Regional and Gender Differences and Trends in the Anesthesiologist Workforce

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ABSTRACT

Background: Concerns have long existed about potential shortages in the anesthesiologist workforce. In addition, many changes have occurred in the economy, demographics, and the healthcare sector in the last few years, which may impact the workforce. The authors documented workforce trends by region of the United States and gender, trends that may have implications for the supply and demand of anesthesiologists.

Methods: The authors conducted a national survey of American Society of Anesthesiologists members (accounting for >80% of all practicing anesthesiologists in the United States) in 2007 and repeated it in 2013. The authors used logistic regression analysis and Seemingly Unrelated Regression to test across several indicators under an overarching hypothesis.

Results: Anesthesiologists in Western states had markedly different patterns of practice relative to anesthesiologists in other regions in 2007 and 2013, including differences in employer type, the composition of anesthesia teams, and the time spent on monitored anesthesia care. The number and proportion of female anesthesiologists in the workforce increased between 2007 and 2013, and females differed from males in employment arrangements, compensation, and work hours.

Conclusions: Regional differences remained stable during this time period although the reasons for these differences are speculative. Similarly, how and whether the gender difference in work hours and shift to younger anesthesiologists during this period will impact workforce needs is uncertain. **(ANESTHESIOLOGY 2015; 123:997-1012)**

THERE have been concerns about shortages of anesthesiologists, who constitute an important part of the healthcare workforce.[1–5] Changing conditions in the economy (especially the "Great Recession"), demographics, and changes in the healthcare sector raise new questions about the supply of and demand for anesthesiologists. For example, there were concerns that the aging of the U.S. population and the impending retirements in the physician workforce might aggravate any existing shortages.[6–8] In addition, the Affordable Care Act was expected to increase the number of insured Americans and healthcare demand.[7] However, efforts to reduce the cost in the healthcare sector and a shift toward nonphysician providers may reduce physician demand. A growing workforce of nonphysician anesthesia providers who may potentially substitute or complement anesthesiologists, such as nurse anesthetists (whose numbers grew by 18% between 2009 and 2012), may affect the anesthesiologist workforce, cost, and patient safety.[9–13]

In this study, we focus specifically on two topics that may have implications for the supply and demand of anesthesiologists, variation in anesthesiologist practice by region and gender. Previous research on regional variation in the anesthesiologist workforce was relatively scarce. Several studies documented shortages of anesthesiologists in rural regions.[14–16] In addition, several studies showed that anesthesia practice differed in the West compared with other regions in the United States, including a greater likelihood for anesthesiologists to be employed by groups and receive fee-for-service compensation, lower per-capita rates of nurse anesthetists, less-frequent use of nurse anesthetists in teams, and less time spent on monitored anesthesia care by anesthesiologists.[5,17] In the current study, we tested whether the large differences in the practice of anesthesia persist across the four major census regions: the Northeast, the Midwest, the South, and the West.

Although females accounted for just 14% of U.S. physicians in 1985, recent studies indicate that the proportion

What We Already Know about This Topic

- Although recent changes in the economy, demographics, and the healthcare sector could impact the U.S. anesthesiologists workforce, this has not been examined since 2007.

What This Article Tells Us That Is New

- American Society of Anesthesiologists members were surveyed in 2013 using a similar instrument to one used in 2007.
- The more recent survey showed increased number and proportion of female anesthesiologists, and these differed from males in employment arrangements, compensation, and work hours. Regional differences were present and unchanged since 2007.

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of females in the physician workforce has subsequently increased.[18,19] However, a lower proportion of anesthesiologists were female in 2012 relative to the entire physician population (23 *vs.* 30%).[19] According to one study, lower representation of females in anesthesiology could include limited exposure to female role models, misperceptions of the physician–patient relationship in anesthesiology, and practice scheduling requirements that are long, unpredictable, and inflexible.[20]

Studies of gender differences in anesthesiologist practice have primarily focused on part-time work and compensation. Several studies found that female physicians work fewer hours per week, with more than one third of female physicians in 2006 working part-time.[21,22] A 2012 study found that female anesthesiologists earn average annual salaries that are 25% lower than that earned by their male counterparts compared with a 17% gap for all physicians.[23,24] A second purpose of this study was to determine whether these gender differences persist, as well as to examine the differences between employer and patient types.

Materials and Methods

Survey of Anesthesiologists

RAND conducted a national survey of anesthesiologists in 2007 and repeated it in 2013 (appendix), which is funded by the American Society of Anesthesiologists (ASA). Our aim was to provide timely analysis of patterns in the workforce and to estimate econometric models of workforce supply and demand, in an effort to understand whether the workforce is in shortage or surplus. The 2013 survey included 49 items on a variety of topics, including employment arrangements, time use, plans for the future, shortage indicators, and demographics. The 2013 survey was similar to the 2007 survey with the exception of a few questions that were added, removed, or slightly changed. Because a number of changes have taken place in the healthcare sector since 2007, we sought to compare data across the surveys to detect changes in the workforce.

For both surveys, the sample included all members of the ASA. ASA membership accounts for more than 80% of all anesthesiologists practicing in the United States. Data files provided by the ASA included name, date of birth, email address, gender, and zip code. Approximately 10% of ASA members (3,531 in 2013) opted out of receiving third-party emails, so they were excluded from the survey sample. Anesthesiologists in the remaining survey sample were emailed a link to the survey in early March 2013 and received four reminder emails throughout the 6-week survey window.

Team Care and Opt-out Status

One of our areas of focus in this study was team care and the use of nonphysician anesthesia providers. Nonphysician anesthesia providers can be used in two ways: (1) anesthesia providers can engage in team anesthesia care, in which nonphysician providers and anesthesiologists in training are medically supervised by a fully trained, accredited anesthesiologist who is typically supervising multiple cases simultaneously; and (2) in some cases, where permitted by regulations, anesthesiologists and nonphysician providers can work independently on separate cases. We looked at the likelihood of anesthesiologists to work in team care arrangements and the makeup of team care arrangements.

One policy that may have had an impact on patterns of team care is the opportunity for states to opt out of the Medicare supervision requirements. The ability of nonphysician providers to provide anesthesia without supervision of a physician has long been limited by Medicare policy, which requires facilities to have nonphysician providers be supervised by a physician for reimbursement. Due to concerns about anesthesia provider shortages in rural areas, in 2001, the U.S. Department of Health and Human Services Centers for Medicare and Medicaid Services decided that states could opt out of the conditions of participation that require nurse anesthetists be supervised by a physician.[25] Seventeen states have opted out of the physician-supervision regulation; since the time of the 2007 RAND survey, three additional states opted out: California, Colorado, and Kentucky. The majority of states opting out of the Medicare supervision requirement are found in the West and Midwest.

Analysis Methods

We tested two families of hypotheses, one on regional variation and another on gender differences. For the first, we were interested in examining the regional variation in three areas to determine whether the regional differences observed in 2007 persisted into 2013: employment arrangements (*e.g.*, employer type and compensation type), the makeup of anesthesia teams, and time allocated to various types of procedures. We identified three subhypotheses to test in our analysis.

Regional hypothesis 1: There are no regional differences in the employment arrangements of anesthesiologists across the United States.

Regional hypothesis 2: Team care arrangements do not vary significantly by region.

Regional hypothesis 3: There are no regional differences in anesthesia provision by anesthesiologists.

With respect to gender we tested the following three hypotheses:

Gender hypothesis 1: There was no change in the proportion of female anesthesiologists from 2007 to 2013.

Gender hypothesis 2: Female anesthesiologists are situated in similar employment arrangements relative to male anesthesiologists.

Gender hypothesis 3: Female anesthesiologists spend the same amount of time working each week and work with similar types of patients.

To test our hypotheses on differences by region and gender, we used *t* tests for continuous data and chi-square tests for categorical data. For each outcome related to each hypothesis, we used linear regression to determine whether the differences remained significant after controlling for other demographic covariates: age, urban/nonurban location, census region, gender, and experience. In some cases, we added additional covariates to the regressions to test hypotheses concerning drivers of gender and regional differences.

