

Final Report

**Recommendations Regarding
Supplemental Practice Expense Data
Submitted for 2005**

**Evaluation of Survey Data for:
Cardiology
Radiology
Radiation Oncology**

**Prepared for:
Centers for Medicare and Medicaid Services
#500-95-0059 /TO#6**

**Prepared by:
Allen Dobson, Ph.D.
Lane Koenig, Ph.D.
Jonathan Siegel, M.A.**

The Lewin Group

May 26, 2004

TABLE OF CONTENTS

I. BACKGROUND.....	1
II. AMERICAN COLLEGE OF CARDIOLOGY DATA SUBMISSION.....	2
A. Evaluation of Survey	2
B. Survey Results	6
C. Recommendation.....	8
D. Appendix.....	8
III. AMERICAN COLLEGE OF RADIOLOGY DATA SUBMISSION.....	11
A. Evaluation of Survey	11
B. Survey Results	15
C. Recommendation.....	16
D. Appendix.....	17
IV. AMERICAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY DATA SUBMISSION.....	19
A. Evaluation of Survey	19
B. Survey Results	21
C. Recommendation.....	23
D. Appendix.....	23

This report discusses the supplemental practice expense surveys conducted for the physician specialties of cardiology, radiology, and radiation oncology. Data for each specialty are being formally submitted to the Centers for Medicare and Medicaid Services (CMS) through the Lewin Group for consideration in developing 2005 practice expense relative value units (RVUs) for the Medicare Physician Fee Schedule. In this report, we present a brief background on the criteria for acceptance of supplemental data and our analyses and recommendations regarding each survey.

I. BACKGROUND

The May 3, 2000 Interim Final Rule published in the *Federal Register* presented an initial set of criteria to be used in evaluating supplemental practice expense surveys. CMS received a number of comments from the public regarding the criteria and finalized the requirements for supplement survey data in its November 1, 2000 Final Rule. In its June 28, 2002 Interim Final Rule, CMS revised the standard relating to the level of precision.

CMS has specified five criteria for evaluating supplemental survey data:

1. **Confidentiality:** Groups conducting surveys must ensure the confidentiality of the sample and not know the names of the individuals selected to be surveyed.
2. **Survey Instrument and Protocols:** Groups must conduct the survey based on the American Medical Association's Socioeconomic Monitoring System (SMS) survey instruments and protocols, including administrative, follow-up, and definitions of practice expenses and hours worked.
3. **Survey Contractor:** Groups must use a contractor that has experience surveying health care professionals, collecting financial information, and using random samples.
4. **Level of Precision:** A 90-percent confidence interval with a range of plus or minus 15 percent of the mean. This implies that the standard error multiplied by 1.645 should be equal to or less than 15 percent of the mean.
5. **Nationally Representative Survey of the Target Population of Physicians:**
 - a. **Random sample from complete nationwide listing** – Groups must draw the sample from AMA's Masterfile if possible. For non-physician groups not included in the Masterfile, a nationally representative sample of members and non-members must be developed.
 - b. **Response rate** – CMS has stated that it is impractical to set rigid response-rate cutoffs for acceptance of supplemental survey data. However, for consideration of survey data, CMS has asked for detailed analyses that indicate that the sample is representative of the population surveyed.

This report discusses the Lewin Group's evaluation of data submitted by American College of Cardiology (ACC), American College of Radiology (ACR), and American Society for Therapeutic Radiology And Oncology (ASTRO). Based on the Lewin Group's independent

assessment of the data submissions, we include our recommendations on whether or not CMS should accept and use each of these data in the calculation of practice expense RVUs for 2005.

II. AMERICAN COLLEGE OF CARDIOLOGY DATA SUBMISSION

The American College of Cardiology (ACC) commissioned a recent practice expenses survey of cardiologists, and has submitted the responses to the Lewin Group for CMS consideration as supplemental practice expense survey data. The data collected were for 2002 expenses. Below, we evaluate the data in reference to the CMS criteria for supplemental practice expense data, report the survey results, and make a recommendation regarding acceptance. Some additional detail is provided in the appendix to this section.

A. Evaluation of Survey

1. Confidentiality

A sample of 8,000 cardiologists was randomly drawn from a universe of approximately 18,000 names in the American Medical Association (AMA) Physician Masterfile. The random sampling was conducted by the survey contractors, and the identities of those sampled were not revealed to ACC or to any other entity. Correspondence to sampled cardiologists by the survey contractor explicitly assured the confidentiality of individually identified data. The survey contractor has stated to us that all data released to ACC has been stripped of identifying information.

- The Lewin Group is satisfied that the ACC survey meets the standards of *confidentiality* required by CMS for supplemental practice expense surveys.

2. Survey Instrument and Protocols

ACC sought advice and guidance from the Lewin Group in developing the survey instrument and survey-related correspondence. The survey follows closely to the language and format of the SMS survey. ACC proposed small modifications to the language of certain survey questions to improve clarity in a specialty-specific questionnaire. All modifications were vetted with the Lewin Group prior to surveying. It is our opinion that the changes made only serve to illicit more accurate response, and do not change any definitions of expenses or hours worked in the survey questions.

The ACC survey followed the CMS-required protocols. Correspondence and expense worksheets sent to surveyed cardiologists were consistent with SMS format, and were reviewed by the Lewin Group prior to mailing. Sampled cardiologists were surveyed by telephone, follow-up calls were made to non-respondents, and a toll-free number was made available for respondents.

- The Lewin Group is satisfied that the ACC survey meets the standards for *survey instrument and protocols* required by CMS for supplemental practice expense surveys.

3. Survey Contractor

ACC hired a survey contractor with prior experience conducting supplemental practice expense surveys. This contractor sought guidance and approval from the Lewin Group for each of its protocols, conducted the survey independently, and submitted the data directly to the Lewin Group.

- The Lewin Group is satisfied that the ACC survey meets the standards for a *survey contractor* required by CMS for supplemental practice expense surveys.

4. Level of Precision

The Lewin Group compiled the results from the ACC survey and computed a measure of the level of precision for total practice expenses per hour. As described by the CMS regulations, the level of precision is formally measured by the 1.645 times the standard error of the mean, divided by the mean. According to CMS requirements, this measure applied to total practice expense per hour should not exceed 15 percent for acceptance as supplementary data. The ACC survey yielded 389 usable responses, and the relevant precision measure is 5.2 percent.

