compares the mean number of patients seen per week with physician age for PCPs, medical subspecialists, and surgeons. For all age groups, PCPs see more patients per week than other specialties. For each specialty, the number of patients seen per week was similar for physicians between the ages of 36 and 65 years. However, productivity decreased dramatically after age 65, perhaps due to older physicians decreasing work hours and changing scopes of practice. Indeed, in all three specialty categories, physicians over 65 years old saw approximately 30 fewer patients per week than younger physicians. These data are presented in Appendix E for each specialty group.

6 In 1994, all physicians took the PPS annually. In 2004-2005, only half the physicians took the survey each year.

Figure 7. Average Number of Patients Seen Per Week By Provider Age and Specialty Group, 2005



Source: AMB and AOB Administrative and Survey data, 2003 – 2005.

Productivity and Gender

It is expected that by the year 2020, 45% of all practicing physicians will be women (Cooper, 2004). A number of national studies from the 1990s reported that female physicians worked fewer hours than men. (Government Accountability Office [GAO], 16th Annual Report, 2005) The increase in the proportion of physicians that are women would, if the studies are correct, suggest that physician productivity, all else equal, will decline as the percentage of physicians who are women increases. However, when we examined hours worked by specialty among Arizona physicians in the 2004 – 2005 survey, many of the initial differences between men and women physicians seen in 1994 had either decreased markedly or disappeared as shown in Table I. For example, in 1994, female physicians in family medicine, obstetrics, orthopedics, and pediatrics saw significantly fewer patients per week, on average, than male physicians in these specialties. By 2004 – 2005, however, the only specialty with a significant difference in productivity between men and women was family medicine. When we examined hours worked by specialty among Arizona physicians, the differences between men and women were small in average number of patients seen per week as well as the average number of hours worked per week (See Appendix E).

Non-physician Clinicians (NPCs)

Non-physician clinicians, who include advanced practice nurses (also known as Nurse Practitioners, or NPs) and PAs, are health care providers whose scopes of practice include providing some health care services that are also provided by physicians. About 50% of PAs and NPs work in primary care fields. PAs are more likely to work in surgical specialties than NPs. There are approximately 110,000 PAs and NPs in active clinical practice in the U.S. in 2006 (Hooker, 2006). The scope of practice for these NPCs is set by state licensing boards. In Arizona, NPs are licensed by AZBN and PAs are licensed by the AMB. In Arizona, NPCs can diagnose and manage acute and chronic illnesses and prescribe medications (Health Resources and Services Administration [HRSA], 2000). Thus, they can in some cases substitute for physicians in

communities which have a shortage of physicians and increase the productivity of physicians when they work in the same setting as physicians. However, because there are limitations in the range of services that can be provided by NPCs, substituting an NPC for a physician in a community will necessarily limit the scope of services available. For example, a NPC trained in women's health may be able to provide contraceptive care when a physician trained in gynecology is not available but will not be able to care for women who need gynecologic surgery. In Arizona, there were 2,304 NPs and 1,232 PAs licensed in 2005 (Table 11). We do not yet have data that can be used to assess the productivity of NPCs but hope to be able to survey them for future reports regarding hours worked per week and number of patients seen. However, there is evidence that approximately 90% of PAs but only 50% of NPs work full-time (more than 32 hours/ week; Hooker & Berlin, 2002).

Approximately 25% of all NPs and PAs in the U.S. work in non-metropolitan areas (Hooker, 2006). In Arizona, 19% of NPs are located in rural areas compared to 26% of the PAs (Table 11). In some rural counties, PAs represent a large percentage of the physician workforce population. For example, 50% of the providers in Greenlee County are PAs (Appendix F).

Table 11. Medical Care Workforce Practice Location, 2005

Location	MDs	% Total MDs	DOs	% Total DOs	NPs	% Total NPs	PAs	% Total PAs	Total Providers	% Total Providers
Rural	1,589	14%	293	18%	433	19%	323	26%	2,638	16%
Urban	10,000	86%	1,299	82%	1,871	81%	909	74%	14,079	84%
Total	11,589	69%	1,592	10%	2,304	14%	1,232	7%	16,717	100%

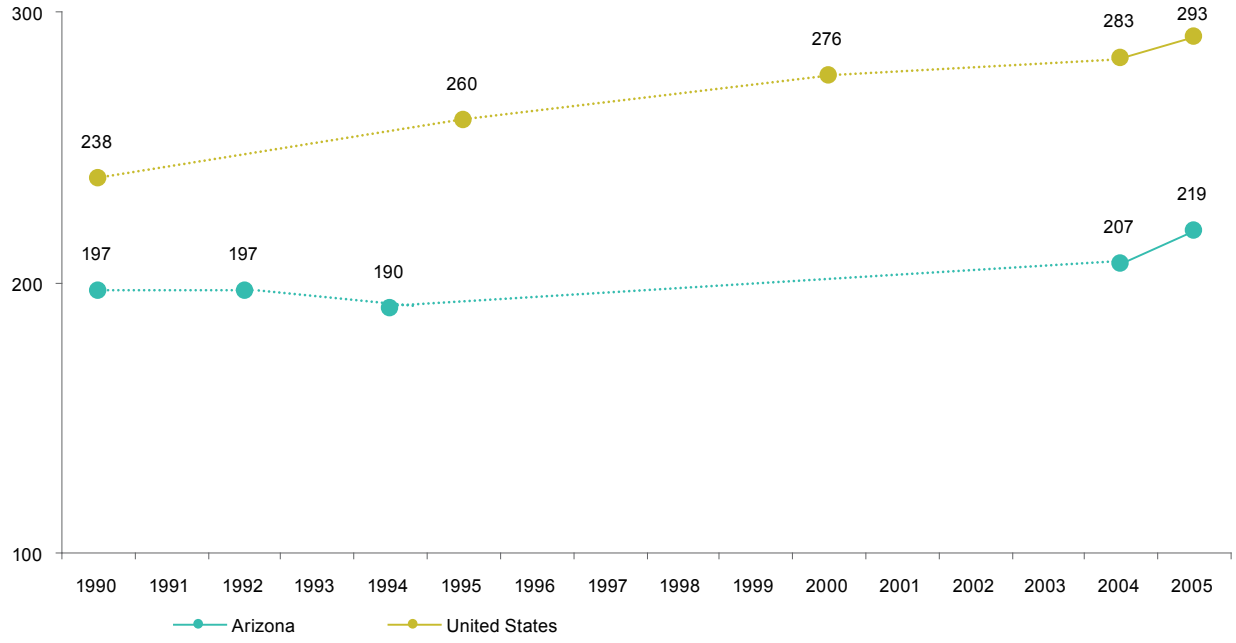
Source: AMB, AOB, and BON, 2005

Note: Urban includes Maricopa and Pima counties, rural includes all other counties.

In addition to the difficulty in counting physicians or physician-equivalents and gauging the impact of the maldistribution highlighted in this report, physician productivity models are further confounded by measurement disagreements. While the number of physicians and the number of visits per physician are indeed measurable, David Goodman (2004) proposes that health outcomes, rather than physician outputs such as visits or other medical services produced by physicians, are the proper measure of physician productivity. Goodman finds that staffing levels vary widely by region, and that there has been little improvement in regional health outcomes given the increases in physician-to-population ratios. Goodman states that adequate care can be provided "…with clinician (physician and non-physician providers) labor inputs that are 64 – 76 percent of overall U.S. levels" (Goodman, 2004, p. W4-68). Weiner (2004) used an average physician-to-population ratio of 280/100,000; by our measure, Arizona's ratio has been approximately 79% of that national figure (Figure 8), and much less in most rural regions of the state, so it seems prudent to attempt to forecast Arizona's demand and supply of physician services in the future.

The physician workforce in Arizona continues to increase, largely by in-migration, at pace with population growth (Figure 8). There is a need, however, for continued assessment of the specialty and geographic distribution of physicians to determine if changes need to be made in Arizona health policies, medical education funding, and licensure to encourage the recruitment of the right physicians for each Arizona community. In addition, we need to monitor the health needs of our communities in order to determine if the supply and productivity of Arizona physicians is meeting the need for physician services.

Figure 8. Physician to Population Ratio for Arizona and the U.S. (1990-2004)



Section III: The Requirement for Physician Services

The most common methods of predicting the requirement for physician services are trend forecasts, demand models, or predictions based on criteria for optimal care or needs for health care. Some methods combine aspects of two or more of these approaches.

Trend Forecasts

The simplest type of forecasting model extrapolates from historical trends without regard to the nature of the structural influences that created the trends. In effect, trend forecasts assume that the relationships among the different influences on physician supply do not change over time. A trend forecast may be made by simply extrapolating a moving average generated over some past time period to the future or by estimating a trend equation in either a linear or non-linear functional form using regression analysis.

Trend equations estimated by regression analysis may include adjustments for events known to have shifted the trends at different points in time, without affecting the underlying structural relationships. In the current context, for example, one could estimate a trend equation that included binary variables for major policy changes affecting the financing of graduate medical education in the United States. A representative assumption of such an approach would be that the number of graduates per year changed but that the relationships among the underlying influences (other than financing) on numbers of graduates remained the same. (e.g., the slope of the trend is the same but the entire trend line is shifted upward or downward)

Trend forecasts offer the advantage of simplicity by avoiding the complex tasks of identifying the structure of the processes by which persons are attracted to careers; defining the processes by which they are trained and assuming that neither process changes significantly in the future. The simplicity of trend forecasts is,

of course, also their major limitation because the relevant processes may not follow historical patterns. The second important limitation is that trend forecasts rarely identify targets for policy interventions designed to alter trends.

It is reasonable, however, to begin the prediction of the supply of physicians by using trend forecasts. The results can be used as a test of the marginal benefits of more complex forecasts. The more complex a model, the more sensitive are the predictions to error, all else equal. Unless the predictions generated by more complex models are significantly better than trend forecasts, the additional complexity and potential increase in uncertainty may not be worth the effort required.

Demand Models

Trend models effectively predict the supply of physicians without regard to any criteria concerning the need for care or optimal levels of supply. Demand based models, at least in concept, measure demand (the number of physicians for which there is a demand and the ability to pay for their services) without regard to measures of need or optimal care. The supply of physicians may or may not equal the demand for physicians in any time period. Observed differences between the predicted demand for physicians and the observed or predicted supply of physicians serve as measures of either shortages or surpluses. It is important to reiterate, however, that models of demand do not typically include criteria for the need for care as defined by clinical standards.

The demand for health care is influenced by many factors, including public demand for the use of new technology, a public desire to have life-sustaining and life-enhancing care, and consumer responses to direct advertising of drugs and other remedies. The rapid aging of the population in the next decade is one of the most important influences on the demand for health care. Although subject to dispute, the effect of population growth on the demand of health care also may be compounded by the increase of diseases related to lifestyle, such as obesity.

The demand for health care is also affected by the economic status and health insurance since patients must have sufficient income to purchase services. If the estimated 45 million uninsured Americans had health insurance and utilized health care as the currently insured U.S. population, the physician workforce would need to increase by 95% by the year 2020 (COGME, 2005, Table 21).

In 2002, Cooper, M.D. and colleagues published a new model of demand for physician services, based on historical correlations between measures of economic activity and the supply of physicians (Cooper, Getzen, McKee, & Laud, 2002). Adjustments to the forecasts include assumptions concerning future productivity of physicians and the increased use of non-physician professionals. This study found a long-term relationship between per-capita Gross Domestic Product (GDP) and physicians per capita over the period of 1929 to 2000, and predicts that in 2010 demand for physician services will outstrip supply by 50,000 physicians nationwide (about 6% of expected demand). By 2020, the shortage of physicians is expected to reach 200,000 physicians, which exceeds 20% of expected demand.

