MASSACHUSETTS MEDICAL SOCIETY HOUSE OF DELEGATES

Code:	Late Report: A-02 (A)
Title:	Physician Workforce Study [Resolution: 108, A-01 (A)]
Sponsor:	Committee on Medical Service Subramanyan Jayasankar, M.D., Chair

Introduction

At A-01, the House of Delegates (HOD) adopted Resolution: 108, A-01 (A) Physician Workforce Study, which included the following recommendations:

1. That the Massachusetts Medical Society (MMS) perform a workforce study to assess current and future physician supply issues in Massachusetts.

2. That the MMS conduct a survey of Massachusetts resident training programs and the trainees who are leaving the Commonwealth to practice elsewhere.

3. That the MMS perform a root cause analysis of any physician supply shortages identified and provide recommendations to resolve them to the Board of Trustees with a report back at the House of Delegates at A-02.

The Resolution was referred to the Committee on Medical Service in consultation with the Resident Physician Section on item 2 above for a report back at A-02.

The Committee consulted with economists James Howell, Ph.D., Carol Simon, Ph.D., and Andrew Sum, Ph.D. Given the large scope of the project, the Committee felt that primary (e.g., survey, focus groups) and secondary data (existing databases) were needed to properly examine the Massachusetts physician workforce. The Committee conducted the following primary research: focus groups of residents and fellows, a survey of residents and fellows in their last year of training, a survey of residency and fellowship program directors, a survey of teaching hospital department chiefs, and a survey of physicians in community and hospital settings throughout Massachusetts.

Background

The Council on Graduate Medical Education (COGME) has historically been the governmental advisory body forecasting national physician workforce supply. COGME's modeling is primarily based on trending the number of trainees, the number of international medical graduates (IMGs), the percentage of generalists versus specialists, the growth of managed care, the growth of non-physician clinical graduates, the average length of stay in hospitals, and other health-sector indicators. In their reports, COGME indicates that there is an impending physician oversupply and, specifically, an

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oversupply of specialists.[12] These reports influenced the government funding agencies to reduce funding of specialist training programs. It is important to note that often these models are based on technological forecasting models rather than labor market models that take into account specific geographic labor markets and specialty supply and demand factors.

In response to the publications of the COGME reports, Richard Cooper, M.D., from the Health Policy Institute at the Medical College of Wisconsin, published an alternative forecasting model for the national physician workforce supply.[3] His trend model focuses on economic growth (gross domestic product and per capita income); health care spending; population growth; physician productivity, which is affected by changes in technology; and the services provided by non-physician clinicians. Predictions from this model indicate that there will be a substantial shortage of physicians by 2020.

At the state level, physician workforce studies have recently been conducted in Arizona, California, and Texas. These studies are similar to the national studies in that they focus on such variables as physician-to-population ratios, health insurance coverage, managed care penetration, and government reimbursement. However, each state has its own unique set of future challenges. Arizona faces very low physician-to-population ratios and a high percentage of uninsured patients.[4] Texas has a high number of physicians imported from other states that currently meets the increase in medical care demanded by a growing population.[5] However, cuts in funding for graduate medical education along with managed care penetration may threaten Texans' access to medical care. Results from the California study show that managed care penetration has eroded physician satisfaction and that practices are having difficulty recruiting physicians.[6]

Although there is anecdotal evidence of shortages in specific specialties, a comprehensive workforce study has not been done in Massachusetts. Some specialty societies, though, have performed initial studies to understand and quantify this situation. For example, a manpower study sponsored by the Massachusetts Society of Anesthesiologists examined vacancies, recruiting, and curtailing of services. In addition, it also surveyed graduating residents to determine their post-residency employment plans. Results show that hospitals are finding it difficult to recruit new anesthesiologists and must often curtail elective surgery schedules. Of the anesthesiology residents surveyed, over half left Massachusetts. An extensive bibliography of resources related to the physician workforce question is contained in Appendix A.

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[1] COGME. Update on the Physician Workforce. August 2000.
[2] COGME. COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals. March 1999.
[3] Cooper, et al. Economic and Demographic Trends Signal an Impending Physician Shortage. Health Affairs, January/February 2002.
[4] Singer JA, Cantoni CJ. Keeping the Doctor Away: What Makes Arizona Unattractive to Physicians. Goldwater Intstitute, October 2001.
[5] Texas Medical Association. Report of the Council on Medical Education: 2001 TMA Physician Workforce Report. October 2001.
[6] California Medical Association. And Then There Were None: The Coming Physician Supply Problem. July 2001.

With these background studies in mind, the Committee took the following steps in an effort to assess the physician workforce supply in Massachusetts.

Methodology

Resident and Fellow Focus Group

Focus groups were held at four different academic medical centers: Massachusetts General Hospital, Brigham and Women's Hospital, Boston University Medical Center, and Baystate Medical Center. These focus groups were intended to more clearly delineate the issues facing residents and fellows when making career decisions and to provide feedback on the survey tool for residents and fellows in their final year of training.

Resident/Fellow Survey and Residency/Fellowship Program Director Survey

In focusing on the factors affecting the residents' and fellows' locational decisions, two groups were surveyed: residents and fellows in their last year of training and the residency and fellowship program directors. The survey mailings targeted fourteen specialties at nine teaching hospitals:

> *Specialties:* anesthesiology, cardiology, emergency medicine, family practice, gastroenterology, general surgery, internal medicine, neurosurgery, obstetrics and gynecology, orthopedics, pediatrics, psychiatry, radiology, and vascular surgery.
>
> *Teaching Hospitals:* Boston University Medical Center, Massachusetts General Hospital, Brigham and Women's Hospital, Beth Israel Deaconess Medical Center, Children's Hospital, Baystate Medical Center, UMass Medical Center, St. Elizabeth's Medical Center, and New England Medical Center

A four-page, seven-question survey was developed to ask about post-training employment decisions, whether or not they were planning on seeking employment in Massachusetts, and how respondents rated Massachusetts (favorably/unfavorably) with respect to professional and personal factors that influence locational decisions. The survey was field-tested at the focus groups and reviewed by the MMS Resident Physician Section, practicing physicians, and survey development experts.

The survey for program directors asked historical questions about program openings and applications over the past year, as well as the number of trainees who stayed or left Massachusetts between 1996 and 2001. Residency and fellowship program directors were also asked how Massachusetts rated (favorably/unfavorably) with respect to professional and personal factors.

Both surveys were mailed in November of 2001. Staff contacted each of the residency and fellowship programs, using the American Medical Association's (AMA's) Graduate Medical Education Directory, to explain the goal of our study and to reemphasize that only graduating residents and fellows were eligible to participate. Working with the program coordinator to determine the number of residents and fellows in their last year of training, a package of surveys was sent to each program containing surveys for residents, fellows, and the program director. Each survey packet included a cover letter, survey, and postage-paid return envelope. In an effort to increase the survey response rate, three follow-up mailings were sent to the programs.

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Hospital Department Chiefs Survey

This survey asked department chiefs of anesthesia, cardiology, orthopedics, and radiology at the nine teaching hospitals questions regarding physician full time equivalents (FTE) currently employed, FTE vacancies, new hires, and separations during the last six months. Only four specialties were selected for this survey in order to test the interest of respondents in completing the data. It also asked for the department chiefs' experience with the adequacy of the physician applicant pool, recruiting time to fill a physician vacancy, altering services and adjusting staffing due to unfilled vacancies, and retention of existing staff physicians. Surveys were sent with a cover letter and postage-paid return envelope. Follow-up phone calls and two additional follow-up mailings were also sent. Results from their surveys were kept in the aggregate to maintain the confidentiality of the respondents.

Survey to Practicing Physicians

A survey of practicing physicians provided another perspective on workforce issues. Questions about vacancies, recruitment efforts, altering services or adjusting staffing due to physician vacancies, shortages in specific specialties, and retention were added to an MMS satisfaction survey that also measures physician opinions on the practice environment in Massachusetts.

This survey was mailed in January 2002 to 4,000 physicians, both MMS members and non-members, who were randomly selected from 14 specialties (anesthesiology, cardiology, emergency medicine, family practice, gastroenterology, general surgery, internal medicine, neurosurgery, obstetrics and gynecology, orthopedics, pediatrics, psychiatry, radiology, and vascular surgery). Each survey was sent with a cover letter and a postage-paid return envelope. The surveys were serially numbered for a second follow-up mailing to non-responders.

By tracking responders and non-responders, it was possible to aggregate results by metropolitan statistical areas (MSA), allowing for statistical analysis by region. The MSA grouping methodology was also based on the Dartmouth Atlas on Healthcare methodology.

Data Entry and Analysis

All returned surveys were logged in and responses were entered into an MS Access database for cleaning and categorization. The databases were imported into SPSS, a statistical software package, for analysis.

Sample Characteristics

Please see Appendix B for a detailed discussion of sample characteristics.

Analysis of Physician Workforce Supply

A very large percentage of respondents indicated that they find evidence of physician shortages in their practices and local markets. In discussions with our economic consultants, it has been repeatedly emphasized that response rates indicating a shortage in similar labor market studies almost never exceed 10 percent. Yet many response rates in the MMS surveys exceed 50 percent. Our consultants conclude that these response rates indicate labor markets where demand and supply are in a state of disequilibrium and can only describe labor markets that are in a state of crisis.

The largest and perhaps most significant element in this research effort involved the assessment of current and future physician supply issues in Massachusetts, as outlined

in the first HOD recommendation. As this statistical analysis evolves, one will be able to see clearly where labor market supply pressures exist, but care should be taken to categorically define them as shortages; that is, where products or services are not provided.