The ACC survey drew a sample of cardiologists consisting of more than 40 percent of the population of cardiologists nationally. As a consequence, it was very likely that larger practices would have multiple cardiologist owners in the sample. This appears to be the case, based on the fact that for most of the larger practices in the sample, there were multiple observations with identical zip codes and cost data. The 389 survey responses appear to represent 129 unique practices. This has an impact on the precision measurement, because the separate responses from physicians of the same practice are not at all independent. For this reason, we computed an additional precision measure representing the 129 unique practices: 13.6 percent, which also meets CMS precision requirements.

- The level of precision for total practice expense per hour satisfies the *level of precision* requirement specified in the June 28, 2002 Interim Final Rule.

5. Nationally Representative Survey of the Target Population of Physicians

a. Random sample from complete nationwide listing

The sample for the ACC survey was 8,000 cardiologists drawn randomly from the approximately 18,000 listed in the AMA Physician Masterfile. The Masterfile is a complete listing of physicians nationwide.

b. Response rate

The ACC survey yielded a response rate of 13 percent. This response rate is low in absolute terms, but comparable to prior expense surveys by other specialties submitted to CMS. Extensive experience with supplemental practice expense surveys has shown that high response rates are not achievable, given the sensitive nature of the data being surveyed and the burden placed on the respondents. In lieu of a high response rate, it is essential to verify that the

responding sample is adequately representative of the population of cardiologists. We examined the data for representativeness along three dimensions: practice size, procedures performed, and geography.

The distribution of cardiology practice sizes among usable responses is shown in the table below, along with certain comparative survey distributions.

Figure II.1 Distribution of Sample by Number of Practice Physicians

Number of Physicians in Practice	Percent of ACC Survey Sample (N=389)	Cardiologists in AMA Survey, 1999 (N=65) ^a	Cardiologists in ACC Member Survey, 2003 (N=4,250)
1	8.2%	31.5%	12.0%
2	2.3%	8.4%	7.2%
3	1.8%	9.2%	5.6%
4 to 8	12.6%	22.3%	27.6%
9+	75.1%	28.6%	47.7%

a/ From the American Medical Association, *Physician Socioeconomic Statistics: 2000-2002 Edition*. Data taken from Socioeconomic Monitoring System 1999 Survey of Physicians.

Three-quarters of the responding cardiologists are in practices of 9 or more physicians, and fewer than one-tenth are in solo practice. This differs substantially from 1999 AMA data, which showed 29 percent of self-employed cardiologists in the 9+ category and 32 percent in solo practice (with a sample size of 65). On the other hand, the Medical Group Management Association (MGMA) data for 2002 report cardiology practices with a median size of 12 physicians (sample size of 100, not shown in table above). This figure contradicts the AMA data, and is consistent with the ACC survey response, showing that a clear majority of cardiologists are part of practices in the largest size category.

We also asked ACC to provide additional information on the distribution of practice sizes. In a recent, unscientific survey of their membership, ACC asked for the number of physicians in the respondent’s practice. According to their data, 12 percent of 4,250 responding cardiologists were solo practitioners, which is similar to our findings from the ACC practice expense survey data. However, only 48 percent were in practices of 9 or more, which is significantly lower than the 75 percent in the practice expense survey response.

ACC added a series of questions to their survey that asked respondents to report whether or not certain types of procedures were performed by staff within their practice. The purpose of the questions was to better assess the representativeness of the responding sample. ACC asserts that certain advanced cardiology procedures are now more frequently performed within physician offices, as compared to the time of the SMS survey on which practice expense values are currently based (1995-1999). The questions asked separately whether nuclear cardiology, echocardiography, diagnostic cardiac catheterizations, electrophysiology, cardiac MRI, and CT scans were performed by staff in their own offices or facilities (as opposed to in a hospital or unrelated facility).

Among the six procedures, nuclear cardiology (80 percent reporting in-office procedures) and echocardiography (93 percent) were the most highly prevalent in the responding sample.

Catheterizations (18 percent), electrophysiology (6 percent), cardiac MRI (1 percent), and CT scans (10 percent) were less common. We tested some of these procedural categories against Medicare physician claims data from the Standard Analytical File (SAF) from 2001. Using sentinel procedure codes for each of the sub-specialties, we examined the percentage of all cardiology Unique Physician Identifier Numbers (UPINs) with any frequency of non-facility billing of these procedures.

Figure II.2 Percent of Cardiologists Reporting Specific Procedures Performed in Practice Facilities

	Percent of Responding ACC Sample Performing	Percent of UPINs in 2001 SAF Billing These Procedures as Non-Facility	Expected Percent of Practices Performing These Procedures (Upper Bound)
Nuclear Cardiology	80.1%	21.5%	87.0%
Echocardiography	93.2%	41.5%	93.4%
Diagnostic Cardiac Catheterizations	18.7%	0.7%	16.0%
Electrophysiology	6.3%	8.3%	69.7%

The UPINs are physician-specific, and therefore the percent of all UPINs billing a certain procedure will be lower than the percent of all physician practices billing the procedure, since most practices have several physicians. Using the percentages obtained from the UPIN analysis, and the distribution of practice sizes in the practice expense survey, we calculated an expected fraction of practices performing the procedures.¹ This expected percent is actually an upper bound, because it assumes the sub-specialists are evenly distributed across all practices, and not clustered together.

Based on this analysis, the percentages performing nuclear cardiology and echocardiography in the sample appear realistic. The similarity of the expected percent of practices and the actual percent observed further validates the representativeness of the sample. The percentage performing electrophysiology in the sample looks low compared with our projected number. However, our projected number does not account for sub-specialists clustering together in practices, which may be more likely for a less common sub-specialty such as electrophysiology.

Finally, we also examined the geographic representativeness of the sample. Responses came from 38 states, well dispersed across the country. However, we note that no responses came from Texas, which is very unusual for a large state in such a large survey. As in past evaluations, we calculated the average practice expense GPCI index for respondents in the sample, which was 0.978. This number is not statistically different from the national average

¹ The expected percentage of practices performing the type of procedure was calculated by assuming that the sub-specialist cardiologists are evenly distributed across all practices. Using the practice size reported by each respondent in the sample, we calculated the probability that at least one of the physicians in their practice provides the sub-specialty services. This probability comes from a binomial distribution. So, for example, a solo practitioner has a 41% probability of providing echocardiography, but in a two-physician practice there is a 65% probability that at least one provides it, and in a ten-physician practice the probability is 99%. This method ignores the possibility that sub-specialists may choose to cluster in certain practices, and that scale economies may make the services less likely in small practices. Each of these features would lower the percentage of practices providing the services, and therefore the estimates can be seen as upper bounds.