We performed tests on each outcome under the larger domain of each hypothesis separately (all statistical tests were two tailed, and estimates with a *P* value of <0.05 were considered to be significant). But to test the aggregate hypothesis that the indicators *overall* show employment arrangements are different in the West, we also followed up with a Seemingly Unrelated Regression (SUR) of all the individual tests that fall under that umbrella hypothesis.[26] Given the single test statistic that results from an SUR, we then performed a Wald test of the joint significance of all of the regional indicators (the West was our baseline census region, and females *vs.* males was the difference of interest for the gender hypotheses), allowing for a direct test of the overarching hypotheses. All of the analyses were conducted by using Stata (USA) and incorporated survey weights to ensure that the respondents mirrored the population in terms of age, gender, and location of respondents relative to the population as a whole.

Each test used survey weights, which incorporated nonresponse weights, to control for systematic differences in survey response rate for the ASA, and population weights to scale from the ASA to the full U.S. anesthesiologist population. We estimated the nonresponse weights using a logistic regression of the probability of responding on demographic variables: with the estimated parameters, for each individual, we estimated the probability of responding and generate weights by taking the reciprocal of these estimated response probabilities. In addition, to aggregate our statistics to all anesthesiologists, including nonmembers of the ASA, we corrected for differential rates in ASA participation using the 2011 counts of anesthesiologists by state in the most recent version of the Area Health Resource File. The nonresponse inverse probability weights were multiplied by the inverse of the ASA participation rate to calculate the overall weight for each respondent.

In looking at regional differences, we focused on census regions as defined by the U.S. Census Bureau. Table 1 identifies the states falling in each census region.

Table 1. States by Census Region

Northeast	Midwest	South	West
Connecticut	Illinois	Alabama	Alaska
Delaware	Indiana	Arkansas	Arizona
Maine	Iowa	Florida	California
Massachusetts	Kansas	Georgia	Colorado
New Hampshire	Michigan	Kentucky	Hawaii
New Jersey	Minnesota	Louisiana	Idaho
New York	Missouri	Maryland	Montana
Pennsylvania	Nebraska	Mississippi	Nevada
Rhode Island	North Dakota	North Carolina	New Mexico
Vermont	Ohio	Oklahoma	Oregon
	South Dakota	South Carolina	Utah
	Wisconsin	Tennessee	Washington
		Texas	Wyoming
		Virginia	
		Washington DC	
		West Virginia	

Results

The total number of respondents to the 2013 survey was 8,178, for a response rate of 25.6%. The analysis in this article focused on active anesthesiologists who have completed all training; after removing resident physicians and retirees, we had a sample of 6,783 individuals.

Data comparing basic demographics of respondents with nonrespondents indicated negligible differences in observable characteristics (table 2). Respondents to the survey were slightly older, more likely to be females, and less likely to live in the Northeast relative to the ASA population. Given these small differences, we applied survey weights to ensure that estimates are representative of the ASA population across the key characteristics we had access to, including state, census region, urban/nonurban, location, age, and gender. The methodology for calculating these weights is described in the Analysis Methods section.

Table 2. Demographics of Respondents and Nonrespondents

	Nonrespondents	Respondents	*P* Value	SD
Age	49.2	50.0*	0.000	9.9
Female	0.24	0.26*	0.000	0.43
Nonrural	0.95	0.95	0.220	0.22
Northeast	0.23	0.21†	0.012	0.39
Midwest	0.22	0.23	0.154	0.40
South	0.33	0.34	0.148	0.43
West	0.23	0.22	0.597	0.40
N	22,269	6,783	29,047	29,047

Shows average age and average proportions of all anesthesiologists, as well as SDs for the full population surveyed.

* Significantly different from nonrespondents at $P < 0.01$ level. † Significantly different at $P < 0.05$ level.

Descriptive Statistics

To contextualize regional differences in workforce practice, it is helpful to understand whether there are differences in the underlying characteristics of anesthesiologists that could be related to variation in workforce practice. Table 3 presents demographics by census region and gender for anesthesiologists in 2013. Regional differences in basic demographics were small and mirrored differences in the population as a whole. The similarities in anesthesiologist characteristics across regions suggest that demographic variation was unlikely to have driven observed differences in practice.

Table 3. Summary Statistics by Region and Gender, 2013

	Northeast		Midwest		South		West‡	Female		Male‡	
	Average	*P* Value	Average	*P* Value	Average	*P* Value	Average	Average	*P* Value	Average	SD
Age	49	0.908	49	0.954	49	0.953	49	47*	0.000	50	9.3
Years of experience	20	0.399	20	0.158	20	0.100	20	17*	0.000	21	9.9
Female	0.28*	0.006	0.24	0.975	0.24	0.881	0.24	N/A	N/A	N/A	0.44
Nonrural	0.96	0.738	0.94*	0.001	0.95†	0.028	0.96	0.96	0.174	0.95	0.23
Northeast	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.26*	0.001	0.22	0.41
Midwest	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.20	0.284	0.21	0.42
South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.32	0.223	0.34	0.47
West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.23	0.250	0.24	0.42
Born in United States	0.72*	0.000	0.82	0.395	0.81	0.587	0.81	0.73*	0.000	0.81	0.40
Has children	0.67	0.107	0.68†	0.043	0.69†	0.005	0.64	0.62*	0.000	0.68	0.47
Married	0.90	0.726	0.89	0.252	0.89	0.751	0.89	0.80*	0.000	0.92	0.31
Earned M.D. degree in United States	0.76*	0.000	0.84	0.135	0.84	0.123	0.87	0.80*	0.001	0.84	0.37
White	0.77	0.168	0.82	0.402	0.79	0.178	0.77	0.73	0.769	0.81	0.39
Hispanic	0.02	0.458	0.02	0.719	0.05†	0.030	0.03	0.04	0.555	0.03	0.18
Black	0.03†	0.038	0.03	0.126	0.03†	0.015	0.02	0.04†	0.029	0.02	0.16
Asian	0.14	0.202	0.10	0.835	0.09	0.850	0.14	0.15	0.307	0.10	0.30
Other	0.04	0.238	0.04	0.926	0.03	0.458	0.05	0.04	0.990	0.04	0.20

Shows average number/average proportion by region and gender, as well as the overall SD for survey respondents. N/A indicates variables where an average is not applicable because it represents the cross-tabulated variable.

* Significantly different from the reference category at the $P < 0.01$ level. † Significantly different at $P < 0.05$ level. ‡ The reference category.

The summary statistics by gender suggest that there were several differences in demographic characteristics across male and females anesthesiologists. Given the more recent movement of females into the physician workforce, these anesthesiologists were on average 3 yr younger and had 4 fewer years of experience relative to their male counterparts. In addition, female anesthesiologists were less likely to be married (80 *vs.* 92%) and less likely to have children (62 *vs.* 68%) than male anesthesiologists. They were also less likely to have been born and educated in the United States. These demographic differences were important to take into account when analyzing survey results by gender to determine whether these covariates are driving some of the differences we observed in practice.

Regional Variation in Anesthesiology Practice

Regional Hypothesis 1: There Are No Regional Differences in Employment Arrangements. Western and Southern anesthesiologists were less likely to be employed by a facility and more likely to be employed by a group or multiple facilities (table 4). Anesthesiologists in the Northeast fall on the other end of the spectrum, having been most likely to have worked for a single facility. The employers of Western anesthesiologists were somewhat larger than the employers in other regions as measured by the total number of anesthesiologists employed. Western anesthesiologists in groups were also the most likely to have reported that their employer (the group) received direct compensation from facilities in addition to fee-for-service.