We must not lose sight of the fact that this study concentrates on the supply side of the physician labor market. A more complete analysis of physician labor markets in Massachusetts would require the collection of specific data on the demand side. Among other issues, this would require quantification of patient service demands and a determination of whether they are being met on a timely basis consistent with patient expectations. Since preliminary investigations indicate that local factors — such as a higher ratio of outpatient clinics, the systematic application of new therapeutic technologies, and an aging population — can all increase the demand for medical services, we fully appreciate the need to develop this type of analysis further. We hope to undertake such a study, but for now, our analysis is limited to issues surrounding the supply of physicians.

Our analysis of the primary and secondary research data proceeded in three successive steps. In the first step, we identified physician specialties that are exhibiting a high degree of labor market stress. The second step determined the degree to which residency and fellowship training programs are providing new physicians to alleviate any existing labor market stress. The third step evaluated the degree to which labor market stress within specific specialties varies by geographic area.

Step #1: Organize the practicing physicians survey response data into a series of analytical tables in order to identify those physician specialties that are exhibiting a high degree of labor market stress.

In this section, we will provide the detailed tabulations of the practicing physicians' response to the questions describing the conditions with which they are confronted in their labor markets. First we will examine the five categories we identified as critical to labor market conditions, the steps taken to determine if shortages existed, and, if so, for which specialties.

A. Adequacy of physician applicant pool to fill vacant positions
   - Question 12: Is the current pool of physician applicants adequate to fill your vacant positions or expand your practice?

B. Specialties where filling existing vacancies is difficult
   - Question 13: Are you currently experiencing difficulty in filling physician vacancies?

C. Specialties where recruitment time has increased, and the average amount of time it takes to recruit a physician
   - Question 17: Based on your current experience, how long does it take to recruit a physician to your practice?
   - Question 18: Over the past three years, has the amount of time needed to recruit physicians changed? If YES, by how much time? (increased/decreased by # months).

D. Specialties where staff retention is more difficult
   - Question 19: Over the past three years, has your ability to retain your existing staff of physicians changed? If YES, has retaining physicians in your practice become: easier/more difficult?

E. Specialties where supply problems make it necessary to alter services, or adjust professional staffing patterns
   - Question 14: Have physician supply problems made it necessary for you to alter the services you provide?
   - Question 15: Have physician supply problems made it necessary to adjust your professional staffing patterns?

Each of these questions is addressed sequentially in the discussion that follows. Once we have completed the analysis of these five areas, the results will be integrated into a matrix showing the specific patterns of labor market stress across the fourteen specialties.

A. Adequacy of physician applicant pool to fill vacant positions

- Question 12: Is the current pool of physician applicants adequate to fill your vacant positions or expand your practice?

In order to make a conservative estimate of physicians facing a workforce shortage, our study highlighted specialties with greater than 40 percent of respondents indicating an inadequate pool of physician applicants to fill vacant positions or expand practices. However, a number of specialties with less than a 40 percent response to this question should still be characterized as experiencing labor supply problems. Based on the data received in response to this question (see Table 1), the following conclusions may be made:

?? Overall, 36 percent of respondents felt that the pool of physician applicants is inadequate to fill vacant positions or expand one's practice, 31 percent of the survey respondents replied that the current labor market pool was adequate, and 29 percent of the survey respondents reported that the question did not apply to their current situation. While these responses appear to be similar, results indicated that the labor market supply varies by specialty. It should be noted that these are very conservative estimates based on the total sample of respondents, which includes those who reported that the question was not applicable to their current situation.

?? Five physician specialty occupations show response ratios well above the sample mean of 36 percent. In these specialties, the majority of survey respondents have indicated that the current pool of physicians is inadequate; these are: Anesthesiology, Radiology, GI, Neurosurgery, Cardiology, and Emergency Medicine. Two other specialties, Orthopedics (40%) and Vascular Surgery (44%), also have high percentages of respondents indicating the same.

TABLE 1.

Q12: Is the current pool of physician applicants adequate to fill your vacant positions or expand your practice?	Yes	No	Not Applicable	No Response	Total # of Respondents
Anesthesiology	9%	83%	6%	2%	65
Cardiology	29%	56%	13%	2%	45
Emergency Medicine	33%	53%	11%	2%	45
Family Practice	36%	23%	39%	3%	101
General Surgery	37%	27%	28%	8%	71
GI	14%	71%	14%	0%	35
Internal Medicine	28%	32%	35%	5%	254
Neurosurgery	21%	58%	21%	0%	24
OB/GYN	46%	26%	24%	5%	85
Orthopedics	43%	40%	15%	1%	67
Pediatrics	53%	14%	31%	2%	150
Psychiatry	20%	25%	51%	4%	146
Radiology	8%	84%	8%	0%	38
Vascular Surgery	44%	44%	11%	0%	9
Total	**31%**	**36%**	**29%**	**4%**	**1,210**

B. Specialties where filling existing vacancies is difficult

- Question 13: Are you currently experiencing difficulty in filling physician vacancies?

The range of sample responses to this question is shown in Table 2. In comparison to the results discussed above, these ratios depict much tighter labor market conditions among the eight specialties singled out in response to the question above.

?? Overall, 46 percent of those surveyed indicated that they are currently experiencing some-to-significant difficulty in filling key specialty positions.

?? The evidence that points to tight labor markets seems to be overwhelmingly the case in terms of four specialties: Anesthesiology, Radiology, Emergency Medicine, and GI. In these specialties, over four out of five respondents indicated that they were experiencing difficulty filling vacancies. In addition, the following specialties also have from 40 to 80 percent of respondents indicating difficulty: Cardiology, General Surgery, Neurosurgery, and Orthopedics.

TABLE 2.

Q13: Are you currently experiencing difficulty in filling physician vacancies?	Yes, Significant Difficulty	Yes, Some Difficulty	TOTAL: Yes, Some-Significant Difficulty	No, No Difficulty	No Response	Total # of Respondents
Anesthesiology	51%	37%	88%	9%	3%	65
Cardiology	29%	31%	60%	27%	13%	45
Emergency Medicine	22%	58%	80%	11%	9%	45
Family Practice	7%	31%	38%	37%	26%	101
General Surgery	15%	30%	45%	24%	31%	71

GI	43%	37%	80%	9%	11%	35
Internal Medicine	14%	25%	39%	32%	29%	254
Neurosurgery	38%	29%	67%	13%	21%	24
OB/GYN	8%	25%	33%	41%	26%	85
Orthopedics	24%	28%	52%	33%	15%	67
Pediatrics	6%	16%	22%	55%	23%	150
Psychiatry	10%	25%	35%	20%	45%	146
Radiology	61%	29%	89%	8%	3%	38
Vascular Surgery	11%	22%	33%	44%	22%	9
TOTAL	**18%**	**28%**	**46%**	**29%**	**25%**	**1,210**

C. Specialties where recruitment time has increased

- Question 17: Based on your current experience, how long does it take to recruit a physician to your practice?
- Question 18: Over the past three years, has the amount of time needed to recruit physicians changed? If YES, by how much time? (increased/decreased by # months).

The statistical data received to these questions is shown in Tables 3 and 4.

TABLE 3.

Q17: **BASED ON YOUR CURRENT EXPERIENCE, HOW LONG DOES IT TAKE TO RECRUIT A PHYSICIAN TO YOUR PRACTICE?**	**# OF RESPONSES**	**MEAN (IN MONTHS)**	**SD**	**TOTAL # RESPONDENTS**
Anesthesiology	57	10.6	6.0	65
Cardiology	30	12.7	9.2	49
Emergency Medicine	37	8.6	5.6	45
Family Practice	47	11.7	10.0	101
General Surgery	41	12.8	6.5	71
GI	20	22.3	13.2	35
Internal Medicine	148	10.3	6.9	254
Neurosurgery	14	22.9	16.7	24
OB/GYN	53	12.8	9.4	85
Orthopedics	44	14.6	9.0	67
Pediatrics	85	7.8	4.8	146
Psychiatry	39	11.1	7.7	146
Radiology	37	14.9	9.3	38
Vascular Surgery	6	17.0	15.4	9
TOTAL	**693**	**11.9**	**8.7**	**1,210**

It was judgmentally determined that specialties in which more than one-third of respondents indicate significant increases in the amount of time to recruit a physician are experiencing a tight labor market. Table 4 shows that the following specialties fall within this criterion: Anesthesiology, GI, Radiology, Neurosurgery, and Orthopedics. Relative to other professional occupations, these lengths of time are extraordinarily long. These results indicate long lags in filling physician shortages, which can affect patient access and availability of services.

TABLE 4.

Specialty	Percent Reporting a Significant Increase in Time to Recruit	Months to Recruit		Total # Respondents
		Mean # of Months	St. Dev.	
Radiology	63%	14.9	9.3	38
Anesthesiology	57%	10.6	6.0	65
GI	51%	22.3	13.2	35
Orthopedics	34%	14.6	9.0	67
Neurosurgery	33%	22.9	16.7	24
Mean Response Rate	**23%**	**11.9**	**8.7**	**1,210**

D. Specialties where staff retention is more difficult

- Question 19: Over the past three years, has your ability to retain your existing staff of physicians changed? If YES, has retaining physicians in your practice become: (easier/more difficult)?

On the surface, the responses to this question do not seem to describe a labor market currently experiencing significant stress.

- Specifically, 39 percent of respondents indicated that the ability to retain physicians had changed somewhat-to-significantly (16 percent significantly, 23 percent somewhat). However, 30 percent stated that it had not changed at all and 31 percent did not answer the question (see Table 5).

TABLE 5.