GPCI (1.000), and also not significant from the national average computed over the geographic distribution of cardiologists in the AMA Physician Masterfile (1.025). We conclude that despite a less than totally even geographic distribution, the sample is adequately representative of the geographic variations in practice expenses.

- The ACC survey is underrepresented in the smallest size practices, but these practices account for only a small percentage of cardiologists. More importantly, the ACC survey appears to be appropriately representative of the mix of services most crucial to practice expense differences, such as nuclear cardiology and echocardiography. In light of this, the Lewin Group is satisfied that the ACC survey adequately meets the CMS requirement for a *nationally representative survey of the target population of physicians*.

B. Survey Results

The table below displays the mean practice expenses per hour, based on the 389 usable responses from the ACC Practice Expenses of Cardiology Survey. For conformity to SMS data, responses are weighted by the ratio of population frequencies (from the Physician Masterfile) to sample frequencies for a combination of characteristics: AMA membership status and years in practice.²

Figure II.3 Practice Expenses Per Hour, Cardiology, 2002

	Estimated Mean (N=389)	Standard Error (N=389)	Precision [1.645 × SE/Mean] (N=389)	Unique Practice Observations Precision (N=130)
<i>Direct PE per hour</i>				
Clinical Payroll	\$54.52	2.08	0.063	0.163
Medical Equipment	\$17.00	0.82	0.079	0.169
Medical Supplies	\$23.67	1.80	0.125	0.340
<i>Indirect PE per hour</i>				
Office Expense	\$48.24	2.21	0.075	0.156
Clerical Payroll	\$48.81	1.91	0.064	0.164
Other Expense	\$22.91	1.95	0.140	0.233
Total PE per hour	\$215.15	6.84	0.052	0.119

The last column shows the precision measure based only on the 130 unique practice observations. As noted above, multiple observations were received from several large practices, and therefore were not independent.

² The AMA also creates sample weights based on a physician’s board certification status and gender. However, these characteristics were omitted because resulting cells sizes would be too small.

The table below demonstrates the variation in practice expenses per hour across practices of different sizes in the sample.

Figure II.4 Practice Expenses Per Hour, Cardiology, By Practice Size, 2002

Number of Physicians in Practice	Observations	Estimated Mean Total PE/hour
1	32	\$124.04
2	9	\$95.84
3	7	\$245.91
4 to 8	49	\$250.16
9+	292	\$226.48

Solo and two-physician practices in cardiology exhibit much smaller mean expenses per hour in this sample. The fact that expenses increase substantially at 3 physicians corresponds to anecdotal information from cardiologists regarding the minimum number of doctors needed for efficient purchase and use of advanced equipment. Indeed, there is a strong relationship in these survey data between practice size and the in-office provision of the specific technological procedures noted above.

This variation makes it essential that, in order to achieve the correct mean practice expense per hour, the sample must accurately represent the size distribution of the population of cardiologists. The table below shows the mean practice expense per hour, with the observations weighted to reflect the practice size distribution, using two alternative sources for that distribution (i.e., the distributions in the two rightmost columns of Figure II.1).

Figure II.5 Practice Expenses Per Hour, Cardiology, Re-weighted For Practice Size, 2002

	Weighted Using 1999 SMS Size Distribution		Weighted Using 2003 ACC Member Survey	
	Estimated Mean	Standard Error	Estimated Mean	Standard Error
<i>Direct PE per hour</i>				
Clinical Payroll	\$44.38	2.38	\$52.05	2.37
Medical Equipment	\$13.96	0.84	\$16.04	0.85
Medical Supplies	\$18.81	1.44	\$22.03	1.55
<i>Indirect PE per hour</i>				
Office Expense	\$52.96	2.92	\$54.59	2.68
Clerical Payroll	\$40.67	1.92	\$47.20	2.06
Other Expense	\$19.52	1.59	\$20.50	1.63
<i>Total PE per hour</i>	\$190.30	7.66	\$212.42	7.23

C. Recommendation

The ACC Practice Expenses of Cardiology Survey meets CMS requirements of confidentiality, survey design and protocols, survey contractor, level of precision, and random sample from nationwide listing. Satisfaction of the one remaining requirement, for a high response rate or a representative responding sample, has required much more examination in our evaluation.

We have looked at the distribution of the sample across practice size, procedural use, and geography, and compared each to alternative measures. Based on these comparisons, there is no clear evidence that this sample is unrepresentative of the population of cardiologists. Nevertheless, the high percentage in large practices (75 percent with 9 or more physicians) does conflict substantially with prior AMA survey data. The large differences in practice expenses per hour between large and small practices make any imbalance in practice size of great consequence to the overall mean. Furthermore, the fact that we received clusters of responses from certain large practices where multiple physicians were sampled makes it plausible that the response rate for physicians at these larger practices was above the response rate at smaller practices. Despite these concerns, we do not have any firm indication that this survey, which is more current and of much greater sample size than the AMA survey, is not representative of practice size. A more recent, larger survey of ACC membership shows a practice size distribution much closer to what was found in the practice expense survey.

Mean total practice expenses per hour reported in this survey are more than double the level measured in the SMS surveys (1995-97). Even before undertaking the survey, ACC explained to us that there were changes in recent years for their specialty that would likely increase the mean practice expense per hour. Among these changes were the increased frequency of performing advanced technologically-driven procedures within their offices, which would lead to higher practice expenses per physician hour.

In this light, the new data from ACC do not demonstrate older practice expense data to be flawed. Rather, the difference is more reflective of change over time in cardiology practice. However, we must note that similar changes may also have occurred throughout the physician services industry, including other specialties that have not been surveyed recently. We recommend that CMS also consider this last point when determining *how* to use this supplementary data for cardiology.