Need Based Models

In 1980, the Graduate Medical Education National Advisory Committee (GMENAC) predicted that there would be a general surplus of physicians in the year 2000, but a shortage of primary care physicians. These results were supported by a series of studies done for COGME during the 1990s. These studies commonly

determined the tasks necessary to care for a population and the time (or FTE physicians) required to perform those tasks. The predictions made by these models have not, however, been confirmed by actual reports of physician surpluses (Figure 9).

Section IV: Predicting the Future Physician Workforce in Arizona

The Accuracy of Previous Forecasts

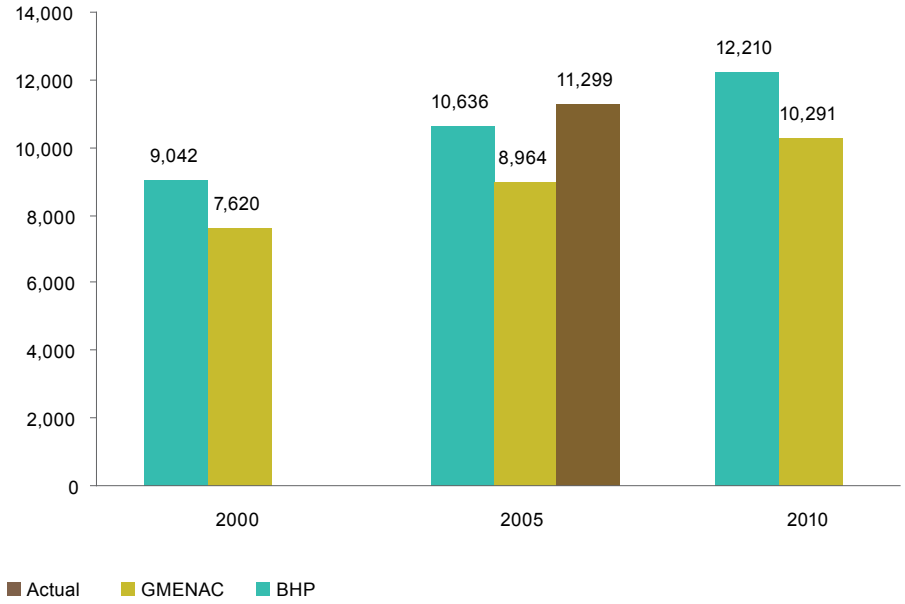
One measure of the accuracy of trend forecasts of physician supply for Arizona is the comparison of previous forecasts to observed changes in supply. The first report on the supply of physicians in Arizona was published in 1989. The report, *Arizona Physicians Today and Tomorrow*, estimated the number of physicians needed in Arizona by 2000 (Flinn Foundation, 1989). The estimates combined population projections from the Arizona Department of Economic Security (DES)[7] with targeted physician-to-population ratios. Two alternative criteria were used to make the projections. The first criterion was the Bureau of Health Professions' (BHP) recommended ratio of 231 physicians per 100,000 people. The second criterion was GMENAC's recommended ratio of 195 physicians per 100,000 people. Thus, using the DES Arizona population estimate (1989) of 4.7 million in 2000, projected needs were for 10,800 (BHP) and 9,100 (GMENAC) physicians, respectively. In urban areas, which were estimated to have a population of 3.6 million in 2000, the physician needs were estimated to be 8,300 (BHP) or 7,000 (GMENAC) physicians. The report also applied the BHP and GMENAC ratios to the DES rural population projection, producing a projected need between 2,500 and 2,100 physicians in rural areas by the year 2000. Assuming the continuation of the 1987–1992 trends, the estimated number of physicians practicing in rural Arizona was predicted to be only 1,000 physicians and the estimated number of urban physicians would have been approximately 9,700.

Thus, although the projected number of physicians in practice in urban Arizona met or exceeded the projected total needs, the report predicted a shortage of physicians practicing in rural areas. However, the urban population in 2000 actually was 4.7 million, and thus using the BHP and GMENAC criteria, the actual needs were 9,042 physicians (BHP) or 7,620 (GMENAC; see Appendix G). The best available estimates of physician supply for the year 2000 suggest that the number of active physicians (both MD and DO) in urban areas was slightly more than 8,000 physicians. The difference or shortage between need and supply ranged, therefore, from an excess of supply over need (surplus) of about 400 physicians to an excess of need over supply (shortage) of about 1,000 physicians.

A series of seven reports on physician supply and graduate medical education in Arizona was published between 1992 and 1997. These reports were based on survey data and licensing data collected as part of the process of licensing physicians. The data were collected by the ASU's School of Health Management and Policy (SHMP) under the auspices of the Arizona Council for Graduate Medical Education (AzCGME) and sponsored by the Flinn Foundation. The studies showed that the growth in the number of Arizona physicians kept pace with population growth, but there were disparities in the distribution of physicians between rural and urban areas such that there would be a shortage of 1,400 physicians outside of Maricopa and Pima counties by 2000 relative to the levels suggested by GMENAC or BHP (Johnson et al., 1992). The 1996 report also predicted that the number of specialty physicians would decrease in future years (Thornton et al., 1998).

7 DES estimate from: *Arizona Business,* February 1992.

Figure 9. Projected Arizona Urban Physician Need, 2000 – 2010



Note: Bureau of Health Professions (BHP) estimates 231 physicians per 100,000 population, Graduate Medical Education National Advisory Committee (GMENAC) estimates 195 physicians per 100,000 population. Year 2000 is based off an estimated urban population of 4.6 million. The year 2010 is based off a projected urban population of 5.3 million.

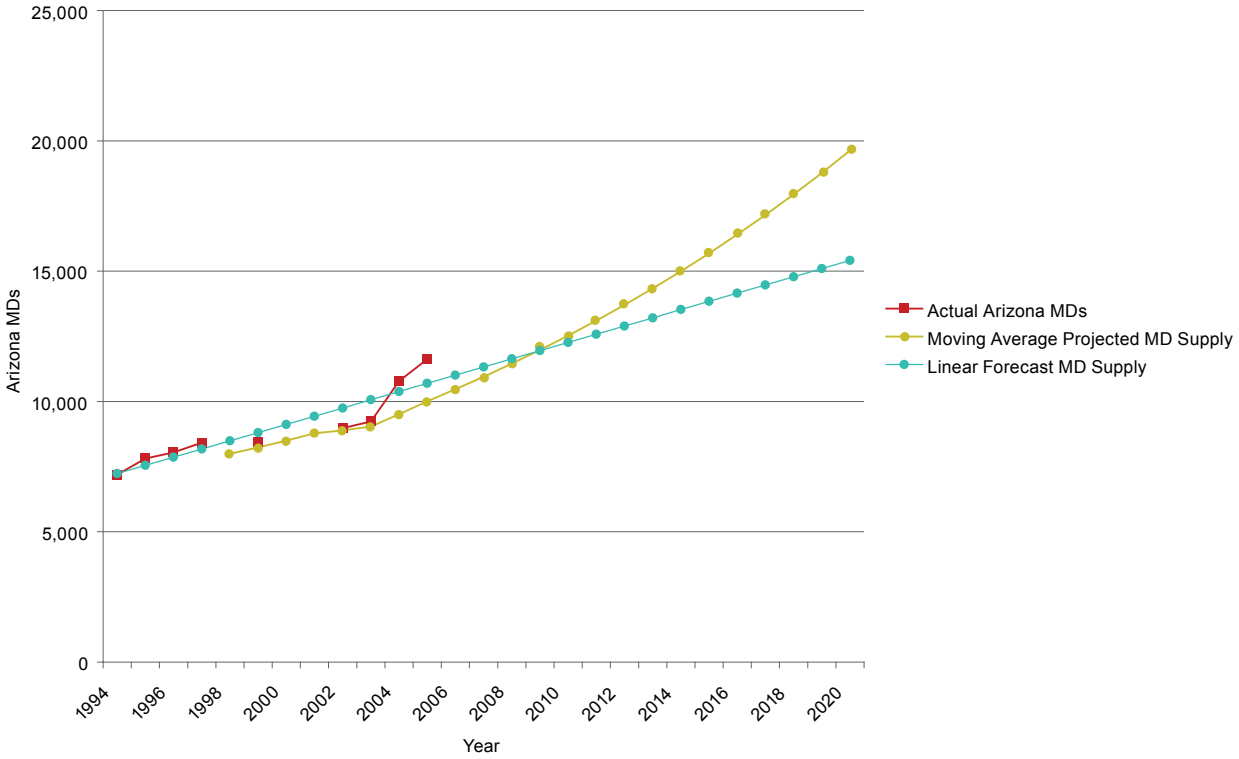
Trend Projections

The absence of information on doctors of osteopathy in many of the years from 1994 – 2002 restricts the trend forecasts to allopathic physicians. The demand projections are not limited to allopathic physicians so it is reasonable to compare the estimated demand in each of the years for which the supply of osteopathic physicians is known to get a more accurate measure of the shortages that are predicted.

The moving average estimates of the number of Arizona physicians underestimate the actual number of active allopathic physicians in every year. The linear trend equation projections tend to overestimate the early years and underestimate supply in more recent years. Both sets of results reflect the fact that the increases in the numbers of allopathic physicians increased at a relatively low rate of change until 2003 but increased by approximately 17% between 2003 and 2004, or nearly twice the average annual rate for the period from 1994 to 2003. The increase between 2004 and 2005 was 8%. The rates of increase for osteopathic physicians were not available from for 1994 to 2004 but was 20% for 2004 – 2005.

The mechanics of moving average projections are that the results reflect past behavior, smoothing out periodic variations. Thus, the recent above average increases for only two years will not be reflected by the moving average estimates unless the rates of increase continue to exceed those of the period from 1994 – 2003. Regression models, such as the linear trend projection, are designed to "split the difference" between higher and lower values. Although the mechanics are straightforward, the question raised by the results is whether there is reason to believe that the increase in supply from 2005 – 2006 will continue at rates above the historical average.

Figure 10. Trend Forecasts of Physician Supply



Forecasts based on the moving average method estimate that there will be 19,633 active allopathic physicians in Arizona by the end of 2019 and the linear trend estimate is 15,412 active allopathic physicians. Expressed as a ratio per hundred thousand persons in the population, the estimates translated into 224/100,000 (moving average) and 176/100,000 (linear trend; See Appendix H).