Western anesthesiologists also worked in different types of facilities relative to Northeastern and Midwestern anesthesiologists. These differences in anesthesiologist facility type likely reflected differences in the types of facilities across regions. Despite having similar numbers of surgeons, facilities used by Western anesthesiologists had substantially fewer anesthesia providers overall (anesthesiologists, residents, nurse anesthetists, and anesthesiology assistants)—an average of only 35 anesthesia providers in a facility compared with more than 45 anesthesia providers in the other regions. So while anesthesiologists in the West worked for larger employers (often groups), these anesthesiologists worked for smaller facilities.

The survey results for compensation arrangements indicated regional differences; Western anesthesiologists largely drew income from fee-for-service and received less income from salary and bonus relative to anesthesiologists in other regions. The differences in compensation rates (expressed in dollars per hour) across regions were relatively small—Southern anesthesiologists earned slightly more than their counterparts in other regions.

We tested the hypothesis for *joint* significant differences between the West and other regions across all of indicators examined in table 4 (related to employment arrangements) by running an SUR. We found a Wald chi-square statistic of 510.27, with 48 degrees of freedom, for a *P* value less than 0.01. Therefore, we strongly rejected the null hypothesis of no differences between the West and other census regions in employment arrangements of anesthesiologists.

Regional Hypothesis 2: Team Care Arrangements Do Not Vary Significantly by Region. Across all regions, the average percent of time anesthesiologists spent supervising nurse anesthetists and anesthesia assistants increased from 33 to

Table 4. Employment Arrangements by Region

	Northeast		Midwest		South		West		
	Average	*P* Value	Average	*P* Value	Average	*P* Value	Average	SD	West *vs.* Other
Employer characteristics									
Employed by one facility	**38%**	**0.000**	**34%**	**0.001**	29%	0.632	28%	47%	⬇
Employed by group(s), multiple hospitals	**59%**	**0.000**	**64%**	**0.004**	68%	0.535	69%	49%	⬆
Average number of anesthesiologists	46	0.063	**38**	**0.003**	**37**	**0.000**	51	84	⬆
Group receives direct compensation	**57%**	**0.000**	**66%**	**0.006**	**64%**	**0.000**	71%	48%	⬆
Facility characteristics									
Work in one facility	**54%**	**0.000**	**49%**	**0.000**	**46%**	**0.004**	41%	50%	⬇
Work in multiple facilities	**42%**	**0.000**	**48%**	**0.000**	**51%**	**0.008**	56%	50%	⬆
Primary facility is ambulatory facility	9%	0.339	**8%**	**0.034**	10%	0.761	10%	29%	⬆
Primary facility is nonprofit	**68%**	**0.001**	**72%**	**0.000**	60%	**0.070**	63%	47%	
Primary facility is for-profit	29%	0.245	**24%**	**0.000**	**35%**	**0.013**	31%	46%	
Primary facility is governmental	**2%**	**0.000**	**4%**	**0.014**	5%	0.245	6%	21%	⬆
Primary facility is teaching facility	**56%**	**0.000**	**49%**	**0.000**	**43%**	**0.000**	30%	50%	⬇
Average number of anesthesia providers	**55**	**0.000**	**52**	**0.000**	**47**	**0.000**	35	60	⬇
Average number of surgeons	51	0.457	55	0.573	48	0.152	54	65	
Compensation arrangement									
Average hourly compensation	$141	0.874	$146	0.265	**$152**	**0.022**	$142	$96	
Percent of compensation fee-for-service	**20%**	**0.000**	**32%**	**0.000**	**31%**	**0.000**	57%	45%	⬆
Percent of compensation salary	**66%**	**0.000**	**57%**	**0.000**	**59%**	**0.000**	35%	42%	⬇
Percent of compensation bonus	**14%**	**0.000**	**11%**	**0.000**	**10%**	**0.000**	8%	17%	⬇

Shows averages by region, followed by the SD for the full sample. Bold values indicate statistically significant differences in the means for the West *vs.* the given region, after controlling for urban/rural, age, gender, and experience. Arrows indicate the direction of these differences, with, for example, a downward arrow indicating that the West has a lower mean than all other states. Compensation is reported at the hourly rate to account for regional differences in hours worked.

37%. However, the percentage of anesthesiologists who reported at least one nurse anesthetist was employed in their primary facility actually decreased from 73 to 65% during that same period. We investigated whether these trends, and other workforce arrangements and characteristics, varied systematically across census regions.

We found wide regional variation in the time anesthesiologists spent supervising nurse anesthetists and anesthesiology assistants as opposed to personally delivering anesthesia, as shown in figure 1. The vast majority of anesthesiologists in the West spent 10% or less of their time supervising nurse anesthetists and anesthesiology assistants. This pattern is distinct from what we observed for the other three regions, where anesthesiologists were spread more evenly across a range of combinations of supervision and personal anesthesia delivery. In U.S. regions other than the West, at least one third of anesthesiologists spent the majority of their time supervising other providers (>70% of all cases). This suggested a substantially different staffing model in these other regions relative to the West.

Similar patterns were observed in facility staffing (table 5). Outside of the West, the ratios of anesthesiologists to nurse anesthetists employed by the facility were relatively similar, with ratios of one or two anesthesiologists for each nurse anesthetist. Western anesthesiologists reported far fewer nurse anesthetists employed by their facility, both in absolute and relative terms, with an average ratio of more than 5:1. In the West, 58% of anesthesiologists reported working in facilities that only use anesthesiologists to administer anesthesia. In the other regions, less than 20% of anesthesiologists worked in such facilities.

Figure 2 indicates that in all regions except the Midwest, anesthesiologists in opt-out states were more likely to spend

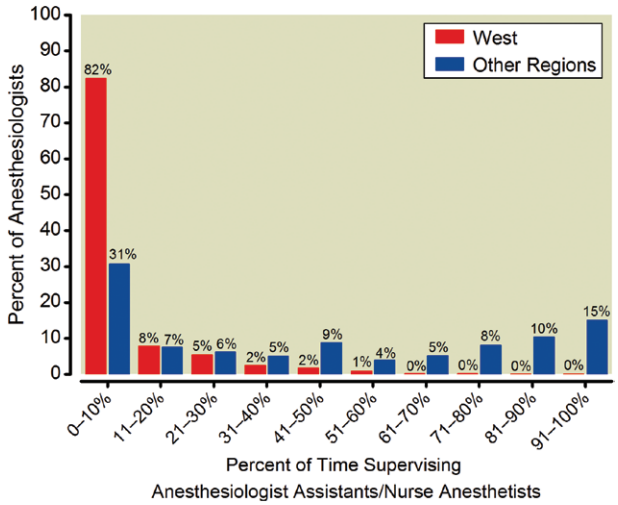

Fig. 1. Regional differences in anesthesiologist time spent in team care. The figure presents the distribution of anesthesiologist by time spent supervising nonphysician providers, comparing anesthesiologists in the West with anesthesiologists in other regions. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children.

Table 5. Number of Anesthesia Providers in the Facility of the Average Anesthesiologist

	Northeast		Midwest		South		West			West *vs.* Other
	Average	*P* Value	Average	*P* Value	Average	*P* Value	Average	SD	
Team care										
Average number of anesthesiologists	**32**	**0.001**	**25**	**0.005**	**23**	**0.000**	28	29		➡
Average number of nurse anesthetists	**15**	**0.000**	**19**	**0.000**	**20**	**0.000**	5	26		➡
Average number of anesthesiology assistants	0	0.606	**1**	**0.000**	**2**	**0.000**	0	5		➡
Average number of residents	**17**	**0.000**	**12**	**0.000**	8	0.098	7	22		➡
Percent of facilities using ANs only	**14%**	**0.000**	**17%**	**0.000**	**11%**	**0.000**	58%	38%		⬅
Percent of facilities using any NAs	**86%**	**0.000**	**81%**	**0.000**	**88%**	**0.000**	38%	42%		➡

Shows average numbers and percentages by region, followed by the full-sample SD. Bold values indicate statistically significant differences in the means for the West *vs.* the given region, after controlling for urban/rural, age, gender, and experience. Arrows indicate the direction of these differences, with, for example, a downward arrow indicating that the West has a lower mean than all other states.
ANs = anesthesiologists; NAs = nurse anesthetists.