Q19: **Over the past three years, has your ability to retain your existing staff of physicians changed?**	Yes, Significantly	Yes, Somewhat	No, Not At All	No Response	Total # of Respondents
Anesthesiology	37%	37%	22%	5%	65
Cardiology	16%	31%	31%	14%	49
Emergency Medicine	24%	38%	29%	9%	45
Family Practice	11%	19%	30%	41%	101
General Surgery	20%	20%	28%	32%	71
GI	14%	20%	43%	23%	35
Internal Medicine	17%	24%	26%	33%	254
Neurosurgery	13%	33%	21%	33%	24
OB/GYN	13%	20%	36%	31%	85
Orthopedics	19%	22%	42%	16%	67
Pediatrics	7%	18%	45%	33%	146
Psychiatry	12%	12%	20%	56%	146
Radiology	32%	55%	11%	3%	38
Vascular Surgery	0%	11%	67%	22%	9
Total	**16%**	**23%**	**30%**	**31%**	**1,210**

Question #19 Verbatim:

1. Young successful physicians are relocating to other states with lower taxes, increased reimbursements, and less managed care.
2. The problem in recruiting is almost completely financial. We in Massachusetts can't even compete with other NE states. The combination of relatively low compensation and high cost of living is deadly.
3. Salary and work conditions (call schedule, workdays, surgical volume, and case mix). Academic centers have difficulty with retaining anesthesiologists since they have been pulled into ORs and lost non-clinical and research time.
4. Rewards aren't there — pay isn't good, hours are long, staff physicians are burning out. ED physicians are burning out. The whole system is melting down.
5. Obvious — we are working 1-2 hours more per day at 10-20 percent less pay — those physicians not tied down with family are leaving, one to PA, one to OH.
6. Economics, work hours — one partner left this busy private practice for an academic (univ. salary) spot in Ohio and increased income by $50K and decreased work hours by 10 hrs/week.

But when one analyzed the 477 responses indicating that the ability to retain a physician has changed, 87 percent stated that retention had become more difficult over the past several years (See Table 6).

TABLE 6.

Q19(A): IF YES, HAS RETAINING PHYSICIANS IN YOUR PRACTICE BECOME:	EASIER	MORE DIFFICULT	TOTAL # OF RESPONDENTS ANSWERING "YES" TO Q19
Anesthesiology	0%	92%	48
Cardiology	0%	96%	23
Emergency Medicine	4%	89%	28
Family Practice	3%	80%	30
General Surgery	0%	96%	28
GI	8%	92%	12
Internal Medicine	4%	86%	105
Neurosurgery	0%	100%	11
OB/GYN	11%	68%	28
Orthopedics	4%	89%	28
Pediatrics	11%	83%	36
Psychiatry	0%	86%	35
Radiology	3%	85%	33
Vascular Surgery	0%	100%	1
Total	**3%**	**87%**	**477**

Table 7 compares the relevant responses to questions about retention and recruitment for the aggregate sample and the five specialties experiencing the most severe shortages.

TABLE 7.

SPECIALTY	% OF PHYSICIANS WHO REPORT THAT THE TIME TO RECRUIT PHYSICIANS HAS INCREASED SIGNIFICANTLY	% OF PHYSICIANS WHO REPORT THAT THEIR ABILITY TO RETAIN PHYSICIANS HAS CHANGED AND BECOME MORE DIFFICULT
Radiology	63%	85%
Anesthesiology	57%	92%
GI	51%	92%
Orthopedics	34%	89%
Neurosurgery	33%	100%
TOTAL SAMPLE	**22%**	**87%**

These responses are entirely consistent with anecdotal information about the current behavior of the physician labor markets; namely, that the retention of existing professional staff is becoming more difficult. There are many factors that contribute to this problem, but one that merits special comment is that Massachusetts has always been regarded as a rich recruitment area for the rest of the country. And with salary and benefit packages in areas outside of Massachusetts becoming increasingly more lucrative, the mid-to-senior level physician becomes a keen target for other growing areas. This is just another dimension to the long-recognized reality that Massachusetts is a powerful training ground for the rest of the country.

E. Specialties where supply problems make it necessary to alter services or to adjust professional staffing patterns

- Question 14: Have physician supply problems made it necessary for you to alter the services you provide?
- Question 15: Have physician supply problems made it necessary to adjust your professional staffing patterns?

This analysis has primarily concentrated on the physicians' perceptions and attitudes regarding the changes in their local labor markets. Unquestionably, these responses are important, but in our survey, we also wanted to collect information on whether physician shortages have required respondents to alter their day-to-day provision of patient care services or adjust professional staffing to meet the needs of patients. In short, the responding physicians are telling us that labor shortages are forcing them to make changes in the manner in which medicine is practiced. For purposes of organization, we have combined our discussion of these responses into a single section. The relevant responses are displayed in Table 8.

Twenty-five percent of all respondents indicated that the current shortage of physicians has necessitated the alteration of services and 27 percent stated that the shortages have induced changes in professional staffing patterns. Unquestionably, ratios of this magnitude describe a practice environment undergoing significant structural adjustments and limitations on patient access to physician services. Again, labor market experts reported that vacancy surveys with response rates indicating a shortage in excess of 10 percent reflect severe market stress.

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It is also important to note that there appears to be a certain threshold of operational stability present in at least some segments of the market, as 60 percent of the respondents indicated that they had not altered services and 57 percent stated that their professional staffing patterns were unchanged. The sharp variances across specialties are to be expected and reflect the segmentations that exist in the physician labor market.

TABLE 8.

SPECIALTY	Q14: HAVE PHYSICIAN SUPPLY PROBLEMS MADE IT NECESSARY FOR YOU TO ALTER THE SERVICES YOU PROVIDE?		Q15: HAVE PHYSICIAN SUPPLY PROBLEMS MADE IT NECESSARY TO ADJUST YOUR PROFESSIONAL STAFFING PATTERNS?		TOTAL # OF RESPONDENTS
	YES	NO	YES	NO	
Anesthesiology	52%	46%	68%	26%	65
Cardiology	27%	67%	38%	56%	45
Emergency Medicine	27%	64%	47%	47%	45
Family Practice	14%	69%	14%	68%	101
General Surgery	20%	66%	30%	56%	71
GI	51%	40%	43%	54%	35
Internal Medicine	23%	58%	20%	60%	254
Neurosurgery	38%	63%	33%	58%	24
OB/GYN	19%	69%	24%	62%	85
Orthopedics	31%	60%	28%	61%	67
Pediatrics	14%	71%	12%	76%	150
Psychiatry	26%	48%	21%	47%	146
Radiology	39%	58%	74%	24%	38
Vascular Surgery	0%	89%	22%	67%	9
TOTAL	**25%**	**60%**	**27%**	**57%**	**1,210**

Physician Verbatim From Question 14:

1. As a member of a large anesthesia group, we have had to close pain clinics or restrict days and restrict number of operating rooms in several hospitals.
2. We tried to recruit — tried hard without success. We have had to tell many groups we just cannot see their patients.
3. We can hardly keep up with demand for existing services, so we will not even try to introduce new services.
4. Our orthopedic specialty group practice can no longer offer spine and foot and ankle surgery.
5. Would like to provide 24 hour ICU coverage but can't afford it with present reimbursement.
6. We are unable to run as many operating rooms due to a shortage of anesthesiologists.

Physician Verbatim From Question 15:

1. We are increasing CRNA nurses and residents to be able to cover the same # ORs.
2. We are hiring physician assistants (NPs and PAs) more.
3. Increasing reliance on clinical nurse specialists in place of psychiatrists.
4. Difficult to staff ED.

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5. We have to take more night call.
6. Unable to expand for increased demand in gastroenterology.

Building on this analysis, it is interesting to note the responses to these two questions in terms of the specialties most often cited as experiencing severe shortages. This information is shown in Table 9.

TABLE 9.

SPECIALTY	PERCENT OF RESPONDENTS INDICATING THAT THEY	
	Alter Services	**Adjust Staffing**
Radiology	39%	74%
Anesthesiology	52%	68%
GI	51%	43%
Orthopedics	31%	28%
Neurosurgery	38%	33%
TOTAL	**25%**	**27%**

Integrating the Survey Results: Specific Patterns of Labor Market Stress in Massachusetts

Without question, the results shown above present a detailed and complex picture of the realities and variations in labor shortage conditions in the Massachusetts physician labor market. At this point in our discussion, it will undoubtedly be helpful to summarize the most important conclusions concerning these shortages across the fourteen specialties. The results from the foregoing discussion have been integrated in a single descriptive table (see Table 10). Based on this survey information, it seems quite clear that there are seven specialties where local labor markets are under significant stress. These would include Anesthesiology, Cardiology, Emergency Medicine, GI, Orthopedics, Neurosurgery, and Radiology. Within each specialty, over 20 percent of respondents indicated a perception of a physician shortage in at least five out of the six categories. General Surgery follows closely with four out of six categories meeting these criteria.

TABLE 10. Shortage of Physician Specialists in Massachusetts: A Summary Matrix Showing the Most Significant Responses

SPECIALTY	Q12: INADEQUATE POOL OF PHYSICIANS	Q18: SIGNIFICANT INCREASE IN TIME TO RECRUIT	Q19: SIGNIFICANT DIFFICULTY TO RETAIN	Q13: SIGNIFICANT DIFFICULTY IN FILLING VACANCIES	Q14: SUPPLY PROBLEMS CAUSE ALTERATION OF SERVICES	Q15: SUPPLY PROBLEMS CAUSE CHANGES IN PROFESSIONAL STAFFING
Anesthesiology	☞	☞	✍	☞	☞	☞
Cardiology	☞	✍		✍	✍	✍
Emergency Medicine	☞	✍	✍	✍	✍	✍
Family Practice	✍	✍				
GI	✍	☞		✍	☞	✍
General Surgery	☞	✍			✍	✍
Internal Medicine	✍				✍	✍
Neurosurgery	☞	✍		✍	✍	✍
OB/GYN	✍					✍
Orthopedics	✍	✍		✍	✍	✍
Psychiatry	✍				✍	
Pediatrics						✍
Radiology	☞	☞	✍	☞	✍	☞
Vascular Surgery	✍					✍

Where: ☞ = Greater than 50%
✍ = Greater than 20%, but less than 50%

Building on the analysis of the results from the survey conducted on practicing physicians, we will examine the physician supply situation as it relates to the output of residents and fellows.

