

Motherhood and Anesthesiology: A Survey of the American Society of Anesthesiologists

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BACKGROUND: The proportion of women medical school graduates in the United States has grown substantially; however, representation of women in anesthesiology lags behind. We sought to investigate factors associated with women recommending against a career in anesthesiology due to obstacles related to motherhood.

METHODS: We surveyed 9525 women anesthesiologist members of the American Society of Anesthesiologists (ASA) with a web-based survey distributed via e-mail. Associations between whether women would counsel against anesthesiology due to obstacles related to motherhood and 34 related categorical variables were estimated. Fisher exact test was used for categorical binary variables, and Wilcoxon-Mann-Whitney test was used for ranked variables.

RESULTS: The response rate for the primary question was 19.2%. Among the 1827 respondents to the primary question, 11.6% would counsel a female medical student against a career in anesthesiology due to obstacles pertaining to motherhood. Counseling against an anesthesiology career was not associated with ever being pregnant ($P = .16$), or whether a woman was pregnant during residency or fellowship training ($P = .41$) or during practice ($P = .16$). No association was found between counseling against anesthesiology and training factors: total number of weeks of maternity leave ($P = .18$), the percentage of women faculty ($P = .96$) or residents ($P = .34$), or the number of pregnant coresidents ($P = .66$). Counseling against a career in anesthesiology was significantly associated with whether respondents' desired age of childbearing/motherhood and desired number of children were adversely affected by work demands (with Bonferroni adjustment for the 34 comparisons, both $P < .0001$). The risk ratio of respondents whose desired childbearing age and desired number of children were affected by work demands counseling against a career in anesthesiology was 5.1 compared to women whose desired childbearing age and desired number of children were not affected (99% confidence interval [CI], 3.3–7.9; $P < .0001$; odds ratio, 6.2).

CONCLUSIONS: In this study of 1827 women anesthesiologists, approximately 1 in 10 would counsel a student against a career in anesthesiology due to obstacles pertaining to motherhood, and this was associated with altering one's timing and number of children due to job demands. Further research is needed to understand how women's perception of a career in anesthesiology is related to factors influencing personal choices. Understanding women's perceptions of motherhood in anesthesiology may help leaders support career longevity and personal satisfaction in this growing cohort of anesthesiologists. (Anesth Analg XXX;XXX:00–00)

KEY POINTS

- **Question:** What factors are associated with a woman counseling a student against anesthesiology due to obstacles related to motherhood?
- **Findings:** Respondents whose desired age of childbearing and number of children were affected by work demands had a risk ratio of 5.1 for counseling against anesthesiology compared to women whose age of childbearing and number of children were not affected (99% confidence interval [CI], 3.3–7.9; $P < .0001$).
- **Meaning:** Women should be counseled to choose their age of childbearing and family size according to their personal goals and values, with less regard to workplace demands.

GLOSSARY

ABA = American Board of Anesthesiology; **ASA** = American Society of Anesthesiologists; **AUC** = area under the receiver operating characteristic curve; **CI** = confidence interval

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The growth of women entering medicine has increased substantially in the past 2 decades, to a point at which women have now reached near parity with men in medical school matriculating classes.¹ Despite parity in medical school ranks, anesthesiology lags behind in percentage of female residents, and even further behind in percentage of women holding leadership roles such as department chair.^{2,3}

Recent publications have highlighted the experiences of female physicians and their possible roles in the leadership gap and specialty gap. For example, in a study of women who gave birth during surgical residency, Rangel et al⁴ found that 39% strongly considered leaving surgical residency, and 29.5% would counsel female residents against a surgical career because of the difficulty of balancing career with motherhood. While data are lacking in anesthesiology, female sex has been shown to be associated with increased attrition in surgical residencies. Potential deterrents have been identified in the literature: gender discrimination, lack of a formal institutional maternity leave policy, changing career plans due to motherhood, perceptions of stigma associated with pregnancy, and perceptions of surgery as incompatible with a rewarding family life.⁴⁻⁶ Regarding anesthesiologists, a pilot survey found that women reported more discouragement in the workplace to become pregnant and breastfeed than encouragement (26.8% vs 18.2%). In addition, a study of major medical specialties found anesthesiology to have the highest rate of maternal discrimination (odds ratio, 1.92).⁷

We sought to survey women members of the American Society of Anesthesiologists (ASA) to gain a better understanding of motherhood-related factors associated with women's likelihood to recommend against a career in anesthesiology.