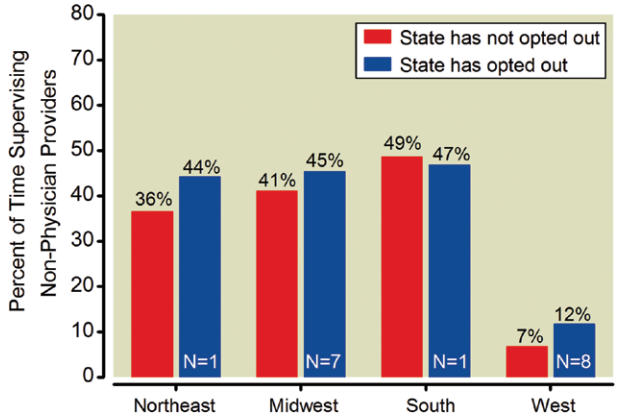

Fig. 2. Differences in time anesthesiologists spent supervising by exemption status and region. The figure presents the percent of anesthesiologist time spent supervising nonphysician providers by region and whether the anesthesiologist's state has been exempted from the Medicare supervision requirement. The Ns stand for the total number of states represented in the data for a given census region. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children.

time supervising relative to their counterparts in states that had not opted out. This suggests that opting out of supervision requirements may not have led to the large shift in the use of nurse anesthetists in team care arrangements, as nurse

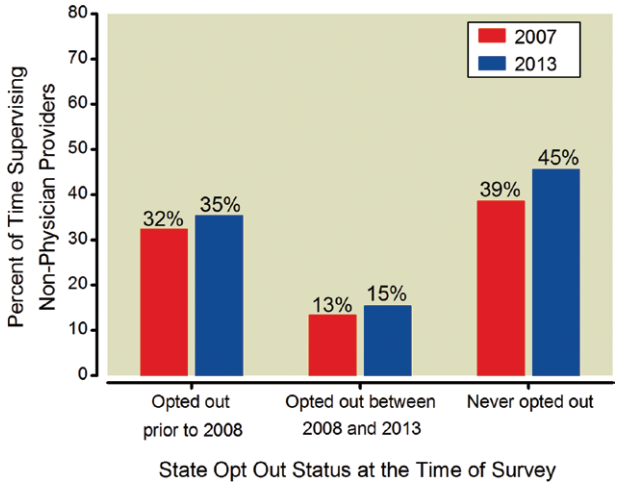

Fig. 3. Change in percent of time supervising by exemption status. The figure presents 2007 and 2013 average percent time spent supervising nonphysician providers. Data are presented separately for states that were exempted from Medicare supervisions during both surveys, states that changed exemption status between 2007 and 2013, and states that were not exempted in 2007 or 2013. Regression analysis controlling for anesthesiologist characteristics, total hours, and employer type indicates that there were no significant changes in the percent of time spent supervising among anesthesiologists in these three states relative to other states that did not switch exemption status.

anesthetists were supervised by anesthesiologists at similar rates irrespective of opportunities to work independently.

However, these averages cannot be interpreted as causal, as states that have pursued exemption may be have been those that were already more likely to have anesthesiologists in teaming situations with nurse anesthetists. To better understand what happens when a state gains exemption status and whether this is correlated with an increase or decrease in teaming, we examined data from three states that changed status between 2007 and 2009: California, Colorado, and Kentucky. Compared with states that did not switch status, these three states saw a smaller increase in anesthesiologist time spent supervising over the 6-yr period (fig. 3). Regression analysis controlling for anesthesiologist characteristics, total hours, and employer type indicated that there were no significant changes in the percent of time spent supervising among anesthesiologists in these three states relative to other states that did not switch exemption status. At least in the short term, exemption did not seem to be associated with substantial shifts in the use of team care with anesthesiologists in the state.

We tested the joint significance of all of the indicators reported in table 5, representing differences in measures of team care arrangements. The Wald Statistic had a value of 1,349.76 with 15 degrees of freedom, for a *P* value less than 0.01. Therefore, we again rejected the null hypothesis that the West had similar workforce arrangements for anesthesiologists as the other regions.

Regional Hypothesis 3: There Are No Regional Differences in Anesthesia Provision by Anesthesiologists. Anesthesiologists in the West census region allocated time to anesthesia differently from anesthesiologists in several other regions (table 6). Although anesthesiologists across all regions spent the majority of their time on general anesthesia cases, anesthesiologists in the West spent more time on general anesthesia relative to anesthesiologists in the Northeast and South. The variation in time spent on general anesthesia was primarily accounted for by variation in monitored anesthesia care, which accounted for 22% of Northeastern anesthesiologist time, but just 13% of Western anesthesiologist time. These regional patterns in time spent on monitored and general anesthesia were similar to those observed in the 2007 RAND survey.[5]

One of the potential drivers of variation in anesthesiologist time spent on monitored anesthesia care was variation in the use of anesthesia providers for certain procedures. For example, colonoscopies have been documented as a procedure in which there is wide variation in anesthesia care, with some individuals receiving care by an anesthesia provider, some receiving sedation from a nonanesthesia provider, and others not receiving anesthesia or sedation from any medical provider. Table 6 presents data for colonoscopies and transesophageal echocardiograms (TEEs), the two procedures in which we observed the greatest regional variation in use of anesthesia providers. The survey asked anesthesiologists to

Table 6. Patterns in Anesthesia Provision by Region

	Northeast		Midwest		South		West		
	Average	*P* Value	Average	*P* Value	Average	*P* Value	Average	SD	West *vs.* Other
Cases by anesthesia type									
Monitored anesthesia	**22%**	**0.000**	**17%**	**0.000**	**15%**	**0.001**	13%	16%	↓
General anesthesia	**59%**	**0.000**	**65%**	**0.000**	69%	0.067	70%	23%	↑
Regional anesthesia	**13%**	**0.000**	**12%**	**0.003**	10%	0.563	10%	14%	↓
Obstetric anesthesia	7%	0.530	6%	0.891	6%	0.777	6%	11%	
Cases by anesthesia provider									
Colonoscopy									
Delivered by anesthesia provider	**55%**	**0.000**	27%	0.327	**45%**	**0.000**	25%	38%	↓
Transesophageal echocardiogram									
Delivered by anesthesia provider	**38%**	**0.000**	16%	0.901	**23%**	**0.032**	16%	32%	↓

Shows average percentages by region, followed by the full-sample SD. Bold values indicate statistically significant differences in the means for the West *vs.* the given region, after controlling for urban/rural, age, gender, and experience. Arrows indicate the direction of these differences, with, for example, a downward arrow indicating that the West has a lower mean than all other states.

report the percentage of cases for which any anesthesia provider—anesthesiologists, resident physicians, anesthesiology assistants, or nurse anesthetist—provided monitored anesthesia care. Note that the survey question was not included in the 2013 survey, so we relied on the 2007 data. We were unable to perform SUR, as was done for the other hypotheses. Instead, we pooled each of the outcomes' regressions and run one regression, with the regressors interacted with an indicator for the outcome variable it comes from. We then did a Wald test on each of the interactions, which provided an alternative, valid, methodology for estimating the joint significance across all of these relevant regressions. In the Northeast, anesthesiologists reported that monitored anesthesia was used for 55% of all colonoscopies, whereas Western anesthesiologists reported that monitored anesthesia was used for just 25% of colonoscopies. In the area of TEE laboratories, Northeastern anesthesiologists reported the use of monitored anesthesia on 38% of cases, whereas monitored anesthesia was reported for just 16% of TEE laboratories in the West.