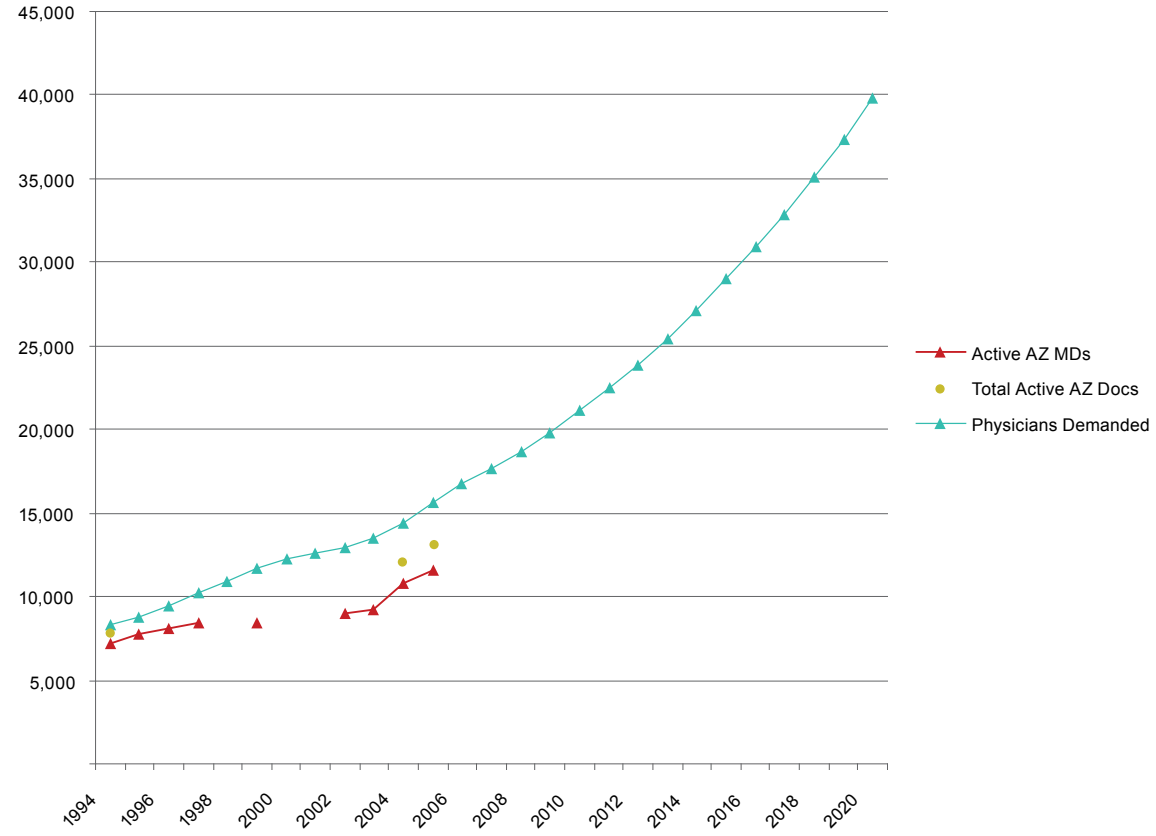
The answer to the question of whether above average rates of increase will continue cannot be answered by either the moving average or the trend projections since both methods simply extrapolate history without attempting to define the structural influences that determine changes in supply.

Demand Forecasts

The trend equations based on the demand model predict increases in the demand for physicians at increasing rates. The estimates from the base year (1999) are well above the observed supply of physicians in Arizona indicating a shortage in the supply of physicians. The shortage is defined in terms of an excess of (estimated) demand over the observed supply without any reference to a standard for an optimal number of physicians. The projected demand estimates for the years from 2006 to 2020 indicate a growing shortage of physicians when compared to any of the predicted trends in the supply of physicians.

The demand projections are not limited to allopathic physicians so it is reasonable to compare the estimated demand in each of the years for which the supply of osteopathic physicians is known to get a more accurate measure of the shortages that are predicted. The years for which the MD plus DO physician supply is known are 1994, 2004, and 2005. The total number of physicians was 12,024 in 2004 and 13,215 in 2005. The demand forecast predicts a demand for 14,389 and 15,060 physicians respectively for these years. Thus, the estimated shortage of physicians is approximately 2,400 and 2,218 physicians, respectively, based on the projected demand.

Figure 11. Cooper Projection vs. Actual Physicians, 1994 – 2020



Another approach to estimating the physician shortage is to compare the differences between the physician-to-population ratios of Arizona with the demand model. The demand model predicts a level of physician demand much higher than Arizona's current physician-to-population ratio of 219/100,000 in 2005 (Figure 11). The general trend of Arizona's physician-to-population ratio appears to be negative (as the population increases, the physician-to-population ratio decreases), indicating that in general, we would predict demand for physician services to increase more rapidly than the supply of physician services, worsening current shortages. But the last two years have not followed this trend. The growth in the physician-to-population ratio in 2004 and 2005 may be outliers to the general trend, or they may be a reversal in the trend, perhaps signaling an underlying structural change in the supply of Arizona physicians.

Need Based Forecasts

There are a number of trends that influence the need for health care in Arizona. Chief among these are changes in the population. Because of Arizona's tremendous population growth over the past 12 years, the state needed a similar increase in the number of physicians in order to meet the health care needs of Arizonans. In addition, the elderly population in Arizona grew 40% from 1990 to 2000 compared to a 12% increase in this age group nationally over this same time period. Finally, in Arizona as across the U.S., the baby boomers (those born between 1946 and 1964) will suffer more chronic diseases and use more costly health care resources as they age. For example, it has been estimated that the prevalence of heart disease will increase by 16% per decade from 2000 – 2029 because of this (Foot, Lewis, Pearson, & Beller, 2000). In addition to population changes, increasing life spans, changes in the ethnic and racial diversity of the population, and personal behaviors will have an impact on future health.

Although there are significant limitations to the demand based and need based criterion, they are probably better measures of the adequacy of physician supply than trend projections. Using demand or need criterion, for projections, it is anticipated that despite recent increases in the physician workforce, shortages will persist and likely increase in the future.

The GMENAC need based predictions, for example, indicate that the current supply of physicians in Arizona is sufficient to meet the need for care. The need based projections are based on national averages and unusual characteristics of the population of Arizona. The conclusion that the supply of physicians is adequate is at odds with nearly every study or commentary on Arizona. Although it might be possible that needs for care are substantially less than demands for care, the evidence of long waits for physician care and the differences between national ratios of physicians to population and the ratios in Arizona suggest that the needs based estimates are unreliable. Our estimate of a shortage in physicians is based on the demand model projections. There are, of course, weaknesses in this model as well. For example, the model presumes to forecast current demand based on historical supply. But the demand model reflects the recent growth of the physician population in Arizona better than other models, so we have used this model for our current estimate of a physician shortage. We urge caution, however, in longer-term forecasting with this model.

The supply forecasts that we have described do not allow for the possibility of changes in the incentives or recruitment practices that could emerge in response to a continuing shortage of physicians. It is possible, therefore, that the size of the potential shortages will not be realized because of changes in policy toward physician recruitment and retention.

There are, however, also changes that are not represented that can have the effect of increasing the need for physicians in Arizona, among which the aging of the baby boom generation is the most important. The current trend forecasts assume implicitly that the age distribution of the population in Arizona is changing in accordance with the actual trends from 1994 to 2004. However, it is likely that proportion of the population that is elderly will increase as the baby boom bulge in the population ages and health care utilization by this group will increase the need for physician services. For example, Foot et al. (2000) found that the need for cardiologists will increase between 2000 and 2050 by more than 100 percent, peaking around 2040; Etzioni, Liu, Maggard, & Ko (2003) predict a 14 to 47% increase in the demand for surgeons to the aging of the population. The potential shortages attributable to the aging of the population will be exacerbated by the aging of the physician workforce, which will be especially pronounced among physicians serving rural populations in Arizona.

Section V – Summary

The number of practicing physicians in Arizona increased 10% from 12,024 in 2004 to 13,215 in 2005. However, the physician per 100,000 population ratio only increased by approximately 6% (from 207 in 2004 to approximately 219 in 2005) and remains well below the national average. The supply of new physicians is affected not only by medical schools and residency training programs, but also by in-migration of physicians who were educated outside of Arizona. Only 5% (72/1,346) of new physicians licensed in Arizona in 2005 completed medical school in the state and only 14% (195/1,346) completed their residency in Arizona. Arizona residency training programs are more likely to supply physicians to urban counties than rural counties. Only 16% of Arizona physicians practicing in rural counties trained in Arizona compared to 29% of Arizona physicians practicing in urban counties. Community characteristics, spouses' preferences, and the work environment were the three most important influences on graduating residents' choice of practice location.

The physician-to-population ratio in rural counties is far less than in the urban counties. While there are family physicians in every Arizona County, two counties do not have a pediatrician and one county does not have an internal medicine specialist. Among the surgical specialties, two counties do not have any general surgeons, obstetricians, or orthopedists. Ignoring physicians practicing under federal or tribal jurisdiction, there are no medical specialists in cardiovascular medicine in five counties, no neurologists in six counties, and no gastroenterologists in seven counties. Additionally, four rural counties are at risk for losing specialists because the average age of their specialists in one or more fields is over 60 years.

The number of patients seen per week by Arizona physicians has increased from 69 in 1994 to 84 in 2005 and is similar for both men and women. However, physicians older than 65 years old see fewer patients per week than younger physicians.

We have estimated the demand for physician services in Arizona in order to determine if there is currently a shortage of physicians. While the total number of Arizona physicians was 12,024 in 2004 and 13,215 in 2005, the demand forecast predicts a demand for 14,389 and 15,060 physicians respectively for these years, increasing to approximately 40,000 physicians by 2020. Thus, the estimated shortage of physicians is approximately 2,218 physicians in 2005.

In conclusion, this study indicates that the physician workforce in Arizona needs to be increased if it is to meet the demand for care. Increasing the number of training programs and medical schools, although helpful, will not be sufficient to meet the demand.

Recommendations

In order for Arizona to have a sufficient supply of physicians in the future, ongoing monitoring of the status of the physician workforce is essential. However, there is also a need to assess the supply of other health care workers in the state since health care is provided by a team of professionals including nurses, doctors, pharmacists, medical technologists, dentists, and others. Shortages in any of these areas will affect the quality of health care for Arizona citizens. The collaborative approach used by CHIR and Arizona licensing boards can serve as a model for cost-effective, ongoing assessment of all health care professionals. By combining licensing data from the professional boards with survey data, it is possible to determine the current health care workforce supply and predict future workforce needs. In addition, this information can be used to enhance recruitment of health care workers to the state, maintain the workforce, and inform policymakers on the strategies that are most likely to be effective in enhancing and maintaining our health care workforce.

The development of incentives and policies to provide an adequate supply of physician services requires an accurate assessment of the current status of the workforce and changes over time. Our database on the physician workforce in Arizona is unique in terms of its longevity and the scope of its coverage. Despite an unfortunate gap in the data, it permits a state-specific foundation for analyzing the current status of the workforce, monitoring trends, and predicting future workforce needs. In 2005, we added administrative data on NPCs and we hope to include surveys of NPCs in the future. We hope the results of this report can be used to develop an integrated approach to increasing the availability of medical care for all Arizonans that considers the characteristics and incentives that influence physicians and other health care professionals to practice in Arizona is needed.

References

Arizona Council for Graduate Medical Education. (1999). The survey of physicians in residencies in Arizona: Academic year 1998-1999. Phoenix, AZ: Author.

Arizona Department of Economic Security. (2006). Arizona Population Projections 2006–2055. Retrieved July 12, 2006, from http://www.workforce.az.gov/.

Babbie, E. (1990). *Survey research methods* (2nd. ed.). Belmont, CA: Wadsworth.

Brotherton, S.E., Rockey, P.H., & Etzel, S.I. (2005). US Graduate Medical Education, 2004 – 2005. *Journal of the American Medical Association, 294*(9), 1075-82.

Brotherton, S. E., Simon, F.A., & Etzel, S.I. (2001). US Graduate Medical Education, 2000 – 2001. *Journal of the American Medical Association, 286*(9), 1056-60.

Cooper, R.A. (2004). Weighing the evidence for expanding physician supply. *Annals of Internal Medicine, 141*(9), 705-14.

Cooper, R. A., Getzen, T. E., McKee, H. J., & Laud, P. (2002). Economic and demographic trends signal an impending physician shortage. *Health Affairs, 21*(1), 140-54.

