The role of experience, specialty certification, and practice ownership in the gender wage gap for veterinarians in the United States

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OBJECTIVE
To explore the role of various factors in the wage gap between male and female veterinarians in the United States in 2016 and 2017.

SAMPLE
2,760 veterinarians across the United States.

PROCEDURES
Data from the Census of Veterinarians Survey administered by the AVMA Economics Division in 2016 and 2017 were analyzed. The Kolmogorov-Smirnov 2-sample test was used to determine whether a difference existed between male and female income distributions at various levels of experience. Quantile regression was performed separately for male and female respondents to determine the direct effects of individual factors on incomes and compare the effects of practice ownership versus nonownership on income.

RESULTS
Income distributions of men and women were unequal at lower experience ranges but equal at higher experience ranges. Income increased for men with each additional year of experience and with practice ownership. For women, practice owners in the lowest income quantile had a negative return to income; overall, their income benefited most from ownership in the form of partnerships. For certain groups, incomes of both genders were lower when they had absences from the workforce.

CONCLUSIONS AND CLINICAL RELEVANCE
Findings suggested that the largest source of gender income disparity for veterinarians was attributable to female practice owners earning less than their male counterparts. Indeed, women earned more from specialty certifications than from owning a clinic. To decrease income disparities between genders, ways should be identified to support women-owned practices and promote equal pay. (*J Am Vet Med Assoc* 2021;258:591–600)

Across almost every industry, men and women with the same amount of education are working in the same occupation, performing the same tasks in the same place, and yet their incomes differ.[1] This gender wage gap has existed in the United States for many years, and efforts have been made to narrow it as far back as the Equal Pay Act of 1963.[2] Nevertheless, the wage gap remains and little is understood about all the factors that play a role, although skill differences due to educational training differences among employees may contribute in some occupations.[1,2] According to the US Department of Labor, women earned 80.5% of what men earned in 2017.[3]

In veterinary school, an individual student's formal educational training is mostly uniform until the student chooses which practice type they wish to pursue on graduation, at which point they are able to select coursework or clinical training that other students may or may not take. Additional decision points that influence career paths may occur with postgraduate training. Practice type has been shown to influence veterinarians' incomes,[4–6] but the interaction of gender and practice type on income is not well understood.

Veterinary medicine is one of the few fields in which the majority of the profession is female. As of 2009, the percentage of women in the veterinary profession exceeded 50% and has steadily increased.[7] Because veterinary medicine is one of the only fields with a > 50% female workforce that also requires a doctorate degree, any gender wage gap is therefore more pertinent comparatively because of the financial and time investment that comes with further postsecondary education; thus, a deeper understanding of the gender wage gap is needed.

The reason women continue to earn less than men is hotly debated, and no single cause has been identified. Instead, it seems a combination of factors and an ever-changing market are involved. One study[8] of the general workforce revealed that the gender wage gap has decreased among those in the lowest portion of the wage distribution, but also that, for women, workforce absences and shorter work hours explain a significant portion of the wage gap among high-skill occupations. More importantly, discrimination remains a concern. Indeed, Sunstein[9] argues that labor markets alone will not eliminate discrimination in a reasonable amount of time to be meaningful and that policy and other types of interventions would be needed to correct the problem.

In a study[10] specific to veterinary medicine, 11 female veterinarians were interviewed about their experience within the field. In the accounts provided, one veterinarian stated that she had to "favor masculine characteristics over feminine ones," whereas another mentioned how men automatically garnered respect. This suggests that gender biases may also exist on the part of clients. More recent work concerning gender differences within veterinary medicine shows gaps in specialties such as surgery. Specifically, female veterinary surgeons in the United States are more likely than their male counterparts to believe that their gender affected client interactions.[11] In addition, female surgeons are more likely to work in academia and, on average, earn less than men across work settings.

Within the economics literature, 2 studies specific to gender wage gaps among veterinarians have been reported. In 1 study,[12] although productivity did not significantly differ between female and male veterinarians, the wage gap between them ranged between 9% and 15%. In another study,[13] distinct differences were identified in regard to where male and female veterinarians chose to locate, which could contribute to the wage gap. Female veterinarians were reportedly much more averse to locating in rural areas, and this aversion has grown over time. Neill et al,[14] after correcting for cost of living, found no significant difference in veterinarians' income on the basis of urban or rural location in the United States, but gender still played a role in income potential. This relationship between practice location and income has also been confirmed for veterinarians in Australia and for expectations of graduating veterinary students in regard to practice ownership and potential earnings.[15]

As identified in the 2017 AVMA Report on Veterinary Markets,[4] female associates and owners earn less than their male counterparts do at almost every level of experience across most practice types. The smallest wage gaps generally occur at the beginning and end of a veterinarian's career (0 and 40 years of experience, respectively). Indeed, new veterinarian starting salaries indicated a wage gap as small as 3% in 2017, even after accounting for veterinarians in training programs (internships and residencies) who receive exactly the same salary. The wage gap between male and female veterinarians is expected to grow as they advance in their careers. Thus, the objective of the study reported here was to explore differences in earning potential between genders and how factors such as experience, ownership, practice type, and specialty certification contributed to the gender wage gap among veterinarians in the United States in 2016 and 2017.