We tested the joint hypothesis of anesthesiologists spending their time differently by anesthesia type in the West. The Wald test had a test statistic of 76.03, with F-distribution of 18 numerator and 22,349 denominator degrees of freedom, for a *P* value less than 0.01. Therefore, we strongly rejected the null hypothesis that the West was the same as other regions in the use of time for various types of anesthesia care.

Gender Differences in the Anesthesiologist Workforce

Gender Hypothesis 1: There Has Been No Change in the Proportion of Female Anesthesiologists from 2007 to 2013. From 2007 to 2013, the proportion of the anesthesiologist workforce comprised females increased from 22 to 25%, a difference that was statistically significant. When looking at gender distribution by age, we saw that the proportion of female in the workforce has increased at every age, but the change was particularly large for the youngest cohort of anesthesiologists (fig. 4). Approximately 40% of anesthesiologists under the age of 36 yr were female, a substantial increase from the 26% of young anesthesiologists who were female in the 2007 population. The fraction of females among the oldest anesthesiologists also saw a substantial jump, suggesting that female anesthesiologists may have been particularly likely to delay retirement between 2007 and 2013. This stands in contrast to prior research that indicates that females typically retire earlier relative to males.[21,27]

Gender Hypothesis 2: Female Anesthesiologists Are Situated in Similar Employment Arrangements Relative to Male Anesthesiologists. Anesthesiologist employment arrangements varied substantially by gender (fig. 5). Female

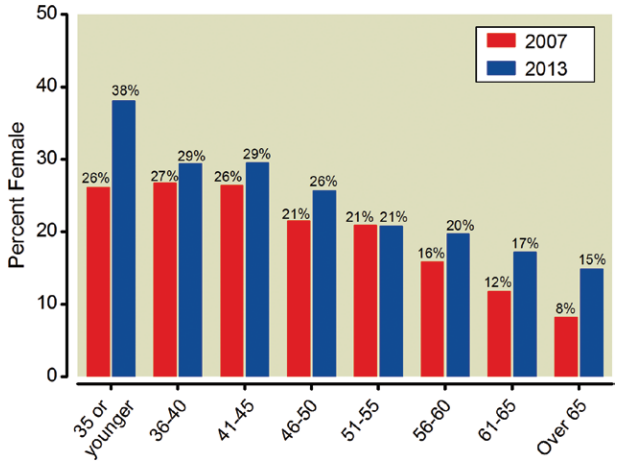

Fig. 4. Percent of female anesthesiologists by age, 2007 *versus* 2013. The figure presents the percent female by age and survey and indicates that the proportion of anesthesiologists who are female has increased, particularly in the youngest cohorts. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children.

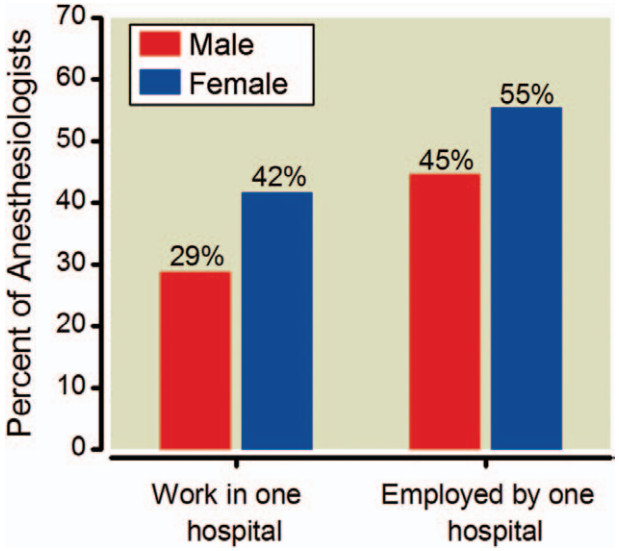

Fig. 5. Percent of anesthesiologists employed by or working in one hospital, males *versus* females. The figure presents the percent of anesthesiologists employed by or working in a single facility by gender, indicating that female anesthesiologists are more likely to be employed by and work in a single facility. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children.

anesthesiologists were 44% more likely to be employed by one hospital and 22% more likely to work in a single facility relative to male anesthesiologists.

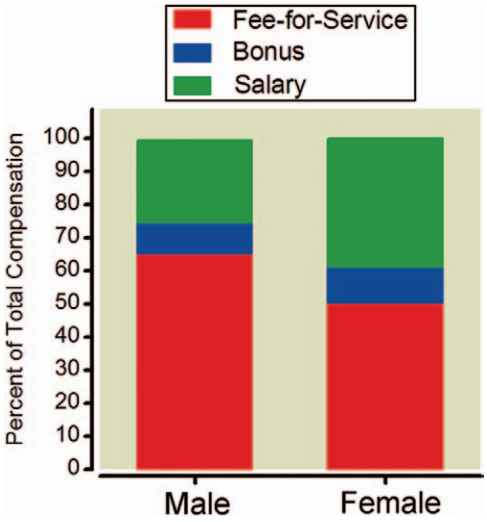

Fig. 6. Sources of compensation, males *versus* females. The figure presents data on the distribution of compensation by source and gender, indicating that female anesthesiologists are less likely to be compensated through fee-for-service and are more likely to be compensated by salary. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children.

Female anesthesiologists also had different compensation arrangements. Figure 6 indicates that while female and male anesthesiologists both received approximately 10% of compensation from bonuses, female anesthesiologists were more likely to receive compensation in the form of a salary and less likely to receive compensation from fee-for-service arrangements.

According to the survey results, in 2012, male anesthesiologists earned more than that earned by female anesthesiologists, with a reported average income of $403,616 for males compared with $313,074 for females, a difference of 29%. When we translated earnings to hourly earnings to account for differences in the hours of male and female anesthesiologists, we similarly found that males earned more than that earned by females, with hourly earnings of $151 and $131, respectively. Table 7 indicates that individual characteristics including experience, employer type, and form of compensation are also related to earnings, and as we demonstrated previously, these characteristics vary for male and female anesthesiologists. For example, when we calculated average hourly earnings for 32-yr-old anesthesiologists with 5 to 6 yr of experience, we found an 11% gap, with male anesthesiologists having averaged $121 per hour compared with $109 for females. Limiting the prior comparison (age 32 yr, 5 to 6 yr of experience) to anesthesiologists employed by groups resulted in average hourly earnings of $122 and $114, a 7% difference. Yet as table 7 demonstrates, gender gaps remain even when we controlled for a large number of demographic and employment characteristics. Therefore, accounting for these differences cannot fully explain gender differences in earnings.

When looking at gender differences across all three employment features—employer type and compensation arrangement and level—the Wald test of the joint significance had a test statistic of 205.29, with 7 degrees of freedom, for a P value less than 0.01. We therefore strongly rejected the null hypothesis that female anesthesiologists had similar employment situations and compensation arrangements as male anesthesiologists.

Gender Hypothesis 3: Female Anesthesiologists Spend the Same Amount of Time Working Each Week and Work with Similar Types of Patients. One of the biggest differences between female and male anesthesiologists was the total number of hours worked. Table 8 indicates that female anesthesiologists worked approximately 6 fewer total hours and 4 fewer clinical hours per week relative to male anesthesiologists or approximately 8 to 11% fewer hours. In addition, female anesthesiologists were nearly three times as likely to work part time, defined as fewer than 35 h per week. We found that gender differences persisted, even when we controlled for characteristics of employment and practice as well as individual demographics.

An oft-argued reason for reduced hours among female professionals is the need to accommodate responsibilities associated with children or marriage. To explore these

Table 7. Estimated Gender Differences in Compensation Levels

Averages		Earnings
Males		$403,617
Females		$313,075
Regression Results	Coefficient	Standard Error (95% CI)
Female	–65,018*	5,362 (–75,532 to –54,504)
Experience	1,512†	700 (141 to 2,885)
Northeast	28,395*	9,143 (10,469 to 46,321)
Midwest	55,458*	10,453 (34,963 to 75,953)
South	36,906*	8,669 (19,910 to 53,903)
Nonrural location	10,016	8,373 (–6,401 to 26,434)
Has children	24,869*	6,845 (11,450 to 38,289)
Married	–5,367	9,978 (–24,931 to 14,196)
Total hours	1,785*	184 (1,424 to 2,146)
Employed by a group	26,810*	5,835 (13,371 to 38,249)
Percentage of compensation salary	–553*	72 (–694 to –413)
Percentage of time spent on MAC	–522*	137 (–792 to –254)

Shows regression estimates, identifying the relationship between earnings and gender, as well as other key characteristics. We also control for anesthesiologist race/ethnicity, age, nationality, and country of education although results were nonsignificant.