Council on Graduate Medical Education. (1992). I*mproving access to health care through physician workforce reform: Directions for the 21st century*. Rockville, MD. Department of Health and Human Services, Health Resources and Services Administration.

Council on Graduate Medical Education. (2005). S*ixteenth report: Physician workforce policy guidelines for the United States, 2000–2020*. Rockville, MD. Department of Health and Human Services, Health Resources and Services Administration.

Etzioni, D., Liu, J., Maggard, M., & Ko, C. (2003). The aging population and its impact on the surgery workforce. *Annals of Surgery, 238*(2), 170-7.

Ferrante, J. M., Gonzalez, E. C., Pal, N., & Roetzheim, R. G. (2000). Effects of physician supply on early detection of breast cancer. *Journal of the American Board of Family Practice, 13*(6), 408-14.

Flinn Foundation. (1989). *Arizona physicians today and tomorrow*. Phoenix, AZ: Commission on Medical Manpower.

Foot, D. K., Lewis, R. P., Pearson, T. A., & Beller, G. A. (2000). Demographics and cardiology, 1950-2050. *Journal of the American College of Cardiology, 35*(5), 1361-2.

Gonzalez, M.L. (n.d.) *Physician marketplace report. An analysis of physician net income: A comparison of high and low earners*. Center for Health Policy and Research for the American Medical Association. Retrieved July 12, 2006, from http://www.ama-assn.org.

Goodman, D.C. (2004, October 7). Twenty-year trends in regional variations in the U.S. physician workforce. *Health Affairs* Web Exclusive, October 7, 2004.

Graduate Medical Education National Advisory Committee. (1980). *Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services, vol. 1.* Washington, DC: Department of Health and Human Services.

Hooker, R. (2006). Physician assistants and nurse practitioners: the United States experience. *The Medical Journal of Australia, 185*(1), 4-7.

Hooker, R. S., & Berlin, L. E. (2002). Trends in the supply of physician assistants and nurse practitioners in the United States. *Health Affairs, 21*(5), 174-181.

Institute of Medicine. (1996). *The nation's physician workforce: Options for balancing supply and requirements.* Washington, DC: National Academy Press.

Johnson, W. G., Brennan, T. A., Newhouse, J. P., Leape, L. L., Lawthers, A. G., Hiatt, H. H., et al. (1992). The economic consequences of medical injuries – implications for a no-fault insurance plan. *Journal of the American Medical Association, 267(*18), 2487-92.

Johnson, W. G., Meenan, R.T., Klett, D., Ott, J., Liddon, M. & Schneller, E. (1994). *The 1992 survey of Arizona physicians: A report to the Arizona Council for Graduate Medical Education.* Tempe, AZ: School of Health Administration and Policy, Arizona State University.

Johnson, W. G., Rimsza, M. E., Garcy, A., & Grossman, M. (2005). *The Arizona physician workforce, part 1: The numbers of practicing physicians 1992-2004.* Tempe, AZ: Center for Health Information and Research, L. William Seidman Research Institute, Arizona State University.

Journal of the American Medical Association. (2005). Graduate medical education. *Journal of the American Medical Association, 294*(9), 1129-43.

Kaiser Family Foundation. (2004). *Rate of nonfederal physicians per 100,000 population, 2004.* Retrieved July 12, 2006, from http://www.statehealthfacts.kff.org

Kemper, L. (2006, July 19). MWU – faculty search email [e-mail to Mark Speicher], [Online]. Available e-mail: Mark.Speicher@asu.edu.

Konrad, B. (2005, May). *Do physicians know when they will quit?* Presentation conducted at the 2005 Association of American Medical Colleges Physician Workforce Research Conference, Washington, D.C.

Krosnick, J. A. (1990). Survey research. *Annual Review of Psychology, 50*, 537-67.

Larsen, E.H., Palazzo, L., Berkowitz, B., Pirani, M.J., & Hart, L.G. (2003). The contribution of nurse practitioners and physician assistants to generalist care in Washington state. *Health Services Research, 38*(4), 1033–50.

National Resident Matching Program. (2006, March 16). *More U.S. medical school seniors choose residencies in competitive and "lifestyle" specialties.* Message posted to http://www.nrmp.org/2006pressrelease.pdf.

Newhouse, J. P. (1990). Geographic access to physician services. *Annual Review of Public Health, 11*, 207-30.

Newton, D. A., Grayson, M. S., & Thompson, L. F. (2005). The variable influence of lifestyle and income on medical students' career specialty choices: Data from two U.S. medical schools, 1998-2004. *Academic Medicine, 80*(9), 809-14.

Newton, D. A., & Grayson, M. S. (2003). Trends in career choice by US medical school graduates. *Journal of the American Medical Association, 290*(9), 1179-82.

Pathman, D. E., Konrad, T. R., Williams, E. S., Scheckler, W. E., Linzer, M., & Douglas, J. (2001). Physician job satisfaction, dissatisfaction, and turnover. *Journal of Family Practice, 51*(7), 593.

Pathman, D. E., Williams, E. S., & Konrad, T. R. (1996). Rural physician satisfaction: Its sources and relationship to retention. *Journal of Rural Health, 12*(5), 366-77.

Rabinowitz, H. K., Diamond, J. J., Markham, F. W., & Hazelwood, C. E. (1999). A program to increase the number of family physicians in rural and underserved areas: Impact after 22 years. *Journal of the American Medical Association, 281*(3), 255-60.

Ricketts, T. C., Hart, L. G., & Pirani, M. (2000). How many rural doctors do we have? *Journal of Rural Health, 16*(3), 198-207.

Roetzheim, R. G., Pal, N., van Durme, D. J., Wathington, D., Ferrante, J. M., Gonzalez, E. C., et al. (2000). Increasing supplies of dermatologists and family physicians are associated with earlier stage of melanoma detection. *Journal of the American Academy of Dermatology, 43*(2 Pt 1), 211-8.

Roetzheim, R. G., Pal, N., Gonzalez, E. C., Ferrante, J. M., Van Durme, D. J., Ayanian, J. Z., et al. (1999). The effects of physician supply on the early detection of colorectal cancer. *The Journal of Family Practice, 48*(11), 850-8.

Rosenthal, M. B., Zaslavsky, A., & Newhouse, J. P. (2005). The geographic distribution of physicians revisited. *Health Services Research, 40*(6), Part I.

Shi, L., Macinko, J., Starfield, B., Wulu, J., Regan, J., & Politzer, R. (2003). The relationship between primary care, income inequality, and mortality in US states, 1980-1995. *Journal of the American Board of Family Practice, 16*(5), 412-22.

Shipman, S. A., Lurie, J. D., & Goodman, D. C. (2004). The general pediatrician: Projecting future workforce supply and requirements. *Pediatrics, 113*(3), 435-42.

Singer, J. A., & Cantoni, C. J. (2001). *Keeping the doctor away: What makes Arizona unattractive to physicians.* Phoenix, AZ: Goldwater Institute.

Thornton, J. A., Johnson, W. G., & Quiroz, J. (1998). *The 1996 survey of Arizona physicians: A report to the Arizona Council for Graduate Medical Education.* Phoenix, AZ: Arizona Council for Graduate Medical Education.

Verby, J. E., Newell, J. P., Andresen, S. A., & Swentko, W. M. (1991). Changing the medical school curriculum to improve patient access to primary care. *Journal of the American Medical Association*, 266(1), 110-3.

Weiner, J.P. (2004, February 4). Prepaid group practice staffing and U.S. physician supply: Lesson for workforce policy. *Health Affairs* Web Exclusive, February 4, 2004.

Appendix A

A response rate of 60% is often cited as the criterion that a survey should meet to be representative (Babbie, 1990, but see also Krosnick, 1999). It is, for example, the criterion applied by the federal Office of Management and Budget. The 60% rule is, however, designed for surveys from samples. The data from our physician surveys is based on a census of all physicians, changing the implications of the 60% rule. If we had selected a sample of physicians, it would have likely not been larger than 25% of all physicians (approximately 3,000) because of the costs of interviewing. The combination of survey questions with licensing forms permits the inclusion of all physicians. A 60% response for a 25% sample of physicians would yield a final survey data set of approximately 15% of the physicians in Arizona. A 60% response rate of the census of physicians yields 60% of the physicians in Arizona. Response rates of less than 60% would be more than adequate for the survey results reported here. In fact, response rates are substantially higher than 60% with the exception of the graduating residents, eliminating potential concerns that our results might not be representative.

The response rate for the graduating residents is approximately 39% of the total number of graduating residents. The response rate for the Practicing Physician Survey is summarized in Appendix Table 1:

Appendix Table 1. Survey Response Rates, 2003 – 2005.

Year Administered	*Survey*	*Allopathic Physicians Receiving Survey*	*Osteopathic Physicians Receiving Survey*	*Total Surveys Distributed*	*Surveys Returned*	*Response Rate*
2003	PPS	8,623	Not Distributed	8,623[1]	8,237	96%
2004	PPS	8,375	1,832	10,207	8,351	82%
2005	PPS	9,470	1,812	11,282	8,480	75%
2005	GRS	N/A	N/A	366[2]	144	39%
2005	NPS	1,308	N/A	1,308[3]	808	62%

[1] Allopathic physicians who renew their licenses in odd years receive the PPS in 2003 and 2005; those renewing in even years received the survey in 2004 (the allopathic physician's birth year determines whether they renew in odd or even years.)

[2] Physicians in their final year of every ACGME-approved residency program in Arizona received a GRS, but whether they were allopathic medical school graduates or osteopathic medical school graduates was not tracked, so only the total number of surveys distributed is provided.

[3] The NPS was only distributed to allopathic physicians in 2005; it is now distributed to new allopathic and osteopathic physicians.

Appendix B

Appendix Table 2. Age Group (as of March 15, 2006) Distributions by County for Selected Specialties (Specialty listed as either Specialty 1 or Specialty 2)

Specialty	Age Group	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
Anesthesiology	<41	1	2	6					109	2		40			1	
	41 – 50		2	8					235	12	2	79	1		5	6
	51 – 55			6	1				84	6	2	28	3		2	6
	56 – 60		2	1					47		1	18			2	4
	61 – 65		1						40	1		15			2	1
	66 – 70		1	1	1				27			7			2	
	>70			1					29			8		1		
Cardiovascular Diseases	<41				1				39	2		12	3			
	41 – 50		1	2					72	2	2	23	3		3	3
	51 – 55			1					37	1		11	2		4	
	56 – 60		1	1	2				37	3	1	16	3		1	3
	61 – 65			1					22	2		9			1	1
	66 – 70								15			3			2	1
	>70			1					14	1		12				
Emergency Medicine	<41		3	5	1				137	3		54	3		10	3
	41 – 50		1	14	3	1	1		136	8	4	45			5	4
	51 – 55	2	1	4	1	1	1		76	2	2	29	3	2		5
	56 – 60		1	5	2			1	54	1	2	27	1	1	5	2
	61 – 65		1	3	1	1			15			12	1	1	1	1
	66 – 70								4		1	6		1		
	>70		1						6	1		2	1		1	
Family Practice	<41	4	6	9	3	8		1	389	9	15	63	16	1	11	13
	41 – 50	9	9	32	9	8	2	1	338	14	20	130	19	4	18	8
	51 – 55	3	6	13	3	3	1	2	185	9	6	73	5	5	14	8
	56 – 60	3	6	11	2	2	1	1	142	7	7	36	8		13	1
	61 – 65	3	5	8	2	4	1	2	83	4	4	25	7		9	1
	66 – 70		3	3	3		1		68	1	1	20	6		2	
	>70		4	7	4	4	2	3	183	5	4	30	6		12	6
Gastroenterology	<41			1					24	1		8			2	1