METHODS

The survey was approved and distributed by ASA and given exemption, and the requirement for written informed consent was waived by the institutional review board at Mayo Clinic (Rochester, MN). The survey was developed by a workgroup of female anesthesiologists with varying childbearing experiences and institutional affiliations. Topics related to motherhood, childbearing, parental leave, and breastfeeding were addressed.

A literature review of relevant English language articles was performed using key terms including anesthesiologist, physician, women, work-life balance, and pregnancy. (Supplemental Digital Content 1, Literature Search, <http://links.lww.com/AA/C993>). Three articles that surveyed various specialty physicians on the subject matter were identified. Those corresponding authors were contacted, and 3

surveys were obtained.⁸⁻¹⁰ Those surveys were used as references to design our survey. In addition, we conducted a pilot study in 2017 at a professional event for Women in Anesthesiology, a nonprofit group of female anesthesiologists.¹¹ Questions from the pilot survey were included in our survey, and the survey was reviewed by collaborators with expertise in qualitative and survey research. The final survey was the result of several rounds of feedback among collaborators (Supplemental Digital Content 2, Survey Questions, <http://links.lww.com/AA/C994>).

The survey was electronically distributed in March 2018 to active female ASA members who were residents, fellows, and attending anesthesiologists. Two e-mail reminders were sent by ASA, and the survey was open for 4 weeks. Participation was voluntary, and there was no compensation provided. The survey design did not allow participants to return to previous questions, and participants were not required to answer all questions. Respondents were alerted when a question was left blank, but they could choose to ignore the prompt and continue.

According to ASA, there are 9999 active female resident, fellow, and physician members. Of these, 473 members had either opted out of surveys or had not responded to the opt-in or opt-out question regarding surveys. This left 9525 possible participants invited to participate.

Confidence intervals for proportions were calculated using the Clopper-Pearson method (STATA 16.0, College Station, TX). Wilcoxon-Mann-Whitney tests were used to assess associations between the response to the primary question and the potentially predictive ranked variables (eg, year of medical school [Table 1]). Strength of those associations between the response to the primary question and the ranked variables were reported using the area under the receiver operating characteristic curve (AUC). Fisher exact tests were used to assess associations between the response to the primary question and the potentially predictive categorical variables (eg, marital status [Table 2]).^{12,13} Strength of those associations between the response to the primary question and categorical variables was estimated using Cramér's *V* (Table 2). Cramér's *V* is a measure of effect size, and ranges from 0 to 1. Cramér's *V* can be used for valid comparison among the results in the contingency tables in Table 2 despite their different sizes (eg, 2 × 2 for "Have you ever been pregnant?" and 2 × 7 for "What is your marital status?"). Values of Cramér's *V* < 0.1 are negligible, and values < 0.3 are small. Interactions between the 2 significantly predictive variables in Tables 1 and 2 and the response to the primary question are shown as a classification tree in Table 3. Those 2 significantly predictive *P* values were recalculated after Bonferroni adjustment for the other 32 tested variables.

Table 1. Associations of Questions Pertaining to All Respondents With “Would You Counsel a Female Student Against a Career in Anesthesiology Due to Obstacles Pertaining to Motherhood?”