<u>Step #2:</u> For the 14 specialties in question, determine the extent to which the historical output of the residency and fellowship programs are providing potential supplies of new physicians to alleviate any existing labor market gaps identified in Step #1.

This is the second step in our iterative analysis of the physician supply issue in Massachusetts. Thus far, we have established a list of eight specialties that are currently experiencing tight physician labor markets. This includes the following physician specialties: Anesthesiology, Cardiology, Emergency Medicine, General Surgery, GI, Orthopedics, Neurosurgery, and Radiology.

This analytical step focuses on the issue of physician pipeline supply; that is, are the physician outputs from existing residency and fellowship programs adequate to meet current and future labor market demands? The results shown in Table 11 include physicians in residency and fellowship training programs in 14 specialties currently being offered at nine teaching hospitals.

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TABLE 11. Program Directors Survey: Number of Respondents (%) Leaving Massachusetts Following Completion of the Residency and Fellowship Programs (1997–2001)

PROGRAM TYPE	# OF PHYSICIANS COMPLETING THEIR TRAINING (1997–2001)	NUMBER LEAVING MA	PERCENT LEAVING MA
FELLOWSHIP			
Neurosurgery	4	3	**75%**
GI	24	12	**50%**
Orthopedics	63	54	**86%**
Cardiology	95	56	**59%**
RESIDENCY			
Pediatrics	55	16	29%
Psychiatry	24	4	17%
Internal Medicine	180	112	62%
Radiology	49	39	80%
OB/GYN	19	7	37%
Orthopedics	69	44	**64%**
Anesthesiology	231	129	**56%**
Family Practice	57	25	44%
General Surgery	144	93	**65%**
TOTAL	834	432	**58%**

When matched against the specialties identified as currently experiencing tight supply side labor markets, our analysis supports a conclusion that is quite disturbing. According to our results, the highest ratios of fellows and residents leaving the Commonwealth are concentrated among the eight specialties cited above as experiencing an extremely tight labor market. Based on this information, it is clear that the training pipeline for the years 1997–2001 was not sufficient to close the labor vacancy gap in the most pressing specialty areas.

In the specific analysis of the resident and fellowship programs that follows, we will discuss in detail those factors that are either pushing or pulling young physicians out of Massachusetts, but at this point we will continue our analysis of labor market conditions for the 14 specialties. In our next step, we will analyze the results within the context of the five dominant urban areas in Massachusetts.

<u>Step #3</u>: Analyze the labor market conditions for the 14 physician specialties across the five urban areas in Massachusetts in order to identify the characteristics and distribution of physician supply shortages.

Over the past two decades, a great deal of research has been undertaken to identify those factors that explain the distribution of physicians in the most highly populated urban areas versus the smaller cities and rural areas. In this context, it was logical that a portion of this analysis should compare the Boston MSA to other Massachusetts MSAs. The relevant data are displayed in Table 12 below. In order to simplify this step, we chose to concentrate the analysis on two issues; that is, *have physician shortages caused difficulty in recruiting and/or retaining physicians in one's practice?*

TABLE 12.

Q18: OVER THE PAST THREE YEARS, HAS THE AMOUNT OF TIME NEEDED TO RECRUIT PHYSICIANS CHANGED?	**BOSTON MSA**		**OTHER MASSACHUSETTS MSAS**	
	# RESPONDING YES, SIGNIFICANTLY	*% of Respondents in MSA*	# RESPONDING YES, SIGNIFICANTLY	*% of Respondents in MSA*
Anesthesiology	24	50%	12	80%
Cardiology	5	19%	7	41%
Emergency Medicine	6	18%	3	27%
Family Practice	3	6%	8	17%
General Surgery	10	19%	4	22%
GI	11	58%	7	44%
Internal Medicine	27	15%	17	27%
Neurosurgery	5	33%	3	33%
OB/GYN	6	10%	5	23%
Orthopedics	13	29%	9	43%
Pediatrics	13	11%	3	10%
Psychiatry	15	12%	4	18%
Radiology	19	63%	5	63%
Vascular Surgery	0	0%	1	20%
TOTAL	**169**	**20%**	**94**	**29%**

Of those physicians indicating a change in the time needed to recruit physicians, all respondents reported that the time has increased.

These results show very clearly the greater degree of difficulty in recruiting physicians outside the Boston urban area. Almost one-third (29 percent) of respondents outside of the Boston MSA reported a significant increase in the time needed to recruit physicians, as opposed to 20 percent of respondents in the Boston MSA. These patterns are most obvious when one compares the responses in Boston MSA with other areas of the state (see Table 13). Note specifically the patterns in the following data for the amount of time required to recruit physicians.

TABLE 13.

SPECIALTY	OVER THE PAST THREE YEARS, THE TIME REQUIRED TO RECRUIT A PHYSICIAN HAS INCREASED SIGNIFICANTLY	
	BOSTON	OTHER MASSACHUSETTS MSAS
Anesthesiology	50%	80%
Cardiology	19%	41%
Emergency Medicine	18%	27%
Orthopedics	29%	43%
Radiology	63%	63%
GI	58%	44%
Neurosurgery	33%	33%

Unquestionably, the data for anesthesiology, cardiology, and orthopedics fit into this pattern in a consistent fashion, but radiology does not. Indeed, the increased time to recruit radiologists is not different, indicating that the current shortage of radiologists is a statewide problem.

A careful review of the response data shown in Table 14 reveals specific aspects relating to retention of physicians.

TABLE 14.

Q19: OVER THE PAST THREE YEARS, HAS YOUR ABILITY TO RETAIN YOUR EXISTING STAFF OF PHYSICIANS CHANGED?	% RESPONDING YES, SIGNIFICANTLY	
	BOSTON	OTHER MASSACHUSETTS MSAS
Anesthesiology	38%	33%
Cardiology	4%	29%
Emergency Medicine	18%	45%
Family Practice	6%	15%
General Surgery	21%	17%
GI	21%	6%
Internal Medicine	17%	16%
Neurosurgery	7%	22%
OB/GYN	11%	18%
Orthopedics	22%	10%

Pediatrics	6%	6%
Psychiatry	11%	14%
Radiology	30%	38%
Vascular Surgery	0%	0%
TOTAL	**15%**	**18%**

In Table 15 below, we have summarized those specialties in which greater than 20 percent of respondents reported a change in their ability to retain physicians.

TABLE 15.

SPECIALTY	OVER THE PAST THREE YEARS, THE ABILITY TO RETAIN STAFF HAS GOTTEN MORE DIFFICULT	
	BOSTON	OTHER MASSACHUSETTS MSAS
Anesthesiology	38%	33%
Emergency Medicine	18%	45%
General Surgery	21%	17%
Neurosurgery	7%	22%
Radiology	30%	38%
Total	**15%**	**18%**

These responses are consistent with our understanding of the performance of segmented labor markets both geographically and in certain specialties; that is, the supply conditions in one urban area are not necessarily related to another area. The Boston urban area seems to enjoy a relatively easier time in retaining physician specialists. This is not the case in the other Massachusetts MSAs.

The next section will analyze the results of our survey of department chiefs at nine teaching hospitals in four specialties.

Analysis of the Responses from Teaching Hospital Department Chiefs

Chiefs of anesthesiology, cardiology, orthopedics, and radiology departments from the nine teaching hospitals were surveyed to further understand recruitment and retention issues. This survey included several of the same questions as the Practicing Physician Survey. A comparison of the two groups can provide insight into the labor market dynamics of the community physician labor market and the academic teaching hospital labor market.

Shown in Table 16 below are the responses to two of the questions comparing the responses of practicing physicians to those of the hospital department chiefs:

- Question 12: Is the current pool of physician applicants adequate to fill your vacant positions or expand your practice?
- Question 13: Are you currently experiencing difficulty in filling physician vacancies?

TABLE 16.

SPECIALTY	CURRENT POOL OF APPLICANTS INADEQUATE		DIFFICULTY IN FILLING VACANCIES	
	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)
Anesthesiology	83%	75%	88%	63%
Cardiology	56%	80%	60%	100%
Orthopedics	40%	33%	52%	83%
Radiology	84%	100%	90%	100%

Without doubt, these responses are interesting in that both samples confirm the severe tightness of the labor markets for these four specialties, but it is a statistical reach to attempt to explain with any degree of precision the differences in these numbers across the two markets. No consistent pattern exists.

Table 17 compares the responses of community physicians and hospitals on questions regarding physician recruitment and retention:

- Question 18: Over the past three years, has the amount of time needed to recruit physicians changed?
- Question 19: Over the past three years, has your ability to retain your existing staff of physicians changed?

TABLE 17.

SPECIALTY	TIME TO RECRUIT PHYSICIANS HAS INCREASED SIGNIFICANTLY		ABILITY TO RETAIN PHYSICIANS HAS BECOME SIGNIFICANTLY MORE DIFFICULT	
	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)
Anesthesiology	60%	50%	68%	75%
Cardiology	41%	80%	45%	80%
Orthopedics	40%	50%	37%	50%
Radiology	68%	100%	74%	88%

These data show that it is also difficult to recruit and retain physicians in teaching hospitals and private practice. Again, one must be careful not to read too much into this conclusion because of the smallness of the sample size in teaching hospitals, but this conclusion is consistent with our a priori expectations; namely, teaching hospital

professional staffs are considered a rich hunting ground for the recruitment of physicians.