Specialty	Age Group	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
	41 – 50	1		1					43	3		17	1		1	2
	51 – 55		1	2					14			4			2	
	56 – 60				1				23			5			1	1
	61 – 65								16			7			1	
	66 – 70								9			3				
	>70								7			1			1	
General Surgery	<41		2	2	1				91	2		25			1	1
	41 – 50	1	2	5	3	1		1	97	4	2	38	2		6	5
	51 – 55		2	1					50	3	1	10			4	2
	56 – 60			1	1				44	2	3	7	2		1	2
	61 – 65		3	2	1				26			8	2	1	3	
	66 – 70			1					41	1	1	10				
	>70		1	1				1	49	1		21	2	1	3	2
Internal Medicine	<41	2	8	4	3	1		1	598	19	2	152	18	2	7	21
	41 – 50	2	8	14	4	1		1	621	26	9	202	15	2	21	20
	51 - 55		6	12	4	1			228	6	2	93	5		16	6
	56 – 60	1	7	8	3	1		1	199	5	4	93	9	1	10	6
	61 – 65	1		3					108	4		48	2		6	6
	66 – 70				1				66	1		32			4	3
	>70		2	2				1	88	1	1	39			2	1
Neurology	<41								43	1		7			2	
	41 – 50			2					51	4		20	2		1	4
	51 – 55			2					24	2		6				
	56 – 60		1	1					19	1		9				1
	61 – 65		1						17			5				
	66 – 70								3			2				
	>70		1	1					5			3	1		1	
Neurosurgery	<41			2					14			2				
	41 – 50								15			7				
	51 – 55			1					5			3				

Specialty	Age Group	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
	56 – 60								4			1				
	61 – 65								6			2				
	66 – 70								3			4				
	>70								6			1				
Obstetrics	<41	1		3	1				130	5	1	28		3	4	2
	41 – 50	1	1	8	2				123	6	1	39	3	2	5	3
	51 – 55	1	4	7	1	1			60	4	2	20	4		2	2
	56 – 60		3	2		1			45	2	4	15	2		3	2
	61 – 65	1							44			8				1
	66 – 70	1		1	1	1			29	2		12	1		1	1
	>70			2					44			13			2	1
Orthopedics	<41		1	4	1	1			62	2		21			3	2
	41 – 50		2	4					93	4	4	31	1		1	4
	51 – 55			2	2				28	2		11	2		2	2
	56 – 60			2					28	1	1	11			3	1
	61 – 65		1	2	1				34	1		11			1	2
	66 – 70			1					29			5		1	2	
	>70								28			7			1	1
Pathology	<41		1						20			10				
	41 – 50			4					60	1		22	2		1	2
	51 – 55		2	1					27	2		12			4	
	56 – 60			1					27	2		9				
	61 – 65								16			9			2	2
	66 – 70		1	1					17			6			1	
	>70		1						15	3		9			1	
Pediatrics	<41		2	5					224	3	2	58	3	4	7	4
	41 – 50	2		15	2	1			208	3	1	87	1	3	6	6
	51 – 55		1	3	1				99	1	3	35	1		2	3
	56 – 60		2	2					71	2		21			2	5

	61 – 65		1	2			51	2	1	17	4	2	4
	66 – 70		1	1	1	1	38			15		1	
	>70			3			41		1	15	1		
Psychiatry	<41			4			68	1		35	4	3	1
	41 – 50		4	10			128	2	1	42	2	6	3
	51 – 55		2	5	1		56	2	1	29	2	5	1
	56 – 60		1	4			45	1		31		2	2
	61 – 65			2			38	2	1	17	1	4	1
	66 – 70		1				35	1		14		1	1
	>70	1		2			55			23	1	4	1
Radiology	<41			2			120			33	1	3	
	41 – 50		2	3	1		115		1	37		4	1
	51 – 55			5	1		57		3	17	2	2	
	56 – 60		3	1	2		44		1	11		4	1
	61 – 65			1	1	1	52		2	21		5	
	66 – 70	1		3			30		1	12		3	
	>70			2	1		25			8		5	1

Appendix C

The specialties of Arizona MD and DO physicians were organized as follows for this report:

Primary Care

Specialty Name	*Common Abbreviation(s)*
Adolescent Medicine	ADL
Family Practice, Family Medicine	FP, FM
General Practice	GP
General/Preventive Medicine	GPM
Geriatric Medicine, Geriatrics, Gerontology	GER, FPG, IMG
Internal Medicine	IM
Osteopathic Manipulative Medicine	OM, OMT
Pediatric and Adolescent Medicine	PDA
Pediatrics, Pediatric Medicine	PD
Internal Medicine/Pediatrics	

Medical Specialties

Specialty Name	*Common Abbreviation(s)*
Allergy, Allergy & Immunology, Immunology	A, AI, IG
Cardiology, Cardiovascular Diseases, Interventional Cardiology, Clinical Cardiac Electrophysiology	CD, IC, ICE
Dermatology	D
Endocrinology	END, DIA
Gastroenterology	GE
Hematology, Hematology/Oncology	HEM, HO
Infectious Diseases	ID
Nephrology	NEP
Neurology	N, CN
Oncology, Medical Oncology	ON, MO, OMO
Psychiatry, Psychoanalysis, Geriatric Psychiatry, Forensic Psychiatry	P, PSY
Pulmonology, Pulmonary Diseases	PUD
Rheumatology	RHU

Pediatric Subspecialties

Specialty	*Common Abbreviation(s)*
Child Neurology	
Child Psychiatry, Child and Adolescent Psychiatry	
Developmental/Behavioral Pediatrics	DBP, NDP
Neonatology	NPM
Pediatric Allergy	
Pediatric Cardiology	PDC
Pediatric Dermatology	
Pediatric Endocrinology	PDE
Pediatric Gastroenterology	PDG, PG
Pediatric Hematology, Pediatric Hematology/Oncology	PHO
Pediatric Infectious Diseases	PDI
Pediatric Nephrology	PNP, PN
Pediatric Ophthalmology	PO
Pediatric Ophthalmology, Internal Pediatric Opthalmology	
Pediatric Otolaryngology	PDO
Pediatric Pulmonary Disease, Pediatric Pulmonology	PDP
Sports Medicine (Pediatrics)	SP

Hospital Specialties

Specialty	*Common Abbreviation(s)*
Anesthesiology	AN
Blood Banking/Transfusion Medicine	BBK
Chemical Pathology	PCH
Clinical & Laboratory Dermatological Immunology	DDL
Critical Care Medicine, Critical Care Medicine (Internal Medicine), Critical Care Medicine (Anesthesiology), Critical Care Medicine (Surgery), Pulmonary Critical Care Medicine	CCM, CCA, CCS, PCC
Cytopathology	PCP
Dermatopathology	DMP
Diagnostic Laboratory Immunology	DLI
Diagnostic Radiology, Radiology, Therapeutic Radiology, Musculoskeletal Radiology, Neuro-Radiology	DR, R, PR, TR, AR, NBN
Emergency Medicine, Pediatric Emergency Medicine	EM, PEM, PE
Hematology (Pathology)	HMP
Hospitalist	HOS
Immunopathology	IP
Medical Toxicology	TOX
Neuropathology	NP
Nuclear Cardiology	
Nuclear Medicine	NM
Nuclear Radiology	RNR
Pain Medicine, Pain Management (Anesthesiology)	PM, APM
Pathology, Anatomic Pathology, Anatomic and Clinical Pathology, Clinical Pathology	P, PTH, ATP, ACP, CP, CLP
Pathology, Blood Banking	BLB
Pathology, Chemical	CMP
Pathology, Forensic	FOP
Pediatric Anesthesiology	PAN
Pediatric Critical Care Medicine	PCC
Pediatric Pathology	PP
Pediatric Radiology	
Radiation Oncology	RO
Therapeutic Radiology	
Vascular and Interventional Radiology, Interventional Radiology	VIR

Surgical Specialties

Specialty	*Common Abbreviation(s)*
Abdominal Surgery	ABS
Cardiovascular Surgery, Cardiovascular Surgery, Cardiothoracic Surgery	CDS,CTS, CVS
Colorectal Surgery, Colon and Rectal Surgery	CRS
Cosmetic Surgery	
Dermatologic Surgery	DS
General Surgery, Surgery	GS, BE
Hand Surgery	HS
Maxillofacial Surgery	MFS, CFS
Neurosurgery, Neurological Surgery	NS
Obstetrics	OBS, OBG
Ophthalmology	OPH
Orthopedic Surgery, Sports Medicine (Orthopedic Surgery), Artificial Joint Surgery	ORS, OSM
Otolaryngology, Otology, Pediatric Otolaryngology, Head and Neck Surgery	OTO, OT, OFS, PDO, HNS, NO
Pediatric Neurological Surgery, Pediatric Neurosurery	NSP
Pediatric Orthopedics	OP
Pediatric Surgery	PDS
Pediatric Urology	UP
Plastic Surgery, Facial Plastic Surgery, Facial Reconstructive Surgery	PS, PSH, FRS
Proctology	PRO
Spine Surgery, Orthopedic Surgery of the Spine	OSS
Surgical Assisting	
Surgical Oncology	SO
Thoracic Surgery	TS
Transplant Surgery	TTS
Trauma Surgery, Orthopedic Trauma Surgery	OTR
Urology	U
Vascular Surgery	VS
Vitreo-Retinal Surgery	

Appendix D

Appendix Table 3. Number of Physicians Listing Specialty 1 or Specialty 2 by Specialty Group

Specialty Group	Number of Physicians with a Specialty From This Group Listed As Specialty 1	Number of Physicians with a Specialty From This Group Listed As Specialty 2
Primary Care	6,139	1,436
Medical Subspecialties	1,558	898
Surgical Specialties	2,127	610
Pediatric Subspecialties	154	113
Hospital Specialties	2,498	891
Other/Unknown	739	631 (Other Only)
Total Physicians	13,215	4,579

Appendix Table 4. Physician Specialty by County of Practice (Listed as primary specialty/Listed as primary or secondary specialty)

	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
Anesthesiology															
primary specialty	1	9	18	1				460	19	3	173	3		12	15
primary or secondary specialty	1	10	19	1				591	22	4	209	4		14	19
Cardiovascular Disease															
primary specialty		1	0	0				27	0	1	10	1		0	0
primary or secondary specialty		1	6	3				207	8	4	76	7		10	7
Emergency Medicine															
primary specialty	0	7	19	6	0	0	1	309	19	4	133	6	2	14	8
primary or secondary specialty	3	8	29	10	3	2	1	411	20	10	179	11	4	24	16
Family Practice*															
primary specialty	17	34	60	24	29	3	11	1238	39	49	306	60	11	72	36
primary or secondary specialty	19	40	83	26	30	7	12	1444	51	59	373	74	13	82	40
Gastroenterology															
primary specialty	0	0	0	1				9	0		5	0		0	0
primary or secondary specialty	1	1	4	1				134	3		44	1		6	4
General Surgery															
primary specialty		10	10	3	1		2	246	12	5	65	4	3	13	6
primary or secondary specialty		10	11	6	1		2	400	13	5	115	7	3	18	11
Internal Medicine															
primary specialty	6	23	39	11	3		3	1555	47	18	500	31	5	55	56
primary or secondary specialty	7	29	44	15	3		4	2004	67	21	668	44	6	72	71