- **The Lewin Group recommends that CMS accept the data submitted by ACC, and the results in Figure II.3, for use in future practice expense calculations.**

D. Appendix

1. *Sample, Edits, and Response Rates*

ACC's survey contractor drew 8,000 cardiologists randomly from the approximately 18,000 listed in the AMA Physician Masterfile, a sampling ratio of 44 percent. The survey contractor reports the following disposition for these 8,000:

- 1,641 had bad or missing telephone numbers, or other contact problems
- 5,213 were not available or refused to be surveyed

- 723 were disqualified as ineligible
- 423 completed the survey

As noted above, we were able to use 389 of the 423 responses. Of the 34 that were edited out of the sample:

- 27 lacked one or more practice expense item response
- 3 lacked a weeks missed response or had more than a half-year missed
- 3 had invalid or missing average hours for employee physicians
- 1 had missing data on physician compensation or malpractice expense

To compute a response rate, we use the 389 as a fraction of the total (8,000) less those disqualified (723):

$$\text{Initial Response Rate} = 389 / 7,277 = 5.3\%$$

This response rate is misleading because all non-respondents, who never completed the screening, are counted as eligible. Instead, we applied the same fraction of respondents ineligible for the survey (63.1%) to the 6,854 non-respondents. This eliminated an additional 4,324 non-respondents from the sample:

$$\text{Adjusted Response Rate 1} = 389 / 2,953 = 13.2\%$$

We made another calculation of the response rate by first eliminating those cases that had bad or missing phone numbers, or other contact problems (1,641). There is reason to expect that these cases would be more likely than other non-contacted cases to be screened out if data had been collected, as they are often out-of-business or mistaken entries. Recalculating our “Adjusted Response Rate 1” with these observations removed gives:

$$\text{Adjusted Response Rate 2} = 389 / 2,347 = 16.6\%$$

2. Sample Weights

We used the same methodology for weighting as the SMS survey in order to correct for potential non-response bias. The weights were first derived by dividing the AMA Physician Masterfile population and the survey respondents into 10 cells according to years in practice (5 categories) and AMA membership status (2 categories). The AMA also creates sample weights based on a physician’s board certification status and gender. However, these characteristics were omitted because resulting cells sizes would be too small. Also, unlike the SMS survey, the cells were defined by only 1 specialty category (cardiology) rather than 10 specialty categories. Unit response weights were constructed by taking the ratio of the number of physicians in the population to the number of survey respondents in each cell.

For the practice-size weighting used in Table II.5, we used the percentage distribution in *AMA Physician Statistics 2000-2002* (1999 Socioeconomic Monitoring System data) for 5 categories of practice size: 1, 2, 3, 4-8, and 9+. The ratio of this percentage to the ACC sample percentage, multiplied by the SMS-type non-response weight described above, formed the new weight. The weighting based on the 2003 ACC member survey was done similarly.

3. Validation of Staff Expenses Data

Clerical and clinical staff expenses together account for nearly half of the cost per physician patient care hour. As additional validation of these expense items, we looked at the non-physician staff expenses per staff employee, as well as the ratios of staff to physicians. The survey asked physicians to report the number of full-time staff of each type, which enables us to observe these per employee figures.

Figure II.6 Non-Physician Employee Compensation and Staff Ratios

	Mean Expenses Per Non-Physician Employee	Non-Physician Employees Per Physician
Clinical Staff	\$47,652	2.81
Clerical Staff	\$47,874	2.99

The staff salaries are in line with national averages for these job classifications. The staff ratios are higher than those appearing in the most recent AMA survey, which shows a 2-to-1 ratio for clerical staff and a 1.5-to-1 ratio for clinical staff among cardiologists.

4. Effect of Specific Sub-Specialties on Expenses

As noted above, the ACC survey asked respondents whether or not specific types of specialty procedures were performed by staff in their own offices or facilities. We examined the mean practice expenses for those reporting the in-office provision of these procedures versus those without such procedures.

Figure II.7 Practice Expense Per Hour, By Type of Specialty Procedures Provided In-Office, Cardiology

	Number of Responses	Percent of Sample	Mean Total PE per Hour
<i>Nuclear Cardiology</i>			
No	79	20.0	\$127.75
Yes	317	80.0	\$243.28
<i>Echocardiography</i>			
No	27	6.8	\$116.96
Yes	369	93.2	\$227.79
<i>Diagnostic Catheters</i>			
No	322	81.3	\$208.05
Yes	74	18.7	\$273.27
<i>Electrophysiology</i>			
No	371	93.7	\$219.73
Yes	25	6.3	\$227.76
<i>CT Scans</i>			
No	358	90.4	\$203.77
Yes	38	9.6	\$375.33

The two most frequent of these sub-specialties, nuclear cardiology and echocardiography, showed much higher practice expenses than those cardiologists in practices without them. There is a strong correlation between providing these procedures in-office and being a larger practice of 3 or more physicians. This accounts for the similarity of these results to those in Figure II.4.

III. AMERICAN COLLEGE OF RADIOLOGY DATA SUBMISSION

The American College of Radiology (ACR) commissioned a practice expenses survey for the specialty of radiology, and has submitted the responses to the Lewin Group for CMS consideration as supplemental practice expense survey data. The survey collected data on 2002 practice expenses.

ACR has explained to the Lewin Group that many radiology centers employing radiologists are owned by non-physician entities. This same fact has also been reported to the Lewin Group by another organization, the National Coalition for Quality Diagnostic Imaging Services (NCQDIS). These organizations have indicated that these types of centers have become a larger part of the specialty in recent years, as radiology has expanded further into MRI, CT scans, and other technology-driven imaging procedures.

As a consequence of these facts, ACR chose to conduct the survey at the practice level, rather than the physician level. This survey method was chosen by ACR after several consultations with the Lewin Group. We agreed with ACR that a survey based on physician owners would be unlikely to provide accurate results overall if the non-physician owned segment of the specialty is substantial. We informed ACR that a practice-level survey would be acceptable, as long as the sample's representativeness of the practice population was verifiable and the data collected could be made to conform to SMS measures. We have previously approved the use of a practice-level survey for supplemental survey data, in the case of independent labs, so this decision has a recent precedent.

Below, we evaluate the data in reference to the concerns expressed above and CMS criteria for supplemental practice expense data. We then report the survey results, and make a recommendation regarding acceptance. Some additional detail is provided in the appendix to this section.

A. Evaluation of Survey

1. Confidentiality

ACR obtained contact information for a population of 1,009 radiology practices from the Radiology Business Managers Association (RBMA). They attempted to survey all of these practices. Therefore, in a strict sense, the confidentiality of the sample was not preserved, since ACR was aware that all radiology practices would be included in the survey.

However, we note that the choice to sample at the practice level substantially reduces the size of the population of potential observations. The decision to survey the entire population is

reasonable in this case, given CMS precision requirements and prior experience with responsiveness. In addressing these concerns by using all practices available, the lack of anonymity is unavoidable. The identity of which practices ultimately responded with eligible data was not known to ACR.

- Although the ACR survey does not meet the strict standard of *confidentiality*, the Lewin Group does not believe that this fact should determine the acceptability of the survey data. The lack of confidentiality was a necessary byproduct of the practice-level design and the choice to sample all available practices.