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The final cluster of sample results from the teaching hospitals related to the impact of physician shortages on the maintenance of the level of services and/or the necessity to adjust professional staffing patterns. Again, we show the results from the two samples in Table 18 below.

TABLE 18.

SPECIALTY	PERCENT OF RESPONDENTS INDICATING THAT IT IS NECESSARY TO:			
	ALTER SERVICES		ADJUST STAFFING	
	PHYSICIAN SAMPLE (N=1,210)	TEACHING HOSPITALS (N=27)	PHYSICIAN SAMPLE (N=1,210)	TEACHING HOSPITALS (N=27)
Anesthesiology	52%	38%	68%	50%
Cardiology	27%	80%	38%	80%
Orthopedics	31%	17%	28%	33%
Radiology	39%	75%	74%	100%

Teaching Hospitals Alter Services Verbatim:

1. Limited capacity for added cases during day leads to more night work. Surgical growth has been slowed or delayed by lack of anesthesia staffing.
2. Cannot provide enough subspecialty service, such as pediatric radiology, interventional neurology.
3. We have reduced coverage at ambulatory care sites. We have eliminated coverage at one site. We have not taken a contract at a small suburban hospital.

Teaching Hospitals Adjust Staffing Verbatim:

1. Increased non-clinical time, longer days and production pressures have leveled the difference between private practice and academic practice: 12 hour days, 24 hour call days and little academic time leads to exodus to private practice.

Again, the sample size comes into play, but the consistently difficult labor market situation for anesthesiologists does show through rather clearly. At the same time the much higher rates among teaching hospitals for cardiology and radiology should be noted.

We may now turn our attention to the final cluster of questions for the department chiefs from the nine teaching hospitals, and this relates to a series of questions concerning recent staffing changes among the teaching hospitals. The relevant data collected are shown in Table 20. A careful review of these data provides support to a number of important conclusions:

- Across the 27 departments in the nine teaching hospitals surveyed, 23 departments' current employment levels are below the total FTE positions authorized. When one breaks the data down by physician specialty the aggregate teaching hospital vacancy rates are as follows:

TABLE 19.

SPECIALTY	NUMBER OF HOSPITALS	VACANCY RATE 11/30/01
Anesthesiology	8	6%
Cardiology	5	17%
Orthopedics	6	13%
Radiology	8	12%

?? Clearly the relatively low vacancy rate among the eight hospitals for anesthesiology is surprising when judged against the other data analyzed in this report and may be due to respondents' coverage arrangements.[7] Since labor experts consider even a 2 percent vacancy rate above average, even a 6 percent vacancy rate is high. For the remaining three specialties, the much higher rates reflect the extreme tightness of labor markets.

?? There is a most interesting pattern of new hires and separations across the hospitals for these four specialties. For anesthesiology and radiology there were net gains in staffing over the past six months, but for cardiology and orthopedics there were net losses in physician staffing. As expected, approximately 45 percent of the separations were due to physician relocations outside Massachusetts — a critical factor that continues to induce instability in local labor markets.

?? Across all four specialties, IMGs accounted for 41 percent of the new hires. Without question, anesthesiology departments reported the greatest reliance on IMGs, where nearly 60 percent of the 31 new hires were IMGs. In the remaining three specialties, IMGs played a far less significant role. Dependency on immigration to fill vacancies is clearly an indicator that there is a domestic shortage.

[7] Reflects survey response from anesthesia group practice that provides coverage to several hospitals throughout Massachusetts.

TABLE 20.

	# of Physician FTEs as of 11/30/01				Changes Over the Last Six Months							Net Change
					New Hires			Separations				
	# of Responses	Total FTE Positions	Currently Employed FTEs	Vacancies	# of USMGs	# of IMGs	Total New Hires	# Due to Relocation Outside MA	# Due to Retirement	# Due to Other Reasons	Total Separations	
Anesthesiology	8	352	332	20	13	18	31	9	3	5	17	14
Cardiology	5	69	57	12	6	0	6	6	2	3	11	-5
Orthopedics	6	53	46	7	3	1	4	2	3	0	5	-1
Radiology	8	212	187	25	14	6	20	5	1	10	16	4
All Specialties Total	27	678	622	64	36	25	61	22	9	18	49	12

The next section will analyze the results of the surveys for residents and fellows in their final year of training, as well as the surveys for their program directors.

Analysis of Massachusetts Residency and Fellowship Training Programs
As part of the study, the Committee was asked to conduct a survey of Massachusetts resident training programs and the trainees who are leaving the Commonwealth to practice elsewhere. A focus group and two surveys were used to understand (1) the career decisions facing residents and fellows in their last year of training; and (2) the perspectives of residency and fellowship program directors of what they think are the driving factors for residents and fellows in deciding where to begin their careers.

The following residency and fellowship programs at the following hospitals participated in the study:

Specialties: anesthesiology, cardiology, emergency medicine, family practice, gastroenterology, general surgery, internal medicine, neurosurgery, obstetrics and gynecology, orthopedics, pediatrics, psychiatry, radiology, and vascular surgery.

Teaching Hospitals: Boston University Medical Center, Massachusetts General Hospital, Brigham and Women's Hospital, Beth Israel-Deaconess Medical Center, Children's Hospital, Baystate Medical Center, UMass Medical Center, St. Elizabeth's Medical Center, and New England Medical Center.

Resident/Fellow Focus Group
Although the focus groups' participants were very diverse, the individual responses were disturbingly similar. Regardless of specialty training, responses to questions about beginning a clinical career or setting up a practice in Massachusetts were almost always negative. Overall, the initial themes were that Massachusetts has no future for physicians wishing to pursue a career in clinical practice; opportunities exist for academic/research careers, but reimbursement pressures and shortages of patient care physicians do not allow sufficient time to pursue these avenues; and, compared to other areas of the country, physician reimbursement is much lower and the cost-of-living, specifically housing, is much higher.[8]

Demand for Massachusetts Residency and Fellowship Programs
Even though the number of residency and fellowship programs at Massachusetts teaching hospitals constitutes only a small number of the training positions in the country as a whole, there is strong national and international demand to enter the Massachusetts programs. Within this context, nine of the teaching hospitals in Massachusetts currently offer 57 residency programs and 33 fellowship programs in the 14 specialties listed above.

The success in attracting interest in and filling Massachusetts residency and fellowship program slots can be seen in the data contained in Table 21; the data cover the 2001–2002 academic year.

[8] Sum A, et al. State of the American Dream in Massachusetts. The American Dream Project: Boston, 2002.

TABLE 21. Residency and Fellowship Training Slots Offered and Filled (14 Specialties at 9 Teaching Hospitals)

	RESIDENCY PROGRAM	FELLOWSHIP PROGRAM	TOTAL
Number of Slots Offered	409	69	478
Number of Slots Filled	399	68	467
Number of Applicants	15,926	2,700	18,626

With applicant-to-acceptance ratios such as these, it is not surprising that 98 percent of the residency slots and 99 percent of the fellowship slots were filled. Further, survey responses show that 28 percent of the residency and fellowship program directors increased the number of slots in their programs over the past five years. In the aggregate, 34 new slots were added.

Unquestionably, these data confirm that there is a very strong demand on the part of recent medical school graduates to participate in Massachusetts-based training programs. Given this strong demand, the locational backgrounds of the students may play a role of where they choose to begin their career or set-up practice. These percentages may play a role in retention of residents in the Massachusetts area.

Survey of Residency and Fellowship Program Directors

In the questionnaire used to survey the program directors, we asked a much more important question concerning the dynamics of labor markets for residents and fellows in their programs: *How many of your residents/fellows have left Massachusetts after completing your program?* The results are tabulated in Table 22.

TABLE 22. Comparative Data Compiled by Program Directors Indicating Geographical Preferences of Residents and Fellows Upon Completion of Their Training Programs (1996–97 through 2000–01)

PERIOD	RESIDENTS			FELLOWS		
	STAYED IN MA	LEFT MA	PERCENT LEFT MA	STAYED IN MA	LEFT MA	PERCENT LEFT MA
1997–98	104	138	57%	16	35	69%
1998–99	90	135	60%	17	30	64%
1999–2000	103	119	54%	11	36	77%
2000–01	101	112	53%	19	35	65%
Total	**294**	**366**	**55%**	**47**	**101**	**68%**

Because of the significance of these data to the research mandate, several interpretive comments will be helpful; these include:

Unquestionably, one of the true causes of the current physician shortage situation in Massachusetts comes from the relatively high numbers of residents and/or fellows that are leaving Massachusetts upon completion of their training. Physician labor markets are not only impacted by higher ratios of residents and fellows that leave Massachusetts, but the sharp swings in their numbers from year to year can induce additional instability. Our analysis has demonstrated that in some key specialties, annual variations as small as 10 to 15 percent will likely have an amplified impact on the total physician supply.

?? A high fraction of residents and fellows have left over the last four years, during a time of physician shortages.

?? Finally, the fact that roughly two-thirds of the physicians leave Massachusetts following their fellowship training is a disturbing trend. A higher departure ratio for fellows is entirely consistent with our a priori expectations; namely, that physicians will take a major career step after the fellowship program — but not necessarily after completion of the residency program — to begin to establish their practices. These data show rather clearly that in many cases, individuals who have completed fellowship programs are choosing to establish their careers outside Massachusetts.

Issues Affecting Career Choices: Massachusetts Vis-à-Vis Other Areas

Another survey question related to the future plans of current residents and fellows who are now completing their advanced training. The range of answers developed for residents and fellows finishing their programs this year are displayed in Table 23.