	Apache	Cochise	Coconino	Gila	Graham	Greenlee	La Paz	Maricopa	Mohave	Navajo	Pima	Pinal	Santa Cruz	Yavapai	Yuma
Neurology															
primary specialty		3	3					149	7	1	45	0		5	4
primary or secondary specialty		3	6					173	8	1	54	1		5	6
Neurosurgery															
primary specialty			3					50	1		19				
primary or secondary specialty			3					56	1		20				
Obstetrics†															
primary specialty	4	7	20	5	2			445	19	8	128	9	4	21	11
primary or secondary specialty	4	8	21	6	3			474	19	9	133	10	4	21	11
Orthopedics**															
primary specialty		4	12	3	2			274	4	3	98	1		11	9
primary or secondary specialty		4	16	4	2			385	6	6	130	1		16	13
Pathology††															
primary specialty		5	3					137	7	1	54	2		8	4
primary or secondary specialty		7	4					172	9	1	66	2		9	5
General Pediatrics***															
primary specialty	4	8	28	5	2			655	13	7	198	15	6	22	22
primary or secondary specialty	4	8	34	5	2			788	13	8	246	16	6	23	23
Psychiatry†††															
primary specialty		8	22	2		1		392	8	2	164	11		22	7
primary or secondary specialty		10	31	2		1		509	9	3	226	11		26	2
Diagnostic Radiology															
primary specialty	0	4	15	5			1	346	8	3	111	3		27	4
primary or secondary specialty	1	6	16	6			1	462	11	5	161	3		33	4
Total Physicians in County	37	147	335	81	40	7	21	8501	268	122	2798	184	35	363	242

Source: AMB and AOB, 2005.

*Family Practice includes Family Medicine, Family Practice, and General Practice

†Includes Obstetrics and Obstetrics/Gynecology

**Includes Hand Surgery, Spine Survey, and Orthopedic Trauma Surgery

††Includes Anatomic, Clinical, and Forensic Pathology

***Includes Internal Medicine/Pediatrics

†††Includes Child Psychiatry, and Forensic Psychiatry

Appendix E

Appendix Table 5. Mean Number of Patient Visits Per Week for Primary Care Physicians 1994 – 2005

	1994	1995	1996	2003	2004	2005
Practice Type						
Solo Practice	88.1	95.6	94.0	98.2	99.0	96.8
Group Practice	93.9	98.7	96.0	108.4	104.9	104.9
Hospital Staff	64.7	70.5	70.0	101.1	104.6	100.2
Managed Care	86.0	93.2	95.0	N/A	N/A	N/A
Residency/Fellowship	60.0	58.0	50.0	48.7	54	53.0
Public	87.3	93.9	68.0	80.2	75.3	80.3
Freestanding Public Health Clinic	96.2	N/A	N/A	93.3	105.8	89.0
Other	N/A	78.0	86.0	N/A	N/A	N/A
Academic	N/A	N/A	N/A	62.4	65.5	69.8
Position						
Salaried	83.4	83.7	N/A	87.5	87.2	88.2
Self-Employed	85.2	N/A	N/A	105.7	106.2	102.6
Employee	N/A	N/A	N/A	91.8	90.3	91.2
Solo Practice	N/A	95.4	85.0	N/A	N/A	N/A
Partner	N/A	111.5	93.0	N/A	N/A	N/A
Other	N/A	71.2	99.0	N/A	N/A	N/A
Production Based	N/A	N/A	N/A	105.9	105.5	101.6
Salary + Incentive	N/A	N/A	N/A	105.5	103.7	103.3
Gender						
Male	87.0	92.7	N/A	103.1	102.2	101.3
Female	82.3	86.5	N/A	89.3	90.0	89.4
Age Group						
35 and Under	82.7	89.1	81.0	95.5	94.8	86.2
36 – 45	88.9	96.3	91.0	105.3	101.9	101.7
46 – 55	91.8	93.2	94.0	98.5	99.2	101.7
56 – 65	85.6	91.8	92.0	98.7	98.3	96.6
Over 65	60.4	69.6	66.0	70.6	81.3	73.0
Practice Location						
Urban	85.5	90.7	87.0	98.1	97.9	96.9
Rural	87.7	94.2	94.0	101.4	100.6	98.7

Appendix Table 6. Mean Number of Patient Visits Per Week for Medical Subspecialist Physicians 1994 – 2005

	1994	1995	1996	2003	2004	2005
Practice Type						
Solo Practice	72.2	83.2	82.0	95.4	99.2	76.0
Group Practice	59.9	74.4	83.0	101.8	109.1	96.3
Hospital Staff	51.5	85.8	52.0	141.3	126.7	54.5
Managed Care	78.0	71.0	69.0	N/A	N/A	N/A
Residency/Fellowship	35.0	88.8	45.0	75.0	74.7	46.7
Public	35.0	10.0	63.0	66.5	73.2	56.3
Freestanding Public Health Clinic	100.0	N/A	N/A	48.0	75.3	63.7
Other	N/A	49.6	74.0	N/A	N/A	N/A
Academic	N/A	N/A	N/A	53.7	57.4	52.7
Position						
Salaried	59.2	63.3	N/A	77.1	76.6	60.6
Self-Employed	73.0	N/A	N/A	102.6	108.1	84.5
Employee	N/A	N/A	N/A	80.1	86.8	67.2
Solo Practice	N/A	82.1	68.0	N/A	N/A	N/A
Partner	N/A	80.3	85.0	N/A	N/A	N/A
Other	N/A	52.8	88.0	N/A	N/A	N/A
Production Based	N/A	N/A	N/A	103.8	112.9	87.4
Salary + Incentive	N/A	N/A	N/A	97.4	97.9	94.8
Gender						
Male	70.5	73.5	N/A	91.2	98.9	76.4
Female	64.2	69.8	N/A	101.9	89.7	71.6
Age Group						
35 and Under	54.9	58.1	58.0	99.9	114.6	84.0
36 – 45	70.2	73.1	73.0	94.5	93.8	81.4
46 – 55	79.2	75.2	86.0	99.7	107.9	78.2
56 – 65	67.0	84.1	73.0	87.4	96.4	77.8
Over 65	40.5	51.8	36.0	63.5	52.6	48.1
Practice Location						
Urban	69.3	72.8	75.0	92.4	97.4	75.9
Rural	75.9	76.2	76.0	96.2	99.8	76.0

Appendix Table 7. Mean Number of Patient Visits Per Week for Pediatric Subspecialty Physicians 1994 – 2005

	1994	1995	1996	2003	2004	2005
Practice Type						
Solo Practice	31.7	40.0	31.0	64.9	52.4	67.6
Group Practice	55.5	47.8	56.0	77.3	77.5	82.3
Hospital Staff	26.6	41.5	47.0	35.0	N/A	60.0
Managed Care	N/A	20.00	25.0	N/A	N/A	N/A
Residency/Fellowship	N/A	N/A	35.0	N/A	N/A	62.5
Public	N/A	N/A	N/A	N/A	N/A	N/A
Freestanding Public Health Clinic	N/A	N/A	N/A	N/A	N/A	N/A
Other	N/A	30.3	N/A	N/A	N/A	N/A
Academic	N/A	N/A	N/A	62.3	46.5	55.1
Position						
Salaried	26.4	34.6	N/A	71.5	63.9	54.8
Self-Employed	59.0	N/A	N/A	73.3	78.3	90.8
Employee	N/A	N/A	N/A	70.5	59.8	55.7
Solo Practice	N/A	30.0	45.0	N/A	N/A	N/A
Partner	N/A	51.4	42.0	N/A	N/A	N/A
Other	N/A	75.0	N/A	N/A	N/A	N/A
Production Based	N/A	N/A	N/A	69.4	78.4	79.6
Salary + Incentive	N/A	N/A	N/A	71.2	60.0	55.6
Gender						
Male	41.1	41.9	N/A	77.2	66.5	76.5
Female	32.2	40.6	N/A	51.4	62.5	49.8
Age Group						
35 and Under	30.0	41.3	59.0	35.0	N/A	101.7
36 – 45	40.2	41.6	45.0	56.1	87.5	66.9
46 – 55	40.8	43.2	48.0	82.0	57.3	55.4
56 – 65	37.5	43.0	41.0	68.3	76.7	89.4
Over 65	N/A	15.0		40.0	40.0	59.7
Practice Location						
Urban	40.4	42.2	45.0	70.9	65.1	69.8
Rural			N/A	77.5	75.0	

Appendix Table 8. Mean Number of Patient Visits Per Week for Hospital Subspecialty Physicians 1994 – 2005

	1994	1995	1996	2003	2004	2005
Practice Type						
Solo Practice	44.1	38.6	41.0	52.5	50.1	47.2
Group Practice	117.0	104.0	67.0	84.6	89.6	88.2
Hospital Staff	87.6	89.1	77.0	102.0	91.8	95.3
Managed Care	78.0	132.0	116.0	N/A	N/A	N/A
Residency/Fellowship	35.0	51.0	59.0	27.0	95.7	51.3
Public		30.0	86.0	53.7	52.1	43.6
Freestanding Public Health Clinic	19.7	N/A	N/A	70.0	120.0	120.0
Other	N/A	69.2	59.0	N/A	N/A	N/A
Academic	N/A	N/A	N/A	119.9	74.9	116.3
Position						
Salaried	124.1	87.9	N/A	109.6	115.6	107.2
Self-Employed	58.4	N/A	N/A	69.3	69.6	70.5
Employee	N/A	N/A	N/A	92.8	92.3	91.824
Solo Practice	N/A	46.5	76.0	N/A	N/A	N/A
Partner	N/A	101.5	59.0	N/A	N/A	N/A
Other	N/A	70.9	93.0	N/A	N/A	N/A
Production Based	N/A	N/A	N/A	60.4	60.8	64.2
Salary + Incentive	N/A	N/A	N/A	97.8	94.1	92.4
Gender						
Male	80.0	84.6	N/A	79.6	87.7	81.6
Female	91.0	87.4	N/A	97.9	82.4	91.5
Age Group						
35 and Under	72.0	69.7	53.0	79.7	82.6	54.5
36 – 45	78.2	84.9	59.0	77.8	78.7	84.6
46 – 55	94.6	92.0	81.0	74.1	81.3	78.8
56 – 65	79.4	92.6	94.0	114.0	91.1	99.9
Over 65	79.4	72.8	72.0	103.5	109.2	109.4
Practice Location						
Urban	79.2	86.3	67.0	82.9	82.3	81.2
Rural	99.6	75.3	71.0	81.9	87.0	95.8

Appendix Table 9. Mean Number of Patient Visits Per Week for Surgical Subspecialty Physicians 1994 – 2005