Question	AUC	Wilcoxon Mann-Whitney P Value, Unadjusted for the 34 Comparisons
Would you counsel a female student against a career in anesthesiology due to obstacles pertaining to motherhood?		
Was your desired number of children adversely affected by work or training demands?	0.652	<.0001
Was/is your desired age of childbearing/motherhood adversely affected by work demands?	0.647	<.0001
In what year did you graduate from medical school?	0.544	.04
In what year were you born?	0.540	.06
In what year did/will you finish residency?	0.534	.10
How many weeks did you take off, or plan to take off, for maternity leave for this pregnancy/child (total)?	0.524	.18
Percentage of residents in your class are/were female	0.520	.34
How many female residents are/were in your class?	0.515	.46
Approximately how many clinical faculty members were/are in your residency training program?	0.510	.64
Approximately how many female clinical faculty members were/are in your residency training program?	0.502	.94
Percentage of clinical faculty members in your program are/were female	0.501	.96
How many residents are/were in your program?	0.500	.99

Sample sizes range from 1704 to 1830 respondents. The *P* values for questions “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” and “Was your desired number of children adversely affected by work demands?” with Bonferroni adjustment for the 34 comparisons are both *P* < .00001. Tables 1 and 2 together display all comparisons. The unadjusted *P* = .04 variable, “In what year did you graduate from medical school?” was significantly correlated with both responses to “Was your desired number of children adversely affected by work or training demands?” (Spearman *r* = 0.20, *P* < .0001) and “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” (Spearman *r* = 0.22, *P* < .0001.) Abbreviation: AUC, area under the receiver operating characteristic curve.

RESULTS

There were 1827 who responded to the primary question, 19.2% of those invited to participate. Among respondents, 11.6% would counsel a female student against a career in anesthesiology due to obstacles pertaining to motherhood. Results for questions applicable to all respondents were compared to a “yes” answer to the question (Tables 1 and 2). Responses themselves are included in Supplemental Digital Content 3, Survey Responses, <http://links.lww.com/AA/C995>.

Neither questions related to pregnancy status nor even having ever been pregnant were associated with counseling against a career in anesthesiology (*P* = .16). Among women never pregnant, 13.5% would counsel against an anesthesiology career (99% confidence interval [CI], 9.5–18.3). Among those who have been pregnant, 11.0% would counsel against anesthesiology (99% CI, 8.9–13.3). There was no association between ever being pregnant and counseling women against an anesthesiology career if a woman had a pregnancy during residency or fellowship training (*P* = .41, Cramér’s *V* = –0.02). There was no association between pregnancy and counseling against anesthesiology when a woman had a pregnancy during practice (*P* = .16, Cramér’s *V* = –0.03). There was no association between a woman counseling against anesthesiology and the total number of weeks of maternity leave during training (*P* = .18, AUC = 0.524).

Questions related to residency program qualities were not associated with counseling against a career

in anesthesiology. There was no association with the percentage of faculty in the respondents’ residency program who were women (*P* = .96, AUC = 0.501) or with the percentage of residents in the respondents’ class who were women (*P* = .34, AUC = 0.520). There also was no association with the number of female residents in the respondents’ program being pregnant during training (*P* = .46, AUC = 0.515).

Demographic information from ASA about each invited subject, age, and year of finishing residency was not associated with counseling against a career in anesthesiology. Among women counseling against an anesthesiology career, the median year of birth was 1979 (25th/75th 1972/1984). Among women not counseling against an anesthesiology career, the median year was 1978 (25th/75th 1968/1983) (unadjusted *P* = .06). There also was no relationship with the year finishing residency (no 2010 [2001/2015], yes 2010 [2004/2016]; *P* = .10). Nonresponse analyses using these variables for counseling against a career in anesthesiology were moot because of the lack of associations.

Counseling against a career in anesthesiology was significantly associated with responses to the questions “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” and “Was your desired number of children adversely affected by work demands?” Both of the *P* values were <.0001 with Bonferroni adjustment for the 34 potentially predictive variables. Responses to these

Table 2. Associations of Questions Pertaining to All Respondents With “Would You Counsel a Female Student Against a Career in Anesthesiology Due to Obstacles Pertaining to Motherhood?”