2. Survey Instrument and Protocols

ACR took guidance from the Lewin Group in developing the survey instrument and survey-related correspondence. Although it is a practice-level survey, it follows the language and format of the SMS survey, wherever possible. The Lewin Group assisted ACR in developing practice-level questions that would yield data compatible to SMS data. In particular, the practice was asked to report total weekly hours for full-time physicians only, exclusive of absences for vacations and sickness.

ACR made modifications to the language of certain survey questions, to improve clarity in a specialty-specific practice-level questionnaire. All modifications were vetted with the Lewin Group prior to surveying, and we deem these changes to be appropriate.

The ACR survey followed the CMS-required protocols. Correspondence and expense worksheets sent to surveyed radiology practices were consistent with precedents, and were reviewed by the Lewin Group prior to mailing. Radiology practices were surveyed by telephone, follow-up calls were made to non-respondents, and a toll-free number was made available for respondents.

- The Lewin Group is satisfied that the ACR survey meets the standards for *survey instrument and protocols* required by CMS for supplemental practice expense surveys.

3. Survey Contractor

ACR hired a survey contractor with prior experience conducting supplemental practice expense surveys. This contractor sought guidance and approval from the Lewin Group for each of its protocols, conducted the survey independently, and submitted the data directly to the Lewin Group.

- The Lewin Group is satisfied that the ACR survey meets the standards for a *survey contractor* required by CMS for supplemental practice expense surveys.

4. Level of Precision

The Lewin Group compiled the results from the ACR survey and computed a measure of the level of precision for total practice expenses per hour. As described by the CMS regulations, the level of precision is formally measured by the 1.645 times the standard error of the mean,

divided by the mean. According to CMS requirements, this measure applied to total practice expense per hour should not exceed 15 percent for acceptance as supplementary data. The ACR practice-level survey yielded 171 usable responses, and the relevant precision measure is 13.6 percent.

- The level of precision for total practice expense per hour satisfies the *level of precision* requirement specified in the June 28, 2002 Interim Final Rule.

5. Nationally Representative Survey of the Target Population of Physicians

c. Random sample from complete nationwide listing

The sample for the ACR survey was drawn from the full commercial list of radiology practices supplied by the Radiology Business Managers Association (RBMA). The 1,009 practices from this list are not a random sample and are not from a complete national listing. However, the geographic distribution of practices on the list, by state, does indicate that the list is nationwide and fairly uniformly distributed across the national population. All states are represented in the list, and larger states are appropriately represented with larger numbers of radiology practices. But the possibility exists that the non-random source of the list is not representative of the characteristics of the population of radiology practices overall, and therefore the representativeness of the responding sample, which derives from the list, must be evaluated. The next section describes our evaluation of this representativeness.

d. Response rate

The ACR survey yielded a response rate of 21 percent. This response rate is not high in absolute terms, but it compares favorably with response rates in prior expense surveys by other specialties submitted to CMS. Experience with supplemental practice expense surveys has shown that high response rates are not achievable, given the sensitive nature of the data being surveyed. In light of the low response rate, and the concern that that original list may not be sufficiently complete and random, it is essential to verify that the responding sample is adequately representative of the population of radiology practices. We examined the ACR survey of radiologists for representativeness along three dimensions: proportion billing global or technical component procedures, practice size, and geography.

ACR has emphasized that the sample should be accurately representative of the diversity in the population of radiologists regarding outside facility use. They suggest that many radiology practices operate using their own technical equipment and staff, while others are more often working in hospitals or other outside facilities. The ACR survey included a question asking the practice to estimate the percent of the practice's cost attributable to professional component (PC) billing, versus technical component (TC) and global billing. A practice primarily working in external facilities work will show a high percentage of PC-only billing, while a practice with greater in-house technical facilities will show a lower PC-only percentage.

The table below shows the distribution of PC-only percentages among responses from the survey. The column on the right compares the distribution to one derived from the Medicare Standard Analytical File (SAF) physician claims data. The Medicare data show the distribution

across radiology Unique Physician Identification Numbers (UPINs) of the percent of claims that are for PC-only services.

Figure III.1 Distribution of Professional Component Billing as a Share of All Billing, Radiology

Fraction PC-only Billing	Percent of Radiology Practices in ACR Survey Sample, 2002	Percent of UPINs in Medicare SAF, 2001
0 to 20%	11.8	17.0
20 to 40%	3.1	3.5
40 to 60%	6.6	5.9
60 to 80%	10.0	11.7
80 to 100%	68.4	62.0

The closeness in these two distributions suggests a fairly representative sample over variations in PC-only share in billing.

Regarding practice size, ACR has referred us to a published report on a 2000 demographic survey of radiologists, which includes information on the distribution by practice size.³ In the table below, we compare the distribution in the sample to the distribution of that found in the prior survey.

Figure III.2 Distribution of Sample by Number of Practice Physicians, Radiology

Number of Physicians in Practice	Responses in ACR Survey Sample	Percent of Practices in ACR Survey Sample, 2002 Data (N=171)	Percent of Practices in 2000 Survey (N=2241)	Percent of Radiologists in 2000 Survey (N=2241)
1	31	4%	34%	6%
2-4	29	15%	29%	15%
5-14	23	47%	28%	41%
15+	59	34%	8%	38%
All	171	100%	100%	100%

Based on this comparison, there is a large under-representation of solo and small practices in this sample. If the source list from which the ACR contractor sampled is biased toward larger practices, this also raises the question of whether the small practices that do appear in the list represent well the population of small practices. However, mitigating this concern is the fact that solo and small practices account for only a small percentage of the population of radiologists. Though solo practices constitute one third of all practices, according to the published 2000 survey, they only comprise 6 percent of radiologists. So, although there is a clear problem with the representation of small practices, it is not likely to have strong consequences on the practice expense per hour numbers.

³ Sunshine JH et al, "Diagnostic Radiologists in 2000: Basic Characteristics, Practices, and Issues Related to the Radiologist Shortage," *American Journal of Roentgenology* 178, February 2002.

Finally, we also examined the geographic representativeness of the sample. Responses came from 44 states, well dispersed across the country. Most large states were represented by several observations. The number-of-physician weighted average practice expense GPCI index for respondents in the sample was 0.982. This number is not statistically different from the national average GPCI (1.000). We conclude the sample is adequately representative of the geographic distribution of radiology practices nationally.

- The ACR practice expense survey is clearly not representative of smaller radiology practices. However, only a small minority of radiologists are in small practices, and the survey does seem to be a good representation of the mix of PC/global billing. Given these facts, the Lewin Group is satisfied that the ACR practice expense survey of radiology practices adequately meets CMS requirements for a *nationally representative survey of the target population of physicians*.