	1994	1995	1996	2003	2004	2005
Practice Type						
Solo Practice	71.7	69.6	72.0	74.8	78.3	74.2
Group Practice	77.2	83.9	85.0	96.5	98.0	96.2
Hospital Staff	48.4	48.1	71.0	74.4	116.0	116.0
Managed Care	72.3	76.9	80.0	N/A	N/A	N/A
Residency/Fellowship	53.0	65.6	65.0	65.3	63.2	91.1
Public	75.0		59.0	67.8	63.5	60.3
Freestanding Public Health Clinic	80.7	N/A	N/A	59.5	59.5	59.5
Other	N/A	69.0	79.0	N/A	N/A	N/A
Academic	N/A	N/A	N/A	74.2	60.0	64.2
Position						
Salaried	68.7	71.5	N/A	74.4	77.7	75.4
Self-Employed	60.5	N/A	N/A	82.7	85.8	82.5
Employee	N/A	N/A	N/A	85.5	87.7	83.1
Solo Practice	N/A	68.1	77.0	N/A	N/A	N/A
Partner	N/A	89.2	77.0	N/A	N/A	N/A
Other	N/A	55.2	79.0	N/A	N/A	N/A
Production Based	N/A	N/A	N/A	84.4	86.8	85.0
Salary + Incentive	N/A	N/A	N/A	95.4	98.0	87.2
Gender						
Male	73.2	74.6	N/A	84.6	87.8	83.2
Female	69.4	74.3	N/A	80.8	81.5	82.3
Age Group						
35 and Under	59.2	70.8	72.0	82.9	89.6	80.8
36 – 45	80.4	81.2	83.0	87.8	85.2	84.9
46 – 55	82.0	80.6	82.0	90.8	95.4	92.3
56 – 65	62.4	65.5	72.0	78.0	85.7	81.6
Over 65	46.4	48.4	43.0	46.7	54.4	52.5
Practice Location						
Urban	66.9	74.2	76.0	83.5	86.9	81.7
Rural	73.5	77.9	82.0	84.6	83.9	89.1

Appendix F

Appendix Table 10. Medical Workforce Location by County

County	*MD*	*%MD*	*DO*	*%DO*	*NP*	*%NP*	*PA*	*%PA*	*Total Providers*	*% Non-Physician*
Apache	27	36%	10	13%	18	24%	21	28%	76	51%
Cochise	117	56%	30	14%	43	21%	18	9%	208	29%
Coconino	313	65%	22	5%	98	21%	45	9%	478	30%
Gila	67	58%	14	12%	15	13%	19	17%	115	30%
Graham	27	44%	13	21%	7	11%	15	24%	62	35%
Greenlee	6	43%	1	7%	0	0%	7	50%	14	50%
La Paz	13	45%	8	28%	5	17%	3	10%	29	28%
Maricopa	7,435	70%	1,066	10%	1,381	13%	773	7%	10,655	20%
Mohave	211	58%	57	16%	38	11%	55	15%	361	26%
Navajo	95	54%	27	15%	36	20%	19	11%	177	31%
Pima	2,565	75%	233	7%	490	14%	136	4%	3,424	18%
Pinal	153	55%	31	11%	47	17%	45	16%	276	33%
Santa Cruz	32	62%	3	6%	13	25%	4	8%	52	33%
Yavapai	308	66%	55	12%	75	16%	31	7%	469	23%
Yuma	220	69%	22	7%	38	12%	41	13%	321	25%
Rural	1,589	14%	293	18%	433	19%	323	26%	2,638	16%
Urban	10,000	86%	1,299	82%	1,871	81%	909	74%	14,079	84%
Total	11,589	69%	1,592	10%	2,304	14%	1,232	7%	16,717	21%
Out-of-State					523		497			

Source: AMB, AOB, and AZBN data, 2005

Appendix G

The report, *Arizona Physicians Today and Tomorrow* (Flinn Foundation, 1989) used a method by which Arizona population estimates were multiplied by the physician-to-population requirements for the United States as estimated by the Health Resources and Services Commission's Graduate Medical Education National Advisory Council (GMENAC) and its Bureau of Health Professions (BHP). That methodology is reproduced here, with more recent population estimates.

Appendix Table 11. Population Figures Used to Test Physician Workforce Estimates

	2000 Actual Census	*2005 Est.*	*2010 Projected*
Arizona	5,130,632	6,044,985	6,999,810
Maricopa County	3,072,149	3,648,545	4,217,427
Pima County	843,746	957,635	1,070,723
Total Urban Population	3,915,895	4,606,180	5,288,150

Source: Arizona Department of Economic Security, Population Statistics Unit, 2006

Appendix Table 12. BHP and GMENAC Physician Workforce Requirements

Source	*Requirement for Physicians/ 100,000 Urban Population*	*Resulting 2000 Estimate*	*Resulting 2005 Estimate*	*Resulting 2010 Projections*
BHPr	230.9	9,042	10,636	12,210
GMENAC	194.6	7,620	8,964	10,291

Source: Commission on Medical Manpower, *Arizona Physicians Today and Tomorrow*. The Flinn Foundation. Phoenix, AZ. 1989, pp. 37 - 43. These numbers are then multiplied by the population numbers in Appendix Table 11.

Appendix H

Appendix Table 13. Actual Arizona Physicians and Projections, 1994 - 2020

Year	Active AZ MDs	Active AZ DOs	Total Arizona Physicians	Moving Average Projection	Linear Forecast MD's	AZ Population (Millions)	Actual Physicians Per Capita	Moving Avg Forecast Ratio	Linear Projection Ratio
1994	7,193	833	8,026	7,193	7,233	4.2	191		172
1995	7,814		7,814	7,814	7,547	4.4	178		172
1996	8,047		8,047	8,047	7,862	4.6	175		171
1997	8,421		8,421	8,421	8,177	4.7	179		174
1998				8,491	8,491	4.9			173
1999	8,428		8,428	8,428	8,806	5.0	169	169	176
2000				9,120	9,120	5.1		179	179
2001				9,435	9,435	5.3		178	178
2002	8,976		8,976	8,976	9,750	5.4	166	166	181
2003	9,228		9,228	9,228	10,064	5.6	165	165	180
2004	10,787	1,237	12,024	10,787	10,379	5.8	207	186	179
2005	11,616	1,599	13,215	11,616	10,693	6.1	217	190	175
2006				10,008	11,008	6.2		160	176
2007				10,123	11,323	6.4		157	176
2008				10,352	11,637	6.6		156	176
2009				10,577	11,952	6.8		155	175
2010				10,535	12,266	7.0		151	175
2011				10,319	12,581	7.2		144	175
2012				10,382	12,896	7.4		141	175
2013				10,433	13,210	7.6		138	175
2014				10,449	13,525	7.7		135	175
2015				10,424	13,839	7.9		132	175
2016				10,401	14,154	8.1		129	175
2017				10,418	14,469	8.3		126	175
2018				10,425	14,783	8.4		124	175
2019				10,424	15,098	8.6		121	175
2020				10,418	15,412	8.8		119	176

Increase in Linear Trend Projection is 8,219 (114%) in 24 years, for a compounded annual rate of increase of 8.92%

Increase in 5-Year Moving Average Projection is 3,225 (45%) in 27 years, for a compounded annual rate of increase of 5.45%

Appendix Table 12. Actual Arizona Physicians and Projections according to Cooper Model, 1994 - 2020

Year	Gross State Product*	Active AZ MDs**	Active AZ DOs	Total Active AZ Docs*****	AZ Population ***	Per Capita GSP	Phys Per Capita****	GSP Per Capita Growth	Cooper Demand For Physician Services	% Change	#Docs Needed	Shortfall
1990	81,143.0	6,617	698	7,315	3.7	21,931	198					
1991	81,771.0											
1992	88,059.0	6,923	758	7,681	3.9	22,579	197					
1993	91,709.0			7,900	4.0	22,927		1.54%		1.16%		
1994	100,206.0	7,193	833	8,026	4.2	23,859	191	4.06%	197	3.05%	8271	245
1995	107,538.0	7,814		7,814	4.4	24,440	178	2.44%	201	1.83%	8823	1,009
1996	116,083.0	8,047		8,047	4.6	25,235	175	3.25%	205	2.44%	9449	1,402
1997	127,439.0	8,421		8,421	4.7	27,115	179	7.45%	217	5.59%	10194	1,773
1998	138,173.0				4.9	28,199		4.00%	223	3.00%	10946	
1999	149,036.0	8,428		8,428	5.0	29,807	169	5.70%	233	4.28%	11647	3,219
2000	157,639.0				5.1	30,910		3.70%	239	2.77%	12210	
2001	162,407.0				5.3	30,643		-0.86%	238	-0.65%	12606	
2002	167,980.0	8,976		8,976	5.4	31,107	166	1.52%	241	1.14%	12990	4,014
2003	175,536.0	9,228		9,228	5.6	31,346	165	0.77%	242	0.57%	13549	4,321
2004	187,953.0	10,787	1,237	12,024	5.8	32,406	207	3.38%	248	2.54%	14389	2,365
2005	205,671.9	11,616	1,599	13,215	6.1	33,717	217	4.05%	256	3.03%	15592	2,377
2006	225,082.5				6.2	36,074		6.99%	269	5.24%	16785	
2007	238,972.5				6.4	37,154		2.99%	275	2.24%	17691	
2008	253,335.3				6.6	38,251		2.95%	281	2.22%	18620	
2009	272,241.7				6.8	39,964		4.48%	291	3.36%	19795	
2010	294,043.5				7.0	42,007		5.11%	302	3.83%	21120	
2015	430,160.5				7.9	54,343		29.37%	368	22.02%	29144	
2020	632,614.3				8.8	72,055		32.59%	458	24.44%	40226	

**Sources include HDRG, HRSA (1998) and the Goldwater Institute (2000)

***Millions

****Per 100,000 Population

*****Estimated for 1993 and 1995 - 2000, 2002 and 2003

Appendix I: Survey Instruments

Note:

Graduating Resident Survey	2004 – 2005
New Physician Survey	2004 – 2005
Practicing Physician Survey	2003 – 2005

(1)☐ M.D. (0)☐ D.O. (1)☐ Female (0)☐ Male

Residency Program_____

1) Year of Residency(2005-2006) Post Graduate Year(check one) 1☐ 2☐ 3☐ 4☐ 5☐ 6+☐ Fellow☐

2) Current Specialty (check all that apply)

(1)☐Anesthesiology (AN)
(2)☐Emergency Medicine (EM)
(3)☐Family Practice (FP)
(4)☐Internal Medicine (IM)
(5)☐Psychiatry (P)
(6)☐ Psychiatry/Internal Medicine (P/IM)
(7)☐Pediatrics/Internal Medicine (PED/IM)
(8)☐Pathology (PTH)
(9)☐General Pediatrics (PD)
(10)☐General Surgery (GS)
(11)☐ Orthopedic Surgery (ORS)
(12)☐ OB/GYN (OBS/GYN)
(13)☐ Transitional
(14)☐ Other: (Enter specialty codes from page 5)
(1)_____ (2)_____

3) What is the nature of your new practice or activity?

(1)☐Solo Practice
(2)☐Single Specialty Group Practice
(3)☐Multi Specialty Group Practice
(4)☐Hospital Based Practice
(5)☐Public Health
(6)☐HMO
(7)☐University
(8)☐Safety Net Clinic/Health Center
(9)☐IHS
(10)☐Further Training (name):_____
(11)☐Other (name):_____

4) Will you be providing mainly primary care or specialty care in your new activity? (1)☐Primary (2)☐Specialty

5) If you actively sought a position, how many were you offered? _____

6) What source of information is (was) most important in searching for a job? (*Please check only one box.*)

(1)☐Through a search firm

(2)☐ Personal contact during medical school

(3)☐ Through professional meetings

(4)☐Through a classified ad in a medical journal

(5) ☐Word of mouth

(6)☐Other

7) Please rank the importance of each of the following influences by circling one of the rankings.