Question	Cramér's V	Fisher Exact Test 2-Sided P Value, Unadjusted for the 34 Comparisons
Would you counsel a female student against a career in anesthesiology due to obstacles pertaining to motherhood?		Reference
Was your desired number of children adversely affected by work or training demands?	0.1882	<.0001
Was/is your desired age of childbearing/motherhood adversely affected by work demands?	0.1841	<.0001
Do you plan to have children in the future?	0.0518	.03
What is your current marital status?	0.0845	.04
Are you aware of the ABA policy on absence from residency?	0.0579	.05
Did you have to delay board certification due to a pregnancy?	0.046	.06
Was the program director during your residency training male or female?	0.0395	.10
Do you have any children?	0.0472	.14
What is your sexual orientation?	0.0557	.15
Have you ever been pregnant?	-0.0326	.16
Were you pregnant, or did you have any children during your practice?	-0.0345	.16
What is your race/ethnicity?	0.0635	.18
Are you board certified?	0.0403	.23
What is your current job?	0.0618	.24
Does/did your residency/fellowship program have a formal maternity leave policy for trainees at the time of your training?	0.0368	.30
Did you train in the United States?	0.0264	.36
Does/did your residency/fellowship program have a formal paternity leave policy for trainees at the time of your training?	0.0328	.39
Were you pregnant during, or did you have any children during, your residency or fellowship training?	-0.02	.41
Was the chief/chair of the anesthesiology department during your residency training male or female?	-0.0212	.44
Did you complete a fellowship?	0.019	.45
Does your partner work outside the home?	0.03	.47
Are you currently in practice?	0.0141	.62
Are/were there female residents in your program who were pregnant during their training at your residency training program?	-0.0108	.66
Is your partner a physician?	0.004	.99
Do you currently live in the United States?	-0.0019	1.00

Sample sizes range from 1704 to 1830 respondents. Cramér's V is negative for some of the 2 x 2 contingency tables showing the association.^{12,13} A positive Cramér's V indicates an answer of “yes.” The P values for questions “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” and “Was your desired number of children adversely affected by work demands?” with Bonferroni adjustment for the 34 comparisons are both $P < .00001$. Tables 1 and 2 together display all comparisons. The unadjusted $P = .03$ variable, “Do you plan to have children in the future?” was significantly correlated with both responses to “Was your desired number of children adversely affected by work or training demands?” (Cramér's V = 0.31, $P < .0001$) and “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” (Cramér's V = 0.26, $P < .0001$). The unadjusted $P = .04$ variable, “What is your current marital status?” was significantly correlated with both responses to “Was your desired number of children adversely affected by work or training demands?” (Cramér's V = 0.55, $P < .0001$) and “Was/is your desired age of childbearing/motherhood adversely affected by work demands?” (Cramér's V = 0.50, $P < .0001$).

Abbreviation: ABA, American Board of Anesthesiology.

Table 3. Percentages of Respondents Who Answered Yes to Whether They Would Counsel a Student Against a Career in Anesthesiology Due to Obstacles Pertaining to Motherhood According to How They Answered the Questions “Was/Is Your Desired Age of Childbearing/Motherhood Adversely Affected by Work Demands?” and “Was Your Desired Number of Children Adversely Affected by Work Demands?”

Response to Whether Work Affected Age of Childbearing	Response to Whether Work Affected Number of Children	Percentage Who Would Recommend Against a Career in Anesthesiology (Ascending Order)	Respondents Reporting Against	Respondents Reporting Not Against
No	Unsure	3.6	1	27
No	No	4.1^a	22	517 ^b
No	Yes	5.1	5	94 ^b
Unsure	No	6.5	4	58
Yes	No	9.1	25	249 ^b
Unsure	Unsure	10.9	6	49
Yes	Unsure	11.5	11	85
Unsure	Yes	14.7	5	29
Yes	Yes	20.8^a	133	507 ^b

^aThe risk ratio of respondents counseling women against a career in anesthesiology among those who answered yes to both questions was 5.1 compared to those who answered no to both (99% confidence interval, 33.3–7.9; $P < .0001$). The odds ratio was 6.2 (99% confidence interval, 33.9–9.8). The Wilcoxon-Mann-Whitney area under the receiver operating characteristic curve equals 0.687 between the primary question and the 4-choice ordinal variable shown in bold.