* Significant at $P < 0.01$ level. † Significant at $P < 0.05$ level.

MAC = monitored anesthesia care.

Table 8. Total Hours and Part-time Work by Gender

Averages	Total Hours		Clinical Hours		Part Time	
Female	51		45		0.11	
Male	57		49		0.04	
Regression Estimate for Female by Subgroup	Coefficient	Standard Error (95% CI)	Coefficient	Standard Error (95% CI)	Coefficient	Standard Error (95% CI)
All anesthesiologists	–6.19*	0.46 (–7.1 to –5.3)	–4.79*	0.43 (–5.6 to –3.9)	0.09*	0.01 (0.07 to 0.10)
Single, no children	–2.41	1.72 (–5.8 to 1.0)	–1.61	1.47 (–0.6 to 0.2)	0.07*	0.03 (0.00 to 0.02)
Single, with children	–2.47	2.48 (–7.4 to 2.4)	–1.61	2.38 (–6.3 to 3.1)	0.03	0.05 (–0.07 to 0.12)
Married, no children	–6.00*	1.11 (–8.2 to –3.8)	–4.57*	0.98 (–6.5 to –2.6)	0.09*	0.02 (0.05 to 0.13)
Married, with children	–7.22*	0.63 (–8.5 to –6.0)	–5.88*	0.59 (–7.0 to –4.7)	0.09*	0.01 (0.07 to 0.12)

Shows the estimated differential in hours associated with being a female anesthesiologist by subgroup. All regressions control for age, urban/nonurban location, census region, gender, and experience.

* Significant at $P < 0.01$ level.

differences, we examined results by gender for anesthesiologists and by marital status and whether the anesthesiologists had children. The results in table 8 suggest that marital status played a more important role than children in driving gender differences in hours. For unmarried anesthesiologists, there were no statistically significant gender differences in hours or clinical hours, irrespective of whether the anesthesiologist had children. Married female anesthesiologists, however, worked significantly fewer hours than their male counterparts, again irrespective of whether the anesthesiologist had children.

Although male and female anesthesiologists did not differ on the allocation of their time across different types of anesthesia, there were some small differences in the types of cases that male and female anesthesiologists spent their time on. In particular, female anesthesiologists spent a greater proportion of their time on pediatric and obstetric/gynecological patients, whereas male anesthesiologists spent a greater proportion of their time on generalist and cardiac/vascular patients (fig. 7). These gender differences in time use remained significant when controlling for a range of demographic characteristics.

The Wald test of the joint significance of the difference between female and male anesthesiologists across each of these characteristics had a test statistic of 226.7 with 5 degrees of freedom, for a P value less than 0.01. We strongly rejected the null hypothesis that male and female anesthesiologists spent their time in similar ways.

Discussion

Regional Variation in Anesthesiology Practice

In this study, we documented a number of key differences in the anesthesiologist workforce by region. Although state-level statistics on a variety of healthcare-related measures

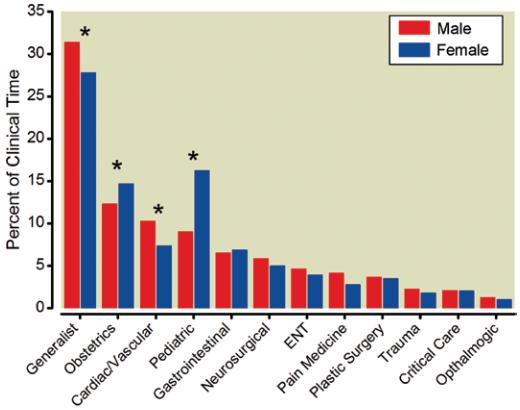

Fig. 7. Time allocation by patient type, males *versus* females. The figure presents data on time allocation by patient type and gender, indicating that females and males differ in time spent on several types of patients. Significant differences by gender at the *P* value less than 0.05 level are noted with an *asterisk*. Differences are statistically significant when controlling for age, years of experience, census region, urban/rural location, race/ethnicity, birth country, whether educated in United States, marital status, and children. ENT = ear, nose, and throat.

were available, there was little in the general medical literature on health care and physicians that explored regional variation in workforce patterns. We found that the regional differences from the 2013 RAND survey were similar to those found in the 2007 RAND survey, indicating that these regional differences were persistent over time.[5] Relative to anesthesiologists in other regions, Western anesthesiologists were more likely to work in larger group-employer settings and receive fee-for-service compensation, were less likely to work with nurse anesthetists, and were less likely to spend time performing or overseeing monitored anesthesia care. Changes in economic conditions, demographic changes, the Affordable Care Act, and the growing role of nonphysician providers did not appear to have had a substantial impact on these large underlying regional differences in practice.

States, regions, and facilities across the United States have considerable flexibility in their decisions regarding the employment of physicians, the use of physicians alongside other health professionals, and the way time is allocated across procedures and other activities. We speculate that regional variation may have been driven by structural differences (*e.g.*, different types of facilities and healthcare markets), differences in the preferences of patients, differences in physician preferences, variation in norms of practice, or differences in state policies. For example, differences in facility-based employment by region may have been driven by state policies that restricted facilities from directly employing physicians. There are five states with these laws in place—California, Colorado, Iowa, Ohio, and Texas—and two of these states (California and Colorado) accounted for approximately half of all anesthesiologists in the West. However, supplementary analysis (data not shown) that controlled for direct physician employment indicated that regional variation could not have been explained by the presence of laws prohibiting direct employment; states in the West showed consistently lower rates of employment by facilities, regardless of whether there were restrictions on direct hiring. Similarly, we explored the relationship between opting out of the Medicare provision on the makeup of team care arrangements and found that states that recently changed status did not exhibit big changes to arrangements in the short run. We found that opt-out status could not explain the patterns of nurse anesthetist use in the West, as Western anesthesiologists in states not opting out were also less likely to work in team care arrangements with nurse anesthetists.

Regional variation in anesthesiologist practice provides an opportunity to compare different models of provider use and potentially explore the relative costs and benefits. With a potential shortage in physicians looming and concerns about the cost of health care, it will be important to ensure that physicians are being used efficiently. Regional variation may help identify patterns of practice that are associated with efficiency and quality and may serve as models to inform practices in other regions. Although our survey did not collect the required information to address all these issues in detail and to make specific policy recommendations, the patterns we observed call for further research into this area.

Alternatively, it may be important to understand regional variation because it suggests different approaches to addressing workforce shortages. These regional differences may also be useful in designing and assessing the impact of policies to address workforce issues. It will be in most cases important to use different strategies to address workforce shortages in the West, given particular preferences and norms of practice in the region.

Gender Differences in the Anesthesiologist Workforce

In this study, we also documented rapid movement of females into the anesthesiologist workforce that is likely to continue as large numbers of female residents continue to enter the workforce and older (predominantly male) anesthesiologists retire. The movement of females into the anesthesiology workforce necessitates a clearer understanding of female anesthesiologists and the implications that the gender shift will have on employment arrangements and the practices of anesthesiologists.