Materials and Methods

Data source and study population

The data used for the study were obtained from the database of responses to the 2016 and 2017 AVMA Census of Veterinarians. During these 2 years, the census survey had been distributed via email to veterinarians registered in the AVMA database, which included AVMA members and nonmembers. The 2016 survey was distributed on May 4, 2016, to 21,638 veterinarians, which included a randomly stratified (by region) sample of veterinarians registered in the AVMA database and all members of the American Association of Equine Practitioners (regardless of AVMA membership status) and closed on July 6, 2016. Four reminder emails were sent throughout the 10-week survey period to increase response rate. A total of 3,642 responses were received. The 2017 survey was distributed on January 30, 2017, to a randomly stratified (by region) sample of 15,904 veterinarians registered in the AVMA database (but not all American Association of Equine Practitioner members) and closed on April 17, 2017. Three reminder emails were sent during the 11-week survey period to increase the response rate. A total of 2,780 responses were received. Overall, the response rate was 17.1% (6,422/37,542). After elimination of incomplete surveys, data representing 2,760 respondents across the 2 years were available for analysis, representing 7.4% of the total number of veterinarians invited to participate.

Data collection

Data were extracted for each respondent regarding age, gender (male or female), total personal income in the previous year (ie, income), year of graduation from veterinary school, practice ownership (yes or no), type of practice ownership (sole proprietorship or partnership), specialty certification (yes or no), practice type, number of degrees earned beyond a DVM degree (ie, additional degrees), employment status (full-time or part-time), mean number of hours worked per week in previous year (ie, weekly hours worked), number of years spent away from employment in veterinary medicine (ie, time away from employment), and area (rural, urban, or suburban) and US region (based on zip code) of workplace.

Statistical analysis

Descriptive statistics were computed to characterize veterinarians within various groups and to explore in more detail selected findings.

Effect of experience on income—To estimate the effects of experience on income, statistical software[a] and 2 distinct analytic approaches were used. The first approach examined empirical income distributions by gender and tested for equality of these distributions across levels of experience. By separating out the wage distributions by experience levels, we were able to crudely gauge how quickly male versus female veterinarians moved to the upper quantiles of their respective distributions across their career lifetimes. The results of this simplistic test were used to determine whether a deeper analysis was necessary and whether experience would be important to control for in further analyses of differences between genders.

The second analysis involved quantile regression, with income as the dependent variable, overall and for male and female veterinarians separately. Quantile regression is similar to linear regression but, in this situation, is conditional on the quantile or percentile of the income distribution. Within a quantile regression model, we were able to control for many potential differences in a veterinarian's career path by including as independent (predictor) variables possible explanations for said difference—a common practice in the economics literature.[8,12,14] For example, the difference in income that a veterinarian earned when they pursued advanced education versus a full-time job could be explicitly accounted for. This regression-based approach allowed evaluation of the direction and magnitude of effects associated with experience, practice ownership, specialty certification, practice type, and other attributes on income earning potential. By performing separate analyses for male and female veterinarians, the different impacts these career choices or individual attributes had on income could be directly estimated and compared with one another.

Income differences across experience levels—To investigate income differences across experience levels, the 2 years of data were broken down into gender, income, and number of years since graduation from veterinary school (as a proxy for experience level). Income was grouped into 25 categories that increased incrementally by $10,000 up to $240,000, which was used as the final category (≥ $240,000). Experience levels were broken down in 5-year increments, starting with 1 to 5 years and extending to > 40 years. Values for mean, median, and SD income and skewness and kurtosis of those data were calculated for each group and then plotted as a histogram.

Skewness refers to how symmetric a data distribution is, whereas kurtosis measures how the tail of any skew appears relative to a normal distribution.[16] Both values allow determination of whether a distribution (in this case, income distribution) is significantly different from a normal distribution. Skewness values indicate in which direction the distribution is skewed from a standard normal distribution, with positive values indicating a right-tailed distribution and negative values a left-tailed distribution. Positive kurtosis values indicate heavy-tailed distributions, whereas negative kurtosis values indicate light-tailed distributions. If a significant difference from a normal distribution is found, classic statistical tests are invalid.

Because all distributions were notably different from normal in this study, the 2-sample Kolmogorov-Smirnov test was performed to test the differences between the male and female distributions. This test, which examines 2 empirical distributions and evaluates the significance of the difference between the distributions,[16] was performed for each respective experience level to formally examine whether a difference existed between incomes for male and female veterinarians with the same experience levels.