^bIn the pilot survey,¹¹ the corresponding observations in sequence from top to bottom were 0 of 21 (Fisher exact test $P = .99$), 0 of 4 ($P = .99$), 0 of 11 ($P = .61$), and 1 of 18 ($P = .14$), respectively. These Fisher exact tests compared the proportions between pilot survey and current study results.

2 questions were correlated (Cramér's $V = 0.41$), and thus were not separable (Table 3).

Among the 29.5% (539) of women who answered no both to age of childbearing and number of children being adversely affected by work demands, an estimated 4.1% would counsel against anesthesiology as a career due to obstacles pertaining to motherhood. Among the 35.0% (640) who answered yes to both, approximately 20.8% would counsel against a career in anesthesiology (Table 3). The risk ratio of respondents counseling women against a career in anesthesiology whose desired age of childbearing and number of children were affected by work demands was 5.1 compared to women whose age of childbearing and number of children were not affected (99% CI, 3.3–7.9; $P < .0001$; odds ratio, 6.2 [99% CI, 3.9–9.8]).

DISCUSSION

In this study, approximately 1 in 10 female anesthesiologists would counsel a student against a career in anesthesiology due to obstacles pertaining to motherhood, regardless of whether they were parents themselves. We detected no associations between counseling against anesthesiology and motherhood status, career phase during pregnancy, or the percentage of residents or faculty in their program who were women. The milieu of the residency (eg, presence of other women in various roles) or the home (marital status, partner who worked outside the home, and whether the partner was a physician) was not otherwise relevant.

Two factors were reliably associated with counseling a student against anesthesiology: whether the anesthesiologist felt that work demands adversely affected the timing and the number of children she had (Table 3). These 2 questions were the only ones that specifically asked to evaluate the influence of their job demands on their childbearing-related decisions. However, our results were consistent with a previous survey of female physicians, 64% of whom deferred personal life decisions. Women who did not defer personal life decisions were more likely to choose medicine again as a career (85% vs 71%).¹⁴ Another study found that 65.3% of female physicians reported that their career had influenced their childbearing decisions.¹⁵

These findings raise the question as to whether a sense of autonomy in personal life decision-making is more important to women's perceptions of the specialty than factors related to the specific demands of the job. Using data from the 2002 National Study of the Changing Workforce, Thompson and Prottas¹⁶ found that a sense of job autonomy was strongly associated with employees' satisfaction in their jobs, families, and lives, whereas formal organizational benefits alone (eg, parental leave) only had modest

relationships with outcomes of value to employees. Also important was informal organizational support, such as having friendly, helpful coworkers and supervisors. Gervais and Millier¹⁷ similarly found that job autonomy and support from colleagues, rather than life course, were associated with less stress, anxiety, and depression in women. It is possible that a perceived sense of control within a supportive organizational culture may be more influential than the work or family demands themselves.

In an extensive study of physician specialty choice, Ku¹⁸ found that medical student specialty choice did not differ significantly between the first year and graduation. Women were more likely to choose primary care or obstetrics-gynecology careers than men, but the gender difference disappeared among first-year students when a student's social-emotional orientation to medical practice was taken into account (ie, toward "people-oriented" fields rather than technically oriented fields). For residents, although the gap was similar, it was not as influenced by gender-socialized values, but rather, a combination of other factors (eg, women medical students were less likely than men to receive encouragement toward or have mentorship in subspecialties such as anesthesiology).¹⁸ In addition, a recent study of women in graduate medical education found that specialties with lower percentages of female trainees had lower percentages of female faculty, were not part of the third-year core rotations, and had lower mean board scores.¹⁹ Combining these results with ours, perhaps highlighting the more people-oriented aspects of anesthesiology and its subspecialties, as well as increasing women's exposure and mentorship in the field, could influence women toward choosing anesthesiology as a specialty.