Specifically, we found that female anesthesiologists received lower levels of compensation, worked fewer hours, were more likely to work for facilities as employees, and allocated time across different types of patients. In many cases, these gender differences were related. For example, anesthesiologists who were employed by facilities appeared to have had lower levels of income, and differences in hours were related to differences in compensation. Our results for gender gaps in compensation for anesthesiologists were similar to those found in other studies of all physicians.[27,28] However, we found a slightly larger gap in compensation than what was found in a 2012 Medscape survey that looked specifically at 2011 earnings for anesthesiologists.[23] The results

on differences in total hours also mirrored those found in other studies on physician and gender. For example, one study found that female physicians work approximately 47 h per week compared with 58 h for males, and another study found that 27% of female pediatricians worked part-time compared with just 9% of male pediatricians.[21,22]

Some of these gender differences may also have been driven by underlying differences between male and female anesthesiologists, including demographics, experience, and preferences. However, a 2011 study showed that the disparities remained even when controlling for total hours, specialties, and ages of female physicians, factors likely to have driven a substantial portion of the differences in earnings.[29] In fact, we demonstrated that the gender gaps in compensation were reduced from 29% when looking at annual salary for the full sample to just 7% when looking at the salary per hour for young anesthesiologists who were employed by similar types of employers and had equivalent experience. With regard to work hours, some argue that reduced hours among female physicians is the need to accommodate family responsibilities.[30,31] Our research found that differences in total hours were in fact related to marital status; we found that married anesthesiologists saw significant differences in hours, whereas single anesthesiologists did not (regardless of whether the anesthesiologist had children).

Similarly, the difference in employment arrangements may have been that practice in a single facility offered more stability than practice across multiple facilities, and female anesthesiologists may have had a preference for these types of employment arrangements to accommodate family responsibilities. In this case, female anesthesiologists who were married and had children may have been more likely to have been employed by a single hospital. However, additional analysis (not detailed in this article) suggested that there was no clear relationship between the employment of female anesthesiologists at one facility and whether the anesthesiologist was married or had children, as single females without children were equally likely to work in a single facility. If the greater presence of females in facility-based employment arrangements reflected a preference by females to be employed in more predictable situations, then employment arrangements may need to shift to accommodate female preferences and continue to attract females into anesthesiology.

Future research should continue to explore the drivers of these compensation gaps, including an analysis of whether the remaining gap constitutes gender discrimination, or is explained by sorting and choice mechanisms not accounted for in our research. Gender differences in hours worked, employer type, and patterns of practice should also be explored to determine whether the variation is driven by preferences as opposed to explicit efforts to limit the scope of practice for female anesthesiologists.

Differences in work patterns by gender could have important policy implications for the overall management of the anesthesiologist workforce. For example, fewer hours worked among female anesthesiologists means more anesthesiologists will be needed to meet a given level of demand. This means that facilities may face higher labor costs due to fixed benefit and administrative costs for each physician employed. In addition, preferences for certain types of employment and compensation arrangements may require employers to provide different arrangements than what might be preferred by male anesthesiologists. For example, female anesthesiologists may demand more flexible or regular work hours to accommodate responsibilities associated with children or marriage. The findings of this study provided some additional evidence on gender differences to supplement existing studies on the compensation and hours of female physicians.

Limitations

Our study had a few limitations. Given that the survey was fielded only among members of the ASA and the response rate was approximately 25%, the results may not be representative of the national anesthesiologist population if nonresponse is correlated with unobserved factors that also affect the measured outcomes. Our comparison of respondents to nonrespondents indicated that nonrespondents were different across a few observable characteristics. In addition, because this study focused on descriptive statistics and basic regression analysis, the findings were not able to provide evidence of causal relationships.

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Competing Interests

The authors are employees of the RAND Corporation (Pittsburgh, Pennsylvania, and Santa Monica, California), and the work presented here was paid for by the American

Society of Anesthesiologists (Schaumburg, Illinois). The authors declare no other competing interests.

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Appendix

Section A: General Employment Information

A1. When did you start practice as an Anesthesiologist (including residency)? [1930 . . . 2012]

A2. Which of the following best describes where you provide services?
1. One hospital/facility
2. Multiple hospitals/facilities
3. Other: Specify _____

We are going to ask some questions about your main affiliation. Please answer these questions with a focus on the entity or entities from which you primarily drew income in 2012. We ask you to use the following categories to describe your main affiliation:

- Hospitals and facilities include university hospitals, academic medical facilities, healthcare systems (*e.g.*, Mayo, Kaiser, and Geisinger), ambulatory surgical centers, office suites, *etc*.
- Groups include physician group practices (including groups that employ individuals working at healthcare systems or academic hospitals), publicly traded companies, and national anesthesia companies.

A3. Which of the following best describes your current affiliation; that is, the primary entity from which you drew income in 2012?
1. One group
2. One hospital/facility
3. Multiple groups
4. Multiple hospitals/facilities
5. Locum tenens
6. Other: Specify _____

A4. For how many years have you been in your current affiliation? [0 … 75]

** Items A5–A8 will have a note that says "If you are affiliated with a large healthcare system or large anesthesia company, please attempt to provide a response for your local region."*

A5. How many other Anesthesiologists practice in your primary group/practice at all facilities (not including locum tenens or other temporary additions to the group)? [0, 5,000]

A6. How many open positions does your group/practice have for
1. Anesthesiologists
2. Anesthesiologist Assistants (AAs)
3. Certified Nurse Anesthetists (CRNAs)
4. Unknown (Go to A9)

A7. To cover our current volume of cases, my group/practice would prefer to have
1. More Anesthesiologists (Yes/No/Unknown)
2. More AAs (Yes/No/Unknown)
3. More CRNAs (Yes/No/Unknown)
4. Does Not Apply (Fully Staffed)

A8. My group/practice could handle more cases if we could hire
1. Additional Anesthesiologists (Yes/No/Unknown)
2. Additional AAs (Yes/No/Unknown)
3. Additional CRNAs (Yes/No/Unknown)
4. Does Not Apply (Fully Staffed)

Now we will ask you some questions about the primary facility where you work. For questions, please use the following interpretation:

- Primary facility: The facility in which you spend a majority of your time.

A9. How many of the following professionals practice/work in your primary facility:
1. Anesthesiologists [0–300, Do Not Know]
2. Anesthesiology residents [0–300, Do Not Know]
3. AAs [0–300, Do Not Know]
4. CRNAs [0–300, Do Not Know]
5. Student Registered Nurse Anesthetists [0–300, Do Not Know]
6. Surgeons [0, 1,000]

A10. What is the financial structure of your primary facility:
1. Nonprofit
2. For-profit
3. Governmental (*e.g.*, VA [Department of Veterans Affairs])

A11. Is your primary facility a teaching institution (for residents, ANs, or AAs)? Yes/No

A12. Is your primary facility a free-standing ambulatory surgical center? Yes/No

A13. How often are procedures at your primary facility delayed due to a lack of availability of anesthesiologists?
1. Never
2. <5% of the time (rarely)
3. 5–25% of the time (a few times a month)
4. 25–50% of the time (a few times a week)
5. More than 50% of the time (almost every day)

A14. How often are procedures at your primary facility delayed due to a lack of availability of surgeons?
1. Never
2. <5% of the time (rarely)
3. 5–25% of the time (a few times a month)
4. 25–50% of the time (a few times a week)
5. More than 50% of the time (almost every day)

A15. My primary facility adopts new technology (anesthesia machines, patient monitoring equipment, delivery system for anesthesia drugs, respirators, *etc.*):
1. Too frequently
2. At the right pace
3. Not frequently enough

The answers you provide to compensation questions allow us to better estimate the response of labor supply to different external events. We do not aim to focus on earnings in this study. Answers to these questions, as to all other questions in this survey, will be held in the strictest confidence, and no attempt will be made to identify a specific person. However, if you feel uncomfortable answering any of the questions, you may proceed to the next question.
Please use the following interpretation for compensation for professional services:

- State the amount reported as direct compensation on a W2, 1099, or K1, plus all voluntary salary reductions (*e.g.*, 401[k], health insurance, *etc.*) The amount reported should include salary, bonus, incentive payments, research stipends, honoraria, and distribution of profits to employees. However, please do not include profits resulting from corporate ownership. Also, do not include benefits paid by the practice, *e.g.*, retirement plan contributions, *etc*. under compensation.