Differences in demographic factors—Quantile regression was again performed for each gender separately to determine the influence of demographic factors on income and then directly compare the results between genders. This approach was chosen to reveal associations not possible with standard regression methods, such as whether an additional level of experience has a larger positive effect for someone in the bottom quantile of the wage distribution, but a smaller effect for someone in the upper quantile. By examining each additional income quantile, a clear understanding of the changes across the wage distribution could be estimated. A quantile regression model was run for each gender's income distribution, and the observed effects on this distribution of various demographic factors were compared. These factors included age, time away from employment, experience, weekly hours worked, additional degrees, specialty certification, employment status, area and region of workplace, practice type, survey year, and practice ownership (including type of ownership). Specialty certifications were not broken down into the various types in this analysis because of the relatively low prevalence (approx 8%) of respondents with such certifications, which would have resulted in specialty categories with too few representatives to accurately estimate their effects on income.

Results

Results are presented by type of analysis to highlight that the first analysis (Kolmogorov-Smirnov test) separated the study sample by experience, whereas the other analyses (quantile regression) separated the study sample by income.

Table 1—Measures of central tendency and other summary statistics for total annual income ($) of veterinarians who participated in the 2016 and 2017 AVMA Census of Veterinarians, by experience level and gender.

Experience level (y),* by gender	No. of respondents	Mean	Median	SD	Skewness	Kurtosis	Range†
1–5							
Female	1,243	78,948	76,000	37,007	0.962	2.442	249,960
Male	356	99,906	85,918	56,510	0.957	0.789	299,980
6–10							
Female	323	100,447	95,000	46,774	1.214	2.559	291,600
Male	117	124,467	112,000	60,930	0.805	0.561	299,895
11–15							
Female	163	99,791	87,000	52,288	1.327	2.490	293,000
Male	80	151,331	140,000	64,264	0.225	–0.714	288,000
16–20							
Female	98	104,611	92,000	55,181	0.964	1.164	297,000
Male	61	141,993	130,000	65,392	0.672	0.483	280,000
21–25							
Female	65	121,806	110,000	67,655	0.410	–0.282	299,700
Male	46	137,349	120,000	71,572	0.549	–0.454	299,815
26–30							
Female	46	112,667	103,500	49,276	1.086	1.249	215,000
Male	44	150,556	137,000	71,037	0.374	–0.479	275,000
31–35							
Female	15	115,500	98,500	75,534	0.327	–1.028	216,000
Male	33	162,043	147,500	74,946	0.451	–0.265	278,000
36–40							
Female	8	82,833	79,000	18,093	1.252	1.762	51,000
Male	27	127,676	93,000	82,092	0.577	–0.877	284,760
> 40							
Female	3	122,333	110,000	49,662	1.048	NA	97,000
Male	32	116,152	113,500	82,437	0.314	–1.016	281,500

Skewness is a numeric value that indicates in which direction the distribution is skewed from a standard normal distribution. A positive skewness value indicates that the distribution is skewed to the right, whereas a negative value indicates that the distribution is skewed to the left. Kurtosis is a measure of the density of the data distribution tail. Positive values indicate heavy-tailed distributions, whereas negative values indicate light-tailed distributions.

*Years of experience was calculated as the number of years since graduation from veterinary school. †Range was calculated as the maximum value minus the minimum value to describe the spread of the data.

NA = Not applicable; kurtosis could not be estimated with only 3 observations.

Kolmogorov-Smirnov test

The cumulative data across both survey years (2016 and 2017) indicated that female veterinarians had a lower mean and median income at every level of experience, except for those with > 40 years of experience, although this group was relatively small **(Table 1)**. The skewness measures for all experience levels within genders were positive and relatively small, indicating a slightly right-skewed distribution of income. Two-thirds of the male income distributions indicated negative kurtosis (smaller data tails than a standard normal distribution), whereas two-thirds of the female income distributions indicated positive kurtosis (larger data tails than a standard normal distribution).

According to results of the Kolmogorov-Smirnov test, the null hypothesis (of equal income distributions between genders) was rejected for all experience groups between 1 and 20 years and the 26 to 30 years group, indicating that the genders differed significantly in income distributions within these experience ranges. The null hypothesis was also rejected for the overall (pooled) sample with all experience subsamples combined. The largest differences between the male and female distributions were in income categories > $120,000 (**Supplementary Figure S1**, available at: avmajournals.avma.org/doi/suppl/10.2460/javma.258.6.591). Note that because the upper experience categories had much smaller sample sizes than the lower categories, these results should be interpreted with caution.

Among veterinarians with an income > $120,000, across all experience levels, 46.5% were practice owners, of which 58.9% were male, 33.5% had a specialty certification, and 64.0% were in companion animal (predominant or exclusive) practice. In addition, 73.5% were practicing in urban or suburban areas.

Quantile regression

Data used in the quantile regression analyses were summarized **(Table 2)**. Clear, significant differences were identified between male and female veterinarians with respect to mean age, mean years of experience, weekly hours worked (albeit this difference was small), percentage with a specialty certification, percentage who were practice owners, percentage working in an urban community, percentages engaging in full-time and part-time work, types of prac-

Table 2—Summary statistics for the veterinarians of Table 1 overall and by gender.