B. Survey Results

To make the results of a practice-level survey comparable with physician-level surveys, such as the SMS, the observations must be weighted by the number of physicians in the practice. The reason for this is that in a physician-level survey, a ten-physician practice is ten times more likely to be sampled (through one of its physicians) as a solo practice. In a practice-level survey, the solo practice and the ten-physician practice are equally likely to be sampled.

The table below shows mean practice expenses, weighted by the number of physicians in the practice.

Figure III.3 Mean Practice Expenses Per Hour, Weighted By Practice Size, Radiology, 2002

	Estimated Mean (N=171)	Standard Error (N=171)	Precision [1.645 × Mean/SE] (N=171)
<i>Direct PE per hour</i>			
Clinical Payroll	\$26.57	3.56	0.221
Medical Equipment	\$24.96	3.87	0.255
Medical Supplies	\$10.28	1.56	0.249
<i>Indirect PE per hour</i>			
Office Expense	\$21.94	2.21	0.166
Clerical Payroll	\$34.63	2.83	0.134
Other Expense	\$41.04	3.14	0.126
<i>Total PE per hour</i>	\$159.41	13.17	0.136

While assessing the representativeness of the sample, we examined the differences in practice expense per hour across practices of different sizes. The table below shows this distribution.

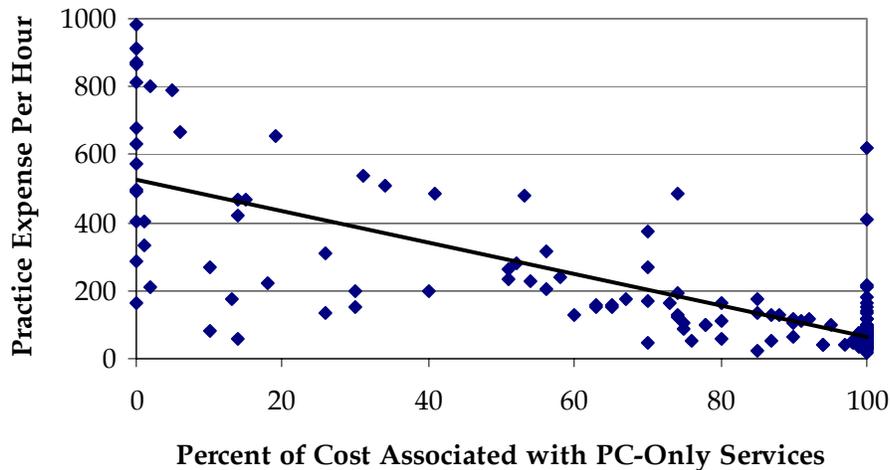
Figure III.4 Practice Expenses Per Hour, By Practice Size, Radiology, 2002

Number of Physicians in Practice	Observations	Estimated Mean Total PE/hour
1-3	24	\$329.57
4 to 8	40	\$157.34
9+	107	\$164.06

Practices with three or fewer physicians show much higher expenses per hour. While it might seem that this is indicative of scale efficiencies, it is more likely to be related to practices that have a small number of physicians, providing a relatively high volume of TC and global services. This combination results in high practice expenses relative to physician hours. 10 of the 24 practices in the 1-3 physician category report PC-only services to be associated with 2 percent or less of costs. Only 7 of the 147 practices with four or more physicians report the same low percentage of PC-only services.

ACR expressed concern regarding the representativeness of the sample in terms of PC/global procedure mix across practices. This was because practices that focus on PC-only services are likely to have lower costs than TC and global service providers. In the section above, we compared the sample distribution to data from Medicare claims, and concluded that the sample looks adequately representative in PC/global mix. In the graph below, the relationship between PC/global mix and total practice expense per hour is clearly shown.

Figure III.5 Practice Expenses Per Hour By PC/Global Service Mix, Radiology Survey Data



C. Recommendation

ACR has stated that prior physician-level surveys of radiologists, such as the SMS, have systematically underrepresented providers of relatively more technical component and global services. Based on this supplementary data submission, this does appear to be the case, because of their comparatively lower ratio of physicians to services and possibly because of non-physician ownership of radiological imaging centers.

The Lewin Group is satisfied that the ACR Practice Expenses of Radiology Survey passes CMS requirements for supplemental practice expense surveys. Though we were not able to verify the completeness of their original list of practices, we have examined the sample distribution across practice size, PC/global procedural mix, and geography. Based on these examinations, we conclude that the resulting sample appears to be representative of the target population of radiologists.

To allow the average practice expenses per hour to be comparable to practice expense data for other specialties, which is collected at the physician level, we recommend that the means are weighted by number of physicians, as in Table II.3.

- **The Lewin Group recommends that CMS accept the data submitted by ACR, and the results in Figure II.3, for use in future practice expense calculations.**

D. Appendix

1. Sample, Edits, and Response Rates

The sample for the ACR survey was drawn from the 1,009 practices in the entire commercial list of radiology practices supplied by the Radiology Business Managers Association (RBMA). The survey contractor reports the following disposition for these 1,009:

- 156 had bad or missing telephone numbers
- 624 were not available or refused to be surveyed
- 47 were disqualified as ineligible
- 182 completed the survey

As noted above, we were able to use 171 of the 182 responses. Of the 11 that were edited out of the sample:

- 10 lacked one or more practice expense item response
- 1 had missing data on physician compensation or malpractice expense

To compute a response rate, we use the 171 as a fraction of the total (1,009) less those disqualified (47):

$$\text{Initial Response Rate} = 171 / 962 = 17.8\%$$

This response rate is misleading because all non-respondents, who never completed the screening, are counted as eligible. Instead, if we assume that the same fraction ineligible for the survey observed in the respondents (20.5%) applied also to the 780 non-respondents, we remove an additional 160:

$$\text{Adjusted Response Rate 1} = 171 / 802 = 21.3\%$$

We made another calculation of the response rate by first eliminating those cases that had bad or missing phone numbers (156). There is reason to expect that these cases would be more likely than other non-contacted cases to be screened out if data had been collected, as they are often

out-of-business or mistaken entries. Recalculating our “Adjusted Response Rate 1” with these observations removed gives:

$$\text{Adjusted Response Rate 2} = 171 / 678 = 25.2\%$$

2. Validation of Staff Expenses Data

As additional validation of reported clerical and clinical staff data, we looked at the non-physician staff expenses per staff employee, as well as the ratios of staff to physicians. The survey asked physicians to report the number of full-time staff of each type, which enables us to observe these per employee figures.