A16. This survey and the research based on it will greatly benefit from data on compensation. Would you be willing to provide your compensation?
1. Yes, I will provide a dollar figure (GO TO A16a)
2. Yes, but I will only choose a range (GO TO A16b)
3. No, I prefer not to answer (GO TO A17)

A16a. Annual overall compensation (as defined earlier) for professional services before taxes in 2012: $_____

A16b. What was your annual overall compensation for professional services before taxes in 2012?
1. [<100K]
2. [100K–150K]
3. [150K–200K]
4. [200K–250K]
5. [250K–300K]
6. [300K–350K]
7. [350K–400K]
8. [400K–450K]
9. [450K–500K]
10. [> 500K]

A17. Does your group receive direct compensation from the healthcare facility or system in addition to fee-for-service billing? (*i.e.*, for medical direction of hospital units, OR [operating room] management, on-call coverage, *etc.*) Yes/No

A18. In 2012, what percent of your personal compensation came from:
1. Guaranteed salary
2. Bonus or incentive programs
3. Direct fee-for-service billing

Section B: Time-use Information

For time-use questions, please use the following interpretation:

- Week: a typical 7-day *work week (excluding vacation and other paid time off)*
- *Clinical time: total number of hours during which the Anesthesiologist is involved in direct patient care (includes on-call hours spent in actively providing care and time spent waiting for cases to begin) and providing clinical instruction*
- *Administrative hours: total number of hours spent performing medical director services, attending meetings, scheduling cases, etc.*
- *Education and research hours: Total number of hours teaching, conducting research, and p*erforming other education duties.

B1. Typically how many hours do you work per week (include clinical, research, administrative, teaching duties, and all call hours)? [0…168]

B1a. Please fill in the following table regarding your typical weekly call hours:

Call Hours	On Site (in a Care Facility)	Off Site (Away from a Care Facility)
Total	[0…168]	[0…168]
Spent actively providing care	[0…168]	[0…168]

B2. What is your typical clinical workload in hours per week? [0…80]

B2a. Indicate the percentage of clinical time you spend each week in each of these practice settings:
1. Hospital or hospital-based (if you cannot split it between inpatient and outpatient give the total percentage) _____%
   a. Inpatient _____%
   b. Outpatient _____%
2. Free-standing ambulatory center _____%
3. Medical office _____%
4. Dental office _____%
5. Other (Specify _____) _____%

B2b. Enter the percentage of clinical time you typically spend each week on each of the following services:
1. Preoperative evaluation (including obtaining informed consent) _____%
2. Intraoperative care _____%
3. Postoperative and Post-PACU [postanesthesia care unit] care _____%
4. Critical care medicine _____%
5. Pain medicine—chronic conditions _____ %
6. Pain medicine—acute pain management _____ %
7. Labor and delivery _____%
8. Other services (Specify): _____; _____ %

B2c. Enter the percentage of clinical time you typically spend each week on each of the following types of patients:
1. Generalist_____ %
2. Cardiac/vascular_____ %
3. Critical care_____ %
4. Neurosurgical_____ %
5. Obstetrical_____ %
6. Gynecologic_____ %
7. Pain medicine_____ %
8. Pediatric_____ %
9. Trauma_____ %
10. Ophthalmic_____ %
11.Gastrointestinal _____ %
12. Plastic surgery_____ %
13. Ear, nose, and throat _____ %
14. Other: specify _____; _____ %

B2d. Enter the percentage of clinical time (and number of procedures) you typically spend each week on each of the following anesthetic techniques:
1. Monitored anesthesia care _____ %
Number of procedures per week: [0 . . . 100]
2. General Anesthesia _____ %
Number of procedures per week: [0 . . . 100]
3. Regional (excluding epidurals placed for obstetrical cases) _____%
Number of procedures per week: [0 . . . 100]
4. Labor epidurals _____ %
Number of procedures per week: [0 . . . 100]

B3. What is your typical administrative workload in hours per week? [1 . . . 80]

B4. What is your typical research workload in hours per week? [1 . . . 100]

B5. What is your typical classroom teaching workload in hours per week? [1 . . . 80]

B6. By what percentage have your work hours changed since 2009?
1. No appreciable change
2. Decreased by less than 10%
3. Decreased by more than 10%
4. Increased by less than 10%
5. Increased by more than 10%

B7. By what percentage has your volume of cases changed since 2009?
1. No appreciable change
2. Decreased by less than 10%
3. Decreased by more than 10%
4. Increased by less than 10%
5. Increased by more than 10%

B8. What is your attitude toward increased work hours (total hours—clinical, research, and administrative—rather than billable hours)?
1. I will increase my work hours if the compensation is high enough (go to B8a)
2. I will not increase my work hours because
a. I am satisfied with my current level of income
b. I do not have any more time available.
c. Other: Specify _____

B8a. When would you increase your work hours by 10%?
1. If income increased by 5%
2. If income increased by 10%
3. If income increased by 20%
4. If income increased by 25%
5. If income increased by more than 25%

B9. What percentage of your patients are (please do not include labor epidurals as emergency, even if administered in the middle of the night).
1. Elective
2. Urgent
3. Emergency
4. Unknown

B10. What percentage of your patients are
1. Pediatric (0–15)
2. Adult (age between 16 and 65)
3. Elderly adults (age greater than 65)

B11. How many hours (excluding call hours) while you are at work during a typical 7-day work week are you not providing professional services because of reasons such as scheduling, staffing, or management delays? [1 . . 80]

B12. In what percentage of cases do you
1. Supervise residents
2. Medically direct AAs
3. Work with or direct CRNAs
3. Personally perform anesthesia services

B13. In two sentences or less, please describe the biggest change related to work that you have experienced since 2009.

Section C: Future Plans

C1. How many hours per week do you expect to work 1 yr from now? (Use 0 if you plan to retire within in a year.) [0 . . . 168]

C2. How many hours per week do you expect to work 5 yr from now? (Use 0 if you plan to retire within 5 yr.) [0 . . . 168]

C3. When do you expect to retire from anesthesia practice?
1. Before the end of this year (2013)
2. 2014 to 2016
3. 2017 to 2021
4. 2022 to 2026
5. After 2026

C4. Before retiring from practice, how much do you plan to decrease hours?
1. I do not plan to decrease hours before retiring
2. Decrease by less than 25%
3. Decrease by 25 to 49%
4. Decrease by 50 to 74%
5. Decrease by 75% or more

Section D: Demographic Information

The answers you provide to the demography questions allow us to better estimate the response in this survey, will be held in the strictest confidence, and no attempt will be made to identify a specific person. However, if you feel uncomfortable answering any of the questions, you may proceed to the next question.

D1. What is your gender?
1. Male
2. Female

D2. In what year were you born? [1900 . . . 1993]

D3. What is your household status?
1. Single with no dependent child(ren) (If so, ask D4)
2. Single with dependent child(ren) (If so, ask D3b)
3. Married or living with a partner with no dependent child(ren) (If so, ask D3a)
4. Married or living with a partner with dependent child(ren) (If so, ask D3a, D3b)

D3a. Are you the sole wage earner of your household?
1. Yes
2. No

D3b. How many children live in your household? [0 . . 10]

D4. Were you born in the United States?
1. Yes (if yes, go to D5)
2. No

D4a. In which country were you born?

D4b. In which year did you come to the United States to stay?

D5. Where did you receive your M.D./D.O. degree?
1. In the United States
2. In Canada
2. Outside of the United States/Canada

D6. Have you practiced anesthesiology for compensation in other countries? Yes/No. If yes, which country? _____

D7. How would you classify yourself? Select all that apply:
1. White or Caucasian
2. Hispanic
3. Black or African American
4. American Indian or Alaskan Native
5. Asian or Pacific Islander
6. Other: Specify _____