Variable	Overall (n = 2,760)	Male (n = 796)	Female (n = 1,964)	Difference between genders
Age (y)	40.33	45.74	38.14	7.60*
Experience (y)	10.67	15.28	8.80	6.48*
No. of additional degrees	1.12	1.13	1.11	0.02
Weekly hours worked (h)	43.52	45.01	42.92	2.09*
Time away from employment (y)	0.54	0.54	0.54	0.00
Employment status				
Full-time (yes vs no)	0.870	0.896	0.859	0.036†
Part-time (yes vs no)	0.130	0.104	0.141	–0.036†
Specialty certification (yes vs no)	0.076	0.101	0.066	0.035*
Practice ownership (yes vs no)	0.269	0.464	0.190	0.273*
Practice ownership				
Sole proprietor (yes vs no)	0.096	0.167	0.067	0.100*
Partner (yes vs no)	0.045	0.069	0.035	0.034*
Area of workplace				
Rural (yes vs no)	0.311	0.345	0.297	0.049
Urban (yes vs no)	0.157	0.131	0.168	–0.037†
Suburban (yes vs no)	0.532	0.524	0.535	–0.011
Region of workplace‡				
0 (yes vs no)	0.066	0.040	0.076	–0.036*
1 (yes vs no)	0.089	0.098	0.086	0.012
2 (yes vs no)	0.112	0.085	0.122	–0.037*
3 (yes vs no)	0.105	0.103	0.105	–0.002
4 (yes vs no)	0.101	0.091	0.106	–0.015
5 (yes vs no)	0.079	0.085	0.077	0.009
6 (yes vs no)	0.083	0.099	0.076	0.023†
7 (yes vs no)	0.139	0.196	0.117	0.079*
8 (yes vs no)	0.108	0.109	0.108	0.001†
9 (yes vs no)	0.117	0.093	0.127	–0.034

Values for age, experience, number of additional degrees, weekly hours worked, and time away from employment are reported as mean. All other values are reported as proportions.

,†Value represents a significant ($P < 0.01$ or †$P < 0.05$) difference between female and male veterinarians. ‡Regions were defined by zip code as follows: 0 = Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, Rhode Island, and Vermont; 1 = Delaware, New York, and Pennsylvania; 2 = District of Columbia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia; 3 = Alabama, Florida, Georgia, Mississippi, and Tennessee; 4 = Indiana, Kentucky, Michigan, and Ohio; 5 = Iowa, Minnesota, Montana, North Dakota, South Dakota, and Wisconsin; 6 = Illinois, Kansas, Missouri, and Nebraska; 7 = Arkansas, Louisiana, Oklahoma, and Texas; 8 = Arizona, Colorado, Idaho, New Mexico, Nevada, Utah, and Wyoming; and 9 = Alaska, American Samoa, California, Hawaii, Oregon, and Washington.

tice ownership, and percentage working in various regions. Interestingly, no significant difference was identified between male and female veterinarians in time spent away from employment.

To better understand the distribution of practice types among respondents, data on practice type were summarized by income quartile and gender **(Table 3)**. Overall, approximately 82% of respondents were in companion animal practice. Data were also summarized by income quartile and gender **(Table 4)**.

Results of quantile regression analyses for male **(Table 5)** and female **(Table 6)** veterinarians were summarized. For a 1% increase in years of experience, both male and female veterinarians had a significant increase in income across all quartiles, except men in the third (75th percentile) quartile. Men had a slightly higher percentage increase in income from experience than did women across all income quartiles except the third quartile. A squared value for experience was also included in each regression model to determine any nonlinear effects of experience on income. Only women in the first quartile had a negative, nonlinear effect of experience on income, indicating that an additional year of experience for women in this group had a diminishing effect on income. In other words, additional experience for most veterinarians was beneficial to increasing income, but for women at the bottom of the income distribution, each year of experience had a smaller effect on income than did the lesser year of experience, demonstrating diminishing marginal returns to experience for this group.

Both genders had evidence of increasing returns to additional hours worked, but this positive effect decreased when considering the movement into higher quartiles. Indeed, each additional hour worked had the highest impact on income for veterinarians with the lowest incomes, but a smaller impact on veterinarians with the highest incomes in the profession. Having a specialty certification had the opposite ef-

Table 3—Distribution (%) of practice types among the veterinarians of Table 1 overall and by income quartile and gender.