Figure III.6 Non-Physician Employee Compensation and Staff Ratios, Radiology

	Mean Expenses Per Non-Physician Employee	Non-Physician Employees Per Physician
Clinical Staff	\$44,908	1.27
Clerical Staff	\$44,327	1.93

The staff salaries are in line with national averages for these job classifications. The staff ratios are higher than those appearing in the AMA 1999 SMS survey, which shows a 1.1-to-1 ratio for clerical staff and a 0.5-to-1 ratio for clinical staff among radiologists. However, as noted above, the SMS may not accurately reflect the global/TC providers, where we would expect higher staff ratios.

3. Unweighted Mean Practice Expenses

As explained, average practice expenses per hour were weighted by practice size. In the table below, we report the unweighted means from the practice-level survey.

	Estimated Mean (N=171)	Standard Error (N=171)	Precision [1.645 × Mean/SE] (N=171)
<i>Direct PE per hour</i>			
Clinical Payroll	\$29.07	3.85	0.218
Medical Equipment	\$35.76	5.85	0.269
Medical Supplies	\$12.82	1.96	0.251
<i>Indirect PE per hour</i>			
Office Expense	\$25.80	2.60	0.166
Clerical Payroll	\$38.38	3.19	0.137
Other Expense	\$43.89	3.75	0.141
<i>Total PE per hour</i>	\$185.72	16.39	0.145

IV. AMERICAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY DATA SUBMISSION

The American Society for Therapeutic Radiology and Oncology (ASTRO) commissioned a practice expenses survey of radiation oncologists, and has submitted the responses to the Lewin Group for CMS consideration as supplemental practice expense survey data. The survey collected data on 2002 expenses. Below, we evaluate the data in reference to CMS criteria for supplemental practice expense data, report the survey results, and make a recommendation regarding acceptance. Some additional detail is provided in the appendix to this section.

A. Evaluation of Survey

1. Confidentiality

A sample of 1,000 radiation oncologists was randomly drawn from a universe of approximately 3,356 names in the American Medical Association (AMA) Physician Masterfile. The random sampling was conducted by the survey contractor, and the identities of those sampled were not revealed to ASTRO or to any other entity. Correspondence to sampled radiation oncologists by the survey contractor explicitly assured the confidentiality of individually identified data.

- The Lewin Group is satisfied that the ASTRO survey meets the standards of *confidentiality* required by CMS for supplemental practice expense surveys.

2. Survey Instrument and Protocols

ASTRO sought advice and guidance from the Lewin Group in developing the survey instrument and survey-related correspondence. The survey follows closely to the language and format of the SMS survey. ASTRO proposed small modifications to the language of certain survey questions, to improve clarity in a specialty-specific questionnaire. All modifications were vetted with the Lewin Group prior to surveying. The changes do not change any definitions of expenses or hours worked in the survey questions.

The ASTRO survey followed the CMS-required protocols. Correspondence and expense worksheets sent to surveyed radiation oncologists were consistent with precedents, and were reviewed by the Lewin Group prior to mailing. Sampled radiation oncologists were surveyed by telephone, follow-up calls were made to non-respondents, and a toll-free number was made available for respondents.

- The Lewin Group is satisfied that the ASTRO survey meets the standards for *survey instrument and protocols* required by CMS for supplemental practice expense surveys.

3. Survey Contractor

ASTRO hired a survey contractor with prior experience conducting supplemental practice expense surveys. This contractor sought guidance and approval from the Lewin Group for each of its protocols, conducted the survey independently, and submitted the data directly to the Lewin Group.

- The Lewin Group is satisfied that the ASTRO survey meets the standards for a *survey contractor* required by CMS for supplemental practice expense surveys.

4. Level of Precision

The Lewin Group compiled the results from the ASTRO survey and computed a measure of the level of precision for total practice expenses per hour. As described by the CMS regulations, the level of precision is formally measured by the 1.645 times the standard error of the mean, divided by the mean. According to CMS requirements, this measure applied to total practice expense per hour should not exceed 15 percent for acceptance as supplementary data. The ASTRO survey yielded 90 usable responses, and the relevant precision measure is 28.2 percent. This exceeds the required maximum measurement for CMS acceptance of supplemental surveys.

ASTRO has suggested that the poor precision measure may be indicative of a bimodal distribution of radiation oncology practice expense per hour. The ASTRO questionnaire asks whether the physician’s practice is hospital-based or freestanding. A freestanding practice should have much higher practice expenses per physician hour because of much larger staff, supplies, equipment, and facility needs compared to a hospital-based practice. Indeed, we do find that hospital-based freestanding practices show much lower practice expense per hour (\$63) than their freestanding counterparts (\$346).

But even when divided into two sub-samples, neither mean comes close to meeting the precision standard. The 67 hospital-based responses have a precision measure of 36 percent, and the 23 freestanding have a measure of 32 percent. In part, these high measures reflect a sample size that is not large enough. But there is also a large underlying variation in practice expense even among the hospital-based physicians.

Based on the mean total practice expenses per hour in this sample and the underlying variation observed, we project that 300-350 usable observations are needed to meet the precision standard. We recognize that it may be impossible to gather this much data, given the size of the national population of radiation oncologists and typically low response rates for these types of survey. With this in mind, we may be willing to recommend a future data submission from this specialty that is more precise than this one, even if it does not go all the way to meeting the precision requirement. Nevertheless, we cannot endorse the precision of the current sample of 90 observations, because it is too far away from required levels.

- The ASTRO survey of radiation oncologists does not meet the standard for *level of precision* required by CMS for supplemental practice expense surveys.

5. Nationally Representative Survey of the Target Population of Physicians

a. Random sample from complete nationwide listing

The survey contactor randomly drew a sample of 1,000 radiation oncologists from a source list of 3,356. The source list was obtained from the AMA Physician Masterfile, which is the most complete nationwide listing and also is the source of SMS survey samples.

b. Response rate

The ASTRO survey yielded a response rate of 23 percent. While not a high response rate in absolute terms, this response rate compares favorably to those we have generally observed in practice expense surveys by other specialties. Nevertheless, it is still important to verify that the responding sample is adequately representative of the population of radiation oncologists. We examined the ASTRO survey for representativeness in the mix of hospital-based versus freestanding practice, and also geography.