The notion of part-time possibilities in a medical career has evolved over time. In previous cohorts, most specialties expected full-time work, which often included substantial practice ownership duties, even in primary care. Now, more physicians are transitioning to large-group, employed-practice models, which may afford more flexibility.^{20,21} However, in this study, we did not find an effect of perceptions of childbearing by age cohort; this would argue against the notion that generational perceptions and massive recent changes in practice structure are influencing responses.

Of the 9525 invitees, 1827 (19.2%) responded to the primary question. This is consistent with previous ASA study response rates, which have ranged from 13.4% to 42%.^{22–25} There may be a nonresponse bias because it is possible that women who did not have children may have had less interest in responding. The demographic data available from ASA were age and year completing residency, and neither of these data had any suggestion of association with our primary variable.

Another potential limitation is that respondents were asked only about whether they would counsel against a career in anesthesiology and not necessarily against a career in medicine, and only as related to motherhood. It is possible that women may be happy with a career in anesthesiology, but regret choosing medicine in general. This would be in line with findings by Dyrbye et al²⁶ comparing anesthesiology residents to other specialties. A limitation of our study, knowing the results, is that the questions did not address whether timing of marriage at different stages of training influenced responses (eg, whether women with a later-career marriage answered differently about the timing and number of children versus women who married in medical school). The average year of birth of respondents was 1983, indicating a younger demographic, with high rates of marriage (82.0%) and heterosexuality (97.0%). It is possible that more women would counsel against anesthesiology for reasons other than motherhood. Finally, asking the question with a negative connotation may have influenced participants to have a more negative response. This question was intended to be in line with previous studies on the topic, and our results with it in the current survey matched those of our pilot (Table 3^b).^{4,11} Future research is needed to better understand the complex factors influencing women's career and lifestyle satisfaction in anesthesiology.

Based on these results, strategies for improving women's perception of anesthesiology as a career may be elusive because no specific job, demographic, or family-related factor appeared to influence the results. Women should be counseled to choose their age of childbearing and family size according to their own goals and values, with less regard to the demands of their workplace. This may be achieved with supportive workplace cultures (both formally and informally) and flexibility surrounding caregiving needs, which have been modeled in recent statements and policies from ASA and the American Board of Anesthesiology (ABA), respectively.^{27,28} Employers and training programs can facilitate personal choices in childbearing by offering reasonable parental leave policies as well as a culture of support in which pregnancy and lactation needs are normalized and facilitated, without fear of judgment, retaliation, or career setback.

Future qualitative studies are necessary to understand underlying barriers and motivators, both for medical students choosing this specialty as well as for anesthesiologists making family decisions. Understanding women's perceptions of motherhood in anesthesiology, especially as it pertains to timing and number of children, may help leaders in anesthesiology support career longevity and personal satisfaction in this growing cohort of physicians.

CONCLUSIONS

In this study of 1827 women anesthesiologists, 11.6% reported that they would counsel a student against a career in anesthesiology due to obstacles pertaining to motherhood, and this was strongly associated with a perception that the timing and number of children a woman had were affected by job demands. Further research is needed to understand how women's perception of a career in anesthesiology is related to factors of personal choice. ■■

DISCLOSURES

Name: Molly B. Kraus, MD.

Contribution: This author helped conceptualize the project, write the survey, and edit the manuscript.

Conflicts of Interest: None.

Name: Franklin Dexter, MD, PhD, FASA.

Contribution: This author helped perform the statistical analysis and write the manuscript.

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Contribution: This author helped conceptualize the project, write the survey, analyze the data, and write the manuscript.

Conflicts of Interest: A. C. S. Pearson is the president of Women in Anesthesiology.

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