	First quartile		Second quartile		Third quartile		Fourth quartile		
Practice type	**Male (n = 137)**	**Female (n = 553)**	**Male (n = 136)**	**Female (n = 560)**	**Male (n = 182)**	**Female (n = 538)**	**Male (n = 341)**	**Female (n = 313)**	**Overall (n = 2,760)**
Food animal	6.57	2.89	8.82	2.86	3.85	0.74	4.69	0.96	3.01
Mixed animal	12.41	9.58	8.82	9.64	6.59	3.72	8.21	2.56	7.39
Companion animal	59.12	73.78	75.00	84.11	82.42	91.64	78.3	92.97	81.99
Equine	10.22	7.59	6.62	1.79	3.85	2.23	5.87	1.60	4.31
Government	1.46	0.36	0.74	0.54	0.55	0.19	0.29	0.00	0.40
Uniformed services	0.00	0.00	0.00	0.18	0.00	0.00	0.29	0.00	0.07
Industry	0.73	0.00	0.00	0.00	1.10	0.19	0.59	0.00	0.22
Not for profit	0.73	1.08	0.00	0.18	0.00	0.56	0.00	0.00	0.40
University	0.00	0.54	0.00	0.00	0.55	0.19	0.88	0.32	0.33
Advanced education*	5.84	2.71	0.00	0.00	0.00	0.00	0.29	0.00	0.87
Other†	2.92	1.45	0.00	0.71	1.10	0.56	0.59	1.60	1.01

The first quartile represents the 0 to 25th percentile, the second quartile the 25th to 50th percentile, the third quartile the 50th to 75th percentile, and the fourth quartile the 75th to 100th percentile.

*Advanced education was defined as any form of education beyond a DVM degree, including internships and residencies. †Other practice types included animal humane societies, wildlife rehabilitation centers, zoo or aquatic centers, and other similar occupations.[15]

Table 4—Summary statistics for income ($) quartiles of the veterinarians of Table 1 by gender.

	No. of respondents		Mean		SD		Minimum		Maximum	
Income quartile	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
First	137	553	43,424	48,730	18,285	15,220	2,000	1,500	67,000	67,000
Second	136	560	76,715	76,515	5,326	5,437	67,500	67,418	85,000	85,000
Third	182	538	103,195	100,495	10,598	10,298	85,365	85,451	120,000	120,0000
Fourth	341	313	306,956	196,693	623,610	147,545	121,000	121,665	10,000,000	2,000,000
Overall	796	1,964	175,674*	94,413	423,898	76,942	2,000	1,500	10,000,000	2,000,000

*Overall, the mean income for male veterinarians was significantly (*t* test, $P < 0.001$) greater than that for female veterinarians.
See Table 3 for definitions of quartiles.

fect, with no significant difference in income identified between male and female veterinarians for this variable. Unsurprisingly, working full-time (vs part-time, as defined by the respondents) was associated with higher incomes.

Regarding the effect of practice ownership, a significant positive effect on income was identified for male veterinarians across all quartiles except the first quartile. Conversely, a negative impact on income was observed for practice ownership among female veterinarians in the lowest quartile. Only for female veterinarians in the third quartile was a significant increase in income from ownership observed. Among female practice owners, sole proprietorship had an additional negative effect on income for those in the lower half of the income distribution and no discernable positive effect in the upper half of the income distribution. However, partnerships had a significant positive impact on income for female veterinarians in the first and fourth quartiles of the income distribution. Results suggested that type of practice ownership did not impact earnings for male veterinarians. Moreover, the impact on income from general practice ownership was much greater for male veterinarians than for female veterinarians. This suggested that practice ownership was not always beneficial for increasing income among female veterinarians, even though women comprise a majority of the profession.

Among male veterinarians, those working for not-for-profit organizations versus "other" organizations (ie, zoo or aquatic centers and other similar occupations not listed in the survey[15]) earned significantly less at all quartiles of the income distribution, but not overall (Table 5). No significant difference in income was identified between male veterinarians pursuing an advanced education and those working for "other" organizations, suggesting that male veterinarians in a nontraditional practice type had relatively low incomes. Overall, female veterinarians working in companion animal practice versus "other" organizations had significantly higher incomes. Among women in the first quartile, those working in industry earned more than did those working for "other" organizations. Women in the third quartile earned less in equine practice and uniformed services versus "other" organizations, and those pursuing advanced education (vs working for "other" organizations) earned less at every point of the income distribution except the first quartile. These data suggested that women in the "other" category of practice types earned more than did those pursuing advanced education.

Table 5—Results of quantile regression showing the estimated mean (SE) effects of various factors on income (analyzed as natural logarithm) for the male veterinarians (n = 796) of Table 1, controlling for year of survey and region of workplace.