INFLUENCES ON YOUR CHOICE OF NEW PRACTICE OR ACTIVITY

	VERY IMPORTANT	IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT VERY IMPORTANT	DOES NOT APPLY
1)Child care arrangements	5	4	3	2	1	9
2)Influence of residency mentor	5	4	3	2	1	9
3)Family/friends in community	5	4	3	2	1	9
4)Financial help for establishing a practice	5	4	3	2	1	9
5)Professional contacts	5	4	3	2	1	9
6)Financial compensation	5	4	3	2	1	9
7)Characteristics of the community	5	4	3	2	1	9
8)Work environment	5	4	3	2	1	9
9)Chance to serve an underserved group	5	4	3	2	1	9
10)Recruited by colleagues	5	4	3	2	1	9
11)Quality of hospital facilities	5	4	3	2	1	9
12)Spouse's work opportunities	5	4	3	2	1	9
13)Spouse's preference for places to live	5	4	3	2	1	9
14)No move required	5	4	3	2	1	9
15)Took rotation in the community	5	4	3	2	1	9
16)Educational debt	5	4	3	2	1	9
17)Night call arrangements	5	4	3	2	1	9
18)Quality of schools	5	4	3	2	1	9
19)No other alternative	5	4	3	2	1	9
20)Salaried position	5	4	3	2	1	9
21)Part-time position	5	4	3	2	1	9
22)Flexible scheduling	5	4	3	2	1	9
23)Good benefits	5	4	3	2	1	9
24)Any other important factors (describe):						

8) Which of the influences checked in question 7 was the most important? (enter the number that corresponds to your choice)_____ (1 – 24)

9) What are your expected earnings in your first year in this position? $_____

10) What city and state do you intend to practice in?

a) The name of the community is:_____. The state or province is:_____.

11) *During medical school,* did you have one or more clinical training experiences in a rural or underserved urban site?

NO: (0)☐ (go to 12)

Yes: (1)☐rural (2)☐underserved

a) Was the experience (1)☐voluntary? (2)☐required?

b) Did this influence your choice of medical specialty? **NO:** (0)☐ **Yes:** (1)☐

12) *During residency training,* did you have one or more clinical training experiences in a rural or underserved urban site?

NO: (0)☐ (go to 13)

Yes: (1)☐rural (2)☐underserved

a) Was the experience (1)☐voluntary? (2)☐required?

b) Did this influence your choice of medical specialty? **NO:** (0)☐ **Yes:** (1)☐

13) Please describe the city/town where you grew up:

a) The community is: (1)☐Large metropolitan area (3)☐Small city or large town

(2)☐Medium-sized city (4)☐Rural, farm, reservation

b) The name of the community is:_____; The state or province is:_____.

14) What sources did you use to finance your medical school education? (check all that apply)

☐Family loans ☐ Loans other than family ☐Health Professions Student Loan

☐National Health Service Corps. ☐Work/spouse's work ☐Savings

☐Scholarships ☐Other (describe)_____

15) Approximately how much have you borrowed to pay for your education since entering medical school?

☐Did not borrow ☐$50,000 - $69,000 ☐$110,000 - $129,000

☐Less than $30,000 ☐$70,000 - $89,000 ☐$130,000 - $149,000

☐$30,000 - $49,000 ☐$90,000 - $109,000 ☐more than $149,000 (enter amount) $_____

16) Please rank the importance of each of the following influences by circling one of the rankings.

INFLUENCES ON YOUR CHOICE OF RESIDENCY TRAINING PROGRAM

	VERY IMPORTANT	IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT VERY IMPORTANT	DOES NOT APPLY
1) Length of residency	5	4	3	2	1	9
2) Earnings potential	5	4	3	2	1	9
3) Prestige of the specialty among the medical profession	5	4	3	2	1	9
4) Opportunity to work regular hours after completing training	5	4	3	2	1	9
5) Best match with spouse's career objectives	5	4	3	2	1	9
6) Best match with family's lifestyle objectives	5	4	3	2	1	9
7) Rural rotation	5	4	3	2	1	9
8) Influence of medical school faculty	5	4	3	2	1	9
9) Availability of residency positions in the specialty	5	4	3	2	1	9
10) Availability of practice opportunities	5	4	3	2	1	9
11) Interest in sub-specialty training	5	4	3	2	1	9
12) Educational Debt	5	4	3	2	1	9

17) Which of the influences checked in question 16 was the most important? (enter the number that corresponds to your choice)

_____ (1 – 12)

18) If you were choosing a specialty now, would you have chosen your current specialty?

(1)☐YES (0)☐NO, because_____

_____

19) Are you a U.S. citizen? (1)☐YES (0)☐NO

20) Are you a graduate of the University of Arizona Medical School? (1)☐YES (0)☐NO

21) Are you a graduate of a NON-U.S. medical school? (1)☐YES (answer a) (0)☐NO

a) If YES, in what country was the school located? _____

Please insert your completed survey instrument in the postage paid envelope. Seal the envelope and return it to the Director of your Residency Program.

THANK YOU VERY MUCH FOR CONTRIBUTING TO A BETTER UNDERSTANDING OF GRADUATE MEDICAL EDUCATION. YOU CAN RECEIVE ONE FREE COPY OF THE RESEARCH REPORT THAT USE THE DATA FROM THE ANNUAL CENSUS OF RESIDENTS BY EMAILING Anthony.Garcy@asu.edu or Mary.Rimsza@asu.edu

DESIGNATED SPECIALTY CODES

	HOSPITAL
AN	Anesthesiology
CCM	Critical Care Medicine
EM	Emergency Medicine
HOS	Hospitalist
PTH	Pathology
PNE	Pediatric Anesthesiology
RO	Radiation Oncology
R	Radiology
	PEDIATRICS
NPM	Neonatology
PDC	Pediatric Cardiology
PDE	Pediatric Endocrinology
PDG	Pediatric Gastroenterology
PHO	Pediatric Hematology-Oncology
PDI	Pediatric Infectious Diseases
PNP	Pediatric Nephrology
PDP	Pediatric Pulmonary Disease
	PRIMARY CARE
FP	General/Family Practice
GER	Geriatrics
IM	Internal Medicine
PD	Pediatrics
	MEDICAL
A	Allergy
CD	Cardiovascular Diseases
D	Dermatology
END	Endocrinology
GE	Gastroenterology
HEM	Hematology
ID	Infectious Diseases
NEP	Nephrology
N	Neurology
ON	Oncology
PUD	Pulmonary Diseases
RHU	Rheumatology
	OTHER SPECIALTIES
ACU	Acupuncture
ADM	Administrative Medicine
ADL	Adolescent Medicine
AM	Aerospace Medicine
CMD	Chemical Dependency
CHP	Child Psychiatry
PA	Pharmacology, Clinical

	OTHER SPECIALTIES
GEN	Genetics
GYN	Gynecology
HEP	Hepatology
INT	Intern
LM	Legal Medicine
TOX	Medical Toxicology
NM	Nuclear Medicine
NTR	Nutrition
PNC	Pain Control
PM	Physical Medicine & Rehabilitation
PHP	Preventive Medicine-Public Health/Preventive Medicine
P	Psychiatry
PH	Public Health
OM	Occupational Medicine
OMM	Osteopathic Manipulative Medicine
OS	Other Specialty
REN	Reproductive Endocrinology
RES	Research
SM	Sports Medicine
UM	Underseas Medicine & Hyperbaric Medicine
VM	Vascular Medicine
	SURGICAL
CDS	Cardiovascular Surgery
CRS	Colon & Rectal Surgery
GS	General Surgery
HS	Hand Surgery
MFS	Maxillofacial Surgery
NS	Neurological Surgery
OBS	Obstetrics
OPH	Ophthalmology
ORS	Orthopedic Surgery
OTO	Otolaryngology
PDS	Pediatric Surgery
NSP	Pediatric Neurosurgery
OP	Pediatric Orthopedics
PO	Pediatric Ophthalmology
PDO	Pediatric Otolaryngology
UP	Pediatric Urology
PS	Plastic Surgery
PRO	Proctology
SO	Surgical Oncology
TS	Thoracic Surgery
TTS	Transplant Surgery
U	Urological Surgery
VS	Vascular Surgery

New Physician Survey

Please complete the survey below and return with your application for licensure.

Applicant Name _____

1. I'm applying for an Arizona license because: (select the three most important reasons from the "Reason for Applying for an AZ License": see box)

_____ _____ _____
Reason #1 Reason #2 Reason #3

REASON FOR APPLYING FOR AN AZ LICENSE
1. Completed a residency.
2. Considering retirement.
3. Bought into practice/became partner.
4. Opportunity to serve an underserved group.
5. Malpractice expenses too high in current practice state.
6. Position ended.
7. Too much paperwork.
8. To change the scope of practice.

2. Please indicate which of the following was important in influencing you to practice in Arizona. Circle **one** code number after each factor.

Factor	Important	Not Important	Does Not Apply
1. Grew up in the area	1	2	3
2. Personal ties in the community	1	2	3
3. Professional contacts	1	2	3
4. Characteristic of the community	1	2	3
5. Financial advantages	1	2	3
6. The opportunity to serve a particular group of people	1	2	3
7. Best professional opportunity available	1	2	3
8. Recruited by colleagues	1	2	3
9. Availability of adequate hospital facilities	1	2	3
10. Influence of Spouse	1	2	3
11. Location of military service	1	2	3
12. Location of residency	1	2	3
13. Earnings potential	1	2	3
14. Work environment/hours of work	1	2	3

15. If other important factor, specify_____

_____

_____

3. Please list the code number from the list above which represents the SINGLE most important reason that influenced you to practice in Arizona.____

4. I am moving **to** (city/town)_____, Arizona **from** (city/town)_____ (state/country)_____.

Practicing Physician Survey

Arizona License Number: _____ Name _____

A. My practice in 1998 and my current practice can be **BEST** described as (**check no more than two in each column**):

	In 1998		**Current**
	Not in Active Practice: Fully Retired		Not in Active Practice: Fully Retired
	Semi-Retired / On Leave		Semi- Retired / On Leave
	Group Practice		Group Practice
	Solo Practice		Solo Practice
	Hospitalist		Hospitalist
	Non-Profit Community Health Center		Non-Profit Community Health Center
	Government (VA, IHS, Public Health)		Government (VA, IHS, Public Health)
	Administrative Medicine		Administrative Medicine
	Academic/Teaching/Research		Academic/Teaching/Research
	In training (med school, intern, resident, fellow)		In training (med school, intern, resident, fellow)

B. My employment in 1998 and current can best be described as

	In 1998		**Current**
	Self-employed		Self-Employed
	Employee		Employee

C. My primary compensation is **BEST described as (check only one in each column)**

	In 1998		**Current**
	Base Salary/Straight Salary		Base Salary/Straight Salary
	Salary plus incentive		Salary plus incentive
	Production based		Production based

If **completely retired**, date of retirement _____ if **completely retired** this is the end of the survey, otherwise, please continue:

D. I usually work _____ days per week (Mon- Fri) and _____ days per weekend (Sat-Sun)

E. I usually work _____ hours per day during the week (Mon-Fri) and _____ per day on the weekend (Sat-Sun)

F. I usually work _____ weeks per year and _____ weekends per year

G. I usually treat _____ patients in a typical week and _____ patients on a typical weekend.

H. I can provide adequate care, without using a translator, to patients who speak the following languages:
(check all that apply):

	English		French		Chinese		Hindi
	Spanish		Vietnamese		Arabic		Tagalog

I. What percent of your work time in a typical week is spent on each of the following?(Insert 0 if none)

1) Providing primary care to non-specialty patients _____ %
2) Providing primary care to continuing specialty patients _____ %
3) Providing specialty care only _____ %
4) Management of practice _____ %
5) Other _____ %

100%