TABLE 23. Locational Preferences Among 2001–2002 Residents and Fellows Seeking Employment in Massachusetts or Elsewhere Following Completion of Their Advanced Training

LOCATION OF EMPLOYMENT OPTION SOUGHT	RESIDENTS		FELLOWS	
	NUMBER	PERCENT	NUMBER	PERCENT
In Massachusetts	92	44%	22	29%
Outside Massachusetts	70	33%	27	36%
Undecided	45	22%	26	35%
Total	**207**	**100%**	**75**	**100%**

These data were collected during the November–December 2001 period; thus, it is not surprising that relatively large numbers of residents and fellows remain undecided about the geographic location of the next stage in their medical careers. But even at this stage, it is disquieting that our analysis shows approximately one-third have already apparently made the decision to leave Massachusetts.

Finally, the relatively large number of undecided is of more than just passing interest. There are several critical points in a physician's career; certainly one of them is during

this year of training. In other words, if Massachusetts is to increase the supply of graduating residents and fellows, a most likely "tipping point" would be to work with these undecided students to address those factors that will make a medical career in Massachusetts more acceptable.

Factors Affecting Locational Preferences

In order to determine the factors underlying these geographical preferences, we included a separate question containing two panels of factors that we believed play a role in determining the physician's locational choice. We asked each respondent to rate Massachusetts as "favorable," "neutral," or "unfavorable" on these factors. The two sets covered "professional factors" and "personal factors." The results from the residents and fellows, along with the program directors, are shown in Table 24.

TABLE 24.

	Residents and Fellows									*Residency and Fellowship Program Directors*		
	Yes, I plan on seeking employment in Massachusetts			*No, I don't plan on seeking employment in Massachusetts*			*I am undecided about seeking employment in Massachusetts*			*All Respondents*		
PROFESSIONAL FACTORS	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable
Research Opportunities	84%	13%	2%	87%	10%	2%	86%	10%	3%	79%	20%	2%
Clinical Opportunities	56%	30%	14%	41%	36%	21%	45%	37%	15%	37%	23%	32%
Intellectual Stimulation	96%	4%	0%	89%	7%	4%	94%	6%	0%	93%	7%	0%
On-Call Schedule/Work Hours	16%	50%	32%	11%	59%	30%	11%	49%	34%	13%	67%	20%
Diverse Patient Demographics	64%	34%	2%	48%	40%	10%	48%	45%	6%	24%	73%	4%
Practice Environment	35%	46%	18%	23%	30%	44%	21%	34%	41%	20%	27%	53%
Strength of Peer Group	82%	16%	0%	70%	23%	5%	73%	21%	3%	80%	16%	4%

	Residents and Fellows									*Residency and Fellowship Program Directors*		
	Yes, I plan on seeking employment in Massachusetts			*No, I don't plan on seeking employment in Massachusetts*			*I am undecided about seeking employment in Massachusetts*			*All Respondents*		
PERSONAL FACTORS	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable	Favorable	Neutral	Unfavorable
Salary Level	5%	16%	79%	5%	19%	75%	1%	20%	76%	5%	18%	77%
Salary Arrangement	7%	31%	59%	5%	23%	69%	1%	37%	58%	2%	27%	71%
Cost of Living	2%	9%	89%	1%	7%	92%	0%	3%	94%	4%	5%	91%
Proximity to Extended Family	61%	14%	24%	21%	25%	54%	34%	27%	38%	41%	54%	5%
Local Amenities	81%	16%	3%	63%	27%	10%	82%	17%	0%	72%	26%	2%
Geographic Location	84%	13%	3%	51%	35%	14%	68%	25%	6%	81%	18%	2%
Community Issues	76%	19%	3%	30%	45%	21%	58%	34%	6%	68%	30%	2%

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In as much as we believe that these results speak directly to a number of the concerns raised in the MMS' research mandate, it will be valuable to make brief comments about the conclusions that these data support; specifically:

?? There is an amazing consistency in these responses, irrespective of whether the respondent was a resident, fellow, or program director. In terms of professional factors, it is uniformly accepted that a practice in Massachusetts offers strong research opportunities, intellectual stimulation, and a strong peer group. By the same token, there is a remarkable consistency that at least three personal factors play an important role in the young physician's locational preferences and that these factors are not favorable to Massachusetts. These factors are salary level, salary arrangement, and cost of living. The physicians training in Massachusetts overwhelmingly cite Massachusetts as unfavorable on the cost of living. This unanimity of opinion is only exceeded by resident and fellow opinions on salary levels.

?? There are two important caveats relating to the three unfavorable factors that should be noted. First is that these are the very same factors that negatively dominate the MMS Physician Practice Environment Index, a separate MMS calculation designed to measure the practice environment of physicians in the Commonwealth. Second is that factors that affect salary and living costs are probably not very amenable to public policy changes with a view toward mitigating them.

?? Finally, there is the issue of personal and family relationships. As expected, those physicians who have indicated a desire to remain in Massachusetts indicated that proximity to family, local amenities, geographical location, and community issues all weigh heavily in their decision-making process.

ISSUES RELATING TO SUPPLY/DEMAND RELATIONSHIPS IN THE PHYSICIAN WORKFORCE

<u>The Departure Point: The Juxtaposition of High Vacancy Rates Among Physicians and High Physician-to-Population Ratios</u>

Over the past several years, a great deal of discussion has focused on the apparent fact that Massachusetts seems to have "too many" physicians. Relying on a macro labor measure of availability is no substitute for a careful analysis of prevailing supply and demand conditions by individual specialty labor markets with in-state and sub-state areas. The evidence offered to support this conclusion is the physician-to-population ratio in Massachusetts in comparison to that of the US as a whole; these two ratios are:

NUMBER OF NONFEDERAL PHYSICIANS PROVIDING PATIENT CARE PER ONE THOUSAND POPULATION

Massachusetts	3.4
U.S.	2.2

It has also been argued that the excess supply of physicians in Massachusetts is one factor — if not the dominant one — in causing health care costs to be higher than the national average. In this brief discussion, we need not concentrate on this latter dimension; this issue has already been analyzed in detail in a recent MMS paper. This study analyzed variances across 11 states, relating the cost of health care to changes in various factor inputs.[9] The primary conclusion of the comprehensive multivariate analysis was stated very clearly in this report:

> "Analysis of changes in total health care costs to changes in variables such as the number of inpatient admissions, number of surgeries performed, number of outpatient visits, percent population over 65, and the number of physicians per 1,000 persons shows that the physician-to-population variables were statistically significant in the HCFA and Medicare databases, but the Beta coefficients were inverse."

Thus we conclude that the former issue does, however, require brief elaboration here because of the seeming incongruity of the juxtaposition of extraordinarily high vacancy rates found in the survey responses to the higher than average physician-to-population ratios in Massachusetts. In short, we must ask how we can have so many shortages while, at the same time, we have such high numbers of physicians. Several comments will be helpful to understand this issue.

It would be tempting to dismiss this seeming statistical dilemma on the basis that the AMA Masterfile listings of physicians are badly flawed. In passing, we should note that this has been a topic of serious investigation. Specifically, Stamps and Boley Cruz analyzed three standard physicians' lists — the Folio Directory, the AMA Master File, and the Massachusetts Board of Registrations in Medicine — concluding that the biggest problem "…is to identify the nature and direction of errors and then determine whether they affect the variables of interest." [10]

These research initiatives are interesting, but we believe that they miss the point. We believe the more productive line of reasoning is to be found elsewhere; specifically, in economic base theory, central place theory, and production function analysis. Each of these aspects will be considered in turn, thus providing considerable new weight to the argument that a simple physician-to-population ratio glosses over what is really a much more complex issue.

<u>Economic Base and Central Place Theory</u>

Economic base theory stipulates that the industry mix in all urban areas may be separated into two components. One is composed of industries that produce for export

[9]Howell, Ross, and Lee, "A Preliminary Analysis to Determine the Relationship Between the Supply of Physicians, Concentrations of Medical Facilities and the Cost of Healthcare," A special study prepared for the Massachusetts Medical Society, Spring 2001.

[10]Stamps, PL and Cruz, NTB, *Issues in Physician Satisfaction: New Perspectives* (Appendix A), Ann Arbor, Michigan: Health Administration Press, 1994.

markets; that is, sales to domestic (but not local) as well as to foreign markets.[11] The other component is composed of industries that produce products and services that fulfill local demand. As we shall see below, physicians operating in the health care system can and do play a role in both sectors. This is not unique to the health care system, but prevails in other key occupational specialties, such as engineering and software development services.

The theoretical explanation of the behavior of industries in the non-export sector is generally discussed in terms of central place theory. In this case, local demand is considered to be a function of local population and income density. Christaller and Lösch have generalized, and our own analyses have verified, that a number of business functions in the non-export sector follow a consistent pattern: as population and income increase, higher and more complex hierarchical thresholds are achieved.[12] That is, greater numbers of increasingly complex firms emerge in local markets as population and incomes increase.

Translating these generalizations into the issue before us, we note that, ceteris paribus, higher physician-to-population ratios are consistently found in those larger urban areas with significant concentrations of medical research and patient care facilities, particularly where there are medical schools and teaching hospitals. Higher physician-to-population ratios exist for two reasons. First is that research itself works best when there is face-to-face proximity. Thus the dynamics of the market tend to lead to higher rates of agglomeration. Second, while a large component of these concentrations provide patient care to local populations, another segment is providing export services outside the local urban area. It does so by attracting patients from outside the area, selling services to pharmaceutical companies seeking research relationships, and other related activities. Thus, the health care system in highly agglomerated urban areas is, in reality, two systems. The first provides local medical care, research, teaching, or administration, and the second provides goods and services for export. In light of this concentration of medical schools and teaching hospitals, it is not surprising that roughly 10 percent of the country's 1,500 biotech firms are located in Massachusetts. Moreover, the ratio of 2.6 biotech firms per 100,000 people in Massachusetts is the highest in the country.[13]

This kind of dual medical services complex stands in sharp contrast to health service systems in smaller-to-medium sized urban areas where the demand for medical services is almost entirely dominated by local resident demand. In these urban areas, the physician-to-population ratio will be much lower, and much more consistent with those located in other areas with similar population thresholds.