Variable	25th percentile	50th percentile	75th percentile	100th percentile (overall)
ln (Age)	–0.162 (0.140)	0.108 (0.188)	–0.041 (0.257)	–0.021 (0.156)
ln (Experience)	0.254* (0.088)	0.181† (0.091)	0.095 (0.077)	0.161* (0.050)
ln (Experience^2)	–0.023 (0.024)	–0.021 (0.030)	0.021 (0.030)	–0.002 (0.014)
ln (Hours worked)	0.443* (0.087)	0.372* (0.096)	0.384† (0.158)	0.438* (0.079)
ln (No. of additional degrees)	–0.072 (0.099)	–0.086 (0.143)	0.044 (0.113)	–0.003 (0.099)
Time away from employment	–0.038 (0.039)	–0.020 (0.018)	–0.038 (0.021)	–0.038* (0.015)
Specialty certification	0.562* (0.087)	0.575* (0.096)	0.722* (0.115)	0.578* (0.089)
Full-time employment	0.604* (0.092)	0.491* (0.075)	0.352† (0.149)	0.545* (0.116)
Practice ownership	0.144 (0.090)	0.400* (0.096)	0.782* (0.124)	0.431* (0.071)
Sole proprietor	–0.097 (0.099)	–0.018 (0.110)	–0.146 (0.132)	–0.027 (0.077)
Partner	0.139 (0.108)	–0.008 (0.129)	0.015 (0.132)	0.0502 (0.103)
Urban workplace	0.066 (0.075)	0.063 (0.078)	0.165 (0.097)	0.131 (0.082)
Suburban workplace	0.098 (0.055)	0.086 (0.061)	0.139* (0.046)	0.128† (0.057)
Practice type‡				
Food animal	0.384 (0.302)	0.127 (0.349)	0.102 (0.372)	0.006 (0.268)
Mixed animal	0.254 (0.281)	0.078 (0.339)	0.012 (0.365)	–0.059 (0.259)
Companion animal	0.412 (0.305)	0.202 (0.320)	0.148 (0.362)	0.071 (0.243)
Equine	0.004 (0.318)	–0.084 (0.367)	–0.129 (0.415)	–0.224 (0.261)
Government	0.279 (0.726)	–0.173 (0.449)	0.370 (0.472)	–0.286 (0.384)
Uniformed services	0.358 (0.298)	–0.054 (0.345)	–0.699† (0.312)	–0.365 (0.713)
Industry	0.798† (0.315)	0.437 (0.386)	0.661 (0.382)	0.404 (0.384)
Not for profit	–0.742† (0.364)	–1.164* (0.351)	–1.227* (0.378)	–1.204 (0.711)
University	0.417 (0.383)	0.413 (0.440)	0.176 (0.677)	0.292 (0.412)
Advanced education	–0.415 (0.337)	–0.638 (0.351)	–0.643 (0.549)	–0.683† (0.334)

For interpretation of these values, a 1-unit increase in the variable has a corresponding effect on the natural logarithm of income. For independent variables that have been transformed by the natural logarithm (ln), this can also be interpreted as a 1% increase in the variable increases or decreases income by the resulting percentage (stated value multiplied by 100). For binary (categorical) variables, the presence of the variable increases or decreases income by the resulting percentage (stated value multiplied by 100).

‡For practice type, the referent group was other, unlisted types.

See Table 2 for remainder of key.

When considering area of workplace, female veterinarians in a suburban area had a distinctly greater income relative to those in a rural area. Women in the second and third quartiles also earned more in urban areas than in rural areas. For male veterinarians, only those in the third quartile earned more when working in a suburban versus rural area. No significant difference in income was identified between men in urban areas and those in rural areas. Note that these findings for area of workplace were independent of region of workplace (based on zip code), which was controlled for in the analysis.

Results of quantile regression also indicated that time away from employment had a significant and negative effect on income for both male and female veterinarians. However, this effect was noted for male veterinarians only in the fourth quartile of their income distribution, whereas for female veterinarians this effect was observed at every point of the distribution other than the third quartile. This suggested that women were more universally affected by workforce absences, whereas only the top quarter of male earners were affected by workforce absences.

To better compare the importance of the evaluated factors on income and the differences between male and female veterinarians, coefficient plots of the fourth quartile were generated for each gender overall **(Figure 1)**. As noted previously, factors associated with greater incomes included specialty certification, practice ownership, weekly hours worked, and years of experience. Among female practice owners, partnership was the only factor with a significant and positive effect on income. For male veterinarians, a clear benefit was evident simply from practice ownership and not type of ownership. Men earned slightly more per year of experience, whereas women earned slightly more for each additional hour worked; however, no significant difference between genders was identified for either factor. Quantile coefficient plots were also generated to provide a more complete view of the parameter estimates over the quantiles for each gender separately (**Supplementary Figures S2 and S3**, available at: avmajournals.avma.org/doi/suppl/10.2460/javma.258.6.591). These plots showed a clear, negative effect of experience across the income distribution for both genders (eg, at higher incomes, veterinarians gained less income for an additional year of experience than did lower-income veterinarians), whereas practice ownership and specialty certification had a clear positive effect. Other factors had a more nonlinear influence on income throughout the income distribution.

Table 6—Results of quantile regression showing the estimated mean (SE) effects of various factors on income (analyzed as natural logarithm) for the female veterinarians (n = 1,964) of Table 1, controlling for year of survey and region of workplace.