The table below shows the distribution in the sample of those self-identified as hospital-based or freestanding radiation oncologists. We compare this ratio to a distribution obtained from Medicare claims data. Using the claims from the Standard Analytical File, we calculated the fraction of procedures performed in a hospital facility for each UPIN with radiation oncology as their specialty. Those with greater than 50 percent of their procedures performed in a hospital were assigned to the hospital-based count.⁴

Figure IV.1 Hospital-Based Versus Freestanding Radiation Oncologists

	Number in Sample	Percent of Sample	Percent Identified by Medicare Claims
Hospital-Based	67	74.4%	75.2%
Freestanding	23	25.6%	24.8%
Total	90	100.0%	100.0%

The sample proportions are very close to our reference point in Medicare data.

We also examined the geographic representativeness of the sample. Responses came from 35 states, with all regions represented. Most large states were represented by several observations. The average practice expense GPCI index for respondents in the sample, which was 1.013. This number is not statistically different from the national average GPCI (1.000). We conclude the sample is adequately representative of the geographic distribution of radiation oncologists nationally.

- The Lewin Group is satisfied that the ASTRO practice expense survey of radiation oncologists satisfies CMS requirements for a *nationally representative survey of the target population of physicians*.

B. Survey Results

The table below displays the mean practice expenses per hour, based on the 90 usable responses from the ASTRO Practice Expenses of Radiation Oncology Survey. The last column shows the precision measures. For conformity to SMS data, responses are weighted by the ratio of

⁴ These proportions are not very sensitive to the choice of 50-percent as a cutoff. Most physicians are very close to either 0 or 100 percent.

population frequencies (from the Physician Masterfile) to sample frequencies for a combination of characteristics: AMA membership status and years in practice.⁵

Figure IV.2 Practice Expenses Per Hour, Radiation Oncology, 2002

	Estimated Mean (N=90)	Standard Error (N=90)	Precision [1.645 × SE/Mean] (N=90)
<i>Direct PE per hour</i>			
Clinical Payroll	\$37.53	8.36	0.366
Medical Equipment	\$26.91	7.07	0.432
Medical Supplies	\$10.54	3.75	0.585
<i>Indirect PE per hour</i>			
Office Expense	\$34.36	6.01	0.287
Clerical Payroll	\$18.76	3.77	0.330
Other Expense	\$17.77	2.92	0.270
<i>Total PE per hour</i>	\$145.88	25.04	0.282

The table below shows average practice expenses per physician hour separately for physicians in hospital-based and freestanding radiation oncology practices.

Figure IV.3 Average Practice Expenses Per Physician Hour by Type of Practice, Radiation Oncology, 2002

	Hospital-Based Physicians (N=67)	Physicians in Freestanding Practices (N=23)
<i>Direct PE per hour</i>		
Clinical Payroll	\$9.93	\$104.80
Medical Equipment	\$3.64	\$80.92
Medical Supplies	\$1.56	\$31.56
<i>Indirect PE per hour</i>		
Office Expense	\$19.31	\$69.40
Clerical Payroll	\$12.04	\$39.42
Other Expense	\$16.92	\$20.17
<i>Total PE per hour</i>	\$63.39	\$346.27

⁵ The AMA also creates sample weights based on a physician’s board certification status and gender. However, these characteristics were omitted because resulting cells sizes would be too small.

Value of expenses per-hour are quite different between the two, as expected. This difference makes crucial the need to have a balanced representation across the two types of radiation oncologists.

C. Recommendation

The ASTRO Practice Expenses of Radiation Oncology Survey fails to meet an essential criterion established by CMS for accepting supplemental surveys. The precision of the estimates, as measured by the standard error, does not meet the requirements. For this reason, we cannot recommend that the mean practice expenses per hour be accepted for use in practice expense payment calculations.

That being said, the survey does provide useful information that possibly surpasses any other practice expense information that has been collected for this specialty to date. The survey meets all of the other requirements for CMS acceptance. Furthermore, the balance between hospital-based and freestanding practices appears to be highly representative of the population. This last feature is essential for an accurate overall mean practice expense per hour, as we have seen that the two types of practice differ markedly in their mean levels.

- **The Lewin Group does not recommend that CMS accept the data submitted by ASTRO as supplementary practice expense data for use in payment calculations. However, the Lewin Group does consider the data submitted to be valid, and CMS might consider using the data in Figures IV.1 through IV.3 as a reference if creating a crosswalk for radiation oncology to other specialties.**

D. Appendix

1. *Sample, Edits, and Response Rates*

The ASTRO Practice Expenses of Radiation Oncology survey drew 1,000 radiation oncologists randomly from 3,356 listed in the AMA Physician Masterfile. The survey contractor reports the following disposition for these 1,000:

- 103 had bad or missing telephone numbers
- 545 were not available or refused to be surveyed
- 197 were screened and disqualified as ineligible
- 115 completed the survey

As noted above, we were able to use 90 of the 115 responses. Of the 25 that were edited out of the sample:

- 19 lacked one or more practice expense item response
- 3 had missing data on physician compensation or malpractice expense
- 2 had invalid or missing weekly hours
- 1 lacked a weeks missed response or had more than a half-year missed

To compute a response rate, we use the 90 as a fraction of the total (1,000) less those disqualified (197):

$$\text{Initial Response Rate} = 90 / 803 = 11.2\%$$

This response rate is misleading because all non-respondents, who never completed the screening, are counted as eligible. Instead, if we assume that the same fraction ineligible observed in the respondents (63.1%) applied also to the 648 non-respondents, we remove an additional 409:

$$\text{Adjusted Response Rate 1} = 90 / 394 = 22.9\%$$

We made another calculation of the response rate by first eliminating those cases that had bad or missing phone numbers (103). There is reason to expect that these cases would be more likely than other non-contacted cases to be screened out if data had been collected, as they are often out-of-business or mistaken entries. Recalculating our “Adjusted Response Rate 1” with these observations removed gives:

$$\text{Adjusted Response Rate 2} = 90 / 356 = 25.3\%$$

2. Sample Weights

We used the same methodology for weighting as the SMS survey in order to correct for potential non-response bias. The weights were first derived by dividing the AMA Physician Masterfile population and the survey respondents into 10 cells according to years in practice (5 categories) and AMA membership status (2 categories). The AMA also creates sample weights based on a physician’s board certification status and gender. However, these characteristics were omitted because resulting cells sizes would be too small. Also, unlike the SMS survey, the cells were defined by only 1 specialty category (cardiology) rather than 10 specialty categories. Unit response weights were constructed by taking the ratio of the number of physicians in the population to the number of survey respondents in each cell.