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[11] A good example of the use of economic base theory is a study by R.E. Bolton, *Defense Purchases and Regional Growth*, Brookings Institution, Washington, D.C. 1996.

[12] Walter Christaller, *Central Places in Southern Germany*, Prentice-Hall, 1996; and A. Lösch, *The Economics of Location*, Yale University Press, 1954.

[13] Howell, Ross, and Lee, "A Preliminary Analysis to Determine the Relationship Between the Supply of Physicians, Concentrations of Medical Facilities and the Cost of Healthcare," A special study prepared for the Massachusetts Medical Society, Spring 2001.

Thus, higher physician-to-population ratios are to be expected wherever medical agglomerations develop. Moreover, when large agglomerations are present in smaller states such as Massachusetts, the physician-to-population ratio will appear to be out of line with national averages of other, much larger states, and even the ratios for larger states with significant medical services complexes.

Now returning to central place theory. It has also been established that large concentrations of business activity can, and will, distort what under nearly normal circumstances is the more direct linear relationship between population and income and the number and scale of business functions.[14] Said slightly differently, the concentrations will push up what would otherwise be considered as normal equilibrium ratios and make them appear to be in structural disequilibrium. But in many cases, detailed examination shows that the higher ratios may be explained by specialized business functions such as military installations, state capitals, and seaport locations. Thus it is a logical outcome of the market dynamics that medical concentrations also induce the same type of results. The point here is that these business concentrations will induce a much more diverse and complex system of primary and backward-linked supportive business functions.

We may conclude at this point by stating that the existence of a large medical complex in an urban area will necessarily mean that there will be a higher number of physicians than what would be observed in broadly generalized averages. The higher than expected ratios may be explained by the existence of a strong medical export sector and a more diverse primary and backwardly linked set of business functions — each providing employment opportunities for physicians.

Production Function Theory

Economists employ production function analysis to explain various sets of factor input to produce a given output. In its simplest form, a production function can be stated:

$$O = f(CAP, LAB, TECH \ldots E)$$

Where:
- O = Output
- CAP = Capital, or machinery
- LAB = Labor
- TECH = Technology input
- E = Residual or unexplained variance

The point in this discussion is to emphasize that the physician is one of the key labor factor inputs in providing for the output of medical services. This is straightforward, but what complicates our discussion is that the physicians themselves can also be considered an “export product” of the urban medical concentration.

There is no doubt that the Boston urban area — and for that matter, another 15 to 20 areas — offer significant medical training. In this context, these areas attract relatively large numbers of physicians-to-be for their medical training, residency, and fellowship

[14] See unpublished urban economic analyses conducted by the Council for Economic Action during the years 1980–1990.

programs only to turn around and "export" them as products of the urban concentration, thereby improving the area's overall balance of payments. Thus, what is a factor input in the teaching hospital's production function and contributes directly to its output in terms of health service delivery can also be an "export product" to other regions and foreign countries. It is in this sense that the physician plays a most unusual dual role in the economics of an urban area.

Conclusions: The Root Cause Analysis

The analysis presented in this paper suggests that there are three principal root causes of the current shortages of physicians in Massachusetts. Two of these root causes are a result of structural characteristics in the state economy, while the third root cause reflects the volatility of year-to-year changes in physicians' locational decisions. As a result of these root causes, Massachusetts physician labor markets currently face critical shortages in a number of physician specialties.

Long-Term Structural Issues And Cost

A. There is a growing perception that Massachusetts is a financially and administratively difficult place to practice.

Without question, there is a growing perception that Massachusetts is a financially and administratively difficult place to practice. While this is a subjective and in many ways hard-to-define issue, the impact is very real.

The results of a twice-yearly Physician Practice Environment Index published by the MMS supports this perception. The Index is composed of 12 variables that capture changes in cost and operational factors relating to a physician's overall practice cost. The variable that captures the cost of doing business in Massachusetts is relevant to the issue at hand. This variable is actually a composite index itself as it is composed of annual rental rates of office suites, annual costs of physician medical supplies, and annual wages paid to nurses, secretaries/receptionists, and accounting clerks/bookkeepers. The cumulative changes in these two indexes are shown in the brief table below.

Cumulative Rates of Change in the Physician Cost of Doing Business Index 1994–2001

	MA	US
1992	100.0	100.0
2001	155.8	130.5

Over the years, the 20 percent cost differential in Massachusetts has taken its toll on the physicians' willingness to operate in a business environment that is non-competitive with states having lower operating costs. Moreover, looking ahead, the economic dynamics of markets in Massachusetts mean that costs will continue to be higher than those of the country as a whole.

In addition, the overall impact of higher costs has not been limited to business costs alone. Massachusetts has long been considered a high cost of living region, especially in terms of the cost of residential housing. The cost of homes in Massachusetts ranks third highest in the country.[15] When one juxtaposes this to the fact that New England regional physicians' income levels are the lowest in the country, Massachusetts and the Boston urban area in particular are becoming financially difficult places to pursue a medical career.

In practice, these pressures have results that echo throughout the system. To the mid-career physician, long hours and relatively lower pay in Massachusetts vis-à-vis other areas contributes to an openness to recruiting offers from other urban areas. To the research physician, a well-funded research chair at a growing medical center outside Massachusetts is a viable option to continuing a career in the Commonwealth. And finally, to younger residents and fellows, it means that upon completion of professional training in Massachusetts, greater financial opportunity and a more flexible work schedule can be found elsewhere. The attitudinal patterns among physicians now practicing in Massachusetts have been directly conditioned by the harsh realities of the high cost of maintaining a practice and high cost of living.

In an attempt to better understand this issue, a series of questions about personal factors affecting the residents' and fellows' locational preferences were included in the survey questionnaire. The following statistical response pattern shows clearly just how salary and living costs can impact the young physicians' attitudes toward practice in Massachusetts.

Residents and Fellows Ranking Massachusetts Unfavorably on Salary Level and Living Costs

FACTOR	FOR RESIDENTS & FELLOWS SEEKING JOBS IN MA	FOR RESIDENTS & FELLOWS SEEKING JOBS OUTSIDE MA
Salary Level	79%	76%
Cost of Living	89%	94%

What seems to be most significant to conclude from these data is that there is very little difference between those residents and fellows who choose to pursue their careers in Massachusetts vis-à-vis locations outside the state. The salary level and cost of living issues have impacted the thinking of both classes of students, but for those who plan to stay to pursue their careers in Massachusetts these differential personal costs are accepted as the "price of the personal sacrifice" to practice in Massachusetts. Both those physicians who plan to stay in Massachusetts and those who plan on leaving see the economics factors of practicing in the Commonwealth exactly the same.

[15] Sum A, et al. State of the American Dream in Massachusetts. The American Dream Project: Boston, 2002.

B. Over the past decade there has been a dramatic growth in the number and quality of new academic medical centers throughout the country. These newly emerging medical centers offer attractive opportunities for physicians who might otherwise have stayed in Massachusetts.

In a questionnaire to practicing physicians and teaching hospital department chiefs, we asked a series of questions concerning their experiences in recruiting and retaining physicians. This was designed to measure the competitive impact of emerging medical center competition. Summarized in the table below are the responses to the questions on recruitment and retention.

SPECIALTY	TIME TO RECRUIT PHYSICIANS HAS INCREASED SIGNIFICANTLY		ABILITY TO RETAIN PHYSICIANS HAS BECOME SIGNIFICANTLY MORE DIFFICULT	
	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)	PRACTICING PHYSICIANS (N=1,210)	HOSPITAL CHIEFS (N=27)
Anesthesiology	60%	50%	68%	75%
Cardiology	41%	80%	45%	80%
Orthopedics	40%	50%	37%	50%
Radiology	68%	100%	74%	88%

These data show the difficulty of recruiting and retaining physicians in teaching hospitals and private practice in Massachusetts.

In a parallel exercise, the survey included a set of questions for residents and fellows to express their preferences regarding careers within the Commonwealth or out of state. The data collected for this study confirm that roughly 55 percent of the residents and 68 percent of the fellows leave Massachusetts upon completion of their programs. But of far greater significance is the fact that very high ratios of those who leave the Commonwealth are in the specialties where demand in local labor markets is highest. The relevant data are displayed in the table below.

The Seven Specialties Experiencing Severe Labor Market Stress

SPECIALTY	PERCENT OF PROGRAM GRADUATES LEAVING MA	
	FELLOWSHIP	RESIDENCY
Anesthesiology	N/A	58%
Cardiology	59	N/A
Emergency Medicine	–	–
GI	52	N/A
Neurosurgery	80	N/A

Orthopedics	84	65
Radiology	N/A	69

Note: Dashes indicate that no information was provided for the specialty.

While the program fit is not complete, these results do provide information that the training pipeline for the years 1997–2001 offers little hope for closing a number of the key physician vacancy gaps; that is, the resident and fellow occupations that are in short supply are the very ones currently experiencing physician out-migration.

Volatility in Labor Markets

A. The medical complex in eastern Massachusetts attracts and trains far more physicians than could ever be effectively absorbed into local labor markets. But physician locational choices on a specialty-by-specialty basis can undergo sharp changes annually, creating short-term gaps in the labor market.