Variable	25th percentile	50th percentile	75th percentile	100th percentile (overall)
ln (Age)	0.158† (0.078)	0.142 (0.077)	0.113 (0.090)	0.165† (0.079)
ln (Experience)	0.247* (0.051)	0.132* (0.032)	0.097 (0.024)	0.154* (0.027)
ln (Experience^2)	–0.047* (0.014)	–0.011 (0.012)	0.005 (0.010)	–0.014 (0.009)
ln (Hours worked)	0.412* (0.081)	0.342* (0.074)	0.333* (0.048)	0.463* (0.041)
ln (No. of additional degrees)	–0.012 (0.047)	–0.026 (0.063)	0.096 (0.050)	–0.010 (0.046)
Time away from employment	–0.038* (0.012)	–0.018† (0.009)	–0.0160 (0.012)	–0.030* (0.008)
Specialty certification	0.457* (0.085)	0.458* (0.056)	0.577* (0.084)	0.481* (0.045)
Full-time employment	0.359* (0.049)	0.326* (0.046)	0.246* (0.045)	0.310* (0.041)
Practice ownership	–0.116† (0.055)	0.104 (0.055)	0.290* (0.069)	0.030 (0.038)
Sole proprietor	–0.174 (0.100)	–0.158† (0.071)	–0.134 (0.099)	–0.135* (0.051)
Partner	0.233* (0.078)	0.124 (0.125)	0.214 (0.143)	0.325* (0.063)
Urban workplace	0.054† (0.026)	0.089* (0.028)	0.064† (0.031)	0.042 (0.033)
Suburban workplace	0.077* (0.021)	0.079* (0.021)	0.057 (0.031)	0.054† (0.025)
Practice type‡				
Food animal	0.255 (0.229)	0.114 (0.155)	–0.096 (0.210)	0.044 (0.126)
Mixed animal	0.184 (0.188)	0.060 (0.146)	–0.160 (0.207)	–0.029 (0.109)
Companion animal	0.324 (0.188)	0.197 (0.151)	0.002 (0.208)	0.206† (0.100)
Equine	–0.155 (0.203)	–0.275 (0.163)	–0.365 (0.198)	–0.279† (0.114)
Government	0.338 (0.238)	0.102 (0.174)	–0.174 (0.242)	0.0405 (0.205)
Uniformed services	0.307 (0.183)	0.047 (0.152)	–0.372 (0.204)	–0.0130 (0.449)
Industry	0.426† (0.167)	0.146 (0.150)	–0.257 (0.199)	0.139 (0.450)
Not for profit	0.254 (0.334)	0.004 (0.207)	0.007 (0.228)	0.041 (0.170)
University	0.296 (0.328)	0.110 (0.317)	–0.082 (0.434)	0.111 (0.220)
Advanced education	–0.492† (0.213)	–0.801* (0.171)	–0.994* (0.256)	–0.672* (0.152)

See Tables 2 and 5 for remainder of key.

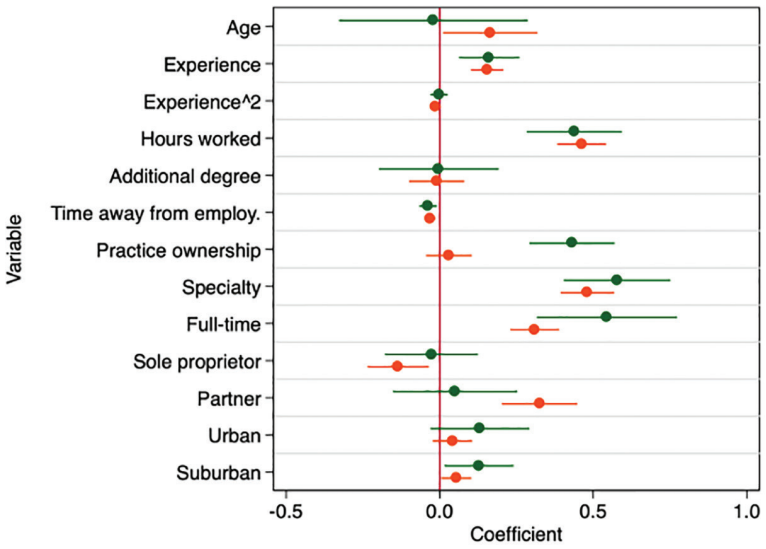

Figure 1—Coefficient plots of estimates derived for the 100th percentile (ie, all respondents) showing the effects of various factors on the natural logarithm of total annual income ($) for male (n = 796; green) and female (1,964; orange) veterinarians participating in the 2016 and 2017 AVMA Census of Veterinarians. Point estimates can be interpreted as the effects of changes in the variables on the natural logarithm of annual income. Dots represent point estimates, and bars represent 95% CIs. Coefficients for which the 95% CI does not cross 0 were considered significant.

Discussion

The gender wage gap among veterinarians is a prevalent concern within the profession and an important area to study. Although this wage gap among new graduates is easy to estimate, the disparity across veterinarians with more experience is much more difficult to analyze owing to the multitude of unique paths a career can take. Nevertheless, characteristics of veterinarians can be analyzed to determine whether factors such as experience, clinic ownership, practice type choice, and specialty certification influence the earning potential of female and male veterinarians differently. By identifying whether these factors affect income, strategies can be formulated to address the underlying issues.

As shown in the present study, the distribution of incomes between genders was not equal. This inequality was predominately evident within the top

half of earners. Of all veterinarians who earned > $120,000, almost half were practice owners and over half of practice owners were male. Among the top 25% of earners, a mean income difference of approximately $100,000 was found between men and women. Within this segment of the income distribution, 70% of male veterinarians but only 44% of female veterinarians were practice owners. However, as shown through quantile regression analysis, female veterinarians did not necessarily receive an increase in income from practice ownership. Rather, our analysis showed that the type of ownership (sole proprietorship vs partnership) was important in this regard. Partnerships were more beneficial to women's income than were sole proprietorships, whereas any form of ownership benefitted men's incomes. A meta-analysis of existing studies may provide a better view of gender disparities.

As previously noted, practice owners are often compensated differently than associates or nonowners are. In controlling for practice ownership status in our analyses, we were better able to make direct comparisons between genders. The finding that practice ownership was not universally beneficial with regard to income for female veterinarians has important implications for future research analyzing risk-taking behavior and practice ownership. A negative return to practice ownership, as observed for some female veterinarians in the present study, is counterintuitive but potentially explainable. For example, previous literature[10] suggests that clients can have gender biases that could affect a veterinarian's income potential. In addition, female small business owners generally have smaller scale operations and receive less external financing for new businesses than do their male counterparts.[17] Without evaluation of practice management and other data, however, the precise nature of income differences between male and female practice owners remains unknown.

Findings regarding area of workplace in the present study suggested that female veterinarians may be seeking employment in urban or suburban areas, where there appeared to be higher income potential for them. Considered together with the shift in gender composition of the veterinary profession, these results might explain in part the dwindling percentage of veterinarians working in rural areas.

As previously reported,[18] absences from the workforce can negatively affect women's incomes more than men's, particularly in science-, technology-, engineering-, and mathematics-related careers. Results of quantile regression in the present study indicated that time away from employment had a significant, negative impact on income for both male and female veterinarians. However, only male veterinarians in the upper half of their income distribution were affected, whereas female veterinarians were affected at every point of their distribution other than the 75th percentile, suggesting they were more universally affected.

Although a large sample of the US veterinarian population was included, the present study had several weaknesses that should be considered when interpreting the results. First, only 7% of all distributed surveys were used in the analysis, leaving the findings vulnerable to nonresponse bias. Veterinarians in experience categories > 25 years were underrepresented and should be included in future studies of gender income disparities. Further, specialty certifications were grouped together owing to the small numbers in some specialty groups, obscuring the potential effect of specialty on income. Future research into income disparities should include stratified subsamples of veterinarians within the various specialty fields. The survey also did not include questions about the number of various staff (eg, veterinarians or veterinary technicians) in the respondents' workplace, which has been known to play a role in income earning potential.[19] In addition, the present study represented a random selection of veterinarians at a single point in time, and it would be interesting to collect data from the same respondents every year to track their earning paths. A further limitation was the lack of inclusion of other variables that might influence the gender wage gap. For example, in recent work related to labor market disparities, Blau and Kahn[8] suggested that noncognitive (or "soft") skills are an overlooked source of wage differences. Within this vein of research, Santos-Pinto[20] found that women generally have less self-confidence than men owing to societal norms and that measures of confidence impact earnings. Although this is just 1 example of noncognitive skills, such types of variables are rarely measured within the veterinary profession; however, it is important to note that the field of labor market disparities is evolving and further research into the impact of noncognitive skills is warranted.

Considering all of the factors identified in the present study, it is important to find solutions to alleviate the disparities in earning potential between genders. From an economic perspective, women in the present study did not necessarily have a comparative advantage in owning a veterinary practice given that the opportunity cost (the value of the next best alternative) would be to pursue specialty certification or increase work hours to increase income. For veterinarians who do not own their practices, income transparency may help to decrease income disparities within a business[21]; however, this would need to be adopted by the entire industry to address the problem on a wider scale.

Similar to findings in human medicine, wage gaps were identified between male and female veterinarians in the present study that began early in their careers (ie, the first 20 years) but generally dissipated after their career peak (25 to 30 years). This observation has important implications for lifetime wealth and earnings because men, on average, will have a larger sum of wealth at the end of their careers than will women. Moreover, potential explanations

for gender disparities in human medicine[22] include issues of doctor-patient relationships (eg, time spent with patients), schedule flexibility regarding family obligations or childcare, and discrimination.

Overall, although several factors were investigated in the present study that explained a part of the gender wage gap, many unknowns remained. In our view, the most prominent question that remains is why female practice owners earn less than male practice owners, even after controlling for other factors. Although not addressed in the present study, it would also be important to better understand income disparities across minorities and the income disparities between genders within minority groups. A more focused survey that includes exploration of noncognitive skills is also warranted. The focus of the present study was on the wider problem of gender disparity within earnings, and we hope the findings will support the momentum of creating pay equality for everyone in veterinary medicine.

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The authors declare that there were no conflicts of interest.

Footnotes

a. SAS, version 9.4, SAS Institute, Cary, NC.
b. Stata, version 12, StataCorp, College Station, Tex.

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