This point can best be made by analyzing the flow of physicians through the Boston medical complex. It is here that we see the dynamics of a potentially disruptive process on the supply of specialist occupations within the Commonwealth.

The medical school training process and residency and fellowship programs are always in the process of dynamic change in terms of absolute numbers and their distribution across the many specialties. It is these changes that can, and often do, induce occupational discontinuities in local physician specialty labor supplies. To be specific, an increase of no more than 15 residency graduates in radiology choosing to pursue their careers outside Massachusetts can contract the state's aggregate supply of radiologists by nearly 10 percent. The AMA Physician Masterfile listed 184 radiologists in the Commonwealth last year 2001. Similarly, the diversion of 20 residency graduates in orthopedic surgery to areas outside the state is equivalent to a nearly 5 percent contraction in the statewide specialist supply. The AMA Physician Masterfile listed 467 orthopedic surgeons in the Commonwealth last year. Within this context, the export of established physicians to practice locations outside Massachusetts will have the same impact. Unquestionably, these small adjustments are critical; they are the most likely causes of significant swings in specialty vacancies or surpluses over time. And it is in this context that one is better able to observe, coincidentally, the interaction of relatively large numbers of physicians in the aggregate, but critical shortages among many of the disaggregated specialists.

Concluding Comments

Our purpose for this discussion was to explain the forces that underlie the physician-to-population ratio are indeed complex, and that small variations in the post-graduate training location preferences can and will induce large variations in the stock of physicians. Within this context, the export of established physicians to practice locations outside Massachusetts will have the same impact.

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Looking ahead, it would be helpful to have timed series data on new hires, separations, sources of new hires, vacancies, and length of time to fill vacancies to be able to judge the dynamic effects of these adjustments over time and to see if this is a generalized statement of how labor markets for physicians actually work, but we simply do not have such data. Until we do, it seems that the most prudent conclusion from this discussion is to place far less emphasis on the physician-to-population ratio as a statistical measure that accurately explains supply-demand balances or imbalances among physicians.

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Appendix B: Sample Characteristics

The following table summarizes the response rates for each of the four surveys.

SURVEY TYPE	# OF SURVEYS MAILED	# OF SURVEYS RETURNED	RESPONSE RATE
Resident/Fellow	850	284	33%
Program Directors	90	57	63%
Hospital Department Chairs	36	27	75%
Practicing Physicians	4,000	1,210	30%

Resident/Fellow Survey and Residency/Fellowship Program Director Survey
The total response rate for the survey of residents and fellows was 33% (n=284). The breakdown of specialties is shown in the table below.

SPECIALTY	# OF SURVEYS MAILED	# OF SURVEYS RETURNED	RESPONSE RATE
Anesthesiology	164	38	23%
Cardiology	56	36	64%
Emergency Medicine	38	15	39%
Family Medicine	25	10	40%
GI	20	4	20%
Internal Medicine	278	75	27%
Neurological Surgery	4	2	50%
Obstetrics and Gynecology	38	10	26%
Orthopedics	39	19	49%
Pediatrics	56	20	36%
Psychiatry	38	11	29%
Radiology-Diagnostic	47	13	28%
General Surgery	40	15	38%
Vascular Surgery	7	4	57%
Other		5	
No Response		7	
TOTAL	**850**	**284**	**33%**

Demographic characteristics of the respondents to the resident/fellow survey are: 63% are male, 79% list a New England state as their permanent residence, 76% list Massachusetts as their permanent residence, 73% are residents in their last year of training, and 27% are fellows in their last year of training.

The survey response rates for the residency and fellowship program directors was 63% (n=57). The table below highlights the numbers of surveys returned by specialty.

PROGRAM DIRECTORS: SPECIALTY	# OF SURVEYS MAILED	# OF SURVEYS RETURNED	RESPONSE RATE
Anesthesiology	9	6	67%
Cardiology	11	6	55%
Emergency Medicine	4	1	25%
Family Medicine	2	2	100%
GI	6	2	33%
General Surgery	8	7	88%
Internal Medicine	8	3	38%
Neurosurgery	3	1	33%
OB/GYN	6	5	83%
Orthopedics	10	10	100%
Pediatrics	4	1	25%
Psychiatry	6	4	67%
Radiology	7	4	57%
Vascular Surgery	6	3	50%
No Response		2	
TOTAL	**90**	**57**	**63%**

Hospital Department Chiefs Survey

The response rate from the department chiefs of anesthesia, cardiology, orthopedics, and radiology at the nine teaching hospitals was 75% (n=27). The table below shows the response rate by the four specialties.

DEPT. CHIEFS: 4 SPECIALTIES	# OF SURVEYS MAILED	# OF SURVEYS RETURNED	RESPONSE RATE
Anesthesiology	9	8	89%
Cardiology	9	5	56%
Orthopedics	9	6	67%
Radiology	9	8	89%
TOTAL	**36**	**27**	**75%**

Survey to Practicing Physicians

The response rate for the practicing physician survey was 30% (n=1,210). The table below shows the response rate by specialty:

MA PHYSICIANS: SPECIALTY	# OF SURVEYS MAILED	# OF SURVEYS RETURNED	RESPONSE RATE
Anesthesiology	236	65	28%
Cardiology	155	49	32%
Emergency Medicine	140	45	32%
Family Practice	271	101	37%
GI	77	35	45%
Internal Medicine	1,225	254	21%
Neurosurgery	72	24	33%
OB/GYN	296	85	29%
Orthopedics	175	67	38%
Psychiatry	445	146	33%
Pediatrics	478	146	31%
Radiology	185	38	21%
Surgery - General	209	71	34%
Vascular Surgery	37	9	24%
Other Specialty		45	
No Response		30	
TOTAL	**4,000**	**1,210**	**30%**

Demographic and practice characteristics are as follows: 73% are male, 52% completed their residency in Massachusetts, and 31% completed their fellowship in Massachusetts. Roughly two-thirds of respondents are specialists (68%) and almost three-quarters of respondents (72%) graduated from medical school between 1960 and 1989. One-third of respondents belong to a single specialty practice (34%), 23% are in solo practice, 14% are in a multispecialty practice, and 16% hold an academic or teaching position.

In addition, we also thought it important to ensure that adequate sample representation would come from the five primary Hospital Service Areas in Massachusetts. The geographic distribution of the respondent sample is shown in the table below. The majority of respondents are from the Boston area (75%). The remaining respondents are located in southeastern Massachusetts (8% from Fall River-New Bedford, Barnstable, Cape and the Islands), the Worcester area (8%), the Springfield area (8%), and areas in the western part of the state that did not fall into a defined Metropolitan Statistical Area (MSA). We should also note that these five urban areas conform to the U.S. Bureau of the Census definition of MSA.[16]

[16] For the most part, the MSA boundaries roughly coincide with the Dartmouth Health Care Service Areas. The two exceptions are southeastern Massachusetts, where Providence is considered the dominant medical center, and Pittsfield, where Albany is the dominant medical center. These spatial discrepancies notwithstanding, this MMS study of labor markets is limited to economic activity within the Commonwealth of Massachusetts.

GEOGRAPHIC GROUPS (MSAS)	# OF SURVEYS MAILED	%	# OF SURVEYS RETURNED	%	RESPONSE RATE
Boston	2,964	77%	859	71%	29%
Worcester	333	9%	102	9%	31%
New Bedford/Fall River/ Barnstable County	227	6%	94	7%	41%
Springfield	295	8%	92	8%	31%
Pittsfield	51	1%	16	1%	31%
TOTAL	**3,870**	**100 %**	**1,163**	**100 %**	**30%**

The difference between the total response rate (n=1,210) and the total response rate from the Massachusetts MSAs (n=1,163) can be attributed to respondents who practice outside of these five urban areas.

Test of Response Bias: The "Specialty" and "Geographic Location (MSA)" variables were used to test whether the returned sample was representative of the mailed sample.

For the "Specialty" variable, the results in the table below demonstrate that with the exception of two categories, "Internal Medicine" and "Other Specialty," the proportion of respondents closely match those of the mailed sample. This indicates that there was no tendency for specialties to respond or not respond to the survey differentially. The difference between the "Internal Medicine" and "Other Specialty" categories is probably due to differences in the specialty indicated on the MMS mailing database versus the specialty listed by the physician on their returned survey.

MA PHYSICIANS: SPECIALTY	MAILED	RETURNED	DIFFERENCE
Anesthesiology	6%	5%	1%
Cardiology	4%	4%	0%
Emergency Medicine	4%	4%	0%
Family Practice	7%	8%	-2%
GI	2%	3%	-1%
Internal Medicine	31%	21%	10%
Neurosurgery	2%	2%	0%
OB/GYN	7%	7%	0%
Orthopedics	4%	6%	-1%
Psychiatry	11%	12%	-1%
Pediatrics	12%	12%	0%
Radiology	5%	3%	1%
Surgery - General	5%	6%	-1%
Vascular Surgery	1%	1%	0%
Other Specialty		4%	-4%

No Response		2%	-2%
TOTAL	**100%**	**100%**	**0%**

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With respect to the geographic distribution of the mailed sample and the returned sample, the two groups are quite similar and demonstrate again that there was no tendency for physicians from different geographic locations to respond or not respond to the survey.

GEOGRAPHIC GROUPS (MSAS)	MAILED	RETURNED	DIFFERENCE
Boston	77%	75%	2%
Worcester	9%	9%	0%
New Bedford/Fall River/ Barnstable County	6%	7%	-1%
Springfield	7%	8%	-1%
Pittsfield	1%	1%	0%
TOTAL	**100%**	**100%**	**0%**